Appendix 6 – Ecology and Woodland

Appendix 6.1 – Woodland Summary

West Riverside and Woodbank
Woodland Summary

December 2018

West Riverside and Woodbank Woodland Summary

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1 INTRODUCTION

1.1 Terms of Reference

EnviroCentre Ltd were requested to produce a summary report describing the chronology, results and appraisal of tree and woodland survey relating to the design and application process for the West Riverside development. This report provides a synopsis of information from baseline studies and surveys, the design access statement principals, the Environmental Statement[1] (ES) proposed mitigation and information from the ES appendices.

During the process of ecological survey and ultimately Ecological Impact Assessment (EcIA) it was noted that the dominant habitat present across the site is broadleaved woodland varying from newly established plantation, long established plantation origin oak woodland with some semi-natural characteristics, to maturing planted exotic (but generally domiciled species) trees. The development design principles included core woodland retention, some adaptation of the newly established planted woodland areas, woodland restoration and habitat/landscape enhancement where possible.

The survey and assessment process was iterative and bespoke to the site and design requirements and was consulted upon through the EIA development process.

1.2 Scope of Report

This report summarises the survey methods and assessment undertaken of woodland and trees to date; and the outcomes of this process used to inform the design principles for an application of Planning Permission in Principle for the proposed development including an assessment of likely impacts and the relevant avoidance, mitigation and compensation strategies to be embedded within the development proposal.

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[1] West Riverside and Woodbank House Environmental Statement Dated May 2018

2 BASELINE CONDITIONS

2.1 Desk Study

2.1.1 Tree Preservation Order, Scottish Native Woodland and Ancient Woodland Inventory

The site is not covered by a Tree Preservation Order[2] or Conservation Area[3]. There is a tree preservation order, known as The Gateway Orientation Area, to the north of the site covering the woodland which houses a Bird of Prey Centre.

Scottish Native Woodland and Ancient Woodland Inventory sites are present within the site boundary. Long-established of plantation origin (LEPO) woodland is present in the west, north and centre of the site. The woodland present in the north and west offer connectivity to similar habitat in the wider area. Figure 2-1 below depicts the extent of LEPO designations applicable to the site.

Figure 2-1: Ancient Woodland Inventory shapefiles

Scottish native woodland habitats are present in the west, centre and across the east of the site, these offer connectivity to the north beyond the site boundary and to fragmented woodland in the east. Please refer to Appendix A for further details of Ancient Woodland Inventory present within the site and its immediate surrounds.

2.1.2 Site History

The site has seen differing land uses over the years. At one time the area would have formed part of the natural forest of Scotland and a cohesive network of dense riparian woodland adjacent to Loch Lomond and the River Leven. Anthropogenic factors would have seen woodland clearance for agriculture and designed

[2] Loch Lomond and the Trossachs Tree Preservation order Listings: https://www.lochlomond-trossachs.org/planning/planning-applications/make-an-application/tree-preservation-orders-national-park/ (Accessed 03/12/2018)
[3] Loch Lomond and the Trossachs Conservation area listings: https://www.lochlomond-trossachs.org/planning/planning-applications/make-an-application/listed-buildings-conservation-areas/ (Accessed 03/12/2018)

landscapes in the area, as is show in Figure 2-2 below in an extract from Roy's Military Map of the Highlands 1747-52[4]. The location of the Riverside site is approximately depicted by a blue circle. This area is slightly shaded in green which may depict grassland or wetland, and the linear dots which may symbolise cultivated land, although they are less defined than neighbouring symbology thus could differ in type. Few distinct trees/woodland are shown in the area.

Figure 2-2: Extract from Roy's Military Map showing distinct anthropogenic activity in the area

Moving through time, the next distinct period of note is one of well-known industrial uses including extensive land use change to cater for widespread woodland coppicing, processing and transport by boat and rail. The region also became a popular tourist destination followed by a rise in residential development. By 1930, shown in Figure 2-3 below, it is clear that the LEPO woodland had been felled (and probably re-stocked) and the River Leven riparian woodland was undergoing significant fragmentation. The area we now know as Drumkinnon woods was largely cultivated land for arable crops.

Figure 2-3: Balloch in 1930 (supplied by client)

[4] Roy's Military Map 1747-52. Available at: https://maps.nls.uk/geo/explore/#zoom=14&lat=55.9987&lon=-4.5923&layers=3&b=1 (Accessed 29th November 2018)

By 1949, the habitat and landscape was continuing to change. The restocked LEPO woodland is evidently developing (probably into what we see as core mature woodland today within Drumkinnon). Figure 2-4 below shows dense riparian woodland (recovering from 1930's tree removal), and the distinct linear tree belt along what is now the access route to Loch Lomond Shores, with bulbous Drumkinnon LEPO woodland projecting southwards.

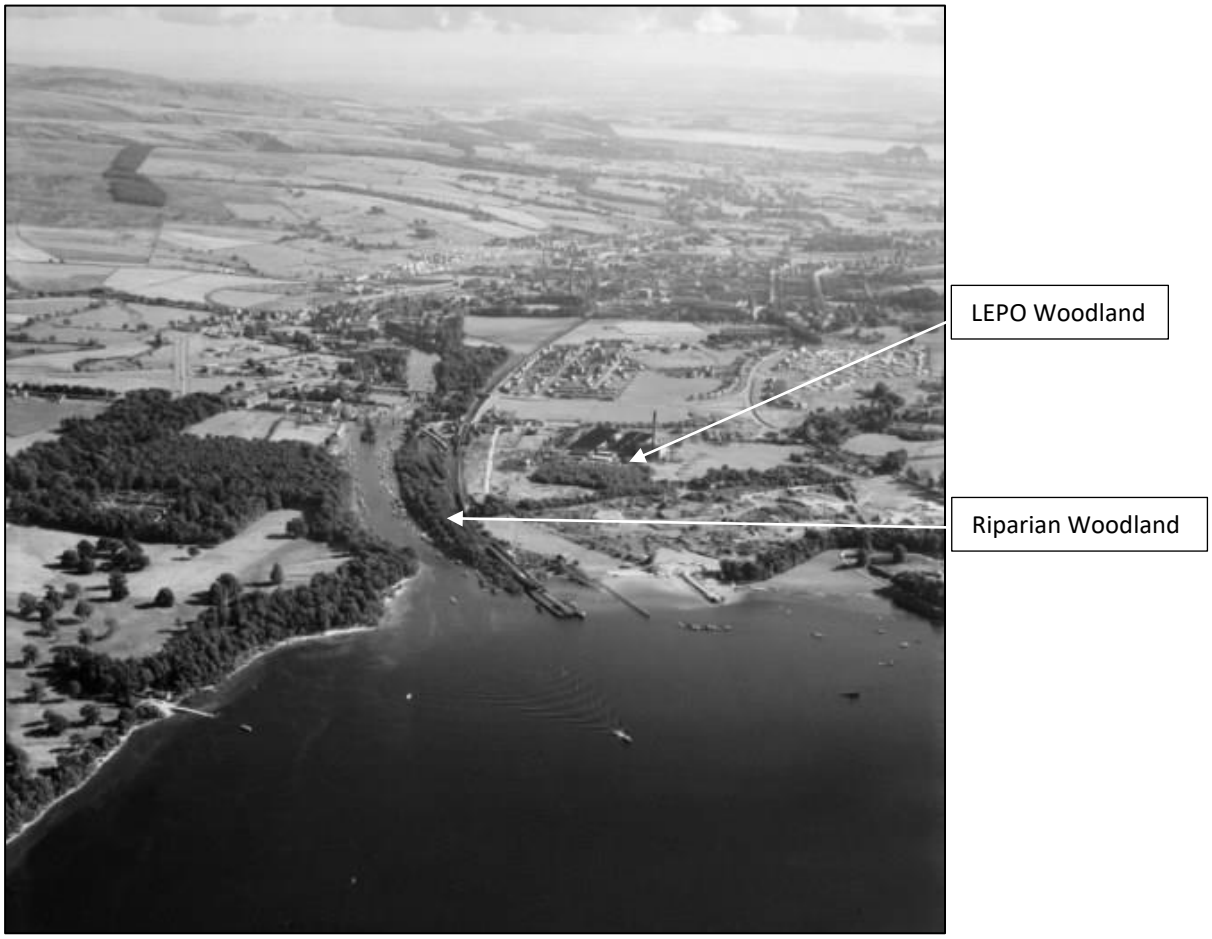

Figure 2-4: Balloch in 1949[5]

This suggests that Drumkinnon Woods and Woodbank saw an increase in planting and natural regeneration in the last 70 years. Also the riparian woodland habitat of the River Leven has seen alterations in the form of clearance, subsequent replanting and creation of amenity grasslands where railway lines used to be positioned. The 'Ineos' pipeline which dissects the woodlands appears to have left a distinct fracture in the otherwise dense Drumkinnon woods and has probably resulted in topographic change and subsequent tree planting.

