Cyfoeth Naturiol Cymru
Natural Resources Wales

# Llyn Tegid Reservoir Safety Project

# Tree Management Plan

Version: 2.0

## Version History:

| Document Version | Date Published | Project Stage |
|---|---|---|
| 1.0 | 24/09/19 | *Draft Report - for NRW internal review* |
| 2.0 | 13/11/19 | *Draft Report - for Pre-Application Consultation* |
| 3.0 | | *Final Report – for Planning Application* |

# Contents

# 1.0 Introduction

This Tree Management Plan (TMP) summarises expected impacts to trees resulting from construction of the Llyn Tegid Reservoir Safety Project (hereafter called 'the project'), and how these are to be managed and mitigated. This includes tree removal and pruning works required to enable construction of the project, proposed tree protection measures, and replacement planting strategies for the project.

Llyn Tegid is the largest natural lake in Wales and is located within, and contributes to, a highly valued and scenic area of the Snowdonia National Park. There are footpaths including Public Rights of Way (PRoWs) along the crest of the lake's embankments, which are well used all year round. Bala is a popular visitor attraction and important for the local economy. The lake and its associated water courses, the River Dee (Afon Dyfrdwy) and Afon Tryweryn are popular for anglers, water sports enthusiasts and other recreational activities. The proposals must be developed sensitively to minimise any potential impacts on these activities and the surrounding landscape.

Llyn Tegid is registered as a Category A Large Raised Reservoir under the Reservoirs Act 1975. As such there are additional legal duties on NRW which include formal inspection by an Inspecting Engineer (IE) from a Reservoir Panel (registered with DEFRA) and compliance with recommendations made by the IE within their report (known as a Section 10 report).

Following a Section 10 report in November 2014, modifications to impounding structures at Llyn Tegid are required to satisfy Measures in the Interest of Safety (MIOS). The outstanding MIOS related to this project, which are required to be completed by the 30/11/19[1], are as follows:

(iii) works are carried out to safely accommodate the design storm and the associated still water flood surcharge and wave surcharge.

(iv) a seepage/ stability analysis be carried out on the embankments to try to predict how the embankments will behave in the design flood.

Therefore, the Llyn Tegid Reservoir Safety Project has been developed by NRW to ensure Llyn Tegid reservoir embankments continue to protect Bala into the future and that it is legally compliant with the Reservoirs Act 1975.

[1] A more recent Section 10 Inspection was undertaken on 9th August 2019, primarily in response to maintenance concerns. The report from this visit is yet to be issued, but is expected to revise the date the MIOS are to be completed, taking account of investigations since 2014 and acceptable implementation timescales. Completion of the works is anticipated to be March 2022.

## 2.0 Scope

The requirement for and scope of this TMP have been defined by NRW for the project, where it is acknowledged there are likely to be extensive impacts to trees within a sensitive area. The standard approach to addressing tree constraints and protection within construction projects is to follow the recommendations set out in the British Standard, *BS5837:2012 - Trees in relation to design, demolition and Construction - Recommendations*. The BS5837:2012 process is required under the Planning system and has been followed; this TMP uses the information provided from the BS5837:2012 process, but also draws on other environmental assessments and perspectives.

The BS5837:2012 process involves prescribed steps undertaken by an arboricultural consultant, including production of tree survey and categorisation assessment, identifying tree constraints and defining Root Protection Areas, identifying trees for removal and retention, and defining tree protection measures required during construction. This TMP captures the above and, with the input of other environmental specialists, provides a wider perspective in considering tree impacts, and the management and mitigation of those impacts.

This TMP addresses and collates the following information relating the management of trees affected by the project:

- **Environmental surveys and assessment** – outlining what survey and assessment processes have been undertaken related to trees
- **Tree Impacts** – description and assessment of the extent of tree clearance works expected. This includes commentary in respect of arboricultural health and condition, ecology and habitats, local landscape character, visual amenity and microclimate; i.e. broader consideration than provided in the BS5837:2012 Arboricultural Impact Assessment (AIA)
- **Tree Retention** – describing and explaining the approach to and extent of tree retention
- **Tree Protection** – outline of how retained trees within the working area will be protected during construction
- **Mitigation Strategy** – principles for mitigation and replacement planting, locations and approach, and future management
- **Enhancements** – opportunities for additional landscape enhancements to be delivered through the project

