KINGSMERE ECOLOGICAL MONITORING REPORT 2018

COUNTRYSIDE PROPERTIES (BICESTER) PLC

SEPTEMBER 2018

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Summary

Terence O'Rourke Ltd was appointed by Countryside Properties (Bicester) Plc to produce an Ecological Management Plan (EMP) in February 2009 for the land surrounding Whiteland's Farm, which is located to the south-west of Bicester, Oxfordshire (grid reference SP 570 219). Targeted botanical monitoring surveys of specific habitats are being undertaken annually along with targeted faunal surveys undertaken once every two years to assess the effectiveness of the EMP.

Botanical monitoring surveys of the translocated calcareous grassland, informal grassland areas, woodlands, hedgerows, Pingle Brook and wetland areas were undertaken in 2018. No targeted faunal surveys were conducted in 2018.

Botanical monitoring surveys

Translocated calcareous grassland

Due to the expansion of the Bellway Homes development, the area of translocated calcareous grassland has significantly contracted in size and now covers an area of approximately 0.2 ha. The grassland within the translocation plot mostly comprises a species-poor sward dominated by coarse grasses, however a low number of desireable calcioles are maintaining their presence within the sward in limited abundance. During the 2018 survey visit the grassland was found to have been recently cut to ground level with the majority of arsings removed, it was also considerably dried out due to the extended period of warm weather. These conditions made it difficult to undertake an accurate assessment of the sward composition and condition and to identify species, consequently only a poor data set was recorded from the quadrat samples and this was not considered to be suitable for NVC analysis. Management recommendations for the calcareous grassland plot are provided in section 4.3.

Informal grassland areas

Following a review of the grassland survey design the informal grassland monitoring quadrats were re-located to different areas of informal grassland on site in July 2018. Quadrats 1-5 were re-located within an area of informal grassland off Whitelands

Way and quadrats 6-10 were re-located within an area of informal grassland adjacent to lake D at the south-east of the site. The informal grassland area off Whitelands Way comprises a rough and overgrown sward that is mostly dominated by coarse grasses and ruderals, however a low number of desirable grassland indicator species are present throughout the sward. NVC analysis of the quadrat data shows a closest match with the MG1 group of species-poor neutral grassland communities. The informal grassland area adjacent to the north-west of lake D comprises a species-rich sward with an abundance of desirable herbs. NVC analysis shows that the quadrat data has an equal best fit with the MG5b and MG1e communities. Management recommendations for the informal grassland areas are provided in section 4.7.

Woodlands

Woodlands 1 and 2 are relatively similar, with both comprising a regenerated woodland community with horse chestnut, ash and sycamore in the canopy; hawthorn, English elm, wild privet, sycamore and ash in the understorey; and a species-poor ground flora largely dominated by ivy. Woodlands 1 and 2 are not considered to be of particular botanical value, although they will provide a valuable ecological resource for a range of fauna. Woodland 3 consists of a regenerating ash/oak woodland community with a number of non-native mature Turkey oaks (*Quercus cerris*) within the canopy. The understorey comprises a good variety of shrub species whilst the field layer is mostly species poor, the woodland indicator species dog's mercury (*Mercurialis perennis*) is present in frequent abundance within the ground flora. NVC analysis of the woodland 3 quadrat data shows a closest match with the W21b scrub community. The wet woodland area comprises of a mixture of natural tree and shrub regeneration alongside established planting of native shrubs on an area of both damp and dry ground. The field layer vegetation beneath the tree and shrub canopy is very species-poor whilst dense stands of tall ruderal vegetation are present in areas where the woody growth is sparser. The wet woodland area does not comprise a distinct natural vegetation community and is considered to have limited botanical interest. Woodland management on the site is covered under a separate planning condition and approved woodland management plan, therefore no habitat enhancement recommendations for the monitored woodland areas are provided in this report.

Hedgerows

A total of eight selected hedgerows located across the site were surveyed in accordance with the methodology outlined in the Hedgerow Survey Handbook (Defra, 2007). This includes four hedgerows that have been recently planted as part of soft landscaping for the residential development and another four hedgerows which existed on site prior to development. The recently planted hedgerows are around 5-6 years in age and comprise a limited number of native shrub specis. They are considered to be developing well and generally forming a good dense structure, although some thin sections, minor gaps and damage were noted and areas where some shrub planting has died. The existing hedgerows are mostly A-shaped and comprise a good variety of woody species with some mature standard trees. They are mostly in good condition apart from some gaps which were identified. Recommendations for management and enhancement of the hedgerows and field layer margins are provided in sections 4.16 – 4.18.

Pingle Brook and wetland areas

Pingle Brook comprises a narrow stream channel with an earth and stone substrate. There is a good range of macrophytic plants which are maintaining their prescence in moderate to low abundance within the stream channel. Removal of fool's watercress (*Apium nodiflorum*) from the stream channel has had a beneficial effect, although stands of tall ruderals and overgrown bankside vegetation remain an issue. The basin of lake A comprises a pool of open water in the centre which is surrounded by areas of damp and dry ground. A good assemblage of macrophytes are present within the lake A basin though there are considerable areas of the pool margin and surrounding ground that have not yet been colonised. The banks and dry areas of the lake A basin are vegetated with a species-poor rough grassland community. Lakes B and C continue to comprise an established wetland habitat with a good variety of macrophytes occupying the majority of the lake basins. The notable orchid species marsh helleborine and southern marsh-orchid (not previously recorded on site) were recorded on the south-western margin of lake C. The lake D basin comprises of an area of standing water to the south-west and a drainage channel running from north-east to south-west, all of which have been colonised by a good assemblage of macrophytic vegetation. The banks and areas surrounding the wetland habitat within

lake D are vegetated with a species-rich grassland community of botanical value. Management recommendations for Pingle Brook and the wetland areas are provided in sections 4.24 to 4.35.

1.0 Introduction

1.1 Terence O'Rourke Ltd was appointed by Countryside Properties (Bicester) Plc to produce an Ecological Management Plan (EMP) in February 2009 for the land surrounding Whiteland's Farm, located to the south-west of Bicester, Oxfordshire (central grid reference: SP 571 219). The development on site is nearing completion and will comprise a total of 1,585 new homes, a primary and secondary school, a mix-use local centre and public green spaces. The EMP outlines the principles, aims and key requirements for managing the biodiversity of this site over a ten-year period (2009 – 2019).

1.2 Prior to development the site mostly comprised intensively-managed arable farmland considered to be of low biodiversity value, although some habitats of ecological value were also present including unimproved calcareous grassland (a UK Biodiversity Action Plan (BAP) habitat), species-rich and species-poor native hedgerows (UK BAP habitat), woodland including three copses and one wet woodland (local and UK BAP habitats), and the Pingle Brook which forms part of the aquatic habitat action plan of the Cherwell BAP. The aim of the EMP was to improve the management of these existing habitats and to enhance them for wildlife as well as creating new wildlife habitats within the site.

1.3 The aims of the EMP include:

- Improvement of the structure and therefore the biodiversity value of the three copses and wet woodland.
- To successfully re-establish the calcareous grassland and implement a management regime which results in a herb-rich calcareous grassland habitat.
- To enhance the site for birds, bats and invertebrates through the provision of roosting, nesting and hibernation opportunities in the form of purpose built bird, bat and insect boxes erected on existing mature trees within the hedgerows and woodland habitats, also to provide more foraging habitat for these fauna on site through the planting of native trees and shrubs and their subsequent management.

1.4 Specific habitats and faunal species are being monitored over a ten-year period, from 2009 to 2019, to assess the effectiveness of the EMP and to

identify any improvements/changes that could be made to the habitat management regimes. This report provides details of the 2018 botanical monitoring surveys only, targeted faunal surveys were not undertaken in 2018. The botanical surveys focussed on a number of specific habitats within the site, including translocated calcareous grassland, informal grassland areas, woodlands, a number of selected hedgerows, and the Pingle Brook and wetland areas.

1.5 Section 2 of this report details the methodologies adopted for the various surveys that were conducted and any subsequent analysis of the results, whilst section 3 provides an account of the survey results. An evaluation of the survey results and recommendations for adjustments to the current habitat management and/or monitoring programme are provided in section 4.

2.0 Methodology

Botanical monitoring surveys

Translocated calcareous grassland and informal grassland areas

2.1 Six 2 x 2 metre quadrats were established within the translocated calcareous grassland on the 12th July 2011. In the time since these quadrats were established the adjacent Bellway Homes development has expanded into the translocated grassland area and now only two of the original quadrats can be re-surveyed.

2.2 Ten 2 x 2 metre quadrats were established within informal grassland areas on site on the 8th and 9th August 2013. Following a review of the survey design in 2017 these quadrats were re-located to different areas of informal grassland on site in July 2018. Quadrats 1-5 were re-located within an informal grassland area off Whitelands Way and quadrats 6-10 were re-located within an informal grassland area adjacent to lake D at the south-east of the site.

2.3 The grassland quadrats were surveyed on 3rd July 2018. Each quadrat was measured out using a tape measure and the corners marked with orange pegs. The cover abundance of plant species within each quadrat was recorded using the DOMIN scale as shown below:

% Cover	Domin score
91-100%	10
76-90%	9
51-75%	8
34-50%	7
26-33%	6
11-25%	5
4-10%	4
<4% with many individuals	3
<4% with several individuals	2
<4% with few individuals	1

Fixed-point photographs were also taken of each quadrat.

Woodlands

2.4 Four 10 x 10 metre quadrats were established within the areas of woodland on site, which included a single quadrat in each of the three copses and a single quadrat in the wet woodland area. The woodland quadrats were resurveyed on 4th July 2018. Each quadrat was measured out using a tape measure and the corners marked with orange pegs. For each quadrat the cover abundance of plant species within the canopy, understorey and field layers was recorded using the DOMIN scale. Fixed point photographs were taken from two opposite corners of each woodland quadrat. In 2018 an additional 10 x 10 metre quadrat sample of the woodland 3 vegetation was taken to provide data for NVC analysis.

Hedgerows

2.5 Eight selected hedgerows within the site, including four recently planted hedgerows and four existing mature hedgerows, were surveyed using the standard methodology outlined in the Hedgerow Survey Handbook (Defra, 2007). A thirty metre sample section of each hedgerow was surveyed and details of the hedgerow dimensions, shape, woody species composition and ground flora compostion were recorded. In addition to this, fixed photography points were established for each hedgerow to monitor growth/establishment and any standard trees along the entire length of the hedgerow were also

recorded. The entire length of each hedgerow was also checked for general condition and presence of any gaps.

Pingle Brook and wetland areas

2.6 The vegetation monitoring of Pingle Brook and the wetland areas (lakes A, B, C and D) comprised a walkover survey and a series of fixed photography points, this was undertaken on 4th July 2018. Species lists were compiled during the walkover surveys of Pingle Brook and the wetland areas and each recorded species was allocated a score of abundance using the DAFOR scale as shown below:

D	Dominant
A	Abundant
F	Frequent
O	Occasional
R	Rare
L	Local (used as a prefix to any of the above).

Data analysis

2.7 Where feasible, the quadrat data was analysed in order to draw comparisons with the vegetation communities described within the National Vegetation Classification (NVC) (Rodwell, 2006). The NVC provides a systematic and comprehensive catalogue of the various natural plant communities occurring within Britain. The quadrat data was analysed using the computer programme TABLEFIT (Hill, 1996) in order to draw a comparison with the floristic data in the NVC. The programme mathematically compares the inputted vegetation data with the diagnostic data of the NVC constancy profiles and assigns a plant community or sub-community of the NVC giving a similarity coefficient. Inputted vegetation data may not always correlate well with the NVC community profiles and in these instances only a "best fit" can be achieved, however this method does provide a useful indication as to the type of communities which are most similar to the data set. The 'goodness-of-fit' rating provided in the programme output shows how well the data set matches the assigned communities. The goodness-of-fit ratings are summarised below:

Goodness-of-fit (%)	Rating
80-100	Very good
70-79	Good
60-69	Fair
50-59	Poor
0-49	Very poor

3.0 Results

Botanical monitoring surveys

Translocated calcareous grassland

3.1 Species recorded and their abundance scores within each surveyed quadrat are presented in table 1 below together with the results of the 2016 and 2017 surveys to enable a comparison. The fixed-point photographs and a plan indicating the locations of the surveyed quadrats are provided in Appendix II.

3.2 Habitat management recommendations for the calcareous grassland plot are provided in section 4.3.

3.3 Due to the expansion of the Bellway Homes development, the area of translocated calcareous grassland has significantly contracted in size and now only quadrats 5 and 6 of the six originally established quadrats remain available to survey, this has been the case since the 2016 monitoring survey. The translocated calcareous grassland plot now covers an area of approximately 0.2 ha and is situated between residential developments to the north and south, with a small area of woodland to the east and an access road and public footpath lined with hedgerows to the west.

3.4 During the 2018 survey visit the grassland within the plot was found to have been recently cut to ground level with the majority of arisings removed, it was also very dry due to to the recent warm weather. These factors made it difficult to assess the condition of the sward and identify species, as a consequence

the data gathered during this survey is considered to be a poor/unreliable sample of this vegetation and not suitable for NVC analysis.

3.5 At the time of the 2018 survey visit the grassland within the plot comprised a recently cut sward, c.4 - 7 centimetres in average height, with the arisings mostly removed apart from some scattered thin patches of arisings in places. The sward was largely dominated by common and coarse tussocky grasses including red fescue (*Festuca rubra*), false oat-grass (*Arrhenatherum elatius*) and cock's-foot (*Dactylis glomerata*). Some undesirable ruderal species were also present in limited abundance, including field bindweed (*Convovulus arvensis*) and creeping cinquefoil (*Potentilla reptans*). Despite this, some desirable calcicoles, including salad burnet (*Sanguisorbia minor*), lady's bedstraw (*Galium verum*) and upright brome (*Bromus erectus*), are maintaining their presence within the sward in low abundance.

3.6 A total of 11 species were recorded within the quadrats during the 2018 survey. Some potential positive trends in the quadrat data include an increase in the abundance of finer common grasses, including red fescue and common bent (*Agrostis capillaris*), decreases in false oat-grass and creeping bent (*Agrostis stolonifera*), and a slight increase in the abundance of lady's bedstraw. Some negative trends include a decrease in the abundance of upright brome (*Bromus erectus*) and the absence of both meadow vetchling (*Lathyrus pratensis*) and common bird's-foot trefoil (*Lotus corniculatus*) in 2018.

3.7 As identified in 2017, there is a notable difference between the two surveyed quadrats, quadrat 5 continues to comprises a more diverse sward which includes the desirable calcicoles upright brome, lady's bedstraw and salad burnet, while quadrat 6 comprises a more grass-dominated sward with no notable/desirable species and few common forbs/ruderals occurring in low abundance.

Table 1: Translocated calcareous grassland - species recorded within each quadrat and their Domin scores 2016 - 2018

Species		Quadrats						Frequency class (2018 survey)	Change in abundance and frequency: 2016 → 2018
Common name	***Scientific name***	**5 2016**	**5 2017**	**5 2018**	**6 2016**	**6 2017**	**6 2018**		
Common bent	*Agrostis capillaris*	2	-	4	-	-	4	II	↑
Creeping bent	*Agrostis stolonifera*	-	5	-	-	5	-	-	↓
Meadow foxtail	*Alopecurus pratensis*	-	2	-	-	-	-	-	↓
False oat-grass	*Arrhenatherum elatius*	6	5	4	2	8	5	II	↓
Upright brome	*Bromus erecta*	-	5	1	-	-	-	I	↓
Field bindweed	*Convolvulus arvensis*	-	2	4	2	1	1	II	△
Cock's-foot	*Dactylis glomerata*	4	4	4	4	7	4	II	△
Common couch	*Elytrigia repens*	-	-	1	2	-	-	I	△
Sheep's fescue	*Festuca ovina*	-	8	-	-	-	-	-	↓
Red fescue	*Festuca rubra*	5	2	8	4	5	8	II	↑
Lady's bedstraw	*Galium verum*	1	4	4	-	-	-	I	↑
Cut-leaved crane's-bill	*Geranium dissectum*	-	1	-	1	1	-	-	△
Yorkshire-fog	*Holcus lanatus*	4	-	-	2	-	-	-	↓
Common feather-moss	*Kindbergia praelonga*	-	2	2	-	4	2	II	△
Meadow vetchling	*Lathyrus pratensis*	-	-	-	-	4	-	-	↓
Perennial rye-grass	*Lolium perenne*	-	-	-	-	1	-	-	↓
Common bird's-foot trefoil	*Lotus corniculatus*	-	2	-	3	-	-	-	↓
Smaller cat's-tail	*Phleum bertolonii*	-	4	-	-	-	-	-	↓
Timothy	*Phleum pratense*	2	-	-	-	-	-	-	↓
Ribwort plantain	*Plantago lanceolata*	3	-	-	-	-	-	-	↓
Smooth meadow-grass	*Poa pratensis*	-	-	-	-	1	-	-	↓

Species		Quadrats						Frequency class (2018 survey)	Change in abundance and frequency: 2016 → 2018
Common name	***Scientific name***	**5 2016**	**5 2017**	**5 2018**	**6 2016**	**6 2017**	**6 2018**		
Rough meadow-grass	*Poa trivialis*	4	4	-	-	4	-	-	↓
Creeping cinquefoil	*Potentilla reptans*	2	2	-	1	4	4	I	△
Common sorrel	*Rumex acetosa*	3	-	-	-	-	-	-	↓
Salad burnet	*Sanguisorba minor*	-	4	4	3	-	-	I	△
Hop trefoil	*Trifolium campestre*	-	1	-	-	-	-	-	↓
Red clover	*Trifolium pratense*	-	2	-	1	-	-	-	↓

Key

↑ An increase in abundance and frequency since 2016

↓ A decrease in abundance and frequency since 2016

* Not previously recorded

△ Little to no change

Informal grassland areas

3.8 Species recorded and their abundance scores within each surveyed quadrat are presented in tables 2 and 3 below. The fixed-point photographs and the locations of the surveyed quadrats are presented in appendix III.

3.9 The informal grassland area off Whitelands Way comprises a fairly rough and mostly grass-dominated sward, c. 45 centimetres in average height, that appears to be managed on an infrequent basis. The sward comprises a mixture of coarse grasses and ruderals, such as false oat-grass, meadow foxtail (*Alopecurus pratensis*), cock's-foot and field bindweed, as well as desireable indicators of unimproved grassland including meadow barley (*Hordeum secalinum*), lady's bedstraw and yellow oat-grass (*Trisetum flavescens*). This area of grassland provides an amenity greenspace for the public/local residents and is frequently used for dog walking and other recreational purposes, there is a mown footpath running through the centre of the grassland area to facilitate pedestrian access.

