Strategic Conservation Plan for Southern Damselfly *Coenagrion mercuriale*

Habitat Enhancement and Creation Opportunities in and adjacent to Eastleigh Borough

Dr Ben Rushbrook

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Executive Summary

Arcadian Ecology & Consulting Ltd (hereafter 'Arcadian Ecology') was appointed by Eastleigh Borough Council to investigate the current and potential future distribution of southern damselfly *Coenagrion mercuriale* within and adjacent to the borough boundary. It was agreed that this work would be delivered in two sequential phases.

Phase 1 involved the completion of surveys and habitat assessments for southern damselfly at known and potential sites throughout the borough. This study focused on sites associated with the River Itchen Site of Special Scientific Interest (SSSI) / Special Area of Conservation (SAC), as the main channels and (in particular) watercourses associated with the floodplain meadows are known to support a nationally important 'population' of this species. The results of the phase 1 study are reported in Rushbrook (2018).

Phase 2 involved more detailed consideration of the findings of the survey and habitat assessment programme in order to develop a Strategic Conservation Plan for southern damselfly across the study area. Specifically, potential habitat enhancement and creation opportunities were identified based on the results of the habitat assessments, with their strategic value assessed based on their potential influence on the strength of existing southern damselfly populations, and their potential influence on the future distribution of this species across the lower Itchen Valley.

It is intended that this report provide a strategic conservation plan for southern damselfly within and immediately adjacent to the Eastleigh Borough boundary, outlining what is considered to be the key principles for the strategic conservation of this species in this area. Specifically, it presents an assessment of potential habitat enhancement and creation opportunities for southern damselfly within and immediately adjacent to areas surveyed and assessed by the author in 2017 (Rushbrook, 2018).

It is important to clarify that this report represents a summary of the habitat enhancement and creation opportunities identified, but does not provide detailed plans on their delivery. In addition, it is emphasised that the majority of these options have not been discussed with the landowners, angling clubs or other relevant stakeholders, and the options should only be considered to represent a strategic plan for potential opportunities, and should not be considered as a programme of agreed works or projects. Furthermore, even if and when this has been secured, a number of these opportunities will require detailed hydrological and topographical studies to be conducted to confirm their feasibility and assess their potential impacts on existing important habitat for southern damselfly.

Opportunities for habitat enhancement of those transects identified to have enhancement potential by the author (Rushbrook, 2018) were assessed irrespective of their existing habitat suitability. Furthermore, opportunities for habitat creation associated with those transects that were identified concurrently by the author (Rushbrook, 2018) were assessed. However, it was agreed that habitat enhancement and creation proposals to be included within this strategic conservation plan would be focused on carrier streams and the floodplain meadows, and therefore three sections of the main river included within the survey and habitat assessment study were excluded.

Transects and features / areas considered to have the potential for habitat enhancement or creation were assessed based on three categories of criteria:

1. The *value* of the proposals for southern damselfly;
2. The *feasibility* of the delivery and long-term 'success' of the proposals identified;
3. The level of *support* and / or engagement it was considered that the proposals would receive from landowners, angling clubs and other relevant stakeholders; this criteria also included the discretion of the author to determine that, on more detailed consideration, the resources required to deliver works were considered to be disproportionate when assessing the potential value of delivered outputs.

These categories are further divided in to a number of criteria as outlined below, and described in more detail in Table 2. It is emphasised that these criteria include a combination of objective and subjective measures. The assessments of criteria were based on the author's knowledge, understanding and experience of the:

- requirements of southern damselfly;

- delivery of such enhancement and creation proposals;
- status of southern damselfly;
- likelihood of support of relevant persons and organisations for the measures that would be required to deliver the proposals.

The assessment of the potential likelihood that the proposed enhancement and creation opportunities could be delivered was calculated in the following way:

[Value (mean) + Feasibility (mean)] x Support

Habitat enhancement opportunities were assessed on forty-three transects over ten sites. Key findings for their value, feasibility, level of support and overall potential included:

- Value
    - Twenty-seven of the transects were assessed to be of high habitat enhancement value; this included transects at eight of the ten sites, with only Ashtrim Nursery and Allington Manor Farm not returning high value habitat enhancement opportunities; the former due in part to the current optimal / sub-optimal conditions already present within transect 1, and the latter a consequence of the strong population present and the absence of immediate threats to the population.
    - Fourteen transect were considered to be of moderate habitat enhancement value, with twelve of these identified at Allington Manor Farm or Ashtrim Nursery.
    - The only habitat enhancement proposals assessed to be of low value were present at Allington Manor Farm.
- Feasibility
    - Only five opportunities were considered to be of high feasibility, with four identified at Allington Manor Farm and one at Ashtrim Nursery; this was largely a consequence of the moderate to minor capital works involved.
    - The majority (thirty-three) of habitat enhancement proposals were assessed to be of moderate feasibility, with all transects considered to involve major or moderate capital works.
    - The low feasibility assessment of the five remaining transects was primarily a consequence of the major capital works involved.
- Support
    - Ashtrim Nursery, owned and managed by Eastleigh Borough Council, was the only instance where it was considered likely that the proposals would be supported by all relevant interest groups.
    - It was considered moderately likely that support and engagement from relevant persons / stakeholders could be secured for the habitat enhancement proposals for fourteen transects.
    - It was considered unlikely that habitat enhancement proposals for sixteen transects would be supported by relevant persons / stakeholders, and it was understood that habitat enhancement proposals for twelve transects would not be supported.
- Potential
    - It was considered that habitat enhancement proposals for seven and eight transects currently had a high and moderate potential of being deliverable respectively, fundamentally a result of the relatively higher perceived likelihood of support.
    - Thirteen transects were assessed to have low habitat enhancement potential.
    - Habitat enhancement proposals for fifteen transects were considered to currently have a very low potential of being deliverable; the majority of these (ten) was a direct consequence of the understood absence of support for these proposals.

Sixteen habitat creation opportunities identified over nine sites were assessed. Key findings for their value, feasibility, level of support and overall potential included:

- Value
    - Habitat creation proposals are inherently likely to be of high value, and this result was returned for fourteen of the sixteen proposals assessed.

    - The remaining two habitat creation areas were considered to be of moderate value due to the strong population present at this site, and the absence of immediate threats to this population.
- Feasibility
    - The majority of habitat enhancement proposals were assessed to be of moderate feasibility; the scale of works associated with the delivery of these proposals was a primary reason for these assessments, although it is important to emphasise that water availability and / or site topography was also an important consideration.
    - A low feasibility assessment was returned for one of the habitat creation proposals.
- Support
    - It was considered that none of the habitat creation proposals were currently likely to secure support for their delivery from all relevant persons / stakeholders.
    - It was considered that there existed a moderate likelihood of support from relevant persons / stakeholders for four of the sixteen habitat creation proposals.
    - It was considered unlikely that habitat creation proposals would be supported by relevant persons / stakeholders at eight of the remaining proposals, and it is understood that proposals for four of the identified areas would not be supported.
- Potential
    - It is currently considered that habitat creation proposals for one and five areas have a high and moderate potential of being delivered respectively.
    - Six identified areas were assessed to currently have a low potential of the habitat creation proposals being delivered.
    - Four proposed habitat creation areas were considered to have a very low potential of being delivered, a consequence of the understood absence of support for these proposals.

The proposed opportunities for individual sites are outlined in Sections 5 – 16, with the assessment of the value, feasibility, perceived level of support afforded, and current habitat enhancement or creation potential discussed in more detail. It is emphasised that detailed proposals have not been developed for any sites at this stage since active engagement with relevant persons / stakeholders and, in a number of instances, a specific hydrological / topographical study will need to be conducted before these can be established. Finally, as outlined in Section 1.3., the majority of Itchen Valley Country Park was excluded from the survey and habitat assessment (Rushbrook, 2018), and it is therefore not appropriate to assess habitat enhancement and creation opportunities using the approach outlined above. However, due to the national importance of this population, a site wide assessment is provided in Section 17.

Two broad, key elements form the basis for the successful delivery of the habitat enhancement and creation opportunities set out in this strategic conservation plan for southern damselfly. Only by addressing and securing these, can the long-term security of a robust southern damselfly metapopulation within the study area be effectively achieved. These elements are:

- Addressing factors currently limiting the distribution of southern damselfly;
- Securing the long term suitability of existing, enhanced and / or recently created suitable habitat.

It is considered that there are three key habitat specific factors currently limiting southern damselfly distribution in the area within and around the Eastleigh Borough boundary:

- Development of scrub;
- Water security and management;
- Land management.

It is considered that there are two key elements to securing the long term suitability of existing, enhanced and / or recently created suitable habitat:

- Securing the support of relevant persons / stakeholders;
- Land security.

Although value and feasibility were considered when assessing the potential likelihood that the proposed enhancement and creation opportunities could be delivered, additional weight was afforded to the support / engagement category. This is considered to be a practical method for determining where resources should be directed when looking to take forward the delivery of the proposals set out in this conservation plan, since it is unrealistic to consider that proposals will be successful in the long term without the agreement and support of landowners, angling clubs and relevant stakeholders.

However, there is a clear case that, given its status as an Annex II species that is a primary reason for the selection of the River Itchen as a SAC, the delivery of the strategic conservation plan for southern damselfly could focus on those proposals where there is a high value and / or feasibility of providing suitable habitat. However, it is considered likely that selection on this basis would alienate relevant persons / stakeholders, and would therefore result in a limited likelihood of success in the long-term.

Finally, for the most successful implementation of the habitat enhancement and creation opportunities included in this strategic conservation plan, it is considered fundamentally important that these sites are considered in combination rather than isolation. Focus should be given to the delivery of a suite of proposals that will most effectively consolidate and strengthen the metapopulation dynamics of southern damselfly in the lower Itchen Valley.

It is emphasised that the accuracy of the assessments included within this plan are based on the current knowledge of the author. More detailed investigation on hydrology, topography, and the level of support and engagement afforded by relevant persons and stakeholders, would greatly enhance the level of confidence that could be afforded to these assessments. The assessments should therefore be considered an on-going process, and it recommended that this conservation plan be developed and updated once there has been an opportunity to investigate these areas further.

This conservation strategy has reviewed all the land within the study area to identify locations where habitat enhancement and conservation measures could be delivered to benefit southern damselfly. It is a general conservation strategy, and does not purport itself to define the extent of land required to mitigate the effects of Eastleigh Borough Council's Local Plan development and link road (in combination with other plans and programmes). Furthermore, it is recognised that any required mitigation of these may not include all the measures set out in this conservation strategy. This assessment, and an assessment of deliverability, will be undertaken to inform the full Habitat Regulations Assessment. Notwithstanding this, it is considered that the delivery of habitat enhancement and creation works within the study area, both at sites supporting and those in-between existing southern damselfly populations, is crucial to secure the long-term conservation of southern damselfly within the study area.

In conclusion, it is emphasised that collaboration between local authorities, statutory bodies, and non-statutory conservation bodies is essential to successfully deliver this strategic conservation plan for southern damselfly. These organisations must work closely with land managers / stakeholders to facilitate the delivery of long-term conservation measures for southern damselfly and, where opportunities arise, secure land for the purpose of the delivery of the habitat enhancement and creation proposals set out in this strategic conservation plan (see Section 19.2). This approach will address a number of constraints associated with the delivery of the proposed habitat enhancement and creations works at some sites (i.e. feasibility and / or level of support), and will be fundamental in maximising the extent and value of the habitat specific conservation measures delivered for southern damselfly within and beyond the Eastleigh Borough boundary.

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Appendix 4: Criteria scores and results of habitat creation assessments (based on Table 2).

Appendix 5: Technical Note: assessment of habitat creation opportunities for southern damselfly at land near Eastleigh.

1. INTRODUCTION

1.1 Background

Arcadian Ecology & Consulting Ltd (hereafter 'Arcadian Ecology') was appointed by Eastleigh Borough Council to investigate the current and potential future distribution of southern damselfly *Coenagrion mercuriale* within and adjacent to the borough boundary. It was agreed that this work would be delivered in two sequential phases.

Phase 1 involved the completion of surveys and habitat assessments for southern damselfly at known and potential sites throughout the borough. This study focused on sites associated with the River Itchen Site of Special Scientific Interest (SSSI) / Special Area of Conservation (SAC), as the main channels and (in particular) watercourses associated with the floodplain meadows are known to support a nationally important 'population' of this species (Thompson *et al*., 2003a). The results of the phase 1 study are reported in Rushbrook (2018).

Phase 2 involved more detailed consideration of the findings of the survey and habitat assessment programme in order to develop a Strategic Conservation Plan for southern damselfly across the study area. Specifically, potential habitat enhancement and creation opportunities were identified based on the results of the habitat assessments, with their strategic value assessed based on their potential influence on the strength of existing southern damselfly populations, and their potential influence on the future distribution of this species across the lower Itchen Valley. This report sets out the findings of this process.

1.2 Status of Southern Damselfly Within and Adjacent to Eastleigh Borough

The survey and habitat assessment study visited 13 sites within and adjacent to the Eastleigh Borough boundary (Rushbrook, 2018), with southern damselfly recorded at nine of the thirteen sites (Table 1). However, only two of the sites included within the study were considered to support a strong southern damselfly population (i.e. Highbridge Farm and Allington Manor Farm), with Itchen Valley Country Park also considered to support a strong but potentially declining number of southern damselfly (Rushbrook, 2018). It is emphasised that only part of this site was included within the survey programme, with the southern damselfly 'population' in this area considered to be of medium strength (Table 1), but the results of an ongoing monitoring programme used to inform the 'strong but declining' population assessment of the wider site (Rushbrook, 2018). Of the remaining six sites, two were considered to support medium strength populations, and four weak or negligible populations.

Furthermore, only 19 of the 112 transects surveyed across all sites were considered to support optimal and / or sub-optimal habitat for southern damselfly, with a number of these not supporting such habitat throughout their entire length. It is considered that the limited availability of optimal / sub-optimal habitat, linked with their relatively smaller size in the instance of Land Behind GW Martin and Ashtrim Nursery, is likely to be a key factor in limiting the population strengths at a number of sites within and adjacent to the Eastleigh Borough boundary. Consequently, it is considered by the author that targeted habitat enhancement and / or creation at all sites currently supporting southern damselfly would be a highly valuable and effective mechanism for increasing the strength of southern damselfly populations at these sites.

Southern damselfly are considered to possess limited dispersal capabilities (Thompson *et al*., 2003a), and studies conducted by University of Liverpool have identified that southern damselfly populations within the Itchen Valley have both become physically isolated due to the presence of large areas of unsuitable habitat between them (Rouquette, 2005), and are also showing evidence of genetic isolation (Watts *et al*., 2004). These concerns are supported by the findings of the survey and habitat assessment study, and the author echoes concerns that southern damselfly have become localised and therefore at increased risk, or potentially already suffering a decline in, the strength of the metapopulation in and around Eastleigh Borough (Rushbrook, 2018). Specifically, the fragmented distribution of southern damselfly in the Itchen Valley is concerning, since it reduces the likelihood of the re-population of a site should a localised extinction event occur. The restriction or absence of genetic transfer may also potentially reduce the robustness of individual populations. Therefore, it is considered that urgent conservation action is required for this species in and around Eastleigh Borough.

Table 1: Summary of field survey results with assessments of current and future potential habitat suitability and southern damselfly population strength at each site *(taken from Rushbrook, 2018)*.

Site Name	No. Habitat Assessments	Length of Transects Assessed (m)	No. Transects with Suitable Habitat	Overall Suitability of Site	Potential for Enhancement of Transects	No. Adult Count Surveys	No Transects Supporting Southern Damselfly	Population Strength	Potential Population Strength
Bishopstoke FC^	5	1,143	0	Unsuitable	Low to Moderate	1	0	Absent*	N/a
Highbridge Farm^	34	9,789	8	Highly Variable (optimal to unsuitable)	High	9	9	Strong	Very Strong
Breach Farm	4	1,853	1	Unsuitable	Moderate	1	1	Weak	Medium
Withy Meadows	2	557	0	Unsuitable	Moderate	0	0	Absent	Medium
Bishopstoke Park	DNS	N/a	N/a	N/a	N/a	N/a	N/a	N/a	N/a
GW Martin^	2	770	1	High to Low	Moderate†	2	2	Medium	Medium‡
Ashtrim Nursery	2	274	1	Optimal to Unsuitable	Low	1	1	Medium	Medium
Morris' Land^	6	814	0	Unsuitable	Moderate†	1	1	Negligible	N/a‡
Toby Carvery	1	88	0	Unsuitable	None	0	0	Absent	N/a
Dunford's Land	12	4,323	3	Unsuitable	Moderate†	3	2	Weak	Medium‡
West Horton Farm^	10	2,553	0	Unsuitable	High[v]	6	2	Weak	Strong[v]
Allington Manor	31	7,495	5	Highly Variable (optimal to unsuitable)	Low to Moderate	5	5	Strong	Strong
Itchen Valley CP^	3	555	1	Sub-optimal to Unsuitable	Low to Moderate	3	3	Medium	Medium

^ Very short sections of suitable habitat present on one or more additional transects though the majority of the transect in question was considered to be unsuitable.

* Sections of the main River Itchen present within the site that may provide suitable habitat for southern damselfly not assessed.

† This assessment may be increased to high if the creation of new, specific watercourses for southern damselfly was included within enhancement programme.

‡ This assessment may be increased to strong if the creation of new, specific watercourses for southern damselfly was included within enhancement programme.

[v] Subject to findings of detailed hydrological assessment.

It is acknowledged that a range of factors will need to be considered to secure long-term conservation of southern damselfly in the Itchen Valley. However, as outlined above, it is considered by the author that the loss and / or degradation of suitable habitat is a significant concern that requires tackling. It is therefore considered that the delivery of habitat enhancement and creation works, both at sites currently supporting and between existing southern damselfly populations within the study area, is required. This would be an important mechanism for not only strengthening the robustness of the individuals sites themselves, but also an effective strategic approach to consolidate and expand the southern damselfly metapopulation in the lower part of Itchen Valley. This approach is consistent with recommendations made for the wider Itchen Valley metapopulation by Rouquette (2005), in his detailed study of the conservation requirements of southern damselfly in chalkstream and fen habitats.

1.3 Study Area

The study area (Appendix 1) agreed with Eastleigh Borough Council for the southern damselfly survey and habitat assessment study was focused on floodplain meadow channels associated with the River Itchen SSSI / SAC that lie within, and immediately north of, the Eastleigh Borough boundary. Map 1 shows those sites included within the survey and habitat assessment study (red boundaries), those sites scoped out of the study (purple boundaries and horizontal lines), and those where access permission was not received (black boundary and vertical lines). However, suitable areas of Itchen Valley Country Park were excluded from this study since pre-existing long-term survey data was available as outlined in Rushbrook (2018). Furthermore, the northern area of Eastleigh Recreation Ground has previously been identified as a potential location for habitat creation for southern damselfly.

It is therefore appropriate for both these sites to be included when considering the long-term conservation of southern damselfly within the wider study area (Appendix 1), and as a result a total of 14 sites have been considered within this Strategic Conservation Plan for southern damselfly.

The locations of all 14 sites are shown on Map 2, with the extent of 200m buffer zones for the four main road transport routes that cross the River Itchen SAC provided. It should be noted that the most northerly buffer zone represents the re-aligned Highbridge Road, as outlined in Eastleigh Borough Council's emerging Local Plan in December 2017.

1.4 Remit and Scope of the Report

It is intended that this report provide a strategic conservation plan for southern damselfly within and immediately adjacent to the Eastleigh Borough boundary, outlining what is considered to be the key principles for the strategic conservation of this species in this area. However, this report will focus on identifying and prioritising the potential options for habitat enhancement and / or creation for this species in and adjacent to the borough boundary.

Specifically, it presents an assessment of potential habitat enhancement and creation opportunities for southern damselfly identified within and immediately adjacent to areas surveyed and assessed by the author and presented in the phase 1 report (Rushbrook, 2018).

It is important to clarify that this report represents a summary of the habitat enhancement and creation opportunities identified during site visits in June, July and October 2017, and provides an overview of opportunities present at each site based on the information currently available; it does not provide detailed plans on their delivery. It is emphasised that the majority of these options have not been discussed with the landowners, angling clubs or other relevant stakeholders, and the options should only be considered to represent a strategic plan for potential opportunities, and should not be considered as a programme of agreed works or projects. Appropriate discussions with, and the approval / support of, relevant parties will be required before these options can be considered in greater detail. Furthermore, even if and when this has been secured, a number of these opportunities will require detailed hydrological and topographical studies to be conducted to confirm their feasibility and assess their potential impacts on existing important habitat for southern damselfly.

2. ECOLOGY AND LEGISLATION

2.1 Ecology

The southern damselfly (Figure 1) is one of five resident members of the *Coenagrion* genus currently found in the UK. Males of this genus are predominately blue and black in colouration, and together with the common blue damselfly *Enallagma cyathigerum* and white-legged damselfly *Platycnemis pennipes* constitute the 'blue damselflies' (Thompson *et al.*, 2003a). The southern damselfly is at the northern edge of its global range in the UK, which is reflected in its southern and western distribution and in the narrow habitat types in which it occurs in the UK (Purse, 2002; Rouquette, 2005).

Figure 1: Adult male southern damselfly.

In the UK, the southern damselfly occurs in two distinct habitat types; base-rich lowland heathland (typically) and calcareous streams and fens (Rouquette, 2005). The former is characterised by the heathland streams and valley mires found in the New Forest and Preseli Hills, and the latter most commonly by the historic meadow systems associated with the rivers Itchen and Test in Hampshire. Although these two habitat types superficially appear different, similarities in the underlying physical and chemical habitat conditions allow both to meet the ecological requirements of this species.

A detailed account of the habitat requirements of southern damselfly on lowland heath and chalk river systems is provided by Rouquette (2005). The specific optimal characteristics of these habitat features vary slightly between adults and larvae (Rouquette, 2005), but key habitat features for sites to support strong numbers of southern damselfly include (illustrated in Figures 2 and 3):

- Shallow, well oxygenated, base-rich water;
- A constant (perennial) slow to moderate flow of water;
- Channel substrate consisting primarily of silt and detritus;
- Presence of a broad fringe of herbaceous emergent dicotyledon plants along margins;
- Presence of some areas of open water; and
- Largely (but not necessarily completely) unshaded by bankside shrubs and trees.

Figure 2: Suitable southern damselfly habitat on a small floodplain ditch at Ashtrim Nursery.

Figure 3: Suitable southern damselfly habitat at the margin of the main River Itchen at Highbridge.

The southern damselfly exhibit a semi-voltine development (two-year life history) in the UK. The eggs hatch between mid-June and mid-August, though the period of larval growth is restricted to between March and October during the two-year larval development (Thompson *et al*., 2003a; Rouquette, 2005). Southern damselfly adults typically emerge from their final larval stage (instar) between mid-May and late July, though the exact timing of emergence varies with locality (altitude and latitude) and between years (Rouquette, 2005; Jenkins, pers. comm.). During emergence, the adult breaks through the cuticle of the final larval instar and extracts itself from the shed larval 'cast' or exuvia, pumping fluids around its body and wings to expand to its adult size.

Following emergence, immature adults (tenerals) will remain at the emergence site whilst the new exoskeleton hardens, before leaving the immediate vicinity of the water and moving to feeding sites, where males develop their mature colouration and females develop clutches of eggs. Adult males spend a significantly greater portion of their lifetime at breeding sites than females, the latter believed to visit only when they have a clutch of eggs to lay (Thompson *et al*., 2003a). Males are not territorial, and will scramble to seize females when they visit a breeding site.

Following copulation, the male will typically remain in contact with the female throughout oviposition (egg-laying), a behaviour know as contact guarding, to ensure the female is not inseminated by another male prior to egg-laying (Thompson *et al*., 2003a). Female southern damselfly oviposit (lay their eggs) directly into the submerged stem tissue of submerged and emergent herbaceous plants including water-cress *Nasturtium officinale*, fool's watercress *Apium nodiflorum*, brooklime *Veronica beccabunga*, and water-speedwell *Veronica anagallis-aquatica agg*..

Southern damselfly are generalist predators, both as larvae and adults. Coenagrionid damselfly larvae that develop over two years tend to be 'sit-and-wait' predators, attacking small moving animals from their 'ambush' sites, whereas adults will actively prey on small flying invertebrates (Thompson *et al*., 2003a; Rouquette, 2005).

Adult southern damselfly are characterised by their slow and erratic flight, with frequent pauses to perch on low vegetation. They are considered to have the weakest flight of the British coenagrionids, which is reflected in the limited dispersal capabilities of this species (Purse, 2002; Rouquette, 2005).

2.2 Status

The distribution of southern damselfly is predominantly restricted to southern and western Europe. Though still widespread in France and parts of Spain, it is considered to be endangered or critically endangered throughout the majority of its European range, and is considered to have become extinct from at least three European countries (Boudot, 2006).

The UK populations of southern damselfly are considered to comprise a significant proportion of the European total, despite its restriction to a small number of localities in the south and west of England and Wales (Rouquette, 2005). Major strongholds occur in the New Forest in Hampshire, the Preseli Hills in Pembrokeshire, and on the Itchen Valley in Hampshire (Thompson *et al*., 2003a; Rouquette, 2005). All these locations have been designated as SACs, with the southern damselfly listed as a primary reason for their designation. Smaller colonies exist in Devon, Dorset and the Gower Peninsula, and single populations are present in both Anglesey and Oxfordshire (Thompson *et al*., 2003a).

Despite this, the southern damselfly has suffered an at least 30% decline in distribution in the UK since 1960, and has an increasingly fragmented and restricted distribution (Thompson *et al*., 2003a; Rouquette, 2005). It has disappeared from Cornwall and St David's Peninsula in Pembrokeshire, and has suffered a decline in Devon and Dorset (Thompson *et al*., 2003a). Furthermore, it is considered that this species has been lost from at least three sites in the New Forest since 1998 (Rushbrook *et al*., 2014), and despite the nationally important numbers of this species supported at Itchen Valley Country Park, it is considered that its long-term future in the River Itchen valley is not guaranteed without conservation action (Rouquette, 2005).

This decline of southern damselfly in the UK and Hampshire is believed to be a consequence of the loss and degradation of suitable habitats as a consequence of under-management, over-management, abstraction, inappropriate water level management and potentially pollution. This has resulted in the increasing isolation and fragmentation of suitable sites, a breakdown of metapopulation

dynamics, and an increased susceptibility of remaining populations to extinction, particularly from localised pollution events and nutrient enrichment (Rouquette, 2005, Rushbrook *et al*., 2014).

2.3 Legislation

The southern damselfly is one of Europe's and Britain's rarest and most threatened damselflies (Thompson *et al*., 2003a). As a consequence of this global and national decline (Thompson *et al*., 2003a; Boudot, 2006), southern damselfly are protected under European and National legislation. They are listed under Annex II of the European Council Directive 92/43/EEC the Habitats Directive 1992, transposed into UK Legislation through the Conservation of Habitats and Species Regulations 2017 that requires:

- *The identification and designation of important sites for southern damselfly as Special Areas of Conservation (SACs)*

The southern damselfly is listed as an Annex II species that is present and a primary reason for selection of the River Itchen as a SAC.

Southern damselfly are provided additional protection through their inclusion on Schedule 5 (sections 9.1, 9.4 and 9.5) of the Wildlife and Countryside 1981 (as amended). It is therefore an offence to:

- *Intentionally kill, injure or take* [capture] *a southern damselfly;*
- *Intentionally or recklessly damage or destroy, or obstruct access to, any structure or any place a southern damselfly uses for shelter or protection; or*
- *Significantly disturb any such animal while it is occupying a structure or place it uses for that purpose;*
- *Sell, offer or expose for sale, or have in one's possession or transport for the purpose for sale, any live or dead southern damselfly, or any part derived from it*.