A range of surveys and assessments have been undertaken during the development of the project, including ecology surveys, landscape appraisals, and environmental assessment. The products of these surveys and assessment are included within the planning application for the project. Key documents of relevance are:

- Arboricultural Impact Assessment Rev A (Tree Solutions, November 2019)
- Preliminary Ecological Appraisal (Enfys Ecology, 2017)
- Aerial, Phase 1 and national Vegetation Classification Survey (Exegesis, 2018)
- Phase 1 Habitat Survey Report (BVL, 2019)

- Environmental Constraints and Opportunities Record (BVL, 2019)
- Preliminary Landscape and Visual Appraisal (BVL, 2018)
- Invasive Species Management Plan (Black & Veatch, 2019)
- Preliminary Bat Roost Potential report (BVL, 2018)
- Bat Survey Report (Egniol Environmental, 2019)
- Environmental Action Plan (BVL, 2019)
- Design & Access Statement (BVL, 2019)

The study area covered by the TMP is the redline boundary shown in Appendix A.

## 3.0 Consultation

NRW has undertaken internal and external consultation activities and discussions relating to works to trees at Llyn Tegid, which has influenced the development of mitigation and detailed design. Discussions relating to trees specifically are summarised in this section, and full details of all consultation activities are given in the Environmental Constraints and Opportunities Record (ECOR).

Internal NRW specialists consulted regarding the impacts of potential tree clearance and potential mitigation and enhancements include Rhodri Parry (Conservation Officer), Dave Thorpe (Biodiversity Technical Specialist), David Liddy (Specialist Advisor Recreational Safety), Lajla Cash (Woodland Creation Manager), Sue Williams (Plant Programme Manager), Charlotte Owen & Eleanor Goupillon (Woodland Programme Officers - Centenary Trees), Sam Milner (Tree Health Officer), and regular liaison with the Conservation, Planning & FRAP Teams.

External consultees have included:

- Aled Lloyd, Head of Development Planning, SNPA
- Caroline Wilson, County Ecologist, SNPA
- Rhydian Roberts, Tree Officer, SNPA
- Bill Taylor (now retired), Warden, SNPA
- Arwel Morris, Warden, SNPA
- Edward Jones, Head of Property, SNPA
- Dafydd Roberts, Senior Ecologist, SNPA
- Welsh Dee Trust
- Planning Department, Gwynedd Council
- Bala Lake Railway Trust
- Llandderfel and Llanycil Community Councils (Part of Penllyn Partnership),
- Llangywer and Llanwuchllyn Community Councils (Part of Penllyn Partnership),
- Dilwyn Morgan, Gwynedd Council Councillor (Bala)
- Lis Pugh, Bala Town Council
- Christopher O'Brien, RSPB
- Chris Wynn, Wildlife Trust Wales
- Adam Williams, Bala Leisure Centre, Gwynedd Council
- Clare Morgan / Brian Palmer, Woodland Trust
- Open Spaces Society
- S Hodgkinson / J Aldridge, Women's Institute
- Russell Horsey MICFor (Chartered Arboriculturalist)
- Gwyneth Jones / Kathleen Davies / Hafwen John, Merched Y Wawr

Whilst tree loss has been avoided where possible to do so, the requirements of this reservoir safety project and embankment design standards do dictate a significant amount of tree loss in this case, for which NRW is planning appropriate mitigation planting.

Stakeholder consultation in June 2018 with the Woodland Trust and representatives from the Women's Institute (WI) (during the Outline Design / Outline Business case stage) highlighted concerns over the extent of anticipated tree loss required to enable the works. Concerns were also raised at a public drop-in session (July 2018). Whilst reinforcing that a significant amount of tree loss is unavoidable, including all the trees currently within the rip rap of the embankment, NRW has reviewed opportunities to retain and protect trees within the working area (on the dry side of the embankment) where possible within the constraints of the project. Whilst several additional trees have been identified for retention as a result, the overall extent of tree loss remains very similar as before, as the majority are within the embankment rip rap where it is not possible to retain trees.

NRW has provided stakeholder updates and aimed to keep ongoing engagement throughout the design process. A follow up meeting and site visit with the WI and Woodland Trust was held (August 2019) to discuss updates to the project and the proposed outline mitigation and enhancement planting proposals; generally feedback was positive, and further suggestions were provided. A site meeting with Merched Y Wawr was held in September 2019 to highlight key issues. Replanting and enhancement proposals were discussed and feedback was positive, and additional suggestions were given for reuse of felled timber in local businesses and schools. Another public drop-in session is scheduled (December 2019) and posters have been published to advertise the project in advance of this (May 2019).

