

Appendix 6 – Ecology and Woodland

Appendix 6.1 – Phase 1 Habitat Study



West Riverside, Balloch Phase 1 Habitat Survey



May 2018

West Riverside, Balloch

Phase 1 Habitat Survey

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Author: Amy Ashe
Reviewer: Gemma Nixon/Doug Blease

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Glasgow

Craighall Business Park
8 Eagle Street
Glasgow
G4 9XA
0141 341 5040
info@envirocentre.co.uk
www.envirocentre.co.uk

Aberdeen

Banchory Business
Centre
Burn O'Bennie Road
Banchory
AB31 5ZU
01330 826 596

Inverness

Alder House
Cradlehall Business Park
Inverness
IV2 5GH
01463 794 212

Edinburgh

Suite 114
Gyleview House
3 Redheughs Rigg
Edinburgh
EH12 9DQ
0131 516 9530

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EXECUTIVE SUMMARY

EnviroCentre Ltd. was appointed by TSL Contractors Limited to undertake a Phase 1 Habitat survey for a proposed multi-purpose development in Balloch on the south shore of Loch Lomond. This report has been produced as an accompanying document for the Environmental Impact Assessment (EIA) being undertaken for the development.

The survey aimed to identify all broad habitat types as per the Joint Nature Conservation Committee (JNCC) guidelines for Phase 1 Habitat survey and included a search for non-native invasive species, Annex 1, Scottish Biodiversity List (SBL), and Groundwater Dependent Terrestrial Ecosystem (GWDTE) habitats.

The site exists within the Loch Lomond and Trossachs National Park (LLTNP). A further 24 statutory designated sites were identified within 10 km of the site boundary. Five of these are considered to have ecological and/or hydrological connections to the development site. Six non-statutory designated sites were identified within 2km of the site boundary, of which, only the River Leven was considered to be connected to the development site.

Fifteen broad habitat types were identified from the survey. The dominant habitat across the site was broadleaved semi-natural and plantation woodland. Part of the woodland is listed on the Ancient Woodland Inventory as long established (of plantation origin). The woodland also represents lowland deciduous woodland which is and Scottish Biodiversity List (SBL) and UK Biodiversity Action Plan (UKBAP) priority habitat. There is a small area of marshy grassland which has been identified as a potential GWDTE. Wet grassland is also listed as a priority on the Local Biodiversity Action Plan. There are also hedgerows present within the site which are also listed as a priority habitat on the LBAP, SBL and UKBAP.

Two stands of Japanese knotweed (*Fallopia japonica*) were identified within the site boundary, and one stand was identified adjacent to the site boundary. Himalayan Balsam (*Impatiens glandulifera*) is sporadically present along minor water courses and *Rhododendron* is present in the west of the site. Treatment or removal is recommended as per The Wildlife and Countryside Act (1981). Non-native laurel (*Laurus nobilis*) and bamboo (*Bambuseae*) are also present in the woodland in the west of the site and recommended for removal.

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1 INTRODUCTION

1.1 Remit

EnviroCentre Ltd. was commissioned by TSL Contractors Limited to undertake a Phase 1 Habitat survey of an area proposed for multi-purpose development near Balloch, on the southern shore of Loch Lomond. This report has presents the baseline site data to inform an Environmental Impact Assessment (EIA) being undertaken for the development.

1.2 Aim and Objectives

Nature conservation entails the conservation of wild plants and animals and natural and semi-natural habitats. It cannot be carried out effectively without knowledge of the nature of these habitats and of their location, extent and distribution. The purpose of Phase 1 Habitat survey is to provide this information (JNCC, 2010).

The survey aimed to establish the ecological baseline in terms of vegetated habitats. The main objectives were as follows:

- Identify and map the broad habitat types present within the site;
- Identify any non-native invasive species within the site;
- Highlight the potential for Groundwater Dependant Terrestrial Ecosystems (GWDTE's) within the site; and
- Make recommendations for further survey.

1.3 Site Description

The site is located on the southern shores of Loch Lomond in Balloch and is situated immediately north of the town centre (OS Grid Reference: NS 38452 81979). The site comprises two distinct areas of land at West Riverside, adjacent to the River Leven, and Woodbank House, located between Old Luss Road and the A82.

The West Riverside area is bounded to the north by the Loch Lomond Shores complex and Loch Lomond itself, to the west by a minor unnamed road and a landowner boundary, to the east by the River Leven and to the south by Balloch Road, the Balloch Road housing estate and Old Luss Road. The site is an irregular shape and effectively surrounds the Balloch Road housing estate on three sides. The site mainly comprises wooded areas (including Drumkinnon Wood) with recreational parkland and footpaths. Pier Road runs from south to north through the site. A beach area (Loch Lomond shore) is present in the north west. The shoreline is used for mooring boats and pontoons are present in the water for this purpose.

The Woodbank House area currently comprises two relatively flat grassy fields in its eastern area which are bisected by an access track running from east to west. The track leads to an area of mixed woodland in the western area which has a more varied topography with levels generally rising to the west and becoming particularly steep in the north west. Within the woodland are the remnants of Woodbank House, outbuildings and a walled garden. The buildings are in a state of advanced disrepair as a result of a fire (at the main hotel building) and subsequent dereliction.

1.4 Legislation and Policy

European and national legislation and national and local policy relevant to this report includes:

- The Wildlife and Countryside Act 1981 (as amended) (WCA);
- The Conservation (Natural Habitats, &c.) Regulations 1994 (as amended);
- The British Standard for Biodiversity;
- The UK Biodiversity Action Plan (UK BAP);
- The Scottish Biodiversity List (SBL);
- Scottish Planning Policy (2014);
- West Dunbartonshire Local Development Plan (LDP); and
- West Dunbartonshire Local Biodiversity Action Plan (LBAP).

1.5 Assessment Limitations

Desk Study

It should be noted that the desk study is limited by the reliability of third party information and the geographical availability of biological and/or ecological records and data. This emphasises the need to collate up-to-date, site-specific data based on field surveys by experienced surveyors. The absence of species from biological records cannot be taken to represent actual absence. Species distribution patterns should be interpreted with caution as they may reflect survey/reporting effort rather than actual distribution.

Field Survey

The field survey was conducted in mid-June. This is an appropriate time of year to carry out a Phase 1 Habitat survey, however, plant species which flower earlier or later in the season may not be identified. It is not considered that the Phase 1 Habitat classifications would be altered by the presence of additional species. It is, however, noted that Bluebell, a local biodiversity plan priority species which may be present within the site flowers from mid-April to late May. This species may have been missed due to the survey timing.

2 METHODS

2.1 Desk Study

In order to anticipate the potential ecological sensitivities at the site, a desk study was conducted in advance of the field studies in June 2017. This included a review of:

- Existing data on statutory designated sites available through Scottish Natural Heritage (SNH) Sitelink website (SNH, n.d.) (up to 10km from the site);
- Existing data on non-statutory designated sites available through the West Dunbartonshire Council Local Development Plan (LDP) (West Dunbartonshire Council, 2017) (up to 2km from the site);
- Records of Ancient Woodland and Scottish Native Woodland available through Scotland's Natural Environment Web (The Scottish Government, n.d.) (up to 2km from the site);
- Loch Lomond and Trossachs National Park, Wild Park 2020 (LLTNP, 2016)
- West Dunbartonshire Local Biodiversity Action Plan (Dunbartonshire Biodiversity Partnership, 2010);
- The Scottish Biodiversity List (SBL) (Scottish Government, 2013); and
- Notable species records from Glasgow Museums Records Centre (up to 2km from the site).

2.2 Phase 1 Habitat Survey

A Phase 1 Habitat survey is a method that rapidly records vegetation and wildlife habitat over large areas. The output of this survey comprises a habitat map and associated photographs. The information is used to identify ecologically sensitive features, inform additional species surveys and, ultimately, recommend mitigation and enhancement measures in connection with the proposed development.

The Phase 1 Habitat Survey was undertaken according to the standard Joint Nature Conservation Committee method (JNCC, 2010) and Chartered Institute of Ecology and Environmental Management (CIEEM) guidelines (CIEEM, 2013). The survey was undertaken on the 19th and 20th of June 2017 by Jennifer Patterson and Amy Ashe, the temperature was between 19 and 21 degrees Celsius, there was a slight breeze, and limited cloud cover.

The Phase 1 Habitat survey also aims to highlight habitats of potential importance including Annex 1 habitats, SBL) habitats and potential GWDTE's.

2.3 Functional Wetland Typology

The Functional Wetland Typology (SNIFFER, 2009), was used to aid the identification of any wetland habitats that derive their water from groundwater and surface water. This information is useful in identifying if and where further surveys are required to identify the presence and potential sensitivity of GWDTE's.

2.4 Site Evaluation

On the basis of the survey information the site was assessed for its requirement for further survey work on a three point scale, which is based on the guidance in the JNCC manual (JNCC, 2010). The categories are:

1. Sites meriting further survey.
2. Sites of wildlife interest which are worth a further visit but do not, at present, merit further survey.
3. Sites of wildlife interest not meriting further survey.

2.5 Invasive Non-Native Species

The search included but was not limited to:

- Japanese Knotweed;
- Himalayan Balsam;
- Rhododendron; and
- Giant hogweed.

3 RESULTS

3.1 Desk Study

3.1.1 Statutory Designated Sites

The site is situated within the Loch Lomond National Park near the southern park boundary. In order to achieve their vision for the park, the Park Authority have set out five key areas for action, or “wild challenges” in their Wild Park 2020 document (LLNTP, 2016). These are:

- Our mountain bogs;
- Our woodland habitat network;
- Black grouse;
- Red squirrels; and
- Invasive non-native species.

There are also several statutory designated sites within 10km of the site. These are listed in table 3-1 below, along with an assessment of the connection between the site and the features of the designated sites.

Table 3-1 Statutory designated sites within 10km of the site and assessment of connectivity.

Site name	Designation	Approximate Distance and Orientation from closest site boundary	Designated Feature(s)	Ecological or hydrological Connection with Proposed Development Site
Boturich Woodlands	SSSI	1.3 km north.	<ul style="list-style-type: none"> • Upland mixed ash woodland; • Wet woodland. 	Yes - Due to the proximity of the development, visitors may use the SSSI recreationally.
Caldarvan Loch	SSSI	3.2 km north east.	<ul style="list-style-type: none"> • Eutrophic Loch. 	No - There are no hydrological or ecological connections between the SSSI features and the proposed development.
Auchenreoch Glen	SSSI	4.3km south west.	<ul style="list-style-type: none"> • Lowland calcareous grassland; • Springs (including flushes). 	No - There are no hydrological or ecological connections between the SSSI features and the proposed development.
Auchensail Quarry	SSSI	4.5km south west.	<ul style="list-style-type: none"> • Palaeozoic Palaeobotany. 	No - Geological feature with no connection to the proposed development.
Portnellan - Ross Priory - Claddochside	SSSI	5km north	<ul style="list-style-type: none"> • Quaternary of Scotland. 	No - Geological feature with no connection to the proposed development.
Ross Park	SSSI	6.8km north west	<ul style="list-style-type: none"> • Lichen assemblage; • Scottish dock (<i>Rumex aquaticus</i>). 	No - There are no hydrological or ecological connections between the SSSI features and the proposed development.

Ross Park - Lochshore Woodland	SSSI	6.8km north west	<ul style="list-style-type: none"> Vascular plant assemblage. 	No - There are no hydrological or ecological connections between the SSSI features and the proposed development.
Aucheneck	SSSI	8.1km north east	<ul style="list-style-type: none"> Quaternary of Scotland. 	No - Geological feature with no connection to the proposed development.
Lang Craigs	SSSI	6.6km south east	<ul style="list-style-type: none"> Tall herb ledge. 	No - There are no hydrological or ecological connections between the SSSI features and the proposed development.
Inchtavannach and Inchconnachan	SSSI	8.4km north west	<ul style="list-style-type: none"> Capercaillie (<i>Tetrao urogallus</i>), breeding; Upland oak woodland. 	No - There are no hydrological or ecological connections between the SSSI features and the proposed development.
Inchmurrin	SSSI	4.5km north	<ul style="list-style-type: none"> Wet woodland. 	No - There are no hydrological or ecological connections between the SSSI features and the proposed development.
Inchmoan	SSSI	8.2km north	<ul style="list-style-type: none"> Raised bog. 	No - There are no hydrological or ecological connections between the SSSI features and the proposed development.
Inchcruin	SSSI	8.4km north	<ul style="list-style-type: none"> Capercaillie, breeding 	No - There are no hydrological or ecological connections between the SSSI features and the proposed development.
Glenarbuck	SSSI	9.7km south east	<ul style="list-style-type: none"> Palaeozoic Palaeobotany 	No - Geological feature with no connection to the proposed development.
Dumbarton Rock	SSSI	7.3km south	<ul style="list-style-type: none"> Carboniferous - Permian Igneous. 	No - Geological feature with no connection to the proposed development.
Geilston Burn	SSSI	5.6km south west	<ul style="list-style-type: none"> Quaternary of Scotland 	No - Geological feature with no connection to the proposed development.
Blairbeich Bog	SSSI	4.6km north east	<ul style="list-style-type: none"> Raised bog. 	No - There are no hydrological or ecological connections between the SSSI features and the proposed development.
Conic Hill	SSSI	9.2km north east	<ul style="list-style-type: none"> Alkaline fen; Beetle assemblage; Moth assemblage; Ordovician Igneous; Subalpine calcareous grassland; Upland oak woodland; Wet woodland. 	No - There are no hydrological or ecological connections between the SSSI features and the proposed development.

Dumbarton Muir	SSSI	5.3km south east	<ul style="list-style-type: none"> Blanket bog; Raised bog. 	No - There are no hydrological or ecological connections between the SSSI features and the proposed development.
Endrick Mouth and Islands	SSSI	6.6km north and north east.	<ul style="list-style-type: none"> Beetle assemblage; Breeding bird assemblage; Bryophyte assemblage; Fluvial Geomorphology of Scotland; Greenland white-fronted goose (<i>Anser albifrons flavirostris</i>), non-breeding; Greylag goose (<i>Anser anser</i>), non-breeding; Hydromorphological mire range; Upland oak woodland; Vascular plant assemblage. 	Yes - The loch connects the development site and the SSSI. It is possible that bird species present in the SSSI could also utilise habitats within or adjacent to the proposed development site.
Inner Clyde	SSSI, SPA	6km south west	<ul style="list-style-type: none"> Redshank (<i>Tringa totanus</i>), non-breeding; Cormorant (<i>Phalacrocorax carbo</i>), non-breeding; Eider (<i>Somateria mollissima</i>), non-breeding; Goldeneye (<i>Bucephala clangula</i>), non-breeding; Oystercatcher (<i>Haematopus ostralegus</i>), non-breeding; Red-breasted merganser (<i>Mergus serrator</i>), non-breeding; Red-throated diver (<i>Gavia stellata</i>), non-breeding; Saltmarsh 	No - There is a considerable area of urban development and intensive agriculture between the designated site and the proposed development. It is therefore considered unlikely that birds would travel between the two areas.

Loch Lomond Woods	SAC	6.4km north	<ul style="list-style-type: none"> • Otter (<i>Lutra lutra</i>); • Western acidic oak woodland. 	Yes - Otter are highly mobile species and so individuals present within the designated site could be utilising habitat within or adjacent to the development site.
Endrick Water	SAC	8km north east	<ul style="list-style-type: none"> • Atlantic salmon (<i>Salmo salar</i>); • Brook lamprey (<i>Lampetra planeri</i>); • River lamprey (<i>Lampetra fluviatilis</i>). 	Yes - The development is hydrologically connected to the designated site via Loch Lomond. Fish from the SAC are mobile and are likely to utilise the wider loch area.
Loch Lomond	SPA, RAMSAR	6.7km north east	<ul style="list-style-type: none"> • Capercaillie, breeding; • Greenland white-fronted goose, non-breeding 	Yes - The loch connects the development site and the SPA. It is possible that the geese present in the SPA could also utilise habitats within or adjacent to the proposed development site.

3.1.2 Non-Statutory Designations

No non-statutory designated sites were identified within the site boundary. The Local Nature Conservation Sites (LNCS) listed in Table XX are found within 2km of the site.

Table 3-2 Non-statutory designated sites within 2km of the site and assessment of connectivity.

Site	Approximate Distance to the nearest site boundary and orientation	Feature of interest	Ecological or hydrological Connection with Proposed Development Site
Stonemollan Road Wood	Approx. 0.6km west	Upland oak woodland.	No - There are no hydrological or ecological connections between the SSSI features and the proposed development.
Fishers Wood & Boat House Wood	Approx. 0.7km west	Woodland.	No - There are no hydrological or ecological connections between the SSSI features and the proposed development.
A82 verge	Approx. 0.75km south west	Woodland.	No - There are no hydrological or ecological connections between the SSSI features and the proposed development.
Alexandria Wood	Approx. 1.2km	Woodland.	No - There are no hydrological or ecological connections between the SSSI features and the proposed development.
Mullour	Approx. 1.8km	Blanket bog, heath and birds.	No - There are no hydrological or ecological connections between the SSSI features and the proposed development.

River Leven Corridor	Approx. 0.5km south	Major river and wildlife corridor.	Yes – The River Leven is adjacent to the eastern boundary of the development site.
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3.1.3 Biodiversity Action Plan Habitats and Plant Species

Habitats and plant species potentially relevant to the site were identified from the West Dunbartonshire LBAP, the SBL and UKBAP. These are detailed in table 3-2 and 3-3 below.

Table 3-3: Local Authority LBAP, SBL and UKBAP Habitats Potentially Relevant to the Site

Habitat	LBAP	SBL	UKBAP
Rivers and Streams	✓	✓	✓
Oligotrophic Loch	✓	✓	✓
Hedgerows	✓	✓	✓
Lowland Mixed Deciduous Woodland	✓	✓	✓
Wet Grassland	✓		
Greenspace	✓		

Table 3-4: West Dunbartonshire LBAP, SBL, UKBAP Plant Species Potentially Relevant to the Site

Species	DBAP	SBL	UKBAP
Adder's Tongue Fern (<i>Ophioglossum vulgatum</i>)	✓		
Bennett's Pondweed (<i>Potamogeton x bennettii</i>)	✓		
Bog Rosemary (<i>Andromeda polifolia</i>)	✓		
Round-leaved Sundew (<i>Drosera rotundifolia</i>)	✓		
Tufted Loosestrife (<i>Lysimachia thyrsoiflora</i>)	✓		
Bluebell (<i>Hyacinthoides non-scripta</i>)	✓		
Greater Butterfly Orchid (<i>Platanthera chlorantha</i>)	✓	✓	
Lesser Butterfly Orchid (<i>Platanthera bifolia</i>)	✓	✓	✓
Aspen (<i>Populus tremula</i>)	✓		
Devil's-bit Scabious (<i>Succisa pratensis</i>)	✓		
Eight-stamened Waterwort (<i>Elatine hydropiper</i>)	✓		
Globe Flower (<i>Sedum villosum</i>)	✓		

Hairy Stonecrop (<i>Sedum villosum</i>)	✓
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3.1.4 Scottish Native Woodland and Ancient Woodland Inventory

Scottish Native Woodland and Ancient Woodland Inventory sites are present within the site boundary. Long-established (of plantation origin) 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.

Scottish native woodland is 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 2km buffer area.

3.1.5 Records of Notable Flora

No notable flora records were returned within the Glasgow Museums records search. A subsequent record search was made on the NBN Atlas. Whilst this did return records of notable species within the site, these were not licenced for commercial use and permission has not been given to use the data so further details have not been presented.

3.2 Phase 1 Habitat Survey

A total of 15 phase 1 habitat types were identified from the survey, including boundary features. Please refer to the phase 1 habitat map in Appendix B for the broad habitat types and locations.

- Broadleaved Semi-natural Woodland A1.1.1.
- Broadleaved Plantation Woodland A1.1.2
- Scattered Scrub A2.2
- Scattered Broadleaved Trees A3.1
- Semi-improved Neutral Grassland B2.2
- Marshy Grassland B5
- Tall Ruderal C3.1
- Inundation Vegetation F2.2
- Standing Water G1
- Running Water G2
- Amenity Grassland J1.2
- Intact Species Poor Hedge J2.2
- Fence J3.4
- Buildings J3.6
- Bare Ground J4

3.2.1 Broadleaved Semi-Natural Woodland

Broadleaved semi-natural woodland is woodland which does not obviously originate from planting and coniferous species comprise less than 10% of the canopy. Semi-natural woodland with planted and semi-natural trees is classified as semi-natural if planted trees account for less than 30% of the canopy. Ancient and more recent stands of woodland are also included within this category. Please refer to Appendix A and B for

further details). This habitat category is dominant within the site. The distribution of species present in an area of semi-natural woodland will generally reflect variations in the soil and in the landscape. An example of this habitat category is available in Appendix D (photograph 1). This habitat category is relevant to the UKBAP, LBAP and SBL as it is lowland mixed deciduous 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 woodland map in Appendix C for an overview of these sub-categories.

3.2.1.1 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.*).

3.2.1.2 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.

3.2.1.3 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.

3.2.1.4 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*).

3.2.1.5 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.

3.2.2 Broadleaved Plantation Woodland

Plantation woodland is defined as all woodland of any age that show evidence of being planted (i.e. are planted in obvious rows or have tree tubes or evidence of their historical use). If woodland is composed of more than 30% planted species it may be classified as plantation. Please refer to Appendix A and B for further details. This habitat category is relevant to the UKBAP, LBAP and SBL as it is a lowland mixed deciduous woodland. An example of Broadleaved plantation woodland from the north of the site is in Appendix D (photograph 2).

The following sections are split into sub-sections referring to different sub-categories of phase 1 broadleaved plantation woodland. Please refer to the woodland map in Appendix C for an overview of these sub-categories.

3.2.2.1 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.

3.2.2.2 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.

3.2.2.3 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.

3.2.3 Scattered Scrub

Scrub is a seral or climax vegetation group usually dominated by native shrubs, less than 5m tall and occasionally contains a few scattered trees. Vegetation in this habitat is usually less than 5m tall and can occasionally include scattered trees. Scattered scrub is present throughout the site and consists of the following species: willow, elder, hawthorn, and dog rose (*Rosa canina*). Please refer to photograph 3 in Appendix D.

3.2.4 Scattered Broadleaved Trees

Scattered and planted broadleaved trees are present throughout the site. These vary from young to mature, and include species such as poplar, cherry, and sycamore.

3.2.5 Semi-improved Neutral Grassland

Semi-improved grassland is a transition category, made up of grasslands which may have historically been modified by artificial or natural fertilisers. Subsequently it has a range of species which are slightly more diverse than improved grassland and amenity grassland, but less diverse than unimproved grasslands. The south west of the site consists of two large fields of semi-improved neutral grassland. The dominant species present are: creeping buttercup, broadleaved dock, spear thistle (*Cirsium vulgare*), nettle, Yorkshire fog, perennial ryegrass, cocksfoot grass, common spotted orchid, rosebay willowherb, and Timothy grass (*Phleum pratense*). Other species present include: common hogweed, common birds-foot trefoil (*Lotus corniculatus*), ribwort plantain (*Plantago lanceolata*), cow parsley (*Anthriscus sylvestris*), goosegrass, common knapweed (*Centaurea nigra*), germander speedwell (*Veronica chamaedrys*), and small area of soft rush. A photograph of this habitat is available in Appendix D (photograph 4).

3.2.6 Marshy Grassland

Marshy grassland is a diffuse category which includes grasslands with a high proportion of *Juncus* species, *Carex* species or meadowsweet (*Filipendula ulmaria*). A small area of marshy grassland is present to the south west of the site adjacent to the semi improved grassland. The area is dominated by *Juncus sp.*, however other species include perennial ryegrass, forget-me-not (*Myosotis sp.*), timothy grass, Yorkshire fog, cocksfoot grass, northern marsh orchid (*Dactylorhiza purpurella*), common sorrel (*Rumex acetosa*), and wild angelica (*Angelica sylvestris*). A photograph of this habitat can be referred to in Appendix D (photograph 5). Wet grassland is listed as a priority category in the West Dunbartonshire LBAP.

3.2.7 Tall Ruderal

Areas of tall ruderal are present throughout the site in areas adjacent to woodland and semi-improved grassland. These tall perennial or biennial dicotyledon groups are composed of species that are usually more than 25cm tall. This habitat is dominated by species such as: bramble, nettle, spear thistle, cow parsley,

common hogweed, rosebay willowherb, bracken, vetch (*Vicia sp.*), foxglove, and hedge woundwort. A photograph of this habitat is available in Appendix D, please refer to photograph 6.

3.2.8 Inundation Vegetation

Inundation vegetation is a habitat category that includes open and innately unstable communities that are subjected to periodic inundation. They are generally found on sorted or unsorted silts, sands, and gravels of river beds and island, and in the drawn-down zone of pools reservoirs and lakes. A wide variety of species tends to occur in these communities. One small area of inundation vegetation was found to be present in the north east of the site, adjacent to the loch. The area is evidently periodically inundated by water as species that thrive in damp conditions are present. These species include: willow, hawthorn, yellow iris, ragged robin, meadowsweet (*Filipendula ulmaria*), meadow buttercup (*Ranunculus acris*), broadleaved willowherb, horsetail, and marsh willowherb (*Epilobium palustre*).

3.2.9 Standing Water

Loch Lomond is a freshwater loch, classified as standing water habitat, which borders the north of the site and contains many islands. The Loch is 37km in length and varies between 1.2 and 8km in width. Loch Lomond is considered to be mostly oligotrophic, with 20% of the loch south of the Highland Boundary Fault regarded as mesotrophic (Palmer and Roy, 2001). Oligotrophic loch is a UKBAP, LBAP and SBL habitat.

The embankments of Loch Lomond along the northern reaches of the site and half way down either side of Drumkinnon Bay, are gently sloping, but gradually change into steeper sloping embankments until becoming reinforced at Loch Lomond Shores to provide support for commercial premises.

3.2.10 Running Water

Four distinct unnamed water courses (burns) and one river (the River Leven) are present within the site boundary. Rivers and streams are a UKBAP, LBAP and SBL habitat. The following watercourses are not named on ordnance survey maps therefore they have been named 'water course' and allocated a corresponding number. All the small water courses on site enter from the east and continue to flow east through the site and ultimately enter Loch Lomond in the north east. The River Leven flows from Loch Lomond along the east boundary of the site and continues south.

3.2.10.1 Water course 1

Water course 1 flows along the south west of the site boundary, through woodland beyond, and connects with water course five via pipe culvert. The flow is low many places and the substrate varies from large pebbles to silt and gravel. The depth is approximately 25cm, and the width is approximately 1.5-2 metres. There is no instream vegetation or overhanging vegetation on the embankments. The watercourse enters pipe culverts and through a highly canalised section in a carpark eventually meeting watercourse 4. Where the watercourse enters the woodland beyond the carpark via a culvert, small trout were seen to be present. A photograph of this water course is available in Appendix C, please refer to photograph 7.

3.2.10.2 Water course 2

Water course 2 flows through the woodland in the west of the site through a large patch of non-native bamboo (*Bambuseae*). The width is approximately 2.5 metres and the gully depth varies from approximately 2-4 metres. At the time of the survey the site was experiencing hot and dry weather conditions which limited water flow in the burn, it is expected that this water course is seasonal and will have water flow during other times of the year. Please refer to photograph 8 (Appendix D).

3.2.10.3 Water course 3

Water course 3 flows along the north of the site boundary west to east. The depth varies from approximately 20-30cm and the width ranges from approximately 1.5-2m. The burn has very low flow and depth, is mainly silty. There is no instream vegetation and the banks have little overhanging vegetation. Please refer to Appendix D (photograph 9).

3.2.10.4 Water course 4

Water course 4 is canalised, and has mesh fencing lining the bed of the stream in the eastern half. It flows adjacent to water course 3 running west to east, and enters Loch Lomond further slightly south of watercourse 3. The water course has very little flow and depth, it is approximately 1.5 metres wide and the depth is approximately 20-25cm. The substrate is composed of pebble and gravel in many places, with some silty areas. There is no instream vegetation and overhanging vegetation is limited. Please refer to photograph 10 in Appendix C.

3.2.10.5 Water course 5

Water course 5 is the River Leven, which runs along the north east of the site boundary. It is approximately 30 metres wide, and the depth was difficult to ascertain from a visual assessment. It is very deep with a fast flow. The substrate is composed of large pebbles and boulders with some sporadic sandy embankments. There is little evidence of instream vegetation. Please refer to photograph 11 in Appendix D).

3.2.11 Amenity Grassland

Amenity grassland is intensively managed and regularly mown grasslands, usually found in gardens, playing fields, and golf courses. The species present will depend on the original seed mixture used and the age of the community. A large area of amenity grassland is present in the east of the site adjacent to the woodland that runs alongside the River Leven and Loch Lomond and multiple smaller sections are located within Drumkinnon Wood and Loch Lomond Shores. Species present include: perennial ryegrass, white clover (*Trifolium repens*), daisy, creeping buttercup, ribwort plantain, Yorkshire fog, dandelion, and selfheal (*Prunella vulgaris* L.). Please refer to Appendix D, photograph 12 for a visual reference to this habitat.

3.2.12 Intact Species Poor Hedge

Intact species poor hedgerows are present in the eastern and central area of the site surrounding areas of woodland. Species present include hawthorn and beech. These are defined as species-poor as they have a low diversity of species, and a poor or absent hedgerow bottom flora community, intact hedges are defined as more-or-less stock proof i.e. lack gaps that allow livestock to pass through. Hedgerows are a UKBAP, LBAP and SBL habitat. Please refer to photograph 13 in Appendix D.

3.2.13 Fence

Fencing is present in the central area of the site. Woodlands that are encompassed by hedgerows also have metal rail fencing as a boundary feature. Wooden fencing is also present in the south of the site where woodland is adjacent to residential housing. A mixture of fencing, including metal, wood post and wire, and plastic barrier fencing is present in the west of the site.

3.2.14 Wall

Sections of stone wall are present within the broadleaved semi-natural woodland adjacent to the semi-improved grassland, in the west of the site.

3.2.15 Buildings

Four buildings are present within the site boundary. Three are present within the west of the site and are in poor deteriorating condition. The fourth building present is in the north of the site and currently used as a bird of prey visitor centre. Please refer to photographs 14-16 in Appendix D.

3.2.16 Bare Ground

Bare ground is present in the site where main roads exist, and also at the site entry road adjacent to the semi-improved grassland in the west of the site.

3.2.17 Target Notes

3.2.17.1 Target note 1

Target note one denotes the presence of extensive non-native bamboo that dominates the north west corner of the site. Please refer to photograph 17 in Appendix D.

3.2.17.2 Target note 2

Target note 2 denotes two additional underground rooms that are present immediately west of the southernmost of these three buildings.

3.3 Functional Wetland Typology

The marshy grassland with vegetation indicators suggesting classification 2a in the Functional Wetland Typology, is present in the west of the site within the site boundary. The species present indicate it would be classified as MG10 *Holcus Lanatus – Juncus Effusus* rush pasture under the National Vegetation Classification System. This is a common habitat type which is listed in Scottish Environmental Protection Agency guidance (SEPA, 2017) as moderately groundwater dependent depending on the hydrogeological setting. A hydrological assessment will be required to determine if this habitat is a GWDTE.

3.4 Invasive Non-Native Species

Japanese knotweed is present at two locations within the site and one adjacent to the site boundary in the north west. Please refer to photograph 18 (Appendix E). Sporadic Himalayan balsam is present along the small watercourses dissecting the site. Non-native bamboo, Rhododendron and laurel are present extensively in the north west area of the site. No aquatic invasive plants were noted during the field surveys.

Please refer to Appendix F: Invasive Non-Native Species Plan

4 EVALUATION

4.1 Site Evaluation

Due to the presence of potential sensitive habitats and invasive non-native species the site is considered to be category 1: Site meriting further survey.

It is recommended that a hydrological assessment is undertaken on the potential GWDTE habitat (marshy grassland) if works are likely to involve excavations less than 1m deep, within 100m radius of the potential GWDTE or within 250m radius if the excavation is deeper than 1m, in line with Scottish Environment Protection Agency (SEPA)¹ guidelines.

Bluebell are an LBAP species and ancient woodland indicator. As the survey was conducted outside of the bluebell flowering season, it is recommended that a further targeted survey for bluebell and other early flowering ancient woodland indicator plants is carried out earlier in the season (May). Information from this survey will inform the need for mitigation to preserve this species within the development site.

Finally, invasive non-native species including Japanese knotweed, Himalayan balsam and Rhododendron are present on site. A targeted survey for these should be carried out to inform a management plan to prevent the spread of these species and remove them from the site.