The woodland habitat therefore has seen marked changes over 300 years and the result is that woodland expansion has occurred in the last 50-70 years, particularly at Drumkinnon. With minimal management the woodlands do display some semi-natural characteristics, despite their plantation origin or anthropogenic influences. Modern aerial imagery (Figure 2-5) shows the shape of the woodlands have changed significantly to encapsulate previously agricultural and industrial land. Recent tourism investment has seen an increase in amenity landscape planting around Loch Lomond Shores.

[5] Balloch in 1949. https://i1.wp.com/www.iconicleisuredevelopments.co.uk/wp-content/uploads/2017/07/Balloch-1949.jpeg?resize=525%2C518&ssl=1 (Accessed 29th November 2018)

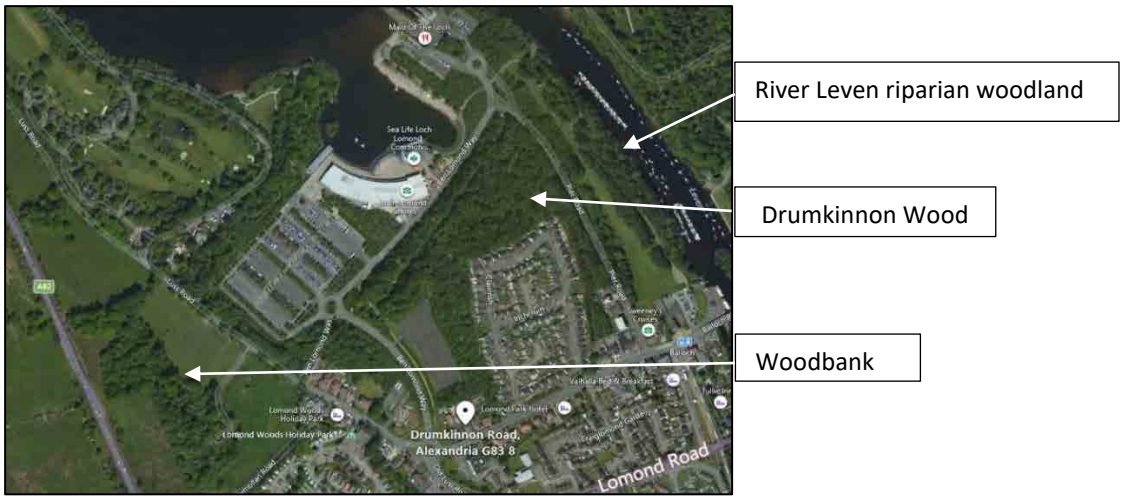

Figure 2-5: Aerial imagery of the area accessed in 2018

2.2 Woodland Habitat Composition

The woodlands present both plantation and semi-natural elements however all are deemed to have resulted from planting and subsequent natural regeneration in certain areas. No true ancient semi-natural woods are present on the site. The woodlands present a variety of 'ecological quality'[6] and this is described further in section 2.3.

The woodlands range from c.12m above sea level (asl) at the banks of the River Leven, to 20m asl at Drumkinnon, to 43m asl at Woodbank, indicating the rising land from east to west across the site, bounded in the west by the A82. Within this topography is regular evidence of man-made undulations resulting from the historic land uses described earlier in this report. A Phase 1 Habitat Survey of the woodlands was undertaken in mid-June 2017 and is summarised below:

2.2.1 Broadleaved Semi-Natural Woodland

The following sections are split into sub-sections referring to different sub-categories of Phase 1 broadleaved semi-natural woodland. Please refer to the Broadleaf Group Map in Appendix B for locations of woodland habitat compartments summarised below.

2.2.1.1 BL1

This woodland is composed of mixed aged classes, ranging from sapling to young/mature. Species in this woodland group are high in density in terms of spatial distribution. There is evidence of regeneration occurring within the woodland as saplings of canopy species at various growth stages are present in the understory.

Dominant species include: ash (*Fraxinus excelsior*), beech (*Fagus sylvatica*), oak *(Quercus sp*.), sycamore (*Acer pseudoplatanus*), silver birch (*Betula pendula*), and European larch (*Larix decidua*). The understory consisted of elder (*Sambucus nigra*), rowan (*Sorbus aucuparia*), buddleia (*Buddleja davidii*), saplings (sycamore, silver birch, and willow (*Salix* sp.)). Species in the ground flora consisted of bracken (*Pteridium aquilinum*), nettle (*Urtica dioica*), broad-leaved willowherb (*Epilobium montanum*), bramble (*Rubus fruticosus*), goosegrass (*Galium aparine*), pendulous sedge (*Carex pendula*) which can be a garden escapee but is also Scottish ancient woodland indicator plant, and comfrey (*Symphytum sp*.).

[6] Consultation response from Simon Franks, LLTNP.

2.2.1.2 BL2

Although classified as LEPO according to the Ancient Woodland Inventory, this woodland has characteristics of a semi-natural woodland. The phase 1 habitat manual describes semi-natural woodland as not *obviously* originating from plantation. The dominant species present in the canopy are as follows: willow, ash, sycamore, silver birch, apple (*Malus sp.*), oak, and cherry (*prunus sp.).* Additional species present include laurel (*Laurus nobilis*), yew (*Taxus baccata*), Scot's pine (*Pinus sylvestris*), Douglas fir (*Pseudotsuga menziesii*), and cedar (*Cedrus sp*.). The coniferous species present are less than 10% of the overall woodland composition; therefore this woodland has been classified as broadleaved. The density of the dominant tree species is moderate as trees present are generally spaced a couple of metres apart. This is likely due to the lack of woodland regeneration. The understory is composed of shrub species including: hawthorn (*Crataegus monogyna*), holly (*Ilex aquifolium*), Rhododendron (*Rhododendron ponticum),* and buddleia. There is no evidence of regeneration occurring as no saplings are present in the understory of the woodland. The north east of the woodland is dominated by introduced bamboo (*Bambusoideae sp*.). The ground flora present includes species such as: nettle, bracken, foxglove (*Digitalis purpurea*), bramble, goosegrass, perennial ryegrass (*Lolium perenne*), Yorkshire fog (*Holcus lanatus*), cocksfoot grass (*Dactylus glomerata*), ivy (*Hedera sp.)* and wild garlic (*Allium ursinum*). Wild garlic is an ancient woodland indicator species. Mosses (including bog mosses (*Sphagnum sp.*)) are present in shaded areas of the woodland floor where the ground is damp. Rhododendron is present in high densities along the east of the woodland boundary and extensive bamboo is present in the northern half of this woodland.