Outline proposals for replanting have been discussed with several stakeholders during design development. Rhodri Parry (Conservation Officer, NRW), Dave Thorpe (Biodiversity Technical Specialist, NRW) and David Liddy (Specialist Advisor Recreational Safety, NRW) have provided advice regarding replanting opportunities within the site, and feedback on outline proposals and additional suggestions. These are included within the Challenges and Opportunities table within the ECOR and where possible have been incorporated within detailed design.

Consideration has been given to linking replacement planting proposals with other NRW tree planting initiatives in the area. Discussions have included NRW's Woodland Creation Manager, the Programme Managers for the 'Plant!' and 'Centenary Trees' initiatives. Due to the scale of replanting there would be no real opportunity for project linkage with Plant!, but there may be possible synergies with the Centenary Trees initiative, so further discussions are planned to take place as the project develops in detail.

## 4.0 Tree Survey (BS5837:2012)

A tree survey was undertaken in March 2018, leading to the production of an Arboricultural Impact Assessment (AIA) and report based on the project proposals. This process has been undertaken in accordance with BS5837:2012 and is the process required under the Planning system. The tree survey and AIA have been produced on behalf of NRW by qualified Arboricultural Consultants, Tree Solutions. Tree Solutions have undertaken subsequent additional survey visits and site meetings with the design team to review potential to retain individual specimens and inform the refinement of the AIA and this TMP.

The AIA includes:

- Tree Survey Schedule
- Tree Constraints Plans
- Arboricultural Impact Assessment plans

The full Tree Survey and AIA is provided in Appendix B. It explains the methodology and process involved in undertaking arboricultural assessment in accordance with BS5837:2012. It records and categorises the condition and value of trees within the project area, and identifies those to be retained and removed, providing explanation of the process followed to retain the optimal trees where possible. The report considers that the proposed design has taken the long-term future of the most visually prominent trees into account and is in accordance with Snowdonia National Park Planning Policies and the recommendations contained within BS5837:2012. It also confirms that there are no trees protected by Tree Protection Orders (TPOs) within the boundary of the works.

As part of the BS5837:2012 Tree Solutions have also developed Tree Protection Plans and an Arboricultural Method Statement (Appendix C) for working in proximity to retained trees, and have advised on the development of engineering details around retained trees within the working area.

Prior to the March 2018 tree survey, the project team referred to an earlier tree survey and management plan covering the trees along Llyn Tegid embankment. This was produced for NRW by Glendale Services in 2016. It does not constitute a BS5837:2012 Arboricultural Survey, and does not cover the river embankment areas, however was, along with site walkover appraisals by environmentalists, ecologists and landscape architects, used to inform early project options appraisal and outline design.

## 5.0 Ecology Surveys and Assessment

The options appraisal stage and subsequent detailed design were informed by a range of ecology surveys to ensure that detailed design and works to trees was well informed and extended beyond the minimum requirement of BS5837:2012.

A Preliminary Ecological Appraisal (PEA) was carried out by Enfys Ecology (2017) to gain baseline data on species and habitats present, which included a Phase 1 habitat plan of the project area. A more recent Phase 1 Habitat Report and National Vegetation Classification (NVC) was then completed by Exegesis (2018). Following this, as the project developed, additional areas were added to the project area. A subsequent Phase 1 report was then undertaken by Black & Veatch (2019) to include these new areas and validate habitats identified in earlier surveys to see if any had changed significantly since the time of survey. A Habitat Regulations Assessment (HRA) and Ecosystems Services Assessment were also carried out.

A preliminary Bat Roost Potential (BRP) survey was carried out (October 2018) by Black & Veatch to identify any trees with roosting potential from the ground. Following the options appraisal and establishment of a more definitive scope of works, a Bat Survey Report was undertaken by Egniol Environmental (2019), which involved a bat roost inspection survey to confirm roosting potential through climbing. Where possible, any trees confirmed as having roosting potential were retained through change to design regardless of arboricultural value.