¹ LUPS-GU31 (2017) Land Use Planning System SEPA Guidance Note 31. Guidance on Assessing the Impacts of Development Proposals on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems. SEPA. Available online at: <https://www.sepa.org.uk/media/144266/lups-gu31-guidance-on-assessing-the-impacts-of-development-proposals-on-groundwater-abstractions-and-groundwater-dependent-terrestrial-ecosystems.pdf> (accessed 19/12/2017)

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APPENDICES

A ANCIENT WOODLAND



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Legend

-  Site Boundary
- Ancient Woodland Inventory**
 -  Ancient (of semi-natural origin)
 -  Long-Established (of plantation origin)
 -  Other (on Roy map)

Do not scale this map

Client
TSL Contractors Limited

Project
West Riverside Balloch

Title
Ancient Woodland

Status
FINAL

Drawing No. 168659-014	Revision
---------------------------	----------

Scale 1:20,000	A3	Date 4 August 2017
Drawn AA	Checked MN	Approved DB



Craighall Business
Park, Eagle Street,
Glasgow, G4 9XA
Tel: 0141 341 5040
Fax: 0141 341 5045

B PHASE 1 HABITAT MAP



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Legend

- Site Boundary
 - Target Note
- JNCC Code
- A1.1.1 Broadleaved Woodland - Semi-Natural
 - A1.1.2 Broadleaved Woodland - Plantation
 - A2.2 Scattered Scrub
 - A3.1 Scattered Broadleaved Trees
 - B2.2 Semi-improved Neutral Grassland
 - B5 Marshy Grassland
 - C3.1 Tall Ruderal
 - F2.2 Inundation Vegetation
 - G1 Standing Water
 - G2 Running Water
 - J1.2 Amenity Grassland
 - J1.4 Introduced Shrub
 - J2.1.1 Intact Hedge
 - J2.1.1/J2.4 Intact Hedge/ Fence
 - J2.4 Fence
 - J2.5 Wall
 - J3.6 Building
 - J4 Bare Ground

Do not scale this map

Client
TSL Contractors Limited

Project
West Riverside Balloch

Title
Phase 1 Habitat Map

Status
FINAL

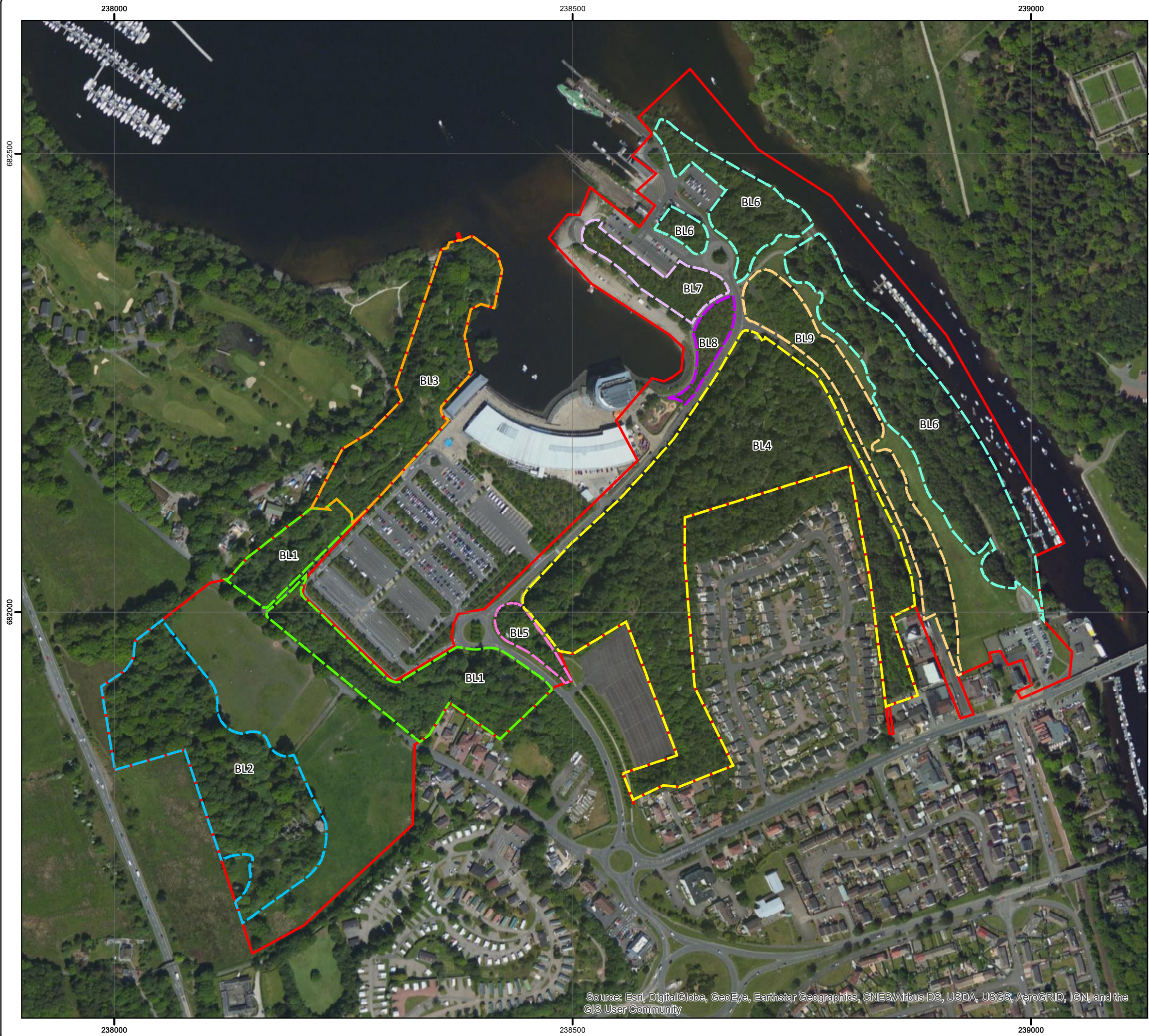
Drawing No. 168659-009	Revision
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Scale 1:4,000	A3	Date 18/01/18
Drawn GV	Checked MN	Approved IB



Craighall Business
Park, Eagle Street,
Glasgow, G4 9XA
Tel: 0141 341 5040
Fax: 0141 341 5045

C WOODLAND MAP



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Legend

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

Do not scale this map

Client
TSL Contractors Limited

Project
West Riverside Balloch

Title
Broadleaf Group Map

Status
Final

Drawing No.	Revision
168659-010	

Scale	A3	Date
1:4,000		3 July 2017
Drawn	Checked	Approved
GV	MN	IB



Craighall Business
Park, Eagle Street,
Glasgow, G4 9XA
Tel: 0141 341 5040
Fax: 0141 341 5045

D BROAD SITE HABITAT PHOTOGRAPHS

Photograph 1: Broadleaved semi-natural woodland (BL2) present in the west of the site.



Photograph 2: Broad-leaved plantation woodland (BL3) present in the north of the site.



Photograph 3; Scattered scrub present in the west of the site.



Photograph 4: Semi-improved grassland present in the west of the site.



Photograph 5: Marshy grassland present in the west of the site.



Photograph 6: Tall ruderal habitat in the central area of the site.



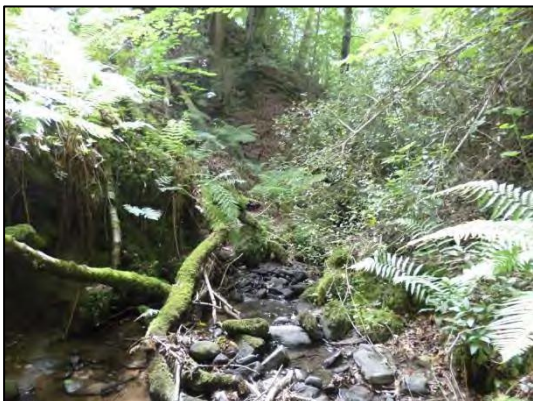
Photograph 7: Water course 1 adjacent to the car park. The riparian vegetation has been trimmed.



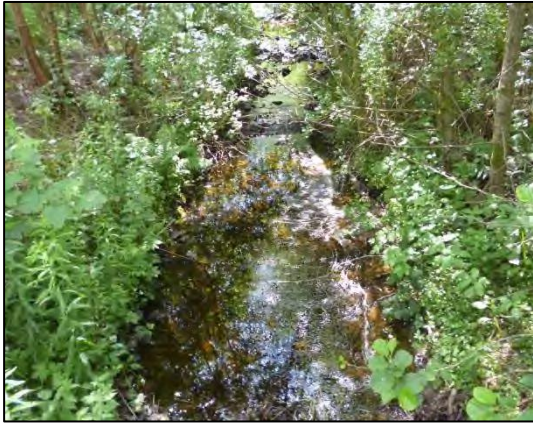
Photograph 8: Water course 2 in the west of the site, evidently dry.



Photograph 9: Water course 3, just north of water course 2.



Photograph 10: Water course 4 which flows through the plantation woodland in the north of the site.



Photograph 11: Water course 5, The River Leven.



Photograph 12: Amenity grassland present in the east of the site.



Photograph 13: Intact species-poor hedgerow.



Photograph 14: Building 1 present in the west of the site (northern most building).



Photograph 15: Building 2 present in the west of the site.



Photograph 16: Building 3 present in the west of the site (southern most building).



Photograph 17: Target note 1, non-native bamboo present in the north west of the site.



E JAPANESE KNOTWEED

Photograph 18: Japanese Knotweed Stand Present in the centre of the site (in BL1).



F INVASIVE NON-NATIVE 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 <div style="text-align: center; font-weight: bold; font-size: 1.1em;">FINAL</div>	
Drawing No. 168659-028	Revision
Scale 1:4,000	<div style="display: flex; justify-content: space-between;"><div style="font-size: 1.5em; font-weight: bold;">A3</div><div>Date 2 Feb 2018</div></div>
Drawn JEP	Checked GV
Approved IB	



ENVIRO
Centre

Craighall Business
Park, Eagle Street,
Glasgow, G4 9XA
Tel: 0141 341 5040
Fax: 0141 341 5045

Appendix 6.2 – Otter and Water Vole Survey



West Riverside, Balloch Otter and Water Vole Survey



February 2018

West Riverside, Balloch

Otter and Water Vole Survey

Client: TSL Contractors Limited

Document number: 7796
Project number: 168659
Status: Version 2

Author: Jennifer Paterson
Reviewer: Douglas Blease

Date of issue: 2 February 2018
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Glasgow

Craighall Business Park
8 Eagle Street
Glasgow
G4 9XA
0141 341 5040
info@envirocentre.co.uk
www.envirocentre.co.uk

Aberdeen

Banchory Business
Centre
Burn O'Bennie Road
Banchory
AB31 5ZU
01330 826 596

Inverness

Alder House
Cradlehall Business Park
Inverness
IV2 5GH
01463 794 212

Edinburgh

Suite 114
Gyleview House
3 Redheughs Rigg
Edinburgh
EH12 9DQ
0131 516 9530

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EXECUTIVE SUMMARY

EnviroCentre Limited was commissioned by TSL Contractors Limited to undertake an otter and water vole survey at West Riverside, Balloch to inform development proposals. The objectives of the survey were to search for the presence of otter and water vole; and identify any suitable habitats on site to support these protected faunal species.

Two otter and water vole surveys were conducted along the banks of all watercourses within the site boundary, plus a buffer of approximately 250m downstream and upstream.

No diagnostic signs of otter were identified during the surveys, however, suitable commuting and foraging habitat exists for otter within the site boundary and the wider landscape.

No evidence or suitable habitat was identified for water vole within the site boundary during the surveys.

Ecological data is generally valid for a period of 12 months. EnviroCentre recommended that the information collected during the otter and water vole survey is reviewed and updated at a frequency no greater than every 12 months in order to maintain valid baseline data.

The potential impacts of the development include habitat fragmentation, disturbance or loss of commuting, foraging and future resting/sheltering habitat for otter and pollution of the watercourses.

General good practice recommendations for design and construction have been provided including recommendations for appropriate temporary and permanent lighting, pollution prevention, general site activity and measures which should be taken into account if a protected species is found on site.

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1 INTRODUCTION

1.1 Remit

EnviroCentre Limited was commissioned by TSL Contractors Limited to undertake an otter and water vole survey at West Riverside, Balloch.

1.1.1 Aim and Objectives

The aim of the survey was to inform development proposals as to the presence/absence of otter and water vole. The aim was achieved via the following objectives:

- Search the site and habitat adjacent to the site for signs and evidence of:
 - Otter (*Lutra lutra*); and
 - Water vole (*Arvicola amphibius*).
- Highlight habitat considered suitable for otter and water vole activity.

1.2 Site Description and Proposed Development

The site is situated to the south of Loch Lomond, at an elevation of 14.7m above sea level and is centred at Ordnance Survey Grid Reference (OSGR) NS 38426 81914. The site currently comprises of woodland, parkland, car parks, public access areas, grassland and derelict buildings, connecting to habitats in the wider area including: woodland, farmland and residential areas.

Refer to Appendix A for site boundary and location.

1.3 Legislation and Policy

European and National legislation and local policy relevant to this study include:

- The Water Framework Directive (2000/60/EC);
- The Wildlife and Countryside Act 1981 (as amended);
- The Nature Conservation (Scotland) Act 2004;
- The Wildlife and Natural Environment (Scotland) Act 2011 (WANE);and
- Scottish Planning Policy (2014).

A summary of protected species legislation is provided in Appendix B.

1.4 Disclaimer

Faunal species are transient and can move between favoured habitats regularly throughout and between years. This survey provides a snapshot of field signs present in the survey area on one day in June 2017 and one day in August 2017.

1.5 Limitations

A section of this watercourse between the middle and upper reaches of watercourse 1 was unable to be accessed due to private landownership.

2 METHODS

2.1 Desk Study

In order to anticipate the potential ecological sensitivities to bats at the site, a desk study was conducted in advance of the survey. The following sources were checked:

- Existing data on designated available through SNH Sitelink website (SNH, n.d.) (up to 5km from the site);
- West Dunbartonshire Local Development Plan (West Dunbartonshire Council, 2017) (for non-statutory designated areas up to 2km from the site);
- Records of Ancient Woodlands (up to 2km from the site) available through Sketchmap (FIND, n.d.);
- Dunbartonshire Biodiversity Action Plan (Dunbartonshire Biodiversity Partnership, 2010);
- Scottish Biodiversity List (Scottish Government, 2013); and
- UK Biodiversity Action Plan (JNCC, n.d.).

2.2 Field Survey

All survey work was led by experienced and competent ecologists, who are members of the Chartered Institute of Ecology and Environmental Management (CIEEM). The survey was designed using the guidelines endorsed by Scottish Natural Heritage (SNH) and CIEEM (CIEEM, 2016). This section provides details of the methods adopted.

Species that were specifically searched for were:

- Otter; and
- Water vole

The otter and water vole surveys were undertaken on:

- 20th June 2017 lead by Jennifer Paterson (GradCIEEM) and supported by Amy Ashe (GradCIEEM); and
- 31st August 2017 lead by Amy Ashe (GradCIEEM) and supported by Emma Archer.

For watercourse locations and extent of survey effort, see Appendix C.

2.2.1 Otter

A survey was conducted along the banks of all watercourses within the survey area, plus an extension beyond the site boundary of approximately 250m downstream and upstream, where access allowed. The survey effort was repeated in conjunction with water vole survey efforts to increase the confidence level of results. The survey followed best practice guidelines (Chanin, 2003), and searched for suitable habitat along with field signs, including:

- Spraints (otter faeces/droppings used as territorial signposts. Often located in prominent positions and placed on deliberate piles of soil or sand); Three categories are used for describing otter spraint: Dried fragmented (Df); Dried intact (Di); and Not fully dry (Nd);
- Footprints;
- Feeding remains (can often be a useful indication of otter presence);

- Paths/slides (otter can often leave a distinctive path from and into the watercourse);
- Holts (underground shelter) are generally found:
 - Within trees roots at the edge of the bank of a river;
 - Within hollowed out trees;
 - In naturally formed holes in the river banks that can be easily extended;
 - Or preferably in ready-made holes created by other large mammals or humans such as badger setts, rabbit burrows or outlet pipes; and
- Couches/lay-ups (couches or lay-ups are places for lying up above ground are usually located near a watercourse, between rocks or boulders, under dense vegetation).

In order to assess their importance, and thus determine the likely impact of the proposed development, the status of otter resting sites was assigned from Low to High according to Table 2-1 below (Bassett & Wynn, 2010).

Table 2-1: Guidance for Assigning Status of Otter Resting Sites

Resting Site Status	Definition
Low	Feature with limited evidence of otter activity – low number of spraints, not all age classes present. Insufficient seclusion to be a breeding site or key resting site, unlikely to have links to the key otter requirements. Most likely to provide a temporary 'stop off' for otters when moving through their territory. Loss/disturbance of such a feature is unlikely to be significant in terms of the individual or population.
Moderate	Feature containing sprainting with a range of age classes, but not in significant quantities. Availability may be limited by season, tides or flow. Unlikely to be suitable as a breeding/natal site but will be a key resting site and may be linked to other important features within the territory. The impact arising from a loss or disturbance of such a feature will be determined by the availability of more suitable or well used sites within the otter's territory.
High	Feature has a high level of otter activity, including an abundance of sprainting of all age classes, large spraint mounds, well used grooming hollows, paths and slides. Affords a high degree of cover and is linked to key features such as fresh water and abundance of prey. May be suitable as a breeding area (spraints may be absent from natal holts). The site is usually available at all times of year and at high and low tide/flow. The loss/ disturbance of such as feature will often be considered significant in terms of the individual or population.

2.2.2 Water vole

Two separated surveys, following standard guidelines (Dean & Andrews, 2016; Strachan & Moorhouse, 2006), were completed for water vole. Water voles tend to confine their activity to within 3m of the edge of the bank along a watercourse. Field evidence includes:

- Faeces: 8-12 mm long, 4-5 mm wide; cylindrical and blunt ended pellets; colour variable with food type. Most droppings left in latrines near the nest, at range boundaries and at water entry points;
- Latrine sites: concentrations of faeces, often with fresh droppings on top of old ones;
- Runways: often 5-9 cm broad and multi-branched; usually within 2m of water's edge and often forming tunnels through vegetation; leading to water's edge or burrows;
- Burrows: 4-8 cm diameter, wider than high; eroded entrances then contract down to typical size; entrances located at water's edge; however some entrances can be up to 3m from the water; no spoil heaps;
- Nests: size and shape of a rugby ball, often in base of rushes, sedges or reeds;
- Feeding stations: located along runways, or at platforms along water's edge; usually a pile of cut/chewed vegetation in sections approximately 10cm long; vegetation ends show marks of two large incisors. Piles of chopped grass, sedge or rush stems, rush pith and leaves;
- Lawns: short, grazed vegetation around land entrances, often used during nursing periods;

- Footprints: difficult to tell from rat; adult hind foot 26-34 mm (heel to claw); stride 120mm (smaller than rat); occur at water's edge and lead into vegetation; and
- Sound: characteristic 'plop' when a vole enters the water.

Emphasis was placed on locating latrine sites, as they are the most useful sign for recording purposes. They indicate whether there is definite presence of water voles at a site.

3 RESULTS

3.1 Desk Study

The results of the desk study are presented below.

3.1.1 Designated sites

One designated site is present within the site boundary and multiple sites are present within a 5km radius as detailed in Table 3-1.

Table 3-1: Statutory Designated Sites

Site Name	Designation ¹	Distance and Orientation	Comment
Loch Lomond and Trossachs	NP	Within the site boundary	Designated for its landscape, habitats and wildlife
Balloch Castle Country Park	CP	Approx. 0.06km east	Designated for its woodland, parkland, gardens, meadow, shoreline
Boturich Woodlands	SSSI	Approx. 1.4km north	Designated for its wet woodland and upland mixed ash woodland
Caldarvan Loch	SSSI	Approx. 3.4km east	Designated for its eutrophic loch
Auchenreoch Glen	SSSI	Approx. 4.3km south	Designated for its lowland calcareous grassland and springs
Blairbeich bog	SSSI	Approx. 4.6km east	Designated for its raised bog

Loch Lomond also has statutory designations as a National Nature Reserve (NNR) and Loch Lomond Woods Special Area of Conservation (SAC), for which otter are a qualifying feature of.

3.1.2 Non-Statutory Designated Sites

There are no non-statutory designated sites present within the site boundary or within a 5km radius of the site.

3.1.3 Ancient Woodland Inventory Sites

There are multiple areas of ancient woodland are present within the site boundary and within a 2km radius of the site in

Table 3-2: Ancient Woodland Inventory

Woodland name	Distance and Orientation	Woodland Type
Unnamed	Within site boundary	Long-Established of Plantation Origin
Unnamed	Within site boundary	Long-Established of Plantation Origin
Unnamed	Within site boundary	Long-Established of Plantation Origin
Mass O' Balloch Plantation	Approx. 0.07km north east	Long-Established of Plantation Origin
Unnamed	Approx. 0.15km south west	Ancient of Semi-Natural Origin
Unnamed	Approx. 0.3km south east	Ancient of Semi-Natural Origin
Cameron Wood	Approx. 0.4km north west	Long-Established of Plantation Origin
Unnamed	Approx. 0.9km north	Other on Roy Map

¹NP (National Park)/ CP (Country Park)/ SSSI (Site of Special Scientific Interest)

Unnamed	Approx. 1km north	Long-Established of Plantation Origin
Unnamed	Approx. 1.05km south west	Long-Established of Plantation Origin
Unnamed	Approx. 1.3km north	Ancient of Semi-Natural Origin
Garden Wood	Approx. 1.4km north	Long-Established of Plantation Origin
Unnamed	Approx. 1.7km west	Long-Established of Plantation Origin
Ledrishmore Wood	Approx. 1.7km north east	Long-Established of Plantation Origin

3.1.4 Biodiversity Action Plan and SBL Species and Habitats

The site is within the West Dunbartonshire council area. Table 3-3 below indicates the species listed on the Dunbartonshire BAP (DBAP), UKBAP and Scottish Biodiversity List (SBL) that are potentially relevant to the site:

Table 3-3: DBAP, UKBAP and SBL Species Potentially Relevant to the Site

Species	DBAP	UKBAP	SBL
Otter	✓	✓	✓
Water vole	✓	✓	✓

3.2 Field Results

3.3 Otter

Loch Lomond is situated north of the site boundary and is known to host a population of otter. Otter have been recorded as exploiting virtually all types of waterway in the UK including rivers and streams of all sizes and will use small streams and ditches, including dry watercourses to commute. Suitable habitat for otter includes; ponds, rivers, lakes, wetlands, woodland and scrub, the majority of which are present within the site boundary and buffer areas (Liles, 2003).

During the surveys, no resting sites or other evidence of otter were recorded.

A total of five watercourses dissect the site. Some watercourses, and some sections of watercourse, presented suitable habitat for commuting and foraging otter although the areas surrounding many of the watercourses are frequently accessed by members of the public (including dog walkers). This human activity is considered to reduce the suitability of the site for otter activity. The site is dominated by deciduous woodland which would typically lend itself to holt creation in and underneath root systems. No potential den, or resting sites were noted and, similarly, the high level of human activity at the site is considered to limit the attractiveness of the site for otter resting or breeding. See Table 3-4 below for descriptions of each watercourse and its respective considered suitability to host otter and refer to Appendix D: Field survey results.

Table 3-4: Watercourse Descriptions and Suitability Assessment

Watercourse	Description	Suitability Summary
1	<p>Suitable foraging habitat was identified in the middle reaches of this watercourse and fish were noted as present within those reaches which would provide foraging opportunities for otter (Photograph 1). However, the upper reach of this watercourse is less suitable for otter, due to a combination of the following;</p> <ul style="list-style-type: none"> • a culvert (with no mammal shelf), extending under a path regularly frequented by members of the public and vehicles; • a caravan park (Photograph 2) which the watercourse leads into and has been managed, with reinforced sides. <p>The lower reaches of the watercourse extend into a public car park which is frequently disturbed by traffic and members of the public (Photograph 3). This would limit the accessibility of otter to the middle and upper reaches.</p>	Sub-optimal due to human activity and physical barriers to commuting otter.
2	<p>No optimal habitat for foraging or commuting otter was identified along this watercourse as it is short, ending abruptly, which has limited flow and is fragmented from other watercourses. No potential prey items (frogs, newts, toads, etc.) were identified. However, the watercourse is surrounded by bamboo which, although probably undesirable at a site level, could provide cover and suitable habitat for otter (Photograph 4) if they could easily access the area.</p>	Poor. Potential habitat for otter but lack of connectivity.
3	<p>This watercourse (Photograph 5 and 6) provides some suitable commuting and foraging habitat in the upper and middle reaches. However, the lower reach appears to be regularly frequented by members of the public and ends abruptly at a road, reducing its connectivity.</p>	Sub-optimal due to human activity and physical barriers to commuting otter.
4	<p>Some suitable habitat is available along the lower reaches of this watercourse, however, the full extent of the watercourse is regularly frequented by members of the public.</p> <p>The banks are gently sloping with lots of overhanging vegetation providing good riparian cover (Photograph 7).</p>	Partially optimal due to some suitable habitat but affected by regular human activity
5	<p>Suitable commuting and foraging habitat exists for otter along the shores of Loch Lomond and along the River Leven, and fish are present within both (Photograph 8).</p> <p>The banks of this watercourse are regularly frequented by members of the public and sections of reinforced banks are present, making it largely unsuitable for holt creation in those areas. However, opportunities for holt creation or resting sites do exist in areas where banks are not reinforced and where there is plenty of vegetation (Photograph 8).</p>	Partially optimal. Good habitat, foraging and holt/resting site creation opportunities but regularly frequented by public.

3.4 Water vole

Water vole were reintroduced back into Loch Lomond and the Trossachs between 2008 and 2011, colonising 12 sites in Loch Ard forest (21km north of the site boundary) (Anderson & Raynor, 2016). Since their release, surveys undertaken in 2016 identified water voles 10km away from the nearest release sites, however, they are not known to be present within the area in which the site boundary is located.

No signs of water vole were recorded during the survey.

Suitable habitat is not present along any of the watercourses as many of the bankside profiles were deemed too gently sloping to be optimal for burrow creation, or ground conditions were impenetrable for burrowing due to reinforced banks. There is a lack of suitable herbaceous vegetation, such as rushes for foraging water vole, which further indicates an overall lack of habitat suitability.

3.5 Other Species

Evidence of roe deer (*Capreolus capreolus*) was observed, including; droppings and footprints.

Multiple bird species were observed within and in proximity to the site boundary including: common wood pigeon (*Columba palumbus*), Buzzard (*Buteo buteo*), common blackbird (*Turdus merula*) and common chaffinch (*Fringilla coelebs*).

4 POTENTIAL IMPACTS

4.1 Site Evaluation

Loch Lomond is known to have a favourable otter population. No resting sites or field evidence of otter or water vole was found during survey of the site and its environs.

Watercourses 4 and 5 provide partially optimal habitat for foraging and commuting otter and it is conceivable that otter may choose to rest in areas of suitable cover. Watercourse 1 and 3 provide sub-optimal suitability for otter activity due to features causing physical barriers. Watercourse 2 has poor suitability as it begins and ends abruptly and is considered to have little or no resources for otter. All the watercourses apart from watercourse 2 show signs of being regularly frequented by the public, which reduces suitability for otter.

The watercourses do not present the conditions that would support a water vole population at the site. The majority of watercourses lack penetrable banks and have a minimal, or no herbaceous vegetation needed to support a population of water vole.

4.2 Construction

At this stage the potential impacts of the construction phase of the proposed development could be:

- Loss or fragmentation of potential commuting and foraging habitat for otter.
- Incidental injury or fatality of otter from increased traffic and construction activities.
- Pollution from fuels, oils, solvents, materials, dust and sediments on the watercourses.

4.3 Operation

At this stage the potential impacts of the post-construction phase of the proposed development on otter have been identified as:

- Incidental injury or fatality of protected species (otter) from an increase in the numbers of cars in the area.
- Development may also increase the human activity and possibly the numbers of domestic predators (such as dogs) in the area, which may have an impact on the behaviour of otter in the locale.

5 FURTHER SURVEY, LICENSING AND GOOD PRACTICE

5.1 Further Survey and Licensing

5.1.1 Otter

Some suitable habitat is present within the site boundary and the wider landscape for commuting and foraging otter. Therefore a pre-construction check and regular diligence for the presence of otter during construction is recommended for this species.

5.1.2 Water Vole

No suitable habitat is present for burrow creation or foraging for water vole. Therefore, as there was no evidence or suitable habitat present, no prior checks to the commencement of works would be required for this species.

5.1.3 Licensing

Given the current results, there is no requirement for a Scottish Natural Heritage (SNH) licence for either species at this stage.

5.2 Mitigation

The following broad mitigation measures should be employed to minimise the effects on otter:

Temporary lights used during construction should be fitted with shades to prevent light spillage outside the working area. Temporary lights should not illuminate the River Leven or Loch Lomond as lighting can affect commuting and foraging success for otter;

Any trenches or pits made during construction should be covered when unattended, or a shallow angled plank inserted to avoid animals becoming trapped. For the same reason, the ends of any exposed pipes should be capped when unattended, or at the end of each working day to prevent animal access;

In the event that a protected species is discovered on site all work in that area must stop immediately and an Ecologist contacted. Details of the SNH Area Officer and Scottish Society for the Prevention of Cruelty to Animals (SSPCA) relevant Officer could be held in site emergency procedure documents;

Scottish Environment Protection Agency (SEPA) Guidance for Pollution Prevention (GPP's) should be followed to prevent pollution of the watercourses; and

Site compounds/materials or plant storage areas would be located as far as possible from the watercourses.

5.3 Optional Enhancement

Increasing, enhancing and managing water quality and the connectivity of appropriate riparian vegetation along watercourses would increase invertebrate and fish for otter to forage and provide cover for otter to feel secure when moving through the landscape.

Including simple structures such as rock piles, felled trees and artificial resting sites close to the watercourses would provide shelter for otter during and following development.

If implementing culverts then designs to include mammal shelves would allow otter to pass through and encourage the culvert use rather than using the roads.

If hard bank protection is required along any of the watercourses, 'gabions' (wire mesh) and boulders could be used to create 'soft' banks rather than using concrete to allow easier commuting for otter.

Providing access to the river and the loch without physical barriers will increase foraging resources and commuting opportunity for otter within and adjacent to the site.

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APPENDICES

A SITE BOUNDARY AND LOCATION



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Legend

 Site Boundary

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Title
Site Boundary and Location Plan

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Craighall Business
Park, Eagle Street,
Glasgow, G4 9XA
Tel: 0141 341 5040
Fax: 0141 341 5045

B PROTECTED SPECIES LEGISLATION SUMMARY

Otter

A European Protected Species (EPS) is a species listed in the EC Directive (92/43) The Conservation of Natural Habitats and of Wild Flora and Fauna (the "Habitats Directive"), which is transposed into UK law through the Conservation (Natural Habitats &c.) Regulations 1994 (the "Habitat Regulations") as amended by The Conservation (Natural Habitats, &c.) Amendment (Scotland) Regulations 2007. Under this legislation an EPS (*e.g.* all bat species) are protected from:

- (a) Deliberate or reckless capture, injuring or killing;
- (b) deliberate or reckless
 - (i) harassment of an animal or group of animals;
 - (ii) disturbance of such an animal while it is occupying a structure or place which it uses for shelter or protection;
 - (iii) disturbance of such an animal while it is rearing or otherwise caring for its young;
 - (iv) obstructing access to a breeding site or resting place of such an animal, or otherwise denying the animal use of the breeding site or resting place;
 - (v) disturbance of such an animal in a manner that is, or in circumstances which are, likely to significantly affect the local distribution or abundance of the species to which it belongs; or
 - (vi) disturbing such an animal in a manner that is, or in circumstances which are, likely to impair its ability to survive, breed or reproduce, or rear or otherwise care for its young;
- (c) deliberate or reckless taking or destroying the eggs of such an animal; or,
- (d) damaging or destroying a breeding site or resting place of such an animal.
- (e) any person:
 - (i) possessing or controlling;
 - (ii) transporting;
 - (iii) selling or exchanging; or
 - (iv) offering for sale or exchange,

any live or dead animal or part of an animal or anything derived from such an animal which has been taken from the wild and which is of a species or subspecies listed in Annex IV(a) to the Habitats Directive – unless the animal from which the part or the thing in question is derived, was lawfully taken from the wild (*i.e.* taken from the wild in the European Union without contravention of appropriate domestic legislation and before the implementation date of the Habitats Directive (in that Country *e.g.* 1994 in UK) or if it was taken from elsewhere).

