

# 7 ECOLOGY

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# 7 ECOLOGY

## 7.1 Introduction

7.1.1 This Chapter identifies and evaluates the potential effects to ecological systems arising from the Development, as described in Chapter 4 Project Description. The chapter will also identify measures to mitigate the effects of significant adverse effects as necessary as part of this assessment.

7.1.2 Potential effects on the ecological features are interrelated with effects from air quality and water quality. This chapter should be read in conjunction with Chapter 9 Water Resources, Chapter 14 Air Quality and Chapter 17 Cumulative Effects.

### *Summary of 2012 Environmental Statement Chapter*

7.1.3 The approved scheme is within a series of disused quarries and makes innovative use of a former industrial location. One Statutory Site was taken forward in the impact assessment, that being Llyn Padarn, an SSSI. Other parts of the Development comprise of two disused quarries and their surrounding habitats including existing man-made spoil heaps, plantation woodland, heathland (Q1 – Quarry 1) and an industrial park (Q6 – Quarry 6). The key species found in the vicinity are bats, corvids (chough), raptors and ground nesting birds, fungi (waxcaps), lichen, reptiles (common lizard and slow worm).

7.1.4 Impacts were to be mitigated through funding enhancement of appropriate quarry voids on the site (in line with the agreed bat mitigation strategy, implementation of a CEMP to manage dust, noise and other pollution control. Pre-construction surveys, method statements for installation, screening, monitoring and management of Llyn Padarn. European Protected Species (EPS) licences will be applied for and their conditions followed where required. This resulted in residual effects which were considered to be not significant.

*Scope of 2015 Environmental Statement Chapter*

7.1.5 Survey works have been ongoing, as agreed with NRW and Gwynedd Council, since the approved scheme was submitted and approved. Therefore this chapter has been updated with information from the following surveys:

- Extended Phase 1 Habitat Survey completed by AECOM in 2013;
- Extended Phase 1 Habitat Survey completed by AECOM in 2015;
- Freshwater surveys in Q1 and Q6 for diatoms, phytoplankton, invertebrates, fish, and aquatic plants completed by ENSIS Ltd. on behalf of AECOM in 2015;
- Aquatic plant surveys for floating water plantain (*Luronium natans*), spring quillwort (*Isoetes echinospora*) and Canadian/Nuttall's (*Elodea* sp.) pondweed undertaken by ENISIS Ltd. within Llyn Padarn in 2015;
- Winter/Hibernation Bat Surveys completed by AECOM 2012 – 2013;
- Summer Bat Surveys completed by AECOM in 2013;
- Winter/Hibernation Bat Surveys completed by AECOM in 2014;
- Breeding Bird Surveys completed by Enfys Ecology on behalf of AECOM in 2013;
- Breeding Bird Surveys completed by AECOM in 2015; and,
- Arboricultural Assessment to BS 5837:2012 of Trees completed by Fairly Arboriculture & Landscape Planning in 2013.

7.1.6 The following surveys have not been updated, but the information used to inform the chapter:

- National Vegetation Classification (NVC) Survey undertaken in 2011 and 2012 by Gritten Ecology;
- Freshwater assessment completed by Etive Ecology in 2012;
- Fungi survey completed by Debbie Evans in 2012;
- Lichen survey completed by S.P. Chambers in 2012;

- Amphibian survey completed by Cambrian Ecological Partnership (CEP) in 2010;
- Reptile survey completed by CEP in 2011;
- Winter bird surveys completed by CEP in 2012;
- Badger surveys completed by CEP in 2011; and,
- Otter survey completed by CEP in 2012.

7.1.7 It has been confirmed in the responses to the Scoping letter (submitted on the 12<sup>th</sup> November 2014) from Natural Resources Wales (NRW) and Gwynedd Council that they are satisfied with this approach. This can be found in Sections 7.6 and 7.7.

7.1.8 Section 7.2 has also been updated to recognise the relevant legislation and guidance when preparing a Development Consent Order (DCO).

## **7.2 Summary of Relevant Planning Policy**

### *National Policy Statements*

7.2.1 Section 5.3 of the Overarching National Policy Statement for Energy (EN-1) (July 2011) is dedicated to conserving biodiversity and geology, in this case only biodiversity will be considered. The relevant measures in place to conserve biodiversity include:

- International sites (Ramsar, Special Area of Conservation (SAC), Special Protection Area (SPA) (including proposed sites));
- Site of Special Scientific Interest (SSSI);
- Regional and local sites (e.g. Local Nature Reserves (LNR));
- Ancient woodland and veteran trees;
- Biodiversity within developments;
- Protection of habitats and other species (i.e. species and habitats of principle importance nationally, or species and habitats of regional importance; and,
- Mitigation.

### *Planning Policy Wales*

7.2.2 Chapter 5 of Planning Policy Wales (7<sup>th</sup> Edition, July 2014) is dedicated to conserving and improving natural heritage. The relevant measures in place to conserve landscape and biodiversity include:

- Statutory designations;
- Non-statutory designations;
- LANDMAP Information System;
- Development plans and the conservation and improvement of the natural heritage;
- Development management and the conservation and improvement of the natural heritage; and,
- Protected species.

*Technical Advice Note*

7.2.3 Technical Advice Note (TAN) 5, Nature Conservation and Planning (2009), provides advice about how the land use planning system should contribute to protecting and enhancing biodiversity and geological conservation.

7.2.4 TAN 5 provides advice for local planning authorities on:

- The key principles of positive planning for nature conservation;
- Nature conservation and Local Development Plans (LDPs);
- Nature conservation in development management procedures;
- Development affecting protected internationally and nationally designated sites and habitats; and,
- Development affecting protected and priority habitats and species.

7.2.5 It is proposed that the best practice as outlined in TAN 5 will be followed. Due regard was paid to The Chartered Institute of Ecology and Environmental Management (CIEEM) Guidelines for Ecological Impact Assessment (EclA) in the United Kingdom (IEEM, 2006) in the preparation of this EclA.

*Local Planning Policies*

*Unitary Development Plan (UDP)*

7.2.6 The Gwynedd Unitary Development Plan (UDP) 2001-2016 was formally adopted in 2009. The main objective of the UDP is to ensure sustainable development and to create favourable circumstances to protect, support and develop communities culturally, environmentally and economically. Policies concerning the environment are included in Part 2; Chapter B -Effective Protection of the Environment. This includes guidance on:

- Historic resources;
- Protected countryside and open spaces;
- Biodiversity and Geodiversity;
- Improving the quality of the environment in Gwynedd and protecting local distinctiveness; and,
- Managing developments on site that are 'At Risk' and developments that create risk.

7.2.7 Policies B15 through to B21 provide land use planning guidance in respect of development that affects statutory protected and locally or nationally valued habitats and species:

- Policy B15 - Protection of International Nature Conservation Sites. Developments that are likely to cause direct or indirect significant harm to SACs, SPAs or Ramsar site will be refused unless the following strict criteria outlined in the plan are met:
  - There is no alternative solution;
  - There are imperative reasons of over-riding public interest for the development which over-ride the ecological importance of the site; and,
  - When priority habitats or species are affected, the only considerations which could justify granting planning permission are those associated with public health, public safety or those that bring benefit of primary importance for the environment.

7.2.8 If granted, the location, design and construction of the development should minimise damage to ecological features, opportunities for ecological gains are taken and compensation provided, remaining habitats are protected and enhanced. A Habitats Regulations Assessment (HRA) will be required in order for the planning authority to approve the application; this will require consultation with NRW.

- Policy B16 - Protecting Nationally Important Conservation Sites. Developments likely to cause direct or indirect significant harm to a SSSI or National Nature Reserve (NNR) will be refused unless:

- The location, design and construction of the development is such that damage to nature conservation features are minimised and opportunities for nature conservation gain are taken, compensating and equivalent nature conservation features are provided; and,
- The remaining nature conservation features are protected and enhanced and provision is made for their management.

7.2.9 Consultation with NRW will be required in order to approve developments which have significant effects on nationally designated sites. The Local Planning Authority (LPA) will ensure that developers provide alternative biodiversity sites locally which provide suitable long term replacement habitat.

- Policy B17 - Protecting Sites of Regional or Local Significance. Proposals likely to cause direct or indirect significant harm to a LNR or Non-statutory Nature Reserve (NsNR) or Wildlife Site (WS) will be refused unless:

- The damage to nature conservation features can be prevented and the developer takes steps to protect, enhance and manage nature conservation features; and,
- The proposal is required in order to fulfil social, environmental or economic needs that override the site's regional or local importance.

The LPA will assess the site based on ecological survey results and consultation with NRW. Damage to nature conservation sites must be minimised, compensatory habitats will be provided and habitats within the Order Limits will be protected and enhanced.

- Policy B19 - Protected Trees, Woodland and Hedgerows. Proposals which lead to the loss or damage to a tree, woodland or hedgerow that is protected or lies within a designated ancient and semi-natural woodland will be permitted only where any harm is clearly outweighed by the economic or social benefits of the development.
- Policy B20 - Species and their Natural Habitats that are internationally and nationally important. Proposals likely to result in direct or indirect unacceptable disturbance or harm to protected species and their habitats will be refused unless:
  - In the case of European Protected Species:
    - There is no satisfactory alternative;
    - The development will not be detrimental to the maintenance of the population of the species and a favourable conservation status is maintained; or,
    - The development will preserve public health or public safety.
  - In the case of nationally protected species:
    - The effects will be minimised or mitigated through design and construction processes; and/or,
    - The developer will take steps to relocate the species or habitat.
- Policy 21 - Wildlife Corridors, Habitat Linkages and Stepping Stones. Development which may adversely affect the integrity or continuity of these landscapes will only be permitted if the reasons for the development outweigh the need to retain the features and mitigating measures can be provided, which would reinstate the integrity or



continuity of the features. Appropriate management of these features will be encouraged.

7.2.10 Supplementary advice regarding wildlife sites is provided in *Supplementary Planning Guidance: Wildlife Sites* (GC, 2010).

#### Local Development Plan (LDP)

7.2.11 The Joint Local Development Plan (JLDP) for Gwynedd and Anglesey is currently being produced and is due to be adopted from May 2016. The JLDP will provide guidance and policies to achieve sustainable development over a 15 year period. Its aim is to guide the development of housing, retail, employment and other uses. It includes policies which will aid the LPA's decisions with regard to planning applications and protect areas to ensure maintenance and enrichment of the natural and built environment.

### **7.3 Methodology**

#### *General Development Description*

7.3.1 The Order Limits, which covers approximately 91.24ha in area, encompasses seven disused slate quarries, the Glyn Rhonwy Industrial Estate platforms and an area adjacent to Llyn Padarn. A former World War II munitions store (referred to as the 'Bomb Store') is not included within, but is within close proximity to, the Order Limits. The Glyn Rhonwy quarry has been abandoned since 1975. The Order Limits is centred at the approximate National Grid Reference (NGR) SH 56268 60660. The town of Llanberis is located to the south east of the Order Limits.

7.3.2 There is a small internal road network leading to Glyn Rhonwy Industrial Estate platforms in the south and from the A4085 in the north. Ffordd Clegir road separates two of the lower quarries and also forms the western boundary of the Glyn Rhonwy Industrial Estate. Llyn Padarn is located to the east.

7.3.3 There are a number of tunnels associated with the quarries. Some tunnels pass between two quarries, although due to rock falls in some tunnels the original connectivity has been lost and exact connection cannot be confirmed. The Order Limits is often subject to unauthorised access and

vandalism with resulting disturbance to many of the quarries, tunnels and Bomb Store.

7.3.4 Habitats include slate waste heaps, slate plateaus, semi natural and plantation broadleaved woodland, coniferous plantation woodland, coniferous woodland – recently felled, mixed woodland – semi-natural, scrub – scattered, acid grassland – semi-improved, marshy grassland, bracken, wet dwarf shrub heath, dry heath / acid grassland, flush and spring – acid / neutral flush, running water, standing water, quarry and wall. Oligotrophic standing water is present in Llyn Padarn. Water is present in two of the quarries, especially in Q6 adjacent to the Glyn Rhonwy Industrial Estate plateau where it is estimated to be approximately 20 – 30m deep.

7.3.5 The slopes around the quarries are built up with slate waste. There is encroachment of natural habitats within the disused quarries at lower elevations, including broadleaved trees, heath and scrub.

7.3.6 The habitat within the Order Limits includes open, upland habitat in the eastern section of the Order Limits in the vicinity of Q1 and Q2. In this area trees are scarce and the habitat is dominated by grazed acid grassland, exposed rock and heath. As the Order Limits descends to lower altitudes this gradually changes with some minor tree and vegetation cover being present around the perimeter of Q3 and Q4. Broadleaved woodland becomes more prevalent at the lower elevation of the Order Limits in the vicinity of Q5, Q6, & Q7. These woodland habitats have woodland cover that is almost continuous in places.

#### *Electrical Connection*

7.3.7 The indicative route of the electrical connection follows the A4086, A4244 and B4547 roads to an electricity sub-station approximately 7km north of the Order Limits. The electrical connection encompasses semi-improved grassland verges, hedgerows and scrub. Adjacent habitats to the electrical connection include improved and semi improved fields, coniferous plantation woodland and semi-natural mixed and broadleaved woodland. The electrical connection crosses two rivers: the Afon Cegin and Afon Rhythallt. The electrical connection crosses 17 other mapped streams or

ditches which were not visible during the survey or may be culverted under roads. The electrical connection passes through the village of Brynrefail and past a number of small settlements and individual dwellings. Llyn Glan-Rhyd reservoir is located 50m east of the north end of the electrical connection.

7.3.8 The potential intra-project effects of the electrical connection are described within Chapter 17 Cumulative Effects. As this is Associated Development, consenting this will be addressed outside the DCO application and as such assessment of potential effects will be as part of that process when the route is confirmed by SP Manweb.

*Desk Study*

7.3.9 An update to the desk study was conducted in 2014. The objective of the desk study was to review the existing information available in the public domain concerning species and habitats. The following information was compiled:

- Internationally and nationally designated sites up to 2 km from the Order Limits using the MAGIC website ([www.magic.gov.uk](http://www.magic.gov.uk)) [Accessed on 20<sup>th</sup> November 2014];
- Locally designated sites, up to 2 km from the Order Limits from North Wales Environmental Information Service (Cofnod) [Records received 20<sup>th</sup> January 2014];
- SACs and SSSIs designated for bats up to 10 km from the Order Limits in accordance with Bat Surveys – Good Practice Guidelines (Hundt, 2012);
- Records of protected species within 2 km and records of bat species within 5 km of the Order Limits from North Wales Environmental Information Service (Cofnod) [Records received 20/1//14];
- The Gwynedd Local Biodiversity Action Plan (LBAP) list of species and habitats was reviewed;
- The Natural Environment and Rural Communities Act 2006, Section 42 List of species and habitats of principal importance in Wales was reviewed;

- Aerial photographs and Ordnance Survey (OS) maps were reviewed identify features of ecological interest surrounding the Order Limits including ponds within 500m of the Order Limits, nearby areas of ecological interest and features connecting these habitats (e.g. hedgerows, watercourses, railway lines);
- GC was contacted for records of Tree Preservation Orders (TPOs) within the Order Limits in 2013, the results of which were considered to be valid for 2014; and,
- The British Trust for Ornithology (BTO) local recorder was contacted for local ornithological records [Letter dated 20/11/14].

7.3.10 The National Biodiversity Network (NBN) restricts the use of its data for commercial purposes and its records are not available at a high enough resolution to support survey and development decisions. Therefore the NBN was not consulted as part of the desk study.

7.3.11 Previous reports of ecology surveys carried out by or on behalf of AECOM within all or part of the Order Limits were reviewed:

- AECOM. (2013a) Glyn Rhonwy Pumped Storage Scheme Breeding Bird Report. December 2013;
- AECOM. (2013b) Glyn Rhonwy Pumped Storage Scheme - Summer Bat Survey Report. December 2013;
- AECOM. (2013c). Glyn Rhonwy Pumped Storage Scheme - Bat Mitigation Report. April 2013;
- AECOM. (2014a) Glyn Rhonwy Pumped Storage Scheme – Winter Hibernation Bat Report. March 2014;
- AECOM. (2014b). Glyn Rhonwy Pumped Storage Bat Licence Method Statement Background Supporting Information and Delivery Information;
- AECOM. (2015a) Glyn Rhonwy Pump Storage Scheme – Phase 1 Habitat Report. May 2015;
- AECOM (2015b) Glyn Rhonwy, Llanberis Non-Confidential Breeding Bird Survey Report. May 2015;

### *Extended Phase 1 Habitat Survey*

- 7.3.12 A Phase 1 Habitat Survey (JNCC, 2010) of the Order Limits plus the indicative electrical connection route was completed by AECOM on 11<sup>th</sup> September 2013. This is provided in Volume 3, Appendix 7.1. All results were recorded using a handheld GIS device (Trimble Juno SD/SB) to aid mapping of habitats and features. The weather during the 2013 survey period was mixed sunshine and showers, and during the 2015 survey period was strong winds, and mixed sunshine and cloud.
- 7.3.13 The survey involved a walkover and preliminary assessment of habitats, land use and ecological features. The main habitats present were recorded using standard Phase 1 Habitat Survey methodology as described in the Handbook for Phase 1 Habitat Survey: A technique for Environmental Audit (JNCC, 2010). The plant species defining the habitat types within the Order Limits were recorded.
- 7.3.14 The Phase 1 Habitat Survey was 'Extended' by including a desk study, as described above, and an assessment of the potential for the Order Limits to support protected species in order to identify potential ecological constraints and to guide recommendations for further Phase 1 Survey requirements for these species. Evidence of any invasive plant species subject to legal controls was recorded. The Extended Phase 1 Habitat Survey report is contained within Volume 3, Appendix 7.1.

### *Freshwater Surveys of Q1 and Q6*

- 7.3.15 To establish presence/absence of rare or protected species, and also presence/absence of non-native or invasive species within the water within Q1 and Q6 a number of surveys were conducted using the following methodologies.

### *Aquatic Plant Survey*

- 7.3.16 Due to their relatively small size, a full survey of the littoral zone was possible. Using an inflatable boat, a visual survey was made of the entire littoral zone (0 – 2.5 m depth) with an underwater viewer (bathyscope). The water was sufficiently clear in both sites to give a good visual range to >3 m.

Normally, a grapnel is used for detecting deeper plants, but the potential of unexploded ordnance within the Q6 site made this unsafe. The grapnel also proved ineffective in Q1 due to the steeply shelving sides and prevalence of large boulders.

7.3.17 The results are included in the protected or notable species Table 7-7 and the full report is provided in Volume 3, Appendix 7.19.

#### Diatom Sampling

7.3.18 When collecting diatoms samples for water framework directive purposes it is normal to account for seasonal variation within the population by sampling during the spring and again in the autumn as detailed within the standard Environment Agency methods (EA Operational Instruction 27\_07). For the purposes of a biological species assessment however, a more complete assessment of the diatom species within a site can be gained by analysing the preserved frustules (siliceous cell walls) from the surface sediments of the deepest point of the water body. This type of sampling provides a diatom assemblage that is representative of the whole water body (not just the littoral benthos) over a period of the past few years and is therefore deemed more appropriate for this project.

7.3.19 Neither site had any significant sediment deposits, but small quantities of the fine sediments overlying the boulders were collected from the deepest point of both quarries (7.3 m in Q1 and 17 m in Q6) using a Renberg gravity corer. In addition samples were also collected from the littoral zone by scraping and gently brushing the surface of five submerged cobbles and collecting the dislodged material into sample phials. All samples were preserved with Lugol's iodine for transport to the laboratories at University College London (UCL).

7.3.20 In the laboratory, the samples were processed and the diatom values identified to species level using high powered light microscopy.

7.3.21 The results are included in the protected or notable species Table 7-7 and the full report is provided in Volume 3, Appendix 7.19.

### Phytoplankton Sampling

7.3.22 Phytoplankton samples were collected from Q1 and Q6 sites. The samples were collected using standard methods for boat sampling as described in “Sampling lakes for water chemistry and phytoplankton” (EA Operational instruction 19\_07). In summary, a single sample was taken from each site using a 25 mm diameter hose. Samples were transferred to sterile sample containers and preserved with Lugol’s iodine as described in EA Operational instruction 87\_07. Samples were analysed in a laboratory.

7.3.23 The results are included in the protected or notable species Table 7-7 and the full report is provided in Volume 3, Appendix 7.19.

### Chironomid Pupal Exuvial Technique (CPET): Sampling and Analysis

7.3.24 The exuviae were sampled by taking sweeps across the water surface with a fine mesh (<250 µm) net from around the lee shore of the quarry sites. The exuviae are then carefully transferred to a suitable container and preserved in denatured alcohol. A single sample was collected from each site (Q1 and Q6) and these have been archived for future analysis if required.

7.3.25 The adult stage of chironomids are mobile up to several kilometres and therefore there are no barriers for their dispersal to and from the Glyn Rhonwy quarry sites and the nearby Llyn Padarn SSSI and Afon Gwyrfa a Llyn Cwellyn SAC. The value of analysing CPET is therefore limited for this project.

### Aquatic Invertebrate Survey

7.3.26 Aquatic invertebrate samples were collected from four separate locations around the littoral zone of the quarries to maximise the detection of species and to ensure full coverage of the site. Due to the limited extent of loose material and suitable invertebrate habitat, the sampling locations were limited to the availability of habitats rather than the planned stratified sampling.

7.3.27 At each sample location, three minute kick / sweep samples were conducted within the main habitats (mainly gravels and cobbles). Samples from each



habitat were combined, but the samples from each sample area were analysed separately. Any free swimming or surface dwelling invertebrates observed during the survey were also recorded. Samples were preserved in alcohol and transported to the laboratories at UCL for further analysis.

7.3.28 In the laboratory, the samples were sorted and all invertebrates picked and identified to species level where possible. The samples have been preserved and archived at UCL.

7.3.29 The results are included in the protected or notable species Table 7-7 and the full report is provided in Volume 3, Appendix 7.19.

#### Fish Survey Q1 and Q6

7.3.30 On day one, gill nets were set in Q6 using a 3 m fibreglass dinghy and left over night. Assuming a depth of around 17 m as indicative, several multimesh gill nets (30m x 1.5 m with variable mesh size) were set at different depths to sample the limnetic habitat. The number, location and depths of the nets depended on the size and depth of the water present. A fyke net was also set depending on the availability of suitable water depths. The fyke net channelled any species encountering a vertical guide net (wing or leader) into a net bag from which they cannot escape easily. This method is qualitative and provides another method for identifying species which may not be caught by other means.

7.3.31 On the morning of day two, an electric fishing survey of the littoral margin and any shallow areas (< 2 m deep) was conducted using Point Abundance Sampling (PAS) from the 3 m dinghy. This technique entails the use of a 1KVa generator, a cathode and a long handled anode used to induce galvanotaxis (movement in response to an electric current) and temporary incapacitation of fish within a specific sphere of influence (allowing the calculation of densities). Fish within this sphere of influence are collected with a long handled net and processed. Sample points are carried out so that they are independent of each other but so that they cover the target habitat as thoroughly as possible. The species, length (mm), weight (g) (for larger specimens or European eels) and general condition of fish caught was be recorded. Following the electric fishing survey the gill and fyke nets



were retrieved and any fish caught processed. Details of any catches were recorded as described for the gill net fishing above.

- 7.3.32 On the afternoon of day two, nets were be set in the smaller Q1 site; the choice of method being dependent on access restrictions and depth of the water. The morning of day three was spent electric fishing and removing and processing the nets in Q1 as above.
- 7.3.33 The results are included in the protected or notable species Table 7-7 and the full report is provided in Volume 3, Appendix 7.19.

*Freshwater Plant Surveys – Llyn Padarn 2015*

- 7.3.34 Aquatic plants (including floating water plantain, spring quillwort and Canadian/Nuttall's pondweed) were surveyed in an area approximately 100m either side of the proposed spillway location (SH5727961170) to the maximum depth of plant colonisation (c. 5.4 m). Surveys were conducted using snorkelling to ensure a full assessment of all plants was achieved; a method which has proved extremely effective for determining the population size and distribution of floating water plantain in clear-water lakes (Goldsmith et al. 2014).
- 7.3.35 The snorkel survey was carried out on June 22nd 2015 by two PADI qualified divers. Surveys were carried out under NRW Protected Species Licence 59401:OTH:SP:2014.
- 7.3.36 When in the water, the snorkeler had very good vision of the littoral zone to a depth of approximately 2.5 m; a short dive to 2.5-4.0 m was adequate to gain a good view to 6.0 m. The entire littoral zone of the survey area was searched to a depth of 6.0 m. Plants were recorded on a 1 – 5 abundance scale at each point whereby a 1 = a single plant, 2 = occasional, 3 = frequent (c. 20% cover), 4 = abundant and 5 = dominant (>50% cover). Each species was mapped over an outline of the survey area and colour coded for its abundance at each point.
- 7.3.37 The results are included in the protected or notable species Table 7-7 and the full report is provided in Volume 3, Appendix 7.19.

*Breeding Bird Surveys 2013 and 2015*

- 7.3.38 Breeding bird surveys have been undertaken since 2011 and were completed in 2013 by Enfys Ecology on behalf of AECOM (AECOM, 2013a). Further surveys were undertaken by AECOM and Enfys in 2015 (AECOM, 2015b; Enfys, 2015).
- 7.3.39 The two transects used in the CEP 2011 survey were adopted to aid comparison between 2011, 2013 and 2015. Thus Q1 and Q2 with surrounding habitat were covered by the Upper Transect, Q3 to Q6 and surrounding habitat were covered by the Lower Transect. For the 2015 survey the transects were extended slightly to account for the increase extent of the Order Limits. Furthermore, owing to this increase in extent, other areas including Q7 and Q8 were also surveyed for the presence of birds.
- 7.3.40 Each transect was walked at a steady pace, with stops for scanning of each quarry void. All birds encountered by sight or sound were recorded on a map using BTO two-letter codes and territorial activity was noted using BTO Common Bird Census notation.
- 7.3.41 The visits involved recording all of the bird species observed, their locations and activity/behaviour. The surveys were carried out between dawn and mid-morning, and from early evening to dusk as much as was practically possible.
- 7.3.42 The 2013 and 2015 breeding bird surveys were carried out using an amended Brown and Shepherd (1993) method in combination with the Common Birds Census (CBC) methodology described in 'Bird Monitoring Methods' (Gilbert et al., 1998).
- 7.3.43 Three survey visits were carried out on the following dates in late spring/early summer 2013: 15<sup>th</sup> – 22<sup>nd</sup> April, 16<sup>th</sup> May and 27<sup>th</sup> June, with a gap of at least 4 weeks between visits; three surveys visits were carried out on the following dates in 2015: 8<sup>th</sup> April, 29<sup>th</sup> April and 19<sup>th</sup> May.
- 7.3.44 The reports are contained within Volume 3, Appendices 7.11 and 7.20 and within Confidential Appendices 7.1, 7.2 and 7.4.

*Assessment of Bat Potential*

- 7.3.45 The tunnels and quarries within the Order Limits has been subject to extensive bat surveys since 2010, initially undertaken by CEP as part of the 2012 ES and latterly by AECOM to support the recently submitted bat license and also to support this ES for the DCO.
- 7.3.46 During the Phase 1 Habitat Survey in 2013 and 2015, trees, structures and buildings at the eastern end of the Order Limits at Llyn Padarn were assessed for their bat roost potential. This was completed via an external appraisal from the ground using binoculars where necessary. Table 7-1a and 7-1b below outline the categories used for trees and buildings. Category descriptions are drawn from Hundt 2012 and Mitchell-Jones, 2004.

<b>Table 7-1a: Building Bat Roost Potential Categories</b>	
<b>Roost Potential</b>	<b>Description</b>
Known or Confirmed	Confirmed signs of bat presence/ occupation (droppings, oily staining around entry points, insect remains, odour, scratching) and actual bat presence.
High	Features present with high potential to support roosting bats. These include structures with points of access to the interior through degraded/missing mortar/brickwork/roof tiles/hanging tiles. Proximity to good foraging habitat such as woodland, good hedgerows and/or water.
Moderate	Features with some potential to support roosting bats. Access points into structures may include mortar cracks in brickwork or holes in soffits/fascias.
Low	Limited roosting potential. Structures in good condition with no access into structure visible with few features of bat interest.

<b>Table 7-1a: Building Bat Roost Potential Categories</b>	
<b>Roost Potential</b>	<b>Description</b>
Negligible	Negligible potential for roosting and bats very unlikely to be present. Includes structures constructed from unsuitable materials e.g. prefabricated with steel, draughty, light and cool buildings with no roosting opportunities.

<b>Table 7-1b: Tree Bat Roost Potential Categories</b>	
<b>Roost Potential</b>	<b>Description</b>
Known or confirmed	Confirmed signs of bat presence/ occupation (droppings, oily staining around entry points, insect remains, odour, scratching) and actual bat presence.
Category I*	Trees with multiple, highly suitable features capable of supporting larger roosts.
Category I	Trees with definite bat potential, supporting fewer suitable features than Category I* trees or with potential for use by single bats.
Category II	Trees with no obvious potential, although the tree is of a size and age that elevated surveys may result in cracks or crevices being found; or the tree supports some features which may have limited potential to support bats.
Category III	Trees with no potential to support bats.

*Bat Surveys 2013 – 2014*

7.3.47 Since 2010 several bat surveys have been conducted, undertaken by or on behalf of AECOM Ecology, and have been summarised in Section 7.6.

7.3.48 A series of bat surveys have been completed by AECOM within the Order Limits over two years. This survey methodology section has been split into:

- Winter Surveys 2013 (Jan, Feb and March) - comprising internal inspections;
- Summer Surveys 2013 (July, Aug and Sept) - comprising walked transects, automated logger surveys and internal inspections; and
- Winter Surveys 2014 (Jan and Feb) - comprising automated logger surveys and internal inspections. The methodology, timing, weather and personnel for each survey will be discussed under each. Constraints and limitations will be discussed collectively at the end.

#### Winter 2013

##### **Internal Inspections**

7.3.49 Internal inspections of the tunnels which may be impacted upon by the Development were completed once a month by AECOM on 30<sup>th</sup> January, 25<sup>th</sup> February and 25<sup>th</sup> March 2013. Inspections were undertaken by licensed bat ecologists. Signs of roosting bats, such as droppings, staining, feeding remains and live bats were recorded. At the time of these surveys Tunnels, 3, 4, 5, 6, 7 and 8 were considered not at risk of demolition or disturbance during both construction and operation and were not surveyed. The following tunnels were surveyed: Tunnels 1, 2, 9, 11, 11A, 12, 13, 14 and the Bomb Store. Weather conditions during each inspection survey were conducive to finding hibernating bats.

7.3.50 The report is contained within Volume 3, Appendix 7.13.

#### Summer Surveys 2013

7.3.51 The scope of the bat surveys was developed based on Hundt (2012) Bat Surveys – Good Practice Guidelines. Survey methodologies are based on this development being a “major infrastructure project” in “medium quality habitat” (Hundt, 2012).

### **Walked Activity Transects**

7.3.52 A walked transect survey was carried out on 11<sup>th</sup> July, 29<sup>th</sup> August, 30<sup>th</sup> August and 24<sup>th</sup> September 2013. Three dusks and one dawn survey were completed. A plan of the transect route is given in (shown in Figure 4 of Volume 3, Appendix 7.14). The transect route contained nine static listening points. Each static listening point lasted three minutes and the transect was walked at a 'steady' pace. Transects were started 15 minutes before sunset and continued for at least 3 hours.

7.3.53 Weather conditions for each survey were recorded and were largely considered favourable for bats. Surveyors used Anabat SD1 detectors and, recordings were examined after the survey to determine species identification.

### **Automated Static Activity Surveys**

7.3.54 Nineteen static detector points for automated activity surveys were selected within the Order Limits focusing on key development areas. Automated activity surveys were undertaken in July, August and September 2013. The locations of the static detectors are shown in Figure 4 (Volume 3, Appendix 7.14) Each single location was surveyed for at least five consecutive nights each month, except for the units described in the limitations section.

7.3.55 Tunnels 3, 4, 5, 7 and 8 were not considered at risk of demolition or disturbance at the time of the survey and were not surveyed. Tunnel 6 was not surveyed during the summer. Tunnels 12 and 13 will be lost during the construction of the Development but were not surveyed during the summer because these are easily accessible to the public and survey equipment would be openly exposed to theft.

7.3.56 A number of static detector units were placed at the entrances of the tunnels in order to survey potential summer roost activity within the tunnels. SM2 and Anabat SD1/2 Static units were used. SD cards were downloaded and calls analysed using Analook software.

### **Internal Inspections**

- 7.3.57 Internal inspections of the tunnels which may be impacted upon by the Development were undertaken once a month by AECOM in July (11<sup>th</sup> and 18<sup>th</sup>), August (7<sup>th</sup> and 14<sup>th</sup>) and September (5<sup>th</sup> and 12<sup>th</sup>) 2013.
- 7.3.58 Tunnels 3, 4, 5, 7 and 8 were not considered at risk of demolition or disturbance at the time of the survey and were not surveyed. Tunnel 6 was not surveyed during the summer. The following tunnels were surveyed: Tunnels 1, 2, 9, 11, 11A, 14 and 15. The Bomb store was to be surveyed but on arrival could not be inspected due to the door being vandalised.
- 7.3.59 Inspections were undertaken by licensed bat ecologists Stuart Spray and Dan Bell. Weather conditions during each inspection survey were conducive to finding roosting bats.
- 7.3.60 The report is contained within Volume 3, Appendix 7.14.

### **Winter 2014**

- 7.3.61 The scope of the bat surveys was developed paying due regard to Hundt (2012) Bat Surveys – Good Practice Guidelines. Survey methodologies are based on this Development being a “major infrastructure project” in “medium quality habitat” (Hundt, 2012).

### **Automated Static Activity Surveys**

- 7.3.62 Automated activity surveys were completed of the tunnels which may be impacted upon by the Development in January and February 2013. SM2 and Anabat SD1/2 static detector units were placed at or in the entrances of the tunnels in order to survey hibernation roost activity within the tunnels. Each single location was surveyed for seven consecutive nights in January and six consecutive nights in February, except for the units described in the limitations section. SD cards were downloaded and calls analysed using Anlook software. Descriptions and survey dates for each static survey location are given in Table C6.5.
- 7.3.63 The following tunnels were surveyed: Tunnels 1, 2, 6, 7, 9, 11, 11A, 13, 14 and 15. Tunnels 3, 4, 5, and 8 are not considered at risk of demolition or disturbance during either the construction or operational phase and



therefore were not surveyed. Tunnel 12 will be lost during the Development but was not surveyed during the winter 2014 (or summer 2013) due to risk of equipment theft. Static detector locations are shown in Figure 4 (Volume 3, Appendix 7.16).

### **Hibernation Internal Inspections**

7.3.64 Internal inspections of the tunnels which may be impacted upon by the Development were undertaken twice; once on 30<sup>th</sup> January and once on 25<sup>th</sup> February 2014. Inspections were undertaken by licensed bat ecologists. The following tunnels were surveyed; Tunnel 1, 2, 6, 7, 8, 9, 11, 11A, 12, 13, 14 and 15. Tunnels 3, 4, 5, and 8 are not considered at risk of demolition or disturbance during either the construction or operational phase. Tunnels 3, 4, and 5 were not surveyed. Tunnel 8 was included in the internal inspections due to its close and easy proximity to Tunnel 7. The Bomb Store was not surveyed during the hibernation period.

7.3.65 Weather conditions during each inspection survey were conducive to hibernation activity by bats. External temperatures at mid-day are given in Table C.6.7. Internal temperatures and humidity was not recorded.

7.3.66 The report is contained within Volume 3, Appendix 7.16.

### *Habitat Regulations Assessment – Stage One: Screening*

7.3.67 To assess the potential for designated sites to be affected by the Development a Habitat Regulations Assessment (HRA) Stage One Screening process has been completed on the all Natura 2000 sites (SACs, SPAs and Ramsar) within 2km of the Order Limits, and Natura 2000 sites designated for bats within 10km (AECOM, 2015d). It has been confirmed in correspondence with NRW and GC that they were satisfied with this approach.

7.3.68 The screening process for HRA was undertaken in line with the approach outlined in Advice Note Ten: Habitat Regulations Assessment relevant to nationally significant infrastructure projects (Version 5, August 2013) (The Planning Inspectorate, 2013).



7.3.69 The HRA Stage One Screening Report is not discussed any further within this report. It is contained as a separate document as the No Significant Effects Report (NSER) (AECOM, 2015d).

*Limitations to Surveys*

Phase 1 Survey and Desk Study

7.3.70 Biological records can be received from a wide variety of sources and may or may not be comprehensive and accurate. However, if assessed in conjunction with an Extended Phase 1 survey they can contribute to a robust ecological assessment of a site.

7.3.71 The disused quarries within the Order Limits are steep sided with big vertical drops. Due to health and safety restrictions, some areas were not accessed; including the base of the quarries. Surveys of the quarry edges and quarry faces were carried out from a safe distance.

7.3.72 There are deemed to be no significant limitations to the desk study and Extended Phase 1 survey described in this report.

Aquatic Surveys

7.3.73 Normally, a grapnel is used for detecting deeper plants, but the potential of unexploded ordnance within Q6 site makes this unsafe. The grapnel also proved ineffective in Q1 due to the steeply shelving sides and prevalence of large boulders.

7.3.74 Due to the limited extent of loose material and suitable invertebrate habitat, the sampling locations were limited to the availability of habitats rather than the planned stratified sampling.

Bird Surveys 2013 and 2015

7.3.75 A number of Wildlife & Countryside Act (WCA) Schedule 1 species were recorded during the surveys. Breeding information on these species is considered 'sensitive'. As a result detailed information regarding WCA Schedule 1 species is considered as confidential and is not disclosed within this report.

### Bat Surveys 2013 – 2014

7.3.76 Limitations during the 2013 and 2014 surveys are provided in detail in Volume 3, Appendices 7.14, 7.15 and 7.16. These relate to the impacts of restricted access, theft and malfunction of equipment, and reduced survey period in summer 2013.

7.3.77 The internal surfaces of the tunnels, apart from the archway entrance to T9, are relatively smooth with only a few scattered drill holes, there are no deep cracks. The only areas where bats would potentially be less visible would be at the ends of the tunnels where they have collapsed. This means that unlike in mines with deep cracks and crevices which could hide bats from view, there can be a high level of certainty that the internal inspections would identify any bats if they were present. The manmade stone archway entrance to T9 has cracks and crevices which could hide bats from plain view. The constraints were not considered to affect the overall picture of bat activity recorded over the four years of survey within the Order Limits.

## **7.4 Summary of Consultation**

7.4.1 The 2012 ES outlined the consultation which had been undertaken by Snowdonia Pumped Hydro (SPH), the applicant of the approved scheme, to agree the scope of the ecology chapter. This resulted in the following recommendations by the Gwynedd Council (GC) Biodiversity Officer at planning committee:

- The detail provided with respect to habitat was sufficient and there was no further comment;
- Further information was requested with respect to forestry land, this was provided on a response to GC Biodiversity Officer dated 3<sup>rd</sup> July 2013;
- The requirement for an invertebrate survey will be conditioned;
- Agree with comments in previous response dated 20th February 2013 with respect to bryophytes;
- A bat mitigation strategy was supplied to GC Biodiversity Officer dated 3<sup>rd</sup> July 2013, which was approved by NRW (previously CCW) on the 2<sup>nd</sup> May 2013 via email;

- With respect to birds, the information provided including the proposed method statement is sufficient and that there was no further comment;
- With respect to plants and fungi, no further information is required;
- Should any lichens be impacted, the client would seek to agree in advance in writing a method statement including the methods and location of the translocation prior to the works being carried out;
- With respect to badgers, GC Biodiversity Officer confirmed that no further information is required but that client or the Environmental Clerk of Works will keep GC and any other statutory regulators informed of the presence of badgers or new setts if confirmed during the construction;
- GC Biodiversity Officer requested clarification with respect to fish, a response was provided dated 3<sup>rd</sup> July 2013 and can be found on the GC planning application website;
- With respect to reptiles, mitigation methods should be set out in a Method Statement and that this will be conditioned.

7.4.2 A Test of Likely Significance was undertaken by GC regarding potential impacts on SAC Gwyrfai (and the connecting non-Natura 2000 site, the Nant-y-Betws watercourse) from slate dust and water contaminated from the creation of the two new excess slate mounds at Q1. This concluded that there would be no Likely Significant Effects on the Natura 2000 site.

7.4.3 SPH submitted a Scoping Letter to NRW and GC on the 12<sup>th</sup> November 2014, and received informal comments from GC and NRW, who both provided no additional advice or comment on the proposed scope of the ecological assessment.

7.4.4 Additional consultation on the 18<sup>th</sup> November was undertaken with GC and NRW regarding the scope of the Habitats Regulations Assessment. This was to confirm which Natura 2000 sites, potential impacts and receptors should be included in the HRA Screening Assessment. A response dated 5<sup>th</sup> December 2015 stated that Natura 2000 sites should be considered within 2km and Natura 2000 sites designated for bats should be considered within 10km.

7.4.5 Consultation with Red Squirrel Trust Wales in 2015 revealed a record of red squirrel from a garden near to Q7 and Q8. The sighting was in September 2013 and the grid reference supplied was SH568613. The Trust also stated that red squirrel is present in the wider north Gwynedd landscape but only very sporadically and out from Treborth and Faenol next to Menai Straits. Red Squirrel Trust also returned a record of the species from summer 2014 at Rhyd ddu 7km south of the Order Limits. Further consultation with NRW to confirm recommended mitigation was undertaken. A response dated 14<sup>th</sup> April 2015 confirmed that a survey of the trees to be removed would be sufficient. Further details on the mitigation is provided in section 7.8.

7.4.6 At a meeting dated 30<sup>th</sup> March 2015 with SPH, NRW and AECOM, the following points were discussed:

- A discharge licence from NRW will provide conditions of discharged water (temperature, quality and rate) into Llyn Padarn;
- NRW are concerned with sediment from the quarries being transferred to Llyn Padarn, specifically Q6 where there is the potential for munitions to be present. SPH confirm that filters/screening and water monitoring will be undertaken, and possibly water treatment;
- SPH enquired about the nutrient levels of Llyn Padarn and whether these have changed since the blue green algae bloom in 2009. NRW confirm that phosphate levels have dropped, and data can be provided should SPH submit a formal request for information (NRW to provide data);
- NRW confirmed that they are able to provide water quality information from monitoring stations in Llyn Padarn and the Afon Gwyfai to assist the HRA. This request should be made through the general enquires department (request made 31<sup>st</sup> March 2015);
- SPH propose that a pre-commencement survey on the badger sett will be undertaken. It is not currently proposed that any works will be undertaken within 30m of the sett. NRW to confirm if works within 30m will require a protected species licence;

- NRW enquired whether there is expected to be felling of trees and whether felling licences will be required. SPH confirmed that some trees near the lagoons, where there is a blanket tree protection order (TPO) may need to be removed when constructing the spillway infrastructure, but that efforts would be made to retain the more valuable species (oak and ash). In addition practical working methods can include reduced the working width where possible to minimise impacts to root systems. There may also need to be some trees felled on the fringes of Q6. SPH confirmed that bat surveys would be carried out prior to any felling and that appropriate mitigation will be put in place, likely in the form of replanting elsewhere within the Order Limits. This will be incorporated in to the Habitat Management Plan;
- NRW could not confirm whether a Designated Site Consent Order (DSCO) would be required for working within the Llyn Padarn SSSI;
- NRW confirm that fish surveys in Q1 and Q6 are to be undertaken and the results included as part of the DCO submission, due to uncertainty of species that may or may not be present within quarry water bodies. These were undertaken in April and May 2015;
- SPH to provide proposed methodologies for approval of fish and invertebrate surveys. SPH note that certain survey methodologies may not be suitable due to potential presence of Unexploded Ordnance in the bottom of Q6. Additionally it was noted that Q1 is very hard to access safely, rope access only, and this may have implications on survey methods;
- NRW to provide most recent floating water plantain survey data from lagoons where spillway infrastructure will be located;
- NRW agreed that surveys prior to commencement of works would be preferable to surveys prior to submission of DCO, and if floating water plantain is found to be present then translocation may be required. NRW are to confirm if a translocation licence is required in this instance;
- AECOM clarified that the sensitivity of Arctic Charr has been incorporated into the SSSI sensitivity classification. NRW note that whilst all fish

species in the assessment are valued as low, the Arctic Charr present in Llyn Padarn are rare and should therefore be of higher value;

- NRW to provide further detail on spawning timescales of the Charr;
- SPH confirm that water discharged from the system will not be of a temperature significantly different from the surface water in the receiving water bodies. This will also be controlled by the conditions of the permits issued by NRW;
- GC agreed that the breeding bird method statement should include all breeding birds, not just the peregrine falcons. SPH requested that the breeding bird method statement be a Requirement of the DCO. This was agreed with NRW and GC
- AECOM requested confirmation of the source of information in the GC s42 response regarding the breeding location of the peregrine falcon. GC confirmed that this was from anecdotal records and that they suggested that the peregrines present in Q3 and Q4 have also used Q5 for nesting. Gwynedd Council suggested that due to the potential movement of the peregrines, annual surveys should be undertaken to monitor their location; and,
- NRW and SPH agreed that during construction, works which may affect the peregrines (blasting in the quarries) should be overseen by the Ecological Clerk of Works.

7.4.7 In an email dated 17<sup>th</sup> April 2015 NRW responded to the proposed freshwater survey methodology stating it should also include survey for diatoms, phytoplankton (including blue-green algae) and Chironomidae. An amendment to the methodology was made accordingly.

- At a meeting on 15<sup>th</sup> July 2015 between AECOM, SPH, GVA, Burges Salmon, NRW and Gwynedd Council the following points were discussed: Fish and invert surveys and a water sampling round at both quarries were complete in late May/ early June.
- Water testing and chemistry and diatom analysis was ongoing.

- Q1 – No fish found, palmate newts were present. No invasive fish were found. Numerous attempts were made using a grab sampler and a core sampler but no sediment could be gained for analysis due to the slate waste and boulders. A round of water sampling was taken.
- Q6 – Three sticklebacks and a large eel were found in Q6. No invasive fish were found. Sediment samples were attempted in 25 locations with a core sampler (not a grab sampler due to the UXO risk) and again no sediment was present. A round of water sampling was taken. The lack of any discernible sediment seems to confirm that the quarries are effectively oligotrophic and therefore there is an extremely unlikely risk of any eutrophication of Llyn Padarn. If they were considered to be mesotrophic or eutrophic we would have expected there to be a reasonable amount of sediment in them.
- Having consulted with the Natural History Museum and Buglife, we are of the opinion that the analysis of CPET will have no meaningful input into the HRA other than setting a species baseline for Chironomids within the quarries. In addition there are no “invasive” species of Chironomids. Adult Chironomids are free flying and can easily cover distances in excess of over 1 – 2km from their hatch sites when windblown. It would not therefore be expected to find any species within the quarries that are not freely mobile within the area of Llyn Padarn SSSI and Afon Gwyfai SAC.
- NRW agreed to review the report and provide comment, however based on their initial review, it appears that nothing of significance has been found in Q1 or Q6.
- Three breeding bird surveys have been undertaken (8th April 0715-1115hrs, 30th April 0650-1125hrs and 19th May 0640-1105hrs).
- On 30th April a male chough was seen feeding the female chough (courting/breeding behaviour) and a pair were regularly seen in/around Q4 so breeding was predicted (noted as confirmed in the report). Peregrine pair regularly seen around Q4 in 8th April and 19th May and birds were very active along the southwest rockface where a nest was predicted. Peregrine often flew up and landed on that cliff (out of sight).



The exact nest location of both the chough and peregrine were not found but breeding was predicted given activity and behaviour in the quarry. Subsequent observations by onsite ecologist during site investigation works confirmed peregrine activity. Fourth survey proposed for July 2015.

- NRW confirm sighting of peregrine on site on a recent site visit and that it had prey in its talons which is a confirmed signal of breeding activity.
- SPH appointed Ecological Clerk of Works is satisfied that Site Investigation (SI) works have not interfered with peregrine falcons that utilise the area. This has been supported by the North Wales Wildlife Trust, who confirm no disturbance to peregrines.