The Bat Survey Report notes that there will be some reduction in connectivity between local woodlands for bats due to tree loss from within flight lines/commuting corridors, and notes the loss of some foraging habitat. The highest levels of bat activity are where the trees provide greatest cover with enclosed areas sheltered from wind on both sides. The report also notes the loss of one known roost for brown long-eared bat, and several other potential bat roosts. It assesses these impacts however as ‘low’ and therefore not significant. It considers the loss of habitat and connectivity to be low due to ‘*the large areas of high-quality woodland near the proposed works*’. It recommends mitigation for the loss of bat roosts, including provision of dedicated roosting locations, which could provide locations of better quality, with the potential to support greater number of bats in secured locations.

## 6.0 Landscape Surveys and Assessment

Landscape architects' input has been provided throughout the development of the project, from initial options appraisals through development of the outline and detailed designs.

The Environmental Constraints and Opportunities Record (ECOR) summarises the process and outcomes of early assessment. A preliminary landscape and visual appraisal was prepared to support the planning and EIA screening and scoping process, and to inform the development of outline design. Within this a baseline was identified along with key landscape and visual receptors, potential impacts of proposed works, and the impacts that would be likely to have the greatest significance. The most significant effects identified in terms of visual amenity and landscape character were associated with the tree and vegetation clearance. Whilst recognising these issues and highlighting their likelihood to be of local interest and concern, the appraisal does not consider them likely to be 'significant' in EIA terms.

Further consideration and assessment of effects on landscape character and visual amenity is also provided in the Design and Access Statement, which describes the loss of trees and other vegetation, including all those trees growing amongst the existing rip rap, as constituting the most notable change in appearance resulting from the project.

The March 2018 arboricultural survey identifies the location and categorises the value of trees within the project boundary. The categorisation methodology is defined by BS5837: 2012, based on current and long term arboricultural, landscape, cultural and conservation values. Trees categorised as 'A' are considered to be of high quality and value, category 'B' trees are moderate quality and value, category 'C' trees are low quality and value and category 'U' are unsuitable for retention. Landscape architects' appraisals concur with the arboriculturalists' categorisation: trees which have been categorised as 'A' in the arboricultural report are those of highest landscape and visual amenity value.

Landscape architect input has been provided into the detail of tree retention and protection. A site walkover on 09th August 2019 including client representatives, landscape architects, arboricultural consultant, engineers and project managers was held to review plans for tree removal and retention, in the context of the works footprint as measured and marked on the ground. The detailed consideration of individual trees, in light of tree survey, landscape, ecology and environmental appraisals, has led to refinements of the design of the engineering works, with the stability berm and erosion protection matting being reworked to avoid a number of valued trees on the landward side of the embankments. There has been no scope to retain any trees within the 'wet' side of the embankment.

# 7.0 Tree Impacts

Tree and vegetation clearance required to enable construction work is detailed in the AIA (Appendix B). The AIA has been developed by Tree Solutions with input from NRW and BV's Ecologists, Landscape Architects, Engineers and local Area team, with site discussions aiming to ensure tree losses are minimised whilst enabling the required Reservoir Safety works.

## 7.1 Description of Impacts

A total of approximately 290 no. trees require removal to facilitate the project, comprising mostly of category B and C trees, only 1 no. category A tree (T19, a large prominent Ash) is scheduled for removal, and the AIA notes that there is evidence of Ash dieback within the crown of this tree.

Relatively few of the trees (c. 60 no.) scheduled for removal are located along the Dee and Tryweryn embankments, the principal impact of tree removal will be the removal of tree groups that form linear closed canopy groups on the wetside of the north embankment (G1, G4, G5, G6, G7 and G8), this accounts for more than half (c. 150 no.) of all trees to be removed. Trees have naturally colonised this embankment largely as a result of a lack of management of the embankment in the past, there is evidence of large wounds and decay in the base of many stems and evidence of ash dieback disease within many of the ash trees.

The AIA records evidence of ash dieback in juvenile growth within several groups that require removal to facilitate works (G4, G6, G7 and G8), also highlighting that further ash dieback within the larger and more mature trees is foreseeable in time. It has been noted by the project Arboricultural Consultant that visible effects of ash dieback have increased significantly between the first site visit (March 2018) and the most recent site visit (August 2019).

Several trees across the site are regarded as being highly valuable, these include 'Category A trees' as identified within the AIA (Tree Solutions, 2018) and trees with high bat roost potential, as identified in Preliminary Bat Roost Potential report (Black & Veatch, 2018) and Bat Survey Report (Egniol Environmental, 2019). Where possible these trees have been retained, however there are some cases where this is not possible.