2.2.1.3 BL4

A section of this woodland has been classified as LEPO according to The Ancient Woodland Inventory, however this woodland has characteristics of a semi-natural woodland, and the phase 1 habitat manual defines semi-natural woodland as not *obviously* originating from plantation. Trees present in the canopy include: oak, sycamore, cherry, Scot's pine, alder (*Alnus sp.),* beech, and ash. The woodland shows evidence of regeneration as saplings are present in the understory (including Douglas fir and sycamore). Additional understory species present include: elder, holly, broom (*Cytisus scoparius*), rowan, honeysuckle (*Lonicera sp.),* and hawthorn. The ground flora in the woodland are composed of nettle, rosebay willowherb (*Chamerion angustifolium*), ground elder (*Aegopodium podagraria*), bracken, perennial ryegrass, red campion (Silene dioica), goosegrass, creeping cinquefoil (*Potentilla reptans*), broadleaved dock (*Rumex obtusifolius*), broadleaved willowherb, foxglove, and common hogweed (*Heracleum sphondylium*). Ground flora species present in lower numbers were: Field forget-me-not (*Myosotis arvensis*), creeping buttercup (*Ranunculus repens*), welsh poppy (*Meconopsis cambrica*), gorse (*Ulex europaeus*.), hedge woundwort (*Stachys sylvatica*), bramble, and broom.

2.2.1.4 BL6

Species present in this stand of woodland are sycamore, silver birch, Douglas fir, willow, beech, wych elm (*Ulmus glabra*), hazel (*Corylus avellana*.), oak, and alder. The understory is dominated by species such as: elder, hawthorn, saplings (including ash, alder, oak, cherry, and birch), and holly. The trees are of mixed age categories ranging from sapling to mature, and show evidence of regeneration. Ground flora present in this woodland group includes: nettle, goosegrass, cocksfoot grass, bramble, creeping cinquefoil, gorse, broadleaved dock, foxglove, and comfrey. Other ground flora species present in lower densities include broadleaved willowherb, ragged robin (*Lychnis flos-cuculi*), red campion, herb robert (*Geranium robertianum*), and yellow iris (*Iris pseudacorus*).

2.2.1.5 BL9

This area of woodland shows evidence of regeneration, and consists of mixed age-class trees ranging from sapling to semi-mature. The dominant species in the canopy are: beech, hazel, ash, alder, rowan, silver birch, oak, and sycamore. The understory contains saplings (sycamore and ash), and hawthorn. Ground flora species present: common spotted orchid (*Dactylorhiza fuchsia*), soft rush (*Juncus effusus*), goosegrass, nettle, hedge woundwort, bramble, welsh poppy, comfrey, bracken, and foxglove.

2.2.2 Broadleaved Plantation Woodland

2.2.2.1 BL3

Dominant canopy species in this woodland group include oak, copper beech (*Fagus sylvatica f. purpurea*) sycamore, and sweet chestnut (*Castanea sativa*). Coniferous species are also present and include cedar, and Norway spruce (*Picea abies*), however, these only make up less than 10% of the overall canopy. The trees are of mixed age classes ranging from sapling to very mature. There is some evidence of regeneration as sycamore saplings are present in the understory. This woodland also has evidence of supplemented tree planting in the boundary adjacent to the carpark. The understory is composed of: saplings (beech, cherry, and ash), Rhododendron, holly, elder, broom and hawthorn. Ground flora species include: Creeping buttercup, field forget-me-not, broad-leaved willowherb, bracken, creeping cinquefoil, herb robert, and foxglove.

2.2.2.2 BL5

All trees in this woodland group are of a similar age class (semi-mature) and planted in obvious rows. Dominant tree species in the canopy include willow, silver birch, sycamore, copper beech, and alder. This woodland is also very densely planted. The understory consists of scrub species including elder and holly. The ground flora is absent in many areas as the woodland is dense and shaded. Less dense areas are colonised by bramble, horsetail (*Equisetum sp*.), bracken, ivy, and comfrey.

2.2.2.3 BL7 and BL8

Two distinct areas of the site in the north are covered by broadleaved plantation woodland. Dominant species include: willow, sycamore, oak, ash, alder, and silver birch. These are densely planted, and consist of semi-mature and immature trees. The ground layer is shaded due to the high density of the woodland. Some sporadically occurring species including bracken are present.

2.2.3 Invasive Species

There are a range of plant species considered to be 'Invasive' associated with the woodlands. The known locations of these species in February 2018 are presented in Appendix C. The species recorded were:

- Japanese knotweed (*Fallopia japonica*)
- Himalayan balsam (*Impatiens glandulifera*)
- *Rhododendron ponticum*
- Laurel (*Laurus nobilis*)
- Bamboo (*Bambusoideae*)

Although displaying semi natural characteristics (namely native species tree stock, natural regeneration in places and some notable flora), the woodlands also contain 'exotic' or 'domiciled' tree species such as beech (*Fagus sylvatica*), lime (*Tilia* sp), sycamore (*Acer pseudoplatanus*), Douglas fir (*Pseudotsuga menziesii*) etc. Although not invasive, these tree species could be considered to detract from the otherwise native component of the semi-natural woodland character. Alternatively, these tree species can be considered as resilience species in terms of pests, diseases and climate change challenges on woodland environments.

2.3 Tree Survey

2.3.1 Prominent Trees and Tree Groups

Early in the gathering of baseline information during February 2017, a tree survey was conducted to gather British Standard 5837:2012 data on prominent trees in the landscape as well as map the extents of the distinct woodland groups. This was conducted by a fieldworker using desk study information and appraising distinct

trees and tree groups from particular vantage points and by traversing the woodland internally. The prominent landscape trees were given an identification number and surveyed in accordance with British Standard 5837:2012.

Prominent landscape trees (those distinctly visible from outside and within the woodland, contributing as individuals to the landscape character) were found to be those along the raised banking south of Ben Lomond Way towards the Loch Lomond Shores complex; trees parallel to Luss Road within the 'Woodbank' section of the site and surrounding the derelict building in that area (many domiciled species listed in section 2.2.3). This survey provided a simple Tree Constraints Plan which is shown in Appendix D showing the location of those prominent landscape trees, and the woodland polygons as depicted on Ordnance Survey data. Individual prominent trees were categorised by the British Standard quality criteria (A, B, C) and measured for their calculated root protection area by extrapolating their Diameter at Breast Height (DBH) in relation to BS5837 calculations. The tree survey datasheet which notes tree species, size, condition and calculated root protection area is also provided in Appendix D.

In addition to the survey of prominent trees described above, various tree groups were described. The location of these tree groups (TG1 to TG12) are shown on the tree constraints plans described above. Summary of the tree group species and character along with age profile, average diameter and height estimates, and representative photographs are also provided within Appendix D.

Following the prominent tree survey and general habitat mapping, with design principles promoting woodland retention and micro-siting, the survey effort to identify every individual tree within relatively homogenous woodland groups was deemed excessive and for 'in-principle' design unnecessary. More detailed targeted survey effort would be expected at detailed design stage.

2.3.2 Identification of Glades

In order to identify areas within Drumkinnon and Woodbank which could be utilised for the installation of accommodation 'pods' it was suggested during consultation with LLTNP that tree retention would be maximised if pods were positioned within glades, particularly at Drumkinnon, and that spaces could be created at Woodbank following removal of the dense Rhododendron. Thus, a survey was conducted in September 2017 to identify the GPS locations glades of c.20m diameter. The selection of a 20m diameter glade was based on approximate dimensions of woodland accommodation design provided by the client which is a maximum of 15m x 12m. Indicative examples of glades are shown in Figure 2-6. There was no considered level of greater 'ecological sensitivity' between glade options although it is likely that floral diversity is higher in the Drumkinnon glades than Woodbank due to the proliferation of Rhododendron which would require clearing at Woodbank. In both woodlands, some glade opportunities may be expanded if removal of a small number young sycamore trees is undertaken. These would be deemed as easily replaceable trees within any woodland planting. A plan showing glade locations is presented in Appendix E. Glade locations were subsequently presented to LLTNP and utilised to progress the Design Statement[7].

The survey carried out clearly established that glades are present, or can be created in Woodbank by removal of rhododendron which can house pods.