3. METHODOLOGY

Habitat enhancement and / or creation opportunities were identified based upon the findings of the southern damselfly adult count surveys and associated habitat assessments conducted in June and July 2017 (Rushbrook, 2018), with further consideration of a number of options undertaken during additional site visits conducted in October 2017. This allowed for potential habitat enhancement and / or creation opportunities to be appraised both on their existing or potential suitability to support southern damselfly, but also to be assessed based on their likelihood to facilitate the consolidation, expansion and increased connectivity of existing populations.

As outlined in Section 1.1, this study focused on the main channels and (in particular) watercourses associated with the floodplain meadows of the River Itchen SSSI / SAC within and immediately adjacent to the Eastleigh Borough boundary. Habitat assessment included a general appraisal of the potential suitability of 112 transects to support southern damselfly based on habitat attributes identified by Rumble *et al*. (2006) and Rushbrook *et al*. (2014). Attributes considered included water flow, presence and level of shading, the presence and composition of emergent and bankside vegetation, and substrate composition. A summary of the results of the habitat assessments and the enhancement potential for all transects is provided in Appendix 2.

Though this assessment focused and reported solely on the assessments of transects, a concurrent assessment was conducted of the surrounding habitat, in order to facilitate the identification of habitat creation opportunities within the study sites. Transects and adjacent habitat areas were then assessed based on the selection criteria and prioritisation process outlined below, in order to identify the most valuable opportunities based upon their potential positive effect on southern damselfly population(s) / metapopulation dynamics, and the author's level of confidence in their deliverability.

3.1 Selection of Transects for Assessment of Habitat Enhancement Opportunities

Detailed accounts of the habitat suitability, habitat enhancement potential, and a justification for these assessments are provided in Sections 5 to 17 of the survey and habitat assessment study conducted in June and July 2017 (Rushbrook, 2018). In total 112 transects were formally assessed during the study, with a further eight excluded from assessment as a consequence of their inclusion within surveys at an adjoining site, or since they were determined to be unsuitable whilst other assessments were being conducted within that area of the site (Rushbrook, 2018). The results of these habitat assessments are summarised in Appendix 2.

In total, 86 of the 112 transects subject to habitat assessment were considered to support no suitable habitat for southern damselfly. These transects were considered to be 'unsuitable' for southern damselfly as a consequence of one or a combination of the following factors (for detailed explanation see Rushbrook, 2018):

- No water was present within the watercourse at the time of survey;
- Watercourse supported water but absence of discernible flow;
- Watercourse was deep and / or fast flowing with little to no emergent marginal herbaceous vegetation for oviposition (egg-laying)
- Watercourse wholly or extensively shaded by bank top / bankside trees and scrub or tall monocotyledon vegetation;
- Presence of thick red / ochre layer on the surface of water within one or more sections.

It was considered that 47 of the 86 transects were not suitable for habitat enhancement (i.e. 'unsuitable' *Habitat Enhancement Potential*) as a consequence of one or a combination of the following factors (for detailed explanation see Rushbrook, 2018):

- No evidence that a perennial water supply could be secured in the future / watercourse was disconnected from existing network;
- Enhancement / creation would result in the loss of habitat / features that (potentially) provide valuable habitat for other important ecological features / species (potentially) present on site;
- Resources required to delivered works considered to be disproportionate when assessing the potential value of delivered outputs.

It was agreed with Eastleigh Borough Council that main river channels would be excluded from the survey and habitat assessment study, although exceptions to this 'rule' were agreed at Highbridge Farm and Breach Farm due to the importance of the main river for southern damselfly at these sites (Rushbrook, 2018). However, irrespective of this, it was agreed that habitat enhancement and creation proposals to be included within this strategic conservation plan would be focused on carrier streams and the floodplain meadows.

Two transects were combined in one instance at both Bishopstoke Fishing Club Land and Highbridge Farm, since it was considered that these represent continuous sections of a watercourse with similar enhancement requirements. Furthermore, where considered appropriate, the assessment of a number of transects are combined within proposed habitat creation areas. This is predominantly where a complex or network of dry ditches exists within a localised area, and more detailed hydrological and topographic information is required to determine whether water can be delivered to this area, and how it can be utilised to maximise the extent of habitat created.

Finally, as outlined in Section 1.3., the majority of Itchen Valley Country Park was excluded from the survey and habitat assessment, and it is therefore not appropriate to assess the habitat enhancement and creation opportunities using the approach outlined above. However, due to the national importance of this population, a site wide assessment is provided in Section 17.

Therefore the habitat enhancement potential of the remaining transects were then assessed irrespective of their existing habitat suitability and their broad habitat enhancement potential (e.g. low, moderate, high, etc.) as previously concluded by the author (Rushbrook, 2018).

3.2 Selection of Features / Areas for Assessment of Habitat Creation Opportunities

A number of features and / or areas were identified as having the potential to be connected to the existing network of watercourses present at a number of sites. This included existing ditches and drains whose historic hydrological connection to the system had been lost and could not be re-established, but that could potentially be linked to the existing system via a newly created connection. For example, where a ditch or network of ditches was historically linked to a high level carrier stream that no long supports water, and based on existing water level management is considered unlikely to ever do so again, a new connection to either another high level watercourse or directly to the main river channels could be created to supply water to the ditch / ditches.

Furthermore, habitat areas were identified where it was considered that new watercourses could be created as achieved by Eastleigh Borough Council and the Environment Agency at Ashtrim Nursery.

3.3 Selection Criteria for Habitat Enhancement and Creation Opportunities

Transects and features / areas considered to have the potential for habitat enhancement or creation were assessed based on three categories of criteria:

1. The *value* of the proposals for southern damselfly;
2. The *feasibility* of the delivery and long-term 'success' of the proposals identified;
3. The level of *support* and / or engagement it is considered that the proposals would receive from landowners, angling clubs and other relevant stakeholders; this criteria also includes the discretion of the author to decide that, on more detailed consideration, the resources required to deliver works were considered to be disproportionate when assessing the potential value of delivered outputs.

These categories are further divided in a number of criteria as outlined below, and described in more detail in Table 2. It is emphasised that these criteria include a combination of objective and subjective measures. The assessments of criteria were based on the author's knowledge, understanding and experience of the:

- requirements of southern damselfly;
- delivery of such enhancement and creation proposals;
- status of southern damselfly;
- likelihood of support of relevant persons and organisations for the measures that will be required to deliver the proposals.

Table 2: Assessment criteria conditions for the value, feasibility and level of support afford for proposed habitat enhancement and creation opportunities.

Category	Assessment Criteria	Assessment Criteria Score			
		1	**2**	**3**	**4**
Value	Extent (approximate)^	Length of habitat to be enhanced / created less than 50m	Length of habitat to be enhanced / created 50m or greater but less than 200m	Length of habitat to be enhanced / created 200m or greater but less than 500m	Length of habitat to be enhanced / created 500m or greater
	Strategic value of works for southern damselfly	Uncertainty exists with regards to potential impacts of option on existing numbers / distribution of southern damselfly at site (i.e. potential implications on water level management)	Increase the resilience (i.e. increase numbers and / or distribution) of an existing population at a site located >500m* from a known population	Increase the resilience of an existing 'strong' population at a site located ≤500m* of a known population / create a new site for southern damselfly located >500m* from a known population	Increase the resilience of an existing 'medium' or 'weak' population at a site located ≤500m* of a known population / create a new site for southern damselfly ≤500m* from a known population
	Threat of population loss / degradation	No existing population present at site / 'strong' population at site with no threats to population identified	'Medium' population with no threats to population identified	'Weak' population with no threats to population identified / medium-term threats to existing population identified (e.g. habitat degradation through current management)	Population considered to be in decline and / or short-term threats to existing population identified (e.g. habitat loss through development pressure / current management)
Feasibility	Perennial water flow†	Low certainty that sufficient water supply can be secured and / or that proposals will track existing site topography to provide perennial flow	Moderate certainty that sufficient supply of water can be secured and that proposals will track existing site topography to provide perennial flow	High certainty that sufficient supply of water can be secured and that proposals will track existing site topography to provide perennial flow	Certain that perennial flow can be achieved / creation or manipulation of water level management not included within proposals
	Scale of capital works	Major capital works required (e.g. substantive tree / scrub removal, substantive excavation, connection to existing network, etc.)	Moderate capital works required (e.g. less extensive tree and / or scrub removal, rotational ditch clearance, limited excavation, etc.)	Minor capital works required (e.g. removal of a small number of tree limbs, limited ditch clearance, etc.)	No capital works required
	Sustainability / security of appropriate management	Notable changes in habitat management required for delivery of option (e.g. from crops to hay or pasture)	Moderate changes in habitat management required and / or future practices likely to be employed considered labour intensive (e.g. regular scrub / vegetation clearance, regular ditch clearance etc.)	Minor changes in management required and / or future practices likely to be employed considered passive or less labour intensive (i.e. periodic management of scrub / vegetation, periodic ditch clearance adjustment to grazing practices, etc.)	No changes in passive (e.g. grazing) management required
	Wider ecological considerations‡	Options potentially have a moderate / low, short term impact on an important / protected species or habitat and extensive mitigation measures will be required to ensure that there will be no long term impact	Options potentially have a moderate / low, short term impact on an important / protected species or habitat and limited mitigation measures will be required to ensure that there will be no long term impact	Delivery of works can be timed and / or designed to avoid / minimise likelihood of impact on important / protected species or habitat	No important / protected species or habitats identified that required consideration
Support	Level of support / engagement	Understood that one or more relevant interest groups would not support delivery of option	Considered unlikely that all relevant interest groups would support delivery of option	Considered moderately likely that all relevant interest groups would support delivery of option	Considered likely that all relevant interest groups would support delivery of option

^ Habitat creation proposals not assessed on this criteria

* Based on findings of Rouquette (2005)

† Any potential options where there is no evidence that a perennial water supply could be secured in the future have already been scoped out

‡ Any potential options that could result in the loss of habitat / features that (potentially) provide valuable habitat for other important species / habitats (potentially) present on site have already been scoped out

3.3.1 Value

The three criteria selected to assess the value of the proposals for southern damselfly within the study area were:

- Physical extent of the enhanced / created habitat;
- Strategic value of works for southern damselfly;
- Level of threat of loss or degradation of population.

The assessment of physical extent to be enhanced was based on the length suitable for enhancement, rather than the total length of the transect where these differed. Furthermore, determining the potential length of a newly created habitat was inherently difficult, and therefore an assessment of the first criteria in this instance was not conducted. Finally, for proposals where enhancement and / or creation measures are proposed at a site not currently known to support southern damselfly, an assessment of the final criteria was not conducted as there is inherently no risk of population loss or degradation.

With the exceptions outlined above, each proposal was scored between 1 and 4 for each criteria based on the conditions set out in Table 2, and the mean of these scores was calculated to provide an overall *value* of the proposals for southern damselfly. The *value* of the individual proposals for southern damselfly was then assessed as:

- Low – mean value of scores ≤1.5
- Moderate – mean value of scores >1.5 but ≤3
- High – mean value of scores >3

3.3.2 Feasibility

The four criteria selected to assess the feasibility of the delivery and long-term 'success' of the proposals identified were:

- Level of certainty that proposals can secure a sufficient supply of water and will track the existing site topography to provide a perennial slow to moderate flow of water;
- Scale of works / level of resources required for the delivery of the enhancement;
- Sustainability / long-term security of appropriate management of enhanced / created habitat;
- Wider ecological considerations of works.

Each proposal was scored between 1 and 4 for each criteria based on the conditions set out in Table 2, and the mean of these scores was calculated to provide an overall *feasibility* of the proposals for southern damselfly. The value of the individual proposals for southern damselfly was then assessed as:

- Low – mean value of scores ≤1.5
- Moderate – mean value of scores >1.5 but ≤3
- High – mean value of scores >3

It is important to recognise that assessment criteria scores represent relative (rather than absolute) values, and are based on the situation as-is / the current knowledge of the author. Although this is relevant for all criteria across the three categories, this is particularly relevant for the first three criteria set out above. For example, the terms used to reflect the scale of works – major, moderate and minor – indicate the level of resources and complexity of works required in comparison with each other (i.e. other habitat enhancement / creation works for southern damselfly). Indeed, when considered in the context of the level of resources and complexity of works required for other schemes of works (e.g. infrastructure works associated with the delivery of Eastleigh Borough Council's Local Plan), the perceived constraints associated with the scale of works may in fact be considered to be minimal for a number of the proposed habitat enhancement and creation opportunities.

Furthermore, as set out in Section 3.5 below, there exist inherent difficulties in accurately assessing proposals that will manipulate water levels and / or create new watercourses, based solely on the information that can be collected on walk over surveys. As a consequence, a precautionary approach was adopted when assessing the level of certainty that sufficient water can be secured. It is therefore

considered possible that, at a number of sites, the feasibility of the proposed habitat enhancement and / or creation works may have been assessed too conservatively or indeed underestimated.

3.3.3 Support

Each proposal was scored between 1 and 4 based on the conditions set out in Table 2, with the level of likelihood of support / engagement for the individual proposals for southern damselfly assessed as:

- Not supported – score = 1
- Unlikely – score = 2
- Moderately likely – score = 3
- Likely – score = 4

It is emphasised that, as set out in Section 3.3.2 above, the assessments of the level support were based on the situation as-is / the current knowledge of the author, and a precautionary approach was adopted when making this assessment. It is therefore feasible that these assessments may have either been too conservative, or the level of support could markedly shift should there be a change in the position of the current landowner or in the landownership itself.

3.4 Habitat Enhancement and Creation Potential

The assessment of the potential likelihood that the proposed enhancement and creation opportunities could be delivered was calculated in the following way:

[Value (mean) + Feasibility (mean)] x Support

The potential that the proposals were currently deliverable was then assessed as:

- Very low potential / likelihood to succeed – score = <8
- Low potential / likelihood to succeed – score = ≥8 but <12
- Moderate potential – score = ≥12 but <18
- High potential – score ≥18

It is considered that this calculation provides a realistic indication of the potential likelihood of successfully delivering the proposals. Additional weight has been afforded to the support / engagement category since, without the agreement and support of landowners, angling clubs and relevant stakeholders, it is considered unrealistic to consider that these proposals will be successful in the long term.

3.5 Limitations on Assessments

Access to channel margins and / or a continuous view of the watercourse during site visits was restricted across a number of transects (see Appendix 2), either as a consequence of tall, dense bankside and bank top monocotyledon vegetation, or as a result of being enclosed within scrub and / or trees. However, since regular access to the watercourse was gained along the length of all transects (Rushbrook, 2018), this did not impact on the surveyor's ability to assess the suitability of the habitat present, nor their ability to provide recommendations that identify opportunities for enhancing the suitability of these carrier streams and ditches for this species. In fact, the presence of these habitat features inherently indicates that the relevant (sections of) transect is at best of sub-optimal quality for southern damselfly, and most likely unsuitable for the species.

It is important to clarify that the assessment of the proposals are based on observations made during site visits in June, July and October 2017, and therefore there exists an inherent degree of error when making subjective assessment in this manner. It is therefore possible, as outlined for specific criteria in Sections 3.3.2 and 3.3.3 above, that some proposals may have been too conservatively assessed or undervalued with regards to one or more criteria.

In addition, it is considered difficult to accurately assess proposals that will manipulate water levels and / or create new watercourses based on walk over surveys only. These difficulties relate both to the level of certainty that a perennial slow to moderate flow of water can be secured, and the potential

impacts on existing numbers / distribution where options involve modifications of the water level management that could / will effect watercourses currently supporting southern damselfly.

3.6 Data Analysis

All data analysis was performed using Microsoft® Excel 2010.

4. RESULTS AND ANALYSIS

The following section summarises the results of the assessment of habitat enhancement and creation opportunities identified during the habitat assessments conducted in June and July 2017 (Rushbrook, 2018), incorporating additional observations made during visits to a number of sites in October 2017. No habitat enhancement or creation opportunities were identified at Bishopstoke Park during the habitat assessment survey conducted in July 2017. Therefore, this site is not discussed any further within this strategic conservation plan.

The proposed opportunities for individual sites are outlined in Sections 5 – 16, with the assessment of the *value*, *feasibility*, perceived level of *support* afforded, and current habitat enhancement or creation potential discussed in more detail. It is emphasised that detailed proposals have not been developed for any sites at this stage since active engagement with relevant persons / stakeholders and, in a number of instances, a specific hydrological / topographical study will need to be conducted before these can be established.

4.1 Assessment of Habitat Enhancement Opportunities

Habitat enhancement opportunities were assessed on 43 transects over 10 sites (Map 3), with two transects combined in one instance at both Bishopstoke Fishing Club Land and Highbridge Farm (see Section 3.1). A summary of the assessment of the habitat enhancement opportunities is provided in Table 3, and set-out in detail in Appendix 3.

4.1.1 Value

Habitat enhancement proposals at 27 of the transects were assessed to be of high value for southern damselfly (Table 3). These included transects at eight of the ten sites, with only Ashtrim Nursery and Alllington Manor Farm not returning high value habitat enhancement opportunities; the former due in part to the limited measures required due to the current optimal / sub-optimal conditions already present within transect 1, and the latter a consequence of the strong population present and the absence of immediate threats to the population (Rushbrook, 2018; Appendix 3).

Conversely, of the 27 transects identified to be of high value (Table 3), six were located across three sites (i.e. Bishopstoke Fishing Club, Withy Meadows, Morris' Land) that are not considered to currently support a population of southern damselfly (Rushbrook, 2018), and a further 15 were located at sites that support medium or weak strength populations (Rushbrook, 2018). Eight of these 15 transects are located at West Horton Farm, a site where the author has identified a decline in habitat quality and southern damselfly numbers, and has considerable concerns regarding the long-term survival of this population without urgent conservation action (Rushbrook, 2018).

The remaining six high value enhancement opportunities were all present Highbridge Farm (Table 3). Although this site currently supports a strong population, habitat enhancements (and creation) across the site is considered to be highly valuable for three reasons:

- Concerns that habitat suitability at a number of transects is in decline and could eventually be lost due to habitat degradation;
- Development pressure and associated potential impacts, both direct (e.g. direct habitat loss, pollution event; etc.) and indirect (e.g. habitat degradation through a reduction in water / air quality);
- Strategic importance of Highbridge Farm in supporting smaller populations to the south and the metapopulation dynamics of the wider Itchen Valley populations (Rouquette, 2005).

Fourteen transect were considered to be of moderate value, with 12 of these opportunities identified at Allington Manor Farm or Ashtrim Nursery (Table 3), their assessment of moderate value primarily a consequence of the reasons outlined above. Furthermore, the only proposals assessed to be of low value were present at the former site also.

Table 3: Summary of the results of the habitat enhancement assessments.

Site	Transect No.	Value	Feasibility	Support	Current Enhancement Potential
Bishopstoke FC	1	High	Low	Not Supported	Very Low
	2	High	Low	Not Supported	Very Low
	3	High	Low	Not Supported	Very Low
	4 & 5	High	Moderate	Unlikely	Low
Highbridge Farm	1	High	Moderate	Moderate	High
	2a & 2b	High	Moderate	Moderate	High
	3	High	Moderate	Moderate	High
	7	High	Moderate	Unlikely	Low
	9	High	Moderate	Moderate	Moderate
	19	Moderate	Moderate	Unlikely	Low
	32	High	Low	Unlikely	Low
	33	Moderate	Moderate	Unlikely	Low
Breach Farm	2	High	Moderate	Not Supported	Very Low
Withy Meadows	1	High	Moderate	Moderate	High
GW Martin	1	High	Moderate	Unlikely	Low
	2	High	Moderate	Not Supported	Very Low
Ashtrim Nursery	1	Moderate	High	Likely	High
	2	Moderate	Moderate	Not Supported	Very Low
Morris' Land	6	High	Low	Not Supported	Very Low
Dunford's Land	1	High	Moderate	Not Supported	Very Low
	2	High	Moderate	Unlikely	Low
	3	High	Moderate	Unlikely	Low
West Horton Farm	1	High	Moderate	Moderate	High
	2	High	Moderate	Moderate	Moderate
	3	High	Moderate	Moderate	Moderate
	4	High	Moderate	Moderate	Moderate
	6	High	Moderate	Moderate	Moderate
	7	High	Moderate	Moderate	Moderate
	8	High	Moderate	Unlikely	Low
	10	High	Moderate	Not Supported	Very Low
Allington Manor	1	Moderate	High	Moderate	High
	3	Moderate	High	Unlikely	Low
	7	Moderate	Moderate	Unlikely	Low
	8	Moderate	Moderate	Unlikely	Low
	9	Moderate	Moderate	Unlikely	Low
	10	Moderate	Moderate	Unlikely	Low
	11	Low	Moderate	Unlikely	Very Low
	12	Low	Moderate	Unlikely	Very Low
	17	Moderate	High	Moderate	Moderate
	18	Moderate	High	Moderate	Moderate
	25	Moderate	Moderate	Not Supported	Very Low
	28	Moderate	Moderate	Not Supported	Very Low
	29	Moderate	Moderate	Not Supported	Very Low

4.1.2 Feasibility

The habitat enhancement assessments returned only five opportunities that were considered to be of high feasibility (Table 3), with four identified at Allington Manor Farm and one at Ashtrim Nursery. Enhancement measures proposed on these transects are focussed on moderate to minor capital works, which not only limits the scale of works required, but is inherently associated with reduced potential implications for the ongoing management and wider ecology of the site (Appendix 3).

The majority of habitat enhancement proposals were assessed to be of moderate feasibility (Table 3). The scale of works associated with the delivery of these proposals was the primary reason for this assessment, with all 33 transects (that were assessed to be of moderate feasibility) considered to involve major or moderate capital works (Appendix 3). Furthermore, in contrast to the five transects discussed above, there often existed potential implications for the ongoing management and wider ecology of the site associated with works of these scale; indeed, 19 and 14 of these enhancement proposals scored 1 or 2 for the wider ecological considerations and sustainability respectively (Appendix 3). However, it is important to emphasise that water availability and / or site topography remains an important consideration; indeed, only a low or moderate certainty that a perennial flow of water could be secured was associated with just over half of the 33 transects (Appendix 3), and the scale of works often a consequence of the need to (re)connect a watercourse to a larger carrier stream or the wider network.

The low feasibility assessment of the five remaining transects represents the extreme scenario of the conditions outlined for moderate assessments above, with all involving major capital works, a low certainty that a perennial flow of water could be secured and notable changes in management required on four transects each, and the potential need for extensive mitigation required on three (Appendix 3).

It is important to note that for a number of transects it was difficult to determine whether sufficient water supply could be secured and / or whether proposals would track existing site topography to provide perennial flow; a result of one or more of trees, dense scrub and tall vegetation associated with the transect. This is an inherent limitation of this specific methodology of habitat assessment, which allows for a large area or number of sites to be covered and is effective for identifying what enhancements are required for watercourses that support a perennial flow; however, it does not provide the detailed hydrological and topographical information that may be required to (re)connect enhanced or created features to ensure that a perennial flow can be secured. Throughout the assessments, the level of certainty was assessed with caution, and therefore there is the potential that this criteria has been undervalued for a number of habitat enhancement proposals.

4.1.3 Support

Habitat enhancement proposals for transect 1 at Ashtrim Nursery have already been the subject of positive discussions with Eastleigh Borough Council (the landowner), and therefore this was the only instance where it was considered likely that the proposals would be supported by relevant interest groups.

It was considered moderately likely that support and engagement from relevant persons / stakeholders would be secured for the habitat enhancement proposals for 14 transects (Table 3). This included three sites, Highbridge Farm, West Horton Farm and Allington Manor Farm, where the landowners have previously engaged with ditch restoration and management practices with (potential) beneficial results for southern damselfly. In addition, the author has already engaged in positive discussions at Withy Meadows in regard to the habitat enhancement measures proposed at this site.

It was considered unlikely that habitat enhancement proposals at 16 sites would be supported by relevant persons / stakeholders (Table 3). These assessments were reached due to a combination of the scale of works involved (all were considered to involve major or moderate works; see Appendix 3) and as the proposals have not yet been discussed with the landowners, angling clubs and relevant stakeholders. Specifically, proposals at 11 transects require a supply of water to be secured from a main river channel or modification of water level management across the site. This may be considered undesirable by relevant persons / groups who own, mange or who have other current interests in corresponding watercourses, and therefore more detailed discussions are required before any greater degree of certainty of support can be afforded to these proposals.

It is understood that habitat enhancement proposals for 12 transects would not be supported (Table 3). This includes one transect at each of Breach Farm and Morris' Land, where the author was informed by the landowner that they would not support these proposals. Furthermore, on more detailed consideration of the remaining eight transects, the author now considers that resources required to deliver works at seven of these transects (i.e. transects at Land Behind GW Martin, Dunford's Land, West Horton Farm, Allington Manor Farm) are disproportionate when assessing the potential value of delivered outputs. In addition, it is considered that measures proposed for transect 2 at Ashtrim Nursery could potentially have negative implications for southern damselfly across the wider site. Indeed, it is considered that resources would be more effectively focused on other habitat enhancement and creation proposals recommended at each of these sites.

Finally, as outlined in Section 3.5, assessing the level of likelihood of support / engagement for the proposed habitat enhancement opportunities was inherently difficult. As a consequence, throughout the assessments the level of certainty was assessed with caution. It therefore important to note that there exists the potential that this criteria may have been undervalued for a number of habitat enhancement proposals.

4.1.4 Current habitat enhancement potential

It is considered that habitat enhancement proposals for seven and eight transects currently have a high and moderate potential of being deliverable respectively (Table 3). These represent transects that have scored 'high' in either *value* or *feasibility* categories, 'moderate' in the other, and 'moderate' or 'high' in the level of *support* category (Table 3). However, these are fundamentally a result of the perceived level of support that these proposals would receive, as they directly correspond to fifteen transects at five sites that were assessed as 'high' or 'moderate' in the support category (see Section 4.1.3).

Thirteen transects were assessed to currently have low habitat enhancement potential (Table 3). This included six transects where potential habitat enhancements were considered to be of 'high' value, with the remaining seven of 'moderate' value. Furthermore, only one transect was considered to have a low feasibility, with the remaining 12 transects assessed to be of moderate feasibility. However, most influentially, all 13 transects were considered to have a low certainty that the proposals would be supported.

Nine of these transects (across three sites, i.e. Bishopstoke Fishing Club, Highbridge Farm, Allington Manor Farm) required a supply of water to be secured from a main river channel or modification of water level management across the site. Conversely, the fact that proposals have not yet been discussed with the landowners, angling clubs and relevant stakeholders explains the 'low' potential values returned at Land behind GW Martin's and Dunford's Land. Finally, it is considered likely that the proposals for the remaining transect (Allington Manor Farm – transect 3) will be considered to be incompatible with the current interests / management practices of some interest groups at the site.

Habitat enhancement proposals at fifteen transects were considered to currently have a very low potential of being deliverable (Table 3). The majority of these (10) were a direct consequence of the understood absence of support for these proposals, for the reasons set out in Section 4.1.3. However, two transects Allington Manor were considered to have a very low potential as a result of their 'low' value score. Specifically, this is a result of their short length and the fact that there exists a concern that securing a perennial flow within these ditches may have negative implications for watercourse currently supporting southern damselfly.

4.2 Assessment of Habitat Creation Opportunities

Sixteen habitat creation opportunities identified over nine sites were assessed (Map 3). A summary of the assessment of these habitat creation opportunities is provided in Table 4, and set-out in detail in Appendix 4.