Approximately 500m of native hedgerow removal is required to facilitate works along the toe of the dryside of the embankment footpath (north of the lake), meaning that with removal of the closed canopy groups described above, large parts of this area will go from being an enclosed area that is well sheltered to being completely open.

## 7.2 Assessment of Impacts

The effects of the tree clearance are discussed above under section 4, 5 and 6. Whilst there will a big and very noticeable difference in the experience of walking along the embankment crest PRoW, particularly the lakeside section, in arboricultural terms the project is considered to be in accordance with Snowdonia National Park Planning Policies and the recommendations contained within BS5837:2012. In ecological

terms, despite some low-level impacts to bats, no significant impacts have been identified. In landscape and visual terms, whilst it is noted that changes can be expected to generate local interest and concern, no significant impacts on landscape character or visual amenity are expected, and in opening views up across the lake for users of the lakeside PRoW and adjacent receptors, some positive visual effects can be expected. Whilst the hedgerow that runs along the dryside of the north embankment is considered to be species poor, native hedgerow is one of the key aspects of landscape character for this area and therefore removal is likely to result in an adverse impact on the landscape character of the area.

The effects of tree and vegetation clearance also impact on local micro-climates. The PRoW along the northern embankment crest is heavily sheltered by the existing tree cover, which will no doubt be welcome by users of the footpath in hot weather; this benefit will be lost with the tree removal. However, the extent of tree cover has also created a heavily shaded micro-climate; increasing levels of natural light through tree clearance is likely to be beneficial in some areas. For example, the south facing elevation of the Penllyn Leisure Centre and its external spaces and public café areas are likely to become more attractive from a reduction in the extent of shade and screening from the proposed tree clearance; increasing the natural light levels to such areas whilst also opening up scenic views across Llyn Tegid may help encourage positive use and enjoyment of these spaces, with benefits to public wellbeing.

Many of the trees to be removed from the embankment north of the lake are ash, and many of these are currently showing signs of ash die-back. This, coupled with their sub-optimal location growing within the embankment between stone rip-rap, means they would have been unlikely to achieve a healthy or mature form if retained.

Overall, assuming the delivery of appropriate mitigation including a ‘no net loss’ replacement planting strategy and dedicated bat roosting locations, no significant environmental impacts are expected to result from the tree losses required as part of the project.

# 8.0 Tree Retention

## 8.1 General Approach

Trees have been identified for removal where necessary to enable the engineering project. Detailed design has been an iterative process relying on communication between the project arboricultural consultant and designers, discussing and where possible amending the design to enable retention of trees. Where possible highly valuable trees have been retained throughout the project, the priority being trees assessed as 'Category A' within the AIA and trees that were assessed to have high bat roost potential during the Bat Roost Potential survey.

Trees that were initially scheduled for removal have been retained following discussion and subsequent refinements to the design. Changes have been made to the layout of the geotextile membrane and stability berm on the dry side of the embankment, enabling retention of some trees on the dry side.

Trees within (or with Root Protection Areas overlapping) the working area that are to be protected and retained are:

- T96 (category A2, Horse Chestnut)
- T97 (category A2, Ash)
- T98 (category B2, Alder)
- T1 (category B2, Ash)
- T2 (category B2, Lime)
- T3 (category A2, Lime)
- T4 (category A2, Ash)
- T5 (category B2, Ash)
- T17 (category A2, Sweet Chestnut)
- T35 (category B2, Oak)
- T36 (category B2, Sycamore)
- T37 (category C2, Oak)
- T38 (category A2, Oak)
- T39 (category A2, Sycamore)
- T40 (category B2, Oak)
- T45 (category C2, Oak)
- T51 (category B2, Alder)
- G14 (category B2)
- G15 (category C3)
- G18 (category B2)

Where possible trees with high BRP have been retained through changes to design. Many of the trees found to have high BRP within the Preliminary Bat Roost Potential Survey (Black & Veatch, 2018) and Llyn Tegid Bat Survey Report (Enigol Environmental, 2019) are not affected by the works as they do not sit within the working area.