## **7.5 Ecological Impact Assessment Method and Guidance**

7.5.1 The Guidelines for Ecological Impact Assessment in the United Kingdom (IEEM, 2006) (the IEEM Guidelines) provide guidance on the process of identifying the value of ecological receptors, characterising impacts upon them and assessing whether these impacts are significant. An ecologically significant impact is defined in the IEEM Guidelines as “an impact (negative or positive) on the integrity of a defined site or ecosystem and/or the conservation status of habitats or species within a given geographical area”. The IEEM Guidelines focus on assessment of impacts at a variety of geographic scales and set out the following process for assessment:

- Identification of the nature conservation value of each ecological receptor that is present within the Order Limits and adjacent areas which may be affected by the Development and the level of sensitivity of each of these receptors to the Development;
- Identification of potential impacts, based on the nature of the construction, operation and decommissioning phases of the Development;
- Determining magnitude of potential impacts – i.e. the scale of the change in population/number of individuals affected and the duration / reversibility of the potential impact;



- Determining the geographic level at which an impact will be significant, based on the interaction between the magnitude of the impact and the nature conservation value of the receptor likely to be affected;
- Identifying mitigation and, if required, compensation measures that are proposed to avoid, reduce or offset significant adverse impacts; and,
- Determining residual impacts on receptors once proposed mitigation measures have been taken into account.

*Determining Value*

7.5.2 The value of ecological receptors identified is determined according to a geographical frame of reference. Value is assigned based on the conservation importance of a receptor, however in some cases social or economic factors may be taken into account. The value of receptors to be used in the EclA is defined in Table 7-2.

Table 7-2: Evaluation of Value (Table based in criteria set out in IEEM 2006 Guidelines)	
Level of Value	Examples of Definitions
<p>Very High (International)</p>	<p>An internationally designated site e.g. SPA, SAC, Ramsar, or site considered worthy of such designation.</p> <p>Regularly occurring globally threatened species.</p> <p>A viable area of a habitat type listed in <i>Annex 1 of the Habitats Directive (92/43/EEC)</i>, or smaller area of such habitat which is essential to maintain the viability of a larger whole.</p> <p>A regularly occurring population of internationally important species listed in <i>Annex II of the Habitats Directive (92/43/EEC)</i>.</p> <p>Any regularly occurring population of internationally important species that are rare or threatened in the UK or of uncertain conservation status (including individual species listed on <i>Annex 1 of the EC Birds Directive</i>) and/or listed as a qualifying feature of an SPA, SAC or Ramsar site.</p>
<p>High (National (UK))</p>	<p>A nationally designated site e.g. a SSSI, NNR or site that meets the criteria for such designation.</p> <p>A regularly occurring population of individual species listed or included on a SSSI citation as a reason for designation of a SSSI.</p> <p>A regularly occurring significant population/number of any nationally important species i.e. listed on the <i>Wildlife and Countryside Act (1981)</i> (as amended).</p> <p>A viable area of priority habitat type as identified in the Section 42 List of Habitats of Principal Importance for Conservation of Biological Diversity in Wales, or smaller areas of such habitat which are essential to maintain the viability of a larger whole.</p> <p>A regularly occurring, substantial population of a nationally rare species i.e. a species that contributes to the integrity of an SAC or SSSI but which are not cited as species for which the site is designated (SACs) or notified (SSSIs).</p> <p>Species present in nationally important numbers (&gt;1% UK population).</p> <p>Any regularly occurring highly significant population of any bird listed on the RSPB Red List of High Conservation Concern.</p>

<b>Table 7-2: Evaluation of Value (Table based in criteria set out in IEEM 2006 Guidelines)</b>	
<b>Level of Value</b>	<b>Examples of Definitions</b>
	A species assemblage that includes one or more nationally important species (as defined above) that occurs regularly in significant numbers.
Medium (Regional)	<p>Areas of internationally or nationally important habitats which are degraded but which could be readily restored.</p> <p>A regularly occurring, substantial population of a nationally scarce species i.e. priority species in the Section 42 List of Species of Principal Importance for Conservation of Biological Diversity in Wales.</p> <p>Viable areas of a Local BAP Priority habitat or small areas of such habitat which are essential to maintain the viability of the larger whole.</p> <p>A regularly occurring regionally significant population of a Local BAP Priority Species</p> <p>Any regularly occurring significant population that is listed in a Local Red Data Book or a highly significant population of any bird listed on the RSPB Amber List of Medium Conservation Concern or substantial population of a regionally scarce species</p> <p>Species present in regionally important numbers (&gt;1% regional population). Species occurring within SACs and SSSIs locally but not crucial to the integrity of the site.</p> <p>A site designated as a Local Nature Conservation Site (LNCS), Wildlife Site or Site of Interest for Nature Conservation (SINC);</p>
Low (Local)	<p>Areas identified as areas of conservation interest by organisations such as the local Wildlife Trust.</p> <p>A regularly occurring, substantial population of a species scarce in the local area or sites/features that are scarce within the locality or which appreciably enrich the local area's habitat resource</p> <p>Species, habitats or features that are a key component of a LNCS or LNR.</p> <p>Locally significant populations of Red and Amber List species. A good example of a common or widespread habitat in the local area.</p>
Negligible	A degraded/impoverished example of a common or widespread habitat in the local area. A habitat which offers

**Table 7-2: Evaluation of Value (Table based in criteria set out in IEEM 2006 Guidelines)**

Level of Value	Examples of Definitions
(Less than Parish)	little value for nature conservation e.g. arable field. Populations of common and widespread species. A species considered to enrich the local ecological resource within the context of the Parish or Neighbourhood.

*Identifying Effects and Determining Magnitude*

7.5.3 Likely effects based on the nature of the construction, operation and decommissioning of the Development are then identified. The magnitude of the potential effect on the conservation status of the particular valued ecological receptor and on the integrity of the habitats that support them as a result of the Development, is then determined. Professional judgment is used to quantify the magnitude of effects using criteria as described in Table 7-3.

<b>Table 7-3: Criteria for Determining Magnitude</b>	
<b>Magnitude</b>	<b>Definition</b>
High	Total loss or major alternation to key elements/features of the baselines conditions such that post development character/composition of baseline condition will be fundamentally changed.
Medium	Loss or alteration to one or more key elements/features of the baselines conditions such that post development character/composition of the baseline condition will be materially changed.
Low	Minor shift away from baseline conditions. Changes arising from the alteration will be detectable but not material; the underlying character/composition of the baseline condition will be similar to the pre-development situation.
Negligible	Very little change from baseline conditions. Change is barely distinguishable, approximating to a “no change” situation.

*Table based in criteria set out in IEEM 2006 Guidelines*

7.5.4 The magnitude of an effect is independent of the value of the receptor. Effects can be permanent or temporary, of various duration (Short-term: <5 years, Medium-term: 5 – 15 years, Long-term: 15 – 25 years and Permanent: >30 years), direct or indirect, adverse or beneficial and can be cumulative.

*Degree of Certainty*

7.5.5 A degree of certainty will be applied to the effect (IEEM, 2006), which is referred to in the effects assessment section:

- Certain/Near-Certain: probability estimated at 95% or higher;

- Likely: probability estimated above 50% but below 95%;
- Unlikely: probability estimated above 5% but less than 50%; or
- Extremely Unlikely: probability estimated at less than 5%.

#### *Determining Significance*

- 7.5.6 The significance of an effect is largely a product of the interaction between the value of the ecological receptor and the magnitude of the effect on it, moderated by professional judgement, to determine whether the integrity of the receptor will be affected. An ecologically significant effect is defined in the IEEM Guidelines as *'effect (negative or positive) on the integrity of a defined site or ecosystem and/or the conservation status of habitats or species within a given geographical area.'* Within this assessment a significant effect therefore means that the predicted effects are considered likely to affect the integrity of a receptor.
- 7.5.7 Table 7-4 provides the matrix for determining significance of ecological effects. The greater the environmental value or magnitude of impact the more significant the effect. In some cases the significance is shown as being one of two alternatives. This allows for the application of professional judgement in appraising significance between individual receptors which may not have equal significance within their context.
- 7.5.8 Where there is doubt over the appropriate level of significance, for example where there is uncertainty about the full extent of the local resource (habitat area or population size), this is stated and as a precaution the higher level of significance of the effect is applied.
- 7.5.9 Effects defined in Table 7-4 as major or moderate (grey) are considered significant in terms of EclA.

<b>Table 7-4 Approach to Assessment of Effects</b>					
<b>Magnitude</b>	<b>Value</b>				
	<b>Very High</b>	<b>High</b>	<b>Medium</b>	<b>Low</b>	<b>Negligible</b>
<b>High</b>	Major	Major	Moderate	Moderate	Minor
<b>Medium</b>	Major	Moderate	Moderate	Minor	Negligible
<b>Low</b>	Moderate	Moderate	Minor	Negligible	Negligible
<b>Negligible</b>	Minor	Minor	Negligible	Negligible	Negligible

Table based in criteria set out in IEM 2006 Guidelines.

#### *Area and Habitat Loss Calculations*

- 7.5.10 Plans for the Development are not at the detailed design stage and therefore all measurements are indicative but considered worst case.
- 7.5.11 As such, all calculations for percentage of habitat removal use the site area excluding the PROW diversions.
- 7.5.12 A number of Local Wildlife Sites (LWSs) are present within and extend beyond the Order Limits. All calculations for percentage removal of LWSs habitat use the total area of the LWS, not just that confined to the Order Limits.

## **7.6 Summary of Previous Reports**

- 7.6.1 Previous reports of ecology surveys carried out by parties, other than AECOM, within all or part of the Order Limits were reviewed. A summary for each has been provided below. The full reports that were reviewed for this ES are included in Volume 3, Appendix 7.1 to 7.20 and Volume 3, Appendix 9.1 Water Framework Directive report.

#### *National Vegetation Classification Survey*

- 7.6.2 An Initial Phase 1 Habitat Survey and an NVC survey were completed in 2011 and 2012 by Gritten Ecology within the boundary of the approved scheme (*Gritten Ecology (2011) Glyn Rhonwy Botanical Survey; Gritten Ecology (2012a) Glyn Rhonwy Addendum to Botanical Surveys August*

2012; and, Gritten Ecology (2012b) *Glyn Rhonwy Addendum to Botanical Survey September 2012*). The reports, with full methodologies, limitations and details are contained within Volume 3, Appendix 7.2 – 7.4.

7.6.3 Two quarry voids were not surveyed. Q3a was considered to be too dangerous to enter by conventional rope access and access permission was not obtained for Q7).

7.6.4 NVC habitats within the Order Limits comprised:

- U1 *Festuca ovina-Agrostis capillaris-Rumex acetosella* grassland;
- U4 *Festuca ovina-Agrostis capillaris-Galium saxatile* grassland;
- U5 *Nardus stricta-Galium saxatile* grassland;
- U6 *Juncus squarrosus-Festuca ovina* grassland;
- U20 *Pteridium aquilinum-Galium saxatile* community;
- U21 *Cryptogramma crisper-Deschampsia flexuosa* acid scree community;
- H8 *Calluna vulgaris-Ulex gallii* heath;
- M15 *Scirpus cespitosus-Erica tetralix* wet heath;
- M23 *Juncus effusus/acutiflorus-Galium palustre* rush pasture;
- M23b *Juncus effusus/acutiflorus – Galium palustre* rush pasture;
- M32 *Philonoto-Saxifragetum stellaris* spring;
- W17 *Quercus petraea-Betula pubescens-Dicranum majus* woodland;  
and,
- W23 *Ulex europaeus-Rubus fruticosus* scrub.

#### *Freshwater Ecology Assessment*

7.6.5 A desk-based study and field sampling were completed in 2012 by Etive Ecology (*Etive Ecology. (2012). Glyn Rhonwy Pumped Storage Scheme: Llyn Padarn Freshwater Ecology Impact Assessment. September 2012*). This was used to establish the baseline freshwater environment of Llyn Padarn and aid the assessment of likely significant impacts on freshwater features. Appropriate mitigation measures and monitoring requirements were recommended. A desk study and local consultation was completed.



Methodologies, limitations and full details are provided in Volume 3, Appendix 7.19.

- 7.6.6 Water quality sampling was completed at four locations within the Order Limits on the 30<sup>th</sup> July 2012. These were 1: the lake in Q6, 3: the inflow manhole below Q7, 4: the lake in Q7 and 5: the lake in the small quarry between Q6 and Q7. The intended fifth field sampling point (Location 2: discharge to manhole below Q7) was dry at the time of survey. Samples were submitted to an independent laboratory and analysed for a range of environmental parameters. Results from the water sampling, indicate that the water quality at all sampling points is 'satisfactory' and with no obvious evidence of contamination. The analysis indicates that the water from sample point 1, 3 and 5 have similar in chemistry, suggesting they are hydrologically linked. Water from sample point 4 is marginally different, suggesting a different water source. The quality of these waters does not pose a constraint to the Development. The potential impacts on ecological receptors, including the Llyn Padarn SSSI Objectives (Arctic charr and floating water plantain) are assessed. Full details are provided in Volume 3, Appendix 7.19.

*Water Framework Directive Compliance Appraisal*

- 7.6.7 A Screening Assessment was completed in 2012 by AECOM Water in response to an Environment Agency Wales (EAW) (now NRW) request for a Water Framework Directive (WFD) assessment of the Development and an updated assessment was made in 2015 (AECOM (2015c) *Environmental Statement Glyn Rhonwy Pumped Storage Scheme WFD Compliance Appraisal September 2015*). Methodologies, limitations and full report are provided in Volume 3, Appendix 9.1.
- 7.6.8 Mechanisms by which the Development may impact the WFD parameters of WFD objectives for nearby water bodies with a hydrological connection to the Development were identified. All water bodies that might be directly affected (including relevant water dependent Protected Areas) and neighbouring water bodies that might experience indirect effects, were assessed against the core WFD objectives for that water body, including

deterioration of relevant ecological, supporting physio-chemical and hydromorphological parameters, and failure to improve.

7.6.9 Overall, the following possible impacts on WFD designated water bodies have been considered:

- The effects on Llyn Padarn from the abstraction of commissioning water;
- The effects on Llyn Padarn from the construction of a permanent intake and outfall structures;
- The effects on Llyn Padarn from the discharge of existing quarry water in Q6
- The effects on Llyn Padarn from routine discharges of excess storm water from Q6;
- The effects on Llyn Padarn from rapidly draining down Q6 in an emergency;
- The indirect effects on the Afon Seiont from the abstraction of commissioning water from Llyn Padarn;
- The effects on Afon Gwyrfai from the discharge of existing quarry water in Q1;
- The effects on the Afon Gwyrfai from routine discharges of excess storm water from Q1; and
- The effects on the Afon Gwyrfai from rapidly draining down Q1 in an emergency.

7.6.10 NRW were consulted for information on historic water quality within Llyn Padarn and for background information on how the Dinorwig Hydro Power Station has affected the nearby Llyn Peris, WFD class boundaries, and any available water quality, lake level and river flow data.

#### Llyn Padarn

7.6.11 Llyn Padarn is a Highly Modified Water Body (HMWB) that is currently at Moderate Ecological Potential and is not expected to achieve Good Ecological potential until 2027 due to technical infeasibility to implement mitigation. This appraisal has assessed the compliance of the Development

against the objectives for this water body considering the potential effects of water abstraction, discharges, and physical impacts. In doing so it has also considered the compliance with proposed mitigation measures and SSSI objectives (principally for Arctic charr and floating water plantain).

### Abstraction

7.6.12 A licence to abstract up to 2000 m<sup>3</sup>/day and 550,000 m<sup>3</sup>/annum from Llyn Padarn for commissioning the Development was issued by NRW in July 2015. Amongst other conditions, this licence prevents abstraction when the water level in the Afon Seiont at the Peblig Mill gauging station is below 0.343 m. It has recently been determined through detailed survey of the quarries that the volume of water that can be stored in the quarry system is 1,300,000m<sup>3</sup> instead of 1,100,000m<sup>3</sup> meaning up to 200,000 m<sup>3</sup> of additional water is needed during commissioning. It is also proposed to abstract this water up to 3,300 m<sup>3</sup>/day over a period of 18 months – a variation to the approved abstraction license will be sought from NRW in due course.

7.6.13 AECOM has undertaken a water balance study and this is presented in Appendix B of Volume 3, Appendix 9.1 WFD Compliance Appraisal which concludes that:

- The catchment is 'flashy' with a good correlation between lake level and flows in the Afon Seiont meaning that inflows to the lake are quickly passed forward along the Afon Rhythallt;
- A daily abstraction of 3300m<sup>3</sup> equates to approximately 0.00022% of the total lake volume per day or approximately a 3.4mm draw down per day across the entire lake surface. However, due to the 'flashy' nature of the catchment significant cumulative lake level falls are unlikely to occur.
- The hands off flow condition is predicted to occur around 15% of the time during an extreme dry year (such as if an extreme dry year like in 2010 were to occur during the construction period) under the 'without abstraction' scenario. A conditions of the current abstraction licence granted by NRW abstraction at the maximum rate is limited to only 275 days or 75% of the year;

- It is considered that there would be no significant effect of the abstraction on lake levels in Llyn Padarn. This is due to the hands off flow condition, linked to levels in the downstream Afon Seiont. Consequentially it is considered that there would be no effect on aquatic receptors in the lake (including at its margins);
- If the construction period and abstraction were to extend over a dry year then it is possible that the hands off flow condition on the licence would be in place for around 20% of the time (and most probably occurring during the spring and summer). Natural runoff into the quarries, during wetter periods of the year may provide a replacement source of water so that they may be filled within the current 18 month programme; and
- Overall, the abstraction regime is not considered to have any significant impact on lake water levels (and therefore littoral habitat quality and extents) and water quality (as it is affected by changing water levels), and thus will not result in the deterioration of any of the biological quality elements (BQEs) present and physico-chemical supporting parameters or likelihood of failing to meet at least good status for lake water levels.

#### Emergency Discharge of Water from Q6

7.6.14 Although very unlikely, under certain circumstances there could be the need for the rapid discharge of water from Q6 to Llyn Padarn via the scour valve. This might occur following a sudden and intense rainfall event or as a worst case in the unlikely event that the dam for Q6 was at risk of breaching and it was not possible to pump water from Q6 to Q1. Water would be discharged at a rate of 0.3 m<sup>3</sup> per second meaning that a constant discharge of just under 26,000 m<sup>3</sup> per day for up to seven days in order to drain 100 % of the impounded volume in Q6. However, any discharge is still likely to be small when compared to the typical volume of water stored in Llyn Padarn, and as discussed earlier it is unlikely to be contaminated with excessive nutrients or other pollutants, be low in oxygen, or significantly elevated in temperature. A coarse sediment screen would be placed on the scour valve to prevent any sediment in the bottom of the reservoir being drawn through. Such very intense sudden rainfall events would be less frequent and the risk of a dam

breach considered a 'one-off' event and unlikely to result in long lasting effects that could prevent WFD targets annually or in the longer term. Operational procedure will also require constant monitoring of dam water pressure meaning that any risk of failure would be identified long before there was a risk of it actually occurring.

### Sedimentation

7.6.15 Another consideration related to the emergency discharge is suspended sediment. Water abstracted from Llyn Padarn will be screened to prevent entrainment of fine sediment and transportation of this material into the pumped storage system. Surveys of Q1 and Q6 have also confirmed that both lakes are oligotrophic and are lacking in any fine sediment, which is indicative of the likely trophic status that will develop over time and implies that low productivity. A coarse screen will be positioned on the scour valve to prevent ingress of larger material that may accumulate on the bed of the quarry. In addition, the rate of runoff from an emergency spill will be controlled through an Environmental Permit. Therefore, sedimentation effects are unlikely to be an issue and have not been considered any further.

### Aluminium

7.6.16 Although not a relevant WFD parameter itself, since high concentrations of bioavailable aluminium can cause physiological effects on biological quality elements (e.g. macroinvertebrates, fish and flora, and in particular may precipitating on the gills of fish) the risk that aluminium rich runoff might be released during construction of the development has been considered.

7.6.17 Slate contains high levels of aluminium that could be leached by surface water runoff and conveyed to Llyn Padarn. The release of dissolved and particulate aluminium in runoff during construction would be exacerbated on the site by activities to crush, work or transport slate as part of excavations and earthworks to construct dams, and from the stockpiling of unused material. Leachate tests on 40 soil samples taken from trial pits close to Q1 and Q6 have variable concentrations between 170 ug/l to a maximum of 260 ug/l, with a mean of 100 ug/l (please refer to Tables C3 and C4 in

Appendix C). In comparison, the average concentration of aluminium-filtered and aluminium total in Llyn Padarn based on predominantly weekly sampling between September 2011 and March 2013 by NRW was 17.7 ug/l (ranging 11.1 ug/l to 24.8 ug/l) and 35.8 ug/l (ranging 16.5 ug/l to 138 ug/l), respectively (please see Table C1 in Appendix C). It should be noted that the long term average of pH in Llyn Padarn is circumneutral, with the pH of water currently residing in Q1 and Q6 being slightly more alkaline.

- 7.6.18 Based on the soil leachate tests and the available background water quality data, it is possible that left unmitigated construction site runoff could contain high levels of dissolved and particulate aluminium that could exceed background levels by as much as ten times. Although pH is circumneutral, and despite uncertainty over the toxic effects of aluminium in the aquatic environment, it is plausible that the discharge of aluminium rich construction site runoff could result in short term and temporary adverse effects on biological quality elements in the Llyn Padarn, although there would be considerable dilution of runoff in Llyn Padarn.
- 7.6.19 The risk to the Llyn Padarn would also be limited by the need to attenuate and discharge construction site runoff to a rate agreed with NRW. However, it is proposed to adopt a precautionary approach to minimise the formation of, and conveyance of aluminium rich surface water (e.g. carefully control the amount, location and method of excavating, crushing, and moving slate material). It is also proposed to set up a temporary construction site drainage system that will intercept, attenuate and filter construction site runoff in accordance with best practice guidance (e.g. CIRIA C648 etc.). Where space allows this may include sedimentation lagoons, but where space is limited other measures including proprietary plant (e.g. straw bale barriers, Silt Busters) may be used in combination to effectively reduce the suspended sediment load in runoff. These measures will be described in detail in a Water Management Plan (including a Silt Management Plan) to be prepared prior to construction works. Measures will be agreed with NRW as part of the application for an Environmental Permit, and if required a water quality monitoring programme will be implemented on site in accordance with any permit conditions.



Specific Pollutants – Copper

- 7.6.20 Water quality testing of both quarries (ENSIS, 2015) did not reveal any 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 (i.e. Llyn Padarn). Dissolved copper ranges between 2.1 ug/l and 3.6 ug/l with an average of 2.8 ug/l in Q1, and ranges 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). In comparison, the long term average in Llyn Padarn is 1.1 ug/l, which also just exceeds the current standard. It is unclear where this copper comes from but it is likely to be leached from the surrounding rock in light of no other anthropogenic sources.
- 7.6.21 Should this water be discharged to Llyn Padarn and become fully mixed it would have a negligible effect on the overall copper concentration of the lake 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 (please note that the standard is an annual average and higher concentrations in the short term can be tolerated by BQE).
- 7.6.22 In the longer term, it is possible that the water in the Development would reflect the copper concentrations observed in the current quarry water, although the operation of the Development should not introduce any new sources. However, it is believed that these quarries already discharge to Llyn Padarn at a similar rate and that the volume of runoff will be small compared to the volume of water in Llyn Padarn. The volume of discharge would be greater in an emergency situation but this would be a 'one-off' event similar to the initial draining of the quarries that is unlikely to cause the annual EQS to be exceeded and no persistent long lasting adverse effects. Overall, despite copper levels in Llyn Padarn already exceeding the annual average EQS, based on the data available for Q6 the discharge of existing



quarry water or future intermittent or emergency discharges of excess water are not likely to result in deterioration or prevent improvement with respect to the copper WFD EQS or BQEs that could be impacted, at the water body level.

### Nutrients

7.6.23 The BQE relevant to and monitored for Llyn Padarn are principally indicators of nutrient status, and to a lesser extent acidification and hydromorphology. The operation of the Development will not result in any change to the nutrient status of Llyn Padarn since the Development will not contribute any significant nutrient loading to the lake.

### Acidification

7.6.24 During operation and over time there is the possibility that sulphides are oxidised due to the repeated passing of water through the turbines and that this could lead to the water becoming more acidic. Sulphides originate from the anaerobic decay of organic matter or may come from sewage discharges. The levels of sulphur measured as sulphate in Llyn Padarn are very low and stable (the long term mean average is 3.8 mg/l with a small standard deviation). Based on the water sampling undertaken for this development, current sulphate levels in Q1 and Q6 are comparable to Llyn Padarn (i.e. averaging 3.4 and 4 mg/l, respectively) reflecting the mesotrophic-oligotrophic conditions. Therefore, in light of no other obvious and substantial sources of sulphate it is considered that the risk of this occurring is low. Long term water quality monitoring will include pH and if it was observed that water in the reservoirs was becoming increasingly acidic options to dose the reservoirs with a suitable alkaline could be undertaken in the future.

### Temperature

7.6.25 NRW have also raised concerns regarding the risk of discharging water of elevated temperature since this could impact on Arctic charr habitat and populations within Llyn Padarn. Once the Development is fully commissioned with 1,300,000m<sup>3</sup> of water, this will pass between Q1 and Q6 in order to provide the battery storage and generate electricity at peak

times. No water is directly discharged into Llyn Padarn from the turbines and so it is unlikely that the discharge will be heated. The following points outline how the Development is different from the adjacent Dinorwig scheme and why there is unlikely to be any potential significant effects from heated water:

- **Scale** - The scale of the Development is considerably smaller than that of Dinorwig. This is in terms of both the power output (99.9MW compared to 1800MW) and, more importantly, the volume of water that is processed and discharged. Llyn Peris is the tailpond for the Dinorwig scheme whereas Llyn Padarn will only receive intermittent overflow from the much smaller Development. This discharge would be above the thermocline in the well-mixed zone where small inflows of water with a slightly different temperature can be quickly assimilated. Consequently, any potential impact of the Development will be significantly reduced in comparison to that of Dinorwig;
- **Heat source: Solar exposure** - The bathymetry of Llyn Peris, the lower reservoir at the Dinorwig facility, is a relatively shallow and wide. This basin undergoes significant drawdown during operation, exposing dark rocks to heating from the sun. It may be possible that this is a driver for increased water temperature in Llyn Peris, as the heat stored is transferred to the surrounding water once re-filled. The Glyn Rhonwy Development is quite different. The lower volume at Q6 is much more narrow, deep and shaded. It is therefore more likely that the water in Q6 will remain cool. While Llyn Peris has an area of around 60 hectares, Q6 has an area of around 3 hectares. Llyn Peris stores 7,000,000m<sup>3</sup> of water, while Glyn Rhonwy will store 1,300,000m<sup>3</sup>, so the Development has 1/7 the volume but 1/20 the surface area. This very different volume to surface area ratio means the water in Glyn Rhonwy is much less exposed to the sun than the water of Llyn Peris;
- **Heat source: Geothermal gradient** - The penstock proposed for the Development is shallower than that used by Dinorwig. This may be relevant because generally the deeper the tunnel, the warmer it gets with the average gradient around 25°C to 30°C per km depth. Though heat

transfer from the rocks to the water will be limited by the surface area of contact, and the conductivity of the surrounding rocks, it is possible that Llyn Peris is warmed by the mountain itself. The tunnels of Dinorwig reach a depth of some 450 m, and are roughly 2.4 km long. At Glyn Rhonwy the tunnels will be between 50 and 80 m deep and are approximately 1.6 km long;

- Configuration - The configuration of the Development is considerably different. Once the water has passed through the turbine it will flow into Q6 where it will be stored until it is ready to be pumped back up to Q1. Only when there is excess water during periods of high rainfall will discharge from the Development into Llyn Padarn be required. We believe that the discharge will be very similar in terms of rate and temperature as to present drainage conditions as the scour valve is close to the maximum water level within the reservoirs;
- Penstock and Tailrace Lining – The inside surface of the penstock and tailrace will be appropriately lined to ensure a smooth surface to reduce friction as much as is practically possible and thus loses of potential energy to warming up the water passing through them.

7.6.26 The Development is fundamentally different to the nearby Dinorwig power station in that it is a closed system with Q6 being the bottom reservoir, not Llyn Padarn. The scheme has also been designed to be low friction, which will minimise any warming of water pumped through the system. It is difficult to predict the temperature range of the water that will be held within the pumped storage system, and which will be allowed to spill into Llyn Padarn. Water temperature will vary diurnally / seasonally and will be moderated by the bathymetry of the reservoirs, the operation of the plant / 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. In addition, 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 and comparable to the surface waters in Llyn Padarn. During the winter, should the water within the Development be elevated above what

would be expected naturally, the relatively low rate and volume of any overflow will be effectively buffered by the much large volume of water within Llyn Padarn, which would be fully mixed. Overall, the strong seasonal variation exhibited by monitoring of Llyn Padarn's surface water temperature record is likely to be much more significant for controlling the status of BQEs and other physico-chemical parameters.

7.6.27 Future water quality in the Development is unlikely to contain excessive levels of nutrients or contaminants, or be significantly different in pH or temperature to the water quality of Llyn Padarn. With the dilution potential of Llyn Padarn and future incident rainfall, and taking account of the relative rate and likely volume of discharges from the Development, no significant changes in water quality in terms of nutrients, contaminants or acidity is predicted, and thus no deterioration of any BQEs or failure to meet chemical EQS as a consequence of the proposed Development.

#### Afon Seiont

7.6.28 The Afon Seiont originates from overspill from Llyn Padarn and is designated as a Highly Modified Water Body (HMWB) under the Water Framework Directive (WFD). It is also a salmonid river under the Freshwater Fish (Consolidated) Directive and this has been taken into account by this appraisal, as well as any proposed mitigation measures. The Afon Seiont will not be directly impacted by the Development, although indirect effects from changes to the flow regime and water quality have been considered.

7.6.29 The hands off flow condition of the proposed licence would help ensure that the lowest flows in this river and the upstream Afon Rhythallt would not be reduced as a result of the abstraction. Moderately low flows, greater or equal to the Q90 may be reduced as a result of the abstraction by up to 4%. This would likely manifest as a reduction in river velocities rather than a reduction in level and is not considered to be significant (with flow naturally being reduced to a greater extent on a regular basis, 10% of the time). The abstraction would also not have any impact on the pattern of flows, which can be important for certain fish species, and would last for only a relatively short period of time. It is therefore considered that the proposed abstraction

would have no significant hydrological or environmental effects on the downstream Afon Rhythallt or Afon Seiont.

7.6.30 In terms of water quality, the changes in water level within Llyn Padarn are negligible and it is not expected that there would be any changes to physico-chemical parameters, nor will there be any discharges of chemical pollutants from the Development. Therefore, the Development should not cause deterioration of any WFD parameter and it is considered to be compliant with the objectives for this water body and any water dependent Protected Areas.

#### Afon Gwyrfai

7.6.31 The Afon Gwyrfai is a lake fed river whose flow has been modified by water storage for drinking water supplies, and which is thus a HMWB. The Development will not have any direct effects on this river, but deterioration could occur as a consequence of transferring nutrient rich, contaminated water or water with a significantly lower pH either by routine runoff to bleed excess water or from a more significant event when it is necessary to rapidly drain Q1. Excess water will preferentially be bled from Q6 to Llyn Padarn rather than from Q1 to the Nant-y-Betws stream, and thus regular discharges to the Afon Gwyrfai are unlikely and each spill could be considered as a 'one-off' event.

#### Runoff

7.6.32 Net annual runoff to Q1 is predicted to be approximately 160,000m<sup>3</sup>, which equates to approximately 438m<sup>3</sup> per day and less than 2% of the Q95 flow in the Afon Gwyrfai. Runoff from Q1 will fluctuate in response to rainfall patterns and system operations, and a greater volume may be released over the short term (hours or days) compared to this scenario in response to rainfall. However, when a spill occurs to the Afon Gwyrfai the flows in the receiving watercourse will be proportionately elevated in response to the same storm event and this will provide increasing dilution of the runoff from Q1.

7.6.33 The mean average water quality of Llyn Padarn (over the long term and over the past couple of years) has been compared with the mean average water

quality in the Afon Gwyrfai. This is considered appropriate since the variations exhibited by some parameters (e.g. copper, zinc, TP, SRP and pH) would be moderated by the relatively slow rate and long period of abstraction. This data comparison has shown that there are no obvious or significant differences in water quality between the two water bodies. Water quality in Llyn Padarn would meet Good Ecological Status or better with respect to the relevant WFD river standards for the Afon Gwyrfai, other than for copper. However, although the long term mean of copper (filtered) for Llyn Padarn just exceeds the annual average WFD river standard, it is less than the Afon Gwyrfai mean average (the latest data from 2011). 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 BQEs in the long term.

7.6.34 Water abstracted from Llyn Padarn (including any contaminants) to fill the Development will be augmented by natural runoff which will help to dilute any parameters of concern. This will continue year on year as natural runoff continues to fill Q1 meaning that the concentration of certain parameters of concern and the lake characteristic of the water will diminish over time. In the long term the water quality of Q1 is expected to take on a similar character to the quality of water that currently resides in the quarry and reflecting the natural conditions, albeit with the added influence of the operation of the pumped storage system. Thus, the risk of excess nutrients etc. being passed from Llyn Padarn to the Afon Gwyrfai will diminish over time. Furthermore, if there was contamination in Q1, it would most likely be in a dissolved form meaning that upon discharge it is likely to disperse and be conveyed rapidly along the Afon Gwyrfai. Any impact on water quality would most likely be short term with the quality and ecology returning quickly to normal once the discharge has ended.

7.6.35 There is a risk that aluminium rich runoff is discharged to the Afon Gwyrfai, which could result in adverse effects on aquatic fauna. It is not possible to compare the leachate tests from soils found in the quarry with background dissolved aluminium levels in the Afon Gwyrfai as NRW have not been able



to provide any data. However, the long term average pH for the Afon Gwyrfai is circumneutral, which would reduce the risk from metal toxicity. The risk to the Afon Gwyrfai would be lower than for Llyn Padarn as it is not proposed to routinely discharge construction site runoff to this watercourse with the main risk coming from the construction of stockpiles of slate, although these would be at least 10 m from the Nant-y-Betws. The Afon Gwyrfai also has a greater potential to disperse the discharge quickly. However, a precautionary approach to minimise the formation of, and conveyance of aluminium rich surface water (e.g. carefully control the amount, location and method of excavating, crushing, and moving slate material) will be adopted with suitable mitigation measures and monitoring as required. Any discharge would also require an Environmental Permit from NRW.

### Nutrients

- 7.6.36 Phosphorus exists in organic, inorganic and soluble sediment-bound forms. It is typically the limiting nutrient controlling biological productivity in freshwaters, although not all forms are readily bioavailable to plants and phytoplankton. The soluble reactive form (SRP or orthophosphate-filtered) is the most bioavailable, but since this is readily taken up by plants and phytoplankton it is not considered a good indicator of nutrient status in lakes and total phosphorus should be used instead. This is problematic for comparison with the Afon Gwyrfai since the current standards for WFD compliance for phosphates in rivers is set for SRP.
- 7.6.37 In Llyn Padarn, the long term and short term mean averages of total phosphorus are both 0.009 mg/l with a relatively small standard deviation of 0.003 mg/l and 0.005 mg/l, respectively. Both averages are just below the annual average WFD standard for Good Ecological Status in lakes (0.01 mg/l) and significantly lower the permit limits typically applied to sewage treatment works operating the best available techniques (i.e. 0.5 to 1 mg/l total phosphorus). However, unlike a sewage treatment works any discharge from Q1 would be intermittent but unlikely to occur due to the preferential bleeding of excess water to Llyn Padarn.



- 7.6.38 As NRW does not monitor total phosphorus in the Afon Gwyrfai there is no data against which to compare with water from Llyn Padarn. Therefore, as a proxy Molybdate Reactive Phosphorous (MRP) has been compared. The long term and short term mean averages for MRP and the range of results are broadly similar for Llyn Padarn and the Afon Gwyrfai suggesting that both have a similar nutrient status. SRP has also been compared and generally the nutrient levels in the Afon Gwyrfai were slightly higher, although this is based on short data record from the Afon Gwyrfai (i.e. 13 monthly samples between January 2005 and February 2006). Despite the limitations of the available data, both MRP and SRP suggest that there would be no significant impact on nutrient status from discharges from Q1. The existing water in Q1 is oligotrophic reflecting the limited allotrophic supply and autotrophic production and it is thought over time both reservoirs will adopt a similar character (i.e. will trend towards oligotrophic conditions). This together with the initial and ongoing dilution of the stored water abstracted from Llyn Padarn by low nutrient rainfall means that there is unlikely to be an impact on the nutrient status of the Afon Gwyrfai.
- 7.6.39 NRW's (as EAW) 2010 investigation into the 2009 algal bloom included nutrient depth profiling between August 2009 to December 2010. Seventeen monitoring visits were made with samples collected at a range of depths for TP and SRP. Although limited in temporal coverage, this data allows a check on whether there would be any difference in water quality at the depth of the intake, which would be a minimum of 5m below normal water level of the lake.
- 7.6.40 Generally, at this depth above the thermocline TP and SRP results were broadly in line with the long and short term mean average results discussed earlier. A significant peak in SRP in August 2010 (>0.2 mg/l) was explained by preceding wet weather increasing runoff from the catchment and the likelihood of spills from Llanberis STW combined with strong winds encouraging river water to spread further across the surface of the lake. Although an isolated event it highlights the need to monitor water quality during abstraction to try and avoid initially abstracting poorer quality water higher in nutrients (i.e. during wet weather, following storm water spills or

potentially lake mixing in late autumn when stratification breaks down). However, due to the slow rate of abstraction over a long period of time any short term peaks will be moderated by longer periods of better water quality and thus the mean average water quality from the data are more likely to be representative of the final quality of abstracted water.

#### Acidification

- 7.6.41 A water quality sample collected from the existing Q1 reservoir water in spring 2015 reported a pH of 8.04 (mild-moderately alkaline). This is within the range of pH recorded in the Afon Gwyrfai, although the mean is typically more circumneutral. The pH of water in Llyn Padarn is circumneutral (mean average 7.14 pH units) and there is no evidence of historical acidification (Bennion et al; 2010). This compares with a mean average pH of 6.88 in the Afon Gwyrfai, which is also circumneutral. Both results are compliant with the WFD standard for High Ecological Status in a cold water river.
- 7.6.42 On rare occasions the pH of Llyn Padarn has exceeded 9 pH, although it is suspected that these short lived events might be associated with algal blooms or increase algal productivity in the summer that are relatively short lived and would most likely require abstraction to be temporarily halted.
- 7.6.43 Consideration has also been given to the risk of acidification from the operation of the Development. Sulphides originate from the anaerobic decay of organic matter or may come from sewage discharges. It is possible that the high oxygenation of water caused by repeatedly passing through the turbines could encourage the formation of sulphur based acids. However, although only six samples have been collected, the levels of sulphur measured as sulphate in Llyn Padarn appear to be low (mean average 3.8 mg/l with small standard deviation). It is therefore considered that the risk of this occurring is low. Future monitoring of water quality in the pumped storage system will help monitor trends and if there was evidence of increasing acidification action could be taken to periodically dose the water with a suitable alkaline, in consultation with NRW.
- 7.6.44 Overall, the pH of existing quarry water and the mean and range of pH for Llyn Padarn is broadly comparable to the mean and range of pH recorded

for the Afon Gwyrfai and it is considered that there is a low risk of increasing acidification from the oxidation of sulphides. Discharges of excess water would preferentially be from Q6 to Llyn Padarn. However, should there be a discharge from Q1 to the Afon Gwyrfai catchment it would be infrequent, temporary and diluted in river. Therefore, it is not thought that discharges from Q1 would result in any significant effect on the watercourse. Regular monitoring of the water in Q1 will include pH and if this begins to trend to more acidic conditions measures could be taken to dose the water with a suitable alkaline.

#### Emergency Discharge of Water from Q1

7.6.45 Under certain but unlikely circumstances (i.e. potential dam failure and inability to transfer water to Q6 via the penstock) there could be the need for the discharge of water from Q1 to the Afon Gwyrfai via a relief valve and spillway infrastructure to the Nant-y-Betws. Water quality issues would be the same as discussed earlier, albeit a potentially greater volume of water would be discharged that could result in a more immediate impact and not necessarily with any increase of in channel dilution in response to a storm. Nevertheless, the water quality data reviewed does not suggest that there would be any significant level of contamination in the discharge and the event would effectively be a 'one-off' with no long lasting effects, providing appropriate measures are put in place to prevent scour and erosion in the Nant-y-Betws to prevent mobilisation of fine sediments downstream and into the Afon Gwyrfai.

#### Sedimentation

7.6.46 Water abstracted from Llyn Padarn will be screened to prevent entrainment of fine sediment and transportation of this material into the pumped storage system and a coarse screen will also be positioned across the scour valve to prevent ingress of larger material that may accumulate on the bed of the quarry. The rate of runoff will be limited to a rate agreed with NRW under an discharge consent to ensure that excessive and unacceptable erosion of Nant-y-Betws does not occur. Therefore, sedimentation effects are unlikely to be an issue and have not been considered any further.

### Specific Pollutants

7.6.47 The Afon Gwyrfai is monitored for a range of hydrocarbons, pesticides, and metals, all of which are at High Status. The Development will not discharge any of these substances and thus no change to these chemical parameters is predicted. It is expected that over time the quality of water held within the system may adopt characteristics similar to the quality of water currently in Q1 and Q6, where average dissolved copper concentrations range from 2.8 (in Q1) to 7.01 (in Q6). Based on a series of water samples collected in 2015 all parameters are at acceptable levels other than copper, which exceeds the annual average standard of 1 ug/l bioavailable. However, as any discharge would be infrequent, diluted and dispersed in the watercourse, and the fact that not all of the dissolved copper would be in a form that is bioavailable, it is unlikely that the discharge would cause a failure in the WFD EQS for dissolved copper.

7.6.48 Overall, the Development is considered to be compliant with all WFD objectives for the Afon Gwyrfai water body.

### *Arboricultural Survey*

7.6.49 An arboricultural survey within two survey blocks (Upper Area (Q1) and Lower Area (Q6)) was completed in late February and April 2013 by Fairley Arboriculture & Landscape Planning Ltd (Fairley Arboriculture & Landscape Planning Ltd (2013) *Assessment to BS 5837:2012 of Trees at The Proposed Hydroelectric Storage Scheme at Glyn Rhonwy, Llanberis April 2013*). The trees were inspected from ground level using the Visual Tree Assessment (VTA) method. The assessment paid due regard to the criteria provided in *BS 5837:2012: Trees in relation to design, demolition and construction*. The survey confirmed the presence of notable trees and areas. The assessment did not take into account any ecological value of the trees in relation to bat roosts or nesting birds.

7.6.50 Methodologies, limitations and full report are provided in Volume 3, Appendix 7.6. A short summary is given below. Recommendations for retention of notable trees and areas are given in Volume 3, Appendix 7.6.

### Upper Area – Q1

7.6.51 The trees in the Upper Area consist of two groups; a small monocultural block of standing sitka spruce (*Picea sitchensis*), which is becoming increasingly wind-blown with the loss of shelter from the adjacent, clear-felled block; and an area of plantation forest which has been clear felled and is now stocked, partly by planting, but predominantly by natural regeneration. The sitka spruce block was categorised as ‘U’ *‘those in such a condition that they cannot realistically be retained as living trees in the context of the current land use for longer than 10 years’*.

### Lower Area – Q6

7.6.52 The trees in the ‘lower area’ of the Order Limits are predominantly tough, adaptable “pioneer” species, as expected on a disused quarry site, seeding freely and germinating where pockets of suitable substrate are available. Trees and areas were categorised as summarised below. Specific details and maps are provided in Volume 3, Appendix 7.6.

- Four Category A trees and eight Category A areas – ‘Trees of high quality with an estimated remaining life expectancy of at least 40 years’;
- Eight Category B trees and 24 Category B areas – ‘Trees of moderate quality with an estimated remaining life expectancy of at least 20 years’;
- Four Category C trees and 16 Category C areas – ‘Trees of low quality with an estimated remaining life expectancy of at least 10 years, or young trees with a stem diameter below 150 mm’; and,
- No Category U trees and 3 Category U areas – ‘Those in such a condition that they cannot realistically be retained as living trees in the context of the current land use for longer than 10 years’.

### *Fungi Survey*

7.6.53 The Order Limits was visited on four separate occasions during autumn 2011 (*Evans, D. (2012) A Survey for Grassland Fungi on the Glyn Rhonwy Site, Llanberis in Autumn 2011*). The aim of the mycological study was to provide a list and location of any species present, to identify the richest areas for grassland fungi, especially waxcaps.

7.6.54 All areas of suitable grassland habitat were surveyed for the presence of fungi. Counts of individual fruiting bodies were made for protected or notable species, otherwise presence only was recorded. The suite of species recorded were compared with the *Survey of Unimproved and Semi-improved Sites for Grassland Fungi in Arfon (2008) compiled by Gwynedd Council* to establish the sites importance in a local context. The areas immediately surrounding the main quarry holes, inclines and levels supported few species and those recorded were mainly Class B and C indicator species and present on other areas of the Order Limits. The richest areas for grassland fungi, containing the highest number of species, including some Class A indicator species, were 3 groups of inter-connected sheep grazed fields (Pen y Bwlch Fields) in the western section of the Order Limits (Referenced as Fields A, B and C Figure in Volume 3, Appendix 7.7). A total of 40 'CHEGD' species, giving a Order Limits Quality Score of 84, were recorded on the whole survey area. The total is comprised of 6 fairy clubs (*Clavarioids*), 21 wax caps (*Hygrocybe*), 9 pinkgills (*Entolomas*), 1 earth tongue (*Geoglossum*) and 3 species in the *Dermoloma* group. A total of 33 species were recorded on the Fields C (Volume 3, Appendix 7.7) making this the most important area for fungi within the Order Limits. There were 7 Class A species including crimson waxcap (*Hygrocybe punicea*), *Hygrocybe ingrate* (a waxcap), violet coral fairy club (*Clavaria zollingeri*) and three pinkgills, *Entoloma anatinum*, *Entoloma asprellum* and mealy pink gill (*Entoloma prunuloides*). These are all excellent indicator species and were considered to show a grassland which has had little if any artificial input or intervention for many decades if ever.

7.6.55 Comparison of the Order Limits with *other sites in Arfon (data from Arfon Survey)* using the total number of CHEGD species and Quality Scoring System showed that the Development ranked 7th for its species total of 40 and 6th for its quality score of 84. The Field area at C, if compared independently, ranked equal 12th for its CHEGD species total of 33 and 11th for its quality score of 66. Most of the higher ranking sites in the Arfon survey had been surveyed over more than one season and sometimes for several years highlighting the importance of the fields especially at C and A.



The fields within the Order Limits are also relatively small areas compared to some of the Arfon survey sites.

7.6.56 The 2011 survey concluded that the grazed grassland field within the Order Limits have considerable mycological interest with a good range of grassland fungi species present including some of the highest Class A value. No protected fungi species were recorded. Waxcaps are a Gwynedd LBAP Species. The results are included in the protected or notable species Table 7-7 and the full report is provided in Volume 3, Appendix 7.7.

#### *Lichen Survey*

7.6.57 Lichen habitats within the Order Limits were surveyed over two days in October 2011 and two days in February 2012 (*Chambers, S.P. (2012) Glyn Rhonwy Slate Quarries, Llanberis – Lichen Survey*).

7.6.58 Areas supporting notable species, or assemblages of species typifying a habitat, were recorded. Suitable habitat types were selected by eye for sampling. Applying experience gained from surveying similar rock waste-dominated metal-mine habitats in Wales a targeted sampling approach was adopted. No protected species were recorded. The following notable species were recorded (Nationally Scarce – NS; Nationally Rare – NR; Near Threatened – NT; Vulnerable - VU):

- *Catillaria atomarioides* NS
- *Cecidonia xenophana* NS;
- *Clauzadeana macula* NS;
- *Coppinsia minutissima* NR;
- *Cryptodiscus gloeocapsa* NS;
- *Fellhanera bouteillei* NS;
- *Fuscidea praeruptorum* NS;
- *Halecania spodomela* NR;
- *Halecania viridescens* NS, NT;
- *Lecanora epanora* NS;



- *Lecanora stenotropa* NS;
- *Lecidea plana* NS;
- *Lecidea swartzioidea* NS;
- *Lepraria ecorticata* NS;
- *Miriquidica pycnocarpa f. pycnocarpa* NS;
- *Placynthiella dasaea* NS;
- *Porpidia contraponenda* NS;
- *Porpidia melinodes* NS;
- *Porpidia striata* NS;
- *Protoparmelia atriseda* VU, NR;
- *Rimularia intercedens* NS
- *Rimularia badioatra* NS
- *Stereocaulon condensatum* NS;
- *Stereocaulon leucophaeopsis* NS;
- *Stereocaulon vesuvianum var. nodulosum* NS

7.6.59 The results are included in the protected or notable species Table 7-7 and the full report is provided in Volume 3, Appendix 7.8.

