A10.3: Detailed Terrestrial and Freshwater Ecological Baseline Data

1 Introduction

1.1.1 This appendix provides the detailed baseline data used to inform an evaluation of terrestrial and freshwater ecological receptors within the study area and the assessment of ecological impacts.

2 Terrestrial Ecology

Designated Sites

2.1.1 There are three statutory designated sites within the study area:

- The River Tay Special Area of Conservation (SAC);
- Cairnleith Moss Site of Special Scientific Interest (SSSI); and
- Mill Dam SSSI.

2.1.2 No non-statutory designated sites except for sites on the Ancient Woodland Inventory were recorded within the study area.

River Tay SAC

2.1.3 The River Tay SAC (site code UK0030312, SNH site code 8366) has six qualifying interests:

- the Annex I habitat, Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the *Isoëto-Nanojuncetea*; and
- five Annexe II species, European otter (*Lutra lutra*), Atlantic salmon (*Salmo salar*), brook lamprey (*Lampetra planeri*), river lamprey (*L. fluviatilis*) and sea lamprey (*Petromyzon marinus*).

2.1.4 Atlantic salmon is a primary reason for site selection. All other habitats and species are present as qualifying features, but are not primary reasons for site selection (JNCC, 2013a). All qualifying features have been assessed as being in a Favourable Maintained condition (SNH, 2013a).

Cairnleith Moss SSSI

2.1.5 The Cairnleith Moss SSSI (SNH site code 289) lies 1km northeast of Bankfoot, to the east of the A9. It covers an area of 80.66ha and is cited for its biological (wetland) features; laggs of raised bog and spring fen. The site is a complex mosaic of wet heath, swamp, open water, scrub and acid grassland communities and there are very few such large areas of unimproved wetland and heath areas remaining in lowland Perth and Kinross (SNH, 2007a). It is also the only site in lowland east Perth and Kinross selected for its flush grassland communities.

2.1.6 The two features for which the SSSI is cited are classed as Favourable Maintained (21/07/2008) (SNH, 2013b). The spring fen is sedge-rich vegetation found where calcium-rich ground water (so-called 'flushes') comes to the soil surface. The key objectives for management of the site are to maintain the water table, and control scrub and tree regeneration (SNH, 2007b).

2.1.7 National Vegetation Classification (NVC) information on the vegetation within the SSSI was received from Perth and Kinross Council. Eight NVC communities from four broad habitats (mires (M), swamps and tall-herb fens (S), calcifugous grasslands (U) and woodlands and scrub (W) were present within the study area. The community types were:

- M6 *Carex echinata-Sphagnum recurvum/auriculatum* mire;
- M15 *Scirpus cespitosus* [now known as Trichophorum cespitosum]-*Erica tetralix* wet heath;
- M18 *Erica tetralix-Sphagnum papillosum* raised mire;

- M23 *Juncus effusus/acutiflorus-Galium palustre* rush-pasture;
- M25 *Molinia caerulea-Potentilla erecta* mire;
- S27 *Carex rostrata-Potentilla palustris* tall-herb fen;
- U4 *Festuca ovina-Agrostis capillaris-Galium saxatile* grassland; and
- W23 *Ulex europaeus-Rubus fruticosus* scrub.

Mill Dam SSSI

2.1.8 The Mill Dam SSSI (SNH site code 1153) lies at the northern end of the proposed scheme approximately 1km west of Kingswood. It covers an area of 8.83ha and is cited for its biological (wetland) feature – basin mire. The site consists of a small area of open water which was artificially impounded by an earth dam and sluice to serve the mills at Murthly.

2.1.9 The most important features are the small area of fen influenced by ground water on the west side of the dam, and the surrounding reed-swamp, which contains the uncommon lesser tussock sedge (*Carex diandra*), bog sedge (*Carex limosa)*, and the locally rare many-stalked spike rush *(Eleocharis multicaulis)*. Interrupted clubmoss (*Lycopodium annotinum)* is a nationally scarce species is present in its only known lowland site in Perth and Kinross (SNH, 2010a).

2.1.10 Site condition monitoring in 2003 showed the site to be in a favourable condition (SNH, 2010b). Further monitoring in 2010 showed that the site was in an unfavourable declining condition (SNH, 2013c). The site appears to be at risk from nutrient enrichment (from slurry spreading on adjacent land), unconsented drainage and silt and vegetation encroachment (SNH, 2010b).

Desk Study

Biodiversity Action Plan

2.1.11 The Scottish Biodiversity List (SBL) (Scottish Government, 2013) contains 41 habitats across five broad types – coastal, freshwater and wetland, lowland, woodland, and upland – of which 27 are assessed as requiring conservation action. Of the 41 habitats on the list it was considered that 19 had the potential to occur within the study area (Table 1).

Table 1: Habitats on the Scottish Biodiversity List Potentially Present within the Study Area

Ecosystem Grouping	Habitat	Conservation Action Needed
Freshwater & wetland	Eutrophic standing waters	Yes
	Lowland fens	Yes
	Lowland raised bog	Yes
	Mesotrophic lakes	Yes
	Ponds	Yes
Lowland	Arable Field Margins	Yes
	Lowland calcareous grassland	Yes
	Lowland dry acid grassland	Yes
	Lowland Heathland	Yes
	Lowland meadows	Yes
	Purple moor-grass & rush pastures	Yes
	Upland hay meadows	Yes
Woodland	Lowland mixed deciduous woodland	Yes
	Native pine woodlands	Yes
	Upland birchwoods	Yes
	Upland mixed ashwoods	Yes
	Upland oakwood	Yes
	Wet woodland	Yes
	Wood Pasture and Parkland	Yes

2.1.12 Habitats and species within Perth and Kinross are covered by the Tayside Local Biodiversity Action Plan (LBAP) (http://www.taysidebiodiversity.co.uk/index.html). The action plan is divided into six sub-groups covering:

- Coasts and Estuaries;
- Farmland;
- Upland;
- Urban and Built Environment;
- Water and Wetland; and
- Woodland.

2.1.13 Full details of the LBAP can be found at http://www.taysidebiodiversity.co.uk/index.html. Habitat descriptions and lists of key species have been produced for a number of habitats pertinent to the study area. These are listed in Table A2.

Table 2: Habitats and Key Species Groups Identified within the Tayside LBAP Potentially Present within the Study Area

Habitat Sub-Group	Habitat Type	Key Species
Farmland	Calcareous & Base-rich grassland	Birds, invertebrates, molluscs, plants and fungi
	Farm buildings	Mammals and birds
	Hedgerows & Treelines	Mammals, birds, invertebrates and plants
	Stone Dykes	Mammals, birds, amphibians, reptiles, invertebrates and plants
	Wet Grassland	Mammals, birds, amphibians, reptiles, invertebrates and plants
Urban & Built Environment	Built & Development Environment	Mammals, birds, amphibians, reptiles, fish, invertebrates, plants
	Businesses with land	Mammals, birds, amphibians, reptiles, invertebrates and plants
Water & Wetlands	Mesotrophic Lochs	Mammals, birds, amphibians and plants
	Rivers & Burns	Mammals, birds, fish, invertebrates and plants
	Standing Open Water	Mammals, birds, amphibians, fish, invertebrates and plants
Woodland	Native Pinewoods	Mammals, birds, invertebrates, higher plants, fungi and lichens

2.1.14 In addition, proposed Habitat Action Plans (HAPs) and Species Action Plans (SAPs) have been developed for 12 additional habitats and ten animal groups or species (amphibians, birds, fish and mammals). No SAPs have been proposed for invertebrates or plants.

Ancient Woodland Inventory

2.1.15 Ancient Woodland Inventory (AWI) areas are illustrated in Figure 10.2 and described below.

2.1.16 One area classed as Ancient Woodland was present within the study area – Byres Wood at the northern end of the study area. Four areas of Long-established Woodland of Plantation Origin occurred with the study area. These were:

- woodland near Tophead in the west of the study area;
- Five-mile Wood;
- Gelly Wood; and
- woodland near Kingswood at the northern end of the study area.

2.1.17 Gelly Wood comprised a number of different parcels of woodland on either side of the proposed Scheme. Within the study area, five of these parcels were also listed on the Semi Natural Ancient Woodland Inventory.

Previous Phase 1 Habitat Information

2.1.18 A Phase 1 habitat survey of the study area was undertaken in 2008 (Atkins, 2009). A variety of habitat types were recorded including arable, dry dwarf shrub heath, grassland (amenity, improved, marshy, semi-improved), wet modified bog and woodland (broad-leaved, coniferous, mixed, wet, plantation and semi-natural). Areas of standing open water and of running water were also recorded.

Field survey

2.1.19 Field surveys were undertaken between June and August 2013 (extended Phase 1 habitat survey) and July 2013 (Phase 2 survey).

Phase 1 Habitat Survey

2.1.20 Phase 1 habitat survey results are illustrated in Figure 10.2 and Table.3 and summarised below. Target notes can be found in Table 4.

Table 3: Phase 1 Habitat Survey Results

Habitat Type	Estimated Total Area (ha)	Percentage Area (%)	Number of Discrete Areas
Arable	643.0	52.6	90
Woodlands and Scrub (total)	**250.9**	**20.5**	**120**
Coniferous plantation woodland	152.9	12.5	19
Broad-leaved semi-natural woodland	38.6	3.2	45
Felled woodland	28.1	2.3	11
Broad-leaved plantation woodland	19.5	1.6	34
Mixed plantation woodland	8.4	0.7	7
Coniferous semi-natural woodland	2.1	0.2	2
Dense scrub	1.3	0.1	2
Grassland (total)	**229.6**	**18.8**	**117**
Improved grassland	188.5	15.4	67
Poor semi-improved grassland	35.5	2.9	39
Amenity grassland	3.5	0.3	8
Semi-improved acid grassland	2.2	0.2	3
Wetland (total)	**50.8**	**4.2**	**25**
Marshy grassland	48.7	4.0	21
Swamp	2.1	0.2	3
Fen	<0.1	<0.1	1
Heathland and bog (total)	**32.5**	**2.7**	**8**
Wet heath	13.6	1.1	2
Wet modified bog	11.7	1.0	2
Dry heath/acid grassland mosaic	6.5	0.6	2
Dry dwarf shrub heath	6.3	0.5	2
Other habitats			
Running water	7.9	0.6	73
Tall ruderal	3.0	0.2	10
Disused quarry	1.5	0.1	2
Standing water	1.2	0.1	5
Bracken	0.6	0.1	3
Not surveyed	0.5	<0.1	1
Bare ground	0.4	<0.1	1

2.1.21 Arable land comprised over 52% of the study area, woodlands and scrub accounted for 21% and grassland (not including marshy grassland) another 19%. Coniferous plantation was the largest woodland component (13%) whilst improved grassland was the largest grassland component

(15%). Heathland and bog habitats accounted for 3% of the study area and wetland habitat 4%.

2.1.22 In the south of the study area the majority of land-use comprises agricultural land; mainly arable and improved or poor semi-improved grassland. To the north of the site, north of Bankfoot, woodland is predominant. This includes mature coniferous and broad-leaved plantation woodland, recently planted plantation and felled woodland. In addition, some areas categorised as long-established plantation in woodland inventories have been classed as semi-natural woodland due to the amount of natural regeneration and habitat reversion.

2.1.23 Other habitats present include marshy grassland and other wetland communities, mainly at Cairnleith Moss SSSI, the Muir of Thorn area and around the Birnam Burn and Mill Dam SSSI in the north-western part of the study area.

Table 4: Phase 1 Target Notes

Target Note ID	OS Grid Reference	Description
1	NO 09287 29253	Northern Marsh-orchid. Small group (x 8) of northern marsh-orchid (*Dactylorhiza purpurella*).
2	NO 08905 29980	Semi-improved Grassland and Plantation Woodland. Small area of grassland containing a variety of plant and invertebrate species. A small area of plantation woodland was also present and alder (*Alnus glutinosa*) was invading the grassy areas. Species such as creeping thistle (*Cirsium arvense*) were also invading. Species present: creeping buttercup (*Ranunculus repens*) (F), oxeye daisy (*Leucanthemum vulgare*)(F), meadow vetchling (*Lathyrus pratensis*) (O-F), lesser trefoil (*Trifolium dubium*) (O), wild angelica (*Angelica sylvestris*) (LA), broad-leaved dock (*Rumex obtusifolius*) (LF), fox-and-cubs (*Pilosella aurantiaca*) (LF), pink purslane (*Claytonia sibirica*) (LF), common dog-violet (*Viola riviniana*) (O), common knapweed (*Centaurea nigra*) (O), cow parsley (*Anthriscus sylvestris*) (O), daisy (*Bellis perennis*) (O), germander speedwell (*Veronica chamaedrys*) (O), greater stitchwort (*Stellaria holostea*) (O), hogweed (*Heracleum sphondylium*) (O), ragwort (*Senecio jacobaea*) (O), spear thistle (*Cirsium vulgare*) (O), tufted vetch (*Vicia cracca*) (O), cut-leaved crane's-bill (*Geranium dissectum*) (R), yellow rattle (*Rhinanthus minor*) (O-R), common figwort (*Scrophularia nodosa*) (R), hybrid avens (*Geum x intermedium*) (R), water avens (*Geum rivale*) (R), wood avens (*Geum urbanum*) (R) and yellow flag (*Iris pseudacorus*) (R). In addition, northern marsh-orchid was also recorded (40+).
3	NO 09104 30263	Wetland area in Broad-leaved Woodland. Small area of wetland comprising a variety of habitat types in semi-natural broad-leaved woodland. The site lies within the River Tay SAC. Tree species included pedunculate oak (*Quercus robur*) (F), ash (*Fraxinus excelsior*) (O-F), goat willow (*Salix caprea*) (LF), hawthorn (*Crataegus monogyna*) (O) and silver birch (*Betula pendula*) (O). Wetland comprises of a number of areas with different species dominating, including bottle sedge (*Carex rostrata*) (LD), common reed (*Phragmites australis*) (LD), articulated rush (Juncus articulatus) (LA), soft-rush (*J. effusus*) (LF), bur-reed (*Sparganium* sp.) (LF), iris (LF), water mint (*Mentha aquatica*) (LF), brooklime (*Veronica beccabunga*) (O), cleavers (*Galium aparine*), marsh horsetail (*Equisetum palustre*) (O), marsh marigold (*Caltha palustris*) (O), meadowsweet (*Filipendula ulmaria*) (O) and marsh cinquefoil (*Comarum palustris*) (O-R). Drier areas were dominated by common nettle (*Urtica dioica*) with broad-leaved dock, creeping buttercup, curled dock (*Rumex crispus*) and with lesser celandine (*Ficaria verna*) (LF) also present. Pink purslane was present in the adjacent woodland with common dog-violet, ground ivy, red campion (*Silene dioica*), sweet vernal-grass (*Anthoxanthum odoratum*) and wood avens all common. Himalayan balsam (*Impatiens glandulifera*) was also recorded here.
4	NO 09341 30302	Invasive Non-native Species. Himalayan balsam recorded on the lower part of the Shochie Burn in small amounts downstream of the railway viaduct.
5	NO 09379 30777	Invasive Non-native Species. Himalayan balsam recorded along a small watercourse near Elisdon cottage. Also present in adjacent scrub and woodland (NO 09327 30715, NO 09421 30932).
6	No 09183 30699	Invasive Non-native Species. Himalayan balsam recorded along the Ordie Burn upstream of the railway viaduct.
7	NO 08487 31925	Invasive Non-native Species. Himalayan balsam recorded along the Ordie Burn. Large stands are present at this location and along the adjacent ditch. The species is also scattered along much of the length of the watercourse. Monkeyflower (*Mimulus guttatus*) and pink purslane were also recorded.
8	NO 08694 32254	Marshy grassland. Small area of species-poor marshy grassland.

Target Note ID	OS Grid Reference	Description
9	NO 07860 33401	Northern Marsh-orchid. Large stand of northern marsh orchid extending along the verge on the eastern side of the A9 for approximately 30m. Large numbers of plants.
10	NO 07537 34004	Mature Trees. Mature trees stretching along both sides of the old A9 between Bankfoot and East Mains. Sycamore (*Acer pseudoplatanus*) and oak (*Quercus* sp.) are the predominant species. Trees up to 25m+ and 1.5m at chest height.
11	NO 07329 34156	Invasive Non-native Species. Himalayan balsam recorded along the Garry Burn in large amounts.
12	NO 07237 34458	Greater butterfly orchid. A single specimen of greater butterfly orchid (*Platanthera chlorantha*) c. 3m from the edge of the Garry Burn in dense, creeping buttercup dominated grassland.
13	NO 07192 34637	Invasive Non-native Species. Himalayan balsam and monkeyflower recorded along the Garry Burn in large amounts.
14	NO 07441 36433	Cairnleith Moss SSSI – wet modified bog, swamp and woodland. Large area of wetland habitat only partly within the study area. Most of the area has been classed as wet modified bog. Marshy grassland areas are dominated by rush species but with a wide range of herbs and grasses. Lesser butterfly-orchid (*Platanthera bifolia*) (NO 07593 36102) was recorded here and elsewhere scattered across the site along with twayblade (*Neottia ovata*) and heath fragrant orchid (*Gymnadenia borealis*). Boggier areas comprise *Sphagnum* spp. with common butterwort common (*Pinguicula vulgaris*), common cottongrass (*Eriophorum angustifolium*), cross-leaved heath (*Erica tetralix*), devil's-bit scabious (*Succisa pratensis*), heather (*Calluna vulgaris*), marsh lousewort (*Pedicularis palustris*) and purple moor-grass (*Molinia caerulea*) and quaking grass (*Briza media*). In other grass areas, the purple moor-grass dominated and species richness was reduced, whilst elsewhere common cottongrass and *Sphagnum* species were dominant. Small patches of semi-improved acid grassland were occasionally encountered and stands of gorse (*Ulex europaeus*) scrub. Where birch (*Betula* sp.) woodland had arisen, the ground flora was generally very grassy and species-poor. To the north of the site, within the study area, was an area of swamp with bogbean (*Menyanthes trifoliata*) abundant and wet woodland. Grey willow (*Salix cinerea*) was present in this area and more individuals of the lesser butterfly orchid.
15	NO 07070 36341	Broad-leaved semi-natural woodland (east of A9). Semi-natural woodland partly dominated by naturally regenerated birch, especially towards the south. Elsewhere beech (*Fagus sylvatica*) (O), European larch (*Larix decidua*) (O), Scots pine (*Pinus sylvestris*) (O) with some very large specimens. Ground flora was grass dominated, but some areas had a heathy flora with bilberry (*Vaccinium myrtillus*) (O) and also chickweed wintergreen (*Trientalis europaea*) (LF). Other tree and scrub species recorded included: gorse (LF), honeysuckle (*Lonicera periclymenum*) (O), goat willow (O), oak (O), sycamore (O), hawthorn (R), holly (*Ilex aquifolium*) (R), rowan (*Sorbus aucuparia*) (R). Ground flora species were common nettle (LA), Yorkshire-fog (LA), the bryophyte *Polytrichum commune* (LF), creeping buttercup (LF), great wood rush (*Luzula sylvatica*) (LF), soft-rush (LF), bramble (*Rubus fruticosus*) (O), chickweed (*Stellaria media*) (O), common dog-violet (O), germander speedwell (O), hogweed (O), jointed rush (O), red fescue (*Festuca rubra*) (O), *Sphagnum* spp. (O), tormentil (*Potentilla erecta*) (O), bluebell (*Hyacinthoides non-scripta*) (R), broad-leaved dock (R), cock's-foot (*Dactylis glomerata*) (R), common sedge (*Carex nigra*) (R), hedge woundwort (*Stachys sylvatica*) (R), raspberry (*Rubus idaeus*) (R), selfheal (*Prunella vulgaris*) (R), snowdrop (*Galanthus nivalis*) (R), sweet vernal-grass (R), tufted hair-grass (*Deschampsia cespitosa*) (R) and wood avens (R).
16	NO 07086 36561	Marshy grassland. Large area of marshy grassland adjacent to Cairnleith Moss SSSI. Generally species-poor, but becoming richer nearer to the SSSI (TN14). Areas of poor semi-improved and improved grassland occur within the fields and they are cattle grazed. The improved areas show grass species typical of agricultural improvement (perennial ryegrass (*Lolium perenne*) and crested dog's-tail (*Cynosorus cristatus*)) but also species indicative of more acid grasslands such as tormentil (O-R) and wavy hair-grass (*Deschampsia flexuosa*) (O). Yorkshire-fog (F) and creeping buttercup (F-O), creeping thistle (O), greater stitchwort (O), ragwort (O), white clover (*Trifolium repens*) (O), common nettle (R), oval sedge (*Carex leporina*) (R), red fescue (R) and selfheal (R) were also present. The marshy areas are dominated by soft-rush and articulated rush with marsh ragwort (*Senecio aquaticus*) (R).
17	NO 67370 37069	Broad-leaved semi-natural woodland (west of A9). Broadly similar to that to the east of the A9 (TN15) but with some areas richer in coniferous species. The woodland also includes some large beech trees which were up to 1m in diameter at chest height.

Target Note ID	OS Grid Reference	Description
		The ground flora was generally (but not entirely) more heathy in character with some areas dominated by a mixture of the bryophyte *Polytrichum commune*, bilberry and heather, with some areas showing frequent devil's-bit scabious, tormentil and heath bedstraw (*Galium saxatile*). Gorse and broom (*Cytisus scoparius*) were also common in parts.
18	NO 07140 37107	Wet woodland and swamp. An area of wet woodland (sparse) of Scots pine and birch. The trees tend to be in poor condition and the ground underfoot is very wet becoming wetter and softer towards the middle where a pond is present – access was compromised by the very soft and "quaking" ground. The ground flora was mainly Sphagnum dominated in the wetter areas. There was a wide area of dense vegetation around the open water. Pondweed species (*Potamogeton* sp.) present in the open water with large sedge species (*Carex* spp.). In the *Sphagnum* dominated areas, *Polytrichum commune* (LA), chickweed wintergreen (F), common sedge (F), common cottongrass (R) and marsh cinquefoil (R) were also present.
19	NO 07727 37203	Small area of wet modified bog. Small area of very short wet modified bog with the occasional Scots pine. The bog transitions rapidly into drier grassland to the east under a Scots pine woodland. The woodland shows evidence of cattle grazing and these will have access to the bog area. The bog area comprises small drier and wetter areas with *Sphagnum* common (LA) in parts and bilberry common (LA in others. In the wetter area, round-leaved sundew (*Drosera rotundifolia*), common cottongrass, bog asphodel (*Narthecium ossifragum*) and northern deergrass (*Trichophorum cespitosum*) were common (LA). Common sedge (F), tormentil (O) and heath rush (*Juncus squarrosus*) (O) were also present. Purple moor-grass (O-F), star sedge (*Carex echinata*) (O), cross-leaved heath (O), *Polytrichum commune* (O) and heather (LF) were also present.
20	NO 06732 37077	Semi-natural broad-leaved woodland. Woodland to the west of the A9, part of Gelly Woods, comprising a number of different parcels including an area of distinct plantation woodland. The main canopy varied in composition but was mainly silver birch, goat willow, beech, oak, rowan. Scots pine was also occasionally present. The ground flora was very variable consisting of acid heath/grass, rough grassland, bryophyte and wet species dominated areas. Species recorded included; Yorkshire-fog (F), red fescue (O-LF), *Sphagnum* spp. (LA), bilberry (LA), soft-rush species (LA), sweet-grass sp. (*Glyceria* sp.) (LF), sweet vernal-grass (O), heath bedstraw (O), tormentil (O), chickweed wintergreen (R-LF), pignut (O), wood sorrel (*Oxalis acetosella*) (O), common sedge (O), violet sp. (O), marsh bedstraw (O), lesser spearwort (O-R), tufted hair-grass (O-R), bottle sedge (R), common cottongrass (R), heath spotted orchid (R), germander speedwell (R) and heath rush (R).
21	NO 06532 37213	Small pond/marsh area. Marshy area in Gelly Woods with swampy vegetation, heavily vegetated. Soft-rush and jointed rush were abundant with reed canary-grass (*Phalaris arundinacea*) present in small stands. Other species included bottle sedge (F), sweet-grass (O), marsh bedstraw (*Galium palustre*) (R) and star sedge (R). Adjacent to woodland and marshy grassland and fed by streams.
22	NO 06607 37347	Marshy grassland. Marshy grassland dominated by a mixture of soft-rush, articulated rush and tufted hair-grass with marsh thistle prominent. Creeping buttercup (F), ragwort (F), Yorkshire-fog (F), greater bird's-foot-trefoil (*Lotus pedunculatus*) (O), marsh bedstraw (O), marsh willowherb (*Epilobium palustre*) (O), meadow vetchling (R), selfheal (O), tormentil (O), white clover (O-R), common sedge (R) common spotted-orchid (*Dactylorhiza fuchsii*) (R), oval sedge (R) and spear thistle (R) were also recorded.
23	NO 06701 37648	Invasive Non-native Species. Stand of rhododendron (*Rhododendron ponticum*) adjacent to the accommodation road to Gelly, approximately 9m x 4m.
24	NO 06183 37432	Heath/acid grassland mosaic. Mixed vegetation developed on area of felled woodland which has been replanted. Naturally regenerated rowan and birch, with some gorse. Areas of bare ground were also present. Bilberry (F), Polytrichum commune (F), tufted hair-grass (F), Yorkshire-fog (F), soft-rush (LF), purple moor-grass (F-O), chickweed wintergreen (O), common milkwort (Polygala vulgaris) (O), common sedge (R), hare's-foot cottongrass (*Eriphorum vaginatum*) (O), heath rush (O), northern deergrass (O), foxglove (*Digitalis purpurea*) (O), Sphagnum (LO), common dog-violet (R), rhododendron (R), spear thistle (R) tormentil (R), wood sorrel (R).
25	NO 06528 37743	Wet heath and trees/scrub. Naturally regenerated birch, goat willow and gorse over remains of wet heath. Scots pine, rowan and naturally regenerated commercial conifers were also present (R). The ground flora comprised areas dominated by Polytrichum commune and cross-leaved heath, with *Sphagnum* spp. sometimes abundant. purple moor-grass (F), rush species (F), heather (O-F), tormentil (O-F), bilberry (O), heath bedstraw (O), wavy hair-grass (O), chickweed wintergreen (R), cranberry (*Vaccinium oxycoccus*) (R) and star sedge (R) also present. Several drains cross the area and these are dominated by rush species with marsh thistle and Yorkshire-fog also present. Tree regeneration was uneven and the area becomes more open towards the centre.

Target Note ID	OS Grid Reference	Description
26	NO 06049 38138	Marshy grassland. Marshy grassland dominated by rushes (articulated rush and soft-rush). With patches of more grassy/heathy vegetation, patches of sedge and areas of *Polytrichum commune* and *Sphagnum* spp. Other species recorded included: purple moor-grass (LA), common sedge (F-O), lesser spearwort (LF), cross-leaved heath (O), heather (O),marsh thistle (R), marsh willowherb (O), tufted hair-grass (O), Yorkshire-fog (O), tormentil (O-R), chickweed wintergreen (R), greater bird's-foot trefoil (R), hare's-foot cottongrass (R), marsh bedstraw (R), sneezewort (*Achillea ptarmica*) (R), star sedge (R), violet sp. (R).
27	NO 06116 38694	Pond. Large man-made pond in poor semi-improved grassland, possibly sown with seed mix (including common bird's-foot trefoil) and dominated by rush species (articulated rush, soft-rush) (in parts). The pond comprises two shallow (to very shallow pools) connected by a narrow, heavily vegetated ditch. Species recorded: articulated rush (A), soft-rush (A), duckweed (*Lemna* sp.) (LA), pondweed sp (LA), bottle sedge (F), common spike rush (*Eleocharis palustris*) (F-O), unbranched bur-reed (*Sparganium emersum*) (O-R), water mint (O-R), oval sedge (R) and sweet-grass (R).
28	NO 06438 38858	Invasive Non-native Species. Himalayan balsam scattered along the roadside by properties at Kingswood.
29	NO 05471 38639	Mill Dam SSSI - Area of wetland (swamp), marshy grassland, wet woodland and broad-leaved woodland. Around the open water, areas of swamp vegetation comprising single species stands of tall emergent, rush (articulated rush and soft-rush), bottle sedge, bulrush (*Typha latifolia*) and unbranched bur-reed. Open water areas (variable water depth) have floating species, yellow water lily and pondweed spp., both locally abundant. Bogbean is LD in some areas. Other species recorded include: spike rush (LA), water mint (LF), lesser spearwort (O), horsetail (O), marsh cinquefoil (O-R), marsh bedstraw (R), marsh marigold (R) and water plantain (*Alisma plantago-aquatica*) (R). The swamp areas transition into boggy areas (which "quake" in some locations) where marsh lousewort can be locally abundant into marshy grassland, poor semi-improved grassland and patches of aquatic emergent. Marshy grassland consists of a variety of grassland species grading into more swampy areas, wet woodland and also improved grassland in surrounding field, as well as small areas of acid bog. Species recorded: rush species (D-A), purple moor-grass (LA) devil's-bit scabious (F), common sedge (F), wild angelica (O), common bird's-foot trefoil (O), common valerian (*Valeriana officinalis*) (O), greater bird's-foot trefoil (O), sweet vernal-grass (F), common cottongrass (O), glaucous sedge (*Carex flacca*) (O), meadowsweet (O), Yorkshire-fog (O), ragged robin (*Silene flos-cuculi*) (O-R), selfheal (O-R), bog asphodel (R), marsh pennywort (*Hydrocotyle vulgaris*) (R), marsh willowherb (R), ragwort (R), round-leaved sundew (R), silverweed (*Potentilla anserina*) (R), skullcap (*Scutellaria galericulata*) (R), sneezewort (R), tufted vetch (R), yellow rattle (R). Unidentified orchid species were scattered across the habitat. Bog myrtle (*Myrica gale*) was recorded around a small watercourse. Perennial ryegrass, common sorrel (*Rumex acetosa*) and other species of agriculturally improved habitats were recorded at the habitat edge. Broad-leaved woodland with some coniferous species was present to the south of the site. Mainly oak (A) with birch (F), rowan (R), Scots pine (R) and spruce (*Picea* sp.) (R). Rhododendron was also present. Dead wood and some treefall were evident with little sign of management. The understorey was mainly grassy with areas of acid grassland/mosaic with wavy hair-grass (F), bilberry (F) and tormentil (F). Wet woodland areas were dominated by goat willow.
30	NO 05581 38765	Semi-natural broad-leaved woodland. Partly wet dense woodland much of which falls within the Mill Dam SSSI, and downstream of the dam itself. Ash (F), alder (F), birch (F), goat willow (F) and holly (R) were the main canopy species. Rhododendron was also present. The ground flora varied between grass, rush or horsetail dominated, or very scrubby (bramble). The area was unmanaged although tipping of garden rubbish had taken place. Other species recorded included: water mint (LA), Yorkshire-fog (F-O), wild angelica (O), common nettle (O), common valerian (O), creeping thistle (R), greater bird's-foot trefoil (O), raspberry (O), wood avens (O), hedge woundwort (O), tufted hair-grass (O-R), bittersweet (*Solanum dulcamara*) (R), bulrush (R), cleavers (R), giant bellflower (*Campanula latifolia*) (R), herb-Robert (*Geranium robertianum*) (R), marsh bedstraw (R), marsh cinquefoil (R), marsh marigold (R), meadowsweet (R), monkshood (R), selfheal (R), twayblade (R), water plantain (R). Unidentified orchid species were also present. Woodland on the other side of the road (at NO 05619 38819) is comprised of a mixture of native and non-native species: rhododendron (LA), sessile oak (*Quercus petraea*), sycamore, hawthorn, elm (*Ulmus* sp.), beech and non-native conifers.
31	NO 05440 38764	Invasive Non-native Species. Large stand of broad-leaved bamboo, also known as chimakizasa (*Sasa palmata*).

Target Note ID	OS Grid Reference	Description
32	NO 05473 38862	Broad-leaved trees. Small group of large mature oaks and beech, up to 60cm diameter at chest height and up to 25m in height.
33	NO 05415 38884	A small pond in an improved (cattle grazed) field. The pond was in an area of dense scrub (mainly goat willow) and tall dense ruderal (common nettle, creeping thistle) behind an electric fence. Other species recorded: soft-rush and duckweed.
34	NO 05495 39103	Broad-leaved semi-natural woodland (Byres Wood). The canopy was dominated by oak, Scots pine, sycamore birch, beech, rowan and spruce. Sweet chestnut (*Castanea sativa*) was rare to occasional and alder was frequent along watercourses. Some of the larger trees were 40-50 cm is diameter at chest height. Bracken (*Pteridium aquilinum*) was locally dominant but the ground flora was very variable from bare ground to grassy or herb rich, or scrub (bramble) dominated, but included a small number of potential ancient woodland indicator species. Towards the railway line rhododendron was locally dominant and extremely dense. The woodland appeared to be largely unmanaged. Other species recorded: bluebell (LA), great wood rush (LA), raspberry (LA), common nettle (F), selfheal (F), climbing corydalis (*Ceratocapnos claviculata*) (LF), Yorkshire-fog (LF), chickweed wintergreen (O), creeping buttercup (O), foxglove (O), hedge woundwort (O), herb-Robert (O), honeysuckle (O), wood avens (O), perennial dog's-mercury (*Mercurialis perennis*) (O-R), broad-leaved dock (R), common figwort (R), common valerian (R), harebell (*Campanula rotundifolia*) (R), ragwort (R), red campion (R), red fescue (R), violet sp. (R), wavy hair-grass (R), wood sage (*Teucrium scorodonia*) (R), wood sorrel (R) and yellow pimpernel (*Lysimachia nemorum*) (R).