## 8.2 Future Management of Retained Trees

All trees retained within the footprint of the embankments will remain the responsibility of NRW for future management. It is acknowledged that extensive establishment of self-set trees within the embankments has been the result of a lack of effective management in the past, leading to the current need for 'accelerated maintenance' in the form of extensive clearance. To avoid this happening again NRW is committed to more proactive and regular future management, which will include:

- Tree survey and management recommendations by professional arboricultural consultant, repeated at maximum 10-year intervals
- Undertaking of tree works in accordance with arboricultural consultant's management recommendations
- Crown-lifting and other arboricultural works as and when required to ensure public safety and accessibility, and to manage risks of inadequate grass cover on embankments due to shading
- Annual site walkover inspections and reporting focussed on trees
- Annual removal of any self-seeded saplings

In addition to the above routine maintenance operations, NRW will monitor and adapt the 'Armoloc Blocks' which are proposed to protect the dryside of the flood embankment within the Root Protection Areas of retained trees. These blocks have been specified as a result of retaining high value trees within the embankment, which would otherwise have had to be removed. The blocks must be laid with minimal opening for the tree trunk to minimise erosion risks, however NRW is aware that this would inhibit the trees' growth unless blocks are periodically removed in the future.

## 9.0 Tree Protection

A preliminary Arboricultural Method Statement (AMS) including Tree Protection Plans (TPPs) has been prepared in accordance with BS 5837:2012, by the project arboricultural consultants Tree Solutions. This is provided at Appendix C.

The AMS sets out requirements for sequencing of works to ensure protection of retained trees, and covers requirements for tree surgery, tree protection fencing and ground protection within Root Protection Areas. There are specific requirements for the installation of Enkamat and Armorloc blocks within the Root Protection Areas of retained trees. There are also detailed requirements defined for specific high-risk operations which are to be undertaken under Arboricultural site supervision. These are:

- Removal of bound surface within the Root Protection Areas of trees number 96 and 97
- Reinstatement of gap in wave wall within Root Protection Area of tree number 97

The arboricultural consultant will also provide 'Tool Box Talks' to the main contractor on all tree protection measures and working practice within designated Root Protection Areas, and will undertake site visits during construction to inspect tree protection measures during key stages.

The AMS and TPPs will be reviewed and updated in relation to more detailed information from the main contractor, once appointed, in terms of proposed site access and working methods, and any more detailed design information.

# 10.0 Mitigation Strategy

## 10.1 General principles

Planting, both within and beyond the construction working area, will be undertaken to mitigate for the tree clearance works required. The tree planting mitigation strategy is to ensure no net loss of trees resulting from the project, along with a focus on linear habitat corridors to support ecological connectivity.

Most of the planned tree clearance is on the lake side of the Llyn Tegid embankment, where there is no scope to replace in-situ, hence a need for replacement planting to include areas beyond the construction working area. Several potential locations for replacement tree planting have been explored, some of which are still to be confirmed, subject to landowner agreements and/or potential land purchase.

New tree planting will be carried out in accordance with the principles and recommendation detailed in *BS 8545:2014 Trees: from nursery to independence in the landscape – Recommendations*. This covers recommendations for transplanting young trees successfully from the nursery, through to achieving their eventual independence in the landscape, including planning, design, production, planting and management. It applies to trees where a distinct crown has been prepared in the nursery. It does not apply to whips, transplants and seedlings, or to other woody material.

All planting will be undertaken by a specialist landscape contractor working on behalf of NRW. There will be a 5-year aftercare/establishment and defects period provided as part of this contract, before maintenance is handed back to landowners.

## 10.2 Plant Health

We recognise that new planting can be a vector for pests and diseases to move into an area. Steps to minimise this are already carefully taken when we procure landscape work. Standard documents and approaches are applied to minimise risk. These can be summarised in the following:

- ***Home Grown:*** We will seek to buy British grown plants and will insist on seeing proof of this from our contractors and nurseries. We accept that costs could be slightly greater for British grown and we will explain to the contractors that this should not be a limiting factor.
- ***Flexibility and communication:*** We will encourage discussion with contractors and nurseries and make it clear that we are prepared to accept substitutes (say in size or species) to help ensure British Grown stock is used.
- ***Size:*** Smaller sized plants will be favoured. These are more resistant to extreme weather conditions, are less likely to be imported and are less likely to harbour pests and diseases. Small plants will establish quicker and catch up. They are cheaper to replace if this is required. It is suggested that tree species would be planted as feathered standards 1500- 1750mm, shrubs at 400-600mm.