#### Amphibian Survey

7.6.60 A terrestrial search under existing refugia within the concrete plateau of Q8/former bomb store was conducted by Cambrian Ecological Partnership (CEP) on 30<sup>th</sup> September 2010 for an unrelated development (*Cambrian Ecological Partnership (CEP) (2010) Glyn Rhonwy, Llanberis. Proposed Tower Construction Bat & Protected Species Survey October 2010*). Any loose material was inspected. Due to the timing of this survey, any amphibians utilising the land within the Order Limits would not have been present in the standing water within the concrete plateau (flooded entrance to one tunnel and water filled concrete channel). Palmate newt (*Lissotriton helveticus*) and common toad (*Bufo bufo*) were identified.

7.6.61 The results are included in the protected or notable species Table 7-7 and the full report is provided in Volume 3, Appendix 7.9.

Reptile Survey

7.6.62 Reptile surveys, utilising artificial refugia, were completed within the Order Limits by CEP in 2011 (CEP (2012b) Proposed Glyn Rhonwy Pumped Storage System Reptile Species Surveys – 2011. February 2012). The surveys concentrated on areas of suitable reptile habitat.

7.6.63 The refugia were checked fortnightly from the middle of May 2011 until the middle of August 2013. Of the 591 refugia checks completed, only three reptiles were recorded, a single slow worm (*Anguis fragilis*) and two common lizards (*Zootoca vivipara*). In addition, five incidental common lizard sightings were also made. The slow worm was recorded on the edge of woodland by Q6. It was considered that in both national regional terms, the slow worm population within the Order Limits is not likely to be significant, primarily due to the very small numbers involved. The land within the Order Limits is not a significant feature locally as at least two areas adjacent to the Order Limits are known to support the species in larger numbers. The common lizards were found adjacent to Q2 and Q6, and further records from outside of the Order Limits adjacent to Q3, Q4 and Q5. It was considered that in both national and regional terms, the common lizard population within the Order Limits is not likely to be significant. The local status of common lizard locally is less clear, but large tracts of habitat suitable for common lizards are present in the local area.

7.6.64 The results are included in the protected or notable species Table 7-7 and the full report is provided in Volume 3, Appendix 7.10.

Breeding and Winter Bird Surveys 2011 – 2012

7.6.65 Breeding and winter bird surveys were completed between 2011 – 2012 by CEP (CEP (2012a) Proposed Pumped Storage Hydro-Electric Scheme Glyn Rhonwy, Llanberis Breeding & Winter Bird Surveys 2011-2012).

7.6.66 The land within the Order Limits was divided into two transects: Q1 and Q2 with surrounding habitat were covered by the upper transect. Q3 to Q6 and

surrounding habitat were covered by the lower transect. These transects were supplemented by a minimum of two hour vantage point surveys which covered each of the quarry voids and the surrounding habitat.

7.6.67 Each, approximately two hour transect was walked twice in April 2011, twice in May 2011 and twice in March 2012 commencing at dawn. All birds heard or seen were recorded and the results plotted on individual species maps. These surveys were then repeated in February 2012 to record winter activity. A desk study was completed to gather local records.

7.6.68 The 2011 and 2012 surveys recorded a total of 36 species, 28 of which are thought to be breeding within the Order Limits. Of these 28 species four are included on the RSPB 'Red List' and ten on the RSPB 'Amber List'. The most notable species recorded were chough and peregrine falcon, both of which are included in 'Schedule 1' of the Wildlife & Countryside Act. Seven of the species recorded are 'Priority BAP Species' Listed under Section 42 of the NERC Act (2006).

7.6.69 The CEP desk study identified a record of barn owl (*Tyto alba*) nesting in the quarry system in 2007. Although no targeted surveys for barn owls have been undertaken (due to health and safety grounds), no barn owls were recorded during the considerable bat survey effort and therefore it has been presumed that this species is not currently nesting within the Order Limits.

7.6.70 During winter the upland areas which are largely devoid of shelter represent a hostile environment with most species abandoning this habitat for more favourable climatic conditions. The lower end of the Order Limits however still supported a fairly typical winter woodland species assemblage, albeit in relatively small numbers.

7.6.71 The results are included in the protected or notable species Table 7-7 and the full report is provided in Volume 3, Confidential Appendix 7.1.

#### Badger Survey

7.6.72 The area around Q8 – the former bomb store, was inspected for badger (*Meles meles*) setts and badger signs, for an unrelated development, on 30<sup>th</sup> September 2010 by CEP (CEP (2010) Glyn Rhonwy, Llanberis.

*Proposed Tower Construction Bat & Protected Species Survey October 2010 CEP, 2010*). Where setts were identified, a movement activated remote infra-red camera system was set up to record any nocturnal badger activity. One active badger sett with three entrances was found.

- 7.6.73 The Order Limits and surrounding 100m buffer zone were inspected for badger setts and badger signs on 10<sup>th</sup> September, 2011 by CEP (*CEP (2012c) Proposed Glyn Rhonwy Pumped Storage System Badger Species Surveys – 2011. March 2012*). Any tracks within the woodlands or grassland areas were followed. A desk study for local badger records was completed. Survey effort was concentrated on the eastern lower elevation of the Order Limits due to the presence of more suitable habitat and proximity to known areas of badger activity, including an active sett.
- 7.6.74 The majority of habitat within the Order Limits offers poor foraging potential for badgers due to the rocky nature of the substrate and thin, low-nutrient top-soil layer in most places. The woodland in the lower elevations of the Order Limits where fungi, fruit, small mammals and invertebrates are present is likely to be more suitable for badgers.
- 7.6.75 No evidence of foraging was found within the Order Limits and none of the badger paths found gave any indication that the animals are making any significant use of the habitats within the Order Limits. The badger sett found in 2010 was still active. No additional setts were identified.
- 7.6.76 Given the presence of an active sett near the Order Limits and the moderate opportunities offered within the lower reaches of the Order Limits, it is reasonable to assume that there may be occasional incursion by individual animals into other areas within the Order Limits. The results are included in the protected or notable species Table 7-7 and the full report is provided in Volume 3, Confidential Appendix 7.3.

#### *Otter Survey*

- 7.6.77 An otter (*Lutra lutra*) survey within the Order Limits was completed on 8<sup>th</sup> November 2011 by CEP (*CEP (2012d) Proposed Glyn Rhonwy Pumped Storage System Otter Species Surveys – 2011. February 2012*). The Order Limits was methodically searched for field signs of otter presence. Tracks

leading directly to and from watercourses/bodies were investigated. In addition to direct field signs of otters, areas of potential habitat were searched for 'lying up' sites, in dense cover possible holts were noted and potential prey availability was assessed. Local otter records were gathered by CEP during a desk top study. The survey was conducted during dry weather conditions and there were no survey limitations due to water levels or rain.

- 7.6.78 The results of the survey for otters were negative, recording no signs of recent or current usage by the species.
- 7.6.79 The area within the Order Limits was considered to offer low quality foraging habitat (the water within Q1 and Q6 supported no fish, apart from stickleback, and the watercourses are too small to support otters) and, in the context of the wider area, holds little to encourage otters to either forage within it or commute through to the upland areas above.
- 7.6.80 Given the proximity of otters to the lower end of the Order Limits at Llyn Padarn SSSI, it was concluded reasonable to assume that there may be occasional incursion by individual animals. However, it is highly unlikely that any otter would remain in the area or utilise the resources to any significant degree. The results are included in the protected or notable species Table 7-7 and the full report is provided in Volume 3, Appendix 7.12.

#### *Water Vole Survey*

- 7.6.81 During the botanical surveys conducted in 2012 incidental evidence of the presence of water voles (*Arvicola amphibius*) was to be noted, the botanical surveys covered the far western and eastern ends of the Order Limits only, during which, no evidence of water voles were identified within the Order Limits. The results are included in the protected or notable species Table 7-7 and the full report is provided in Volume 3, Appendix 7.3.

#### *Bat Surveys*

- 7.6.82 Surveys were carried out by CEP in 2010, for an unrelated development in the location of the former bomb store (*CEP (2010) Glyn Rhonwy, Llanberis. Proposed Tower Construction Bat & Protected Species Survey October*

2010). The surveys included one internal inspection of the bomb store and connected tunnels, two emergence surveys and remote monitoring. The results are included in the protected or notable species Table 7-7 and the full report is provided in Volume 3, Appendix 7.9.

- 7.6.83 The internal survey of the tunnels and explosives store on 30<sup>th</sup> September 2010 was negative. Occasional small accumulations of lesser horseshoe bat (*Rhinolophus hipposideros*) droppings were found. The survey of the culvert, which was outside the unrelated development, (now referred to as Tunnel 16) revealed the presence of three lesser horseshoe bats on 30<sup>th</sup> September and four on 1st October. Foraging activity by small numbers of common and soprano pipistrelles; (*Pipistrellus pipistrellus* and *P. pygmaeus*), whiskered/Brandts bats; (*Myotis mystacinus/brandtii* and *Myotis* sp. and lesser horseshoe was recorded. Conditions within the tunnels associated with the bomb store were considered suitable to support hibernating lesser horseshoe bats.
- 7.6.84 Previous surveys were carried out within the Order Limits by CEP between 2011 and 2012 to inform the presence and assemblage of bat species within the Order Limits (*CEP (2012e) Proposed Pumped Storage Hydro-Electric Scheme Glyn Rhonwy, Llanberis Bat Surveys 2011-2012*).
- 7.6.85 Common pipistrelle, soprano pipistrelle, brown long eared (*Plecotus auritus*) and whiskered/Brandt's were identified during walked activity transects in relatively low numbers. Automated surveys at the bottom of Quarries 5, 6 and 7 between May and July 2011 identified that the vegetated areas within each void are utilised by foraging bats with the timing and numbers of files suggesting a low number of bats foraging for prolonged periods in the vicinity of the Anabat. Common pipistrelle, soprano pipistrelle, brown long-eared, *Myotis* species, noctule (*Nyctalus noctula*) and lesser horseshoe calls were all recorded on Anabats during the foraging surveys. Swarming surveys in August to October 2011 did identify some social calling however not in significant numbers to suggest a swarming site of significance, rather that there is a low number of bats potentially preparing to hibernate within the tunnel systems. Hibernation surveys in December 2011 and January 2012 identified lesser horseshoes (max count 12) and Natterer's (*Myotis*

*nattereri*) (max count 2) hibernating within tunnels. The results are included in the protected or notable species Table 7-7 and the full report is provided in Volume 3, Appendix 7.13.

### *Habitats*

7.6.86 Habitats within the Order Limits are provided in Table 7-5 below. This data was recorded during the Extended Phase 1 habitat surveys. Volume 3, Appendix 7.1 and Volume 4, Figures 7.1.1 – 7.1.6 provide a detailed map of these habitats.



Table 7-5: Habitat Zones	
Habitat	Description
Broadleaved Semi-Natural Woodland	<p>There are several areas of broadleaved semi natural woodland in the lower elevation of the Order Limits. A strip of broadleaved semi-natural woodland surrounds Q6. Woodland extends down towards Q7, species include downy birch (<i>Betula pubescens</i>), oak (<i>Quercus</i> sp.), rowan (<i>Sorbus aucuparia</i>), willow, (<i>Salix</i> sp.), heather (<i>Calluna vulgaris</i>), ferns (<i>Pteridophyta</i> sp.), buddleia (<i>Buddleja davidii</i>) and bracken (<i>Pteridium aquilinum</i>). The woodland to the south west of Q7 has a species rich glade, species include sweet vernal grass (<i>Anthoxanthum odoratum</i>), selfheal (<i>Prunella vulgaris</i>), thyme (<i>Thymus serpyllum</i>), stonecrops (<i>Sedum</i> sp.), gorse (<i>Ulex europaeus</i>), heather, cocksfoot (<i>Dactylis glomerata</i>), Yorkshire fog (<i>Holcus lanatus</i>).</p> <p>Broadleaved semi-natural woodland extends towards the east following the pipe route down to Llyn Padarn. Species include downy birch, willow, ash (<i>Fraxinus excelsior</i>) and oak with an understory of bramble (<i>Rubus fruticosus</i>) and buddleia.</p> <p>A strip of broadleaved semi-natural woodland borders the southern Order Limits adjacent to Q6. This has a stream running through it and contains areas of wet woodland; species present include birch, willow, oak, sycamore (<i>Acer pseudoplatanus</i>), hawthorn (<i>Crataegus monogyna</i>), dog rose (<i>Rosa canina</i>), moss and fern species.</p> <p>The tree survey identified four Category A trees and eight Category A areas (trees of high quality with an estimated remaining life expectancy of at least 40 years); and eight Category B trees and 24 Category B areas (trees of moderate quality with an estimated remaining life expectancy of at least 20 years).</p> <p>There are four TPOs that fall within the Order Limits comprising three areas and one woodland. Volume 4, Figure 7.2 shows the location of the TPOs. The TPO document is contained within Appendix 7.17.</p>
Coniferous Woodland – Plantation	<p>In the west of the Order Limits there is an area of sitka spruce plantation woodland; there are some areas of windfall within the stand.</p>
Coniferous Woodland – Recently Felled	<p>In the west of the Order Limits there is an area of recently clear felled plantation woodland within an area of commercial forestry; there is one small area of clear felled plantation woodland within the PRoW diversion route.</p>

Table 7-5: Habitat Zones	
Habitat	Description
Mixed Woodland – Semi-Natural	There are several areas of mixed semi natural woodland in the lower elevations of the Order Limits. Species include downy birch, rowan, sitka spruce, oak, ash, Scots pine ( <i>Pinus sylvestris</i> ), larch ( <i>Larix sp.</i> ) and buddleia with an understory of mosses, heather, ferns and bramble. All woodland is under a blanket TPO (Volume 4, Figure 7.2).
Scrub – Scattered	Scrub surrounds Q8. A further area of scattered scrub is located to the south east of Q6. Species include downy birch, buddleia, heather, oak, birch, gorse and bramble.
Acid Grassland – Semi-Improved	There several small areas of semi-improved acid grassland in the west of the Order Limits, grazed by sheep; there are two small areas within the PRow diversion route, one of which is grazed by sheep, and one area within the compensatory land grazed by sheep.. Species include mat grass ( <i>Nardus stricta</i> ), heath bedstraw ( <i>Galium saxatile</i> ), tormentil ( <i>Potentilla erecta</i> ), soft rush ( <i>Juncus effusus</i> ), black rush ( <i>Juncus roemerianus</i> ), heather, bilberry ( <i>Vaccinium myrtillus</i> ), purple moor grass ( <i>Molinia caerulea</i> ) and sedge species ( <i>Carex sp.</i> ).
Marshy Grassland	There is one small area of marshy grassland adjacent to the running water within the PRow diversion route. Species include lesser celandine ( <i>Ranunculus ficaria</i> ), soft rush and blunt-leaved bog-moss ( <i>Sphagnum palustre</i> ).
Bracken – Scattered	There is a patch of scattered bracken within the acid grassland located south of Q3.
Bracken – Continuous	There is a patch of dense bracken to the south of Q4, between the quarry and spoil heaps.
Wet Dwarf Shrub Heath	An area within the PRow diversion route. Species include purple moor grass, compact bog-moss ( <i>Sphagnum compactum</i> ) and heather.
Dry Heath / Acid Grassland	There is a large area of dry heath / acid grassland surrounding Q1, and a large area covering the majority of the compensatory land and two sections of the PRow diversion route. To the west of Q1 an area of heath amongst a slate waste heap, species include heather, gorse, bilberry, stonecrop, buttercup species ( <i>Ranunculus sp.</i> ) and mosses.  To the east and north of Q1 there is a large area of mosaic habitat of heathland and grassland. Species include

Table 7-5: Habitat Zones	
Habitat	Description
	<p>gorse, heather, bilberry, black rush, soft rush and mosses. Lichen is growing on the slate waste.</p> <p>A strip of heath is located to the north of Q2, this surrounds the outer edge of the quarry. Species include heather, bilberry and mosses.</p>
Flush and Spring – Acid / Neutral Flush	<p>There are several small areas of acid / neutral flush between Q2 and Q3, and along the PRow diversion route within the wet dwarf shrub heath. Species include soft rush with a sphagnum moss (<i>Sphagnum</i> sp.) carpet.</p>
Running Water	<p>There are a total of eight watercourses within or immediately adjacent to the Order Limits. Three unnamed watercourses run in a north-south located towards the northern Order Limits of the western section of the Development; the Nant-y-Betws runs east-west immediately adjacent to the southern Order Limit towards the west of the Development, and also crosses the PRow diversion route; two unnamed tributaries of the Nant-y-Betws cross the PRow diversion route; and there are two unnamed watercourses/drains to the east of the Order Limits adjacent to/crossing the southern Order Limit, one of which sinks underground.</p>
Standing Water	<p>Immediately adjacent to the PRow diversion route is an area of standing water (pond), at the time of survey supporting a broadleaved pondweed species (<i>Potamogeton</i> sp.).</p>
Standing Water – Oligotrophic	<p>Standing water is located in Q1 and Q6, and the Order Limits extends into Llyn Padarn, a large lake extending over 3km along the length of the valley. Llyn Padarn has a rock substrate with no emergent vegetation. The quarry ponds have no emergent vegetation.</p>
Quarry	<p>There are nine quarries present at Glyn Rhonwy and the Bomb Store (Q8), although Q3, Q4, Q5, and Q8 are all outside of but immediately adjacent to the Order Limits. The quarries are disused and are currently under varying stages of re-colonisation by vegetation. Tunnels are present within the quarries.</p> <ul style="list-style-type: none"> <li>• Q1 – Bare slate rock face. Sparsely vegetated with small areas of heather and ferns and five small trees</li> </ul>

Table 7-5: Habitat Zones	
Habitat	Description
	<p>including rowan, downy birch and oak.</p> <ul style="list-style-type: none"> <li>• Q2 – Quarry with spoil heaps with some scattered heath on ledges.</li> <li>• Q3 – Comprising three small quarries, only Q3a is within the Order Limits. Q3 to the north west has standing water in the bottom and heath vegetation around the edge. Species include heather, rowan and ferns. The quarry to the north east has heath vegetation around the edge, species include heather, fern, soft rush, oak and rowan. The quarry to the south has a small stream running into it. Ferns are growing on the sides and trees are in the bottom. Species include sycamore, willow, downy birch and rowan.</li> <li>• Q4 – Quarry with heath vegetation around rim.</li> <li>• Q5 – Quarry with a woodland base and trees around edges. Species include oak, birch, ash, buddleia and rowan.</li> <li>• Q6 – Quarry with rock face. Vegetation is sparse with small areas of scattered scrub. Species include oak, birch, ash, buddleia and rowan.</li> </ul> <p>Q7 – Rock face with area of scattered scrub in the base; species include downy birch, buddleia and heather. There is a concrete lined pit with scattered buddleia in the east of the quarry. A tunnel to the former bomb store is located on the southern wall. A small quarry is located in-between Q6 and Q7. This has steep rock faces and sparse vegetation.</p> <p>There are two small quarries within the compensatory land and one immediately adjacent to the PRow diversion route.</p>
Spoil (Slate Waste)	<p>Slate spoil heaps associated with the slate quarries are located throughout the Order Limits. Vegetation on the spoil heaps is sparse with the exception of two spoil heaps within the compensatory land and a spoil heap adjacent to Q2 and Q1, all of which form a mosaic with acid grassland and heath vegetation. Species include heather, bilberry, gorse, lichens and moss.</p>

Table 7-5: Habitat Zones	
Habitat	Description
Bare Ground (hard standing and slate plateaus)	<p>Areas of bare ground (hard standing and slate plateaus) are present throughout the Order Limits. A road runs in an east-west direction in the south west of the Order Limits, south of Q1. This continues west beyond the Order Limits into the village of Groeslon.</p> <p>Another road bisects the Order Limits between Q5 and Q6. This continues beyond the Order Limits into the town of Llanberis.</p> <p>The A4086 bisects the Order Limits in the south east.</p> <p>There are several plateaus of crushed slate. To the south of Q6 there is a plateau of crushed slate. This is sparsely vegetated with small areas of stonecrop. To the north east of Q6 and south of Q7 there are further plateaus of slate, without vegetation. Several tracks link these plateaus and join to the A4086.</p> <p>Within Q7 there is a concrete lined pit, this has a tunnel at its southern end extending to the former explosives store.</p> <p>The Llyn Padarn car park is within the south east corner of the Order Limits.</p> <p>The PRow diversion route includes five areas of gravel forest roads.</p>
Wall	<p>A stone wall runs parallel to the road in the west. Another stone wall forms a field boundary joining at its northern end to Q2. There are stone walls present along the southern boundaries of the compensatory land.</p>

*Protected or Notable Species*

7.6.87 Species records identified during the desk study are listed below.

7.6.88 Cofnod returned the following protected and notable species . Only records from the last 10 years have been included:

- Invertebrates: Small heath (*Coenonympha pamphilus*), small pearl bordered fritillary (*Boloria selene*), dusky brocade (*Apamea remissa*), grayling (*Hipparchia semele*), white ermine (*Spilosoma lubricipeda*), shaded broad-bar (*Scotopteryx chenopodiata*), rosy rustic (*Hydraecia micacea*), small emerald (*Hemistola chrysoprasaria*), pale eggar (*Trichiura crataegi*), garden tiger (*Arctia caja*) oak lutestring (*Cymatophorima diluta*), small phoenix (*Ecliptopera silaceata*);
- Fish: European eel (*Anguilla anguilla*);
- Amphibians: Palmate newt, common toad;
- Reptiles: Common lizard, slow worm, adder (*Vipera berus*);
- Birds: See Table 7-6 for a list of bird species;
- Bats: Common pipistrelle, indeterminate pipistrelle (*Pipistrellus* sp.), Daubenton's (*Myotis daubentonii*), brown long-eared, lesser horseshoe, indeterminate horseshoe (*Rhinolophus* sp.), noctule, soprano pipistrelle, whiskered, and indeterminate Myotis. Bat roost records were identified within 2km for common pipistrelle and lesser horseshoe (includes records of hibernating lesser horseshoes within the Order Limits);
- Other Mammals: Water vole, Eurasian badger, otter; polecat (*Mustela putorius*).

Table 7-6: Records of Bird Species Returned from Cofnod	
Scientific Name	Common Name
( <i>Alauda arvensis</i> )	Skylark
( <i>Alcedo atthis</i> )	Kingfisher
( <i>Bucephala clangula</i> )	Goldeneye
( <i>Carduelis cabaret</i> )	Lesser redpoll
( <i>Chroicocephalus ridibundus</i> )	Black-headed gull

**Table 7-6: Records of Bird Species Returned from Cofnod**

<b>Scientific Name</b>	<b>Common Name</b>
<i>(Circus aeruginosus)</i>	Marsh harrier
<i>(Circus cyaneus)</i>	Hen harrier
<i>(Cuculus canorus)</i>	Cuckoo
<i>(Emberiza citronella)</i>	Yellowhammer
<i>(Emberiza schoeniclus)</i>	Reed bunting
<i>(Falco peregrinus)</i>	Peregrine
<i>(Falco tinnunculus)</i>	Kestrel
<i>(Ficedula hypoleuca)</i>	Pied flycatcher
<i>(Larus argentatus)</i>	Herring gull
<i>(Linaria cannabina)</i>	Linnet
<i>(Linaria flavirostris)</i>	Twite
<i>(Locustella naevia)</i>	Grasshopper warbler
<i>(Loxia curvirostra)</i>	Common crossbill
<i>(Muscicapa striata)</i>	Spotted flycatcher
<i>(Passer domesticus)</i>	House sparrow
<i>(Phylloscopus sibilatrix)</i>	Wood warbler
<i>(Poecile palustris)</i>	Marsh tit
<i>(Prunella modularis)</i>	Dunnock
<i>(Pyrrhocorax pyrrhocorax)</i>	Chough
<i>(Pyrrhula pyrrhula)</i>	Bullfinch
<i>(Regulus ignicapilla)</i>	Firecrest
<i>(Sturnus vulgaris)</i>	Starling
<i>(Turdus philomelos)</i>	Song thrush
<i>(Turdus torquatus)</i>	Ring ouzel
<i>(Tyto alba)</i>	Barn owl
<i>(Vanellus vanellus)</i>	Lapwing



- 7.6.89 No response was received from the local BTO recorder regarding records of protected species within the local area.
- 7.6.90 *Rugathodes bellicosus* (a small theridiid spider), has been recorded by the local biodiversity group in slate waste south of Q6. This species is notable due to its 50% population decline in the past 20 years. Although it appears to have declined, this may in part be due to under-recording in its specialised micro-habitat (Dawson et al, in prep.). The species is found within boulders, scree slopes and manmade quarries with a main threat to the species being tidying of quarries.
- 7.6.91 Trees within the Order Limits are under a blanket TPO. A plan of trees with TPOs is shown in Volume 4, Figure 7.2 and the report in Volume 3, Appendix 7.17.
- 7.6.92 A tree survey undertaken in 2013 identified four Category A trees and eight Category A areas (trees of high quality with an estimated remaining life expectancy of at least 40 years); and eight Category B trees and 24 Category B areas (trees of moderate quality with an estimated remaining life expectancy of at least 20 years). The report can be found in Volume 3, Appendix 7.6.
- 7.6.93 Table 7-7 below details the potential for protected or notable species within the Order Limits. This information is taken from the Extended Phase 1 habitat surveys and the subsequent Phase 2 surveys for protected and notable species (see Volume 3, Appendices 7.1 – 7.4, 7.6 – 7.16, 7.19 and 7.20, and Confidential Appendices 7.1 – 7.4 for the full text).

Table 7-7: Protected or Notable Species	
Species	Description
Lichens and Bryophytes	<p>Llyn Coed SSSI is located 0.75 km from the Order Limits and supports a collection of unusual bryophytes.</p> <p>The 2011 and 2012 lichen survey identified 178 species, of which: 21 are Nationally Scarce, 1 is Nationally Rare and Red Data Book (RDB) Vulnerable, 1 is Nationally Scarce and RDB Near Threatened, 1 is Nationally Rare and RDB Data Deficient, and 1 is Nationally Rare (Chambers, 2012).</p> <p>Volume 4, Figure 7.3 shows the locations of the notable lichens. The lichen report is contained within Volume 3, Appendix 7.8.</p>
Fungi	<p>The 2011 grassland fungi survey identified 40 species with the Order Limits. The richest areas being the grazed fields (Volume 4, Figure 7.4 Fields A, B and C). The report concluded that grassland had the most mycological interest and the areas immediately surrounding the main quarry holes, inclines and levels had less mycological interest (Evans, 2012). The report is contained within Volume 3, Appendix 7.7.</p>
Aquatic Plants	<p>No submerged aquatic (higher) plants were recorded growing in Q1 or Q7.</p> <p>In Q6, the waterline along the west and east margin had growths of moss on the solid rocks and larger boulders. All sample specimens of the moss were <i>Brachythecium plumosum</i>, a species common throughout the UK in damp shaded environments, and particularly on lake and streamsides.</p> <p>In Q1, the flatter areas around the western and south shore were relatively rich in bryophytes. Of these only two species of liverwort were recorded growing in the water below the splash zone: <i>Nardia scalaris</i> (ladder flapwort) and <i>Pellia</i> sp.. These are common within Wales and the UK.</p>
Diatom	<p>The diatom assemblages are typical of nutrient poor, circum-neutral lakes with clear water. The majority of species recorded in both sites are benthic species which is indicative of the high water clarity; <i>Fragilariaceae</i> being the most represented family.</p> <p>The full species list is contained within Volume 3, Appendix 7.19 (ENSIS, 2015).</p>
Phytoplankton	<p>Phytoplankton concentrations were low in both sites, which is typical for nutrient poor waters. Q1 was particularly dilute and dominated (in numbers) by picoplankton; tiny single-celled algae. Q6 was slightly more diverse and in addition to picoplankton had relatively high numbers of the colonial chrysophyte <i>Dinobryon sociale</i>. This species often</p>

Table 7-7: Protected or Notable Species	
Species	Description
	<p>blooms in the spring and is common in UK lakes. There were no cyanobacteria (blue-green) recorded in either site and no invasive/non-native species.</p> <p>The full species list is contained within Volume 3, Appendix 7.19 (ENSIS, 2015).</p>
Trees	<p>The arboricultural assessment (Fairley Arboriculture &amp; Landscape Planning Ltd., 2013) identified a number of large, mature oak trees adjacent to Q6 and Q7 (Volume 4, Figure 7.9.3). These trees will be assessed separately from the woodlands.</p>
Aquatic Invertebrates	<p>A total of 26 different taxa were recorded from the Q 1 and Q6; 18 in Q1 and 17 in Q6, only nine of which were common to both sites. The assemblages are typical of still water oligotrophic sites and there were no rare or invasive/non-native species recorded.</p> <p>The full species list is contained within Volume 3, Appendix 7.19 (ENSIS, 2015).</p>
Invertebrates	<p>Cofnod returned records of several butterflies and moths: small heath, small pearl bordered fritillary, dusky brocade, grayling, white ermine, shaded broad-bar, rosy rustic, small emerald, pale eggar, garden tiger, oak lutestring and small phoenix. None are protected species, all are Section 42 and/or Local BAP species.</p> <p>Heath and disused quarries have the potential to support small heath and grayling. Small heath primary larval food sources include fescues and meadow grasses which are found within the grassland areas. Adult nectar sources include bramble, yarrow, buttercup and ragwort which are found throughout the Order Limits. Grayling adult nectar sources include red clover, thistle, bramble and heather which are found throughout the Order Limits.</p> <p>Habitats within the Order Limits have the potential to support the following species: dusky brocade, shaded broad-bar, rosy rustic, pale eggar and oak lutestring.</p> <p>A small theridiid spider (<i>Rugathodes bellicosus</i>) has been recorded by the local biodiversity group in slate waste in the south of Q6. Quarries and spoil heaps the potential to support further populations of the species.</p> <p>The habitats with the Order Limits have potential to support a number of generalist and notable invertebrates.</p>
Fish	<p>Cofnod returned records of European eel within the Order Limits. Llyn Padarn SSSI is designated for hosting Arctic</p>

Table 7-7: Protected or Notable Species	
Species	Description
	<p>charr (<i>Salvelinus alpinus</i>). and Afon Gwyrfai a Llyn Cwellyn SAC/SSSI, located 1.8km from the Order Limits, is designated for Atlantic salmon (<i>Salmo salar</i>).</p> <p>The Welsh populations of Arctic charr represent a distinct race and the Llyn Padarn population is genetically different from those in Llyn Cwellyn SAC.</p> <p>The Afon Gwyrfai, Nant-y-Betws and Llyn Padarn have the potential to support a number of non-protected fish species.</p> <p>The survey of the water within Q1 and Q6 revealed the presence of 3-spine stickleback (<i>Gasterosteus aculeatus</i>) and European eel in Q6, and no fish in Q1.</p>
Amphibians	<p>Cofnod returned records of palmate newt from within the Order Limits, and palmate newt, common frog and common toad from within 2km of the Order Limits.</p> <p>No records of great crested newt were returned. The known distribution of great crested newts does not extend over the location of the Order Limits and they are considered unlikely to be present within the Order Limits.</p> <p>The standing water and terrestrial habitats such as scrub edges, woodland, marshy grassland and semi improved grassland, have the potential to support amphibians.</p> <p>A search of existing terrestrial refugia in Q8 in 2010 by CEP, for an unrelated development near the former identified one palmate newt and one common toad. The report is contained within Volume 3, Appendix 7.9.</p> <p>During the freshwater surveys of Q1 and Q6 a palmate newt were observed in Q1 only.</p>
Reptiles	<p>Cofnod returned records of common lizard, slow worm and adder within 2km of the Order Limits.</p> <p>Scrub, woodland edges, semi-improved grassland, bracken, heath and dry stone walls provide potential habitat for reptiles. Slate spoil heaps provide potential basking sites and hibernacula.</p> <p>A reptile survey conducted by CEP in 2011 recorded one slow worm and two common lizards within the Order Limits, plus five incidental sightings of common lizard, one of which was within the Order Limits and the others near to the Order Limits (CEP, 2012b). Volume 4, Figure 7.5 shows the locations of the reptiles identified during the survey. The</p>

Table 7-7: Protected or Notable Species	
Species	Description
	report is contained within Volume 3, Appendix 7.10.
Birds	<p>A number of bird records were returned from Cofnod, including two Schedule 1 listed species.</p> <p>Quarries and cliff faces have potential to support breeding peregrine and choughs and these two species have been recorded within the vicinity of the Order Limits. Woodland, scrub and hedgerows have potential to support a number of breeding birds. Heath and upland improved grassland have the potential to support upland breeding birds.</p> <p>CEP carried out summer breeding bird surveys in 2011. Birds observed during these surveys include; peregrine falcon (Schedule 1 WCA), chough (Schedule 1 WCA, BOCC Amber List, S42, Gwynedd LBAP), cuckoo (BOCC Red List), grasshopper warbler (BOCC Red List), ring ouzel (BOCC Red List, S42 and Gwynedd LBAP) skylark (BOCC Red List, S42 and Gwynedd LBAP), song thrush (BOCC Red List, S42 and Gwynedd LBAP), wheatear (<i>Oenanthe oenanthe</i>) (BOCC Amber List), whitethroat (<i>Sylvia communis</i>) (BOCC Amber List) and willow warbler (<i>Phylloscopus trochilus</i>) (BOCC Amber List).</p> <p>A breeding bird survey conducted in 2011 and 2012 recorded a total of 36 species, 28 of which were thought to be breeding within the Order Limits. Of these 28 species four are included on the RSPB 'Red List' and ten on the RSPB 'Amber List'. The most notable species recorded breeding were the chough and peregrine falcon, both of which are included in Schedule 1 of the Wildlife and Countryside Act. Seven of the species recorded are Priority BAP Species Listed under Section 42 of the NERC act (CEP, 2012a). A species assemblage of similar conservation value was recorded during the 2013 and 2015 surveys (AECOM, 2013a, AECOM, 2015b and Enfys 2015).</p> <p>The results of the breeding bird surveys conducted by AECOM in 2013, CEP in 2012 and AECOM in 2015 are summarised and presented in Table 7-10, Table 7-11 and 7-12 respectively below.</p> <p>The full results and analysis are reported in the Breeding Bird Reports Volume 3, Appendix 7.11 (AECOM, 2013a) and Appendix 7.20 (AECOM, 2015b). Confidential results are contained within Volume 3, Confidential Appendix 7.1, Confidential Appendix 7.2 and Confidential Appendix 7.4.</p>
Polecat	<p>Cofnod returned records of polecat within 2km of the Order Limits, the latest from 2009.</p> <p>No polecat surveys have been completed and their presence within the Order Limits is unknown. No incidental</p>

<b>Table 7-7: Protected or Notable Species</b>	
<b>Species</b>	<b>Description</b>
	<p>polecat records during other surveys have been reported.</p> <p>Polecats move around more than other mustelids to exploit seasonally abundant food sources. There are often piles of scats near den sites, but little evidence that scats are left around the territory to defend its borders (Mammal Society, undated), so signs are not easily recorded.</p> <p>Polecats in Britain are able to live in a wide range of landscapes, with no strong dependence upon a particular habitat (Vincent Wildlife Trust, 2014) but make particular use of hedgerows and woodland edges and in winter they visit farmyards and farm buildings. They prey on rodents such as rabbits and rats.</p> <p>The broadleaved woodland and grassland within the Order Limits have the potential to support foraging and/or commuting polecat. There is no habitats with the potential to support polecat den creation within the Order Limits.</p>
Badgers	<p>Cofnod returned records of badger within the Order Limits and within 2km of the Order Limits.</p> <p>The woodland has the potential to support the creation of badger setts. The woodland, scrub and grassland provide foraging and commuting habitat for badgers. The Order Limits is well connected to surrounding habitats by hedgerows and woodland corridors.</p> <p>An active badger sett was identified in 2010 by CEP (CEP, 2010) just outside of the Order Limits. In 2011 CEP confirmed the sett as still active. There was no evidence of badgers or badger setts within the rest of the Order Limits (CEP, 2012c). During the Phase 1 survey in 2015 the badger sett was re-visited; the sett had no signs of recent activity (within the last 3 – 6 months). The reports can be found in Volume 3, Appendix 7.9 and Confidential Appendix 7.3.</p>
Water Vole	<p>Cofnod returned records of water vole from an upland area near to but outside of the Order Limits near a small water body, a record from Llyn Padarn, and also from the Afon Gwyrfai.</p> <p>Evidence of water vole was to be noted during a botanical survey conducted in 2012 focussing on two areas of terrestrial habitat at the western and eastern ends of the Order Limits.</p> <p>Habitat within the Order Limits is not suitable except where the pipeline meets Llyn Padarn. Here there is significant human pressure from recreation and modified banks are generally unsuitable to support the species.</p>

<b>Table 7-7: Protected or Notable Species</b>	
<b>Species</b>	<b>Description</b>
	No evidence of water voles has been identified within the Order Limits, although no targeted surveys for water vole have been completed.
Otters	<p>Cofnod returned records of otters from around Llyn Padarn (outside of the Order Limits), the Afon Gwyrfai, and the streams and rivers that connect to these two features to the wider landscape.</p> <p>Llyn Padarn SSSI is designated for otters. Otters have been recorded using the lake and adjoining outflows. Otters are present at Afon Gwyrfai a Llyn Cwellyn SAC/SSSI.</p> <p>An otter survey conducted in 2011 by CEP concluded otter activity within the Order Limits as absent as the habitat and foraging opportunities are considered to be low quality, especially in context of the adjacent habitats. However, there is limited potential for otters to be present where the Order Limits joins Llyn Padarn (CEP, 2012d). The results of the otter survey are provided in Volume 3, Appendix 7.12.</p>
Bats	<p>Cofnod returned records of 9 species of bat including the Annex II species lesser horseshoe. Roost records were identified within 2km for common pipistrelle and lesser horseshoe, including records of hibernating lesser horseshoe within the Order Limits.</p> <p>Llyn Padarn SSSI within the Order Limits is not designated for bats; but features in relation to bats which contribute to the special interest of the site include semi natural broadleaved woodland which supports foraging pipistrelle bats and open water which supports foraging habitat for Daubenton's bat. Glynllifon SAC is located 8km from the Order Limits. The primary and sole reason for selection of this site as an SAC is the presence of lesser horseshoe bats, an Annex II species. This single site in north Wales is both a maternity and hibernation site for a large population of lesser horseshoe bat, comprising about 6% of the UK population.</p> <p><b>Species Composition</b></p> <p>Inspection and activity surveys have identified <u>activity</u> by the following species within the Order Limits during <u>summer</u>:</p> <ul style="list-style-type: none"> <li>• Common pipistrelle;</li> <li>• Soprano pipistrelle;</li> </ul>



Table 7-7: Protected or Notable Species	
Species	Description
	<ul style="list-style-type: none"> <li>• Nathusius pipistrelle;</li> <li>• Pipistrelle sp.;</li> <li>• Brown long eared;</li> <li>• Noctule;</li> <li>• Leisler's;</li> <li>• Noctule/Leisler's sp.;</li> <li>• Daubenton's</li> <li>• Natterer's</li> <li>• Myotis sp.; and</li> <li>• Lesser horseshoe.</li> </ul> <p>Inspection and activity surveys have identified <u>activity</u> by the following species within the Order Limits during <u>winter</u>:</p> <ul style="list-style-type: none"> <li>• Brown long-eared;</li> <li>• Daubenton's;</li> <li>• Natterer's; and</li> <li>• Lesser horseshoe.</li> </ul> <p>Inspection and activity surveys have identified <u>summer roosting</u> by the following species within the Order Limits:</p> <ul style="list-style-type: none"> <li>• Brown long-eared;</li> <li>• Natterer's; and</li> </ul>

Table 7-7: Protected or Notable Species	
Species	Description
	<ul style="list-style-type: none"> <li>• Lesser horseshoe;</li> </ul> <p>Inspection and activity surveys have identified <u>hibernation roosting</u> by the following species within the Order Limits:</p> <ul style="list-style-type: none"> <li>• Brown long-eared;</li> <li>• Daubenton's;</li> <li>• Natterer's; and</li> <li>• Lesser horseshoe.</li> </ul> <p><b>Tunnel Roost Locations</b></p> <p>Table 7-8 combines the results of the AECOM winter 2013 surveys, AECOM summer 2013 bat surveys, AECOM winter 2014 surveys and survey data from CEP 2010 to 2012 in order to give a full picture of roosting activity within each tunnel.</p> <p>Some tunnels appear to be used more frequently than others. However, it would be correct to assume that all of the tunnels could be and likely are used by roosting bats for short periods during the summer and winter, likely moving between tunnels as conditions and requirements change, utilising the whole set of tunnels as a single roosting resource rather than each tunnel in isolation.</p> <p>No maternity roosts were identified during the surveys. Tunnel 7 which had the highest number of hibernating bats and a large number of droppings was not surveyed in summer. There is a possibility that T7 could support a small maternity roost of lesser horseshoe bats. This tunnel will not be destroyed or significantly disturbed by the Order Limits and will be fitted with enhancements.</p> <p><b>Culvert</b></p> <p>During the 2015 Phase 1 Survey a under road grided culvert was identified that has not been previously surveyed. An inspection of the entrance identified evidence of use by bats (droppings).</p>

Table 7-7: Protected or Notable Species	
Species	Description
	<p><b>Order Limits Population Estimate</b></p> <p>The Order Limits is not known to support maternity roosts.</p> <p>The Order Limits is not known to support swarming.</p> <p>The Order Limits does support summer roosting by small numbers of male and/or non-breeding females.</p> <p>The Order Limits does support hibernation roosting by small numbers of bats.</p> <p>The estimated number of bats considered likely to be roosting at Glyn Rhonwy in summer and winter is given below. This was based on the maximum count in one month.</p> <p>Lesser Horseshoe: Summer = 1, Winter = 12.</p> <p>Brown Long-Eared: Summer = 4, Winter = 1.</p> <p>Daubenton's: Summer = 0, Winter = 1.</p> <p>Natterer's: Summer = 1, Winter = 2.</p> <p><b><u>Tree Roosts</u></b></p> <p>An assessment of tree roost potential in the habitat adjacent to Llyn Padarn was completed in September 2013 and reported in the Phase 1 Habitat Survey Report (AECOM, 2015a). This survey identified three Category II trees (Hundt, 2012) which are defined as "<i>tree supports some features which may have limited potential to support bats</i>". It also identified one Category I tree near Q7 (Hundt, 2012) which are defines as "trees with definite bat potential, supporting fewer suitable features than Category I* trees or with potential for use by single bats" (Table 7-9).</p> <p>Trees with potential for roosting bats in close proximity to the Order Limits were assessed by CEP during 2012 for the presence of cavities, rot holes etc. AECOM, 2015a reported that "<i>there are four trees surrounding Q7 identified as having potential for supporting roosting bats</i>". However, it was noted that "<i>these trees are not to be disturbed during construction and therefore are not considered to be affected by the development</i>". Trees were not categorised.</p> <p>Trees with roost potential have not been surveyed (emergence/re-entry/climbed inspection surveys) to confirm</p>

Table 7-7: Protected or Notable Species	
Species	Description
	<p>presence/absence of roosting bats.</p> <p><b>Foraging and Commuting</b></p> <p>The habitat within the Order Limits varies from very open, upland habitat in the west in the vicinity of Q1 and Q2 to more low land and wooded habitats near Q6 and Q7 and Llyn Padarn in the east.</p> <p>In the vicinity of Q1 and Q2 trees are scarce and the habitat is dominated by grazed acid grassland, exposed rock and heath. These upper two quarry voids, from a bat foraging point of view are largely devoid of vegetation that could support either shelter or foraging opportunities. Connectivity is also very poor at this upper with no specific linear landscape features to aid bat navigation.</p> <p>As the Order Limits descends to lower altitudes this gradually changes with some minor tree and vegetation cover being present around the perimeter of Q3 and Q4. Due to the very open nature of the habitats surrounding these two quarry voids however, this area represents sub-optimal foraging habitat and habitat connectivity is still poor.</p> <p>Broadleaved woodland becomes more prevalent at the lower end of the Order Limits in the vicinity of Q5, Q6, &amp; Q7. These woodland habitats have good connectivity with the woodland cover being almost continuous in places. This represents optimal foraging habitat for many British bat species.</p> <p>Figure 10 of the Winter 2014 Bat Report in Volume 3, Appendix 7.16 shows the spatial spread of bat records from the walked transect surveys. Pipistrelle sp. was detected in high density south of Tunnel 15, while noctule bats were more frequently detected around Quarries 7 and 8. Bats were detected across the majority of the walked transect survey area. No lesser horseshoes were recorded during the walked transects.</p> <p>The three quarries associated with the highest Bat Activity Index (BAI) scoring tunnels were Quarries 5, 6 and 7. These quarries coincide with the most suitable foraging habitat of semi-natural broadleaved woodland and scrub. Quarry 1 had a lower scoring BAI, this quarry is at the highest altitude and the surrounding habitat is grazed dry heath and acid grassland, with no broadleaved woodland and no linear vegetated features. Though Quarry1 had a low BAI, some bat activity was recorded throughout the season, particularly at Location 17 which had a total BAI value of 4.109.</p>

Table 7-7: Protected or Notable Species	
Species	Description
	The results of the bat surveys and inspections are provided in Volume 3, Appendix 7.13 – Appendix 7.16.
Invasive Species	One stand of Himalayan balsam was recorded close to the Llyn Padarn car park within the Order Limits. Two stands of Rhododendron were identified within the woodland to the east of the Order Limits. During the aquatic surveys Cotoneaster was observed growing on the rocky outcrops in the Q1 and Q6 voids. The aquatic survey of Llyn Padarn identified Nuttall's pondweed ( <i>Elodea nuttallii</i> ) around the lagoons on the south-western shore near to where the spillway infrastructure will be located, the nearest specimen is approximately 75m away.

Table 7-8: Bat Tunnel Roost Locations			
Tunnel	Roost Type	Species (estimated population)	Evidence
Tunnel 1	Hibernation Occasional summer	Lesser horseshoe (1)	One hibernating lesser horseshoe bat recorded in 2010/2011 and 2013. No bats recorded in winter 2014. *Automated bat detectors identified potential occasional summer roosting/foraging activity by lesser horseshoe. No droppings or live bats identified during internal summer inspections.
Tunnel 2	Occasional hibernation Occasional summer	Lesser horseshoe Daubenton's (1) Brown long-eared (1)	Low numbers of scattered droppings considered to be lesser horseshoe recorded in winter 2013. One Daubenton's bat and one brown long-eared bat recorded in winter 2014. Small numbers of fresh lesser horseshoe droppings at the end of the tunnel in 2013. The amount of droppings recorded suggests occasional rather than frequent summer use.

Table 7-8: Bat Tunnel Roost Locations			
Tunnel	Roost Type	Species (estimated population)	Evidence
			*Automated bat detectors identified potential occasional summer roosting/foraging activity by lesser horseshoe, Myotis sp., common pipistrelle and long-eared.
Tunnel 3	No roost	Nil	Not surveyed by AECOM. CEP surveyed in December 2010 and January 2011 and no roosting bats were recorded.
Tunnel 4	No roost	Nil	Not surveyed by AECOM. CEP surveyed in December 2010 and January 2011 and no roosting bats were recorded.
Tunnel 5	No roost	Nil	Not surveyed by AECOM. CEP surveyed in December 2010 and January 2011 and no roosting bats were recorded.
Tunnel 6	Occasional hibernation	Lesser horseshoe	Low number of lesser horseshoe droppings recorded in 2010/11. The number and distribution of dropping suggested occasional rather than frequent winter use.  Tunnel was not surveyed in winter 2012/13 or summer 2013.  No bats were found in winter 2014.
Tunnel 7	Hibernation	Lesser horseshoe (11)	Eleven hibernating lesser horseshoe bats recorded in 2010/11.  Peak count of eleven hibernating lesser horseshoe bats in winter 2014  Automated bat detectors recorded 169 lesser horseshoe passes across January and February 2014.  Tunnel was not surveyed in winter 2012/13 or summer 2013.
Tunnel 8	No roost	Nil	Not surveyed by AECOM. CEP surveyed in December 2010 and January 2011 and no roosting bats were recorded.