2.3.3 Woodland Character (Ecological Quality)

Following consultation with Simon Franks of LLTNP in August 2017 (and again in November 2017), more information on the woodland character (*ecological quality*) was requested. As a result EnviroCentre provided a digital output of distinct woodland composition changes. This has been provided in Drawing 168659-027 in

[7] West Riverside and Woodbank Design Statement, April 2018

Appendix A and shows that there are core areas of oak (*Quercus*) with a variety of understory vegetation, largely associated with Drumkinnon. This would suggest that the replanting undertaken around 1930 was that of predominantly oak and that other species such as sycamore and birch probably colonised as successive growth following that clear-fell. This older woodland habitat has developed good ecological quality/interest with a diverse species list and vertical structure.

Moving westwards the woodland composition alters towards a younger profile of birch and sycamore and eventually the planted woodlands of the amenity grassland adjacent to the River Leven. Surrounding the Loch Lomond Shores infrastructure is also a young to semi-mature aged broadleaf plantation which has emanated from development landscaping of previous projects. Ecological quality of these planted woodlands is low (minimal ground cover/floral diversity/homogenous age profile), but likely to improve with age with some active management.

To the east is the woodland of Woodbank which is of plantation origin, somewhat dominated by species such as sycamore but have matured as a woodland to provide varying structure. Detracting from this is the proliferation of invasive Rhododendron and laurel and the intense grazing pressure from horses. Thus the 'ecological quality' may be focussed on particular individual trees however, this woodland presents opportunities for restorative strategies.

Figure 2-6 Example Glades

2.3.4 Bluebells

There is a reported abundance of bluebell within the woodland. Unfortunately ecological surveys of the woodlands did not coincide with the flowering period of this plant.

It has not been possible, through consultation with stakeholders, to confirm if the bluebells are British native (*Hyacinthoides non-scripta*), invasive Spanish bluebells (*Hyacinthoides hispanica*) or the result of hybridisation (*Hyacinthoides x massartiana*).

However, consultation with LLTNP indicates that bluebells are certainly present across the woodland and thus the project would require a mitigation strategy for minimising effects on all woodland ground flora, for any activity within the woodland. To inform detailed design layouts a survey of the woodlands would take place in April/May. This survey would inform glade selection and the micro-siting process.

2.4 Design Proposals

The proposed development is for a tourism and leisure-led mixed use development at West Riverside and Woodbank House (Site area 27.9 hectares (69acres)). Figure 2-7 below outlines the proposal in principle with accompanying detail.

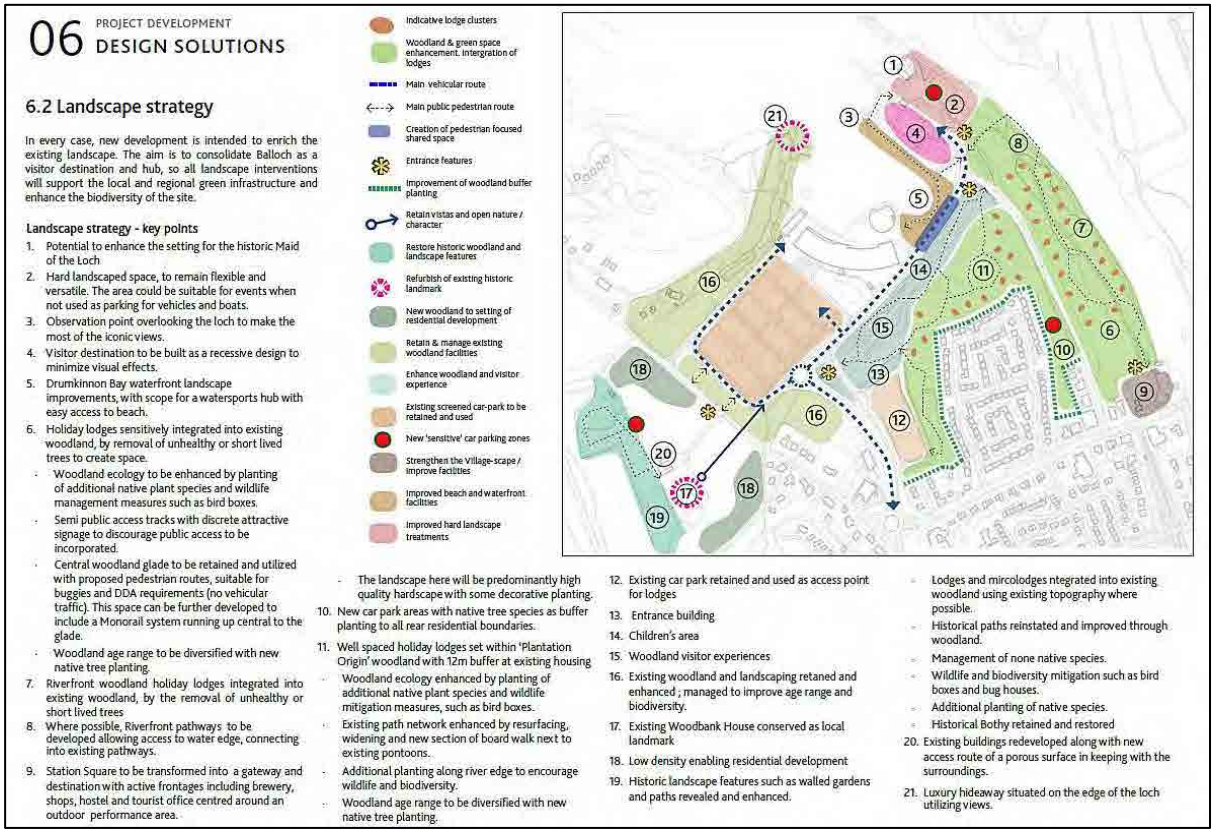

Figure 2-7: West Riverside and Woodbank design proposals

The current design detail is elaborated upon within the Design Statement[8].

[8] Anderson Bell Christie (April 2018), 2018_0133_PPP-Design_Statement parts 1-8 .

2.4.1 Principles of Design Relevant to Woodland

The woodland, habitat and ecological survey information and constraints were provided to the design team in order to compile the West Riverside and Woodbank Design Statement.

Throughout the process the principles of design have been to retain the woodland (no net loss of trees), contribute to its management and restoration/function and utilise the spaces provided naturally, through past human management. It would also potentially use those spaces that could be created following removal of invasive plant species, or small exotic/domiciled tree species (such as young sycamore). The existing and created spaces would afford the opportunity to locate accommodation pods of varying sizes within both Drumkinnon Wood and Woodbank.

Woodland lodges would be expected to be constructed upon raised 'stilt' type footings negating the need for traditional strip foundations, thus maximising protection of the soil environment. Access pathways would likely follow existing networks which have been constructed, but may require upgrading in places. This should be achieved using sensitive construction techniques[9].

The protection of soils was deemed an important factor given that the woodlands (particularly Drumkinnon) are developing semi-natural character and that floral diversity, fungal interaction as well as invertebrate life which are all valuable factors. Thus a principle that woodland soils would not leave site, that disturbance of soils would be kept to a minimum and that minor micro-siting or short-distance translocation of soils containing notable flora, under supervision by an ecologist, would feature within construction method statements.