- ***Replanting:*** We will consider if any existing trees on site are suitable for moving and replanting.
- ***Contract Growing and local seed collection:*** The long lead in time for this landscape contract means that there is scope for contract growing of some species. This could be of particular relevance in securing the supply of Oak for the project. The current threat of Oak Processionary Moth in UK is making this harder to source. Local schools are being encouraged to join our Acorn Antics initiative whereby acorns can be collected and grown on to be returned in time to their local area. The Woodland Trust are also looking at seed collection locally.

### 10.3 Lake Shore – Protection and Management of Trees

The lake shore is owned by Snowdonia National Park. As part of their management of the area they routinely remove scrubby willow species that can cause a drying out of this important wetland. However, a fringe of other trees, such as Alder and Birch are left to grow on. NRW is liaising with the SNPA Rangers and our Operations team to identify trees that can be carefully retained during construction that will help to break up the view of the new stone along the lake. Some trees may need to be coppiced back to allow construction access but if the coppice crowns are protected these will quickly grow back.

### 10.4 Planting on NRW Operational Land

Natural Resources Wales owns land associated with the operation of the sluices and spillways necessary to manage the reservoir. We have identified the following proposals to increase and manage tree cover on NRW owned land.

- Approximately 300m of linear planting alongside the old railway line which runs parallel to the Afon Tryweryn. This strip will be approximately 2m wide, and will be planted with native tree and shrub species at approx. 1.5m centres. Approximately 200 trees will be planted in this area.
- An area of approximately 400 sqm opposite the sluices to plant a small copse of trees, with native tree and shrub species at approx. 1.5m centres. Approximately 200 trees will be planted in this area.
- Approximately 280m of native hedgerow running parallel to the re constructed Dee embankment, with hedgerow trees planted at approximately 10m spacings. Approximately 28 trees will be planted within this length of hedgerow. (See section 10.8 for hedgerow species mix).
- Identified management opportunities to improve the diversity and structure of existing copses planted c 20 years ago.
- An opportunity for shrubby planting and/or Orchard trees near the NRW office.

Tree and shrub species likely to be used for these areas are:

<u>Trees</u>

- Sessile Oak – Quercus petraea
- Downy Birch – Betula pubescens

- Hawthorn – Crataegus monogyna
- Rowan – Sorbus aucuparia
- Native Black Poplar (Populus nigra betulifolia) would be suitable for the area but locations for this must be very carefully chosen as it is a large tree with very invasive roots.
- Traditional Welsh Orchard varieties.

Shrubs

- Hazel – Corylus avellana
- Holly – Ilex aquifolium
- Osiers and goat willows could be planted away from key operational areas.

### 10.5 Replacement Hedgerow Planting alongside Llyn Tegid Embankment

The existing hedgerow on the dry side of the Llyn Tegid embankment must be removed to enable the embankment protection works. A replacement section measuring approximately 330m will be planted, with trees planted at approximately 10m spacings. Approximately 28 trees will be planted within this length of hedgerow. (See section 10.8 for hedgerow species mix).

### 10.6 New Planting on lakeside foreshore as part of car park enhancement

Proposals for optimising the layout of the informal overspill parking area adjacent the Bala Watersports and Adventure Centre have been agreed in principal with Snowdonia National Park Authority. The proposals serve to ensure more efficient use of available parking space, whilst protecting more areas of the foreshore for wetland habitat development, and breaking up the parking areas with more landscaping and planting. The planting will include shrubby species such as Osiers and goat willows along with small native trees such as Downy birch, Rowan, Field maple and Alder. Approximately 50 trees will be planted in this area.

### 10.7 Potential Woodland Copse Planting (subject to landowner agreement)

NRW is hoping to plant a woodland copse in the farmland adjacent to Y Bala Rhif 4 and Y Bala Rhif 5; this is however subject to NRW agreeing purchase of this land with the current landowner. The total area of land in this area is approximately 25,000m², and a woodland copse within this area would involve planting several thousand trees, producing a range of landscape, visual and ecological benefits. The location is publicly accessible and visible, and close to the location of greatest tree loss from the scheme, therefore has the potential to deliver optimum mitigation and public benefit.

NRW's landowner negotiations are ongoing here; the design of this area would be developed subject to the outcome of those negotiations. It is suggested that this opportunity could form the basis of a Community Planting scheme, which would be developed with detailed local community consultation.