3.10 The informal grassland area adjacent to the north-west of lake D comprises a species-rich sward with abundant wildflowers. The sward is approximately 45 centimetres in average height and appears to be managed on an infrequent basis, it comprises a good variety of herbs and grasses including desirable indicator species of unimproved grasslands such as crested dog's-tail (*Cynosurus cristatus*), common knapweed (*Centaurea nigra*), lady's bedstraw, salad burnet and common bird's-foot trefoil. The uncommon plant wild clary (*Salvia verbenaca*) was also noted in this area of grassland. The sward is generally in good condition with a high proportion of herbs throughout and coarse grasses mostly in low abundance, however some areas were noted to be a bit overgrown with patches of ruderals developing, including creeping thistle (*Cirsium arvense*), spear thistle (*Cirsium vulgare*), hedge bindweed (*Calystegia sepium*) and common couch (*Elytrigia repens*).

Table 2: 2018 quadrat survey data for the informal grassland area off Whitelands Way

Species		Quadrats					Frequency class
Common name	**Scientific name**	**1**	**2**	**3**	**4**	**5**	
Creeping bent	*Agrostis stolonifera*	-	4	3	-	4	III
Meadow foxtail	*Alopecurus pratensis*	9	6	5	7	5	V
False oat-grass	*Arrhenatherum elatius*	-	4	5	7	5	IV
Common mouse-ear	*Cerastium fontanum*	-	-	-	-	2	I
Creeping thistle	*Cirsium arvense*	4	2	-	-	-	II
Field bindweed	*Convolvulus arvensis*	5	4	5	7	4	V
Cock's-foot	*Dactylis glomerata*	4	4	4	4	4	V
Wild carrot	*Daucus carota*	-	-	-	-	2	I
Red fescue	*Festuca rubra*	4	4	7	4	2	V
Lady's bedstraw	*Galium verum*	-	4	4	4	-	III
Hogweed	*Heracleum sphondylium*	-	4	-	4	1	III
Yorkshire-fog	*Holcus lanatus*	2	4	5	5	7	V
Meadow barley	*Hordeum secalinum*	1	4	2	2	-	IV
Meadow vetchling	*Lathyrus pratensis*	-	-	5	4	-	II
Smooth meadow-grass	*Poa pratensis*	-	-	-	4	-	I
Rough meadow-grass	*Poa trivialis*	2	-	2	-	2	III
Meadow buttercup	*Ranunculus acris*	-	-	-	1	-	I
Common sorrel	*Rumex acetosa*	1	-	-	-	-	I
Red clover	*Trifolium pratense*	-	2	-	-	-	I
Yellow oat-grass	*Trisetum flavescens*	1	5	4	2	1	V

Table 3: 2018 quadrat survey data for the informal grassland area adjacent to the north-west of Lake D

Species		Quadrats					Frequency class
Common name	**Scientific name**	**1**	**2**	**3**	**4**	**5**	
Yarrow	*Achillea millefolium*	2	1	4	4	4	V
Creeping bent	*Agrostis stolonifera*	-	-	-	1	-	I
Meadow foxtail	*Alopecurus pratensis*	4	4	5	4	5	V

Species		Quadrats					Frequency class
Common name	**Scientific name**	**1**	**2**	**3**	**4**	**5**	
False oat-grass	*Arrhenatherum elatius*	2	-	-	-	-	I
Hedge bindweed	*Calystegia sepium*	-	-	-	-	4	I
Common knapweed	*Centaurea nigra*	5	7	5	5	5	V
Greater knapweed	*Centaurea scabiosa*	-	-	-	4	-	I
Creeping thistle	*Cirsium arvense*	-	4	-	-	2	II
Spear thistle	*Cirsium vulgare*	-	1	-	-	-	I
Crested dog's-tail	*Cynosurus cristatus*	2	-	-	-	-	I
Cock's-foot	*Dactylis glomerata*	4	2	4	4	4	V
Tufted hair-grass	*Deschampsia cespitosa*	1	-	-	-	-	I
Common couch	*Elytrigia repens*	-	-	-	-	2	I
Red fescue	*Festuca rubra*	4	9	5	5	4	V
Lady's bedstraw	*Galium verum*	6	-	5	5	4	IV
Cut-leaved crane's-bill	*Geranium dissectum*	-	-	1	-	-	I
Yorkshire-fog	*Holcus lanatus*	4	2	2	4	1	V
Common feather-moss	*Kindbergia praelonga*	7	4	4	4	4	V
Oxeye daisy	*Leucanthemum vulgare*	4	5	4	4	5	V
Perennial rye-grass	*Lolium perenne*	-	1	-	-	-	I
Common bird's-foot trefoil	*Lotus corniculatus*	5	1	1	-	-	III
Ribwort plantain	*Plantago lanceolata*	4	5	5	7	5	V
Rough meadow-grass	*Poa trivialis*	4	1	1	1	1	V
Selfheal	*Prunella vulgaris*	2	2	1	-	-	III
Meadow buttercup	*Ranunculus acris*	-	1	-	-	-	I
Common sorrel	*Rumex acetosa*	-	-	-	-	1	I
Salad burnet	*Sanguisorbia minor*	-	-	-	1	-	I
Tall fescue	*Schedonorus arundinaceus*	5	5	5	5	4	V
White clover	*Trifolium repens*	-	1	-	-	-	I
Yellow oat-grass	*Trisetum flavescens*	2	-	4	-	-	II
Hairy tare	*Vicia hirsuta*	-	-	4	1	-	II
Smooth tare	*Vicia lathyroides*	-	-	-	1	-	I

Species		Quadrats					Frequency class
Common name	**Scientific name**	**1**	**2**	**3**	**4**	**5**	
Common tare	*Vicia sativa*	-	-	-	1	-	I

3.11 A total of 20 species were recorded within quadrats 1 – 5. The most frequently recorded species with highest domin values include meadow foxtail, false oat-grass, cock's-foot, red fescue, Yorkshire fog (*Holcus lanatus*) and field bindweed. The desirable indicator species of unimproved grasslands, including meadow barley, yellow oat-grass and lady's bedstraw, were recorded relatively frequently across the quadrats though abundance scores for these species was generally low.

3.12 A total of 33 species were recorded within quadrats 6 – 10, eleven of which were recorded as constants. Species with the highest recorded abundance values across the quadrats include common knapweed, red fescue, lady's bedstraw, tall fescue (*Schedonorus arundiancea*), ribwort plantain (*Plantago lanceolata*), meadow foxtail and oxeye daisy (*Leucanthemum vulgare*). The desirable indicator species of unimproved grasslands, including salad burnet, yellow oat-grass, common knapweed, greater knapweed, lady's bedstraw, crested dog's-tail and common bird's-foot trefoil, were recorded at a range of frequencies and abundance scores across the quadrats, species such as common knapweed and lady's bedstraw were recorded frequently at rerlatively high abundance values whilst species such as greater knapweed and salad burnet were only recorded in single quadrats at low abundance values.

- NVC analysis

3.13 Results of the NVC analysis of the informal grassland quadrat data are presented in tables 4 and 5 below.

Table 4: Summary of TABLEFIT analysis: Quadrats 1 – 5, informal grassland area off Whitelands Way

NVC code	Community	Sub-community	% fit	Goodness-of-fit rating
MG1a	*Arrhenatherum elatius* grassland	*Festuca rubra*	56	Poor
MG1	*Arrhenatherum elatius* grassland	-	56	Poor
MG1e	*Arrhenatherum elatius* grassland	*Centaurea nigra*	51	Poor
MG9b	*Holcus lanatus – Deschampsia cespitosa* grassland	*Arrhenatherum elatius*	48	Very poor
W24b	*Rubus fruticosus – Holcus lanatus* underscrub	*Arrhenatherum elatius – Heracleum sphondylium*	46	Very poor

Table 5: Summary of TABLEFIT analysis: Quadrats 6 – 10, informal grassland area adjacent to north-west of Lake D

NVC code	Community	Sub-community	% fit	Goodness-of-fit rating
MG5b	*Cynosurus cristatus – Centaurea nigra* grassland	*Galium verum*	51	Poor
MG1e	*Arrhenatherum elatius* grassland	*Centaurea nigra*	51	Poor
MG5	*Cynosurus cristatus – Centaurea nigra* grassland	-	47	Very poor
MC9c	*Festuca rubra – Holcus lanatus* Maritime grassland	*Achillea millefolium*	46	Very poor

NVC code	Community	Sub-community	% fit	Goodness-of-fit rating
MG5a	*Cynosurus cristatus – Centaurea nigra* grassland	*Lathyrus pratensis*	44	Very poor

3.14 The quadrat data for the informal grassland area off Whitelands Way shows greatest correlation with the MG1 *Arrhenatherum elatius* grassland group and MG1a *Festuca rubra* and MG1e *Centaurea nigra* sub-communities, however the poor goodness-of-fit ratings indicate that these results are relatively inconclusive. The data also shows some level of correlation with the MG9b *Holcus lanatus – Deschampsia cespitosa* grassland *Achillea millefolium* sub-community and the W24b *Rubus fruticosus – Holcus lanatus* underscrub *Arrhenatherum elatius – Heracleum sphondylium* sub-community, although the goodness of fit ratings for these matches are very poor.

3.15 The quadrat data for the informal grassland area adjacent to the north-west of Lake D shows greatest correlation with both the MG5b *Cynosurus cristatus – Centaurea nigra* grassland *Galium verum* sub-community and the MG1e *Arrhenatherum elatius* grassland *Centaurea nigra* sub-community, although the poor goodness-of-fit ratings indicate that these results are relatively inconclusive. The data also shows some level of correlation with the MG5 *Cynosurus cristatus – Centaurea nigra* grassland group and MG5a sub-community, as well as the MC9c *Festuca rubra – Holcus lanatus* maritime grassland *Achillea millefolium* sub-community, however the goodness of fit ratings for these matches are very poor.

Woodlands

2.8 A summary of each of the surveyed woodland areas on site is provided in this section together with the quadrat data from the monitoring surveys from 2016 to 2018. NVC analysis of the quadrat data for woodland 3 was undertaken as this woodland bears some resemblance to a distinct natural vegetation community, the other woodland areas were excluded from NVC analysis as they comprise a mixture of planted trees/shrubs and natural regeneration rather than recognisable stands of native woodland vegetation.

3.1 The woodland quadrat locations and fixed-point photographs are provided in appendix IV. Woodland management on the site is covered under a separate planning condition and approved woodland management plan, therefore no habitat enhancement recommendations for the monitored woodland areas are provided in this report.

Woodland 1

3.2 Woodland 1 comprises a regenerated woodland community with horse chestnut (*Aesculus hippocastanum*), ash (*Fraxinus excelsior*) and sycamore (*Acer pseudoplatanus*) in the canopy; hawthorn (*Crataegus monogyna*), English elm (*Ulmus procera*), ash, sycamore and wild privet (*Ligustrum vulgare*) in the understorey; and a species-poor ground flora dominated by ivy (*Hedera helix*). Table 6 below provides a summary of the quadrat survey data for woodland 1 from 2016 – 2018. The quadrat data has shown little change since 2016 apart from slight increases in the abundance of sycamore, horse chestnut and wild privet within the canopy and understorey, and the loss of cow parsley (*Anthriscus sylvestris*) from the field layer.

Table 6: Species recorded in the woodland 1 quadrat and relevant Domin scores (2016 – 2018)

Species		Domin score		
Common name	**Scientific name**	**2016**	**2017**	**2018**
Canopy				
Sycamore	*Acer pseudoplatanus*	4	4	5
Horse chestnut	*Aesculus hippocastanum*	2	7	8
Ash	*Fraxinus excelsior*	3	5	5
English elm	*Ulmus procera*	-	5	4
Understorey				
Sycamore	*Acer pseudoplatanus*	1	2	4
Horse chestnut (saplings)	*Aesculus hippocastanum*	-	-	1
Hawthorn	*Crataegus monogyna*	4	4	-
Ash	*Fraxinus excelsior*	-	2	2
Privet	*Ligustrum vulgare*	-	4	5
Elder	*Sambucus nigra*	2	-	-
English elm	*Ulmus procera*	5	5	5
Field layer / ground flora				
Sycamore saplings	*Acer pseudoplatanus*	3	1	-

Species		Domin score		
Common name	**Scientific name**	**2016**	**2017**	**2018**
Garlic mustard	*Alliaria petiolata*	4	1	2
Cow parsley	*Anthriscus sylvestris*	2	2	-
Lord's-and-ladies	*Arum maculatum*	1	1	1
Hedge bindweed	*Calystegia sepium*	-	1	-
Rough chevril	*Chaerophyllum temulum*	3	-	-
Bearded couch	*Elymus caninus*	-	-	1
Ash saplings	*Fraxinus excelsior*	2	1	-
Cleavers	*Galium aparine*	7	1	2
Herb-Robert	*Geranium robertianum*	6	1	2
Ivy	*Hedera helix*	10	10	10
Bramble	*Rubus fruticosus agg.*	1	3	4
Blackthorn saplings	*Prunus spinosa*	1	-	-
Hedge woundwort	*Stachys sylvatica*	-	2	-
Black bryony	*Tamus communis*	-	1	-
Colt's-foot	*Tussilago farfara*	1	-	-
English elm saplings	*Ulmus procera*	-	3	-
Common nettle	*Urtica dioica*	5	3	3

Woodland 2

3.3 Woodland 2 is fairly similar to woodland 1 in composition, the canopy is dominated by mature horse chestnuts with few ash and sycamore; the understorey includes the following species in relatively low abundance: English elm, hawthorn, wild privet, sycamore and ash; and the ground flora is relatively species-poor being mostly dominated by ivy with occasional herb-Robert (*Geranium robertianum*), although the notable species of woodland ground flora stinking iris (*Iris foetidissima*) was also recorded. Table 7 below provides a summary of the quadrat survey data for woodland 2 from 2016 to 2018. The quadrat data shows a slight increase in the abundance of horse chestnut and ash within the canopy and notable increases in abundance of horse chestnut, hawthorn and elder within the understorey. There has been little change in the ground flora apart from slight increases in the abundance of ivy, bramble (*Rubus fruticosus* agg.), common nettle (*Urtica dioica*) and garlic mustard (*Alliaria petiolata*), a decrease in the abundance of herb-Robert, and the new addition of wood false-brome (*Brachypodium sylvaticum*) to the quadrat data.

Table 7: Species recorded in the woodland 2 quadrat and relevant Domin scores (2016 – 2018)

Species		Domin scores		
Common name	**Scientific name**	**2016**	**2017**	**2018**
Canopy				
Sycamore	*Acer pseudoplatanus*	4	1	1
Horse chestnut	*Aesculus hippocastanum*	5	7	8
Ash	*Fraxinus excelsior*	-	1	4
Understorey				
Sycamore	*Acer pseudoplatanus*	3	1	1
Horse chestnut	*Aesculus hippocastanum*	3	5	7
Hawthorn	*Crataegus monogyna*	3	1	4
Ash	*Fraxinus excelsior*	3	1	1
Privet	*Ligustrum vulgare*	-	4	4
Elder	*Sambucus nigra*	2	1	4
English elm	*Ulmus procera*	2	-	-
Field layer / ground flora				
Bare ground		-	4	5
Sycamore saplings	*Acer pseudoplatanus*	2	-	-
Horse chestnut saplings	*Aesculus hippocastanum*	2	3	-
Garlic mustard	*Alliaria petiolata*	5	2	4
Cow parsley	*Anthriscus sylvestris*	2	-	-
Lord's-and-Ladies	*Arum maculatum*	-	1	1
Wood false-brome	*Brachypodium sylvaticum*	-	-	1
Hairy brome	*Bromus ramosus*	2	-	-
Spear thistle	*Cirsium vulgare*	1	-	-
Hawthorn	*Crataegus monogyna*	1	-	-
Bearded couch	*Elymus caninus*	-	1	1
Ash saplings	*Fraxinus excelsior*	3	1	-
Cleavers	*Galium aparine*	5	-	4
Herb-Robert	*Geranium robertianum*	9	7	4
Wood avens	*Geum urbanum*	-	1	1
Ivy	*Hedera helix*	9	8	9
Stinking iris	*Iris foetidissima*	1	1	1
Privet	*Ligustrum vulgare*	3	-	-
Bramble	*Rubus fruticosus agg.*	3	4	5
Hedge woundwort	*Stachys sylvatica*	1	-	-
Colt's-foot	*Tussilago farfara*	2	-	-

Species		Domin scores		
Common name	**Scientific name**	**2016**	**2017**	**2018**
Common nettle	*Urtica dioica*	4	2	4

Woodland 3

3.4 Woodland 3 comprises a mostly natural, though relatively species-poor oak/ash woodland community. The canopy is mostly dominated by oaks, in particular a number of mature Turkey oak (*Quercus cerris*), this non-native tree species was misidentified in 2017 as sessile oak (*Quercus petraea*). Ash also forms an important constituent of the canopy and is present in occasional abundance. The understorey mostly comprises hawthorn, elms (*Ulmus procera* and *Ulmus glabra*) and ash, with field maple (*Acer campestre*) and blackthorn (*Prunus spinosa*) also present in low abundance. The ground flora was generally species-poor throughout, however the woodland axiophyte dog's mercury (*Mercurialis perennis*) was recorded in relatively high abundance. Woodland 3 was noted as having good structure within the canopy and understorey, though in some areas bramble and nettle are becoming invasive. Table 8 below provides a summary of the quadrat survey data for woodland 3 from 2016 to 2018. The quadrat data shows little change since 2016, apart from an increase in the abundance of English elm within the canopy and increases in the abundance of field maple and blackthorn within the understorey. There was little change in the field layer vegetation though a number of potentially negative changes are apparent including a decrease in the abundance of the woodland indicator species dog's mercury and Lords-and-ladies, and increases in the abundance of species that are more typically associated with an impoverished woodland ground flora, including ivy, cleavers and oak saplings. In spite of this, there is still a considerable proportion of bare ground within the field layer.