4.2.1 Value

Habitat creation proposals are inherently likely to be of high value, and this result was returned for fourteen of the sixteen proposals assessed (Table 4).

Table 4: Summary of the results of the habitat creation assessments.

Site	Transect No.	Value	Feasibility	Support	Current Creation Potential
Highbridge Farm	HFA1	High	Moderate	Moderate	**Moderate**
Breach Farm	BFA1	High	Moderate	Unlikely	**Low**
	BFA2	High	Moderate	Unlikely	**Moderate**
Withy Meadows	WMA1	High	Moderate	Moderate	**High**
GW Martin	GWA1	High	Moderate	Moderate	**Moderate**
Eastleigh RG	ERA1	High	Moderate	Moderate	**Moderate**
Morris' Land	MA1	High	Moderate	Not Supported	**Very Low**
	MA2	High	Moderate	Not Supported	**Very Low**
	MA3	High	Moderate	Not Supported	**Very Low**
Toby Carvery	TCA1	High	Moderate	Not Supported	**Very Low**
Dunford's Land	DA1	High	Moderate	Unlikely	**Low**
	DA2	High	Low	Unlikely	**Low**
	DA3	High	Moderate	Unlikely	**Low**
West Horton Farm	WHA1	High	Moderate	Unlikely	**Moderate**
Allington Manor	AMA1	Moderate	Moderate	Unlikely	**Low**
	AMA2	Moderate	Moderate	Unlikely	**Low**

Specifically, these proposals either have the potential to create a new site for southern damselfly (i.e. Withy Meadows, Eastleigh Recreation Ground, Morris' Land, Toby Carvery), provide new opportunities at sites supporting a weak or medium strength population (i.e. Breach Farm, GW Martin, Dunford's Land, West Horton Farm), or provide new opportunities at sites where potential threats to the existing population have been identified (i.e. Highbridge Farm). The former is strategically important as it will potentially facilitate the establishment of new populations, particularly when located well within the dispersal range of this species (see Rouquette, 2005), which if established should increase the resilience of the metapopulation. The latter two will potentially facilitate the expansion of the numbers and range of southern damselfly across the site, with a consequential strengthening of the population and, where it drives increased dispersal away from the site, potentially the metapopulation also.

The remaining two habitat creation areas were considered to be of moderate value, a consequence of the strong population present at this site and the absence of immediate threats (Rushbrook, 2018; Appendix 4).

4.2.2 Feasibility

The majority of habitat creation proposals were assessed to be of moderate feasibility and include proposals for all nine sites where creation opportunities were identified (Table 4). The scale of works associated with the delivery of these proposals was a primary reason for this assessment, with all 16 habitat creation proposals considered to involve major capital works (Appendix 4), including the installation of structures to secure a perennial supply of water, the (re)excavation of ditches / other watercourses, and tree and scrub removal.

Although less frequently of major influence when compared with the scale of works (Appendix 4), and as also discussed for habitat enhancements, there are often potential implications for the ongoing management and wider ecology of the site associated with works of these scale. Furthermore, it is important to emphasise that water availability and / or site topography remains an important

consideration, with six of the 16 proposed habitat creation areas considered to have only a low or moderate certainty that a perennial flow of water could be secured (Appendix 4), and the need to (re)connect the newly created ditches / watercourse to a larger carrier stream or the wider network an important factor in the scale of works for all 16 areas. It is emphasised that, as set out in Section 4.1.2, the assessments of the level of certainty that a perennial water flow could be secured was intentionally assessed with caution, and therefore there is the potential that this criteria this been undervalued for a number of habitat creation proposals.

A low feasibility assessment was returned for one of the proposed habitat creation areas at Dunford's Land (i.e. DA2), a consequence of the fact that this proposal returned low scores for the scale of works, certainty of securing a perennial flow, and the need for notable changes in habitat management (i.e. from arable crops to hay or pasture).

4.2.3 Support

It was considered that none of the habitat creation proposals were currently likely to secure support from all relevant persons / stakeholders for their delivery. It was considered however, that there existed a moderate likelihood of support and engagement from relevant persons / stakeholders for four of the 16 habitat creation proposals (Table 4). Specifically, it is understood that habitat creation proposals at Withy Meadows, Land behind GW Martin's and Eastleigh Recreation Ground have already been the subject of positive discussions. Furthermore, the fourth area is located at Highbridge Farm, where the landowners have previously engaged with ditch restoration and management practices with (potential) beneficial results for southern damselfly.

It was considered unlikely that habitat creation proposals would be supported by relevant persons / stakeholders at eight of the remaining proposals (Table 4). This assessment was reached largely due to a combination of uncertainties as to whether perennial flowing water can be secured and, more critically, the fact the proposals have yet to be discussed with all relevant persons / stakeholders at each site. Specifically, even where it is considered feasible to secure a supply of water from a main river channel or modification of water level management across the site, this may be considered to be undesirable or unacceptable by relevant stakeholders. Therefore, more detailed discussions are required before any greater degree of certainty of support can be afforded to these proposals.

It is understood that habitat creation proposals for four of the identified areas would not be supported (Table 4). Specifically, the author was informed by the landowner at Morris' Land that they would not support any such proposals. Furthermore, proposals at Land Associated with Toby Carvery and Morris' Land would require securing water from main rivers channels. It is understood that, in at least at the former, this is located outside of these landownerships and would require the support of relevant groups that may consider the proposals incompatible with their interests and / or management of these channels.

Finally, as outlined in Section 3.5, assessing the level of support / engagement for the proposed habitat creation opportunities was inherently difficult. As a consequence, throughout the assessments the level of likelihood was intentionally assessed with caution. It is therefore important to note that there exists the potential that this criteria may been undervalued for a number of habitat enhancement proposals.

4.2.4 Current habitat creation potential

It is currently considered that habitat creation proposals for one and five areas have a high and moderate potential of being delivered respectively (Table 4). This includes all four areas (i.e. Highbridge Farm – HFA1; Withy Meadows WMA1; GW Martin – GWA1; Eastleigh Recreation Ground – ERA1) assessed to have a moderate certainty of support and engagement from relevant persons / stakeholders. It also included one area at Breach Farm (BFA2) and West Horton Farm (WHA1), a result of their slightly higher mean *value* and / or *feasibility* scores when compared to other proposals with a corresponding low certainty of support (Appendix 4).

Six identified areas were assessed to currently have low habitat creation potential (Table 4). This included the remaining area at Breach Farm, and all three areas at Dunford's Land, and both areas at Allington Manor Farm. It is considered that the fact that proposals have not yet been discussed with the landowners, angling clubs and relevant stakeholders primarily explains the 'low' potential values returned.

Four proposed habitat creation areas were considered to have a very low potential of being deliverable (Table 4). These were a consequence of the understood absence of support for these proposals, for the reasons set out in Section 4.2.3.

5. BISHOPSTOKE FISHING CLUB LAND

5.1 Assessment of Habitat Enhancement and Creation Opportunities

Four habitat enhancement opportunities were identified at Bishopstoke Fishing Club Land (Figure 4) during habitat assessments conducted in July 2017. A summary of the results of the assessment of these habitat enhancement opportunities is provided in Table 5.

Table 5: Summary of the results of the assessments for Bishopstoke Fishing Club Land.

Transect No.	Value	Feasibility	Support	Current Enhancement Potential
1	High	Low	Not Supported	**Very Low**
2	High	Low	Not Supported	**Very Low**
3	High	Low	Not Supported	**Very Low**
4 & 5	High	Moderate	Unlikely	**Low**

Southern damselfly were not recorded at Bishopstoke Fishing Club Land during adult count survey conducted in July 2017 (Table 1; Rushbrook, 2018). Furthermore, the habitat present at four of the five transects assessed was considered to be wholly unsuitable for this species, with the remaining watercourse (transect 5) considered to be largely unsuitable (Table 1; Rushbrook, 2018). This assessment was a consequence of the absence of a discernible flow of water throughout the entire / majority of the length of all transects, and the presence of dense tree, scrub and / or monocotyledon vegetation cover over the channels.

Given the 'absence' of southern damselfly from this site, the delivery of habitat enhancement works that would provide habitat to potentially support a new population of southern damselfly in the future is considered to be highly valuable (Table 5; Appendix 3). However, the delivery of these works are inherently complex, as they all involve moderate or major capital works, require a supply of water to be secured from a main river channel, and the introduction of grazing or other grassland management practice (Appendix 3). Furthermore, a specific hydrological / topographical study would be required to ensure that the enhanced transects will operate as outlined below (see Section 5.2.), and for a route to be secured to return the water to a main river channel.

Therefore, these transects almost exclusively returned a low score for feasibility, with the combined transect 4 and 5 proposal the only the exception. This was considered to be of moderate feasibility as it is believed to have an existing connection to the main river channel, and would involve less extensive capital works (see Section 5.2; Appendix 3).

Due to the low feasibility scores returned (Appendix 3), associated uncertainty that a perennial supply of water can be secured, and perceived uncertainty of support from relevant persons / stakeholders, the author no longer supports further investigation of enhancement proposals for three of the four opportunities previously identified.

5.2 Outline Proposals

As outlined above, following more detailed assessment (see Section 5.1) it is considered that only the enhancement opportunity identified on the combined transects 4 and 5 warrants further discussion.

Transect 4 and 5

Water was present throughout the majority of its length, but included extensive sections with no discernible flow. Dense scrub and some trees dominated the north-south orientated section (transect 4), with the ditch becoming more open as it turned east (transect 5), though still dominated by tall vegetation on the bank tops (Figure 4). Proposals would include the formalisation of its connection to the main river channel to the north, clearance of scrub (retaining mature tree specimens) along the ditch length, and re-grading of the ditch to secure a perennial flow of water.

Figure 4: Bishbopstoke Fishing Club Land

Southern Damselfly Conservation Plan: Eastleigh Borough

Habitat enhancement proposals

Habitat creation proposals

Site boundary

200m road buffer

River Itchen SAC

Eastleigh Borough boundary

Drain

Drain

Drain

Drain

3

16m

4&5

1

2

0

100

metres

N

General

It is considered that the introduction of grazing or another sustainable grassland management practice will be required to maintain the proposed habitat enhancements for the long term.

6. HIGHBRIDGE FARM

6.1 Assessment of Habitat Enhancement and Creation Opportunities

Eight habitat enhancement and one habitat creation opportunities were identified at Highbridge Farm (Figure 5) during habitat assessments conducted in June 2017 and an additional site visit conducted in October 2017. A summary of the results of the assessment of habitat enhancement and creation opportunities for Highbridge Farm is provided in Table 6.

Table 6: Summary of the results of the assessments for Highbridge Farm.

Transect No. / Area Name	Value	Feasibility	Support	Current Enhancement / Creation Potential
1	High	Moderate	Moderate	**High**
2a & 2b	High	Moderate	Moderate	**High**
3	High	Moderate	Moderate	**High**
7	High	Moderate	Unlikely	**Low**
9	High	Moderate	Moderate	**Moderate**
19	Moderate	Moderate	Unlikely	**Low**
32	High	Low	Unlikely	**Low**
33	Moderate	Moderate	Unlikely	**Low**
HFA1	High	Moderate	Moderate	**Moderate**

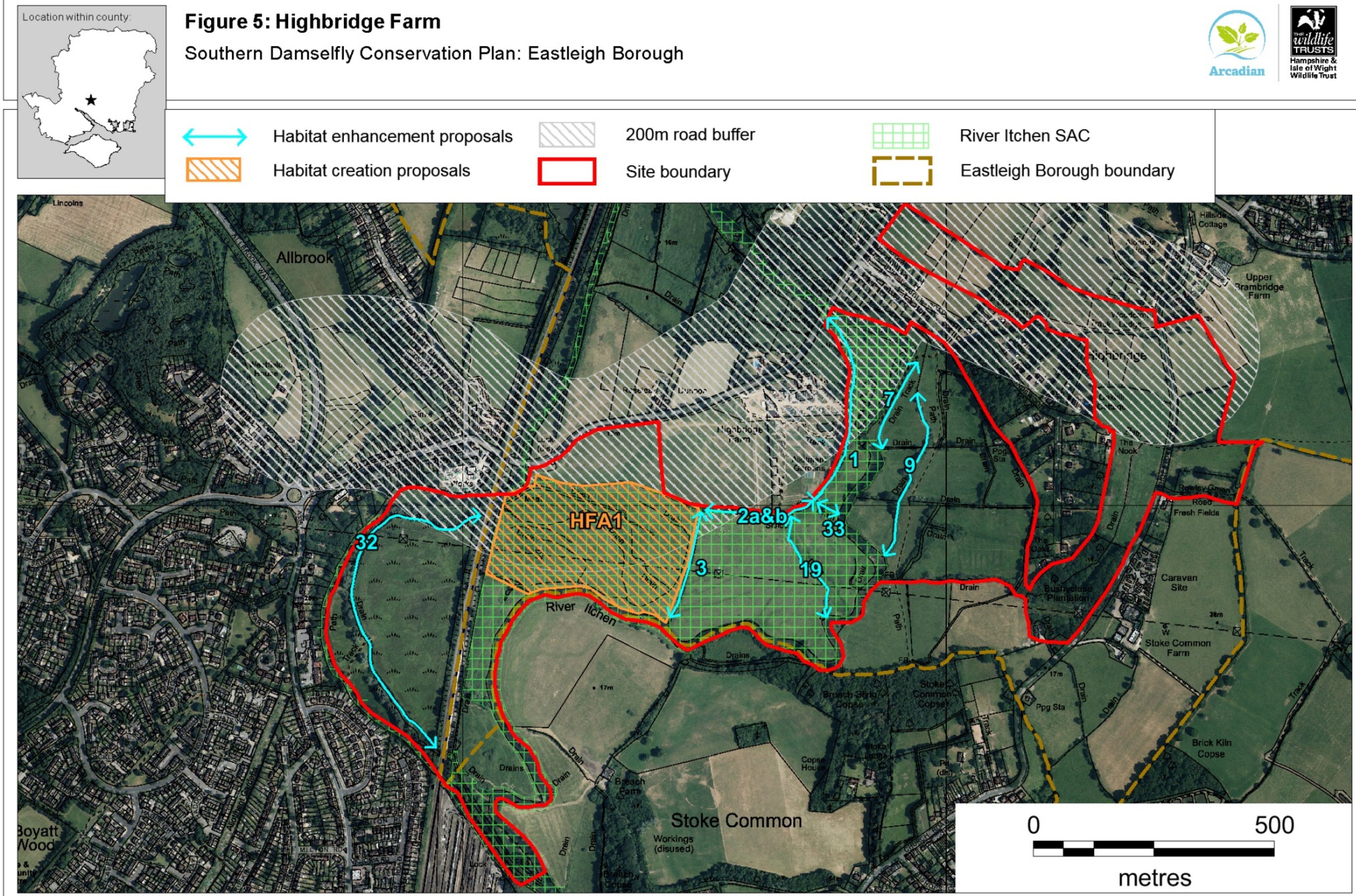
Highbridge Farm supports a strong population of southern damselfly (Rushbrook, 2018) and is considered to be an important central 'hub' in the Itchen Valley (Rouquette, 2005). However, concerns exist with regards to potential impacts of development in the area, and a perceived reduction in habitat quality in recent years (Rushbrook, personal observations). Given the strategic importance of this population, and the threats identified, measures to increase its resilience would be strongly supported. Furthermore, where works focus on the enhancement of transects that currently support southern damselfly (i.e. transects 1, 2a & 2b, 3 and 9), it is considered more likely that these will be supported by the landowner since these will primarily involve moderate scale works such scrub and tree limb removal and ditch clearances, which are activities previously undertaken at the site. These works are therefore considered to have a high or moderate current potential (Table 5).

The majority of opportunities identified were considered to have a 'moderate' feasibility. However, this is largely a consequence of the current management practices and the fact that extensive mitigation is not considered to be needed (Appendices 3 and 4), since the majority of the works were considered to involve moderate or major capital works, and some would need to secure a water supply to provide a perennial flow. Specifically, if additional water could be secured from the Itchen Navigation, it may be feasible to create a perennial flow through transect 32. There also exists the opportunity to secure water directly from the main river channel to provide suitable habitat through transect 7.

Furthermore, two habitat enhancement (i.e. transects 19 and 33) and the single habitat creation proposal will require water to be secured from the main carrier stream (i.e. transect 1, 2a, 2b and 3). This carrier stream provides core habitat for southern damselfly at the site, and a hydrological assessment will be required to determine whether the necessary quantity of water can be secured without negatively impacting on the suitability of this existing important habitat. This assessment should take into account whether additional water can be secured from the main river channel at their junction, located immediately upstream of the Highbridge Farm boundary. Given the scale of works required and limitations on water availability across the wider River Itchen, it is considered unlikely that all three proposals associated with the main carrier (i.e. transects 19 and 33 and HFA1) will be deliverable. It is recommended that, of these options, the habitat creation opportunity is prioritised.

Figure 5: Highbridge Farm

Southern Damselfly Conservation Plan: Eastleigh Borough



Produced on 7 September 2017 by Ben Rushbrook For enquiries relating to GIS data contact Catherine McGuire, email Catherine.McGuire@hiwwt.org.uk, tel: 01489 774455.

It is understood that the landowner is largely supportive of works associated with ditch management and reconnection. If sufficient water was available without the need to secure additional water from the main river, it is considered that there exists a moderate level of certainty that proposals associated with transects 1, 2a & 2b, 3, 9 and HFA1 would be supported (Table 5). However, due to the scale of works required and, without securing additional water from the main river channel, the likely limitations on water availability, it is considered uncertain that the remaining four proposals would be supported (Table 5). As a result, it is considered that habitat enhancement proposals associated with transects 7, 19, 32 and 33 have a low current potential of being deliverable.

6.2 Outline Proposals

Transect 1

It is recommended that scrub associated with the upper half of transect 1 (i.e. to the north of the bridge from the main farm yard) is removed, and a programme of rotational ditch clearance is designed and implemented. The latter would focus on reducing the extent of encroaching monocotyledon vegetation without increasing the original depth or bank top width of the channel.

Enhancement measures on the lower half of transect 1 would primarily involve the clearance of scrub and ruderal vegetation from the true left (eastern) bank top, and (selective) removal of tree and scrub limbs that overhang the channel from the established hedgeline on the true right (western) bank top.

Transect 2a & 2b

Sections of transect 2a, particularly immediately upstream of the track bridge from the farm, are enclosed within scrub on the true left and overhanging branches from the true right bank top. It is recommended that the former is cleared and the latter subject to (selective) limb removal.

It is recommended that the dense, extensive patches of scrub present on the true left (south) bank top of transect 2b (downstream / west of the track bridge) are removed.

Transect 3

It is recommended that a programme of rotational ditch clearance is designed and implemented, focusing on reducing the extent on encroaching monocotyledon vegetation without increasing the original depth or bank top width of the channel. Furthermore, it was observed that the ditch margins and adjacent terrestrial habitat is currently grazed by horses, which has facilitated the development of suitable habitat features such as marginal berms and roosting habitat for adults. However, if feasible, it is recommended that this be complimented with periodic cattle grazing.

Transect 7

It is recommended that the ditch is (re)connected to the main river channel at is northern point, and re-graded to create a perennial flow of water that returns to the main river approximately 250m downstream via the bottom of transect 8.

Transect 9

It is recommended that the extensive scrub that dominates the majority of the channel's length is cleared. However, it is recommended that a hydrological assessment is conducted prior to the implementation of these works to assess the strength of the spring that is believed to feed this channel, to ensure that the works maximise the length of suitable habitat that can be secured.

Transect 19

It is recommended that scrub is cleared from the bank top, the ditch is reconnected to transect 2a, and re-excavated where necessary to create a perennial flow of water from transect 2a to the main river channel in the south.

Transect 32

It is recommended that a detailed investigation is commissioned to determine whether a perennial flow of water can be secured. If this is possible, then it is recommended that this is delivered in parallel to extensive scrub clearance and (selective) tree limb removal.

Transect 33

It is recommended that this ditch's connection to the top of transect 2a is formalised to secure a perennial flow of water (i.e. water / flow was present in June but not in October 2017) from transect 2a to the main river channel in the south. Furthermore, dense bank top scrub should be cleared, but with mature trees retained.

HFA1

It is recommended that a hydrological and topographical study is commissioned to see if a perennial flow of water can be secured through one or more of the historic ditches present in this area. It is considered likely that the most feasible option would be to extend transect 2b west approximate 20m (i.e. into transect 2c; see Figure 10 of Rushbrook, 2018), and connect this to the ditch which runs parallel to transect 3 before turning west to follow the main river channel (i.e. transects 23 and 22; see Figure 10 of Rushbrook, 2018).

General

It is recommended that, if feasible, in those fields adjacent to the relevant watercourses where vegetation cutting is implemented for hay, either the cutting regime is designed to both safeguard and provide suitable habitat for the adult life stage of southern damselfly (i.e. a cut taken in late April / early May to allow some vegetation to re-establish prior to the main flight period), or grazing is introduced.

Furthermore, it was observed that currently grazing at the site is being delivered by horses, which has facilitated the development of suitable habitat features such as marginal berms and roosting habitat for adults on a number of transect. However, if feasible, in order to further encourage the development of suitable features it is recommended that this be complimented with periodic cattle grazing.

7. BREACH FARM

7.1 Assessment of Habitat Enhancement and Creation Opportunities

One habitat enhancement and two habitat creation opportunities were identified at Breach Farm (Figure 6) during habitat assessments conducted in June 2017 and an additional site visit conducted in October 2017. A summary of the results of the assessment of habitat enhancement and creation opportunities for Breach Farm is provided in Table 7.

Table 7: Summary of the results of the assessments for Breach Farm.

Transect No. / Area Name	Value	Feasibility	Support	Current Enhancement / Creation Potential
2	High	Moderate	Not Supported	**Very Low**
BFA1	High	Moderate	Unlikely	**Low**
BFA2	High	Moderate	Unlikely	**Moderate**

Breach Farm supports a weak population of southern damselfly, its distribution focused along the margins of the main river since no other watercourse supporting perennially flowing water is present at the site (Rushbrook, 2018). Therefore, the delivery of habitat enhancement or creation works that would provide habitat to increase the numbers and distribution of southern damselfly at the site are considered to be highly valuable (Table 5; Appendices 3 and 4).

Delivery of these works would inherently be complex as all involve major capital works and require a supply of water to be secured from a main river channel (Appendices 3 and 4). Furthermore, a specific hydrological / topographical study would be required to ensure that a perennial flow of water can be achieved within the habitat creation areas proposed. However, given the current management practices employed at the site, and since it is considered that the works can be designed and delivered to avoid / minimise the likelihood of impacting on important / protected species or habitat, all three proposals have been assessed to be of moderate feasibility (Table 7). However, following discussions with the landowner, it is understood that the habitat enhancement proposal for transect 2 would not be supported, and therefore no further consideration will be given to this proposal.

Furthermore, despite the landowners more positive response to the habitat creation options discussed, it is considered unlikely that the proposal will be supported by other relevant groups given the need to secure water from the main river channel (Table 7).

Finally, although it is considered unlikely that either habitat creation measure would be supported, it is considered more likely to be feasible to secure a perennial flow across BFA2 (Appendix 4), and this options therefore is considered to currently have a greater habitat creation potential (Table 5).

7.2 Outline Proposals

As outlined above, only proposals for the two habitat creation opportunities are provided.

<u>BFA1</u>

A number of historic ditches / drains are present within this area. However, based on the observations made during the site visits, it remains unclear in which direction these would have his flowed. It is therefore recommended that a topographical survey is commissioned to determine whether a perennial flow of water can be achieved through this area via a direct connection with the main river channel in the west of BFA2. If this can be achieved, it is recommended that the proposals are designed to maximise the extent of perennially flowing water through this area.

<u>BFA2</u>

A number of historic ditches / drains are present within this area. It considered likely that historically these flowed from north-west to south-east, with water potentially delivered from the east of the site.

Figure 6: Breach Farm

Southern Damselfly Conservation Plan: Eastleigh Borough

Habitat enhancement proposals

Habitat creation proposals

Site boundary

200m road buffer

River Itchen SAC

Eastleigh Borough boundary

River Itchen

2

Drains

17m

Drain

Drains

BA1

Drain

Breach Farm

Stoke Commo

Workings (disused)

BA2

Drain

Drain

Breach Copse

Path

Path

FB

0 100

metres

N

However, it is considered no longer feasible to secure water from this source, and is instead recommended that a topographical survey is commissioned to determine whether a perennial flow of water can be achieved through this area via a direct connection with the main river channel in the north of BFA2. If this can be achieved, it is recommended that the proposals are designed to maximise the extent of perennially flowing water by reconnecting and (if necessary) re-grading one or more of the historic ditches / drains present in this area. These will then return water to the main river via the main ditch (i.e. transect 4; see Figure 11 of Rushbrook, 2018) which forms the eastern extent of this area.

8. WITHY MEADOWS

8.1 Assessment of Habitat Enhancement and Creation Opportunities

One habitat enhancement and one habitat creation opportunity was identified at Withy Meadows (Figure 7) during habitat assessments conducted in June 2017. A summary of the results of the assessment of habitat enhancement and creation opportunities for Withy Meadows is provided in Table 8.

Table 8: Summary of the results of the assessments for Withy Meadows.

Transect No. / Area Name	Value	Feasibility	Support	Current Enhancement / Creation Potential
1	High	Moderate	Moderate	**High**
WMA1	High	Moderate	Moderate	**High**

Withy Meadows does not currently support any suitable habitat for southern damselfly, and the single individual recorded during the habitat assessment was most likely a transient individual from the Itchen Navigation (Rushbrook, 2018). Therefore, the delivery of habitat enhancement and / or creation works that would provide habitat to potentially support a new population of southern damselfly in the future is considered to be highly valuable (Table 8; Appendices 3 and 4).

Delivery of these works would inherently be complex as both involve major capital works and require a supply of water to be secured from a main river channel (Appendices 3 and 4). However, it is understood that water can be secured from a watercourse in the north of the site that lies completely within the site ownership and, if secured, it is considered likely that a perennial flow can be achieved across the site. Furthermore, given the current cattle grazing regime present at the site, and the belief that these works can be designed and delivered to avoid / minimise the likelihood of impacting on important / protected species or habitat, both proposals have been assessed to be of moderate feasibility (Table 8).

Furthermore, initial discussions with the landowner were very positive and, if water can indeed be secured from within the site, there is a strong likelihood that these measures can be delivered. However, until it is confirmed that all elements required lie within a single ownership, it is considered prudent to assess the level of support for the proposals as moderate (Table 8).

Irrespective of this cautious assessment of the level of support afforded, both proposals are currently assessed as having a high potential of being delivered (Table 8).

8.2 Outline Proposals

Transect 1

It is recommended that transect 1 is reconnected to the main river system and re-graded to create a perennial flow for approximately 300m before being returning to the Itchen Navigation on the site's eastern boundary (Figure 7). This does not represent the full length of habitat assessed in June 2017 (see Figure 12 of Rushbrook, 2018), but avoids the need for extensive tree / scrub clearance.

WMA1

It is considered that, should the habitat enhancement proposed for transect 1 be delivered and a sufficient amount of water is available, the length of suitable habitat available at Withy Meadows should be maximised by creating an additional braid or braids from the main ditch (transect 1) channel.

Figure 7: Withy Meadows

Southern Damselfly Conservation Plan: Eastleigh Borough

Habitat enhancement proposals

Habitat creation proposals

Site boundary

200m road buffer

River Itchen SAC

Eastleigh Borough boundary

9. LAND BEHIND GW MARTIN

9.1 Assessment of Habitat Enhancement and Creation Opportunities

Two habitat enhancement and one habitat creation opportunities were identified at Land behind GW Martin (Figure 8) during habitat assessments conducted in June 2017. A summary of the results of the assessment of habitat enhancement and creation opportunities for Land behind GW Martin's is provided in Table 9.