The mix of tree species used for woodland copse planting would likely to be chosen from the following:

Canopy Trees

- Sessile Oak – Quercus petraea. – predominant tree.
- Downy birch – Betula pubesens – a coloniser/ nurse tree to also give quicker cover for bats and wildlife.
- Wild Cherry - Prunus avium and Ulmus glabra Wych Elm could also be introduced in smaller numbers.

Understorey

- Hazel – Corylus avellana
- Holly – Ilex aquifolium

Edge species

- Rowan – Sorbus aucuparia
- Field maple – Acer campestre
- Hawthorn – Crataegus monogyna
- Bramble – Rubus fruticose
- Dog Rose – Rosa canina

### 10.8 Potential Hedgerow Enhancements (subject to landowner agreement)

In addition to replacement hedgerow planting (see 10.4 and 10.5) NRW is aiming to secure agreements for additional hedgerow planting and gapping up of existing hedgerows within the fields immediately surrounding the embankment protection works. The landscape plans indicate the locations of this potential work, however it is too early to estimate final quantities that might be delivered.

Hedgerows are identified as a significant characteristic of the area, though they are deteriorating in places and have been replaced with fencing which detracts from the local landscape character. Creating and enhancing hedgerows along field boundaries will also contribute to green infrastructure connectivity and habitat diversity. Existing hedgerows are generally species-poor and predominantly hawthorn, so there is an opportunity to increase species diversity by inter-planting with other complementary native species and adding hedgerow trees at appropriate intervals.

The mix of species used for hedgerow planting would likely to be chosen from the following:

- Hawthorn – Crataegus monogyna (40%)
- Hazel – Corylus avellana (20%)
- Holly – Ilex aquifolium (20%)
- Blackthorn – Prunus spinosa (10%)
- Guelder rose -Viburnum opulus (5%)
- Dogwood – Cornus sanguinea (5%)

Hedgerow trees will be planted at approximately 10m spacings, and include Oak, Field maple, and Small leaved lime.

The project team is also considering limited amenity use of Dutch Elm Disease (DED) resistant Elms such as Ulmus ‘New Horizon’ or White Elm – Ulmus laevis.

## 10.9 Management of existing hedgerows

There are a number of approaches that can be taken here and it is envisaged that these will be agreed on an individual basis with the landowners concerned. Works may involve gapping up with new shrubby species and trees, as long as this can be achieved without causing damage to existing plants.

Other hedges could be best managed by laying them and installing new fencing in to prevent grazing and allow successful re growth.

NRW are also looking for opportunities to de-compact soil in areas around mature trees and hedgerows. The use of activated charcoal and mulches can also further improve the health of these important features. Following this work the hedges would then be fenced to prevent damage by grazing animals.

## 11.0 Environmental Enhancement

Section 10 outlines the strategy for planting and works to be delivered by the project to mitigate for the expected loss of trees. Key to that strategy is ensuring no net loss of trees resulting from the project, along with a focus on linear habitat corridors to support ecological connectivity.

In pursuing opportunities for planting locally, NRW has identified opportunities which, if they are all delivered (some remain subject to landowner agreement at the time of writing) would exceed this mitigation strategy and deliver significant net gains in tree and woodland cover, biodiversity and ecological connectivity. The potential woodland copse planting (section 10.7) in particular would deliver extensive planting in an optimal location. The potential hedgerow enhancements would also deliver benefits in terms of landscape condition, connectivity and habitat diversity.

Other enhancements being delivered by the project, although not focused on tree planting, include:

- Hard and soft landscape improvements and seating within the open spaces south of Penllyn Leisure Centre
- Habitat regeneration within SAC/SSSI/Ramsar designated area, on lake foreshore, through optimisation of overflow car park layout and limiting access (does include some tree planting, which is referred to in section 10.6)
- Changes in grassland management on NRW operational land to encourage greater floristic species diversity
- INNS management (of Japanese knotweed and Himalayan balsam)
- Improvements to accessibility of PRoWs, including providing shallower gradients and more inclusive access controls
- Additional seating areas, with opportunities for bespoke artwork
- Installation of interpretative signage at key locations
- Installation of bird and bat boxes

# Appendices

**Appendix A – Tree Plan Overview, Extent of Working Area**

**Appendix B – Arboricultural Impact Assessment (Nov 2019)**

**Appendix C – Arboricultural Method Statement / Tree Protection Plans (Nov 2019)**

**Appendix D – Hedgerow Planting Typical Arrangement**