Table 8: Species recorded in the woodland 3 quadrat and relevant Domin scores (2016 – 2018)

Species		Domin scores		
Common name	***Scientific name***	**2016**	**2017**	**2018**
Canopy				
Field maple	*Acer campestre*	4	-	-
Hawthorn	*Crataegus monogyna*	3	-	-
Ash	*Fraxinus excelsior*	5	5	5
Pedunculate oak	*Quercus robur*	3	7	5
Turkey oak	*Quercus cerris*	-	6	8
English elm	*Ulmus procera*	3	-	4
Understorey				
Field maple	*Acer campestre*	3	2	4
Hawthorn	*Crataegus monogyna*	4	7	5
Ash	*Fraxinus excelsior*	2	5	5
Privet	*Lingustrum vulgare*	2	-	-
Blackthorn	*Prunus spinosa*	-	1	2
Elder	*Sambucus nigra*	2	-	-
Wych elm	*Ulmus glabra*	-	4	4
English elm	*Ulmus procera*	2	5	4
Field layer / ground flora				
Bare ground		-	5	5
Garlic mustard	*Alliaria petiolata*	3	1	-
Cow parsley	*Anthriscus sylvestris*	2	5	5
Lord's-and-ladies	*Arum maculatum*	2	3	2
Wood brome	*Bromopsis ramosus*	2	-	-
Hawthorn saplings	*Crataegus monogyna*	-	1	-
Cleavers	*Galium aparine*	5	1	2
Herb-Robert	*Geranium robertianum*	3	-	-
Wood avens	*Geum urbanum*	-	2	2
Ground-ivy	*Glechoma hederacea*	7	2	2
Ivy	*Hedera helix*	7	6	8
Ash saplings	*Fraxinus excelsior*	-	1	1
Dog's mercury	*Mercuralis perennis*	8	7	5
Annual meadow-grass	*Poa annua*	2	-	-
Oak saplings	*Quercus sp*	-	3	4
Bramble	*Rubus fruticosus agg.*	5	1	-
Broad-leaved dock	*Rumex obtusifolius*	2	-	-
Wood dock	*Rumex sanguineus*	1	-	-
Smooth sow-thistle	*Sonchus oleraceus*	1	-	-
Hedge woundwort	*Stachys sylvatica*	2	-	-

Species		Domin scores		
Common name	***Scientific name***	**2016**	**2017**	**2018**
Dandelion	*Taraxacum agg.*	1	-	-
Wych elm saplings	*Ulmus glabra*	-	1	-
Common nettle	*Urtica dioica*	10	3	3

- NVC analysis of woodland 3 data

In order to provide a more robust data set for NVC analysis an additional quadrat sample of the woodland 3 vegetation was taken, the location of this quadrat is indicated on the plan included as appendix IV, table 9 below provides a summary of the species recorded and Domin scores.

Table 9: Species recorded in the additional woodland 3 quadrat and relevant Domin scores (2018)

Species		Domin scores
Common name	***Scientific name***	**Additional quadrat**
Canopy		
Ash	*Fraxinus excelsior*	4
Pedunculate oak	*Quercus robur*	4
English elm	*Ulmus procera*	4
Understorey		
Field maple	*Acer campestre*	5
Hawthorn	*Crataegus monogyna*	5
Ash	*Fraxinus excelsior*	2
Privet	*Lingustrum vulgare*	2
Elder	*Sambucus nigra*	1
English elm	*Ulmus procera*	7
Field layer / ground flora		
Bare ground		8
Garlic mustard	*Alliaria petiolata*	1
Cow parsley	*Anthriscus sylvestris*	4
Lord's-and-ladies	*Arum maculatum*	2
Cleavers	*Galium aparine*	1
Ground-ivy	*Glechoma hederacea*	1
Ivy	*Hedera helix*	4
Ash saplings	*Fraxinus excelsior*	1
Dog's mercury	*Mercuralis perennis*	7
Oak saplings	*Quercus sp*	3
Bramble	*Rubus fruticosus agg.*	2
Common nettle	*Urtica dioica*	2

3.5 Results of the NVC analysis of the woodland 3 quadrat data are presented in table 10 below.

Table 10: Summary of TABLEFIT analysis: woodland 3 quadrat data

NVC code	Community	Sub-community	% fit	Goodness-of-fit rating
W21b	*Crataegus monogyna-Hedera helix* scrub	*Mercurialis perennis*	83	Very good
W8	*Fraxinus excelsior-Acer campestre-Mercurialis perennis* woodland	-	63	Fair
W8e	*Fraxinus excelsior-Acer campestre-Mercurialis perennis* woodland	*Geranium robertianum*	61	Fair
W8d	*Fraxinus excelsior-Acer campestre-Mercurialis perennis* woodland	*Hedera helix*	61	Fair
W21	*Crataegus monogyna-Hedera helix* scrub	-	53	Poor

3.6 The results of the NVC analysis show that woodland 3 has a strong affinity with the W21 (*Crataegus monogyna - Hedera helix* scrub) and a fair affinity with W8 (*Fraxinus excelsior-Acer campestre-Mercurialis perennis* woodland) group. The data shows greatest correlation with the W21b scrub *Mercurialis perennis* sub-community with a very good goodness-of-fit rating. The next closest match is the W8 woodland community with a fair goodness-of-fit rating.

Wet woodland

3.7 The wet woodland area comprises a mixture of natural ash, wych elm (*Ulmus glabra*) and willow (*Salix spp*) growth together with mature native shrub planting on an area of both damp and dry ground. The canopy is generally quite patchy/fragmented and consists of ash, white willow (*Salix alba*), grey willow (*Salix cinerea*), and wych elm. The understorey is notably dense and comprises a mixture of mature planted shrubs with stem guards still present,

including dogwood (*Cornus sanguinea*), hawthorn, hazel (*Corylus avellana*), field maple and cherry (*Prunus sp*), alongside natural regrowth of willows and elm (*Ulmus spp*). The field layer beneath the densely shaded parts of the canopy and understorey is impoverished and comprises a considerable proportion of bare ground with scattered colonisation by ruderal species including nettle, ivy, cleavers (*Galium aparine*) and ground ivy (*Glechoma hederacea*). In the more open parts of the wet woodland area with less woody species growth, there are dense stands of ruderal vegetation which mostly comprise very common species, such as great willowherb (*Epilobium hirsutum*), common nettle, hedge bindweed, false oat-grass, creeping thistle, rough meadow grass (*Poa trivialis*) and bramble scrub, the presence of great willowherb and hard rush (*Juncus inflexus*) amongst the stands of ruderals indicates somewhat damp soil conditions. Table 11 below provides a summary of the quadrat survey data for the wet woodland from 2016 to 2018.

Table 11: Species recorded in the wet woodland quadrat and relevant Domin scores (2016 – 2018)

Species		Domin scores		
Common name	**Scientific name**	**2016**	**2017**	**2018**
Canopy				
Ash	*Fraxinus excelsior*	4	4	4
White willow	*Salix alba*	-	5	5
Grey willow	*Salix cinerea*	-	6	6
Willow	*Salix sp.*	6	-	-
Wych elm	*Ulmus glabra*	-	2	2
Understorey				
Field maple	*Acer campestre*	-	2	4
Dogwood	*Cornus sanguinea*	-	2	4
Hazel	*Corylus avellana*	3	2	2
Hawthorn	*Crataegus monogyna*	4	5	5
Ash	*Fraxinus excelsior*	-	1	4
Cherry	*Prunus sp*	-	1	-
Blackthorn	*Prunus spinosa*	-	2	4
Grey willow	*Salix cinerea*	-	-	8
Willow sp.	*Salix sp.*	4	-	-
Elder	*Sambucus nigra*	5	3	3
Wych elm	*Ulmus glabra*	-	3	2
English elm	*Ulmus procera*	-	2	5
Elm	*Ulmus sp.*	2	-	-

Species		Domin scores		
Common name	**Scientific name**	**2016**	**2017**	**2018**
Geulder rose	*Viburnum opulus*	-	-	2
Field layer / ground flora				
Bare ground		-	-	5
Fool's watercress	*Apium nodiflorum*	-	2	-
Greater burdock	*Arctium lappa*	2	-	-
Burdock	*Arctium sp*	-	3	2
False oat-grass	*Arrhenatherum elatius*	-	2	4
Garlic mustard	*Alliaria petiolata*	-	4	-
White bryony	*Bryonia dioica*	4	2	3
Hedge bindweed	*Calystegia sepium*	3	1	4
Creeping thistle	*Cirsium arvense*	8	3	3
Spear thistle	*Cirsium vulgare*	-	1	2
Cock's-foot	*Dactylis glomerata*	-	-	2
American willowherb	*Epilobium cilliatum*	2	-	-
Great willowherb	*Epilobium hirsutum*	9	8	8
Cleavers	*Galium aparine*	5	3	4
Herb-Robert	*Geranium robertianum*	2	-	-
Wood avens	*Geum urbanum*	-	-	2
Ground-ivy	*Glechoma hederacea*	2	7	4
Floating sweet-grass	*Glyceria fluitans*	-	1	-
Ivy	*Hedera helix*	1	-	2
Hogweed	*Heracleum sphondylium*	1	1	2
Square-stalked St John's-wort	*Hypericum tetrapterum*	-	-	-
Yorkshire-fog	*Holcus lanatus*	3	-	3
Hard rush	*Juncus inflexus*	-	-	2
Ragged-robin	*Lychnis flos-cuculi*	-	-	-
Water mint	*Mentha aquatica*	-	3	-
Forget-me-not	*Myosotis sp.*	4	1	-
Rough meadow-grass	*Poa trivialis*	4	-	4
Creeping buttercup	*Ranunculus repens*	5	-	1
Bramble	*Rubus fruticosus agg.*	4	3	5
Curled dock	*Rumex crispus*	2	-	-
Broad-leaved dock	*Rumex obtusifolius*	2	1	1
Wood dock	*Rumex sanguineus*	-	3	3
Willow sapling	*Salix sp.*	1	-	-
Water figwort	*Scrophularia auriculata*	1	-	-
Common ragwort	*Senecio jacobaea*	2	2	2
White campion	*Silene latifolia*	1	-	1
Bittersweet	*Solanum dulcamara*	2	-	3
Prickly sow-thistle	*Sonchus asper*	1	2	-

Species		Domin scores		
Common name	**Scientific name**	**2016**	**2017**	**2018**
Smooth sow-thistle	*Sonchus oleraceus*	-	2	-
Hedge woundwort	*Stachys sylvatica*	-	1	-
Common nettle	*Urtica dioica*	9	8	8

3.8 The quadrat data for the wet woodland area shows no change in the canopy layer since the last survey, although increases in the abundance of field maple, dogwood, ash, blackthorn and English elm have been recorded within the understorey. A number of negative trends are apparent in the quadrat data for the field layer, including the dominance of the tall ruderals great willowherb and common nettle, an increase in the abundance of coarse grasses and common ruderals, such as false oat-grass, hedge bindweed and spear thistle, an increase in the abundance of bramble scrub, and the loss of a number of desireable species indicative of damp conditions from the data set including square-stalked St Johns-wort (*Hypericum tetrapterum*), ragged robin (*Silene flos-cuculi*), and water mint (*Mentha aquatica*). A variety of other common species are also now absent from the data set including hedge woundwort (*Stachys sylvatica*), water figwort (*Scrophularia auriculata*) and herb-Robert.

Hedgerows

3.9 The fixed-point photographs together with plans illustrating the locations of the surveyed sections of hedgerow are presented in appendix V. A summary of each surveyed hedgerow is presented below, management recommendations for the hedgerows on site are outlined within sections 4.16 to 4.18.

Hedgerow 1

3.10 Hedgerow 1 is a newly planted native hedgerow, with tree guards still in place, which is approximately five years in age. The hedgerow is approximately 2 metres in average height and 1–1.5 metres in average width, it comprises a double row of shrub planting, spaced at 30–40 centimetres and has stem diameters ranging between 1.5 and 4 centimetres. No standard trees are present. The majority of the hedgerow is developing well and forming a good dense structure, although the section to the south-east appears to be more

recently planted and less well established. A public walkway with regularly mown grass verges and an access road are present to the west of the hedgerow. An open field of semi-improved grassland is present to the east. Hawthorn is the most abundant shrub within the hedgerow with other species, including field maple, blackthorn, spindle (*Euonymus europaeus*) and wild privet present in occasional to rare abundance. The field layer is species-poor, comprising a regularly mown grass verge and scattered ruderals. A full species list is presented in table 12 below.

Table 12: Species recorded in hedgerow 1 and their DAFOR abundance scores 2017 - 2018

Species		DAFOR score 2017	DAFOR score 2018
Common name	***Scientific name***		
Woody species			
Field maple	*Acer campestre*	O	O
Hornbeam	*Carpinus betulus*	-	R
Hawthorn	*Crataegus monogyna*	D-A	D-A
Spindle	*Euonymus europaeus*	O	O-R
Privet	*Ligustrum vulgare*	O	O-R
Blackthorn	*Prunus spinosa*	O	O-R
Field layer/ground flora			
Barren brome	*Anisantha sterilis*	-	R
False oat-grass	*Arrhenatherum elatius*	O-R	-
Daisy	*Bellis perennis*	R	-
Soft brome	*Bromus hordeaceus*	O	O
Hedge bindweed	*Calystegia sepium*	R	O-R
Smooth hawk's-beard	*Crepis capillaris*	R	R
Red fescue	*Festuca rubra*	D-A	D-A
Ground ivy	*Glechoma hederacea*	O-R	-
Cat's-ear	*Hypochaeris radicata*	O	O
Yorkshire-fog	*Holcus lanatus*	F	F
Ox-eye daisy	*Leucanthemum vulgare*	O	O-R
Perennial rye-grass	*Lolium perenne*	O	O
Black medick	*Medicago lupulina*	O	O
Annual meadow-grass	*Poa annua*	-	F-O
Rough meadow-grass	*Poa trivialis*	O	O-R
Bristly ox-tongue	*Picris echioides*	-	R
Bramble	*Rubus fruticosus agg.*	O	O
Hoary ragwort	*Senecio erucifolius*	R	-
Dandelion	*Taraxacum agg.*	O	O

Species		DAFOR score 2017	DAFOR score 2018
Common name	***Scientific name***		
Field speedwell	*Veronica persica*	-	R

Hedgerow 2

3.11 Hedgerow 2 is a recently planted native hedgerow, with tree guards still present, of around five to six years in age. The hedgerow is approximately 1.5-3 metres in average height and 1.5-2 metres in average width, it comprises a double row of shrub planting, spaced at 30–40 centimetres, and has stem diameters ranging between 2 and 4.5 centimetres. No standard trees are present. The hedgerow is developing well and comprises a good dense structure, although some minor gaps were noted where the shrub planting has died. An informal public footpath, a similar planted native-species hedgerow and a residential development are present to the east of the hedgerow. An access road and arable field are present to the west. Hawthorn is the most abundant shrub within the hedgerow with other species, including hornbeam (*Carpinus betulus*), wild privet and beech (*Fagus sylvatica*), present in occasional to rare abundance, as well as a young specimen of Scot's pine (*Pinus sylvestris*). The field layer comprises a variety of common grasses, forbs and ruderals. A full species list is presented in table 13 below.

Table 13: Species recorded in hedgerow 2 and their DAFOR abundance scores 2017 - 2018

Species		DAFOR score 2017	DAFOR score 2018
Common name	***Scientific name***		
Woody species			
Hornbeam	*Carpinus betulus*	O	O-R
Hawthorn	*Crataegus monogyna*	D-A	D-A
Beech	*Fagus sylvatica*	O	O-R
Privet	*Ligustrum vulgare*	O	O
Scots pine	*Pinus sylvestris*	R/L	R/L
Field layer/ground flora			
Creeping bent	*Agrostis stolonifera*	F	-
Barren brome	*Anisantha sterilis*	LF	F
False oat-grass	*Arrhenatherum elatius*	O	A-O
Mugwort	*Artemisia vulgaris*	LF	-
Wild oat	*Avena fatua*	O	O-R
Soft brome	*Bromus hordeaceus*	-	O-R

Species		DAFOR score 2017	DAFOR score 2018
Common name	***Scientific name***		
Common mouse-ear	*Cerastium fontanum*	R	-
Creeping thistle	*Cirsium arvense*	R	-
Field bindweed	*Convolvulus arvensis*	O	O-R
Cock's-foot	*Dactylis glomerata*	O	O
Wild carrot	*Daucus carota*	R	-
Common couch	*Elytriga repens*	-	O
Red fescue	*Festuca rubra*	D-A	D-A
Hedge bedstraw	*Galium mollugo*	R	-
Lady's bedstraw	*Gallium verum*	R	R
Cut-leaved crane's-bill	*Geranium dissectum*	LO	O-R
Yorkshire-fog	*Holcus lanatus*	O	-
Perforate St-John's-wort	*Hypericum perforatum*	LF	-
Prickly lettuce	*Lactuca serriola*	R	-
Common toadflax	*Linaria vulgaris*	R	-
Perennial rye-grass	*Lolium perenne*	LF-O	-
Common mallow	*Malva sylvestris*	R	-
Black medick	*Medicago lupulina*	LF	-
Smaller cat's-tail	*Phleum bertolonii*	-	O
Timothy	*Phleum pratense*	O	-
Bristly ox-tongue	*Picris echioides*	O	F
Ribwort plantain	*Plantago lanceolata*	R	-
Rough meadow-grass	*Poa trivialis*	-	O
Creeping cinquefoil	*Potentilla reptans*	-	O
Wild radish	*Raphanus raphanistrum*	R	-
Creeping buttercup	*Ranunculus repens*	LF	-
Bramble	*Rubus fruticosus agg.*	O-R	R
Broad-leaved dock	*Rumex obtusifolus*	LF	-
Hoary ragwort	*Senecio erucifolius*	R	-
Common ragwort	*Senecio jacobaea*	-	O-R
White campion	*Silene latifolia*	R	-
Field sow-thistle	*Sonchus arvensis*	O	-
Smooth sow-thistle	*Sonchus oleraceus*	R	-
Dandelion	*Taraxacum agg.*	LF	-
White clover	*Trifolium repens*	O	-
Common nettle	*Urtica dioica*	O	O

Hedgerow 3

3.12 Hedgerow 3 is a recently planted native hedgerow, with tree guards still present, of around five to six years in age. The hedgerow is approximately 2-

2.5 metres in average height and 1-1.5 metres in average width, it comprises a double row of shrub planting, spaced at 30–40 centimetres, and has stem diameters ranging between 1.5 and 4.5 centimetres. No standard trees are present. The hedgerow is developing well and comprises a good dense structure with hardly any gaps noted. A drainage ditch, public footpath, a similar planted native-species hedgerow and a residential development are present to the north-east of the hedgerow. A new residential development under construction and an arable field are present to the south-west. Hawthorn is the dominant shrub within the hedgerow with other species, including hornbeam, wild privet and beech present in occasional to rare abundance, as well as a young Scot's pine. The field layer comprises a variety of common grasses, forbs and ruderals. A full species list is presented in table 14 below.