Table 9: Summary of the results of the assessments for Land behind GW Martin.

Transect No. / Area Name	Value	Feasibility	Support	Current Enhancement / Creation Potential
1	High	Moderate	Unlikely	**Low**
2	High	Moderate	Not Supported	**Very Low**
GWA1	High	Moderate	Moderate	**Moderate**

Land behind GW Martin currently supports a medium strength population and, in combination with Ashtrim Nursery, is strategically important in linking the strong population 'hub' at Highbridge Farm in the north of the study area, with strong populations at Allington Manor Farm and Itchen Valley Country Park in the south. The limited availability of suitable habitat restricts the strength of this important population, and therefore measures that will increase the availability of suitable habitat, and as a consequence the resilience (i.e. numbers and distribution) of this population, are considered to be highly valuable (Table 9).

All three proposals were assessed to be of 'moderate' feasibility, largely as a consequence of the presence or high level of certainty that a perennial flow of water can be secured. However, potential habitat enhancement proposals on transect 2 will require not only substantial tree and scrub removal, but ongoing intensive management in the mid- to short term, and is expected to require detailed mitigation (Appendix 3). The author therefore does not support further investigation of this enhancement proposal.

Conversely, proposals on transect 1 and within GWA1 are considered to more sustainable with fewer ecological considerations (Appendices 3 and 4), and have already been subject to prior investigation (Rushbrook, 2015). Indeed, it is understood that the broad proposals for this site set out by Rushbrook (2015) have been subject to more detailed investigations by the Environment Agency, with particular interest afforded to the concept of habitat creation (Table 9). A greater emphasis on the habitat creation proposal is supported by the author, as this should not only provide a greater extent of additional suitable habitat, but is considered to be a more cost-effective use of resources. However, since the creation of habitat within area GWA1 is dependent of securing water from transect 1, it is essential that any proposals developed for this area take due consideration of the potential implications these may have for the existing southern damselfly population.

The varying degree of support for each of these three proposals is reflected in the assessment of their current potential of being deliverable (Table 9).

9.2 Outline Proposals

As outlined above, the potential of undertaking habitat enhancement on transect 2 is no longer supported.

Although outlined below, it is emphasised that more detailed recommendations for habitat enhancement and creation proposals (i.e. for transect 1 and GWA1 respectively) have previously been provided by Rushbrook (2015), and these have been included in Appendix 5 of this report for ease of reference. Furthermore, it is understood that detailed investigation of the feasibility and design of proposals within area GWA1 were commissioned by the Environment Agency, and it is essential that these are utilised to inform any potential future habitat creation works at Land behind GW Martin.

Figure 8: Land behind GW Martin

Southern Damselfly Conservation Plan: Eastleigh Borough

Habitat enhancement proposals

Habitat creation proposals

Site boundary

200m road buffer

River Itchen SAC

Eastleigh Borough boundary

GWA1

1

2

DUTTON LANE

Recreation Ground

Depot

Works

12m

0 100

metres

For enquiries relating to GIS data contact Catherine McGuire, email Catherine.McGuire@hiwwt.org.uk, tel: 01489 774455.

Transect 1

Habitat enhancement recommendations for transect 1 are focused on three key elements (Rushbrook, 2015; Appendix 5):

- Enhance the existing marginal vegetation on the true left (east) bank in the middle section of the transect;
- Establish a marginal berm along the true left bank down the lower third of the channel;
- Selective removal of bank top trees / overhanging limbs from the true right bank down the lower third of the channel.

GWA1

It is recommended that a single, braided or multiple channels are created that support a perennial flow of water from transect 1 to transect 2. The length / number of channel(s) will be dependent on the amount of water that can be secured from transect 1, once due consideration has been given to the potential implications their creation may have on the existing southern damselfly population.

General

It is recommended that following an initial cut and removal exercise to reduce the biomass of vegetation material present within area GWA1, cattle grazing should be introduced to the site. If this is not feasible, then a cutting regime should be designed and implemented that will both safeguard and provide suitable habitat for the adult life stage of southern damselfly (i.e. a cut taken in late April / early May to allow some vegetation to re-establish prior to the main flight period).

10. EASTLEIGH RECREATION GROUND

10.1 Assessment of Habitat Enhancement and Creation Opportunities

Eastleigh Recreation Ground was scoped out of the survey and habitat assessment study as it was known that the site does not currently support any potentially suitable habitat for southern damselfly (Rushbrook, 2018). However, a habitat creation opportunity (Figure 9) was identified during a study conducted in August 2015 to assess potential habitat enhancement / creation opportunities at the site (Rushbrook, 2015). A summary of the results of the assessment of this habitat creation opportunity at Eastleigh Recreation Ground is provided in Table 10.

Table 10: Summary of the results of the assessments for Eastleigh Recreation Ground.

Area Name	Value	Feasibility	Support	Current Enhancement Potential
ERA1	High	Moderate	Moderate	**Moderate**

Eastleigh Recreation Ground does not currently support any suitable habitat for southern damselfly (Rushbrook, 2015). Therefore, the delivery of habitat creation works that would provide habitat to potentially support a new population of southern damselfly in the future is considered to be highly valuable (Table 10; Appendix 4), particularly as it could form part of an important network of sites in the Eastleigh area with Land behind GW Martin and Ashtrim Nursery.

Creating suitable habitat within area ERA1 will require extensive excavation and the installation of an offtake structure within the wooded strips located between the amenity grassland and main river channels (i.e. either the Barton Carrier or the Itchen Navigation). Furthermore, notable changes in management practices will need to be employed at the site if suitable habitat is to be secured in the long-term. However, given the high level of certainty that a perennial flow of water can be secured, and the low ecological value of the amenity grassland that dominates the site (Rushbrook, 2015; Appendix 4), these proposals are assessed to be moderately feasible. Indeed, this area has already been subject to prior investigation (Rushbrook, 2015), and it is understood that the broad proposals for this site have been subject to more detailed investigations by the Environment Agency. It is understood that these investigations are currently being discussed within and between relevant persons and organisations, and it is considered that the habitat creation proposals for area ERA1 have moderate potential for being delivered.

10.2 Outline Proposals

Although outlined below, it is emphasised that more detailed recommendations for habitat creation proposals within area ERA1 has previously been provided by Rushbrook (2015), and are included in Appendix 5 of this report. Furthermore, it is understood that detailed investigation of the feasibility and design of proposals within this area was commissioned by the Environment Agency, and it is essential that this is utilised to inform any potential future habitat creation works at Eastleigh Recreation Ground

ERA1

It is recommended water that is secured from the Barton Carrier (to the north of the site) or Itchen Navigation (to the east of the site) through the reinstallation of historic structures and / or the formalisation of an existing breach (Rushbrook, 2015). Depending on the amount of water that can be secured, it is recommended that historic drains / existing low points within the amenity grassland are excavated to create a single, braided or multiple channels that support a perennial flow of water in a north-east to south-west direction. This water should exit the site and return to the main river system via transect 2 in Land behind GW Martin.

General

It is recommended that cattle grazing is introduced to the site. If this is not feasible, then a cutting regime should be designed and implemented that will both safeguard and provide suitable habitat for the adult life stage of southern damselfly (i.e. a cut taken in late April / early May to allow some vegetation to re-establish prior to the main flight period).

Figure 9: Eastleigh Recreation Ground

Southern Damselfly Conservation Plan: Eastleigh Borough

Habitat enhancement proposals

Habitat creation proposals

Site boundary

200m road buffer

River Itchen SAC

Eastleigh Borough boundary

ERA1

Recreation Ground

Drain

Sks

Allott Gdns Works

Stoke Lock (disused)

Car Park

12m

Bishopstoke Road

0 100

metres

N

For enquiries relating to GIS data contact Catherine McGuire, email Catherine.McGuire@hiwwt.org.uk, tel: 01489 774455.

11. ASHTRIM NURSERY

11.1 Assessment of Habitat Enhancement and Creation Opportunities

Two habitat enhancement opportunities were identified at Ashtrim Nursery (Figure 10) during habitat assessments conducted in June 2017. A summary of the results of the assessment of habitat enhancement opportunities for Ashtrim Nursery is provided in Table 11.

Table 11: Summary of the results of the assessments for Ashtrim Nursery.

Transect No.	Value	Feasibility	Support	Current Enhancement Potential
1	High	High	Likely	**High**
2	Moderate	Moderate	Not Supported	**Very Low**

Ashtrim Nursery currently supports a medium strength population and, in combination with Land behind GW Martin, is strategically important in linking the strong population 'hub' at Highbridge Farm in the north of the study area, with strong populations at Allington Manor Farm and Itchen Valley Country Park in the south. Therefore, the delivery of habitat enhancement or creation works that would provide habitat to increase the numbers and distribution of southern damselfly at the site is considered to be highly valuable.

The limited availability of suitable habitat restricts the strength of this important population. However, it is considered unlikely that additional water could be secured for the site, and therefore unlike Land behind GW Martin, no habitat creation measures are proposed. Therefore, it is essential that the suitability of existing habitat at the site is maximised, and this reflected in the high value attributed to habitat enhancement proposals for transect 1 (Table 11). However, based on the author's observations of the development of transect 2 over the past six years, which was choked with vegetation and supported only localised standing water in June 2017, concerns exist as to whether attempting to provide suitable habitat in transect 2 will negatively impact on transect 1. As a consequence, it is considered that unless it can be demonstrated that suitable habitat can be maintained in both channels simultaneously, transect 2 should be left to function as an overflow channel. Indeed, further investigations of potential habitat enhancement proposals on this transect are not supported by the author.

The proposed habitat enhancement works on transect 1 are considered to be highly feasible since they involve only minor work with no potential negative implications on important / protected species or habitats. Furthermore, as the site is owned and sensitively managed for southern damselfly by Eastleigh Borough Council, these measures are considered to be afforded a high level of support. As a result, it is considered that there exists a high potential that these measures can be delivered (Table 11).

11.2 Outline Proposals

As outlined above, only proposals for the habitat enhancement opportunities on transect 1 have been provided.

Transect 1

It is recommend that young willow scrub developing on the island between transects 1 and 2 is cleared, as it is starting to encroach on and hang over the channel.

Location within county:

Figure 10: Ashtrim Nursery

Southern Damselfly Conservation Plan: Eastleigh Borough

Habitat enhancement proposals

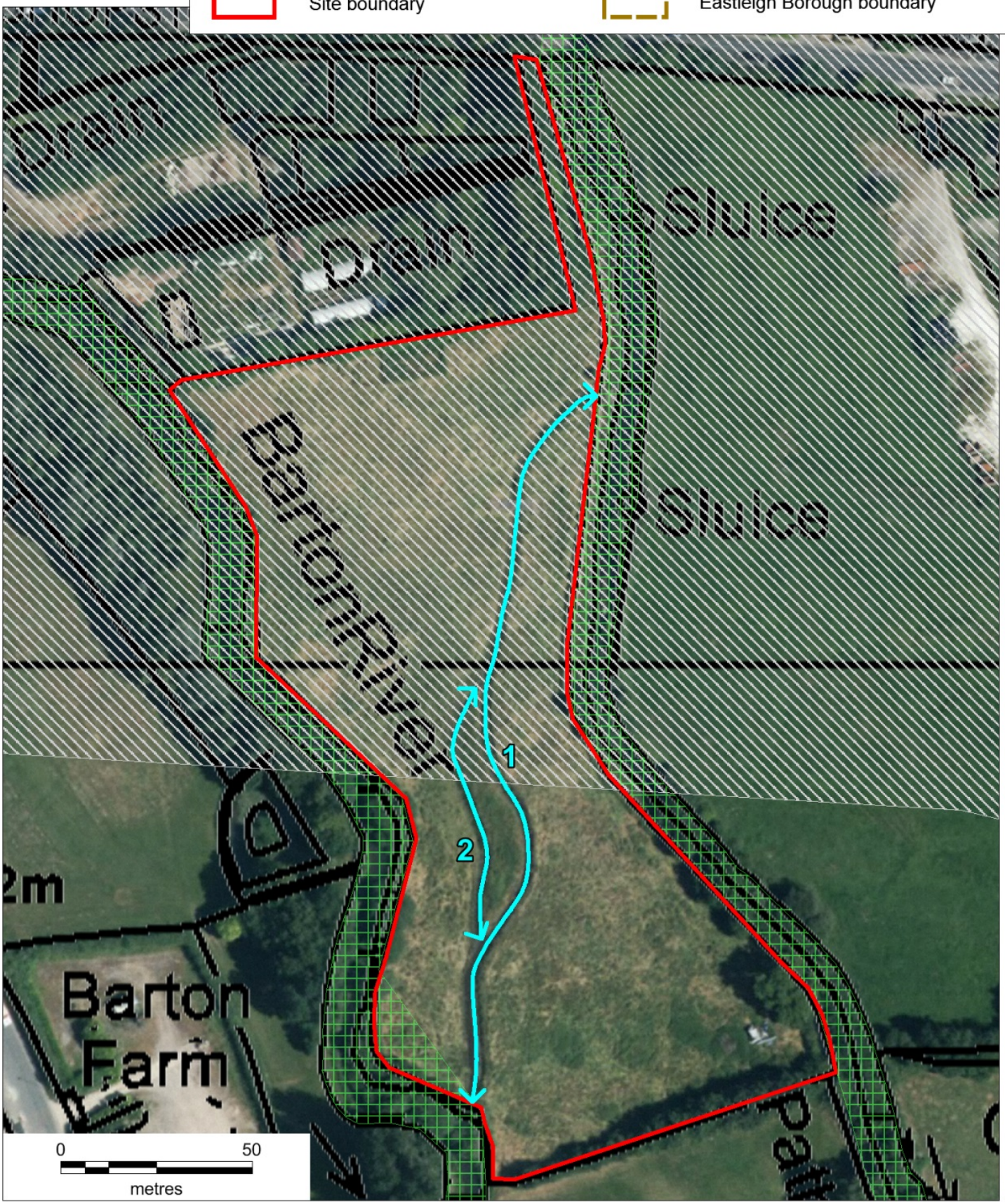
Habitat creation proposals

Site boundary

200m road buffer

River Itchen SAC

Eastleigh Borough boundary



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For enquiries relating to GIS data contact Catherine McGuire, email Catherine.McGuire@hiwwt.org.uk, tel: 01489 774455.

12. MORRIS' LAND

12.1 Assessment of Habitat Enhancement and Creation Opportunities

One habitat enhancement and three creation opportunities were identified at Morris' Land (Figure 11) during habitat assessments conducted in June 2017. A summary of the results of the assessment of habitat enhancement and creation opportunities for Morris' Land is provided in Table 12.

Table 12: Summary of the results of the assessments for Morris' Land.

Transect No. / Area Name	Value	Feasibility	Support	Current Enhancement Potential
6	High	Low	Not Supported	**Very Low**
MA1	High	Moderate	Not Supported	**Very Low**
MA2	High	Moderate	Not Supported	**Very Low**
MA3	High	Moderate	Not Supported	**Very Low**

The results of the adult count survey conducted in June 2017 indicated that Morris's Land does not support a population of southern damselfly, with the two individuals recorded on site considered to be transient males (Table 1; Rushbrook, 2018). Furthermore, the habitat present within five of the six transects assessed was considered to be wholly unsuitable for this species, with the remaining watercourse (transect 6) considered to be largely unsuitable (Table 1; Rushbrook, 2018). This assessment was a consequence of the absence of a discernible flow of water throughout the entire / majority of the length of all transects, and the presence of dense tree, scrub and / or monocotyledon vegetation cover over the channels.

Given the 'absence' of southern damselfly from this site, the delivery of habitat enhancement and or creation works that would provide habitat to potentially support a new population of southern damselfly in the future is considered to be highly valuable (Table 12; Appendices 3 and 4), particularly as it could form part of an important network of sites in the Eastleigh area with Land behind GW Martin and Ashtrim Nursery.

The habitat enhancement proposal for transect 6 would involve major capital works to clear scrub from the bank tops along the lower (southern) half of this watercourse, and to regrade the ditch bed. Furthermore, it is currently unclear from where sufficient water could be secured to supply a perennial flow of water through this ditch, and its positon adjacent to an existing vehicular track would limit management to more labour intensive practices. As a consequence, habitat enhancement proposals for transect 6 are considered unlikely to be feasible (Table 12).

Although also considered to require major capital works, the proximity of habitat creation areas MA1, MA2 and MA3 to main river channels increases the likelihood that perennially flowing water courses could be created. This could either be achieved through the excavation of a new channel as undertaken at the adjoining Ashtrim Nursery (e.g. MA1), or through utilising historic ditches / drains or existing low points with the meadows (e.g. for MA2 utilising transects 4, 3 and 2; see Figure 16 of Rushbrook, 2018). As a consequence, these proposals are considered to be moderately feasible (Table 12).

However, following discussions with the landowner in October 2017, it is understood that none of the identified habitat enhancement or creation proposals would be supported, and therefore currently no further consideration will be given to potential delivery of works for southern damselfly at Morris' Land.

Figure 11: Morris' Land

Southern Damselfly Conservation Plan: Eastleigh Borough

Habitat enhancement proposals

Habitat creation proposals

Site boundary

200m road buffer

River Itchen SAC

Eastleigh Borough boundary

N

For enquiries relating to GIS data contact Catherine McGuire, email Catherine.McGuire@hiwwt.org.uk, tel: 01489 774455.

13. LAND ASSOCIATED WITH TOBY CARVERY

13.1 Assessment of Habitat Enhancement and Creation Opportunities

One habitat creation opportunity was identified at Land associated with Toby Carvery (Figure 12) during habitat assessments conducted in July 2017. A summary of the results of the assessment of the habitat creation opportunity at Land associated with Toby Carvery is provided in Table 13.

Table 13: Summary of the results of the assessments for Land associated with Toby Carvery.

Area Name	Value	Feasibility	Support	Current Enhancement Potential
TCA1	High	Moderate	Not Supported	**Very Low**

Land associated with Toby Carvery does not currently support any suitable habitat for southern damselfly, and no southern damselfly were recorded during the habitat assessment conducted in July 2017 (Rushbrook, 2018). Therefore, the delivery of habitat creation works that would provide habitat to potentially support a new population of southern damselfly in the future is considered to be highly valuable (Table 13; Appendix 4).

It is considered that, given the presence of the main river channel adjacent to its eastern boundary, there exists a high certainty that sufficient supply of water could feasibly be secured to support a perennially flowing channel through habitat creation area TCA1 (Appendix 4). This is able to offset the scale of the works and associated ecological considerations (Appendix 4) sufficiently to result in an assessment of moderate feasibility (Table 13).

It is considered likely that the installation of an offtake structure and the removal of water from the main river at this location will be considered by some relevant persons / stakeholders to be detrimental to their interests on the main river / river banks. It is therefore believed that one or more relevant interest groups would not support delivery of this habitat creation option, and therefore currently no further consideration will be given to the potential delivery of works for southern damselfly at Land associated with Toby Carvery.

Figure 12: Land associated with Toby Carvery

Southern Damselfly Conservation Plan: Eastleigh Borough

Habitat enhancement proposals

Habitat creation proposals

Site boundary

200m road buffer

River Itchen SAC

Eastleigh Borough boundary

TCA1

Drain

Coneger

0 50

metres

14. DUNFORD'S LAND

14.1 Assessment of Habitat Enhancement and Creation Opportunities

Three habitat enhancement and three habitat creation opportunities were identified at Dunford's Land (Figure 13) during habitat assessments conducted in July 2017 and an additional site visit conducted in October 2017. A summary of the results of the assessment of habitat enhancement and creation opportunities for Dunford's Land is provided in Table 14.

Table 14: Summary of the results of the assessments for Dunford's Land.

Transect No. / Area Name	Value	Feasibility	Support	Current Enhancement Potential
1	High	Moderate	Not Supported	**Very Low**
2	High	Moderate	Unlikely	**Low**
3	High	Moderate	Unlikely	**Low**
DA1	High	Moderate	Unlikely	**Low**
DA2	High	Low	Unlikely	**Low**
DA3	High	Moderate	Unlikely	**Low**

Dunford's Land is a relatively large site but supports only a weak population of southern damselfly, its distribution limited to small numbers at two specific locations on transect 1 and a short section towards the south-west end of transect 2 (Rushbrook, 2018). Therefore, the delivery of habitat enhancement or creation works that would provide habitat to increase the numbers and distribution of southern damselfly at the site is considered to be highly valuable (Table 14; Appendices 3 and 4).

Habitat enhancement proposals were focused on three transects following habitat assessments conducted in July 2017, since the majority of transects were considered unsuitable for habitat enhancement as a consequence of one or a combination of the factors outlined in Section 3.1. However, the large size of the site provides potential opportunities for extensive habitat creation, and as a consequence three large potential habitat creation areas have been identified.

It is considered that the delivery of any of the six proposals will require major capital works (Appendices 3 and 4), with tree and scrub removal the main consideration for the three habitat enhancement options, and the installation of offtake structures an essential element of the three habitat creation proposals. Regrading / excavating new channels is also a key element of works for habitat creation. Furthermore, notable or moderate changes in management, or the introduction of labour intensive management practices, will be required to secure the long-term success of any habitat enhancement or creation measures implemented (Appendices 3 and 4). However, despite these considerations, since transects 1, 2 and 3 already support flowing water, the proposals associated with these features are considered to be moderately feasible.

Habitat creation measures are reliant on securing additional water from larger water channels and / or modifications in water level management at the site. The proximity of habitat creation areas DA1 and DA3 to the main river channel enables these proposals to be inherently more feasible (Table 14; Appendix 4). In contrast, area DA2 will require water to be taken from the main carrier stream in the north and west of the site (i.e. transects 1 and 2 combined), and is therefore considered to be of only low feasibility. However, more detailed hydrological and topographical study is required to accurately determine where water can be secured and how it can most effectively be distributed across the site. For example, options may potentially exist for the use of water secured from the main carrier stream in the north and west of the site to create habitat in areas DA1, DA2 and D3; however, it is considered highly unlikely that sufficient water will be available for the creation of habitat in all three areas, so more detailed assessment is required to determine what (combination of) proposals will create the greatest extent of suitable habitat.

Figure 13: Dunford's Land

Southern Damselfly Conservation Plan: Eastleigh Borough

Habitat enhancement proposals

Habitat creation proposals

Site boundary

200m road buffer

River Itchen SAC

Eastleigh Borough boundary

It was assessed to be unlikely that all relevant interest groups would support delivery of five of the six proposed options, either due to the need / desire to secure water from main river channels (i.e. habitat creation proposals), and / or the scale or works and necessary notable adjustments in management practices at the site (both habitat enhancement and creation proposals). Furthermore, given the association of transect 1 with vehicular tracks, residential properties and gardens, and a residential road, further investigations of potential habitat enhancement proposals on this transect are not supported by the author.

Finally, primarily due to the low certainty that all relevant interest groups would support delivery, combined with the scale of works required, it currently considered that there is only a low potential that the remaining five habitat enhancement / creation measures are deliverable.

14.2 Outline Proposals

As outlined above, following more detailed assessment (see Section 14.1) proposals for habitat enhancement of transect 1 have not been included.

Transect 2

It is recommended that scrub, semi-mature trees and non-native tree species (e.g. sycamore *Acer pseudoplatanus*) is cleared from the length of the lower (east to west flowing) half of transect 2, with only mature, specimen native trees retained. It is considered likely that on-going scrub management will be required for a number of years and, once suitable habitat has developed in the upper reaches of the section, the ditch is cleared in sections over a period of 3 to 5 years. It is emphasised that the latter should focus on reducing the extent of encroaching monocotyledon vegetation without increasing the original depth or bank top width of the channel.

Transect 3

It is recommended that scrub, semi-mature trees and non-native tree species (e.g. sycamore *Acer pseudoplatanus*) is cleared from the length of the lower (west to east flowing) half of transect 3, with only mature, specimen native trees retained. In addition, bank re-profiling should be undertaken on one or both banks of incised sections, to either create a shallower bank profile or allow for the creation of sections of two stage channel / with marginal berms.

DA1

It is recommended that a detailed hydrological / topographic study is commissioned to determine (if feasible) the most effective option for creating a new floodplain channel(s) in this area. The study should both investigate the potential of securing water directly from the main river channel and from transect 1, and consider these options in combination with any options identified for habitat creation in areas DA2 and DA3.

DA2

It is recommended that a detailed hydrological / topographic study is commissioned to determine (if feasible) the most effective option for creating a new floodplain channel(s) in this area. The study should both investigate the potential for creating habitat between transect 1 and transect 2, and from the upper (north to south flowing) to the lower half of transect 2, and must consider these options in combination with any options identified for habitat creation in areas DA1 and DA3.

DA3

It is recommended that a detailed hydrological / topographic study is commissioned to determine (if feasible) the most effective option for creating a new floodplain channel(s) in this area. The study should both investigate the potential of securing water directly from the main river channel and from transect 2, and consider these options in combination with any options identified for habitat creation in areas DA1 and DA2.

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General

It is recommended that cattle grazing is introduced in conjunction with any habitat enhancement or creation measures delivered. If this is not feasible, then it is strongly recommended that where the land currently supports arable crops, these areas are converted to grassland, and a cutting regime designed and implemented that will both safeguard and provide suitable habitat for the adult life stage

of southern damselfly (i.e. a cut a taken in late April / early May to allow some vegetation to re-establish prior to the main flight period).

15. WEST HORTON FARM

15.1 Assessment of Habitat Enhancement and Creation Opportunities

Eight habitat enhancement and one habitat creation opportunities were identified at West Horton Farm (Figure 14) during habitat assessments conducted in July 2017 and an additional site visit conducted in October 2017. A summary of the results of the assessment of habitat enhancement and creation opportunities for West Horton Farm is provided in Table 15.

Table 15: Summary of the results of the assessments for West Horton Farm.

Transect No. / Area Name	Value	Feasibility	Support	Current Enhancement Potential
1	High	Moderate	Moderate	**High**
2	High	Moderate	Moderate	**Moderate**
3	High	Moderate	Moderate	**Moderate**
4	High	Moderate	Moderate	**Moderate**
6	High	Moderate	Moderate	**Moderate**
7	High	Moderate	Moderate	**Moderate**
8	High	Moderate	Unlikely	**Low**
10	High	Moderate	Not Supported	**Very Low**
WHA1	High	Moderate	Unlikely	**Moderate**

West Horton Farm supports a weak and potentially declining population of southern damselfly, with the majority of individuals (i.e. eight of ten) localised to two short stretches of transect 4 (Rushbrook, 2018). Urgent conservation action for this species is required at West Horton Farm, and the delivery of habitat enhancement or creation works to provide habitat to increase the numbers and distribution of southern damselfly at the site would be considered highly valuable (Table 15; Appendices 3 and 4).

All habitat enhancement and creation measures are considered to be moderately feasible, and, involving moderate to major capital works (Appendices 3 and 4). However, only three transects currently support perennially flowing water (i.e. transects 1, 4 and 8), and it is considered unlikely / unfeasible that sufficient water supply can be secured to provide flowing water through all of the remaining five transects and area WHA1. In contrast to the other four transects, there is no hydrological link between transect 10 and an existing flowing watercourse, and no clear approach to return abstracted water to a main river channel. In order to maximise the length of suitable habitat at the site, this habitat enhancement is therefore no longer supported by the author and has been investigated no further. Furthermore, a hydrological / topographical assessment will be required to determine the most effective combination of the remaining recommendations that will provide the greatest extent of suitable habitat for southern damselfly, taking into account the potential impact on the current / potential value of transect 4. In addition, this assessment will need to take into account the importance of transect 2 and 3 to supply water to other parts of the site, but also the greater sustainability / lower potential ecological considerations (Appendices 3 and 4) associated with the delivery of measures within the floodplain meadows (i.e. transects 6 and 7 and area WHA1).