2.4.2 Mitigation

Broad mitigation likely to be required would be as follows:

- Exact lodge location and orientation based on glade choice and targeted survey of surrounding trees;
- When being scoped and designed, utility and engineering proposals should take cognisance of trees and woodlands in order to carefully microsite the routes. Excavation for any required services should be targeted to areas free from tree root constraints; areas that have already been disturbed to create access networks; should use technology such as directional drilling if necessary to avoid tree roots, preservation of soil structure/profile during backfill; and careful excavation using hand tools will be necessary in areas in order to retain structural roots and thread utility conduits beneath (roots bridging excavations). All excavations of this nature will be guided by the project arboriculturalist;
- Minimise vegetation clearing works throughout the process;
- No removal of mature trees to create access or glades will be undertaken;
- Removal of undesirable and easily replaceable species may be undertaken to create space or maximise the extent of a woodland glade. Trees removed within woodlands shall be replaced with compensatory planting within that woodland;
- All other tree removal (i.e. modification of the greenspaces adjacent to the River Leven) shall be compensated through a landscaping scheme using appropriate species;
- All tree and vegetation removal will be informed by a pre-check for features of ecological interest. Tree and vegetation removal should avoid the bird nesting season (March-August/September);
- Ground level changes should not occur within areas deemed vital for tree health. In general this will feature an avoidance of stem-root collar burial, level changes within tree root areas which would create ponding of water or root severance;

[9] Greenfix Tree Root Protection: http://greenfix.co.uk/product/geoweb-tree-root-protection-system/ (Accessed 29/11/2018)

- British Standard 5837:2012 specification vertical tree protection barriers will be installed to protect main stems of trees and ground protection will be installed where necessary to protect areas where working within the calculated root protection area is required;
- Construction of lodges upon small 'corner' foundations, or stilts to minimise excavation;
- Micro-siting of these foundations to avoid structural tree roots;
- Foundations could be screw-piled to further reduce impacts on soils and tree roots;
- All mechanical plant operations which pose a risk to trees will follow a bespoke method statement and/or shall be supervised by a project arboriculturalist;
- Use of load spreading engineering design for access and pedestrian footpaths;
- Retention of all soils within the woodland;
- Short-distance translocation of soil matter and flora to suitable donor sites within the woodland may be undertaken if necessary following advice from a project ecologist;
- Use of sustainable drainage for surface water retention within the woodland;
- Soil contamination will be avoided by applying pollution prevention measures detailed within a Construction Environment Management Plan;
- Use of no lighting, or low-lux level lighting directed using cowls, to minimise effects of on fauna using woodland habitats; and
- Compensatory planting, aiming for net woodland gain in the area through an approved scheme of landscaping.

Consultation with LLTNP representatives suggested that manipulation of the more recent plantings adjacent to the River Leven would be acceptable with replacement planting featuring within landscaping where necessary. Thus the distinct woodland removal is proposed to be focussed in this area. No loss of overall woodland cover is proposed at Drumkinnon Wood or Woodbank as trees or vegetation to be removed would be of invasive species or easily replaceable trees.

2.4.3 Opportunities for Future Management and Enhancement

The development also proposes the opportunity to form a pro-active management regime in order to tackle the future challenges faced by the woodland. In particular the following:

- The control and eradication of invasive plant species, some of which have direct vectors to the wider national park;
- The monitoring and possible reduction in grazing pressure from browsing mammals would promote greater natural regeneration;
- The regular audit of maturing tree stock for pests, disease and required remedial works would be undertaken;
- There is the opportunity to manage the reduction of any declining mature trees to rapidly increase veteran characteristics and prolong their persistence in the landscape;
- The opportunity to apply strategies such as bracken and bramble control should this promote floral diversity, in particular ancient woodland indicator plants;
- Dead wood material, fallen and standing, can be retained within the woodland to promote fungal and invertebrate communities over time;
- Continued supplementary planting to promote an overall woodland composition preferred by stakeholders (i.e. native semi-natural, or promoting species with more resilience to climate change);
- Promotion of habitat connectivity to green infrastructure adjacent to the development boundary; and
- There is the immediate opportunity to drastically increase the number of bat, bird and invertebrate habitat/shelter available across all woodlands through a biodiversity management plan.

2.5 Impact Assessment

It is without doubt that the woodland habitats in this area have undergone large changes over at least 300 years, with the most drastic perhaps of recent industrial times. That the development of Loch Lomond Shores appears to have invested in tree planting, woodland access provisions and some management of green spaces.

The design statement has been produced with cognisance of the woodland habitats on site and seeks to develop the opportunity of a multi-purpose woodland environment to provide recreation, education and habitat management. Low impact construction techniques have been included and depicted within the design statement document.

Woodland removal to facilitate development appears will be of the planted habitats at the site of the old railway, now mainly grassland, adjacent to the River Leven. Compensatory planting is anticipated within landscape schemes to replace the initial loss of trees in this area.

Tree removal may occur at Location 9 (presented within page 65 of the design statement) where it is proposed to develop the site entrance at the south aspect of Drumkinnon woods. This infrastructure is likely to be positioned on the woodland edge and would necessitate minimal tree loss and British Standard tree protection. Tree loss in this area should be easily replaceable directly adjacent to the entrance infrastructure.

Other development within the woodlands seeks to follow the design principles outlined in section 2.4 in order to achieve the proposed development with no net loss of woodland cover from Drumkinnon or Woodbank, and where individual tree removal (such as young sycamore) is required, replanting within and adjacent to the woodlands is feasible and will be undertaken.

The impacts of the development on woodlands is summarised in the following regards:

1. The manipulation of the River Leven riparian woodland to facilitate development may result in habitat fragmentation and restructuring, and would require to be compensated within landscaping and tree planting plans to the satisfaction of the planning authority;
2. That the woodlands of Drumkinnon and Woodbank have expanded well over the recent decades and offer existing and future multi-purpose opportunities alongside required proactive management;
3. Design will follow the outlined principles, through which impacts to Drumkinnon and Woodbank are predicted to be low in regards of tree loss and soil/flora disruption and that opportunities for woodland enhancement and eradication of invasive species are high; and
4. Targeted detailed tree survey of particular areas will aid in developing detailed designs and avoidance of negative impacts through micro-siting and use of low impact construction/engineering techniques within root protection areas.

2.5.1 Future Survey Requirements

This summary and outline impact assessment relates only to principles and outline design at this stage, thus the impacts can only be described in relation to woodlands in general, rather than any particular tree, or trees. Nonetheless, a robust set of mitigating principles has been set in order to guide the detailed design process and ultimately the construction process.

Woodland are dynamic and the baseline information can change over time. Thus regular updates of data, or addition of targeted survey data must be undertaken in order to progress elements of the design process.

Whilst a good spread of woodland flora was identified within the Phase 1 Habitat Survey, field survey visits throughout the flowering period (including Bluebells) will be required to inform detailed layouts. In evolving the detailed designs further more targeted tree surveys should be undertaken.

3 CONCLUSION

Following an iterative process the design statement has embraced the woodland habitats of the site as an asset within the developer's vision for the site as a recreational woodland offering opportunity for an increase in leisure and tourism provision in the area.

The retention and management of woodlands therefore is intrinsic to the development and its design. For the purposes of planning permission in principle, the mitigation and enhancement outlined in this report can become embedded and further developed as the planning process moves towards detailed design and engineering. It is concluded that through careful design and construction, the development as proposed in the design statement can be completed with due attention to the site's treed assets. Additionally the longevity of quality woodland and trees, ecological function for a range of species, monitoring and continued habitat management would be achievable.

The only area of woodland that is likely to see noticeable change is the woodland along the River Leven (riparian woodland). There will however be no net loss of trees along the River Leven corridor, or anywhere within the development area for that matter. The areas for retention therefore are the areas within Drumkinnon Wood and Woodbank which fall outwith the areas with existing glades, or where glades can be created through removal of trees such as young sycamore, or invasive species (Rhododendron in Woodbank)

In the absence of a detailed design it is simply not possible to detail where the compensatory planting within the River Leven corridor would take place or indeed where native species would be planted to replace the felling of young sycamore.

Of importance also are the practical works required within the woodlands to eradicate and control invasive plant species, which will threaten the semi-natural characteristics (natural tree regeneration), and in particular the ground level flora such as bluebells and ancient woodland indicator plants. These would be ultimately facilitated through the development process and likely to continue in perpetuity of the site's management.