European Protected Species Licensing

For a licence to be issued these three tests must be satisfied:

1. That the development is 'in the interests of public health and public safety, or for other imperative reasons of overriding public interest, including those of a social or economic nature and beneficial consequences of primary importance for the environment';
2. That there is 'no satisfactory alternative'; and
3. That the derogation (i.e. any permission/licence granted) is 'not detrimental to the maintenance of the populations of the species concerned at a favourable conservation status in their natural range'.

To obtain a licence a Method Statement is required that identifies the activities to be undertaken, the location of all resting sites (e.g. bat roosts), the potential effects and details of the proposed mitigation.

Water Vole

Water voles are protected under the WCA, Schedule 5, as amended by the Nature Conservation (Scotland) Act, 2004, to include both intentional and reckless acts.

Subject to certain exceptions, it is now an offence to 'intentionally or recklessly':

- Kill, injure or take (capture) a water vole;
- Damage, destroy or obstruct access to any structure or place which a water vole uses for shelter or protection; or to
- Disturb a water vole while it is occupying a structure or place which it uses for that purpose.

Anyone who carries out, or knowingly causes or permits these acts to occur could be committing an offence.

In some cases licenses may be issued by Scottish Natural Heritage to enable certain otherwise illegal activities to take place. With respect to development-related activities, licenses can be issued where there is likely to be damage to a water vole burrow, or disturbance to a water vole within its burrow, for social, economic or environmental reasons. Licenses may only be issued for this purpose provided that:

- The activity authorised by the licence will contribute to significant social, economic or environmental benefit; and
- There is no other satisfactory solution.

Note: The above information constitutes a summary only. Please refer to original legislation for full information.

C WATERCOURSES



Legend

- Site Boundary
- Otter and Watervole Survey Area
- Water Features

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Project
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Title
Watercourses

Status
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enviroCentre

Craighall Business
Park, Eagle Street,
Glasgow, G4 9XA
Tel: 0141 341 5040
Fax: 0141 341 5045

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D FIELD SURVEY RESULTS



Legend

- Site Boundary
- Watercourses

Suitability for Otter

- Partially Optimal
- Sub-optimal
- Poor

Do not scale this map

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Project
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Title
Watercourses and Suitable Sections for Otter

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Craighall Business
Park, Eagle Street,
Glasgow, G4 9XA
Tel: 0141 341 5040
Fax: 0141 341 5045

E PHOTOGRAPHS



Photograph 1: Middle reaches of watercourse 1



Photograph 2: Upper reaches of watercourse 1 flowing through Caravan Park



Photograph 3: Watercourse 1 extending into car park



Photograph 4: Watercourse 2 surrounded by bamboo



Photograph 5: Lower reaches of watercourse 3



Photograph 6: Steeply sloping upper reaches of watercourse 3



Photograph 7: Vegetation along banks of watercourse 4



Photograph 8: Watercourse 5

Appendix 6.3 – Badger, Red Squirrel and Pine Marten Survey



West Riverside, Balloch Protected Species Survey



February 2018

West Riverside, Balloch

Protected Species Survey

Client: TSL Contractors Limited

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Reviewer: Karen Couper/ Douglas Blease

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Glasgow

Craighall Business Park
8 Eagle Street
Glasgow
G4 9XA
0141 341 5040
info@envirocentre.co.uk
www.envirocentre.co.uk

Aberdeen

Banchory Business
Centre
Burn O'Bennie Road
Banchory
AB31 5ZU
01330 826 596

Inverness

Alder House
Cradlehall Business Park
Inverness
IV2 5GH
01463 794 212

Edinburgh

Suite 114
Gyleview House
3 Redheughs Rigg
Edinburgh
EH12 9DQ
0131 516 9530

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EXECUTIVE SUMMARY

EnviroCentre Limited was commissioned by TSL Contractors Limited to undertake a protected species survey for the following terrestrial mammals:

- Badger (*Meles meles*)
- Red squirrel (*Sciurus vulgaris*); and
- Pine marten (*Martes martes*).

The survey was required to inform a proposed multi-purpose development in Balloch on the south shore of Loch Lomond. This report has been produced as a supporting document for the Environmental Impact Assessment (EIA) being undertaken for the development.

The survey was undertaken on the 3rd October in dry bright conditions.

No evidence of badger, red squirrel or pine marten was recorded during the survey. However records of red squirrel and pine marten in the wider landscape were returned during the desk study.

The woodland and grassland present on site offer suitable foraging habitat for badgers, however the high volume of visitors and dog walkers in the locale is considered to reduce the likelihood of badger frequenting the site.

Suitable habitat for red squirrel is present within the woodlands onsite, however the confirmed presence of grey squirrel reduces the sites overall suitability to support a red squirrel population.

Suitable habitat for pine marten is present within the woodland on site, however the high volume of human disturbance in the locale is considered to reduce the likelihood of pine marten frequenting the site.

Given the current results, there is no requirement for a Scottish Natural Heritage (SNH) licence for badger, red squirrel or pine marten at this stage.

Pre-works checks should be undertaken for badger, red squirrel and pine marten prior to the commencement of any works, to avoid unforeseen ecological constraints.

Ecological data is generally valid for a period of 12 months. EnviroCentre recommend that the information collected during this survey is reviewed and updated at a frequency no greater than every 12 months in order to maintain valid baseline data.

Mitigation measures during design and construction; and compensation and enhancement measures post development are outlined in section 5 of this report.

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1 INTRODUCTION

1.1 Remit

EnviroCentre Limited was commissioned by TSL Contractors Limited to undertake a protected species survey for the following terrestrial mammals:

- Badger (*Meles meles*)
- Red squirrel (*Sciurus vulgaris*); and
- Pine marten (*Martes martes*).

The survey was required to inform a proposed multi-purpose development in Balloch on the south shore of Loch Lomond. This report has been produced as a supporting document for the Environmental Impact Assessment (EIA) being undertaken for the development.

1.2 Aim and Objectives

The aim of the survey was to inform development proposals as to the presence/absence of these protected species within and adjacent to the application boundary. The aim was achieved via the following objectives:

- Search the site and habitat adjacent to the site for signs and evidence of:
 - Badger;
 - Red squirrel; and
 - Pine marten.
- Identify suitable habitat for these protected species within the site boundary plus appropriate buffers;
- Assess the potential impacts to these species and outline appropriate mitigation methods; and
- Make recommendations for further survey and/or species licencing requirements.

1.3 Site Description

The site is situated to the south of Loch Lomond, at an elevation of 14.7m above sea level and is centred at Ordnance Survey Grid Reference (OSGR) NS 38426 81914. The site currently comprises of woodland, parkland, car parks, public access areas, grassland and derelict buildings, connecting to habitats in the wider area including: woodland, farmland and residential areas.

Refer to Appendix A for site boundary and location.

1.4 Legislation and Policy

European and National legislation and local policy relevant to this study include:

- The Water Framework Directive (2000/60/EC);
- The Wildlife and Countryside Act 1981 (as amended);
- The Nature Conservation (Scotland) Act 2004;
- The Wildlife and Natural Environment (Scotland) Act 2011 (WANE);
- Scottish Planning Policy (2014);

- Loch Lomond and the Trossachs Local Development Plan (LLTNP, 2011) (for Natural Environmental Policies); and
- Loch Lomond and the Trossachs National Park Biodiversity Action Plan (Lomond & Trossachs National Park, 2016)

A summary of protected species legislation is provided in Appendix B.

1.5 Disclaimer

Faunal species are transient and can move between favoured habitats regularly throughout and between years. This survey provides a snapshot of field signs present in the survey area on one day in September 2017 and one day in October 2017,

1.6 Limitations

Desk Study

It should be noted that the desk study is limited by the reliability of third party information and the geographical availability of biological and/or ecological records and data. This emphasises the need to collate up-to-date, site-specific data based on field surveys by experienced surveyors. The absence of species from biological records cannot be taken to represent actual absence. Species distribution patterns should be interpreted with caution as they may reflect survey/reporting effort rather than actual distribution.

Field study

The full 50m survey buffer could not be accessed due to private landownership in some areas. Please refer to Appendix C for inaccessible areas.

Dense rhododendron within Woodbank woods and dense scrub in Drumkinnon woods reduced visibility during the survey. The survey was undertaken in autumn when natural dieback of vegetation occurs and visibility of the underlying substrate improves, however rhododendron and scrub species such as bramble are present all year round.

2 METHODS

2.1 Desk Study

In order to anticipate the potential ecological sensitivities at the site, a desk study was conducted in advance of the survey. The following sources were checked:

- Dunbartonshire Biodiversity Action Plan (Dunbartonshire Biodiversity Partnership, 2010);
- Scottish Biodiversity List (Scottish Government, 2013);
- UK Biodiversity Action Plan (JNCC, n.d.);
- Loch Lomond and the Trossachs National Park Biodiversity Plan (Lomond & Trossachs National Park, 2016);
- Notable species records from Glasgow Museums Records Centre (up to 2km from the site);
- Saving Scotland's Red Squirrel¹ (SSRS) (for squirrel sightings); and
- Scottish Badgers (SB) (for records of badgers and setts up to 2km from the site).

2.2 Field Survey

All survey work was led by experienced and competent ecologists, who are members of the Chartered Institute of Ecology and Environmental Management (CIEEM). The survey was designed using the guidelines endorsed by Scottish Natural Heritage (SNH) and CIEEM (CIEEM, 2013). This section provides details of the methods adopted.

2.2.1 Badger

A survey was undertaken within the site boundary, plus a 50m buffer where accessible, according to the standard guidance (Scottish Badgers, 2005). Searches were made for:

- Suitable habitat for sett creation, foraging and commuting;
- Setts; and
- Field signs, including tracks, trails, hair, feeding remains and dung.

Habitat suitability

A habitat assessment was undertaken to highlight suitable habitat for setts, foraging resources and commuting routes.

Badgers require suitable ground conditions for sett creation (e.g. soil that is free draining and can be easily excavated). Continuous, well-connected, linear vegetation, such as tree lines and hedgerows, provide good foraging for their main food source (earthworms), sheltering and commuting habitats for badgers, and native berry producing trees and shrub species offer a seasonal food resource.

Following the SNH guidance note (Scottish Natural Heritage, n.d.), badger foraging habitat is classified on a primary and secondary basis. An assessment of the distribution of primary and secondary habitat (defined below) within the survey area was undertaken:

¹ Saving Scotland's Red Squirrel. 2017. <https://scottishsquirrels.org.uk/squirrel-sightings/squirrel-sighting-map/>. Accessed 15/11/17.

- Primary foraging habitat is assessed as: short grazed or mown grassland, improved or unimproved, golf course habitat and broadleaved woodland (> 80% broadleaved); and
- Secondary foraging habitat is assessed as: arable, rough grassland (not grazed by domestic stock or mown), scrub and mixed woodland.

Sett survey

A badger sett is any structure or place which displays signs indicating current use by badger/located within an active badger territory. Setts comprise a series of underground tunnels and chambers which form the home of a badger social group (clan). Although normally recorded in sloping, sandy soil in woodland habitats, it should be noted that badgers will excavate setts in a wide range of environments, including urban settings.

Setts can be located anywhere within the territory of the clan and more than one sett can often be in use. Within one territory, badgers may maintain a main sett with several annexe or satellite setts. Setts are identified by a number of characteristic features. These features include:

- A network of broad, D-shaped (concave) entrances;
- Well-worn paths between entrances and foraging areas;
- Piles of excavated soil beside entrances (spoil heaps); and
- Piles of bedding materials beside entrances.

Diagnostic footprints and hair found around a sett can often confirm the presence of badgers and provide evidence of recent use. Fresh soil on spoil heaps can also indicate recent use.

Setts, except for main setts, are either active or inactive and are categorised (Clark, 1988) as follows:

- Main sett: numerous entrances, large spoil heaps, active and with well used paths. One per social group;
- Annexe setts: numerous entrances well used paths leading to the main sett nearby. Not always in use;
- Subsidiary setts: variable number of entrances not connected to other setts by obvious path. Not always used; and
- Outlier setts: one or two entrances, no defined paths. Used sporadically.

Field signs

Badger field signs not only provide evidence of the species, but also give an indication of badger movements and how they utilise their territory. Badger field signs include:

- Guard hair;
- Footprints;
- Snuffling (badgers use their snout to turn over vegetation or soft soil to forage for bulbs and invertebrates);
- Scratching posts (marks on tree trunks/ fallen trees where badgers have left claw marks);
- Breach points (gaps in fences or crossing points over roads);
- Dung pit (single faeces deposit placed in a small excavation); and
- Latrines (collection of faecal deposits often used by badger clans to mark home range boundaries).

2.2.2 Red Squirrel

A survey was undertaken based on best practice guidance (Gurnell, Lurz, McDonald & Pepper, 2009) which involves a search of suitable habitat (primarily coniferous woodland) for two distinct signs of squirrel activity. It

should be noted that neither of these methods accurately distinguishes between red or grey squirrels (*Sciurus carolinensis*). The two distinct field signs are:

1. Dreys– are the nests made by both species of squirrel in trees. Dreys are distinguishable from birds' nests as they are normally 50cm in diameter and 30cm deep, comprise a ball shape and are usually densely constructed. The dreys are normally located close to the main stem of the tree at a height of 3m or more; and
2. Feeding evidence – where cone producing trees (conifers) are evident, evidence of squirrel feeding is searched for. Although the two species of squirrel cannot be distinguished from feeding remains, the manner in which squirrels break open seeds and nuts, which are then left on the forest floor, is diagnostic.

2.2.3 Pine Marten

A passive sign survey was conducted for pine marten according to standard guidance (The Mammal Society, 2012). The survey included a search for scats (e.g. on prominent features such as tree stumps, dead logs or stones), footprints and potential den sites as well as the presence of scats on paths, rides and track ways through woodland or rock habitats.

An assessment of the habitat was also undertaken to identify likely prey resources, which include small mammals, birds and invertebrates, and potential den sites such as large tree cavities.

It should be noted that in areas where pine marten populations are sparse and territorial defence is relatively unimportant, searches for signs (including scats) may fail to detect presence simply because the animals are less likely to deposit scats as territory markers; in such situation most scats are deposited at den sites and in foraging areas.

3 RESULTS

3.1 Desk Study

The results of the desk study are presented below.

The site is within the West Dunbartonshire council area. Table 3-1 below indicates the species listed on the Dunbartonshire BAP (DBAP), UKBAP and Scottish Biodiversity List (SBL) that are potentially relevant to the site:

Table 3-1: DBAP, UKBAP and SBL Species Potentially Relevant to the Site

Species	DBAP	UKBAP	SBL
Badger			
Red squirrel		✓	✓
Pine marten		✓	✓

3.1.1 Loch Lomond Biodiversity Plan

The site is within the Loch Lomond and the Trossachs National Park. The Loch Lomond Biodiversity Plan highlights priority species and habitats and undertakes work to safeguard and enhance these. Table 3-2 below indicated the species listed on the Loch Lomond Biodiversity Plan (LLBP) that are potentially relevant to the site.

Table 3-2: Loch Lomond Biodiversity Action Plan Species Potentially Relevant to the Site

Species	LLBP	UKBAP	SBL
Red Squirrel	✓	✓	✓

3.1.2 Glasgow Museums Records Centre

One record of pine marten from September 2010 was returned from the records search. The sighting was recorded in Ballock Park approximately 600m north west of the site, separated by the River Leven.

3.1.3 Saving Scotland's Red Squirrel

Saving Scotland's Red Squirrel combines reports of sightings of both red and grey squirrels. Table 3-3 lists the records from Saving Scotland's Red Squirrels within 5km of the site.

Table 3-3: Saving Scotland's Squirrel Sightings Potentially Relevant to the Site

Species	Distance and Location	Comment
Grey squirrel	Approx. 1.1km north	3 (alive) in mixed conifer and broadleaf habitat in 2017
Red squirrel	Approx. 2.2km north	1 (alive) in broadleaf e.g. oak habitat in 2017
Grey squirrel	Approx. 2.6km south	1 (alive) in broadleaf e.g. oak habitat in 2017
Grey squirrel	Approx. 3.9km north	1 (alive) in broadleaf e.g. oak habitat in 2017

3.1.4 Scottish Badgers

Scottish Badgers collate information on badger sightings and locations of setts. Table 3-4 lists the records from Scottish Badgers.

Table 3-4: Scottish Badger Records

Record	Date	Distance and Orientation	Habitat
Badger	22/03/09	Approx. 3.9km north west of the site	Identified in arable field, next to broadleaved woodland
Badger	06/03/2016	Approx. 1.5km north west of the site	Identified near broadleaved woodland, in arable field, next to scrub habitat
Unclassified Sett	20/05/17	Approx. 4.8km north east of the site	Identified within broadleaved woodland, next to arable field

3.2 Field Survey

3.2.1 Badger

No badger setts or field signs were identified during the survey.

Mammal burrows were identified in the east section of Drumkinnon Wood, however these were assessed to be created and utilised by rabbit.

The woodland throughout the site offers good primary and secondary foraging opportunities as does the semi-improved grassland present in the west of the site and the mown grassland in the east which offers a source of earthworms which comprise a key component of their diet. Steep embankments suitable for sett creation are present in Drumkinnon wood and within the woodland in the west of the site. However, the ground throughout the site is not free draining, making it less suitable for sett creation. The high volume of dog walkers and visitors frequenting this area further reduces the likelihood to be used by badgers.

More suitable primary habitat exists out with the site, specifically Cameron House Golf Course to the north east of the site and woodlands to the west and north, providing primary foraging opportunities.

3.2.2 Red squirrel

No evidence of red squirrel was identified during the survey.

The desk study returned one sighting of red squirrel in broadleaved woodland 2.2km north of the site. The woodland within the survey area is primarily broadleaf, while red squirrel can occupy broadleaf habitats, they are often outcompeted by grey squirrel where populations of grey squirrel are present. During the survey a grey squirrel was observed in the east of the site (NGR 38755 82322) and grey squirrel sightings have been more readily recorded in the wider area during 2017 according to reports Saving Scotland's Red Squirrel. This suggests the site currently offers low suitability for the local red squirrel population. However, grey squirrels are being controlled within the Loch Lomond National parks and red squirrel population is thought to be recovering.

3.2.3 Pine marten

No dens or other evidence of pine marten were recorded in the survey area.

The desk study returned one sighting of pine marten in Ballock Park approximately 600m north west of the site. The mature trees present within the Drumkinnon and Woodbank woodland not did display (from ground level observations) any cavities large enough to host a pine marten. Cavities may be present at height, which are not visible from ground level. The remainder of the woodland within the survey area was predominantly semi-mature to immature and therefore not of an age to provide the cavities required for pine marten dens.

Foraging resources for pine marten are available in woodland habitats which are likely to support populations of birds, small mammals and invertebrates. Pine marten also predate grey squirrel which are known to frequent the woodland on site. The habitats on site are well connected to the woodland habitats to the north and west of the site.

Pine martens are shy creatures who are mostly active at night, therefore more likely to favour less disturbed habitats further north and west of the site as woodland within the survey area is relatively disturbed by visitors to Loch Lomond Shores and dog walkers.

3.2.4 Other Observations

Roe deer (*Capreolus capreolus*) footprints and droppings were identified in various locations across the site during the surveys. Deer are able to utilise the site and access the wider landscape with ease.

Good levels of natural tree and vegetation regeneration appears to be occurring within the woodlands and more recent plantings seem well established with minimal evidence of direct browsing pressure from deer. This indicates that roe deer may not be present in large numbers, on the site. Frequent human access in proximity to Loch Lomond, the River Leven and through Drumkinnon wood is likely to affect the behavior of roe deer, dissuading them from persistent browsing of trees and vegetation. The woodland in the west, of the site, known as Woodbank, is likely to be less disturbed by human presence and with dense rhododendron providing secure cover, may host a more prolonged presence of roe deer.

4 FURTHER SURVEY AND LICENSING

4.1 Further Survey and Licensing

4.1.1 Further Survey

No evidence of badger, red squirrel or pine marten was recorded during the survey, however as these species are known to or have the potential to be present in the locale a further survey to maintain accurate data, or pre-works check, for these species prior to development works commencing will be required. .

Ecological data is generally considered valid for a period of 12 months. After this time it is recommended that the full suite of protected species surveys is reviewed with regard to the need or otherwise for updates. If the site boundary changes further survey work for these species may be required.

4.1.2 Licensing

Given the current results, there is no requirement for a Scottish Natural Heritage (SNH) licence for badger, red squirrel or pine marten at this stage.

5 MITIGATION, COMPENSATION AND ENHANCEMENT

5.1 Mitigation

The following mitigation measures should be employed to minimise the effects on any wildlife present within the site and surrounding area:

- All contractors should be made aware of the potential presence of protected species prior to works commencing; and if any evidence of badger, red squirrel or pine marten is uncovered all works must stop and appropriately qualified ecologist contacted for advice.
- Temporary lights used during construction should be fitted with shades to prevent light spillage outside the working area. Temporary lights should not illuminate linear features such as tree lines or watercourses as lighting can affect commuting and foraging success for wildlife;
- Any trenches or pits made during construction should be covered when unattended, or a shallow angled plank inserted to avoid animals becoming trapped. For the same reason, the ends of any exposed pipes should be capped when unattended, or at the end of each working day to prevent animal access;
- Scottish Environment Protection Agency (SEPA) Guidance for Pollution Prevention (GPP's) should be followed to prevent pollution of the watercourses; and
- Trees and woodland on site should be maintained and protected wherever possible during and post development works.

5.2 Compensation

As woodland fragmentation is known to be one of the main limitations to the growth of the local red squirrel population in the Loch Lomond area, the development should seek harmony with the woodland habitats, rather than risk or cause fragmentation. Any tree loss should be compensated within an agreed woodland management/landscape plan and species choice may reflect Red squirrel conservation as an objective.

5.3 Enhancement

The following enhancement measures are recommended for positive impacts on biodiversity:

- It is recommended that any vegetation planting in the form of landscaping etc., should include a wide range of native species, including berry or nectar producing plants which encourage invertebrates. This increases the foraging opportunity for mammals and invertebrates, as well as enhancing commuting corridors. Species to be considered include hawthorn (*Crataegus monogyna*), blackthorn (*Prunus spinosa*), elder (*Sambucus nigra*), hazel (*Corylus avellana*) and honeysuckle (*Lonicera* spp.).
- Den boxes for pine marten and nest boxes for red squirrel could be installed on remaining trees to enhance resting and breeding opportunities.
- Grey squirrel control could be concentrated on site to increase the suitability of remaining woodland for red squirrel and to encourage their return into the area.
- A variety of bird boxes, 'invertebrate hotels' and hedgehog boxes could also be installed within and adjacent to the new development to protect and enhance biodiversity in the site.

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APPENDICES

A SITE LOCATION PLAN AND SURVEY BUFFER



Legend

Site Boundary

50m Survey Area Buffer

Do not scale this map

Client

TSL Contractors Limited

Project

West Riverside Balloch

Title


Site Location Plan and Survey Buffer

Status

FINAL

Drawing No. 168659-030	Revision
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Scale 1:5,000	A3	Date 2 Feb 2018
Drawn GV	Checked GV	Approved IB



Craighall Business
Park, Eagle Street,
Glasgow, G4 9XA
Tel: 0141 341 5040
Fax: 0141 341 5045

B LEGISLATION

Badger

Under the Protection of Badgers Act (1992), as amended by the Nature Conservation (Scotland) Act 2004, it is an offence to:

- Kill, injure or take a badger;
- Have in possession a dead badger or any part of a badger;
- Cruelly ill-treat a badger; and
- Damage, destroy, interfere or obstruct a badger sett or disturb a badger whilst it is occupying a sett.

Where an offence is committed the individual (as well as the body corporate, Scottish partnership or, as the case may be, unincorporated association) is guilty of the offence and is liable to be proceeded against and punished accordingly.

In some cases licenses may be issued by Scottish Natural Heritage to enable certain otherwise illegal activities to take place. With respect to development-related activities, licenses can be issued where there is likely to be damage or disturbance to a badger sett, for social, economic or environmental reasons. Licenses may only be issued for this purpose provided that:

- The activity authorised by the license will contribute to significant social, economic or environmental benefit; and
- There is no other satisfactory solution.

Red Squirrel and Pine Marten

Red squirrel and pine marten are protected under Schedule 5 of the Wildlife and Countryside Act 1981 (as amended), as amended by the Nature Conservation (Scotland) Act 2004.

Subject to certain exceptions, it is now an offence to 'intentionally or recklessly':

- Kill, injure or take (capture) a red squirrel or pine marten;
- Damage, destroy or obstruct access to any structure or place which they use for shelter or protection;
- Disturb a species while it is occupying a structure or place which it uses for that purpose; or to
- Possess or control, sell, offer for sale or possess or transport for the purpose of sale any live or dead red squirrel or pine marten or any derivative of such an animal.

Knowingly causing or permitting any of the above acts to be carried out is also an offence.



In some cases licenses may be issued by Scottish Natural Heritage (SNH) to enable certain otherwise illegal activities to take place. With respect to development-related activities, licenses can be issued where there is likely to be damage to a red squirrel or pine marten resting place, or disturbance to the animal within its resting place, for social, economic or environmental reasons. Licenses may only be issued for this purpose provided that:

- The activity authorised by the license will contribute to significant social, economic or environmental benefit; and
- There is no other satisfactory solution.

C INACCESSIBLE AREAS



Legend

-  Site Boundary
-  Inaccessible Area

Do not scale this map

Client
TSL Contractors Limited

Project
West Riverside Balloch

Title
Innaccessible Area

Status
FINAL

Drawing No.	Revision
168659-021	

Scale	A3	Date
1:4,000		2 Feb 2018
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JEP	JMC	IB



Craighall Business
Park, Eagle Street,
Glasgow, G4 9XA
Tel: 0141 341 5040
Fax: 0141 341 5045

Appendix 6.4 – Bat Survey



West Riverside, Balloch Bat Surveys



February 2018

West Riverside, Balloch

Bat Surveys

Client: TSL Contractors Limited

Document number: 7860
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Author: Amy Ashe/Karen Hassard
Reviewer: Kate Elliott/Doug Blease

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Glasgow

Craighall Business Park
8 Eagle Street
Glasgow
G4 9XA
0141 341 5040
info@envirocentre.co.uk
www.envirocentre.co.uk

Aberdeen

Banchory Business
Centre
Burn O'Bennie Road
Banchory
AB31 5ZU
01330 826 596

Inverness

Alder House
Cradlehall Business Park
Inverness
IV2 5GH
01463 794 212

Edinburgh

Suite 114
Gyleview House
3 Redheughs Rigg
Edinburgh
EH12 9DQ
0131 516 9530

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EXECUTIVE SUMMARY

EnviroCentre Limited was commissioned by TSL Contractors Limited to undertake bat surveys at a site referred to as 'West Riverside' in Balloch. The surveys were required to inform a proposed multi-purpose development in Balloch on the south shore of Loch Lomond. This report has been produced as a supporting document for the Environmental Impact Assessment (EIA) being undertaken for the development.

The following was undertaken as part of the assessment:

- Habitat assessment for bats;
- Preliminary roost assessment;
- Emergence surveys on buildings;
- Transect surveys; and
- Static automated surveys

Many bat species are strongly associated with woodland edge habitats as they offer abundant insect prey. Bats also use linear features such as woodland edges, tree lines and watercourses to navigate. The woodland edges, tree lines and watercourses present, are considered to offer good sheltering, commuting and foraging habitats for bats. The watercourses will also attract invertebrate species and in turn increase the foraging resource on the site for bats.

Buildings 1 to 3 present within the west of the site were assessed as having low roost suitability. These buildings are structurally unsound, have partially collapsed walls and no roof. No roost was confirmed during emergence surveys.

The transect and static recorder surveys identified Soprano pipistrelles (*Pipistrellus pygmaeus*) to be the most abundant bat species on site followed by Common pipistrelles (*Pipistrellus pipistrellus*). The transects found evidence of Common and Soprano pipistrelles using the habitats present for both foraging and commuting purposes. As well as Common and Soprano pipistrelle bats the static detectors also recorded a small number of Daubenton's (*Myotis daubentonii*) bat passes.

The potential impacts (negative and positive) of the proposed development on bats are:

- Habitat loss during the construction phase (woodland and grassland areas);
- Disturbance to commuting and foraging bats from construction activities (temporary); and
- Habitat gain once the development has been completed (permanent).

Through applying mitigation (Section 5) it is considered that the works will not affect the overall favourable conservation status of the local bat population and, as such, the planned activities are not considered to affect bats in a manner that is, or in circumstances which are, likely to significantly affect the local distribution or abundance of the species.

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1 INTRODUCTION

1.1 Remit

EnviroCentre Limited was commissioned by TSL Contractors Limited to undertake bat surveys at a site referred to as 'West Riverside' in Balloch. Following a survey for Ecological Constraints and Opportunities (ECOP) in February 2017, (Drawing no. 168659-001) the site was evaluated as having 'moderate' habitat value for foraging and commuting bats according to the Bat Conservation Trust (BCT) guidelines (The Bat Conservation Trust, 2016).

The surveys were requested to inform a proposed multi-purpose development in Balloch on the south shore of Loch Lomond. This report has been produced as a supporting document for the Environmental Impact Assessment (EIA) being undertaken for the development.

1.2 Aims and Objectives

The aim of the bat activity surveys undertaken in 2017 was to provide a baseline of information about bat behaviour to inform a planning application for a multi-purpose development at the site. The objectives were to:

- Assess and categorise the potential for any buildings or trees to host roosting bats;
- Identify and categorise any bat roosts present within the site;
- Identify which bat species are using the site;
- Identify the bat species present on the site in the key periods during the bat lifecycle summer roosting/rearing young/dispersal/mating/migration/torpor);
- Describe the bat activity level and behaviour at the site;
- Consider how bats may be impacted by the proposed development and suggest appropriate mitigation, compensation and enhancement measures; and
- Identify any further survey or licensing requirements.

1.3 Site Description

The site is situated to the south of Loch Lomond, at an elevation of 14.7m above sea level and is centred at Ordnance Survey Grid Reference (OSGR) NS 38426 81914. The site currently comprises of woodland, parkland, car parks, public access areas, grassland and derelict buildings, connecting to habitats in the wider area including: woodland, farmland and residential areas.

A site location plan is provided in Appendix A.

1.4 Legislation

All bats and their roosts are legally protected in Scotland by the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended). Under this legislation it is an offence to:

- (a) Deliberately capture or intentionally take a bat;
- (b) Deliberately or intentionally kill or injure a bat;
- (c) To be in possession or control of any live or dead wild bat or any part of, or anything derived from a wild bat;

- (d) Damage or destroy a breeding site or resting place of such an animal or intentionally or recklessly damage, destroy or obstruct access to any place that a wild bat uses for shelter or protection;
- (e) Intentionally or recklessly disturb any wild bat while it is occupying a structure or place that it uses for shelter or protection; and
- (f) Deliberately disturb any bat, in particular any disturbance which is likely to impair their ability:
 - i. To survive, breed, reproduce or to rear or nurture their young; or
 - ii. In the case of hibernating or migratory species, to hibernate or migrate; or to affect significantly the local distribution or abundance of the species to which they belong.

1.5 Licensing

Any work which results in the disturbance of bats or the destruction of their roosts requires to be carried out under a licence issued by Scottish Natural Heritage (SNH) to disturb an EPS.

For a licence to be issued these three tests must be satisfied:

1. The development is 'in the interests of public health and public safety, or for other imperative reasons of overriding public interest, including those of a social or economic nature and beneficial consequences of primary importance for the environment';
2. That there is 'no satisfactory alternative'; and
3. That the derogation (i.e. any permission/licence granted) is 'not detrimental to the maintenance of the populations of the species concerned at a favourable conservation status in their natural range'.

To obtain a licence a Method Statement is required that identifies the activities to be undertaken, the location of all resting sites (e.g. bat roosts), the potential effects and details of the proposed mitigation.

1.6 Disclaimer

Ecological data is generally valid for a period of 12 months. EnviroCentre recommend that the information collected during this survey is reviewed and updated at a frequency no greater than every 12 months in order to maintain valid baseline data.

1.7 Assessment Limitations

Desk Study

It should be noted that the desk study is limited by the reliability of third party information and the geographical availability of biological and/or ecological records and data. This emphasises the need to collate up-to-date, site-specific data based on field surveys by experienced surveyors. The absence of species from biological records cannot be taken to represent actual absence. Species distribution patterns should be interpreted with caution as they may reflect survey/reporting effort rather than actual distribution.