Transect 8 is currently not hydrologically linked to the other transects within the site boundary, and therefore can be considered to a degree in isolation. This channel historically supported the highest density of southern damselfly at the site, (Rouquette, 2005; Rushbrook, personal observations), but is now considered to be unsuitable for this species following the habitat assessment conducted in July 2017. Furthermore, downstream this channel becomes transect 17 of Allington Manor Farm, which supports a high density of southern damselfly, and the implementation of enhancement on this transect will not influence / restrict the feasibility of others outlined above.

Figure 14: West Horton Farm

Southern Damselfly Conservation Plan: Eastleigh Borough

Habitat enhancement proposals

Habitat creation proposals

Site boundary

200m road buffer

River Itchen SAC

Eastleigh Borough boundary

It is considered moderately likely that support can be secured for the majority of the proposals (Table 15), since works of this type have been delivered at the site previously. However, since some of these measures have been largely unsuccessful, the results of the recommended hydrological / topographical study will be very important in assuring the confidence and therefore support of relevant persons / stakeholders that these measures are feasible. However, it is considered that transect 8 may be an exception to this, since it is a larger carrier stream and therefore may be of greater interest to / be of interest to a greater number of relevant organisations. It is therefore considered that there is a low certainty that habitat enhancement proposals for this transect will be supported (Table 15).

It is considered moderately certainty that on their individual merit, six of the eight remaining (i.e. excluding transect 10) habitat enhancement / creation measures can be delivered (Table 15). Furthermore, as a consequence of it's slightly higher combined scores for the 'value' and 'feasibility' criteria (Appendix 3), it is considered their exists a high potential that enhancement proposals on transect 1 can be delivered. Conversely, as consequence of the unlikelihood of it being afforded the support of relevant persons / stakeholders, it is considered that there is currently only a low potential that habitat enhancement proposals for transect 8 can be delivered.

15.2 Outline Proposals

As outlined above, following more detailed assessment (see Section 15.1) proposals for habitat enhancement of transect 10 have not been included.

Transect 1

It is recommended that dense vegetation and low-lying scrub clearance (with removal of the arising) is undertaken on the true left (east) bank across the entirety of the area between the channel and associated fence line, with scrub / tree limbs that over-hang the channel from the true right bank also removed.

Furthermore, it is recommended that, over the first five years, the ditch is cleared in sections, limited to reducing the extent of encroaching monocotyledon vegetation without increasing the original depth or bank top width of the channel.

Transect 2

It is recommended that a perennial flow of water be re-established along the length of transect 2 through the restoration of its connection with transect 1, and by re-grading the channel bed to clear areas choked by vegetation where necessary.

Furthermore, it is recommended that the clearance of dense scrub / tall vegetation (with removal of the arisings) is undertaken on the true left (south / east) bank across the entirety of the area between the channel and associated fence line, with scrub / tree limbs that over-hang the channel from the true right bank also removed.

Transect 3

It is recommended that a perennial flow of water be re-established along transect 3 between its junction with transects 2 and 5, to its junction with transect 7. This could be achieved by its connection with an enhanced transect 2, or through the formalisation of its connection with transect 5, and undertaken in association with a light regrading of the channel bed to clear areas choked by vegetation where necessary.

Furthermore, it is recommended that the clearance of dense scrub / tall vegetation (with removal of the arisings) is undertaken on the true left (south / east) bank across the entirety of the area between the channel and associated fence line, with scrub / tree limbs that over-hang the channel from the true right bank also removed.

Transect 4

It is recommended that extensive scrub and vegetation clearance (with removal of the arisings) is undertaken on both banks across the entirety of the area between the channel and associated fence line.

Transect 6

It is recommended that a perennial flow of water be re-established along the length of transect 6 through its existing connection with transect 3, subject to the re-establishment of a perennial flow through the latter. This should be complemented by regrading of the channel bed, and the investigation and resolution of the potential impounding impact of a culvert in the lower reaches of transect 6.

Transect 7

It is recommended that a perennial flow of water be re-established along the length of transect 7 through its existing connection with transect 3, subject to the re-establishment of a perennial flow through the latter. This should be complemented by regrading of the channel bed.

Transect 8

It is recommended that the clearance of dense scrub / tall vegetation (with removal of the arisings) is undertaken on the true left (east) bank across the entirety of the area between the channel and associated fence line.

WHA1

It is recommended that one or more of the north-south orientated ditches / drains present within area WHA1 are excavated to create a perennial flow of water between transect 2 and transect 4. This will be subject to the re-establishment of a perennial flow through the former.

General

It is recommended that the existing fence lines are removed or set back from the true left bank tops of transects 1, 2, 3, 8, and the true right bank top of transect 4, to allow cattle to graze the margins of these watercourses. If this is not feasible, then a programme of vegetation management along these bank tops should be agreed to prevent tall vegetation / scrub dominating the fenced areas once again.

Furthermore, it is emphasised that tall mature trees and tree limbs supporting rot holes and cracks should be retained during scrub clearance works.

16. ALLINGTON MANOR FARM

16.1 Assessment of Habitat Enhancement and Creation Opportunities

Thirteen habitat enhancement and two habitat creation opportunities were identified at Allington Manor Farm (Figure 15) during habitat assessments conducted in July 2017. A summary of the results of the assessment of habitat enhancement and creation opportunities for Allington Manor Farm is provided in Table 16.

Table 16: Summary of the results of the assessments for Allington Manor Farm.

Transect No. / Area Name	Value	Feasibility	Support	Current Enhancement Potential
1	Moderate	High	Moderate	**High**
3	Moderate	High	Unlikely	**Low**
7	Moderate	Moderate	Unlikely	**Low**
8	Moderate	Moderate	Unlikely	**Low**
9	Moderate	Moderate	Unlikely	**Low**
10	Moderate	Moderate	Unlikely	**Low**
11	Low	Moderate	Unlikely	**Very Low**
12	Low	Moderate	Unlikely	**Very Low**
17	Moderate	High	Moderate	**Moderate**
18	Moderate	High	Moderate	**Moderate**
25	Moderate	Moderate	Not Supported	**Very Low**
28	Moderate	Moderate	Not Supported	**Very Low**
29	Moderate	Moderate	Not Supported	**Very Low**
AMA1	Moderate	Moderate	Unlikely	**Low**
AMA2	Moderate	Moderate	Unlikely	**Low**

Allington Manor Farm supports a strong population of southern damselfly (Rushbrook, 2018), and with Itchen Valley Country Park and (to a lesser degree) West Horton Farm, is considered to be an important population 'complex' in the lower Itchen Valley (Rouquette, 2005). Furthermore, the site is managed through extensive grazing, with cattle access to all floodplain channels, and is not currently considered to be directly threatened by developmental pressure. In fact, due to the suitability of habitat present on transect 13 (see Figure 20 of Rushbrook, 2018), and the belief that the current management regime will retain these features, this was the only transect within the study area where it was considered that no recommendations were required.

However, as already identified above at a number of sites, water availability and security is a key limiting factor at this site. Indeed, it is considered that there may be potential implications for existing sections of suitable habitat, if measures were delivered that manipulated water level management across the site in an attempt to secure a perennial flow of water over a greater total length of watercourse (Appendices 3 and 4). As a consequence of the current strength and perceived stability of this population, combined with the potential implications on those transects currently supporting southern damselfly, it is considered that habitat enhancement and creation at this site would predominantly be of moderate value for southern damselfly in the Itchen Valley (Table 16). The only exceptions were habitat enhancement proposals for transects 11 and 12 which, due to their limited extent, are in fact considered to be of low value.

Figure 15: Allington Manor Farm

Southern Damselfly Conservation Plan: Eastleigh Borough

Habitat enhancement proposals

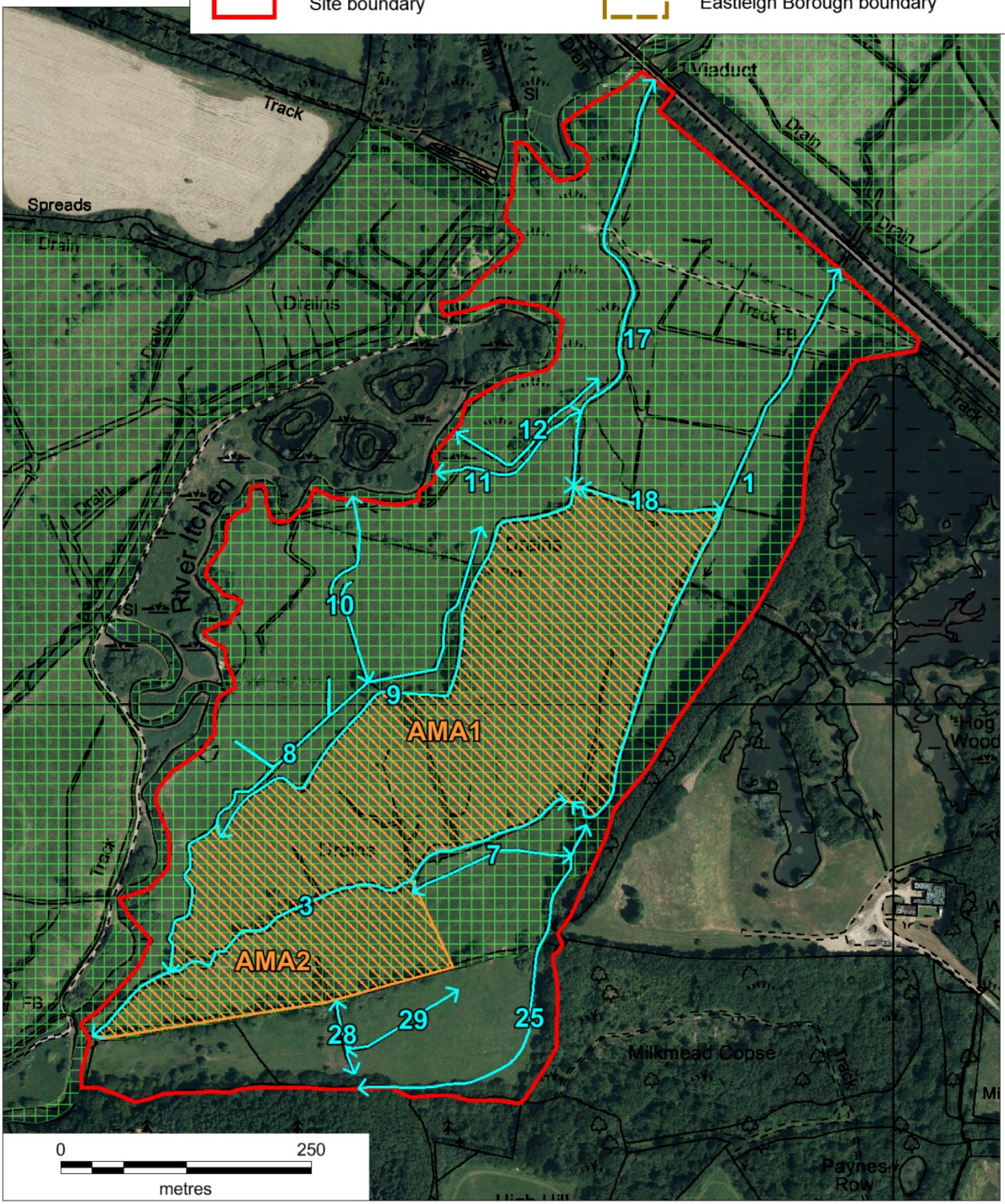
Habitat creation proposals

Site boundary

200m road buffer

River Itchen SAC

Eastleigh Borough boundary



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BAP Priority habitat, notable species and SINC data supplied by the Hampshire Biodiversity Information Centre on behalf of the HBIC Partnership.
Aerial photography courtesy of GetMapping plc. Produced on 9 October 2017 by Ben Rushbrook
For enquiries relating to GIS data contact Catherine McGuire, email Catherine.McGuire@hiwwt.org.uk, tel: 01489 774455.

Habitat enhancement proposals on four transect (i.e. 1, 3, 17 and 18) were considered to be highly feasible. These represent four of the five transects found to support southern damselfly during the survey and habitat assessment study (Rushbrook, 2018), and this assessment is a consequence of the perennial flow they already support, the positive management practices employed at the site, and the minor to moderate scale of the proposed works (Appendix 3).

The remaining habitat enhancement and creation proposals are all considered to be moderately feasible (Table 16), with an uncertainty in regard to whether a perennial flow of water could be secured the primary reason for the lower assessment of feasibility (Appendices 3 and 4). Therefore, a similar approach will be required to that recommended at Highbridge Farm, Dunford's Land and West Horton Farm. Specifically, a hydrological / topographical assessment will be required to determine the most effective combination of these remaining recommendations that will provide the greatest extent of suitable habitat for southern damselfly, whilst taking into account the potential impact of modifying water level management at the site on the current / future value of those transects currently supporting suitable habitat and / or southern damselfly (i.e. transects 1, 3, 13, 17 and 18).

Furthermore, based on further consideration of the habitat assessments conducted in July 2017, in particular the limitations on water availability and the perceived difficulties / scale of works associated with reconnecting these ditches to the wider floodplain meadow complex, it is considered that the resources required to develop suitable habitat in transects 25, 28 and 29 would be disproportionately high when assessing the potential value of delivered outputs. As a consequence, habitat enhancement of these transects is no longer supported by the author, and no further analysis on these proposals will be undertaken.

It is considered moderately likely that habitat enhancement proposals for three transects (i.e. 1, 17 and 18) will be supported since they will be largely in keeping with the management practices currently employed by the landowner at the site, and are unlikely to have notable implications for the activities / interests of other relevant persons or organisations. Conversely, though largely similar in concept, it is considered less likely (i.e. low certainty) that all proposals for transect 3 will be supported all by relevant persons or organisations, given the inclusion of some localised tree works in the lower (south-western) extent of transect 3.

It is considered unlikely that the remaining eight habitat enhancement and creation proposals will be supported by all relevant persons or organisations, since they require modifications in water level management and / or the establishment of a new supply of water from the main river channel, in order to secure a perennial flow of water along their lengths.

It is considered that only one (i.e. transect 1) and two (i.e. transects 17 and 18) habitat enhancement proposals have a high and moderate current potential of being deliverable respectively (Table 16). This is largely a consequence of the perceived moderate level of support afforded, but also as a result of their relatively 'high' feasibility. In contrast, five habitat enhancement and two habitat creation proposals are considered to currently have a low potential of being delivered, primarily since it is considered unlikely that these proposals will be supported by all relevant persons or organisations.

16.2 Outline Proposals

As outlined above, following more detailed assessment (see Section 15.1) the proposals for habitat enhancement of five transects (i.e. transect 11, 12, 25, 28 and 29) has not been included.

Transect 1

It is recommended that sections of dense, extensive marginal / bank top monocotyledon vegetation, particularly where associated with marginal berms, are cleared over a period of 3 - 5 years using hand or power tools, with the arisings taken away from the bank tops. This will ensure that an abundance of suitable emergent herbaceous vegetation for oviposition is provided along the length of this transect, and will be maintained in the long term through the existing grazing regime at the site.

Transect 3

It is recommended that sections of dense, extensive marginal / bank top monocotyledon vegetation, particular where associated with marginal berms, are cleared over a period of 3 - 5 years using hand or power tools, with the arisings taken away from the bank tops. This will ensure that an abundance of

suitable emergent herbaceous vegetation for oviposition is provided along the length of this transect, and will be maintained in the long-term through the existing grazing regime at the site.

Furthermore, it is recommended that scrub and semi-mature trees are cleared from both bank tops in the lower reaches of the transect, though mature tree specimens should be retained.

Transect 7

It is recommended that, as part of a detailed hydrological / topographical study conducted across the whole site, the potential of establishing an offtake and inlet from / to transect 3 is investigated. If this is both considered feasible and an effective use of the available water at the site, it is recommended that these connection with transect 3 are established and that the ditch is regraded to clear the dense vegetation currently dominating the channel and to ensure a perennial flow of water is supported.

Transect 8 and 9

It is recommended that, as part of a detailed hydrological / topographical study conducted across the whole site, the potential of establishing a perennial flow of water though transect 8 and / or 9 is investigated; specifically, through their (re)connection to transect 17, transect 18 or transect 10 (see below). If this is both considered feasible and an effective use of the available water at the site, it is recommended that a supply of water is provided to one or both of these transects, and that the ditch(es) is / are regraded to clear the dense vegetation currently dominating the channel(s), and to ensure a perennial flow of water is supported.

Transect 10

It is recommended that, as part of a detailed hydrological / topographical study conducted across the whole site, the potential of establishing a perennial flow of water through a new connection between the main river channel be investigated. If secured, this could reduce the level of water that would need to be secured from transect 17 or 18 to support a perennial flow of water through transect 8 and / or 9.

If this is both considered feasible and an effective use of the available water at the site, it is recommended that a supply of water is secured for transect 10, and that the ditch is regraded to clear the dense vegetation currently dominating the channel, and to ensure a perennial flow of water is supported.

Transect 17

It is recommended that sections of dense, extensive marginal / bank top monocotyledon vegetation, particular where associated with marginal berms, are cleared over a period of 3 - 5 years using hand or power tools, with the arisings taken away from the bank tops. This should be supported by the clearance of localised scrub where present. In combination, these measures will ensure that an abundance of suitable emergent herbaceous vegetation for oviposition is provided along the length of this transect, and will be maintained in the long-term through the existing grazing regime at the site.

Furthermore, it is recommended that localised re-profiling of one or both banks is undertaken in sections along the lower part of the channel where the bank tops have become noticeably perched.

Transect 18

It is recommended that sections of dense, extensive marginal / bank top monocotyledon vegetation, particular where associated with marginal berms, are cleared over a period of 3 - 5 years using hand or power tools, with the arisings taken away from the bank tops. This should be supported by the clearance of localised scrub where present. In combination, these measures will ensure that an abundance of suitable emergent herbaceous vegetation for oviposition is provided along the length of this transect, and will be maintained in the long-term through the existing grazing regime at the site.

Furthermore, it is recommended that where the bank top has become noticeably perched, re-profiling of the true right (south) bank is undertaken in sections over a period of 3 years.

AMA1

It is recommended that, as part of a detailed hydrological / topographical study conducted across the whole site, the potential of establishing one, or a number of, or a network of ditches within area AMA1 is investigated.

Specifically, this could include the establishment of a ditch(es) between:

- transect 18 and transect 3,
- transect 1 and transect 3, and
- a newly enhanced transect 8 / 9 and transect 3.

If this is both considered feasible and an effective use of the available water at the site, it is recommended that a new ditch / ditches / network of ditches is / are excavated utilising existing low points in the meadow (i.e. transects 4, 5 and 6 at the site; see Figure 20 of Rushbrook, 2018) as effectively as is possible.

AMA2

It is recommended that, as part of a detailed hydrological / topographical study conducted across the whole site, the potential of establishing one, or a number of, or a network of ditches within area AMA2 is investigated.

Specifically, this could include the establishment of:

- a ditch(es) between transect 3 and the ditch that forms the southern extent of this area (i.e. transects 26; see Figure 20 of Rushbrook, 2018); and
- the connection of an enhanced transect 7 to the ditch that forms the southern extent of this area (i.e. transects 26; see Figure 20 of Rushbrook, 2018), rather than its direct return to transect 3.

If this is both considered feasible and an effective use of the available water at the site, it is recommended that a new ditch / ditches / network of ditches is / are excavated utilising existing low points in the meadow (i.e. transects 26 and 27 at the site; see Figure 20 of Rushbrook, 2018) as effectively as is possible.

General

It is emphasised that the any ditch bed regrading and / or vegetation clearance works proposed should not increase the original depth or bank top width of the channel, except where associated with bankside re-profiling.

17. ITCHEN VALLEY COUNTRY PARK

17.1 Habitat Assessment and Recommendations

As outlined in Sections 1.3 and 3.1, the majority of Itchen Valley Country Park was excluded from the survey and habitat assessment study conducted in June and July 2017, and it is therefore not appropriate to assess the habitat enhancement and creation opportunities using the approach outlined in Sections 3.2 and 3.3. However, the current status of the population was assessed by Rushbrook (2018) using a combination of data collected from the site and a long-term monitoring data set provided by Eastleigh Borough Council. Based on this information, it was considered highly likely that the size and / or strength of the southern damselfly population at the site is in decline.

The southern damselfly population at Itchen Valley Country Park is considered to be of national importance (Thompson, 2003), and with Allington Manor Farm and (to a lesser degree) West Horton Farm, is considered to be an important population 'complex' in the lower Itchen Valley (Rouquette, 2005). It is therefore considered that urgent conservation action for this species is required at Itchen Valley Country Park. Furthermore, the delivery of habitat enhancement and / or creation works to provide habitat to increase the numbers and distribution of southern damselfly at the site would be considered highly valuable.

It is therefore strongly recommended that a detailed assessment is conducted to determine the potential factors driving the observed downward trend in numbers recorded at the site (Rushbrook, 2018). This should be delivered in association with a feasibility study to identify and recommend habitat enhancements and / or creation opportunities that will consolidate and subsequently expand the distribution and numbers of southern damselfly at the site. Based on discussions in late 2017, it was understood that this approach was being discussed by Eastleigh Borough Council at that time, with potential funding for the investigation and subsequent works being sought.

18. GENERAL RECOMMENDATIONS

In additional to the site specific recommendations outlined in Sections 5 – 16, it is strongly advised that the following three general recommendations are considered when implementing any of the habitat enhancement and creation opportunities outlined in this strategic conservation plan.

Firstly, it is emphasised that is considered inherently essential to secure the support of landowners, angling clubs and other relevant stakeholders for the success of these proposals. It is therefore strongly recommended that discussions with the relevant persons and stakeholders are conducted at the earliest possible date to ensure that this support is forth-coming, and that therefore there exists a high likelihood of successfully delivering these proposals.

Secondly, it is strongly recommended that, where available, additional hydrological and topographical information is incorporated into any further investigation of the potential delivery of the proposals included within this report. Furthermore, where not available, it is strongly recommended that detailed hydrological and topographical investigations are commissioned at the outset of further investigations in to the potential delivery of proposals associated with the manipulations of water levels from (i.e. water will be secured from) watercourses currently supporting southern damselfly.

Finally, where appropriate opportunities arise through the planning process, it is strongly advised that the relevant statutory and non-statutory bodies endeavour to ensure that the security and / or sympathetic management of land included within this study is achieved to protect, consolidate and potentially expand the number and distribution of southern damselfly at these sites.

19. DISCUSSION

19.1 Status of Southern Damselfly in and around Eastleigh Borough

The decline of southern damselfly in the UK and Hampshire is believed to be a consequence of the loss and degradation of suitable habitats, a result of under-management, over-management, unsustainable abstraction, inappropriate water level management, and pollution. This has resulted in the increasing isolation and fragmentation of suitable sites, a breakdown of metapopulation dynamics, and an increased susceptibility of remaining populations to extinction, particularly from localised pollution and over-abstraction events, and nutrient enrichment (Rouquette, 2005, Rushbrook *et al*., 2014). This situation is exacerbated by the limited dispersal capabilities of this species (Thompson *et al*., 2003a), decreasing the likelihood of the species colonising or re-colonising new or historic sites respectively.

Recent studies in the Itchen Valley reiterate these concerns. Research conducted by University of Liverpool identified that southern damselfly populations within the Itchen Valley have not only become physically isolated, due to the presence of large areas of unsuitable habitat between them (Rouquette, 2005), but are also showing evidence of genetic isolation (Watts *et al*., 2004). Indeed, it is considered that southern damselfly have become localised and therefore at an increased risk, or potentially already suffering, a decline in the strength of the metapopulation in and around Eastleigh Borough (Rushbrook, 2018). Furthermore, the fragmented distribution of southern damselfly in the Eastleigh Borough area is concerning, since it reduces the likelihood of the re-population of a site should a localised extinction event occur. The restriction or absence of genetic transfer may also potentially reduce the robustness of individual populations. Therefore, it is considered that urgent conservation action is required for this species in and around Eastleigh Borough.

19.2 Habitat Enhancement and Creation

19.2.1 Key considerations

Two broad, key elements form the basis for the successful delivery of the habitat enhancement and creation opportunities set out in this strategic conservation plan for southern damselfly. Only by addressing and securing these, can the long-term security of a robust southern damselfly metapopulation within the study area be effectively achieved. These elements are:

- Addressing factors currently limiting the distribution of southern damselfly;
- Securing the long-term suitability of existing, enhanced and / or created suitable habitat.

It is considered that there are three key habitat specific factors currently limiting southern damselfly distribution in the area within and around the Eastleigh Borough boundary:

- Development of scrub;
- Water security and management;
- Land management.

Dense scrub was present along the length of a number of ditches included within the habitat assessments conducted in June and July 2017. This can render sections or entire watercourses unsuitable for southern damselfly where it results in heavy shading or complete enclosure of the channel, and is currently a key factor limiting the numbers and distribution of southern damselfly within a number of sites (e.g. Highbridge Farm, Dunford's Land, and West Horton Farm). However, although this issue is generally considered to be the most simple to address in the short-term, it is reliant on securing ongoing favourable management at the site to secure the long-term success of the enhancement / creation proposals.

Water security and management is generally a more difficult issue to address, since it is impacted by factors outside the control of the site (i.e. abstraction and water level management upstream), often requires agreement between two or more stakeholders, and requires careful investigation before modifications are made to the distribution of water across a site. Specifically, in previous habitat enhancement / creation projects the author has been involved with, there have been difficulties when trying to secure a formalised or increased supply of water from main river channels, and there remain concerns (as set out for a number of sites above) that re-distributing an existing supply of water could

have a negative impact on area of existing suitable habitat at the site. Therefore, it is essential when developing detailed designs of the relevant outline proposals provided within this report, that the proposals are designed to maximise the extent of suitable (i.e. perennially flowing) habitat based on the supply of water that can be secured with a high degree of confidence.

The development of scrub and / or tall monocotyledon vegetation on the banksides and bank tops at a number of sites is likely to be a consequence of under-management, whereas limitations on adult roosting sites is likely to a consequence of the opposite. It is considered that notable enhancements could be achieved at some sites purely through the implementation of grazing or a modified cutting regime. Furthermore, it is considered that physical enhancement / creation works proposed at some sites should only be implemented if an appropriate management regime can be agreed with the land / riparian manager. For example, unless there is certainty that these areas will be appropriately managed in the future, the removal of dense scrub or tall bankside vegetation will not result in suitable habitat for southern damselfly in the long term, and therefore the value of their delivery should be questioned.

It is considered that there are two key facets to securing the long term suitability of existing, enhanced and / or recently created suitable habitat:

- Securing the support of relevant persons / stakeholders;
- Land security.

The need for positive engagement with landowners, angling clubs or other relevant stakeholders is re-iterated throughout this strategic conservation plan. This is considered essential for protecting and consolidating its current status since, as outlined above, inappropriate management is considered to be a key factor in the dominance of unsuitable habitats at a number of the study sites (Rushbrook, 2018). Furthermore, as well as being essential for their delivery in the first instance, without the support of the relevant persons / stakeholders it is highly unlikely that any habitat enhancement and creation proposals delivered would be successful in the long-term. It is therefore essential that this support is achieved, and that the landowners and relevant others are in turn supported by local authorities, statutory bodies and non-statutory conservation bodies to secure successful delivery, by facilitating them to access relevant grants and other financial support (e.g. Countryside Stewardship Schemes, etc.).