Table 14: Species recorded in hedgerow 3 and their DAFOR abundance scores 2017 - 2018

Species		DAFOR score 2017	DAFOR score 2018
Common name	***Scientific name***		
Woody species			
Hornbeam	*Carpinus betulus*	O-R	O-R
Hawthorn	*Crataegus monogyna*	D-A	D-A
Beech	*Fagus sylvatica*	O	O-R
Privet	*Ligustrum vulgare*	O	O-R
Scot's pine	*Pinus sylvestris*	R/L	R/L
Field layer/ground flora			
Black-grass	*Alopecurus myosuroides*	-	LO-R
Barren brome	*Anisantha sterilis*	F-O	-
False oat-grass	*Arrhenatherum elatius*	F	O
Wild oat	*Avena fatua*	O	-
Soft brome	*Bromus hordeaceus*	-	O-R
Creeping thistle	*Cirsium arvense*	-	R
Field bindweed	*Convovulus arvensis*	R	-
Cock's-foot	*Dactylis glomerata*	O-R	-
Wild carrot	*Daucus carota*	-	R
Wild teasel	*Dipsacus fullonum*	-	R
American willowherb	*Epilobium ciliatum*	-	R
Great willowherb	*Epilobium hirsutum*	LF-O	-
Square-stalked willowherb	*Epilobium tetragonum*	R	-
Red fescue	*Festuca rubra*	A	D-A

Species		DAFOR score 2017	DAFOR score 2018
Common name	***Scientific name***		
Cut-leaved crane's-bill	*Geranium dissectum*	R	R
Wood avens	*Geum urbanum*	R	-
Yorkshire-fog	*Holcus lanatus*	F	A-O
Common poppy	*Papava rhoeas*	-	R
Bristly ox-tongue	*Picris echioides*	-	R
Rough meadow-grass	*Poa trivialis*	-	O
Wild radish	*Raphanus raphanistrum*	-	R
Bramble	*Rubus fruticosus agg.*	LF-O	LA-R
Clustered dock	*Rumex conglomeratus*	-	R
Common ragwort	*Senecio jacobaea*	-	O-R
White campion	*Silene latifolia*	R	R
Marsh sow-thistle	*Sonchus palustris*	-	R
Dandelion	*Taraxacum agg.*	-	R
Common nettle	*Urtica dioica*	LF-R	R

Hedgerow 4

3.13 Hedgerow 4 comprises an existing mature native hedgerow with a shallow adjacent ditch on its northern side. The hedgerow has a rounded A-shape and is approximately 2 metres in average height and 1.5 metres in average width. No standard trees are present. A two metre gap has been created in the hedge for a tarmac footpath. The hedgerow is generally in good condition and has good structure throughout, although it is relatively low in height for an old/established hedgerow. A residential development lies to the north of the hedgerow. An amenity meadow with footpaths and recreational facilities is present to the south. The hedgerow mostly consists of hawthorn with a number of other species present in occasional to rare abundance, including ash, dog rose, wild privet, English elm and blackthorn. The ground flora mostly comprises a rough grassland community of common grasses, forbs and ruderals. A full species list is presented in table 15 below.

Table 15: Species recorded in hedgerow 4 and their DAFOR abundance scores 2017 - 2018

Species		DAFOR score 2017	DAFOR score 2018
Common name	***Scientific name***		
Woody species			
Horse chestnut	*Aesculus hippocastanum*	R	R

Species		DAFOR score 2017	DAFOR score 2018
Common name	***Scientific name***		
Hawthorn	*Crataegus monogyna*	D-A	D-A
Ash	*Fraxinus excelsior*	O-R	R
Wild privet	*Ligustrum vulgare*	O-R	O-R
Blackthorn	*Prunus spinosa*	LF	LA-R
Dog-rose	*Rosa canina*	R	O-R
Meadow foxtail	*Alopecurus pratensis*	O	-
Cow parsley	*Anthriscus sylvestris*	O-R	O-R
False oat-grass	*Arrhenatherum elatius*	D-A	D-A
Field bindweed	*Convolvulvus arvensis*	F	F
Cock's-foot	*Dactylis glomerata*	O	O
Red fescue	*Festuca rubra*	-	F-O
Cleavers	*Galium aparine*	O	-
Hedge bedstraw	*Gallium mollugo*	R	R
Wood avens	*Geum urbanum*	O-R	-
Ivy	*Hedera helix*	A-F	-
Hogweed	*Heracleum sphondylium*	O	O
Common poppy	*Papaver rhoeas*	R	-
Timothy	*Phleum pratense*	O	-
Burnet-saxifrage	*Pimpinella saxifraga*	-	R
Rough meadow-grass	*Poa trivialis*	-	O-R
Wild radish	*Raphanus raphanistrum*	R	-
Bramble	*Rubus fruticosus agg.*	O	O
Wood dock	*Rumex sanguineus*	O	O
White campion	*Silene latifolia*	L-R	-
Woody nightshade	*Solanum dulcamara*	R	-
Red clover	*Trifolium pratense*	-	O-R
Common nettle	*Urtica dioica*	F	O

Hedgerow 5

3.14 Hedgerow 5 is an existing mature native hedgerow. It is A-shaped and measures approximately 3–4 metres in average height and 1.5–2 metres in average width. No standard trees are present. The hedgerow has a number of large gaps which have been created to allow installation of infrastructure associated with the new housing development, including access roads, pedestrian footpaths and children's play areas. There is a considerable gap and section of sparse shrub growth at the southern end of the hedgerow. A green walkway with planted trees, an access driveway and residential housing

are present to the east of the hedgerow. A new residential development which appears to be mostly complete lies to the west. English elm is the most abundant woody species within this hedgerow, with hawthorn, ash, field maple, elder, dogwood and dog rose also present in occasional to rare abundance. The field layer comprises rough grassland and ruderal vegetation. A full species list is presented in table 16 below.

Table 16: Species recorded in hedgerow 5 and their DAFOR abundance scores 2017 – 2018

Species		DAFOR score 2017	DAFOR score 2018
Common name	**Scientific name**		
Shrubs			
Field maple	*Acer campestre*	F-O	O
Dogwood	*Cornus sanguinea*	-	R
Hawthorn	*Crataegus monogyna*	O	O
Ash	*Fraxinus excelsior*	O	O-R
Dog-rose	*Rosa canina*	O-R	LA-O
Elder	*Sambucus nigra*	-	O-R
English elm	*Ulmus procera*	A-F	D-A
Ground flora			
Yarrow	*Achillea millefolium*	O	-
Garlic mustard	*Alliaria petiolata*	O	-
Barren brome	*Anisantha sterilis*	F-O	-
Sweet vernal-grass	*Anthoxanthum odoratum*	-	O-R
Cow parsley	*Anthriscus sylvestris*	-	O-R
False oat-grass	*Arrhenatherum elatius*	A-F	F
Mugwort	*Artemesia vulgaris*	O	O-R
Lords-and-ladies	*Arum maculatum*	R	R
Wild oat	*Avena fatua*	O	-
Soft brome	*Bromus hordeaceus*	O	-
White bryony	*Bryonia alba*	R	-
Hedge bindweed	*Calystegia sepium*	O	O
Greater knapweed	*Centaurea scabiosa*	R/L	R
Creeping thistle	*Cirsium arvense*	O	-
Spear thistle	*Cirsium vulgare*	-	R
Field bindweed	*Convolvulvus arvensis*	-	O
Crested dog's-tail	*Cynosurus cristatus*	-	O-R
Cock's-foot	*Dactylis glomerata*	O	O-R
Great willowherb	*Epilbium hirsutum*	O	-
Common couch	*Elytrigia repens*	O	O-R
Red fescue	*Festuca rubra*	F-O	F-O

Species		DAFOR score 2017	DAFOR score 2018
Common name	**Scientific name**		
Cleavers	*Galium aparine*	F-O	A
Hedge bedstraw	*Galium mollugo*	R/L	-
Ground-ivy	*Glechoma hederacea*	O	-
Ivy	*Hedera helix*	-	F
Hogweed	*Heracleum sphondylium*	O	O
Yorkshire-fog	*Holcus lanatus*	F	O
Field scabious	*Knautia arvensis*	LO	R/L
White dead-nettle	*Lamium album*	R	-
Hoary cress	*Lepidium draba*	O	-
Perennial rye-grass	*Lolium perenne*	-	O
Black medick	*Medicago lupulina*	-	O-R
Common poppy	*Papaver rhoeas*	O	-
Bristly oxtongue	*Picris echioides*	O-R	-
Ribwort plantain	*Plantago lanceolata*	-	O-R
Rough meadow-grass	*Poa trivialis*	O	O
Wild radish	*Raphanus raphanistrum*	-	R
Bramble	*Rubus fruticosus agg.*	F	A-O
Broad-leaved dock	*Rumex obtusifolius*	O	O-R
White campion	*Silene latifolia*	O	O
Bladder campion	*Silene vulgaris*	R/L	-
Bittersweet	*Solanum dulcamara*	O	O-R
Prickly sow-thistle	*Sonchus asper*	O-R	-
Smooth sow-thistle	*Sonchus oleraceus*	O	-
Hedge woundwort	*Stachys sylvatica*	O	-
Red clover	*Trifolium pratensis*	O	O
White clover	*Trifolium repens*	O	-
Common nettle	*Urtica dioica*	O	F

Hedgerow 6

3.15 Hedgerow 6 is an existing mature native hedgerow. It is A-shaped and mostly 2 metres in average height and 1.5-2 metres in average width. The hedgerow has a number of standard trees which include mature specimens of horse chestnut and ash, and mature/veteran specimens of pedunculate oak. There is a two metre gap in the north-western section of the hedgerow to accommodate a new public footpath, there was also a large pre-existing gap at the north-western end of the hedgerow but this has been planted up with hawthorn whips which are establishing well. This hedgerow is generally in condition with good structure and shape throughout. Residential housing lies

to the north and east of the hedgerow. An amenity meadow with footpaths and recreational facilities is present to the south and west. The hedgerow largely comprises hawthorn though there is also a good variety of other woody species present in occasional to rare abundance including elder, English elm, sycamore, crab apple, ash, pedunculate oak and blackthorn. The field layer consists of rough grassland with ruderals. A full species list is presented in table 17 below.

Table 17: Species recorded in hedgerow 6 and their DAFOR abundance scores 2017 - 2018

Species		DAFOR score 2017	DAFOR score/number of standard trees 2018
Common name	**Scientific name**		
Standard trees			
Horse chestnut	*Aesculus hippocastanum*	1	1
Ash	*Fraxinus excelsior*	1	1
Pedunculate oak	*Quercus robur*	4	4
Woody species			
Sycamore	*Acer psuedoplatanus*	O-R	O-R
Hawthorn	*Crataegus monogyna*	D-A	D-A
Ash	*Fraxinus excelsior*	LO-R	LO-R
Blackthorn	*Prunus spinosa*	LF-R	LF-R
Crab apple	*Malus sylvestris*	O-R	R
Pedunculate oak	*Quercus robur*	R	R
Dog-rose	*Rosa canina*	O	O
Elder	*Sambucus nigra*	O-R	O-R
English elm	*Ulmus procera*	O	O
Ground flora			
Creeping bent	*Agrostis stolonifera*	LF-O	O
Garlic mustard	*Alliaria petiollata*	O	-
Meadow foxtail	*Alopecurus pratensis*	O	O-R
Cow parsley	*Anthriscus sylvestris*	O	F-O
False oat-grass	*Arrhenatherum elatius*	A-F	D-A
Lords-and-ladies	*Arum maculatum*	-	R
Glaucous sedge	*Carex flacca*	-	R
Creeping thistle	*Cirsium arvense*	O-R	-
Spear thistle	*Cirsium vulgare*	-	R
Hedge bindweed	*Convulvulus arvensis*	O	O-R
Cock's-foot	*Dactylis glomerata*	O	O

Species		DAFOR score 2017	DAFOR score/number of standard trees 2018
Common name	**Scientific name**		
Common couch	*Elytrigia repens*	-	O-R
Great willowherb	*Epilobium hirsutum*	O-R	-
Red fescue	*Festuca rubra*	-	O
Cleavers	*Galium aparine*	F-O	A-O
Lady's bedstraw	*Galium verum*	O	O-R
Ivy	*Hedera helix*	A	A
Hogweed	*Heracleum sphondylium*	O	O
Yorkshire fog	*Holcus lanatus*	-	F-O
Meadow barley	*Hordeum secalinum*	O-R	R
Hoary cress	*Lepidium draba*	R	R
Perennial rye-grass	*Lolium perenne*	O	-
Black medick	*Medicago lupulina*	-	O
Rough meadow-grass	*Poa trivialis*	-	O
Creeping cinquefoil	*Potentilla reptans*	-	O-R
Bramble	*Rubus fruticosus agg.*	O	O
Broad-leaved dock	*Rumex obtusifolius*	-	O-R
Wood dock	*Rumex sanguineus*	O-R	O-R
Common ragwort	*Senecio jacobaea*	-	O-R
White campion	*Silene latifolia*	R	-
Bittersweet	*Solanum dulcamara*	R	O-R
Hedge woundwort	*Stachys sylvatica*	LF-O	-
Black bryony	*Tamus communis*	O-R	O-R
Upright hedge-parsley	*Torilis japonica*	-	R
Red clover	*Trifolium pratense*	-	O-R
Yellow oat-grass	*Trisetum flavescens*	-	R
Common nettle	*Urtica dioica*	O	F-O

Hedgerow 7

3.16 Hedgerow 7 is an existing mature native hedgerow. It is A-shaped and measures approximately 2-2.5 metres in average height and 1.5-2 metres in average width. A number of standard trees are present within the hedgerow, including semi-mature and mature specimens of pedunculate oak, ash, crack willow (*Salix fragilis*), horse chestnut and plane (*Platanus sp*). There is a wet drainage ditch adjacent to the south-west of the hedge. A number of small gaps measuring between 1 and 2 metres were noted in the hedgerow and it appears that some of these were created for the installation of drainage

outflows. There were also some thin sections and gaps that have been planted up with shrubs in tree guards and these appeared to be establishing although a number were dead. The hedgerow is generally in good condition with good structure and shape throughout. At the south-eastern end of the hedgerow there is an abundance of blackthorn suckers spreading outward from the hedge and the adjacent grassland vegetation is notably tall and rank, this indicates a general lack of management on this hedgerow. An amenity meadow with footpaths and recreational facilities lies to the north of the hedgerow. An area of regularly managed amenity grassland with sports pitches and recreational facilities is present to the south and west. The hedgerow is mostly comprised of hawthorn though a range of other species were also present in frequent to rare abundance including field maple, ash, English elm, crab apple, elder, dogwood, wild privet and blackthorn. The field layer comprises rough grassland and ruderals. A full species list is presented in table 18 below.

Table 18: Species recorded in hedgerow 7 and their DAFOR abundance scores 2017 - 2018

Species		DAFOR score 2017	DAFOR score/number of standard trees 2018
Common name	**Scientific name**		
Standard trees			
Horse chestnut	*Aesculus hippocastanum*	1	1
Ash	*Fraxinus excelsior*	8	8
Plane	*Platanus sp*	1	1
Pedunculate oak	*Quercus robur*	2	2
Crack willow	*Salix fragilis*	1	1
Woody species			
Field maple	*Acer campestre*	O	O
Ash	*Fraxinus excelsior*	O	O-R
Dogwood	*Cornus sanguinea*	LF-O	LF-O
Hawthorn	*Crataegus monogyna*	D-A	D-A
Wild privet	*Ligustrum vulgare*	O-R	O-R
Crab apple	*Malus sylvestris*	R	O-R
Blackthorn	*Prunus spinosa*	O	LA-O
Oak	*Quercus sp.*	R/L	R/L
Dog-rose	*Rosa canina*	O	O-R
Elder	*Sambucus nigra*	O-R	O-R

Species		DAFOR score 2017	DAFOR score/number of standard trees 2018
Common name	**Scientific name**		
Crack willow	*Salix fragilis*	-	R/L
Willow	*Salix sp.*	R/L	R/L
English elm	*Ulmus procera*	LF	LF
Field layer/ground flora			
Garlic mustard	*Alliaria petiolata*	O-R	-
Meadow foxtail	*Alopecurus pratensis*	F	F-O
Barren brome	*Anisantha sterilis*	R	O
Cow parsley	*Anthriscus sylvestris*	O-R	O
False oat-grass	*Arrhenatherum elatius*	F	A-F
Lord's-and-ladies	*Arum maculatum*	-	R
Wood false-brome	*Brachypodium sylvaticum*	O-R	-
White bryony	*Bryonia dioica*	R	O-R
Hedge bindweed	*Calystegia sepium*	LA-O	A-O
Rough chervil	*Chaerophyllum temulum*	O	-
Creeping thistle	*Cirsium arvense*	O	O
Spear thistle	*Cirsium vulgare*	-	R
Field bindweed	*Convolvulus arvensis*	-	F-O
Cock's-foot	*Dactylis glomerata*	O	F-O
Common couch	*Elytriga repens*	O-R	O
Great willowherb	*Epilobium hirsutum*	-	O-R
Meadowsweet	*Filipendula ulmaria*	R	R
Cleavers	*Galium aparine*	LF-O	A-O
Cut-leaved crane's-bill	*Geranium dissectum*	-	O-R
Herb-Robert	*Geranium robertianum*	O	O
Wood avens	*Geum urbanum*	O	O
Ground-ivy	*Glechoma hederacea*	F-O	-
Ivy	*Hedera helix*	F	A-F
Hogweed	*Heracleum sphondylium*	F-O	A-O
Bristly oxtongue	*Picris echioides*	R	-
Rough meadow-grass	*Poa trivialis*	-	O
Meadow vetchling	*Lathyrus pratensis*	-	O-R
Musk mallow	*Malva moschata*	-	R
Meadow buttercup	*Ranunculus acris*	-	O-R
Bramble	*Rubus fruticosus agg*	O	O
Broad-leaved dock	*Rumex obtusifolius*	-	O-R
Wood dock	*Rumex sanguineus*	R	-
Common ragwort	*Senecio jacobaea*	-	O-R
Bittersweet	*Solanum dulcamara*	R	R

Species		DAFOR score 2017	DAFOR score/number of standard trees 2018
Common name	**Scientific name**		
Prickly sow-thistle	*Sonchus asper*	R	-
Hedge woundwort	*Stachys sylvatica*	R	R
Black bryony	*Tamus communis*	O	O-R
Common nettle	*Urtica dioica*	O	O

Hedgerow 8

3.17 Hedgerow 8 is a newly planted native hedgerow, with tree guards still in place, of around five years in age. It measures approximately 2–2.5 metres in average height and 1–1.5 metres in average width. It comprises a double row of shrub planting spaced at 30–40 centimetres and has stem diameters ranging between 2 and 5 centimetres. No standard trees are present. The hedgerow appears to be establishing well and has a good dense structure, however some dead shrub growth and stems were noted and one localised section near the southern end of the hedgerow has been damaged, probably from a car accident. The A41 Oxford Road is situated to the east of the hedgerow. A regularly mown footpath lies directly adjacent to the west of the hedegrow, as well as lake D and its surrounding habitat area. The hedgerow entirely comprised hawthorn and field maple, with hawthorn the most abundant of the two species. The field layer comprises a section of species-poor regularly mown grassland to the south-west and an area of uncut species-rich grassland with ruderals further to the north. A full species list is presented in table 19 below.