<b>Table 7-8: Bat Tunnel Roost Locations</b>			
<b>Tunnel</b>	<b>Roost Type</b>	<b>Species (estimated population)</b>	<b>Evidence</b>
Tunnel 9	Hibernation  Occasional summer	Natterer's (2)  Brown long-eared (1)	Two hibernating Natterer's bats recorded in 2010/11, a peak count of two hibernating Natterer's bats in 2013 and one hibernating Natterer's in 2014. One hibernating brown long eared bat in 2013.  Old suspected Natterer's droppings recorded during summer 2013.  *Automated bat detectors identified potential occasional summer roosting/foraging activity by lesser horseshoe, Myotis sp., and common pipistrelle.
Tunnel 10	Not surveyed	Nil	Completely blocked by rock fall. Tunnel not accessible to bats.
Tunnel 11	Occasional hibernation  Occasional summer	Lesser horseshoe	Low numbers of scattered lesser horseshoe droppings recorded in winter 2010/2011. The amount of droppings recorded suggests occasional rather than frequent winter use.  Automated bat detectors recorded 22 lesser horseshoe passes in winter 2014, confirming use during hibernation.  No droppings or live bats identified during internal inspections summer 2013.  *Automated bat detectors identified potential occasional summer roosting/foraging activity by lesser horseshoe, Myotis sp., common pipistrelle and noctule/Leisler's.
Tunnel 11A	Hibernation  Summer	Lesser horseshoe (4)  Natterer's (2)  Brown long-eared (4)	Four hibernating lesser horseshoe bats were recorded in winter 2013.  Peak counts of 1 lesser horseshoe and 2 Natterer's bats were recorded in winter 2014.  Four brown long-eared and a Natterer's bat were found roosting in



<b>Table 7-8: Bat Tunnel Roost Locations</b>			
<b>Tunnel</b>	<b>Roost Type</b>	<b>Species (estimated population)</b>	<b>Evidence</b>
			September 2013. Fresh lesser horseshoe droppings were recorded indicating summer use.
Tunnel 12	No hibernation roost.	Nil	No evidence of bats identified, including no bats, droppings or calls on automated detectors in winter 2013 and 2014.  Tunnel was not surveyed in summer 2013.
Tunnel 13	Occasional hibernation	Lesser horseshoe	Approximately 200 lesser horseshoe droppings recorded in 2010/2011. The amount and distribution of droppings suggests occasional rather than frequent use.  No bats identified in winter 2013 or winter 2014.  Tunnel was not surveyed in summer 2013.
Tunnel 14	Hibernation  Occasional summer	Lesser horseshoe (3)	Peak count in one visit of three hibernating lesser horseshoe bats recorded in winter 2013 and 1 lesser horseshoe bat in winter 2014.  Automated bat detectors recorded 24 lesser horseshoe passes and 4 indeterminate bat passes during winter 2014.  No droppings or live bats identified during internal summer 2013 inspections.  *Automated bat detectors identified potential occasional summer roosting/foraging activity by lesser horseshoe, Myotis sp., and common pipistrelle.
Tunnel 15	Hibernation	Lesser horseshoe (1)	One hibernating lesser horseshoe bat recorded in 2008 (CEP, 2012 historic record), 2010/11 and 2013.  No bats recorded in winter 2014.

Table 7-8: Bat Tunnel Roost Locations			
Tunnel	Roost Type	Species (estimated population)	Evidence
	Occasional summer		No droppings or live bats identified during internal inspections summer 2013. *Automated bat detectors identified potential occasional summer roosting/foraging activity by lesser horseshoe and Myotis sp.
Bomb store	Hibernation	Lesser horseshoe (2)	Lesser horseshoe bat droppings recorded during winter 2010/11. One lesser horseshoe bats recorded hibernating in tunnel in winter 2013. Not surveyed in winter 2014. Could not access to survey in summer 2013. Summer roosting unknown, but possible.

\*Indicative only. Automated detectors were placed in the entrances of tunnels. Activity recorded on the detectors may give an indication of which species are using the tunnels to roost. However, some the activity detected is likely to be a result of foraging. Common pipistrelles were recorded on automated detectors at Tunnels 2, 9, 11, 11A and 14. It is considered that these passes were indicative of foraging near or in the entrances to tunnels. It is considered unlikely that common pipistrelles are roosting in the tunnels as features are not optimal for that species. Noctule/Leisler's are not considered to be roosting in the tunnels as features are not suitable for that species.

**Table 7-9: Features Assessed as having Potential to Support Roosting Bats on the Banks of Llyn Padarn (AECOM 2013 Phase 1 Survey)**

Feature	Description	Bat Roost Potential Category
Toilet block	Well maintained stone building with pitched slate roof.	Negligible
Former explosives store tunnel entrance	Tunnel with corrugated iron gate. Tunnel has slate walls with large internal gaps. There is a side room with a brick access hole into the wall of the tunnel. Several gaps and crevices provide potential roosting opportunities.	High
Culvert	A culvert leading under the road; entrance grilled and facing woodland; bat dropping found in entrance.	Confirmed
Tree 1	Willow - 5 metre high, 0.5 metre diameter at breast height (DBH). Tree has several features with the potential to support roosting bats including knotholes, cracks and splits and hollow limbs.	Category II
Tree 2	Downy birch - 5 metre high, 0.5 metre DBH. Tree has several features with the potential to support roosting bats including knotholes, hollows and cavities.	Category I
Tree 3	Willow - 5 metre high, 0.5 metre DBH. Tree has several features with the potential to support roosting bats including cracks and splits.	Category II
Tree 4	Sessile oak - 15 metre high, 1 metre DBH. Tree has several features with the potential to support roosting bats including cracks and splits.	Category II
Tree 5	Birch – 11 metre high, 0.65 metre DBH. Main stem is half rotted, unable to inspect closely to see if it supports a cavity or large crevice.	Category II
Tree 6	Birch – 12 metre high, 0,7 metre DBH. With a bird box, but unlikely to support bats.	Category III
Tree 7	Unknown species – 5 metre high, 0.3 metre DBH. Two holes 1.5 – 2 metres off the ground.	Category II

Tree 8	Birch – 6 metre high; 0,25 metre DBH. Dead; unknown whether it supports hollows or cavities.	Category II
Tree 9	Birch – 12 metre high, 0.45 metre DBH. Woodpecker hole, missing limb, crack in major limb, unknown whether it supports a hollow/cavity. Features open to the elements.	Category III
Tree 10	Ash – 13 metre high, 0.55 metre DBH. Crack/split in major limb, missing limb, but open to the elements,	Category III
Tree 11	Ash – 10 metre high, 0.25m DBH. Knothole/natural hole 2.5 metre off the ground.	Category II
Tree 12	Ash – 14 metre high, 0.45 metre DBH. Missing limb with upward facing hole.	Category III
Tree 13	Ash – 12 metre high, 0.65 metre DBH. Ivy obscuring view, and potentially features with the potential to support bats.	Category II
Tree 14	Birch – 8 metre high, 0.65 metre DBH. Two woodpecker hole and missing limb.	Category II

- 7.6.94 The results of the bird surveys are presented in the Table 7-10, 7-11 and 7-12. Birds protected under Schedule 1 of the Wildlife and Countryside Act (WCA), birds on the Red and Amber Lists (BOCC 3), birds listed on Section 42 (S42) of the NERC Act, and Gwynedd LBAP (JNCC/BARS) are indicated where relevant.
- 7.6.95 Table 7-10 shows the results of the Summer 2013 breeding bird survey (carried out by Enfys Ecology on behalf of AECOM). Two protected species, peregrine and chough were recorded. Breeding status is confidential. The following notations have been used in Table 7-10:
- Q indicates those birds encountered within Quarry Voids (Quarry Voids within the Order Limits numbered 1 – 6);
  - UT indicates those birds outside the Quarry Voids encountered in the Upper Transect; and
  - LT indicates those birds outside of the Quarry Voids encountered in the Lower Transect.
- 7.6.96 Table 7-11 shows the results of the CEP Winter 2012 bird surveys. The quarry voids within the Order Limits were numbered 1 to 7. No protected species were recorded.
- 7.6.97 Table 7-12 shows the results of the AECOM 2015 bird surveys. Birds and their breeding status were recorded inside and outside of the quarry voids numbered 1 – 8.
- 7.6.98 The reports are contained within Volume 3 (non-confidential) Appendices 7.11 and 7.20, and Confidential Appendices 7.1 – 7.2, and 7.4.

Table 7-10: Results of the Summer 2013 Breeding Bird Survey				
Species Common Name	Latin Name	Status	Location/ Quarry Number	Breeding Evidence
Peregrine falcon	<i>Falco peregrinus</i>	WCA Schedule 1	Confidential, within the Order Limits	Confidential
Wood pigeon	<i>Columba palumbus</i>	-	Q6 UT LT	Probable breeder
Cuckoo	<i>Cuculus canorus</i>	BOCC Red, S42	Q2 UT LT	Possible breeder Probable breeder
Meadow pipit	<i>Anthus pratensis</i>	BOCC Amber	Q1 and Q2 UT LT	Possible breeder Confirmed breeder Probable breeder
Wren	<i>Troglodytes troglodytes</i>	-	Q1-6 UT LT	Probable breeder
Dunnock	<i>Prunella modularis</i>	BOCC Amber, S42	Q6	Probable breeder
Robin	<i>Erithacus rubecula</i>	-	Q4-6 UT LT	Probable breeder
Redstart	<i>Phoenicurus phoenicurus</i>	BOCC Amber List	Q3-4 and Q6	Probable breeder

Table 7-10: Results of the Summer 2013 Breeding Bird Survey				
Species Common Name	Latin Name	Status	Location/ Quarry Number	Breeding Evidence
			LT	
Blackbird	<i>Turdus merula</i>	-	Q4-6 UT LT	Confirmed breeder
Willow warbler	<i>Phylloscopus trochilus</i>	BOCC Amber List	Q6 UT LT	Probable breeder Possible breeder Probable breeder
Great tit	<i>Parus major</i>	-	Q3 and Q5-6 LT	Probable breeder
Coal tit	<i>Periparus ater</i>	-	Q4	Possible breeder
Blue tit	<i>Cyanistes caeruleus</i>	-	Q3 and Q5-6	Probable breeder
Long-tailed tit	<i>Aegithalos caudatus</i>	-	Q5	Possible breeder
Jay	<i>Garrulus glandarius</i>	-	Q5 UT	Possible breeder Non-breeder
Chough	<i>Pyrrhocorax pyrrhocorax</i>	WCA Schedule 1, BOCC Amber List, Gwynedd LBAP	Confidential, within the Order Limits	Confidential
Carrion crow	<i>Corvus corone</i>	-	Q4 UT	Possible breeder Non-breeder



Table 7-10: Results of the Summer 2013 Breeding Bird Survey				
Species Common Name	Latin Name	Status	Location/ Quarry Number	Breeding Evidence
			LT	Possible breeder
Raven	<i>Corvus corax</i>	-	Q1-2 and Q 5 UT LT	Possible breeder Non-breeder Possible breeder
Chaffinch	<i>Fringilla coelebs</i>	-	Q3-6 UT LT	Probable breeder
Lesser redpoll	<i>Carduelis cabaret</i>	BOCC Red List, S42	Q6 UT LT	Possible breeder
Greenfinch	<i>Carduelis chloris</i>	-	Q6	Probable breeder
Common buzzard	<i>Buteo buteo</i>	-	UT	Non-breeder
Kestrel	<i>Falco tinnunculus</i>	BOCC Amber List	UT	Possible breeder
Skylark	<i>Alauda arvensis</i>	BOCC Red List, S42, Gwynedd LBAP	UT	Probable breeder
Pied wagtail	<i>Motacilla alba yarrellii</i>	-	UT LT	Probable breeder
Goldcrest	<i>Regulus regulus</i>	-	UT	Possible breeder

Table 7-10: Results of the Summer 2013 Breeding Bird Survey				
Species Common Name	Latin Name	Status	Location/ Quarry Number	Breeding Evidence
Wheatear	<i>Oenanthe oenanthe</i>	BOCC Amber List	UT LT	Possible breeder
Stonechat	<i>Saxicola torquatus</i>	-	UT	Confirmed breeder
Song thrush	<i>Turdus philomelos</i>	BOCC Red List, S42	UT LT	Confirmed breeder Probable breeder
Mistle thrush	<i>Turdus viscivorus</i>	BOCC Amber List	UT	Confirmed breeder
Siskin	<i>Carduelis spinus</i>	-	UT	Probable breeder
Reed bunting	<i>Emberiza schoeniclus</i>	BOCC Amber List, S42	UT	Possible breeder
Great spotted woodpecker	<i>Dendrocopos major</i>	-	LT	Possible breeder
Blackcap	<i>Sylvia atricapilla</i>	-	LT	Probable breeder

Table 7-11: Results of the Winter 2012 Breeding Bird Survey				
Species Common Name	Latin Name	Status	Location/ Quarry Number	Quarry
Blackbird	<i>Turdus merula</i>	-	6	
Blue tit	<i>Cyanistes caeruleus</i>	-	5-6 and 7	
Bullfinch	<i>Pyrrhula pyrrhula</i>	BOCC Amber List, S42, Gwynedd LBAP	4	
Common	<i>Buteo buteo</i>	-	1	

Table 7-11: Results of the Winter 2012 Breeding Bird Survey				
Species Common Name	Latin Name	Status	Location/ Number	Quarry
buzzard				
Carrion crow	<i>Corvus corone</i>	-	1	
Coal tit	<i>Periparus ater</i>	-	6 and 7	
Dunnock	<i>Prunella modularis</i>	BOCC Amber List, S42	5	
Great tit	<i>Parus major</i>	-	5-6 and 7	
Eurasian magpie	<i>Pica pica</i>	-	5	
Meadow pipit	<i>Anthus pratensis</i>	BOCC Amber List	2 and 3	
Mistle thrush	<i>Turdus viscivorus</i>	BOCC Amber List	3	
Raven	<i>Corvus corax</i>	-	1	
Siskin	<i>Carduelis spinus</i>	-	7	
Skylark	<i>Alauda arvensis</i>	BOCC Red List, S42 and Gwynedd LBAP	1 and 2	
Snipe	<i>Gallinago gallinago</i>	BOCC Amber List	2 and 3	

Table 7-12: Results of the 2015 Breeding Bird Survey					
Species Name	Common	Latin Name	Status	Quarry (Q)	Breeding Evidence
Blackbird		<i>Turdus merula</i>	-	Inside voids 6, 8  Outside Q1, outside Q3- outside Q6, and outside Q7 and Q8	Possible breeder  Probable breeder
Blackcap		<i>Sylvia atricapilla</i>	-	Outside Q1  Outside Q5, Q6, Q7, Q8	Possible breeder  Probable breeder
Blue Tit		<i>Cyanistes caeruleus</i>	-	Inside voids 1 and 4, and outside Q4, Q5  Outside Q8	Probable breeder  Possible breeder
Bullfinch		<i>Pyrrhula pyrrhula</i>	BoCC Amber List, NERC S41, Local BAP (Gwynedd)	Outside Q5	Possible breeder
Carrion Crow		<i>Corvus corone</i>	-	Outside Q2  Outside Q5, Q7	Unknown (over-flying only)  Possible breeder
Chaffinch		<i>Fringilla coelebs</i>	-	Inside voids 1, 3, 4, 5, and outside Q1, Q2, Q3- Q6, Q8	Probable breeder
Chiffchaff		<i>Phylloscopus collybita</i>	-	Outside Q1, Q5, Q8	Probable breeder

Table 7-12: Results of the 2015 Breeding Bird Survey					
Species Name	Common	Latin Name	Status	Quarry (Q)	Breeding Evidence
Chough		<i>Pyrrhocorax pyrrhocorax</i>	WCA Schedule 1, BoCC Amber List, Local BAP (Gwynedd)	Confidential	Confidential
Coal Tit		<i>Periparus ater</i>	-	6	Possible breeder
Common Buzzard		<i>Buteo buteo</i>	-	Outside Q1, Q2, Q5 Outside Q4, Q6	Unknown (over- flying only) Probable breeder
Cuckoo		<i>Cuculus canorus</i>	BoCC Red List, NERC S41	Inside voids 3, 4, and outside Q3, Q5	Possible breeder
Dunnock		<i>Prunella modularis</i>	BoCC Amber List, NERC S41	Outside Q1, Q8	Possible breeder
Garden Warbler		<i>Sylvia borin</i>	-	Outside Q6, Q7	Possible breeder
Goldcrest		<i>Regulus regulus</i>	-	Outside Q1 Outside Q6	Probable breeder Possible breeder
Great Tit		<i>Parus major</i>	-	Inside voids 3, 5 Outside Q4, Q6, Q8	Possible breeder Probable breeder
Grey Heron			-	Outside Q5, Q6	Unknown (over-flying only)
Grey Wagtail		<i>Motacilla cinerea</i>	BoCC Amber List	Inside void 3	Possible breeder
Greylag Goose		<i>Anser anser</i>	BoCC Amber List	Outside Q7	Unknown (over-flying)

Table 7-12: Results of the 2015 Breeding Bird Survey					
Species Name	Common	Latin Name	Status	Quarry (Q)	Breeding Evidence
					only)
Jay		<i>Garrulus glandarius</i>	-	Inside void 4, and outside Q1 (and over-flying near Q2), Outside Q4, Q5 Outside Q7	Possible breeder Probable breeder
Kestrel		<i>Falco tinnunculus</i>	BoCC Amber List	Inside void 1 Outside Q3	Confirmed breeder Possible breeder
Lesser Redpoll		<i>Carduelis cabaret</i>	BoCC Red List, NERC S41	Outside Q6 Outside Q7, Q8	Possible breeder Confirmed breeder
Linnet		<i>Carduelis cannabina</i>	BoCC Red List, NERC S41, Local BAP (Gwynedd)	Outside Q2	Unknown (over-flying only)
Magpie		<i>Pica pica</i>	-	Outside Q6 (and over-flying near Q3)	Possible breeder
Meadow Pipit		<i>Anthus pratensis</i>	BoCC Amber List	Inside voids 2 and 3, and outside Q3 Outside Q1, Q2	Possible breeder Confirmed breeder
Mistle Thrush		<i>Turdus viscivorus</i>	BoCC Amber List	Outside Q2	Possible breeder
Nuthatch		<i>Sitta europaea</i>	-	Outside Q5	Possible breeder
Peregrine Falcon		<i>Falco peregrines</i>	WCA Schedule 1	Confidential	Confidential

Table 7-12: Results of the 2015 Breeding Bird Survey					
Species Name	Common	Latin Name	Status	Quarry (Q)	Breeding Evidence
Pied Wagtail		<i>Motacilla alba</i>	-	Inside void 2, and outside Q5 Outside Q1, Q2 Outside Q8	Possible breeder Confirmed breeder Probable breeder
Raven		<i>Corvus corax</i>	-	Inside voids 1, 5, 6 Outside Q2 (and over-flying near Q1) Outside Q3	Confirmed breeder Non-breeder Unknown (over-flying only)
Redstart		<i>Phoenicurus phoenicurus</i>	BoCC Amber List	Inside voids 3, 4, 5, and outside Q3-Q5 Outside Q7	Probable breeder Possible breeder
Ring Ouzel		<i>Turdus torquatus</i>	BoCC Red List, NERC S41, Local BAP (Gwynedd)	Outside Q2	Possible breeder
Robin		<i>Erithacus rubecula</i>	-	Inside voids 4 and 6, and outside Q1, Q3-Q6, Q7, Q8	Probable breeder
Skylark		<i>Alauda arvensis</i>	BoCC Red List, NERC S41, Local BAP (Gwynedd)	Outside Q2 Outside Q3	Probable breeder Probable breeder
Snipe, Common		<i>Gallinago gallinago</i>	BoCC Amber List	Outside Q2	Possible breeder



Table 7-12: Results of the 2015 Breeding Bird Survey					
Species Name	Common	Latin Name	Status	Quarry (Q)	Breeding Evidence
Song Thrush		<i>Turdus philomelos</i>	BoCC Red List, NERC S41	Outside Q1 (and over-flying near Q2), outside Q5, Q7	Probable breeder
Stonechat		<i>Saxicola rubicola</i>	-	Inside void 1, and outside Q3 Outside Q1	Possible breeder Probable breeder
Treecreeper		<i>Certhia familiaris</i>	-	Outside Q5	Possible breeder
Wheatear		<i>Oenanthe oenanthe</i>	BoCC Amber List	Outside Q2, outside Q3-Q5 Outside Q4-Q6	Possible breeder Probable breeder
Willow Warbler		<i>Phylloscopus trochilus</i>	BoCC Amber List	Inside voids 4, 5 and 6, and outside Q1, Q7, Q8	Probable breeder
Wood Pigeon		<i>Columba palumbus</i>	-	Outside Q1, Q3-Q6 Outside Q7	Probable breeder Possible breeder
Wren		<i>Troglodytes troglodytes</i>	-	Inside voids 1, 2, 3, 4, 5 and 6, and outside Q1, Q2, Q4-Q6, Q7-Q8	Probable breeder
Yellowhammer		<i>Emberiza citrinella</i>	BoCC Red List, NERC S41, Local BAP (Gwynedd)	Outside Q6 (and over-flying near Q5)	Possible breeder

### *Designated Sites*

7.6.99 Statutory and non-statutory designated sites were collated within and up to 2 km from the Order Limits (Volume 4, Figure 7.6 and Figure 7.7 respectively). SACs and SSSIs designated for bats were collated within and up to 10 km from the Order Limits (Volume 4, Figure 7.8).

7.6.100 MAGIC and Cofnod returned records on 20<sup>th</sup> November 2014 of nine statutory designated sites. These include two SACs, six SSSIs and one National Park (NP). The descriptions and distance/direction of these from the Order Limits are given in Table 7-13.

7.6.101 One SAC and one SSSI designated for bats were identified within 10km. The descriptions of these and the distance/direction from the Order Limits are given in Table 7-14.

7.6.102 Cofnod returned records on 20<sup>th</sup> November 2014 of 50 non-statutory locally designated sites including 49 LWSs and one LNR. Eleven of the LWSs are within the Order Limits. The descriptions of these and sites outside but adjacent to the Order Limits are given in Table 7-15.

7.6.103 A Restored Ancient Woodland Site (RAWS) is present within the Order Limits, and another is present 35m outside the Order Limits.

Table 7-13: Statutory Designated Sites within 2km of the Order Limits			
Designation	Site	Description	Distance
SSSI	Llyn Padarn	<p>Designated for a number of ecological features:</p> <p>Hosts a population of arctic charr . The welsh population is a genetically distinct race existing in three lakes in North Wales. This population is genetically distinct from the other populations in Llyn Cwellyn and Llyn Bodlyn.</p> <p>Hosts a population of the nationally scare floating water-plantain.</p> <p>Includes a number of habitats including; open water, semi-natural broad-leaved woodland and bracken. The woodland supports populations of common pipistrelle bats, open water provides foraging habitat for Daubenton's bat.</p> <p>Otters and small numbers of wildfowl are seen using the lake and the outflow.</p> <p>Supports other aquatic plants of interest, including spring quillwort <i>Isoetes echinospora</i>.</p>	Within Order Limits - east
SSSI	Coed Dinorwig	The sites main feature is semi-natural broadleaved woodland. This is an Restored Ancient Woodland Site, and forms a prominent feature on the steep slopes above the south-eastern end of Llyn Padarn.	0.53km east
SSSI	Llwyn Coed y	The sites main feature is a native upland oak woodland supporting a collection of unusual bryophytes and also has small areas of wet heath, acid grassland, bracken and rock exposures important for supporting wildlife.	0.75km north
SAC SSSI NP	Eyri/ Snowdonia	<p>Site is designated as an SAC due to the presence of Annex I habitats and Annex II species.</p> <p>Annex I habitats that are a primary reason for selection of this site are Oligotrophic to mesotrophic standing waters with vegetation of the <i>Littorelletea uniflorae</i> and/or of the <i>Isoëto-Nanojuncetea</i>, Siliceous alpine and boreal grasslands, Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels, Siliceous scree of the montane to snow levels (<i>Androsacetalia alpinae</i> and <i>Galeopsietalia ladani</i>), Calcareous rocky slopes with chasmophytic vegetation and Siliceous rocky slopes with chasmophytic vegetation.</p>	1.8km east

Table 7-13: Statutory Designated Sites within 2km of the Order Limits			
Designation	Site	Description	Distance
		<p>Annex II species that are a primary reason for selection of this site are slender green feather-moss and floating water-plantain.</p> <p>The site is designated for its upland habitats. The site supports vascular and lower plant species of special interest as well as fungi, and large assemblages of bryophytes and lichens of special interest. The site is also of special interest for chough and for an assemblage of upland moorland and grassland birds. Other animal species of interest include Atlantic salmon, the rainbow leaf beetle <i>Chrysolina cerealis</i> and an upland invertebrate assemblage.</p> <p>Snowdonia / Eryri National Park comprises 823 square miles of beautiful and unspoilt countryside. It includes Snowdon which, at 1085 metres is the highest mountain in England and Wales.</p>	
SAC SSSI	Afon Gwyrfai Llyn Cwellyn	<p>Site is designated as an SAC due to the presence of Annex I habitats and Annex II species.</p> <p>Annex I habitats that are a primary reason for selection of this site are Oligotrophic to mesotrophic standing waters with vegetation of the <i>Littorelletea uniflorae</i> and/or of the <i>Isoëto-Nanojuncetea</i> and water courses of plain to montane levels with the <i>Ranunculion fluitantis</i> and <i>Callitricho-Batrachion</i> vegetation.</p> <p>Annex II species that are a primary reason for selection of this site are Atlantic salmon and floating water-plantain. Annex II species which are present as a qualifying feature, but not a primary reason for site selection is otters.</p> <p>The site has been designated a SSSI for its features of special interest: running and standing water, aquatic plant assemblage, floating water-plantain, Arctic charr, Atlantic salmon and otter.</p>	1.8km south west

**Table 7-14: Designated Sites for Bats within 10km of the Order Limits**

Designation	Site	Description	Distance
SSSI	Llyn Padarn	Llyn Padarn has three special features Arctic charr, nationally scarce floating water plantain and Cambrian rock exposures. Features in relation to bats which contribute the special interest of the site include semi natural broadleaved woodland which supports foraging pipistrelle bats and open water at Llyn Padarn SSSI supports foraging habitat for Daubenton's bat.	Within Order Limits, to the east
SAC	Glynllifon	This site is selected as an SAC due to the presence of lesser horseshoe bat, an Annex II species. The site is both a maternity and hibernation site for a large population of lesser horseshoe bat, comprising about 6% of the UK population.	8km west

**Table 7-15: Non-Statutory Designated Local Wildlife Sites within or adjacent to the Order Limits**

Designation	Site	Description	Distance
LWS	Glyn Rhonwy Quarries 1	Quarry/spoil.	Within Order Limits
LWS	Bwlch-y-groed Quarry	Quarry/spoil.	Within Order Limits
LWS	Coedydd Glyn Rhonwy	Broadleaved woodland.	Within Order Limits
LWS	Bryn Mawr	Acid grassland; dry heath/acid grassland mosaic; acid/neutral flush.	Within Order Limits
LWS	Coed Donen Las	Coniferous woodland.	Within Order Limits

<b>Table 7-15: Non-Statutory Designated Local Wildlife Sites within or adjacent to the Order Limits</b>			
<b>Designation</b>	<b>Site</b>	<b>Description</b>	<b>Distance</b>
LWS	Glyn Rhonwy Quarries woodland mosaic	Quarry/spoil; broadleaved woodland; standing water.	Within Order Limits
LWS	Llwyn Coed Heath	Dry dwarf shrub heath; wet dwarf shrub heath; bracken; acid grassland.	Within Order Limits
LWS	Barrack Mawr	Semi-improved neutral grassland.	Within Order Limits
LWS	Pen Gilfach	Broadleaved woodland; standing water.	Within Order Limits
LWS	Glyn Rhonwy Quarries 2	Acid grassland/quarry mosaic.	Within Order Limits
LWS	Cefn Du	Acid grassland; dry dwarf shrub heath; dry heath/acid grassland mosaic; acid/neutral flush.	Within Order Limits
LWS	Donen Las	Acid grassland; dry heath/acid grassland mosaic.	11m south west
LNR	Coed Dinorwig	The sites main feature is semi-natural broadleaved woodland. This is an RAWS, and forms a prominent feature on the steep slopes above the south-eastern end of Llyn Padarn.	0.53km east

## **7.7 Value of Receptors**

- 7.7.1 Table 7-16 outlines the value of Ecological Receptors. This section evaluates the nature conservation value of the habitats and species present within or in the immediate vicinity of the Order Limits. Each ecological receptor has been assigned an ecological value according to the geographical scale at which it is important in accordance with the IEEM 2006 guidelines (Table 7-2).
- 7.7.2 Where conservation sites or species have designations at different levels (international, national and regional/county/local) the highest value is assigned. The value is assigned based on the value of the identified population, rather than the scarcity or legal protection of the species as a whole, and therefore individual occurrences within the site of a nationally scarce species are not necessarily valued at the National level.



Table 7-16 – Value of Ecological Receptors			
Site Name	Evaluation Rationale	Reason	Value
Eyri/ Snowdonia SAC	Designated for its EC Habitats Directive Annex I Habitats: Oligotrophic to mesotrophic standing waters with vegetation of the <i>Littorelletea uniflorae</i> and/or of the <i>Isoëto-Nanojuncetea</i> , Siliceous alpine and boreal grasslands, Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels, Siliceous scree of the montane to snow levels ( <i>Androsacetalia alpinae</i> and <i>Galeopsietalia ladani</i> ), Calcareous rocky slopes with chasmophytic vegetation and Siliceous rocky slopes with chasmophytic vegetation, and Annex II species: Slender green feather-moss and Floating water-plantain.	Designated Internationally Important Site	Very High
Afon Gwyrfai a Llyn Cwellyn SAC	Designated for its EC Habitats Directive Annex I Habitats: Oligotrophic to mesotrophic standing waters with vegetation of the <i>Littorelletea uniflorae</i> and/or of the <i>Isoëto-Nanojuncetea</i> and Water courses of plain to montane levels with the <i>Ranunculion fluitantis</i> and <i>Callitricho-Batrachion</i> vegetation; and Annex II Species: Atlantic salmon, floating water-plantain and otter.	Designated Internationally Important Site	Very High
Glynllifon SAC	Designated for Annex II species lesser horseshoe bat, an Annex II Maternity and hibernation site for a large population of lesser horseshoe bat, comprising about 6% of the UK population.	Designated Internationally Important Site	Very High
Llyn Padarn SSSI	A proportion of the site is within the Order Limits. Designated for its population of Arctic charr, floating water-plantain and Cambrian rock exposures. The site has habitat that supports otters; foraging common pipistrelle and Daubenton's bats and other aquatic plants such as spring quillwort.	Designated Nationally Important Site	High
Coed Dinorwig SSSI	Designated for its broadleaved woodland on an ancient woodland	Designated	High

<b>Table 7-16 – Value of Ecological Receptors</b>			
<b>Site Name</b>	<b>Evaluation Rationale</b>	<b>Reason</b>	<b>Value</b>
	site which supports interesting flora and bird species.	Nationally Important Site	
Llwyn y Coed SSSI	Designated for its upland oak woodland that supports a collection of unusual bryophytes.	Designated Nationally Important Site	High
Eyri/ Snowdonia SSSI	Designated for its upland habitats including lichen and bryophyte heath, montane heath, dry heath, wet heath, blanket bog, flush and spring, calcareous grassland, tall herb and fern ledges, vegetated scree and broadleaved woodland communities and for its inland rock exposures with crevice vegetation and low nutrient lakes, with a mixture of other habitats including acid and neutral grasslands, fen, rush pasture and marshy grassland, swamp, bracken and scrub along with a large number of streams and rivers. The site supports vascular and lower plant species of special interest, as well as fungi and large assemblages of bryophytes and lichens of special interest. The site is also of special interest for birds, fish and invertebrates.	Designated Nationally Important Site	High
Eyri/ Snowdonia NP	A National Park encompassing 823 square miles. It includes Snowdon, the highest mountain in England and Wales. Approximately 20% of the Snowdonia National Park is designated as SACs and Ramsar Sites. There are 17 NNRs and 56 SSSIs.	Designated Nationally Important Site	High
Afon Gwyrfai a Llyn Cwellyn SSSI	The site has been designated a SSSI for its features of special interest: running and standing water, aquatic plant assemblage, floating water-plantain, Arctic charr, Atlantic salmon and otter.	Designated Nationally Important Site	High

<b>Table 7-16 – Value of Ecological Receptors</b>				
<b>Site Name</b>	<b>Evaluation Rationale</b>	<b>Reason</b>		<b>Value</b>
Coed Dinorwig LNR	Supporting upland oak woodland that supports a collection of unusual bryophytes.	Designated	Locally Important Site	Low
Glyn Rhonwy Quarries 1 LWS	Supporting habitat features of local importance.	Designated	Locally Important Site	Low
Bwlch-y-groed Quarry LWS	Supporting habitat features of local importance.	Designated	Locally Important Site	Low
Coedydd Glyn Rhonwy LWS	Supporting habitat features of local importance.	Designated	Locally Important Site	Low
Bryn Mawr LWS	Supporting habitat features of local importance.	Designated	Locally Important Site	Low
Coed Donen Las LWS	Supporting habitat features of local importance.	Designated	Locally Important Site	Low
Glyn Rhonwy Quarries woodland mosaic LWS	Supporting habitat features of local importance.	Designated	Locally Important Site	Low
Llwyn Coed Heath LWS	Supporting habitat features of local importance.	Designated	Locally Important Site	Low
Barrack Mawr LWS	Supporting habitat features of local importance.	Designated	Locally Important Site	Low
Pen Gilfach LWS	Supporting habitat features of local importance.	Designated	Locally Important Site	Low

<b>Table 7-16 – Value of Ecological Receptors</b>			
<b>Site Name</b>	<b>Evaluation Rationale</b>	<b>Reason</b>	<b>Value</b>
Glyn Rhonwy Quarries 2 LWS	Supporting habitat features of local importance.	Designated Locally Important Site	Low
Cefn Du LWS	Supporting habitat features of local importance.	Designated Locally Important Site	Low
Donen Las LWS	Supporting habitat features of local importance.	Designated Locally Important Site	Low
RAWS within Order Limits	Supporting habitat features of local importance.	Locally Important Site	Low
Broadleaved Semi- Natural Woodland	Woodlands are a Gwynedd LBAP habitat. The woodlands within the Order Limits are covered by a blanket TPO. There are some areas of woodland and woodland that support trees that have conservation value.	Woodland and trees of local importance; a viable area of Priority Habitat.	Medium
Coniferous Woodland – Plantation	The coniferous woodland within the Order Limits is designated as a LWS, but generally plantation coniferous woodland tends to have a lower conservation value than the surrounding habitats.	A habitat which offers limited value for nature conservation.	Valued under Coed Donen Las LWS.
Coniferous Woodland – Recently Felled	Generally of limited value to wildlife.	A habitat which offers limited value for nature conservation.	Negligible
Mixed Woodland – Semi-Natural	Woodlands are a Gwynedd LBAP habitat. The woodlands within the Order Limits are covered by a blanket TPO.	A viable area of Priority Habitat.	Low
Scrub – Scattered	Feature which appreciably enriches the local area's habitat resource. Habitat type is common in locality. Scrub provides an important habitat corridor network and provides potential to support	Enriches the local area's habitat	Low

<b>Table 7-16 – Value of Ecological Receptors</b>			
<b>Site Name</b>	<b>Evaluation Rationale</b>	<b>Reason</b>	<b>Value</b>
	breeding birds.	resource.	
Acid Grassland – Semi-Improved	Feature which appreciably enriches the local area’s habitat resource. Habitat type is common in locality. Supports interesting fungi.	Enriches the local area’s habitat resource.	Low
Marshy Grassland	Feature which appreciably enriches the local area’s habitat resource. Habitat type is common in locality. A small area of habitat within the Order Limits.	Due to the limited area within the Order Limits, habitat which offers limited value for nature conservation.	Low
Bracken – Scattered	Present over acid grassland. The bracken is generally of limited value to wildlife; the scattered nature offers limited value to birds and small mammals. However, the acid grassland links to other areas of acid grassland, overall creating large area of similar habitat.	A habitat which offers limited value for nature conservation.	Negligible
Bracken – Continuous	Generally of limited value to wildlife; offers some value to birds and small mammals in the form of cover.	A habitat which offers limited value for nature conservation.	Negligible
Wet Dwarf Shrub Heath	An area connecting to the wider landscape of similar habitat. Upland heathland is a Gwynedd LBAP habitat.  Habitat type is common in locality. Provides habitat for a number of species.	A viable area of priority habitat.	Low
Dry Heath / Acid	A large of area connecting to the wider landscape of similar habitat.	A viable area of	Low

Table 7-16 – Value of Ecological Receptors				
Site Name	Evaluation Rationale		Reason	Value
Grassland	Upland heathland is a Gwynedd LBAP habitat. Habitat type is common in locality. Provides habitat for a number of species.		priority habitat.	
Flush and Spring – Acid / Neutral Flush	Feature which appreciably enriches the local area's habitat resource. Upland flushes are a Gwynedd LBAP habitat.		Enriches the local area's habitat resource and a priority habitat.	Low
Running Water	Feature which appreciably enriches the local area's habitat resource. River corridors are a Gwynedd LBAP habitat.		Enriches the local area's habitat resource and a priority habitat.	Low
Standing Water	An upland pond that supports some aquatic vegetation and as such has some value to wildlife. Feature which appreciably enriches the local area's habitat resource. Ponds are a Gwynedd LBAP habitat.		Enriches the local area's habitat resource and a priority habitat.	Low
Standing Water – Oligotrophic	Oligotrophic and dysotrophic lakes are a Gwynedd LBAP habitat.	Standing water within the quarries has no emergent vegetation and is of limited value to wildlife. However, it does enrich the local area habitat resource.	A viable area of priority habitat.	Low
		The standing water of Llyn Padarn has high value to wildlife and supports a number of Gwynedd LBAP species.		Valued under Llyn Padarn SSSI

<b>Table 7-16 – Value of Ecological Receptors</b>			
<b>Site Name</b>	<b>Evaluation Rationale</b>	<b>Reason</b>	<b>Value</b>
Quarry	Supporting breeding birds and roosting bats and the notable small theridiid spider. Quarries are a Gwynedd LBAP habitat and designated LWSs.	Supporting protected and notable species; a viable area of priority habitat; locally designated sites.	Medium
Spoil	Generally of limited value to wildlife; has the potential to support the notable lichens, the notable small theridiid spider and basking reptiles.	A habitat which offers limited value for nature conservation.	Low
Bare Ground	There are no features of ecological interest associated with the bare ground.	No features of ecological interest.	Negligible
Wall	Generally of limited value to wildlife; has the potential to support basking reptiles.	A habitat which offers limited value for nature conservation.	Low
Lichens	Assemblages of nationally notable lichens	Species populations of regional importance.	Medium
Bryophytes	The site supports a range of commonly encountered species of bryophytes.	Species populations of local importance.	Low
Fungi	Assemblages of considerable mycological interest within the grassland areas, including waxcaps. Waxcaps are a Gwynedd LBAP species.	Species assemblage of regional importance.	Medium
Diatom	The water in Q1 and Q6 supports a range of commonly encountered species.	Species populations of local importance.	Low



<b>Table 7-16 – Value of Ecological Receptors</b>			
<b>Site Name</b>	<b>Evaluation Rationale</b>	<b>Reason</b>	<b>Value</b>
Phytoplankton	The water in Q1 and Q6 supports a range of commonly encountered species.	Species populations of local importance.	Low
Aquatic Plants	The littoral zone of Llyn Padarn lying within 100 m either side of the proposed spillway infrastructure is dominated by boulders that slope steeply away from the shore and offer very few opportunities for aquatic plant growth. No floating water plantain or spring quillwort was recorded within the survey area, the closest populations being within the bays to the north-west and south-east and well in excess of 100 m from the proposed spillway infrastructure location.	Species of local and national importance, both absent from Order Limits and survey area.	Negligible
Invertebrates	Potential for a number of Section 42 and/or Gwynedd LBAP species within heath, quarries, grassland and woodland.  Spoil supports the notable small theridiid spider ( <i>Rugathodes bellicosus</i> ).  The water in Q1 and Q6 supports a range of commonly encountered species.	Species populations of local importance.	Medium
Fish	Q6 is known to support 3-spine stickleback and European eel.  Due to the location of the Afon Gwyrfai a Llyn Cwellyn SAC outside of the Order Limits, Atlantic salmon have been valued under SAC.  The Afon Gwyrfai, Nant-y-Betws and Llyn Padarn have the potential to support a number of non-protected fish species.	Species population of local importance.	Low

<b>Table 7-16 – Value of Ecological Receptors</b>			
<b>Site Name</b>	<b>Evaluation Rationale</b>	<b>Reason</b>	<b>Value</b>
	Arctic charr are a designated feature of the Llyn Padarn SSSI. However, due to the rarity of the species and the location of the SSSI within the Order Limits, Arctic charr have been valued separately..	A rare species population of national importance.	High
Amphibians	The eastern end of the Order Limits is known to support palmate newt and common toad. Q1 is known to support palmate newt.  Palmate newts are a Gwynedd LBAP species. Common toad is a Section 42 Priority Species.	Species populations of local importance.	Low
Reptiles	The Order Limits is known to support low numbers of slow worm and common lizard.  Reptiles are a nationally protected species. Common lizard is a Gwynedd LBAP species. Slow worm and common lizard are Section 42 Priority Species.	Species population of local importance.	Medium
Birds – Schedule 1 and BOCC Red and Amber List Species	The Order Limits is known to support chough and peregrine, both of which are included on Schedule 1 of the Wildlife and Countryside Act. The Order Limits supports bird species listed on the LBAP , Section 42 species, four species on the RSPB ‘Red List’ and ten on the RSPB ‘Amber List’.	Species population of national importance.	High
Birds - Common Species	The Order Limits is known to support a number of breeding birds not listed as Schedule 1 or BOCC Red/Amber List.	Species population of local importance.	Low
Polecat	The Order Limits supports woodland and grassland; habitats with the potential to support polecat, although no evidence was recorded during field surveys.	Under the LBAP objectives there is an aim to maintain and expand existing	Low

<b>Table 7-16 – Value of Ecological Receptors</b>			
<b>Site Name</b>	<b>Evaluation Rationale</b>	<b>Reason</b>	<b>Value</b>
	Polecat is a Gwynedd LBAP species.	populations.	
Badgers	An badger sett was identified near the Order Limits; its current status was assumed to be inactive (i.e. no evidence of activity such as fresh bedding within the last 3 – 6 months). The lower eastern elevations of the Order Limits have habitats with the potential to support badgers.	Badgers and their setts are nationally protected although badgers are not a species of conservation concern in the UK	Low
Water Vole	Results returned from Cofnod and the non-targeted survey conducted in 2012 suggest there is potential for water vole within the Order Limits limited to where the pipeline enters Llyn Padarn, although the habitat is considered to be generally unsuitable.  Water vole is a nationally protected species and a Gwynedd LBAP species.	Water vole is a nationally protected species. However, the habitat within the Order Limits is not of a size or type to support anything but a transient population.	Negligible
Otters	Otters were not recorded during field surveys although have some limited potential to be present within the Order Limits limited to where the pipeline enters Llyn Padarn, although the habitat is thought to be generally unsuitable due to high levels of disturbance.  Otter is a European Protected Species and a Gwynedd LBAP species.	Otter is a European protected species.	Negligible
Red Squirrel	There is the potential for the Order Limits to support red squirrel, although this is likely to be a very low numbers given only the	Red squirrel is a nationally protected	Low

<b>Table 7-16 – Value of Ecological Receptors</b>			
<b>Site Name</b>	<b>Evaluation Rationale</b>	<b>Reason</b>	<b>Value</b>
	recent record of one sighting in the area and the sparse population within north Gwynedd.	species. However, the population within the Order Limits likely to be small or absent.	
Bats	<p>The Order Limits is known to support a small population of summer roosting and hibernating bats within the tunnels and former bomb store, including an estimated Order Limits population 12 lesser horseshoe bats, an Annex II species.</p> <p>The numbers of significance of identified potential tree roosts within the Order Limits is unknown. Nine potential tree roost have been identified.</p> <p>Bats are a European Protected Species and are a Gwynedd LBAP species.</p>	Species of international importance. However population within Order Limits is not of significant numbers compared to the regional, Welsh or UK population.	High
Invasive Species	One stand of Himalayan balsam was recorded within the Order Limits close to the car park near Llyn Padarn. Several stands of rhododendron were identified within the broadleaved woodland to the west of the Order Limits. Cotoneaster was identified growing on the rocky outcrops within Q1 and Q6. Nuttall's pondweed was identified around the lagoons on the south-western shore of Llyn Padarn approximately 75m away from the proposed the spillway infrastructure.	Small areas of an invasive species of national importance.	Low

## 7.8 Potential Effects

7.8.1 Potential effects have been assessed for each receptor during construction and operation of the Development. Each potential effect is assigned a magnitude (Table 7-3), and the potential significance of the effect is determined prior to any mitigation being implemented. Table 7-4 provides the matrix for determining significance of ecological effects using magnitude for the potential effect and the value of the receptor. The greater the magnitude of impact the more significant the effect.

7.8.2 The process of determining residual significance is then undertaken in section 7.9 with the addition of mitigation to reduce the magnitude of the potential effect.

### *Enabling Works*

7.8.3 There is the potential for the appointed construction contractor to undertake some site investigation works (a limited number of 100mm diameter bore holes within the penstock route) prior to works commencing on site. Some of the boreholes and associated access tracks may be located within areas of vegetated habitats. The potential for protected species (nesting birds and reptiles) within vegetated areas to be injured or killed will be managed using targeted habitat management and ecological supervision during the winter months. Access tracks (up to 1.5m wide) will be hand searched and strimmed, any refugia will be avoided to prevent disturbance to hibernating reptiles, and the removal of the vegetation will help to ensure no ground nesting birds are disturbed, injured or killed. The removal of the vegetation will be a temporary effect on the habitat, and will regenerate naturally over time. The habitat management and site investigation works will be supervised by an ecologist. As such the potential effects of the enabling works will not be assessed any further.

### *Construction*

### *Eyri/ Snowdonia SAC, SSSI and NP*

7.8.4 Due to the distance (1.8 km) from the Order Limits there will be no direct effect on the features or species utilising the SAC or SSSI, or the features of

the National Park. Eyri is connected to the Order Limits via Llyn Padarn and associated tributaries, and there could be the potential for a pollution pathway. However, potential effects generated during the construction phase of the Development, such as soil runoff or pollution incidents will have no impact on Eyri due to the direction of flow of the tributaries flowing from Eyri into Llyn Padarn. Eyri will be scoped out of any further assessment.

#### *Afon Gwyrfai a Llyn Cwellyn SAC and SSSI*

- 7.8.5 There are no direct watercourse connections between the Order Limits and the SAC or SSSI. However, the spillway infrastructure from Q1 will discharge to the Nant-y-Betws stream, which discharges into the designated Afon Gwyrfai SAC/SSSI (over 4km downstream of the Llyn Cwellyn) within 2 km downstream of the Order Limits. The Development requires the creation and re-establishment of new permanent slate mounds adjacent to Q1.

#### *Floating Water Plantain*

- 7.8.6 Floating water plantain is unlikely to be affected as it is present within the lake (Llyn Cwellyn) whilst, downstream from the lake it occupies a highly unusual and vulnerable habitat along several hundred metres of slow-moving river (Afon Gwyrfai), both of which are upstream of the Order Limits and discharge point, and therefore there will be no effect. Floating water plantain within the Afon Gwyrfai a Llyn Cwellyn SAC and SSSI will be scoped out of any further assessment.

#### *Arctic Charr*

- 7.8.7 Arctic charr are unlikely to be affected as they are present only in Llyn Cwellyn, which is upstream of the Order Limits and discharge point, and therefore there will be no effect. Arctic charr within the Afon Gwyrfai a Llyn Cwellyn SAC and SSSI will be scoped out of any further assessment.

#### *Pollution and/or Runoff*

- 7.8.8 The construction of the spillway infrastructure and permanent slate mounds have the potential to impact the aquatic environment through pollution of surface water runoff from vehicle fuel, oil, chemicals, silt or dust during

construction. This has potential to result in discharge of contaminated water to Afon Gwyrfai a Llyn Cwellyn SAC/SSSI via Nant-y-Betws.