Field Survey

Internal inspections and internal activity survey of particular buildings were not undertaken as they were in a state of disrepair and not considered to be structurally sound.

Two transects were originally planned for the site. Due to health and safety concerns regarding livestock, the transect survey in the west of the site was abandoned during the May surveys. In order to obtain data from

these habitats a further static recorder was deployed (location 6) for the remainder of the surveys. (June to September).

The transect surveys are based on a snapshot of time only although, when repeated, can build observational/qualitative data over time. Bat behaviour cannot be observed using static recorders but do provide data on species diversity.

As this survey was conducted from ground level it is possible that some species were under recorded (i.e high flying species such as noctule and Leisler's). However as this development is for housing, bats flying over the height of the houses will not be affected.

The number of bat calls or bat passes recorded by the static recorders does not directly relate to the number of bats in a location. Night time length also varies across the season. To standardise these factors the number of bat passes were divided by the number of hours the static recorders were deployed for.

During the automated surveys, two of the static recorders were stolen from site, one in July and one in September. Some malfunctioning of static recorders occurred during the July and September surveys. The data results provided in Section 3.2.3 are expressed as bat passes per hour, therefore is still comparative where recording hours have been reduced due to theft or recorder malfunction.

Inspection of the trees was undertaken from ground level during summer months. Therefore a full visual inspection was limited by leaf cover.

2 METHODS

Bat activity survey work was undertaken and verified by experienced and competent ecologists, who are all members of the Chartered Institute of Ecology and Environmental Management (CIEEM). The surveys followed standard methods endorsed by SNH and CIEEM (CIEEM, 2013) and were designed to highlight bat activity across the 2017 active bat season (May to September). This section provides a summary of the methods.

Surveys were conducted by experienced surveyors, refer to Appendix B for surveyor profiles.

2.1 Desk Study

In order to anticipate the potential bat sensitivities at the site, a desk study was conducted in advance of the survey. The following sources were checked:

- Dunbartonshire Biodiversity Action Plan (Dunbartonshire Biodiversity Partnership, 2010);
- Scottish Biodiversity List (Scottish Government, 2013); and
- UK Biodiversity Action Plan (JNCC, n.d.).

2.2 Site Assessment for Bats

2.2.1 Habitat Assessment

Following the survey in February 2017 the site was considered to offer 'moderate' habitat quality for bats, therefore based on standard guidance (Collins, 2016) the survey effort recommended to achieve a reasonable survey effort in relation to habitat suitability was one visit per month from May to September, detailed in Table 2.1 below.

Table 2.1: Recommended survey effort for sites with moderate habitat suitability for bats

Survey type	Recommended survey effort
Transect surveys	One survey visit per month ¹ (May to September in Scotland ²) in appropriate weather conditions for bats. At least one of the surveys should comprise dusk and pre-dawn within one 24 hour period.
Automatic/ static bat recorder surveys ³	Two locations per transect, data to be collected on five consecutive nights per month (May-September in Scotland ²) and appropriate weather conditions for bats.

2.2.2 Preliminary Roost Assessment

An assessment was undertaken in accordance with the criteria set out by the Bat Conservation Trust (BCT) (Collins, 2016) to search for Potential Roost Features (PRF). This aimed to categorise features, such as those found in trees and buildings in terms of their potential to host roosting bats.

¹ A survey visit should aim to cover all habitats represented in the survey area that could be impacted by proposed activities.

² Survey season reduced from recommended May to September due to lower temperatures in Scotland

³ Detector locations should be assigned to cover all habitats represented in the survey area that could be impacted by the proposed activities.

A ground based visual assessment was undertaken of trees and buildings within and adjacent to the site boundary to identify features that bats could use for roosting. Table 2-2 and 2-3 below list the common indicators used to determine the actual or potential presence of roosting bats in trees and buildings.

Table 2.2: Active bat roost indicators and potential roosting features in buildings

Signs indicating possible use by bats	Features of buildings frequently used as bat roosts
Live bats or dead specimens	Gaps in windowsills and window panes
Droppings and their relative freshness, shape and	Underneath peeling paintwork or lifted rendering
Feeding remains including the amount and type	Behind hanging tiles, weatherboarding, eaves, soffit
Urine splashes and fur-oil straining around	Under tiles and slates
Distinctive smell of bats	Gaps in brickwork and stonework

Table 2.3: Potential bat roost features in trees

PRFs in trees frequently used as roosts	Signs indicating possible use by bats
Hollows and cavities from: woodpecker, rot and knot holes.	Tiny scratches around PRF
Hazard beams and other vertical or horizontal cracks and splits in stems or branches	Staining around PRF
Partially detached plated bark	Bat droppings in or around PRF
Cankers, included bark and compression forks with potential cavities	Audible squeaking at dusk or during warm weather
Partially detached ivy with stem diameters in excess of 50mm	Flies around PRF
Bat or bird boxes	Smoothing of surfaces around cavity

According to their suitability to host roosting bats, trees and structures were categorised as follows in Table 2-4:

Table 2.4: Bat suitability categories for structures and trees

Suitability	Structures	Trees
Moderate	A structure with one or more potential roost features that could be used by bats due their size, shelter, protection, conditions and/ or surrounding habitat but unlikely to support a roost of high conservation status	A tree with one or more potential roost features that could be used by bats due their size, shelter, protection, conditions and/or surrounding habitat but unlikely to support a roost of high conservation status
Low	A structure with features that could be used by individual bats opportunistically; PRF's not suitable for use on a regular basis or by larger numbers of bats	A tree of sufficient size and age to contain PRFs but with none seen from the ground; or features seen with only very limited roosting potential
Negligible	A structure with negligible features which is unlikely to be used by bats	A tree with negligible features which is unlikely to be used by bats

2.3 Bat Activity Surveys

2.3.1 Emergence/Re-entry Surveys

Emergence/ re-entry surveys aim to establish if a roost is present on or immediately adjacent to the site. This information is used to determine the type and extent of mitigation and/or compensation that may be required to address the issue of bats in line with current wildlife legislation. The survey effort (i.e. number of survey visits) is scoped from the overall potential of the structure to host roosting bats. There are four buildings within the site boundary. Three of these buildings were assessed as having low roost suitability. Building 4 was considered to have negligible suitability for bats and no emergence surveys were undertaken.

Accurate numbers of bats can be difficult to identify during flight, therefore each bat pass (i.e. each call identified using a bat detector) is recorded to species level with an indication of the time it was identified, its location and behaviour. This information is gathered to characterise activity and any roosts discovered.

One emergence survey was conducted of Buildings 1 and 2. These surveys were conducted from eight vantage points in total, four on each building over two consecutive nights, to ensure visual and audible coverage of all potential roost features. Please refer to the Vantage Point Location Plan in Appendix C. A thorough inspection, using a digital endoscope, of Building 3 was undertaken prior to a single emergence survey commencing on the 30th August.

The activity surveys commenced 15 minutes before sunset and continued until 90 minutes after sunset to ensure any later emerging bat species would be encapsulated in the results. The survey was conducted on the 30th and 31st August. The weather was dry, overcast and still with a sunset temperature of 16°C and a light wind on both evenings.

2.3.2 Transect Surveys

The site is considered to offer moderate habitat quality for bats, the survey effort comprised one transect survey per month, from May to September, with an additional dawn transect survey in September as per BCT guidelines (The Bat Conservation Trust, 2016).

Walked transect surveys were conducted by experienced surveyors (See Appendix B for Surveyor Profiles) following standard methods (Collins, 2016) and were designed to highlight and observe bat activity within the 2017 activity season across a variety of habitats. The transect route (and recording points) were designed to account for the habitat features present on site and included the following habitats: woodland edge, water edge, open grassland, within woodland and residential edge.

Each survey involved surveyors walking one set transect, recording for three minutes at each of 20 recording points across the site beginning at sunset and continuing for at least two hours after sunset (see Table 2.5 for survey timings and Appendix C for transect route). The dawn transect in September started two hours prior to sunrise and continued for 15 minutes after sunrise. Each month the direction of the walked transect was alternated to reduce bias in the data.

Frequency division bat detectors (Bat Box Duet) coupled with MP3 recorders (Zoom H1) tuned to a frequency of 50 kHz on the heterodyne channel (right earphone), an ideal frequency for detecting most echolocation calls of small bat species. The duet also allows the listener to listen and record in frequency division in the left earphone, which allows the user to listen to bats across all frequencies simultaneously. Where bat activity was identified, the bat detectors were used to identify the bat to species level. Post survey analysis of sound recordings was conducted to confirm species identification if this could not be confirmed during the survey.

Species identification was also aided by an understanding of individual species behaviour such as typical flight patterns and emergence times.

Accurate numbers of bats can be difficult to identify during flight, therefore each bat pass (*i.e.* each call identified using a bat detector) was identified to species level with an indication of the time it was identified, its location and whether the bat was foraging, commuting, or producing 'social' calls.

Table 2.5: Transect surveys 2017 details

Date	Sunset	Start	Finish	Weather Conditions
30/05/2017	21:37	21:30	23:35	Still, drizzle, 100% cloud cover, 16°C
19/06/2017	22:08	21:59	23:38	Still, sunny, 30% cloud cover, 16°C
17/07/2017	21:51	21:41	23:41	Overcast, still, 16°C
23/08/2017	20:35	20:20	22:18	Slight wind (0-0.4 m/s), 80% cloud cover, 8°C
26/09/2017	19:05	19:05	21:05	Still, 80% cloud cover, 14°C
27/09/2017	05:15	07:15	07:15	Slight breeze, 100% cloud cover, 13°C

2.3.3 Static Recorder Surveys

The use of static recorders facilitate quantitative analysis of way to supplement qualitative data collected during transect surveys. The placement of recorders can be random, systematic, judgemental or stratified. For this survey the locations of the recorders were chosen subjectively, which is a judgemental sampling strategy.

Six Anabat SD2 and Express recorders were positioned at six locations across the site each month from May to September. The static recorders were positioned at the same locations each month to provide coverage of bat activity across the site and to account for the habitat features present (e.g. tree lines, watercourses, hedgerow and open habitat). Please refer to Appendix D for static recorder locations.

The Anabat Express and SD2 are zero crossing bat recorders with removable internal storage (CF and SD cards respectively) and computing power that enables it to be used as a remote static recorder. Each static recorder is calibrated monthly. Sound is recorded in .ZC files with no sound, and the recorded noise displays as dots. The loudest sound at any one moment in time is recorded which means that quieter species, echolocating simultaneously with louder species, may be missed (such as brown long-eared bats (*Plecotus auritus*)). Recording is triggered by sound above a specified threshold, such as echolocation, and then stored on the memory cards.

A description of the habitats at each static recorder location are given in Table 2.6 below and shown in Appendix C.

Table 2.6: Habitat descriptions of static recorder locations

Static recorder location	Habitat description
1	Water edge
2	Within woodland
3	Residential edge
4	Within woodland
5	Open grassland
6	Within woodland

The static recorders were set to record for up to five consecutive nights each month. They were positioned at ground level at a 45° angle and were programmed to record from an hour prior to sunset to one hour after sunrise. The table below provides details of the location, dates and times each static recorder was deployed.

Table 2.7: Location of static recorders 2017

Location	Grid reference	Dates deployed	Nights deployed	Total Hours deployed
May				
1	NS 38728 82391	23/05/2017-	5	45
2	NS 38478 81994	27/05/2017	5	45
3	NS 38913 81966		5	45
4	NS 38186 81814		5	45
5	NS 38084 82030		5	45
June				
1	NS 38728 82391	20/06/2017-	5	40
2	NS 38478 81994	24/06/2017	5	40
3	NS 38913 81966		5	40
4	NS 38186 81814		5	40
5	NS 38084 82030		5	40
6	NS 38303 82225		5	40
July				
1	NS 38728 82391	18/07/2017-	5	45
2	NS 38478 81994	22/07/2017	malfunction	0
3	NS 38913 81966		stolen	0
4	NS 38186 81814		5	45
5	NS 38084 82030		5	45
6	NS 38303 82225		malfunction	0
August				
1	NS 38728 82391	23/08/2017-	5	60
2	NS 38478 81994	28/08/2017	5	60
3	NS 38913 81966		5	60
4	NS 38186 81814		5	60
5	NS 38084 82030		5	60
6	NS 38303 82225		5	60
September				
1	NS 38728 82391	26/09/2017-	5	70
2	NS 38478 81994	30/09/2017	malfunction	0
3	NS 38913 81966		stolen	0
4	NS 38186 81814		malfunction	0
5	NS 38084 82030		malfunction	0
6	NS 38303 82225		malfunction	0

2.4 Analysis

Static recordings were analysed using specialised software (AnalogW version 4.2n). During the analysis, calls were assigned to species according to their key parameters (Middleton, 2014; Russ, 2012) as detailed in Table 2-7 below. The majority of passes could be identified to species level using these parameters. For some passes of particular bats it was only possible to identify the call to genus level. These recordings were classified as *Pipistrellus* species (not including *Nathusius' pipistrelle*) or *Myotis* sp. Data was double-checked for quality control.

A bat pass was considered to be a file containing distinct echolocations (a minimum of three pulses constitutes one bat call).

Table 2.8: Bat species and their commuting call parameters.

Species	Latin name	Call Frequency
Soprano pipistrelle	<i>Pipistrellus pygmaeus</i>	Calls with an average peak frequency of 55kHz
Common pipistrelle	<i>Pipistrellus pipistrellus</i>	Calls with an average peak frequency of 45KHz
Pipistrelle species	<i>Pipistrellus</i> species	Calls between 49-51kHz (crossover range between <i>P. pygmaeus</i> / <i>P. pipistrellus</i>)
Nathusius' pipistrelle	<i>Pipistrellus nathusii</i>	Calls with an average peak frequency of 39.3KHz
<i>Myotis</i> species	<i>Myotis</i> species	Difficult to separate to species level. Long downward FM sweep with no break between 25-30KHz.
Brown long-eared bat	<i>Plecotus auritus</i>	Long downward FM sweep (61KHz to 12KHz) with a break between 25-30KHz
Noctule	<i>Nyctalus noctula</i>	qCF calls below 23.8-52.2kHz; Average call duration 24.5ms.
Leisler's bat	<i>Nyctalus leisleri</i>	qCF calls 25-32.1kHz; Average call duration 8.3ms

During analysis of transect and static recorder data, descriptive levels of bat activity were defined based on the numbers of bat passes recorded per minute during the season at each transect recording point. Levels of bat activity were defined by EnviroCentre⁴ as high, moderate or low based on the parameters below for each recording location.

The parameters for each of the categories for the walked transect survey are as follows:

- Low = 0 to 5 passes/hour
- Medium = 5 to 10 passes/hour
- High = 10 plus passes/hour

The parameters for each of the categories for the static recorder locations are as follows:

- Low = 0 to 3 passes/hour
- Medium = 3 to 5 passes/hour
- High = 5 plus passes/hour

⁴ No guidance exists for bat activity parameters. Therefore EnviroCentre has created its own site specific parameters for the purpose of describing activity at the site.

3 RESULTS

3.1 Desk Study

The site is within the West Dunbartonshire council area. Table 3.1 below indicates the species listed on the Dunbartonshire BAP (DBAP), UKBAP and Scottish Biodiversity List (SBL) that are potentially relevant to the site:

Table 3.1: DBAP, UKBAP and SBL bat species potentially relevant to the site

Species	DBAP	UKBAP	SBL
Brown long-eared bat	✓	✓	✓
Daubenton's bat	✓		✓
Natterer's bat	✓		✓
Common pipistrelle bat	✓	✓	✓
Soprano pipistrelle bat	✓	✓	✓
Noctule bat	✓	✓	✓

3.2 Site Assessment for Bats

3.2.1 Preliminary Roost Assessment

Buildings

Four buildings are present within the site boundary. Buildings 1 to 3 are present within the west of the site and are in a deteriorating condition. The partially collapsed stonework walls comprise small cracks and gaps where the pointing has crumbled away, these may support small numbers of individual summer roosting bats. They are unlikely to provide the space, shelter, protection or appropriate climatic conditions to support maternity or hibernation roosts. Overall the buildings 1 to 3 were assessed as having **low** roost suitability.

Building 4 is a collection of smaller buildings in the north of the site, currently used as a bird of prey visitor centre. They are of modern construction with wooden clad walls and flat roofs with no features suitable to support bat roosts. Overall they are considered to have **negligible** suitability for bats and it is not suggested that they are to be affected by development, thus not considered further in this study.

Trees

The majority of trees on site were observed to be semi-mature and in good condition with no features suitable to support roosting bats. They were therefore assessed as having **negligible** suitability.

The woodlands do contain a number of mature trees, however no potential features were observed from ground level. However these trees may display some features at height (not visible from ground level) which could be exploited by bats.

3.3 Bat Activity Surveys

3.3.1 Emergence Survey

As the three buildings in the west of the site were assessed as having low roost potential, one emergence survey was undertaken on the two larger derelict buildings (Buildings 1 and 2) from eight vantage points and a thorough inspection of any cracks and crevices present in Building 3 was undertaken using an endoscope.

Soprano and Common pipistrelle bats were observed commuting and foraging around the building edges and surrounding tree lines. Daubenton's bats were also recorded commuting along the adjacent tree lines.

During the survey of the Building 1 and 2 no emergence of bats from the buildings was observed. No bats or their field signs were recorded during the endoscope search of Building 3.

Please refer to Appendix E for detailed emergence survey results.

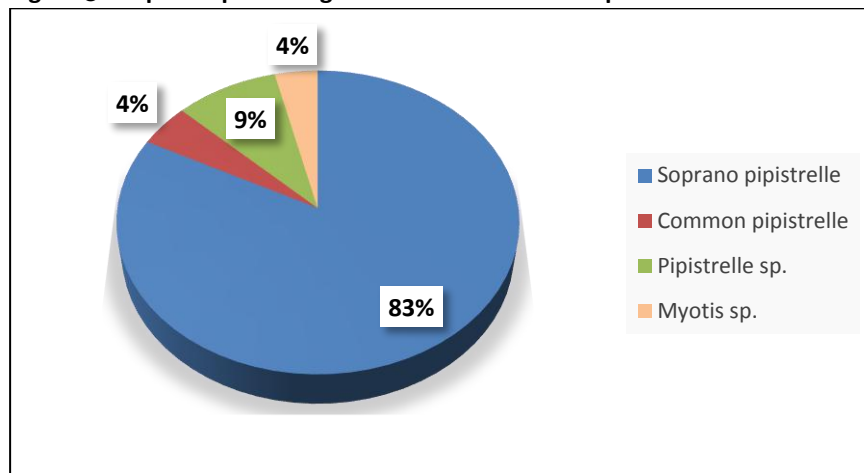
3.3.2 Transect Surveys

A total of 132 bat passes were recorded. The bat species recorded were:

- Common pipistrelle;
- Soprano pipistrelle;
- *Myotis* sp (later defined via analysis as Daubenton's); and
- *Pipistrelle* sp.

The total number of bat passes of each species shown as a percentage of the total during the transect surveys is shown in Figure 3-1 below.

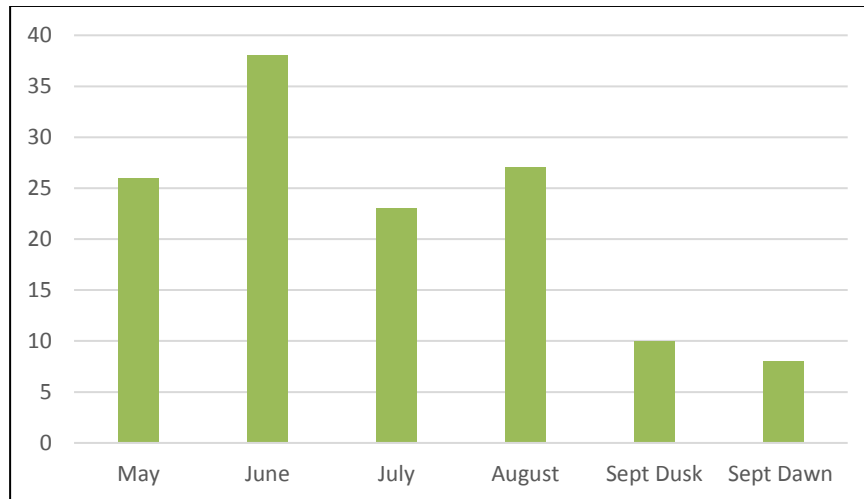
Figure 3-1: Species percentage of total number of bat passes from all transect surveys



The majority of bat passes recorded during the transect surveys were Soprano pipistrelle (109), with unknown Pipistrelle species being the second most common (12). A similar number of Common pipistrelle and *Myotis* species were recorded (6 and 5).

Figure 3.2 represents the total number of bat passes recorded each month

Figure 3-2: Total number of bat passes per transect each month



June had the highest number of total bat passes during the season (38). May, July and August had a similar number of passes with the lowest activity recorded during the September transects.

The plans presented in Appendix E shows the level of activity at each of the listening points over the whole survey season. Highest levels of activity was found at recording points 7, 15, 16 and 20 with points 1, 2, 3, 14 and 17 recording the lowest activity across the season. All other points recorded a medium level of activity with 5 to 10 passes across the 2017 season. Table 3.1 below details the recording points, habitats, species and numbers of bat passes per hour across the season. Appendix E shows the levels of activity at each listening point.

Table 3.2: Habitat, species and activity levels at each recording point across the whole season.

Recording Point	Numbers of bat passes	Species	Habitat	Activity Level
1	0	None	Water edge	Low
2	3	Soprano pipistrelle	Woodland edge	Low
3	2	Soprano pipistrelle	Woodland edge	Low
4	5	Soprano pipistrelle	Woodland edge	Medium
5	11	Soprano pipistrelle	Woodland edge	High
6	5	Soprano pipistrelle	Woodland edge	Medium
7	12	Soprano pipistrelle	Woodland edge	High
8	8	Soprano pipistrelle	Within woodland	Medium
9	6	Soprano pipistrelle	Within woodland	Medium
10	9	Soprano pipistrelle	Within woodland	Medium
11	5	Soprano pipistrelle	Woodland edge	Medium
12	3	Soprano pipistrelle	Woodland edge	Low
13	6	Soprano pipistrelle Pipistrelle sp.	Residential edge	Medium
14	3	Soprano pipistrelle	Within woodland	Low
15	10	Soprano pipistrelle Pipistrelle sp.	Within woodland	High

16	17	Soprano pipistrelle Pipistrelle sp. <i>Myotis</i> sp.	Within woodland	High
17	3	Pipistrelle sp. <i>Myotis</i> sp.	Within woodland	Low
18	7	Soprano pipistrelle Pipistrelle sp. <i>Myotis</i> sp.	Road within woodland	Medium
19	6	Soprano pipistrelle <i>Myotis</i> sp.	Road within woodland	Medium
20	11	Soprano pipistrelle Pipistrelle sp.	Residential	High

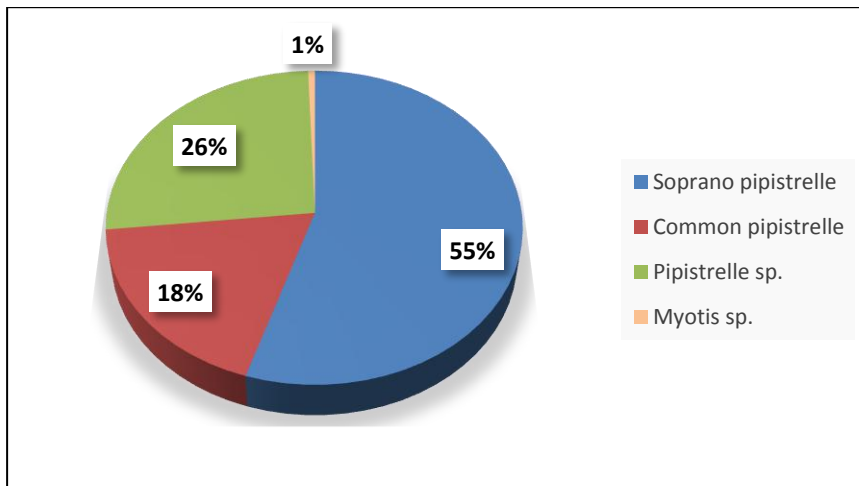
3.3.3 Static Recorder Surveys

Static recorder devices were deployed for a total of 25 nights at 6 locations across the site. A total of 2,869 bat passes were recorded. The bat species recorded were:

- Common pipistrelle;
- Soprano pipistrelle;
- *Myotis* sp (later defined via analysis as Daubenton's); and
- Pipistrelle sp.

The total number of bat passes of each species shown as a percentage of the total during the Static recorder surveys is shown in Figure 3-3 below.

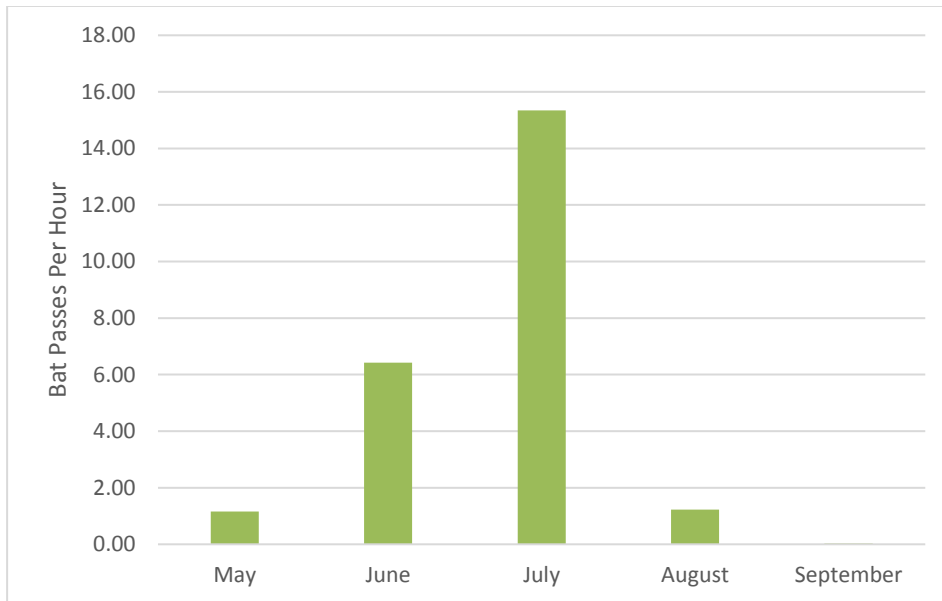
Figure 3-3: Species percentage of total number of bat passes from all static recorder surveys



The majority of bat passes recorded during the static surveys were Soprano pipistrelle (2.3bp/h), closely followed by Common pipistrelle (0.7bp/h) and then unknown Pipistrelle species (1.1bp/h). *Myotis* sp. bats only represents 1% of the overall passes recorded during 2017 (0.02bp/h).

Figure 3.4 below represents the total number of bat passes/per hour per species each month.

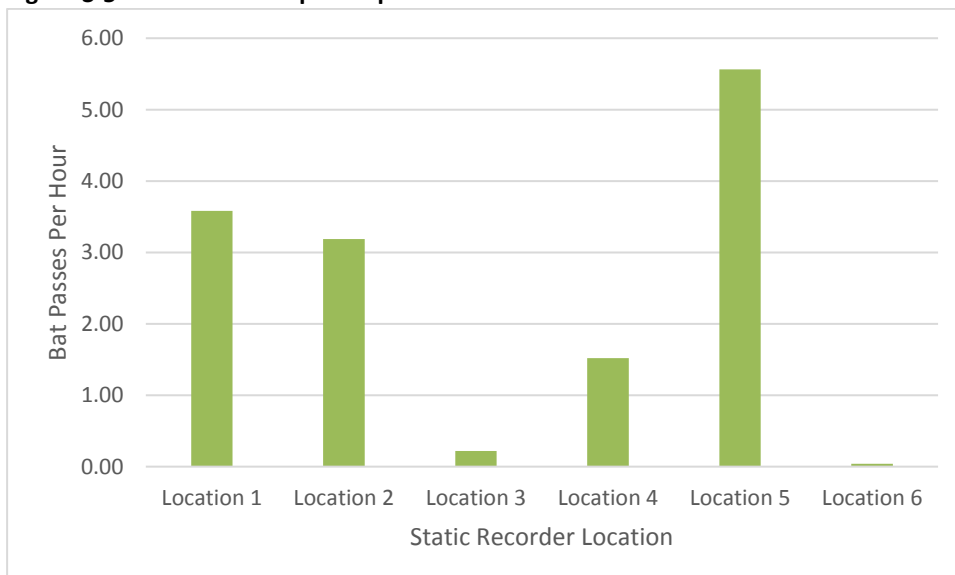
Figure 3-4: Total number of bat passes per hour per month.



July had the highest number of total bat passes per hour (15.35bpph) during the season followed by June (6.42bpph). May and August had a similar number of bat passes per hour (1.16 and 1.23bpph) with September displaying the least bat passes per hour (0.03bpph).

Figure 3-5 below shows the number of bats passes per hour at each static recorder location. Location 5 had the highest number of bat passes per hour. This recorder was located in open grassland along a road. Location 3 and 6 had the lowest numbers of bat passes per hour. Location 3 was at the residential edge and location 6 was within woodland. The map provided in Appendix G shows the bat activity level per static recorder location over the complete 2017 survey season.

Figure 3-5: Number of bat passes per hour at each static recorder location



4 DISCUSSION

4.1 Site Assessment

4.1.1 Foraging and Commuting Habitat

Many bat species are strongly associated with woodland edge and riparian habitats as they offer a wide variety of insect prey. Bats also use linear features such as woodland edges, tree lines and watercourses to navigate. The woodland edges, tree lines and watercourses on site, are considered to offer good sheltering, commuting and foraging habitats for bats. Assuming good water quality, the watercourses will also attract and provide an invertebrate resource and in turn increase the foraging resource on the site for bats.

In the wider landscape it is considered that bats have access to considerable habitat associated with Loch Lomond and its woodland features. Slow or still water bodies provide a foraging environment for specialist feeders such as Daubenton's who catch prey in the surface film of water, or Natterer's and Brown long eared bats which are adept at gleaning their prey from trees.

4.1.2 Roosting Habitat

The buildings and mature trees on site are considered to offer low potential for a small number of summer roosting bats. No roosts were confirmed. The residential properties to the north west and the residential area of Balloch to the south are considered to offer moderate roosting suitability for the bat species identified on site. Pipistrelle bats are highly adaptable and commonly found roosting in occupied dwellings, similar to those which the site is bounded by to the south.

4.1.3 Species Present

The surveys demonstrated that the bat activity on the site is dominated by pipistrelle bats, which are the most abundant species in this part of the UK. They are also the species most strongly associated with woodland edge habitat. As well as Common and Soprano pipistrelle bats the static recorder also recorded a small number of Daubenton bat passes.

4.1.4 Location Activity

Transect recording points 7, 15, 16 and 20 all recorded relatively high levels of activity. These points are located along woodland edges and are closest to the residential properties which are likely to offer suitable roosting opportunities out with the site.

The static recorder at location 5 had the highest level of bat passes per hour. This static recorder was located in the west of the site adjacent to a variety of habitats including woodland edge, open grassland and Old Luss Road. These vegetated areas probably provide a good foraging resource for bats. The linear woodland edge features offer a typical commuting route for bats and offer some connectivity to other suitable woodland habitats adjacent to the site. Artificial lighting within woodland features is low or non-existent which will aid bat activity and foraging on a diverse range of invertebrates, rather than concentrated assemblages of invertebrate species focussed around a light source. However the wider landscape is well-lit artificially and as such this may affect the movement of some bat species throughout the wider landscape.

4.1.5 Activity Levels

Activity levels peaked in June during the transect surveys and in July during the static recorder surveys. During June and July pregnant females give birth to their young. As the mothers are providing their young with milk they are leaving and returning to the roost more regularly to feed themselves and their young which is likely to account for the higher number of bat passes/per hour during these months.

The lowest level of bat passes/per hour was recorded in September during both the transect and static recorder surveys. As this round of transect and static surveys were undertaken towards the end of September, it may be that bats in the area had already dispersed and breeding adults moved on to their mating site which is likely to account for the lower number of bat passes/per hour during this month.

4.2 Potential Impact to Bats

The following potential impacts may therefore change depending on the final design stages of the project and as such this subject should be reviewed and adjusted accordingly.

The potential impacts (negative and positive) of the proposed development on bats, at present, are:

- Habitat loss during the construction phase (woodland and grassland areas);
- Disturbance and loss of commuting and foraging resource for bats from construction activities (temporary/permanent);
- Increased number of buildings within habitats providing roost resource (permanent);
- Increased light levels on site (permanent); and
- Habitat improvements once the development has been completed, including artificial roost provision and woodland management (permanent).