Table 19: Species recorded in hedgerow 8 and their DAFOR abundance scores 2017 – 2018

Species		DAFOR score	DAFOR score
Common name	**Scientific name**		
Shrubs			
Field maple	*Acer campestre*	F	F-O
Hawthorn	*Crataegus monogyna*	D-A	D-A
Ground flora			
Common bent	*Agrostis capillaris*	O	-
Creeping bent	*Agrostis stolonifera*	-	-

Species		DAFOR score	DAFOR score
Common name	**Scientific name**		
Barren brome	*Anisantha sterilis*	O	O-R
Mugwort	*Artemisia vulgaris*	-	R
False oat-grass	*Arrhenatherum elatius*	F-O	F-O
Soft brome	*Bromus hordeaceus*	O	-
Hedge bindweed	*Calystegia sepium*	O	O
Common knapweed	*Centaurea nigra*	-	O-R
Rough chervil	*Chaerophyllum temulum*	R	-
Creeping thistle	*Cirsium arvense*	O-R	O-R
Smooth hawk's-beard	*Crepis capillaris*	R	R
Cock's-foot	*Dactylis glomerata*	O	F-O
Wild carrot	*Daucus carota*	O	O
Square-stalked willowherb	*Epilobium tetragonum*	R	-
Red fescue	*Festuca rubra*	A	A
Hedge bedstraw	*Galium mollugo*	O-R	O-R
Ground-ivy	*Glechoma hederacea*	O	O
Hogweed	*Heracleum sphondylium*	O-R	-
Oxeye daisy	*Leucanthemum vulgare*	O	O
Common toadflax	*Linaria vugaris*	-	R
Perennial rye-grass	*Lolium perenne*	O	F-O
Common bird's-foot trefoil	*Lotus corniculatus*	O-R	O-R
Bristly ox-tongue	*Picris echiodes*	-	O
Ribwort plantain	*Plantago lanceolata*	-	O-R
Rough meadow-grass	*Poa trivialis*	O	O
Common fleabane	*Pulicaria dysenterica*	O-R	O-R
Creeping buttercup	*Ranunculus repens*	LF	-
Yellow rattle	*Rhinanthus minor*	R	R/L
Bramble	*Rubus fruticosus agg.*	O	O
Wood dock	*Rumex sanguineus*	R	O-R
Hoary ragwort	*Senecio erucifolius*	O-R	O-R
Common ragwort	*Senecio jacobaea*	-	O
White campion	*Silene latifolia*	-	R
Hedge woundwort	*Stachys sylvatica*	O	O
Dandelion	*Taraxacum officinale agg.*	O	O
Upright hedge parsley	*Torilis japonica*	R	R
Hop trefoil	*Trifolium campestre*	O	-
Lesser trefoil	*Trifolium dubium*	-	O
Red clover	*Trifolium pratense*	-	O-R
Common nettle	*Urtica dioica*	O-R	-

Pingle Brook and wetland areas

3.18 The fixed-point photos for Pingle Brook and the wetland areas (Lakes A, B, C and D) and plans showing their locations are included as appendix VI. Management recommendations for Pingle Brook and the wetland areas are outlined in sections 4.24 – 4.35.

Pingle Brook

3.19 Pingle Brook consists of a narrow stream channel with an earth and stone substrate, a variety of macrophytic vegetation and uncut grassy margins on the banks. Table 20 below summarises the macrophytic vegetation and abundance scores recorded within the stream channel from 2015 to 2018.

Table 20: Macrophytic species recorded within the channel of Pingle Brook and their DAFOR abundance scores (2015 – 2018)

Species		**DAFOR score 2015**	**DAFOR score 2016**	**DAFOR score 2017**	**DAFOR score 2018**
Common name	**Scientific name**				
Fool's watercress	*Apium nodiflorum*	LF/A	LA/O	LD - O	LF-O
Hairy sedge	*Carex hirta*	-	-	-	O
False fox-sedge	*Carex otrubae*	-	-	-	R
Tufted hair-grass	*Deschampsia cespitosa*	-	-	-	O-R
Great willowherb	*Epilobium hirsutum*	LF	LF/O	F - LA	LF-O
Hoary willowherb	*Epifolium parviflorum*	O	-	O	O
Floating sweet-grass	*Glyceria fluitans*	LR	LF/O	F	LF-O
Square-stalked St John's wort	*Hypericum tetrapterum*	-	-	-	R
Sharp-flowered rush	*Juncus acutiflorus*	-	-	-	O
Hard rush	*Juncus inflexus*	LF	LF	O	O
Common duckweed	*Lemna minor*	-	-	-	O
Water mint	*Mentha aquatica*	-	LO	R	LO-R
Water forget-me-not	*Myosotis scorpioides*	LO	LO	R/L	R
Redshank	*Persicaria maculosa*	-	-	O - R	R
Water-cress	*Rorippa nasturtium-aquaticum*	LA	LO	LF	LF
Water dock	*Rumex hydrolapathum*	-	-	R (1 plant found)	R
Water figwort	*Scrophularia auriculata*	O	LO	O	O-R

Branched bur-reed	*Sparganium erectum ssp neglectum*	LO	LF	O - LF	O
Blue water-speedwell	*Veronica anagallis-aquatica*	LF	LO	R	R/L
Brooklime	*Veronica beccabunga*	LF	LO	O-R	O-R

3.20 At the time of the walkover survey, much of the Pingle Brook channel was completely dry which is likely due to the extended period of warm and dry weather that was experienced in June/July 2018. The species composition within the Pingle Brook channel is broadly similar to what was previously recorded since 2015, however a number of new species were recorded in 2018 which include the common (and moderately desirable) wetland plants square-stalked St John's-wort, hairy sedge (*Carex hirta*), false fox-sedge (*Carex otrubae*) and sharp-flowered rush (*Juncus acutiflorus*). The abundances of the desirable macrophtyes, including brooklime (*Veronica beccabunga*), branched bur-reed (*Sparganium erectum*), blue water-speedwell (*Veronica anagallis-aquatica*), water dock (*Rumex hydrolapathum*), water mint, water forget-me-not (*Myosotis scorpioides*) and watercress (*Rorippa nasturtium-aquaticum*), have remained broadly stable since 2015. One positive change in the survey data is the notable decrease in the abundance of both fool's water-cress (*Apium nodiflorum*) and great willowherb, though considerable stands of great willowherb are still present within the channel. The decrease in abundance of fool's watercress is particularly evident in fixed-point photgraphs 1. One negative observation which was noted during the walkover survey is that the uncut grassy banks are considerably dense and encroaching into the stream channel (see fixed-point photographs 3, 4 and 5), this was also noted in 2017. These grassy margins are mostly dominated by coarse grasses and ruderals such as false oat-grass, rough meadow-grass, common nettle, wild teasel (*Dipsacus fullonum*) and creeping thistle, however some sections also include a number of desirable grassland herbs including lady's bedstraw and meadowsweet (*Fillipendula ulmaria*).

Lake A

3.21 In 2018 the lake A area comprised a pool of standing water in the centre surrounded by areas of damp ground and dry grassland, very similar to what was recorded in 2017. A summary of the species recorded within lake A and

their DAFOR abundance scores for 2017 to 2018 are presented in table 21 below.

Table 21: Species recorded in Lake A and their DAFOR abundance scores 2017 -2018

Species		***DAFOR score in 2017***	***DAFOR score in 2018***
Common name	***Scientific name***		
Macrophytic and other vegetation within the lake			
Creeping bent	*Agrostis stolonifera*	A	A
Water plantain	*Alisma plantago-aquatica*	O	O
False oat-grass	*Arrhenatherum elatius*	F	-
Hairy sedge	*Carex hirta*	-	O-R
False fox-sedge	*Carex otrubae*	R	R
Pendulous sedge	*Carex pendula*	LF	L/R
Tufted hair-grass	*Deschampsia caespitosa*	O	F-O
Common spike-rush	*Eleocharis palustre*	LO-R	F-O
Great willowherb	*Epilobium hirsutum*	F	F-O
Floating sweet-grass	*Glyceria fluitans*	LF	-
Reed sweet-grass	*Glyceria maxima*	LF	R/L
Yellow iris	*Iris pseudacrous*	-	R/L
Sharp-flowered rush	*Juncus acutiflorus*	O-R	A-F
Soft rush	*Juncus effusus*	O	O
Hard rush	*Juncus inflexus*	O-R	O
Meadow vetchling	*Lathyrus pratensis*	L-R	-
Water mint	*Mentha aquatica*	O	L/R
Smaller cat's-tail	*Phleum bertolonii*	O	-
Common reed	*Phragmites australis*	LF	LF
Water dock	*Rumex hydrolapathum*	-	R
Broad-leaved dock	*Rumex obtusifolius*	O	-
Eared willow	*Salix aurita*	O	R
Grey willow	*Salix caprea*	-	R
White clover	*Trifolium repens*	LF-O	-
Bulrush	*Typha latifolia*	LF-O	F-O
Blue water-speedwell	*Veronica anagallis-aquatica*	R	LF-R
Brooklime	*Veronica beccabunga*	-	R
Common nettle	*Urtica dioica*	O	-
Bankside vegetation			
Creeping bent	*Agrostis stolonifera*	F	F
Meadow foxtail	*Alopecurus pratensis*	O	O
False oat-grass	*Arrhenatherum elatius*	A	A
Glaucous sedge	*Carex flacca*	R	R
Hairy sedge	*Carex hirta*	LF-O	-

Species		DAFOR score in 2017	DAFOR score in 2018
Common name	**Scientific name**		
Common knapweed	*Centaurea nigra*	-	R
Creeping thistle	*Cirsium arvense*	O	-
Spear thistle	*Cirsium vulgare*	-	R
Cock's-foot	*Dactylis glomerata*	F	F-O
Common couch	*Elytriga repens*	O	O
Great willowherb	*Epilobium hirsutum*	-	O-R
Red fescue	*Festuca rubra*	-	O
Lady's bedstraw	*Galium verum*	-	R
Yorkshire-fog	*Holcus lanatus*	F	F
Perennial rye-grass	*Lolium perenne*	O	-
Common bird's-foot trefoil	*Lotus corniculatus*	O	-
Creeping jenny	*Lysimachia nummularia*	L/R	-
Smaller cat's-tail	*Phleum bertolonii*	-	O-R
Ribwort plantain	*Plantago lanceolata*	-	O-R
Rough meadow-grass	*Poa trivialis*	-	O
Silverweed	*Potentilla anserina*	O	O
Creeping cinquefoil	*Potentilla reptans*	LF	-
Selfheal	*Prunella vulgaris*	-	O-R
Meadow buttercup	*Ranunculus acris*	-	O
Bramble	*Rubus fruticosus agg.*	R	R
Clustered dock	*Rumex conglomeratus*	-	R
Broad-leaved dock	*Rumex obtusifolius*	-	R
Salad burnet	*Sanguisorbia minor*	R	-
Red clover	*Trifolium pratense*	-	O-R
White clover	*Trifolium repens*	-	O
Colt's-foot	*Tussilago farfara*	LO-R	-
Common nettle	*Urtica dioica*	-	O-R

3.22 The small area of open water and surrounding damp ground continues to support a good variety of macrophytes which includes common reed (*Phragmites australis*), bulrush (*Typha latifolia*), water plantain (*Alisma plantago-aquatica*), blue water-speedwell, common spike-rush (*Eleocharis palustris*), reed sweet-grass (*Glyceria maxima*), water mint and the new records for 2018 of yellow iris (*Iris pseudacorus*), water dock and brooklime. The abundance values for the macrophytic species within Lake A are broadly similar to those recorded in 2017 apart from notable increases in common spike-rush and sharp-flowered rush. There are still considerable areas of bare ground and sections along the pool margins that have yet to be fully colonised by macrophytic vegetation (see fixed-point photos 6 and 7).

3.23 The banks of the lake and areas of drier ground within the lake basin have been colonised by a range of common grassland and ruderal plants including creeping bent, meadow foxtail, false oat-grass, Yorkshire fog, silverweed (*potentilla anserina*), meadow buttercup (*Ranunculus acris*), red clover (*Trifolium pratense*) and common nettle. The bankside vegetation of lake A is relatively species-poor and now mostly resembles a rank grassland community largely dominated by coarse grasses with a limited number of ruderals and common forbs together with some bramble encroachment, this was also noted to be the case in 2017. The species data and abundance values are relatively similar to 2017 with some losses and new records of common species and ruderals. A number of desirable grassland plants are maintaining a presence with the bankside vegetation and dry areas of the lake basin including glaucous sedge (*Carex flacca*) and the new records for 2018 of lady's bedstraw and common knapweed. The desirable grassland plants salad burnet and common bird's-foot trefoil which were recorded in 2017 were not recorded again in 2018.

Lake B

3.24 Lake B comprises an established wetland habitat with a good variety of macrophytes which occupy the vast majority of the lake basin. A summary of the species recorded within lake B and DAFOR abundance scores for 2017 to 2018 are presented in table 22 below.

Table 22: Species recorded in Lake B and their DAFOR abundance scores 2017 - 2018

Species		***DAFOR score in 2017***	***DAFOR score in 2018***
Common name	***Scientific name***		
Macrophytic and other vegetation within the lake			
Water plantain	*Alisma plantago-aquatica*	O	O
Fool's-water-cress	*Apium nodiflorum*	O	O
Hairy sedge	*Carex hirta*	-	O
False fox-sedge	*Carex otrubae*	R	-
Tufted hair-grass	*Deschampsia caespitosa*	-	O-R
Common spike-rush	*Eleocharis palustris*	O-LF	F-O
Great willowherb	*Epilobium hirsutum*	A	A-F
Hoary willowherb	*Epilobium parvifolrum*	-	O-R
Marsh horsetail	*Equisetum palustre*	R	LA-O

Species		***DAFOR score in 2017***	***DAFOR score in 2018***
Common name	***Scientific name***		
Marsh bedstraw	*Galium palustre*	R	R
Square-stalked St John's wort	*Hypericum tetrapterum*	O-R	O-R
Sharp-flowered rush	*Juncus acutiflorus*	-	O
Hard rush	*Juncus inflexus*	F	F
Common duckweed	*Lemna minor*	O	F-O
Water mint	*Mentha aquatica*	LF	LF-O
Water forget-me-not	*Myosotis scorpioides*	-	R
Common reed	*Phragmites australis*	LA	LA
Water-cress	*Rorippa nasturtium-aquaticum*	R	-
White willow	*Salix alba*	LF-O	LF-O
Eared Willow saplings	*Salix aurita*	LF-O	F-O
Water figwort	*Scrophularia auriculata*	O-R	O
Club-rush	*Schoenoplectus lacustris*	LF	LA
Ragged robin	*Silene flos-cuculi*	R	-
Branched bur-reed	*Sparganium erectum*	R	R
Bulrush	*Typha latifolia*	D-A	D
Brooklime	*Veronica beccabunga*	LF-R	-
Bankside vegetation			
Creeping bent	*Agrostis stolonifera*	F	F
False oat-grass	*Arrhenatherum elatius*	A	D-A
Hedge bindweed	*Calystegia sepium*	O	O
Hairy sedge	*Carex hirta*	A	A
Creeping thistle	*Cirsium arvense*	LA-O	O
Marsh thistle	*Cirsium palustre*	-	R
Spear thistle	*Cirsium vulgare*	R	R
Field bindweed	*Convolvulus arvensis*	-	O
Cock's-foot	*Dactylis glomerata*	O	F
Tufted hair grass	*Deschampsia cespitosa*	O	-
Field horsetail	*Equisetum arvense*	-	O
Red fescue	*Festuca rubra*	F	A
Cleavers	*Galium aparine*	-	O
Cut-leaved crane's-bill	*Geranium dissectum*	-	R
Yorkshire-fog	*Holcus lanatus*	F	A
Meadow vetchling	*Lathyrus pratensis*	O	O
Smaller cat's-tail	*Phleum bertolonii*	-	O-R
Bristly oxtongue	*Picris echoides*	-	O-R
Rough meadow-grass	*Poa trivialis*	-	O-R
Silverweed	*Potentilla anserina*	O	O

Species		DAFOR score in 2017	DAFOR score in 2018
Common name	**Scientific name**		
Creeping cinquefoil	*Potentilla reptans*	-	O
Meadow buttercup	*Ranunculus acris*	-	O-R
Creeping buttercup	*Ranunculus repens*	O	-
Bramble	*Rubus fruticosus* agg.	O	O
Common sorrel	*Rumex acetosa*	-	R
Clustered dock	*Rumex conglomeratus*	-	R
Curled dock	*Rumex crispus*	O	-
Water dock	*Rumex hydrolapathum*	-	R
Broad-leaved dock	*Rumex obtusifolius*	O	O
Wood dock	*Rumex sanguineus*	O	-
Eared willow	*Salix aurita*	-	R
Common ragwort	*Senecio jacobaea*	-	O
Marsh sow-thistle	*Sonchus palustris*	-	O
Hedge woundwort	*Stachys sylvatica*	-	R
Red clover	*Trifolium pratense*	-	O-R
Nettle	*Urtica dioica*	-	O

3.25 The macrophytic vegetation within Lake B is broadly similar to what was previously recorded apart from the addition in 2018 of the desirable species water forget-me-not and sharp-flowered rush. Bulrush continues to dominate the lake basin and there are limited areas of open water remaining, white willow (*Salix alba*) and eared willow (*Salix aurita*) maintain a presence in frequent to occasional abundance. A number of desirable macrophytic plants have been lost from the data set in 2018 including brooklime, ragged robin and watercress.

3.26 The lake B bankside vegetation mostly comprises a species-poor rank grassland community dominated by coarse grasses and ruderals, such as false oat-grass, cock's-foot, Yorkshire fog, broad-leaved dock (*Rumex obtusifolius*), creeping cinquefoil, cleavers and field horsetail (*Equisetum arvense*), together with bramble encroachment. In 2018 almost no desirable species were recorded amongst the bankside vegetation of lake B apart from water dock and meadow vetchling. Some negative changes in the quadrat data include an increase in the abundance of false oat-grass, cock's-foot and red fescue, and the new records in 2018 of a number of tall ruderals including common ragwort, common nettle and bristly oxtongue (*Picris echioides*).

Lake C

3.27 Lake C comprises an established wetland habitat with a particularly good variety of macrophytes which occupy the entire lake area. The lake basin comprises some areas of open standing water near the western margin and damp to dry ground elsewhere. A summary of the species recorded within lake C and DAFOR abundance scores for 2017 to 2018 are presented in table 23 below.