Finally, should the opportunity arise, a potential mechanism for ensuring support would be through the collaboration of local authorities, statutory bodies and non-statutory conservation bodies to secure land for the purpose of the delivery of the habitat enhancement and creation proposals set out in this conservation plan. For example, Ashtrim Nursery was created through the collaboration of such organisations and is now considered to be strategically important in linking the strong population ‘hub’ at Highbridge Farm in the north of the study area, with strong populations at Allington Manor Farm and Itchen Valley Country Park in the south (Rushbrook, 2018).

19.2.2 Delivery of works

Although value and feasibility was considered, additional weight was afforded to the support / engagement category in the assessment of the potential likelihood that the proposed enhancement and creation opportunities could be delivered. This is considered to be a practical method for determining where resources should be directed when looking to take forward the delivery of the proposals set out in this conservation plan, since it is unrealistic to consider that these proposals will be successful in the long term, without the agreement and support of landowners, angling clubs and other relevant stakeholders.

There is a clear case that, given its status as an Annex II species that is a primary reason for the selection of the River Itchen as a SAC, the delivery of the strategic conservation plan for southern damselfly could focus on those proposals where there is a high value and / or feasibility of providing suitable habitat. However, it is considered likely that selection on this basis would alienate relevant persons / stakeholders, and would therefore result in a limited likelihood of success in the long-term.

As set out in Sections 3.3, assessment criteria scores for the feasibility of delivering the proposed habitat enhancement and creation opportunities represent relative (rather than absolute) values, and that within all categories of criteria (i.e. *value*, *feasibility* and *support*) assessments are based on the

situation as-is / the current knowledge of the author. Furthermore, a collaborative approach between the aforementioned organisations (see Section 19.2.1) could address perceived constraints to the delivery of a number of the proposed habitat enhancement and creation opportunities, either by improving their feasibility and / or the likely level support for their delivery. This would include (but not necessarily be limited to):

- Identifying potential appropriate mechanisms and funding streams to support the delivery of the strategic conservation plan;
- Providing resources and support to current landowners to address concerns in regards to the scale of works and therefore increasing the feasibility and (potentially) level of support for relevant habitat enhancement and creation proposals (i.e. where it is considered that a major or moderate scale of works is required);
- Where opportunities arise, securing land for the purpose of the delivery of the habitat enhancement and creation proposals, thereby ensuring relevant habitat enhancement and creation proposals would receive a high level of support;
- Combine resources and knowledge to maximise the value of any works undertaken by current or future landowners.

Finally, for the most successful implementation of the habitat enhancement and creation opportunities included in this strategic conservation plan, it is considered fundamentally important that these sites are considered in combination rather than isolation. Delivery of one proposal could influence the feasibility of works at others, particularly where either securing additional water or altering water level management is involved. Focus should be given to the delivery of a suite of proposals that will most effectively consolidate and strengthen the metapopulation dynamics of southern damselfly in the lower Itchen Valley. Specifically, the combination of measures selected should increase the size and / or number of populations, increase their connectivity, and by association reduce the reliance of the metapopulation on one or two strong populations for its long-term survival in this area.

19.3 Limitations and Future Strategic Conservation Planning

It is emphasised that the accuracy of the assessments included within this plan are based on the current knowledge of the author. More detailed investigation on hydrology, topography and the level of support and engagement afforded by relevant persons and stakeholders would greatly enhance the level of confidence that could be afford to these assessments. This should therefore be considered an on-going process, and it recommended that this conservation plan be developed and updated once there has been an opportunity to investigate these areas further.

20. CONCLUSION

A range of factors will need to be considered to secure the long-term conservation of southern damselfly within and around the Eastleigh Borough boundary. This is a consequence of the array of potential threats identified, including the direct loss of habitat through development, and the degradation of suitable habitats as a result of unsustainable abstraction, inappropriate water level management, and pollution driven changes in habitat structure and characteristics. However, the author considers that the loss and / or degradation of suitable habitat through a combination of inappropriate management practices (i.e. under-management and over-management) is a significant concern that requires tackling.

This conservation strategy has reviewed all the land within the study area to identify locations where habitat enhancement and conservation measures could be delivered to benefit southern damselfly. It is a general conservation strategy, and does not purport itself to define the extent of land required to mitigate the effects of Eastleigh Borough Council's Local Plan development and link road (in combination with other plans and programmes). Furthermore, it is recognised that any required mitigation of these may not include all the measures set out in this conservation strategy. This assessment, and an assessment of deliverability, will be undertaken to inform the full Habitat Regulations Assessment.

Notwithstanding this, it is considered that the delivery of habitat enhancement and creation works identified within the study area, both at sites supporting and those in-between existing southern damselfly populations, is crucial. Specifically, this combined approach would not only strengthen the resilience and robustness of the individual sites themselves, but also deliver an effective strategic approach to consolidate and expand the southern damselfly metapopulation in the lower part of the Itchen Valley. This approach is consistent with recommendations made for the wider Itchen Valley metapopulation by Rouquette (2005) in his detailed study of the conservation requirements of southern damselfly in chalkstream and fen habitats.

It is emphasised that collaboration between local authorities, statutory bodies, and non-statutory conservation bodies is essential to successfully deliver this strategic conservation plan for southern damselfly. These organisations must work closely with land managers / stakeholders to facilitate the delivery of long-term conservation measures for southern damselfly and, where opportunities arise, secure land for the purpose of the delivery of the identified habitat enhancement and creation proposals (see Section 19.2). This approach will address a number of constraints associated with the delivery of the proposed habitat enhancement and creations works at some sites (i.e. feasibility and / or level of support), and will be fundamental in maximising the extent and value of the habitat specific conservation measures delivered for southern damselfly within and beyond the Eastleigh Borough boundary.

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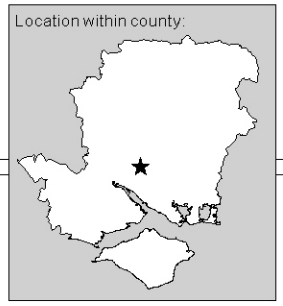
MAPS



Map 1. Results of site selection process

Southern Damselfly Study: Eastleigh Borough

Ordnance Survey basemap (1:50,000)

Arcadian

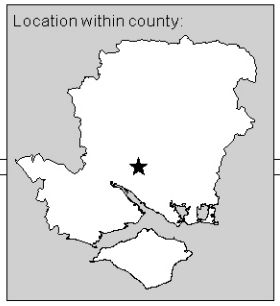
The Wildlife Trusts
Hampshire & Isle of Wight Wildlife Trust

Site included within study
Site scoped out of study
Site where access refused
River Itchen SAC
Eastleigh Borough boundary

N

For enquiries relating to GIS data contact Catherine McGuire, email Catherine.McGuire@hiwwt.org.uk, tel: 01489 774455.

Location within county:



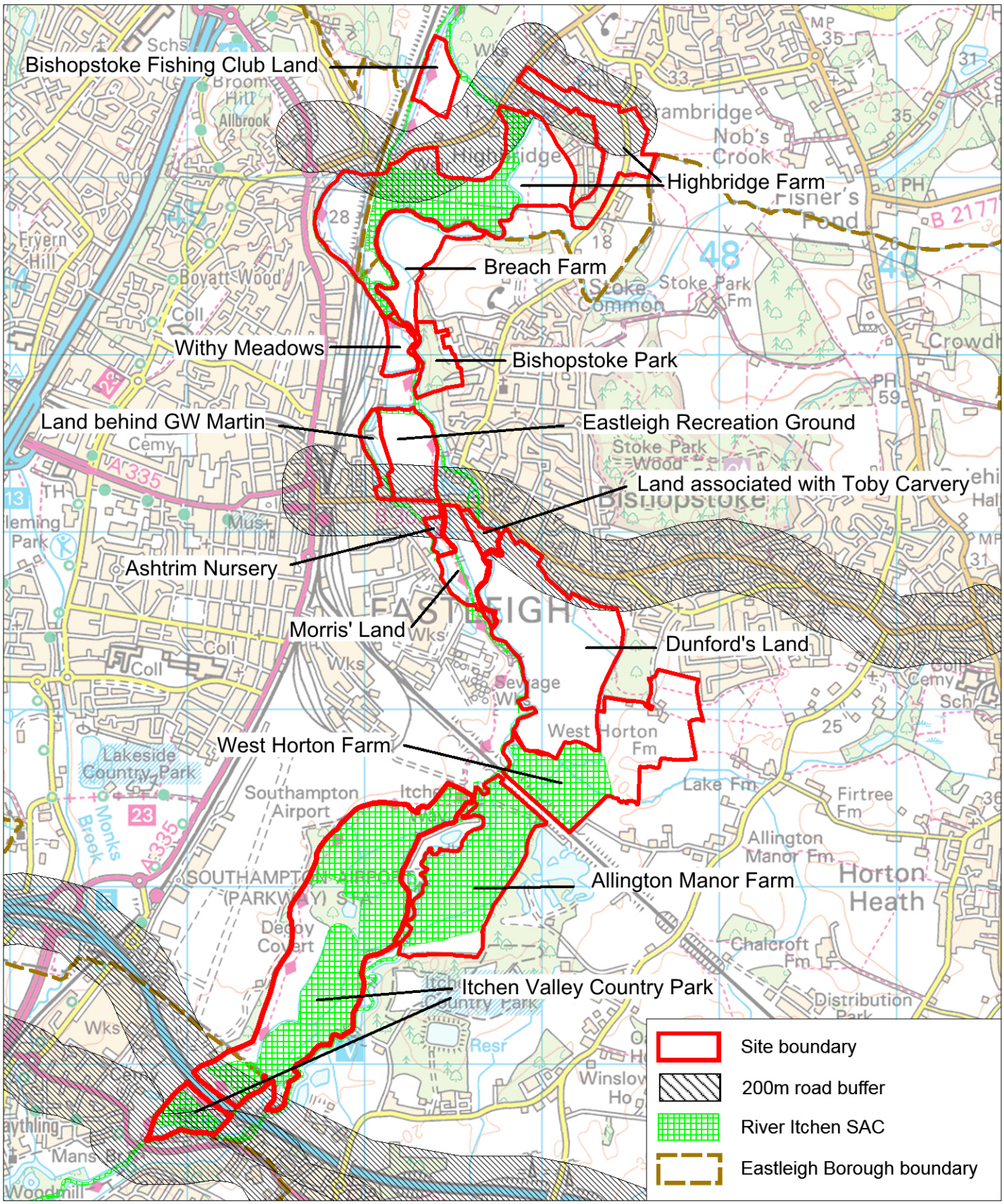
Map 2. Location of sites included within assessments

Southern Damselfly Study: Eastleigh Borough

Ordnance Survey basemap (1:50,000)

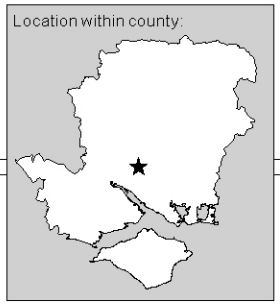
Arcadian

The Wildlife Trusts – Hampshire & Isle of Wight Wildlife Trust



N

BAP Priority habitat, notable species and SINC data supplied by the Hampshire Biodiversity Information Centre on behalf of the HBIC Partnership.
Aerial photography courtesy of GetMapping plc. Produced on 6 September 2017 by Ben Rushbrook
For enquiries relating to GIS data contact Catherine McGuire, email Catherine.McGuire@hiwwt.org.uk, tel: 01489 774455.



Map 3. Location of enhancement and creation proposals

Southern Damselfly Study: Eastleigh Borough

Ordnance Survey basemap (1:50,000)

Habitat enhancement proposal

Habitat creation proposal

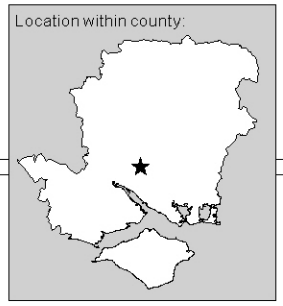
Site boundary

200m road buffer

River Itchen SAC

Eastleigh Borough boundary

N



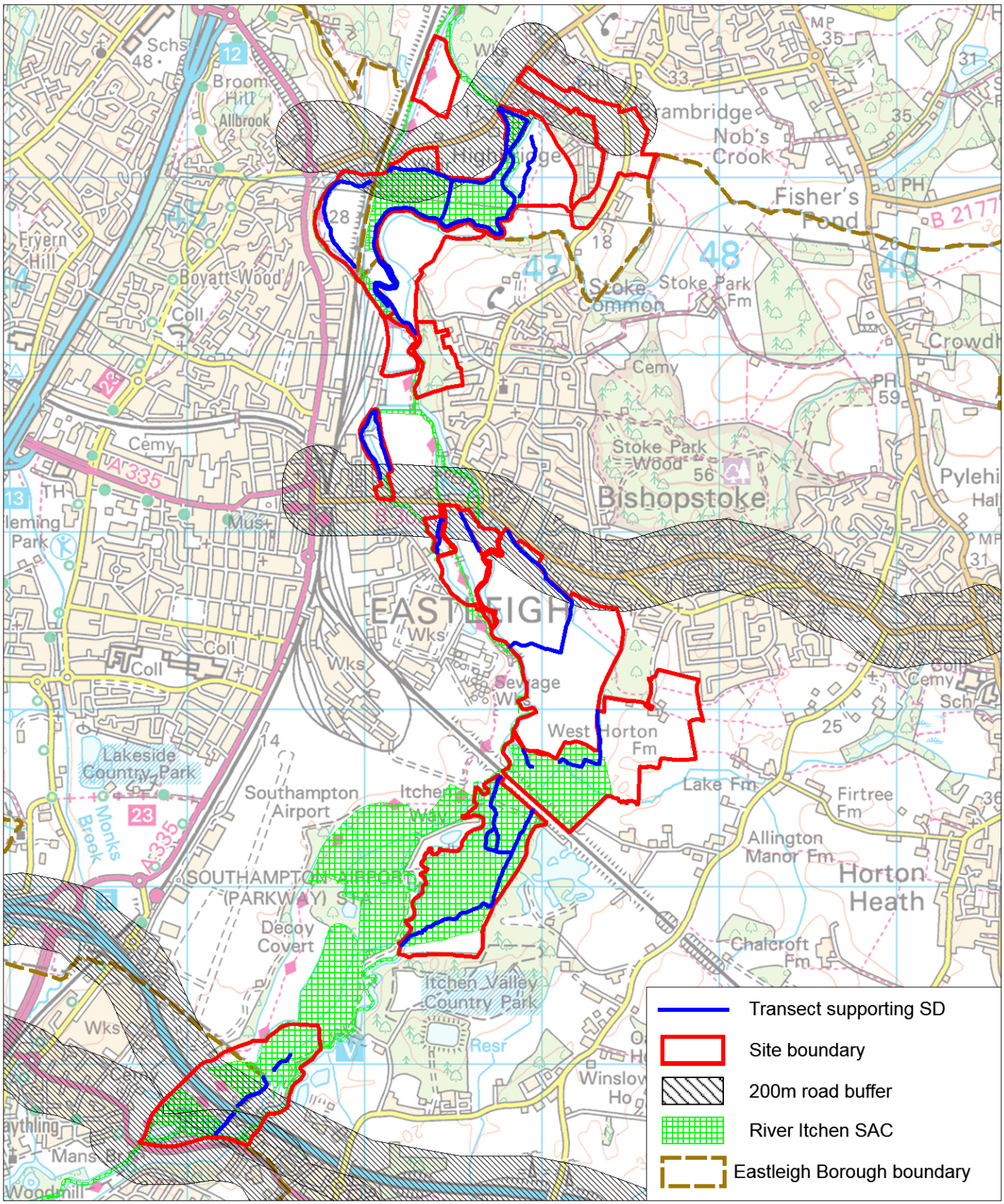
Map 4. Transects supporting southern damselfly

Southern Damselfly Study: Eastleigh Borough

Ordnance Survey basemap (1:50,000)

Arcadian

The Wildlife Trusts Hampshire & Isle of Wight Wildlife Trust



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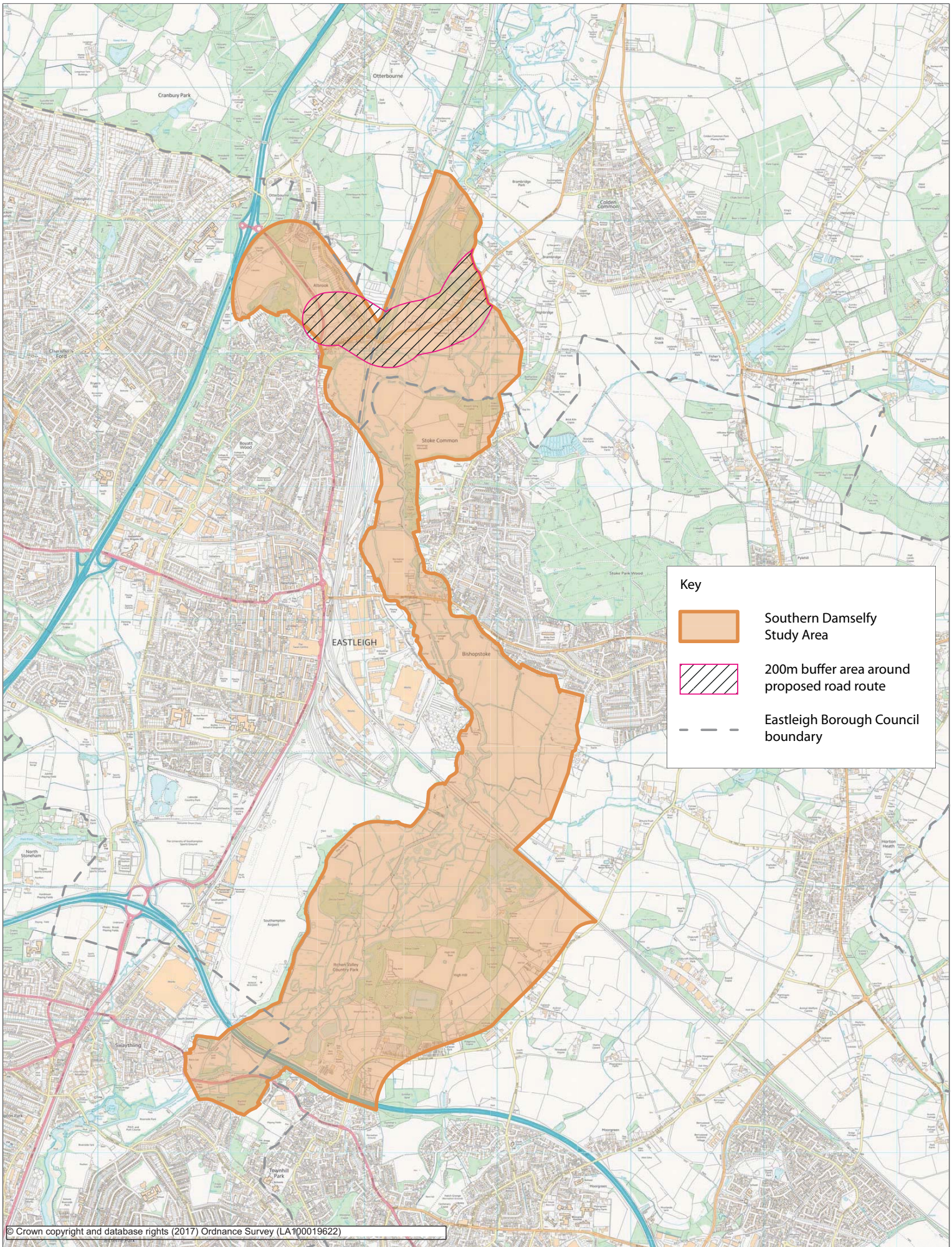
For enquiries relating to GIS data contact Catherine McGuire, email Catherine.McGuire@hiwwt.org.uk, tel: 01489 774455.

APPENDICES

Appendix 1:
Southern damselfly study area



EASTLEIGH BOROUGH COUNCIL

Implementation & Design

Title:

Southern Damselfly Study Area

Scale:
1:25000

Map Ref:
SU4618

Date:
16/05/2017

N

Appendix 2:

Results of habitat assessments (taken from Rushbrook, 2018)

Appendix 2: Results of habitat assessments (taken from Rushbrook, 2018).

Site Name & Transect No.	Length (m)	Watercourse Type	Habitat Suitability	Habitat Enhancement Potential	Entire Length Accessible
Bishopstoke FC - T1	194	Ditch	Unsuitable	Low	No
Bishopstoke FC - T2	213	Ditch	Unsuitable	Low	Yes
Bishopstoke FC - T3	360	Ditch	Unsuitable	Low	No
Bishopstoke FC - T4	279	Ditch	Unsuitable	Low	No
Bishopstoke FC - T5	97	Ditch	Largely unsuitable	Low to Moderate	Yes
Highbridge Farm - T1	421	Carrier Stream	Sub-optimal	High	Yes
Highbridge Farm - T2a	103	Carrier Stream	Sub-optimal	High	No
Highbridge Farm - T2b	149	Carrier Stream	Sub-optimal	High	No
Highbridge Farm - T2c	397	Carrier Stream	Unsuitable	Moderate	Yes
Highbridge Farm - T3	229	Carrier Stream	Optimal to sub-optimal	High	Yes
Highbridge Farm - T4	1382	Main River†	Optimal‡	Low to Moderate	Yes
Highbridge Farm - T5	1075	Main River†	Optimal‡ to sub-optimal	Low to Moderate	Yes
Highbridge Farm - T6	191	Carrier Stream	Unsuitable	Unsuitable	No
Highbridge Farm - T7	200	Ditch	Unsuitable	Moderate	Yes
Highbridge Farm - T8	85	Ditch	Unsuitable	Unsuitable	No
Highbridge Farm - T9	372	Ditch	Sub-optimal to unsuitable	High	No
Highbridge Farm - T10	548	Ditch	Unsuitable	Unsuitable	No
Highbridge Farm - T11	200	Ditch	Unsuitable	Unsuitable	No
Highbridge Farm - T12	189	Ditch	Unsuitable	Unsuitable	No
Highbridge Farm - T13	34	Ditch	Unsuitable	Unsuitable	No
Highbridge Farm - T14	247	Ditch	Unsuitable	Unsuitable	No
Highbridge Farm - T15	198	Ditch	Unsuitable	Unsuitable	No
Highbridge Farm - T16	97	Ditch	Unsuitable	Unsuitable	No
Highbridge Farm - T17	162	Ditch	Unsuitable	Unsuitable	Yes
Highbridge Farm - T18	81	Ditch	Unsuitable	Unsuitable	Yes
Highbridge Farm - T19	248	Ditch	Unsuitable	Moderate	Yes
Highbridge Farm - T20	-	Ditch	DNS	DNS	DNS
Highbridge Farm - T21	-	Ditch	DNS	DNS	DNS
Highbridge Farm - T22	506	Ditch	Unsuitable	Moderate	Yes
Highbridge Farm - T23	139	Ditch	Unsuitable	Moderate	Yes
Highbridge Farm - T24	354	Ditch	Unsuitable	Moderate	Yes
Highbridge Farm - T25	228	Ditch	Unsuitable	Moderate	Yes
Highbridge Farm - T26	-	Ditch	DNS	DNS	DNS
Highbridge Farm - T27	66	Ditch	Unsuitable	Unsuitable	No
Highbridge Farm - T28	46	Ditch	Unsuitable	Unsuitable	No
Highbridge Farm - T29	28	Ditch	Unsuitable	Unsuitable	No

Site Name & Transect No.	Length (m)	Watercourse Type	Habitat Suitability	Habitat Enhancement Potential	Entire Length Accessible
Highbridge Farm - T30	136	Ditch	Unsuitable	Unsuitable	No
Highbridge Farm - T31	357	Ditch	Unsuitable	Low	Yes
Highbridge Farm - T32	759	Carrier Stream	Largely unsuitable	Low	No
Highbridge Farm - T33	50	Ditch	Unsuitable	Moderate	No
Highbridge Farm - T34	150	Ditch	Unsuitable	Unsuitable	No
Highbridge Farm - T35	362	Ditch	Unsuitable	Unsuitable	No
Breach Farm - T1a	-	Main River	DNS	DNS	DNS
Breach Farm - T1b	-	Main River	DNS	DNS	DNS
Breach Farm - T1c	661	Main River[†]	Sub-optimal[‡] to unsuitable	Moderate	Yes
Breach Farm - T2	834	Carrier Stream	Unsuitable	Moderate	No
Breach Farm - T3	224	Ditch	Unsuitable	Unsuitable	Yes
Breach Farm - T4	243	Ditch	Unsuitable	Unsuitable	Yes
Withy Meadows - T1	389	Ditch	Unsuitable	Moderate	No
Withy Meadows - T2	168	Ditch	Unsuitable	Unsuitable	No
Bishopstoke Park - T-	-	-	-	-	-
GW Martin - T1	431	Stream	Optimal to sub-optimal	High	Yes
GW Martin - T2	339	Stream	Largely unsuitable	Low	No
Ashtrim Nursery - T1	200	Ditch	Optimal to sub-optimal	Moderate	Yes
Ashtrim Nursery - T2	74	Ditch	Unsuitable	Low	Yes
Morris' Land - T1	192	Ditch	Unsuitable	Low	No
Morris' Land - T2	133	Ditch	Unsuitable	Low	No
Morris' Land - T3	66	Ditch	Unsuitable	Moderate	Yes
Morris' Land - T4	106	Ditch	Unsuitable	Moderate	Yes
Morris' Land - T5	80	Ditch	Unsuitable	Low	No
Morris' Land - T6	237	Ditch	Largely unsuitable	Low	Yes
Toby Carvery - T1	88	Ditch	Unsuitable	Unsuitable	No
Dunford's Land - T1	553	Carrier Stream	Sub-optimal to unsuitable	Low	No
Dunford's Land - T2	559	Carrier Stream	Sub-optimal to unsuitable	Low	No
Dunford's Land - T3	490	Carrier Stream	Sub-optimal to unsuitable	Low	No
Dunford's Land - T4	488	Ditch	Unsuitable	Unsuitable	No
Dunford's Land - T5	253	Ditch	Unsuitable	Unsuitable	No
Dunford's Land - T6	202	Ditch	Unsuitable	Unsuitable	No
Dunford's Land - T7	492	Ditch	Unsuitable	Unsuitable	No
Dunford's Land - T8	-	Ditch	DNS	DNS	DNS

Site Name & Transect No.	Length (m)	Watercourse Type	Habitat Suitability	Habitat Enhancement Potential	Entire Length Accessible
Dunford's Land - T9	295	Ditch	Unsuitable	Unsuitable	No
Dunford's Land - T10	293	Carrier Stream	Unsuitable	Unsuitable	No
Dunford's Land - T11	316	Carrier Stream	Unsuitable	Unsuitable	No
Dunford's Land - T12	-	Carrier Stream	DNS	DNS	DNS
Dunford's Land - T13	187	Ditch	Unsuitable	Unsuitable	No
Dunford's Land - T14	195	Ditch	Unsuitable	Unsuitable	No
West Horton Farm - T1	233	Carrier Stream	Largely unsuitable	High	No
West Horton Farm - T2	317	Ditch	Unsuitable	High	No
West Horton Farm - T3	207	Carrier Stream	Unsuitable	High	No
West Horton Farm - T4	465	Carrier Stream	Largely unsuitable	High	No
West Horton Farm - T5	169	Carrier	Unsuitable	Unsuitable	No
West Horton Farm - T6	188	Ditch	Unsuitable	High	Yes
West Horton Farm - T7	114	Ditch	Unsuitable	High	Yes
West Horton Farm - T8	186	Carrier Stream	Unsuitable	Moderate	No
West Horton Farm - T9	374	Carrier Stream	Unsuitable	Unsuitable	No
West Horton Farm - T10	300	Ditch	Unsuitable	Low	Yes
Allington Manor - T1	640	Carrier Stream	Optimal to sub-optimal	Low	Yes
Allington Manor - T2	73	Ditch	Unsuitable	Unsuitable	No
Allington Manor - T3	561	Carrier Stream	Optimal to sub-optimal	Moderate	Yes
Allington Manor - T4	159	Ditch	Unsuitable	Unsuitable	No
Allington Manor - T5	75	Ditch	Unsuitable	Unsuitable	No
Allington Manor - T6	131	Ditch	Unsuitable	Unsuitable	No
Allington Manor - T6a	718	Ditch	Unsuitable	Unsuitable	No
Allington Manor - T7	169	Ditch	Unsuitable	Low	No
Allington Manor - T8	871	Ditch	Unsuitable	Low	Yes
Allington Manor - T9	577	Ditch	Unsuitable	Low	No
Allington Manor - T10	208	Ditch	Unsuitable	Low	No
Allington Manor - T11	491	Ditch	Unsuitable	Low	No
Allington Manor - T12	186	Ditch	Unsuitable	Low	No
Allington Manor - T13	132	Ditch	Largely optimal	Low	Yes
Allington Manor - T14	24	Ditch	Unsuitable	Unsuitable	Yes
Allington Manor - T15	113	Ditch	Unsuitable	Unsuitable	Yes
Allington Manor - T16	88	Ditch	Unsuitable	Unsuitable	Yes
Allington Manor - T17	447	Carrier Stream	Optimal to sub-optimal	Moderate	No
Allington Manor - T18	144	Carrier Stream	Sub-optimal	Moderate	No
Allington Manor - T19	56	Ditch	Unsuitable	Unsuitable	No

Site Name & Transect No.	Length (m)	Watercourse Type	Habitat Suitability	Habitat Enhancement Potential	Entire Length Accessible
Allington Manor - T20	150	Ditch	Unsuitable	Unsuitable	Yes
Allington Manor - T21	51	Ditch	Unsuitable	Unsuitable	Yes
Allington Manor - T22	125	Ditch	Unsuitable	Unsuitable	Yes
Allington Manor - T23	80	Ditch	Unsuitable	Unsuitable	No
Allington Manor - T24	37	Ditch	Unsuitable	Unsuitable	Yes
Allington Manor - T25	411	Ditch	Unsuitable	Low	No
Allington Manor - T26	443	Ditch	Unsuitable	Low	Yes
Allington Manor - T27	46	Ditch	Unsuitable	Low	Yes
Allington Manor - T28	75	Ditch	Unsuitable	Low	Yes
Allington Manor - T29	127	Ditch	Unsuitable	Low	Yes
Allington Manor - T30	-	Ditch	DNS	DNS	DNS
Allington Manor - T31	87	Ditch	Unsuitable	Unsuitable	Yes
Itchen Valley CP - T1	136	Carrier Stream	Sub-optimal to unsuitable	Moderate	No
Itchen Valley CP - T2	262	Ditch	Largely unsuitable	Low	No
Itchen Valley CP - T3	157	Carrier Stream	Unsuitable	Low	No

† Assessment was focused on habitats present along one bank only

‡ In the context of a large river channel

DNS – Did not survey

Appendix 3:

Criteria scores and results of habitat enhancement assessments (based on Table 2)

Appendix 3: Criteria scores and results of habitat enhancement assessments (based on Table 2).