Agricultural Land and Grassland

2.1.24 Agricultural land comprised the majority of the study area consisting of arable and grazing land, the majority of the latter being improved grassland. The improved grassland consisted of species typical of agricultural intensification and re-seeding including perennial ryegrass (*Lolium perenne*), white clover, meadow foxtail (*Alopecurus pratensis*), rough meadow grass (*Poa trivialis*) and crested dog's-tail. The herb count was low.

2.1.25 Poor semi-improved grassland had a greater range of grass and herb species but diversity was still low and the species recorded were common and widespread.

2.1.26 In addition, land used for grazing included areas of marshy grassland which was mainly adjacent to the Cairnleith Moss SSSI. These are described below under wetlands.

Woodland

2.1.27 Woodland habitat was found principally in the northern part of the study area and consisted mainly of coniferous plantation woodland of various stages of development, including felled and replanted. Some mixed and broad-leaved woodland planting was present but these areas were young. In general, plantation woodlands often have a poorly developed ground flora and this was true of the older, mature areas.

2.1.28 A single area of AWI ancient woodland, Byres Wood, was present within the study area at the extreme northern end (Target note 34). The main canopy was comprised of mainly native species. The ground flora was highly variable although containing a few species that could be classed as ancient woodland indicators (bluebell, great wood rush and perennial dog's-mercury) (Rose, 2006). Parts of the woodland had been clear-felled and re-planted, whilst bracken and rhododendron formed dense stands elsewhere.

2.1.29 Semi-natural broad-leaved woodland in around Gelly Woods/Muir of Thorn (Target note 15, 17 and 20) was mainly derived from long-established plantations. It comprised a variety of species including coniferous species (Scots pine and larch) and obviously planted specimens of mature beech. Natural regeneration of silver birch was evident. The ground flora was generally poor but characteristic of heathland or acid grassland. Heather, bilberry and chickweed wintergreen were distinctive features in parts of the woodland. Small sedge or cottongrass dominated wetland areas were also occasionally present, but these were species poor.

2.1.30 Other small areas of semi-natural woodland in the Muir of Thorn and Cairnleith Moss area comprised grey willow goat willow, silver and downy birch (*Betula pubescens*). These were in wetland habitats with a bryophyte or swamp understory.

2.1.31 A small area of semi-natural coniferous woodland was present in the north of the study area (Target note 19). This comprised mature specimens with a generally poor ground flora due to grazing. At the northern end of the woodland there was a transition to wet modified bog.

2.1.32 Broad-leaved woodlands in the south of the study area were generally of poor quality and had a high presence of sycamore.

Heathland and Bog

2.1.33 Heathland and bog habitats were found mainly in the plantation woodland areas and in Cairnleith Moss SSSI (Target note 14). Habitats within the woodland, wet heath, dry heath and dry heath/acid grassland mosaics were species poor and heavily modified from planting. It has developed in open areas within the woodland where trees have either been felled or have not produced a closed canopy. A large area of dry heath/acid grassland in Gelly Woods has formed on recently planted coniferous plantation woodland and will tend to deteriorate in extent and species rich as the canopy closes.

Wetlands

2.1.34 Wetland habitats were present mainly within or adjacent to the two SSSIs. The largest component of this was marshy grassland and most of this was of low species diversity. Around the Cairnleith Moss SSSI the marshy grassland was used for grazing (Target note 16), but small areas of marshy grassland were present elsewhere, for instance, within the plantation woodland areas.

2.1.35 Swamp and fen habitats were associated with the two SSSIs. The area within the Cairnleith Moss SSSI was a good example of swamp habitat.

Other Habitats and Species

2.1.36 Tall ruderal habitat comprised common species of low conservation interest such as common nettle, creeping thistle and rosebay willowherb (*Chamerion angustifolium*).

2.1.37 Two species of conservation interest were recorded within the study area. Greater butterfly-orchid, a SBL species and classed as “near threatened” (Cheffings & Farrell et al., 2005) was recorded by the Garry Burn in Bankfoot (Target note 12). Lesser butterfly-orchid, also a SBL species and classed as “vulnerable” (Cheffings & Farrell et al., 2005) was recorded within and adjacent to the Cairnleith Moss SSSI (Target note 14).

2.1.38 Lesser butterfly-orchid was included in the Species Action Framework, a targeted programme of management action undertaken between 2007 and 2012 (SNH, 2007c). Surveys conducted in 2013 found that the species is widely distributed, but declining, in Scotland with a stronghold in the north and west.

Non-native Species

2.1.39 Non-native species were recorded at a number of locations. Rhododendron was found in woodland in the northern part of the study area and Himalayan balsam was recorded along watercourses in the study area. Monkeyflower and pink purslane were also recorded along the Garry Burn and by the Shochie Burn, respectively. A stand of broad-leaved bamboo was recorded near the Mill Dam SSSI (Target note 31).

2.1.40 Rhododendron is widespread on acid soils throughout the UK. Flowers are pollinated by bees, hoverflies and butterflies. Each flower head can produce approximately 3000-7000 seeds, so a large bush can produce several million seeds per year (GB Non-Native Species Secretariat

(NNSS), 2011a) and seeds can remain viable for several years. The dense thickets of rhododendron plants shade out other plants preventing regeneration of indigenous vegetation. It is also poisonous to livestock and hosts disease organisms which attack beech and oak.

2.1.41 Himalayan balsam is a well established annual herb widespread throughout Britain (GB NNSS, 2011b). It occurs in moist and semi-shaded damp areas. The environmental impact from Himalayan balsam is considered to be high; it forms extensive monocultural stands, shading and crowding out many native species. In addition, it produces much nectar and is attractive to pollinating insects possibly to the detriment of native flowering plants (GB NNSS, 2011b).

2.1.42 Monkeyflower occurs in marshland, high altitude meadows and on the banks of streams and pools (GB NNSS, 2011c). The plant spreads by means of seeds and stolons; it may also spread from detached pieces of lower stem and rhizome. It has been assessed as being unlikely to have a significant impact on natural ecosystems.

2.1.43 Pink purslane is a low growing plant of moist woodland, especially near river banks (GB NNSS, 2011d). Species spread is by seed and possibly also by bulbils. Although the species is spreading "it would probably be an exaggeration to describe it as invasive" (GB NNSS, 2011c); it may suppress other plant species early in the season, but there is no other evidence that it has any ecosystem impact.

2.1.44 The GB NNSS does not provide any information with regard to the invasive potential of broad-leaved bamboo, although the Royal Horticultural Society (www.rhs.org.uk) classes it as invasive due to its growth habit (long underground rhizomes). The species was first recorded from the wild by 1964 and is apparently increasing, mostly due to deliberate planting (Preston et al., 2002).

Phase 2 Habitat Survey

2.1.45 A Phase 2 habitat survey of that portion of the Cairnleith Moss SSSI within the study area was undertaken. Land or vegetation parcels were ground truthed against the mapped NVC information received from Perth and Kinross Council.

2.1.46 The available information indicated that significant parts of the SSSI within the study area had been classified as W23. This type of vegetation is dominated by gorse, with a species-poor ground flora of plants such as bramble and bracken (Averis et al., 2004; Rodwell, 1991a). W23 is usually a secondary vegetation type developing on cleared woodland or on abandoned pasture. The Phase 2 survey indicated that the W23 vegetation was almost entirely absent from the area where it was previously indicated to occur, the gorse being reduced to seedlings, scattered plants or small stands within other vegetation types.

2.1.47 In the south of the site, the W23 vegetation had been in a mosaic with U4 (acid grassland) vegetation. The U4 vegetation was still present but in a mosaic with M23 (articulated rush) and patches of purple moor-grass tussocks suggesting small areas of M25. The M25 was also in transitions to both sub-communities, the heathy (M25a *Erica tetralix* sub-community) and grassy forms (M25b *Anthoxanthum* sub-community). Frequent common cottongrass in some areas suggested the M15 (M15b typical sub-community) community. Lesser butterfly-orchid was found scattered across this area (Target note 14) with fragrant orchid and twayblade also seen, together with heath and common spotted orchids.

2.1.48 Towards the northern part of the site, the W23 parcel was dominated by downy birch, with a species-poor mainly grass (including purple moor-grass and Yorkshire-fog) or soft-rush dominated ground flora, with a low herb count. There were small patches of drier acid grassland vegetation with wavy hair-grass, bird's-foot trefoil, tormentil and chickweed wintergreen. This vegetation was reminiscent of the W4 *Betula pubescens-Molinia caerulea* woodland.

2.1.49 Parts of the previously recorded M15 vegetation appeared to be dominated by purple moor-grass with a concurrent reduction in species such as deergrass, cross-leaved heath, heather and common cottongrass. This indicated a tendency for a transition to M25 (M25a), a community where

purple-moor grass dominates which can occur as a result of reduced grazing (Averis et al, 2004; Rodwell, 1991b).

2.1.50 Within the study area there appeared to be no change in the extent of the S27 vegetation and little change in the large area of M23. However, the S27 itself was very variable in composition including areas dominated by bottle sedge forming dense tussocky like vegetation, with more open areas of pondweed and areas where bogbean was dominant. The bottle sedge vegetation falls into the S27a sub-community (*Carex rostrata-Equisetum fluviatile*) with the bogbean vegetation being classed as S27b (*Lysimachia vulgaris* sub-community) (Rodwell, 1995).

2.1.51 In the most northerly part of the site within the study area, the vegetation had been recorded as being in bands of M23, M25 and U4. The current survey suggested that this was an over-simplification of the situation and that the three communities occurred in a complex mosaic with transitions between the three. High levels of Yorkshire-fog in some areas suggested a transition towards the MG10 (MG10a) *Holcus lanatus-Juncus effusus* rush-pasture (typical sub-community). Lesser butterfly-orchid was also seen in this area.

2.1.52 Overall, the vegetation types recorded indicated a loss of gorse, possibly through clearance, resulting in an increase in grassland, mire and wet heath communities. The survey also showed that in some locations there had been a change in the wet heath vegetation (M15) to a more wet grassland/mire vegetation (M25) which can occur due to a relaxation in grazing. In general, outwith the large rush-pasture areas (M23) species composition was very variable showing transitions on a micro-scale between a variety of acid grassland, mire, wet heath and, in some locations, swamp vegetation.

3 Terrestrial Invertebrates

Consultation Information

3.1.1 No consultation information was received through the EIA process with regard to terrestrial invertebrates.

Desk Based Study

3.1.2 A data search on National Biodiversity Network (NBN) Gateway (NBN, 2013) identified one record of terrestrial invertebrate, a mason bee species (*Osmia* sp.) (Table 5).

Table 5: Terrestrial Invertebrate Species Recorded by NBN.

Date Recorded	Grid Reference	Location	Species	Frequency	Record Type
June 2012	NO 086 292	Battleby	A mason bee	1	Presence

3.1.3 Tayside Biodiversity Partnership has identified 51 terrestrial invertebrate species either within the current LBAP (HAPs) or within draft HAPs (Table 6). Only the northern damselfly (*Coenagrion hastulatum*) is classified as endangered on the IUCN Red List 2001. All other species are of lower concern.

Table 6: Terrestrial Invertebrate listed in Habitat Plans on the Tayside LBAP

Note: draft/Consultative Habitat Plans are shown in Italics

Name	Habitat Plan	Conservation Status
Beetles	*Businesses with Land*	-
Bumble bees (*Bombus* spp.)	*Calcareous and base-rich grassland* *Stone Dykes* *Businesses with Land* *Hospital, Sheltered Housing and Residential Complexes* *Schools, College and University Grounds*	-

Name	Habitat Plan	Conservation Status
Butterflies and moths	*Hospital, Sheltered Housing and Residential Complexes*	-
Damselfly spp.	*Wet Grassland* *Hospital, Sheltered Housing and Residential Complexes* *Schools, College and University Grounds*	-
Grasshopper spp.	Wet Grassland	-
Grasshoppers and Beetles	*Hospital, Sheltered Housing and Residential Complexes*	-
Grasshoppers, damselflies and dragonflies	Built and Developed Environment	-
Hoverfly spp.	Wet Grassland	-
A beetle (*Abdera flexuosa*)	*Traditional Orchards*	-
A beetle (*Triplax russica*)	*Traditional Orchards*	-
A click beetle (*Ampedus tristis*)	*Planted Coniferous Woodlands*	-
A diving beetle (*Hydroporus rufifrons*)	Standing Open Water	SBL
A leaf beetle (*Cryptocephalus primaries*)	Calcareous and base-rich grassland	-
A reed beetle (*Donacia aquatica*)	*Ponds & Pools*	SBL
Ten spotted spot beetle (*Crytocephalus decemmaculatus*)	*Wet Woodlands*	SBL
A cranefly (*Rhabdomastrix laeta*)	Rivers & Burns *Ponds & Pools*	SBL
A cranefly (*Lipsothrix errans*)	*Wet Woodlands*	SBL
A cranefly (*Tipula laetabilis*)	*Wet Woodlands*	SBL
A hoverfly (*Parasyrphus nigritarsis*)	*Wet Woodlands*	SBL
A stiletto fly (*Spiriverpa lunulata*)	Rivers & Burns	SBL
A stonefly (*Brachyptera putata*)	Rivers & Burns	SBL
A true Fly (*Tanyptera nigricornis*)	*Traditional Orchards*	SBL
A mason bee (*Osmia inermis*)	Calcareous and base-rich grassland	SBL
A mason bee (*Osmia parietina*)	Stone Dykes	SBL
Cuckoo wasp (*Chrysura hirsuta*)	Calcareous and base-rich grassland Native Pinewoods	SBL
A spider (*Dipoena torva*)	Native Pinewoods	SBL
A spider (*Haplodrassus soerenseni*)	Native Pinewoods	SBL
A spider (*Robertus scoticus*)	Native Pinewoods	SBL
Caledonian sac spider (*Clubiona subsultans*)	Native Pinewoods	SBL
Hairy wood ant (*Formica lugubris*)	*Lowland Mixed Broadleaved Woodlands* *Planted Coniferous Woodlands*	-
Narrow-headed wood ant (*Formica exsecta*)	Native Pinewoods	SBL
Scottish wood ant (*Formica aquilonia*)	Native Pinewoods *Planted Coniferous Woodlands*	-
Shining guest ant (*Formicoxenus nitidulus*)	Native Pinewoods *Lowland Mixed Broadleaved Woodlands* *Planted Coniferous Woodlands*	SBL
Common blue damselfly (*Enallagma cyathigerum*)	Businesses with Land	-
Northern damselfly (*Coenagrion hastulatum*)	Standing Open Water	SBL
A micro-moth *Ancylis tineana*	Calcareous and base-rich grassland	-
Cousin German moth *(Protolampra sobrina)* Formerly *Paradiarsia sobrina*	Native Pinewoods	SBL
Garden tiger moth (*Arctia caja*)	Businesses with Land	-
Goat moth (*Cossus cossus*)	*Traditional Orchards*	SBL
Sword-grass moth (*Xylena exsoleta*)	Wet Grassland	SBL

Name	Habitat Plan	Conservation Status
Meadow brown butterfly (*Maniola jurtina*)	Built and Developed Environment *Schools, College and University Grounds*	-
Mountain ringlet (*Erebia epiphron*)	Calcareous and base-rich grassland	SBL
Northern brown argus (*Aricia artaxerxes*)	Calcareous and base-rich grassland	SBL
Orange tip butterfly *Anthocharis cardamines*	Built and Developed Environment *Schools, College and University Grounds*	-
Painted lady butterfly *Vanessa cardui*	Built and Developed Environment	-
Peacock butterfly *Inachis io*	Built and Developed Environment Businesses with Land *Schools, College and University Grounds*	-
Pearl-bordered fritillary (*Boloria euphrosyne*)	Native Pinewoods *Lowland Mixed Broadleaved Woodlands*	SBL
Red admiral butterfly (*Vanessa atalanta*)	Built and Developed Environment Businesses with Land *Schools, College and University Grounds*	-
Ringlet butterfly (*Aphantopus hyperantus*)	Hedgerows and Treelines Built and Developed Environment *Schools, College and University Grounds*	-
Small blue butterfly (*Cupido minimus*)	Calcareous and base-rich grassland	SBL
Small pearl-bordered fritillary (*Boloria selene*)	Wet Grassland *Planted Coniferous Woodlands*	SBL

SBL = Listed on Scottish Biodiversity List

Incidental Observations

3.1.4 Incidental observations were made of a number of butterfly, moth and dragonfly and species (Table 7). Observations of the small pearl-bordered fritillary (*Boloria selene*) were made in Gelly Wood at the northern end of the study area, especially along the edge of tracks and in cleared areas. It was also recorded in the Cairnleith Moss SSSI. Damselfly records were mainly from ponds or other wetland habitats, including vehicle tracks in Gelly Wood.

3.1.5 The orange tip butterfly, peacock butterfly and common blue damselfly are also listed within habitat action plans of the Tayside LBAP, although not in plans associated with habitats where the incidental observations were recorded.

Table 7: Incidental Observations of Invertebrate Species

Invertebrate Species	Grid Reference	Location	Date
Common blue butterfly (*Polyommatus Icarus*)	NO 07235 37730	Muir of Thorn (clearfell area)	07.08.2013
Orange-tip butterfly	NO 08792 29905	Shochie Burn Loch	19.06.2013
Peacock butterfly	NO 08792 29905	Shochie Burn Loch	19.06.2013
Small pearl-bordered fritillary	NO 06323 38161 NO 06532 37213 NO 06283 37493 NO 07641 36084	Gelly Wood (trackside) Gelly Wood (pond) Gelly Muir (clear fell area) Cairnleith Moss SSSI	21.06.2013 25.06.2013 25.06.2013 16.07.2013
Clouded border moth (*Lomaspilis marginata*)	NO 06532 37213	Gelly Wood (pond)	25.06.2013
Blue-tailed damselfly (*Ischnura elegans*)	NO 08792 29905 NO 07216 34994 NO 05429 388629 NO 06116 38694	Shochie Burn Loch A9 SUDS pond (east) Mill Dam SSSI Pond near Kingswood	19.06.2013 - 07.08.2013 07.08.2013
Common blue damselfly	NO 07140 37107 NO 08792 29905 NO 06532 37213 NO 05428 83690	Muir of Thorn (pond) Shochie Burn Loch Gelly Wood (pond) Mill Dam SSSI	06.06.2013 19.06.2013 25.06.2013 07.08.2013
Large red damselfly (*Pyrrhosoma nymphula)*	NO 07140 37107 NO 08792 29905	Muir of Thorn (pond) Shochie Burn Loch	06.06.2013 19.06.2013

Invertebrate Species	Grid Reference	Location	Date
	NO 06237 37884 NO 06532 37213 NO 07216 34994 NO 05428 38690	Gelly Wood (ditch) Gelly Wood (pond) A9 SUDS pond (east) Mill Dam SSSI	21.06.2013 25.06.2013 - 07.08.2013
Four-spotted chaser (*Libellula quadrimaculata*)	NO 07140 37107	Muir of Thorn (pond)	06.06.2013
Common hawker (*Aeshna juncea)*	NO 06018 38179 NO 05517 38637	Gelly Wood (woodland glade) Mill Dam SSSI	21.06.2013 07.08.2013

Field Survey

3.1.6 Assessments of invertebrate habitat potential were undertaken between June and August 2013 as part of the Phase 1 habitat surveys. Twelve land parcels were identified within the study area. Descriptions of these parcels and of cultivated land are provided in Table 8.

Table 8: Areas Assessed for Invertebrate Habitat Potential

Habitat Area	Name/Location	Description
1	Shochie Burn	Watercourse north of Luncarty. Forms part of the River Tay SAC and includes Shochie Burn Loch, small patches of woodland, scattered trees and scrub, and a small wetland area.
2	Lower Ordie Burn	Watercourse north of Luncarty and east of the A9. Forms part of the River Tay SAC and flows into the Shochie Burn. Small patches of woodland, scattered trees and scrub and semi-improved grassland are present along the watercourse.
3	Upper Ordie Burn	Watercourse north of Luncarty and west of the A9. Forms part of the River Tay SAC and flows into the Shochie Burn, and includes small patches of woodland, scattered trees and scrub and a fowling pond.
4	Five Mile Wood	Area of mainly single-species and age coniferous plantation woodland.
5	Garry Burn	Watercourse between Luncarty and Bankfoot and west of the A9. Forms part of the River Tay SAC and includes small patches of woodland, scattered trees and scrub and semi-improved grassland.
6	Cairnleith Moss SSSI	A large area of wetland SSSI. Within the study area, the SSSI is a complex mosaic of wet heath, swamp, scrub and acid grassland communities. The habitat area includes adjacent areas of marshy grassland and woodland.
7	Semi-natural broad-leaved woodland by A9	Area of semi-natural broad-leaved woodland on either side of the A9.
8	Muir of Thorn (south)	An area of mainly coniferous plantation woodland, but also including areas of swamp, *Sphagnum* bog, wet woodland, wet heath and Scots pine woodland.
9	Gelly Woods	A large area comprising large parcels of coniferous plantation woodland, felled woodland, recently planted woodland (with wet or dry heath understory), marshy grassland, and semi-natural broad-leaved woodland.
10	Muir of Thorn (north)	A large area comprising parcels of mainly coniferous plantation woodland, felled woodland and heath areas under naturally regenerated scrub.
11	Mill Dam SSSI	An area of wetland SSSI. The site comprises areas of open water swamp, marshy grassland, wet woodland and broad-leaved semi-natural woodland.
12	Byres Wood	An area of broad-leaved semi-natural woodland, plantation and felled woodland.
-	Cultivated land (arable and grazing)	Large areas of cultivated land comprising arable and grazing land. The latter is composed of mainly improved and poor-semi-improved grassland, scattered trees, species-poor hedges, small areas of woodland and wetland (marshy grassland, wet ditches and ponds) are also present.

3.1.7 Parcel 4 had Low potential. Habitat potential scores varied within the eleven land parcels classed as having Moderate habitat potential. The highest scores were returned for land parcels 11 (Mill Dam SSSI) and 9 (Gelly Woods) at 19 and 18 respectively, with parcels 10 and 12 (Muir of Thorn (north) and Byres Wood) scoring 17 (Table 9). The lowest scores (within the Moderate band) were returned for parcels 1-3, 5 and 7 which scored 10 or 11 (Shochie Burn, lower and upper Ordie Burn, Garry Burn and semi-natural broadleaved woodland by the A9).

3.1.8 Collectively, cultivated land (arable and improved/poor semi-improved grassland) was assessed as having Low habitat potential for invertebrates (score = 9).

Table 9: Land Parcels Assessed for Invertebrate Habitat Potential

Invertebrate Habitat Criteria	Land Parcel											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Decaying timber	1	1	1	1	1	1	2	1	2	2	2	3
Rotational management	1	1	1	1	1	1	1	1	2	2	1	1
Nectar sources	1	1	1	1	1	2	2	2	2	2	2	3
Wetland features	3	3	3	3	3	3	1	2	3	2	3	1
Structural patchwork	2	2	2	1	1	2	1	2	3	2	3	1
Still air	1	1	1	1	1	1	2	2	2	2	2	2
Connectivity	1	1	1	0	1	2	2	3	2	3	3	3
Ecoclines	0	0	0	0	0	2	0	1	1	1	2	1
Bare Earth	1	1	1	1	1	1	0	1	2	1	1	1
Total Score	**11**	**11**	**11**	**9**	**10**	**15**	**11**	**15**	**18**	**17**	**19**	**17**

4 Bats

Consultation Information

4.1.1 Six organisations, the Bat Conservation Trust (BCT), Perth Bat Group (PBG), SNH, National Trust for Scotland, Perth and Kinross Council and the Perth Museum Biological Records Centre, were consulted for information on bats. The BCT noted that the habitat, woodland and water make for a good feeding habitat and believed bats to be present in the area. Tayside Bat Group confirmed that bats were recorded in the Luncarty to Pass of Birnam area, mainly near the river, and also in Luncarty and Bankfoot. Tayside Bat Group also confirmed the presence of a large maternity colony of pipistrelles north of Perth but outside the study area.

Desk Based Study

4.1.2 A data search on NBN Gateway (NBN, 2013) identified records of common (*Pipistrellus pipistrellus*) and soprano (*P. pygmaeus*) pipistrelle and brown long-eared bats (*Plecotus auritus*) within the study area during 1970-2007. Specifically, common pipistrelle bats have been recorded in the 1km grid squares at Luncarty (National Grid Reference (NGR) NO 09 29) and Bankfoot (NO 06 35); soprano pipistrelle bats have been recorded in the 1km grid square west of the scheme at Redgorton (NO 08 29); brown long-eared bats have been recorded north of Waterloo in the 1km grid square west of the scheme (NO 05 38). It is not clear whether these records relate to field capture, roost or other data.

4.1.3 During the Stage 2 Environmental Assessment, a casualty record of one brown long-eared bat was recorded near Bankfoot (NO 06 35) by Perth and Kinross Council on 20th August 1998 (Atkins, 2009). One field record of a vesper bat species (Vespertilionidae) was also observed in Bankfoot (NO 07193489) on the east side of the A9 in March 1995 (Atkins, 2009). In addition, the BCT also provided data with records in the area of common and soprano pipistrelle, brown long-eared, Daubenton's bat (*Myotis daubentonii*) and Natterer's bat (*M. nattereri*) (Atkins, 2009). The Stage 2 Environmental Assessment also identified bats crossing the existing road at the Luncarty flyover (NO 09336 29348), Newmills crossroads (NO 08406 32478) and the Gelly Wood crossroads (NO 06732 37634).

4.1.4 Nine species of bats, common pipistrelle and soprano pipistrelle, brown long-eared bat, Nathusius' pipistrelle (*Pipistrellus nathusii*), noctule (*Nyctalus noctula*), Natterer's bat, whiskered bat (*Myotis mystacinus*), Daubenton's bat and Brandt's bat (*Myotis brandtii*) are listed on the SBL. The Tayside Biodiversity Partnership has a proposed SAP for five bats species known to be within the area. These are; common pipistrelle, soprano pipistrelle, Daubenton's bat, brown long-eared and Natterer's bat.

Incidental Observations

4.1.5 Two incidental sightings of bats were recorded. A pipistrelle sp. bat was seen emerging from a barn

at Newmill Farm, and a Daubenton's bat was seen roosting in Ordie culvert (Peter Stronach, Company Director - The Wildlife Survey Unit Ltd. pers. comm., Dr Susie Coyle, Jacobs, July 2013).

Bat Survey

Habitat Survey

4.1.6 A visual survey was undertaken in March 2013 to assess the habitat between Luncarty and Pass of Birnam for potential as foraging, commuting and roosting habitat for bats and is described in Table 10. For the purposes of the assessment sites were identified numerically with the exception of cultivated land which was considered as 'everything else' (Figure 10.5). As bats are a mobile species habitat areas were not considered in isolation.

Table 10: Bat Habitat Descriptions

Site and ID Number	Roost Value	Foraging Value	Commuting Value	Habitat Description
Luncarty - 1	High	Medium	Medium	The village of Luncarty is a modern, urban area east of the existing A9 with high roosting potential for species such as common and soprano pipistrelles. Foraging habitat includes urban habitats and gardens, tree lined roads, and Shochie Burn which may support Myotis species (sp.) such as Daubenton's bats. Commuting routes exist along Shochie Burn and tree lined roads and provides connecting habitat to foraging habitat at the River Tay.
Shochie Burn - 2	Medium	High	High	Shochie Burn provides good foraging potential for various bat species primarily Myotis sp., as a result of the section of the burn featuring a standing water body (attracting various invertebrates) and coniferous vegetation that lines the water course on both sides, also adding to its commuting value for bat species. To the east of the A9 is Shochie Viaduct, a stone railway bridge with four arches (cracks in the roof of the bridge provide potential roost sites for various bat species). The surrounding area consists primarily of cultivated arable land with an area of residential housing and amenity grassland to the south-east. Further to the east is the River Tay.
Ordie Burn - 3	Medium	High	High	Ordie Burn provides good foraging potential for various bat species primarily Myotis sp. due to the running water and coniferous vegetation that lines the water course on both sides, also adding to its commuting value for bat species. Ordie Viaduct; a stone railway bridge is located to the east of the A9 and features two arches (cracks in the roof of the bridge pose potential roost sites for various bat species). The surrounding area primarily consists of cultivated arable land with an area of residential housing and amenity grassland to the south-east. To the north east of the burn, Sand Pit railway bridge offers roosting potential for bats.
Newmill - 4	High	High	High	Area surrounding Newmill Farm east and west of existing A9. Newmill Farm and barns offer high roosting potential for all bats species in the area. Mature oak and sycamore trees with potential to support roosting bats also exist to the east of the carriageway. The area includes arable land with low value to bats. A road lined with mature trees and hedgerow offers a wildlife corridor for foraging and commuting. Ordie Burn and Ordie tributary which are to the west of and are close to Newmill, are also tree lined which offer an excellent foraging and commuting route for all bat species within the area. An additional commuting route exists along a dismantled railway and the Newmill railway bridge offers roosting potential for bats. Five Mile Wood also offers excellent foraging and commuting habitat on the east of the existing A9 carriageway.
Westwood - 5	High	High	High	The area surrounding Westwood Farm has high potential for roosting bat species. The stone quarry located on the eastern side of the A9 has many accessible gaps and crevices leading deep into the middle of the stone piles. Foraging and commuting opportunities are also considered as high due to the presence of Garry Burn to the north west of the A9 (ideal for Myotis sp.) and deciduous trees lining the western side of the A9, providing a wildlife corridor for foraging bats. The

Site and ID Number	Roost Value	Foraging Value	Commuting Value	Habitat Description
				surrounding area largely consists of large cultivated arable fields, three residential buildings and large barns which are currently in use.
Garry Burn - 6	Medium	High	High	Garry Burn provides some potential for roosting bats due to the presence of oak trees on the eastern bank of the burn, south of the Perthshire Visitor Centre. The burn also offers good foraging potential for various bat species primarily Myotis sp. due to the running water and trees that line the watercourse to the east, also adding to its commuting value for bat species. The surrounding area consists primarily of cultivated arable land with an area of residential housing.
Bankfoot - 7	Medium	Medium	Medium	A modern urban area west of the existing A9 offering medium roosting potential for roosting bats such as common and soprano pipistrelles. Foraging habitat is limited to pasture edge habitat and Garry Burn which runs through Bankfoot. Commuting routes are limited to burn/riparian habitat and some tree lined roads.
Coltrannie/ Cairnleith Crossing - 8	Medium	High	High	The area around Coltrannie Farm west of the existing A9 is mainly arable farmland and young plantation woodland which offers low potential for roosting bats. Foraging habitat includes treelines along arable fields and a small area of deciduous mixed woodland which exists on both east and west sides of the A9, particularly in the area west of Cairnleith Moss SSSI. Commuting habitat also exists at this section of woodland which may offer connectivity across the A9 carriageway.
Muir of Thorn woodland - 9	Low	Low	High	The Muir of Thorn woodland in the Murthly Estate consists of mainly plantation conifer which offers low potential for roosting bats. Foraging habitat is limited to areas of rough grassland, pasture and woodland edge. Commuting habitat exists along woodland edge and tree lines between arable fields.
Gelly Wood - 10	Medium	Medium	Medium	The area of Gelly Wood in the Murthly Estate consists of semi-natural coniferous woodland which offers medium level roosting potential for bats. Foraging habitat includes a small area of mixed deciduous woodland, rough grassland and pasture. Commuting habitat exists along woodland edge and tree lines between arable fields and pasture.
Murthly Estate (north) - 11	Low	Medium	Medium	The northern section of the Murthly Estate consists mainly of plantation woodland with some areas of clear felled, scrub and coniferous woodland, offering low potential for roosting bats. Limited foraging potential exists around the areas of scrub and young plantation. Commuting routes exist along woodland edge habitat.
Byres of Murthly/ Mill Dam SSSI - 12	High	Medium	High	North of Gelly wood lies an area of grazed grassland adjacent to which are areas of wetland, broad-leaved woodland and coniferous plantation woodland. A line of mature trees in which three tree roosts were identified crosses the grassland connecting the habitats. The broad-leaved woodland also offers good roosting potential whilst the wetland and woodland edges offer good foraging habitat.
Cultivated land	Low	Low	Medium	Large pockets of cultivated land exist along the route of the A9. This is primarily arable, however, some pasture is also present which has been subjected to cattle grazing. These areas are considered to be of low value to bats due to the fragmentation of woodland and lack of suitable habitat (Fuentes-Montemayor et al., 2013).

4.1.7 The habitat was assessed to be of high foraging potential along the tree lined Shochie, Ordie and Garry burns (Figure 10.5). Additional areas of high foraging potential were identified in Gelly Wood (NO 06737 37128) a semi-natural coniferous woodland to the west of the A9; and within Cairnleith Moss SSSI (NO 07116 36260), which is a mixed, semi-natural woodland located along the eastern edge of the A9 north east of Bankfoot. Newmill crossroads (NO 08543 32240) also offers high foraging potential for bats as does the habitat close to Westwood Farm (NO 07998 33267). Areas of broadleaved woodland located west of the A9 at NO 0689 3649 and NO 0664 3705 were also assessed as having high potential to support foraging bats. Smaller areas of woodland are located along the entire length of the existing A9 and were assessed to have moderate foraging potential for bats; as were the urban areas of Luncarty and Bankfoot.

Roost Survey Results

Trees

4.1.8 Trees along the route were surveyed in March 2013 for their potential to support roosting bats. Additional surveys were undertaken in August 2013 to take account of a change in the study area. Surveys were carried out in accordance with the best practice guidance (BCT, 2012; Cowan, 2003). A total of 183 trees (or groups of trees) were surveyed for roost potential according to Cowan (2003). Of the 183 trees; 24 were assessed at Category 1*, 97 as Category 1, 53 as Category 2 and 9 as Category 3. Results of the individual tree assessments are shown in Table 11 and Figure 10.5. Three trees (158, 160 and 164) towards the northern end of the proposed scheme were identified as confirmed bat roosts due to the presence of droppings. It is possible that droppings are from Nathusius' pipistrelle as this species is a tree roosting bat and the species has been recorded in the area.