Table 23: Species recorded in Lake C and their DAFOR abundance scores 2017-2018

Species		**DAFOR score in 2017**	**DAFOR score in 2018**
Common name	**Scientific name**		
Macrophytic and other vegetation within the lake			
Water plantain	*Alisma plantago-aquatica*	LF-R	O-R
Alder	*Alnus glutinosa*	-	R
Marsh marigold	*Caltha palustris*	R	R
Hairy sedge	*Carex hirta*	O	O
False fox-sedge	*Carex otrubae*	R	O
Common sedge	*Carex nigra*	R	-
Cyperus sedge	*Carex pseudocyperus*	O	O
Common spike-rush	*Eleocharis palustris*	A	A
Great willowherb	*Epilobium hirsutum*	F-O	A-F
Field horsetail	*Equisetum arvense*	A	-
Water horsetail	*Equisetum fluviatile*	-	LF-R
Meadowsweet	*Fillipendula ulmaria*	-	O-R
Square-stemmed St John's-wort	*Hypericum tetrapterum*	R	R
Yellow iris	*Iris pseudacorus*	F	O
Jointed rush	*Juncus acutiflorus*	O	O
Conglomerate rush	*Juncus conglomeratus*	-	O
Hard rush	*Juncus inflexus*	-	F
Common duckweed	*Lemna minor*	F-O	F-O
Gypsywort	*Lycopus europaeus*	LF-O	LF-O
Purple-loosestrife	*Lythrum salicaria*	A-O	A-O
Water mint	*Mentha aquatica*	A	F
Water forget-me-not	*Myosotis scorpioides*	-	R
Broad-leaved pondweed	*Potamogeton natans*	LF	-
Celery-leaved buttercup	*Ranunculus sceleratus*	R (1 plant recorded)	-
White willow	*Salix alba*	O	O

Species		**DAFOR score in 2017**	**DAFOR score in 2018**
Common name	**Scientific name**		
Eared willow	*Salix aurita*	O	O
Grey willow	*Salix cinerea*	-	O
Common club-rush	*Schoenoplectus lacustris*	F	F-O
Water figwort	*Scrophularia auriculata*	-	R
Branched bur-reed	*Sparganium erectum ssp. neglectum*	F-O	F-O
Bulrush	*Typha latifolia*	D-A	D
Brooklime	*Veronica beccabunga*	LF	O-R
Bankside vegetation			
Creeping bent	*Agrostis stolonifera*	O	-
Alder whip	*Alnus glutinosa*	R	-
Meadow foxtail	*Alopecurus pratensis*	-	O-R
False oat-grass	*Arrhenatherum elatius*	O	O
Soft brome	*Bromus hordeaceus*	O	-
Hedge bindweed	*Calystegia sepium*	LF-O	LF-O
Creeping thistle	*Cirsium arvense*	R	O-R
Crested dog's-tail	*Cynosurus cristatus*	-	O-R
Common spotted-orchid	*Dactylorhiza fuchsii*	-	R/L
Southern marsh-orchid	*Dactylorhiza praetermissa*	-	R/L
Common spike-rush	*Elocharis palustris*	-	O-R
Great willowherb	*Epilobium hirsutum*	O	-
Marsh helleborine	*Epipactis palustris*	-	R/L
Field horsetail	*Equisetum arvense*	A	A
Red fescue	*Festuca rubra*	O	O
Meadowsweet	*Filipendula ulmaria*	O	-
Hogweed	*Heracleum sphondylium*	R	R
Yorkshire-fog	*Holcus lanatus*	-	O
Cat's-ear	*Hypochaeris radicata*	R	-
Conglomerate rush	*Juncus conglomeratus*	O	-
Hard rush	*Juncus inflexus*	O	-
Black medick	*Medicago lupulina*	O	O
Water mint	*Mentha aquatica*	F	-
Bristly ox-tongue	*Picris echiodes*	O	O
Ribwort plantain	*Plantago lanceolata*	-	O-R
Greater plantain	*Plantago major*	O	-
Rough meadow-grass	*Poa trivialis*	O	O
Selfheal	*Prunnela vulgaris*	-	O-R
Common fleabane	*Pulicaria dysenterica*	F-O	F-O
Meadow buttercup	*Ranunculus acris*	R	O-R
Lesser spearwort	*Ranunculus flammula*	-	O-R

Species		DAFOR score in 2017	DAFOR score in 2018
Common name	**Scientific name**		
Bramble	*Rubus fruticosus agg*	-	O-R
Wood dock	*Rumex sanguineus*	-	R
Eared willow	*Salix aurita*	O	O
Hoary ragwort	*Senecio erucifolius*	O	O
Common ragwort	*Senecio jacobaea*	R	O-R
Perennial sow-thistle	*Sonchus arvensis*	-	R
Dandelion	*Taraxacum agg.*	O	-
Red clover	*Trifolium pratense*	O	-
White clover	*Trifolium repens*	F-O	F-O

3.28 The macrophytic vegetation in lake C is very similar to what was previously recorded in 2017 with abundance values largely stable apart from a notable increase in the abundance of great willowherb which is considered to be a negative indicator species. In 2018 new records of the desirable species water forget-me-not, water horsetail (*Equisetum fluviatile*), meadowsweet, and hard rush were added to the dataset. Desirable species previously recorded in 2017 but not recorded in 2018 include broad-leaved pondweed (*Potamogeton natans*), celery-leaved buttercup (*Ranunculus sceleratus*) and common sedge (*Carex nigra*), however it is possible that these species could have been missed during the walkover survey.

3.29 The bankside vegetation is largely similar to what was recorded in 2017, comprising a mixed community of grassland, ruderals and macrophytic plant species with a small amount of willow scrub. However the notable species marsh helleborine (*Epipactis palustris*) and southern marsh-orchid (*Dactylorhiza praetermissa*) were recorded at one location on the south-western margin of lake C (location indicated on the plan included in appendix VI) together with a number of common spotted orchids (*Dactylorhiza fuchsii*). A total of six flowering spikes of marsh helleborine were recorded at this location.

Lake D

3.30 The lake D basin comprises an area of standing water to the south-west and a drainage channel running from north-east to south-west, all of which have been colonised by a good assemblage of macrophytic vegetation. There is also species-rich calcareous grassland which has colonised the banks and

areas of damp to dry ground within the lake basin. A summary of the species recorded within lake D and their DAFOR abundance scores for 2017 to 2018 are presented in table 24 below.

Table 24: Species recorded in Lake D and their DAFOR abundance scores 2017-2018

Species		***DAFOR score in 2017***	***DAFOR score in 2018***
Common name	***Scientific name***		
Macrophytic and other vegetation within the lake			
Water plantain	*Alisma plantago-aquatica*	O	O
Fool's water-cress	*Apium nodiflorum*	LF	LA-O
Water starwort	*Callitriche sp*	-	R
Hairy sedge	*Carex hirta*	O	-
False fox-sedge	*Carex otrubae*	R	R
Cyperus sedge	*Carex pseudocyperus*	F	LF-R
Tufted hair-grass	*Deschampsia cespitosa*	-	O-R
Great willowherb	*Epilobium hirsutum*	F	LA-O
Water horsetail	*Equisetum fluviatile*	R	LA-R
Marsh horsetail	*Equisetum palustre*	-	LA-R
Meadowsweet	*Filipendula ulmaria*	-	R
Compact rush	*Juncus conglomeratus*	O	O
Hard rush	*Juncus inflexus*	F-O	F-O
Jointed rush	*Juncus acutiflorus*	O	O
Gypsywort	*Lycopus europaeus*	-	O-R
Purple-loosestrife	*Lythrum salicaria*	O	O-R
Water mint	*Mentha aquatica*	F-O	A-O
Water forget-me-not	*Myosotis scorpioides*	-	R
Common fleabane	*Pulicaria dysenterica*	-	O-R
Water-cress	*Rorippa nasturtium-aquaticum*	LF	-
White willow	*Salix alba*	O	F-O
Eared willow	*Salix aurita*	O	O
Grey willow	*Salix cinerea*	-	O
Club-rush	*Schoenoplectus lacustris*	O	F-O
Branched bur-reed	*Sparganium erectum ssp. neglectum*	LF	LF
Bulrush	*Typha latifolia*	A	D-A
Blue water speedwell	*Veronica anagallis-aquatica*	LF	O-R
Bankside vegetation			
Yarrow	*Achillea millefolium*	-	O
Creeping bent	*Agrostis stolonifera*	O	F-O

Species		DAFOR score in 2017	DAFOR score in 2018
Common name	**Scientific name**		
Sweet vernal-grass	*Anthoxanthum odoratum*	O	-
Kidney vetch	*Anthylis vulneraria*	LF	-
Soft brome	*Bromus hordeaceus*	-	O-R
Quaking grass	*Briza media*	R	R
Glaucous sedge	*Carex flacca*	O	A
Oval sedge	*Carex ovalis*	-	O-R
Common knapweed	*Centaurea nigra*	O	F-O
Creeping thistle	*Cirsium arvense*	A	A
Spear thistle	*Cirsium vulgare*	O	O
Crested dog's-tail	*Cynosurus cristatus*	O	O
Wild carrot	*Daucus carota*	O	O
Great willowherb	*Epilobium hirsutum*	-	LF
Field horsetail	*Equisetum arvense*	-	F-O
Red fescue	*Festuca rubra*	O	O
Hedge bedstraw	*Galium mollugo*	LF-R	LF-R
Lady's bedstraw	*Galium verum*	O-R	O
Hogweed	*Heracleum sphondylium*	O	-
Yorkshire-fog	*Holcus lanatus*	O	O
Sharp-flowered rush	*Juncus acutiflorus*	-	O-R
Hard rush	*Juncus inflexus*	-	O-R
Field scabious	*Knautia arvensis*	R	R
Meadow vetchling	*Lathyrus pratensis*	-	O
Oxeye daisy	*Leucanthemum vulgare*	O	O
Common bird's-foot-trefoil	*Lotus corniculatus*	O	O
Black medick	*Medicago lupulina*	O	O
Field forget-me-not	*Myosotis arvensis*	R	-
Ribwort plantain	*Plantago lanceolata*	O	O
White poplar saplings	*Populus alba*	-	O-R
Selfheal	*Prunella vulgaris*	O-R	-
Common fleabane	*Pulicaria dysenterica*	LF-O	-
Meadow buttercup	*Ranunculus acris*	O	O
Yellow-rattle	*Rhinanthus minor*	O	O
Grey willow	*Salix cinerea*	-	O-R
Hoary ragwort	*Senecio erucifolius*	-	O-R
Ragged robin	*Silene flos-cuculi*	-	R
Perennial sow thistle	*Sonchus arvensis*	-	R
Devil's-bit scabious	*Succisa pratensis*	-	R
Red clover	*Trifolium pratense*	O	O
Colt's foot	*Tussilago farfara*	O	-

Species		***DAFOR score in 2017***	***DAFOR score in 2018***
Common name	***Scientific name***		
Common nettle	*Urtica dioica*	O	F-O

3.31 The macrophytic vegetation recorded within the wet areas of lake D in 2018 is broadly identical to what was recorded in 2017, with similar abundance values recorded for most of the notable macrophytes. Positive changes in the dataset for 2018 include a notable increase in the abundance of the desirable macrophyte water horsetail, and the new records of the desirable species water-starwort (*Callitriche sp*), water forget-me-not, gypsywort (*Lycopus europaeus*), marsh horsetail (*Equisetum palustre*) and meadowsweet. Negative changes in the dataset include a slight increase in the abundance of bulrush, great willowherb, fool's watercress and white willow, and the loss of the desirable macrophyte watercress.

3.32 The bankside vegetation, which also encompasses the damp to dry areas within the lake basin, comprises an unimproved calcareous grassland habitat mostly similar to what was recorded in 2017, it includes a variety of grassland indicator species such as glaucous sedge, common quaking-grass (*Briza media*), common knapweed, lady's bedstraw, common bird's-foot trefoil, field scabious (*Knautia arvensis*) and yellow rattle (*Rhinanthus minor*). Positive changes in the 2018 dataset for the bankside vegetation of lake D include increases in the abundance of glaucous sedge and common knapweed, and new records of the desirable species devil's-bit scabious (*Succisa pratensis*), ragged robin, meadow vetchling and oval sedge (*Carex ovalis*). Negative changes in the 2018 dataset for the bankside vegetation include the continued high abundance value for creeping thistle, slight increases in the abundance of common nettle and creeping bent, the addition of the ruderals hoary ragwort (*Epilobium erucifolius*), great willowherb, perennial sow-thistle (*Sonchus arvensis*) and field horsetail as well as white poplar (*Populus alba*) saplings to the dataset, and the loss of the desireable calcareous grassland species kidney vetch (*Anthylis vulneraria*). It was also noted that the vegetation on the sloping banks of the lake basin was becoming particularly tall and dense with an abundance of creeping thistle, great willowherb, nettle and hedge bedstraw (*Galium mollugo*).

4.0 Conclusions and recommendations

Vegetation

Translocated Calcareous Grassland

4.1 Due to the expansion of the Bellway Homes development, the area of translocated calcareous grassland has significantly contracted in size and now covers an area of approximately 0.2 ha. During the 2018 survey visit the grassland was found to have been recently cut to ground level with the majority of arsings removed, it was also considerably dried out due to the extended period of warm weather. These conditions made it difficult to undertake an accurate assessment of the sward composition and condition and identify species. Consequently only a poor data set was recorded from the quadrat samples and this was not considered to be suitable for NVC analysis. In order to conduct a thorough assesssement and survey of grassland habitats they should ideally be left unmanged during the spring and summer months on the lead up to the botanical survey so that species can be identified and abundance values recorded with accuracy, the timings detailed in the habitat management recommendations below should be adhered to, especially if survey work is planned.

4.2 The grassland within the translocation plot mostly comprises a species-poor sward dominated by coarse grasses, including red fescue, cock's-foot and false oat-grass, with the ruderals field bindweed and creeping cinquefoil also present in limited abundance. A low number of desireable calcioles, including lady's bedstraw, salad burnet and upright brome, are maintaining their presence within the sward in limited abundance. The species-poor/grass-dominated composition of the sward indicates that more consistent management of this grassland plot is required.

- Habitat management recommendations

4.3 The translocated calcareous grassland plot should be cut twice annually for at least the next two years. The sward should ideally be cut once in late summer (late August – early September) and once in early spring (late March – early April) with all arisings removed from the site. During the 2018 survey it was noted that some scattered thin layers of arisings had been left after

management, it is important that arisings are raked off as thoroughly as possible in order to remove the smothering effect they cause and to create spaces within the sward for species to proliferate and establish. The overall aim of these management prescriptions is to reduce the abundance of coarse grasses and encourage the desirable species to proliferate and establish further.

Informal grassland

4.4 In 2018 the informal grassland monitoring quadrats were re-located to different areas of informal grassland on site, quadrats 1-5 were re-located within an informal grassland area off Whitelands Way and quadrats 6-10 were re-located within an area of informal grassland adjacent to lake D in the south-east of the site. These locations were selected because it was noted during the previous survey in 2017 that the grassland sward in these areas is not managed intensively, is allowed to grow tall in summer and comprises a reasonably good variety of species. Quadrats 1-7 were previously located within a regularly mown and species-poor grassland area adjacent to Pingle Brook at the north of the site. It was considered that continued monitoring of this grassland was a poor use of survey effort as it is intensively managed to provide a short sward amenity grassland for local residents, therefore this area is no longer being monitored. Quadrats 8-10 were previously located within the grassland area adjacent to Lake D which was identified to be a species-rich/ecologically valuable habitat and therefore the number of survey quadrats in this area was increased to five in 2018 with quadrats 8-10 re-distributed within this area.

4.5 The informal grassland area off Whitelands Way comprises a rough and overgrown sward that is mostly dominated by coarse grasses and ruderals, including false oat-grass, meadow foxtail, cock's-foot, field bindweed and hogweed, however the desirable indicator species of unimproved grasslands meadow barley, lady's bedstraw and yellow oat-grass are present throughout the sward in occasional to rare abundance. The species composition of the sward is indicative of an unimproved grassland community that has declined in species-richness through lack of suitable management. This area of grassland was formerly used as sheep pasture up until planning permission

was granted for the site. NVC analysis of the quadrat data shows that the grassland most closely resembles the MG1 group of species-poor neutral grassland communities that tend to be dominated by coarse tussocky grasses including false oat-grass, cock's-foot and Yorkshire fog, and large umbelifers such as hogweed (*Heracleum sphondylium*). This result does fit with the rough and species-poor condition of the sward however the goodness-of-fit-values are poor for these matches which indicates that the analysis is inconclusive. This is possibly due to the mixed composition of the sward which includes both common species and grassland axiophytes.

4.6 The informal grassland area adjacent to the north-west of lake D comprises a species-rich sward with an abundance of desirable herbs including common knapweed, oxeye daisy, lady's bedstraw, salad burnet and common bird's-foot trefoil. This area of grassland appears to be managed infrequently and this has allowed a diverse sward to develop. However, some ruderal species and coarse grasses, including creeping thistle, hedge bindweed, cock's-foot and common couch, are beginning to proliferate in parts of the sward. This area of grassland was formerly arable land, the grassland community that is currently present has established from native grassland seed mixes that were sown in the area (as part of landscaping for the development) and natural regeneration. The NVC analysis shows that the quadrat data has an equal best fit with the MG5b and MG1e NVC communities though the goodness-of-fit value for these matches was poor. MG5b is a species-rich grassland community that occurs on calcareous loam with lady's bedstraw being a distinctive component of the sward. Interestingly the NVC analysis of quadrat 8-10 data in 2017 also showed a closest match with MG5b (Terence O'Rourke, 2017). MG1e is a more herb-rich sub-community of the coarse grass-dominated/species-poor MG1 group. The poor goodness-of-fit-values indicate that the analysis is inconclusive which is likely to be due to inconsistencies in frequency and abundance cover of species recorded across the quadrats and the records of negative indicator species. However, it is considered that this grassland more closely resembles the MG5 group due to the profusion of herbs such as lady's bedstraw and limited abundance of coarse grasses. Future management of this grassland area should aim to preserve the botanical diversity of the sward and enhance its overall condition.

- Management recommendations

4.7 A low intensity management regime should be implemented within both of the surveyed areas of informal grassland, this should comprise a single hay cut during late August/early September together with removal of all arisings. A one metre width margin of rough, uncut grassland should also be maintained adjacent to hedgerows which border these grasslands in order to provide an overwinter resource for invertebrates and other fauna. These margins should be cut with arisings removed on a biannual rotation to prevent scrub/tall ruderal encroachment.

Woodlands

4.8 Woodlands 1 and 2 are relatively similar, with both comprising a regenerated woodland community with horse chestnut, ash and sycamore in the canopy; hawthorn, English elm, wild privet, sycamore and ash in the understorey; and a species-poor ground flora largely dominated by ivy, although woodland 2 has a slightly more diverse field layer which includes the notable species stinking iris and the new record of wood false-brome in 2018. The quadrat data for woodlands 1 and 2 has shown little change since 2016 apart from slight increases in the abundance of woody species within the canopy and understorey. Woodlands 1 and 2 do not represent distinct natural vegetation communities and are not considered to be of particular botanical value, however they would undoubtedly provide a valuable ecological resource for a range of fauna including invertebrates, bats, birds and small mammals.