7.8.9 There is a risk that aluminium rich runoff is discharged to the Afon Gwyrfai, which could result in adverse effects on aquatic fauna from the construction of stockpiles of slate, although these would be at least 10 m from the Nant-y-Betws.

7.8.10 Pollution, eutrophication, acidification, and/or changes to the water chemistry may cause long term damage to productivity and diversity of the aquatic habitat and the species it supports, including Atlantic salmon, floating water-plantain and otter for which the site is designated. Therefore this is considered a **temporary major adverse** effect.

#### Glynllifon SAC

7.8.11 The permanent removal of nine tunnels within the Order Limits, seven of which are used by small numbers of hibernating and summer roosting lesser horseshoe bats is unlikely to impact on the SAC lesser horseshoe population.

7.8.12 At least seven of the quarry tunnels present within the Glyn Rhonwy Quarry system and the bomb store will be retained, maintaining a roosting resource within the Order Limits in the long term.

7.8.13 The size of the estimated Order Limits population is not significant compared with the SAC population. Based on lesser horseshoe population estimates from Matthews and Halliwell, (2008), Schofield (2008 - BCT website 2013) and an estimated population of twelve lesser horseshoe bats within the Order Limits, the estimated population represents 0.04% of the Welsh population and 0.02% of the UK population. Glynllifon SAC supports 6% of the lesser horseshoe UK population.

7.8.14 The impact of the loss of this roosting resource on the SAC population due to the presence of numerous abandoned quarries and similar workings in the local and regional area of north-east Wales plus the distance and limited connectivity between the Order Limits and the SAC is considered to have no effect. Glynllifon SAC will be scoped out of any further assessment.



### Llyn Padarn SSSI

7.8.15 An assessment of potential effects on Llyn Padarn SSSI has also been made in the report: Volume 3, Appendix 9.1 WFD Compliance Appraisal (AECOM, 2015c) and in Chapter 9 Water Resources of this ES.

### Alteration of Hydrological Regime

7.8.16 Llyn Padarn SSSI has an objective to maintain a natural hydrological regime. AECOM has undertaken a water balance study and this is presented in Volume 3, Appendix 9.1 WFD Compliance Appraisal which concluded that there would be no significant effect of the abstraction on levels in Llyn Padarn. This is due to the *hands of flow condition, linked to levels in the downstream Afon Seiont*. Consequentially it is considered that there would be no effect on aquatic receptors in the lake (including at its margins)

7.8.17 The abstraction regime is not considered to have any significant impact on lake water levels (and therefore littoral habitat quality and extents) and / or water quality (as it is affected by changing water levels) as to have a **temporary minor adverse effect** on aquatic habitats.

### Pollution and/or Runoff

7.8.18 The construction of the spillway infrastructure connection of it to the lake bed has the potential to temporarily impact the aquatic environment through pollution of surface water runoff from vehicle fuel, oil, chemicals or silt during construction which could result in discharge of contaminated water to Llyn Padarn. Pollution, eutrophication, acidification, algal blooms and/or changes to the water chemistry may cause damage to productivity and diversity of the aquatic habitat and the species it supports, including bats, otter, floating water-plantain and Arctic charr for which it is designated.

7.8.19 Silt and suspended solids could result in:

- Smothering of Arctic charr spawning gravels and substrate;
- Smothering of macrophytes (including floating water-plantain) and macro-invertebrates;

- Reduced oxygen levels as a result of the biological oxygen demand of decay of silt and suspended solids, affecting floating water-plantain and Arctic charr; and
- Increased turbidity and low light levels affecting growth of macro-invertebrates and floating water plantain.

7.8.20 This is considered to be **temporary moderate adverse** effect.

7.8.21 A targeted survey for floating water plantain and spring quillwort was undertaken in June 2015 (Goldsmith et al, 2015). The results from which confirmed the absence of both species from the Order Limits and survey area. The nearest floating water plantain to the Order Limits was approximately 250m away, and the nearest spring quillwort was 300m away. As such neither species will be removed by the construction works. Given the distance between the Order Limits and the nearest floating water plantain and spring quillwort, any sediment produced by the in-water construction works is likely to disperse and/or settle before reaching the plants. Therefore, it is considered that there is **no effect associated with smothering on floating water plantain and spring quillwort**.

7.8.22 Any potential impacts on water quality could affect invertebrates, which has the potential to affect foraging Daubenton's bats over the lake. However, due to the likely small scale of effects on invertebrates, the construction of the Development near Llyn Padarn is not likely to significantly affect the foraging potential offered to Daubenton's bats by the SSSI. Therefore, it is considered that there is **no effect associated with reduction in water quality on bats**.

#### **Direct Loss of Habitat**

7.8.23 The spillway infrastructure will cause permanent loss of lake bed habitat within the immediate footprint of the spillway infrastructure of approximately 0.013% of the total area.

7.8.24 This is considered to be **permanent moderate adverse** effect.

### **Disturbance to Species**

7.8.25 The construction of the pumping house and lake bed spillway infrastructure is unlikely to disturb otters as the area is highly disturbed as it is heavily used by people where the pipe enters Llyn Padarn.

### **Light Spill**

7.8.26 Light spill from security lighting during construction onto the woodland edge or shore line at Llyn Padarn has the potential to impact on bats by deterring foraging Daubenton's and common pipistrelle bats, otters and water vole from those areas of the SSSI. This is considered to be **temporary moderate adverse** effect.

### **Intake of Species**

7.8.27 There is no potential for fish and other aquatic species to be drawn in to the pipe during abstraction as the intake will be grilled and the abstraction rate will be controlled through the abstraction license to minimise adverse effect to habitat and wildlife, including fish, spring quillwort and floating water-plantain. This is considered to be **temporary minor adverse** effect.

### **Noise and Vibration**

7.8.28 Noise is unlikely to have an effect beyond the immediate vicinity (less than 50m). Vibrations dissipate in water, as such any effects on fish and otters will be limited to a precautionary 500m radius and will be temporary. Therefore, it is considered that there is no effect associated with noise and vibration.

### **Invasive Species**

7.8.29 The aquatic survey of Llyn Padarn identified Nuttall's pondweed within the lagoons on the south-western shore, either side of where the spillway infrastructure pipe is proposed to be located, the nearest specimen is approximately 75m away. 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 should be taken to help prevent the spread as the plant reproduces vegetatively.

7.8.30 This is considered a **permanent moderate adverse** effect.

*Glyn Rhonwy Quarries 1 LWS and Glyn Rhonwy Quarries 2 LWS*

7.8.31 The Development will not require the removal of any of the habitat associated with these LWSs. Due to the distance of the LWSs from the Order Limits construction effects are unlikely.

*Barrack Mawr LWS*

7.8.32 The Development will require the temporary disturbance and removal of 0.03ha (0.2%) for construction compounds etc. This is considered to be a **negligible** effect.

*Bryn Mawr LWS*

7.8.33 The Development will require the temporary disturbance and removal of 0.2ha (0.3%) for construction compounds etc. This is considered to be a **negligible** effect.

*Bwlch-y-Groed Quarry LWS*

7.8.34 The Development will require the temporary disturbance and removal of 5.4ha (13.1%) for construction compounds etc and permanent disturbance and removal of 9.0ha (21.9%) of the quarry/spoil habitat within the LWS for the construction of the Q1 dam. This is considered to be a **permanent minor adverse** effect.

*Coedydd Glyn Rhonwy LWS*

7.8.35 The Development will require the temporary disturbance and removal of 0.1ha (0.5%) for construction compounds etc. This is considered to be a **negligible** effect.

7.8.36 Due to the close proximity of the LWS to the proposed turbine house, there is the potential for the trees to be damaged or killed through: root compaction by vehicles or machinery tracking over or repeated foot traffic over the roots, pollution and/or run off, and directly damaged by vehicles or machinery knocking limbs off or damaging the trunks. This has the potential to have an effect on any species utilising the habitat and therefore this is considered to be a **temporary minor adverse** effect.

Coed Donen Las LWS

7.8.37 Unrelated to the Development, a proportion of the coniferous plantation woodland has already been clearfelled. The Development will require the the temporary disturbance and removal of 1.1ha (1.6%) for construction compounds etc and permanent disturbance and removal of 10.7ha (16.1%) of the northern section of woodland to facilitate the construction of the Q1 dam, and a strip of woodland to facilitate the PRoW diversion. This is considered **negligible** due to the low value of the receptor and low magnitude of effect.

Glyn Rhonwy Quarries Woodland Mosaic LWS

7.8.38 The Development will require the the temporary disturbance and removal of 0.4ha (3%) for construction compounds etc and permanent disturbance and removal of 4.0ha (32.7%) of the central section of woodland to facilitate the construction of a section of the Q6 dam. This is considered to be a **permanent minor adverse** effect.

7.8.39 The retained woodland has the potential to be damaged or killed through: root compaction of trees by vehicles or machinery tracking over or repeated foot traffic over the roots, pollution and/or run off, and directly damaged by vehicles or machinery knocking limbs off or damaging the trunks. This has the potential to have an effect on any species utilising the habitat and therefore is considered to be a **permanent minor adverse** effect.

Llwyn Coed Heath LWS

7.8.40 The Development will require the removal of a very small area (<0.001ha; <0.001%) of the southern section of LWS to facilitate the construction of a section of the Q6 dam. This is considered to be a **negligible** effect.

7.8.41 The retained habitat and vegetation adjacent to the construction works has the potential to be damaged or killed through vehicles or machinery tracking over or repeated foot traffic over the vegetation, and pollution and/or run off. This has the potential to have a **temporary minor adverse** effect the LWS or on any species utilising the habitat.

Pen Gylfach LWS

7.8.42 The Development will not require the removal of any of the habitat within the LWS. However, due to the close proximity of the LWS to the proposed pumping station and spillway infrastructure, there is the potential for the trees to be damaged or killed through: root compaction by vehicles or machinery tracking over or repeated foot traffic over the roots, pollution and/or run off, and directly damaged by vehicles or machinery knocking limbs off or damaging the trunks. This has the potential to have a **temporary minor adverse** effect on the LWS or any species utilising the habitat.

Cefn Du LWS

7.8.43 The Development will require the the temporary disturbance and removal of 1.9ha (0.5%) for construction compounds etc and permanent disturbance and removal of of up to 1.0ha (0.3%) of the dry heath/acid grassland mosaic associated with south-eastern section of LWS to facilitate the construction of a section of the Q1 dam. This is considered to be a **negligible** effect.

7.8.44 The retained habitat and vegetation adjacent to the Development construction works have the potential there to be damaged or killed through vehicles or machinery tracking over or repeated foot traffic over the vegetation, and pollution and/or run off. This has the potential to have a **temporary minor adverse** effect on the LWS or any species utilising the habitat.

Donen Las LWS

7.8.45 The Development will require the the temporary disturbance and removal of 0.1ha (0.2%) for construction compounds etc and permanent disturbance and removal of of up to 0.1ha (0.2%) of the dry heath/acid grassland habitat for the construction of the spoil heaps. This is considered to be a **negligible** effect.

7.8.46 Due to the proximity of the LWS to the proposed spoil heaps the dry heath/acid grassland habitat and vegetation adjacent to the proposed spoil heaps have the potential to be damaged or killed through vehicles or machinery tracking over or repeated foot traffic, and pollution and/or run off.

This has the potential to have a **temporary minor adverse** effect on any species utilising the habitat.

#### Restored Ancient Woodland Sites

7.8.47 The Development will potentially require the removal of habitat from both of the RAWS. The Development will seek to use tracks and other areas of hardstanding that are already present within the Order Limits to avoid removing vegetation where possible. However, currently there are no detailed design plans and so for the purposes of this assessment it is assumed that the RAWS within the Order Limits will be removed. The RAWS are 0.93ha and 0.98ha in size, and up to 0.15ha will be removed from each, which equates to a loss of 16% and 15% respectively. This is considered to be a **permanent minor adverse** effect.

7.8.48 Any retained RAWS adjacent to the enabling works for the provision of access to facilitate the construction of the pumping house and lake bed spillway infrastructure have potential for the trees to be damaged or killed through: root compaction by vehicles or machinery tracking over, or repeated foot traffic over the roots, pollution and/or run off, and directly damaged by vehicles or machinery knocking limbs off or damaging the trunks. This has the potential to have a **temporary minor adverse** effect on any species utilising the habitat.

#### Other Designated Sites

7.8.49 There will be no potential construction effects on the following designated sites due to the lack of direct or indirect linkages and/or distance from the Development:

- Coed Dinorwig SSSI and LNR; and
- Llwyn y Coed SSSI.

#### Broadleaved Semi-Natural Woodland

7.8.50 The Development will require the the temporary disturbance and removal of 0.4ha (9.1%) for construction compounds etc and permanent disturbance and removal of 0.5ha (10.7%) for the construction of the access track to facilitate the construction of the pumping house and lake bed pipeline,



construction of the tail race from Q6 and a section of the Q6 dam of broadleaved semi-natural woodland, including some large, mature oak trees. This is considered a **permanent minor adverse** effect.

7.8.51 Where adjacent to the construction areas, the retained broadleaved plantation woodland has the potential to be damaged or killed through: root compaction by vehicles or machinery tracking over or repeated foot traffic over the roots, pollution and/or run off, and directly damaged by vehicles or machinery knocking limbs off or damaging the main stems. This is considered a **temporary minor adverse** effect.

#### Coniferous Woodland – Plantation

7.8.52 The potential effects of the Development on coniferous woodland plantation are assessed under Coed Donen Las LWS.

#### Coniferous Woodland – Recently Felled

7.8.53 The Development will require the the temporary disturbance and removal of 0.3ha (2.3%) for construction compounds etc and permanent disturbance and removal of 8.0ha (72.7%) of this habitat for creation of the slate mounds. Given the negligible value of the receptor, combined with a medium magnitude, the effect is considered to be **negligible**.

7.8.54 The retained adjacent habitat and vegetation has the potential to be damaged or killed through vehicles or machinery tracking over or repeated foot traffic, pollution and/or run off. Given the negligible value of the receptor, combined with a medium magnitude, the effect is considered to be **negligible**.

#### Mixed Woodland – Semi-Natural

7.8.55 The Development will require the the temporary disturbance and removal of 0.1ha (2.7%) for construction compounds etc and permanent disturbance and removal of 0.1ha (2.3%) for the tailrace and access routes to facilitate construction of the pumping house of mixed semi natural woodland. It is considered that the habitat loss of the enabling works will have a **negligible** effect although any trees which are removed or damaged will result in a **temporary minor adverse** effect.



Scrub – Scattered

- 7.8.56 The Development will require the the temporary disturbance and removal of 0.2ha (16.5%) for construction compounds etc and permanent disturbance and removal of 0.2ha (16.1%) of scattered scrub for the drilling of boreholes. This is considered to be a **temporary minor adverse** effect.
- 7.8.57 Where the scattered scrub is adjacent to the proposed Q6 dam and access routes facilitate the construction of the pumping house and lake bed spillway infrastructure, there is the potential for the habitat to be damaged or killed through: root compaction by vehicles or machinery tracking over or repeated foot traffic over the roots, pollution and/or run off, and directly damaged by vehicles or machinery knocking limbs off or damaging the main stems. This is considered to be a **temporary minor adverse** effect.

Acid Grassland – Semi-Improved

- 7.8.58 The Development will require the the temporary disturbance and removal of 1.6ha (33.2%) for construction compounds etc and permanent disturbance and removal of 0.01ha (0.2%) of acid grassland for the construction of the spoil heap at Q1. This is considered to be a **temporary minor adverse** effect.

Improved Grassland; Bracken – Scattered; Bracken – Continuous; Dry Dwarf Shrub Heath

- 7.8.59 The penstock will be tunnelled under these habitats and as such the Development does not require their removal.

Marshy Grassland

- 7.8.60 The Development will require the the temporary disturbance and/or permanent removal of 0.012ha (25.3%) of marshy grassland for the PRow diversion, some of which will be reinstated after completion of construction works. The habitat will be temporarily and/or permanently subject to light foot traffic which is unlikely to damage the habitat significantly. This is considered to be a **negligible** effect.

Wet Dwarf Shrub Heath

7.8.61 The Development will require the the temporary disturbance and/or permanent removal of 0.1ha (26.7%) of wet dwarf shrub heath for the PRoW diversion, some of which will be reinstated after completion of construction works. The habitat will be temporarily and/or permanently subject to light foot traffic which is unlikely to damage the habitat significantly. This is considered to be a **negligible** effect.

Dry Heath / Acid Grassland

7.8.62 The Development will require the the temporary disturbance and removal of 0.3ha (1.7%) for construction compounds etc and permanent disturbance and removal of 2.1ha (12.3%) for the construction of the Q6 dam of dry heath/acid grassland. This is considered to be a **permanent minor adverse** effect.

7.8.63 The retained habitat adjacent to the Q6 dam works has the potential to be damaged or killed through vehicles or machinery or repeated foot traffic tracking over, pollution and/or run off. This is considered to be a **permanent minor adverse** effect.

7.8.64 The tunnelling of the penstock route will not remove dry heath/acid grassland and so this is considered a **negligible** effect.

Flush and Spring – Acid / Neutral Flush

7.8.65 The penstock will be tunnelled under a section of this habitat and as such the Development does not require its removal. This is considered a **negligible** effect.

7.8.66 In other areas the habitat is at a significant distance from areas of construction and therefore unlikely to be subject to any potential effects.

7.8.67 However, this habitat occasionally occurs within a PRoW diversion route, some of which will be reinstated after completion of construction works. The habitat will be temporarily and/or permanently subject to light foot traffic which is unlikely to damage the habitat significantly. This is considered to be a **negligible** effect.

### Running Water

- 7.8.68 There are eight small, unnamed watercourses present on site. The construction of the slate mounds has potential to impact the aquatic environment through pollution of surface water runoff from vehicle fuel, oil, chemicals, silt or dust during construction could result in discharge of contaminated water.
- 7.8.69 Pollution, eutrophication, acidification, and/or changes to the water chemistry and/or temperature may cause long term damage to productivity and diversity of the aquatic habitat and the species it supports. Therefore this is considered a **temporary minor adverse** effect.

### Nant-y-Betws

- 7.8.70 The existing access track near Q1 will be diverted and will cross the Nant-y-Betws in two places. Culverting of the water course and construction of bridge crossings will disturb the stream banks and stream bed. This could result in the discharge of sediments into the stream. Accidental spills of fuels, oil or chemicals from machinery near the water course could result in water pollution.
- 7.8.71 The construction of the spillway infrastructure into the Nant-y-Betws and the construction of the slate mounds has potential to impact the aquatic environment through pollution of surface water runoff from aluminium during crushing of the spoil waste, vehicle fuel, oil, chemicals, silt or dust during construction could result in discharge of contaminated water.
- 7.8.72 Pollution, eutrophication, acidification, and/or changes to the water chemistry and/or temperature may cause long term damage to productivity and diversity of the aquatic habitat and the species it supports. Therefore this is considered a **temporary minor adverse** effect.

### Standing Water

- 7.8.73 The upland pond is at a significant distance from areas of construction and therefore unlikely to be subject to any potential effects.

7.8.74 However, it is adjacent to a PRoW diversion route but it is unlikely that it will suffer any potential effects due to this. This is considered to be a **negligible** effect.

#### **Standing Water – Oligotrophic**

7.8.75 The volume of oligotrophic water in Q1 and Q6 will be increased in size during construction with water abstracted from Llyn Padarn. The water in Llyn Padarn used to re-flood the quarries is the same in water quality and nutrient quality. However, the water will be moved between the two quarried to generate electricity, and as such there will be no over benefit to wildlife. This is considered a **neutral** effect

7.8.76 The construction of the two dams has the potential to damage the habitat through pollution and/or run off. This is considered a **temporary minor adverse** effect.

7.8.77 The potential effects on Llyn Padarn have been assessed under Llyn Padarn SSSI.

#### **Quarry**

7.8.78 The potential lining of Q1 and Q6 will result in the loss of the exposed rock quarry face. This is considered a **permanent moderate adverse** effect.

7.8.79 The construction of the Q6 dam is unlikely to damage Q7 through pollution and/or run off as the tunnel (T14) connecting Q6 and Q7 will be in filled prior to the works.

#### **Spoil (Slate Waste)**

7.8.80 Vibration during blasting of Q1 and Q6 could result in minor movement within the slate spoil, although this is not likely to adversely affect this habitat.

7.8.81 The creation of the two dams will result in the permanent loss of 5.8ha (26.0%) of this habitat which is considered a permanent minor adverse effect. However, two spoil mounds of a considerably larger area than of that lost will be created near Q1. These will consist of waste material from tunnelling of the penstock and re-profiling of Q1, Q6 and existing slate spoil heaps, which is considered an overall **negligible** effect.

7.8.82 The tunnelling of the penstock route will not affect existing slate spoil heaps.

Bare Ground (Hard Standing)

7.8.83 There will be a loss of 0.91ha (16%) of this habitat due to the construction of the two dams and turbine house. This habitat is of low ecological value. Therefore the effects are considered **negligible**.

Wall

7.8.84 The construction of the Q1 dam will require the removal the dry stone wall within the Order Limits. The retained adjacent habitat has the potential to be damaged or destroyed by the construction works and construction compound. This is considered a **temporary minor adverse** effect.

Lichens

7.8.85 A number of Nationally Scarce lichens will be removed by the construction of the Q1 dam including: *Rimularia badioatra*, *Catillaria atomarioides* and *Lecidea swartzioidea*. These lichens are present across the south facing slate spoil habitat of adjacent to Q1 and another location is known outside of the Order Limits adjacent to Q2.

7.8.86 There is potential for the re-profiling and stabilisation of Q1 to damage or destroy *Caloplaca asserigena*, a species under-recorded and only recently recognised in Britain.

7.8.87 Due to the proximity of the following lichens to the construction of Q1 dam, there is potential for them to be damaged or destroyed by tracking of vehicles or people, run-off, dust and/or pollution: *Protoparmelia atriseda* (RDB Vulnerable and Nationally Rare), *Catillaria atomarioides* (Nationally Scarce), *Rimularia intercedens* (Nationally Scarce), *Cladonia arbuscula*, *Stereocaulon leucophaeopsis* (Nationally Scarce), *Porpidia striata* (Nationally Scarce) and *Stereocaulon vesuvianum* var. *nodulosum* (Nationally Scarce).

7.8.88 Therefore this is considered a **permanent moderate adverse** effect.

7.8.89 The tunnelling of the penstock route will not remove habitats which support lichens.

7.8.90 Due to the diminutive nature of lichens it is not possible to survey and map the extent of the locations within the entire Order Limits. The species that have the potential to be impacted by the Development are likely to be present elsewhere within the Order Limits within similar habitat.

Bryophytes

7.8.91 The Development will cause the loss of some common bryophyte species, and there is the potential for species to be damaged or destroyed through vehicles or people tracking over, or through pollution and runoff. The effects on the species within the Order Limits will be limited due to the commonness of the species within the Order Limits and the wider landscape.

Fungi

7.8.92 The tunnelling of the penstock route will not remove habitats which support fungi.

Invertebrates

7.8.93 The removal of heath, quarries and woodland will have an effect on invertebrates utilising those habitats.

7.8.94 Although the Order Limits does not support protected species, it supports a number of species of conservation significance (Section 42 and LBAP species). It is likely that a number common species and species of conservation significance will be adversely affected though the loss of the small areas of heath (11% loss), quarries and woodland (11% loss), although the effects will be localised and unlikely to affect the invertebrate population as within the Order Limits or the wider environment. This is considered a **permanent minor adverse** effect.

7.8.95 The removal and re-profiling of the spoil habitat is likely to have an effect on the small theridiid spider (*Rugathodes bellicosus*). However, additional spoil heap habitat is being created as part of the Development.

7.8.96 Pollution and dust during construction may smother vegetation and adversely affect the ability of invertebrates to use the plants.

7.8.97 The water bodies and soils within and adjacent to the Order Limits could become polluted which could cause long term damage to productivity and

diversity of the aquatic and terrestrial habitat, adversely affecting invertebrates. This is considered a **temporary minor adverse** effect

### Fish

7.8.98 The effect of the Development on Atlantic salmon has been assessed under Afon Gwyrfai a Llyn Cwellyn SAC.

7.8.99 Pollution of surface water runoff from vehicle fuel, oil, chemicals or silt during construction could result in discharge of contaminated water to the water bodies adjacent to or within the Order Limits. Pollution may cause long term damage to productivity and diversity of the aquatic habitat, which could have an adverse effect on fish species. Silt will increase the turbidity of the water and potentially smother fish spawning grounds, therefore this is considered a **temporary minor adverse** effect.

7.8.100 Noise and vibration during construction has some potential to disturb fish within Llyn Padarn. It is extremely unlikely that noise or vibration will reach the Nant-y-Betws.

7.8.101 However, noise is unlikely to an effect beyond the immediate vicinity (less than 50m). Vibrations dissipate in water, as such any effects on fish will be limited to a precautionary 500m radius and will be temporary. This is considered to be **negligible** effect.

### Fish – Arctic Charr

7.8.102 A report from 2011 *Diver observations on Arctic charr (Salvelinus alpinus L.) spawning grounds in Llyn Padarn SSSI* (Thomas and Holt, 2011) identified a number of potential areas suitable for Arctic charr spawning around the perimeter of Llyn Padarn utilising hydroacoustic survey to identify areas of high fish densities to focus survey efforts. During the survey no Arctic charr were observed within the survey areas, nor were any eggs found. However, some potential areas scraped by fish for spawning were found to the south-east corner and the far western end of Llyn Padarn, and at the far end of the connecting watercourse, the Afon y Bala. The report stated that the lack of positive results may be due to several reasons including timing, surveyor error, and/or spawning occurring at other sites in the lake not included in the



survey. The report went on to conclude that the observations from the dive survey have shown that potential locations of Arctic charr spawning areas could not have been predicted by reference to the lake depth profile or shoreline composition.

7.8.103 It is known that Arctic charr spawning is confirmed along the Afon y Bala (Thomas and Holt, 2011). However, since it cannot currently be ruled out that Arctic charr spawn in the construction area and the construction is within the water depths suitable for spawning, there is the potential for spawning grounds to be removed, damaged or disturbed by the works and for spawning Arctic charr to be disturbed by the works.

#### **Loss of Spawning Grounds**

7.8.104 The spillway will remain buried until its entry into Llyn Padarn at a depth of 5m below the surface of the water. There is the potential for a very small amount of spawning habitat to be destroyed if present within the footprint of the spillway infrastructure pipe (5m x 20m approximate size) during construction. This is considered to be **permanent moderate adverse** effect.

#### **Pollution and/or Runoff**

7.8.105 Pollution of surface water runoff from vehicle fuel, oil, chemicals or silt during construction could result in discharge of contaminated water to the water bodies adjacent to or within the Order Limits. Pollution may cause long term damage to productivity and diversity of the aquatic habitat, which could have an adverse effect on Arctic charr. Silt will increase the turbidity of the water and potentially smother Arctic charr spawning grounds. This is considered to be **temporary moderate adverse** effect.

#### **Intake during Abstraction**

7.8.106 It is extremely unlikely for Arctic charr to be drawn into the pipe during abstraction resulting in injury and killing due to the provision of a gridded intake on the pipe. This is considered to be **temporary minor adverse** effect.



### **Noise and Vibration**

7.8.107 Noise and vibration during construction of the spillway infrastructure on the bed of Llyn Padarn and pumping station on the shore has some potential to effect Arctic charr. However, noise is unlikely to an effect beyond the immediate vicinity (less than 50m). Vibrations dissipate in water, as such any effects on Arctic charr will be limited to a precautionary 500m radius and will be temporary. This is considered to be **temporary moderate adverse** effect.

### **Amphibians**

7.8.108 The eastern area of the Order Limits is known to support common toad and palmate newt.

7.8.109 The removal of terrestrial habitat (broadleaved and mixed woodland – 11%, scrub – 9%, and heath/acid grassland mosaic – 11%) has the potential to affect amphibians. However the affects will be localised given the extent of suitable habitat retained within the Order Limits and that available within the wider environment, and the very low numbers of amphibians recorded on site.

7.8.110 There is no habitat on site suitable for supporting breeding amphibians. Amphibians may be crushed by machinery and/or people tracking over the retained vegetation and/or refugia.

7.8.111 Degradation and/or destruction of the retained terrestrial habitat through vehicles, machinery or people tracking over it and/or pollution (spillages of vehicle fuel, oils, cement, silt runoff and dust) has the potential to have an effect on amphibians. This is considered a **temporary minor adverse** effect.

### **Reptiles**

7.8.112 The removal of terrestrial habitat (quarries Q1 and Q6, spoil – 32%, heath/acid grassland mosaic – 11%, scrub – 9%, woodland edges (total loss of broadleaved and mixed woodland area is 11%) and the dry stone wall) has the potential to affect reptiles. Slow worms were found around Q6, common lizards across the whole of the Order Limits, but mainly associated

with the quarries. However, the construction will result in an increase to the spoil habitat; the majority of the habitats listed above will be retained and there is an abundance of these habitats within the wider environment. This is considered a **permanent minor adverse** effect.

7.8.113 Terrestrial habitats adjacent to or within the Order Limits may become polluted by spillages of vehicle fuel, oils, cement, silt runoff and dust during construction which could cause long term damage to productivity and diversity of the habitat adversely affecting reptiles. This is considered a **temporary moderate adverse** effect.

7.8.114 Reptiles may be crushed by machinery or people tracking over the vegetation and refugia. This is considered a **temporary moderate adverse** effect.

7.8.115 There is likely to be increased disturbance to reptiles from the noise and movement of construction machinery during the construction phase and enabling works. This could be a **localised, temporary moderate adverse** effect if occurring during specific times of the year.

7.8.116 Vibration during blasting has the potential to disturb reptiles. Vibration could deter reptiles from affected habitats and affect access to foraging or breeding areas. Blasting will be completed during construction. This could be a **localised, temporary minor adverse** effect if occurring during specific times of the year.

### Birds

#### Schedule 1 Species

7.8.117 Peregrine and chough have been recorded in the quarry system and there is a record of barn owl from 2007 within the quarry system. The exact location and breeding status for all species is confidential.

7.8.118 No dedicated surveys for barn owl has been undertaken due to the opportunities for observing barn owl during the number of bat surveys undertaken.

7.8.119 Re-profiling, stabilisation and pressure grouting of Q1 and Q6, followed by flooding will remove habitat with the potential to support nesting. Although

there will be no direct impact on any of the Schedule 1 species as they were found not to be using Q1 or Q6 during the bird surveys, therefore this is considered a **permanent minor adverse** effect.

7.8.120 Q2, Q3, Q3a, Q4, Q5, Q7 and Q8 (bomb store) will be retained and there are similar habitats of equal or greater value with the potential to support ledge nesting birds in the immediate surroundings.

7.8.121 Choughs feed where soil depths are shallow and vegetation is short and impoverished, particularly on the fringes of rocky outcrops, where they can more easily find invertebrates. Construction dust has a potential impact on chough as it can settle and cover the vegetation preferred by chough for foraging. This is considered a **temporary moderate adverse** effect.

7.8.122 Choughs are currently experiencing a moderate adverse impact from reduced sheep grazing of its feeding grounds and the birds are known to be foraging further afield (Enfys Ecology, 2013). This is a wider issue that is not restricted to the Order Limits, and also applies to wider upland habitat in the local area.

7.8.123 Vibration during blasting could disturb barn owl, peregrine falcon and chough, particularly during the breeding season. Though blasting would be a sporadic temporary event. Human visual activity is generally more disturbing to breeding birds than noise (particularly where it is regular). This is considered a **temporary moderate adverse** effect.

7.8.124 Increased human activity within the Order Limits during construction has potential to cause disturbance, particularly during nesting. This is considered a **temporary moderate adverse** effect.

#### **BOCC Red List Species**

7.8.125 Cuckoo has been recorded as a probable and possible breeder in and around the quarries; lesser redpoll has been recorded as confirmed breeding in and around the quarries; skylark has been recorded as probably breeding in and around the quarries; song thrush has been recorded as confirmed breeding in and around the quarries; linnet has been recorded as possibly breeding in and around the quarries; yellowhammer has been

recorded as possibly breeding around the quarries; and ring ouzel has been recorded as possibly breeding around the quarries.

7.8.126 Removal of Q1, Q6 and woodland has the potential to affect these species though loss of nesting habitat and destruction of nests. Q2, Q3, Q3a, Q4, Q5, Q7 and Q8 (bomb store) and areas of grassland, scrub and woodland will be retained post construction so suitable habitat will be retained within the Order Limits. This is considered a **permanent minor adverse** effect.

#### **BOCC Amber List Species**

7.8.127 Meadow pipit has been recorded as a confirmed breeder in and around the quarries; dunnock has been recorded as probably breeding in and around the quarries; redstart has been recorded as probably breeding in and around the quarries; willow warbler has been recorded as probably breeding in and around the quarries; chough has been recorded as a confirmed breeder in and around the quarries; kestrel has been recorded as breeding confirmed breeder in and around the quarries; wheatear has been recorded as possibly breeding in and around the quarries; mistle thrush has been recorded as a confirmed breeder in and around the quarries; redstart have been recorded as probably breeding in and around the quarries; grey wagtail has been recorded as possibly breeding in and around the quarries; ring ouzel has been recorded as possibly breeding around the quarries; bullfinch has been recorded as possibly breeding around the quarries; greylag goose was recorded flying over the quarries; and song thrush has been recorded as probably breeding around the quarries.

7.8.128 Removal of Q1, Q6 and woodland has the potential to affect these species, although Q2, Q3, Q3a, Q4, Q5, Q7 and Q8 (bomb store) and grassland, scrub and woodland habitats will be retained. This is considered a **permanent moderate adverse** effect.

#### **Other Breeding Birds**

7.8.129 A number of other birds have been recorded breeding in and around the quarries, the woodland, heathland and scrub has the potential to support breeding birds. The removal of these habitats has the potential to damage or

destroy nesting birds. There will be a loss of some suitable nesting habitat. This is considered a **negligible** effect.

7.8.130 Vegetation removal and presence of people has the potential to disturb nesting birds. This is considered a **temporary minor adverse** effect.

#### Polecat

7.8.131 Polecats have the potential to present within the Order Limits for foraging and/or commuting, as such there is a risk of collision with Development construction traffic. Development construction traffic is likely to be heaviest during the day. Polecats are nocturnal, except in mid-summer when breeding females may hunt in daylight to feed their young (Vincent Wildlife Trust, 2014). The collision with construction traffic is considered to be a **temporary minor adverse** effect.

#### Badgers

7.8.132 A badger survey conducted in 2011 identified the presence of one badger sett just outside of the Order Limits. It is possible that since 2011 new badgers setts have been created. Although the Phase 1 surveys conducted in 2013 and 2015 identified no further evidence of activity or any new setts.

7.8.133 The removal of a proportion of the woodland is has the potential to affect badgers, through damage, destruction or disturbance of newly created sett, loss of habitat suitable for sett creation and loss of foraging habitat. There is an abundance suitable habitat within the landscape to compensate for the loss of foraging and potential sett creation habitat. This is considered a **negligible** effect.

7.8.134 The sett identified in 2011 and 2015 is approximately 100m away from the proposed dam for Q6 and the access track leading to the pump house on Llyn Padarn, and as such there are no adverse effects associated with construction works and disturbance or destruction of an active badger sett. However, any new setts created before works commence and within 100m of construction works have the potential to be damaged or destroyed, and the badgers inhabiting them disturbed, injured or killed. This is considered a **permanent moderate adverse** effect.

7.8.135 There is likely to be increased disturbance to foraging or commuting badgers from the noise, vibration and movement of construction machinery and people during the construction phase and enabling works. This could have an effect on foraging or commuting badgers across the Order Limits near to the sett (i.e. not the upland areas), although the effects will be localised and unlikely to effect the badger population in the area. This is considered a **negligible** effect.

7.8.136 Habitats adjacent to or within the Order Limits may become polluted by spillages of vehicle fuel, oils, cement, silt runoff and dust during construction which could cause long term damage to productivity and diversity of the habitat adversely affecting badgers, although the effects will be localised and unlikely to effect the badger population in the area. This is considered a **negligible** effect.

7.8.137 Risk of collision with construction vehicle is unlikely as the 2011 survey found tracks that suggested occasional use only. and, badgers are most active at dusk and dawn, when site traffic volumes will be low. Site traffic is likely to be heaviest during the day. Therefore the risk of a collision is likely to be low. This is considered to be a **negligible** effect.

7.8.138 Although it is likely that badgers only occasionally commute and forage within the Order Limits, there is the potential for foraging or commuting badgers to become trapped in any open excavations or pits. This is considered to be a **temporary minor adverse** effect.

#### Water Vole

7.8.139 Cofnod returned no records of water vole from within the Order Limits. Records of water vole were returned from:

- An upland area south outside of the Order Limits adjacent to a water body;
- Llyn Padarn; and,
- The Afon Gwyrfai, which is connected to the Nant-y-Betws into which the spillway infrastructure from Q1 discharges.

7.8.140 Habitat within the Order Limits is not suitable except where the pipeline meets Llyn Padarn. Where the spillway infrastructure enters Llyn Padarn there will be a small loss of bank habitat. Here there is significant human pressure from recreation and the modified bank are generally unsuitable to support the species.

7.8.141 No evidence of water voles has been identified within the Order Limits, although no targeted surveys for water vole have been completed, and therefore the effects are considered to be **negligible**.

#### Otters

7.8.142 The results of the 2011 survey for otters were negative, recording no signs of past or current usage by the species. The area within the Order Limits was considered to offer low quality foraging habitat and, in the context of the wider area, hold little to encourage otters to either forage within it or commute through to the upland areas above.

7.8.143 Given the proximity of otters to the lower end of the Order Limits at Llyn Padarn SSSI, it was concluded reasonable to assume that there may be occasional incursion by individual animals. However, it is highly unlikely that any otter would remain in the area or utilize the resources to any significant degree.

7.8.144 Otters at Afon Gwyrfai are discussed under Afon Gwyrfai SAC.

7.8.145 Where the spillway infrastructure enters Llyn Padarn there will be a small loss of bank habitat. Here there is significant human pressure from recreation and the modified bank are generally unsuitable to support the species and as such it is unlikely that a new holt/couch would have been created since 2011. Therefore the effects are considered to be **negligible**

7.8.146 Aquatic habitats adjacent or linked to, or within the Order Limits may become polluted by spillages of vehicle fuel, oils, cement, silt runoff and dust during construction which could cause long term damage to productivity and diversity of the habitat adversely affecting otters.



### Red Squirrel

7.8.147 Removal of trees near Q7 have the potential to kill or injure a red squirrel, or damage or destroy any structure or place a red squirrel uses for shelter or protection (drey) or disturb a red squirrel while it is occupying such a place. This is considered to be a **temporary moderate adverse** effect.

7.8.148 Noise, vibration and increase activity has the potential to disturb a red squirrel while it is occupying a place for shelter or protection (drey). This is considered to be a **temporary minor adverse** effect.

### Bats

#### **Disturbance from Vibration**

7.8.149 There is very little published information on the affects of ground borne vibration disturbance on roosting bats. A study by URS in 2012 at Potters Wood Cave, the closest bat hibernation site to Whitecleave Quarry, found that the peak particle velocity (PPV) measurement detected at Potters Wood cave during the blasting trial was 1.8 mm sec<sup>-1</sup>. URS conclude that based on the current research and survey results the rock blasting at Whitecleave Quarry was unlikely to affect a significant number of hibernating bats in these caves. Their report quotes several existing studies on vibration and bats: A study in Australia (Heggies SLR, undated) found no effect on cave roosting bats from ground vibration rates of 6.5 mm sec<sup>-1</sup>. Delaney (2002) in New York State, USA, quoted information from earlier studies of disturbance to cave-roosting Indiana bat *Myotis sodalis* (Myers 1975; Besha 1984). Besha (1984) found that quarrying activities generated ground-borne vibration peak particle velocities (PPV) of 6.35 mm sec<sup>-1</sup> and suggested limiting seismic vibration to 2.54 mm sec<sup>-1</sup> would be a safe threshold to avoid disturbed hibernating bats. Myers (1975) concluded that Indiana bat was not impacted by construction activity and suggested that PPV of 0.5 mm sec<sup>-1</sup> would not be detrimental to hibernating Indiana bats.

7.8.150 A number of studies have shown that non tactile stimuli (including vibration) have little effect on torpid bats whereas handling bats or human presence within hibernacula present a more serious threat (Speakman et. al, 1991; Hutson and Mickleburgh, 1988; Stebbings, 1969; Swift, 1998).



7.8.151 The culvert, Tunnel 15 and the Bomb Store may be subject to short term low level noise and vibration due to the construction of a spillway infrastructure pipe from Q6. This pipe will be shallow near the service and will be constructed using open trench cutting. Any vibration or noise on T15 or the Bomb Store is will be temporary and likely to be insignificant.

7.8.152 The culvert and Tunnels 1, 2, 6, 11, 11a, 12, 13, 14 and 15 may be subject to short term noise and vibration during detailed ground investigation works (trail pits and boreholes). Trail pits will be near the surface (max depth 1.5 to 2m) and unlikely to create significant amounts of vibration. Boreholes will be deeper, particularly in the location of the Penstock route where boreholes could reach 70 – 100m deep, and may create localised temporary vibration.

7.8.153 Blasting for profiling and stabilisation of Q1 and Q6 is target to create short term ground borne vibration of 6 mm/s at 95% confidence level (Chapter 13 Noise). Based on existing studies on the effects of vibration on bats, it is considered that temporary ground borne vibration from blasting on these tunnels is unlikely to have a significant effect on roosting bats.

7.8.154 Deep excavation of the Penstock pipeline with drill and blast or TBM is predicted to create ground borne vibration of 0.45mm/s at 100m from the source (Chapter 13 Noise). This falls well below the level existing studies have considered unlikely to disturb bats. Tunnel 6 will be in-filled before the penstock construction so there will be no impact on T6. The distance from the penstock route of Tunnels 3, 4, 5, 7, 8 and 9 are given below:

- T3 = 119m;
- T4 = 148m;
- T5 = 171m;
- T7 = 59m;
- T8 = 72m; and
- T9 = 71m.

7.8.155 Based on existing studies on the effects on vibration on bats, it is considered that temporary ground borne vibration from drill and blast or TBM on the

tunnels would be at a level unlikely to have a significant effect on roosting bats.

7.8.156 It is not known if different species perceive vibration disturbance in the same way or if they have different levels of tolerance. Therefore, for the purposes of this document, the impact vibration disturbance is considered to be the same for all species recorded roosting in the tunnels, Lesser horseshoe, brown long eared, Daubenton's and Natterer's.

7.8.157 All species recorded roosting in the tunnels which are proposed for exclusion are considered to be relatively abundant in Wales. In addition numbers recorded were low. The temporary and sporadic nature of the vibration coupled with the low levels of vibration likely to occur in the retained tunnels supporting roosting bats means that vibration is unlikely to cause a disturbance to roosting bats. The effect is considered to be **temporary minor adverse**.

#### **Roost Modification**

7.8.158 Tunnels 1, 2, 6, 11, 11a, 12, 13, and 14 will be in filled by pumping in or pressure grouting with a concrete type substance. This will make the tunnels watertight preventing leakage from the quarries and providing stability of ground conditions under the dams and penstock route. This will result in the loss of tunnel roosts with no opportunity for modification. Only if ground conditions and tunnel stability allow, at the eastern end of T2 and T14 a minimum 50m section of the tunnel will be retained for use by bats thus modifying these two existing tunnels to a much shorter length.

7.8.159 There will be no modification to Tunnels 3, 4, 5, 7, 8, 9, 15 or the bomb store.

7.8.160 All species recorded roosting in the tunnels, Lesser horseshoe, brown long eared, Daubenton's and Natterer's, which are proposed for exclusion and infilling are considered to be relatively abundant in Wales. In addition numbers recorded were low. As a result the long term impact on the local bat populations due to roost modifications this effect is considered to be a **permanent moderate adverse** effect.

### **Roost Loss – Tunnels and Former Bomb Store**

7.8.161 The Order Limits is not known to support maternity roosts or swarming sites. However, the Order Limits does support small hibernation and summer non-breeding roosts.

7.8.162 Table 7-17 summaries the tunnels and roosts which will be lost or disturbed by the Development and the impact on the resident roosting bats. Those highlight in red text will be lost permanently. There are ten tunnels in total which will be lost permanently to the Development. These are Tunnels 1, 2, 6, 10, 11, 11A, 12, 13, and 14.

7.8.163 Of the nine tunnels to be destroyed seven are confirmed bat roosts (as detailed in Table 7-17). Though it would be correct to assume that all of the tunnels could be and likely are used by roosting bats for short period during the summer and winter, with bats moving between the tunnels utilising the whole set of tunnels as a single roosting resource rather than each tunnel in isolation. The impact of the loss of some, but not all tunnels will mean that a roosting resource will be maintained within Glyn Rhonwy. Impacts on species roosting within the Order Limits are described below:

#### **Lesser Horseshoe**

7.8.164 Ten tunnels and the bomb store within the Order Limits were confirmed to support lesser horseshoe. Seven will be lost: T 1, 2, 6, 11, 11A, 13, and 14. These tunnels support hibernation roosting by at least eight bats and static detectors recorded summer activity.

7.8.165 Tunnel 7 which supports the largest count of hibernating lesser horseshoe bats within the Order Limits (11 bats peak one-day count) will be retained.

7.8.166 The bomb store, where two hibernating lesser horseshoes were recorded will be retained.

7.8.167 Tunnel 15, where one hibernating lesser horseshoe was recorded and where static detectors recorded summer activity, will be retained.

7.8.168 Tunnel 9, where static detectors recorded summer activity, will be retained.

**Brown Long-Eared**

7.8.169 Three tunnels within the Order Limits were confirmed to support brown long-eared. One of two hibernation roost sites for brown long-eared identified, Tunnel 2, will be lost. Tunnel 9 will be retained.

7.8.170 The tunnel supporting at least four summer roosting brown long-eared bats, Tunnel 11A, will be lost.

**Daubenton's**

7.8.171 One tunnel, Tunnel 2, was confirmed to support one hibernating Daubenton's. Tunnel 2, will be lost.

7.8.172 Static detectors suggest summer activity by Myotis in T2, 9, 11, 14 and 15. Tunnel 9 and 15 will be retained, the rest will be lost. A short section of Tunnel 2 and 14 will be retained only if ground conditions allow.

**Natterer's**

7.8.173 Two tunnels within the Order Limits were confirmed to support Natterer's. One of two hibernation roost sites for Natterer's, Tunnel 11A, will be lost. Tunnel 9 will be retained. The tunnel supporting at least one summer roosting Natterer's, Tunnel 11A, will be lost. Static detectors suggest summer activity by Myotis in T2, 9, 11, 14 and 15. Tunnel 9 and 15 will be retained, the rest will be lost.

7.8.174 All species recorded roosting in the tunnels which are proposed for exclusion are considered to be relatively abundant in Wales. In addition numbers recorded were low.

<b>Table 7-17: Bat Tunnel Roost Locations</b>				
<b>Tunnel</b>	<b>Roost Type</b>	<b>Species (estimated population)</b>	<b>Evidence</b>	<b>Roost Loss</b>
Tunnel 1	Hibernation Occasional summer	Lesser horseshoe (1)	One hibernating lesser horseshoe bat recorded in 2010/2011 and 2013.  No bats recorded in winter 2014.  *Automated bat detectors identified potential occasional summer roosting/foraging activity by lesser horseshoe. No droppings or live bats identified during internal summer inspections.	The pressure grouting and submerging of the tunnel will result in the entire loss of the roost.
Tunnel 2	Occasional hibernation Occasional summer	Lesser horseshoe Daubenton's (1) Brown long-eared (1)	Low numbers of scattered droppings considered to be lesser horseshoe recorded in winter 2013.  One Daubenton's bat and one brown long-eared bat recorded in winter 2014.  Small numbers of fresh lesser horseshoe droppings at the end of the tunnel in 2013. The amount of droppings recorded suggests occasional rather than frequent summer use.  *Automated bat detectors identified potential occasional summer roosting/foraging activity by lesser horseshoe, Myotis sp., common pipistrelle and long-eared.	This will affect at least one hibernating lesser horseshoe bat and similarly small number of summer roosting bats.
Tunnel 3	No roost	Nil	Not surveyed by AECOM. CEP surveyed in December 2010 and January 2011 and no roosting bats were recorded.	
Tunnel 4	No roost	Nil	Not surveyed by AECOM. CEP surveyed in December 2010 and January 2011 and no roosting bats were recorded.	The pressure grouting and submerging of the tunnel will result in the entire loss

<b>Table 7-17: Bat Tunnel Roost Locations</b>				
<b>Tunnel</b>	<b>Roost Type</b>	<b>Species (estimated population)</b>	<b>Evidence</b>	<b>Roost Loss</b>
				of the roost.
Tunnel 5	No roost	Nil	Not surveyed by AECOM. CEP surveyed in December 2010 and January 2011 and no roosting bats were recorded.	Only if ground conditions and tunnel stability allow a minimum 50m section at the eastern end of T2 will be retained for use by bats modifying it to a much shorter length. This is dependent on ground conditions.
Tunnel 6	Occasional hibernation	Lesser horseshoe	Low number of lesser horseshoe droppings recorded in 2010/11. The number and distribution of dropping suggested occasional rather than frequent winter use.  Tunnel was not surveyed in winter 2012/13 or summer 2013.  No bats were found in winter 2014.	There is a low risk of temporary disturbance from noise and vibration during stabilisation works.
Tunnel 7	Hibernation	Lesser horseshoe (11)	Eleven hibernating lesser horseshoe bats recorded in 2010/11.  Peak count of eleven hibernating lesser horseshoe bats in winter 2014  Automated bat detectors recorded 169 lesser horseshoe passes across January and February 2014.  Tunnel was not surveyed in winter 2012/13 or summer 2013.	This will affect at least one hibernating Daubenton's and one hibernating brown long-eared bat. Plus a small number of summer roosting Myotis (likely Daubenton's) and brown-long eared bats.