Table 11: Bat Tree Survey Results

Tree ID	Grid Reference	Tree Species	Roost Category	Survey Results
1	NO 08962 31162	Beech	2	Some raised bark, may be other features higher up but not obvious from ground.
2	NO 08496 32215	Oak	1	Dead limb with cracks, fallen limbs with knots and gaps between bark, dead limbs with bark flaps. Mostly north and south facing, > 3m in height.
3	NO 08456 32230	Sycamore	2	Has potential features higher up but cannot assess easily from ground.
4	NO 08529 32300	Sycamore	2	May have suitable features higher up but not obvious from the ground.
5	NO 08539 32309	Sycamore	2	North facing knot holes (>5m in height) depth unknown.
6	NO 08564 32356	Oak	1	Broken branches, decayed branches, lifted bark - all on trunk or large branches. Features > 5m in height.
7	NO 08580 32365	Oak	2	No obvious features from the ground.
8	NO 08584 32378	Oak	1*	Crack/cavity goes from base of tree to approx. 6m. From about 5m up the cavity/crack closes over – north west facing feature.
9	NO 08584 32405	Oak	1	Dead wood, bark into cavities, broken limbs, potential holes. Only negative about tree is the largest hole is open to rain BUT there is dark staining around this feature.
10	NO 08573 32422	Oak	1	Dead limbs, cracks, bark flaps. All north west to north facing, > 6m in height.
11	NO 08517 32460	Oak	1	Rotten/dead branches, split branches and bark flaps. Features north and west facing, > 5m in height.
12	NO 08496 32476	Oak	1	One knot hole and small amount of split and dead branches, north and west facing and > 6m in height.
13	NO 08482 32492	Oak	1	One split branch.
14	NO 08449 32513	Oak	1	Split branch off main trunk about 20m high, east facing.
15	NO 08386 32555	Oak	1	Cracks, holes and splits in trunk and main stems. All features start > 4m and are mostly north and east facing.
16	NO 08469 32479	Oak	1	Large crack in north east facing branch about 25m high.
17	NO 08307 32607	Oak	1	Dead limbs with bark flaps, cracks, rotten wood. Features > 6m in height and north, west and south facing.
18	NO 08302 32629	Oak	1	Limbs with dead wood higher up. Ivy around lower reaches of tree up to about 12m in height. Features at height of 10m. Also a crack in a stem off the main trunk. south and east facing
19	NO 08293 32649	Oak	2	No obvious feature from ground but age of tree suggests there may be features higher up.
20	NO 08291 32651	Oak	1	Dead wood high up in tree and a broken limb with cracks. Cracks are west facing and > 5m in height
21	NO 08264 32694	Oak	2	May be features higher up.
22	NO 08245 32735	Oak	1	Dead wood/limbs, broken limbs, bark flaps and holes that may lead to larger cavities. All features east to south facing and > 4m in height.
23	NO 08203 32795	Oak	1	Dead wood, broken limbs, knot holes all facing west to south and > 3m in height.

Tree ID	Grid Reference	Tree Species	Roost Category	Survey Results
24	NO 08217 32788	Oak	2	Presence of dead wood but no obvious features.
25	NO 08200 32808	Oak	1	Cracked and broken limbs and diseased (?) limbs with holes. Features are east and west facing and > 6m in height.
26	NO 08176 32843	Oak	1*	Holes in broken limbs/calluses that may lead to cavities and dead wood, broken limbs. Features are mainly north west facing and about 9m in height.
27	NO 08164 32851	Oak	1*	Broken limbs with cracks and dead wood. Main feature > 9m in height and features are East, North and west facing.
28	NO 08175 32967	Ash	1	Dead wood, About 12m high. Holes look water logged.
29	NO 08176 32970	Ash	1	Dead branches, rotten with gaps, bark flaps and knot hole. Branch 1 south facing and about 4m high. Knot hole north facing and about 4m high.
30	NO 08181 32978	Ash	1	Dead branches that are rotten, have bark flaps and gaps in the dead wood. Features > 6m high.
31	NO 08191 32986	Ash	1	Dead branches, north and south facing, > 7m in height. Gaps and holes in these branches and bark flaps.
32	NO 08203 32998	Ash	2	One west facing hole at base of a dead branch, depth unknown and exit point cluttered.
33	NO 08211 33008	Ash	2	One east facing hole depth unknown. About 6m high
34	NO08210 33016	Ash	1*	Multiple holes north and east facing about 4m high. Dead branches with bark flaps south facing and about 5m high. South facing knot hole about 8m high.
35	NO 08053 33029	Oak	1	Limbs with bark flaps and possible features higher up. Features are east facing and about 10m high.
36	NO 08034 33060	Oak	2	Nothing obvious from ground.
37	NO 07930 33204	Oak	1	Multiple cracks, broken limbs and dead wood. Features south to north east facing and > 6m in height.
38	NO 07920 33220	Ash	1	One hole present on a dead limb off the main trunk. West facing and about 10m in height.
39	NO 08007 33257	Ash	2	No obvious features from the ground.
40	NO 08007 33243	Ash	2	Dead wood and holes are present.
41	NO 08003 33252	Ash	1	Two bases of branches on the trunk are rotten/dead with potential gaps at base. One east and one west facing about 7m high.
42	NO 07990 33247	Ash	2	Dead wood present but nothing obvious from ground.
43	NO 07987 33238	Ash	1	Hole, west facing about 6m high but may be damp. Staining present but could be result of water. Dead branches also present.
44	NO 07988 33234	Ash	1	Dead branches with bark flaps. South east facing and about 7m high.
45	NO 07980 33241	Ash	1*	Two holes, one east facing about 5m high and one west facing about 6m high.
46	NO 07974 33228	Ash	2	Nothing obvious from ground.
47	NO 07976 33216	Ash	1	East facing hole in branch about 10m high on a dead branch. Possible not used as water marking evident all around hole.
48	NO 07976 33317	Ash	2	Dead wood present but nothing obvious from ground.
49	NO 07860 33306	Oak	2	Nothing obvious from ground but there may be features higher up.
50	NO 07854 33317	Oak	1	One south facing hole about 6m high on branch.
51	NO 07860 33332	Oak	2	Nothing obvious from the ground but there may be features higher up.
52	NO 07826 33381	Oak	2	Nothing obvious from the ground but there may be features higher up.
53	NO 07805 33416	Oak	1	Broken limbs with dead wood. Feature is west facing and about 15m high.
54	NO 07797 3442	Oak	2	May have features higher up but nothing obvious from ground.
55	NO 07788 33449	Oak	1	Dead limbs, cracks, splits and broken limbs with gaps and holes. Features > 5m in height and south and east facing.
56	NO 07777 33462	Oak	1	Dead wood. Smaller branches but holes and cracks on dead limbs, cracks where whole limbs have fallen off. West and south facing features > 6m in height.

Tree ID	Grid Reference	Tree Species	Roost Category	Survey Results
57	NO 07778 33484	Oak	1	Holes, bark flaps, dead wood, gaps in calluses. Features south to east to north facing and > 5m in height.
58	NO 07768 33476	Oak	1	One hole present but looks more suitable for birds than bats. West facing and about 8m in height.
59	NO 07763 33495	Oak	2	Nothing obvious from ground.
60	NO 07758 33509	Oak	1	Woodpecker hole, east facing about 8m high.
61	NO 07744 33517	Oak	2	Nothing obvious from the ground.
62	NO 07735 33544	Oak	1	East facing hole about 7m high where old branch has been chopped and is rotten. Also dead wood with cracks and gaps - east facing.
63	NO 07728 33549	Oak	1	Broken and snapped limbs with gaps in split wood. Dead wood also present and gaps in old limbs wounds. Features are mostly east and south facing and > 14m in height.
64	NO 07727 33568	Oak	1	Dead wood, broken and split limbs. Mostly east and north facing and > 10m in height.
65	NO 07722 33577	Ash	2	Nothing obvious from ground.
66	NO 07722 33592	Oak	1	North facing limb, about 14m high, has dead wood with gap between bark and wood of branch.
67	NO 07700 33635	Oak	1	Holes on limbs where branches removed and also where there is dead wood on higher branches. Features are mostly east facing and > 5m high.
68	NO 07625 33828	Oak	1	Holes, dead wood with cracks and bark flaps. Features > 10m in height and mostly south and east facing. Barn owl box present.
69	NO 07612 33841	Oak	1	No obvious holes or cracks but there is dead wood. These are south and east facing and > 12m in height.
70	NO 07599 33863	Oak	2	Nothing obvious from ground.
71	NO 07573 33901	Oak	1	Split limbs with dead wood in middle and gaps between bark. North facing and about 14m high.
72	NO 07563 33917	Oak	1	Holes and gaps around two locations where limbs have fallen off. Dead wood and limbs with cracks. Features are south facing at about 8m.
73	NO 07556 33934	Unknown	1*	South facing hole approximately 7m high that may lead to a cavity. Also broken limbs and cracked branches with dead wood. Features east and west facing > 5m in height.
74	NO 07561 33938	Oak	1	Broken limbs, calluses with holes and dead wood with cracks. Features south, west and east facing > 20m high.
75	NO 07553 33949	Oak	1	Broken and split limbs with dead wood and cracks. Features > 5m in height - north, west and south facing.
76	NO 07550 33958	Oak	1	Knot holes, rotten and broken limbs. Features present are south and west facing and higher than 6m.
77	NO 07542 33961	Oak	2	Nothing obvious from ground
78	NO 07539 33982	Oak	1*	Woodpecker holes on broken, dead branches. Cracks in dead wood also. South facing and about 8m high. Dead limbs with cracks west facing and about 6m high.
79	NO 07532 33980	Oak	2	Some broken branches.
80	NO 07532 33991	Oak	1	Diseased part of a south branch that has dead wood with holes where it meets the calluses of the branch. Features about 20m high.
81	NO 07526 33994	Oak	1	Limb with knot hole and cracks, west facing. Another knot hole and dead limbs with cracks, mainly east facing and > 5m in height.
82	NO 07512 34009	Oak	2	Nothing obvious. Has a squirrel feeder in the tree.
83	NO 07524 34027	Oak	1	Broken limbs with splits in remaining stumps, multiple but mostly west facing and > 6m in height.
84	NO 07498 34028	Oak	1	Multiple dead and rotting limbs with cracks. Facing all aspects > 8m in height.
85	NO 07489 34044	Oak	1	One split limb with potential cracks and other broken and split limbs but with lower potential. Features are west facing and about 15m high.
86	NO 07488 34041	Oak	1	North facing broken limb about 12m high with cracks. Some other broken limbs present.

Tree ID	Grid Reference	Tree Species	Roost Category	Survey Results
87	NO 07480 34061	Oak	1	North and south facing broken limbs about 6 and 7m high. Limb with calloused dead part, cracks at bottom on north aspect.
88	NO 07472 34059	Oak	1	Broken and dead limbs with multiple cracks present. > 8m in height and facing multiple directions.
89	NO 07473 34070	Sycamore	1*	East facing hole possibly leading to a cavity but likely used by birds as no staining. Rotten tree core.
90	NO 07460 34086	Oak	2	Dead wood but no obvious features.
91	NO 07427 34116	Oak	1	Branch with broken limb to the west. Cracks along dead parts and a hole at bottom of folded up bark. Dead wood and broken limbs.
92	NO 07409 34134	Oak	2	Dead wood.
93	NO 07392 34139	Oak	1	Broken branches at 17m on east aspect and areas of raised bark throughout thicker limbs. Small hole on snag end on south aspect. Dead wood on north aspect and dead stem off main trunk which extends to 20m with snag ends.
94	NO 07420 34139	Oak	2	Two stems on north and east aspect have been cut and have raised bark. Snapped branch on south east with loose bark. Possible hole at dropped limb collar at 15m on south east aspect.
95a	NO 07256 34510	Cherry	3	Three cherry trees in a garden.
95b				
95c				
96	NO 07655 35381	Ash	3	Broken branch at 10m on south aspect - unable to see if there is a cavity. Some snag ends.
97	NO 07660 35381	Ash	3	Broken branches at 3m and 6m on south aspect - unable to see if there is a cavity. Some snag ends.
98	NO 07630 35424	Ash	2	Cavity in stubby branch at 3m to the west.
99	NO 07620 35442	Ash	3	Cavity in snag end on west aspect at 6m, entrance obstructed by telegraph wire.
100	NO 07617 35447	Ash	2	Cavity in snag end on west aspect at 4.5m and looks like hole in base of snag.
101	NO 07619 35453	Ash	3	Number of dead limbs on west aspect which cannot be ruled out to have cavities.
102	NO 07608 35471	Ash	2	Hole on west aspect on limb at 10m - limb looks dead. Other deadwood above it. Hole on north west dead limb at 10m.
103	NO 07672 35360	Ash	3	Unable to see trunk and branches due to dense ivy cover all over tree.
104	NO 07102 36149	Birch	1*	West facing hole in branch which could have a cavity, about 8m from ground.
105	NO 07111 36135	Oak	1	Dead wood and hole on underside of a calloused branch and other broken branches. Hole is west facing and about 5m from ground.
106	NO 07075 36206	Birch	1*	Woodpecker hole, west facing and about 10m high.
107	NO 07062 36355	Birch	1	West facing hole about 12m high with staining but probably water. Bark collapsed inwards directly above hole.
108	NO 07038 36413	Oak	2	Small dead limbs.
109a	NO 06908 36594	Oak	2	Two oaks right next to one another. Nothing obvious from the ground but may have potential higher up.
109b				
110	NO 06889 36585	Beech	2	Small holes and rotten sections.
111	NO 06924 36578	Oak	1	Underside of south facing branch has dead wood and bark flaps around callouses. About 12m high.
112	NO 06924 36520	Oak	1	Broken branch with split and gaps. East facing and about 12m high.
113	NO 06960 36443	Birch	1	North west facing hole and bark flap about 10m high. Also a west facing vertical crack about 1.5m below hole.
114	NO 06969 36376	Oak	1	Standing dead wood and has a number of west facing bark flaps.
115	NO 06977 36355	Oak	1	Multiple dead branches, woodpecker holes and bark flaps. North, south, east and west facing > 5m high.
116	NO 06958 36340	Oak	1	Multiple dead branches, woodpecker holes and bark flaps facing multiple directions. > 5m high.

Tree ID	Grid Reference	Tree Species	Roost Category	Survey Results
117	NO 06963 36341	Oak	1	Multiple dead branches, bark flaps and woodpecker holes facing multiple directions >4m high.
118	NO 06967 36333	Alder	1*	Dead branch with woodpecker hole with a cavity inside about 3m from ground. Hole is west facing and branch is south facing.
119	NO 06768 37121	Scots pine	1	Partially dead tree with holes and cracks at top of trunk. Features are north west facing and about 20m high.
120	NO 06765 37096	Scots pine	2	Dead wood higher up but nothing obvious from the ground.
121	NO 06792 37035	Scots pine	2	Dead wood at top of tree but nothing obvious from the ground.
122	NO 06787 37021	Scots pine	1	East facing branch with cracks, about 10m high. Dead wood on branches and small hole on western side about 15m high.
123	NO 06776 37031	Scots pine	1	East facing dead limbs about 20m high. Multiple cracks, splits and broken branches. South facing limb about 15m high with potential west facing hole.
124	NO 06777 37024	Scots pine	1*	East facing woodpecker holes and multiple dead branches on east side with cracks. All features > 10m high.
125	NO 06786 37019	Scots pine	1*	Dead tree with bark flaps in multiple locations, cracks and woodpecker holes.
126	NO 06783 37004	Scots pine	1	Dead tree with cracks, gaps and holes in trunk about 5m upwards facing multiple directions.
127	NO 06774 36999	Scots pine	2	Broken limbs and dead wood but nothing obvious.
128	NO 06776 36995	Scots pine	2	Broken and dead branches higher up.
129	NO 06788 36979	Scots pine	2	Dead limbs on main trunk and broken at top.
130	NO 06798 36968	Scots pine	2	Dead branches off the main trunk (forks) > 10m high.
131	NO 06774 36966	Scots pine	2	Dead limbs.
132	NO 06778 36967	Scots pine	1*	Eastern facing woodpecker holes 20m high in dead branch on second fork in tree. Also large number of multidirectional dead limbs 5m and above.
133	NO 06781 36966	Scots pine	1*	Dead tree with bark flaps and woodpecker holes, east facing about 15m high.
134	NO 06768 37001	Scots pine	1	East facing limb with holes and gaps about 20m high. North west facing limb with hole about 1m away from trunk about 18m high.
135	NO 06784 36957	Scots pine	2	Dead limbs on main trunk and broken at top.
136	NO 06784 36953	Beech	1	South east facing hole where branch has broken, about 15m from ground.
137	NO 06496 37181	Scots pine	2	Dead wood present.
138	NO 06392 37623	Oak	1	Some lateral splits and snag ends. Raised bark where there have been breakages. Some deadwood.
139	NO 06295 37786	Elm	3	Group of trees (approx. 23) many of which have broken branches which may have cavities (unable to tell from ground).
140	NO 05779 38681	Oak	2	Broken branches at 10m on north aspect. Dead wood on outside limbs on north. Area of raised bark on dead limb west aspect at 9m.
141	NO 05793 38679	Oak	1	Dead limbs at 3.5m on north aspect with extensive cracks and splits in branch. Other dead limbs to west and south.
142	NO 05801 38671	Oak	1	Hole in main trunk on south aspect at 4m, dead limbs just above this hole including snag ends on west aspect. Various dead limbs on south aspect - heights of 8 and 12m. Epicormic growth at 0-2m.
143	NO 05807 38670	Oak	1	South facing dead limb at 4m with long split, small dead limb at 12m on south aspect with splits. Some epicormic growth starting and deadwood throughout tree.
144	NO 05809 38662	Oak	2	Trunk not visible due to epicormic growth, some dead wood at 15-16m.
145	NO 05814 38652	Oak	1	Splits and cracks all aspects at variety of heights. Cannot see trunk above 5m.
146	NO 05801 38651	Oak	1	Dead limbs on south side with some lateral splits. Broken limbs at 3.5m. Dead wood and limbs on east and south. Possible hole in dead limb elbow at 13m on south aspect.
147	NO 05805 38641	Oak	1	Dead wood, splits and raised bark on east aspect.

Tree ID	Grid Reference	Tree Species	Roost Category	Survey Results
148a	NO 05814 38612	Oak	1	Area of six oak trees all with limb damage and dead wood (located north side of fence).
148b				
148c				
148d				
148e				
148f				
149a	NO 05822 38595	Oak	1	Area of six oaks and an uprooted stump. All have deadwood, splits and raised bark at all aspects and varying heights.
149b				
149c				
149d				
149e				
149f				
150	NO 05840 38561	Oak	1	Deep hole on elbow of dead limb extending upwards from 2m on north west aspect. Number of snag ends and dead limbs at varying heights.
151a	NO 05849 38552	Oak	1*	Two trees leaning into each other. Both with deadwood, splits, cavities and holes in end of branches.
151b				
152	NO 05870 38536	Oak	2	Some deadwood and snag ends in north facing stem. Deadwood on north west of main stem. View obscured from 12m up - may be other features higher up.
153	NO 05861 38563	Beech and birch	2	Row of trees along track side (inside electric fence line). Many with dead stems/branches. Forms a good commuting route but not many visible features from the ground.
154	NO 05861 38563	Scots pine	1	On east aspect of main vertical limb there is a hole leading to a cavity and some stripping of the bark.
155	NO 05879 38530	Oak	1	Mature oak with many branches with lateral splits (located on south east corner of field boundary with electric fence just before large metal gate into another field).
156	NO 05888 38506	Rowan	1	Hole leading to small upward cavity on south aspect. Leaning into elm tree creating cavity between the two trees. To be endoscoped to rule out.
157	NO 05903 38497	Elm	1	Small cavity suitable for pipistrelles at 1.5-2m on north west aspect. Cannot see crown of tree or features due to epicormic growth. Evaluated as category 1 but endoscope could rule out.
158	NO 05898 38479	Birch	1*	Double stem - north stem dead and snapped at 4m, deep cavity with old and new droppings present (sample taken). Main stem has hole on south aspect.
159	NO 05902 38472	Birch	3	Double stem tree with hole at end of snag end at 11m on south aspect.
160	NO 05903 38472	Lime (*Tilia sp.*)	1*	Tree over hanging path with cut branches at 1.5m, two hole in this branch one leading to a cavity. Lots of raised bark and cracks all around tree. Southern stem has most potential. Droppings found and sample taken.
161	NO 05920 38458	Rowan	3	Cavity in tree but not suitable.
162	NO 05919 38443	Elm	2	Small cavity at 2m in snag end. Overhanging path.
163	NO 05918 38440	Elm	2	Dead branches with lateral splits at 12m and 16m. Skinny broken tree beside.
164	NO 05938 38411	Elm	1*	Group of four trees and dead monolith in the middle. The four trees have splits and cracks. The monolith has recent droppings in a hole that leads to a cavity (samples taken).
165	NO 05973 38350	Birch	2	Number of broken branches on east and south aspects at 5, 6 and 8m.
166	NO 06614 38603	Birch	1*	South facing woodpecker hole about 7m high.
167	NO 06619 38604	Scots pine	1	North facing broken limb with dead wood, cracks and woodpecker holes, about 12m high. Also dead branches and broken limbs.
168	NO 06628 38607	Scots pine	1*	Dead tree with woodpecker holes and cracks in trunk. Features face multiple directions and are at multiple heights.
169	NO 06631 38779	Beech	1	Small cavity behind east facing dead limb in split stem of trunk. About 7m high.
170	NO 06632 38755	Ash	1	West facing hole about 10m high in dead branch of main trunk.

Tree ID	Grid Reference	Tree Species	Roost Category	Survey Results
171	NO 06636 38743	Scots pine	1	Dead scots pine. Multiple bark cracks and flaps.
172	NO 06693 38883	Oak	1	Multiple broken branches with splits and dead wood. Features are multi-directional and > 12m in height.
173	NO 06671 38836	Oak	1	Some dead branches with insect damage and cracks. Small holes at bases of cracked and broken limbs. About 5, in height south and west facing.
174	NO 06689 38836	Oak	1	Knot holes south and west facing 6m and 12m in height and dead limbs and calluses with gaps and cracks.
175	NO 06700 38837	Oak	1*	One south facing dead limb about 15m high, callous may lead to cavity. North east facing branch with dead wood and cracks/gaps about 10m high. Knot holes and bark flaps.
176	NO 06651 38906	Oak	1	Large east facing crack in a branch that is south facing. About 12m high.
177	NO 06591 38813	Oak	1	Dead limb facing south with crack about 4 and 6m high. Other dead branches higher up.
178	NO 06598 38818	Oak	1	Multiple dead branches with cracks and bark flaps. Mostly north east facing from 5m high. Other dead wood present.
179	NO 06604 38819	Oak	1*	Downward facing crack in a south facing limb about 10m high. Other broken limbs and dead wood, crack is through and through but likely it goes along limb beyond hole.
180	NO 06613 38816	Birch	1	Dead trunk about 5m high with woodpecker holes about 4m high and south facing.
181	NO 06586 38882	Oak	1	East facing branch has a dead limb with cracks in wood and bark flaps, about10m high.
182	NO 06573 38877	Oak	1*	Dead section of west facing limb. Crack is south facing and about 5m high. Dead limbs with cracks and small holes.
183	NO 06559 38870	Oak	2	Nothing obvious from ground.

Man-made Structures

4.1.9 Roost assessment surveys were carried out between March and May 2013 on 16 properties and 25 bridges and culverts along the proposed scheme which may be potentially impacted. Of these, 13 properties and four bridges were assessed to have moderate to high potential to support roosting bats (Table 12 and Figure 10.5). Emergence/re-entry surveys were subsequently undertaken on these structures. The remaining four properties and 21 bridges and culverts were assessed as having low roost potential and were excluded from further surveys.

4.1.10 It should be noted that Newmill Farm and barns were regarded as two separate properties, as were the Scottish Liqueur Centre and Reception Building. This was due to the size of the buildings and/or the large footprint of the property which merited separate surveys on these sets of buildings.

4.1.11 No underground structures, with the exception of culverts, were found within the study area.

Table 12: Assessments of Structures for Potential for Roosting Bats

Grid Reference and Property Name	Potential Roost Category	Property Description and Key Features	Taken Forward for Survey	Date of Building Assessment
Properties				
NO 09264 29291 Kirkhill House	2a	Detached two storey stone house with slate roof and outbuildings. Missing slates, gaps near soffits, multiple gaps in stonework.	✓	06.06.13
NO 09166 30649 Ordie Cottage	2a	Detached two storey house with pitched, traditional slate roof. Weather boarding on extension. Record of a bat inside the property in 2013 from consultation with owner.	✓	16.05.13
NO 09224 30621 Glen Ordie	2a	Two storey residential dwelling with garden to east. Stone built, covered in plaster. Wooden and slate roof. Holes in roof ends and gaps between roof and guttering.	✓	30.04.13

Grid Reference and Property Name	Potential Roost Category	Property Description and Key Features	Taken Forward for Survey	Date of Building Assessment
NO 09272 30630 Minordie House	2b	Stone building with slate roof. Wooden frame around garage door is failing. Some gaps in roof tiling.	✓	29.04.13
NO 09200 30623 Ordie House	2b	Cottage with brick extension and slate, pitched roof. Some gaps in metal work of roof.	✓	29.04.13
NO 09136 30648 Ordie View	3	Detached bungalow and converted garage in good condition. No suitable features for bats.	X	16.05.13
NO 08724 31942 Ladner	2b	Large bungalow with likely roof space. Roof pitched and slated. Small gap between roof and wall on north side of building.	✓	29.04.13
NO 08468 32180 Newmill Farm House	2a	Stone and brick property with gaps in pointing and weather boards. Some fascia missing and gaps where wall meets roof. Gaps between soffits and stonework. Some holes in stonework.	✓	16.05.13
NO 08468 32180 Newmill Farm Barns	2a	Barns with slate roofing. Some loose bricks and cracks in brickwork.	✓	16.05.13
NO 08850 32519 Newmill Cottages	3	Brand new brick building in excellent condition. No suitable features for bats.	X	29.04.13
NO 08095 32964 Barn House, East Mains Farm	2a	Detatched two-storey house. Gaps between roof tiles and roof ridge.	X	23.05.13
NO 07403 34200 Scottish Liqueur Centre Reception Building	2b	Residential, brick built property, with small gaps in roof skirting on west gable and south gable.	✓	30.04.13
NO 07407 34221 Scottish Liqueur Centre	2a	Metal sheds and outbuildings with corrugated iron, pitched roof. Bats known to roost in Liqueur Centre close to roof edge. Droppings present on gas meter box.	✓	29.04.13
NO 07356 34265 Hilton Cottage	2a	Single storey detached dwelling. Hipped and pitched slate roof with some holes in chimney brickwork. Gaps under lead flashing and tiles. Droppings present.	✓	16.05.13
NO 07316 34355 Perthshire Visitor Centre	3	Single storey detached building in good condition. No suitable features for bats.	X	16.05.13
NO 07189 35532 Broompark Farm	2a	Detached two storey stone build cottage with outbuildings. Some gaps in slate roof and potential access points in outbuilding roofing.	✓	05.06.13
Bridges and Culverts				
NO 09175 30281 Shochie Burn culvert	3	Low lying culvert, subject to flooding from run off from surrounding landscape. No bat roost potential. Prone to high water in winter and therefore no hibernation potential.	X	19.03.13
NO 09334 30281 Shochie Burn viaduct	2b	30+m under arch barrel. Some cracks and missing pointing creating areas for roosting bats.	✓	19.03.13
NO 09410 30332 Shochie Burn road bridge	3	Approx 15m from low water level to underside of arch. Pointing intact and bridge in generally good order.	X	19.03.13
NO 09346 30615 Ordie Burn road bridge	3	Approx. 10m to underside of arch barrel. In good order generally with little potential for bats.	X	20.03.13
NO 09308 30648 Ordie Burn viaduct	2a	30+ m from ground to underside of arch barrel. Some cracks and gaps where pointing is missing.	✓	20.03.13
NO 09373 30738 Benchil Burn culvert	3	Stone bridge in good repair throughout offering little to no rooting potential.	X	20.03.13
NO 09004 31163 Ordie Burn culvert	3	Low lying culvert, subject to flooding from run off from surrounding landscape. No bat roost potential. Prone to high water in winter and therefore no hibernation potential.	X	20.03.13
NO 09443 31490 Sandpits bridge	2b	High arch railway bridge with cracks potentially suitable for roosting bats. Clear access beneath bridge.	✓	26.03.13

Grid Reference and Property Name	Potential Roost Category	Property Description and Key Features	Taken Forward for Survey	Date of Building Assessment
NO 08189 32323 Ordie Burn road bridge	3	Approx 10m to underside of arch barrel. In good order generally with little potential for bats.	X	21.03.13
NO 08388 32277 Ordie Ditch culvert	3	Low lying culvert, subject to flooding from run off from surrounding landscape. No bat roost potential. Prone to high water in winter and therefore no hibernation potential.	X	21.03.13
NO 08623 32469 Newmill old rail bridge	2b	Abandoned railway line. Deck missing, abutments with cracks potentially suitable for roosting bats.	✓	20.03.13
NO 08298 32670 Ordie Ditch culvert	3	Low lying culvert, subject to flooding from run off from surrounding landscape. Concrete and corrugated iron construction with no gaps. No bat roost potential. Prone to high water in winter and therefore no hibernation potential.	X	21.03.13
NO 07511 33940 Loak Mill/Garry Burn road bridge	3	2m from burn to underside of bridge. Some loose pointing underneath but too close to the water to have any bat roost potential due to high water and flooding of the Garry Burn.	X	25.03.13
NO 07273 34349 Garry Burn road bridge	3	Approx 8-10m high. Concrete construction. No gaps or cracks. No bat roost potential	X	25.03.13
NO 07202 34821 Ardonachie Burn culvert	3	Low lying culvert, subject to flooding from run off from surrounding landscape. No bat roost potential. Prone to high water in winter and therefore no hibernation potential.	X	27.05.13
NO 07357 34962 Ardonachie Burn culvert	3	Low lying culvert, subject to flooding from run off from surrounding landscape. No bat roost potential. Prone to high water in winter and therefore no hibernation potential.	X	27.05.13
NO 07134 34835 Garry Burn road bridge	3	Bridge in good repair throughout offering little to no rooting potential.	X	20.03.13
NO 07178 34897 Bankfoot road bridge	3	Road bridge with supporting steel structure. No features suitable for bat roosting recorded.	X	25.03.13
NO 06806 37144 Road culvert (Unnamed tributary 1)	3	Road culvert, low lying, subject to flooding from run off from surrounding landscape. No bat roost potential. Prone to high water in winter and therefore no hibernation potential.	X	26.05.13
NO 06788 37225 Road culvert (Unnamed tributary 2)	3	Road culvert, low lying, subject to flooding from run off from surrounding landscape. No bat roost potential. Prone to high water in winter and therefore no hibernation potential.	X	26.05.13
NO 06773 37370 Gelly Burn road culvert	3	Road culvert, low lying, subject to flooding from run off from surrounding landscape. No bat roost potential. Prone to high water in winter and therefore no hibernation potential.	X	26.05.13
NO 06721 37714 Road culvert (Unnamed tributary 3)	3	Road culvert, low lying, subject to flooding from run off from surrounding landscape. No bat roost potential. Prone to high water in winter and therefore no hibernation potential.	X	26.05.13
NO 06723 37841 Broomhill Burn road culvert	3	Road culvert, low lying, subject to flooding from run off from surrounding landscape. No bat roost potential. Prone to high water in winter and therefore no hibernation potential.	X	26.05.13
NO 05588 38789 Birnam Burn culvert	3	Very low lying culvert. Surrounded by clutter making access difficult. Little or no bat roost potential. Culvert will be subject to high water in winter making it unsuitable as a hibernation site.	X	28.05.13
NO 05625 38829 Birnam Burn culvert	3	Approx 1.5m high, 2.5m wide. Wood cladding on the walls from water level, and wood along the ceiling of the culvert. Gaps throughout the wood cladding where it has warped. Summer roost potential for small numbers of bats. Winter hibernation potential is limited due to the likely high water levels in winter.	X	28.05.13

4.1.12 Bat surveys (emergence/re-entry) commenced in May 2013 and were completed in July 2013. Where possible, two surveys, a dusk or dawn, were carried out following best practice guidance, which states that surveys should be at least 24hrs apart (BCT, 2012). However, where time allowed a dusk followed by a dawn survey was undertaken within a 24hr period and this was counted as one survey.

4.1.13 Entry could not be gained at Barn House, East Mains Farm and consequently no survey was undertaken at this property. Access constraints also prevented a second survey being undertaken at Broompark Farm.

4.1.14 Bat roosts were confirmed at nine of the 12 properties surveyed. Bats were observed emerging and re-entering Ordie Cottage, Newmill Farm House and Newmill Farm Barns, emerging from a further five properties (Kirkhill House, Glen Ordie, Ordie House, Hilton Cottage and Broompark Farm) and re-entering another property (Scottish Liqueur Centre) (Table 13). Highest peak count recorded at a building was at Broompark Farm with an estimated roost size of seven bats.

4.1.15 Bat roosts were confirmed at two of the four structures surveyed (Table 13). Roosts of *Myotis* spp. bats were recorded at Shochie and Ordie viaducts with estimated roost sizes of 10 and 14 bats, respectively.

4.1.16 Common and soprano pipistrelles were the most numerous species recorded during the activity surveys, although brown long-eared and Daubenton's bats were also been observed. Brown long-eared feeding signs and feeding perch identified in north facing open ended barn close to wigwams at Newmill Farm Barns were also recorded.