4.9 Woodland 3 consists of a natural, though relatively species-poor, oak/ash woodland community. Given the presence of a number of mature Turkey oaks (a non-native tree species) and the lack of plant diversity within the field layer vegetation, it is therefore considered that woodland 3 resembles a regenerating woodland community rather than a remnant of ancient semi-natural woodland as was concluded in 2017 (Terence O'Rourke, 2017). The quadrat data for woodland 3 shows little change since 2016, apart from increases in the abundance of English elm, field maple and blackthorn, and decreases in abundance of dog's mercury and lords-and-ladies. These changes could potentially indicate a gradual decline in ground flora diversity as woody species regenerate and the understorey becomes increasingly dense over time.

Common nettle and bramble were also noted as being invasive in certain parts of the woodland area which indicates a general absence of woodland management. NVC analysis of the quadrat data shows that the woodland 3 vegetation has a closest match with the W21b scrub *Mercurialis perennis* sub-community with a very good goodness-of-fit rating. The W21 group covers a number of regenerating spinose scrub communities with key constituents including hawthorn, blackthorn and bramble. W21b is one of the more species-rich sub-communities of this group and has a similar composition to that of young natural woodland with a good variety of developing shrubs and tree saplings and higher abundances of woodland indicators such as dog's mercury. The dataset also shows some affinity with the W8 woodland group, however it is considered that the woodland 3 vegetation lacks the structure and field layer diversity to be closely compared with this type of species-rich native woodland community.

4.10 The wet woodland area comprises a mixed assemblage of natural tree and shrub regeneration alongside established planting of native shrubs on an area of both damp and dry ground. The ground flora beneath the shrub cover is impoverished and comprises a low number of common ruderals, including common nettle, cleavers and ivy, whilst considerable stands of dense tall ruderal vegetation have formed in the areas where the tree and shrub growth is sparser. The quadrat data for the wet woodland shows some increases in the abundance of a number of woody species within the understorey as well as a decline in the diversity of the field layer vegetation, including the loss of a number of moderately desirable species and high recorded abundances for tall ruderals and coarse grasses. These changes indicate a general lack of management within this woodland area which is leading to increased density of shrub growth within the understorey and a decline in field layer diversity. The wet woodland area does not form a recognisable natural vegetation community and is considered to have limited botanical interest. Despite this, it would certainly provide a valuable ecological resource for a range of fauna including foraging/commuting bats, foraging/nesting birds, invertebrates, small mammals and amphibians.

Hedgerows

4.11 The recently planted hedgerows (hedgerows 1, 2, 3 and 8) are around 5-6 years in age and range from 1–3 metres in average height and 1–2 metres in average width. They comprise a limited number of native shrub species including hawthorn, field maple, wild privet, spindle and crab apple, with hawthorn the most abundant shrub in each hedgerow. The field layers ranged from species-poor, regularly mown grass verges to more species-rich rough grassland and ruderal vegetation. These hedgerows are considered to be developing well and generally forming a good dense structure, though some thin sections, minor gaps and damage were noted and areas where some shrub planting has died.

4.12 The existing mature hedgerows (hedgerows 4, 5, 6 and 7) comprise a good variety of woody species including hawthorn, field maple, English elm, crab apple, dog rose, elder, sycamore, ash, blackthorn and pedunculate oak. Hedgerows 6 and 7 include a number of mature standard trees including pedunculate oak (two notable veteran specimens in hedgerow 6), ash, horse chestnut, white willow and plane. The existing hedgerows are mostly A-shaped and range from 2 to 4 metres in average height and 1.5 to 2 metres in average width. The field layers mostly comprise rough grassland and ruderal vegetation. A number of gaps were noted in these hedgerows, which ranged from small 1-2 metre gaps to more considerable 4–8 metre gaps where sections have been removed to accommodate new infrastructure associated with the residential development. Attempts to plant up some gaps in these hedgerows using hawthorn whips was noted to be successful in most instances, though some dead whips in tree guards were also noted.

- Management recommendations

4.13 The hedgerows on site should be lightly flailed on a biannual basis and sculpted into a rounded A-shape during flailing. Flailing of the hedgerows should not be too deep and severe.

4.14 Any gaps and thin or damaged sections within the hedgerows on site, including the notable gap at the southern end of hedgerow 5, should be planted up with a variety of native shrubs such as hazel, hawthorn, field maple, dogwood and guelder rose (*Viburnum opulus*). Any dead whips should be

removed and replaced with fresh shrub planting. It is also recommended that native standard trees are planted along hedgerows to enhance their ecological value and provide aesthetic appeal and natural screening, standard tree planting should include species such as pedunculate oak, sessile oak, lime (*Tilia x europaea*), wild cherry (*Prunus avium*), wild service (*Sorbus torminalis*) and yew (*Taxus baccata*).

4.15 A 1–2 metre margin of field layer vegetation adjacent to all hedgerows on site should be managed on a biannual rotation with a cut and removal of arisings. This will allow a margin of rough grassland to develop alongside the hedgerows which will provide a valuable resource for a range of fauna, such as invertebrates, birds, small mammals and amphibians, throughout the year.

Pingle Brook and wetland areas

Pingle Brook

4.16 Pingle Brook comprises a narrow stream channel with an earth and stone substrate, during the 2018 survey much of the channel was completely dry as a result of the prolonged period of warm/dry weather. There are a good range of macrophytic species which are maintaining their prescence in moderate to low abundance within the stream channel. The stream banks comprise rough grassland which is largely dominated by coarse grasses, ruderals and common forbs. The 2018 survey data indicates that the macrophytic vegetation within Pingle Brook is largely stable with desirable species such as branched bur-reed and brooklime maintaining similar abundance levels to what was previously recorded. Some positive changes in 2018 include a notable reduction in fool's watercress, which appears to have resulted from recommended habitat management work being undertaken, there have also been new records of moderately desirable species including square-stalked St John's-wort and sharp-flowered rush. These results suggest that the advised habitat management work is having a positive effect on the stream habitat, with a visible improvement in the stream channel clearly evidenced in fixed-point photographs 1, and is creating suitable conditions for new species to colonise. Despite this there are still considerable stands of great willowherb establishing within the stream channel and the bankside grassland is notably rank and overgrown, this indicates an absecence of management in regards to the stream banks and stands of tall ruderals.

Lake A

4.17 The basin of lake A comprises a pool of open water in the centre which is surrounded by areas of damp and dry ground. The open water and damp areas continue to support a reasonably good assemblage of macrophytic flora in moderate to low abundance. The 2018 survey data shows increases in the abundance of a number of macrophytes, including common spike-rush and sharp-flowered rush, as well as new records of desirable species such as yellow iris and water dock. These results indicate that the macrophytic flora within the lake A basin is gradually colonising more ground and increasing in species-richness, however there are still considerable areas of bare ground within the lake basin and uncolonised sections of the pool margin. In 2018 the vegetation on the banksides and dry areas of the lake basin was found to have developed into a species-poor rank grassland community dominated by coarse grasses with a limited number of ruderals and common forbs together with some bramble encroachment. It is considered that this vegetation is declining in condition and species diversity due to a lack of appropriate management.

Lake B

4.18 Lake B continues to comprise an established wetland habitat with a good variety of macrophytes occupying the entire lake basin. There has been little change in the macrophytic plant assemblage compared with the previous surveys, bulrush continues to dominate the lake with willows (*Salix spp*) also present in frequent to occasional abundance. In 2018 there were new records of two desirable macrophytes, whilst three desirable species were lost from the dataset. Although the macrophytic flora within lake B has remained relatively stable, with some losses of desireable macrophytes counterbalanced by records of new species, it is considered that without management intervention bulrush and willows will proliferate further leading to a more impoverished wetland habitat with further losses of desireable species, little to no areas of open water remaining, and shading/deposition of leaf litter from developing willow trees. The lake B bankside vegetation continues to comprise a mostly species-poor rank grassland community dominated by coarse grasses and ruderals together with bramble encroachment. The condition of the bankside vegetation indicates a general absence of habitat management in this area.

Lake C

4.19 Lake C also continues to comprise an established wetland habitat with a particularly good variety of macrophytes occupying the majority of the lake basin. There is a limited amount of standing water present within lake C with the majority of the basin comprising damp to dry ground. In 2018 the macrophytic vegetation was found to be largely similar to what has previously been recorded, apart from a notable increase in the abundance of the tall ruderal great willowherb and the addition and loss of a low number of desirable macrophytes. Bulrush continues to be a dominant constituent of the macrophytic flora whilst willows (*Salix spp*) are present in occasional abundance, if left unchecked these species could potentially dominate the lake over time leading to a decline in the condition and species-richness of the habitat. The bankside vegetation of lake C is mostly similar to what was recorded in 2017, comprising a mixed community of grassland, ruderals and macrophytic plant species with a small amount of willow scrub, however in 2018 the notable orchid species marsh helleborine and southern marsh-orchid were recorded on the south-western margin of lake C. Marsh helleborine in particular is an uncommon orchid with a very localised distribution. The presence of these orchid species makes the bankside vegetation an ecologically valuable habitat that is worthwhile preserving, measures to conserve these species and enhance the bankside vegetation are detailed in the management recommendations below.

Lake D

4.20 The lake D basin comprises an area of standing water to the south-west and a drainage channel running from north-east to south-west, all of which have been colonised by a good assemblage of macrophytic vegetation. The macrophytic vegetation is broadly similar to what has previously been recorded, however there have been some positive changes in 2018 including a notable increase in abundance of water horsetail and the addition of a number of new desirable macrophytes to the dataset including marsh horsetail and water forget-me-not. These positive results indicate that the marophytic flora within lake D is developing further with colonisations by new species and proliferation of existing species. Despite this some negative changes were also identified including small increases in the abundance of negative indicators

including bulrush, great willowherb, fool's watercress and white willow, as well as the loss of the desirable species watercress. These negative changes indicate a general lack of management within the wetland areas of lake D which is allowing the proliferation of vigorous and undesirable species, this could potentially lead to impoverishment of the macrophytic flora over time and development of a species-poor community dominated by bulrush and willow scrub. The banksides and areas of damp to dry ground within the lake basin continue to support a species-rich grassland community comprising numerous dersiable axiophytes such as yellow rattle and common quaking grass. It is considered that these areas of grassland within the lake D basin are a botanically diverse and ecologicaly valuable habitat that is worth conserving. In 2018 the bankside vegetation was noted to be rather overgrown with tall ruderal species such as creeping thistle forming stands in places, this indicates a general lack of grassland management within the lake D habitat area.

- Mangement recommendations

Pingle Brook

4.21 Stands of great willowherb and dense growth of fool's watercress should be removed from the stream channel on an annual basis. This will control the spread and dominance of these species within the stream channel and create open areas suitable for colonisation by desirable macrophytes.

4.22 The grassy margins and banks of the stream should be cut on an annual basis during late summer (August/September) with all arisings removed. This should reduce the density of the sward and prevent it from overshadowing the stream channel and competing with the macrophytic species, it will also provide a more attractive herb-rich sward along the stream margins.

Lake A

4.23 The vegetation occupying the banksides and dry areas within the lake basin should receive an annual cut in late August/early September with removal of all arisings. This will enhance the vegetation structure and increase plant diversity within these areas forming a herb-rich grassland community over time.

4.24 The pool of open water within the lake basin could potentially be enhanced with the installment of coir matting which is pre-planted with native macrophytic vegetation (Salix, 2018).

Lake B

4.25 Minor coppicing of willows and some removal of bulrush should be undertaken within lake B to prevent the spread/dominance of these species. It is recommended that up to 20% of the existing willows are coppiced and up to 30% of the bulrush is cleared and removed. This management should be repeated on an annual to biannual basis depending on the level of successive regrowth.

4.26 The bankside vegetation should receive an annual cut in late August/early September with removal of all arisings. This will enhance the vegetation structure and increase plant diversity forming a herb-rich grassland community over time.

Lake C

4.27 Some minor coppicing of willows and removal of bulrush should be undertaken within lake C. It is recommended that up to 10% of the existing willows are coppiced and up to 30% of the bulrush is cleared and removed. This management should be repeated on an annual to biannual basis depending on the level of successive regrowth. Approximately 40% of willow scrub should be retained on the lake margins to provide a habitat resource for invertebrates and birds.

4.28 The vegetation within the damp to dry areas of the lake basin should be cut with removal of all arisings on a biannual basis in order to maintain plant diversity and restrict colonisation by scrub and tall ruderals.

4.29 An additional 1.5 metre margin of wildflower grassland should be established around the margin of the lake and excluded from intensive mowing with the aim of conserving the notable orchid species. This margin of grassland together with the bankside vegetation should receive an annual cut in late August/early September with removal of all arisings. This management will enhance vegetation structure and increase plant diversity forming a herb-rich

grassland community over time, it will also create suitable conditions for the identified orchid species to proliferate.

Lake D

4.30 Some removal of bulrush, great willowherb and fool's water-cress should be undertaken within the wet areas of lake D. It is recommended that approximately 30% of the existing bulrush is cleared and removed. All great willowherb and fool's watercress should also be cleared and removed from the aquatic habitat areas. This management should be repeated on an annual to biannual basis depending on the level of successive regrowth.

4.31 The bankside vegetation and grassland areas within the lake basin should be managed with an annual hay cut in late August/early September together with removal of all arisings. This will maintain the condition of the grassland habitat and preserve/enhance species diversity within the sward.

4.32 Targeted treatment of thistles (*Cirsium spp*) and common nettle within the lake basin and along the banks, via hand-pulling and/or spot treatment, should be undertaken. This will prevent further proliferation of these species.

Habitat management summary

4.33 A summary of the recommended management prescriptions for each of the monitored habitat features on site together with recommended timings for habitat management is presented in table 25 below.

Table 25: Habitat management summary for Kingsmere, Bicester

Habitat feature	Management prescription	Timing
Translocated calcareous grassland plot	Hay cut and removal of all arisings.	Once in late August/early September and a second cut in late March/early April (second cut for next two years only).
Informal grassland areas	Hay cut and removal of all arisings.	Late August/early September.
Hedgerows	Light biannual flailing with hedgerows sculpted into a rounded A-shape during flailing.	Between the months of September and February (inclusive).

	Planting up any gaps and thin or damaged sections within the hedgerows on site using a variety of native shrubs. Any dead whips to be removed and replaced with fresh shrub planting.	Between the months of September and February (inclusive).
	Retention and management of a 1–2 metre margin of field layer vegetation adjacent to all hedgerows on site. Management will comprise a biannual cut and removal of all arisings.	Late August/early September.
Pingle Brook	Stands of great willowherb (*Epilobium hirsutum*) and dense growth of fool's watercress (*Apium nodiflorum*) to be removed from the stream channel on an annual basis.	Any time.
	The grassy margins and banks of the stream to be cut on an annual basis with all arisings removed.	Late August/early September.
Lake A	Vegetation occupying the banksides and dry areas within the lake basin to be cut on an annual basis with all arisings removed.	Late August/early September.
Lake B	Coppicing of up to 20% of the existing willows (*Salix spp*) within the Lake basin and clearance/removal of up to 30% of bulrush (*Typha latifolia*).	Between the months of September and February (inclusive).
	The bankside vegetation to be cut on an annual basis with all arisings removed.	Late August/early September.
Lake C	Coppicing of up to 10% of the existing willows within the Lake basin and clearance/removal of up to 30% of bulrush.	Between the months of September and February (inclusive).
	Vegetation within the damp to dry areas of the lake basin to be cut with removal of all arisings on a biannual basis.	Late August/early September.
	Bankside vegetation and a 1.5 metre margin of adjacent grassland to be cut	Late August/early September.

	on an annual basis with all arisings removed.	
Lake D	Clearance/removal of all great willowherb and fool's watercress and up to 30% of bulrush from the wet areas of the lake basin.	Between the months of September and February (inclusive).
	Bankside vegetation and grassland areas within the lake basin to be cut on an annual basis with all arisings removed.	Late August/early September.
	Targeted treatment of thistles (*Cirsium spp*) and common nettle within the lake basin and along the banks, via hand-pulling and/or spot treatment.	Any time.

5.0 References

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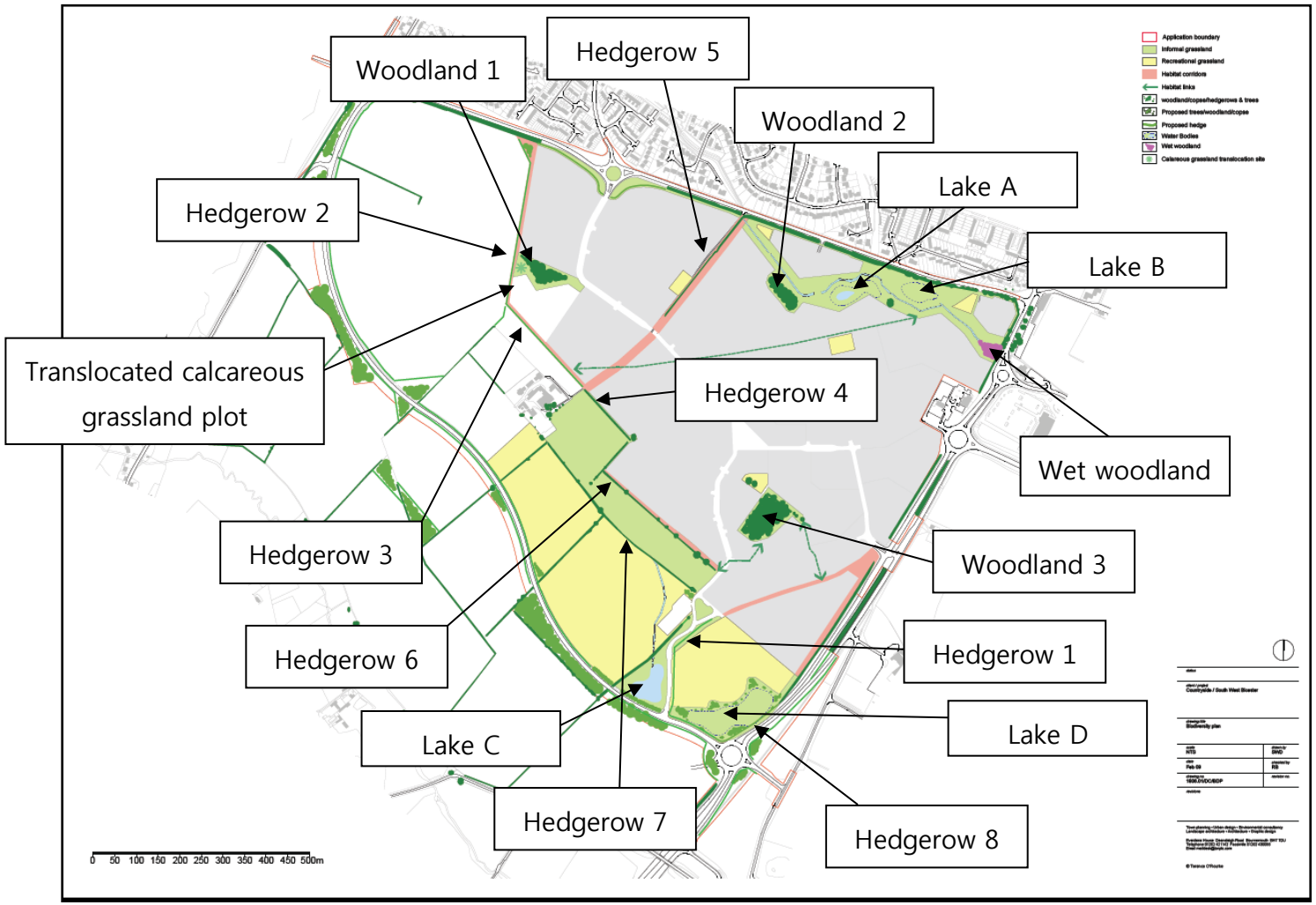
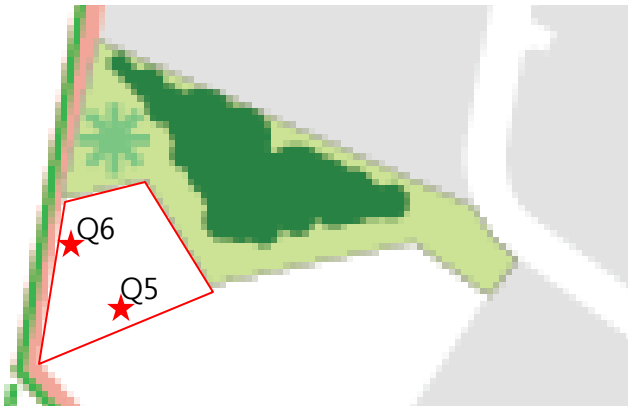
Appendix I: Site plan