Site Name & Transect No.	Value				Feasibility					Support		Current Enhancement Potential
	Extent	Strategic Value	Threats	Assessment of Value	Perennial water flow	Scale of works	Sustainability	Ecological considerations	Assessment of Feasibility	Level of support	Assessment of Support	
Bishopstoke FC - T1	2	4	n/a	High	3	1	1	1	Low	1	Not Supported	Very Low
Bishopstoke FC - T2	3	4	n/a	High	1	1	1	1	Low	1	Not Supported	Very Low
Bishopstoke FC - T3	3	4	n/a	High	1	1	1	1	Low	1	Not Supported	Very Low
Bishopstoke FC - T4 + T5	3	4	n/a	High	3	2	1	1	Moderate	2	Unlikely	Low
Highbridge Farm - T1	3	3	4	High	4	2	2	3	Moderate	3	Moderate	High
Highbridge Farm - T2a + 2b	3	3	4	High	4	2	3	2	Moderate	3	Moderate	High
Highbridge Farm - T3	3	3	4	High	4	2	3	2	Moderate	3	Moderate	High
Highbridge Farm - T7	3	3	4	High	4	1	3	2	Moderate	2	Unlikely	Low
Highbridge Farm - T9	3	3	4	High	3	1	2	2	Moderate	3	Moderate	Moderate
Highbridge Farm - T19	3	1	4	Moderate	1	2	3	3	Moderate	2	Unlikely	Low
Highbridge Farm - T32	4	3	3	High	1	1	2	2	Low	2	Unlikely	Low
Highbridge Farm - T33	2	1	4	Moderate	2	2	2	2	Moderate	2	Unlikely	Low
Breach Farm - T2	4	4	3	High	3	1	3	3	Moderate	1	Not Supported	Very Low
Withy Meadows - T1	3	4	n/a	High	2	1	4	3	Moderate	3	Moderate	High
GW Martin - T1	3	4	2	High	4	2	2	2	Moderate	2	Unlikely	Low
GW Martin - T2	3	4	2	High	4	1	1	1	Moderate	1	Not Supported	Very Low
Ashtrim Nursery - T1	3	4	2	High	4	3	2	4	High	4	Likely	High
Ashtrim Nursery - T2	2	1	2	Moderate	1	2	3	4	Moderate	1	Not Supported	Very Low
Morris' Land - T6	3	4	n/a	High	1	1	1	2	Low	1	Not Supported	Very Low
Dunford's Land - T1	4	4	3	High	4	1	1	1	Moderate	1	Not Supported	Very Low
Dunford's Land - T2	3	4	3	High	4	1	1	2	Moderate	2	Unlikely	Low
Dunford's Land - T3	3	4	3	High	4	1	1	2	Moderate	2	Unlikely	Low

Site Name & Transect No.	Value				Feasibility					Support		Current Enhancement Potential
	Extent	Strategic Value	Threats	Assessment of Value	Perennial water flow	Scale of works	Sustainability	Ecological considerations	Assessment of Feasibility	Level of support	Assessment of Support	
West Horton Farm - T1	3	4	4	High	4	2	2	2	Moderate	3	Moderate	High
West Horton Farm - T2	3	4	4	High	1	2	2	2	Moderate	3	Moderate	Moderate
West Horton Farm - T3	3	4	4	High	3	2	2	2	Moderate	3	Moderate	Moderate
West Horton Farm - T4	3	4	4	High	4	1	2	2	Moderate	3	Moderate	Moderate
West Horton Farm - T6	2	4	4	High	2	2	3	3	Moderate	3	Moderate	Moderate
West Horton Farm - T7	2	4	4	High	2	2	3	3	Moderate	3	Moderate	Moderate
West Horton Farm - T8	2	4	4	High	4	2	2	2	Moderate	2	Unlikely	Low
West Horton Farm - T10	3	4	4	High	1	1	3	4	Moderate	1	Not Supported	Very Low
Allington Manor - T1	4	3	1	Moderate	4	3	4	3	High	3	Moderate	High
Allington Manor - T3	4	3	1	Moderate	4	2	4	2	High	2	Unlikely	Low
Allington Manor - T7	2	3	1	Moderate	1	1	4	2	Moderate	2	Unlikely	Low
Allington Manor - T8	4	1	1	Moderate	1	2	4	3	Moderate	2	Unlikely	Low
Allington Manor - T9	4	1	1	Moderate	1	2	4	3	Moderate	2	Unlikely	Low
Allington Manor - T10	3	1	1	Moderate	1	2	4	3	Moderate	2	Unlikely	Low
Allington Manor - T11	2	1	1	Low	1	1	4	2	Moderate	2	Unlikely	Very Low
Allington Manor - T12	2	1	1	Low	1	1	4	2	Moderate	2	Unlikely	Very Low
Allington Manor - T17	3	3	1	Moderate	4	2	4	3	High	3	Moderate	Moderate
Allington Manor - T18	2	3	1	Moderate	4	2	4	3	High	3	Moderate	Moderate
Allington Manor - T25	3	3	1	Moderate	1	1	4	3	Moderate	1	Not Supported	Very Low
Allington Manor - T28	3	3	1	Moderate	1	1	4	3	Moderate	1	Not Supported	Very Low
Allington Manor - T29	3	3	1	Moderate	1	1	4	3	Moderate	1	Not Supported	Very Low

Appendix 4:

Criteria scores and results of habitat creation assessments (based on Table 2)

Appendix 4: Criteria scores and results of habitat creation assessments (based on Table 2).

Site Name & Area Name	Value				Feasibility					Support		Current Creation Potential
	Extent	Strategic Value	Threats	Assessment of Value	Perennial water flow	Scale of works	Sustainability	Ecological considerations	Assessment of Feasibility	Level of support	Assessment of Support	
Highbridge Farm - HFA1	n/a	3	4	High	1	1	3	3	Moderate	3	Moderate	Moderate
Breach Farm - BFA1	n/a	4	3	High	1	1	3	3	Moderate	2	Unlikely	Low
Breach Farm - BFA2	n/a	4	3	High	3	1	3	3	Moderate	2	Unlikely	Moderate
Withy Meadows - WMA1	n/a	4	n/a	High	2	1	4	3	Moderate	3	Moderate	High
GW Martin - GWA1	n/a	4	2	High	3	1	2	2	Moderate	3	Moderate	Moderate
Easteligh RG - ERA1	n/a	4	n/a	High	3	1	1	2	Moderate	3	Moderate	Moderate
Morris' Land - MA1	n/a	4	n/a	High	3	1	2	2	Moderate	1	Not Supported	Very Low
Morris' Land - MA2	n/a	4	n/a	High	3	1	2	1	Moderate	1	Not Supported	Very Low
Morris' Land - MA3	n/a	4	n/a	High	3	1	2	2	Moderate	1	Not Supported	Very Low
Toby Carvery - TCA1	n/a	4	n/a	High	3	1	2	2	Moderate	1	Not Supported	Very Low
Dunford's Land - DA1	n/a	4	3	High	3	1	2	2	Moderate	2	Unlikely	Low
Dunford's Land - DA2	n/a	4	3	High	1	1	1	3	Low	2	Unlikely	Low
Dunford's Land - DA3	n/a	4	3	High	3	1	1	2	Moderate	2	Unlikely	Low
West Horton Farm - WHA1	n/a	4	4	High	1	1	4	3	Moderate	2	Unlikely	Moderate
Allington Manor - AMA1	n/a	3	1	Moderate	2	1	4	2	Moderate	2	Unlikely	Low
Allington Manor - AMA2	n/a	3	1	Moderate	3	1	4	2	Moderate	2	Unlikely	Low

Appendix 5:

Technical Note: assessment of habitat creation opportunities for southern damselfly at land near Eastleigh

Hampshire & Isle of Wight Wildlife Trust

Technical Note

Assessment of habitat creation opportunities for southern damselfly at land near Eastleigh

Ben Rushbrook

October 2015

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APPENDICES

INTRODUCTION

Background

The Environment Agency is assessing the feasibility of undertaking river restoration measures on the Barton River, a side channel of the Itchen Navigation near Eastleigh in Hampshire, and of the adjacent floodplain. A range of proposed restoration measures are currently under consideration, including (but not limited to) the removal, installation or modification of structures, channel narrowing, channel realignment, bed level raising, and the creation of a ditch network(s) within the adjacent floodplain.

Southern Damselfly

The southern damselfly (Figure 1) is one of Europe's rarest and most threatened species of damselfly (Thompson *et al*., 2003), and is listed on Schedule 5 of the Wildlife and Countryside Act 1981 (as amended) and Annex II of the European Council Directive 92/43/EEC (the Habitats Directive 1992).

Figure 1: Photograph of a southern damselfly taken at the Itchen Valley Country Park.

The River Itchen, River Test, and more specifically their associated historic water meadow systems are considered of national importance for southern damselfly (Thompson *et al.*, 2003; Rouquette, 2005; personal observations). The presence of this species is a primary reason for the selection of the River Itchen and areas of associated floodplain as Sites of Special Scientific Interest (SSSIs) and as a Special Area of Conservation (SAC).

Southern damselfly have been recorded on the Barton River by the Environment Agency, and are known to have colonised a small ditch network on the adjacent floodplain that was created by the Environment Agency and Eastleigh Borough Council in 2009 (Appendix 1).

A detailed account of the habitat requirements of southern damselfly on chalk river systems (e.g. water meadow ditches) is provided by Rouquette (2005), but key habitat features indicating favourable conditions include:

- A constant (perennial) slow to moderate flow of water;
- Channel substrate consisting primarily of silt and detritus;
- Presence of a broad fringe of herbaceous emergent dicotyledon plants along margins, especially water-cress *Rorippa nasturtium-aquaticum* and fool's water-cress *Apium nodiflorum*;
- Presence of some areas of open water (i.e. ditch not completely choked by vegetation);
- Largely (but not necessarily completely) unshaded by bankside shrubs and trees.

Scope of Work

Hampshire and Isle of Wight Wildlife Trust (hereafter the 'Trust') were contracted by the Environment Agency to identify potential habitat enhancement / creation opportunities for southern damselfly to be included for consideration as part of the proposed restoration of the Barton River and associated floodplain.

Specifically, the Trust was appointed to undertake walkover surveys of two sites to identify potential opportunities to a) enhance existing features of the Barton River to increase its suitability for southern damselfly, and b) identify areas of the adjacent floodplain where opportunities to create new habitat for southern damselfly may exist.

During these walkover surveys, a note was made of the presence of other matters identified that may potentially require consideration. However, it is emphasised that it was outside the remit of this work to survey for, or provide an assessment of any potential effect of the proposed works on, any other protected or notable species or habitats.

Objectives

The objective of this technical note is to assess the current suitability of the existing features to support southern damselfly, and outline potential opportunities for habitat enhancement and creation. These are to be included for consideration within the proposed restoration of the Barton River and associated floodplain. These opportunities are based on the findings of walkover surveys undertaken by Dr Ben Rushbrook at the two study sites in August 2015.

SITE DESCRIPTIONS

Land off Dutton Lane

This site is located to the east of Dutton Lane (Figure 2), with the Barton River flowing along the northern and western boundary of the site. The site is separated from the Eastleigh Recreation Ground to the east by a tall wire fence with a dense band of trees and tall scrub between. In addition, a carrier stream runs roughly parallel to the eastern site boundary for approximately two thirds of the boundary's length. Statutory and non-statutory sites designated for nature conservation are present within the site boundary.

<u>Barton River</u>

The Barton River forms part of the River Itchen SSSI and SAC, and is designated as 'main river' by the Environment Agency.

The character of the Barton River within the site varies along its length. The upper reaches, where the channel forms the northern boundary, are relatively wide and deep, with slow to sluggish flow, some submerged vegetation, and prominent silt bars. The true right bank is dominated by tall herbs (primarily willowherbs *Epilobium* spp.) with localised willow *Salix* spp. and hazel *Corylus avellana* scrub that occasionally completely overhangs the channel. The true left bank supports a strip of vegetation dominated by common reed *Phragmites australis* and common nettle *Urtica dioica*, with a mown path set immediately back from the bank top.

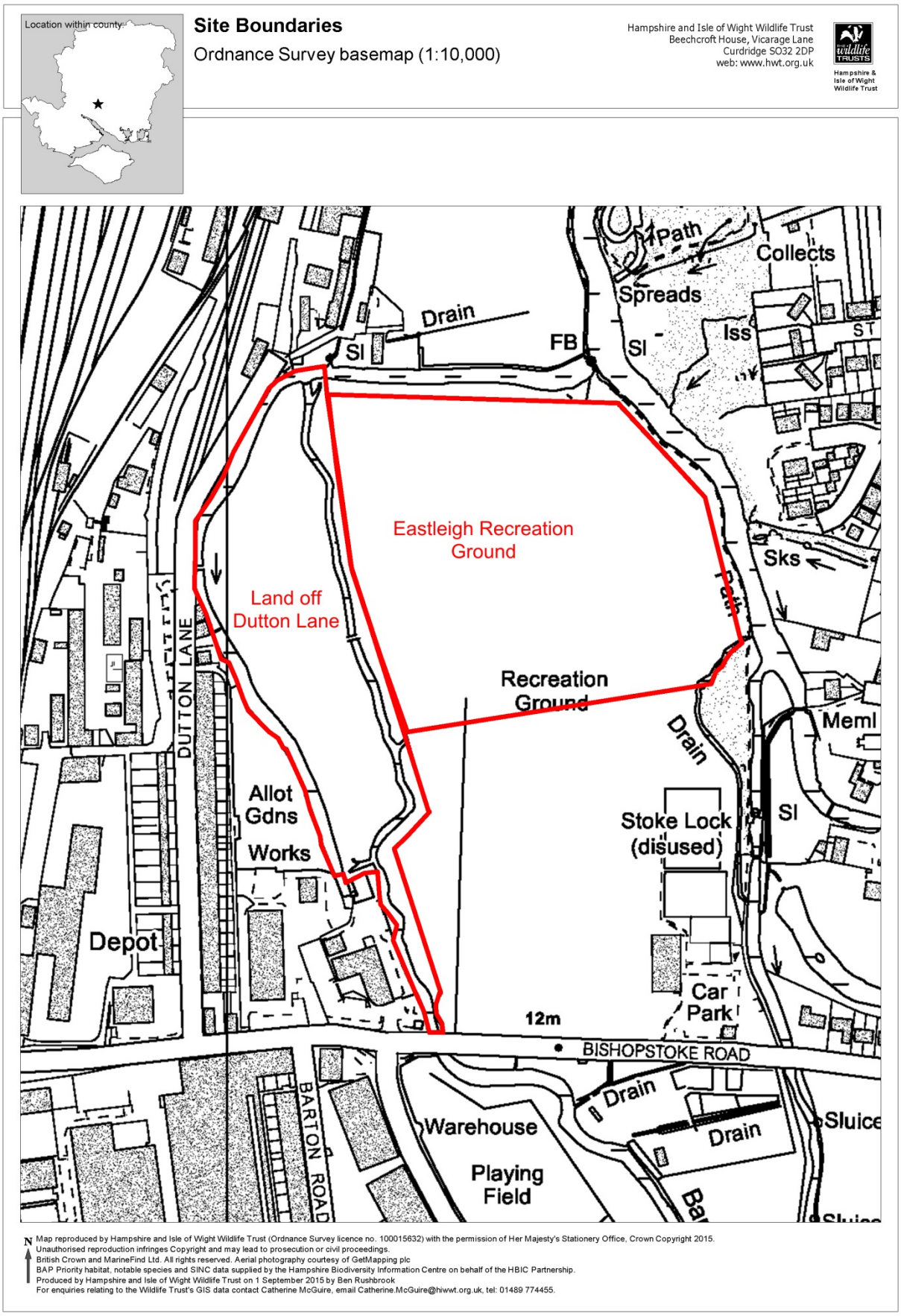


Figure 2: Map showing site locations.

As the channel becomes the western boundary it is separated from Dutton Lane by a tall metal fence. The channel is narrower, supporting a moderate to high flow (depending on channel width) and occasional sections with areas of dense in-channel emergent vegetation including watercress, water speedwell *Veronica* c.f. *anagallis-aquatica* and branched bur-reed *Sparganium erectum*. The river bed substrate is dominated by silt, with occasional gravel sections.

The true right bank is varied, with sections supporting tall vegetation including herbs, common reed and bulrush *Typha* sp., sections dominated by scrub that occasionally completely overhangs the channel, and sections comprising of hard-engineered reinforced banksides associated with the adjacent residential properties (Figure 3). The true left bank initially remains similar to the section above, but becomes increasingly wide (over 3m) with a silt bar or berm dominated by dense marginal (emergent) vegetation including sedges *Carex* spp. reed-sweet grass *Glyceria maxima* and common nettle. Furthermore, intermittent dense areas of emergent watercress and water speedwell extend into the channel (Figure 3). The true left bank top along the western boundary of the site appears to be perched above the channel, potentially a consequence of historic in-channel management.

Figure 3: Section of the Barton River.

The channel then becomes wider and more variable in depth, with long sections of shallow water and a gravel dominated substrate, and some areas of deeper water and silt locally present. Flow rates correspond to this variation in stream depth, with sections of shallower water supporting moderate to fast flowing water with patches of water-crowfoot *Ranunculus* sp. and water starwort *Callitriche* spp. The true right bank is dominated by mature trees including oak *Quercus robur*, willow and hazel, which shade long sections of the channel. The true left bank top is dominated by a 1-2m strip of common nettle with occasional areas of reed-sweet grass, and remains perched above the channel.

In the lower (southern) third of the site the channel turns sharply north-east (Figure 2), flowing through a narrow sluice and over a medium-sized (approximately 80cm) weir. The channel downstream of the structure is relatively wide, enclosed with dense tree cover, and within a short distance merges with the carrier stream (see below) and turns sharply south flowing down to the Bishopstoke Road. Based

on the velocity of water through the sluice, the height of the weir and general design of this structure, it is considered likely that this structure will obstruct upstream migration of fish and invertebrates.

Carrier stream

A large weir, with a steep to vertical profile, is located in the north-east corner of the site and supplies water from the Barton River to the carrier stream. The carrier stream is designated as 'main river' by the Environment Agency, and flows along the majority of the eastern boundary of the site. Based on the velocity of water across the weir, and the size and design of this structure, it is considered highly likely that this structure will obstruct upstream migration of fish and invertebrates.

The carrier stream is generally 3–5m in width, with a medium-fast flow, and is almost completely shaded by overhanging willow. Where short sections of unshaded channel are present, these are largely choked by dense, tall emergent vegetation. The stream bed and banks are predominantly comprised of silt, but with areas overlain by gravels, and there is evidence of extensive burrowing in sections of the stream bank. It is considered likely that this indicates the presence of the invasive non-native signal crayfish *Pacifastacus leniusculus* at the site, which is known to be present in the Itchen Navigation upstream at Brambridge (personal observation).

Floodplain meadow

The majority of the site is comprised of the floodplain meadow (Figure 4), located between the two watercourses. The floodplain meadow, carrier stream, and bank top beyond constitute the *Swamp West of Recreation Ground* Site of Importance for Nature Conservation, a non-statuary site designation for nature conservation. It is designated under criteria 5A, which are areas of open freshwater (e.g. lakes, ponds, canals, rivers, streams and ditches, etc) that support outstanding assemblages of floating / submerged / emergent plant species, invertebrates, birds or amphibians.

Figure 4: Large area of rank grassland within the floodplain meadow.

With the exception of the mown path associated with the watercourses, the floodplain meadow appears to be unmanaged (Figure 4). The centre of the meadow is dominated by tall rank grasses

and thistle, with a dry reed bed to the north, dense scrub to the south, and long bands of common nettle, bindweed and / or hemp-agrimony *Eupatorium cannabinum* running parallel to the mown pathways.

Though a detailed botanical list was not collected, it is considered reasonably likely that the site supports only common and widespread plant species, which have predominantly formed species-specific or single species dominated communities which are of limited ecological value.

Eastleigh Recreation Ground

The site forms part of the Eastleigh Recreation Ground, situated to the east of Eastleigh and to the north of the Bishopstoke Road. The walkover survey was concentrated on the playing fields in the north of the Recreation Ground (Figure 2), an area subject to flooding during periods of high water levels in the Itchen Navigation / Barton River. The site itself is adjacent to the land off Dutton Road to its west, bound by the Barton River and Itchen Navigation to the north and east respectively, and further playing fields to the south. Though not present within the site boundary, statutory and non-statutory sites designated for nature conservation are located adjacent to the site and are included within the wider study area.

Playing field

The playing field (Figure 5) is dominated by closely mown amenity grassland, primarily supporting common and widespread grass species such as fescues *Festuca* sp., meadow grasses *Poa* sp., bent's *Agrostis* sp. and cock's-foot *Dactylis glomerata*. The playing field is surrounded to the north and east by rows of planted trees including ash *Fraxinus excelsior*, poplars *Populus* sp. and willows. Coarse grasses, bramble and ruderal vegetation such as common nettle and thistles are locally dominant beneath. The site is separated from the Land off Dutton Lane to the west by a band of dense scrub, between 1.5m and 3m in height, and a metal fence line present within the scrub marks the formal boundary.

Figure 5: Playing field in the north of the Eastleigh Recreation Ground.

Barton River

The Barton River is located immediately to the north of the site (Figure 2), forms part of the River Itchen SSSI and SAC, and is designated as 'main river' by the Environment Agency. The channel is relatively wide (3-6m), is dominated by silt that has accumulated into deep bars in places, and has a slow to moderate flow in an east to west direction. The channel is generally shaded by scrub and semi-mature trees on both bank tops, and as a consequence has only limited emergent or marginal vegetation. The understory of the southern bank is dominated by ruderal vegetation and sprawling scrub vegetation.

Itchen Navigation

The Itchen Navigation forms part of the River Itchen SSSI and SAC, and is designated as 'main river' by the Environment Agency.

The Itchen Navigation is located to the east of the site and is separated from the playing fields by a further band of scrub / ruderal vegetation and a public footpath. The channel is wide, has a variable depth along the length that runs adjacent to the playing field, with resulting variability in substrate and vegetation growth. A disused offtake structure is located to the north-east of the site (Figure 6), which appears to act as an avenue for water to enter the site during periods of high flow. Furthermore, a number of partially repaired breaches are present along this length of the Itchen Navigation, with evidence that these have historically acted as a route for water to enter the site.

Figure 6: Existing offtake structure associated with the Itchen Navigation.

ASSESSMENT AND PROPOSALS

The proposals outlined within this section are based on the findings of the initial walkover survey and on LiDAR (Light Detection and Ranging) data provided by the Environment Agency. It is emphasised that a more detailed topographic survey will be required to confirm their feasibility and suitability.

Furthermore, it was outside the remit of this work to survey for, or provide an assessment of any potential effect of the proposed works on, any other protected or notable species or habitats.

Land off Dutton Lane

Short sections of the Barton River provide sub-optimal habitat for southern damselfly. However, it is considered that neither the carrier stream nor the floodplain meadow provide any suitable habitat characteristics or features for southern damselfly in their existing condition.

This site is considered to provide a number of potential opportunities for both habitat enhancement (i.e. Barton River) and habitat creation (i.e. floodplain meadow). These are illustrated on Figure 7, and summarised in the sections below.

Habitat enhancement potential

Three potential options have been identified based on the findings of the walkover survey, and the details of each are outlined below.

Option E1 focuses on the management of the floodplain meadow (Figure 7). Currently, the floodplain is dominated by tall monocotyledon plants and ruderal vegetation, and even with the creation of a new channel(s) for southern damselfly (see options C1 – C3 below) the site would still be considered unsuitable based on the lack of suitable habitat for adults. Southern damselfly, particularly the adults, prefer vegetation at the bankside and on the adjacent land that has a more heterogeneous sward structure, for example as is typically associated with lightly grazed (water) meadows.

It is therefore recommended that the site is managed by extensive grazing with cattle, as this is considered the most effective method to break up the thatch generated by the existing rank grassland species / reeds, remove nutrients from the system, and encourage the growth of more suitable vegetation such as tussock grasses and rushes. Furthermore, the use of the correct density of cattle should help develop and maintain favourable bankside profiles on any newly created ditches (see below).

If this is not considered feasible, then a cut and remove regime will need to be developed. This regime is likely to initially require a number of cuts each year to remove the existing dominant vegetation types, though the level of management should decrease with time (3-5 years).