Table 13: Structure Bat Emergence/Re-Entry Survey Results

Grid Reference Property/ bridge Name	Roost Category	Survey Results	Peak Bats Counts at Identified Roosts*	Survey Type, Date and Weather Conditions
Properties				
NO 09264 29291 Kirkhill House	1a	Confirmed presence of a pipistrelle roost with one emergence. Survey confirmed the presence of both soprano and common pipistrelle bats foraging close to the property.	1	Emergence 06.06.13 Dry, slight breeze, 14.8°C dropping to 9°C, 30% CC.
		Second survey not conducted for H&S reasons.	n/a	n/a
NO 09166 30649 Ordie Cottage	1a	Confirmed presence of a pipistrelle roost by sight at the left dormer window. No echolocation was recorded. Surveyors also recorded three potential emergence points but not confirmed due to distance of surveyors from the points.	2	Re-entry 30.05.13 Dry, calm, 15°C dropping to 8°C, 40% CC.
		Confirmed presence of a pipistrelle roost at the right dormer window. No echolocation was recorded. Visiting behaviour was also recorded at this point. Soprano pipistrelles were recorded foraging close to the property.	1	Emergence 29.05.13 Dry, light breeze, 14°C dropping to 10°C, 90% dropping to 20% CC.
		Third survey was not conducted due to access constraints.	n/a	n/a
NO 09224 30621 Glen Ordie	1a	Confirmed presence of a pipistrelle roost with one bat in the property. Both soprano and common pipistrelle bats were noted foraging and commuting close to the property.	1	Emergence 28.05.13 Dry, calm, 10°C dropping to 5°C, 40% dropping to 0% CC.
		No bat was seen re-entering the property. Very little bat activity recorded. Soprano pipistrelles were detected in the area.	0	Re-entry 29.05.13 Dry, calm, 3°C, 0% increasing to 40% CC.
		No bat was seen emerging from the property. Both soprano and common pipistrelle recorded foraging close to the house and above the garden.	0	Emergence 03.07.13 Dry, light breeze, 14°C, 90% CC.
NO 09272 30630 Minordie House	3	No bat was seen emerging from the property. Both soprano and common pipistrelle were recorded foraging close to the house and above Ordie Burn, situated close to the property.	0	Emergence 28.05.13 Dry, calm, 10°C dropping to 5°C, 40% dropping to 0% CC.

Grid Reference Property/ bridge Name	Roost Category	Survey Results	Peak Bats Counts at Identified Roosts*	Survey Type, Date and Weather Conditions
		No bats were seen re-entering the property. Very little bat activity was recorded.	0	Re-entry 29.05.13 Dry, calm, 3°C, 0% increasing to 40% CC.
		No bat was seen emerging from the property. Both soprano and common pipistrelle were recorded foraging close to the house and above Ordie Burn at canopy level of tree line along burn. Daubenton's bat also heard but not seen.	0	Emergence 03.07.13 Dry, calm, 15°C, 100% CC.
NO 09200 30623 Ordie House	1a	Confirmed presence of a roost at the south east corner of the property. Species could not be confirmed as bats not using echolocation. Common pipistrelles were recorded in the area close to the property.	1	Emergence 28.05.13 Dry, calm, 10°C dropping to 5°C, 40% dropping to 0% CC.
		No bats seen re-entering. Very little bat activity was recorded around or near to the property.	0	Re-entry 29.05.13 Dry, calm, 3°C, 0% increasing to 40% CC.
		No bats were seen emerging from the property. Two soprano pipistrelle passes were recorded.	0	Emergence 24.07.13 Dry, calm, 21°C dropping to 16°C, 50% CC.
NO 08724 31942 Ladner	3	No bats were seen re-entering the property. Soprano and common pipistrelle were recorded foraging in trees close to the property. Bats also observed crossing the A9 carriageway.	0	Re-entry 31.05.13 Dry, calm, 6°C, 30% CC.
		No bats were seen emerging from the property. Soprano and common pipistrelle were recorded commuting close to the property.	0	Emergence 02.07.13 Light rain, calm, 13°C, 100% CC.
NO 08468 32180 Newmill Farm House	1a	Confirmed presence of roosts both close to the chimney and at the west gable end of the property but no echolocation was recorded. One potential soprano pipistrelle roost was identified close to the chimney on the roof. Both soprano and common pipistrelle were recorded foraging close to the house and barns.	3	Emergence 30.05.13 Dry, calm, 16°C dropping to 10°C, 50% dropping to 10% CC.
		Confirmed presence of a roost in the roof of the property, with re-entry points close to the chimney, apex of the roof and loose slates near the middle of the roof. Both soprano and common pipistrelle were recorded foraging close to the house and barns. Brown long-eared bat activity was also recorded; bats were heard but not seen.	3	Re-entry 04.07.13 Dry, calm, 14°C, 100% CC.
NO 08468 32180 Newmill Farm Barns	1a	Confirmed presence of a soprano pipistrelle roost in the west facing barn. Bats emerged from open-ended section of barn and at roof line ridge at the centre of the barn. Brown long-eared feeding signs and feeding perch identified in north facing open ended barn close to wigwams. Both soprano and common pipistrelle were recorded foraging close to the house and barns.	6	Emergence 30.05.13 Dry, calm, 16°C dropping to 10°C, 50% dropping to 10% CC.
		Confirmed presence of a pipistrelle roost above the toilet block next to the open barn/kitchen section. Both soprano and common pipistrelle were recorded foraging close to the house and barns and also inside open-ended barns. Brown long-eared bats were also recorded close to the barns and some visiting behaviour was recorded.	1	Re-entry 04.07.13 Dry, calm, 14°C, 100% CC.
NO 08095 32964 Barn House, East Mains Farm	N/A	Unable to survey for bat emergence/re-entry due to access constraints.	N/A	N/A
NO 07407 34221 Scottish	3	No bats were seen emerging from the building. Common pipistrelles were recorded foraging close to building above garden area and above hedge.	0	Emergence 27.05.13 Dry, calm, 9°C, 90% CC.

Grid Reference Property/ bridge Name	Roost Category	Survey Results	Peak Bats Counts at Identified Roosts*	Survey Type, Date and Weather Conditions
Liqueur Centre Reception Building		No bats were seen re-entering from the building. Common pipistrelles were recorded foraging close to building above garden area and hedge line.	0	Re-entry 28.05.13 Some light rain, calm, 8°C, 100% CC.
		No bats were seen emerging from the building. Both soprano and common pipistrelle were recorded foraging close to building above garden area and hedge line.	0	Emergence 04.07.13 Some light rain at points, calm, 14°C dropping to 10°C, 90% CC.
NO 07407 34221 Scottish Liqueur Centre	1a	No bats were seen emerging from the building. Both soprano and common pipistrelle were recorded foraging close to building.	0	Emergence 27.05.13 Dry, calm, 9°C, 90% CC.
		Confirmed presence of a common pipistrelle roost at south-west corner roof fitting. Site of known bat roost. Both soprano and common pipistrelle were recorded foraging close to building.	1	Re-entry 28.05.13 Some light rain, calm, 8°C, 100% CC.
		No bats were seen emerging from the building. Both soprano and common pipistrelle were recorded foraging close to building.	0	Emergence 04.07.13 Some light rain at points, calm, 14°C dropping to 10°C, 90% CC.
NO 07356 34265 Hilton Cottage	1a	Confirmed presence of common pipistrelle roosts in the apex and gable end of the building. Soprano and common pipistrelle recorded in the area.	2	Emergence 29.05.13 Dry, light breeze, 16°C dropping to 13°C, 70% dropping to 40% CC.
		No bats were seen re-entering the property. Soprano and common pipistrelle were recorded foraging close to the property.	0	Re-entry 30.05.13 Dry, calm, 15°C dropping to 8°C, 40% CC.
		No bats were seen re-entering the property. Soprano pipistrelles were recorded foraging close to the property but activity was very low.	0	Re-entry 02.07.13 Dry, calm, 9°C, 50% CC.
NO 07189 35532 Broompark Farm	1a	Confirmed presence of a pipistrelle roost in the barn at this property. Both soprano and common pipistrelle were also recorded foraging close to the house and at the tree line adjacent to the paddock.	7	Emergence 05.06.13 Dry, slight breeze, 13°C dropping to 10°C, 90% Cloud Cover (CC).
		Second survey was not conducted due to access constraints	N/A	N/A
Bridges				
NO 09325 30274 Shochie Burn Viaduct	1a	Confirmed presence of a roost. Bats were seen entering around a drainage pipe on the bridge. Species not confirmed due to distance from re-entry site and lack of echolocation. Soprano and common pipistrelle bats foraging close to the bridge.	10	Re-entry 19.06.13 Dry, calm, 10°C, 70% CC.
		No bats were seen emerging from the bridge. Soprano and common pipistrelle were recorded commuting and foraging close to the bridge.	0	Emergence 17.07.13 Dry, slight breeze, 16°C, 50% CC.
NO 09303 30637 Ordie Burn Viaduct	1a	No bats were seen emerging from the bridge. Soprano and common pipistrelle recorded commuting and foraging close to the bridge. *Myotis sp.*, and brown-long eared bat passes also heard close to Ordie Burn but not seen.	0	Emergence 18.06.13 Dry, slight breeze, 15°C, 60% CC.
		Confirmed presence of a *Myotis sp. r*oost in bridge. Bats re-entered under the metal supports on escarpments between the two spans. *Myotis* social calls were also recorded. Soprano and common pipistrelle also recorded commuting and foraging close to bridge.	14	Re-entry 17.07.13 Dry, slight breeze, 11°C, 10% CC.
NO 09438 31493 Sand Pit Bridge	3	No bats were seen emerging from the bridge. Soprano pipistrelle and *Myotis sp.* bats recorded commuting close to the bridge.	0	Emergence 19.06.13 Dry, calm, 12°C dropping to 9°C, 30% increasing to 80% CC.

Grid Reference Property/ bridge Name	Roost Category	Survey Results	Peak Bats Counts at Identified Roosts*	Survey Type, Date and Weather Conditions
		No bats were seen emerging from the bridge. Soprano and common pipistrelles recorded commuting close to the bridge.	0	Emergence 22.07.13 Dry, calm, 16°C, 100% CC.
NO 08629 32469 Newmill Bridge	3	No bats were seen re-entering the bridge. Soprano pipistrelles were recorded commuting close to the bridge.	0	Re-entry 20.06.13 Dry, slight breeze, 11°C dropping to 9°C, 90% CC.
		No bats were seen re-entering the bridge. Soprano pipistrelles were recorded commuting close to the bridge but activity was low.	0	Re-entry 23.07.13 Some light rain, calm, 15°C, 100% CC.

* An estimate of the highest number of bats roosting at the property/ bridge. This is based on the number of bats observed over all visits and combined between emergence and re-entry.

Transect Survey Results

4.1.17 Bat activity transects commenced in June 2013 and were completed in July 2013. A total of six bat survey transects were completed at dusk within the study area incorporating the habitats around Ordie Burn (Transect 1), Newmill (T2), Westwood (T3), Bankfoot (T4), Cairnleith (T5) and Gelly Wood (T6) (Figure 10.4). It should be noted that for the purposes of this assessment <5 bat passes = low activity, 5-10 = moderate activity and >10 = high activity. Categories boundaries were derived from professional judgement and number of recorded bat passes.

4.1.18 Bat activity was recorded at all six transects and both common and soprano pipistrelle activity was recorded during the majority of transects (Table 13). Transects surveyed in the Newmill area (T2) showed high levels of bat activity. At Ordie Burn (T1) levels of high to moderate activity were recorded. At the remaining four transects (T3, T5 and T6) moderate to low bat activity was recorded. The lowest level of bat activity was recorded during the Bankfoot transect (T4).

Table 13: Bat Survey Transect (T) Results

T No.	Location and Grid Reference	Species Present	Date of survey 1 and 2	Habitat Description	Weather Conditions	Activity	Number of Passes per Survey & Activity Level (for all species present)	
							Survey 1	Survey 2
1	Ordie Burn, Luncarty NO 08503 30602 to NO 09668 30914	Common and soprano pipistrelle	20.06.13 17.07.13	Covers area north of Luncarty. Includes part of Ordie Burn, railway bridge, residential properties and arable land.	Dry, light breeze, 15°C, 10% CC for both surveys.	Commuting and foraging	9 Moderate	34 High
2	Newmill NO 07787 32415 to NO 09257 32481	Common and soprano pipistrelle	17.06.13 16.07.13	Covers the area of Newmill Farm and Ordie Burn. Includes: arable land, hawthorn hedge line, mature trees, farm buildings and Ordie Burn.	Dry, light breeze, 14°C, between 20 and 60% CC for both surveys.	Commuting and foraging	24 High	19 High
3	Westwood NO 07479 33535 to NO 07895	Soprano pipistrelle	20.06.13 16.07.13	Covers areas of Loak and Westwood farms.	Dry, light to moderate wind speed, between	Commuting, foraging and feeding buzzes.	9 Moderate	10 Moderate

T No.	Location and Grid Reference	Species Present	Date of survey 1 and 2	Habitat Description	Weather Conditions	Activity	Number of Passes per Survey & Activity Level (for all species present)	
	34192			Includes areas of woodland, pasture, arable land, and farm buildings.	13°C and 16°C, between 70 and 100% CC.			
4	Bankfoot NO 06935 34153 to NO 07860 35471	Pipistrelle sp.	18.06.13 15.07.13	Covers the area in southern Bankfoot. Includes areas of arable land, lamp lit residential areas and hedge line.	Dry, light breeze, 13°C-18°C, between 40% and 80% CC for both surveys.	Commuting and foraging	2 Low	7 Moderate
5	Cairnleith Woods NO 06690 36050 to NO 07403 35830	Common and soprano pipistrelle	20.06.13 15.07.13	Covers area close to Coltrannie Farm and Cairnleith. Includes areas of arable land, hedge line and woodland. Bats were seen crossing the A9 carriageway during survey.	Dry, light to moderate wind speed, between 14°C and 18°C, between 50 and 90% CC.	Commuting and foraging	8 Moderate	7 Moderate
6	Gelly Wood cross-roads NO 05927 37438 to NO 07457 37800	Common and soprano pipistrelle	17.06.13 16.07.13	Covers the area in the Muir of Thorn woodland which is predominantly conifer plantation and young woodland.	Dry, light breeze, 15°C-17 °C, 50% CC for both surveys.	Commuting and foraging	6 Moderate	5 Moderate

Commuting Route Survey Results

4.1.19 The current A9 road comprises long stretches of tree-lined single and dual carriageway, which may form ideal commuting routes along its length, allowing bats to reach habitats on either site of the highway. Potential bat commuting routes crossing the A9 were identified at points where the Shochie Burn (NO 09163 30289) and Ordie Burn (NO 08993 31151) cross the existing road. Since these burns are similar in character a static detector was positioned at Shochie Burn only to investigate if bats were crossing the existing road. A further four potential bat commuting routes were surveyed incorporating the areas around Newmills, Bankfoot, Cairnleith Wood and Gelly Wood.

4.1.20 At each location a static bat detector (Anabat SD1, Titley Electronics) was deployed for four consecutive days during June and four consecutive days in July 2013. Bat activity results are presented in Table 14.

4.1.21 Commuting activity was recorded at all five locations with common and soprano pipistrelle species being recorded at each site, three showing high activity (Table 14). Low levels of *Myotis* sp. activity was recorded at all five locations. Nathusius' pipistrelle commuting activity was recorded at low levels in Bankfoot, Cairnleith Wood and Muir of Thorn. Low activity levels of brown long-eared bat were also recorded at Cairnleith Wood and Muir of Thorn. The lowest level of bat commuting activity was recorded at Bankfoot.

4.1.22 Due to technical issues, data for static points at Bankfoot and Shochie Burn were only recorded over one night in July 2013. To take into account these missing data, data for the remainder of the static points are presented as an average for four nights.

Table 14: Commuting Route (CR) Survey Results

CR No.	Location and Grid Ref	Commuting Route Habitat Description	Species Present	Ave. Passes per species
1	Shochie Burn NO 09185 30273	Area featuring a standing water body with coniferous vegetation lining the water course on both banks. Shochie viaduct is located east of the A9. The surrounding land is consists mainly of cultivated arable land with an area.	Common pipistrelle Soprano pipistrelle *Myotis sp.*	62 253 6
2	Newmills/ Ordie Burn NO 08389 32278	Area including the Ordie Burn, a running water body with coniferous vegetation lining the burn on both banks with a stone railway bridge. Surrounding areas include arable land, hawthorn hedge line, mature trees and farm buildings.	Common pipistrelle Soprano pipistrelle *Myotis sp.*	125 97 6
3	Bankfoot NO 07190 34940	Area includes lamp lit modern residential area, hedge line and arable land.	Common pipistrelle Soprano pipistrelle Nathusius' pipistrelle *Myotis sp.* Brown long-eared	24 21 3 15 16
4	Cairnleith Wood NO 06983 36326	Covers the area near Coltrannie Farm which mainly consists of arable farmland, young plantation and hedge line.	Common pipistrelle Soprano pipistrelle Nathusius' pipistrelle *Myotis sp.* Brown long-eared	48 59 1 1 5
5	Muir of Thorn NO 06750 37636	Area in the Muir of Thorn woodland which consists of semi-natural coniferous woodland with small areas of rough grassland and pasture.	Common pipistrelle Soprano pipistrelle Nathusius' pipistrelle *Myotis sp.* Brown long-eared	112 144 1 1 1

5 Badger

5.1.1 No badger signs, including setts, paths or foraging signs were recorded during surveys.

6 Breeding Birds

Consultation Information

6.1.1 The Royal Society for the Protection of Birds (RSPB) was the only consultee to provide records of breeding birds within the survey area. A total of seven species were received from searches of 10 kilometre (km) grid squares that cover the survey area. From the records received; five species are listed on Schedule 1 Part 1 of the Wildlife and Countryside Act 1981 c.69 (as amended) (WCA1i) (barn owl (*Tyto alba*), hen harrier (*Circus cyaneus*), merlin (*Falco columbarius*), osprey (*Pandion haliaetus*) and red kite (*Milvus milvus*), one species is a Joint Nature Conservation Committee (JNCC) red listed species (hen harrier), five species are JNCC amber listed (barn owl, merlin, osprey, red kite and swift (*Apus apus*), six species are listed on the SBL (barn owl, hen harrier, merlin, osprey, red kite and swift) and four species are listed as a priority species on the Tayside LBAP (barn owl, merlin, osprey and swift). The species list is illustrated in Table 15.

Desk Based Study

6.1.2 Incidental bird records were gathered during the Stage 2 extended Phase 1 habitat surveys in 2008 (Atkins, 2009). During these surveys a total of 58 species were recorded. The species list is illustrated in Table 15.

6.1.3 The Tayside LBAP contains 50 species that could potentially be found breeding in the survey area,

based on habitats present (Tayside Biodiversity Partnership, undated). The species list is reported in Table 15.

6.1.4 A data search on the NBN Gateway (NBN, 2013) produced a list of 55 species of breeding birds within the survey area. The species list is reported in Table 15.

Table 15: Conservation Status of Bird Species; Including Desk Based Results from the LBAP, NBN Gatesway, Atkins Report, Consultation (C), Incidental Sightings (I) and 2013 Surveys

Species	JNCC	Sch1	SBL	LBAP	NBN	Atkins (2009)	C	I	Survey Results
Arctic skua (*Sterna paradisaea*)	Red		✓			✓			
Barn owl (*Tyto alba*)	Amber	✓	✓	✓	✓	✓	✓	✓	
Black grouse (*Tetrao tetrix*)	Red		✓	✓	✓				
Blackbird (*Turdus merula*)	Green			✓	✓	✓			✓
Blackcap (*Sylvia atricapilla*)	Green					✓		✓	✓
Black-headed gull (*Chroicocephalus ridibundus)*	Amber				✓	✓			
Blue tit (*Cyanistes caeruleus*)	Green			✓	✓	✓			✓
Bullfinch (*Pyrrhula pyrrhula*)	Amber		✓	✓	✓				✓
Buzzard (*Buteo buteo*)	Green					✓		✓	✓
Carrion crow (*Corvus corone corone*)	Green					✓			✓
Chaffinch (*Fringilla coelebs*)	Green			✓	✓	✓			✓
Chiffchaff (*Phylloscopus collybita*)	Green					✓			✓
Coal tit (*Parus ater*)	Green					✓			✓
Collared dove (*Steptopelia decaocto*)	Green					✓			✓
Common gull (*Larus canus*)	Amber					✓			
Common redstart (*Phoenicurus phoenicurus*)	Amber			✓	✓				
Common sandpiper (*Actitis hypoleucos*)	Amber				✓			✓	
Common whitethroat (*Sylvia communis*)	Amber								✓
Corn bunting (*Emberiza calandra*)	Red		✓		✓				
Cuckoo (*Cuculus canorus*)	Red		✓		✓	✓			
Curlew (*Numenius arquata*)	Amber		✓	✓		✓			✓
Dipper (*Cinclus cinclus*)	Green			✓	✓			✓	
Dunnock (*Prunella modularis*)	Amber		✓	✓		✓			✓
Feral pigeon (*Columba livia*)	Green					✓			✓
Garden warbler (*Sylvia borin*)	Green					✓			✓
Goldcrest (*Regulus regulus*)	Green					✓			✓
Goldfinch (*Carduelis carduelis*)	Green			✓	✓				✓
Goosander (*Mergus merganser*)	Green			✓					
Goshawk (*Accipter gentilis*)	Green	✓		✓					
Grasshopper warbler (*Locustella naevia*)	Red		✓	✓	✓				
Great black backed-gull (*Larus marinus*)	Amber					✓			
Great spotted woodpecker (*Dendrocopus major*)	Green			✓	✓	✓		✓	✓
Great tit (*Parus major*)	Green			✓	✓	✓			✓
Green woodpecker (*Picus viridis*)	Amber				✓				
Greenfinch (*Carduelis chloris*)	Green			✓	✓	✓		✓	✓
Grey heron (*Ardea cinerea*)	Green			✓		✓			
Grey partridge (*Perdix perdix*)	Red		✓	✓	✓			✓	

Species	JNCC	Sch1	SBL	LBAP	NBN	Atkins (2009)	C	I	Survey Results
Grey wagtail (*Motacilla cinerea*)	Amber				✓	✓			
Hawfinch (*Coccothrautes coccothrautes*)	Red		✓	✓	✓				
Hen harrier (*Circus cyaneus*)	Red	✓	✓		✓		✓		
Herring gull (*Larus argentatus*)	Red		✓			✓			
House martin (*Delichon urbica*)	Amber			✓	✓	✓			✓
House sparrow (*Passer domesticus*)	Red		✓	✓	✓	✓			✓
Jackdaw (*Corvus monedula)*	Green					✓			✓
Jay (*Garrulus glandarius)*	Green					✓			✓
Kestrel (*Falco tinnunculus*)	Amber		✓	✓	✓	✓			
Kingfisher (*Alcedo atthis*)	Amber	✓	✓	✓				✓	
Lapwing (*Vanellus vanellus*)	Red		✓	✓	✓	✓			
Lesser black backed gull (*Larus fuscus)*	Amber					✓			
Lesser redpoll (*Carduelis cabaret*)	Red		✓		✓				
Linnet (*Carduelis cannabina*)	Red		✓	✓	✓	✓		✓	✓
Long-tailed tit (*Aegithalos caudatus)*	Green					✓			✓
Magpie (*Pica pica)*	Green					✓			
Mallard (*Anas platyrhynchos*)	Amber				✓	✓			
Meadow pipit (*Anthus pratensis*)	Amber				✓	✓			✓
Merlin (*Falco columbarius*)	Amber	✓	✓	✓	✓		✓		
Mistle thrush *(Turdus vicivorus*)	Amber				✓				✓
Moorhen (Gallinula chloropus)	Green			✓					
Mute swan (*Cygnus olor*)	Green							✓	
Osprey (*Pandion haliaetus*)	Amber	✓	✓	✓	✓		✓	✓	
Oystercatcher (*Haematopus ostralegus*)	Amber				✓	✓			✓
Pheasant (*Phasianus colchicus*)	n/a					✓			✓
Pied flycatcher (*Ficedulahypoleuca)*	Amber			✓					
Pied wagtail (*Motacilla alba)*	Green					✓		✓	
Quail (*Coturnix coturnix)*	Red	✓				✓			
Raven (*Corvus corax*)	Green						✓		
Red kite (*Milvus milvus*)	Amber	✓	✓				✓		
Redshank (*Tringa totanus*)	Amber			✓	✓				
Reed bunting (*Emberiza schoeniclus*)	Amber		✓	✓	✓			✓	✓
Redwing (*Turdus iliacus*)	Red		✓	✓					
Robin (*Erithacus rubecula*)	Green			✓	✓	✓			✓
Rook (*Corvus frugilegus)*	Green					✓			✓
Sand martin (*Riparia riparia*)	Amber			✓	✓	✓			
Scottish crossbill (*Loxia scotica*)	Amber		✓	✓	✓				
Sedge warbler (*Acrocephalus Schoenobaenus)*	Green					✓			✓
Short eared owl (*Asio flammeus*)	Amber		✓		✓				
Siskin (*Carduelis spinus)*	Green		✓			✓		✓	✓
Skylark (*Alauda arvensis*)	Red		✓	✓	✓	✓		✓	✓
Snipe (*Gallinago gallinago*)	Amber			✓	✓			✓	
Song thrush (*Turdus philomelos*)	Red		✓	✓	✓	✓			✓
Sparrowhawk *(Accipiter nisus*)	Green			✓	✓	✓		✓	✓
Spotted flycatcher (*Muscicapa striata*)	Red		✓	✓	✓				✓
Starling (*Sturnus vulgaris*)	Red		✓	✓	✓	✓			✓

Species	JNCC	Sch1	SBL	LBAP	NBN	Atkins (2009)	C	I	Survey Results
Stonechat (*Saxicola torquata*)	Green			✓					
Swallow (*Hirundo rustica*)	Amber			✓	✓	✓		✓	✓
Swift (*Apus apus*)	Amber		✓	✓	✓	✓	✓		
Tawny owl (*Strix aluco*)	Green			✓	✓	✓			✓
Treecreeper (*Certhia familiaris)*	Green								✓
Tree pipit (*Anthus trivialis*)	Amber		✓		✓				
Tree sparrow (*Passer montanus*)	Red		✓	✓		✓			✓
Whinchat (*Saxicola rubetra*)	Amber			✓					✓
Willow warbler (*Phylloscopus trochilus*)	Amber				✓	✓			✓
Woodpigeon (*Columba palumbus*)	Green								✓
Wood warbler (*Phylloscopus sibilatrix*)	Red		✓		✓				
Woodcock (*Scolopax rusticola*)	Amber				✓			✓	
Wren (*Troglodytes troglodytes*)	Green			✓	✓	✓			✓
Yellowhammer (*Emberiza citrinella*)	Red		✓	✓	✓	✓		✓	✓

Incidental Observations

6.1.5 A total of 21 species were recorded as incidentals between March and June 2013 during the course of other surveys. From the species recorded; one is listed on Annex 1 of Council Directive 2009/147/EC on the conservation of wild birds (The Birds Directive) (osprey), three are listed on Schedule 1 of the WCA (barn owl, kingfisher and osprey), four are JNCC red listed species, eight are JNCC amber listed species, nine are SBL priority species, and 14 species are listed on the LBAP. The species list is reported above in Table 15.

6.1.6 Additional information with regards to WCA1i species is provided below.

6.1.7 A barn owl was observed crossing the A9 at dusk just north of Luncarty in June 2013 and multiple barn owl pellets were found in woodland directly north of Cairnleith Moss SSSI. In addition, a landowner informed surveyors that a barn owl roosted in a barn on his property for a number of years until winter of 2011/12 (Mr Gary Fraser Collie pers. comm., R.Watt, Jacobs, March 2013). The barn called North Barns is located directly south of Cairnleith Moss SSSI (grid reference: NO 0747 3563).

6.1.8 A kingfisher was observed foraging at Shochie Burn Loch (grid reference: NO 0890 2992) in May 2013.

6.1.9 An osprey was observed in June 2013 exhibiting behavioural cues (calling incessantly, following the surveyors) suggestive of a nest site located nearby. In order to avoid disturbing the birds the surveyors withdrew from the field. The Ecological Clark of Works (ECoW) for the ground investigation works subsequently confirmed an osprey nest location (Peter Stronach, Company Director - The Wildlife Survey Unit Ltd., pers. comm., Mr Robbie Watt, Jacobs, June 2013).

Breeding Birds Survey

6.1.10 Six quadrats were surveyed for breeding birds within the survey area (Figure 10.6). Survey results for each quadrat are illustrated in Tables 16 to 21. A total of 49 breeding bird species were recorded throughout the study area; there were no Schedule 1 (WCA1i) species recorded:

- Eight JNCC red listed species: linnet, skylark, song thrush, spotted flycatcher, starling, house sparrow, tree sparrow and yellowhammer.
- Twelve JNCC amber listed species: bullfinch, common whitethroat, curlew, dunnock, house martin, meadow pipit, mistle thrush, oystercatcher, reed bunting, swallow, willow warbler and whinchat.

- Thirteen listed on the SBL: bullfinch, curlew, dunnock, linnet, reed bunting, siskin, skylark, song thrush, spotted flycatcher, starling, house sparrow, tree sparrow and yellowhammer.
- Twenty-six listed on the Tayside LBAP: blackbird, blue tit, bullfinch, chaffinch, curlew, dunnock, goldfinch, great spotted woodpecker, great tit, greenfinch, house martin, house sparrow, linnet, reed bunting, robin, skylark, song thrush, sparrowhawk, spotted flycatcher, starling, swallow, tawny owl, tree sparrow, whinchat, wren and yellowhammer.

Table 16: Survey Results for Quadrat 1

Species	Number	Species	Number
Woodpigeon	23	Dunnock	3
Chaffinch	16	Coal tit	2
Robin	12	Great spotted woodpecker	2
Wren	11	Oystercatcher	2
Goldcrest	11	Reed bunting	2
Blackbird	7	Garden warbler	2
Treecreeper	6	Swallow	2
Skylark	6	Siskin	2
Willow warbler	5	Buzzard	1
Great tit	5	Chiffchaff	1
Blue tit	5	Tawny owl	1
Goldfinch	5	Pheasant	1
Carrion crow	4	Song thrush	1
Yellowhammer	4	Common whitethroat	1
Tree sparrow	4		

Table 17: Survey Results for Quadrat 2

Species	Number	Species	Number
Meadow pipit	18	Goldfinch	4
Starling	15	Skylark	4
Chaffinch	14	Feral pigeon	4
Woodpigeon	11	Carrion crow	3
Willow warbler	10	Jackdaw	3
Yellowhammer	10	Curlew	3
Robin	9	Reed bunting	3
Linnet	8	Dunnock	3
Wren	8	Pheasant	2
Swallow	7	Spotted flycatcher	2
Tree sparrow	6	Blackbird	2
Sedge warbler	6	Common whitethroat	2
Blackcap	5	Pied wagtail	2
Blue tit	5	Mistle thrush	1
Treecreeper	5	Coal tit	1
Great tit	5	Garden warbler	1

Table 18: Survey Results for Quadrat 3

Species	Number	Species	Number
Woodpigeon	23	Chiffchaff	3
Chaffinch	22	Carrion crow	7
Robin	13	Jackdaw	3
Coal tit	11	Whinchat	3
Wren	9	Dunnock	2
Goldcrest	9	Blackcap	2
Willow warbler	7	Buzzard	1
Siskin	6	Jay	1
Great tit	5	Meadow pipit	1

Species	Number	Species	Number
Blue tit	4	Yellowhammer	1
Song thrush	3	Long-tailed tit	1
Blackbird	3		

Table 19: Survey Results for Quadrat 4

Species	Number	Species	Number
Woodpigeon	17	Treecreeper	3
Chaffinch	15	Jackdaw	3
Wren	11	Chiffchaff	2
Great tit	8	Dunnock	2
Goldcrest	7	Blackcap	2
Robin	6	Mistle thrush	2
Siskin	5	Common whitethroat	2
Goldfinch	5	Collard dove	1
Coal tit	5	Buzzard	1
Meadow pipit	5	Swallow	1
Song thrush	4	Pheasant	1
Blue tit	4	Jay	1
Blackbird	4	Carrion crow	1
Yellowhammer	4		

Table 20: Survey Results for Quadrat 5

Species	Number	Species	Number
Woodpigeon	18	Song thrush	4
Wren	14	Willow warbler	4
Goldcrest	13	Greenfinch	3
Goldfinch	12	Blue tit	3
Jackdaw	12	Treecreeper	3
Chaffinch	11	Yellowhammer	2
Robin	10	Dunnock	2
Coal tit	10	Great tit	2
Chiffchaff	9	Collard dove	2
Siskin	8	Oystercatcher	2
Carrion crow	7	Reed bunting	1
Blackbird	7	Sparrowhawk	1
House martin	7	Jay	1
House sparrow	6	Buzzard	1
Swallow	5		

Table 21: Survey Results for Quadrat 6

Species	Number	Species	Number
Woodpigeon	19	Blackbird	4
Coal tit	14	Siskin	4
Chaffinch	12	Treecreeper	4
Willow warbler	11	Goldfinch	4
Wren	10	Dunnock	3
Robin	9	Jackdaw	3
Chiffchaff	7	Yellowhammer	3
Goldcrest	7	Jay	2
Blue tit	7	Bullfinch	2
Great tit	6	Garden warbler	1
Carrion crow	4	Great spotted woodpecker	1
Song thrush	4	Meadow pipit	1

7 Reptiles

Consultation Information

7.1.1 No consultation information was received through the EIA process with regard to reptiles.

Desk Based Study

7.1.2 During the Stage 2 Environmental Assessment, a common lizard was observed at Cairnleith Moss SSSI (TN 25, Atkins, 2009). A data search on NBN Gateway (NBN, 2013) identified a record of common lizard (*Lacerta vivipara*) within the study area at Bankfoot (NO 107 354) in July 2011. There were no records for adder (*Vipera berus*) or slow worm (*Anguis fragilis*).