APPENDICES

A WOODLAND SPECIES COMPOSITION

Legend

- Site Boundary
- Approximate Glade Location
- Birch, Willow, Cherry, Sycamore Woodland
- Core Sessile Oak Habitat with Bramble
- Oak, Birch, Sycamore Woodland
- Oak, Sycamore, Bramble, Bracken
- Pipeline Clearing, Dense Bramble
- Planted/ Exotic/ Domiciled Tree Species
- Planted or Highly Modified Woodland

ANTIQUITY

- Long-Established (of plantation origin)
- Wider Woodland Connectivity

Revisions
A: Minor changes to symbology only

Do not scale this map

Client
TSL Contractors Limited

Project
West Riverside Balloch

Title
Woodland Species Composition

Status
Final

Drawing No.	Revision
168659-027	A

Scale		Date
1:2,000	A1	07 Dec 2018

Drawn	Checked	Approved
GV/FR	GV	IB

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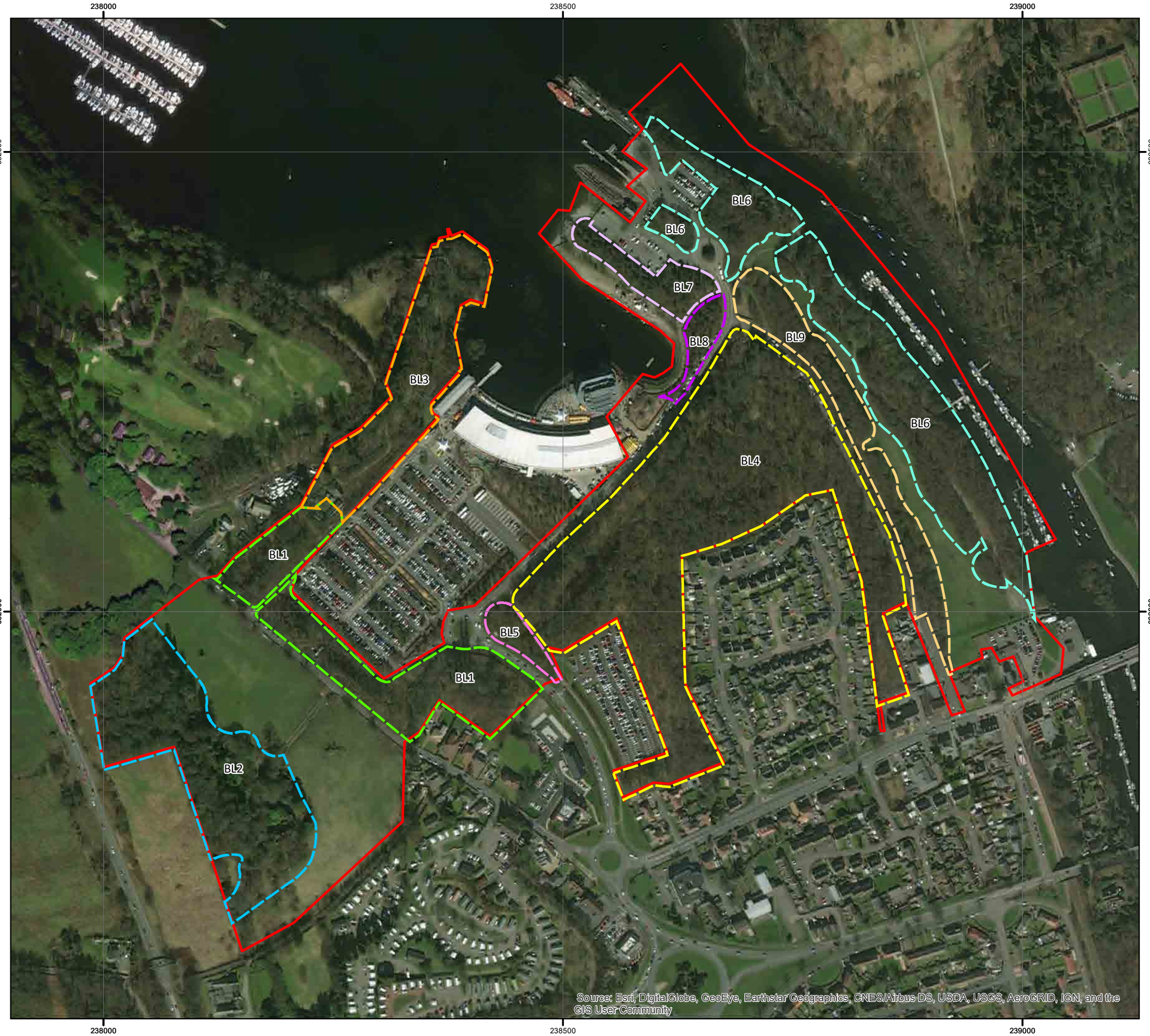
B BROADLEAF GROUP MAP



Legend

- Site Boundary
- Broadleaf 1
- Broadleaf 2
- Broadleaf 3
- Broadleaf 4
- Broadleaf 5
- Broadleaf 6
- Broadleaf 7
- Broadleaf 8
- Broadleaf 9

Revisions
A: Amended boundaries for site and Broadleaf 4

Do not scale this map

Client
TSL Contractors Limited

Project
West Riverside Balloch

Title
Broadleaf Group Map

Status
FINAL

Drawing No.
168659-010

Revision
A

Scale
1:4,000

A3

Date
03 Dec 2018

Drawn	Checked	Approved
GV/FR	MN	IB

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C INVASIVE SPECIES PLAN

Legend

Site Boundary

Invasive Non-Native Species

- Bamboo
- Himalayan Balsam
- Japanese Knotweed
- Laurel
- Rhododendron

Do not scale this map

Client
TSL Contractors Limited

Project
West Riverside Balloch

Title
Invasive Non-Native Species Plan

Status
FINAL

Drawing No.
168659-028

Revision

Scale
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A3

Date
2 Feb 2018

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JEP	GV	IB

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D TREE CONTRAINTS PLANS

Legend

- Site Boundary
- Tree Location
- Root Protection Area
- Tree Group (TG1 - TG12)