Through applying mitigation (Section 5) it is considered that the works will not affect the overall favourable conservation status of the local bat population and, as such, the planned activities are not considered to affect bats in a manner that is, or in circumstances which are, likely to significantly affect the local distribution or abundance of the species.

5 FURTHER SURVEY AND RECOMMENDATIONS

5.1 Further Survey

Prior to any demolition works being undertaken within or adjacent to the three derelict buildings in the west of the site, further emergence/re-entry surveys should be undertaken to maintain accurate baseline data and confirm the presence and locations of any unforeseen bat roosts.

A pre-felling check should be undertaken on any trees due to be felled for any potential bat roost features. This may include elevated surveys where required.

Ecology, and in particular woodland ecology, is dynamic. Therefore it is strongly suggested that baseline data is maintained, for validity, on an annual basis in order that the development is fully aware of ecological constraints.

5.2 Licensing

No bat roosts have been identified during this study, however bats are active in the area. Should a bat roost be identified, targeted survey work may be necessary to inform an SNH licence to destroy/disturb a bat roost if it poses a constraint to development.

5.3 Mitigation and Compensation

In order to minimise the potential impacts on bats the following mitigation measures are suggested to be applied during construction:

- All site contractors should be made aware of the potential presence of bats on the site prior to development works commencing.
- In the event that a bat is discovered all work in that area must stop immediately and a suitably qualified Ecologist contacted.
- During construction, noise and vibration caused by machinery, or by the movement of construction traffic, should be kept to a minimum at times when bats are active; i.e. between sunset and sunrise during the bat activity season (April to September).
- Site compounds/material or plant storage areas should be located as far as possible from woodland habitats, to reduce disturbance and pollution.

5.3.1 Lighting

In order to protect the ecological functioning of the site and boundary features the following is recommended:

Construction

- Light spill from external artificial lighting within woodland habitats should be minimised by use of appropriate lighting.
- External light sources should be avoided wherever not absolutely required.
- Light sources should be set back as far as possible from the woodland edge boundaries.

Design

- No illumination of the River Leven or woodland edges.
- Motion lights could be used for footpaths/greenspaces so they switch off when no-one is using them.
- Lighting levels should be restricted (cows/shrouds) within 8 metres of the woodland edges and limited to background levels (background levels to be a Lux level of 0-2), except where higher levels are required to ensure pedestrian safety and security on walkways.
- Where acceptable, artificial lighting installations should be restricted to the use of white, mercury vapour, louvered (hooded), or those which emits low ultra-violet light.
- Lighting bollards and floodlights should be directional and potentially timed to emit after twilight hours depending on seasonal variation, or integrate light and/or movement sensors to limit duration.

5.3.2 Tree, Hedge, Shrub Planting,

It is understood that the majority of the woodland will be retained, however, there will be a net loss, or alteration of, recorded grassland foraging habitat within the main site area. To address this the following is recommended:

- Landscaping schemes should provide a variety of native species and habitat structure for the benefit of invertebrate species, which will support foraging opportunities for bats.
- New landscaping and existing retained habitat should be managed with biodiversity in mind to ensure bat commuting routes and foraging areas are maintained.
- It is recommended that, where possible, felling and modification of mature trees is avoided.
- It is recommended, where possible, that green infrastructure such as scattered trees and shrubs are planted to create connectivity for bats.

5.3.3 Ponds and Wetland Sections

To increase the foraging habitat it is suggested that the proposed Sustainable Urban Drainage Systems (SuDS) ponds within the site incorporate bat friendly elements such as pollen producing plants and shrubs and sensitive lighting to reduce effects on invertebrates and bats.

5.4 Enhancement

The foraging value of the site for bats could be increased by planting native broadleaved tree species to bolster woodland diversity. Suggested species would include:

- Blackthorn (*Prunus spinosa*);
- Hawthorn (*Crataegus monogyna*);
- Holly (*Ilex aquifolium*);
- Rowan (*Sorbus aucuparia*);
- Elder (*Sambucus nigra*); and
- Blackberry (*Rubus fruticosus*).

A range of Schwegler© 1FF bat box and Schwegler 2F bat boxes could be fitted to trees for year round roosting along foraging and commuting corridors. A suitable planting scheme should be developed to restore and connect riparian woodlands along the watercourse banks. This would also enhance bat foraging and commuting corridors.

The woodland should also be managed with biodiversity as an objective. This could include encouraging natural regeneration, removing invasive plant species, and increasing plant diversity within a woodland.

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APPENDICES

A SITE LOCATION PLAN



Legend

 Site Boundary

Do not scale this map

Client
TSL Contractors Limited

Project
West Riverside Balloch

Title
Site Location Plan

Status	FINAL	
Drawing No.	168659-009	Revision

Scale	1:7,000	A3	Date	13 October 2017
Drawn	JEP	Checked	MN	Approved
				KH



Craighall Business
Park, Eagle Street,
Glasgow, G4 9XA
Tel: 0141 341 5040
Fax: 0141 341 5045

B SURVEYOR PROFILES

Surveyor	Role	Profile
Amy Ashe BSc (Hons) MSc GradCIEEM	Lead surveyor	Amy has studied to Masters level, achieving a Distinction in Environmental Protection and Management from The University of Edinburgh. Amy is a graduate member of CIEEM and is currently working towards obtaining her roost visitors licence through the BatAbility training programme. She is also an active member of Lothian Bat Group and has assisted with bat box checks and hand-netting surveys. Amy has experience in assisting with dusk and dawn activity surveys, emergence and re-entry surveys, preliminary roost assessment, and transect surveys. Amy has also gained experience in deploying SM2 bat detectors, anabat detectors, and analysis of zero crossing data using Analook software.
Jennifer Paterson BSc Hons MSc GradCIEEM (pending)	Assistant surveyor	Jennifer studied to Masters level in Ecology and Environmental Sustainability at the University of Aberdeen. Jennifer has experience in bat surveys through conducting emergence/re-entry surveys on multiple buildings, and activity transects for both small and large scale projects. She is competent at conducting Preliminary Roost Assessments on trees and buildings, being involved in multiple rural and urban projects to date. Jennifer is also competent in the use, assessment and interpretation of Anabat recording systems.
Emma Archer (Graduate Ecologist) BSc (Hons)	Assistant surveyor	Emma is trained to undertake background research, bat roost potential, bat activity surveys, sound analysis and reporting in relation to development projects in Scotland. She is also a member of the North East Scotland Bat group.
Helen Embleton BSc (Hons) MCIEEM	Assistant surveyor	Helen studied Environmental Science and Environmental Management at Strathclyde and has since accrued over ten years' experience in ecology and environmental consultancy. Helen is a Full member of CIEEM. Helen has over ten years' experience of designing surveys for bats under the latest guidance from the BCT and SNH and has undertaken numerous Preliminary Roost Assessment surveys on a wide range of trees and structures. Helen has carried out extensive work on both urban and rural bat projects, including dusk emergence, dawn re-entry and activity transect surveys. She is competent in the use of Anabat recording systems at ground level and assessment and interpretation of results for inclusion in Ecological Impact Assessments.
Rachel Clarke	Assistant surveyor	Rachel worked as a seasonal field ecologist for EnviroCentre for two years and is experienced in bat activity surveys and walked bat transect surveys.

C BUILDING VANTAGE POINT LOCATION PLAN



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Legend

- Site Boundary
- Surveyor Vantage Point Location
- Field of Vision
- Building

Do not scale this map

Client
TSL Contractors Limited

Project
West Riverside Balloch

Title
Building Vantage Point Location Plan

Status
FINAL

Drawing No. 168659-023	Revision
---------------------------	----------

Scale 1:1,500	A3	Date 2 Feb 2018
Drawn JEP	Checked GV	Approved IB



Craighall Business Park, Eagle Street, Glasgow, G4 9XA
Tel: 0141 341 5040
Fax: 0141 341 5045

D BAT TRANSECT ROUTE & STATIC RECORDER LOCATIONS



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Legend

- Site Boundary
- Bat Transect Route
- Recording Point
- Anabat
- Out of Bounds for H&S Reasons

Do not scale this map

Client
TSL Contractors Limited

Project
West Riverside Balloch

Title
Bat Transect Route and Anabat Locations

Status
FINAL
Drawing No.
168659 - 008
Revision

Scale	A3	Date
1:4,000		2 Feb 2018
Drawn	Checked	Approved
JEP	GV	IB



Craighall Business
Park, Eagle Street,
Glasgow, G4 9XA
Tel: 0141 341 5040
Fax: 0141 341 5045

E EMERGENCE SURVEY RESULTS

Dusk Survey Results for Building 1

Dusk Survey West Riverside Building 1 30.08.17		
Sunset:	20.18	
Survey start time:	20.00	
Survey end time:	21.48	
Weather conditions @ start:	16.6°C, dry, 70% c/c and still	
Weather conditions @ end:	14°C, dry, overcast and still	
Surveyor: Amy Ashe		Vantage point: 4
Time	Species	Activity
2022	Soprano pipistrelle	Commuting from SE.
2039	Soprano pipistrelle	Commuting from NE.
2041	Myotis x2	Foraging (came from inside ruins).
2043	Soprano pipistrelle	Foraging.
2044	Myotis	Flew in and out of window repeatedly.
2045	Soprano pipistrelle	Flew in window.
2046	Soprano pipistrelle x2	Flew in and out of window, constant foraging, and social calling.
2055	Myotis	
2058	Soprano pipistrelle	Commuting from building centre to RC.
2101	Soprano pipistrelle	Commuting east to RC.
2102	Soprano pipistrelle & Myotis	Foraging (Heard not seen). Commuting (Both heard not seen).
2105	Soprano pipistrelle	
2106	Soprano pipistrelle x2	Commuting from ruins to RC.
2110	Soprano pipistrelle	Commuting (Heard not seen).
2119	Soprano pipistrelle	Commuting east to west.
2126	Soprano pipistrelle	Faint pass.
2131	Soprano pipistrelle	Commuting (Faint pass).
2137	Soprano pipistrelle x3	Foraging pass. Foraging pass RC to EA.
2139	Soprano pipistrelle	Commuting and social call (HNS). Rapid pass (Heard not seen).
Surveyor: Rachel Clarke		Vantage point: 3
Time	Species	Activity
2022	Unknown	Faint, quick pass.
2028	Pipistrelle sp.	Flight pattern observed whilst flying within building.
2031	Soprano pipistrelle	Faint (inside building).
2037	Soprano pipistrelle	Foraging inside and outside building. Side window and chimney.
2042	Soprano pipistrelle	
2047	Soprano pipistrelle	Emerged from middle window and foraging in trees.
2049	Soprano pipistrelle X2	Multiple bats foraging around the top of the building/chimney.
2100	Soprano pipistrelle x4	Multiple foraging passes.
	Soprano pipistrelle	Commuting pass.
2105	Soprano pipistrelle	Foraging in trees and above roof.
2112	Soprano pipistrelle	Foraging in trees/top of roof.
2120	Soprano pipistrelle x2	Multiple passes.
2126	Soprano pipistrelle x2	Pass.
2137	Soprano pipistrelle x2	Pass.
2141	Soprano pipistrelle	Pass.
2145	Soprano pipistrelle x5	Pass.
2145	Soprano pipistrelle	Pass.

Surveyor: Helen Embleton		Vantage point: 2
Time	Species	Activity
2030-2041	Soprano pipistrelle	Foraging bats within building.=.
2041-2047	Soprano pipistrelle	Continued foraging within the building and light sampling.
2055-2107	Soprano pipistrelle	Constant foraging in the treeline to the north, and north west.
2110	Soprano pipistrelle	Multiple passes (heard not seen).
2111	Soprano pipistrelle	Heard not seen.
2115	Possible Myotis	Quick pass.
2127	Common pipistrelle	Foraging (heard not seen).
2134	Common pipistrelle	Foraging (head not seen).
2148	Soprano pipistrelle	Foraging in trees to west.
Surveyor: Emma Archer		Vantage point: 1
Time	Species	Activity
2025	Pipistrelle	Flight pattern observed commuting south-east to north-west.
2030	Soprano pipistrelle	Faint social call.
2041	Soprano pipistrelle	Faint foraging north-east to south-east.
2053	Soprano pipistrelle	Multiple foraging back and forth south-east and north.
2056	Pipistrelle sp.	Foraging.
2104	Soprano pipistrelle	Continuous foraging.
2106	Pipistrelle sp.	Foraging south-east to north east (trees).
2110	Soprano pipistrelle	Faint pass.
2112	Pipistrelle sp.	Faint pass.
2130	Pipistrelle sp.	Faint pass.
2132	Soprano pipistrelle	Pass.
2136	Common pipistrelle	Pass.

Dusk Survey Results for Building 2

Dusk Survey West Riverside Building 2 31.08.17		
Sunset:	20.15	
Survey start time:	20.00	
Survey end time:	21.45	
Weather conditions @ start:	16.2°C, dry, 50% c/c and still	
Weather conditions @ end:	13.8°C, dry, overcast and still	
Surveyor: Amy Ashe		Vantage point: 4
Time	Species	Activity
2034	Soprano Pipistrelle x2	Commuting and social call.
2035	Pipistrelle species	Two pips chasing each other high above HE (seen not heard).
2036	Pipistrelle species	Multiple bats. Constant foraging
2038	Myotis	Multiple foraging.
2048	Soprano Pipistrelle x2	Commuting west to east.
2050	Soprano Pipistrelle	Foraging (heard not seen).
2051	Soprano Pipistrelle	Quick pass.
2051	Soprano Pipistrelle	Foraging.
2052	Soprano Pipistrelle x2	Commuting.
2056	Pipistrelle species	Commuting east to south.
2100	Soprano Pipistrelle x2	Foraging pass.
2101	Pipistrelle species x3	Commuting.
2107	Pipistrelle species	Foraging (faint).
2109	Pipistrelle species	Foraging (faint).
2113	Possible Nyctalus	Brief pass
2115	Pipistrelle species	Faint pass.
Surveyor: Emma Archer		Vantage point: 3
Time	Species	Activity

2022	Soprano Pipistrelle	Foraging around trees (north-east aspect).
2026	Soprano Pipistrelle	Observed foraging along the treeline, and in woodland to the west.
2033	Pipistrellus sp.	Multiple bats foraging on north-east aspect, in woodland, and above centre of building.
2046	Soprano Pipistrelle	Quiet pass. One foraging around north-east aspect. 2 nd bat flew south-west.
2046-2108	Soprano Pipistrelle	
Surveyor: Helen Embleton		Vantage point: 2
Time	Species	Activity
2028	Unknown	Faint call.
2031 – 2035	Soprano pipistrelle x2	First bat flew from north west (quiet initially). 2 nd bat flew from woodland to south-east. Both constantly foraging over courtyard then flew off to mansion to the south.
2037-2045	Soprano pipistrelle x5	Constant foraging over courtyard, flew into the woodland east.
2047	Soprano pipistrelle	Commuting north to south.
2048	Soprano pipistrelle	Heard not seen.
2051	Soprano pipistrelle	Heard not seen.
2059	Soprano pipistrelle	Commuting south to north
2059	Soprano pipistrelle	Commuting north to south
2101	Soprano pipistrelle	Commuting north to south.
2104	Soprano pipistrelle	Commuting (heard not seen).
2108	Soprano pipistrelle x1 & Common pipistrelle x2	Foraging passes south to north.
Surveyor: Rachel Clarke		Vantage point: 1
Time	Species	Activity
2022	Soprano pipistrelle	Multiple bats foraging over building and trees.
2033-2040	Soprano pipistrelle	Multiple passes, constant foraging in trees.
2043-2045	Soprano pipistrelle	Constant activity.
2055-2100	Soprano pipistrelle	Activity in trees.
2103-2107	Soprano pipistrelle	Foraging in trees
2107	Myotis	Very faint pass.

F TRANSECT SURVEY RESULTS

May transect 30/05/2017			
Weather	Still, drizzle, 0m/s, 100% cc, 16°C		
Surveyors:	AA & JEP		
Sunset:	21:37		
Start:	21:30		
Finish:	23:35		
Recording point	Time	Species	Activity
1	21:30	-	-
2	21:36	Soprano pipistrelle	1 commuting pass (E-W), 1 commuting pass (S-N), 1 foraging pass (N-S)
3	21:39	Soprano pipistrelle	2 foraging (S-N-S)
4	21:42	Soprano pipistrelle Common pipistrelle	1 foraging, 1 brief pass, 1 foraging pass (SNH)
5	21:48	Soprano pipistrelle	1 commuting pass, 1 foraging pass (continuous), 1 foraging
6	21:52	Soprano pipistrelle	1 commuting pass (N-S)
7	21:57	Soprano pipistrelle	1 commuting pass (S-N), 2 foraging passes, 1 foraging pass (N-S), foraging pass (S-N)
8	22:04	Soprano pipistrelle	1 pass, 1 foraging pass
9	22:10	Soprano pipistrelle	1 pass (faint)
10	22:18	-	-
11	22:26	Soprano pipistrelle	1 pass (faint)
12	22:33	Soprano pipistrelle	1 pass
13	22:38	-	-
14	22:47	-	-
15	22:52	-	-
16	22:59	Soprano pipistrelle	1 pass, 1 foraging pass
17	23:03	Soprano pipistrelle	-
18	23:08	Soprano pipistrelle	-
19	23:17	Soprano pipistrelle	1 foraging pass
20	23:32	Soprano pipistrelle	1 pass, 1 pass (brief)
June transect 19/06/2017			
Weather	Still, sunny, 30% cc, 16°C		
Surveyors:	AA & JEP		
Sunset:	22:08		
Start:	21:59		
Finish:	23:38		
Recording point	Time	Species	Activity
1	21:59	-	-
2	22:05	-	-
3	22:09	-	-
4	22:14	Soprano pipistrelle	1 foraging pass (west to east), 1 pass (observed)
5	22:19	Soprano pipistrelle	1 pass, 1 faint pass, both heard not seen
6	22:24	Soprano pipistrelle	1 pass, 2 faint passes, all heard not seen
7	22:29	Soprano pipistrelle	1 faint pass heard not seen
8	22:35	Soprano pipistrelle	2 bats continuously foraging (north to south)
9	22:40	Soprano pipistrelle	1 faint pass, 1 faint pass, both heard not seen
10	22:45	Soprano pipistrelle	1 faint pass, 1 continuous foraging, both heard not seen
11	22:50	Soprano pipistrelle	2 foraging passes, both heard not seen
12	22:57	Soprano pipistrelle	1 commuting pass, 1 foraging pass, both heard not seen
13	23:01	Soprano pipistrelle	1 commuting pass (south to north)
14	23:06	Soprano pipistrelle	1 commuting pass, heard not seen
15	23:13	Soprano pipistrelle	1 commuting pass, heard not seen
16	23:18	Soprano pipistrelle Myotis	5 Soprano pipistrelle commuting passes, 2 Myotis passes, all heard not seen
17	23:23	Myotis	1 foraging pass
18	23:28	Soprano pipistrelle	1 commuting pass, 1 foraging pass, both heard not seen
19	23:31	Soprano pipistrelle	1 commuting pass
20	23:35	Soprano pipistrelle	

			1 commuting pass (south west to north east), 2 foraging passes (south to north), 1 commuting pass (north west to south east), 1 foraging pass, 1 commuting pass, all observed
July Transect 17/07/2017			
Weather	Overcast, still, 16°C		
Surveyors:	AA & FR		
Sunset:	21:51		
Start:	21:41		
Finish:	23:41		
Recording point	Time	Species	Activity
1	-	-	-
2	-	-	-
3	-	-	-
4	-	-	-
5	-	-	-
6	22:10	Soprano pipistrelle	Commuting south to north.
7	22:15	Soprano pipistrelle	Foraging, heard and not seen.
	22:16	Soprano pipistrelle	Foraging, heard and not seen.
	22:17	Soprano pipistrelle	Foraging, heard and not seen x2.
8	22:20	Soprano pipistrelle	Constant foraging in trees.
9	22:29	Soprano pipistrelle	Continuous foraging, heard not seen x2.
10	22:35	Soprano pipistrelle	Foraging, heard and not seen x3.
	22:37	Soprano pipistrelle	Foraging, heard and not seen.
11	22:42	Soprano pipistrelle	Constant foraging, heard and not seen x2; commuting north to south.
	22:43	Soprano pipistrelle	Constant foraging in canopy x3.
12	22:49	-	-
13	22:56	Soprano pipistrelle	Faint pass x2.
		Soprano pipistrelle	Commuting north west to south east.
14	22:58	Soprano pipistrelle	Faint pass, heard and not seen.
15	23:08	Soprano pipistrelle	Faint pass, heard and not seen x 5
16	23:13	-	-
17	23:18	Pipistrelle sp.	Faint pass, heard and not seen.
18	23:25	Possible Myotis sp.	Commuting north west to south east.
19	23:29	Possible Myotis	X4 quick passes
20	23:38	Pipistrelle sp.	Faint pass x2
August Transect 23/08/2017			
Weather	8 °C, 0-0.4 m/s wind, 80% c/c.		
Surveyors:	AA & GV		
Sunset:	20:35		
Start:	20:20		
Finish:	22:18		
Recording point	Time	Species	Activity
1	20:20	-	-
2	20:26	-	-
3	20:30	-	-
4	20:37	Soprano pipistrelle	Foraging
5	20:43	Soprano pipistrelle	X4 brief pass
6	20:49	-	-
7	20:55	Soprano pipistrelle	X3 foraging
8	21:03	Soprano pipistrelle	X3 foraging
9	21:09	Soprano pipistrelle	Foraging
10	21:14	Soprano pipistrelle	X3 faint pass
11	21:19	Soprano pipistrelle	X1 faint pass
12	21:26	-	-
13	21:31	50Khz Pipistrelle	Foraging
14	21:43	-	-
15	21:48	Soprano pipistrelle and 50Khz	X4 fast pass; x1 forage pass
16	21:53	Pipistrelle	Faint passes

17	21:58	Soprano pipistrelle and 50Khz	Faint pass
18	22:03	Pipistrelle	Faint pass
19	22:37	50Khz Pipistrelle	-
20	22:15	50Khz Pipistrelle	Commuting & social calls
September Dusk Transect 26/09/17			
Weather	Still, 80%cc, 14°C		
Surveyors:	JEP & GV		
Sunset:	19:05		
Start:	19:05		
Finish:	21:05		
Recording point	Time	Species	Activity
1	19:05	-	-
2	19:12	-	-
3	19:20	-	-
4	19:25	-	-
5	19:29	-	-
6	19:35	-	-
7	19:40	Soprano pipistrelle	1x pass
8	19:46	-	-
9	19:52	-	-
10	19:58	-	-
11	20:03	-	-
12	20:08	-	-
13	20:14	Common pipistrelle	Commuting pass x1, Pass x1
14	20:19	-	-
15	20:24	Soprano pipistrelle	Pass x1
16	20:29	Soprano pipistrelle	3x foraging pass
17	20:34	-	-
18	20:43	Soprano pipistrelle	3x passes
19	20:55	-	-
20	21:02	-	-
September Dawn Transect 27/09/17			
Weather	Slight breeze, 100%cc, 13°C		
Surveyors:	JEP & GV		
Sunrise:	07:15		
Start:	05:15		
Finish:	07:15		
Recording point	Time	Species	Activity
1	05:17	-	-
2	05:22	-	-
3	05:29	-	-
4	05:33	-	-
5	05:44	Pipistrelle sp & Soprano pipistrelle	1 x pass 1 x foraging pass
6	05:49	-	-
7	05:54	-	-
8	06:00	-	-
9	06:04	-	-
10	06:10	-	-
11	06:17	-	-
12	06:22	-	-
13	06:28	-	-
14	06:34	Soprano pipistrelle	1x pass
15	06:40	Soprano pipistrelle	Silent bat circled trees, 1x pass (N-S), 1x pass (N-S) SNH
16	06:46	Soprano pipistrelle	2x pass chasing each other (N-S) 1x pass flying around trees in north
17	06:54	-	-
18	07:02	-	-
19	07:09	-	-
20	07:14	-	-

G TRANSECT ACTIVITY MAP



Legend

Site Boundary

Bat Transect Route

Recording Point

● High (10+ Passes)

● Medium (5-10 Passes)

● Low (≤5 Passes)

Do not scale this map

Client
TSL Contractors Limited

Project
West Riverside Balloch

Title
Transect Activity Plan

Status
FINAL

Drawing No. 168659 - 025	Revision
-----------------------------	----------

Scale 1:4,000	A3	Date 2 Feb 2018
Drawn JEP	Checked MN	Approved IB



Craighall Business
Park, Eagle Street,
Glasgow, G4 9XA
Tel: 0141 341 5040
Fax: 0141 341 5045

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community


H STATIC RECORDER ACTIVITY MAP



- Legend
- Site Boundary
 - Bat Transect Route
- Anabat Locations
- High (5+ Passes)
 - Medium (3-5 Passes)
 - Low (0-3 Passes)

Do not scale this map

Client		
TSL Contractors Limited		
Project		
West Riverside Balloch		
Title		
Anabat Activity Plan		
Status		
FINAL		
Drawing No.		Revision
168659 - 026		
Scale	A3	Date
1:4,000		2 Feb 2018
Drawn	Checked	Approved
JEP	MN	IB



Craighall Business
Park, Eagle Street,
Glasgow, G4 9XA
Tel: 0141 341 5040
Fax: 0141 341 5045

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Appendix 6.5 – Ecological Impact Assessment (EcIA)



**West Riverside and Woodbank House, Balloch
Ecological Impact Assessment (EcIA)**

April 2018

West Riverside and Woodbank House, Balloch

Ecological Impact Assessment (EclA)

Client: TSL Ltd

Document number: 8123

Project number: 168659

Status: Final

Author: Gemma Nixon

Reviewer: Kathy Dale

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Glasgow

Craighall Business Park
8 Eagle Street
Glasgow
G4 9XA
0141 341 5040
info@envirocentre.co.uk
www.envirocentre.co.uk

Aberdeen

Banchory Business
Centre
Burn O'Bennie Road
Banchory
AB31 5ZU
01330 826 596

Inverness

Alder House
Cradlehall Business Park
Inverness
IV2 5GH
01463 794 212

Edinburgh

Suite 114
Gyleview House
3 Redheughs Rigg
Edinburgh
EH12 9DQ
0131 516 9530

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- A Appendix Title (Style: Appendix Heading)

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1 INTRODUCTION

1.1 Terms of Reference

This Ecological Impact Assessment (EcIA) provides an assessment of the likely significant effects on biodiversity from the proposed development. The assessment focuses on predicted effects relating to the loss, disturbance, damage or deterioration of valued ecological receptors. This chapter has been prepared by EnviroCentre Limited.

1.2 Scope of Report

This chapter details the ecological studies undertaken and presents the results of an Ecological Impact Assessment (EcIA) undertaken for the proposed development in accordance with the latest guidance from the Chartered Institute of Ecology and Environmental Management (CIEEM) (CIEEM, 2016). The assessment is based on the characteristics of the site and surrounding area and the key parameters of the proposed development detailed in the Environmental Statement (**Chapter 2 – Site and Surrounding Area** and **Chapter 3 – The Proposed Development** respectively).

The aims of this chapter are to:

- Outline the methodology used in this assessment;
- Establish a robust and accurate ecological baseline for the site;
- Identify and evaluate the nature conservation/biodiversity interest present;
- Identify any likely impacts arising from the proposed development (construction and operational stages);
- Establish the magnitude of identified impacts;
- Identify further mitigation and enhancement measures where required to address identified impacts;
- Assess residual predicted impacts and effects; and,
- Assess cumulative impacts from the proposed development in combination with other relevant cumulative developments.

The Environmental Statement is supported by the following technical reports provided in **Appendices 6.1 to 6.5**:

- **Appendix 6.1 – Phase 1 Habitats Survey (including woodlands);**
- **Appendix 6.2 – Otter and Water Vole Survey;**
- **Appendix 6.3 – Badger, Red Squirrel and Pine Martin Survey (including Roe Deer); and,**
- **Appendix 6.4 – Bat Survey.**
- **Appendix 6.5 – Ecological Impact Assessment**

1.3 Report Usage

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2 LEGISLATIVE AND POLICY CONTEXT

2.1 Legislation

Subject specific legislation of relevance to the EclA is listed in Table 2-1 below.

Table 2-1 Relevant Subject Specific Legislation

Geographical Coverage	Legislative Instrument
European Legislation	<ul style="list-style-type: none"> • Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Flora and Fauna (The Habitats Directive) • Water Framework Directive 2000/60/EC of the European Parliament
National (UK) Legislation	<ul style="list-style-type: none"> • The Protection of Badgers Act 1992 • The Wildlife and Countryside Act 1981 (as amended) (WCA)
Scottish Legislation	<ul style="list-style-type: none"> • The Nature Conservation (Scotland) Act 2004 (NCA) • The Conservation (Natural Habitats, &c.) Amendments (Scotland) Regulations 2007 (The Habitats Regulations) • The Wildlife and Natural Environment (Scotland) Act 2011 (WANE)

2.2 Policy

Planning policy considerations of specific relevance to this assessment are:

- Adopted Loch Lomond and the Trossachs National Park (LLTNP) Local Development Plan (LDP) (2016), in particular:
 - Overarching Policy 2 - Development Requirements;
 - Natural Environment Policy 5 - Species and Habitats;
 - Natural Environment Policy 6 - Enhancing Biodiversity; and,
 - Open Space Policy 2 - Protecting Other Important Open Space.
- Draft LLTNP Partnership Plan (2018-2023), in particular outcomes 1 -3 and 5 - 9;
- National Planning Framework 3 (NPF3) (2014);
- Scottish Planning Policy (2014), in particular:
 - Principal Policy on Sustainability (paragraphs 24-35); and,
 - Valuing the Natural Environment Subject Policy (Paragraphs 193 - 233).
- PAN 60 Planning for Natural Heritage (2000, revised January 2008);

Other policy considerations of relevance to this assessment are:

- UK Post-2010 Biodiversity Framework;
- The Scottish Biodiversity Strategy 2004 and 2013;
- LLTNP Local Biodiversity Action Plan (LBAP), Wildpark2020 (LLTNP, 2016); and,

- Scottish Government Control of Woodland Removal Policy (2009)
 - West Dunbartonshire LBAP 2013.

2.3 Scoping

2.3.1 Initial Project Description

A scoping report was produced by Peter Brett Associates in April 2017 to identify potential impacts associated with the proposed development. The scoping report was based the project description, described below, which presents some variation to the current scope as described in Chapter 3 of the Environmental Statement:

- Refurbished tourist information building
- 60-bedroom Apart-hotel
- 32-bedspace budget accommodation
- Up to 105 self-catering lodges
- 20 houses
- 900m² brewery
- Leisure / pool /water park area up to approximately 2,500m²
- Restaurants/Cafe & Retail areas up to 1,100m² in total
- Visitor reception areas & hub building up to approximately 2,000m²
- External activity areas including tree top walk, events/ performance areas, children's play areas,
- monorail, forest adventure rides, picnic / play areas
- Staff and service area of up to approximately 900m²
- Associated parking (up to 320 additional spaces), landscaping and infrastructure development works
- Access to be taken from the surrounding road network including Ben Lomond Way and Pier Road

2.4 Potential Impacts

Potential impacts identified in the scoping report for further assessment included the following broad themes:

Potential Negative Impacts

- Direct habitat loss, fragmentation and damage;
- Habitat loss, fragmentation and damage for faunal species;
- Habitat loss, fragmentation and damage for avian species;
- Discharge to a waterbody and other hydrological impacts;
- Disturbance to/ displacement of faunal species;
- Terrestrial faunal injury and fatality; and
- Avian injury and fatality.

Potential Positive Impacts

- Habitat creation and enhancement

2.5 Consultations

Consultation responses in reference to the initial development description as listed in paragraph 2.3.1 above were received in mid-May 2017 and these were reviewed in order to finalise and agree the scope of the EclA. A summary of the most relevant formal consultation responses is provided in Table 2-2 below.