Incidental Observations

7.1.3 A common lizard was identified under an artificial refuge placed around a pond subject to amphibian surveys (NO 07140 37107).

Survey

7.1.4 A walkover of the survey area was conducted and six sites were identified as having potential to support reptiles (Table 21 and Figure 10.7). A total of 241 artificial refuges (at a density of between five and ten refuges per hectare) were distributed across five of these locations between 24 and 26 April 2013, with refuges added to Gelly Muir on 29 May 2013. Reptile surveys at these locations started in March 2013 and continued until July 2013.

7.1.5 A total of 15 common lizards were found with the majority identified at Gelly Muir (Table 22). No adders or slow worms were found.

Table 22: Locations of Reptile Survey Sites and Reptiles Found

Area	Grid Reference	No. of Reptile refuges	No. of survey visits	Reptiles identified
Woodland east	NO 0707 3624	69	8	none
Woodland west	NO 0691 3649	50	8	none
Cairnleith Moss SSSI	NO 0708 3676	34	8	1 common lizard
Gelly Muir	NO 0629 3751	40	6	10 common lizard
Area of clear fell	NO 0667 3770	24	9	3 common lizard
Murthly Muir	NO 0679 3772	24	9	1 common lizard

8 Pine Marten

Consultation Information

8.1.1 No consultation information was received through the EIA process with regard to pine marten.

Desk Based Study

8.1.2 A data search on NBN Gateway (NBN, 2013) did not provide any records of pine marten (*Martes martes*) within the study area. The Stage 2 Environmental Assessment identified one pine marten record from the study area. This was a road kill from the Muir of Thorn in 1997 (NO 068 374) (Atkins, 2009).

8.1.3 A recent joint survey between SNH and the Vincent Wildlife Trust (VWT) that assessed the expansion zone of pine marten in Scotland, recorded pine marten scats in the vice counties of east, west and mid-Perthshire. These areas encompass the study area (Croose et al., 2013).

Incidental Observations

8.1.4 Six potential pine marten scats were found in the Gelly Wood and Muir of Thorn area (Table 23 and Figure 10.8). Scats thought to be fresh and in good condition were recovered for DNA analysis to confirm their species of origin as previous studies have highlighted problems associated with identifying scats from morphology alone (Davison et al., 2002). One of the potential pine marten scats recorded from Gelly Wood was collected and maintained in a suitable condition for DNA analysis. However, despite several attempts and different processes the sample did not yield a result.

Table 23: Incidental Pine Marten Records

Date	Location	Grid Ref.	Field Sign	Comments
12.03.2013	Gelly Wood	NO 06498 37587	Scat	Potential pine marten scat, characteristic shape and size located on a trail through a woodland shelter belt.
12.03.2013	Gelly Wood	NO 06532 37600	Scat	Potential pine marten scat located on mammal trail through woodland shelter belt (young Scots pine).
26.03.2013	Gelly Wood	NO 06493 37337	Scat	Potential pine marten scat at the edge of a Scots pine woodland next to Gelly Cottage, located on the fence line next to a fallen pine tree.
11.06.2013	Gelly Wood	NO 06915 36578	Scat	Possible pine marten scat found on floor of woodland.
-	Muir of Thorn	NO 06872 37626	Scat	Potential pine marten scat located on forest floor, two metres from a dry stone wall.
-	Gelly Wood	NO 06539 37111	Scat	Potential pine marten scat collected from a footpath next to a coniferous woodland in the Gelly wood area.

Habitat Assessment

8.1.5 An assessment of the habitat within the survey corridor demonstrates that the only suitable habitat for pine marten is located in the northern most 1.5km of the scheme. This area is a mosaic of habitats dominated by commercial conifer plantation. Other habitats within this mosaic include clear felled plantation woodland, improved and semi-improved grassland.

8.1.6 The remaining habitat along the proposed route of the scheme is mainly composed of agricultural land (arable, improved grassland and semi-improved grassland) with occasional, isolated patches of woodland. These habitats are considered unsuitable for pine marten on account of the high degree of exposure and disturbance associated with farming (Croose et al., 2013).

Survey

8.1.7 A survey of habitat identified as suitable for pine marten and informed by the presence of possible scats recovered earlier in the year, was undertaken on 19 July 2013. No evidence of pine marten, including additional scats, was located during this survey. No features suitable for den sites were also identified.

8.1.8 Scat analysis did not yield a result. This may have been due to no DNA present in the scat (DNA test is of the mucous membrane on the scat rather than the scat itself) or the DNA was washed out or degraded, probably due to exposure to the weather.

9 Red Squirrel

Consultation Information

9.1.1 Information received from the A9 SEA team indicated the presence of grey squirrel near Luncarty (NO 092 296). .Data were also provided on red squirrel taken from the NBN (see Table 24).

Desk Based Study

9.1.2 No red squirrel dreys were found during the Stage 2 Environmental Assessment surveys although several squirrel chewed cones were found in Muir of Thorn/Gelly Wood (Atkins, 2009). A data search on NBN Gateway (NBN, 2013) identified records of red squirrel within the study area at Muir of Thorn and Bankfoot as shown in Table 24.

Table 24: Consultation Records from NBN Gateway

Date Recorded	Grid Reference	Location	Record Type	Condition
09/11/1994	NO 068 372	A9 at Muir of Thorn	Combined	n/a
27/04/1998	NO 06 37	n/a	Combined	n/a
01/09/2006	NO 065 355	Bankfoot	Casual Sighting	n/a
16/07/2007	NO 065 355	Bankfoot	Casual Sighting	n/a
03/09/2007	NO 070 348	A9 between Dunkeld and Perth	Casual Sighting	Dead on Road
05/04/2011	NO 067 377	Muir of Thorn	Casual Sighting	Alive
08/05/2011	NO 069 369	A9 North of Bankfoot	Casual Sighting	Dead on Road
21/06/2011	NO 070 350	Bankfoot	Casual Sighting	Alive
23/06/2011	NO 070 350	Bankfoot	Casual Sighting	Alive
09/11/2003	NO 092 326	Five Mile Wood	Casual Sighting	Not recorded
15/06/2011	NO 092 327	Five Mile Wood	Casual Sighting	Alive

9.1.3 Transects conducted as part of Saving Scotland's Red Squirrels (SSRS) Survey were conducted close to the study area in spring 2012. Red and grey squirrels were both recorded in the Bankfoot area west of the A9 (Brassey et al., 2012).

Incidental Observations

9.1.4 Three squirrel sightings were recorded during 2013 surveys and are detailed in Table 25. A red squirrel was seen feeding on 12 March 2013 in Gelly Wood; a grey squirrel was seen on 14 March 2014 in woodland along the banks of Shochie Burn Loch, west of Luncarty, and; a red squirrel was seen on 30 April 2013 in woodlands in the Muir of Thorn area.

Table 25: Squirrel Sightings

Date	Location	Grid Reference	Species
12/03/2013	Gelly Wood	NO 06235 38061	Red
14/03/2013	Shochie Burn Loch	NO 08804 29858	Grey
30/04/2013	Muir of Thorn	NO 06978 37373	Red

9.1.5 Squirrel feeding signs have been found within a number of the plantation forests across the survey area (Table 26). It is not possible to determine which species produced them due to the similarity of feeding signs of both species. One squirrel drey was also found along Ordie Burn (Table 26). Similar to feeding signs, it is not possible to attribute a drey to a specific species due to the similarity in drey structure.

Table 26: Location of Incidental Records of Squirrel Signs

Sign	Date Recorded	Grid Reference	Location
Cones	07/03/2013	NO 07040 37210	Muir of Thorn
Cones	12/03/2013	NO 06532 37600	Gelly Wood
Drey	13/03/2013	NO 08535 31914	Ordie Burn
Cones	27/03/2013	NO 06858 37653	Muir of Thorn
Cones	28/03/2013	NO 06331 37295	Gelly Wood
Cones	04/06/2013	NO 05980 37700	Gelly wood
Cones	07/08/2013	NO 05982 38243	Gelly Wood
Cones	07/08/2013	NO 05174 38880	Rohallion Loch
Cones	07/08/2013	NO 05530 38572	Mill Dam

Habitat Assessment

9.1.6 Red squirrels are most abundant in mature Scots pine woodland, but they will also live in mixed conifer and deciduous woodlands (SNH, 2012). However, the non-native grey squirrel can feed more efficiently in broadleaved woodlands reducing the number of red squirrels in these woodlands when both species are present (Scottish Squirrel Group, 2004). Habitat suitable for red squirrels may also comprise high levels of landscape connectivity and a diverse age structure.

9.1.7 An assessment of the habitat within the survey corridor undertaken between March and August 2013 resulted in the identification of three woodland areas providing potential to support populations of red squirrels. Two of these areas, Muir of Thorn and Gelly Wood, are located in the northern 2km of the scheme in (Figure 10.9). Five Mile Wood is located southeast of Bankfoot and east of the proposed scheme. This is further supported by the incidental records of red squirrel being from these areas (Table 25). Table 27 presents a habitat description of the woodland areas suitable for red squirrel and assesses their potential value to red squirrels.

Table 27: Habitat Description and Potential Value to Red Squirrels of Suitable Red Squirrel Woodlands

Woodland	Grid Ref.	Value	Habitat Description
Muir of Thorn	NO 07015 38121	Medium-High	Mixed coniferous and broad-leaved woodland of varying age structure. Potential foraging opportunities for red squirrels provided by presence of tree species such as Scots pine. Woodland area is large, but isolated from surrounding woodland and is subject to low levels of disturbance.
Gelly Wood	NO 06030 38021	Medium-High	Good potential foraging and breeding habitat due to mixture of tree species present and age structure. Gelly Wood is well connected to woodland in the north-west.
Five Mile Wood	NO 09155 32592	Medium	Mainly coniferous plantation woodland. Potential foraging opportunities for red squirrels. Poorly connected to other woodlands but red squirrels known to be present.

9.1.8 Woodlands to the south of this area are mixed broadleaf favoured by grey squirrels. Indeed, an incidental of a grey squirrel was recorded in broadleaved woodland along Shochie Burn Loch. In addition, records on NBN indicated the presence of grey squirrel at Five Mile Wood.

10 Wildcat

Consultation Information

10.1.1 Consultation with SNH confirmed that wildcat were unlikely to be present in the study area (meeting held 25 September 2013).

Desk Based Study

10.1.2 The Stage 2 environmental assessment recorded two unconfirmed sightings of wildcat and one RTA approximately two miles from the study area (Atkins, 2009). A data search on NBN Gateway (NBN, 2013) did not provide any recent records of wildcat (*Felis silvestris*) within the study area.

Incidental Observations

10.1.3 No incidental observations were recorded during 2013 surveys.

Habitat Assessment

10.1.4 An assessment of the habitat within the survey corridor demonstrates that the only suitable habitat for wildcat is located in the northern most 1.5km of the proposed scheme, an area known as Gelly Wood. This area is composed of a mosaic of habitats dominated by commercial conifer plantation. Other habitats within this mosaic include clear felled plantation woodland, improved and semi-improved grassland.

10.1.5 The remaining habitat along the proposed route of the scheme is mainly composed of agricultural land (arable, improved grassland and semi-improved grassland) with occasional, isolated patches of woodland. These habitats are considered unsuitable for wildcat on account of the high degree of exposure and disturbance associated with intensive farming (SNH, 2013d).

10.1.6 The relatively small area of suitable habitat located within the survey corridor suggests this would only form part of any wildcat territory, with more suitable habitat located to the north west of the survey corridor. Further to this the survey corridor is located beyond the likely southern range of the Scottish wildcat (Davis & Gray, 2010).

Survey

10.1.7 A walkover survey of identified suitable wildcat habitat was undertaken on 19th July 2013. No wildcat field signs, such as observations, prints or scats, were found and no suitable den sites were located.

11 Otter (Confidential)

11.1.1 Refer to Appendix A10.4.

12 Water Vole

Consultation Information

12.1.1 No consultation information was received through the EIA process with regard to water vole.

Desk Based Study

12.1.2 The Stage 2 Environmental Assessment identified one un-verified record of water vole (*Arvicola amphibius*) from the Murthly estate in 2005 (NO 073 393) (Atkins, 2009). A data search on NBN Gateway (NBN, 2013) did not provide any records of water vole within the study area.

Incidental Observations

12.1.3 During surveys there were no incidental records of water vole within the study area. However, incidental records of American mink (*Neovison vison*), a species known to have a serious impact on water vole populations (Aars et al., 2001), were noted and the results are shown in Table 28.

Table 28: Incidental Records of American Mink

Date Recorded	Grid Reference	Location	Evidence
30/04/2013	NO 09004 30227	Shochie Burn	Mink prints recorded on the north bank of the burn in sandy substrate next to a fallen tree.
30/04/2013	NO 08932 29918	Shochie Burn Loch	Mink prints recorded around the water edge on the south side of the loch by the wall of the fish ladder.
02/05/2013	NO 08202 32005	Ordie Burn	Mink prints found on the east bank of burn going into a cleared ledge under some tree roots.
10/05/2013	NO 07449 34006	Garry Burn	Mink prints were found on the west bank of the burn on a sandy substrate.

Water Vole Survey

12.1.4 No evidence of the presence of water vole, droppings, feeding stations or burrows, was recorded during 2013 surveys. The habitat along watercourses in the study area was considered to be of low suitability due to the lack of riparian vegetation for foraging or cover. Suitable burrowing habitat was also absent, water was of a poor quality and at some watercourses there was either too little or no water present. Also mink are present throughout the study area and will preclude water voles.

13 Amphibians

Consultation Information

13.1.1 No consultation information was received through the EIA process with regard to amphibians.

Desk Based Study

Biodiversity Action Plan

13.1.2 Amphibian species within Perth and Kinross are covered by the Tayside LBAP. Six species are listed (Table 29) within a range of HAPs. For great crested newt a consultative/draft SAP has also been produced (Tayside Biodiversity Partnership, undated).

Table 29: Amphibian Species Listed in the Tayside Biodiversity Action Plan

Common Name	Scientific Name	Status	Tayside Habitat Action Plan
Common frog	*Rana temporaria*	CC	Stone Dykes Wet grassland Built and Developed Environment Businesses with Land *Community Gardens, Orchards & Allotments* *Hospital, Sheltered Housing & Residential Complexes* *Schools, College & University Grounds*
Common toad	*Bufo bufo*	CC	Stone Dykes Built and Developed Environment Businesses with Land *Community Gardens, Orchards & Allotments* *Hospital, Sheltered Housing & Residential Complexes* *Schools, College & University Grounds*
Natterjack toad	*Epidalea calamita*	P	*Ponds & Pools*
Great crested newt	*Triturus cristatus*	L, P, SAP	Standing Open Water *Ponds & Pools* *Lowland Mixed Broad-leaved Woodlands* *Planted Coniferous Woodlands* *Traditional Orchards*
Palmate newt	*Lissotriton helveticus*	CC	Mesotrophic Lochs *Community Gardens, Orchards & Allotments*
Smooth newt	*Lissotriton vulgaris*	CC	*Community Gardens, Orchards & Allotments*

CC = UK species of Conservation Concern, L = Locally important species, P = UK priority species, SAP = Tayside draft/consultative species action plan. Draft/consultative habitat action plans in italics.

13.1.3 A search on the NBN Gateway (NBN, 2013) found four historical records of great crested newt (Table 30) from two sites. Both sites are to the south/south-west of Perth.

Table 30: Great Crested Newt Records from NBN Gateway

Date Recorded	Grid Reference	Location	Record Type
1911	NO 111 187	Dunbarney	Presence
1950 - 1985	NO 196 143	Turflundie Wood, Fire Pond	Presence
1973	NO 196 143	Auchtermuchty, Turflundie Wood	Presence
1973	NO 196 143	Auchtermuchty	Presence

13.1.4 Turflundie Wood is designated as a SSSI and a SAC with great crested newt being a primary reason for selection of the site. Surveys at the site in 2003 (Central Environmental Surveys, 2003) found that great crested newt were still present. Information indicates that great crested newt have been recorded breeding in eight ponds at the site and is determined to be the most northerly known cluster of great crested newt ponds in the UK (JNCC, 2013b). Turflundie Wood is approximately 18km south-west of the proposed scheme.

13.1.5 Great crested newts are covered by the proposed Tayside Great Crested Newt Action Plan (Tayside Biodiversity Partnership, undated). The SAP lists one site, Pitmedden Forest near Abernethy, which includes the Turflundie Wood area. Great crested newts are also on the SBL.

13.1.6 The Stage 2 report for the proposed Scheme (Atkins, 2009) identified three ponds within the study area which were considered to be suitable for great crested newts. These were identified on the Phase 1 maps as TN4, TN22 and TN30. No surveys for great crested newt presence in these ponds were undertaken.

Incidental Observations

13.1.7 A male smooth newt was recorded on 28th March 2013 on the edge of open woodland near the Carnleith Moss SSSI (NO 07301 36756). An eft (either smooth or palmate) was recorded in ponds P4 and in P15 (see Table 30) during freshwater surveys.

13.1.8 A common frog was found in the lower Ordie Burn during electrofishing surveys (Section 20: Freshwater Fish). A common toad was recorded under reptile mats at Cairnleith Moss and under a metal sheet in grassland to the north of Luncarty (NO 09248 30776).

Survey

13.1.9 Fifteen waterbodies were identified from maps, aerial photography and surveys to inform other ecological receptors (Table 31). Habitat Suitability Index (HSI) assessments were carried out at these sites in April 2013 (Figure 10.7). Due to changes in the engineering design, additional HSI assessments were undertaken in August 2013 at three ponds.

13.1.10 One waterbody was found to no longer exist (P3). Seven waterbodies had HSI values of 0.60 or greater; two of these (P5 and P7) were garden ponds and access to P8 was not possible and so these were not taken forward for further surveys. In addition, waterbody P1 (Shochie Burn Loch) was assessed as being not suitable to support great crested newt. The waterbody is part of an active catchment (the Shochie Burn) and forms part of the River Tay SAC which is designated for a number of qualifying interests including four species of fish (Section 2: Terrestrial Habitats).

Table 31: HSI for Ponds Identified within the Study Area

Pond ID	Atkins ID	OS Grid Reference	HSI	Notes	Taken Forward for Further Survey
P1		NO 08792 29905	0	Shochie Burn Loch	
P2		NO 09080 30225	0.78	Lies within the River Tay SAC	✓
P3		NO 09351 31585	n/a	No longer exists	
P4	TN 04	NO 08765 31599	0.70	Waterfowling pond	✓
P5		NO 08856 32046	0.78	Garden pond	
P6		NO 08991 32209	0.43	In cutting on disused railway line	
P7		NO 07585 33835	0.69	Garden pond	
P8		NO 07439 34145	0.82	SUDS pond	
P9		NO 07216 34994	0.57	SUDS pond	✓
P10	TN 22	NO 07140 37107	0.91	Not suitable for trapping, netting or torching due to extensive area of boggy ground.	✓
P11		NO 07116 37292	0.44	Part of ditch network	
P12		NO 07167 37319	0.57	Part of ditch network	
P13		NO 07215 37693	0.70		✓
P14		NO 06265 37085	0.41	Pond in improved grassland for cattle grazing	
P15	TN 30	NO 06532 37213	0.52	Confluence of ditches forming marshy area	✓
P16		NO 06116 38694	0.64	Man-made pond, possibly for waterfowling	
P17		NO 05471 38639	0.58	Mill Dam SSSI	
P18		NO 05415 38884	0.60	In cattle grazed field behind electric fence	

13.1.11 Six waterbodies were taken forward for further surveys. This included waterbody P15 which had a below average HSI (0.52) but had been identified in the Stage 2 report as having potential as GCN breeding habitat (Atkins, 2009). Waterbody P10 was not suitable for standard survey techniques due to the large area of deep boggy habitat surrounding it. As a result a refuge search survey was undertaken in this area which included the placement of artificial refuges (50cm x 50cm) roofing felt squares). The three waterbodies (P16, P17, P18) assessed in August 2013 could not be taken forward for further survey.

13.1.12 Due to the lack of free water at pond P13 by the third survey and at pond P2 by the fourth survey, trapping or netting could not be carried out. Results of the surveys are presented in Table 32.

Table 32: Results of Amphibian Surveys

Pond ID	Survey No.	Date of Survey	No. of Newts in Traps			Tadpoles	Other
			Smooth newt	Palmate newt	Great crested newt		
P2	1	30/04/2013	0	0	0	✓	-
	2	15/05/2013	0	0	0	-	-
	3	29/05/2013	0	0	0	-	-
	4	10/06/2013	0	0	0	-	-
P4	1	30/04/2013	0	0	0	✓	Fish
	2	15/05/2013	0	0	0	✓	Fish
	3	29/05/2013	0	0	0	✓	Fish
	4	10/06/2013	0	0	0	-	Fish
P9	1	30/04/2013	0	0	0	✓	-
	2	14/05/2013	0	0	0	✓	-
	3	29/05/2013	0	0	0	-	-
	4	10/06/2013	0	0	0	-	-
P13	1	08/05/2013	0	1 x female	0	-	-
	2	22/05/2013	0	0	0	-	1 x male palmate (netting)
	3	05/06/2013	0	0	0	✓	-
	4	20/06/2013	0	0	0	-	-
P15	1	07/05/2013	0	2 x male	0	✓	1 x eft (netting)
	2	22/05/2013	0	2 x female	0	✓	1 x eft (netting)
	3	05/06/2013	0		0	✓	Common frog
	4	20/06/2013	0	0	0	✓	Common frog

13.1.13 No GCN were recorded at any pond (Table 32). Small numbers of palmate newts were recorded at ponds P13 (Muir of Thorn) and P15 (Gelly). Tadpoles were recorded in all ponds and a common frog was found in P15. Fish (three-spined stickleback, *Gasterosteus aculeatus*) were found in large numbers in P4. No amphibian species were recorded from the refuge search at pond P10. However, a common lizard was recorded here.

14 Deer

Consultation Information

14.1.1 Deer collision data were obtained from Langbein Wildlife Associates (Deer Casualty and Collisions Database). Fifty records of deer casualties were recorded between 2003 and February 2013 within

the study area, although none were recorded in 2013. The species of deer were unknown but the consultee indicated that there were likely to be a mixture of fallow deer (*Dama dama*) and roe deer (*Capreolus capreolus*).

14.1.2 The majority of the records (49) were recorded as being associated with the A9 with one further deer casualty recorded on the B867 in Bankfoot village. Eight records also appeared to be north of the proposed scheme in the Pass of Birnam area. However, the consultee indicated that actual incident locations are rarely known and therefore the casualty locations do not necessarily indicate deer activity loci (such as crossing points).

14.1.3 The number of deer casualties along the A9 varied between 1 (2007) and 9 (2005), with an average of 4.9 per year. Assessments undertaken by the consultee indicated that it is likely that these were an under-estimation of the actual numbers and data sources were not consistent. The consultee indicated that the most consistently available data was from 2008 onwards; these data indicated an average of 4.6 deer casualties a year with a range of 3 to 7.

Field Survey

14.1.4 Deer fencing was reported around individual blocks of woodland/felled woodland in the Murthly Estates area towards the northern end of the proposed scheme. To the west of the proposed scheme, deer fencing was recorded at one location, around a small woodland block at OS NGR NO 06039 37556 approximately 625m away.

14.1.5 Deer fencing was also observed around woodland to the east of the proposed scheme in the Muir of Thorn area. The fencing ran from approximately OS NGR NO 06782 37366 to NO 06856 36897 and continued east away from the proposed scheme. An estate road ran between these woodland blocks and the current A9 highway. It was observed that the fencing was not deer proof; push-throughs had been forced through the fence by deer and tree-fall had also resulted in damage.

14.1.6 Deer fencing also ran from OS NGR NO 06754 37647 to NO 07302 37774, running east from a location adjacent to the A9 along the estate road. It turned north along the A9 for approximately 190m and encompassed an area of felled woodland which was regenerating as wet heath and woodland/scrub (see Target note 25). In all locations, the deer fencing appeared to primarily intended to protect specific areas of woodland and not with preventing the movement of deer onto and across the carriageway.

15 Aquatic Habitat / River Habitat Survey

Consultation Information

15.1.1 No information specific to river habitat was received through EIA consultation.

Desk Based Study

15.1.2 Desk based study found that SEPA classifications indicate that both the Shochie and Ordie burns reach a minimum of Good Ecological Status (SEPA, 2013). Therefore hydrology and morphology are not having an impact on the ecological features within the watercourse. Hydrology and morphology are assessed at the waterbody scale and as such these assessments may not be suitable to assign classification to individual reaches.

15.1.3 Incidental data collected during protected species survey of the Shochie Burn in 2008 (Atkins, 2009) indicates that the watercourse runs through a mixture of fringing woodland and agricultural farmland, upstream of the A9, whilst downstream of the culverted crossing point land use is residential and agricultural. With relatively high stream power due to steep planform above the A9 the Shochie Burn demonstrates a diverse pool and riffle flow habitat, although marginal habitats are limited. Below the A9 culvert sedimentation of the substrate increases although aquatic habitats are reported to be similar to upstream, with a greater proportion of marginal cover form tree roots and deeper pools, especially at the confluence with the Ordie Burn.

15.1.4 Only a small proportion of the lower Ordie catchment lies within the proposed scheme. Upstream of the A9 the burn exhibits features associated with an active river channel, including sand and gravel bars as well as eroding and depository section suitable for supporting salmonid spawning. The Stage 2 Environmental Assessment identified bank slips and fallen trees/woody debris contributing to the habitat diversity in 2008. Associated with the crossing of the B9099, and its embankments, the river habitat is modified by the presence of tipped bank debris and access to the watercourse by cattle leading to poaching of the bank and a significant sediment source. This, combined with lower energy flow types below the road crossing was shown in the Stage 2 Environmental Assessment to increase the proportion of fine sediment in the lower reaches of the Ordie, and although providing a greater proportion of deeper water and marginal cover to aquatic species the lower Ordie acts as a sediment sink, covering gravel substrates with silt.

Aquatic Habitat Survey

15.1.5 Aquatic Habitat Surveys were undertaken on the named watercourses in association with the freshwater fish and freshwater invertebrate assessments and outcomes from these surveys are described in Sections 16 (Freshwater Invertebrates) and 20 (Freshwater Fish). Only SEPA designated main-river watercourses were surveyed by means of River Habitat Survey. Non SEPA designated named watercourses and unnamed burns, tributaries and ditches were assessed for aquatic habitat during visits for other aquatic receptors. Observations made of flow types, channel substrates and riparian zone structure are used to characterise the non-designated watercourses.

River Habitat Survey

15.1.6 River Habitat Surveys (RHS) were undertaken on the Shochie, Ordie (lower and upper) and Garry burns on the 14th - 16th May 2013. Surveys were undertaken according to the standard River Habitat Survey methodology (EA, 2003) by an accredited surveyor. Data was provided to the Environment Agency, as the database co-ordinator, and Habitat Modification Scores (HMS) and Habitat Quality Assessment (HQA) indices derived (Table 33).

Table 33: Outputs from the River Habitat Surveys (14–16 May 2013).

Site	RHS ref.	Location	Habitat Modification Score	Habitat Modification Score (class)	Habitat Quality Assessment
Shochie Burn	39160	NO 09092 30220	480	3	56
Ordie Burn (lower)	39161	NO 09026 31162	1015	4	59
Ordie Burn (upper)	39159	NO 08125 32166	280	3	46
Garry Burn	39162	NO 07200 34584	695	4	46

15.1.7 The Shochie Burn is classified as Obviously Modified using the 2013 survey data (Table 34). The presence of a low embankment running along at least 50% of the left bank of the Shochie Burn and the existing A9 culvert increases the HMS scores. HMS is also negatively affected by the presence of the reinforcement of the channel around the railway crossing viaduct at the bottom of the reach.

Table 34: RHS Outputs for the Shochie Burn (site reference 39160)

Parameters	Description
Valley Form, Channel Dimensions, Bank Profile and Type and Artificial Features	Shallow vee valley without a distinct flat valley bottom. Channel bank full width 9m on average with water width approximately 5m. Bank top heights of 2.3m and 2.5m for left and right bank respectively. Left bank predominantly steep, and earth, with isolated modification associated with the existing road crossing. A low embankment is present along the left bank for over 50% of the survey reach. Right bank is predominantly earth although with some reinforced and re-sectioned banks recorded at the downstream spot checks. One minor bridge reported. Channel is not obviously realigned through its length except for the presence of the road culvert.
Substrate, Channel Features and Flow	Cobbles predominate in the substrate, with localised boulders, gravel and pebble also present. Rippled flow was present in 80% of the spot checks, with smooth glide flows in the remaining 20%. Unbroken waves associated with riffles were also observed. Both eroding and stable cliffs were reported, with both unvegetated point and side bars.
Bank Top Land Use and	Bank faces and tops were simple or complex in vegetation structure at all but one spot

Parameters	Description
Vegetation	check with grasses, tall herb and trees lining the channel. Bank top vegetation cover was influenced by the adjoining land use and the complexity of cover mirrors the mixed land use in the riparian zone. The right bank tops border tilled land through 90% of the survey reach however the channel is lined on both banks by trees at least to 5m.
Surrounding Land Use	Riparian land use was predominantly tilled land used for agriculture upon both banks, although woodland and suburban (A9 road crossing) were also recorded on both banks. A wet wooded area was recognised on the left bank immediately above the existing road culvert.
Features of Special Interest and Overall Characteristics	No non-native species were present during the survey.

15.1.8 The lower Ordie Burn reach is classified as Significantly Modified using the 2013 survey data (Table 35), principally as a result of the existing A9 road culvert and historic impoundment of water at the downstream end of the reach. Over half of the surveyed left bank is affected by a low embankment, increasing the modification score.

Table 35: RHS Outputs for the Ordie Burn (lower) (site reference 39161)

Parameters	Description
Valley Form, Channel Dimensions, Bank Profile and Type and Artificial Features	Asymmetric valley with a distinct flat valley bottom. Channel bank full width 7.5m on average with water width approximately 4.4m. Bank top heights of 2.5m and 1.5m for left and right bank respectively with a 1m embankment recorded on the left bank. The left bank exhibits a mix of vertical and steep banks comprised of earth, with isolated reinforcement and embankment associated with existing road crossing and the impoundment of water at the downstream end. The right bank is earth with vegetated and unvegetated side bars recorded in one spot check each. One major weir and the A9 road culvert are significant modifications to bank and channel profile. Channel is not obviously realigned through its length although bank reinforcement is present on the left bank in small areas. Less than 33% of the reach is impounded by the weir at the downstream
Substrate, Channel Features and Flow	The substrate is a cobble, pebble, gravel mix with localised sand and silt also present. Flow variation is high, with rippled flow, smooth flow and unbroken waves represented across the spot checks. Overall ten riffles and three pools were observed over the 500m survey reach. Dispositional features include two vegetated point bars and a number of unvegetated side and mid channel bars.
Bank Top Land Use and Vegetation	Bank faces were varied in vegetation structure, whilst bank tops on both banks were uniform or simple in vegetation structure. Bank top vegetation cover was influenced by the adjoining land use and the complexity of cover mirrors the mixed land use in the riparian zone. The left bank top, where visible, was tilled land, (50%) and improved grassland (30%) The right bank land use was tilled land, whilst the becoming broadleaved woodland in the upper reaches. Channel is semi continuously lined on the left bank and continuous lining on the right bank although trees shade less than a third of the wetted channel. Shading does not prevent the presence of mosses and emergent reed/rush from being present in 60% of spot checks.
Surrounding Land Use	Tilled land dominates the riparian land use along both banks. Within 50m of the left and right bank other land uses, including broadleaf woodland (Over 33% of the right bank), shrub and improved grassland were recorded.
Features of Special Interest and Overall Characteristics	No non-native species were present during the survey.

15.1.9 River habitats on the upper Ordie Burn are classified as Obviously Modified (HMS score of 3) using the 2013 survey data (Table 36). Bank top modification in the form of a low embankment between the watercourse and agricultural land, and the crossing of the minor road bridge are the largest contributors to the HMS score.

Table 36: RHS Outputs for the Ordie Burn (upper) (site reference 39159).

Parameters	Description
Valley Form, Channel Dimensions, Bank Profile and Type and Artificial Features	No obvious valley sides with a distinct flat valley bottom and no natural terraces. Channel bank full width 5.0m at spot check 8 with water width approximately 3.0m. Bank top heights of 2.0m and 1.5m for left and right bank respectively and water depth of 0.4m. Both banks are predominantly steep (>45o) with vertical or undercut sections. Bank material is earth throughout the reach however some isolated historic reinforcement of the right bank toe is evident at spot check 4. A low embankment is present on both banks for less than 50% of the reach. Some natural erosion and depositional features

Parameters	Description
	are evident in the form of eroding cliffs (vertical bare faces over 0.5m high) and unvegetated side bars. Channel not obviously realigned through its length or impounded by in channel structures.
Substrate, Channel Features and Flow	Cobbles and pebble predominate the substrate, with localised silt and gravel also present. Rippled flow present in 80% of spot checks, with smooth glide flow and unbroken waves associated with riffle features in remaining 20%. Isolated areas of unbroken waves and marginal slack flows observed. Vegetated mid channel bar, and unvegetated side and point bars are important features.
Bank Top Land Use and Vegetation	Both bank faces supported simple vegetation structure, with a mix of grasses, herbs and shrub whilst the bank tops on both banks were uniform in structure and dominated by terrestrial grasses. The left bank top was improved grassland down the entire reach. The right bank land use was tall herb for the lower 300m of the reach and mix of improved and rough grassland in the upper 200m. Channel is semi continuously lined on the right banks by trees, with occasional clumps along the left bank shading less than a third of the wetted channel. Exposed tree roots and overhanging boughs provide potential habitat. Shading does not prevent the presence of mosses (present in 5 spot checks), emergent reeds/rush (2 spot checks) and submerged fine leaved macrophyte species (2 spot checks) becoming established.
Surrounding Land Use	Riparian land use was dominated by improved grassland (left bank) and tall herb with some associated shrub on the right, changing to grassland upstream. Within 50m of the right bank top the tall herb and grassland buffered tilled / agricultural land and this was present for over a third of the RHS reach. Additionally suburban development was evident on both banks, as a result of the minor road bridge crossing upstream of spot check 6.
Features of Special Interest and Overall Characteristics	No non-native species were present during the survey.