<b>Table 7-17: Bat Tunnel Roost Locations</b>				
<b>Tunnel</b>	<b>Roost Type</b>	<b>Species (estimated population)</b>	<b>Evidence</b>	<b>Roost Loss</b>
Tunnel 8	No roost	Nil	Not surveyed by AECOM. CEP surveyed in December 2010 and January 2011 and no roosting bats were recorded.	This will affect at least and a small number of hibernating lesser horseshoe bats and similarly small number of summer roosting bats.
Tunnel 9	Hibernation  Occasional summer	Natterer's (2)  Brown long-eared (1)	Two hibernating Natterer's bats recorded in 2010/11, a peak count of two hibernating Natterer's bats in 2013 and one hibernating Natterer's in 2014. One hibernating brown long eared bat in 2013.  Old suspected Natterer's droppings recorded during summer 2013.  *Automated bat detectors identified potential occasional summer roosting/foraging activity by lesser horseshoe, Myotis sp., and common pipistrelle.	This tunnel will be retained. Disturbance from noise and vibration will be negligible.
Tunnel 10	Not surveyed	Nil	Completely blocked by rock fall. Tunnel not accessible to bats.	There will be no impact on roosting bats.
Tunnel 11	Occasional hibernation  Occasional summer	Lesser horseshoe	Low numbers of scattered lesser horseshoe droppings recorded in winter 2010/2011. The amount of droppings recorded suggests occasional rather than frequent winter use.  Automated bat detectors recorded 22 lesser horseshoe passes in winter 2014, confirming use during hibernation.  No droppings or live bats identified during internal inspections	This tunnel will be retained. Disturbance from noise and vibration will be negligible.



Table 7-17: Bat Tunnel Roost Locations				
Tunnel	Roost Type	Species (estimated population)	Evidence	Roost Loss
			<p>summer 2013.</p> <p>*Automated bat detectors identified potential occasional summer roosting/foraging activity by lesser horseshoe, Myotis sp., common pipistrelle and noctule/Leisler's.</p>	
Tunnel 11A	Hibernation Summer	Lesser horseshoe (4) Natterer's (2) Brown long-eared (4)	<p>Four hibernating lesser horseshoe bats were recorded in winter 2013.</p> <p>Peak counts of 1 lesser horseshoe and 2 Natterer's bats were recorded in winter 2014.</p> <p>Four brown long-eared and a Natterer's bat were found roosting in September 2013. Fresh lesser horseshoe droppings were recorded indicating summer use.</p>	There will be no impact on roosting bats.
Tunnel 12	No hibernation roost.	Nil	<p>No evidence of bats identified, including no bats, droppings or calls on automated detectors in winter 2013 and 2014.</p> <p>Tunnel was not surveyed in summer 2013.</p>	This tunnel will be retained. Disturbance from noise and vibration will be negligible.
Tunnel 13	Occasional hibernation	Lesser horseshoe	<p>Approximately 200 lesser horseshoe droppings recorded in 2010/2011. The amount and distribution of droppings suggests occasional rather than frequent use.</p> <p>No bats identified in winter 2013 or winter 2014.</p> <p>Tunnel was not surveyed in summer 2013.</p>	There will be no impact on roosting bats.
Tunnel	Hibernation	Lesser	Peak count in one visit of three hibernating lesser horseshoe bats recorded in winter 2013 and 1 lesser horseshoe bat in	The pressure grouting and in filling of the tunnel for

<b>Table 7-17: Bat Tunnel Roost Locations</b>				
<b>Tunnel</b>	<b>Roost Type</b>	<b>Species (estimated population)</b>	<b>Evidence</b>	<b>Roost Loss</b>
14	Occasional summer	horseshoe (3)	winter 2014. Automated bat detectors recorded 24 lesser horseshoe passes and 4 indeterminate bat passes during winter 2014. No droppings or live bats identified during internal summer 2013 inspections. *Automated bat detectors identified potential occasional summer roosting/foraging activity by lesser horseshoe, Myotis sp., and common pipistrelle.	construction of the penstock will result in the entire loss of the roost.
Tunnel 15	Hibernation  Occasional summer	Lesser horseshoe (1)	One hibernating lesser horseshoe bat recorded in 2008 (CEP, 2012 historic record), 2010/11 and 2013. No bats recorded in winter 2014. No droppings or live bats identified during internal inspections summer 2013. *Automated bat detectors identified potential occasional summer roosting/foraging activity by lesser horseshoe and Myotis sp.	
Bomb store	Hibernation	Lesser horseshoe (2)	Lesser horseshoe bat droppings recorded during winter 2010/11. One lesser horseshoe bats recorded hibernating in tunnel in winter 2013. Not surveyed in winter 2014.	This will affect at least a small number of hibernating lesser horseshoe bats and possibly a similarly small number of summer

<b>Table 7-17: Bat Tunnel Roost Locations</b>				
<b>Tunnel</b>	<b>Roost Type</b>	<b>Species (estimated population)</b>	<b>Evidence</b>	<b>Roost Loss</b>
			Could not access to survey in summer 2013. Summer roosting unknown, but possible.	roosting bats.

\*Indicative only. Automated detectors were placed in the entrances of tunnels. Activity recorded on the detectors may give an indication of which species are using the tunnels to roost. However, some the activity detected is likely to be a result of foraging.

7.8.175 Tunnel 16 has not been surveyed. The tunnel is gridded, indicating preservation as a bat roost site. This tunnel may need to be removed to facilitate the Development but this is not confirmed. Additional surveys will be required to assess the impact of the Development on bats in Tunnel 16. A survey by CEP in 2010 identified four lesser horseshoe bats roosting in the Tunnel 16 (CEP, 2010).

7.8.176 The culvert has not been surveyed. However, given that the culvert runs under a busy road subject to considerable noise and vibration, the noise and vibration from the construction works are unlikely to be greater than those already experienced by any bats utilising the habitat as a roost.

7.8.177 In summary effects on bats from the loss of roosts in the tunnels is considered to be a **permanent moderate adverse** effect.

#### ***Roost Loss – Trees***

7.8.178 The construction of the spillway infrastructure and pumping station adjacent to Llyn Padarn will result in the loss of a small area of semi-natural deciduous woodland which may impact on foraging bats.

7.8.179 The construction of the spillway infrastructure into Llyn Padarn is not shown to remove the trees with bat potential.

7.8.180 The construction of the dam at Q6 will not require removal of any tree within Q7 identified by CEP. But the current Development plans show it is likely that Bat Tree 4, identified by AECOM during the Phase 1 Habitat survey 2013 will be removed. No bat surveys have been completed on any trees with bat potential. There is a risk that trees which support roosting bats could be removed by the dam, and therefore this is considered to be a **permanent moderate adverse** effect.

#### *Isolation and Fragmentation*

7.8.181 There are minimal liner features at the Glyn Rhonwy site particularly at higher elevations around Q1 and Q2 where there are few trees and no hedgerows.

7.8.182 There will be loss of broadleaved woodland for construction of the dam at Q6.

- 7.8.183 There will be loss of woodland around Q6 during stabilisation of the tail pond.
- 7.8.184 There will be loss of trees to construct the outflow pipe and pumping station into Llyn Padarn.
- 7.8.185 The woodland edge along the south of the slate waste heaps at Q4 and Q5 will be retained.
- 7.8.186 A review of the Phase 1 Habitat Report (AECOM, 2013) shows that the vegetation surrounding Tunnel 1 is dominated by dry heath and acid grassland with no trees and few linear features resulting in poor landscape connectivity for foraging bats.
- 7.8.187 Tunnels 9 to 15 are all located around Q5, Q6 and Q7 which have substantial semi-natural broadleaved woodland and scrub providing foraging habitat for lesser horseshoe and Myotis bat species. This is supported by the results of the walked and automated activity surveys carried out in 2013 and additionally by the previous surveys carried out within the Order Limits by CEP in 2011/2012.
- 7.8.188 The construction of the tailrace and pumping station near to Llyn Padarn will result in the loss of semi-natural deciduous woodland dominated by birch and scrubby sessile oak. The woodland edges are likely to provide suitable foraging and commuting habitat to bats using Q8 (the bomb store).
- 7.8.189 The loss of foraging habitat will impact on foraging bats, particularly around Q5, Q6 and Q7. However, there are additional suitable foraging areas adjacent to the site which will remain unaffected. Habitat loss immediately around the tunnels used by lesser horseshoe bats could impact on winter survival, as lesser horseshoe bats often rely on nearby winter feeding resources (Billington & Rawlingson 2006), though these areas are often cattle grazed fields but foraging habitat can include woodland. The timing of vegetation removal within the quarries could impact on winter survival.
- 7.8.190 External lighting will be required during both construction and operation. There is potential, if poorly designed, that light could spill onto foraging and commuting habitats. For less light tolerant species such as lesser horseshoe

this could restrict access to some areas of the site. Daubenton's, Natterer's and brown long-eared will be deterred from illuminated foraging and commuting areas. There is unlikely to be any direct illumination on to roost entrances, as the retained entrances will be within the quarry voids that will not be illuminated.

7.8.191 As a result the long term impact on the local population of bat species roosting within the Order Limits due to habitat fragmentation and isolation is considered to be **permanent adverse moderate** effect.

#### Invasive Species

7.8.192 Enabling and construction works has the potential to be spread Himalayan balsam, rhododendron, Cotoneaster and Nuttall's pondweed. No invasive plants were identified within Q1 and Q6. The Phase 1 Habitat Survey has identified Himalayan Balsam and rhododendron near Llyn Padarn, although they are unlikely to be disturbed and/or spread by the construction works. The aquatic survey of Llyn Padarn identified Nuttall's pondweed within the lagoons on the south-western shore near to where the spillway infrastructure will be located, the nearest specimen is approximately 75m away from the proposed spillway infrastructure and are unlikely to be disturbed and/or spread by the construction works. This is considered a **permanent minor adverse** effect.

#### *Operation*

#### Afon Gwyrfaï a Llyn Cwellyn SAC and SSSI

7.8.193 Any changes that adversely affect the aquatic environment of Afon Gwyrfaï will likely have an effect on the designated features (Water Courses of Plain To Montane Levels with the *Ranunculion*, *Fluitantis* and Callitricho-Batrachion Vegetation, Atlantic Salmon, Floating Water-Plantain, Otter and Running Water) of the SAC and SSSI limiting the ability of the features to function.

7.8.194 Arctic charr are unlikely to be affected by the following (apart from invasive species) as they are present only in the lake Llyn Cwellyn, which is upstream of the Order Limits and discharge point.

### **Alteration of Flow**

7.8.195 The conservation objectives of the SAC state that the flow regime should be characteristic of the river,  $\pm 10\%$  of the naturalised daily flow throughout the year. (CCW, 2008).

7.8.196 The Q1 spillway infrastructure 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 storm water runoff into the Development is via the Q6 spillway infrastructure to Llyn Padarn. However, if the estimated annual rainfall to Q1 was discharged to the Afon Gwyrfaï via the Nant-y-Betws and spread evenly throughout the year it would amount to approximately  $442 \text{ m}^3 / \text{day}$  which is  $<2\%$  of the Q95 flow (Q95 is the flow exceeded 95% of the time) in the Afon Gwyrfaï (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 Gwyrfaï will be subsequently controlled.

7.8.197 Any increases to the flow are likely to have a **temporary minor adverse** effect on the flows in the Afon Gwyrfaï.

### **Nutrient Enrichment**

7.8.198 The surrounding catchment is predominantly comprised of old quarries and slate mines. Nutrient inputs from the surrounding quarry face and environment will therefore be low, and the chemistry of the water from the initial in-fill from Llyn Padarn is unlikely to be changed significantly.

7.8.199 However, regarding the initial in-fill, 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. One of the most significant sources of phosphorus are discharges from Llanberis Waste Water



Treatment Works (WWTW). Initial improvements were made following the introduction of tertiary treatment in 1995. A series of further improvements have been planned for the WWTW between April 2015 and March 2020 to help reduce phosphorus inputs into the lake. Further detail is provided in Chapter 9 Water Resources.

7.8.200 Despite reductions in the loading of phosphorus from the principle catchment source, internal loading as a consequence of phosphorus being released seasonally from sediments under anoxic conditions can result in high phosphorus concentrations persisting for some time. This is a phenomenon that has been observed in Llyn Padarn, although it may only be an issue immediately following overturn (i.e. October/November and perhaps sometimes in the spring).

7.8.201 The proposed increased abstraction from Llyn Padarn would be restricted to approximately 3300 m<sup>3</sup> per day meaning that if all the required water came from the lake it would take around 394 consecutive days of abstraction. It is proposed that natural runoff to the quarries will be used to augment the abstraction, although this can be unreliable year on year. To allow for interruptions to abstraction the construction programme has allowed 24 months in which to fill the pumped storage system. This long period of a relatively low rate of abstraction means that short term deteriorations in water quality should be evened out and mean averages are likely to be a reasonable representation of the likely end water quality in Q1.

7.8.202 This is considered a to be a **minor adverse** effect.

### **Water Quality**

7.8.203 The operation of the Development will not significantly alter the quality of water that will be discharged into the Afon Gwyrfa.

7.8.204 A water quality sample collected from the existing Q1 reservoir water in spring 2015 reported a pH of 8.04 (mild-moderately alkaline). This is within the range of pH recorded in the Afon Gwyrfa, although the mean is typically more circumneutral.

- 7.8.205 The pH of water in Llyn Padarn is circumneutral (averaging 7.14 pH units) and there is no evidence of historical acidification (Bennion et al; 2010). This compares with an average pH of 6.88 in the Afon Gwyrfai, which is also circumneutral. Both results are compliant with the WFD standard for High Ecological Status in a cold water river.
- 7.8.206 On rare occasions the pH of Llyn Padarn has exceeded 9 pH, although it is suspected that these short lived events might be associated with algal blooms or increase algal productivity in the summer (e.g. the Anabaena bloom in 2009).
- 7.8.207 Consideration has also been given to the risk of acidification from the operation of the Development. Sulphides originate from the anaerobic decay of organic matter or may come from sewage discharges. It is possible that the high oxygenation of water caused by repeatedly passing through the turbines could encourage the formation of sulphur based acids. However, the levels of sulphur measured as sulphate in Llyn Padarn are very low and stable (long term mean average 3.8 mg/l with small standard deviation) and thus it is considered that the risk of this occurring is unlikely.
- 7.8.208 Overall, the pH of existing quarry water and the mean and range of pH for Llyn Padarn is broadly comparable to the mean and range of pH recorded for the Afon Gwyrfai. Discharges of excess water would preferentially be from Q6 to Llyn Padarn. However, should there be a discharge from Q1 to the Afon Gwyrfai catchment it would be infrequent, temporary and diluted in river. Therefore, it is not thought that discharges from Q1 would result in any significant effect on the Afon Gwyrfai. Regular monitoring of the water in Q1 will include pH and if this begins to trend to more acidic conditions measures could be taken to dose the water with a suitable alkaline.
- 7.8.209 Another consideration related to water quality and the Q1 spillway infrastructure discharge into the Afon Gwyrfai is suspended sediment. Water abstracted from Llyn Padarn will be screened to prevent entrainment of fine sediment and transportation of this material into the pumped storage system. Surveys of Q1 and Q6 have also confirmed that both lakes are oligotrophic and are lacking in any fine sediment (Goldsmith et al., 2015),

which is indicative of the likely trophic status that will develop over time and implies low productivity. A coarse screen will also be positioned on the scour valve to prevent ingress of larger material that may accumulate on the bed of the quarry. In addition, the rate of runoff from an emergency spill will be controlled through an Environmental Permit and mitigated in order not to cause the mobilisation of fine sediment downstream. Therefore, sedimentation effects are unlikely to be an issue and have not been considered any further.

7.8.210 This is considered to be a **temporary minor adverse** effect.

### **Invasive Species**

7.8.211 There is the potential for the water quality and species to be affected through the introduction of invasive species or non-native species into Afon Gwyrfai could occur through the routine discharges of water from the system into Afon Gwyrfai via Nant-y-Betws. The water in Q1 and Q6 were found to contain no invasive or non-native species of plant or animal (Goldsmith et al. 2015). However, the aquatic survey of Llyn Padarn in 2015 identified the presence of Nuttall's pondweed within the lagoons on the south-western shore, either side of where the spillway infrastructure is proposed to be located; the nearest plant is approximately 75m away (Goldsmith et al. 2015).

7.8.212 Due to the distance between the nearest specimen and the abstraction pipe it is unlikely that Nuttall's pondweed will be transferred into Q1 and Q6 during abstraction, and then into the Afon Gwyrfai via the Q1 spillway infrastructure and the Nant-y-Betws. In addition, Nuttall's pondweed requires still or slow-flowing water for colonisation, and the plant does not have the potential to be transferred into the lake of the SAC due to the flow direction of the river and the point at which the Nant-y-Betws.

7.8.213 This is considered a **negligible** effect.

### **Temperature Change**

7.8.214 There is the potential for the aquatic habitat and species it supports to be affected by temperature change caused through friction in the system

warming the water and by the spillway discharging colder water that has been drawn the deeper colder water in Q1.

7.8.215 However, a low-friction system will be used to minimise any warming of water pumped through the system. Water temperature will vary diurnally / seasonally and will be moderated by the bathymetry of the reservoirs, the operation of the plant / 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. The water remains between the quarries and is not discharged directly to a water body immediately after being through the turbine. In addition, water that has to be discharged will be siphoned off from near to the surface at the scour valve where it is most likely to be acclimatised to the surrounding air temperature.

7.8.216 Under normal operations the main pathway for releasing stormwater runoff into the Development is via the Q6 spillway infrastructure to Llyn Padarn. The Q1 spillway infrastructure 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 Gwyrfae are also likely to be higher offering increased dilution and dispersion of the Q1 spillway waters.

7.8.217 Temperature change is considered a **temporary minor adverse** effect.

Llyn Padarn SSSI

**Nutrient Enrichment**

7.8.218 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

7.8.219 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. The section

above for Afon Gwyrfai SAC – Nutrient Enrichment describes how measures are being undertaken to help limit phosphorus inputs into Llyn Padarn. These measures will help prevent the uptake of nutrient-rich water into the quarries during abstraction, thereby helping prevent the input of nutrient-rich water back into Llyn Padarn via the Q6 spillway. It is also considered that due to the turbulent nature of the system, algal ‘seeding’ of Llyn Padarn would be extremely unlikely.

7.8.220 This is considered to be a **temporary moderate adverse** effect.

### **Water Quality**

7.8.221 The operation of the Development will not significantly alter the natural quality of water that currently drains to Llyn Padarn (from Q6), and which has been tested and found not to contain any significant contaminants. Therefore, it is not expected that overflow into Llyn Padarn will differ from the current status quo and no changes to the natural concentration and variability of the Water Framework Directive physio-chemical parameters (i.e. ammonia, dissolved oxygen, and acid neutralising capacity) is predicted. Therefore, there is no effect associated with water quality and as such it is scoped out of any further assessment for Llyn Padarn.

### **Invasive Species**

7.8.222 The introduction of fish (including Arctic charr), invasive or non-native species through the routine discharges of water from the system into Llyn Padarn have the potential to impact upon the integrity of the SSSI and the species it supports including otter, Arctic charr and floating water-plantain.

7.8.223 .However, the water in Q1 and Q6 were found to contain no invasive or non-native species of plant or animal (Goldsmith et al. 2015).

7.8.224 The aquatic survey of Llyn Padarn in 2015 identified the presence of Nuttall’s pondweed within the lagoons on the south-western shore, either side of where the spillway infrastructure is proposed to be located; the nearest plant is approximately 75m away (Goldsmith et al. 2015). Due to the distances between the nearest specimen and the abstraction pipe it is unlikely that Nuttall’s pondweed will be transferred into Q1 and Q6 during

abstraction, and then back into the Llyn Padarn via the Q6 spillway infrastructure. This is considered a **negligible** effect, but due to the value of the receptor the effect is considered to be **permanent minor adverse**.

### **Pollution and Runoff**

7.8.225 Routine maintenance of the lake bed spillway infrastructure and pumping station has the potential to affect water quality by pollution and/or runoff, and this is considered a **temporary moderate adverse** effect.

### **Temperature Change**

7.8.226 There is the potential for the aquatic habitat and species it supports to be affected by temperature change caused through friction in the system warming the water and by the spillway infrastructure discharging colder water that has been drawn the deeper colder water in Q6. However, a low-friction system will be used to minimise any warming of water pumped through the system. Water temperature will vary diurnally and seasonally and will be moderated by the bathymetry of the reservoirs, the operation of the plant / 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. In addition, discharged water will be siphoned off from near to the surface where it is most likely to be acclimatised to the surrounding air temperature and comparable to the surface waters in Llyn Padarn.

7.8.227 For these reasons the potential for heated water at Glyn Rhonwy is unlikely. This is considered a to be a **negligible** effect, although due to the value of the receptor it results in a **temporary minor adverse** effect.

### **Light Spill**

7.8.228 There is the potential for light spill from the security lighting at the pumping station and associated infrastructure onto the woodland edge or shore of Llyn Padarn which has the potential to deter bats from foraging in those areas, and this is considered a **temporary moderate adverse** effect.

### Other Designated Sites

7.8.229 No potential effects from the operation of the Development are likely on these designated sites due to the distance between them and the Order Limits and/or the nature of the Development.

- Eyri/ Snowdonia SAC, SSSI and NP;
- Glynllifon SAC;
- Coed Dinorwig SSSI
- Llwyn y Coed SSSI;
- Coed Dinorwig LNR;
- Glyn Rhonwy Quarries 1 LWS;
- Bwlch-y-Groed Quarry LWS;
- Coedydd Glyn Rhonwy LWS;
- Bryn Mawr LWS;
- Coed Donen Las LWS;
- Glyn Rhonwy Quarries Woodland Mosaic LWS;
- Llwyn Coed Heath LWS;
- Barrack Mawr LWS;
- Pen Gilfach LWS;
- Glyn Rhonwy Quarries 2 LWS;
- Cefn Du LWS; and
- Donen Las LWS.

### Running Water – Nant-y-Betws

#### Alteration of Flow

7.8.230 Discharge from the Q1 spillway infrastructure will alter the flow regime of the Nant-y-Betws on temporary basis. However, the Q1 spillway infrastructure 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. However, if the estimated annual rainfall to Q1 was discharged to the Nant-y-Betws and spread evenly throughout the year it would be comparable with natural runoff from the catchment in response to the incident rainfall. 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.

7.8.231 Therefore, this is considered a **negligible** effect.

#### **Nutrient Enrichment**

7.8.232 The potential effects of nutrient enrichment on the Nant-y-Betws will be the same as those discussed for the Afon Gwyrfai SAC. Therefore, this is considered a **negligible** effect.

#### **Water Quality**

7.8.233 The potential effects of water quality on the Nant-y-Betws will be the same as those discussed for the Afon Gwyrfai SAC, and is therefore considered a **negligible** effect.

#### **Invasive Species**

7.8.234 The potential effects of invasive species on the Nant-y-Betws will be the same as those discussed for the Afon Gwyrfai SAC. This is considered a **permanent minor adverse** effect.

#### **Temperature Change**

7.8.235 The potential effects of temperature change on the Nant-y-Betws will be the same as those discussed for the Afon Gwyrfai SAC. Therefore this is considered to be a **negligible** effect.

#### **Habitats within the Order Limits**

7.8.236 There will be no further effects on the following habitats within the Order Limits during operation (the effects of habitat loss have been assessed under construction effects):

- Broadleaved semi-natural woodland;
- Coniferous woodland – plantation;
- Coniferous woodland – recently felled;
- Mixed woodland – semi-natural;
- Scrub – scattered;
- Acid grassland – semi-improved;
- Marshy grassland;
- Bracken – scattered;
- Bracken – continuous;
- Dry heath / acid grassland;
- Wet dwarf shrub heath;
- Flush and spring – acid / neutral flush;
- Running water;
- Standing water;
- Standing water – oligotrophic;
- Quarry;
- Spoil;
- Bare ground; and
- Wall.

*Protected and/or Notable Species*

7.8.237 There will be no effects on the following species during operation:

- Lichens and bryophytes;
- Fungi;
- Trees;
- Reptiles;
- Birds;

- Polecat;
- Badgers; and,
- Red squirrels.

*Invertebrates, Fish, Amphibians, Otters & Water Vole*

7.8.238 Routine maintenance of the lake bed spillway infrastructure and pumping station has the potential to affect these species by pollution and/or runoff.

*Fish – Arctic Charr*

7.8.239 Surveys conducted on the water within Q1 and Q6 found there were no invasive or non-native species, and no presence of Arctic charr that could potentially affect the population of Arctic charr found in Llyn Padarn. As such, there are no effects associated with invasive species on Arctic charr.

7.8.240 Arctic charr are highly sensitive to pollution. Routine maintenance of the lake bed spillway infrastructure and pumping station has the potential to affect water quality by pollution and runoff and therefore Arctic charr, and this is considered a **temporary moderate adverse** effect.

7.8.241 Fish are sensitive to temperature changes, as variance in temperature can affect feeding and the reproductive cycle. However, as detailed under the potential effects for Llyn Padarn SSSI, the Development will not affect the temperature of the water discharged to or held within Llyn Padarn. As such this is considered a **temporary minor adverse** effect.

*Bats*

7.8.242 The Glyn Rhonwy site is currently disused and the tunnels and quarries are used by unauthorised recreational climbers and other users. The fences and bomb store are often vandalised. When the site becomes operation it is likely that this will deter trespassers into the quarries and tunnels and reduce the impact of human disturbance on the retained roost sites.

7.8.243 External lighting will be required during operation, though this will be restricted to the roads and power house. There is potential, if poorly designed, that light could spill onto foraging and commuting habitats. For less light tolerant species such as lesser horseshoe this could restrict

access to some areas of the site. Daubenton's, Natterer's and brown long-eared will be deterred from illuminated foraging and commuting areas, and therefore this is considered a **permanent moderate adverse** effect. There is unlikely to be any direct illumination on to roost entrances, as the retained entrances will be within the quarry voids that will not be illuminated.

7.8.244 The overall level of disturbance for the retained tunnels will be reduced in relation to human disturbance, resulting in a **potential permanent beneficial** effect.

7.8.245 No other operation impacts are considered likely.

#### Invasive Species

7.8.246 Himalayan balsam is close to the pumping station location. Disturbance of ground within area of Himalayan balsam during maintenance has the potential to cause the spread of the plant.

7.8.247 The broadleaved woodland – semi-natural near to Llyn Padarn has been found to support Rhododendron. It is extremely unlikely that the works will cause the spread of this plant.

7.8.248 The rocky outcrops within Q1 and Q6 voids support cotoneaster. Works within the voids have the potential to cause the spread of the plant.

7.8.249 The water within Q1 and Q6 have been found not to contain any invasive species. However, the aquatic survey of Llyn Padarn in 2015 identified the presence of Nuttall's pondweed within the lagoons on the south-western shore, either side of where the spillway infrastructure is proposed to be located; the nearest plant is approximately 75m away (Goldsmith et al. 2015).

7.8.250 The potential effects of invasive species on designated sites and species have been assessed under Afon Gwyrfai a Llyn Cwellyn SAC, SSSI and Llyn Padarn and Fish – Arctic charr.

#### *Decommissioning*

7.8.251 Decommissioning will require the drainage of reservoirs; dismantling of turbine and electrical equipment, removal of equipment from site,

decommissioning of dams and reservoirs, reinstatement and safety. This will require vehicle access to site; dismantling; removal and drainage.

7.8.252 A number of impacts could possibly occur as a result of decommissioning including:

- Changes in water quality, water levels and water temperature as a result of draining the quarry system into Llyn Padarn;
- Siltation or other pollution of Llyn Padarn as result of decommissioning activities; and
- Disturbance of protected species as a result of decommissioning activities.

7.8.253 The impacts during decommissioning will be similar to construction impacts. The anticipated operational period for the Development is 125 years.

7.8.254 At this stage it is therefore very difficult to determine the exact magnitude and significance of any impacts, as the baseline status of the site, Llyn Padarn and the quarries may have altered. As such, the effects of decommissioning have not been included in the assessment. However, it is likely that without appropriate detailed pre-decommissioning survey and mitigation design that the impacts on SSSI and non-SSSI ecological receptors could be significant with the return of water from the quarries having the potential to have large significant impacts on the Llyn Padarn system without appropriate consideration and mitigation. The requirement for further survey and protective measures is discussed further in Section 7.9 of this report.

## **7.9 Mitigation**

7.9.1 The design of the Development has evolved through the 2012 ES and has considered potential effects on species and designated sites. As such the design and precautionary Rochdale Envelope currently employed has sought to minimise the direct effect through refinement of design options.

7.9.2 The most effective way of mitigating against ecological effects is by designing the Development such that it can avoid adverse effects upon

ecological receptors. This has been considered throughout the design phase, using all available ecological baseline information.

- 7.9.3 Environmental measures will be secured under an environmental strategy for the Development, via implementation of a CoCP (Volume 3, Appendix 16.1) and a Habitat Management Plan (HMP), which will be finalised through a DCO Requirement. The plans will include both environmental measures to avoid or reduce significant effects, and to provide compensation and enhancement where appropriate. The details of the management plans will need to be approved by Gwynedd Council through the DCO Requirement.
- 7.9.4 The CoCP will set out in detail the individual items of works associated with the construction of the Development to ensure that the activity is carried out safely and in an environmentally sensitive manner.
- 7.9.5 The aims of the CoCP is to provide guidance on good working practices within the Order Limits to minimise the potential effects resulting from the construction of the Development, as well as working methods identified to minimise effects on ecology.
- 7.9.6 All site staff will be briefed on any ecological issues affecting the site during the site induction, the mitigation implemented and methods of working adopted as part of a 'tool box talk'. A tool box talk is a briefing specific to a certain activity, a certain piece of equipment or certain protected species at risk. The talk will be undertaken at the start of that day to the site staff undertaking the activity or working within the sensitive area.
- 7.9.7 All site compounds and access tracks will be of the minimum size required for safe working. These will be fenced to prevent encroachment of machinery and materials onto adjacent habitats. Temporary stockpiling of materials will be restricted to specific sites such as the construction compound.
- 7.9.8 Measures will be employed to ensure that dust is minimised during the construction works through a Dust Management Plan (DMP). Measures will be in place in order to deal with pollution incidents efficiently.

- 7.9.9 In order to avoid potential pollution effects to soils, vegetation and watercourses from machinery during construction, all refuelling and servicing of vehicles will be carried out within a designated area with an impermeable base away from any natural habitats. Further details are outlined in the CoCP. Good practice construction techniques will be followed with regard to control of wastes and protection of trees during construction.
- 7.9.10 Pollution control measures as required in the Environment Agency's (now Natural Resources Wales) Pollution Prevention Guidelines (PPG), *Works in, Near or Liable to Affect Watercourses (PPG 5)* will be implemented in order to avoid and minimise adverse effects on water quality of aquatic habitats and *Working at Construction and Demolition Sites (PPG6)*. This will be implemented via the CoCP. Detailed descriptions of mitigation regarding aquatic habitats can be found within the Chapter 8 Water Resources.
- 7.9.11 Sensitive areas of habitat which are being retained will be fenced off to prevent trampling of habitat and injury to protected species by machines, vehicles and humans. This will be implemented via the CoCP.
- 7.9.12 Concrete will either be imported from a local batching plant or a concrete batching plant will be established within the Order Limits. The final choice will depend on the chosen contractor, the availability of local supply and the time of year. If concrete is to be batched within the Order Limits, appropriate containment and clean-up measures and procedures will be put in place that are in accordance with foundations, following specific method statements to ensure there is no spillage risk or contamination of soils, water and vegetation.
- 7.9.13 The HMP will set out in detail the individual items of works associated with the long-term management of the habitats, species and features of the Development post-construction to help ensure Development's value for nature conservation, and that any operational or maintenance works are undertaken in a manner so as not to damage or destroy habitats, species or features present.

*Construction*



*Afon Gwyrfai a Llyn Cwellyn SAC and SSSI*

- 7.9.14 Throughout construction adequate pollution prevention measures in line with current NRW guidelines will be adhered to where works are being undertaken near to watercourses, thereby minimising effects on water quality and aquatic habitats. In addition a Pollution Prevention Plan (PPP) and Water Management Plan (WTMP) will be implemented through the CoCP.
- 7.9.15 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. 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. These 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.

*Llyn Padarn SSSI*

- 7.9.16 A licence to abstract the water to fill the quarries has been issued by NRW in July 2015.
- 7.9.17 AECOM has undertaken a water balance study and this is presented in Appendix B of the WFD Compliance Appraisal.
- 7.9.18 Throughout construction and routine maintenance during operation adequate pollution prevention measures in line with current NRW guidelines will be adhered to where works are being undertaken within or near to water, thereby minimising effects on water quality and aquatic habitats.
- 7.9.19 Loss of lake bed habitat is up to approximately 0.013% of the total lake bed area and as such no mitigation is proposed.

- 7.9.20 To prevent fish being drawn into the abstraction pipe intake screens must meet statutory requirements under the Salmon and Freshwater Fisheries Act.
- 7.9.21 Although the disturbance and spread of Nuttall's pondweed within Llyn Padarn is unlikely due to the distances between the nearest plant and the construction zone (approximately 75m), measures should be taken to help ensure this. Presence of invasive species subject to legal controls should be included within the CoCP, and any toolbox talks for contractors working within Llyn Padarn should include invasive species, the locations of the plants within the lake and how to avoid disturbing and spreading them.
- 7.9.22 During construction appropriate measures will be undertaken to help prevent sediment disturbance within Llyn Padarn, this in turn will help prevent effects on Arctic charr and floating water plantain as well as other species:
- Sheet Piling will be installed approximately 20m from the shore of Llyn Padarn and will continue up and around pumping station and Valve Chamber;
  - Excavation will commence when sheet piles are in place, a sump will be excavated at the lowest level to allow for dewatering of the excavation works. (Note: dewatering system will pass through several tanks allowing potential silts and other sediments to settle before water is discharged into Llyn Padarn);
  - Once backfilled the sheet piling can be removed and dewatering will stop; and,
  - The remaining length of pipe and screen or apron that will lie on the existing floor of Llyn Padarn will be floated out to the required distance and then sunk and connected on the lake floor.
- 7.9.23 Lighting will also 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.

*Bwlch-y-Groed Quarry LWS; Coed Donen Las LWS; Glyn Rhonwy Quarries Woodland Mosaic LWS; Llwyn Coed Heath LWS; Pen Giffach LWS; and Cefn Du LWS.*

7.9.24 The loss of habitat is not significant in terms of EIA, and as such no mitigation has been proposed.

*Coedydd Glyn Rhonwy LWS*

7.9.25 Trees will be protected during construction according to the requirements of *BS5837:2012 Trees in relation to design, demolition and construction* to ensure no inadvertent damage to them occurs.

7.9.26 Pollution prevention measures in line with current NRW guidelines will be adhered to, through the PPP and CoCP.

*Donen Las LWS*

7.9.27 To protect retained habitat from direct damage (trampling and vehicles tacking over) and pollution and/or runoff good site working practices will be adhered to. Adjacent habitats to be retained will be fenced off.

*Restored Ancient Woodland Sites*

7.9.28 The Development should seek to use tracks and other areas of hardstanding that are already present within the Order Limits to avoid removing vegetation where possible.

7.9.29 To protect habitats from damage trees will be protected during construction according to the requirements of *BS5837:2012 Trees in relation to design, demolition and construction* to ensure no inadvertent damage to them occurs. Good site working practices will be adhered to. Habitats to be retained will be fenced off.

*Broadleaved Semi-Natural Woodland and Mixed Woodland – Semi-Natural*

7.9.30 The loss of habitat is not significant, and as such no mitigation has been proposed.

7.9.31 Where the woodland is to be retained it will be protected during construction according to the requirements of *BS5837:2012 Trees in relation to design, demolition and construction* to ensure no inadvertent damage to the woodland or individual species occurs.

7.9.32 Site compounds and stock piles will be kept within designated areas away from the woodland.

7.9.33 Re-fuelling and servicing of vehicles will be carried out in line with the requirements of CoCP and PPP.

*Coniferous Woodland – Recently Felled*

7.9.34 The loss of habitat is not significant, and as such no mitigation has been proposed.

7.9.35 To protect retained habitat from direct damage (trampling and vehicles tacking over) and pollution and/or runoff good site working practices will be adhered to. Adjacent habitats to be retained will be fenced off.

*Scrub – Scattered; Dry Heath / Acid Grassland*

7.9.36 Where the scrub is to be retained it will be protected during construction according to the requirements of *BS5837:2012 Trees in relation to design, demolition and construction* to ensure no inadvertent damage to the woodland or individual species occurs.

7.9.37 To protect the dry heath / acid grassland habitat from direct damage (trampling and vehicles tacking over) and pollution and/or runoff good site working practices will be adhered to. Adjacent habitats to be retained will be fenced off.

7.9.38 Site compounds and temporary stock piles will be kept within designated areas away from the scrub and dry heath / acid grassland.

7.9.39 Re-fuelling and servicing of vehicles will be carried out in line with the requirements of CoCP and PPP.

Running Water – Nant-y-Betws

- 7.9.40 To protect retained habitat from direct damage (trampling and vehicles tacking over) and pollution and runoff good site working practices will be adhered to. Adjacent habitats to be retained will be fenced off.
- 7.9.41 Re-fuelling and servicing of vehicles will be carried out within a designated area with an impermeable base away from the retained habitats.
- 7.9.42 Site compounds and temporary stock piles will be kept within designated areas away from the retained habitats.
- 7.9.43 Pollution control measures as required in the EAs PPG, Works in, Near or Liable to Affect Watercourses (PPG 5) will be implemented in order to avoid and minimise adverse effects on water quality of aquatic habitats through the CoCP.
- 7.9.44 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. 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. These 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.

Standing Water – Oligotrophic

- 7.9.45 The increase in habitat is a significant beneficial effect, and therefore does not require any mitigation measures.
- 7.9.46 Pollution control measures as required in the EAs PPG, Works in, Near or Liable to Affect Watercourses (PPG 5) will be implemented in order to avoid and minimise adverse effects on water quality of aquatic habitats through the WTMP and CoCP.

### Quarry

- 7.9.47 To mitigate for the loss of quarry habitat through the in-filling of Q1 and Q6 enhancement to retained quarries Q2, Q3 and Q5 will be made through the installation of stock-proof fencing.
- 7.9.48 To protect retained habitat from direct damage (trampling and vehicles tacking over) and pollution and runoff good site working practices will be adhered to. Adjacent habitats to be retained will be fenced off.
- 7.9.49 Re-fuelling and servicing of vehicles will be carried out in line with the requirements of CoCP and PPP.
- 7.9.50 Site compounds and temporary stock piles will be kept within designated areas away from the retained habitats.

### Spoil

- 7.9.51 No mitigation has been proposed for the loss of spoil heaps as there will be creation of this habitat as part of the Development.

### Bare Ground

- 7.9.52 The loss of habitat is not significant, and as such no mitigation has been proposed.

### Wall

- 7.9.53 The loss of habitat is not significant, and as such no mitigation has been proposed.
- 7.9.54 To protect retained habitat from direct damage (trampling and vehicles tacking over) and pollution and runoff good site working practices will be adhered to. Adjacent habitats to be retained will be fenced off.

### Lichens

- 7.9.55 To help prevent loss of lichen species slate slabs colonised by notable lichens will be translocated to areas with similar environmental conditions.
- 7.9.56 To help protect retained lichens from damage or destruction good site working practices will be adhered to. Adjacent habitats to be retained will be fenced off.

7.9.57 Re-fuelling and servicing of vehicles will be carried out in line with the requirements of CoCP and PPP.

7.9.58 Site compounds and temporary stock piles will be kept within designated areas away from the retained habitats.

#### Trees

7.9.59 Where the woodland is to be retained it will be protected during construction according to the requirements of *BS5837:2012 Trees in relation to design, demolition and construction* to ensure no inadvertent damage to the woodland or individual species occurs.

7.9.60 Site compounds and temporary stock piles will be kept within designated areas away from the woodland.

7.9.61 Re-fuelling and servicing of vehicles will be carried out in line with the requirements of CoCP and PPP.

#### Invertebrates

7.9.62 The loss of habitat with the potential to support invertebrates is not significant, and as such no mitigation has been proposed.

7.9.63 The loss of spoil heaps supporting the small theridiid spider (*Rugathodes bellicosus*) will be compensated for through the provision of additional spoil heaps as part of the Development. In addition, there is similar habitat of equal or greater quality in abundance within the wider landscape.

7.9.64 To help protect retained habitats that have the potential to support invertebrates, pollution prevention measures in line with current NRW guidelines will be adhered to.

#### Fish

7.9.65 To help protect retained habitats that have the potential to support fish, pollution prevention measures in line with current NRW guidelines will be adhered to.



### Fish – Arctic Charr

- 7.9.66 To prevent Arctic charr being drawn into the abstraction pipe intake screens must meet statutory requirements under the Salmon and Freshwater Fisheries Act.
- 7.9.67 Pre-construction surveys will be undertaken to ascertain presence/absence of Arctic charr spawning grounds within the vicinity of the works (T&CPA Decision Notice dated 19/02/2014; Application Number: C12/1451/15/LL). If present then mitigation will be implemented to help prevent disturbance and/or loss.
- 7.9.68 The hands off abstraction regime will not allow the abstraction to cause water levels to decrease to a level that would have an effect on Arctic charr.
- 7.9.69 During construction appropriate measures will be undertaken to help prevent sediment disturbance within Llyn Padarn, this in turn will help prevent effects on Arctic charr. To help protect Arctic charr pollution prevention measures in line with current NRW guidelines will be adhered to.
- 7.9.70 To help prevent effects on spawning Arctic charr through disturbance created through noise and vibration, if after the pre-construction surveys Arctic charr are found to be spawning within the area, then noise-generating activities will be limited within a 50m radius during spawning season, and vibration-generating activities limited within 500m during spawning season. This will be implemented via the CoCP.

### Amphibians

- 7.9.71 To help protect retained habitats that have the potential to support amphibians, good site working practices will be adhered to; adjacent habitats to be retained will be fenced off; and, pollution prevention measures in line with current NRW guidelines will be adhered to.

### Reptiles

- 7.9.72 There will be a large proportion of habitats with the potential to support reptiles retained within the Order Limits. There are similar habitats of equal or greater value with the potential to support reptiles in the immediate surroundings. Additional spoil piles are being created as part of the

construction works. As such, the loss of habitat with the potential to support reptiles is not significant in terms of EIA, and as such no mitigation has been proposed.

7.9.73 To help protect retained habitats that have the potential to support reptiles, good site working practices will be adhered to; adjacent habitats to be retained will be fenced off; and, pollution prevention measures in line with current NRW guidelines will be adhered to.

7.9.74 To help protect reptiles against death or injury and as only a small area of vegetation will be removed by the construction works habitat management will be undertaken to discourage reptiles from the area before soil stripping.

#### Schedule 1 Breeding Birds

7.9.75 There will be no direct impact on Schedule 1 species due to habitat loss as they were found not to be using Q1 or Q6 during the bird surveys.

7.9.76 A number of quarries will be retained within the Order Limits, and there are an abundance of similar habitats of equal or greater value with the potential to support birds in the immediate surroundings, as such no mitigation has been proposed to compensate for the loss of Q1 and Q6, as Schedule 1 species have not been observed using these quarries during the 2011, 2013 and 2015 surveys.

7.9.77 To avoid visual or noise disturbance to breeding Schedule 1 birds, it is recommended that an Ecological Clerk of Works is present to help minimise disturbance to Schedule 1 species during nesting season (March – July inclusive). Access to the known nesting area will be prohibited during nesting season for Schedule 1 species.

7.9.78 Appropriate actions to help prevent disturbance to breeding birds during construction activities will be detailed in the Breeding Bird Method Statement.

7.9.79 The long-term management of habitats suitable for foraging and breeding birds will be implemented via the HMP.

*BOCC Red and Amber List Breeding Bird Species*

- 7.9.80 A number of quarries and woody habitats will be retained within the Order Limits, and there are an abundance of similar habitats of equal or greater value with the potential to support birds in the immediate surroundings, as such no mitigation has been proposed to compensate for the loss of the quarries and woody habitats.
- 7.9.81 To avoid disturbance to breeding birds, it is recommended that removal of vegetation with the potential to support nesting birds (woodland, trees, bracken and scrub) is to be undertaken outside of breeding bird season (clearance October – February inclusive).
- 7.9.82 If vegetation clearance is undertaken during breeding bird season (from March to September inclusive) the area will first be inspected by an ecologist a maximum of 48 hours before work begins in an area. If any nests are found, work will have to be halted and the nest left undisturbed with a buffer zone until the chicks have fledged. This could take up to six weeks.
- 7.9.83 Any retained vegetation will be fenced off during construction to prevent vehicles, machinery and site staff tracking onto and over it.
- 7.9.84 To help prevent dust settling on vegetation impeding the ability of chough to feed, measures will be employed to ensure that dust is minimised during the construction works. Chapter 14 Air Quality has further details on minimisation of dust.
- 7.9.85 Appropriate actions to help prevent disturbance to breeding birds during construction activities will be detailed in the Breeding Bird Method Statement.
- 7.9.86 The long-term management of habitats suitable for foraging and breeding birds will be implemented via the HMP.

*Other Breeding Birds – Common Species*

- 7.9.87 To avoid disturbance to breeding birds, it is recommended that removal of vegetation with the potential to support nesting birds (woodland, trees, bracken and scrub) is to be undertaken outside of breeding bird season (clearance October – February inclusive).

- 7.9.88 If vegetation clearance is undertaken during the breeding bird season (from March to September inclusive) the area will first be inspected by an ecologist a maximum of 48 hours before work begins in an area. If any nests are found, work will be halted and the nest left undisturbed with a buffer zone until the chicks have fledged. This could take up to six weeks.
- 7.9.89 Any retained vegetation will be fenced off during construction to prevent vehicles, machinery and site staff tracking onto and over it.
- 7.9.90 Appropriate actions to help prevent disturbance to breeding birds during construction activities will be detailed in the Breeding Bird Method Statement.
- 7.9.91 The long-term management of habitats suitable for foraging and breeding birds will be implemented via the HMP.

#### Polecat

- 7.9.92 There will be a large proportion of broadleaved woodland with the potential to support polecat retained within the Order Limits. There are similar habitats of equal or greater value with the potential to support polecat in the immediate surroundings. As such, the loss of habitat with the potential to support polecat is not significant in terms of EIA, and as such no mitigation has been proposed.
- 7.9.93 To help prevent loss of retained suitable habitat pollution prevention measures in line with current guidelines will be adhered to.
- 7.9.94 Site inductions and tool box talks will raise awareness of protected species collisions.
- 7.9.95 The CoCP is to be finalised prior the start of construction along with Tool Box Talks to brief site staff during the site induction on all ecological issues affecting the site.

#### Badgers

- 7.9.96 There will be a large proportion of broadleaved woodland with the potential to support badgers retained within the Order Limits. There are similar habitats of equal or greater value with the potential to support badgers in the immediate surroundings. As such, the loss of habitat with the potential to

support badgers is not significant in terms of EIA, and as such no mitigation has been proposed.