Table 2-2 Consultee Response and Action Table

Organisation	Consultation Response	Comment /Action and Location in EIA
SNH	Designated site	
	It is unlikely that there will be any direct impacts on the protected features of designated sites. Indirect impacts, for example resulting from increase in visitor numbers to the area, should be considered.	Impacts on designated sites are considered in Section 4.4 – Assessment of Ecological Impacts and Section 7 - Cumulative Impact Assessment.
	Protected species	
	The surveys proposed in the Scoping report to be carried out for the baseline ecological assessment are suitable to identify potential impacts, and to inform requirements for further detailed surveys and / or protection plans once the detailed development proposals are finalised.	Protected species surveys included otter, water vole, badger, red squirrel, pine marten and bats (Section 4- Baseline). Full details can be found in Technical Appendix 6.2, 6.3 and 6.4.
SEPA	A Phase 1 habitat survey should be carried out for the whole site and the guidance A Functional Wetland Typology for Scotland, should be used to help identify all wetland areas. National Vegetation Classification (NVC) should be completed for any wetlands identified.	A Phase 1 habitat survey was completed (Section 4 - Baseline). Full details can be found in Technical Appendix 6.1. The GWDTE potential for wetland identified within the site is discussed in Water, Hydrology and Floodrisk, Chapter 11.
	If any excavations are close to the Site boundary, a buffer zone (100 or 250m) to sensitive habitats might fall outwith the Site, in which case any vegetation survey will need to include these buffer zones.	The Loch Lomond shoreline and the River Leven were covered in the Phase 1 Habitat Survey (Section 4 – Baseline, Technical Appendix 6.1).
	The results of the NVC survey and Appendix 2 of our Planning guidance on windfarm developments should be used to identify if wetlands are Ground Water Dependent Terrestrial Ecosystems (GWDTE)	One wetland was identified within the site. See section 4– Baseline. Technical Appendix 6.1 and Water, Hydrology and Floodrisk, Chapter 11.

Organisation	Consultation Response	Comment /Action and Location in EIA
	Where avoidance is impossible, details of how impacts upon wetlands are minimised and mitigated should be provided within the ES. In particular impacts that should be considered include those from drainage, pollution and waste management.	Marshy grassland can be avoided via micro-siting of the woodland lodges during detailed design. See Water, Hydrology and Floodrisk, Chapter 11.
	There is mention in the report of invasive non-native species (INNS) being present within the Site. In the ES we expect these habitat types to be mapped and we will also expect more information on the measures to be taken to avoid their spread and furthermore the details of a strategy for the treatment/removal of these species from the site	INNS were identified and mapped during the Phase 1 Habitat survey (Section 4.12 – Baseline). Full details can be found in Technical Appendix 6.1. Recommendations for further survey and management are made in sections 6.10 – Mitigation and Monitoring and 6.11 – Enhancement.
LLTNP Natural Heritage Planning Officer	Habitats	
	It is advised that Trees and Woodlands considerations should be assigned its own section rather than being incorporated into the ecology section.	To avoid repetition and the requirement to cross reference, trees and woodlands are included as part of this ecology chapter. They are considered in Appendix 6.1 and section 6.2.
	An extended phase 1 survey with target notes for protected species and any plants/trees of note	An extended Phase 1 Habitat survey was completed (Section 4.12 – Baseline). See Technical Appendix 6.1 for full details.
	Bluebells are protected by the Wildlife and Countryside Act 1981; bluebell areas should be target noted on maps.	Consultation responses were received in mid-May 2017. No bluebells were found during the habitat survey, which was conducted in June 2017. As this is outside the main bluebell flowering period, further survey is recommended. See Technical Appendix 6.1 for full details.
	All non-native species should also be target noted.	Non-native species were mapped in Technical Appendix 6.1.
	All proposed development should be overlain on an NVC map and aerial photograph with pull out photographs where appropriate to assist with micro-siting.	The proposed development is overlain on the Phase 1 Habitat map. An NVC survey was not conducted of the woodland habitats as it was considered that the identification of sub-communities would have been constrained by the absence of bluebell

Organisation	Consultation Response	Comment /Action and Location in EIA
		and other early flowering woodland ground flora.
	Protected species	
	Otters –There is no knowledge of otters utilising Loch Lomond at the location of the development. They are however in the vicinity	Survey for otter, bats, badgers, water vole, red squirrel and pine marten were carried out. (Section 4.11 - Baseline). Full details can be found in Technical Appendix 6.2, 6.3 and 6.4.
	Bats – The section relative to bats in the ES should be clearly titled 'Bats'; The methodology proposed in the scoping report is acceptable. It should be noted that further surveys will be required for buildings and trees (identified as having bat potential features) that are to be demolished/felled or altered.	
	Badgers – There are mammal holes in Drumkinnon woods indicative of a badger sett however it is not in current use. A protected species survey should be carried out taking particular note of this area.	
	Water vole, Red Squirrel, Pine Marten – Methodology is acceptable however the walkover survey will influence the level of detail required in further survey work and also where further survey work will not be required.	
LLTNP Woodland Adviser	Vegetation survey should include assessment of the species considered ancient woodland indicators, in order to assess the quality of the woodland.	Ancient woodland indicators were highlighted in the Phase 1 Habitat Survey (Technical Appendix 6.1) and woodland quality is discussed within section 5.5.
	Any proposed loss of woodland should be assessed with respect to the Scottish Government Control of Woodland Removal Policy.	Woodland loss calculations are provided in table 4.3 and compensatory planting to adhere with the Scottish Government Control of Woodland Removal Policy is outlined in section 5.9 – Mitigation and Monitoring.
	Should the Control of Woodland Removal Policy be applicable then proposals for compensatory planting within the NP should be outlined and demonstrated as viable.	Landscaping plans should be referred to for details on compensatory planting within the proposal.

Organisation	Consultation Response	Comment /Action and Location in EIA
	The roe deer population should be assessed and proposals to mitigate any impact on the population (if present) should be provided.	Roe deer were considered during the protected species surveys. Refer to Technical Appendix 6.3 for survey results and section 5.6 and 5.9 of this ES chapter for impact assessment and mitigation.
	The location of the proposals forms a core area of Forest Habitat Network (source - Forestry Commission Scotland 2017). The EIA should also include an assessment of potential impact on this Habitat Network.	Forest Habitat Network is considered in Design Mitigation
	<p>We met with LLTNP's woodland officer Simon Franks In August 2017 in order to:</p> <p>a) establish with the woodland officer whether any development can take place in designated woodland.</p> <p>b) agree a methodology only – at this stage – for determining which areas of woodland can be developed</p> <p>c) provide a broad brush estimate of the likely areas available – this is important in terms of overall viability</p>	<p>Woodland officer requested a Glade Assessment be undertaken</p> <p>Refer to sections 5.3.1, 5.6.1 and 5.6.2</p>
	Following the Glade assessment, consulted with the LLTNP woodland officer again on 14th November to discuss the outcome of the assessment.	Refer to the design drawings and development masterplan
LLTNP Planning Case Officer	The proposals must be considered together with other development in the area (e.g. Loch Lomond Shores, Duncan Mills Memorial Slipway, pontoons along the River Leven, Sweeney's Boats) and other planning applications/proposals (e.g. Balloch Street Design Project).	Cumulative impacts have been considered in section 7 – Cumulative Impact Assessment.

2.6 Scope of Ecological Studies

Based on the Ecological Constraints and Opportunities Plan (ECOP) undertaken to inform the scoping report and the preliminary consultation responses summarised in Table 2-2, the scope of the ecology survey work is summarised below

- Vegetation, comprising a Phase 1 Habitat Survey, including potential Groundwater Dependent Terrestrial Ecosystems (GWTDE's) and Invasive Non-native Species (INNS)
- Tree and woodland

- Otter (*Lutra lutra*)
- Water vole (*Arvicola amphibius*)
- Badger (*Meles meles*)
- Red squirrel (*Sciurus vulgaris*)
- Pine marten (*Martes martes*)
- Roe deer (*Capreolus capreolus*)
- Bats (all species) (automated and activity)

Following the ECOP findings and the consultation responses summarised in table 2-2 the following works were scoped out of the EclA:

- The direct impacts to designated sites ecologically linked to the proposed development site have been scoped out as it is considered that no direct impacts as a result of the proposed development are likely. Aside from Loch Lomond, indirect impacts to ecologically connected sites have also been scoped out as they are not considered to be tourist destinations and therefore impacts such as increased public pressure are not anticipated.
- Breeding or winter bird surveys were scoped out due to the habitats on and directly adjacent to the site being considered suitable to support bird population of only local importance. It was considered that these local populations could be mitigated for by enacting good practice mitigation during and post construction.

2.7 Zone of Influence

The CIEEM Guidelines (2016) identify the zone of influence as the area over which ecological features may be subject to significant effects as a result of the proposed development and associated activities. This is likely to extend beyond the project site, for example where there are ecological or hydrological links beyond the site boundaries. Activities associated with the construction, operation (best and worst-case operating conditions), decommissioning and restoration phases should be separately identified. The zone of influence will vary for different ecological features depending on their sensitivity to an environmental change. It may be appropriate to identify different zones of influence for different features. The features affected could include habitats, species, and ecosystems and the processes on which they depend.

The scoping exercise narrowed down the important ecological features. The zone of influence has been set for each one (see Table 2-3 below).

2.8 Important Ecological Features

Table 2-3 IEFs and Zones of Influence

IEF	Zone of Influence
Loch Lomond SPA and Ramsar	Within the SPA and RAMSAR boundary
Ancient woodland: LEPO	Within site boundary
Broad-leaved semi natural woodland	Within site boundary
Broad-leaved plantation woodland	Within site boundary
Semi-improved neutral grassland	Within site boundary
Marshy grassland	Within site boundary
Inundation vegetation	Within site boundary
Scattered Scrub	Within site boundary
Scattered broad-leaved trees	Within site boundary

Standing water	Loch Lomond
Running water	Watercourses within site and downstream of site
Intact hedge	Within site boundary
Otter	The local population
Badger	Within site boundary
Red squirrel	Within site boundary and connective woodland habitat
Pine marten	Within site boundary and connective woodland habitat
Roe deer	Within site boundary
Bats	Within site boundary

3 METHODS

In order to anticipate the potential ecological sensitivities at the site and inform the impact assessment a desk study was conducted in advance of the survey work. Where field surveys were not undertaken, desk study information was used to carry out the impact assessment. The IEFs were assigned a level of geographical importance based on the CIEEM guidance.

The assessment of impacts describes how the baseline conditions would change as a result of the project and its associated activities and from other developments. The term 'impact' is defined as a change experienced by a receptor (this can be positive, neutral or negative). The term 'effect' is defined as the consequences for the receptor of an impact after embedded and further mitigation and enhancement measures have been taken into account, as per the CIEEM guidance. The EIA Regulations specifically require all likely significant effects to be considered, therefore, impacts and effects are described separately and the effects on the IEFs are assessed as being either significant at a relevant geographic scale or not significant

3.1.1 Study Area

The study area differs to encapsulate the zone of influence for each IEF (as outlined in Table 2-3).

The area of baseline studies aims to build a picture of ecological features, resources and process within the zone of influence. The survey buffer for this project included 250m from the site boundary for water courses and 50m from the site boundary for other habitat types during the protected species surveys.

Desk study sources included the site plus a buffer considered appropriate to assess ecological connectivity to the site to encapsulate the zone of influence. The following areas were considered when undertaking the required survey and assessment of the site to inform this EclA.

3.2 Information Sources

3.2.1 Desk Top Study

In order to anticipate the potential ecological sensitivities at the site, and inform site assessment a desk study was conducted in advance of the survey work, which included a review of the following sources:

- Existing data on statutory designated sites available through Scottish Natural Heritage (SNH) Sitelink website (SNH, no date) (up to 10km, where considered ecologically linked to the site);
- Existing data on non-statutory designated sites available through the LLTNPA, West Dunbartonshire Local Plan (2010) and the West Dunbartonshire LDP Proposed Plan (2015) (up to 2km from the centre of the site);
- Records of Ancient Woodland and Scottish Native Woodland available through Scotland's Natural Environment Web (The Scottish Government, no date) (up to 2km from the centre of the site);
- Notable species records from Glasgow Museums Resource Centre (up to 2km from the centre of the site);

- West Dunbartonshire Local Biodiversity Action Plan (LBAP) (Dunbartonshire Biodiversity Partnership, 2010); The UK Biodiversity Action Plan (UKBAP) (Joint Nature Conservation Committee (JNCC), 2016) and the LLTNP LBAP, Wildpark2020 (LLTNP, 2016); and
- The Scottish Biodiversity List (Scottish Government, 2013);
- Saving Scotland's Red Squirrel (SSRS) website (for squirrel sightings); and
 - Scottish Badgers (SB) (for records of badgers and setts up to 2km from the centre of the site).

3.2.2 Field Studies

Based on an Ecological Constraints and Opportunities Plan (ECOP) undertaken to inform the EIA Screening and Scoping Report (PBA, April 2017) and relevant EIA Scoping consultation responses as summarised in Table 6.2 above, field surveys were undertaken for the following:

- Vegetation, comprising a Phase 1 Habitat Survey, including potential Groundwater Dependent Terrestrial Ecosystems (GWTDE's) and Invasive Non-native Species (INNS). Survey detailed in **Technical Appendix 6.1**;
- Tree and woodland survey detailed in **Technical Appendix 6.1**;
- Otter (*Lutra lutra*) – survey detailed in **Technical Appendix 6.2**;
- Water vole (*Arvicola amphibius*) - survey detailed in **Technical Appendix 6.2**;
- Badger (*Meles meles*) – survey detailed in **Technical Appendix 6.3**;
- Red squirrel (*Sciurus vulgaris*) – survey detailed in **Technical Appendix 6.3**;
- Pine marten (*Martes martes*) – survey detailed in **Technical Appendix 6.3**;
- Roe deer (*Capreolus capreolus*) considered in **Technical Appendix 6.3**;- and,
- Bats (all species) (automated and activity) – survey detailed in **Technical Appendix 6.4**.

Where field surveys were not undertaken, desk study information was used to carry out the impact assessment.

Field surveys were undertaken during 2017, survey dates are listed in Table 3-1 below, along with key dates in the assessment process for context.

Table 3-1 Field Survey Timeline

Project Phase	Date
Ecological Constraints and Opportunities Plan (ECOP)	December 2016
EIA Screening and Scoping Report	April 2017
EIA Screening and Scoping Opinion	119 th May 2017
Tree survey, glade location and woodland composition mapping (Refer to design drawings and masterplan)	February 2017 and Autumn/Winter 2017
Phase 1 Habitat Survey (Technical Appendix 6.1)	June 2017
Otter and Water Vole Survey (Technical Appendix 6.2)	June and August 2017
Badger, Red Squirrel and Pine Marten Survey (incl. roe deer) (Technical Appendix 6.3)	September and October 2017
Bat Survey (Technical Appendix 6.4)	Late May to September 2017

3.3 Assessment Constraints

3.3.1 Desk Study

The desk study is limited by the reliability of third party information and the geographical availability of biological and/or ecological records and data. This emphasises the need to collate up-to-date, site-specific data based on field surveys by experienced surveyors. The absence of a species from biological records cannot be taken to represent actual absence. Species distribution patterns should be interpreted with caution as they may reflect survey/reporting effort rather than actual distribution.

3.3.2 Field Surveys

The following limitations and difficulties encountered should be noted with respect to the field surveys undertaken:

- The Phase 1 Habitat survey was not conducted until June which is outside the main bluebell flowering season.
- Parts of the 50m buffer area surrounding the site to the north south and west of the site could not be accessed during the badger, red squirrel and pine marten survey due to the presence of private residential areas (refer to Technical Appendix 6.3).
- Dense Rhododendron within Woodbank Woods and dense scrub in Drumkinnon Woods reduced visibility during the protected species surveys.
- During the bat surveys, internal inspections and internal activity surveys of all the buildings present on site were not undertaken as they were in a state of disrepair and not structurally sound.
- Due to health and safety concerns regarding livestock within the semi-improved grassland in the west of the site, the bat transect survey in the west of the site was abandoned during the May surveys.
- During the automated bat surveys, two of the static recorders were stolen from the site, one in July and one in September.
- Static recorder malfunction occurred during the July and September bat surveys.
- Inspection of the trees for potential bat roost features was undertaken from the ground during the summer months. Therefore, the full visual inspection was limited by leaf cover.

3.4 Evaluation of Important Ecological Features

In accordance with the CIEEM (2016) EclA guidance it was necessary to determine which existing ecological features are sufficiently important (and potentially affected by the proposed development) to be subject to detailed assessment. These are termed Important Ecological Features (IEFs). Decisions on receptor importance are presented after descriptions of relevant baseline characteristics within Section 4 – Baseline.

European, national and local governments and specialist organisations have together identified a large number of sites, habitats and species that provide the key focus for biodiversity conservation in the UK and Ireland, supported by policy and legislation. These provide an objective starting point for identifying the important ecological features that need to be considered. Table 3-2 shows a procedure for determining the geographical level of importance of site designations, habitats and species. JNCC provide a description of site designations on their website (JNCC, 2014). Where a feature is important at more than one level in the table, its overriding importance is that of the highest level. Usually only the highest level of legal protection is listed.

Table 3-2 Geographical Level of Importance of Ecological Features

Level of Importance	Sites	Habitats	Species
International	Designated, candidate or proposed Special Areas of Conservation, Special Protection Areas and Ramsar sites; UNESCO (Ecological) World Heritage Sites; UNESCO Biosphere Reserves; Biogenetic Reserves.	A viable area of habitat included in Annex I of the EC Habitats Directive (92/43/EEC); a habitat area that is critical for a part of the life cycle of an internationally important species.	A European Protected Species; an IUCN Red Data Book species that is globally Vulnerable, Endangered or Critically Endangered; a Category An internationally important bryophyte assemblage (Averis <i>et al.</i> , 2012).
National (UK)	Sites of Special Scientific Interest/Areas of Scientific Interest; National Nature Reserves; Nature Conservation Review Sites; Marine Conservation Zones (UK offshore).	A viable area of priority habitat listed in the UK Biodiversity Action Plan (JNCC, 2016); an area of habitat fulfilling the criteria for designation as an SSSI or MCZ; a habitat area that is critical for a part of the life cycle of a nationally important species.	An IUCN Red Data Book species that is Vulnerable, Endangered or Critically Endangered in the UK; a species that is Rare in the UK (<15 10km grid squares); a priority species in the UKBAP (JNCC, 2016); a Schedule 5 (animal) or Schedule 8 (plant) species included in the Wildlife and Countryside Act 1981; a Category A nationally important bryophyte assemblage (Averis <i>et al.</i> , 2012).
National (Scotland)	National Parks ; Marine Protected Areas; Marine Consultation Areas	Habitats of principal importance for biodiversity in the relevant countries ¹ .	Species of principal importance for biodiversity in the relevant countries ² .
Regional	Regional Parks (Scotland).	Regional Local Biodiversity Action Plan habitats noted as requiring protection (Dunbartonshire Biodiversity Partnership, 2010, LLTNP, 2016).	A species that is Nationally Scarce in the UK (present in 16-100 10km grid squares); a species that is included in the Regional LBAP (Dunbartonshire) Biodiversity Partnership, 2010, LLTNP, 2016); an assemblage of regionally scarce species.

¹ These are all the habitats that were identified as requiring action in the UKBAP and continue to be regarded as conservation priorities in the subsequent UK Post-2010 Biodiversity Framework, including any additions. See here: <http://jncc.defra.gov.uk/page-6189>

² These are all the species that were identified as requiring action in the UKBAP and continue to be regarded as conservation priorities in the subsequent UK Post-2010 Biodiversity Framework, including any additions. See here: <http://jncc.defra.gov.uk/page-6189>

County / Metropolitan	Local Nature Reserves; Wildlife Trust Reserves (England and Wales); Woodland Trust Sites; Royal Society for the Protection of Birds Sites; Local Wildlife Sites (Scotland).	County LBAP habitats noted as requiring protection (Dunbartonshire Biodiversity Partnership, 2010, LLTNP, 2016); semi-natural, ancient woodland >0.25ha in extent.	A species that is included in the County LBAP (Dunbartonshire Biodiversity Partnership, 2010, LLTNP, 2016); an assemblage of species that are scarce at the county level.
Local		Semi-natural, ancient woodland <0.25ha in extent; diverse or ecologically valuable hedgerow network; semi-natural habitats that are unique or important in the local area; flushes, springs and base rich rock that support bryophyte assemblages that are widespread but localised to these habitats.	Species as defined by Local Authority lists (if available).

3.5 Impact Assessment

The assessment of impacts describes how the baseline conditions would change as a result of the project and its associated activities and from other developments. The term 'impact' is used commonly throughout the EIA process and is usually defined as a change experienced by a receptor (this can be positive, neutral or negative). The term 'effect' is commonly used at the conclusion of the EIA process and is usually defined as the consequences for the receptor of an impact after mitigation measures have been taken into account. The EIA Regulations specifically require all likely significant effects to be considered. Therefore, impacts and effects are described separately and the effects for the IEFs are assessed as being either significant or not according to the importance and sensitivity of the IEF.

Significant cumulative effects can result from the individually insignificant but collectively significant effects of actions taking place over a period of time or concentrated in a location, for example:

- Additive / incremental; and
- Associated / connected

3.5.1 Assessment Criteria - Magnitude

The CIEEM (2016) EclA guidance states that when describing changes/activities and positive or negative impacts on ecosystem structure and function, reference should be made to the following parameters:

- **Magnitude** - refers to the size, amount, intensity and volume of an impact, determined on a quantitative basis if possible, but typically expressed in terms of relative severity, such as major, moderate, low or negligible. Extent, duration, reversibility, timing and frequency of the impact can be assessed separately but they tie in to determine the overall magnitude;
- **Extent** - the area of which the impact occurs. When the IEF is the habitat itself, magnitude and extent may be synonymous;
- **Duration** - the time for which the impact is expected to last prior to recovery or replacement of the IEF. This is defined in relation to ecological characteristics, rather than human timeframes. The duration of an activity may differ from the duration of the resulting impact caused by the activity and this is taken into account;
- **Reversibility** - an irreversible (permanent) impact is one from which recovery is not possible within a reasonable timescale or for which there is no reasonable chance of action being taken to reverse it. A reversible (temporary) impact is one from which spontaneous recovery is possible or for which effective mitigation is possible and an enforceable commitment has been made; and
- **Timing and frequency**- the number of times an activity occurs will influence the resulting impact. The timing of an activity or change may cause an impact if it happens to coincide with critical life-stages or seasons.

Criteria for describing the magnitude of an impact are presented in Table 3-3 below:

Table 3-3 Criteria for Describing Magnitude of Impact

Magnitude	Description of Impact
Major	Total or major loss or alteration to the IEF, such that it will be fundamentally changed and may be lost from the site altogether; and/or loss of a very high or high proportion of the known population or range of the IEF.
Moderate	Loss or alteration to the IEF, such that it will be partially changed; and/or loss of a moderate proportion of the known population or range of the IEF.
Minor	Minor shift away from the existing or predicted future baseline conditions. Change arising from the loss or alteration will be discernible but the condition of the IEF will be similar to the pre-development conditions; and/or having a minor impact on the known population or range of the IEF.
Negligible	Very slight change from the existing or predicted future baseline conditions. Change barely discernible, approximating to the 'no change' situation; and/or having a negligible impact on the known population or range of the IEF.

3.5.2 Assessment Criteria- Significance

In reference to CIEEM (2016) EclA guidance, significance is a concept related to the weight that is attached to effects when decisions are made. For the purposes of EclA, a 'significant effect' is an effect that either supports or undermines biodiversity conservation objectives for IEFs. In broad terms, significant effects encompass effects on the structure and function of defined sites, habitats or ecosystems and the conservation status of habitats and species (including extent, abundance and distribution).

Significant effects are quantified with reference to an appropriate geographic scale (see Table 3-2 above). The CIEEM (2016) guidance has one 'level of importance' and a geographical 'scale of significance'. This is to deal with the fact that the geographical scale at which the effect is significant is not necessarily the same as the geographic level of importance of the IEF.

3.5.3 Assessment Criteria – Confidence in Prediction

CIEEM (2016) does not cover levels of confidence in predictions, therefore an approach has been adopted based on river conservation evaluation (Boon et al., 2001). A simple, qualitative index based on professional judgement is assigned to each predicted effect as follows:

- A: high confidence.
- B: intermediate confidence.
- C: low confidence.

Factors influencing confidence include:

- The frequency and effort of field sampling;
- Constraints to the field survey;
- The completeness of the data (field and desk);
- The age of the data (although recent data are not necessarily always more reliable than old data);
- The state of scientific knowledge relating to the predicted effects of development activities on the IEF (the accuracy of the magnitude assessment); and
- The accuracy of the assessment of significance.

It is considered that the majority of the data collected during the desk and field studies is robust enough to accurately inform the PPiP application for the proposed development. Where data is lacking the confidence level of the relevant part of the assessment is adjusted accordingly.

3.5.4 Assessment Criteria – Success of Mitigation

When including mitigation in the impact assessment it is important to know how successful it will be. Therefore, it is necessary to consider five potentially distinct kinds of counter-acting measures for the effects of a project on ecology as follows:

- Avoidance;
- Cancellation;
- Reduction;
- Remedial / compensatory; and
- Enhancement / net beneficial.

The word 'mitigation' has developed a wider meaning and common usage in environmental assessment than its strict meaning related to reducing the severity of something. Mitigation can sometimes be used as a generic term for a wide range of counter-acting measures, all of which, as the Directive and Regulations prescribe, are intended to prevent, reduce and where possible offset any significant adverse effect on the environment. Mitigation can be used to encompass measures intended to avoid, cancel or reduce adverse effects (this is the 'mitigation hierarchy').

Mitigation and compensation measures often carry a degree of uncertainty. Uncertainty associated with a design will vary according to a number of factors, such as:

- The technical feasibility of what is proposed;
- The overall quantity of what is proposed;
- The overall quality of what is proposed;

- The level of commitment provided to achieve what is proposed;
- The provision of long-term management; and
- The timescale for predicted benefits.

The following objective scale is used for the success of mitigation:

- Certain/near certain: probability estimated at 95% chance or higher.
- Probable: probability estimated above 50% but below 95%.
- Unlikely: probability estimated above 5% but less than 50%.
- Extremely unlikely: probability estimated at less than 5%.

3.6 Approach to Cumulative Impact Assessment

As stated in CIEEM EclA guidance (2016), cumulative effects can result from individually insignificant but collectively significant actions taking place over a period of time or concentrated in a location. A cumulative impact assessment is included as cumulative effects (construction or operational phase) are likely. The cumulative impact assessment considers if the combined actions of adjacent developments is likely to have a negative impact on the IEFs identified within the zone of influence of a project.

4 BASELINE

4.1 The Site

4.1.1 Overview

The site can be considered in two separate areas: the land at West Riverside; and the area associated with Woodbank House. The area surrounding West Riverside is dominated by Drumkinnon Woods. This semi-natural woodland is located south east of the Loch Lomond Shores complex, across an undulating landform and is dissected by footpaths. The woodland is bounded to the west and north by roads accessing Loch Lomond Shores and the pier. Part of the woodland is designated as Ancient Woodland (long-established of plantation origin). Although subject to a level of disturbance, the woodland has the potential to support a range of wildlife.

A corridor of woodland is also present alongside the River Leven on the eastern boundary of the site, whilst pockets of landscaped woodland, amenity areas and car parks are present in the north of the site and to the east of the existing Loch Lomond Shores complex.

The area associated with Woodbank House is situated to the west of Old Luss Road and approximately 500m east of the A82. At the centre of the site are the remains of Woodbank House, a Grade-A listed property, which is now largely derelict.

The remains of the house are accessed from Old Luss Road by a driveway through an area of paddock, used for grazing horses and surrounded by the remains of the former terraced gardens. Ancient woodland surrounds the site of the building with mature specimens of broadleaved species such as oak and yew. The woodland and small watercourses present to the north and south of the site boundary at Woodbank House have the potential to support a range of faunal species.

4.2 Climate

The Gazetteer for Scotland describes the climate of Balloch as follows:

Winters in Balloch are usually mild for Scotland, with January daily temperatures of about 6.7°C and nights cooling off to 1.2°C in the coldest month. Summers are very warm, with daytime temperatures in July typically reaching 19.0°C and nights dipping to 11.1°C. Rainfall in Balloch is high, totalling 1355 mm in a typical year. Precipitation tends to fall more in the winter, falling over about 177 days per year. Balloch has average sunshine totals, with 1270 hours of sunshine recorded in a typical year.

4.3 Geology & Hydrogeology

4.3.1 Bedrock Geology

The British Geological Survey's (BGS) geological data (BGS, n.d.-a) (1:50,000 scale) indicates that the site is underlain by Teith Sandstone Formation.

4.3.2 Drift Deposits

The BGS(BGS, n.d.-b) data indicates that the superficial deposits are predominantly formed of Glaciofluvial Deposits - Gravel, Sand and Silt, which cover the southern and western parts of the site. To the north and surrounding the shore of Loch Lomond the superficial deposits consist of Raised Marine Deposits of Holocene Age - Clay, Silt, Sand and Gravel.

4.3.3 Soils

Soil survey of Scotland 1:25,000 scale mapping(Soil Survey of Scotland Staff, n.d.) shows the site to be underlain by brown soils which have been stated to have parent materials of fluvioglacial sands and gravels derived from acid schists and Lower Old Red Sandstone sediments and lavas.

4.3.4 Hydrogeology

The UK Hydrogeology Map (BGS, n.d.-a) shows that the site is underlain by the Strathmore Group, a moderately productive aquifer. It consists of sandstones, in places flaggy, with siltstones, mudstones and conglomerates and interbedded lavas locally yield up to 12 L/s in parts of Strathmore.

Under the Scotland River Basin Management Plan (RBMP)(The Scottish Government, n.d.), the development site is located within the *Loch Lomond and Leven Sand and Gravel (ID:150766)* and *Balloch (ID:150651)* groundwater bodies, both of which have overall classifications of Good.

4.3.5 Hydrology

Loch Lomond is located to the north of the proposed development, and has a surface area of approximately 71 km². Areas within and adjacent to the water body are designated Special Protection Areas (SPA), Sites of Special Scientific Interest (SSSI), Special Areas of Conservation (SAC), Ramsar Sites and National Nature Reserves (NNR). The loch is also used extensively for recreational use.

There are four watercourses which have been identified as flowing through the proposed development site. Further details of these water courses can be found in Chapter 11' Water, Hydrology and Flood Risk', The major watercourse is the River Leven which flows to the east of the site in a southerly direction. It rises at the outflow from Loch Lomond to the north of the development site, and routes south through the towns of Balloch and Alexandria to outfall into the River Clyde at Dumbarton.

To the west of the site there are two smaller unnamed watercourses (burns). One burn (un-named watercourse 1) flows in an easterly direction along the north-western boundary and passes beneath Old Luss Road before routing north of the existing car park and Loch Lomond Shores development.

The second burn (un-named watercourse 1) flows along the south boundary of the Woodbank House area of the site, then passes below Old Luss Road and routes north towards the car park of the Loch Lomond Shores complex. It outfalls into Loch Lomond at the end of a small headland in the bay north of the site.

A fourth smaller watercourse is marked upon the Ordnance Survey mapping within the wooded area at Woodbank House. During the site walkover there was water present within the channel however there was very little flow. The channel appeared to route into a culvert structure, but it is not known where this routes to or if it discharges into the unnamed watercourse 1.

4.3.6 Topography and Land Use

The general topography of the site falls from the west down to the east towards Loch Lomond and the River Leven. In the west of the site surrounding Woodbank House and adjacent to the A82, the ground is at a maximum elevation of approximately 45m AOD. From here the ground slopes down relatively steeply towards Old Luss Road, beyond which the ground levels off and undulates at 15-19m AOD. Adjacent to the shores of the Loch, the ground level is approximately 7.5m AOD.

Within Drumkinnon Wood the ground levels undulate significantly, but in general slope from the west to the east towards Pier Road, from a level of approximately 16 mAOD down to approximately 12 mAOD.

The site currently consists of a range of different uses including leisure and recreation (water sports) along the shores of the loch, several areas of car parking which serve the public slipways as well as the neighbouring Loch Lomond Shores development, areas of woodland through Drumkinnon Woods and open parkland along the banks of the River Leven.

The tourist information and visitor centre is located at the south eastern point of the site, opposite Balloch train station and Sweeney's Cruises.

4.4 Designated and Non-designated Sites

4.4.1 Statutory Designated Sites

The site is situated within the Loch Lomond National Park near the southern park boundary. No other statutorily or non-statutorily designated sites encompass the site.

The National Park Partnership Plan which sets out the five year vision for the park is currently under review. The draft Park Partnership Plan 2018 – 2023 (LLTNPA, 2017) sets out the vision for conservation and land management, which is as follows:

"An internationally- renowned landscape where nature, heritage, land and water are valued, managed and enhanced to provide multiple benefits for people and nature."

The outcomes which will be used to focus efforts on achieve the vision are:

- C1 The Park's natural resources are enhanced for future generations: important habitats are restored and better connected on a landscape scale.
- C2 The Park's special landscape qualities and sense of place are conserved and enhanced with more opportunities to enjoy and experience them.
- C3 The natural environment of the Park is better managed to help mitigate and address the impacts of climate change.
- C4 New catchment-scale partnerships deliver better integrated management of the land and water environment providing multiple benefits for people and nature.