15.1.10 Habitat Modification Scores of the Garry Burn indicates that the Burn is Significantly Modified using the 2013 survey data (Table 37). The largest contributor to the Habitat Modification Score is the re-sectioning of the Garry Burn through the upper survey reach, and extensive right bank embankment. The presence of an intermediate bridge, three surface water outfalls and associated bank reinforcement result in the classification of Significantly Modified.

Table 37: RHS Outputs for the Garry Burn (site reference 39162)

Parameters	Description
Valley Form, Channel Dimensions, Bank Profile and Type and Artificial Features	Concave valley with a distinct flat valley bottom. Channel bank full width 3.6m on average with water width approximately 3.2m. Bank top heights of less 0.8m and 1.4m for left and right bank respectively. Left bank predominantly steep, and comprising earth, with isolated modification associated with minor road crossing. The upstream end of the reach shows signs of channel re-sectioning along the left bank associated with suburban land usage. The right bank is earth with a low embankment present for over 50% of the survey reach. One intermediate bridge and three outfalls, with associated headwalls present. Channel is not obviously realigned through its length although bank reinforcement is present on both banks in low quantity.
Substrate, Channel Features and Flow	Cobbles and pebble predominate the substrate, with localised sand, silt and gravel also present. Rippled flow was present in 90% of the spot checks, with smooth glide flows in the remaining 10%. Isolated areas of unbroken waves and marginal slack flows were also observed. A single vegetated mid channel bar and one mature island are present.
Bank Top Land Use and Vegetation	Bank faces were varied in vegetation structure, whilst bank tops on both banks were uniform or simple in vegetation structure. Bank top vegetation cover was influenced by the adjoining land use and the complexity of cover mirrors the mixed land use in the riparian zone. The left bank top was rough pasture and shrub in the lower reaches, with suburban land (industrial units, car park and road) close to the bank top in the upper half of the survey reach. The right bank land use was rough pasture in the lower reaches and tilled land in the upper. Channel is semi continuously lined on both banks by trees shading less than a third of the wetted channel. Shading does not prevent the presence of mosses (present in every spot check) and fine leaved submerged macrophyte species (present in 4 spot checks).
Surrounding Land Use	Riparian land use differed between banks, although was reflected in the bank top land use. Additional suburban development (as described above) was evident within the 50m land use sweep up on both banks, including minor roads, the main A9, residential property and the Perthshire Visitors Centre. Tilled land along the left bank was buffered to the channel by the low embankment.
Features of Special Interest	No non-native species were present during the survey.

Parameters	Description
and Overall Characteristics	

Named and Unnamed Watercourses

15.1.11 Aquatic habitat across non SEPA designated watercourses (including named burns, unnamed tributaries and wetted field drains) was characterised of being of low to moderate habitat quality. The SEPA designated watercourses surveyed provide significantly greater diversity in flow, substrate composition and riparian habitat than the named burns and unnamed tributaries. The non-designated watercourses can generally be characterised by increased channel management (straightened, embanked, reinforced banks), lower flows and velocity and associated effects on geomorphological activity, such as increased turbidity and sedimentation. In comparison to the designated watercourses the smaller burns and tributaries demonstrate a higher proportion of channel shading, detritus and the potential for anthropogenic interaction (e.g. cattle poaching).

16 Freshwater Invertebrates

Consultation Information

16.1.1 Consultation data has been received from SEPA regards a single freshwater invertebrate site on the Garry Burn. Data has been provided for the Garry burn (at Ford downstream of Loak – NO0728833586) between 2008 – 2009 (Table 38).

Table 38: Biological Metrics Provided for the Garry Burn Freshwater Invertebrates Site from Consultation Information

	21/05/08	27/11/08	22/04/09	22/09/09
BMWP	120	97	124	94
ASPT	6.00	5.71	6.20	5.53
nTaxa	20	17	20	17
LIFE (f)*	7.58	7.92	7.87	8.00

* Calculated by Jacobs using Invertebrate Raw Data

16.1.2 No further consultation data was received for watercourses within the study area for 2008-2013.

Desk Based Study

16.1.3 SEPA classification of the Shochie and Ordie burns indicates that freshwater invertebrate communities are demonstrating High Ecological Status (HES) for each of the predicted metrics (quality and richness), despite the overall ecological classification being Good Ecological Status (GES) (SEPA, 2013). Incidental data collected during protected species survey of the Shochie Burn in 2008 (Atkins, 2009) indicates that the Shochie Burn supports a diverse assemblage of freshwater invertebrates representing good–high water quality. Freshwater invertebrate diversity was reported to decrease below the A9 culvert on the Shochie Burn, linked to a potential increase in sedimentation and naturally occurring elevation of ferrous inputs from bank material.

16.1.4 Freshwater invertebrate diversity was noted as potentially depressed on the Ordie Burn during the Stage 2 Environmental Assessment protected species survey in 2008 due to low energy types and sedimentation downstream of the A9 crossing (Atkins, 2009). No assessment was made upstream of the existing road crossing.

16.1.5 Numerous freshwater invertebrate species of conservation concern are listed on the IUCN red list and listed as priority species on the UKBAP. Additionally, 83 aquatic invertebrates are listed on the SBL. Several freshwater invertebrates are priority species on the Tayside LBAP (*Brachyptera putata* and *Hydroporus rufifrons*) for which national Species Action Plans have been produced.

Incidental Observations

16.1.6 No incidental observations have been recorded.

Survey Results

16.1.7 Freshwater invertebrate surveys were undertaken on the 14-16 May 2013 and 27 August 2013. Kick samples were taken using standard monitoring methodologies and biological metrics calculated using published literature. Results are presented in Table 39.

Table 39: Biological Results of Freshwater Invertebrate Sampling of Aquatic Habitats (2013 survey)

Site name	NGR	Season	BMWP	ASPT	NTAXA	CCI	LIFE	Quality class & probability
Shochie Burn	NO0913730252	Spring	141	6.71	21	10.37	8.70	H 89.239
		Summer	131	5.70	23	10.50	8.19	H 52.475
Ordie Burn	NO0813632239	Spring	142	5.92	24	10.00	8.63	G 64.766
		Summer	142	5.92	24	8.50	8.45	H 74.507
Garry Burn	NO0728134388	Spring	151	6.29	24	14.6	8.46	H 63.416
		Summer	136	5.91	23	8.75	8.54	H 72.567
Ardonachie Burn	NO0734834948	Spring	111	6.17	18	8.82	8.59	H 54.025
		Summer	97	5.71	17	5.25	7.20	H 49.735
Gelly Burn	NO0680137220	Spring	62	4.77	13	5.79	6.19	M 55.116
		Summer	73	5.21	14	6.33	6.00	H 69.347

16.1.8 One species of conservation interest, taken as those of at least local conservation importance, was recorded in the 2013 surveys. The regionally notable stonefly *Protonemura meyeri* was recorded in summer from the Shochie Burn.

16.1.9 The freshwater invertebrate community on the Shochie Burn was dominated by species indicative of high velocity flow types as indicated by the LIFE scores (Table 39). Taxon assigned to the higher LIFE groups indicate an invertebrate community established to flows 20cm->100cm s^{-1}. The diverse assemblage, characterised by caddisfly, stonefly and mayfly, is indicative of good biological conditions, supported by high biological metric scores with 'high' ecological status for macro-invertebrates in spring and summer (Table 39). The CCI scores of indicate 'fairly high' conservation value, driven by the taxon richness and presence of the regionally notable stonefly species.

16.1.10 Freshwater invertebrates on the Shochie Burn were collected from a high energy run habitat characteristic of the fish survey and RHS reaches. Water depth was 30cm and flowing over an unconsolidated coarse bed of pebble, cobble and boulder. Marginal areas were sampled for discrete fine sediment deposition and exposed tree roots lining the channel. Riparian land use was a mixture of broadleaved woodland (principally right bank) and wet woodland (left bank). One juvenile brown trout (*Salmo trutta*) was recorded during the spring freshwater invertebrate sampling.

16.1.11 The freshwater invertebrate community on the Ordie Burn was dominated by species indicative of high velocity flow types as indicated by the LIFE scores (Table 39). Taxon assigned to the higher LIFE groups indicates an invertebrate community established to flows 20cm->100cm s^{-1}. The diverse assemblage, characterised by caddisfly, stonefly and mayfly, is indicative of good biological conditions, supported by the biological metric scores (BMWP, ASPT and NTAXA), achieving 'good' status for macro-invertebrates in spring and 'high' status in summer, see Table 39. The CCI scores indicate 'fairly high' conservation value in spring and 'moderate' conservation value in summer, driven by the taxon richness rather than presence of uncommon species.

16.1.12 The Ordie Burn freshwater invertebrate site was selected in a mixed riffle run reach, in a section also containing deeper glide sections. The sample was taken from an unconsolidated gravel cobble bed, with a sweep through the marginal sand and deeper channel boulders as required by the sampling methodology. Average sampling depth was 25cm. Mosses covered approximately 30% of the wetted channel and no submerged or emergent higher plants were noted. Surrounding land use was uniform grassland along the left bank and broadleaved woodland on the right. Shading was light (<25%) and provided principally from overhanging boughs on the right bank.

16.1.13 The Garry Burn demonstrates good biological quality with both samples reaching 'high' ecological

status for macro-invertebrates and with high flow sensitivity (LIFE) scores (Table 39). Taxa indicative of fast flowing clean water dominate the fauna, with mayfly, stonefly and freshwater shrimp present in high numbers. The CCI scores indicate 'fairly high' conservation value in spring and 'moderate' conservation value in summer, driven by the taxon richness rather than presence of uncommon species.

16.1.14 Sampling 25m upstream of the Perthshire Visitors Centre the Garry Burn freshwater invertebrate site was a shallow (20cm), relatively high energy run/riffle site flowing over a coarse cobble, pebble and gravel substrate. Land use on both banks was rough pasture however suburban impacts, from a local surface water outfall were evident immediately downstream of the site. Above the freshwater invertebrate site natural erosion from unstable banks was observed and may contribute fine sediments to the downstream watercourse. Submerged linear leaved macrophytes were sampled, as were tree roots from the trees situated along the riparian corridor.

16.1.15 The Ardonachie Burn invertebrate community was dominated by species indicative of shallow, high velocity environments as indicated by the LIFE scores (Table 39). Taxon assigned to the higher LIFE groups indicate an invertebrate community established to flows 20cm->100cm s^{-1}. The diverse assemblage, characterised by caddisfly, stonefly and mayfly, is indicative of good biological conditions, supported by high biological metric scores (BMWP, ASPT and NTAXA), achieving 'high' status for macro-invertebrates for both surveys. CCI scores indicated 'moderate' conservation value in both seasons, driven by a community of moderate taxon richness.

16.1.16 The sampling site on the Ardonachie Burn was situated on a riffle 30m downstream from the local access track. Cattle poaching from the surrounding agricultural pasture was evident although sand and fine silts formed a relatively small proportion of the stream substrate (30%), compared to the dominance of gravels and pebbles (65%). This small burn supported no in-stream macrophytes, although terrestrial grasses form the marginal areas provide limited cover over the shallow, narrow stream.

16.1.17 The Gelly Burn invertebrate community was dominated by species indicative of slow flowing and standing water as indicated by the LIFE scores (Table 39), which was supported by observations made in the field. The community diversity (NTAXA) of the Gelly Burn was suppressed with invertebrate families characteristic of slow flowing wooded streams with variable water quality and oxygen levels. The biological quality of the Gelly burn was assessed as 'moderate' status in spring and 'high' status in summer (Table 39). Coleopteran (water beetle) diversity was high, associated with the presence of submerged vegetation. CCI scores indicated a site of 'moderate' conservation value in both spring and summer.

16.1.18 The Gelly Burn site was selected at the margin of a mixed plantation where the burn flows beneath the existing A9 road alignment. Demonstrating slack flow types the narrow (1m) and shallow (0.2m) the watercourse was covered in an orange floc which covered a bed of soft sediment. The burn was heavily shaded from the adjacent woodland leaf litter and detritus were present in marginal areas, whilst 50% of the survey reach was vegetated with pondweed (15%) and terrestrial grasses (35%).

17 Freshwater Pearl Mussel

Consultation Information

17.1.1 SNH has indicated that freshwater pearl mussel (*Margaritifera margaritifera*) is not present on tributaries of the River Tay SAC which is crossed by the proposed scheme. This was re-affirmed in a meeting with SNH in September 2013.

Desk Based Study

17.1.2 The NBN Gateway (NBN, 2013) returned records to 10 km grid squares for this species, though all are more than 35 years old, as listed below in Table 40.

Table 40: Records from NBN Gateway for Pearl Mussels

Date	Grid reference	Area	Record Type
1961	NO12	Mid Perthshire	Presence
1976	NO12	Mid Perthshire	Presence
1967	NO13	Mid Perthshire	Presence
1970	NO13	Mid Perthshire	Presence

17.1.3 Freshwater pearl mussel habitat assessments were carried out at three locations which are crossed by the proposed scheme; Shochie Burn, lower Ordie Burn and upper Ordie Burn. Small patches of habitat suitable for freshwater pearl mussel were found but no mussels were observed during searches of these areas. Descriptions of the habitats throughout the survey areas are presented in Table 41 below.

Table 41: Description of Habitats within Freshwater Pearl Mussel Survey Area

Survey Reach	Description	Suitability
Shochie Burn		
500m downstream – A9 culvert	Predominantly cobble substrate with few boulders and little gravel. Sediment evident throughout, particularly downstream of confluence with Ordie Burn. Water depth 20 – 30cm throughout.	Unsuitable.
A9 culvert	Large natural stone layed slabs with a heavy sediment load on substrate on west side of the culvert, extending 7m upstream. Unstable cobble substrate on the east side of the culvert. Water depth is shallow (10cm) at this point.	Unsuitable.
A9 culvert – 100m upstream	Predominantly sand and gravel substrate with few boulders. Water depth 20cm average.	Mostly unsuitable – spot checks undertaken.
Lower Ordie Burn		
600m downstream – A9 culvert	Substrate predominantly cobble and gravel with few boulders. Water depth 20 – 30cm with a few areas of water up to 80cm deep. Heavy silt layer evident throughout. Approximately 100m downstream of the culvert there is a weir which is 1 – 2m high. Immediately behind the weir the substrate is cobble and pebble with a heavy silt load.	Unsuitable – spot checks were carried out around the weir.
Culvert	Deeper water (50cm) with large boulders on west side of culvert. Culvert has heavily silted flat concrete bed. East side of culvert has shallow pebble substrate on left bank and deeper water (50cm) on right bank.	Unsuitable – spot checks made at each end of culvert.
A9 culvert – 100m upstream	Cobble substrate with a heavy sediment load and very few boulders.	Unsuitable
Upper Ordie Burn		
500m downstream – Bridge	Mixed substrate throughout from pebble to cobble although a few boulders were also present. In the downstream section the substrate was predominantly cobble and sediment was present. At the mid section pebble/gravel was prevalent with little sediment evident. From the mid point to the bridge substrate size increased with cobble/gravel dominant, although boulders were present. In some areas there was a heavy coating of sediment over the substrate. Water depth of 20 – 30cm with some deeper pools, up to 80cm deep. Areas of heavy silt present in some sections.	Unsuitable – spot checks around boulders.
Bridge	Bed composed of large flat stone slabs.	Unsuitable
Crossing point – 100m upstream	Predominantly cobble substrate with patches of gravel and a few boulders. Water depth of 20cm. Fast moving run.	Suitable – spot checks made.

18 Macrophtes

Consultation Information

18.1.1 No information has been received through EIA consultation regarding freshwater macrophytes.

Desk Based Study

18.1.2 SEPA classification of the Shochie and Ordie burns indicates that macrophyte communities are demonstrating High Ecological Status (HES), despite the overall ecological classification being Good Ecological Status (GES) (SEPA, 2013). This indicates that the macrophyte communities on these burns are at, or exceeding reference conditions for this water body typology.

18.1.3 Numerous aquatic species of conservation concern are listed on the IUCN red list. There are 212 vascular plants, 111 bryophytes and 11 stoneworts listed as priority species on the UKBAP, many of which are aquatic plants. A red data book species, river jelly lichen (*Collema dichotomum*), was reported opposite the Shochie Burn confluence with the River Tay in 2008 (Atkins, 2009).

18.1.4 Many macrophytes are listed on the SBL. Several macrophytes are listed as priority species on the Tayside LBAP.

Survey Results

18.1.5 Surveys were undertaken on 23-24 June 2013 at four locations which are crossed by the proposed scheme; Shochie Burn, lower Ordie Burn, upper Ordie Burn and Garry Burn. Two sites were chosen on the Ordie Burn due to obvious differences in macrophyte communities between the two sites and to capture the wide range of species in the burn. The river levels were in the normal range. The surveys were undertaken between the following grid references:

Shochie Burn	NO0894430199 to NO0912430251
Ordie Burn (lower)	NO0886031152 to NO0896331159
Ordie Burn (upper)	NO0815932249 to NO0815132158
Garry Burn	NO0722434477 to NO0729434375

Species Diversity and Distribution

18.1.6 The results of the macrophyte surveys in the four locations are summarised in Table 41 which shows the number of taxa present within the surveyed reaches. Between five and nine taxa were recorded at the sites, with the upper Ordie Burn showing the most diversity and the Shochie Burn, the least. Complete records of identified taxa, together with their taxon cover values are presented in Table 42.

Table 42: Summary of Macrophyte Survey Results from 100m Survey Lengths

Site	Number of Listed Taxa
Shochie Burn	5
Ordie Burn (lower)	8
Ordie Burn (upper)	9
Garry Burn	6

Table 43: Macrophyte Taxa and Taxon Cover Values (TCVs) from 100m Survey Lengths

Taxa	Number of Listed Taxa			
	Shochie Burn	Ordie Burn (lower)	Ordie Burn (upper)	Garry Burn
Algae				
Blue-green algae	1	-	-	-
Cladophora aegagropila	1	-	1	-
Cladophora glomerata/Rhizoclonium hieroglyphicum	-	-	1	3
Lemanea sp.	1	-	1	-
Zygnematalean alga	-	1	1	-
Bryophytes				
Amblystegium fluviatile	-	-	1	6

Taxa	Number of Listed Taxa			
	Shochie Burn	**Ordie Burn (lower)**	**Ordie Burn (upper)**	**Garry Burn**
Cratoneuron filicinum	-	-	-	1
Fontinalis antipyretica	-	1	1	-
Hygrohypnum luridum	1	1	1	-
Hyocomium armoricum	-	1	-	-
Liverworts				
Fissidens pusillus	1	-	-	-
Vascular Plants				
Brooklime	-	-	1	1
Marsh marigold	-	1	-	-
Reed canary-grass	-	1	-	-
Water crowfoot (*Ranunculus Batrachium* hybrid indet)	-	-	1	-
Water crowfoot (*Ranunculus Batrachium* sp.)	-	1		5
Water mint	-	-	-	1
Water starwort (*Callitriche sp.)*	-	1	-	-

18.1.7 Of the 100m section surveyed at Shochie Burn, macrophytes covered approximately 0.5%. Five taxa were present and none dominated over another. There were no higher plants recorded in the survey reach; which is attributed to the heavy shading of the channel. However one bryophyte (*Hygrohypnum luridum*) and one liverwort (*Fissidens pusillus*) were present. These were located slightly submerged or within the splash zone, attached to rocks. Three algae species were recorded in very low quantities (covering approximately 0.3% of the channel combined). These were located in discrete patches attached to submerged rocks or in the case of *Lemanea* sp., attached to rocks in the splash zone. Diatoms were heavily abundant, covering approximately 35% of the submerged substrate.

18.1.8 At lower Ordie Burn, macrophytes covered approximately 1% of the surveyed reach. Eight taxa were present in roughly equal proportions. Discrete strands of water-crowfoot were recorded in the main flow and marsh marigold, reed canary-grass and water starwort were recorded along the margins. Three bryophytes were recorded attached to rocks in the splash zone of the channel. Diatoms covered approximately 20% of the submerged substrate.

18.1.9 Macrophytes covered 1% of the 100m survey reach at the upper Ordie Burn. A total of nine taxa were recorded within the channel; none of which covered more than 0.1% of the reach. This site had the highest number of different algal species and supported three different bryophytes. Diatoms covered approximately 15% of the submerged substrate. The non-native invasive Himalayan balsam was present along the banks of the burn.

18.1.10 At the Garry Burn, 10% of the surveyed reach was covered by macrophytes. Six taxa were present, with *Amblystegium fluviatile* covering the largest area (approximately 10% of the reach) and water starwort. covering just less than 10% of the reach. Diatoms covered approximately 10% of the submerged substrate. The non-native invasive Himalayan balsam was present along the banks.

Species of Conservation Interest

18.1.11 No species of international, national or local conservation interest were recorded in any of the survey reaches at any of the sites. This includes species listed in the Tayside LBAP.

Ecological Status

18.1.12 The survey data was assessed using the LEAFPACS assessment tool and the summary data is provided in Table 44.

Table 44: Summary of LEAFPACS Metrics

Site	RMNI EQR	RMHI EQR	NFG EQR	NTAXA EQR	Algal EQR	LEAFPACS EQR	WFD Status
Shochie Burn	1.00	1.00	0.93	0.91	0.98	0.97	High
Ordie Burn (lower)	0.91	1.00	0.89	0.86	1.00	0.89	High
Ordie Burn (upper)	0.71	0.97	0.76	1.00	0.98	0.72	Good
Garry Burn	0.52	0.46	0.76	0.65	0.84	0.51	Moderate

18.1.13 The taxa present at Shochie Burn indicated low nutrient levels and were what would be expected for a river of this type (indicated by the high RMNI EQR of 1.00, see Table 44). Ecological Quality Ratio (EQR) scores range between 0.00 and 1.00; 1.00 representing a site which is at reference condition. The RMHI EQR (1.00) shows that the hydraulics of the river represented pristine conditions. The LEAFPACS overall number of taxa (taken to be the number of taxa recorded which are not helophytes) was five. A helophyte is a plant that is usually rooted underwater with emergent shoots, typically growing in marginal or marshy areas (WFD-UKTAG, 2008). The number of non-helophyte aquatic taxa (NTAXA), was approximately what would be expected for a river of this type (NTAXA EQR = 0.91). The functional group diversity (NFG) is based on the number of life forms of aquatic species present, with up to 23 different possible life forms. For example, stoneworts are one life form and free-floating plants another. Four different life forms were present, which is close to what would be expected for a river of similar physical characteristics in reference condition (NFG EQR = 0.93). Very little alga was present. The overall LEAFPACS EQR combines all the above elements to produce a single assessment of macrophyte status. The score of 0.97 (Table 44) indicates High status based on WFD boundaries.

18.1.14 At the lower Ordie Burn, nutrient levels were indicated to be low; close to what would expected for a river of this typology (RMNI EQR 0.91).The river hydraulics represented a river in pristine condition. Five non-helophytes and four functional groups were recorded, which was slightly lower than expected (NTAXA EQR = 0.86; NFG EQR = 0.89); most likely due to heavy shading of the channel. Algae cover was low (0.1%), which represents reference condition (algal EQR = 1.00). The overall LEAFPACS EQR of 0.89 (Table 44) indicates High status based on WFD boundaries.

18.1.15 At the upper Ordie Burn, nutrient levels were indicated to be elevated (RMNI EQR 0.71).The river hydraulics however were in line with reference conditions (RMHI EQR 0.97). Eight non-helophytes were more than expected for this river, suggesting a high level of diversity (NTAXA EQR = 1.00). However as most of these taxa were algae and bryophytes, only three functional groups were recorded (NFG EQR = 0.76). Algae cover was low (0.3%), which is extremely close to reference condition (algal EQR = 0.98). The overall LEAFPACS EQR of 0.72 (Table 44) indicates Good status based on WFD boundaries.

18.1.16 At the Garry Burn, nutrient levels were more elevated than expected (RMNI EQR 0.52).The river hydraulics were also not as expected for a river of this type (RMHI EQR 0.46). Only three non-helophytes and three functional groups were recorded, which indicates a relatively low level of diversity in the Burn (NTAXA EQR = 0.65; NFG EQR = 0.76). Algae cover was low (2%), which is close to reference condition (algal EQR = 0.84). The overall LEAFPACS EQR of 0.51 (Table 44) indicates Moderate status based on WFD boundaries.

19 Ponds

Consultation Information

19.1.1 No information specific to ponds was received through EIA consultation.

Desk Based Study

19.1.2 No flagship or priority ponds are present in the study area (Pond Conservation, 2013). The Tayside local BAP contains a habitat action plan for ponds and pools. In addition, the LBAP contains macrophyte and macro-invertebrate species which are found in ponds and pools.

19.1.3 There are no statutory or non-statutory designated sites associated with the ponds within the study area.

19.1.4 In the DMRB Stage 2 Environmental Assessment (Atkins, 2009) carried out habitat assessment (not PSYM) on three ponds. No fish or invertebrate surveys were carried out for these ponds. One of the ponds (pond 15) had an aquatic plant cover of 75%, dominated by pondweed, one (pond 4) was margined by sedges and rushes, and the third pond was mostly open.

Incidental Observations

19.1.5 The following incidental observations have been made while carrying out the PSYM assessments: one frog was recorded at pond 4, two juvenile newts (efts, species unidentified), a frog and tadpoles were recorded at pond 15.

Survey Results

19.1.6 PSYM surveys were undertaken on the five ponds listed in Table 45. Macro-invertebrates (freshwater invertebrates) were assessed on the week commencing 13 May 2013 and macrophytes were assessed on the week commencing 24 June 2013.

19.1.7 A number of ponds were initially identified for assessment. A PSYM assessment was undertaken on four ponds identified as potentially being affected by the proposed scheme, a fifth pond, pond 2, was initially identified for assessment but was found to be an area of wetland and did not contain enough water during the survey season to undertake an assessment. Table 45 details the pond locations and reason for selection. It was not possible to survey three waterbodies (ponds 16-18) which were located within an extension to the study area (August 2013).

Table 45: Identification, Location and Selection Information for Surveyed Ponds

Pond number	Location description	Location (NGR)	Reason for selection
Pond 2	Wetland area adjacent to Shochie Burn	NO 09095 30267	Situated in the immediate area.
Pond 4	South of Newmill	NO 08789 31586	Within 500m, potential input via runoff, Previously identified by Atkins (2009) as containing GCN.
Pond 8	Bankfoot South - SUDS South of Visitor Centre	NO 07439 34145	SUDS pond in the immediate area with potential for inputs via inflow and runoff.
Pond 9	Bankfoot - SUDS by Road	NO 07215 34980	SUDS pond in the immediate area with potential for inputs via inflow and runoff.
Pond 15	Gelly - Adjacent to woodland between Gelly and Waterloo	NO 06532 37191	Within 500m, potential inputs via runoff and inflow, Previously identified by Atkins (2009) as containing GCN.

19.1.8 Physical characteristics and data were recorded for each pond. No pH readings were available for ponds 8 and 9. Under the advice of the Pond Conservation Trust who undertake the PSYM calculations, pH values between 6.5 and 7.5 were tested to determine the influence of this variable on the final result and were found not to alter the scores so a pH of 7 was used.

19.1.9 Each pond scored an Index of Biotic Integrity (IBI) based on the macrophyte and macro-invertebrate data which is used to determine the PSYM quality category (Table 46).

Table 46: PSYM Results, 2013

Pond number	IBI (%)	PSYM quality category	Priority
Pond 4	44%	Poor	No
Pond 8	50%	Poor	No
Pond 9	28%	Poor	No
Pond 15	28%	Poor	No

19.1.10 Freshwater macrophyte surveys indicated two species of potential conservation interest (rarity scores = 2) (Table 47). Pond water crow-foot (*Ranunculus peltatus*) is found in ponds in lowland

areas, often colonising newly created ponds or present where annual drying takes place. It demonstrates a broad trophic range and found in a wide range of moist to fully wet habitats. Lesser pondweed (*Potamogeton pusillus*) grows in standing or slow flowing waterbodies and may often be found in shallow water growing over a fine silt substrate (Preston & Croft, 2001).

Table 47: Macrophyte Species with a Rarity Score of 2 or more Recorded in the 2013 PSYM Surveys

Species	Pond	Rarity score	Definition
Pond water crow-foot	Pond 4	2	Local
Lesser pondweed	Pond 9	2	Local

19.1.11 The freshwater invertebrate metric scores for each pond are given in Table 48.

19.1.12 The freshwater invertebrate assessment of ponds indicates a generally low taxa richness, dominated by species tolerant to organic pollution. Important pond taxa, namely dragonflies and alderfly (Odonata and Megaloptera) and aquatic beetles (Coleoptera) were present in low numbers and diversity at all pond sites. No species of conservation interest were recorded from the four ponds surveyed.

Table 48: Freshwater invertebrate Metric Scores

Pond number	NTAXA	ASPT	No. OM	No. CO
Pond 4	11	3.7	0	2
Pond 8	14	4.6	2	2
Pond 9	14	4.6	2	1
Pond 15	11	4.7	2	2

20 Freshwater Fish

Consultation Information

20.1.1 Consultation with SNH has provided data on the presence of lamprey (brook, river and sea) within the River Tay, but no information specific to the tributaries within the proposed scheme.

20.1.2 No consultation data has been returned regards the presence of salmonids or coarse fish from watercourses within the proposed scheme. However, the Tay District Salmon Fisheries Board (TDSFB) confirmed that the system is a productive one for spawning Atlantic salmon and brown trout (Chapter 6: Scoping and Consultation). Brown trout, grayling (*Thymallus thymallus*), pike (*Esox lucius*), perch (*Perca fluviatilis*) and roach (*Rutilus rutilus*) are known from watercourses within the River Tay catchment (Tay District Salmon Fisheries Board (TDSFB, 2009).

Desk Based Study

20.1.3 A number of fish species are reported as feature species of the River Tay SAC, which includes the Shochie, Ordie and Garry burns which fall within the proposed scheme. Atlantic salmon are recorded as a primary reason for the selection of the River Tay as a SAC, with the Tay identified as one of the best salmon rivers in Scotland, supporting the full range of salmon life history habitat types. Salmon migrate throughout the catchment to spawn in headwaters where suitable water quality and habitats allow and would therefore be expected to be present from all of the tributaries within the proposed scheme.

20.1.4 SEPA classification (SEPA, 2013) of the Shochie and Ordie burns indicates that fish populations are reaching High Ecological Status for all fish metrics (ecology and barriers to migration) despite the overall ecological classification being Good Ecological Status (GES). This indicates that the fish populations on these burns is at or exceeding reference conditions for this water body typology.

20.1.5 Salmon have been historically been recorded on Shochie, Ordie and Garry burns on NBN (NBN, 2013).

20.1.6 Shochie Burn - Site condition monitoring of the River Tay SAC in 2005 surveyed the Shochie Burn and demonstrated that juvenile salmon (0 – 2+ year class) were prevalent throughout the length of the Burn. This is supported by juvenile fish monitoring of the Shochie Burn by the Tay Foundation between 2004 – 2009 that identifies salmon, sea and brown trout from the upper reaches of the burn (TDSFB, 2009). The former two species would be expected to migrate through the proposed scheme during annual migrations. A fish counter was operational on the lower Shochie Burn, between September 2011 and January 2012 and reported 793 fish ascending, with numbers dropping rapidly after November. Data from TDSFB surveys dating back to the early 1990s indicate that salmon spawn extensively in the headwaters of the Shochie Burn, with access to much of the catchment possible. With spawning concentrated in the upper reaches juvenile salmon are found throughout the mid and lower catchment where habitat is suitable. An indication of suitable fisheries habitat can be made using incidental data collected during protected species survey of the Shochie Burn in 2008. Target notes (Atkins, 2009) indicate that the pool riffle sequences observed on the Shochie Burn would be suitable for salmonids, with deeper pools noted, particularly below the A9 culvert that may benefit resting adult fish. Despite the presence of weirs reporting in the 2008 stage 2 assessment and observed on OS mapping the SEPA classification indicates that these are passable to salmonids and do not pose a barrier to migration (SEPA, 2013).

20.1.7 Ordie Burn – Juvenile fish monitoring by the Tay Foundation between 2004 – 2009 identifies both salmon and migratory trout from the burn above the existing crossing point of the A9 (TDSFB, 2009). This suggests that both salmon and trout will be expected to utilise, either as resident or migratory, the section of Ordie Burn within the proposed scheme. A mixture of habitats suitable for salmonid life stages was reported from the Ordie Burn during the Stage 2 Environmental Assessment (Atkins, 2009). The lower catchment, below the A9 crossing provides adult habitat, with lower energy flow types, deeper pools and cover from riparian shading and exposed tree roots. Above the A9 there is a higher proportion of gravel substrates, forming bars and riffles suitable for spawning. Data from TDSFB surveys dating back to the early 1990s indicate that salmon spawn in the headwaters of the Ordie Burn, with access to much of the catchment possible. With spawning concentrated in the upper reaches juvenile salmon are found throughout the mid and lower catchment where habitat is suitable. A spawning redd was observed during the 2008 otter survey of this reach. A number of structures have been identified on the Ordie but are not considered to act as barriers to migration.