7.9.97 To help prevent loss of retained suitable habitat pollution prevention measures in line with current guidelines will be adhered to.

7.9.98 A CoCP is to be finalised prior the start of construction along with Tool Box Talks to brief site staff during the site induction on all ecological issues affecting the site.

7.9.99 Due to the mobile nature of these species and a record of an active sett within the Order Limits, a walkover survey for newly established setts within 100m will be conducted within 6 months of construction commencing. If any new setts are identified within the vicinity of the construction boundary appropriate measures can be employed to prevent an offence being committed.

7.9.100 Site inductions and tool box talks will raise awareness of protected species collisions.

7.9.101 Trenches and excavations will be closed at night to prevent badgers from entering or be fitted with a ramp to allow mammals to escape.

7.9.102 Good practice during construction, as outline in the above text, implemented via a CoCP and monitored by an ECoW will mitigate the likelihood and extent of noise and vibration. Noise or vibration within 30m (or 100m if blasting or drilling) of a badger sett will require a licence.

#### Water Voles

7.9.103 There will be a large proportion of bank side habitat with the potential to support water vole retained within the immediate surroundings. As such, the loss of habitat with the potential to support water voles is negligible , and as such no mitigation has been proposed.

7.9.104 To help prevent destruction or disturbance of a burrow a walkover survey for newly established burrows within 100m will be conducted within 6 months of construction commencing. If any new burrows are identified within the vicinity of the construction boundary appropriate measures can be employed to prevent an offence being committed.

7.9.105 To help prevent damage of habitat with the potential to support water voles Pollution prevention measures in line with current guidelines will be adhered to. A CoCP and PPP will be finalised before the start of construction along with Tool Box Talks to brief site staff during the site induction on all ecological issues affecting the site.

7.9.106 Good practice during construction, as outline in the above text, implemented via a CoCP and monitored by an ECoW will mitigate the likelihood and extent of noise and vibration.

7.9.107 Noise or vibration within 30m (or 100m if blasting or drilling) of a burrow will require a licence.

#### Otters

7.9.108 There will be a large proportion of bank side habitat with the potential to support otters retained within the immediate surroundings. As such, the loss of habitat with the potential to support otters is not significant in terms of EIA, and as such no mitigation has been proposed.

7.9.109 To help prevent destruction or disturbance of a holt / couch a walkover survey for newly established holts / couches within 100m will be conducted within 6 months of construction commencing. If any new holts / couches are identified within the vicinity of the construction boundary appropriate measures can be employed to prevent an offence being committed.

7.9.110 To help prevent damage of habitat with the potential to support otters pollution prevention measures in line with current guidelines will be adhered to. A CoCP will be finalised before the start of construction along with Tool Box Talks to brief site staff during the site induction on all ecological issues affecting the site.

7.9.111 Good practice during construction, as outline in the above text, implemented via a CoCP and monitored by an ECoW will mitigate the likelihood and extent of noise and vibration.

7.9.112 Noise or vibration within 30m (or 100m if blasting or drilling) of a holt / couch will require a licence.

### Red Squirrel

7.9.113 The development proposals do not require the removal of woodland that would result in the severance of the woodland structure and/or canopy. A number of trees near around Q7 will be removed to facilitate construction.

7.9.114 Taking the above into consideration it is recommended that a pre-construction survey is undertaken on the trees to be removed. Should any dreys be identified within the trees to be removed initially consultation will be undertaken to ascertain whether the plans can be micro-sited thereby negating the requirement to remove the tree. If this cannot be accommodated a camera trap will be set by the drey to ascertain use by red or grey squirrels. Should the results of the camera trap reveal usage by a red squirrel NRW will be consulted on how to proceed.

7.9.115 To help prevent disturbance to red squirrels during the breeding season (March – October) it is recommended that a walkover survey be conducted to identify dreys within a 50m buffer. An ECoW will monitor the dreys for activity and/or camera traps will be used to ascertain usage by grey or red squirrels. If works are deemed to be disturbing red squirrels works will halt and NRW consulted.

### Bats

7.9.116 The proposed mitigation for bats is outlined the Bat Licence Application Method Statement presented in a separate document (AECOM, 2014b). A summary is provided below.

7.9.117 The conservation status of lesser horseshoe, brown long-eared, Daubenton's and Natterer's will be protected during the construction of the Development by implementing the following mitigation:

#### *General Measures*

- Exclusion of bats from locations that will be destroyed. Tunnels 1, 2, 6, 11, 11a, 12, 13, and 14 will be fitted with excluders. This will allow bats to exit the tunnel but not re-enter, so that no bats are present when the tunnels are in-filled;
- Instruction of the workforce undertaking the demolition in a toolbox talk;



- In the unlikely event that bats need to be handled (as the exclusion of bats from the tunnels should avoid the need for handling), only licensed and experienced bat ecologists will handle bats. No bats in torpor will be handled or moved;
- Clear reporting protocol and immediate stop to works in the event of workers finding bats;
- Provision of enhancements within retained tunnels to improve roosting resource;
- Monitoring of the site, including mitigation measures, regularly during construction; and
- Monitoring of the site, including mitigation measures, for two years post installation and one year post construction.

#### *Specific Measures*

- Licensed ecologist or accredited agents will be present to inspect the tunnels immediately before infilling of the tunnels;
- Retained Tunnels 3, 7, 8, 9, and 15 will be enhanced at the same time as the excluders are fitted to tunnels that will be destroyed;
- The retained section of Tunnel 2 will be enhanced after completion of infilling the rest of Tunnel 2. A section of Tunnel 2 will only be retained if ground conditions and stability can permit a north eastern section to be retained for bats
- The enhancements for crevice dwelling bats (Daubenton's, Natterer's and brown long-eared will comprise installation of two bat boxes in Tunnels 2, 3, 7, 8, 9, and 15 and ten bat boxes in the bomb store.
- The enhancements for lesser horseshoe will comprise installation of at least 10 wooden batons on ceilings and walls into each of Tunnels 2, 3, 7, 8, 9, and 15 and the bomb store.
- Tunnels 2, 3, 7, 8, 9, and 15 and the bomb store will be fitted with grilles to deter human access. Grills will have access hatches to allow hibernation monitoring access.

### *Commuting and Foraging Habitat*

- The vicinity of the retained roosts will be dark;
- Existing levels of connectivity to other foraging areas and other potential roost sites will be retained; and
- Artificial lighting will be designed to avoid foraging and commuting habitat.

### *Vibration*

7.9.118 The nearest tunnels supporting bat roosts will be filled as part of the Development, and as such bats will be excluded from these tunnels prior vibration-causing works commence.

7.9.119 The temporary and sporadic nature of the vibration coupled with the low levels of vibration likely to occur in the retained tunnels supporting roosting bats means that vibration is unlikely to cause a disturbance to roosting bats.

### *Lighting*

7.9.120 Lighting will also 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.

7.9.121 Lighting will be designed in line with Bats and Lighting Guidelines. Lighting spill will avoid retained roost locations.

7.9.122 Appropriate actions to help prevent light disturbance to bats during construction activities will be detailed in the Lighting Plan.

### *Invasive Species*

7.9.123 To help prevent the spread of the species appointment of a contractor to create a management plan to detail the removal of the species within the Order Limits and action will be required.

7.9.124 The presence of Nuttall's pondweed within Llyn Padarn will be included in the Bio-Security Plan and areas shown on a map. The information will be

included in the toolbox talk prior to works commencing within Llyn Padarn to make contractor aware of its' location to help prevent disturbance and/or spread of the species.

### *Operation*

#### Designated Sites

7.9.125 There will be no potential effects associated with operation on the following designated sites and therefore no mitigation is proposed:

- Eyri / Snowdonia SAC;
- Coed Dinorwig SSSI;
- Llwyn y Coed SSSI;
- Glyn Rhonwy Quarries 1 LWS;
- Bwlch-y-Groed Quarry LWS;
- Coedydd Glyn Rhonwy LWS;
- Bryn Mawr LWS;
- Coed Donen Las LWS;
- Glyn Rhonwy Quarries Woodland Mosaic LWS;
- Llwyn Coed Heath LWS;
- Barrack Mawr LWS;
- Glyn Rhonwy Quarries 2 LWS;
- Pen Gilfach LWS;
- Cefn Du LWS;
- Donen Las LWS; and
- Restored Ancient Woodland Sites.

#### Afon Gwyrfai a Llyn Cwellyn SAC and SSSI

### **Nutrient Enrichment**

7.9.126 Monitoring of Llyn Padarn during abstraction will help to prevent uptake of nutrient-rich waters in times when phosphorus levels are elevated within the

lake, for example, following overturn. As such this will help reduce the likelihood of the system containing nutrient-rich water.

7.9.127 The water quality of the reservoirs in the Development will be monitored and trends evaluated in the context of any remedial action that might be needed on a periodic basis. Discharge quality and rate will be controlled by an discharge consent issued by NRW if appropriate.

### **Temperature Change**

7.9.128 To help to reduce the likelihood of the Development causing temperature change of the Afon Gwyrfaï a low-friction system will be used. In addition, water temperature will vary diurnally and seasonally and will be moderated by the bathymetry of the reservoirs, the operation of the plant / 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. In addition, 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.

7.9.129 Water discharged from the system will not be of a temperature significantly different from the surface water in the receiving water bodies. Temperature will be monitored in pumping station and will also be controlled by the conditions of the permits issued by NRW. This will ensure that water temperature within the pumped storage system is within local natural tolerances.

### **Invasive Species**

7.9.130 The water held within Q1 and Q6 have been found not to contain any invasive species and it is unlikely that the Nuttall's pondweed identified in Llyn Padarn will be transferred into Q1 and Q6, Nant-y-Betws or Afon Gwyrfaï. In addition, the Q1 spillway infrastructure (leading to Afon Gwyrfaï via the Nant-y-Betws) 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 storm water runoff into the Development is via the Q6 spillway infrastructure to Llyn Padarn.

7.9.131 However, once operational, the operator of the proposed development will liaise directly with NRW on a regular basis to maintain communication about the presence of any new invasive species. Should any new species be identified in Llyn Padarn, the operator will work with NRW to facilitate a treatment programme of the waters contained with the reservoirs as necessary and as appropriate and to stop any planned discharges from Q1 to the Nant-y-Betws. This will prevent cross contamination between catchments.

#### Llyn Padarn SSSI

#### **Nutrient Enrichment**

7.9.132 Monitoring of Llyn Padarn during abstraction will help to prevent uptake of nutrient-rich waters in times when phosphorus levels are elevated within the lake, for example, following overturn. As such this will help reduce the likelihood of the system containing nutrient-rich water.

7.9.133 The water quality of the reservoirs in the Development will be monitored and trends evaluated in the context of any remedial action that might be needed on a periodic basis. Discharge quality and rate will be controlled by an discharge consent issued by NRW if appropriate.

#### **Invasive Species**

7.9.134 The water held within Q1 and Q6 have been found not to contain any invasive species and it is unlikely that the Nuttall's pondweed identified in Llyn Padarn will be transferred into Q1 and Q6.

7.9.135 However, once operational, the operator of the proposed development will liaise directly with NRW on a regular basis to maintain communication about the presence of any new invasive species. Should any new species be identified in Llyn Padarn, the operator will work with NRW to facilitate a treatment programme of the waters contained with the reservoirs as necessary and as appropriate and to stop any planned discharges from Q6 to Llyn Padarn.

### **Pollution and Runoff**

7.9.136 During routine maintenance pollution prevention measures in line with current NRW guidelines will be adhered to reduce the likelihood of pollution incidents and the potential effect of such incidents.

### **Temperature Change**

7.9.137 Water discharged from the system will not be of a temperature significantly different from the surface water in the receiving water bodies. Temperature will be monitored in pumping station and will also be controlled by the conditions of the permits issued by NRW. This will ensure that water temperature within the pumped storage system is within local natural tolerances.

### **Light Spill**

7.9.138 Lighting will also 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.

7.9.139 Appropriate actions to help prevent light disturbance will be detailed in the Lighting Plan.

### **Habitats**

7.9.140 There will be no potential effects associated with operation on the following habitats and therefore no mitigation is proposed:

- Broadleaved Semi-Natural Woodland;
- Coniferous Woodland – Recently Felled;
- Mixed Woodland – Semi-Natural;
- Scrub – Scattered;
- Semi-Improved;
- Bracken– Scattered;

- Bracken– Continuous;
- Flush and Spring – Acid / Neutral Flush;
- Dry Heath / Acid Grassland;
- Standing Water – Oligotrophic;
- Quarry;
- Spoil;
- Bare Ground; and
- Wall.

Running Water – Nant-y-Betws

**Nutrient Enrichment**

7.9.141 Monitoring of Llyn Padarn during abstraction will help to prevent uptake of nutrient-rich waters in times when phosphorus levels are elevated within the lake, for example, following overturn. As such this will help reduce the likelihood of the system containing nutrient-rich water.

7.9.142 The water quality of the reservoirs in the Development will be monitored and trends evaluated in the context of any remedial action that might be needed on a periodic basis. Discharge quality and rate will be controlled by an discharge consent issued by NRW if appropriate.

**Invasive Species**

7.9.143 The water held within Q1 and Q6 have been found not to contain any invasive species and it is unlikely that the Nuttall's pondweed identified in Llyn Padarn will be transferred into Q1 and Q6.

7.9.144 However, once operational, the operator of the proposed development will liaise directly with NRW on a regular basis to maintain communication about the presence of any new invasive species. Should any new species be identified in Llyn Padarn, the operator will work with NRW to facilitate a treatment programme of the waters contained with the reservoirs as necessary and as appropriate and to stop any planned discharges from Q6



to Llyn Padarn. This will help prevent transfer of invasive species between the catchments.

### **Temperature Changes**

7.9.145 To help prevent temperature changes caused by the Development a low-friction system will be used. In addition, water temperature will vary diurnally / seasonally and will be moderated by the bathymetry of the reservoirs, the operation of the plant / 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. In addition, 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. SPH confirmed that water discharged from the system will not be of a temperature significantly different from the surface water in the receiving water bodies. Temperature will be monitored in pumping station and will also be controlled by the conditions of the permits issued by NRW. This will ensure that water temperature within the pumped storage system is within local natural tolerances.

### **Species**

7.9.146 There will be no potential effects associated with operation on the following species and therefore no mitigation is proposed:

- Lichens;
- Bryophytes;
- Fungi;
- Trees;
- Reptiles;
- Birds: Schedule 1 Species, BOCC Red and Amber List Species;
- Other Breeding Birds – Common Species;
- Polecat;
- Badgers; and,

- Red squirrel.

7.9.147 The following species have the potential to be effected by pollution generated during routine maintenance. As such, pollution prevention measures in line with current NRW guidelines will be adhered to and a site management plan will be in place to inform maintenance team of how to reduce likelihood of pollution incidents:

- Invertebrates;
- Fish;
- Amphibians;
- Water vole; and
- Otters.

#### Arctic Charr

#### **Pollution**

7.9.148 During routine maintenance pollution prevention measures in line with current NRW guidelines will be adhered to reduce the likelihood of pollution incidents and the potential effect of such incidents.

#### **Temperature Change**

7.9.149 To help prevent temperature changes caused by the Development a low-friction system will be used. In addition, water temperature will vary diurnally and seasonally and will be moderated by the bathymetry of the reservoirs, the operation of the plant / 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. In addition, 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. SPH confirmed that water discharged from the system will not be of a temperature significantly different from the surface water in the receiving water bodies. Temperature will be monitored in pumping station and will also be controlled by the conditions of the permits issued by NRW. This will ensure that water

temperature within the pumped storage system is within local natural tolerances.

### Bats

7.9.150 To help prevent the effects of light spill on bats lighting will be designed in line with Bats and Lighting Guidelines. Lighting spill will avoid retained roost locations. Appropriate actions to help prevent light disturbance to bats during construction activities will be detailed in the Lighting Plan.

### Invasive Species

7.9.151 To help prevent the spread of Himalayan balsam, Cotoneaster, rhododendron and Nuttall's pondweed during operation (routine maintenance), appointment of a contractor to create a management plan to detail the removal and/or management of the species within the Order Limits and action will be required. In addition, details of the locations of the invasive species will be included in the HMP, and regular surveys will be undertaken to update this information to help prevent disturbance and/or spread of these species throughout the lifetime of the Development.

### *Decommissioning*

7.9.152 At the end of the Development's operational life, a Decommissioning Plan will be prepared, approved with NRW and Gwynedd Council and implemented. The current lifespan of the proposed development is 125 years and so this will be a requirement of the DCO to be implemented at the appropriate time.

7.9.153 Temporary disturbance during the decommissioning phase are likely to result in impacts similar to the construction phase but, with an operational phase of 125 years, the habitats and species on the site and their status may be altered and will require new surveying.

7.9.154 Potential impacts associated with decommissioning of the pumped storage facility include changes in water quality, water levels and water temperature as a result of de-watering the system into Llyn Padarn. It is considered that the impacts of de-watering can be minimised to a non-significant level

through monitoring, designing and implementing an appropriate de-watering regime which will be agreed through a Decommissioning Plan.

7.9.155 Baseline water quality, flow and temperature monitoring will have been collated over the lifespan of the Development and for Llyn Padarn. On the basis of this data it will be possible to establish whether, without mitigation there will be significant impacts on Llyn Padarn as a result of quarry de-watering.

7.9.156 If impacts are identified as being likely there are several options to mitigate these to a non-significant level including:

- Establishing a discharge rate which, like the initial abstraction rate, will be set to minimise the change in water levels and temperature within Llyn Padarn. This may mean emptying the system slowly over a period of many years;
- Employ methods to treat the discharge water and strip it of any potential contaminants or reduce levels of key nutrients for example through the use of phosphate stripping; and
- Where significant impacts are identified, consider the options for emptying the system to another surface water system outside the Llyn Padarn catchment area or maintaining the quarry system as a non-operational pumped storage system.

7.9.157 Other possible impacts as a result of decommissioning include the potential for siltation and pollution incidents as a result of any demolition activity, and the potential to disturb protected species as a result of these activities. These impacts will be dealt with in a similar way to the impacts of construction.

7.9.158 Given the lifespan of the operation of the Development (125 years), prior to decommissioning it will to assess the potential effects of the phase on protected species, habitats and designated sites. As such it is recommended that a full suite of surveys, beginning with a Phase 1 survey, is undertaken to help inform any mitigation that will be required to help prevent loss, destruction, damage and/or injury.

7.9.159 Water pollution prevention measures will be put in place during any demolition works and will follow the same principles as those outlined for construction, following relevant guidance. The Decommissioning Plan will be written and agreed with Gwynedd Council and NRW in advance of works proceeding. As with the construction phase, this document will outline all water management and pollution prevention procedures and the measures that will be in place to protect the aquatic environment, particularly that of Llyn Padarn.

7.9.160 Prior to decommissioning, surveys for protected species should be undertaken to determine their status and to determine any necessary mitigation measures. For example measures may be required in accordance with statutory guidance in terms of badger, otter, bats and reptiles. There is also potential for other protected species to colonise the area within this time period, for example water vole, and this should be considered. Any changes in legislation and policy guidance would also need to be considered.

## **7.10 Residual Effects**

7.10.1 There is a residual **minor adverse** effect from alternation of the flow regime on the Afon Gwyrfai a Llyn Cwellyn SAC.

7.10.2 There is a residual **minor adverse** effect on the water quality through the introduction of invasive species, of the Afon Gwyrfai a Llyn Cwellyn SAC.

7.10.3 There is a residual **minor adverse** effect on the water quality through the nutrient enrichment of the Afon Gwyrfai a Llyn Cwellyn SAC.

7.10.4 There is a residual **minor adverse** effect on the water quality through the change the natural concentration and variability of the Water Framework Directive physio-chemical parameters (i.e. ammonia, dissolved oxygen, and acid neutralising capacity) of the Afon Gwyrfai a Llyn Cwellyn SAC.

7.10.5 There is a residual **minor adverse** effect on the water quality through the temperature change of the Afon Gwyrfai a Llyn Cwellyn SAC.

7.10.6 There is a residual **minor adverse** effect from alternation of the flow regime on the Llyn Padarn SSSI.

- 7.10.7 There is a residual **minor adverse** effect from pollution and/or runoff, disturbing sediment causing smothering and turbidity, species intake during abstraction, noise and vibration, nutrient enrichment, spread of invasive species, temperature change, loss of habitat from, and light spill on Llyn Padarn SSSI.
- 7.10.8 There is a residual **minor adverse** effect from loss of habitat on Bwlch-y-Groed Quarry LWS.
- 7.10.9 There is a residual **minor adverse** effect from loss of habitat on Glyn Rhonwy Quarries Woodland Mosaic LWS.
- 7.10.10 There is a residual **minor adverse** effect on the restored ancient woodland sites habitat from loss of habitat.
- 7.10.11 There is a residual **minor adverse** effect on the broadleaved semi-natural woodland habitat from loss of habitat.
- 7.10.12 There is a residual **minor adverse** effect on the coniferous woodland – recently felled habitat from loss of habitat.
- 7.10.13 There is a residual **minor adverse** effect on the dry heath / acid grassland habitat from loss of habitat.
- 7.10.14 There is a residual **minor adverse** effect on the quarry habitat from loss of habitat.
- 7.10.15 There is a residual **minor adverse** effect on the wall habitat from loss habitat.
- 7.10.16 There is a residual **minor adverse** effect on Arctic charr from loss of potential spawning grounds, pollution and/or runoff, species drawn into intake pipe during abstraction, and noise and vibration.
- 7.10.17 There is a residual **minor adverse** effect on reptiles from loss of habitat, and noise and vibration.
- 7.10.18 There is a residual **minor adverse** effect on Schedule 1 bird species, and BOCC Red and Amber List bird species from loss of habitat.

7.10.19 There is a residual **minor adverse** effect on bats from construction vibration, roost modification, roost loss – tunnels, isolation and fragmentation and operational lighting.

7.10.20 There is a residual **moderate adverse** effect on bats from roost loss – trees.

7.10.21 There is a residual **moderate beneficial** effect on bats from decreased disturbance during operation due to increased security measures.

7.10.22 The residual effects are the effects that remain after the environmental and mitigation measures have been taken into account. Implementation of the mitigation measures outlined will avoid or minimise the potential effects to the majority of the ecological receptors

7.10.23 The overall residual effect assessment is assessed as minor adverse (excluding effects on bat tree roosts). Therefore the effects are considered to be not significant in EIA terms.

7.10.24 The overall residual effect assessment on bat tree roosts only is assessed as moderate adverse. Therefore the effects are considered to be significant in EIA terms.

7.10.25 The residual effects for Development during construction, operation and decommissioning and the significance of those residual effects are displayed in Table 7-18 Summary of Assessment.

## **7.11 Assessment of Effects on Natural Features (APFP Regulations 2009)**

7.11.1 Regulation 5(2)(l) of the Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 requires DCO applicants to provide, where applicable:

*a plan with accompanying information identifying—*

- *any statutory or non-statutory sites or features of nature conservation such as sites of geological or landscape importance;*
- *habitats of protected species, important habitats or other diversity features; and*
- *water bodies in a river basin management plan.*



*together with an assessment of any effects on such sites, features, habitats or bodies likely to be caused by the proposed development.*

- 7.11.2 Statutory and non-statutory designated sites of nature conservation importance are shown in Volume 4, Figures 7.6 – 7.8, the Figures also show habitats of protected species, important habitats and other diversity features.
- 7.11.3 Relevant water bodies are identified in Volume 4, Figure 9.4 and Figure 9.5.
- 7.11.4 Sections 7.7 to 7.9 of this chapter (together with Appendices 7.1 to 7.20) assess any effects of the Development on the sites, features and habitats mentioned in regulation 5(2)(l) and consider whether or not they are 'significant' for EIA purposes.
- 7.11.5 An assessment of the effects on relevant water bodies is provided in Chapter 9 Water Resources.
- 7.11.6 The majority of effects on natural features are negligible or minor when taking account of the mitigation measures that will be delivered by the Development.
- 7.11.7 Where no mitigation has been proposed the receptors are of such limited value for nature conservation that this is not considered necessary. The majority of the residual effects are of negligible value.
- 7.11.8 This is outlined in Table 7-18 Summary of Assessment.

**Table 7-18 – Summary of Assessment**

Description of Receptor		Description of Potential Effect						Description of Residual Effect		
Receptor	Value Sensitivity /	Effect	Phase of Effect C/O/D	Nature of Effect	Duration	Magnitude	Potential Significance	Summary Mitigation	Residual Effect	Residual Significance
Eyri / Snowdonia SAC	Very High	No potential effects associated with construction or operation.	N/A	Neutral	N/A	N/A	No change	N/A	N/A	No change
Afon Gwyrfai a Llyn Cwellyn SAC	Very High	Potential effects on Arctic charr are unlikely as the species are present only in the Llyn Cwellyn, which is upstream of the Development and discharge point, and therefore there is a negligible effect.	N/A	Neutral	N/A	N/A	No change	N/A	N/A	No change
		Damage integrity of SAC, harm or kill species, or damage or kill designated features through pollution and runoff during construction of spillway infrastructure and/or slate mounds.	C	Adverse	Temporary	Medium	Major	Pollution prevention measures in line with current NRW guidelines will be adhered to. Runoff from the site would be filtered and attenuated using silt traps and settlement ponds.	Mitigation will reduce the likelihood of pollution incidents and the potential effect of such incidents.	Minor
		Alteration of flow regime.	O	Adverse	Temporary	Negligible	Minor	No mitigation proposed.	The conservation objectives of the SAC state that the flow regime should be characteristic of the river, ± 10% of the naturalised daily flow throughout the year. (CCW, 2008). The Q1 spillway infrastructure 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	Minor

Table 7-18 – Summary of Assessment										
Description of Receptor		Description of Potential Effect						Description of Residual Effect		
Receptor	Value / Sensitivity	Effect	Phase of Effect C/O/D	Nature of Effect	Duration	Magnitude	Potential Significance	Summary of Mitigation	Residual Effect	Residual Significance
									increase by natural inflow. The rate and volume of discharge 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.	
		Nutrient enrichment.	O	Adverse	Temporary	Negligible	Minor	Monitoring of Llyn Padarn during abstraction will help to prevent uptake of nutrient-rich waters in times when phosphorus levels are elevated within the lake, for example, following overturn. The water quality of the reservoirs in the Development will be monitored and trends evaluated in the context of any remedial action that	Nutrient enrichment of Afon Gwyrfai via Nant-y-Betws via the Q1 spillway infrastructure discharge is unlikely as 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.	Minor

**Table 7-18 – Summary of Assessment**

Description of Receptor		Description of Potential Effect						Description of Residual Effect		
Receptor	Value / Sensitivity	Effect	Phase of Effect C/O/D	Nature of Effect	Duration	Magnitude	Potential Significance	Summary of Mitigation	Residual Effect	Residual Significance
								might be needed on a periodic basis. Discharge quality and rate will be controlled by an discharge consent issued by NRW if appropriate.		
		Reduction of water quality.	O	Adverse	Temporary	Negligible	Minor	No proposed mitigation.	The operation of the Development will not significantly alter the quality of water that will be discharged into the Afon Gwyrfai, which has been tested and found not to contain any significant contaminants. Therefore, it is not expected that overflow into Afon Gwyrfai via Nant-y-Betws will change the natural concentration and variability of the Water Framework Directive physio-chemical parameters (i.e. ammonia, dissolved oxygen, and acid neutralising capacity).	Minor
		The water in Q1 and Q6 were found to contain no invasive or non-native species of plant or animal (Goldsmith et al. 2015). However, the aquatic survey of Llyn Padarn in 2015 identified the presence of Nuttall's pondweed within the lagoons on the south-western shore, either side of where the spillway	O	N/A	N/A	Negligible	Negligible	N/A	N/A	Negligible

Table 7-18 – Summary of Assessment										
Description of Receptor		Description of Potential Effect						Description of Residual Effect		
Receptor	Value / Sensitivity	Effect	Phase of Effect C/O/D	Nature of Effect	Duration	Magnitude	Potential Significance	Summary of Mitigation	Residual Effect	Residual Significance
		<p>is proposed to be located; the nearest plant is approximately 75m away.</p> <p>Due to the distance between the nearest specimen and the abstraction pipe it is unlikely that Nuttall's pondweed will be transferred into Q1 and Q6 during abstraction, and then into the Afon Gwyrfaï via the Q1 spillway and the Nant-y-Betws.</p>								
		<p>Aquatic habitat and species it supports to be affected by temperature change caused by:</p> <p>Friction in the system; and</p> <p>Draw of discharge water from colder depths of quarries.</p>	O	Adverse	Permanent	Medium	Major	<p>Use of a low-friction system.</p> <p>Water temperature will vary diurnally / seasonally and will be moderated by the bathymetry of the reservoirs, the operation of the plant / 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. In addition, 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</p>	<p>Mitigation will help to reduce the likelihood of the Development causing temperature change of the Afon Gwyrfaï.</p>	Minor

Table 7-18 – Summary of Assessment										
Description of Receptor		Description of Potential Effect						Description of Residual Effect		
Receptor	Value / Sensitivity	Effect	Phase of Effect C/O/D	Nature of Effect	Duration	Magnitude	Potential Significance	Summary of Mitigation	Residual Effect	Residual Significance
								temperature. 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. Temperature change is considered a negligible effect.		
Glynllifon SAC	Very High	No potential effects associated with construction or operation.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Llyn Padarn SSSI	High	Alteration to natural hydrological regime during abstraction, this has the potential to effect the habitats and the species the SSSI supports.	C	Adverse	Temporary	Negligible	Minor	A licence to abstract up to 2200 m <sup>3</sup> /day and 550,000 m <sup>3</sup> /annum from Llyn Padarn for commissioning the Development was issued by NRW in July 2015. A variation to increase abstraction to 3300m <sup>3</sup> is to be	The abstraction regime is not considered to have any significant impact on lake water levels (and therefore littoral habitat quality and extents) and / or water quality (as it is affected by changing water levels).	Minor

**Table 7-18 – Summary of Assessment**

Description of Receptor		Description of Potential Effect						Description of Residual Effect		
Receptor	Value / Sensitivity	Effect	Phase of Effect C/O/D	Nature of Effect	Duration	Magnitude	Potential Significance	Summary of Mitigation	Residual Effect	Residual Significance
								submitted and has been assessed. A hands-off water level has been set as part of the licensing condition.		
		Damage integrity of SSSI, harm or kill species, or damage or kill designated features through pollution and/or runoff during construction of spillway, and pipeline and connection to lake bed.	C	Adverse	Temporary	Medium	Moderate	Pollution prevention measures in line with current NRW guidelines will be adhered to.	Mitigation will reduce the likelihood of pollution incidents and the potential effect of such incidents.	Minor
		Construction of spillway disturbing lake bed sediment. Smothering spawning gravels, macrophytes, macro-invertebrates, reducing oxygen levels, & increased turbidity. Floating water plantain and spring quillwort (features of the SSSI) are not at risk from smothering due to the dispersal distance of the sediment and the nearest specimens to the construction works.	C	Adverse	Temporary	Medium	Moderate	Pollution prevention measures in line with current NRW guidelines will be adhered to.	Mitigation will reduce the likelihood of pollution incidents and the potential effect of such incidents. Limited potential for Arctic charr spawning habitat within the vicinity of the works. Potential for floating water plantain to be present within the construction area. Pre-construction surveys for Arctic charr and floating water plantain. Construction designed to limit sediment disturbance.	Minor
		Loss of lake bed habitat (0.013%) through spillway connection affecting the potential Arctic charr spawning grounds.	C	Adverse	Permanent	Medium	Moderate	Pre-construction surveys for Arctic charr to allow micro-siting.	Pre-construction surveys will allow presence of species within the construction area to be ascertained. If present then	Minor



**Table 7-18 – Summary of Assessment**

Description of Receptor		Description of Potential Effect						Description of Residual Effect		
Receptor	Value / Sensitivity	Effect	Phase of Effect C/O/D	Nature of Effect	Duration	Magnitude	Potential Significance	Summary of Mitigation	Residual Effect	Residual Significance
									mitigation will be implemented to help prevent disturbance and/or loss.	
		There is no potential for fish and other aquatic species to be drawn in to the pipe during abstraction as the intake will be gridded and the abstraction rate will be controlled through the abstraction license to minimise adverse effect to habitat and wildlife including fish, spring quillwort and floating water-plantain.	C	Adverse	Temporary	Negligible	Minor	The provision of intake screens on the abstraction pipe must meet statutory requirements under the Salmon and Freshwater Fisheries Act.	Abstraction pipe intake screens will help to prevent fish and other aquatic species being drawn into the pipe during abstraction.	Minor
		Noise and vibration on designated features Arctic charr and otter: Noise is unlikely to an effect beyond the immediate vicinity (less than 50m). Vibrations dissipate in water, as such any effects on fish will be limited to a precautionary 500m radius and will be temporary. If within spawning distance then they should work outside of spawning season.	C	Neutral	N/A	N/A	Neutral	N/A	N/A	Neutral
		Nutrient enrichment.	O	Adverse	Temporary	Medium	Moderate	Monitoring of Llyn Padarn during abstraction will help to prevent uptake of nutrient-rich waters in times when phosphorus levels are elevated within the lake.  Measures will be undertaken to help prevent the uptake of nutrient-rich water	These measures will help prevent the uptake of nutrient-rich water into the quarries during abstraction, thereby helping prevent the input of nutrient-rich water back into Llyn Padarn via the Q6 spillway.	Minor

Table 7-18 – Summary of Assessment										
Description of Receptor		Description of Potential Effect						Description of Residual Effect		
Receptor	Value / Sensitivity	Effect	Phase of Effect C/O/D	Nature of Effect	Duration	Magnitude	Potential Significance	Summary of Mitigation	Residual Effect	Residual Significance
								into the quarries during abstraction, thereby helping prevent the input of nutrient-rich water back into Llyn Padarn via the Q6 spillway. It is also considered that due to the turbulent nature of the system, algal 'seeding' of Llyn Padarn would be extremely unlikely. Discharge quality and rate will be controlled by an discharge consent issued by NRW if appropriate.		
		Spread of invasive or non-native species through the disturbance during construction affecting integrity of the SSSI and the species it supports.	C	Adverse	Permanent	Medium	Moderate	The aquatic survey of Llyn Padarn identified Nuttall's pondweed 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. 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	No invasive species present within Q1 or Q6. Nuttall's pondweed has been identified outside of the construction area in Llyn Padarn; however, inclusion of the species within the CoCP will help to prevent disturbance and spread of the species.	Minor

**Table 7-18 – Summary of Assessment**

Description of Receptor		Description of Potential Effect						Description of Residual Effect		
Receptor	Value / Sensitivity	Effect	Phase of Effect C/O/D	Nature of Effect	Duration	Magnitude	Potential Significance	Summary of Mitigation	Residual Effect	Residual Significance
								<p>the plants. Measures will be taken to help prevent the spread as the plant reproduces vegetatively by including its location in the CoCP document and how to prevent the disturbance and spread of the species.</p> <p>Surveys of Q1 and Q6 confirmed the absence of invasive species.</p>		
		<p>Introduction of invasive or non-native species through the routine discharges of water affecting integrity of the SSSI and the species it supports.</p> <p>Due to the distances between the nearest specimen and the abstraction pipe it is unlikely that Nuttall's pondweed will be transferred into Q1 and Q6 during abstraction, and then back into the Llyn Padarn via the Q6 spillway.</p>	O	Adverse	Permanent	Negligible	Minor	<p>The aquatic survey of Llyn Padarn identified Nuttall's pondweed 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. 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. Surveys of Q1 and Q6</p>	<p>Due to the value of the receptor, the overall significance remains at minor.</p>	Minor

Table 7-18 – Summary of Assessment										
Description of Receptor		Description of Potential Effect						Description of Residual Effect		
Receptor	Value / Sensitivity	Effect	Phase of Effect C/O/D	Nature of Effect	Duration	Magnitude	Potential Significance	Summary of Mitigation	Residual Effect	Residual Significance
								confirmed the absence of invasive species.		
		Routine maintenance of the lake bed spillway and pumping station has the potential to affect water quality by pollution and/or runoff, this has the potential to effect the species the SSSI supports.	O	Adverse	Temporary	Medium	Moderate	Pollution prevention measures in line with current NRW guidelines will be adhered to.	Mitigation will reduce the likelihood of pollution incidents and the potential effect of such incidents.	Minor
		<p>Aquatic habitat and species it supports to be affected by temperature change caused by:</p> <p>Friction in the system; and</p> <p>Draw of discharge water from colder depths of quarries.</p> <p>The following mitigation measures have been included by design:</p> <p>A low-friction system will be used to minimise any warming of water pumped through the system.</p> <p>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.</p> <p>Due to the scale, limited solar exposure, the heat transfer from the rocks to the water will be limited by the surface area of contact, and the configuration of the design (i.e. closed system) the potential for heated water at Glyn Rhonwy is not high.</p>	O	Adverse	Permanent	Negligible	Minor	Mitigation by design. No further mitigation required.	Temperature will be monitored in pumping station and controlled via the environmental permit. This will ensure that water temperature within the pumped storage system is within local natural tolerances.	Minor

**Table 7-18 – Summary of Assessment**

Description of Receptor		Description of Potential Effect						Description of Residual Effect		
Receptor	Value / Sensitivity	Effect	Phase of Effect C/O/D	Nature of Effect	Duration	Magnitude	Potential Significance	Summary of Mitigation	Residual Effect	Residual Significance
		Light spill during construction and/or operation onto the woodland edge and/or shore line of Llyn Padarn has the potential to impact on species utilising those areas of the SSSI such as bats, otter and water vole.	C & O	Adverse	Temporary	Low	Moderate	Lighting will also 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. Appropriate actions to help prevent light disturbance will be detailed in the Lighting Plan.	Minor
Afon Gwyrfai a Llyn Cwellyn SSSI	High	Potential effects on the features of the SSSI have been assessed under the Afon Gwyrfai a Llyn Cwellyn SAC, of which the SSSI is a part.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Coed Dinorwig SSSI	High	No potential effects associated with construction or operation.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Llwyn y Coed SSSI	High	No potential effects associated with construction or operation.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Glyn Rhonwy Quarries 1 LWS	Low	No potential effects associated with construction or operation.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		No potential effects associated with operation.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Bwlch-y-Groed Quarry LWS	Low	Habitat loss: the Development will require the temporary disturbance and removal of 5.4ha (13.1%) and the permanent removal 9.0ha (21.9%) of the quarry/spoil habitat within the LWS for the construction of the spoil heaps	C	Adverse	Permanent	Medium	Minor	No mitigation has been proposed.	The loss of habitat is not significant in terms of EIA.	Minor

**Table 7-18 – Summary of Assessment**

Description of Receptor		Description of Potential Effect						Description of Residual Effect		
Receptor	Value / Sensitivity	Effect	Phase of Effect C/O/D	Nature of Effect	Duration	Magnitude	Potential Significance	Summary of Mitigation	Residual Effect	Residual Significance
		and Q1 dam.								
Coedydd Glyn Rhonwy LWS	Low	No potential effects associated with operation.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		The Development will require the temporary disturbance and removal of 0.1ha (0.5%) for construction compounds etc. This is considered to be a negligible effect.	C	Adverse	Temporary	Low	Negligible	No mitigation has been proposed.	The loss of habitat is no significant in terms of EIA.	Negligible
		Trees to be damaged or killed through: root compaction by vehicles or machinery tracking over or repeated foot traffic over the roots, and directly damaged by vehicles or machinery knocking limbs off or damaging the trunks.	C	Adverse	Temporary	Medium	Minor	Trees will be protected during construction according to the requirements of BS5837:2012 Trees in relation to design, demolition and construction to ensure no inadvertent damage to them occurs.	Mitigation will prevent damage to trees.	Negligible
		Trees to be damaged or killed through pollution and/or run off.	C	Adverse	Temporary	Medium	Minor	Pollution prevention measures in line with current NRW guidelines will be adhered to.	Mitigation will reduce the likelihood of pollution incidents and the potential effect of such incidents.	Negligible
Bryn Mawr LWS	Low	No potential effects associated operation.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		The Development will require the temporary disturbance and removal of 0.2ha (0.3%) for construction compounds etc.	C	Adverse	Temporary	Low	Negligible	No mitigation has been proposed.	The loss of habitat is no significant in terms of EIA.	Negligible
Coed Donen Las LWS	Low	No potential effects associated with operation	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		Habitat loss: the Development will require the temporary disturbance and removal of 1.1ha (1.6%) and the	C	Adverse	Permanent	Low	Negligible	No mitigation has been proposed.	The loss of habitat is no significant in terms of EIA.	Negligible



Table 7-18 – Summary of Assessment										
Description of Receptor		Description of Potential Effect						Description of Residual Effect		
Receptor	Value / Sensitivity	Effect	Phase of Effect C/O/D	Nature of Effect	Duration	Magnitude	Potential Significance	Summary of Mitigation	Residual Effect	Residual Significance
		permanent removal of 10.7ha (16.1%) of the coniferous woodland habitat within the LWS for the construction of Q1 dam, and removal of a strip of woodland to facilitate the PRow diversion.								
Glyn Rhonwy Quarries Woodland Mosaic LWS	Low	No potential effects associated with operation	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		Habitat loss: the Development will require the temporary disturbance and removal of 0.4ha (3.0%) and the permanent removal of 4.0ha (32.7%) of the woodland habitat within the LWS for the construction of Q6 dam.	C	Adverse	Permanent	Medium	Minor	No mitigation has been proposed.	The loss of habitat is no significant in terms of EIA.	Minor
Llwyn Coed Heath LWS	Low	No potential effects associated with operation	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		Habitat loss: the Development will require the removal of < 0.001ha (<0.001%) of the heath habitat within the LWS for the construction of Q6 dam.	C	Adverse	Permanent	Negligible	Negligible	No mitigation has been proposed.	The loss of habitat is no significant in terms of EIA.	Negligible
		The retained habitat and vegetation adjacent to the construction works has the potential to be damaged or killed through vehicles or machinery tracking over or repeated foot traffic over the vegetation, and pollution and/or run off. This has the potential to have a temporary minor adverse effect the LWS or on any species utilising the habitat.	C	Adverse	Temporary	Medium	Minor	Good site working practices will be adhered to. Adjacent habitats to be retained will be fenced off.	Mitigation will prevent access to fenced areas.	Negligible
Barrack Mawr LWS	Low	No potential effects associated with operation.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A



Table 7-18 – Summary of Assessment										
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Receptor	Value / Sensitivity	Effect	Phase of Effect C/O/D	Nature of Effect	Duration	Magnitude	Potential Significance	Summary of Mitigation	Residual Effect	Residual Significance
		The Development will require the temporary disturbance and removal of 0.03ha (0.2%) for construction compounds etc.	C	Adverse	Permanent	Negligible	Negligible	No mitigation has been proposed.	The loss of habitat is no significant in terms of EIA.	Negligible
Glyn Rhonwy Quarries 2 LWS	Low	No potential effects associated with construction or operation.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Pen Gilfach LWS	Low	No potential effects associated with operation .	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		Trees to be damaged or killed through pollution and/or run off.	C	Adverse	Temporary	Medium	Minor	Pollution prevention measures in line with current NRW guidelines will be adhered to.	Mitigation will reduce the likelihood of pollution incidents and the potential effect of such incidents.	Negligible
Cefn Du LWS	Low	No potential effects associated with operation.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		Habitat loss: the Development will require the temporary disturbance and removal of 1.9ha (0.5%) and permanent removal of 1.0ha (0.3%) of the dry heath/acid grassland mosaic associated with south-eastern section of LWS to facilitate the construction of a section of the Q1 dam.	C	Adverse	Permanent	Low	Negligible	No mitigation has been proposed.	The loss of habitat is no significant in terms of EIA.	Negligible
		Trees to be damaged or killed through pollution and/or run off.	C	Adverse	Temporary	Medium	Minor	Pollution prevention measures in line with current NRW guidelines will be adhered to.	Mitigation will reduce the likelihood of pollution incidents and the potential effect of such incidents.	Negligible
Donen Las LWS	Low	No potential effects associated with operation.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		Habitat loss: the Development will require the temporary disturbance and removal of 0.1ha (0.2%) and permanent removal of 0.1ha (0.2%) of the dry heath/acid grassland	C	Adverse	Permanent	Low	Negligible	No mitigation has been proposed.	The loss of habitat is no significant in terms of EIA.	Negligible

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		mosaic associated with south-eastern section of LWS to facilitate the construction of a section of the Q1 dam.								
		The dry heath/acid grassland habitat and vegetation adjacent to the proposed spoil heaps have the potential to be damaged or killed through pollution and/or run off.	C	Adverse	Temporary	Medium	Minor	Good site working practices will be adhered to. Adjacent habitats to be retained will be fenced off.	Mitigation will prevent access to fenced areas.	Negligible
		No potential effects associated with operation	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Restored Ancient Woodland Sites	Low	The Development will potentially require the removal of habitat from both of the RAWs. The Development will seek to use tracks and other areas of hardstanding that are already present within the Order Limits to avoid removing vegetation where possible. However, currently there are no detailed design plans and so for the purposes of this assessment it is assumed that the RAWs within the Order Limits will be removed. The RAWs are 0.93ha and 0.98ha in size, and up to 0.15ha will be removed from each, which equates to a loss of 16% and 15% respectively.	C	Adverse	Permanent	Medium	Minor	The Development should seek to use tracks and other areas of hardstanding that are already present within the Order Limits to avoid removing vegetation where possible.	Mitigation will seek to limit the removal of the habitat where possible.	Minor
		Trees and woodland to be damaged or killed through root compaction by vehicles or machinery tracking over or repeated foot traffic over the roots, and directly damaged by vehicles or machinery knocking limbs off or damaging the trunks	C	Adverse	Temporary	Medium	Minor	Trees will be protected during construction according to the requirements of BS5837:2012 Trees in relation to design, demolition and	Mitigation will prevent damage to trees.	Negligible

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Receptor	Value / Sensitivity	Effect	Phase of Effect C/O/D	Nature of Effect	Duration	Magnitude	Potential Significance	Summary of Mitigation	Residual Effect	Residual Significance
								construction to ensure no inadvertent damage to them occurs.		
		Trees and woodland to be damaged or killed through pollution and/or run off.	C	Adverse	Temporary	Medium	Minor	Good site working practices adhered to- location of site compounds. Habitats to be retained will be fenced off.	Mitigation will prevent access to fenced areas.	Negligible
Coed Dinorwig LNR	Low	No potential effects associated with construction or operation..	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Broadleaved Semi-Natural Woodland	Medium	Habitat loss: the enabling works for the provision of access to facilitate the construction of the pumping house and lake bed pipeline, the construction of the pumping house, and a section of the Q1 dam will require the removal of 0.5ha (10.7%) of broadleaved semi-natural woodland.	C	Adverse	Permanent	Low	Minor	No mitigation has been proposed.	The loss of habitat is no significant in terms of EIA.	Minor
		Trees have the potential to be damaged or killed through root compaction by vehicles or machinery tracking over or repeated foot traffic over the roots, and directly damaged by vehicles or machinery knocking limbs off or damaging the trunks during construction.	C	Adverse	Temporary	Medium	Minor	Where the woodland is to be retained it will be protected during construction according to the requirements of BS5837:2012 Trees in relation to design, demolition and construction to ensure no inadvertent damage to the woodland or individual species occurs. Site compounds	Mitigation will prevent access and damage to fenced areas.	Negligible

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								and stock piles will be kept within designated areas away from the woodland.		
		Trees have the potential to be damaged or killed through pollution and/or run off during construction.	C	Adverse	Temporary	Medium	Minor	Re-fuelling and servicing of vehicles will be carried out within a designated area with an impermeable base away from the woodland.	Mitigation will prevent access and damage to fenced areas.	Negligible
		No potential effects associated with operation.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Coniferous Woodland Plantation	–	The potential effects of the Development on coniferous woodland – plantation are assessed under Coed Donen Las LWS.								
Coniferous Woodland Recently Felled	– Negligible	Habitat loss: Development will require the removal of 8.0ha (72.7%) of this habitat due to the creation of the proposed spoil heaps.	C	Adverse	Permanent	Medium	Negligible	No mitigation has been proposed.	The loss of habitat is no significant in terms of EIA.	Minor
		The habitat has the potential to be damaged or killed through root compaction by vehicles or machinery tracking over or repeated foot traffic during construction.	C	Adverse	Permanent	Medium	Negligible	Good site working practices will be adhered to. Adjacent habitats to be retained will be fenced off.	Mitigation will prevent access to fenced areas.	Negligible
		The habitat has the potential to be damaged or killed through pollution and/or run off during construction.	C	Adverse	Temporary	Medium	Negligible	Good site working practices will be adhered to. Adjacent habitats to be retained will be fenced off.	Mitigation will prevent access to fenced areas.	Negligible
		No potential effects associated with operation	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