Tree Category

- A
- B

Do not scale this map

Client
Peter Brett Associates

Project
West Riverside, Balloch

Title
Tree Constraints Plan
Map 1 of 2

Status
Final

Drawing No.	Revision
168659-004a	

Scale		Date
1:2,000	A3	13 Feb 2016

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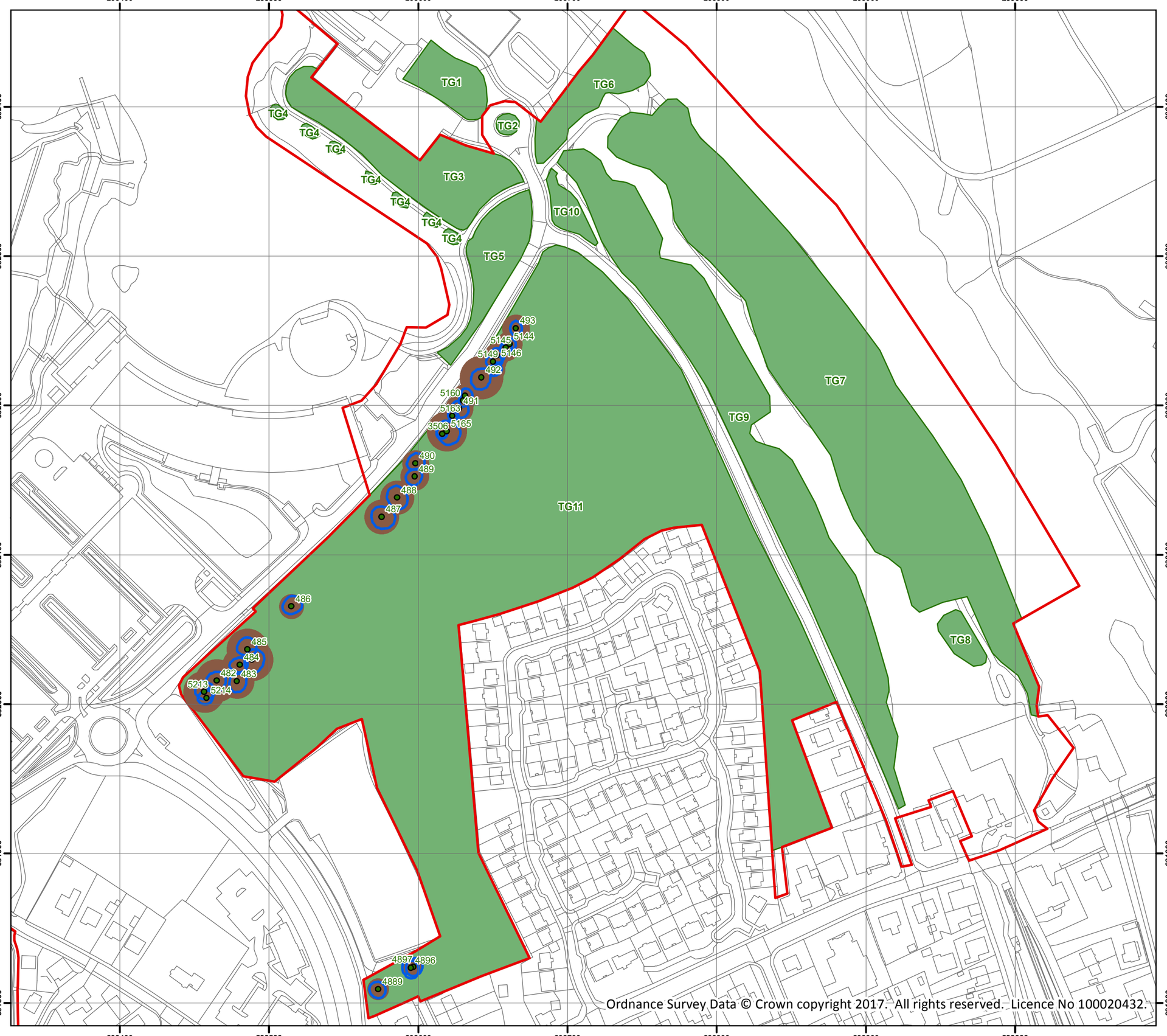

Legend

- Site Boundary
- Tree Location
- Root Protection Area
- Tree Group (TG1 - TG12)

Tree Category

- A
- B

Do not scale this map

Client
Peter Brett Associates

Project
West Riverside, Balloch

Title
Tree Constraints Plan
Map 2 of 2

Status
Final

Drawing No.
168659-004b

Revision

Scale
1:2,500

A3

Date
13 Feb 2016

Drawn	Checked	Approved
JI	DB	IB

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West Riverside and Woodbank Tree Schedule

No.	TreeID	Species	Height (m)	DBH (mm)	Branch Spread (m)				Age	Condition	Comment	British Standard Category	RPA Radius (m)	Crown Average (m)	x	y
					N	E	S	W								
1	5213	BEECH	15	1170	7	7	5	6	M	G		B	14.04	6.25	238456.5	682008.3
2	5214	SYCAMORE	14	810	5	4	4	6	M	F	CO DOM STEMS FROM GROUND LEVEL	B	9.72	4.75	238458.2	682004.1
3	482	BEECH	15	1200	6	6	7	7	M	F	IMBALANCED CROWN TO W	B	14.40	6.5	238464.9	682015.6
4	483	BEECH	16	960	5	6	7	5	M	F		B	11.52	5.75	238478.6	682015.2
5	3461	BEECH	17	1180	7	8	9	5	M	P	LOST LIMB S. ROT/FUNGUS	B3	14.16	7.25	238488.7	682029.6
6	484	BEECH	15	970	5	5	5	7	SM	F	CO/DOM STEMS AT 1M	B	11.64	5.5	238480.5	682026.3
7	485	SYCAMORE	16	1160	8	6	4	7	M	G	3 MAIN STEMS FROM 1M	B	13.92	6.25	238485.5	682036.6
8	486	SYCAMORE	16	700	7	7	5	6	M	F		B	8.40	6.25	238515.0	682065.4
9	487	BEECH	16	970	7	9	8	7	M	F	SOME TORN OUT LIMBS	B	11.64	7.75	238575.5	682125.4
10	488	BEECH	17	950	8	7	8	7	M	F	DECAY/BASE STEM.INCLUDED BARK	B	11.40	7.5	238585.9	682138.2
11	489	D.FIR	18	800	5	5	6	6	SM	G		B	9.60	5.5	238597.6	682152.5
12	490	SYCAMORE	14	750	7	6	4	6	SM	F	310.470.320.380. ON SLOPE	B	9.00	5.75	238598.2	682161.1
13	3506	D.FIR	15	690	5	3	3	4	M	G		B	8.28	3.75	238616.2	682180.9
14	5165	BEECH	16	1120	7	9	9	7	M	G	SOME LOST LIMBS W DECAY	B	13.44	8	238619.1	682182.7
15	5163	D.FIR	16	690	4	4	3	3	M	G		B	8.28	3.5	238622.9	682192.9
16	491	SYCAMORE	14	780	5	6	6	5	SM	F	PRUNING. CO/DOM STEMS AT 1.5M	B	9.36	5.5	238627.5	682197.9
17	5160	D.FIR	15	660	4	3	4	3	M	G		B	7.92	3.5	238630.2	682203.3
18	5155	D.FIR	16	670	5	5	4	3	M	G		B	8.04	4.25	238631.3	682206.4
19	492	BEECH	13	1220	6	6	8	7	M	P	LOST LIMB W DEADWOOD FUNGUS	B	14.64	6.75	238642.4	682218.7
20	5149	D.FIR	16	740	5	6	4	5	M	G		B	8.88	5	238650.3	682229.3
21	5150	D.FIR	15	630	4	5	4	3	M	F	SMALLER STEM HAS RIPPED OUT	B	7.56	4	238650.8	682223.8
22	5146	LIME	11	700	5	5	5	4	SM	F	CO/DOM STEMS 1M.460/530	B	8.40	4.75	238652.7	682233.5
23	5145	S.PINE	17	760	4	4	4	4	M	G	LEAN TO S	B	9.12	4	238658.7	682238.6
24	5144	N.SPRUCE	16	730	4	4	5	4	M	F	SOME STORM DAMAGE	B	8.76	4.25	238661.2	682241.1
25	493	D.FIR	18	780	5	4	5	4	M	G	SOME LOST LIMBS	B	9.36	4.5	238665.5	682251.6
26	4897	SYCAMORE	15	540	6	6	6	5	SM	F		B	6.48	5.75	238596.8	681824.0
27	4896	OAK	15	460	5	5	7	6	SM	F		B	5.52	5.75	238595.2	681823.4
28	4889	OAK	13	610	5	5	6	6	SM	F		B	7.32	5.5	238573.1	681809.1
29	494	CEDAR LEB	20	1140	5	7	7	6	M	G		A	13.68	6.25	238206.9	681791.1
30	495	LIME	22	700	4	4	4	4	M	G	EST.DBH. TAG ON EPI GROWTH	B	8.40	4	238169.7	681767.4
31	496	YEW	8	380	4	4	4	4	SM	F	SUPRESED/LAUREL	B	4.56	4	238180.3	681768.9
32	497	OAK	22	1270	8	8	12	12	M	G		A	15.24	10	238183.6	681806.0
33	498	YEW	12	850	6	6	6	6	SM	F	BASAL FIRE DAMAGE	A	10.20	6	238179.3	681819.2
34	499	OAK	18	940	4	5	5	5	M	G		B	11.28	4.75	238182.2	681829.5
35	500	OAK	23	1100	5	8	8	6	M	F	TORN OUT LIMB.STORM DAM	B	13.20	6.75	238183.4	681848.9
36	501	N.SPRUCE	25	1000	4	4	4	4	M	G	COMP SOIL.NAILS IN STEM	A	12.00	4	238075.2	681944.1
37	502	LIME	20	1060	5	8	5	7	M	G		A	12.72	6.25	238117.5	682022.5
38	503	LIME	19	1210	5	8	5	7	M	G		A	14.52	6.25	238131.0	682008.8
39	504	SYCAMORE	11	410	4	4	3	4	SM	G		B	4.92	3.75	238149.7	681997.5
40	505	LIME	19	1090	5	7	5	7	M	G		A	13.08	6	238153.1	681995.3
41	506	LIME	15	1070	11	7	2	6	M	P	LOST MAIN LEADER. REDUCTION	B	12.84	6.5	238169.7	681979.1
42	507	LIME	19	980	6	7	6	6	M	G		A	11.76	6.25	238203.7	681952.6
43	508	LIME	19	1050	7	7	5	7	M	G		A	12.60	6.5	238223.1	681935.5
44	509	LIME	19	1120	7	7	6	7	M	G	EV. OF PRUNING	A	13.44	6.75	238269.5	681896.3
45	510	LIME	14	1060	7	7	7	7	M	G		B	12.72	7	238294.0	681876.1