20.1.8 All three lamprey species are recorded as a qualifying, but not primary, reason for selection within the River Tay SAC. Recent studies of lamprey (APEM, 2004; APEM, 2002; Watt et al., 2008) indicate that lamprey are spread throughout the Tay catchment and are therefore likely to utilise many of the tributaries that form the wider catchment. Watt et al. (2008) indicate that lamprey abundance, density and habitat utilisation meets favourable condition for the SAC and that lamprey are only absent from watercourse where barriers to migration are reported. Lamprey would therefore be expected from all of the tributaries within the proposed scheme.

20.1.9 APEM (2004) report that optimum and sub optimum ammocoete habitat are present (on average) in 12% and 14% of each kilometre respectively on the main stem Tay. This figure would be expected to be considerably lower on the tributaries where gradient and velocities may be expected to be higher, resulting in lower sediment settlement rates.

Incidental Observations

20.1.10 A number of juvenile fish were recorded during freshwater aquatic surveys in 2013 (Table 49). A common frog was also recorded.

Table 49: Incidental Observations of Fish and Size Range (in mm) from other Aquatic Surveys (2013)

Site	NGR	Fish	Survey
Shochie Burn	NO0913730252	2 brown trout (25 + 35mm)	Freshwater invertebrates (May 2013)
Garry Burn	NO0728134388	1 brown trout (25mm)	Freshwater invertebrates (May 2013)

Survey Results

20.1.11 Freshwater fisheries surveys were undertaken on the Shochie Burn, upper and lower Ordie Burn, and Garry Burn between 14-6 May 2013. Habitat survey sheets are shown below. Fish abundance is presented in Table 50.

Table 50: Abundance of Fish and Size Range (in mm) from each of the Surveyed Sites

Species	Shochie Burn	Ordie Burn (lower)	Ordie Burn (upper)	Garry Burn
Brown trout *Salmo trutta*	134 (25-140)	23 (60-170)	118 (55-190)	142 (25-155)
Sea trout *Salmo trutta t*	4 (110-145)	-	-	-
Lamprey *Lampetra* sp.	3 (130-145)	9 (60-115)	15 (80-140)	Observed but not caught
European eel *Anguilla anguilla*	1 (350)	-	4 (160-600)	-
Stone loach *Barbatula barbatula*	1 (115)	-	-	-
3 spined stickleback	3 (45)	2 (35-40)	3 (35-45)	1 (50)
TOTAL	145	34	140	143

20.1.12 The Shochie Burn was surveyed upstream of the existing A9 culvert and had an average bank width of 8m and an average wet width of 7m. Water depth was shallow (75% of reach less than 40cm), flowing over a predominantly cobble and boulder bed. Finer substrates were interspersed among the coarse substrate observed or restricted to marginal areas. High energy flow types forming discrete riffles between longer run sections were typical. In channel macrophyte growth was low however the channel received 100% shading form the adjacent broadleaf woodland and good bank cover (35% left bank and 65% right bank) from undercutting banks, exposed roots and larger boulder. There was no evidence of collapse or trampling on either bank with very little erosion on both banks. In the vicinity of the existing culvert salmonid and lamprey habitat would be described as sub optimal for spawning salmonids and lamprey, due to the substrate form and flow types. No signs of spawning were observed during the redd surveys, nor would be expected so low in the catchment with spawning known to occur principally in the headwaters. Suitable parr habitat is ubiquitous to the lower catchment.

20.1.13 Five species were reported from the Shochie Burn on the 16th May. Sea trout and brown trout were reported from the Shochie Burn, as were lamprey sp., one of which was positively identified as brook lamprey, European eel, stone loach and three-spined stickleback. Three distinct age classes of trout were recorded (determined by the length frequency), indicating that this section of the Shochie Burn supports habitat suitable for multiple age group fish, Low densities of the very small (25mm) individuals is likely to be a factor of the time of year, and lower efficiency of capture whilst their presence demonstrating interconnectivity between localised spawning habitat and suitable juvenile habitats. 80% of all brown trout caught on the Shochie Burn were between 50-90mm and utilising typical trout parr habitats within the Burn. Coarse substrates variable flow velocities and depth along are anticipated to provide brown trout with significant resting and feeding habitat.

20.1.14 The Shochie Burn was the only watercourse surveyed which held sea trout. This is the migratory form of the brown trout (only a small percentage of brown trout become sea trout) and as such utilise similar habitats when in freshwaters.

20.1.15 Lamprey sp. were recorded as ammocoete (juvenile) and transformers (juveniles turning to adults) on the Shochie Burn. Identification of a single individual as brook lamprey was made by counting myomeres (muscle bands), pigmentation on the hood and length at transformation. Unlike the river and sea lamprey, brook lamprey will not undertake significant migrations through the catchment, however they may move between interconnecting habitats between spawning, juvenile and adult life phases.

20.1.16 A single European eel was recorded from the Shochie Burn. Eel are relatively ubiquitous in habitat preference although commonly associated with silt beds or between coarse sediments. European eel have undergone significant population declines as a result of exploitation, declining water quality, climatic variation and barriers to migration.

20.1.17 The lower Ordie was characterised by diverse flow variation flowing over a predominantly cobble and gravel bed. Small quantities of sand and silt were reported restricted to isolated marginal deposits which are unlikely to represent optimal, or sub optimal spawning or juvenile lamprey habitat. Shallow run and glide flow types, particularly suitable for juvenile salmonids were observed during the fisheries survey, with a variety of bankside cover provided by exposed tree roots, in-channel and marginal vegetation and submerged rocks/boulders. In channel and marginal cover would be suitable for juvenile salmonid life stages. In the vicinity of the existing culvert salmonid and lamprey habitat would be described as sub optimal for spawning salmonids and lamprey, due to the substrate form and flow types. No signs of spawning were observed during the redd surveys, nor would be expected so low in the catchment with spawning known to occur principally in the headwaters. Suitable parr habitat is ubiquitous to the lower catchment.

20.1.18 Four species were recorded from the Ordie Burn, three of which; brown trout, lamprey sp. (of which four individuals were identified as brook lamprey) and European eel are species of conservation interest. No salmon or sea trout were reported from the Ordie Burn. In total 174 individuals were reported from the Ordie Burn, 140 from the upper Ordie site and 34 from the lower Ordie.

20.1.19 The upper Ordie shares many of the physical characteristics of the lower Ordie, unsurprisingly given the proximity of sites. The upper site, situated in agricultural land, as opposed to grassland and woodland at the lower Ordie site exhibits a similar high energy flow typology. Flowing over a more mixed bed of cobble, gravel pebble and sand than the downstream site the upper Ordie supported a higher abundance (140 individuals) and diversity (4 species) than the lower Ordie. Both European eel and lamprey were reported from the upper Ordie but not the lower Ordie. As both these species may under take migration it would be expected that they would be present at the lower Ordie site either as migrants passing through seasonally or, in the case of lamprey related to changes in fine deposition within the reach. The majority of lampreys observed in the upper Ordie were associated with a single deep silt bed on the right bank created from within a back water associated with a fallen tree. Bank cover was broadly similar to the downstream site, although the upper Ordie demonstrated a higher percentage of undercut banks that were suitably deep to provide cover to juvenile trout. Bank reinforcement was noted on the upper Ordie, however this limited section of bank reinforcement (less than 20m) is unlikely to significantly affect the fisheries interest within the reach.

20.1.20 Brown trout, three-spined stickleback and lamprey sp. were reported from the Garry Burn on the 15th May. Of these brown trout represented 99% of the total catch, with a single stickleback reported. Lampreys were observed but evaded capture. Three age classes of trout were reported including very young fish. Habitat was considered to be sub-optimal for salmonid spawning, however cover was high along both left and right bank for parr and in-stream submerged macrophytes also contributed to stream cover. The shallow (predominantly less than 40cm) water with moderate velocities over a mixed cobble and gravel bed are indicative of good parr habitat and this was supported by high catches of juvenile trout. A number of outfalls were observed within the survey reach, introducing depositions of fine sediment, potentially from existing road or hard surface run off. Despite the urban riparian areas, the immediate land use (improved and rough grassland used for grazing) and upstream agricultural land provide a buffer to the local residential areas. Lampreys were observed utilising marginal silt areas but evaded capture. These marginal features were isolated, shallow and may be prone to loss in high flows.

20.1.21 Lamprey species are a qualifying feature of the River Tay SAC, although not a primary reason for its selection. The presence of lamprey sp. in at least 75% of the surveyed sites indicates that this species of conservation interest is distributed through the catchment areas within the proposed scheme. Suitable habitat for brook and river lamprey was observed on all four watercourses sampled, with sub-optimal spawning habitat reported at each site. The low density of lamprey is likely due to the relatively low proportion of silt bed (for larval ammocoete) in each watercourse.

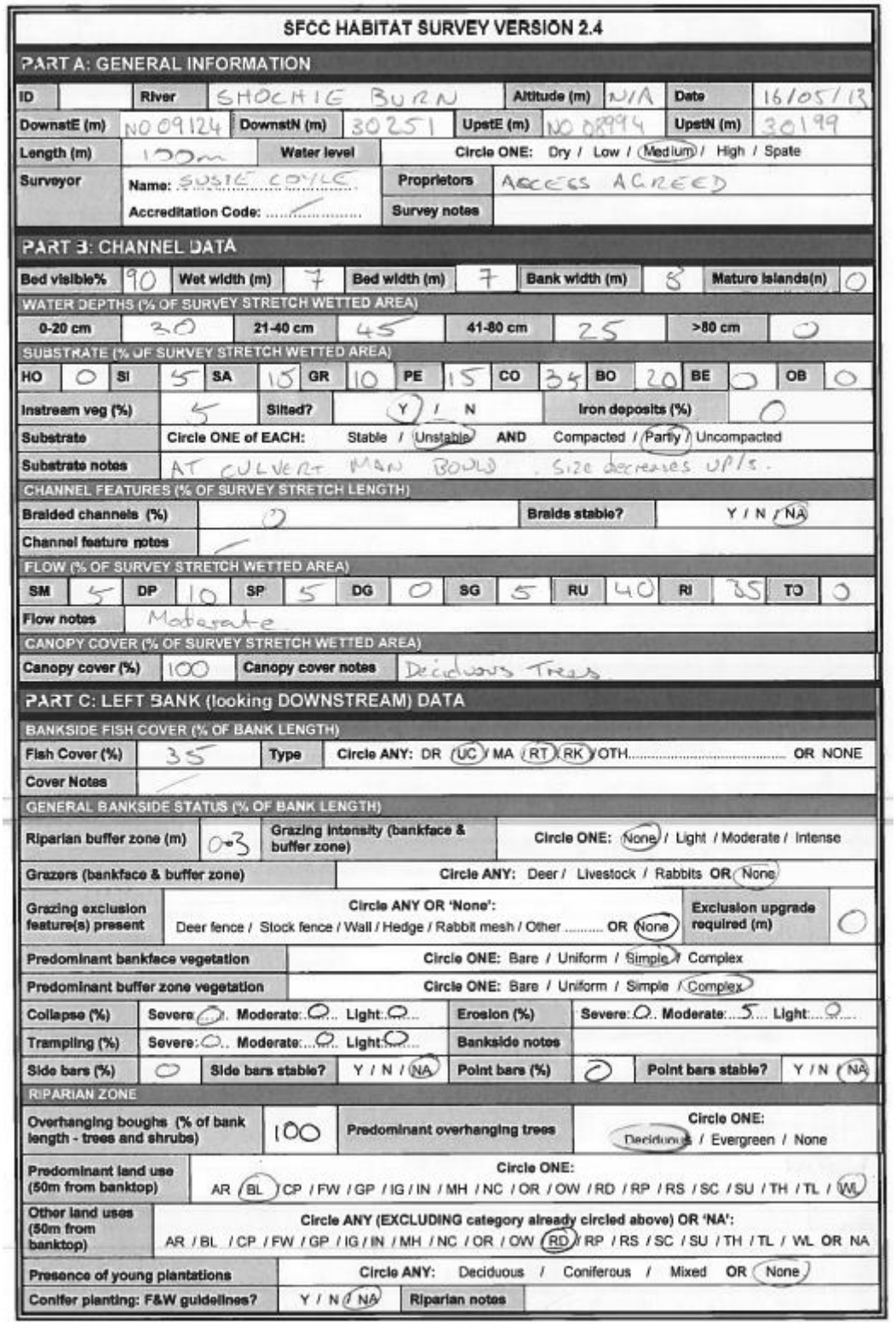
Where silt beds are lacking or present only as discrete marginal features, juvenile lamprey may be using sub optimal depository features or their capture in the May surveys incidental as the ammocoete travel to forage from suitable habitat. The Tay is in favourable condition for all three lamprey species, indicating suitable habitat is available within the wider catchment for all life stages, the small area assessed as part of this study is unlikely to be include all habitat types within the Tay catchment. RHS surveys of the wider watercourses indicate fine sediment deposition, often associated with marginal dead waters, or slack areas behind natural deflectors or accumulated woody debris. In the vicinity of the crossings (and approaches to the culverts) flows tend to be homogenous as the channels are modified (embanked to support headwalls.

20.1.22 No primary species for qualification of the SAC, such as Atlantic salmon, were recorded during the May 2013 fish survey. The absence of salmon during the May 2013 surveys should not be accepted as the absence of this species from these watercourses. Suitable habitats for all life stages of salmon were observed within the survey reaches, particularly parr which require fast flowing water (50-65cm/s), with moderate coarse substrates for cover. Channel cover is very important and for juveniles this can include loose substrate, large rocks, undercut banks, overhanging vegetation, aquatic vegetation.

20.1.23 Given the presence and abundance of brown trout, and observations of lamprey, European eel and sea trout (of which the latter three species will undertake migrations within, and between catchments) each of the surveyed catchments should be assumed accessible to other migratory salmonids. Furthermore it can be assumed that there are no barriers to migration between the main Tay and survey areas, or that any existing structures are passable under certain flow conditions. The current alignment or culvert design is not preventing fish from entering the catchment above each structure.

Habitat Survey Sheets

Sheet 1. Shochie Burn habitat survey sheet



SFCC HABITAT SURVEY VERSION 2.4

PART A: GENERAL INFORMATION

ID		River	SHOCHIE BURN	Altitude (m)	N/A	Date	16/05/13
DownstE (m)	NO 09124	DownstN (m)	30251	UpstE (m)	NO 08994	UpstN (m)	30199
Length (m)	100m	Water level	Circle ONE: Dry / Low / (Medium) / High / Spate				
Surveyor	Name: SUSIE COYLE		Proprietors	ACCESS AGREED			
	Accreditation Code: ✓		Survey notes				

PART B: CHANNEL DATA

Bed visible%	90	Wet width (m)	7	Bed width (m)	7	Bank width (m)	8	Mature islands(n)	0

WATER DEPTHS (% OF SURVEY STRETCH WETTED AREA)

0-20 cm	30	21-40 cm	45	41-80 cm	25	>80 cm	0

SUBSTRATE (% OF SURVEY STRETCH WETTED AREA)

HO	0	SI	5	SA	15	GR	10	PE	15	CO	35	BO	20	BE	0	OB	0

Instream veg (%)	5	Silted?	Y / N	Iron deposits (%)	0
Substrate	Circle ONE of EACH: Stable / (Unstable) AND Compacted / (Partly) / Uncompacted				
Substrate notes	AT CULVERT MAN BOULD . SIZE decreases UP/S.				

CHANNEL FEATURES (% OF SURVEY STRETCH LENGTH)

Braided channels (%)	0	Braids stable?	Y / N / (NA)
Channel feature notes	✓		

FLOW (% OF SURVEY STRETCH WETTED AREA)

SM	5	DP	10	SP	5	DG	0	SG	5	RU	40	RI	35	TO	0

Flow notes	Moderate

CANOPY COVER (% OF SURVEY STRETCH WETTED AREA)

Canopy cover (%)	100	Canopy cover notes	Deciduous Trees

PART C: LEFT BANK (looking DOWNSTREAM) DATA

BANKSIDE FISH COVER (% OF BANK LENGTH)

Fish Cover (%)	35	Type	Circle ANY: DR (UC) / MA (RT) (RK) / OTH.....	OR NONE	
Cover Notes	✓				

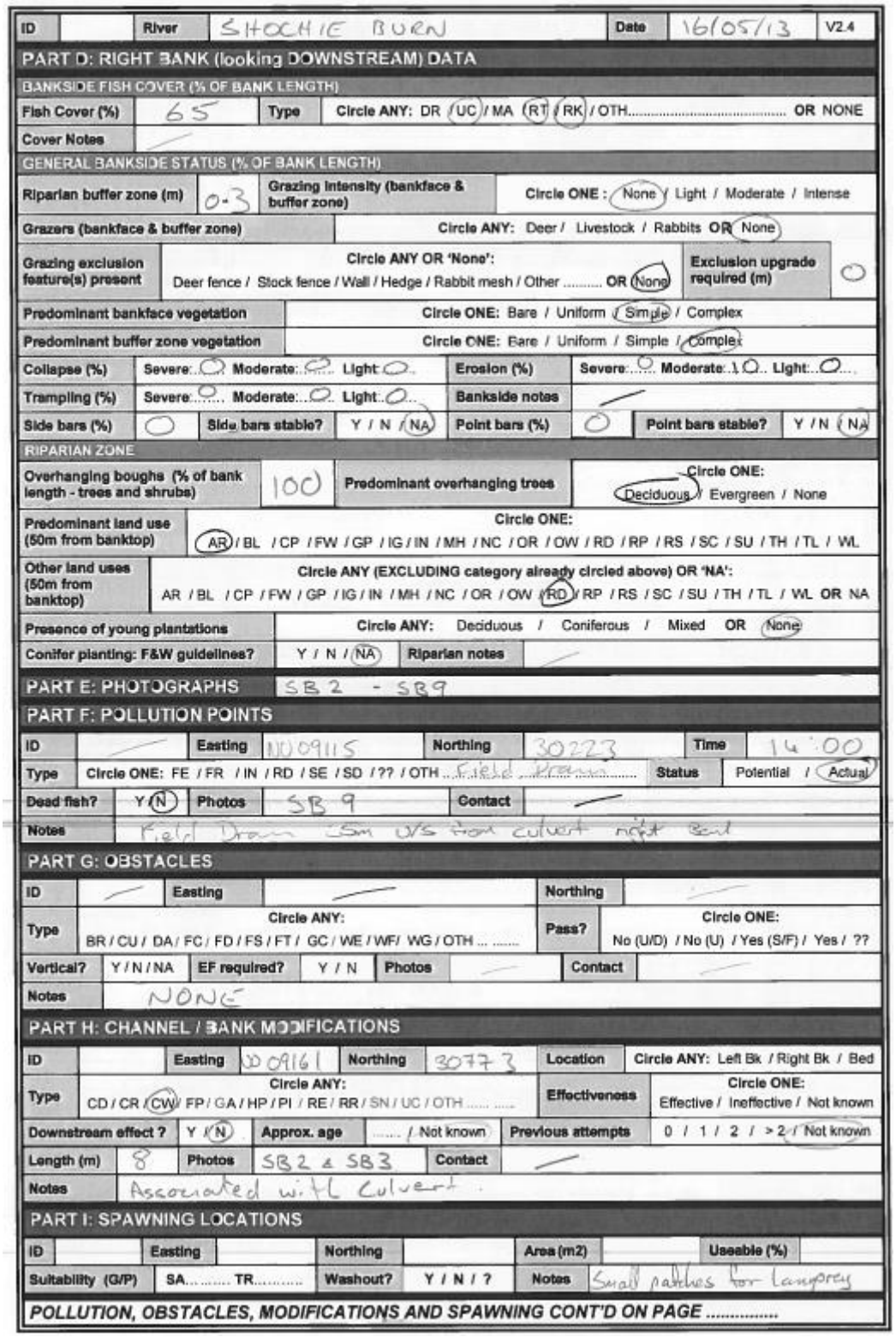
GENERAL BANKSIDE STATUS (% OF BANK LENGTH)

Riparian buffer zone (m)	03	Grazing intensity (bankface & buffer zone)	Circle ONE: (None) / Light / Moderate / Intense		
Grazers (bankface & buffer zone)	Circle ANY: Deer / Livestock / Rabbits OR (None)				
Grazing exclusion feature(s) present	Circle ANY OR 'None': Deer fence / Stock fence / Wall / Hedge / Rabbit mesh / Other ..... OR (None)			Exclusion upgrade required (m)	0
Predominant bankface vegetation	Circle ONE: Bare / Uniform / (Simple) / Complex				
Predominant buffer zone vegetation	Circle ONE: Bare / Uniform / Simple / (Complex)				

Collapse (%)	Severe:0	Moderate:0	Light:0	Erosion (%)	Severe:0	Moderate:5	Light:0
Trampling (%)	Severe:0	Moderate:0	Light:0	Bankside notes			
Side bars (%)	0	Side bars stable?	Y / N / (NA)	Point bars (%)	0	Point bars stable?	Y / N / (NA)

RIPARIAN ZONE

Overhanging boughs (% of bank length - trees and shrubs)	100	Predominant overhanging trees	Circle ONE: (Deciduous) / Evergreen / None
Predominant land use (50m from banktop)	Circle ONE: AR / (BL) / CP / FW / GP / IG / IN / MH / NC / OR / OW / RD / RP / RS / SC / SU / TH / TL / (WL)		
Other land uses (50m from banktop)	Circle ANY (EXCLUDING category already circled above) OR 'NA': AR / BL / CP / FW / GP / IG / IN / MH / NC / OR / OW / (RD) / RP / RS / SC / SU / TH / TL / WL OR NA		
Presence of young plantations	Circle ANY: Deciduous / Coniferous / Mixed OR (None)		
Conifer planting: F&W guidelines?	Y / N / (NA)	Riparian notes	



ID		River	STOCHIE BURN	Date	16/05/13 V2.4

PART D: RIGHT BANK (looking DOWNSTREAM) DATA

BANKSIDE FISH COVER (% OF BANK LENGTH)

Fish Cover (%)	65	Type	Circle ANY: DR / (UC) / MA / (RT) / (RK) / OTH..... OR NONE
Cover Notes			

GENERAL BANKSIDE STATUS (% OF BANK LENGTH)

Riparian buffer zone (m)	0-3	Grazing intensity (bankface & buffer zone)	Circle ONE : (None) / Light / Moderate / Intense
Grazers (bankface & buffer zone)		Circle ANY: Deer / Livestock / Rabbits OR (None)	
Grazing exclusion feature(s) present	Circle ANY OR 'None': Deer fence / Stock fence / Wall / Hedge / Rabbit mesh / Other ..... OR (None)	Exclusion upgrade required (m)	0
Predominant bankface vegetation	Circle ONE: Bare / Uniform / (Simple) / Complex		
Predominant buffer zone vegetation	Circle ONE: Bare / Uniform / Simple / (Complex)		
Collapse (%)	Severe: 0 Moderate: 0 Light: 0	Erosion (%)	Severe: 0 Moderate: 10 Light: 0
Trampling (%)	Severe: 0 Moderate: 0 Light: 0	Bankside notes	
Side bars (%)	0 Side bars stable? Y / N / (NA)	Point bars (%)	0 Point bars stable? Y / N / (NA)

RIPARIAN ZONE

Overhanging boughs (% of bank length - trees and shrubs)	100	Predominant overhanging trees	Circle ONE: (Deciduous) / Evergreen / None
Predominant land use (50m from banktop)	Circle ONE: (AR) / BL / CP / FW / GP / IG / IN / MH / NC / OR / OW / RD / RP / RS / SC / SU / TH / TL / WL		
Other land uses (50m from banktop)	Circle ANY (EXCLUDING category already circled above) OR 'NA': AR / BL / CP / FW / GP / IG / IN / MH / NC / OR / OW / (RD) / RP / RS / SC / SU / TH / TL / WL OR NA		
Presence of young plantations	Circle ANY: Deciduous / Coniferous / Mixed OR (None)		
Conifer planting: F&W guidelines?	Y / N / (NA)	Riparian notes	

PART E: PHOTOGRAPHS SB 2 - SB 9

PART F: POLLUTION POINTS

ID		Easting	NO 09115	Northing	30223
Time	14:00				
Type	Circle ONE: FE / FR / IN / RD / SE / SD / ?? / OTH ... Field drain			Status	Potential / (Actual)
Dead fish?	Y (N)	Photos	SB 9	Contact	
Notes	Field Drain 15m U/S from culvert not sent				

PART G: OBSTACLES

ID		Easting		Northing	
Type	Circle ANY: BR / CU / DA / FC / FD / FS / FT / GC / WE / WF / WG / OTH ...			Pass?	Circle ONE: No (U/D) / No (U) / Yes (S/F) / Yes / ??
Vertical?	Y / N / NA	EF required?	Y / N	Photos	Contact
Notes	NONE				

PART H: CHANNEL / BANK MODIFICATIONS

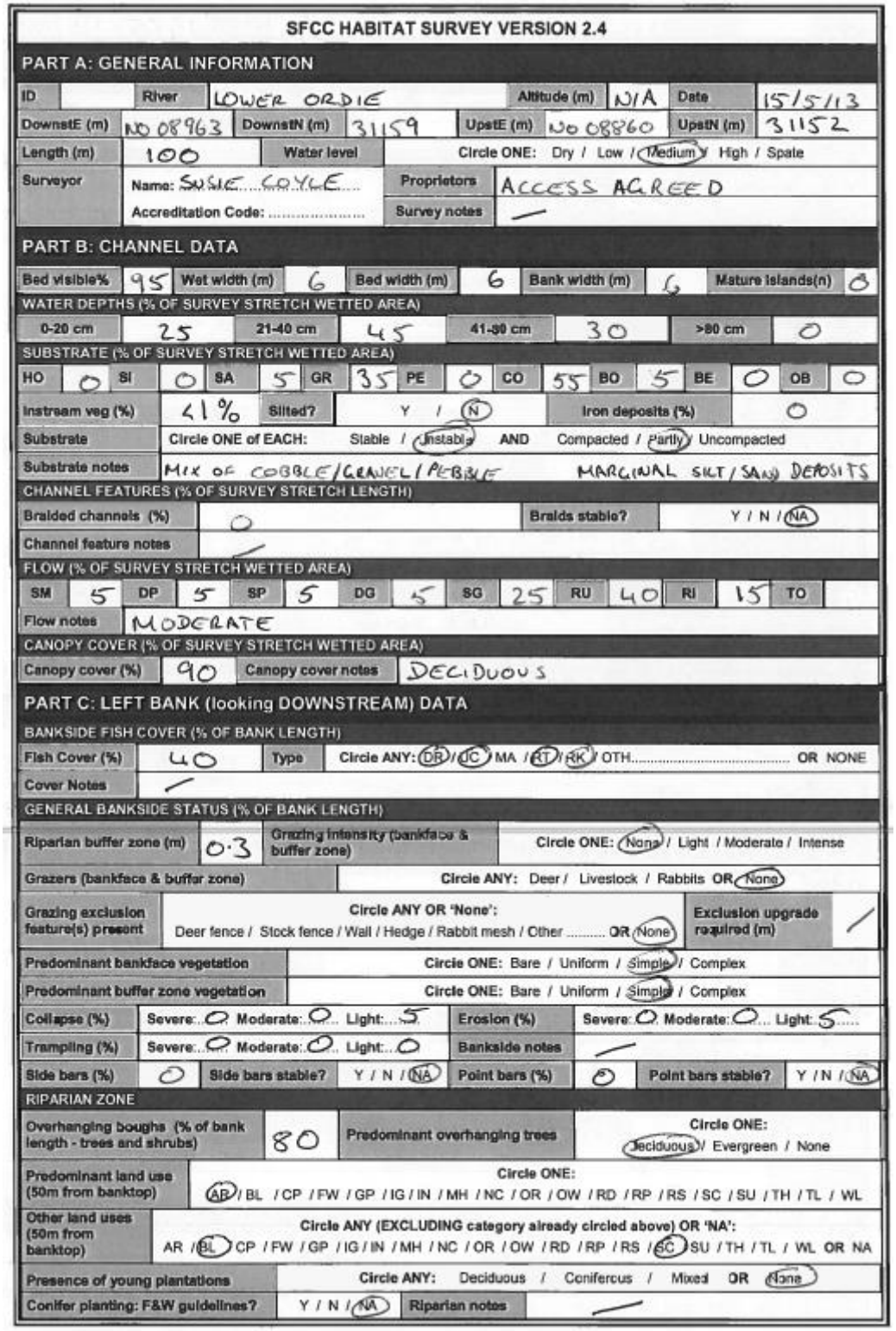
ID		Easting	NO 09161	Northing	30773
Location	Circle ANY: Left Bk / Right Bk / Bed				
Type	Circle ANY: CD / CR / (CW) / FP / GA / HP / PI / RE / RR / SN / UC / OTH			Effectiveness	Circle ONE: Effective / Ineffective / Not known
Downstream effect ?	Y / (N)	Approx. age	..... / Not known	Previous attempts	0 / 1 / 2 / > 2 / Not known
Length (m)	8	Photos	SB2 & SB3	Contact	
Notes	Associated with Culvert.				

PART I: SPAWNING LOCATIONS

ID		Easting		Northing		Area (m2)	Useable (%)
Suitability (G/P)	SA..... TR.....	Washout?	Y / N / ?	Notes	Small patches for Lamprey		

POLLUTION, OBSTACLES, MODIFICATIONS AND SPAWNING CONT'D ON PAGE .....