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Mixed Woodland – Semi-Natural	Low	Habitat loss: the enabling works for the provision of access to facilitate the construction of the pumping station and lake bed pipeline will require the removal of 0.1ha (2.3%) of this habitat.	C	Adverse	Permanent	Low	Negligible	No mitigation has been proposed.	The loss of habitat is no significant in terms of EIA.	Negligible
		Trees have the potential to be damaged or killed through root compaction by vehicles or machinery tracking over or repeated foot traffic over the roots, and directly damaged by vehicles or machinery knocking limbs off or damaging the trunks during construction.	C	Adverse	Temporary	Medium	Minor	Where the woodland is to be retained it will be protected during construction according to the requirements of BS5837:2012 Trees in relation to design, demolition and construction to ensure no inadvertent damage to the woodland or individual species occurs. Site compounds and stock piles will be kept within designated areas away from the woodland.	Mitigation will prevent access and damage to fenced areas.	Negligible
		Trees have the potential to be damaged or killed through pollution and/or run off during construction.	C	Adverse	Temporary	Medium	Minor	Re-fuelling and servicing of vehicles will be carried out within a designated area with an impermeable base away from the woodland.	Mitigation will prevent access and damage to fenced areas.	Negligible
		No potential effects associated with operation.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A



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Receptor	Value / Sensitivity	Effect	Phase of Effect C/O/D	Nature of Effect	Duration	Magnitude	Potential Significance	Summary of Mitigation	Residual Effect	Residual Significance
Scrub Scattered	Low	Habitat loss: The Development will require the the temporary disturbance and removal of 0.2ha (16.5%) for construction compounds etc and permanent disturbance and removal of 0.2ha (16.1%) of scattered scrub for the drilling of boreholes.	C	Adverse	Permanent	Low	Negligible	No mitigation has been proposed.	The loss of habitat is no significant in terms of EIA.	Negligible
		Scrub has the potential to be damaged or killed through root compaction by vehicles or machinery tracking over or repeated foot traffic over the roots, and directly damaged by vehicles or machinery knocking limbs off or damaging the trunks during construction.	C	Adverse	Temporary	Medium	Minor	Where the scrub is to be retained it will be protected during construction according to the requirements of BS5837:2012 Trees in relation to design, demolition and construction to ensure no inadvertent damage to the scrub or individual species occurs. Site compounds and stock piles will be kept within designated areas away from the scrub.	Mitigation will prevent access and damage to fenced areas.	Negligible
		Scrub has the potential to be damaged or killed through pollution and/or run off during construction.	C	Adverse	Temporary	Medium	Minor	Re-fuelling and servicing of vehicles will be carried out within a designated area with an impermeable base away from the scrub.	Mitigation will prevent access and damage to fenced areas.	Negligible
		No potential effects associated	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

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		with operation.								
Acid Grassland – Semi-Improved	Low	No potential effects associated with operation.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		Habitat loss: The Development will require the the temporary disturbance and removal of 1.6ha (33.2%) for construction compounds etc and permanent disturbance and removal of 0.01ha (0.2%) of acid grassland.	C	Adverse	Permanent	Low	Negligible	No mitigation has been proposed.	The loss of habitat is no significant in terms of EIA.	Negligible
Bracken– Scattered Bracken– Continuous	Negligible	No potential effects associated with construction or operation.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Marshy Grassland	Low	The Development will require the the temporary disturbance and/or permanent removal of 0.012ha (25.3%) of marshy grassland for the PRow diversion, some of which will be reinstated after completion of construction works. The habitat will be temporarily and/or permanently subject to light foot traffic which is unlikely to damage the habitat significantly.	C & O	Adverse	Temporary	Low	Negligible	No mitigation has been proposed.	The loss of habitat is no significant in terms of EIA.	Negligible



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Wet Dwarf Shrub Heath	Low	The Development will require the temporary disturbance and/or permanent removal of 0.1ha (26.7%) of wet dwarf shrub heath for the PRow diversion, some of which will be reinstated after completion of construction works. The habitat will be temporarily and/or permanently subject to light foot traffic which is unlikely to damage the habitat significantly.	C & O	Adverse	Temporary	Low	Negligible	No mitigation has been proposed.	The loss of habitat is not significant in terms of EIA.	Negligible
Dry Heath / Acid Grassland	Low	Habitat loss: the construction of the Q1 dam requires the removal of 2.1ha (12.3%) of this habitat.	C	Adverse	Permanent	Medium	Minor	No mitigation has been proposed.	The loss of habitat is not significant in terms of EIA.	Minor
		The dry heath/acid grassland habitat and vegetation adjacent to the Q1 dam has the potential to be damaged or killed through vehicles or machinery tracking over or repeated foot traffic.	C	Adverse	Temporary	Medium	Minor	Good site working practices will be adhered to. Adjacent habitats to be retained will be fenced off.	Mitigation will prevent access to fenced areas.	Negligible
		The dry heath/acid grassland habitat and vegetation adjacent to the Q1 dam has the potential to be damaged or killed through pollution and/or run off.	C	Adverse	Temporary	Medium	Minor	Good site working practices will be adhered to. Adjacent habitats to be retained will be fenced off.	Mitigation will prevent access to fenced areas.	Negligible
		No potential effects associated with operation.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Flush and Spring – Acid / Neutral Flush	Low	Light foot traffic due to PRow diversion.	C	Adverse	Temporary	Low	Negligible	No mitigation has been proposed.	The effects on the habitats are not significant in terms of EIA.	Negligible
		No potential effects associated with operation.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Running Water	Low	The unnamed watercourses within the Order Limits have the potential impact the aquatic	C	Adverse	Temporary	Medium	Minor	Pollution prevention measures in line with current NRW	Mitigation will reduce the likelihood of pollution incidents and	Negligible

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Receptor	Value / Sensitivity	Effect	Phase of Effect C/O/D	Nature of Effect	Duration	Magnitude	Potential Significance	Summary of Mitigation	Residual Effect	Residual Significance
		environment through pollution of surface water runoff from vehicle fuel, oil, chemicals, silt or dust during construction could result in discharge of contaminated water.						guidelines will be adhered to.	the potential effect of such incidents.	
		No potential effects associated with operation.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Running Water – Nant-y-Betws	Low	The Nant-y-Betws has the potential to be damaged or killed through vehicles or machinery tracking over or repeated foot traffic.	C	Adverse	Temporary	Medium	Minor	Good site working practices will be adhered to. Adjacent habitats to be retained will be fenced off.	Mitigation will prevent access to fenced areas.	Negligible
		The construction of the spillway into the Nant-y-Betws and slate mounds have the potential to impact the aquatic environment through pollution of surface water runoff from vehicle fuel, oil, chemicals, silt or dust during construction could result in discharge of contaminated water.	C	Adverse	Temporary	Medium	Minor	Pollution prevention measures in line with current NRW guidelines will be adhered to. Runoff from the site would be filtered and attenuated using silt traps and settlement ponds.	Mitigation will reduce the likelihood of pollution incidents and the potential effect of such incidents.	Negligible
		Alteration of hydrological regime.	O	Adverse	Temporary	Negligible	Negligible	No mitigation proposed.	Discharge from the Q1 spillway will alter the flow regime of the Nant-y-Betws. However, the discharge from the spillway will be intermittent and unlikely to permanently alter the flow regime of the Nant-y-Betws. However, the Q1 spillway overflow is unlikely to be used unless there is a failure of the pumping system,	Negligible

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Receptor	Value / Sensitivity	Effect	Phase of Effect C/O/D	Nature of Effect	Duration	Magnitude	Potential Significance	Summary Mitigation	Residual Effect	Residual Significance
									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. However, if the estimated annual rainfall to Q1 was discharged to the Nant-y-Betws and spread evenly throughout the year it would be comparable with natural runoff from the catchment in response to the incident rainfall. 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.	
		Nutrient enrichment.	O	Adverse	Permanent	Negligible	Negligible	Monitoring of Llyn Padarn during abstraction. The water quality of the reservoirs in the Development will be monitored and trends evaluated in the context of any	Monitoring during abstraction will help to prevent uptake of nutrient-rich waters in times when phosphorus levels are elevated within the lake, for example, following overturn. As such this will help reduce the	Negligible

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Receptor	Value / Sensitivity	Effect	Phase of Effect C/O/D	Nature of Effect	Duration	Magnitude	Potential Significance	Summary of Mitigation	Residual Effect	Residual Significance
								remedial action that might be needed on a periodic basis.  Discharge quality and rate will be controlled by an discharge consent issued by NRW if appropriate.	likelihood of the system containing nutrient-rich water.  Monitoring of the quarry water will enable remedial action to be put into place.	
		Reduction of water quality.	O	Adverse	Permanent	Negligible	Negligible	No proposed mitigation.	The operation of the Development will not significantly alter the quality of water that will be discharged into the Nant-y-Betws, which has been tested and found not to contain any significant contaminants. Therefore, it is not expected that overflow into Afon Nant-y-Betws will change the natural concentration and variability of the physio-chemical parameters (i.e. ammonia, dissolved oxygen, and acid neutralising capacity).	Negligible
		Introduction of invasive or non-native species.	O	Adverse	Permanent	Medium	Minor	The water in Q1 and Q6 were found to contain no invasive or non-native species of plant or animal. However, the aquatic survey of Llyn Padarn in 2015 identified the presence of	Due to the distance between the nearest specimen and the abstraction pipe it is unlikely that Nuttall's pondweed will be transferred into Q1 and Q6 during abstraction, and then into the Nant-y-Betws via the Q1	Negligible

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								Nuttall's pondweed within the lagoons on the south-western shore, either side of where the spillway is proposed to be located; the nearest plant is approximately 75m away.	spillway.	
		<p>Aquatic habitat and species it supports to be affected by temperature change caused by:</p> <p>Friction in the system; and</p> <p>Draw of discharge water from colder depths of quarries.</p> <p>Use of a low-friction system.</p> <p>Water temperature will vary diurnally / seasonally and will be moderated by the bathymetry of the reservoirs, the operation of the plant / 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. In addition, 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.</p> <p>The Q1 spillway overflow is unlikely to be used unless there is a failure of the pumping</p>	O	Adverse	Permanent	Negligible	Negligible	Mitigation by design, as such no further mitigation has been provided.	Temperature will be monitored in pumping station and controlled via the environmental permit. This will ensure that water temperature within the pumped storage system is within local natural tolerances.	Negligible

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		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 Nant-y-Betws are also likely to be higher offering increased dilution and dispersion of the Q1 spillway overflow waters.								
Standing Water	Low	No potential effects associated with construction or operation.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Standing Water – Oligotrophic	Low	Increase in aquatic habitat due to the infilling with water of Q1 and Q6. However, no overall benefits to wildlife due to movement of the water between the two quarries.	C	Neutral	Neutral	Neutral	Neutral	No mitigation required.	The effect is not significant in terms of EIA.	Neutral
		The construction of the two dams has the potential to damage the habitat through pollution and/or run off.	C	Adverse	Temporary	Medium	Minor	Pollution prevention measures in line with current NRW guidelines will be adhered to.	Mitigation will reduce the likelihood of pollution incidents and the potential effect of such incidents.	Negligible
		No potential effects associated with operation.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		The potential effects on the water in Llyn Padarn have been assessed under Llyn Padarn SSSI.								
Quarry	Medium	Habitat loss: the filling of Q1 and Q6 with water will result in the loss of this habitat.	C	Adverse	Permanent	Medium	Moderate	Enhancement to the retained quarries will be made through the installation of stock-proof fencing.	Mitigation will compensate for the loss of Q1 and Q6.	Minor
		The construction of the Q6 dam has the potential to damage the Q7 habitat through vehicles or machinery tracking over or repeated foot traffic.	C	Adverse	Temporary	Medium	Moderate	Good site working practices will be adhered to. Adjacent habitats to be retained will be	Mitigation will prevent access to fenced areas.	Negligible



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								fenced off.		
		The construction of the Q6 dam has the potential to damage the Q7 habitat through pollution and/or run off.	C	Adverse	Temporary	Medium	Moderate	Re-fuelling and servicing of vehicles will be carried out within a designated area with an impermeable base away from the retained habitats. Site compounds and stock piles will be kept within designated areas away from the retained habitats.	Mitigation will reduce the likelihood of pollution incidents and the potential effect of such incidents.	Negligible
		No potential effects associated with operation.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Spoil Waste (Slate)	Low	Habitat loss: the creation of the two dams will result in the loss of 9.05ha (32%) of this habitat. Habitat creation: 8.85ha of spoil habitat will be created to the west of the site.	C	Neutral	Permanent	N/A	Negligible	No mitigation has been proposed.	The loss of habitat is compensated for by the gain of habitat elsewhere. Overall, virtually no change in the total area of habitat.	Negligible
		No potential effects associated with operation.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Bare Ground	Negligible	Habitat loss: 9.1ha (16%) of this habitat will be removed due to the construction of the two dams and turbine house.	C	Neutral	Permanent	Negligible	Negligible	This habitat has negligible value, as such no mitigation has been proposed.	The loss of this habitat is no significant in terms of EIA.	Negligible
		No potential effects associated with operation.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A



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Wall	Low	Loss of habitat.	C	Adverse	Temporary	Medium	Minor	No mitigation has been proposed.	The loss of habitat is no significant in terms of EIA.	Minor
		The retained habitat has the potential to be damaged or degraded.	C	Adverse	Temporary	Medium	Minor	Good site working practices will be adhered to. Adjacent habitats to be retained will be fenced off.	Mitigation will prevent access to fenced areas.	Negligible
		No potential effects associated with operation.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Lichens	Medium	Loss of species: three species will be removed due to the construction of the Q1 dam.	C	Adverse	Permanent	Medium	Moderate	Translocate slate slabs colonised by notable lichens to areas with similar environmental conditions.	Mitigation will help to prevent loss of notable lichens.	Negligible
		Seven species of lichens have the potential to be damaged or destroyed by the construction of the Q1 dam through vehicles or people tracking over.	C	Adverse	Permanent	Medium	Moderate	Good site working practices will be adhered to. Adjacent habitats to be retained will be fenced off.	Mitigation will prevent access to fenced areas.	Negligible
		Seven species of lichens have the potential to be damaged or destroyed by the construction of the Q1 dam runoff and/or pollution.	C	Adverse	Permanent	Medium	Moderate	Pollution prevention measures in line with current NRW guidelines will be adhered to.	Mitigation will reduce the likelihood of pollution incidents and the potential effect of such incidents.	Negligible
		No potential effects associated with operation.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

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Bryophytes	Low	No potential effects associated with construction or operation.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Fungi	Medium	No potential effects associated with construction or operation.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Invertebrates, including the small theridiid spider ( <i>Rugathodes bellicosus</i> )	Medium	Loss of heath (11%), quarries and woodland habitats (11%) during construction.	C	Adverse	Permanent	Low	Minor	No mitigation has been proposed.	The loss of habitat with the potential to support invertebrates is not significant in terms of EIA. The loss of spoil heaps supporting the small theridiid spider ( <i>Rugathodes bellicosus</i> ) will be compensated for through the provision of additional spoil heaps as part of the Development. In addition, there is similar habitat of equal or greater quality in abundance within the wider landscape.	Negligible

**Table 7-18 – Summary of Assessment**

Description of Receptor		Description of Potential Effect						Description of Residual Effect		
Receptor	Value / Sensitivity	Effect	Phase of Effect C/O/D	Nature of Effect	Duration	Magnitude	Potential Significance	Summary of Mitigation	Residual Effect	Residual Significance
		<p>Pollution and dust during construction may smother vegetation and adversely affect the ability of invertebrates to use the plants.</p> <p>The water bodies and soils within and adjacent to the Development could become polluted which could cause long term damage to productivity and diversity of the aquatic and terrestrial habitat, adversely affecting invertebrates.</p>	C	Adverse	Temporary	Medium	Minor	Pollution prevention measures in line with current NRW guidelines will be adhered to.	Mitigation will reduce the likelihood of pollution incidents and the potential effect of such incidents.	Negligible
		Routine maintenance of the lake bed pipeline and pumping house has the potential to affect invertebrates by pollution and/or runoff.	O	Adverse	Temporary	Medium	Minor	<p>Pollution prevention measures in line with current NRW guidelines will be adhered to.</p> <p>A site management plan will be in place to inform maintenance team of how to reduce likelihood of pollution incidents.</p>	Mitigation will reduce the likelihood of pollution incidents and the potential effect of such incidents.	Negligible
Fish	Low	Pollution of surface water runoff from vehicle fuel, oil, chemicals or silt during construction could result in discharge of contaminated water to the water bodies adjacent to or within the Order Limits. Pollution may cause long term damage to	C	Adverse	Temporary	Medium	Minor	Pollution prevention measures in line with current NRW guidelines will be adhered to.	Mitigation will reduce the likelihood of pollution incidents and the potential effect of such incidents.	Negligible

Table 7-18 – Summary of Assessment										
Description of Receptor		Description of Potential Effect						Description of Residual Effect		
Receptor	Value / Sensitivity	Effect	Phase of Effect C/O/D	Nature of Effect	Duration	Magnitude	Potential Significance	Summary of Mitigation	Residual Effect	Residual Significance
		productivity and diversity of the aquatic habitat, which could have an adverse effect on fish species. Silt will increase the turbidity of the water and potentially smother fish spawning grounds.								
		Routine maintenance of the lake bed spillway and pumping house has the potential to affect fish by pollution and/or runoff.	O	Adverse	Temporary	Medium	Minor	Pollution prevention measures in line with current NRW guidelines will be adhered to. A site management plan will be in place to inform maintenance team of how to reduce likelihood of pollution incidents.	Mitigation will reduce the likelihood of pollution incidents and the potential effect of such incidents.	Negligible
		Noise is unlikely to an effect beyond the immediate vicinity (less than 50m). Vibration during construction has the potential to disturb fish within Nant-y-Betws and Llyn Padarn. It is unlikely that the Nant-y-Betws supports protected migratory fish. However, vibration could temporarily affect common species.  Vibrations dissipate in water, as such any effects on fish will be limited to a precautionary 500m radius and will be temporary.	C	Adverse	Temporary	Negligible	Negligible	No mitigation proposed.	The effects of noise and vibration on fish are not significant in terms of EIA.	Negligible
Fish – Arctic Charr	High	Loss of potential spawning grounds through construction of spillway.	C	Adverse	Permanent	Low	Moderate	Loss of a very small area of potential spawning grounds. Previous surveys within the area did	Mitigation will be implemented to reduce the impact of spawning ground loss on Arctic charr if found present during the pre-	Minor

**Table 7-18 – Summary of Assessment**

Description of Receptor		Description of Potential Effect						Description of Residual Effect		
Receptor	Value / Sensitivity	Effect	Phase of Effect C/O/D	Nature of Effect	Duration	Magnitude	Potential Significance	Summary of Mitigation	Residual Effect	Residual Significance
								not confirm the survey areas as spawning grounds. Overall loss of potential habitat is minimal.  Pre-construction surveys will be undertaken to ascertain presence/absence of Arctic charr spawning grounds within the vicinity of the works. If present then mitigation will be implemented to help prevent disturbance and/or loss.	construction surveys.	
		Pollution of surface water runoff from vehicle fuel, oil, chemicals or silt during construction could result in discharge of contaminated water to the water bodies adjacent to or within the Order Limits. Pollution may cause long term damage to productivity and diversity of the aquatic habitat, which could have an adverse effect on Arctic charr. Silt will increase the turbidity of the water and potentially smother Arctic charr spawning grounds.	C	Adverse	Temporary	Medium	Moderate	Pre-construction surveys will be undertaken to ascertain presence/absence of Arctic charr spawning grounds within the vicinity of the works. If present then mitigation will be implemented to help prevent disturbance and/or loss.  Pollution prevention measures in line with current NRW guidelines will be adhered to. Measure will be undertaken to	Mitigation will reduce the likelihood of pollution incidents and the potential effect of such incidents.	Minor

Table 7-18 – Summary of Assessment										
Description of Receptor		Description of Potential Effect						Description of Residual Effect		
Receptor	Value / Sensitivity	Effect	Phase of Effect C/O/D	Nature of Effect	Duration	Magnitude	Potential Significance	Summary of Mitigation	Residual Effect	Residual Significance
								prevent sediment disturbance within Llyn Padarn, this in turn will help prevent effects on Arctic charr.		
		It is extremely unlikely for Arctic charr to be drawn into the pipe during abstraction resulting in injury and killing due to the provision of a grilled intake on the pipe.	C	Adverse	Temporary	Negligible	Minor	Mitigation proposed as part of the design: grilled intake to prevent uptake of fish during abstraction.	Mitigation will reduce the likelihood of fish being drawn into the pipe during abstraction.	Minor
		Noise is unlikely to an effect beyond the immediate vicinity (less than 50m). Vibration during construction has the potential to disturb Arctic charr. Vibrations dissipate in water, as such any effects on Arctic charr will be limited to a precautionary 500m radius and will be temporary. There is potential for disturbance to spawning Arctic charr.	C	Adverse	Temporary	Medium	Moderate	Pre-construction surveys will be undertaken to ascertain presence/absence of Arctic charr spawning grounds within the vicinity of the works. If present then mitigation will be implemented to help prevent disturbance and/or loss such as restrictions on vibration and/or noise generating activities during spawning season.	Post-mitigation, the effects of noise and vibration on fish are not significant in terms of EIA.	Minor
		No invasive species with the potential to effect Arctic charr were identified within Q1 or Q6 during the surveys.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A



Table 7-18 – Summary of Assessment										
Description of Receptor		Description of Potential Effect						Description of Residual Effect		
Receptor	Value / Sensitivity	Effect	Phase of Effect C/O/D	Nature of Effect	Duration	Magnitude	Potential Significance	Summary of Mitigation	Residual Effect	Residual Significance
		Routine maintenance of the lake bed spillway and pumping house has the potential to affect Arctic charr by pollution and/or runoff.	O	Adverse	Temporary	Medium	Moderate	<p>Pollution prevention measures in line with current NRW guidelines will be adhered to.</p> <p>A site management plan will be in place to inform maintenance team of how to reduce likelihood of pollution incidents.</p>	Mitigation will reduce the likelihood of pollution incidents and the potential effect of such incidents.	Negligible
Amphibians	Low	Direct damage to water bodies or suitable terrestrial through vehicles, machinery or people tracking over has the potential to affect amphibians.	C	Adverse	Temporary	Medium	Minor	<p>Good site working practices will be adhered to.</p> <p>Adjacent habitats to be retained will be fenced off.</p>	Mitigation will prevent access to fenced areas.	Negligible
		Water bodies and suitable terrestrial within the Order Limits have the potential to be degraded by runoff and/or pollution which has the potential to affect any amphibians that may be present during construction.	C	Adverse	Temporary	Medium	Minor	<p>Pollution prevention measures in line with current NRW guidelines will be adhered to.</p>	Mitigation will reduce the likelihood of pollution incidents and the potential effect of such incidents.	Negligible
		Routine maintenance of the lake bed spillway and pumping station has the potential to affect amphibians by pollution and/or runoff.	O	Adverse	Temporary	Medium	Minor	<p>Pollution prevention measures in line with current NRW guidelines will be adhered to.</p> <p>A site management plan will be in place to inform maintenance team of how to reduce likelihood of</p>	Mitigation will reduce the likelihood of pollution incidents and the potential effect of such incidents.	Negligible



Table 7-18 – Summary of Assessment										
Description of Receptor		Description of Potential Effect						Description of Residual Effect		
Receptor	Value / Sensitivity	Effect	Phase of Effect C/O/D	Nature of Effect	Duration	Magnitude	Potential Significance	Summary of Mitigation	Residual Effect	Residual Significance
								pollution incidents.		
Reptiles	Medium	Habitat loss: removal of quarries, spoil, grassland, scrub and woodland during construction.	C	Adverse	Permanent	Low	Minor	No mitigation is proposed.	There will be a large proportion of habitats with the potential to support reptiles retained within the Order Limits. There are similar habitats of equal or greater value with the potential to support reptiles in the immediate surroundings. Additional spoil piles are being created as part of the construction works.	Minor
		Habitat degradation – (pollution, contamination and/or machines and people tracking over suitable retained habitat during construction.	C	Adverse	Temporary	Medium	Moderate	Good site working practices will be adhered to. Adjacent habitats to be retained will be fenced off. Pollution prevention measures in line with current NRW guidelines will be adhered to.	Mitigation will prevent access to fenced areas. Mitigation will reduce the likelihood of pollution incidents and the potential effect of such incidents.	Negligible
		Direct injury or death – crushed by machinery or foot during construction.	C	Adverse	Permanent	High	Moderate	As only a small area of vegetation will be removed by the construction works habitat management will be undertaken to discourage reptiles from the area before soil stripping.	Mitigation will remove reptiles from working area and prevent access to fenced areas, this will reduce the likelihood of injury or killing.	Negligible

Table 7-18 – Summary of Assessment										
Description of Receptor		Description of Potential Effect						Description of Residual Effect		
Receptor	Value / Sensitivity	Effect	Phase of Effect C/O/D	Nature of Effect	Duration	Magnitude	Potential Significance	Summary of Mitigation	Residual Effect	Residual Significance
								Retained vegetation will be fenced off to prevent injury or killing. Good site working practices adhered to- location of site compounds.		
		Increased disturbance from noise, movement and vibration. The effects will be temporary and localised.	C	Adverse	Temporary	Low	Minor	No mitigation proposed.	The effects are not significant in terms of EIA.	Minor
		There will be no effects on reptiles associated with the operation of the Development.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Birds: Schedule 1 Species, BOCC Red and Amber List Species	High	Schedule 1 habitat destruction –removal potential nesting habitat through removal of quarries.	C	Adverse	Permanent	Negligible	Minor	No mitigation is proposed.	There will be no direct impact on Schedule 1 species as they were found not to be using Q1 or Q6 during the bird surveys. A number of quarries retained within the Order Limits, and there are an abundance of similar habitats of equal or greater value with the potential to support birds in the immediate surroundings.	Minor
		BOCC Red and Amber List habitat destruction –removal potential nesting habitat through removal of quarries and woody vegetation.	C	Adverse	Permanent	Negligible	Minor	No mitigation is proposed.	A number of quarries and woody habitats will be retained within the Order Limits, and there are an abundance of similar habitats of equal or greater value with the potential to support birds in the immediate	Minor

**Table 7-18 – Summary of Assessment**

Description of Receptor		Description of Potential Effect						Description of Residual Effect		
Receptor	Value / Sensitivity	Effect	Phase of Effect C/O/D	Nature of Effect	Duration	Magnitude	Potential Significance	Summary of Mitigation	Residual Effect	Residual Significance
									surroundings.	
		Disturbance of Schedule 1 nesting birds during construction and operational maintenance.	O	Adverse	Permanent	Medium	Moderate	To avoid visual disturbance to breeding Schedule 1 birds, it is recommended that an ECoW is present within the Order Limits to help minimise disturbance to Schedule 1 species during nesting season (March – July inclusive). Access to the known nesting area will be prohibited during nesting season for Schedule 1 species.	Mitigation will prevent nesting birds being disturbed and an offence being committed.	Negligible
		Disturbance of BOCC Red and Amber List Species nesting birds during construction and operational maintenance.	O	Adverse	Permanent	Medium	Moderate	To avoid disturbance to breeding birds, it is recommended that removal of vegetation with the potential to support nesting birds (woodland, trees, bracken and scrub) is to be undertaken outside of breeding bird season (clearance October – February inclusive). If vegetation clearance is undertaken during breeding bird	Mitigation will prevent nesting birds being disturbed and an offence being committed. Mitigation will prevent access to fenced areas.	Negligible

Table 7-18 – Summary of Assessment										
Description of Receptor		Description of Potential Effect						Description of Residual Effect		
Receptor	Value / Sensitivity	Effect	Phase of Effect C/O/D	Nature of Effect	Duration	Magnitude	Potential Significance	Summary of Mitigation	Residual Effect	Residual Significance
								season (from March to September inclusive) the area will first be inspected by an ecologist a maximum of 48 hours before work begins in an area. If any nests are found, work will have to be halted and the nest left undisturbed with a buffer zone until the chicks have fledged. This could take up to six weeks.  Any retained vegetation will be fenced off during construction to prevent vehicles, machinery and site staff tracking onto and over it.		
		Dust settling on vegetation impeding the ability of chough to feed.	C	Adverse	Temporary	Medium	Moderate	Measures will be employed to ensure that dust is minimised during the construction works. Air Quality – Chapter 13 has further details on minimisation of dust.	Mitigation will minimise the effects of dust.	Negligible

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Receptor	Value / Sensitivity	Effect	Phase of Effect C/O/D	Nature of Effect	Duration	Magnitude	Potential Significance	Summary of Mitigation	Residual Effect	Residual Significance
		There will be no effects on birds associated with the operation of the Development.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Other Breeding Birds – Common Species	Low	Habitat destruction –removal potential nesting habitat through removal of woody vegetation.	C	Adverse	Permanent	Negligible	Negligible	No mitigation is proposed.	A number of woody habitats will be retained within the Order Limits, and there are an abundance of similar habitats of equal or greater value with the potential to support birds in the immediate surroundings.	Negligible
		Disturbance of nesting birds during construction and operational maintenance.	C	Adverse	Permanent	Medium	Minor	To avoid disturbance to breeding birds, it is recommended that removal of vegetation with the potential to support nesting birds (woodland, trees, bracken and scrub) is to be undertaken outside of breeding bird season (clearance October – February inclusive).  If vegetation clearance is undertaken during breeding bird season (from March to September inclusive) the area	Mitigation will prevent nesting birds being disturbed and an offence being committed.  Mitigation will prevent access to fenced areas.	Negligible

Table 7-18 – Summary of Assessment										
Description of Receptor		Description of Potential Effect						Description of Residual Effect		
Receptor	Value / Sensitivity	Effect	Phase of Effect C/O/D	Nature of Effect	Duration	Magnitude	Potential Significance	Summary of Mitigation	Residual Effect	Residual Significance
								<p>will first be inspected by an ecologist a maximum of 48 hours before work begins in an area. If any nests are found, work will have to be halted and the nest left undisturbed with a buffer zone until the chicks have fledged. This could take up to six weeks.</p> <p>Any retained vegetation will be fenced off during construction to prevent vehicles, machinery and site staff tracking onto and over it.</p>		
		There will be no effects on birds associated with the operation of the Development.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Table 7-18 – Summary of Assessment										
Description of Receptor		Description of Potential Effect						Description of Residual Effect		
Receptor	Value / Sensitivity	Effect	Phase of Effect C/O/D	Nature of Effect	Duration	Magnitude	Potential Significance	Summary of Mitigation	Residual Effect	Residual Significance
Polecat	Low	Collision with construction traffic during the day by females in summer.	C	Adverse	Temporary	Medium	Minor	Reduced speed limits will reduce the likelihood of collision. Site inductions and tool box talks will raise awareness of protected species collisions. Any sightings or collisions will be recorded and submitted to the Local Record Centre to aid local knowledge of the species.	If mitigation is undertaken residual effects will be minimised.	Negligible
		There will be no effects on polecats associated with the operation of the Development.	N/A	Neutral	N/A	N/A	Neutral	N/A	N/A	Neutral
Badgers	Low	Habitat loss	C	Adverse	Permanent	Low	Negligible	No mitigation proposed.	There will be removal of 18% of the broadleaved woodland. This habitat type is abundant within the Order Limits and within the wider landscape.	Negligible
		Loss of habitat through pollution, dust or direct damage.	C	Adverse	Temporary	Low	Negligible	Pollution prevention measures in line with current guidelines will be adhered to. CoCP to be prepared before the start of construction along with Tool Box Talks to brief site staff during the site	Mitigation will reduce the likelihood of pollution incidents and the potential effect of such incidents.	Negligible



Table 7-18 – Summary of Assessment										
Description of Receptor		Description of Potential Effect						Description of Residual Effect		
Receptor	Value / Sensitivity	Effect	Phase of Effect C/O/D	Nature of Effect	Duration	Magnitude	Potential Significance	Summary of Mitigation	Residual Effect	Residual Significance
								induction on all ecological issues affecting the site.		
		Direct destruction / disturbance of a newly created sett.	C	Adverse	Permanent	High	Moderate	Due to the mobile nature of these species and a record of an active sett within the Order Limits, a walkover survey for newly established setts within 100m will be conducted within 6 months of construction commencing.	If any new setts are identified within the vicinity of the construction boundary appropriate measures can be employed to prevent an offence being committed and avoid disturbance to the sett. If this is not possible, and if required, appropriate licences sought.	Negligible
		Commuting and/or foraging badgers: Increased disturbance by humans due to increased access. Noise and/or vibration during construction and operation.	C	Adverse	Permanent	Low	Negligible	Construction and maintenance activities should avoid working at least 1 hour before dusk until 1 hour after dawn, when otters are most active. Avoid external lighting during construction and operation. Good practice during construction, as outline in the above text, implemented via a CoCP and monitored by an ECoW will mitigate the likelihood and extent of noise and vibration.	No badger setts identified within 100m of works. If any new setts are identified within the vicinity of the construction boundary appropriate measures can be employed to prevent an offence being committed. There will be a small residual effect in that the creation of new roads will increase the accessibility of the area to people and vehicles.	Negligible

Table 7-18 – Summary of Assessment										
Description of Receptor		Description of Potential Effect						Description of Residual Effect		
Receptor	Value / Sensitivity	Effect	Phase of Effect C/O/D	Nature of Effect	Duration	Magnitude	Potential Significance	Summary of Mitigation	Residual Effect	Residual Significance
								<p>Noise or vibration within 30m (or 100m if blasting or drilling) of a badger sett will require a licence.</p> <p>Construction and maintenance activities should avoid working at least 1 hour before dusk until 1 hour after dawn, when badgers are most active.</p> <p>Site inductions and tool box talks will raise awareness of protected species.</p>		
		<p>Risk of collision with construction vehicles or vehicles during construction is unlikely.</p>	C	Adverse	Permanent	Low	Negligible	<p>Speed limits on the access tracks.</p> <p>Site inductions and tool box talks will raise awareness of protected species collisions.</p> <p>Any sightings or collisions will be recorded and submitted to the Local Record Centre to aid local knowledge of the species.</p>	<p>If mitigation is undertaken residual effects will be minimised.</p> <p>Reporting fatalities will help to monitor the effect and implement further mitigation if required.</p>	Negligible

Table 7-18 – Summary of Assessment										
Description of Receptor		Description of Potential Effect						Description of Residual Effect		
Receptor	Value / Sensitivity	Effect	Phase of Effect C/O/D	Nature of Effect	Duration	Magnitude	Potential Significance	Summary of Mitigation	Residual Effect	Residual Significance
		Badgers could become trapped in excavations during construction.	C	Adverse	Temporary	Medium	Minor	Trenches and excavations will be closed at night to prevent badgers from entering or be fitted with a ramp to allow mammals to escape.	Measures will prevent badgers becoming trapped should they enter trenches or excavations.	Negligible
		There will be no effects on badgers associated with the operation of the Development.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Water Vole	Negligible	Damage to habitat outside of Order Limits through pollution or dust.	C	Adverse	Temporary	Low	Negligible	Pollution prevention measures in line with current guidelines will be adhered to. CoCP to be prepared before the start of construction along with Tool Box Talks to brief site staff during the site induction on all ecological issues affecting the site.	Mitigation will reduce the likelihood of pollution incidents and the potential effect of such incidents.	Negligible
		Noise and/or vibration during construction and operation. No water vole burrows identified within 100m of proposed works.	C	Adverse	Temporary	Low	Negligible	Good practice during construction, as outline in the above text, implemented via a CoCP and monitored by an Ecological Clerk of Works will mitigate the likelihood and extent of noise and vibration.	If mitigation is undertaken residual effects will be limited to temporary periods.	Negligible

Table 7-18 – Summary of Assessment										
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Receptor	Value / Sensitivity	Effect	Phase of Effect C/O/D	Nature of Effect	Duration	Magnitude	Potential Significance	Summary of Mitigation	Residual Effect	Residual Significance
								Noise or vibration within 30m (or 100m if blasting or drilling) of a burrow will require a licence. Site inductions and tool box talks will raise awareness of protected species.		
		Routine maintenance of the lake bed spillway and pumping station has the potential to affect water vole by pollution and/or runoff.	O	Adverse	Temporary	Low	Negligible	Pollution prevention measures in line with current NRW guidelines will be adhered to. A PPP will be in place to inform maintenance team of how to reduce likelihood of pollution incidents.	Mitigation will reduce the likelihood of pollution incidents and the potential effect of such incidents.	Negligible
Otters	Negligible	Damage to adjacent habitat through pollution or dust.	C	Adverse	Temporary	Low	Negligible	Pollution prevention measures in line with current guidelines will be adhered to. CoCP to be prepared before the start of construction along with Tool Box Talks to brief site staff during the site induction on all ecological issues affecting the site.	Mitigation will reduce the likelihood of pollution incidents and the potential effect of such incidents.	Negligible
		Noise and/or vibration during construction and operation within Llyn Pardarn No otter holts / couches identified within	C & O	Adverse	Temporary	Low	Negligible	Good practice during construction, as outline in the above text,	If mitigation is undertaken residual effects will be limited to temporary periods.	Negligible

Table 7-18 – Summary of Assessment										
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Receptor	Value / Sensitivity	Effect	Phase of Effect C/O/D	Nature of Effect	Duration	Magnitude	Potential Significance	Summary of Mitigation	Residual Effect	Residual Significance
		100m of proposed works.						implemented via a CoCP and monitored by an Ecological Clerk of Works will mitigate the likelihood and extent of noise and vibration.  Noise or vibration within 30m (or 100m if blasting or drilling) of a holt / couch will require a licence.  Site inductions and tool box talks will raise awareness of protected species.		
		Routine maintenance of the lake bed pipeline and pumping house has the potential to affect otters by pollution and/or runoff.	O	Adverse	Temporary	Medium	Negligible	Pollution prevention measures in line with current NRW guidelines will be adhered to.  A site management plan will be in place to inform maintenance team of how to reduce likelihood of pollution incidents.	Mitigation will reduce the likelihood of pollution incidents and the potential effect of such incidents.	Negligible
Red Squirrel	Low	Kill or injure a red squirrel, or damage or destroy any structure or place a red squirrel uses for shelter or protection (drey).	C	Adverse	Permanent	High	Moderate	A pre-construction survey will be undertaken on the trees to be removed. Should any dreys be identified within the trees to be removed initially consultation will be undertaken	If mitigation is undertaken residual effects will be minimised.	Negligible

Table 7-18 – Summary of Assessment										
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Receptor	Value / Sensitivity	Effect	Phase of Effect C/O/D	Nature of Effect	Duration	Magnitude	Potential Significance	Summary of Mitigation	Residual Effect	Residual Significance
								to ascertain whether the plans can be micro-sited thereby negating the requirement to remove the tree. If this cannot be accommodated a camera trap will be set by the drey to ascertain use by red or grey squirrels. Should the results of the camera trap reveal usage by a red squirrel NRW will be consulted on how to proceed.		
		Noise, vibration and increase activity has the potential to disturb a red squirrel while it is occupying a place for shelter or protection (drey).	C	Adverse	Temporary	Medium	Minor	To help prevent disturbance to red squirrels during the breeding season (March – October) it is recommended that a walkover survey be conducted to identify dreys within a 50m buffer. An ECoW will monitor the dreys for activity and/or camera traps will be used to ascertain usage by grey or red squirrels. If works are deemed to be disturbing red squirrels works will halt and NRW	If mitigation is undertaken residual effects will be minimised.	Negligible

**Table 7-18 – Summary of Assessment**

Description of Receptor		Description of Potential Effect						Description of Residual Effect		
Receptor	Value / Sensitivity	Effect	Phase of Effect C/O/D	Nature of Effect	Duration	Magnitude	Potential Significance	Summary of Mitigation	Residual Effect	Residual Significance
								consulted.		
Bats	High	Disturbance from vibration	C	Adverse	Temporary	Negligible	Minor	The temporary and sporadic nature of the vibration coupled with the low levels of vibration likely to occur in the retained tunnels supporting roosting bats means that vibration is unlikely to cause a disturbance to roosting bats.	Site conditions dictate that any residual effects will be minor.	Minor
		Roost modification	C	Adverse	Permanent	Medium	Moderate	Where sections of Tunnel 2 and 14 can be retained they will be retained for use by bats. Exclusion of bats to avoid injury and killing. Enhancement of retained tunnels to retain a roosting resource within the Development.	Retained roosting resource within the Order Limits. Retained tunnels offer increased crevice and perching roost spaces.	Minor
		Roost Loss - Tunnels	C	Adverse	Permanent	Medium	Moderate	Exclusion of bats to avoid injury and killing. Enhancement of retained tunnels to retain a roosting resource within the Development.	Retained roosting resource within the Order Limits. Retained tunnels offer increased crevice and perching roost spaces.	Minor
		Roost Loss - Trees	C	Adverse	Permanent	Medium	Moderate	Trees have not been surveyed for bat roosts. No mitigation currently	Potential loss of tree roosts unknown. However all suitable mitigation will be	Moderate



Table 7-18 – Summary of Assessment										
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Receptor	Value / Sensitivity	Effect	Phase of Effect C/O/D	Nature of Effect	Duration	Magnitude	Potential Significance	Summary of Mitigation	Residual Effect	Residual Significance
								proposed.	implemented prior to construction commencing	
		Isolation and Fragmentation	C	Adverse	Permanent	Low	Moderate	Habitat Management to improve quality of foraging and commuting habitats	Minimal change for the current condition	Minor
		Decreased disturbance due to increase security during operation.	O	Beneficial	Permanent – for life of the Development	Low	Moderate	None proposed-positive impact predicted	Decrease disturbance to roosting bats in the retained tunnels which will be of benefit to roosting bats.	Moderate Beneficial
		Disturbance form lighting during operation.	O	Adverse	Permanent – for life of the Development	Low	Moderate	Design lighting in line with Bats and Lighting Guidelines. Lighting spill will avoid retained roost locations.	Foraging and commuting connectivity retained. No impact on retained roosts.	Minor
Invasive Species	Low	Spread of Himalayan balsam, rhododendron, Cotoneaster and Nuttall’s pondweed during construction and operation (routine maintenance).	C & O	Adverse	Permanent	Medium	Minor	Appointment of a contractor to create a management plan to detail the removal and/or management of the species within the Order Limits and action will be required. In addition, details of the locations of the invasive species will be presented in the HMP, and regular surveys will be undertaken to update this information to help prevent disturbance and/or spread of	Contractor will be aware of, manage and/or treat the invasive species as appropriate.	Negligible

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Receptor	Value / Sensitivity	Effect	Phase of Effect C/O/D	Nature of Effect	Duration	Magnitude	Potential Significance	Summary of Mitigation	Residual Effect	Residual Significance
								these species. The presence of Nuttall's pondweed within Llyn Padarn will be included in the CoCP and areas shown on a map. The information will be included in the toolbox talk prior to works commencing within Llyn Padarn to make contractor aware of its' location to help prevent disturbance and/or spread of the species.		
		No invasive plants were identified within Q1 and Q6.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

## 7.12 Summary

### *Construction*

- 7.12.1 The Development will have a permanent residual minor adverse effect on Llyn Padarn SSSI through the loss of lake bed habitat due to the spillway connection to the lake bed. The effect on Llyn Padarn SSSI is deemed to be not significant.
- 7.12.2 The Development will have a permanent residual minor adverse effect on Bwlch-y-Groed Quarry LWS through the loss of habitat due to the construction of the spoil heaps and Q1 dam. The effect on Bwlch-y-Groed Quarry LWS is deemed to be not significant.
- 7.12.3 The Development will have a permanent residual minor adverse effect on Coed Donen Las LWS through the loss of habitat due to the construction of the Q6 dam. The effect on Coed Donen Las LWS is deemed to be not significant.
- 7.12.4 The Development will have a permanent residual minor adverse effect on Llwyn Coed Heath LWS through the loss of habitat due to the construction of the Q6 dam. The effect on Llwyn Coed Heath LWS is deemed to be not significant.
- 7.12.5 The Development will have a permanent residual minor adverse effect on Pen Gilfach LWS through the loss of habitat to facilitate access for the construction of the pumping house and lake bed pipeline. The effect on Pen Gilfach LWS is deemed to be not significant.
- 7.12.6 The Development will have a permanent residual minor adverse effect on Cefn Du LWS through the loss of habitat to facilitate the construction of a section of the Q1 dam. The effect on Cefn Du LWS is deemed to be not significant.
- 7.12.7 The Development will have a permanent residual minor adverse effect on broadleaved semi-natural woodland through the loss of habitat due to the enabling works for the provision of access to facilitate the construction of the pumping station and lake bed spillway and a section of the Q1 dam. The

effect on broadleaved semi-natural woodland is deemed to be not significant.

7.12.8 The Development will have a permanent residual minor adverse effect on coniferous woodland – recently felled through the loss of habitat due to the creation of the proposed spoil heaps. The effect on coniferous woodland – recently felled is deemed to be not significant.

7.12.9 The Development will have a permanent residual minor adverse effect on mixed woodland – semi-natural through the loss of habitat due to the enabling works for the provision of access to facilitate the construction of the pumping house and lake bed pipeline. The effect on mixed woodland – semi-natural is deemed to be not significant.

7.12.10 The Development will have a permanent residual minor adverse effect on dry heath / acid grassland through the loss of habitat due to the construction of the Q1 dam. The effect on dry heath / acid grassland is deemed to be not significant.

7.12.11 The Development will have a permanent residual minor adverse effect on standing water – oligotrophic through the loss of habitat due to the infilling with water of Q1 and Q6. The effect on standing water – oligotrophic is deemed to be not significant.

7.12.12 The Development will have a permanent residual minor adverse effect on the quarry habitat through the loss of habitat due to the infilling with water of Q1 and Q6. The effect on the quarry habitat is deemed to be not significant.

7.12.13 The Development will have a permanent residual minor adverse effect on the spoil habitat through the loss of habitat due to the creation of the two dams. The effect on the spoil habitat is deemed to be not significant.

7.12.14 The Development will have a permanent residual minor beneficial effect on the spoil habitat through the creation of habitat. The effect on the spoil habitat is deemed to be not significant.

7.12.15 The Development will have a permanent residual minor adverse effect on the wall habitat through the loss of habitat. The effect on the spoil habitat is deemed to be not significant.

7.12.16 The Development will have a permanent residual minor adverse effect on the trees through the loss of habitat within TPO designated area A5. The effect on the spoil habitat is deemed to be not significant.

7.12.17 The Development will have a permanent residual minor adverse effect on Arctic charr through vibration. The effect on the Arctic charr is deemed to be not significant.

7.12.18 The Development will have a permanent residual minor adverse effect on reptiles through the loss of habitat (removal of quarries, spoil, grassland, scrub and woodland). The effect on the reptiles is deemed to be not significant.

7.12.19 The Development will have a permanent residual minor adverse effect on the Schedule 1 bird species, BOCC Red and Amber List bird species through the loss of habitat (removal of potential nesting habitat through removal of quarries and woody habitats). The effect on the Schedule 1 bird species, BOCC Red and Amber List bird species is deemed to be not significant.

7.12.20 Development will have a permanent residual minor adverse effect on bats from construction vibration, roost modification, roost loss – tunnels, isolation and fragmentation and operational lighting. The effect on the bats is deemed to be not significant.

7.12.21 Development will have a permanent residual moderate adverse effect on bats from roost loss – trees. The effect on the bats is deemed to be significant, however all mitigation will be implemented prior to construction starting.

#### *Operation*

7.12.22 The Development will have a residual minor adverse effect on Afon Gwyrfaï a Llyn Cwellyn SAC through the alteration of the flow regime, alteration of temperature during the routine discharges, nutrient enrichment, and introduction of invasive species. The effect on Afon Gwyrfaï a Llyn Cwellyn SAC is deemed to be not significant.

7.12.23 The Development will have a residual minor adverse effect on Llyn Padarn SSSI through the alteration of the hydrological regime, alteration of temperature during the routine discharges, nutrient enrichment, light spill, and pollution during routine maintenance. The effect on Llyn Padarn SSSI is deemed to be not significant.

*Decommissioning*

7.12.24 The residual effects during decommissioning are likely to be similar to those identified during construction. However, due to the lifespan of the project (125 years) it is not currently possible to predict potential and residual effects on designated sites, habitats and species.

### **7.13 References**

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