Key

TREE ID	Refer to Drawings 168659-004a and 004b
DBH	Diameter at Breast Height
N, E, S, W	Canopy Spread (North, East, South, West)
Age	M (Mature), SM (Semi Mature)
Condition	G (Good) F (Fair) P (Poor)
Category	Refer to Tree Quality Assessment Criteria
RPA	Root protection area

Category and colour on TCP	Criteria		
U - Removal 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.	• Trees that have a serious, irremediable structural defect such that early loss is expected through collapse, or become unviable after removal of other category U trees. • Trees that are dead or are showing signs of significant, immediate or irreversible overall decline. • Trees infected with pathogens of significance to the health and/or safety of other nearby trees or trees of very low quality, suppressing adjacent trees of better quality.		
A - Retain **Trees of high quality** with an estimated remaining life expectancy of at least 40 years.	**Mainly arboricultural value**	**Mainly landscape value**	**Mainly cultural values including conservation**
	1 Trees that are particularly good examples of their species, especially if rare or unusual. Essential components of groups or formal or semi-formal arboricultural features (i.e. dominant/principal trees in an avenue).	2 Trees, groups or woodlands of particular visual importance as arboricultural and/or landscape features.	3 Trees, groups or woodlands of significant conservation, historical, commemorative or other value (e.g. Veteran trees or wood-pasture).
B - Retain **Those of moderate quality** with an estimated remaining life expectancy of at least 20 years.	1 Trees that might be included in the high category, but are downgraded because of impaired condition (e.g. remediable defects or poor past management/storm damage) such that they are unlikely to be suitable for retention beyond 40 years.	2 Trees present in numbers usually as groups or woodlands, such that they form distinct landscape features thereby attracting a higher collective rating than they might as individuals, or trees occurring as collectives but situated so as to make little visual contribution to the wider locality.	3 Trees with measurable conservation or cultural value.
C - Retain **Those of low quality** with an estimated remaining life expectancy of at least 10 years, or young trees with a stem diameter below 150mm.	1 Unremarkable trees of very limited merit or such impaired condition that they do not qualify in higher categories.	2 Trees present in groups or woodlands, but without this conferring on them significantly greater collective landscape value and/or trees offering low or only temporary/transient landscape benefits.	3 Trees with very limited conservation or cultural value.

Tree Group Descriptions.

Tree Group Number	Species composition and character	Age Profile	Average DBH	Average Height	Area (Ha)	Photograph/s
1	An area of semi-natural woodland dominated by alder, sycamore and ash. The shrub layer consists of holly and regenerating alder and the woodland group is surrounded by a mature hawthorn hedge.	SM	200	8	0.16	
2	Small landscaped area planted with birch. There is no shrub layer and the ground flora is dominated by bramble and ivy.	SM	180	9	0.02	

Tree Group Number	Species composition and character	Age Profile	Average DBH	Average Height	Area (Ha)	Photograph/s
3	An area of plantation woodland dominated by oak, birch, alder, ash and Scot's pine. There is no apparent regeneration but occasional broom shrubs are present. The ground layer is limited due to shading. The area is enclosed with a hawthorn and beech hedgerow.	Y/SM	150	7	0.51	
4	Several small clusters of birch and alder located along the bank of Loch Lomond that have been grouped together. Many of the trees are multi-stemmed and show signs of damage to their roosts from mowing.	SM	200	8	0.05	

Tree Group Number	Species composition and character	Age Profile	Average DBH	Average Height	Area (Ha)	Photograph/s
5	Woodland group with the same species composition and structure as Tree Group 3. Again, the group is enclosed by a hawthorn and beech hedgerow.	Y/SM	150	7	0.25	
6	Semi-natural woodland with species present including oak, alder, ash, birch, sycamore, willow, holly and beech. The shrub layer consists of regenerating alder and holly in addition to bramble and bracken. The ground layer includes ivy, moss species and woodrush.	SM	450	9	0.25	

Tree Group Number	Species composition and character	Age Profile	Average DBH	Average Height	Area (Ha)	Photograph/s
7	Semi-natural woodland dominated by sycamore and alder. Other species present include holly, willow, beech, hawthorn, elm and hazel. Regeneration is occurring with alder, birch and ash present in the shrub layer along with broom and bramble. The ground layer includes snow drops and moss species but is limited due to shading. Some evidence of woodland management is present as it appears the borders of the tree group are strimmed back.	SM	350	12	2.51	
8	A small area of birch, sycamore and willow dominated woodland enclosed by a dog rose hedge. The shrub layer consists of willow, bramble and broom. There is no discernible ground layer.	SM	270	12	0.07	

Tree Group Number	Species composition and character	Age Profile	Average DBH	Average Height	Area (Ha)	Photograph/s
9	Belt of semi-natural woodland with species present including sycamore, birch, oak, hawthorn, hazel, beech and alder. There is a large amount of windfall present which is now regenerating. The shrub layer is dominated by hazel, alder and holly.	SM	300	12	1.42	
10	A small area of woodland consisting of alder, birch and beech with an understorey of bramble and hawthorn. There is no discernible ground layer.	SM	170	10	0.07	

Tree Group Number	Species composition and character	Age Profile	Average DBH	Average Height	Area (Ha)	Photograph/s
11	Ancient Woodland (Long-established of plantation origin). Species present in this mature semi-natural woodland include beech, sycamore, oak, birch, ash, hawthorn, Douglas fir, Scot's pine and holly. Several mature beech, sycamore and Douglas fir trees are present along an embankment in the north western extent of the group. Fallen and standing deadwood is present throughout this woodland with abundant associated fungal bodies. Regeneration is present from ash, oak, hawthorn and beech. Bramble and bracken are present along with areas of sphagnum moss on the ground layer.	M	300	12	7.37	 

Tree Group Number	Species composition and character	Age Profile	Average DBH	Average Height	Area (Ha)	Photograph/s
12	Ancient Woodland (Long-established of plantation origin). This mature woodland is dominated by oak, birch, and laurel. Other species present include yew, Scot's pine, cedar, holly and sycamore. The understory is dominated by buddleia and rhododendron with bracken and bramble also present. The ground layer is limited due to shading from the canopy however lichens, mosses, ferns and fungi are present on the woodland floor and on the trees.	M	300	13	2.93	 

The screenshot below shows areas of Ancient Woodland (Long-established of plantation origin) present within the site:

E GLADE LOCATION PLAN

Legend

- Approximate Glade Location

Revisions

A: Amended site boundary

Do not scale this map

Client

TSL Contractors Limited

Project

West Riverside Balloch

Title

Glade Location Plan

Status

FINAL

Drawing No.	Revision
168659-018	A

Scale		Date
1:1,250	A1	03 Dec 2018

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