Sheet 2. Lower Ordie Burn habitat survey sheet



SFCC HABITAT SURVEY VERSION 2.4

PART A: GENERAL INFORMATION

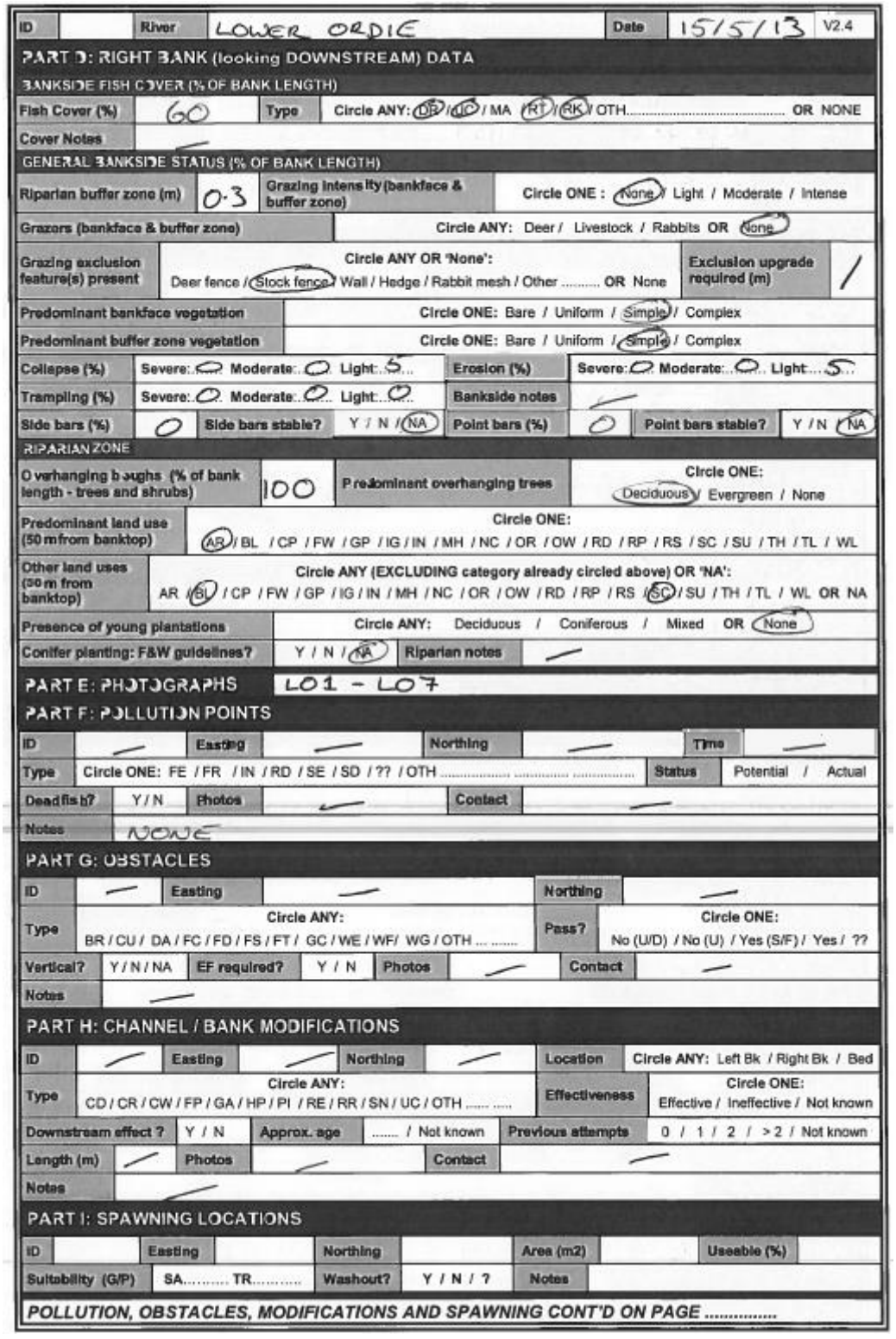
ID		River	LOWER ORDIE	Altitude (m)	N/A	Date	15/5/13
DownstE (m)	NO 08963	DownstN (m)	31159	UpstE (m)	NO 08860	UpstN (m)	31152
Length (m)	100	Water level	Circle ONE: Dry / Low / (Medium) / High / Spate				
Surveyor	Name: SUSIE COYLE		Proprietors	ACCESS AGREED			
	Accreditation Code:		Survey notes	—			

PART B: CHANNEL DATA

Bed visible%	95	Wet width (m)	6	Bed width (m)	6	Bank width (m)	6	Mature islands(n)	0		
WATER DEPTHS (% OF SURVEY STRETCH WETTED AREA)											
0-20 cm	25	21-40 cm	45	41-80 cm	30	>80 cm	0				
SUBSTRATE (% OF SURVEY STRETCH WETTED AREA)											
HO	0	SI	0	SA	5	GR	35	PE	0	CO	55
BO	5	BE	0	OB	0						
Instream veg (%)	<1%	Silted?	Y / (N)	Iron deposits (%)	0						
Substrate	Circle ONE of EACH: Stable / (Unstable) AND Compacted / (Partly) / Uncompacted										
Substrate notes	MIX OF COBBLE/GRAVEL/PEBBLE MARGINAL SILT/SAND DEPOSITS										
CHANNEL FEATURES (% OF SURVEY STRETCH LENGTH)											
Braided channels (%)	0	Braids stable?	Y / N / (NA)								
Channel feature notes	—										
FLOW (% OF SURVEY STRETCH WETTED AREA)											
SM	5	DP	5	SP	5	DG	5	SG	25	RU	40
RI	15	TO									
Flow notes	MODERATE										
CANOPY COVER (% OF SURVEY STRETCH WETTED AREA)											
Canopy cover (%)	90	Canopy cover notes	DECIDUOUS								

PART C: LEFT BANK (looking DOWNSTREAM) DATA

BANKSIDE FISH COVER (% OF BANK LENGTH)							
Fish Cover (%)	40	Type	Circle ANY: (DR) / (JC) / MA / (RT) / (RK) / OTH..... OR NONE				
Cover Notes	—						
GENERAL BANKSIDE STATUS (% OF BANK LENGTH)							
Riparian buffer zone (m)	0.3	Grazing intensity (bankface & buffer zone)	Circle ONE: (None) / Light / Moderate / Intense				
Grazers (bankface & buffer zone)	Circle ANY: Deer / Livestock / Rabbits OR (None)						
Grazing exclusion feature(s) present	Circle ANY OR 'None': Deer fence / Stock fence / Wall / Hedge / Rabbit mesh / Other ..... OR (None)					Exclusion upgrade required (m)	—
Predominant bankface vegetation	Circle ONE: Bare / Uniform / (Simple) / Complex						
Predominant buffer zone vegetation	Circle ONE: Bare / Uniform / (Simple) / Complex						
Collapse (%)	Severe: 0 Moderate: 0 Light: 5	Erosion (%)	Severe: 0 Moderate: 0 Light: 5				
Trampling (%)	Severe: 0 Moderate: 0 Light: 0	Bankside notes	—				
Side bars (%)	0	Side bars stable?	Y / N / (NA)	Point bars (%)	0	Point bars stable?	Y / N / (NA)
RIPARIAN ZONE							
Overhanging boughs (% of bank length - trees and shrubs)	80	Predominant overhanging trees	Circle ONE: (Deciduous) / Evergreen / None				
Predominant land use (50m from banktop)	Circle ONE: (AR) / BL / CP / FW / GP / IG / IN / MH / NC / OR / OW / RD / RP / RS / SC / SU / TH / TL / WL						
Other land uses (50m from banktop)	Circle ANY (EXCLUDING category already circled above) OR 'NA': AR / (BL) CP / FW / GP / IG / IN / MH / NC / OR / OW / RD / RP / RS / (SC) SU / TH / TL / WL OR NA						
Presence of young plantations	Circle ANY: Deciduous / Coniferous / Mixed OR (None)						
Conifer planting: F&W guidelines?	Y / N / (NA)	Riparian notes	—				



ID		River	LOWER ORDIE	Date	15/5/13	V2.4

PART D: RIGHT BANK (looking DOWNSTREAM) DATA

BANKSIDE FISH COVER (% OF BANK LENGTH)

Fish Cover (%)	60	Type	Circle ANY: (OV) (UC) / MA (RT) (RK) / OTH..... OR NONE
Cover Notes	—		

GENERAL BANKSIDE STATUS (% OF BANK LENGTH)

Riparian buffer zone (m)	0.3	Grazing intensity (bankface & buffer zone)	Circle ONE : (None) / Light / Moderate / Intense
Grazers (bankface & buffer zone)		Circle ANY: Deer / Livestock / Rabbits OR (None)	
Grazing exclusion feature(s) present	Circle ANY OR 'None': Deer fence / (Stock fence) / Wall / Hedge / Rabbit mesh / Other ..... OR None	Exclusion upgrade required (m)	/
Predominant bankface vegetation	Circle ONE: Bare / Uniform / (Simple) / Complex		
Predominant buffer zone vegetation	Circle ONE: Bare / Uniform / (Simple) / Complex		

Collapse (%)	Severe: 0 Moderate: 0 Light: 5	Erosion (%)	Severe: 0 Moderate: 0 Light: 5		
Trampling (%)	Severe: 0 Moderate: 0 Light: 0	Bankside notes	—		
Side bars (%)	0	Side bars stable? Y / N / (NA)	Point bars (%)	0	Point bars stable? Y / N (NA)

RIPARIAN ZONE

Overhanging boughs (% of bank length - trees and shrubs)	100	Predominant overhanging trees	Circle ONE: (Deciduous) / Evergreen / None
Predominant land use (50 m from banktop)	Circle ONE: (AR) / BL / CP / FW / GP / IG / IN / MH / NC / OR / OW / RD / RP / RS / SC / SU / TH / TL / WL		
Other land uses (50 m from banktop)	Circle ANY (EXCLUDING category already circled above) OR 'NA': AR / (BL) / CP / FW / GP / IG / IN / MH / NC / OR / OW / RD / RP / RS / (SC) / SU / TH / TL / WL OR NA		
Presence of young plantations	Circle ANY: Deciduous / Coniferous / Mixed OR (None)		
Conifer planting: F&W guidelines?	Y / N / (NA)	Riparian notes	—

PART E: PHOTOGRAPHS L01 - L07

PART F: POLLUTION POINTS

ID	—	Easting	—	Northing	—	Time	—
Type	Circle ONE: FE / FR / IN / RD / SE / SD / ?? / OTH			Status	Potential / Actual
Dead fish?	Y / N	Photos	—	Contact	—		
Notes	NONE						

PART G: OBSTACLES

ID	—	Easting	—	Northing	—
Type	Circle ANY: BR / CU / DA / FC / FD / FS / FT / GC / WE / WF/ WG / OTH	Pass?	Circle ONE: No (U/D) / No (U) / Yes (S/F) / Yes / ??		
Vertical?	Y / N / NA	EF required?	Y / N	Photos	—	Contact	—
Notes	—						

PART H: CHANNEL / BANK MODIFICATIONS

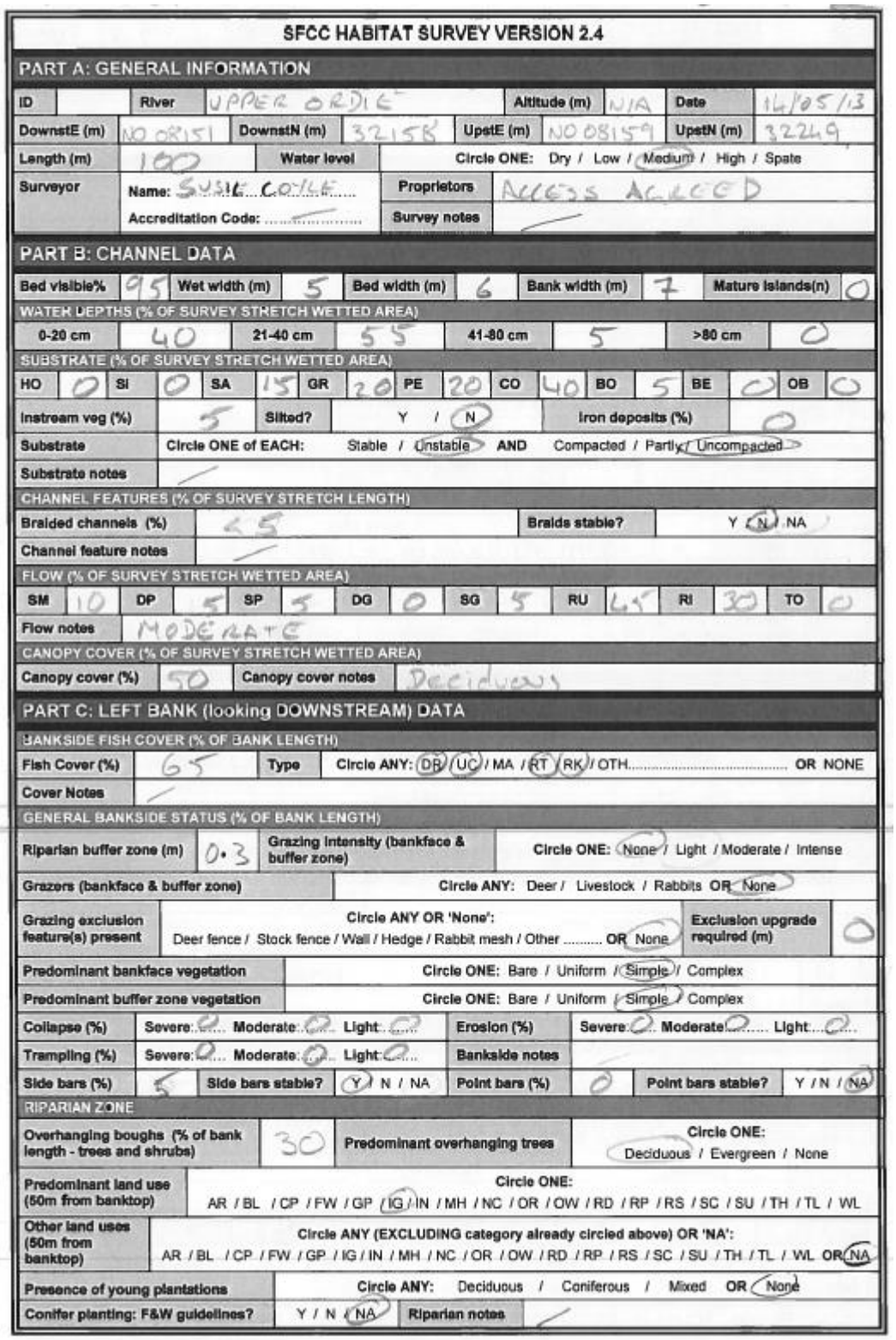
ID	—	Easting	—	Northing	—	Location	Circle ANY: Left Bk / Right Bk / Bed
Type	Circle ANY: CD / CR / CW / FP / GA / HP / PI / RE / RR / SN / UC / OTH			Effectiveness	Circle ONE: Effective / Ineffective / Not known
Downstream effect ?	Y / N	Approx. age	..... / Not known	Previous attempts	0 / 1 / 2 / > 2 / Not known
Length (m)	—	Photos	—	Contact	—
Notes	—				

PART I: SPAWNING LOCATIONS

ID		Easting		Northing		Area (m2)		Useable (%)	
Suitability (G/P)	SA..... TR.....	Washout?	Y / N / ?	Notes			

POLLUTION, OBSTACLES, MODIFICATIONS AND SPAWNING CONT'D ON PAGE .....

Sheet 3. Upper Ordie Burn habitat survey sheet



SFCC HABITAT SURVEY VERSION 2.4

PART A: GENERAL INFORMATION

ID		River	UPPER ORDIE			Altitude (m)	N/A	Date	16/05/13		
DownstE (m)	NO 08151	DownstN (m)	32158	UpstE (m)	NO 08159	UpstN (m)	32249				
Length (m)	100	Water level	Circle ONE: Dry / Low / (Medium) / High / Spate								
Surveyor	Name: SUSIE COYLE			Proprietors	ACCESS AGREED						
	Accreditation Code:			Survey notes							

PART B: CHANNEL DATA

Bed visible%	95	Wet width (m)	5	Bed width (m)	6	Bank width (m)	7	Mature islands(n)	0		
WATER DEPTHS (% OF SURVEY STRETCH WETTED AREA)											
0-20 cm	40	21-40 cm	55	41-80 cm	5	>80 cm	0				
SUBSTRATE (% OF SURVEY STRETCH WETTED AREA)											
HO	0	SI	0	SA	15	GR	20	PE	20	CO	40
BO	5	BE	0	OB	0						
Instream veg (%)	5	Silted?	Y / (N)	Iron deposits (%)	0						
Substrate	Circle ONE of EACH: Stable / (Unstable) AND Compacted / Partly / (Uncompacted)										
Substrate notes											
CHANNEL FEATURES (% OF SURVEY STRETCH LENGTH)											
Braided channels (%)	25	Braids stable?	Y / (N) / NA								
Channel feature notes											
FLOW (% OF SURVEY STRETCH WETTED AREA)											
SM	10	DP	5	SP	5	DG	0	SG	5	RU	45
RI	30	TO	0								
Flow notes	MODERATE										
CANOPY COVER (% OF SURVEY STRETCH WETTED AREA)											
Canopy cover (%)	50	Canopy cover notes	Deciduous								

PART C: LEFT BANK (looking DOWNSTREAM) DATA

BANKSIDE FISH COVER (% OF BANK LENGTH)											
Fish Cover (%)	65	Type	Circle ANY: (DR) / (UC) / MA / (RT) / (RK) / OTH..... OR NONE								
Cover Notes											
GENERAL BANKSIDE STATUS (% OF BANK LENGTH)											
Riparian buffer zone (m)	0.3	Grazing intensity (bankface & buffer zone)	Circle ONE: (None) / Light / Moderate / Intense								
Grazers (bankface & buffer zone)	Circle ANY: Deer / Livestock / Rabbits OR (None)										
Grazing exclusion feature(s) present	Circle ANY OR 'None': Deer fence / Stock fence / Wall / Hedge / Rabbit mesh / Other ..... OR (None)								Exclusion upgrade required (m)	0	
Predominant bankface vegetation	Circle ONE: Bare / Uniform / (Simple) / Complex										
Predominant buffer zone vegetation	Circle ONE: Bare / Uniform / (Simple) / Complex										
Collapse (%)	Severe: 0	Moderate: 0	Light: 0	Erosion (%)	Severe: 0	Moderate: 0	Light: 0				
Trampling (%)	Severe: 0	Moderate: 0	Light: 0	Bankside notes							
Side bars (%)	5	Side bars stable?	(Y) / N / NA	Point bars (%)	0	Point bars stable?	Y / N / (NA)				
RIPARIAN ZONE											
Overhanging boughs (% of bank length - trees and shrubs)	30	Predominant overhanging trees	Circle ONE: (Deciduous) / Evergreen / None								
Predominant land use (50m from banktop)	Circle ONE: AR / BL / CP / FW / GP / (IG) / IN / MH / NC / OR / OW / RD / RP / RS / SC / SU / TH / TL / WL										
Other land uses (50m from banktop)	Circle ANY (EXCLUDING category already circled above) OR 'NA': AR / BL / CP / FW / GP / IG / IN / MH / NC / OR / OW / RD / RP / RS / SC / SU / TH / TL / WL OR (NA)										
Presence of young plantations	Circle ANY: Deciduous / Coniferous / Mixed OR (None)										
Conifer planting: F&W guidelines?	Y / N / (NA)	Riparian notes									

ID		River	UPPER ORDIE	Date	15/05/13	V2.4

PART D: RIGHT BANK (looking DOWNSTREAM) DATA

BANKSIDE FISH COVER (% OF BANK LENGTH)

Fish Cover (%)	60	Type	Circle ANY: DR / UC / MA / RT / RK / OTH..... OR NONE
Cover Notes	—		

GENERAL BANKSIDE STATUS (% OF BANK LENGTH)

Riparian buffer zone (m)	0.3	Grazing intensity (bankface & buffer zone)	Circle ONE : None / Light / Moderate / Intense
Grazers (bankface & buffer zone)		Circle ANY: Deer / Livestock / Rabbits OR None	
Grazing exclusion feature(s) present	Circle ANY OR 'None': Deer fence / Stock fence / Wall / Hedge / Rabbit mesh / Other ..... OR None		Exclusion upgrade required (m) 0
Predominant bankface vegetation	Circle ONE: Bare / Uniform / Simple / Complex		
Predominant buffer zone vegetation	Circle ONE: Bare / Uniform / Simple / Complex		

Collapse (%)	Severe: 0 Moderate: 0 Light: 0	Erosion (%)	Severe:..... Moderate: 5 Light:.....
Trampling (%)	Severe:..... Moderate:..... Light:.....	Bankside notes	—

Side bars (%)	0	Side bars stable?	Y / N / NA	Point bars (%)	0	Point bars stable?	Y / N / NA

RIPARIAN ZONE

Overhanging boughs (% of bank length - trees and shrubs)	60	Predominant overhanging trees	Circle ONE: Deciduous / Evergreen / None
Predominant land use (50m from banktop)	Circle ONE: AR / BL / CP / FW / GP / IG / IN / MH / NC / OR / OW / RD / RP / RS / SC / SU / TH / TL / WL		
Other land uses (50m from banktop)	Circle ANY (EXCLUDING category already circled above) OR 'NA': AR / BL / CP / FW / GP / IG / IN / MH / NC / OR / OW / RD / RP / RS / SC / SU / TH / TL / WL OR NA		
Presence of young plantations	Circle ANY: Deciduous / Coniferous / Mixed OR None		
Conifer planting: F&W guidelines?	Y / N / NA	Riparian notes	—

PART E: PHOTOGRAPHS UOB14, UOB15, UOB16

PART F: POLLUTION POINTS

ID	—	Easting	—	Northing	—	Time	—
Type	Circle ONE: FE / FR / IN / RD / SE / SD / ?? / OTH					Status	Potential / Actual
Dead fish?	Y / N	Photos	—	Contact	—		
Notes	NONE						

PART G: OBSTACLES

ID	—	Easting	—	Northing	—
Type	Circle ANY: BR / CU / DA / FC / FD / FS / FT / GC / WE / WF / WG / OTH			Pass?	Circle ONE: No (U/D) / No (U) / Yes (S/F) / Yes / ??
Vertical?	Y / N / NA	EF required?	Y / N	Photos	—
Notes	NONE				

PART H: CHANNEL / BANK MODIFICATIONS

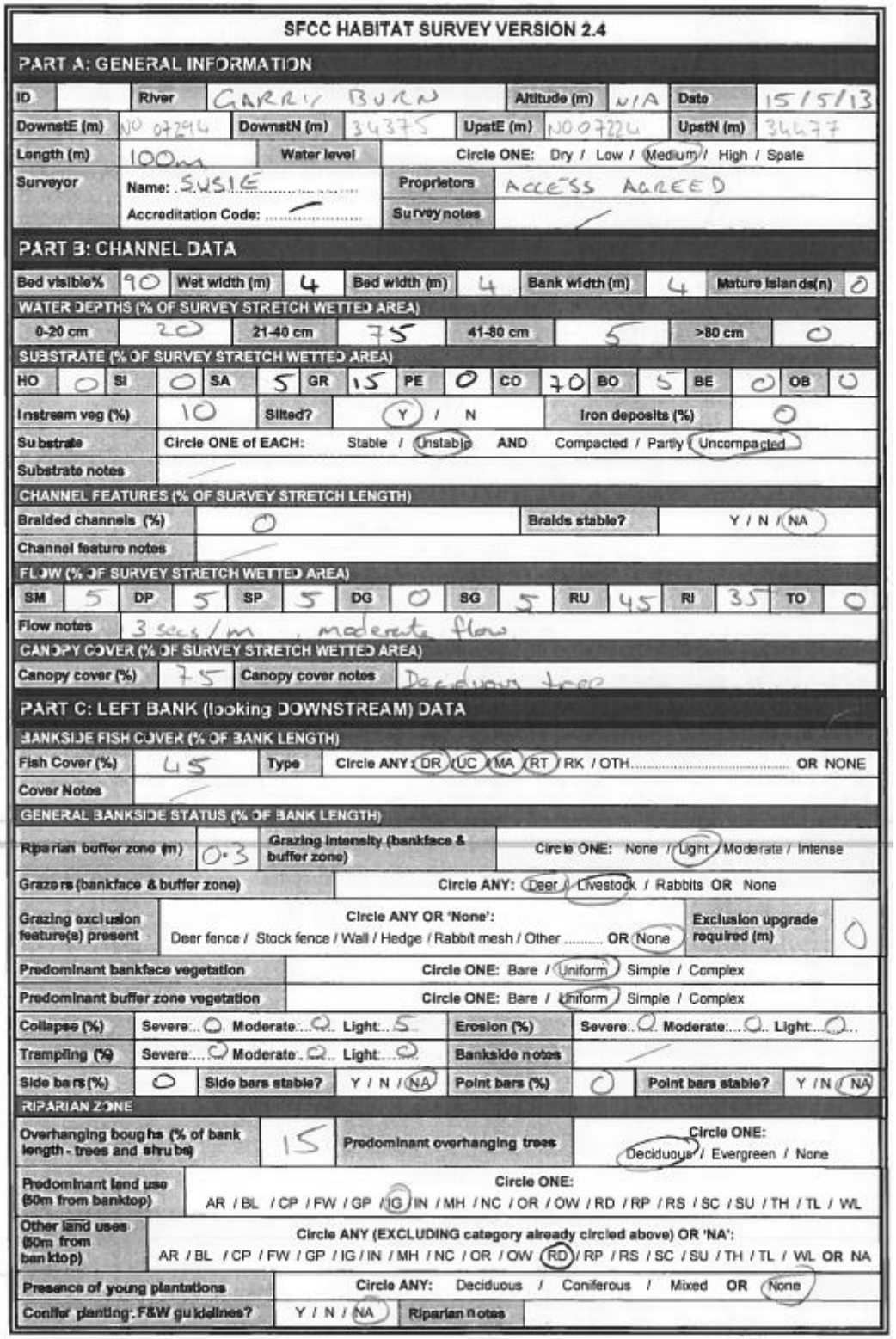
ID		Easting	0008127	Northing	32197	Location	Circle ANY: Left Bk / Right Bk / Bed
Type	Circle ANY: CD / CR / CW / FP / GA / HP / PI / RE / RR / SN / UC / OTH					Effectiveness	Circle ONE: Effective / Ineffective / Not known
Downstream effect ?	Y / N	Approx. age	..... / Not known	Previous attempts	0 / 1 / 2 / >2 / Not known		
Length (m)	20	Photos	NONE	Contact	—		
Notes	Strengthened right bank.						

PART I: SPAWNING LOCATIONS

ID		Easting		Northing		Area (m2)		Useable (%)	
Suitability (G/P)	SA..... TR.....			Washout?	Y / N / ?	Notes			

POLLUTION, OBSTACLES, MODIFICATIONS AND SPAWNING CONT'D ON PAGE .....

Sheet 4. Garry Burn habitat survey sheet



SFCC HABITAT SURVEY VERSION 2.4

PART A: GENERAL INFORMATION

ID		River	GARRY BURN			Altitude (m)	N/A	Date	15/5/13
DownstE (m)	NO 07296	DownstN (m)	34375	UpstE (m)	NO 07226			UpstN (m)	34477
Length (m)	100m	Water level	Circle ONE: Dry / Low / (Medium) / High / Spate						
Surveyor	Name: SUSIE			Proprietors	ACCESS AGREED				
	Accreditation Code: —			Survey notes					

PART B: CHANNEL DATA

Bed visible%	90	Wet width (m)	4	Bed width (m)	4	Bank width (m)	4	Mature islands(n)	0

WATER DEPTHS (% OF SURVEY STRETCH WETTED AREA)

0-20 cm	20	21-40 cm	75	41-60 cm	5	>60 cm	0

SUBSTRATE (% OF SURVEY STRETCH WETTED AREA)

HO	0	SI	0	SA	5	GR	15	PE	0	CO	70	BO	5	BE	0	OB	0

Instream veg (%)	10	Silted?	(Y) / N	Iron deposits (%)	0
Substrate	Circle ONE of EACH: Stable / (Unstable) AND Compacted / Partly / (Uncompacted)				
Substrate notes					

CHANNEL FEATURES (% OF SURVEY STRETCH LENGTH)

Braided channels (%)	0	Braids stable?	Y / N / (NA)
Channel feature notes			

FLOW (% OF SURVEY STRETCH WETTED AREA)

SM	5	DP	5	SP	5	DG	0	SG	5	RU	45	RI	35	TO	0

Flow notes	3 secs/m, moderate flow

CANOPY COVER (% OF SURVEY STRETCH WETTED AREA)

Canopy cover (%)	75	Canopy cover notes	Deciduous tree

PART C: LEFT BANK (looking DOWNSTREAM) DATA

BANKSIDE FISH COVER (% OF BANK LENGTH)

Fish Cover (%)	45	Type	Circle ANY: (DR) (UC) (MA) (RT) RK / OTH..... OR NONE
Cover Notes			

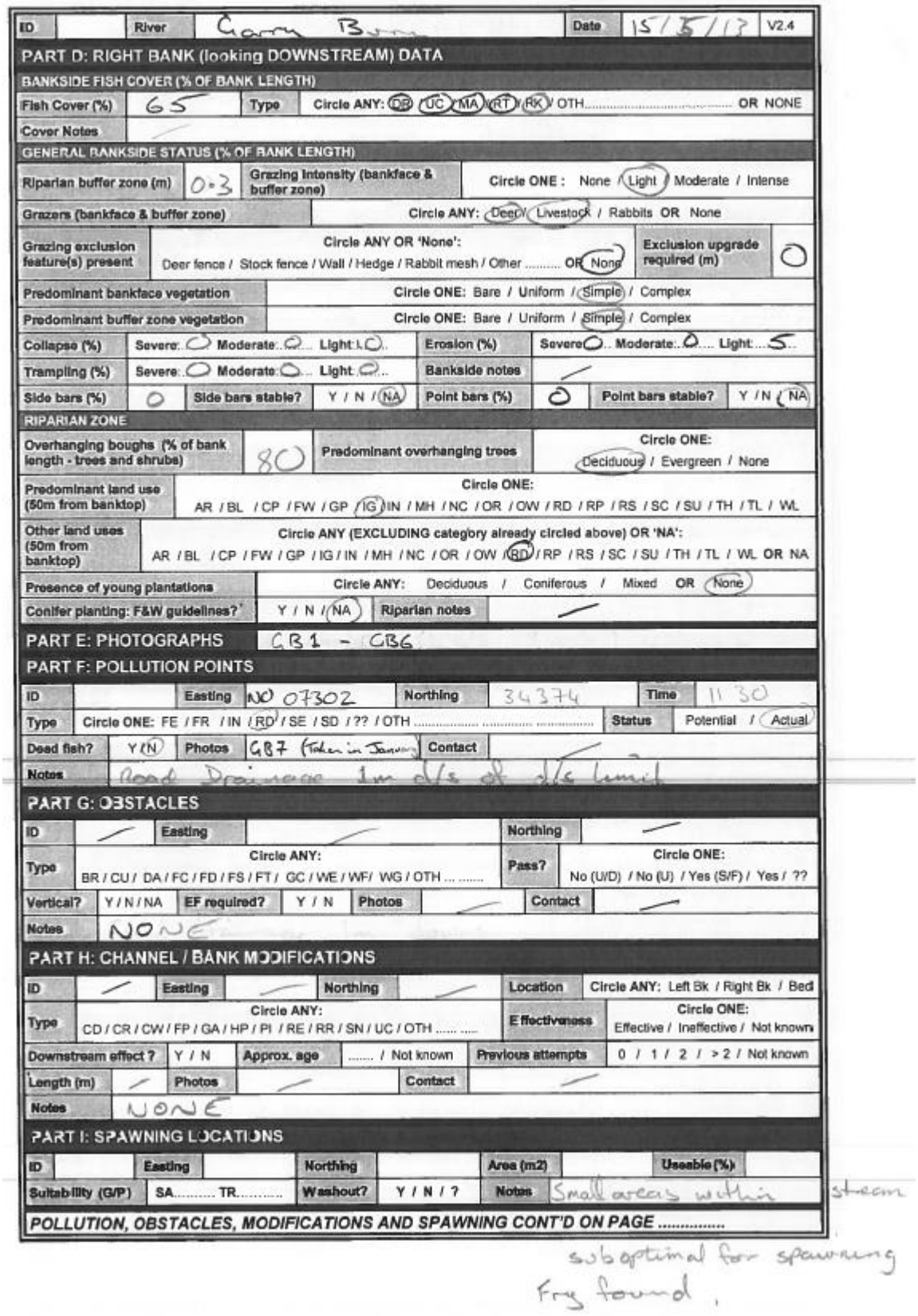
GENERAL BANKSIDE STATUS (% OF BANK LENGTH)

Riparian buffer zone (m)	0.3	Grazing intensity (bankface & buffer zone)	Circle ONE: None / (Light) / Moderate / Intense
Grazers (bankface & buffer zone)	Circle ANY: (Deer) / (Livestock) / Rabbits OR None		
Grazing exclusion feature(s) present	Circle ANY OR 'None': Deer fence / Stock fence / Wall / Hedge / Rabbit mesh / Other ..... OR (None)	Exclusion upgrade required (m)	0
Predominant bankface vegetation	Circle ONE: Bare / (Uniform) / Simple / Complex		
Predominant buffer zone vegetation	Circle ONE: Bare / (Uniform) / Simple / Complex		

Collapse (%)	Severe: 0 Moderate: 0 Light: 5	Erosion (%)	Severe: 0 Moderate: 0 Light: 0		
Trampling (%)	Severe: 0 Moderate: 0 Light: 0	Bankside notes			
Side bars (%)	0	Side bars stable?	Y / N / (NA)	Point bars (%)	0	Point bars stable?	Y / N / (NA)

RIPARIAN ZONE

Overhanging boughs (% of bank length - trees and shrubs)	15	Predominant overhanging trees	Circle ONE: (Deciduous) / Evergreen / None
Predominant land use (50m from banktop)	Circle ONE: AR / BL / CP / FW / GP / (IG) / IN / MH / NC / OR / OW / RD / RP / RS / SC / SU / TH / TL / WL		
Other land uses (50m from banktop)	Circle ANY (EXCLUDING category already circled above) OR 'NA': AR / BL / CP / FW / GP / IG / IN / MH / NC / OR / OW (RD) / RP / RS / SC / SU / TH / TL / WL OR NA		
Presence of young plantations	Circle ANY: Deciduous / Coniferous / Mixed OR (None)		
Conifer planting: F&W guidelines?	Y / N / (NA)	Riparian notes	



ID		River	Garry Burn	Date	15/5/17 V2.4

PART D: RIGHT BANK (looking DOWNSTREAM) DATA

BANKSIDE FISH COVER (% OF BANK LENGTH)

Fish Cover (%)	65	Type	Circle ANY: OB / UC / MA / RT / RK / OTH ..... OR NONE
Cover Notes			

GENERAL BANKSIDE STATUS (% OF BANK LENGTH)

Riparian buffer zone (m)	0-3	Grazing intensity (bankface & buffer zone)	Circle ONE: None / Light / Moderate / Intense
Grazers (bankface & buffer zone)		Circle ANY: Deer / Livestock / Rabbits OR None	
Grazing exclusion feature(s) present	Circle ANY OR 'None': Deer fence / Stock fence / Wall / Hedge / Rabbit mesh / Other ..... OR None		Exclusion upgrade required (m)
Predominant bankface vegetation	Circle ONE: Bare / Uniform / Simple / Complex		
Predominant buffer zone vegetation	Circle ONE: Bare / Uniform / Simple / Complex		

Collapse (%)	Severe: 0 Moderate: 0 Light: 0		Erosion (%)	Severe 0 Moderate: 0 Light: 5	
Trampling (%)	Severe: 0 Moderate: 0 Light: 0		Bankside notes		
Side bars (%)	0	Side bars stable? Y / N / NA	Point bars (%)	0	Point bars stable? Y / N / NA

RIPARIAN ZONE

Overhanging boughs (% of bank length - trees and shrubs)	80	Predominant overhanging trees	Circle ONE: Deciduous / Evergreen / None
Predominant land use (50m from banktop)	Circle ONE: AR / BL / CP / FW / GP / IG / IN / MH / NC / OR / OW / RD / RP / RS / SC / SU / TH / TL / WL		
Other land uses (50m from banktop)	Circle ANY (EXCLUDING category already circled above) OR 'NA': AR / BL / CP / FW / GP / IG / IN / MH / NC / OR / OW / RD / RP / RS / SC / SU / TH / TL / WL OR NA		
Presence of young plantations	Circle ANY: Deciduous / Coniferous / Mixed OR None		
Conifer planting: F&W guidelines?	Y / N / NA	Riparian notes	

PART E: PHOTOGRAPHS GB1 - GB6

PART F: POLLUTION POINTS

ID		Easting	NO 07302	Northing	34374 Time 11 30
Type	Circle ONE: FE / FR / IN / RD / SE / SD / ?? / OTH			Status	Potential / Actual
Dead fish?	Y / N	Photos	GB7 (Taken in January)	Contact	
Notes	Road Drainage 1m d/s of d/s limit				

PART G: OBSTACLES

ID		Easting		Northing	
Type	Circle ANY: BR / CU / DA / FC / FD / FS / FT / GC / WE / WF / WG / OTH			Pass?	Circle ONE: No (U/D) / No (U) / Yes (S/F) / Yes / ??
Vertical?	Y / N / NA	EF required?	Y / N	Photos	Contact
Notes	NONE				

PART H: CHANNEL / BANK MODIFICATIONS

ID		Easting	Northing	Location	Circle ANY: Left Bk / Right Bk / Bed
Type	Circle ANY: CD / CR / CW / FP / GA / HP / PI / RE / RR / SN / UC / OTH			Effectiveness	Circle ONE: Effective / Ineffective / Not known
Downstream effect?	Y / N	Approx. age	..... / Not known	Previous attempts	0 / 1 / 2 / > 2 / Not known
Length (m)		Photos		Contact	
Notes	NONE				

PART I: SPAWNING LOCATIONS

ID		Easting	Northing	Area (m2)	Useable (%)
Suitability (G/P)	SA..... TR.....	Washout?	Y / N / ?	Notes	Small areas within stream sub optimal for spawning Fry found.

POLLUTION, OBSTACLES, MODIFICATIONS AND SPAWNING CONT'D ON PAGE .....

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