Options E2 requires the management of the dense monocotyledon vegetation on the marginal berm that has developed on the true left bank of the Barton River (Figure 7). This is initially likely to be difficult due to the extent of the vegetation and the underlying soft substrate conditions. This will initially need to be achieved through cut and removal, though could be undertaken in conjunction with the regular weed cuts undertaken on the River Itchen during the summer. On-going control of this would then need to be included within the management regime selected in option E1.

Option E3 recommends the selective removal of semi-mature trees and scrub from the true right bank to allow sunlight to reach the channel and promote the growth of plant species such as watercress, water speedwell and water-forget-me-not *Myosotis scorpioides*. These are all species that are utilised by southern damselfly larvae for refuge, and by adults for oviposition.

Habitat creation potential

Four potential options have been identified and the details of each are outlined below. These options have been designed to maximise the potential length of new habitat created, rather than following defined low points within the floodplain meadow. This is a consequence of the fact that, though the LiDAR data provided a clear outline of the general gradient of the land, it did not provide clear information on distinct routes for water to be transferred across the site in a suitable design. The lack of clarity of the LiDAR data is potentially due to historic movement of material across the site.

Option C1 involves the installation of a new offtake structure in the upper reaches of the Barton River. This will supply water to a newly created meandering channel (Figure 7) that will flow from the north-west to the south-east of the site, largely avoiding the area currently dominated by reed. The installation of a new outflow structure will be required, though it is considered that this could discharge either directly into the lower reaches of the Barton River, or the lower reaches of the carrier stream.

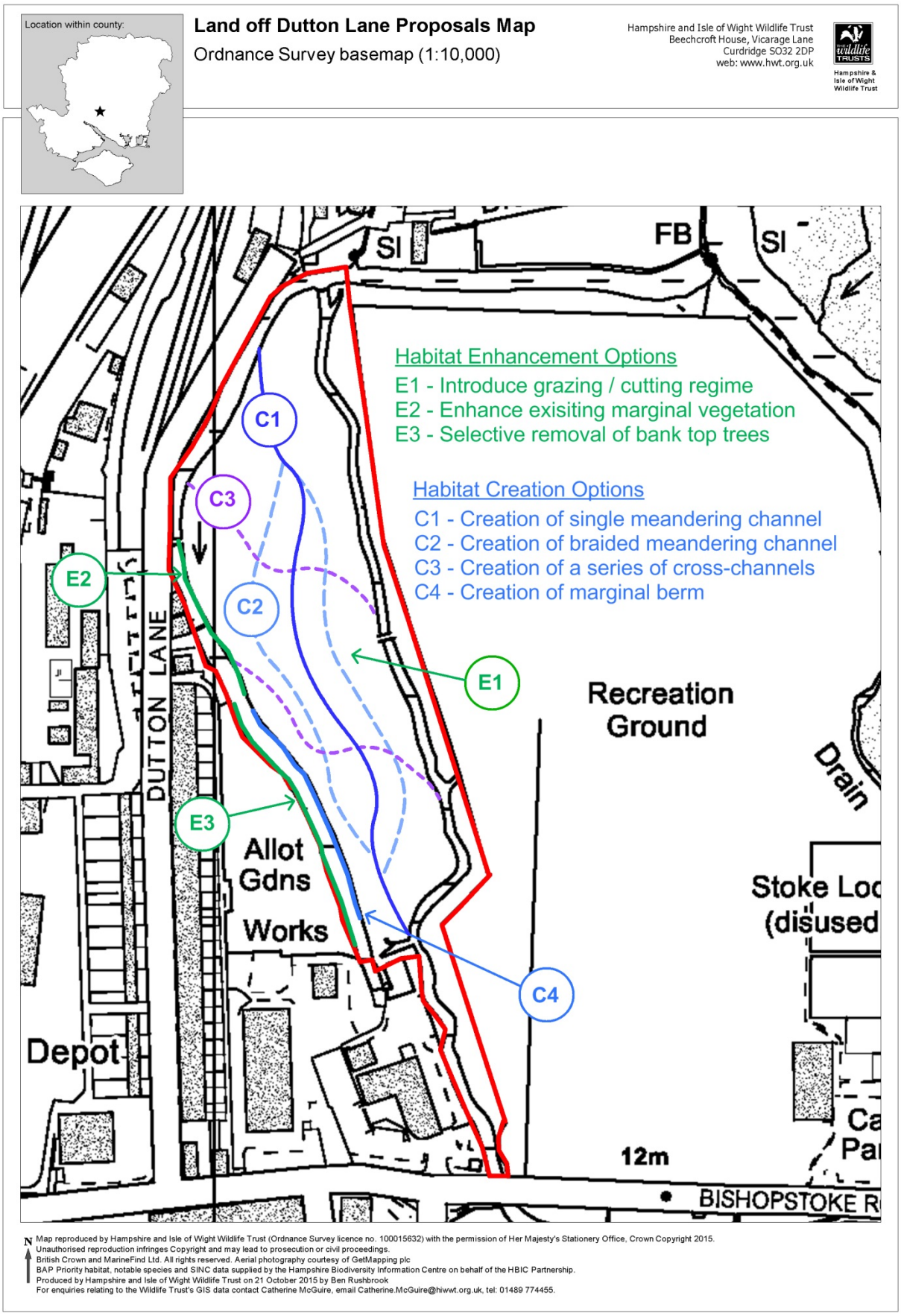


Figure 7: Opportunities for habitat enhancement and creation at Land off Dutton Lane.

Option C2 involves the installation of offtake and outflow structures in the same locations as those outlined above for option C1 (Figure 7). However, if sufficient water supply is available, it is recommended that the channel is braided and that water flows through two distinct channels for the majority of its length to increase the extent of habitat created.

Option 3 involves the creation of a number of cross-channels that transfer water from the Barton River to the carrier stream (Figure 7). This will involve the installation of the corresponding number of offtake and outflow structures.

Option 4 involves the creation of a new two stage channel along a section of the true left bank by re-profiling the existing vertical face to create a marginal berm. This, implemented in combination with enhancement option E3, will encourage the deposition of silt and development of marginal vegetation suitable for southern damselfly larvae and oviposition.

For all options, it is recommended that the construction of the ditch profile is based on one or more of the schematics provided in Appendix 2.

Other considerations

Statutory and non-statutory sites designated for nature conservation are present within the site boundary, and will be directly affected by a number of the proposed habitat enhancement and creation options. Consultation with the relevant statuary bodies will therefore be required, and it is considered highly likely that the proposals will need to demonstrate that the measures implemented will not be to the detriment of the interest features included within these designations, and may be required to be implemented under consent(s). Furthermore, the Barton River and the carrier stream are designated as 'main river' by the Environment Agency, and the relevant consents may be required to undertake these proposals.

The floodplain meadow is currently dominated by a substantial amount of rank vegetation. Though it is recommended that this is managed through grazing (preferred) or a cutting regime (alternative) in the long term, it is recommended that the material is cut and removed from the site prior to works, as this will allow the removal of nutrients and thatch from the system and provide a more favourable starting point for the future management regime to operate from.

The creation of a new ditch / ditch system within in the floodplain meadow will generate a degree of spoil. There may be the potential to spread this across existing excavated / low lying areas within the site, but will require more formal consideration if / when potential habitat creation options are being assessed

A number of mature trees are present on the true right bank, and it is recommended that these are excluded from any proposed tree removal.

A mown path provides a circular walk around the site. Habitat creation options C1 – C3 will obstruct access / recreational use around the site and, if it is desired that the current level of access / recreational use around the site is maintained, structures such as bridges (preferred) or culverts (alternative option) will need to be included within the works.

Finally is considered likely that the non-native signal crayfish is present within the carrier stream and / or the Barton River. It is therefore fundamentally important that adequate biosecurity measures are implemented in association with any works undertaken as part of the proposed river restoration for the Barton River. Further details on biosecurity recommendations are provided below.

Eastleigh Recreation Ground

It is considered that none of the habitats within the site boundary provide any suitable habitat characteristics or features for southern damselfly in their existing condition.

This site is considered to provide potential opportunities for both habitat enhancement and habitat creation. These are illustrated on Figure 8, and summarised in the sections below.

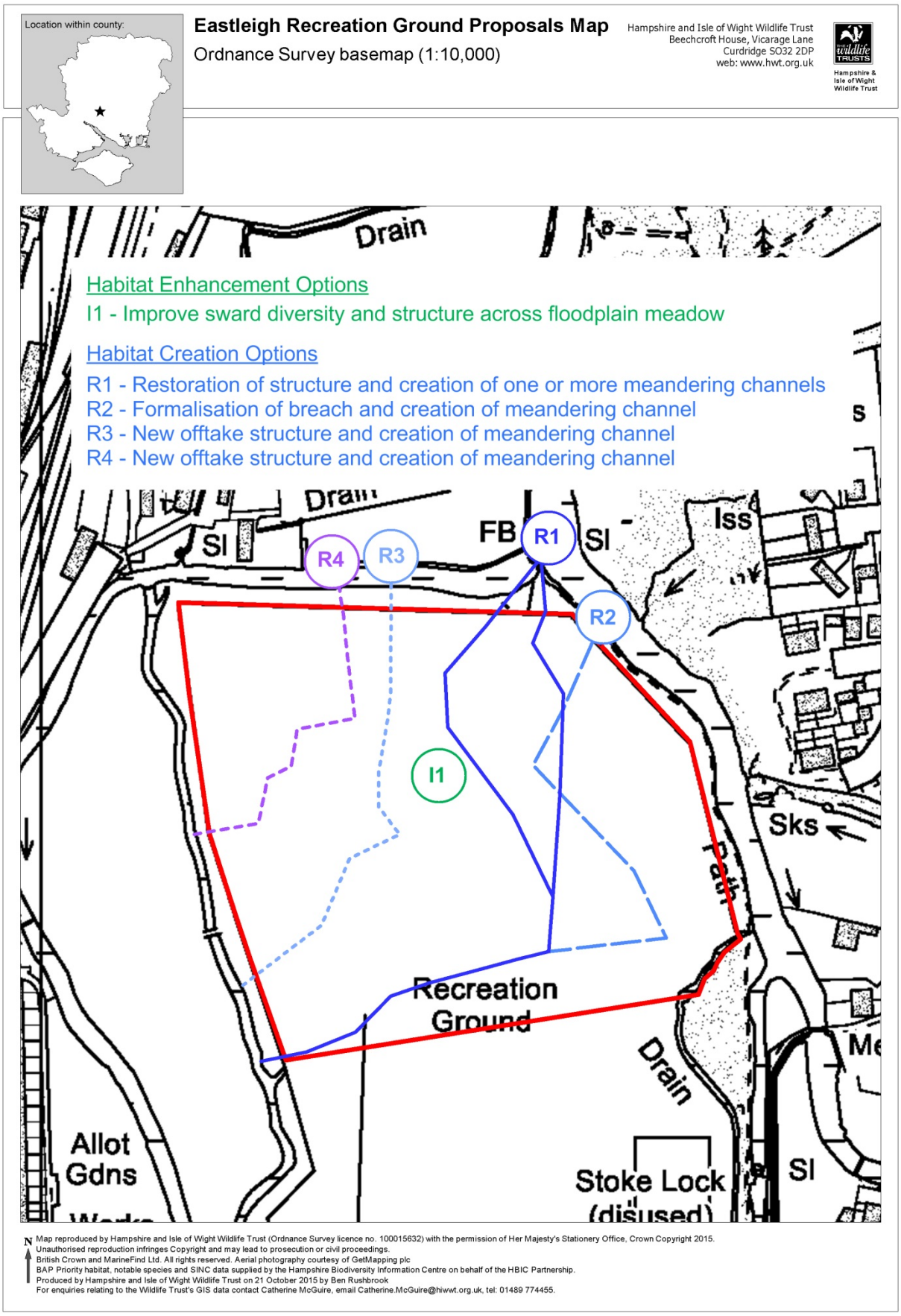


Figure 8: Opportunities for habitat creation at Eastleigh Recreation Ground

Habitat enhancement potential

A single potential option has been identified based on the findings of the walkover survey, the details of which are outlined below. However, it is emphasised that this will only enhance the site for southern damselfly if delivered in combination with one or more of the potential habitat creation options outlined below.

Option I1 focuses on the enhancement of the diversity and structure of the vegetation across the amenity grassland (Figure 8). Prior to the commencement of works, it is recommended that the amenity grassland is enclosed within stock proof fencing, and extensively grazed with cattle to facilitate the breaking up of the existing low, dense sward, and the development of a more open heterogeneous character.

Following the completion of any ditching works, it is recommended that this process is supplemented by the sowing of 'green hay', collected from a source of native species at a site of local provenance, and preferably within the Itchen Valley. If feasible, it is recommended that it is undertaken across the site; however, if there is insufficient resources, sowing should be focused in association with areas of ditch creation, with a sown strip of at least 10m adjacent to the ditch. Furthermore, it is recommended that cattle grazing is returned to the site immediately after this process to assist the establishment of the seeded areas.

Finally, it is recommended that the site is managed in the long-term with an extensive cattle grazing regime to allow for the development and then maintenance of a more diverse and structurally heterogeneous sward.

Habitat creation potential

Four potential options have been identified and the details of each are outlined below. These options have been designed based on the interpretation of LiDAR data provided by the Environment Agency.

However, it is apparent that the site has a variable topography with a number of areas of low ground and, as outlined above, these options will require ground-truthing through a more detailed topographic survey.

Option R1 includes the restoration of an existing structure (Figure 6) on the true right bank of the Itchen Navigation, and the installation of a new outflow structure on the carrier stream in the Land off Dutton Lane (Figure 8). This will supply water to a braided channel that follows existing low points through the playing fields. This option will also include scrub removal associated with the northern boundary of the playing fields, and the band of scrub between the two sites.

Option R2 includes the installation of a new offtake structure to formalise a perceived high flow breach on the true right bank of the Itchen Navigation, and the installation of a new outflow structure on the carrier stream in the Land off Dutton Lane (Figure 8). This will supply water to a single channel that follows existing low points through the playing fields, potentially connecting to the channel included within option R1 in the south of the site (Figure 8). This option will also include scrub removal associated with the northern boundary of the playing fields, and the band of scrub between the two sites.

Options R3 and R4 include the installation of individual new offtake structures from the true left bank of the Barton River, and the installation of a new outflow structure on the carrier stream in the Land off Dutton Lane. These options will supply water to two separate channels that follow existing low points through the playing fields. These options will also include scrub removal associated with the Barton River and northern boundary of the playing fields, and the band of scrub between the two sites.

It is recommended that the construction of the ditch profile is based on one or more of the schematics provided in Appendix 2.

Other considerations

Statutory sites designated for nature conservation are present adjacent to the site boundary, and will be directly affected by a number of the proposed habitat creation options. Consultation with the relevant statuary bodies will therefore be required, and it is considered highly likely that the proposals

will need to demonstrate that the measures implemented will not be to the detriment of the interest features included within these designations, and may be required to be implemented under consent(s). Furthermore, the Itchen Navigation, the Barton River and the carrier stream are designated as 'main river' by the Environment Agency, and the relevant, consents may be required to undertake these proposals.

The site is currently used by a range of different recreational users. All the habitat creation options outlined above will obstruct access around the site and, if it is desired that the current level of access / recreational use around the site is maintained, structures such as bridges (preferred) or culverts (alternative option) will need to be included within the works.

Furthermore, the creation of a new ditch / ditch system within in the existing playing fields will generate a degree of spoil. There may be the potential to spread this across existing excavated / low lying areas within the site, but will require more formal consideration if / when potential habitat creation options are being assessed.

Habitat creation options R1 and R2 require the transfer of water from the Itchen Navigation to the Barton River system. Though this water will be returned to the Itchen Navigation approximately 1.2km downstream, this may considered undesirable by other interest groups. Furthermore, it may be considered appropriate to include measures that inhibit fish passage (i.e. grills) from the Barton Carrier to the Itchen Navigation and vice versa, and this may require the consideration of associated measures such as the inclusion of weed screens or barriers.

Finally it is considered likely that the non-native signal crayfish is present within the Itchen Navigation and / or the Barton River. It is therefore fundamentally important that adequate biosecurity measures are implemented in association with any works undertaken as part of the proposed river restoration for the Barton River. Further details on biosecurity recommendations are provided below.

BIOSECURITY

It is considered highly likely that the invasive non-native signal crayfish is present within the channel and banks of the three watercourses included within this study. Therefore, any measure implemented within the proposed restoration that directly contacts / effects the watercourses, their beds or banks, will require the implementation of stringent biosecurity measures to minimise the risk of transferring signal crayfish or the disease crayfish plague (that they are carriers of) from the site. It is important to note that it is an offence under the Wildlife and Countryside Act 1981 (as amended) to 'release or allow to escape' signal crayfish into the wild. It is considered that the implementation of the biosecurity safeguards / mitigation measures recommended below will minimise the risk of such an offence being committed.

Particular risks include the movement of personnel, equipment and machinery to and from the site(s), and the disposal of spoil or in-channel / bankside vegetation that may harbour signal crayfish or crayfish plague.

It is strongly recommended that a stringent biosecurity protocol is agreed between all the relevant statutory bodies and stakeholders during the early stages of the feasibility study for all elements of the river restoration work potentially under consideration. It is recommended that measures to be discussed / implemented should include, but not be limited to:

- All site staff must be briefed with regards to the (potential) presence of signal crayfish on the site and must be familiar with the recommendations set out within this section;
- A number of biosecurity measures must be put in place to ensure that neither non-native crayfish nor the crayfish plague is transferred to or (if present) from the site;
- No crayfish, either live or dead, should be removed from the site. Emphasise to all staff that it is illegal to trap any species of crayfish without a licence from the Environment Agency, and it is illegal to move any species of crayfish to a new site without written permission from Natural England;

- It is highly likely that any bank side material removed as part of the works will contain (potentially a large number of) signal crayfish and no material should be removed from the site. It is recommended that guidance is sought from the statutory bodies with regards to -
    - (Natural England / Environment Agency) the necessity and recommended measures required to dispose of potentially a large number of signal crayfish; and
    - (Environment Agency) the proximity to the watercourse that the material can be deposited to ensure that any undetected signal crayfish return to the existing population (rather than spread outwards) but meet other regulatory conditions (i.e. Flood Defence Consent).
- Where practicable staff should not move between sites. If this is not feasible, staff must thoroughly clean, disinfect / treat with hot water and where feasible dry their equipment (i.e. waders, wellington boots, etc) both before entering the site and before moving to a new site.
- All large equipment and machinery should be cleaned with hot water where feasible, and allowed to dry both prior to arriving on site and before being transferred to a new site.
- If stocking with aquatic plants or incorporating inorganic material, do not use material or stockists from watercourses that support non-native crayfish.

SUMMARY AND CONCLUSIONS

Based on the findings of a walkover survey and the interpretation of LiDAR data, three and one potential habitat enhancement options have been identified on the Land off Dutton Lane site and Eastleigh Recreation Ground respectively. Furthermore, four potential habitat creation options have been identified on each of the two sites included within this study. As outlined above, the feasibility of all these proposals will need to be validated through more detailed topographic survey and analysis of water supply availability.

A number of additional considerations have been identified during this study including:

- water availability and potential transfer between systems;
- requirement of fish grills and weed screens / barriers;
- spoil generation;
- removal of existing rank vegetation material;
- retention of mature trees;
- access and current recreational use;
- biosecurity.

Although it has been demonstrated that the presence of signal crayfish can have a negative impact on macroinvertebrates communities (Crawford *et al*., 2006), southern damselfly are present and often found in large numbers in ditch networks adjacent to sections of the River Itchen known / believed to support signal crayfish. It is therefore considered that the presence of this invasive non-native species will not prevent these works from providing potential opportunities for southern damselfly. However, it is strongly recommended that a stringent biosecurity protocol for all elements of the river restoration work potentially under consideration is agreed between all the relevant statutory bodies and stakeholders during the early stages of the feasibility study.

In conclusion, based on the existing information it is recommended that all proposed habitat enhancement options be included in the next stage of feasibility assessment. Furthermore, it is considered that the delivery of habitat creation works at either site will provide potential opportunities that could benefit southern damselfly, irrespective of whether works are completed at the other site. However, it should be recognised that all options (R1 – R4) associated with the creation of ditches at Eastleigh Recreation Ground will require some works within the eastern boundary of Land off Dutton Lane. Furthermore, it is emphasised that the implementation of works at both sites in combination has the potential to provide substantially greater potential opportunities.

It is recommended that habitat creation options C1 and C2 be considered as the preferred options within the next stage of feasibility assessment for Land off Dutton Lane, with the latter the favoured option if sufficient water supply can be secured. In addition, it is strongly recommended that option C4

should be considered in combination with option E3, as the implementation of both is required to maximise the benefit gained from each individually. Furthermore, it is emphasised that to maximise the potential benefit achieved through the implementation of any of the other habitat creation options, the establishment of an agreed appropriate management regime of the adjacent floodplain (E1) is required. Finally, it is considered that the implementation of either the enhancement options E1 – E3 only, or the enhancement options and habitat creation option C4, will potentially provide limited and moderate benefits for southern damselfly respectively. However, it is emphasised that their implementation in combination with one of the habitat creation options (C1 – C3) is likely to provide significantly greater opportunities.

Finally, it is recommended that all habitat creation options for the Eastleigh Recreation Ground be considered within the next stage of the feasibility assessment and, if sufficient water supply can be secured, that at least one of options R1 / R2 and R3 / R4 be implemented. The delivery of one or more these habitat creation options should be implemented in combination with habitat enhancement option I1 to ensure there is suitable habitat for all stages of southern damselfly life history, and therefore maximise its ability to support a robust 'colony' of this species.

REFERENCES

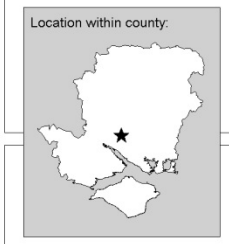
Rouquette, J.R. (2005). *Conservation requirements of the southern damselfly in chalkstream and fen habitats*. Science Report SC000017/SR, Environment Agency, Bristol.

Thompson, D.J., Rouquette, J.R. & Purse, B.V. (2003). *Ecology of the southern damselfly*. Conserving Natura 2000 Rivers Ecology Series No.8, English Nature, Peterborough.

APPENDICES

Appendix 1:

Data search of an area around Eastleigh Recreation Ground

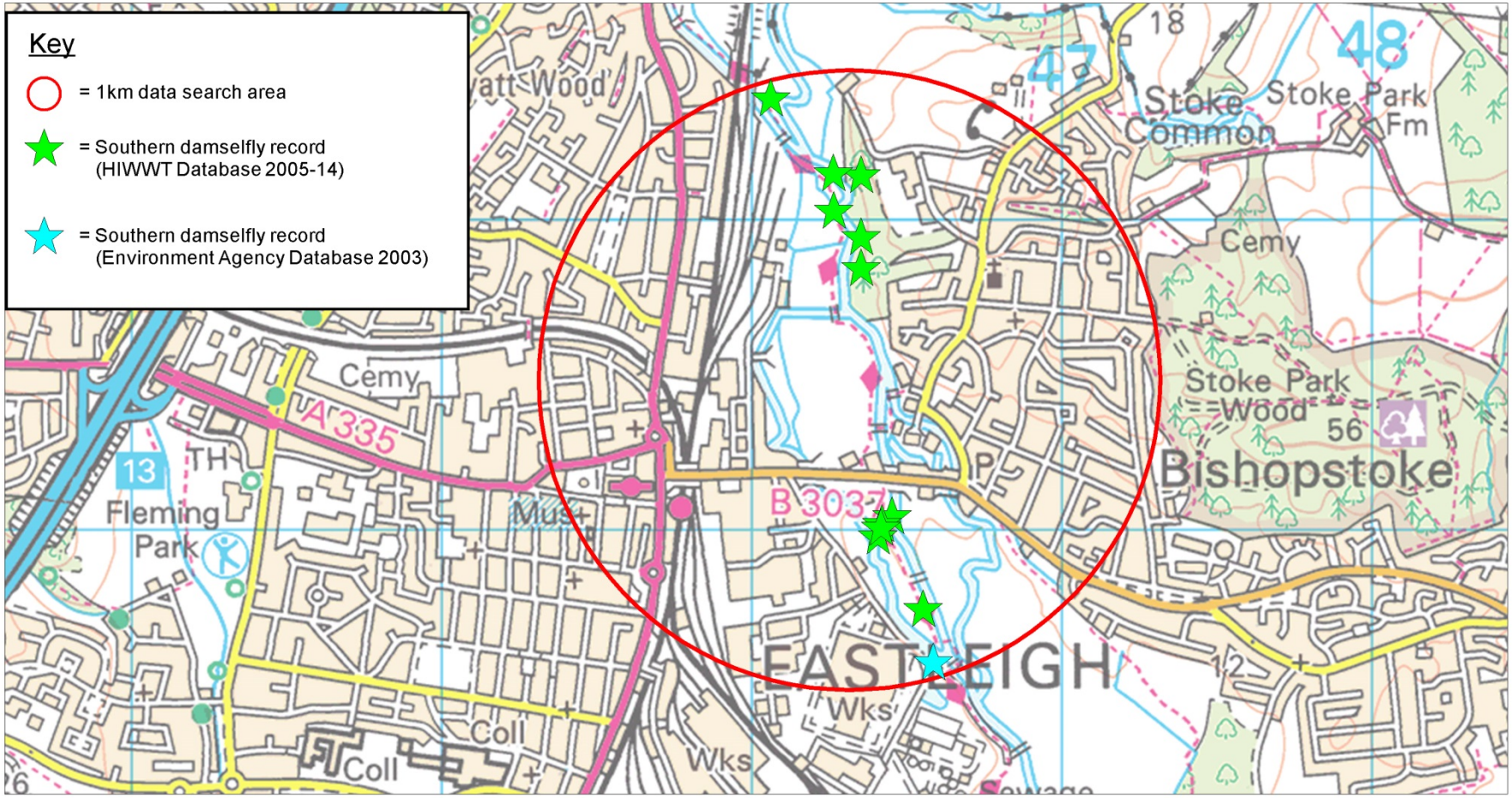


Data search of an area around Eastleigh Recreation Ground

Ordnance Survey basemap (1 : 50,000)

Hampshire and Isle of Wight Wildlife Trust
Beechcroft House, Vicarage Lane
Curdridge, Hampshire
SO32 2DP

Hampshire & Isle of Wight Wildlife Trust



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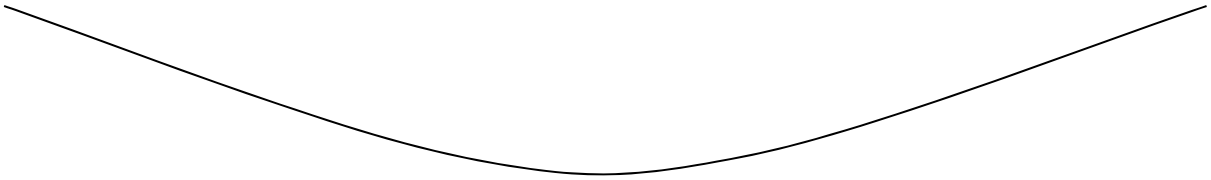
Produced by Hampshire and Isle of Wight Wildlife Trust on 17 February 2015 by Ben Rushbrook For enquiries relating to the Wildlife Trust's GIS data contact Catherine McGuire, email Catherine.McGuire@hiwwt.org.uk, tel: 01489 774455.

Appendix 2:
Schematics of proposed ditch profiles

Newly Created Ditch Profile – option 1



Newly Created Ditch Profile – option 2

Modified Ditch Profile