LLNTPA have also set out five key areas for action, or "wild challenges" in their Wild Park 2020 document (LLNTP, 2016). These are:

- Our mountain bogs;
- Our woodland habitat network;
- Black grouse;
- Red squirrels; and
- Invasive non-native species.

24 statutory designated sites within 10km of the centre of the site boundary were identified within the desk study of Technical Appendix 6.1. Five of those sites are considered to be ecologically connected to the site are listed in table 4-1 below.

Table 4-1 Statutory designated sites within 10km with connectivity to the site.

Site name	Designation ³	Distance /Orientation	Designated Feature(s)
Boturich Woodlands	SSSI	1.3 km north	<ul style="list-style-type: none"> • Upland mixed ash woodland; • Wet woodland.
Loch Lomond Woods	SAC, SSSI	6.4km north	<ul style="list-style-type: none"> • Otter; • Western acidic oak woodland.
Endrick Mouth and Islands	SSSI	6.6km north and north east	<ul style="list-style-type: none"> • Beetle assemblage; • Breeding bird assemblage; • Bryophyte assemblage; • Fluvial Geomorphology of Scotland; • Greenland white-fronted goose (<i>Anser albifrons flavirostris</i>), non-breeding; • Greylag goose (<i>Anser anser</i>), non-breeding; • Hydromorphological mire range; • Upland oak woodland; • Vascular plant assemblage.

³ SSSI – Site of Special Scientific Interest, SAC – Special Area of Conservation, SPA – Special Protected Area, RAMSAR– a wetland site designated of international importance under the Ramsar Convention

Loch Lomond	SPA, RAMSAR	6.7km north east	<ul style="list-style-type: none"> • Capercaillie, breeding (<i>Tetrao urogallus</i>); • Greenland white-fronted goose, non breeding
Endrick Water	SAC	8km north east	<ul style="list-style-type: none"> • Atlantic salmon (<i>Salmo salar</i>); • Brook lamprey (<i>Lampetra planeri</i>); • River lamprey (<i>Lampetra fluviatilis</i>).

4.4.2 Non-Statutory Designations

Areas of Loch Lomond and Loch Lomond woods listed in table 4-1 above are also National Nature Reserves NNR's. Six Local Nature Conservation Sites (LNCS) were identified within 2km of the site during the desk study in Technical Appendix 6.1. Only the River Leven LNCS was assessed to have direct hydrological and ecological connectivity to the site.

4.5 Ancient Woodland Sites

Long-established woodland of plantation origin (LEPO) is present in the north and west of the site (see Appendix B, Technical Appendix 6.1). The woodland present in the north and west offers connectivity to similar habitat in the wider area. Table 4-2 provides further details of Ancient Woodland Inventory sites present within the site and a 2km radius of the site boundaries.

Table 4-2 Ancient Woodland Inventory Sites within 2km of the Site

Ancient Woodland Name (within 2km)	Distance and orientation	Category
Unnamed	Within the site boundary to the north	Long-established (of Plantation origin) (LEPO)
Unnamed	Within the site boundary to the west	LEPO
Unnamed	Approx. 0.03km east	LEPO
Moss O' Balloch Plantation	Approx. 0.06km east	LEPO
Auchiewannie Wood	Approx. 1.7km west	LEPO
Cameron Wood	Approx. 0.2km north	LEPO
Unnamed	Approx. 0.4km south	Ancient (of Semi-natural Origin) (ASNO)
Unnamed	Approx. 0.95km north	LEPO
Unnamed	Approx. 1.1km south	LEPO
Unnamed	Approx. 1.3km north	ASNO
Garden Wood	Approx. 1.4km north west	LEPO
Unnamed	Approx. 1.7km south west	LEPO
Unnamed	Approx. 1.7km south west	Other (on Roy military map)
Ledrishmore Wood	Approx. 1.8km north east	LEPO

Unnamed	Approx. 2km north	LEPO
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4.6 Habitats

The Phase 1 Habitat Map, Woodland Group Map, Target Notes and Photographs and descriptions of the main habitats and woodland groups can be found in Technical Appendix 6.1: Phase 1 Habitat Survey.

- A1.1.1 Broadleaved semi-natural woodland
- A1.1.2 Broadleaved plantation woodland
- A2.2 Scattered scrub
- A3.1 Scattered broadleaved trees
- B2.2 Semi-improved neutral grassland
- B5 Marshy grassland
- C3.1 Tall ruderal
- F2.2 Inundation vegetation
- G1 Standing water
- G2 Running water
- J1.2 Amenity grassland
- J2.2 Intact species poor hedge
- J3.4 Fence
- J3.6 Buildings
- J4 Bare ground

The absolute and relative areas of each habitat present within the site are detailed in Table 4-3 below.

Table 4-3 Areas of Phase 1 Habitat Types

Phase 1 Habitat Type	Absolute Area (ha)	Relative Area Within the Site (%)
A1.1.1 Broadleaved woodland - semi-natural	17.77	56.68
A1.1.2 Broadleaved woodland - plantation	2.78	8.88
B2.2 Semi-improved neutral grassland	3.48	11.09
B5 Marshy grassland	0.06	0.2
C3.1 Tall ruderal	0.64	2.04
F2.2 Inundation vegetation	0.03	0.09
J1.2 Amenity grassland	1.49	4.75
J3.6 Building	0.17	0.54
J4 Bare ground	4.93	15.72

*The areas of scattered habitats and linear features are not included as they cannot be accurately measured. Built-up areas and bare ground were removed from the calculation of relative area.

4.7 Ground Water Dependent Terrestrial Ecosystems (GWDTE)

There is marshy grassland present in the west of the site within the site boundary with vegetation indicators suggesting classification 2a in the Functional Wetland Typology. The species present indicate it would be classified as MG10 *Holcus lanatus* – *Juncus effusus* rush pasture under the National Vegetation Classification (NVC). This is a common habitat type which is listed in SEPA guidance (SEPA, 2017) as moderately groundwater dependent depending on the hydrogeological setting. Further hydrological assessment of this feature has not been proposed in Chapter 11 of the Environmental Statement – **Water, Hydrology and Flood Risk**.

4.8 Invasive Non-native Species

Japanese knotweed (*Fallopia japonica*) is present in woodland east of Old Luss Road and adjacent to the site boundary in the north west of the site.

Bamboo (*Bambuseae*), *Rhododendron* and laurel (*Laurus nobilis*) are present in the west of the site within the woodland where Woodbank House is situated..

Himalayan balsam (*Impatiens glandulifera*) is sporadically present along minor water courses throughout the site within the woodland where Woodbank House is situated.

Please refer to the Invasive Non-Native Species (INNS) map for exact locations (Appendix G, Technical Appendix 6.1).

4.9 Notable Flora

The mature open woodland habitats on site offer suitable habitat for bluebell (*Hyacinthoides non-scripta*) to colonise as ground flora, which is protected under the Wildlife and Countryside Act 1981 and is a West Dunbartonshire LBAP priority species. Consultee responses suggest bluebell may be present within the site boundary. There are also records of bluebell on the NBN Atlas within the site (the precise locations were not available for commercial use). The habitat survey was undertaken in June, outside the bluebell flowering season (mid-April to late May), and no vegetative signs of bluebell (leaves, stems) were identified during the survey. No other bluebell or other notable flora records were returned via desk study sources.

4.10 Trees and Woodlands

Woodlands and trees form the dominant habitats on the site. Nine defined areas of sub-category broadleaf woodland habitat (BL1-BL9) are described in detailed composition in section 3.2 of Appendix 6.1 and mapped in Appendix D of Appendix 6.1. Although mainly of plantation origin, the core area of oak woodland is developing semi-natural characteristics as it matures.

Historic land use changes have seen the woodland composition develop towards the regeneration of planted species including English oak (*Quercus robur*) and sycamore, and the addition of more recent planting surrounding the Loch Lomond Shores area being of more native composition such as willow, alder and hazel.

Surrounding Woodbank House, in the west of the site, it is evident that exotic tree planting was conducted probably in the early 20th Century by the presence of mature species such as Atlantic cedar (*Cedrus atlantica*), sycamore and Norway spruce as well as a dense understorey of rhododendron.

The woodlands have also been subject to pressures from residential development, road infrastructure, pipeline installation and increased countryside access. These activities have curtailed woodland connectivity and natural regeneration in some areas and also influenced species composition at times of replanting.

4.11 Notable Fauna

4.11.1 Otter

No diagnostic field signs of otter were identified during the surveys.

Loch Lomond is situated north of the site boundary and is known to host a population of otter. One record of otter was 2km north of the site was returned from the desk study. Suitable commuting and foraging habitat exists for otter within the site boundary and the wider landscape via the four watercourses that dissect the site. The site is dominated by deciduous woodland which would typically lend itself to habitat suitable for otter holt creation in and underneath root systems. However, no potential den or resting sites were noted during the site survey. Human presence via recreation activities and dog walking routes within and adjacent to the watercourses and woodland on site is considered to reduce the suitability of the site for otter activity.

The otter is a European Protected Species (EPS) and is listed on the DBAP, UKBAP and SBL as priority species.

Refer to Technical Appendix 6.2 for full survey results.

4.11.2 Water Vole

No field signs of water vole were identified during the survey.

Water vole were reintroduced back into Loch Lomond and the Trossachs between 2008 and 2011, colonising 12 sites in Loch Ard forest (21km north of the site boundary) (Anderson & Raynor, 2016). Since their release, surveys undertaken in 2016 identified water voles 10km away from the nearest release sites, however, they are not known to be present within the area in which the site boundary is located.

No suitable habitat for burrow creation was identified along the watercourses within and adjacent to the site due to the presence of reinforced or gently sloping embankments. A lack of herbaceous vegetation, such as rushes which are favoured by foraging water vole, was also evident during the survey.

Water vole is listed on the LBAP, UKBAP and SBL as priority species.

Refer to Technical Appendix 6.2 for full survey results.

4.11.3 Badger

No evidence of badger was identified during the survey.

The desk study returned two badger sightings, the latest was 1.5km north west of the site boundary in 2016 within an arable field adjacent to scrub and woodland habitats. An unclassified sett was also identified approximately 4.8km north east of the site in 2017.

Mammal burrows were identified in the east section of Drumkinnon Wood, however these were assessed to be created and utilised by rabbit.

The woodland throughout the site offers good primary and secondary foraging opportunities for badger, as does the semi-improved grassland present in the west of the site and the mown grassland in the east, which offer a source of earthworms - a key component of their diet. Steep embankments suitable for sett creation are present in Drumkinnon wood and within the woodland in the west of the site. However, the ground throughout the site is not free draining, making it less suitable for sett creation. The high volume of dog walkers and visitors frequenting this area further reduces the likelihood that it is used by badgers.

More suitable primary habitat exists out with the site, specifically Cameron House Golf Course to the north east of the site and woodlands to the west and north, providing primary foraging opportunities.

Badger are protected under Schedule 5 of the Wildlife and Countryside Act 1981.

Refer to Technical Appendix 6.3 for full survey results.

4.11.4 Red Squirrel

No evidence of red squirrel was identified during the survey.

The desk study returned one sighting of red squirrel in broadleaved woodland 2.2km north of the site. The woodland within the survey area is primarily broadleaf, while red squirrel can occupy broadleaf habitats, they are often outcompeted by grey squirrel where populations of grey squirrel are present. During the survey a grey squirrel was observed in the east of the site (NGR 38755 82322) and grey squirrel sightings have been more readily recorded in the wider area during 2017 according to reports from Saving Scotland's Red Squirrels. This suggests the site currently offers low suitability for the local red squirrel population. However, grey squirrels are being controlled within the Loch Lomond National parks and red squirrel population is thought to be recovering.

Red Squirrel are listed on the LBAP, UKBAP and SBL as priority species.

Refer to Technical Appendix 6.3 for full survey results.

4.11.5 Pine Marten

No evidence of pine marten was identified during the survey.

The desk study returned one sighting of pine marten in Balloch Park approximately 600m north west of the site. The mature trees present within the Drumkinnon and Woodbank woodland did not display any cavities large enough to host a pine marten were recorded from ground level. Cavities may be present at height, which are not visible from ground level. The remainder of the woodland within the survey area was predominantly semi-mature to immature and therefore not of an age to provide the cavities required for pine marten dens.

Foraging resources for pine marten are available in woodland habitats which are likely to support populations of birds, small mammals and invertebrates. Pine marten also predate grey squirrel which are known to frequent the woodland on site. The habitats on site are well connected to the woodland habitats to the north and west of the site.

Pine martens are shy creatures who are mostly active at night, therefore more likely to favour less disturbed habitats further north and west of the site as woodland within the survey area is relatively disturbed by visitors to Loch Lomond Shores and dog walkers.

Pine marten are listed on the LBAP, UKBAP and SBL as priority species.

Refer to Technical Appendix 6.3 for full survey results.

4.11.6 Roe Deer

Roe deer footprints and droppings were identified in various locations across the site during the surveys (refer to Technical Appendix 6.3). Deer are able to utilise the site and access the wider landscape with ease.

Good levels of natural tree and vegetation regeneration appears to be occurring within the woodlands and more recent plantings appear to be well established with minimal evidence of direct browsing pressure from deer. This indicates that roe deer may not be present in large numbers on the site. Frequent human access in proximity to Loch Lomond, the River Leven and through Drumkinnon Wood is likely to affect the behavior of roe deer, dissuading them from persistent browsing of trees and vegetation. The woodland in the west, of the site, known as Woodbank, is likely to be less disturbed by human presence and with dense rhododendron providing secure cover, may host a more prolonged presence of roe deer.

4.11.7 Bats (all species)

No bat roosts were identified during the activity, transect or automated surveys conducted at the site.

Four buildings are present within the site boundary. Buildings 1 to 3 are present within the west of the site are assessed as having low roost suitability for bats and are in a deteriorating condition. The fourth building located in the north of the site is assessed to offer negligible suitability for roosting bats (refer to Technical Appendix 6.4).

Bat activity was recorded during the activity survey, three soprano pipistrelles were identified foraging within building 1 during the activity survey.

The transect and anabat surveys identified soprano pipistrelles to be the most abundant bat species on site followed by common pipistrelles. A small number of Daubenton's bats were also detected during the automated surveys.

Bats were noted to favour the woodland edge habitat and tree lines for foraging and commuting during the transect surveys. Anabat 5 in the west of the site adjacent to the tree lined Old Luss Road, woodland edge and open grassland habitats, recorded the highest level of bat passes per hour.

Activity levels peaked in June during the transect surveys and in July during the anabat surveys. This suggests that the habitats on site are utilised by breeding females for foraging during the peak season for birthing and feeding young.

All species of bats found in Scotland are European Protected Species (EPS) and feature on the UKBAP and SBL as priority species.

Refer to Technical Appendix 6.4 for full survey results.

4.12 Evaluation

The evaluations have been applied only to those habitats and species that have been scoped in to the assessment and those where there is the potential for impacts that could result in significant adverse ecological effects as a result of the proposed development. The IEFs and the evaluations are presented in Tables 4-4 (vegetation and plant communities) and 4-5 (fauna) below

Table 4-4 Evaluation of Important Vegetation and Plant Community Features

IEF	Importance	Justification
Ancient woodland: LEPO	County	BL1 in the west of the site, a section of BL2 in the north west of the site, BL3 in the north of the site and a section of BL4 west of the River Leven comprises an area of ancient woodland (LEPO) These woodlands are of County importance as they are LBAP priority habitats.
Broad-leaved semi natural woodland	National (UK)	Broad-leaved semi natural woodland makes up the majority of the habitats present on site. These woodlands are of National importance as they are UKBAP priority habitats, this habitat is also listed as an SBL and LBAP habitat too.
Broad-leaved plantation woodland	County	Broad-leaved plantation woodland is present within the north of the site (BL3 and BL7). These woodlands are of County importance as they are LBAP priority habitats.
Semi-improved neutral grassland	Local	The south west of the site consists of two large fields of semi-improved neutral grassland. This habitats is considered to provide foraging habitats for badger and roe deer,
Marshy grassland	County	A small area of marshy grassland is present in the south west of the site and is considered to be of County importance as wet grassland is an LBAP priority habitat.
Inundation vegetation	Local	One small area of inundation vegetation is present in the north east of the site, adjacent to the loch. This is an area of woodland edge that occasionally floods.
Scattered Scrub	Local	Scattered scrub is present throughout the site and consists of the following species: willow, elder, hawthorn, and dog rose. This is of Local importance as habitat for nesting birds, and sheltering and foraging habitat for mammal species.
Scattered broad-leaved trees	Local	The lines of broad-leaved trees within the site adjacent to Old Luss Road provide connectivity to woodland habitats, contribute to the habitat diversity on the site and offer foraging, sheltering and commuting habitat for mammal and bird species.
Standing water	International	Loch Lomond is an SPA and Ramsar and an NNR. Loch Lomond is part oligotrophic (Palmer & Roy 2001) and oligotrophic lakes are UKBAP, SBL and LBAP priority habitats. This habitat adjacent to the site is suitable for otter and a variety of bird species.
Running water	National (UK)	Rivers and streams are UKBAP, SBL and LBAP priority habitats. This habitat on and adjacent to the site is considered suitable for otter.
Intact hedge	National (UK)	Hedgerows are present in sections throughout the site and are a UKBAP Priority Habitat. This habitat is considered to offer foraging, sheltering and commuting habitat for mammal and bird species.

Table 4-5 Evaluation of Important Faunal Features

IEF	Importance	Justification
Otter	International	<p>Otter is an EPS and is listed on the LBAP, UKBAP and SBL as priority species. Otter is listed as Near Threatened by the IUCN. This listing is a precautionary approach as otter is recovering in western Europe but conservation actions need to be sustained. Scotland is a stronghold for otter in the UK.</p> <p>The desk study returned a record of a dead otter within 2km of the site and there is known to be an otter population present in the Loch Lomond area. The standing and running water and woodland habitat on site and in the wider landscape offer suitable resting, commuting and feeding habitat for otter present in the locale.</p>
Badger	National (UK)	<p>Badger is listed as Least Concern by the IUCN in view of its wide distribution, large population, occurrence in a number of protected areas and tolerance to some degree of habitat modification. The population is stable to increasing, after former steep declines in some of its range.</p> <p>The desk study returned two badger sighting and an unclassified sett within 5km of the site boundary. The woodland throughout the site and adjacent habitats offers good primary and secondary foraging opportunities for badger, as does the semi-improved grassland present in the west of the site and the mown grassland in the east, which offer a source of earthworms - a key component of their diet.</p> <p>Steep embankments suitable for sett creation are present in Drumkinnon wood and within the woodland in the west of the site.</p>
Red squirrel	National (UK)	<p>Listed as Least Concern by the IUCN because the species has a large population size and a wide distribution and there are no known widespread threats at present. Red squirrel are listed on the LBAP, UKBAP and SBL as priority species.</p> <p>The desk study returned one sighting of red squirrel in broadleaved woodland 2.2km north of the site. The woodland habitats within and adjacent to site offer suitable habitat for the local red squirrel population which is thought to be recovering as a result of grey squirrel control within the Loch Lomond National Park.</p>

IEF	Importance	Justification
Pine marten	National (UK)	<p>Pine marten is listed as Least Concern by the IUCN in view of its wide distribution, large population, occurrence in a number of protected areas and tolerance to some degree of habitat modification. The population is stable to increasing, after former steep declines in some of its range. Pine marten are listed on the LBAP, UKBAP and SBL as priority species. The desk study returned one sighting of pine marten in Balloch Park approximately 600m north west of the site.</p> <p>Foraging resources for pine marten are available in woodland habitats which are likely to support populations of birds, small mammals and invertebrates. Pine marten also predate grey squirrel which are known to frequent the woodland on site. The habitats on site are well connected to the woodland habitats to the north and west of the site.</p>
Roe deer	Local	<p>Roe deer utilise the habitats on site and there is open access the wider landscape. The woodland in the west of the site, known as Woodbank, is likely to be less disturbed by human presence and has dense rhododendron providing secure cover for roe deer present in the locale.</p> <p>LLTNP requested during consultation that the roe deer population should be assessed and proposals to mitigate any impact on the population (if present) should be provided.</p>
Bats	International	<p>All bat species present in Scotland are EPS and feature on the UKBAP and SBL as priority species. Common pipistrelle, soprano pipistrelle, brown long-eared bat, Daubenton's bat, Leisler's bat (<i>Nyctalus leisleri</i>) and noctule bat are listed as Least Concern by the IUCN as these species are widespread and abundant, and there is no evidence of current significant population declines. Common and soprano pipistrelle bats are Scotland's most ubiquitous bat species.</p> <p>Soprano pipistrelles, common pipistrelles and Daubenton's bats were detected during surveys of the site. The woodlands and watercourses and Loch Lomond offer optimal habitat for foraging and commuting species present in the locale. Three of the buildings on site are considered to offer low roosting potential for bats.</p>

4.13 Baseline Evolution

4.13.1 Increased Public Pressure

The presence of Loch Lomond and Loch Lomond Shores, makes it a popular tourist and recreational area. The woodland on site already experiences human impacts via tourists and local residents engaged in walking, cycling, accessing the river and loch shore, visiting the retail outlets and utilising the experiential elements such as the falconry and zip-line tree centres. Regular public access is also made to the field system in the west of the site to tend to a number of horses. Parts of the site is accessible by vehicles using the existing road network surrounding most habitats and separating sections of the site. This current level of habitat use is expected to increase as a result of the proposed development.

An increase in public pressure without formal management of access and habitats may alter the ground flora composition of the woodland habitats, contribute to pollution of the freshwater habitats, and have an effect on the behaviour of the local wildlife. An increase in public access could conceivably be associated with an increase in litter which would affect both woodland and freshwater habitats.

4.13.2 Climate Change

There is evidence that climate change is already affecting UK biodiversity (Living with Environmental Change, 2015). Impacts are expected to increase as the magnitude of climate change increases. Many species are occurring further north and at higher altitudes than in previous decades, including some species which have colonised large parts of the UK from continental Europe. Recent rates of change in distributions differ between species. Some species, including many plants, are intrinsically slow to disperse and fragmentation of habitat may contribute to some species spreading more slowly than would be expected from climate change alone.

Warmer springs in recent decades have caused a trend towards many biological events (e.g. flowering, budbreak, laying and hatching of eggs) occurring earlier in the year. The rates of change vary among species, which may alter the interactions between species. There is evidence of changes in the composition of plant and animal communities, consistent with different responses of different species to rising temperature.

Species differ in their responses to variation in precipitation. The effects of climate change are less certain for precipitation than for temperature, but potential changes could lead to substantial changes in biodiversity and ecosystems.

Some habitats are particularly vulnerable to climate change; the risks are clearest for montane habitats (to increased temperature), wetlands (to changes in water availability) and coastal habitats (to sea-level rise). Climate change exacerbates the risk that non-native species (including pests and pathogens) may establish and spread. It is expected that there will be regional differences in the impact of climate change on biodiversity, reflecting different species, climate, soils and patterns of land use and management. The protected area network, which includes SSSIs and National Nature Reserves, will continue to have a valuable role in conservation although there will be changes in populations, communities and ecosystems at individual sites.

Climate change will interact with, and may exacerbate, the impact of other continuing pressures on biodiversity, such as land use change and pollution. Extreme weather events, such as droughts and floods,

have clear impacts on ecosystems and the ecosystem services they provide; climate change may alter the frequency and severity of such events.

5 IMPACT ASSESSMENT

5.1 Scope of the Impact Assessment

5.1.1 Habitats

The following habitats have been scoped out of the assessment as they have no local or national protection and there is no potential for impacts that could result in significant adverse ecological effects as a result of the proposed development. Habitats which are considered to be associated with IEF species listed below have been considered in the impact assessment for these species:

- C3.1 Tall ruderal;
- J1.2 Amenity grassland;
- J1.4 Introduced shrub;
- J3.4 Fence;
- J3.6 Buildings; and
- J4 Bare ground.

The following habitats have been taken forward in the assessment as there is the potential for impacts that could result in significant adverse ecological effects as a result of the proposed development:

- A1.1.1 Broadleaved semi-natural woodland;
- A1.1.2 Broadleaved plantation woodland;
- A2.2 Scattered scrub;
- A3.1 Scattered broadleaved trees;
- B2.2 Semi-improved neutral grassland;
- B5 Marshy grassland;
- F2.2 Inundation vegetation;
- G1 Standing water;
- G2 Running water; and
- J2.2 Species poor hedge.

LEPO woodlands within and adjacent to the site and Loch Lomond have also been taken forward in the assessment due to their ecological connectivity to the site and the potential for impacts to occur from the proposed development.

5.1.2 Species

Following a review of the desk study results and completion of baseline survey work, the following species have been scoped out of the assessment as no field evidence was recorded and/or only marginal suitable habitat is present on the site and in its surroundings, therefore there is no potential for impacts that could result in significant adverse ecological effects as a result of the proposed development:

- Water vole
- Birds (all species)

The following species have been taken forward in the assessment as there is the potential for impacts that could result in significant adverse ecological effects as a result of the proposed development:

- Otter
- Badger
- Red squirrel
- Pine marten
- Roe deer
- Bats (all species)

5.2 Potential Impacts

The construction of the proposed development is likely to comprise the following activities, which could potentially have a significant negative impact on ecology in the absence of good construction management practices and effective mitigation:

Construction phase

- Vegetation clearance and tree felling;
- Access and travel on/off-site, including temporary access routes for construction vehicles ;
- Areas for plant maintenance and for storage of equipment, oils, fuels and chemicals;
- Movement of materials to/from or within a site;
- Acoustic disturbance and vibration from construction activities;
- Discharge to a water body (fuel leaks and spills/ sediment runoff/ erosion);
- Dust generation;
- Soil stripping;
- Environmental incidents and accidents e.g. spillages, noise and emissions;
- Lighting;
- Provision of services and utilities e.g. underground power lines, water supply and drainage;
- Setup and subsequent removal of site offices/compounds and final site clearance after construction;
- Storage areas for construction / excavated materials; and
- Structural works to erect new buildings and structures and modify existing structures.

Operational phase

- Access to site;
- Drainage;
- Implementation of landscape design and habitat management;
- Increased presence of people, vehicles and their activities e.g. increased public access and recreational pressure, risk of fires;
- Lighting;
- Physical presence of structures e.g. new buildings and roads;
- Discharge to a water body (fuel leaks and spills/ sediment runoff/ erosion); and
- Site operation and management e.g. maintenance operations, industrial processes generating emissions, lighting, noise, use of a road by traffic etc.

5.3 Mitigation

5.3.1 Overview

The proposed development seeks to construct small woodland lodges, on elevated support structures to avoid the creation of foundations within the woodland areas. These woodland areas form part of the Forest Habitat Network, i.e. those that are physically or functionally connected so that dependent species are able to move and/or disperse between patches to create interlinked populations. And the proposed development intends to maintain and enhance this network during construction and post development. The access would be formed by a minor road system constructed using low impact technology to protect tree roots, soils and surrounding vegetation.

Access routes within woodlands would be upgraded versions of existing footpath networks with extensions to reach lodge entrances. Lodge locations have been scoped for existing open areas (glades and rides) within woodlands, avoiding the core area of ancient woodlands and targeting opportunities to remove invasive plant species (such as dense Rhododendron) to create new woodland spaces. The development proposal intends to diversify the multi-use aspect of the woodland as a recreational resource, but maintain woodland as the dominant habitat type where it is currently located, improving its condition by controlling invasive species and replacing any area lost to meet the policy on Control of Woodland Removal.

5.4 Embedded Mitigation

In line with EIA and CIEEM best practice, the iterative EIA, planning and design processes for the proposed development have been undertaken in tandem, with close dialogue maintained between the Applicant, EIA project team, project architect and other advisers. This has allowed an overarching suite of mitigation measures and commitments to be incorporated into the proposed development from the outset, in order to both address potentially adverse effects and enhance its environmental performance. These are termed embedded mitigation measures.

The embedded mitigation measures incorporated within the proposed development that relevant to this chapter and are considered in the impact assessment below are as follows:

Construction Environmental Management Plan (CEMP)

- Development and implementation of measures relating to: construction traffic routing, site access/deliveries, parking, contractor management, parking, fuels and materials storage, standard dust and noise suppression techniques and standard pollution presentation and control techniques. These measures will be set out within a CEMP. Any other measures to be included in the CEMP would be identified as 'further mitigation' (not embedded) through the EIA.
- Any construction activities within a 5m strip along waterfronts will be subject to specific consideration within a CEMP to be agreed with the NPA prior to commencement.
- Adoption of standard construction industry working hours for noise generating activities.

Landscape

- 12m buffer (i.e. no development activities) around site boundary with Drumkinnon Gate;
- Safeguarding of identified valuable trees from disturbance or loss;

Ecology

- Safeguarding of identified important trees, including their root systems, from disturbance or loss.
- Erection of forest lodges on elevated support structures to minimise the need for the development of building foundations within woodland areas;
- Siting and design of forest lodges to be informed by detailed tree surveys of the site, to be undertaken in accordance with relevant British Standards. This siting and design process should:
 - Maintain the integrity of the existing forest habitat network;
 - Utilise existing open areas where possible;
 - Ensure the retention of desirable, native species trees (to be identified through aforementioned surveys;
 - Mitigate predicted tree loss and disturbance impacts; and,
 - Target opportunities to remove invasive species through construction activities;
- Commitment to the provision of appropriate compensatory planting to offset the loss of trees in building footprint and working areas within existing woodland (the details of which are considered below and treated as further mitigation and enhancement).
- Manage extents of invasive species such as rosebay willowherb, Japanese knotweed and bamboo in particular on the Woodbank site.
- Development of path and minor route networks using low impact technology to protect tree roots, soils and surrounding vegetation.
- Existing woodland managed to improve age range and biodiversity;
- Boost ecology and diversify species mix further by replanting lost species with native hardwood trees such as beech and oak;
- Boost ecology and ground flora within woodland by thinning out trees, consequently allowing more sunlight to reach the woodland floor. Management of none native species;
- A speed limit of 10mph would be applied to all construction traffic to reduce the risk and frequency of potential collisions
- Boundary features and fences would be designed to allow badger and roe deer to move freely

Landscape

- Safeguarding of identified important trees within existing woodland areas, as identified on the Parameters Plan; and
- No structures or buildings within woodland areas of the proposed development to exceed height of tree canopy.

Hydrology

- Surface water drainage scheme for the proposed development to be designed in accordance with Sustainable Drainage Systems (SuDS) principles and such that the maximum discharge rate will be equivalent to the greenfield (i.e. pre-development) runoff rate

5.5 Assessment of Ecological Impacts

The following sections quantify and characterise the potential effects of the proposed development on ecological receptors during the construction and operational phases, taking account of embedded mitigation which has been incorporated into the proposed development (Section 5-4 above) but in the absence of any further mitigation or enhancement measures.

In overall terms, Table 5.11 quantifies the approximate area of LEPO Woodland and each identified Phase 1 habitat within the site that would be potential removed by the proposed development

Table 5-11 Area of Phase 1 Habitat Impacted by the Proposed Development

Phase 1 Habitat	Area Impacted (hectares)
Long established woodland (of plantation origin)	0.75
A1.1.1 Broadleaved semi-natural woodland	3.3
A1.1.2 Broadleaved plantation woodland	0.65
B2.2 Semi-improved neutral grassland	1.05
B5 Marsh/marshy grassland	0.007
C3.1 Tall ruderal	0.12
J1.2 Cultivated/disturbed land, amenity grassland	0.62
J2.1.1./J2.4 Intact species rich hedge / fence	0.15

5.6 Predicted Negative Construction Phase Impacts

5.6.1 Ancient woodland (LEPO)

Nature of Impact

It is expected the proposed development would result in the total loss of 0.75 ha of LEPO woodland to facilitate development of woodland lodges in the west of the site and the centre of the site.

Construction activities, including the movement vehicles and storage of materials, also have the potential to damage trees within the woodlands via direct damage or compaction of soil around rooting areas.

Duration of Impact

The loss of woodland would be permanent and potential damage during construction could be both temporary and permanent.

Importance of IEF

County.

Magnitude of Impact

The construction aims to avoid tree removal by, where practicable, developing within existing access tracks and existing glades and rides within the woodlands. Trees identified as important silvicultural features would be protected from disturbance or loss.

The remainder of the LEPO woodland would be retained and protected during construction. The magnitude of impacts would therefore be minor.

Significance of Effect

Significant at a local level. The Loch Lomond and the Trossachs LDP (2016) Overarching Policy 2 states that proposed developments should protect and enhance designated sites including semi natural woodland.

Confidence in Assessment

A: high confidence

5.6.2 Broad-leaved semi natural woodland

Nature of Impact

It is expected the proposed development would result in the total loss of 2.73 ha of broad-leaved semi natural woodland (non- LEPO) to facilitate development of woodland lodges in in the south of the site and in the east of the site.

Construction activities, including the movement vehicles and storage of materials, also have the potential to damage trees within the woodlands via direct damage or compaction of soil around rooting areas

Duration of Impact

The loss of woodland would be permanent and potential damage during construction could be both temporary and permanent.

Importance of IEF

National (UK).

Magnitude of Impact

The construction aims to avoid tree removal, where practicable, developing existing access tracks and develop in existing glades and openings within the woodlands. Trees identified as important arboriculture features will be protected from disturbance or loss.

The remainder of the broad-leaved semi-natural woodland would be retained and protected during construction. The magnitude of impacts would therefore be moderate.

Significance of Effect

Significant at a local level. The Loch Lomond and the Trossachs LDP (2016) Overarching Policy 2 states that proposed developments should protect and enhance designated species including semi natural woodland.

Confidence in Assessment

A: high confidence

5.6.3 Broad-leaved plantation woodland

Nature of Impact

It is expected the proposed development would result in the loss of 0.86ha of broad-leaved plantation woodland to facilitate development of a hotel and parking in the north of the site.

Duration of Impact

The removal of the woodland will be permanent.

Importance of IEF

County

Magnitude of Impact

The broad-leaved plantation woodland proposed for removal comprises densely planted immature specimens. The impacts are therefore reversible as woodland could be re-planted. The magnitude of impacts would be minor.

Significance of Effect

Not significant

Confidence in Assessment

A: high confidence

5.6.4 Semi-improved neutral grassland

Nature of Impact

The loss of 1.05 ha semi-improved neutral grassland is anticipated as a result of the construction of houses and access in the west of the site.

Duration of Impact

The loss of this habitat would be permanent.

Importance of IEF

Local.

Magnitude of Impact

This habitat is considered to provide suitable foraging habitat for badger and roe deer. This habitat is present in areas adjacent to the site. The magnitude of impacts would therefore be minor.

Significance of Effect

Not significant.

Confidence in Assessment

A: high confidence

5.6.5 Marshy grassland

Nature of Impact

The loss of 0.007ha marshy grassland may occur during construction of lodges in the south west of the site. This loss could be mitigated via micro-siting the lodges during detailed design to avoid the habitat.

Duration of Impact

The loss of marshy grassland habitat would be permanent.

Importance of IEF

County.

Magnitude of Impact

This was the only area of wetland habitat identified in the site. The magnitude of impacts, should they occur, would be moderate.

Significance of Effect

Not significant due to its very small area.

Confidence in Assessment

A: high confidence

5.6.6 Scattered scrub

Nature of Impact

Scattered scrub is present throughout the majority of the vegetated areas of the site. This habitat is expected to be removed from all areas proposed for development to aid construction.

Duration of Impact

The removal of this habitat would be permanent.

Importance of IEF

Local.

Magnitude of Impact

The scrub habitat is expected to provide a source of connective sheltering and foraging habitat for a range of mammal and bird species present in the locale. However, it is anticipated that connectivity needs to be maintained through compensatory planting. The magnitude of impacts would therefore be minor.

Significance of Effect

Not significant.

Confidence in Assessment

A: high confidence.

5.6.7 Scattered broad-leaved trees

Nature of Impact

There is a line of broad-leaved trees considered to provide habitat connectivity along Old Luss Road and the adjacent field edge, which dissects the site from south to north that may be lost or damaged. Important trees will be retained and protected during construction.

Duration of Impact

The impacts would be temporary.

Importance of IEF

Local

Magnitude of Impact

Trees identified as important arboriculture features would be protected from disturbance or loss.

These trees would be retained and protected during construction. The magnitude of impacts would therefore be negligible.

Significance of Effect

Not significant.

Confidence in Assessment

A: high confidence.

5.6.8 Standing water

Loch Lomond may be subject to pollution via surface water run-off, or the release of sediment and pollutants during construction.

Duration of Impact

Temporary.

Importance of IEF

International.

Magnitude of Impacts

Good practice mitigation to prevent accidental pollution incidents would be in place at all times during construction. Areas stripped of earth and vegetation will be kept to a minimum at any one time. Soil loss and erosion will be minimised through careful storage, reinstatement and re-vegetation. Clean runoff from vegetated areas or offsite will be kept clean and diverted around works to prevent mixing with silt-laden water. A 5m strip along waterfronts will be subject to specific consideration within a CEMP. The magnitude of impacts, should they occur, would therefore be minor.

Significance of Effect

A pollution incident, should it occur, may be significant at a local level.

Confidence in Assessment

A: high confidence.

5.6.9 Running water

The watercourses within the site may be subject to pollution via surface water run-off, or the release of sediment and pollutants during construction.

Duration of Impact

Temporary

Importance of IEF

National.

Magnitude of Impacts

Good practice mitigation to prevent accidental pollution incidents would be in place at all times during construction. Areas stripped of earth and vegetation will be kept to a minimum at any one time. Soil loss and erosion will be minimised through careful storage, reinstatement and re-vegetation. Clean runoff from vegetated areas or offsite will be kept clean and diverted around works to prevent mixing with silt-laden water. A 5m strip along waterfronts will be subject to specific consideration within a CEMP. The magnitude of impacts, should they occur, would therefore be minor.

Significance of Effect

A pollution incident, should it occur, may be significant at a local level.

Confidence in Assessment

A: high confidence.

5.6.10 Intact hedge

Nature of Impact

The removal of 0.11ha of hedgerow from the central, north and eastern areas of the site would be required to facilitate construction of a hotel, parking and access.

Duration of Impact

Permanent

Importance of IEF

National.

Magnitude of Impacts

Hedgerows are present throughout the site and a majority of this habitat would be maintained and unaffected by construction. The hedgerows on site are species poor and lack a ground flora beneath them. It is also anticipated that compensatory planting would maintain the existing connectivity on site. The magnitude of impacts would therefore be minor.

Significance of Effect

Significant at a local level. The Loch Lomond and the Trossachs LDP (2016) Overarching Policy 2 and LDP Natural Environment Policy 6 - Enhancing Biodiversity: states that green corridors and habitat networks should be protected and enhanced.

Confidence in Assessment

A: high confidence.

5.6.11 Otter

Nature of Impact

Construction of the proposed development including all hotel and associated access and parking in the north, and woodland lodges in proximity to watercourses in the east, have the potential to disturb foraging, commuting and resting otter, which are considered to be present in the locale, via noise, vibration and lighting.

Access by otter to watercourse or Loch Lomond may be obstructed by physical barriers or high levels of disturbance as a result of construction activities.

There is also a risk of pollution to watercourses if appropriate pollution and accident prevention measures are not in place during the construction phases. Injury and fatality may occur to otter present in the locale due to increased construction traffic.

Duration of Impact

Temporary.

Importance of IEF

International.

Magnitude of Impact

Standard construction industry working hours for noise generating activities would be adopted. There may be some noise, vibration and artificial lighting in the early morning and late afternoon during reduced daylight hours (November to February).

A 5m strip along waterfronts will be subject to specific consideration within a CEMP. Any accidental pollution incidents in proximity to the adjacent watercourses will be cleaned up immediately.

No crossing or culverting of watercourses on site is anticipated as a result of the construction work and passage along the shoreline of Loch Lomond and along water courses would be available for otter during the construction period.

Good practice mitigation to prevent accidental pollution incidents will be in place at all times during construction. A speed limit of 10mph would be applied to all construction traffic to reduce the risk and frequent of potential collisions. The magnitude of impacts, should they occur, would therefore be minor.

Significance of Effect

Not significant.

Confidence in Assessment

A: high confidence.

5.6.12 Badger

Nature of Impact

There would be loss of primary foraging habitats for badgers (broad-leaved woodland and grassland), considered to be present in the locale, due to the proposed structures and associated access and parking.

Construction activities in the development area also have the potential to disturb badger foraging and commuting in the locale, via noise, vibration and lighting occurring around dawn and dusk, when badgers are more active.

The passage of badgers through the site may be blocked by the construction works in areas that will require to be temporarily fenced, constraining badger movement. Injury and fatality may occur to badger due to increased construction traffic.

Duration of Impact

Permanent habitat loss and temporary disturbance.

Importance of IEF

National (UK).

Magnitude of Impact

Primary habitats (woodland, grass and scrub) for foraging and commuting badger is available in the immediate and wider landscape.

Adoption of standard construction industry working hours for noise generating activities would be undertaken. There may be noise, vibration and artificial lighting in the early morning and late afternoon if construction works are to take place during reduced daylight hours (November to February). The passage of badgers through the site would be maintained as far as possible. A speed limit of 10mph would be applied to all construction traffic to reduce the risk and frequent of potential collisions. The magnitude of impacts would therefore be minor.

Significance of Effect

Not significant.

Confidence in Assessment

A: high confidence.

5.6.13 Red squirrel

Nature of Impact

Loss of habitat and reduced connectivity to adjacent habitat is expected via the felling of woodland to accommodate the development of woodland lodges, access and parking in the east south and west of the site.

Disturbance to red squirrel is also possible via noise, vibration and lighting in proximity to woodland features on and adjacent to the development area. Injury and fatality may occur to red squirrel present in the locale due to increased construction traffic.

Duration of Impact

Permanent habitat loss and temporary disturbance.

Importance of IEF

National (UK).

Magnitude of Impacts

Due to grey squirrel control within the Loch Lomond National Park the red squirrel population is thought to be recovering and the habitat on the site is suitable. The majority of the woodland is expected to be maintained during construction. A speed limit of 10mph would be applied to all construction traffic to reduce the risk and frequent of potential collisions. The magnitude of impacts would therefore be minor.

Significance of Effect

Due to the fragility of the red squirrel population around Loch Lomond there may be significant effects at a local level.

Confidence in Assessment

A: high confidence.

5.6.14 Pine marten

Nature of Impact

Loss of habitat and reduced connectivity to adjacent habitat is expected via the felling of woodland on site to accommodate the development of woodland lodges, access and parking in the east south and west of the site.

Disturbance to pine marten is also possible via noise, vibration and lighting in proximity to woodland features on and adjacent to the development area. Injury and fatality may occur to pine marten present in the locale due to increased construction traffic.

Duration of Impact

Permanent habitat loss and temporary disturbance.

Importance of IEF

National (UK).

Magnitude of Impacts

The site provides some suitable habitat for foraging and commuting pine marten, however, the current level of disturbance is a deterrent. The majority of the woodland is expected to be maintained during construction. A speed limit of 10mph would be applied to all construction traffic to reduce the risk and frequent of potential collisions. The magnitude of impacts would therefore be negligible.

Significance of Effect

Not significant.

Confidence in Assessment

A: high confidence.

5.6.15 Roe Deer

Nature of Impact

Loss of habitat and reduced connectivity to adjacent habitat is expected via the felling of woodland and removal of semi-improved neutral grassland, scrub and rhododendron from the west of the site to facilitated woodland lodges, houses and access.

Disturbance to roe deer is also possible via noise, vibration and lighting in proximity to woodland features on and adjacent to the development area. Injury and fatality may occur to roe deer present in the locale due to increased construction traffic.

Duration of Impact

Permanent habitat loss and temporary disturbance.

Importance of IEF

Local

Magnitude of Impacts

The woodland and scrub habitats favoured by roe deer in the west of the site are linked to further suitable habitat outside the site. A speed limit of 10mph would be applied to all construction traffic to reduce the risk and frequent of potential collisions. The magnitude of impacts would therefore be minor.

Significance of Effect

Not significant.

Confidence in Assessment

A: high confidence.

5.6.16 Bats (all species)

Nature of Impact

Habitat loss and reduced connectivity is expected due to the construction of the development including proposed structures and associated access and parking within woodland, grassland habitats and other connective linear vegetated features.

Construction activities in the development area also have the potential to disturb bats foraging and commuting in the locale, via any noise, vibration and lighting occurring around dawn and dusk, when bats are active.

Duration of Impact

Permanent habitat loss and temporary disturbance.

Importance of IEF

International

Magnitude of Impacts

Adoption of standard construction industry working hours for noise generating activities would be undertaken, therefore there would be no noise, vibration or artificial lighting within the bat activity hours between May and September. The development intends to retain woodland features and linear tree lines. The current layout does not suggest that the woodland edges, favoured by commuting bats, would be removed or greatly altered. The new development may enhance foraging and commuting via landscaping and it could also provide roosting opportunities for bats. The magnitude of impacts would therefore be minor.

Significance of Effect

Not significant (all species).

Confidence in Assessment

A: high confidence.

5.7 Predicted Negative Operation Impacts

5.7.1 Ancient woodland (LEPO), Broad-leaved semi natural woodland

Nature of Impact

There is the potential for recreational use (including tree top walk, events/ performance areas, children's play areas, monorail, forest adventure rides, picnic / play areas) to impact on areas of woodland (soil compaction around rooting areas and physical damage to tree stems and limbs) including the proposed visitor attraction within woodland in the centre of the site (BL4) and increase in informal access points.

Duration of Impact

Permanent.

Importance of IEF

County (LEPO) and National (UK) (broad-leaved semi natural woodland).

Magnitude of Impacts

It is expected that the woodland visitor attraction would be created within and between the existing woodlands. The woodlands would be managed to enhance and protect the longevity of their habitats in the long term. The magnitude of impacts would therefore be minor.

Significance of Effect

Significant at a local level.

Confidence in Assessment

A: high confidence.

5.7.2 Inundation vegetation

Nature of Impact

Surface runoff from the development and pollution events via oils and fuels within surface runoff from access roads may also pose a risk to the habitat. Increased recreational pressure including water based activities could also impact on this habitat.

Duration of Impact

Permanent.

Importance of IEF

Local.

Magnitude of Impacts

The surface water and SuDS scheme would be designed for the proposed development to treat and attenuate flows to maintain high water quality standards so no negative impacts should occur to this habitat via pollution.

Recreational pressure could impact the habitat if not managed. The magnitude of impacts would therefore be moderate.

Significance of Effect

May be significant at a local level.

Confidence in Assessment

A: high confidence.

5.7.3 Open water; Running water

Nature of Impact

Surface runoff from the development into the watercourses on and adjacent to the site and the adjacent Loch Lomond could impact on water quality. Pollution events via oils and fuels within surface runoff from access roads may also pose a risk to water quality.

Duration of Impact

Impacts would be temporary following heavy rain or a pollution incident but would be permanent for the life of the development.

Importance of IEF

International (Loch Lomond) and National (UK) (watercourses).

Magnitude of Impacts

The surface water and SuDS scheme would be designed for the proposed development to treat and attenuate flows to maintain high water quality standards and ensure that it is not subject to flooding and that there are no up or downstream negative impacts. The magnitude of impacts would therefore be minor.

Significance of Effect

A pollution incident, should it occur, may be significant at a local level.

Confidence in Assessment

A: high confidence.

5.7.4 Otter

Nature of Impact

Injury and fatality may occur to otter present in the locale due to increased traffic as a result of development.

Disturbance via increased lighting of water courses, human activity and recreational pressure may also be an impact.

Surface runoff into watercourses and Loch Lomond from the new development may affect water quality and also impact otter both directly and indirectly through prey reduction.

Duration of Impact

Permanent

Importance of IEF

International

Magnitude of Impact

Collisions are more likely at dawn and dusk but lower volumes of traffic would be present during this time and an appropriate speed limit would be applied to all traffic.

The final development would ensure that lighting is sensitive to nocturnal faunal species and their habitat requirements (i.e. not illuminated water courses or Loch Lomond).

Appropriate habitat buffers adjacent to water courses would be in place for continued use of water courses by otter would be maintained adjacent to water courses and Loch Lomond.

Development design would incorporate an appropriate drainage system to avoid surface runoff from development directly entering water courses on site or Loch Lomond. The magnitude of impacts would therefore be minor.

Significance of Effect

Significant at a local level.

Confidence in Assessment

A: high confidence.

5.7.5 Badger

Nature of Impact

Injury and fatality may occur to badger present in the locale due to increased traffic as a result of development.

Disturbance via increased lighting and human activity may also be an impact.

The passage of badgers through the site may be blocked by permanent fencing constraining and diverting badger movement.

The presence of badger on site may cause disturbance to residents or site managers due to them digging up landscaped areas of gardens in their foraging activities.

Duration of Impact

Permanent

Importance of IEF

National (UK).

Magnitude of Impacts

Collisions are more likely at dawn and dusk but lower volumes of traffic would be present during this time and an appropriate speed limit would be applied to all traffic.

The final development would ensure that lighting is sensitive to nocturnal faunal species and their habitat requirements (woodlands and grasslands).

Boundary features and fences would be designed to allow badger movement through the site to allow continued access to suitable habitats in the locale post development.. The magnitude of impacts would therefore be minor.

Significance of Effect

Not significant.

Confidence in Assessment

A: high confidence.

5.7.6 Red squirrel

Nature of Impact

Injury and fatality may occur to red squirrel present in the locale due to increased traffic as a result of development.

Disturbance via increased human activity and predation via increased domestic pets.

Duration of Impact

Permanent

Importance of IEF

National (UK)

Magnitude of Impact

An appropriate speed limit would be applied to all traffic to reduce collision risk.

Colonisation of the site by red squirrel may be hindered by increased human disturbance and predation by the presence of domestic pets, however, the proposed development is unlikely to increase these threats much beyond what already exists in proximity to the site. The magnitude of impacts would therefore be minor.

Significance of Effect

Due to the fragility of the red squirrel population around Loch Lomond there may be significant effects at a local level.

Confidence in Assessment

A: high confidence.

5.7.7 Pine marten

Nature of Impact

Injury and fatality may occur to pine marten present in the locale due to increased traffic as a result of development.

Disturbance via increased human activity may also hinder colonisation of the site by pine marten.

Duration of Impact

Permanent.

Importance of IEF

National (UK).

Magnitude of Impacts

An appropriate speed limit would be applied to all traffic to reduce collision risk.

Colonisation of the site by pine marten may be hindered by increased human disturbance, however, the proposed development is unlikely to increase these threats beyond what already exists in proximity to the site. The magnitude of impacts would therefore be negligible.

Significance of Effect

Not significant.

Confidence in Assessment

A: high confidence.

5.7.8 Roe Deer

Nature of Impact

Injury and fatality may occur to deer present in the locale due to increased traffic as a result of development.

Disturbance via increased lighting and human activity may also be an impact.

The passage of deer through the site may be blocked by permanent fencing constraining and diverting deer movement.

Duration of Impact

Permanent

Importance of IEF

Local

Magnitude of Impacts

A speed limit would be applied to all traffic to reduce the risk and frequent of potential collisions.

The final development would ensure that lighting is sensitive to roe deer and their habitat requirements (woodlands, scrub, grasslands).

Boundary features and fences would be designed to allow roe deer movements through the site. The magnitude of impacts would therefore be minor.

Significance of Effect

Not significant.

Confidence in Assessment

A: high confidence.

5.7.9 Bats

Nature of Impact

Disturbance via increased lighting of water courses, woodland edges or linear vegetated features as a result of development.

Duration of Impact

Permanent.

Importance of IEF

International

Magnitude of Impacts

The final development would ensure that lighting is sensitive to nocturnal faunal species and their habitat requirements (water courses, Loch Lomond and the River Leven, woodlands and linear vegetation).

The magnitude of impacts would therefore be negligible.

Significance of Effect

Not significant.

Confidence in Assessment

A: high confidence

5.8 Predicted Positive Operational Impacts

5.8.1 Broadleaved Woodland, Scattered Trees and Hedgerow Habitats

Nature of Impact

Proposed planting measures include a generous compensatory planting scheme of native tree and shrub species to replace and enhance existing woodland features on the site. The woodlands and tree lines which are

being retained and also those which are to be planted (including any hedgerows) would be subject to ongoing maintenance and management, in order to maintain ecological function and connectivity across the site and to the wider landscape.

Duration of Impact

Permanent.

Importance of IEF

National (UK) (broadleaved woodland and intact hedge) and local (scattered trees).

Magnitude of Impact

The magnitude of impacts from true enhancement rather than compensation would be negligible to minor.

Significance of Effect

May be significant at a local level

Confidence in Assessment

B: intermediate confidence, as final planting proposals and species lists will need to be agreed during the detailed design phase.

5.8.2 Open water, Running water and Otter

Nature of Impact

Management of the riparian and shoreline habitats, including the removal of invasive plant species and encouraging appropriately vegetated banks comprising native woodland species, will enhance the composition of vegetated connectivity between woodland and watercourses and reduce waterbody pollution via runoff. Such improvements would reduce the spread of invasive plants, improve water quality and increase future habitat for otter prey species such as invertebrates, amphibians and fish.

Duration of Impact

Permanent

Importance of IEF

International (Loch Lomond), National (UK) (watercourses) and International (Otter)

Magnitude of Impacts

The existing riparian and shoreline habitats are currently poorly vegetated and have low species diversity, therefore the magnitude of true enhancement impacts would be minor.

Significance of Effect

May be significant at a local level.

Confidence in Assessment

B: intermediate confidence, as final landscaping proposals and species lists will need to be agreed during the detailed design phase

5.8.3 Red squirrel and Pine marten

Nature of Impact

These species may benefit from a greater number of sheltering opportunities from purpose built shelter' and feeding stations commonly provided by increased public attendance

Duration of Impact

Permanent

Importance of IEF

National

Magnitude of Impacts

The feeding stations would provide a year round feeding resource for red squirrel and pine marten which is not currently considered to be available due to a lack of coniferous woodland species on site. The magnitude of enhancement impacts would therefore be moderate.

Significance of Effect

May be significant at a local level.

Confidence in Assessment

B: intermediate confidence, as final landscaping proposals and species lists will need to be agreed during the detailed design phase

5.8.4 Bats

Nature of Impact

Bat may benefit from a greater number of sheltering opportunities, both from purpose built shelter's or utilising new structures. These may increase food resource (insects) if landscaping plans include nectar producing flora which attracts insects.

Duration of Impact

Permanent

Importance of IEF

International (Loch Lomond), National (UK) (watercourses) and International (Otter)

Magnitude of Impacts

The existing open water, woodland riparian habitats are currently considered to offer a good food supply to bat species present in the locale. The availability to roost in buildings on site and purpose built bat boxes would enhance roosting resource for bat species present in the locale. The magnitude of enhancement impacts would therefore be moderate.

Significance of Effect

May be significant at a local level.

Confidence in Assessment

B: intermediate confidence, as final landscaping proposals and species lists will need to be agreed during the detailed design phase

5.9 Further Mitigation and Enhancement

Table 5-1 Schedule of Proposed Further Mitigation and Enhancement Measures

Topic	Proposed Further Mitigation and Enhancement Measures
Ecology and Woodland	Construction Phase
	1. Appointment of Environmental/Ecological Clerk of Works (ECoW) team to monitor compliance, produce auditable records and provide onsite advice (different environmental constraints may require ECoWs of differing specialisms).
	2. Pre-construction and regular protected species surveys.
	3. Provision of information regarding ecological sensitivities as part of site induction.
	4. Seasonal working checks and restrictions: where vegetation (including woodland, grassland, hedgerow, scrub and trees) clearance is to be undertaken in March to August inclusive, a pre-works nesting bird check would be carried out by a suitably qualified ecologist. If nesting birds are found an appropriate works exclusion area would be put in place to protect the nest until the young have fledged.
	5. Implementation of 10mph speed limit for all site traffic.
	6. Safeguarding of protected species: In the event that a protected species is discovered on site, the contractor will be expected to comply with relevant legislation and guidance. Where necessary all work in that area would stop immediately and the site ECoW contacted.
	7. Site compounds/material and plant storage areas to be located as far as possible from watercourses.
	8. Commitment to site and design working areas and building footprints (at detailed design stage) with the objectives of minimizing habitat disturbance/loss and safeguarding important ecological features (IEF).
	9. Undertaking an early flowering plants survey prior to the detailed design of the proposed development.
	10. Any trenches or pits made during construction (for example that may be present to lay infrastructure) to be covered at the end of each working day or a wooden plank placed inside to allow any mammal species to escape, should it fall in. Any temporarily exposed open pipe system to be capped in such a way as to prevent wildlife gaining access.
	11. Use of geoweb to protect adjacent tree rooting systems from development within woodland.
	12. Porous gravel or vegetated ground for proposed parking.
	13. Turf translocation if required.

	14. Tree survey to be undertaken of focused areas of the development to provide information on individual trees in relation to design and construction. This would inform the production of method statements for particular construction activities within woodland habitats.
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6 RESIDUALS

Table 6-1 identifies a summary of the residual effects of the proposed development

Table 6-1 Residual Effects

IEF	Importance of IEF	Nature of Impact	Duration of Impact	Mitigation by Design	Magnitude of Impact	Significance of Effect	Confidence in Assessment
Predicted negative construction impacts							
Ancient woodland (LEPO)	County	Partial loss of habitat and damage.	Permanent and temporary	Yes	Moderate	Significant at a local level	High
Broadleaved semi-natural woodland	National (UK)	Partial loss of habitat and damage.	Permanent and temporary	Yes	Moderate	Significant at a local level	High
Broadleaved woodland	County	Partial loss of habitat	Permanent	Yes	Low	Non-significant	High
Semi-improved neutral grassland	Local	Partial loss of habitat	Permanent	Yes	Low	Non-significant	High
Marshy grassland	County	Partial loss of habitat.	Permanent	No	Moderate	Non-significant	High
Scattered scrub	Local	Partial loss of habitat	Permanent	Yes	Low	Non-significant	High
Scattered broad-leaved trees	County	Potential damage to habitat.	Temporary	Yes	Negligible	Non-significant	High
Standing water	International	Pollution	Temporary	Yes	Low	Significant at a local level	High
Running water	National (UK)	Pollution	Temporary	Yes	Low	Significant at a local level	High
Intact hedgerow	National (UK)	Partial loss of habitat	Permanent	Yes	Low	Significant at a local level	High

IEF	Importance of IEF	Nature of Impact	Duration of Impact	Mitigation by Design	Magnitude of Impact	Significance of Effect	Confidence in Assessment
Otter	International	Habitat damage (pollution) disturbance, displacement, injury and fatality	Temporary	Yes	Low	Non-significant	High
Badger	National (UK)	Habitat loss, disturbance, displacement, injury and fatality.	Permanent and temporary	Yes	Low	Non-significant	High
Red Squirrel	National (UK)	Habitat loss, disturbance, displacement, injury and fatality.	Permanent and temporary	Yes	Low	Significant at a local level	High
Pine marten	National (UK)	Habitat loss, disturbance, displacement, injury and fatality	Permanent and temporary	Yes	Negligible	Non-significant	High
Roe Deer	Local	Habitat loss, disturbance, displacement, injury and fatality	Permanent and temporary	Yes	Low	Non-significant	High

IEF	Importance of IEF	Nature of Impact	Duration of Impact	Mitigation by Design	Magnitude of Impact	Significance of Effect	Confidence in Assessment
Bats (all species)	International	Habitat loss, disturbance, displacement, injury and fatality.	Permanent and temporary	Yes	Low	Non-significant (all species)	High
Predicated negative operational impacts							
Ancient woodland (LEPO)	County	Recreational use	Permanent	Yes	Low	Significant at a local level	High
Broadleaved semi-natural woodland	National (UK)	Recreational use	Permanent	Yes	Low	Significant at a local level	High
Inundation vegetation	Local	Pollution and recreational activities	Permanent	No	Moderate	Significant at a local level	High
Standing water	International	Pollution	Permanent and temporary	Yes	Low	Non-significant	High
Running water	National (UK)	Pollution	Permanent and temporary	Yes	Low	Non-significant	High
Otter	International	Injury and fatality, disturbance and displacement	Permanent	Yes	Low	Significant at a local level	High
Badger	National (UK)	Injury and fatality, disturbance and displacement	Permanent	Yes	Low	Non-significant	High

IEF	Importance of IEF	Nature of Impact	Duration of Impact	Mitigation by Design	Magnitude of Impact	Significance of Effect	Confidence in Assessment
Red squirrel	National (UK)	Injury and fatality, disturbance and displacement	Permanent	Yes	Low	Significant at a local level	High
Pine marten	National (UK)	Injury and fatality, disturbance and displacement	Permanent	Yes	Negligible	Non-significant	High
Roe deer	Local	Injury and fatality, disturbance and displacement	Permanent	Yes	Low	Non-significant	High
Bats	International	Disturbance and displacement	Permanent	Yes	Negligible	Non-significant	High
Predicated positive operational impacts							
Ancient woodland (LEPO)	County	Compensatory planting and future management	Permanent	Yes	Low	Significant at a local level	Intermediate
Broadleaved semi-natural woodland	National (UK)	Compensatory planting and future management	Permanent	Yes	Low	Significant at a local level	Intermediate
Intact hedgerow	National (UK)	Compensatory planting and future management	Permanent	Yes	Low	Significant at a local level	Intermediate

IEF	Importance of IEF	Nature of Impact	Duration of Impact	Mitigation by Design	Magnitude of Impact	Significance of Effect	Confidence in Assessment
Standing water	International	Shoreline habitat management	Permanent	Yes	Low	Significant at a local level	Intermediate
Running water	National (UK)	Riparian habitat management	Permanent	Yes	Low	Significant at a local level	Intermediate
Otter	International	Shoreline and riparian habitat management	Permanent	Yes	Low	Significant at a local level	Intermediate
Red squirrel	National (UK)	Purpose built resting and feeding provisions	Permanent	Yes	Moderate	Significant at a local level	Intermediate
Pine marten	National (UK)	Purpose built resting and feeding provisions	Permanent	Yes	Moderate	Significant at a local level	Intermediate
Bats	International	Increased roosting and foraging resources	Permanent	Yes	Moderate	Significant at a local level	Intermediate

7 CUMULATIVE IMPACT ASSESSMENT

Four projects are assessed for cumulative impacts in reference the proposal are detailed in Table 7.1 below.

To complete the cumulative assessment according to the impact assessment methods we would need further information on the other developments which was unavailable at the time of writing. Therefore, the cumulative assessment can only be assessed in broad terms only.

Table 7-1 Cumulative Impact Assessment

Project Name	Description/ Assessment
Replacement building and infrastructure for Sweeney's Cruises	<p>This development is taking place within an urban site which does not contain and/or is unsuitable for the IEFs identified at West Riverside. Therefore cumulative ecological impact of habitat loss or species disturbance are considered unlikely for these features.</p> <p>Cumulative impacts could occur if pollutants or sediments are released into the River Leven and/or Loch Lomond during the construction phase of the developments. If construction is occurring simultaneously, without mitigation, the impacts may increase in magnitude and significance at a local level. If construction occurs consecutively impacts could increase in duration and significance at a local level.</p> <p>This development could have a cumulative impact with West Riverside once both are in the operation, if increased visitor numbers lead to increased frequency or duration of boat tours. If not properly managed this could lead to increased disturbance of species within the Loch Lomond Woods SAC and Loch Lomond SPA.</p>
Drumkinnon Bay dredging	<p>The LLTNP EIA screening document (LLNPA, 2018) states that "there are no other developments nearby which would have a cumulative impact with the proposed development".</p> <p>In addition, the planning permission has been granted with conditions for a mitigation and method statement to be approved with the Planning Authority in advance of work. This will minimise any ecological impacts such as pollutants or disturbance of wildlife.</p>
Woodbank Inn Hotel Extension	<p>This development is taking place within an urban site which is adjacent to the south east site boundary and does not contain and/or is unsuitable for the IEFs identified at West Riverside. However, without mitigation, cumulative impact of disrupting the normal behaviour of transient and resident fauna within nearby habitats may occur during construction, if there is temporary, yet simultaneous, increased noise,</p>

	<p>lighting and vibrations from both developments. The magnitude of impact would increase if the developments take place simultaneously and the duration of impact would increase if they occur consecutively. However the relatively narrow habitat corridor adjacent to the Woodbank Inn site means that effects are not likely to be significant.</p> <p>Once the hotel is operational, cumulative impacts could occur with West Riverside and the Sweeney's Cruises development. An increase in numbers of visitors from the hotel extension could have an additive effect with the increase in visitors at West Riverside. An increase in demand for boat tours could lead to increased frequency of tours and increased disturbance of species within the Loch Lomond Woods SAC and Loch Lomond SPA.</p>
Balloch Street Design Project	<p>Detailed plans for this project are not yet available. The works will take place within the urban Balloch area of the Village and Station Square, which are not connected to the West Riverside site and do not contain and/or are unsuitable for the IEFs identified at West Riverside. As such no cumulative impacts are predicted.</p>

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