Appendix II: Translocated calcareous grassland plot and quadrat locations



Fixed point photographs of the surveyed quadrats

Quadrat 5 – 2017

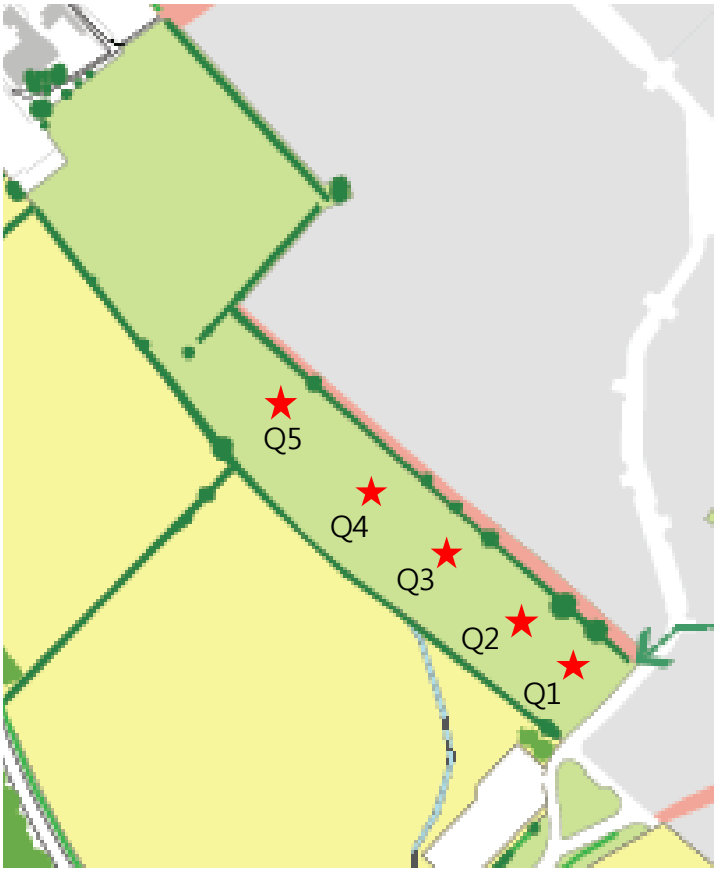
Quadrat 5 – 2018

Quadrat 6 – 2017

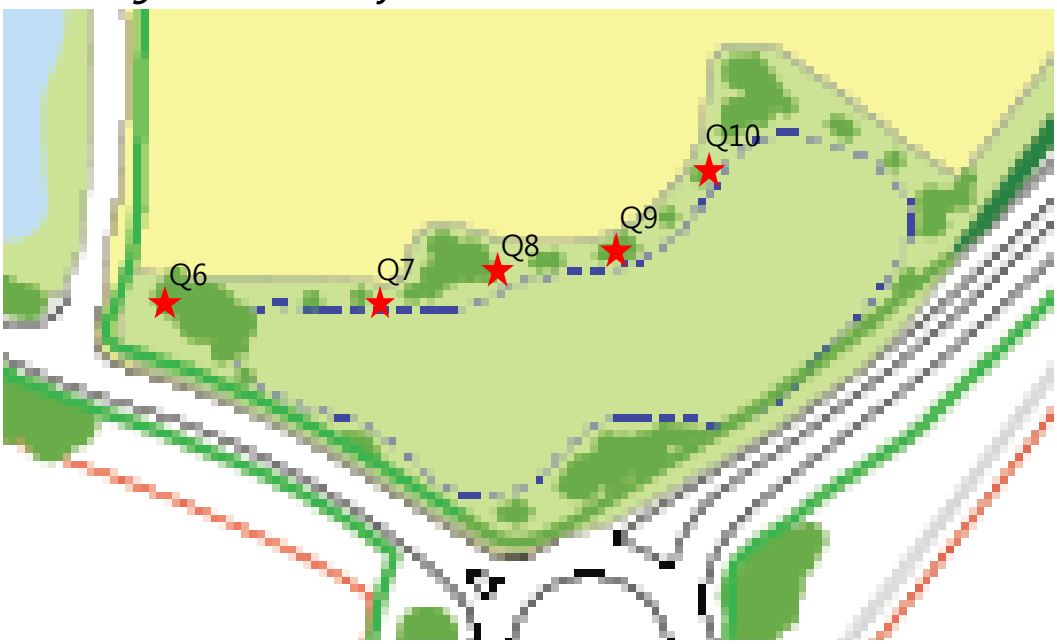
Quadrat 6 – 2018

Appendix III: Informal grassland areas and quadrat locations

Informal grassland area off Whitelands Way



Informal grassland area adjacent to lake D



Fixed point photographs of the surveyed quadrats

Informal grassland area off Whitelands Way

Overview of grassland area – 2018

Quadrat 1 – 2018

Quadrat 2 – 2018

Quadrat 3 – 2018

Quadrat 4 – 2018

Quadrat 5 – 2018

Informal grassland area adjacent to lake D

Overview of grassland area – 2018

Quadrat 6 – 2018

Quadrat 7 – 2018

Quadrat 8 – 2018

Quadrat 9 – 2018

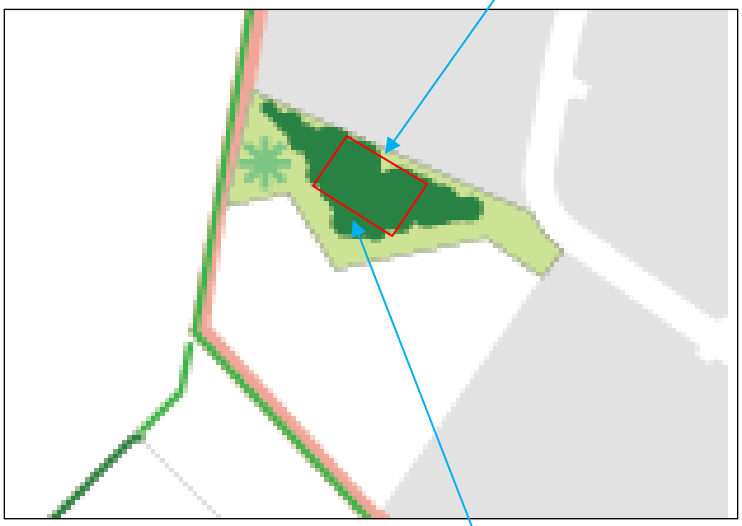
Quadrat 10 – 2018

Appendix IV: Quadrat locations within the woodland areas and fixed-point photographs

Woodland 1

2017

2018



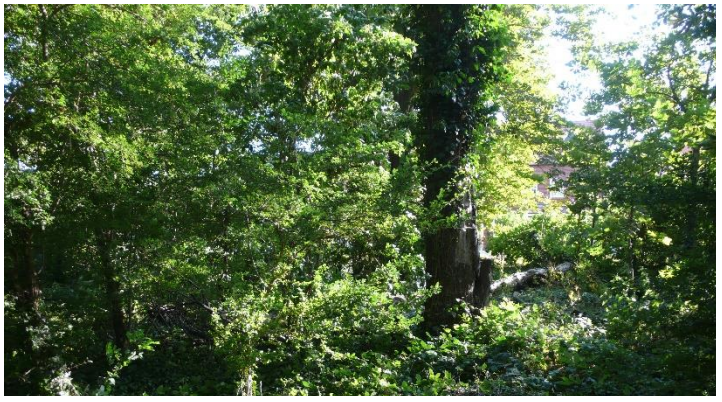
2017

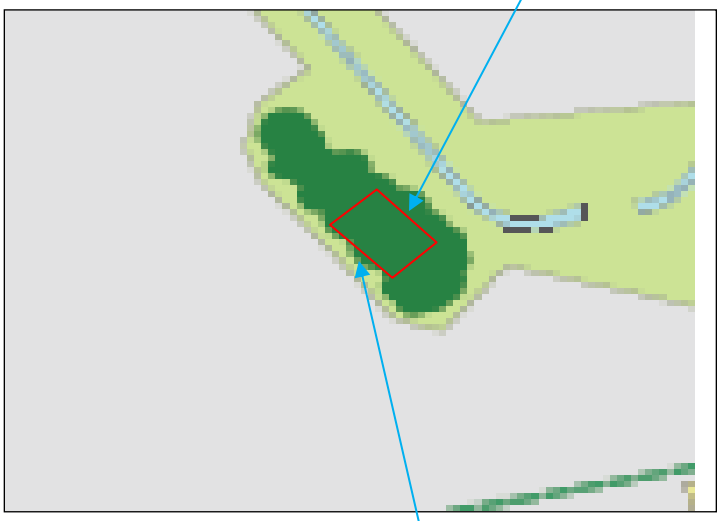
2018

Woodland 2

2017

2018





2017

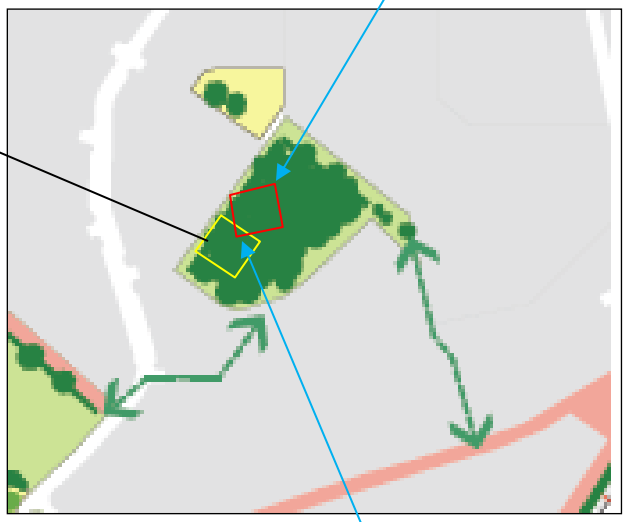
2018

Woodland 3

2017

2018

Additional quadrat for NVC



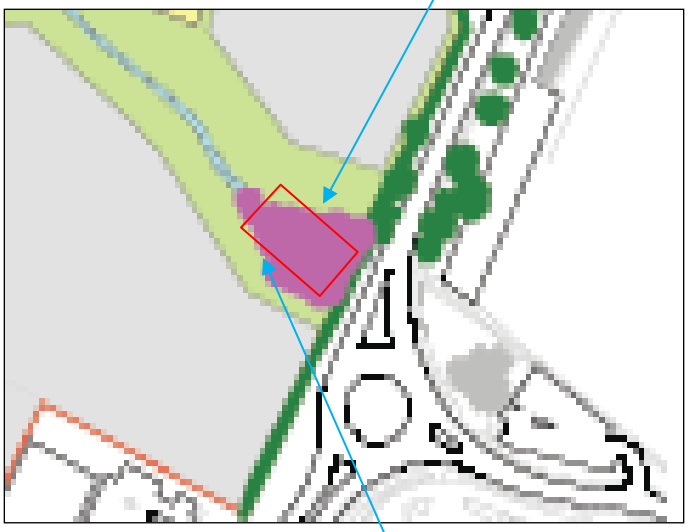
2017

2018

Wet woodland

2017

2018



2017

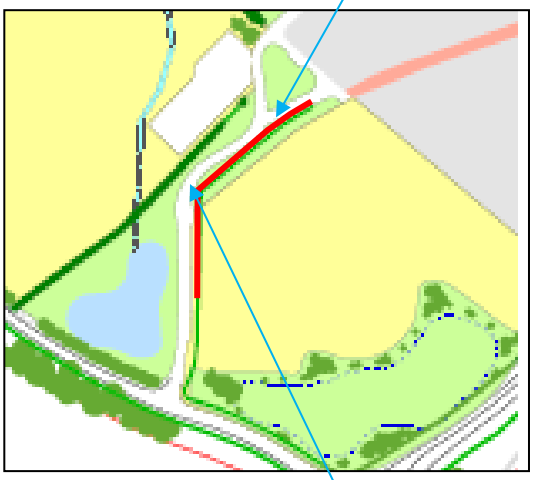
2018

Appendix V: Hedgerow survey sections and fixed-point photographs

Hedgerow 1

2017

2018



2017

2018

Hedgerow 2

2017

2018

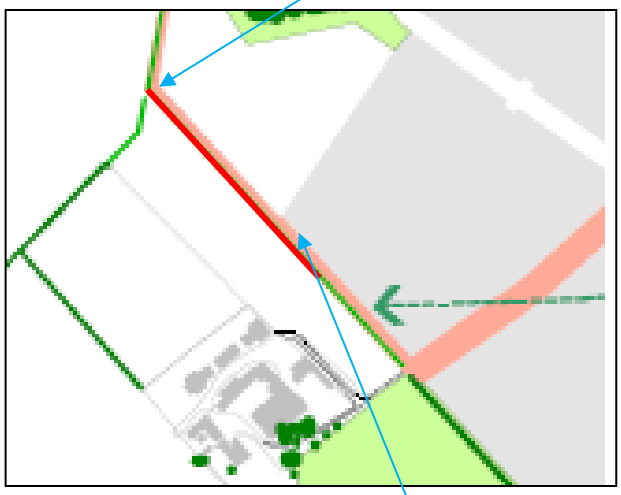
2017

2018

Hedgerow 3

2017

2018



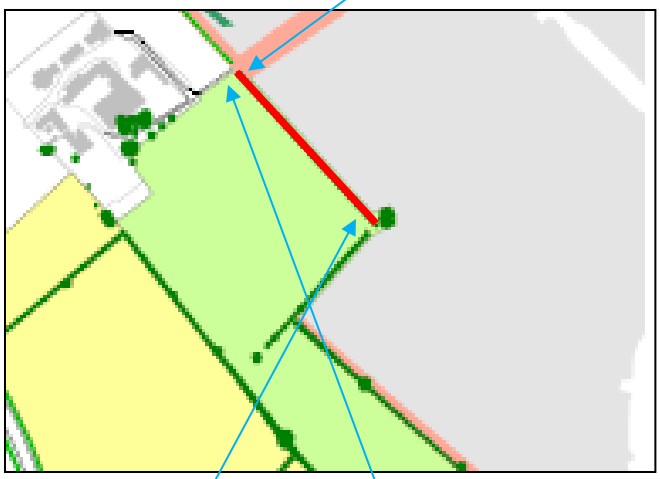
2017

2018

Hedgerow 4

2017

2018



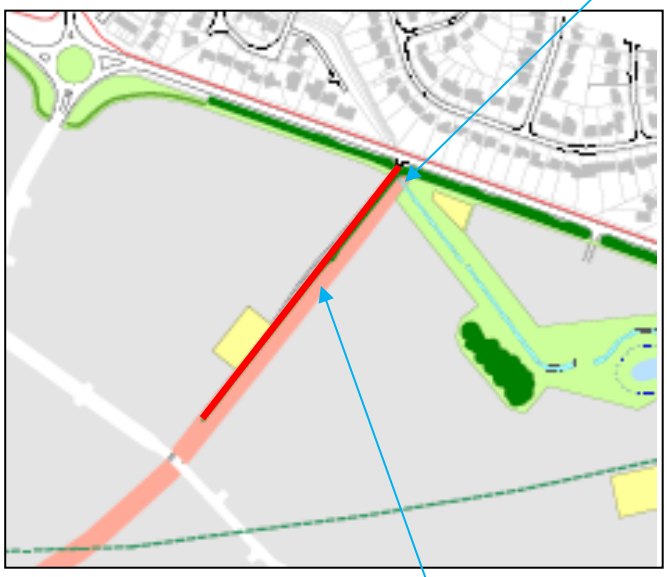
2017

2018

Hedgerow 5

2017

2018



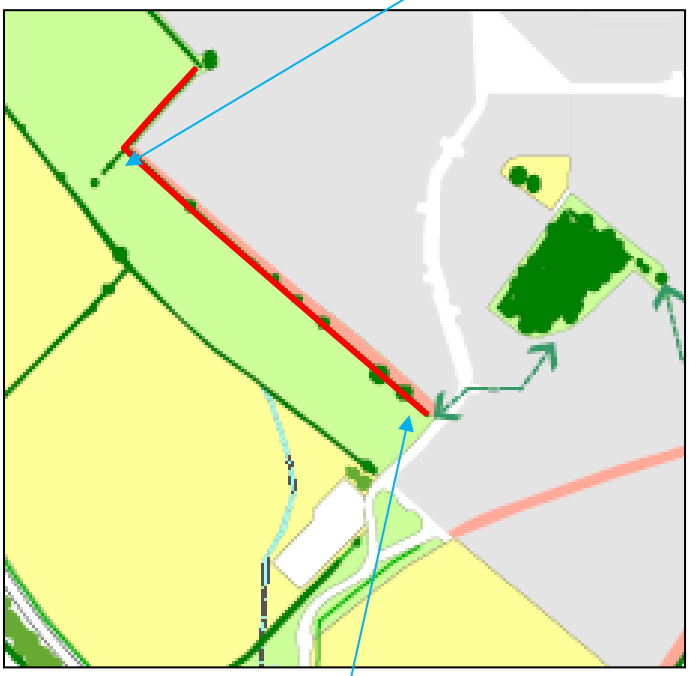
2017

2018

Hedgerow 6

2017

2018

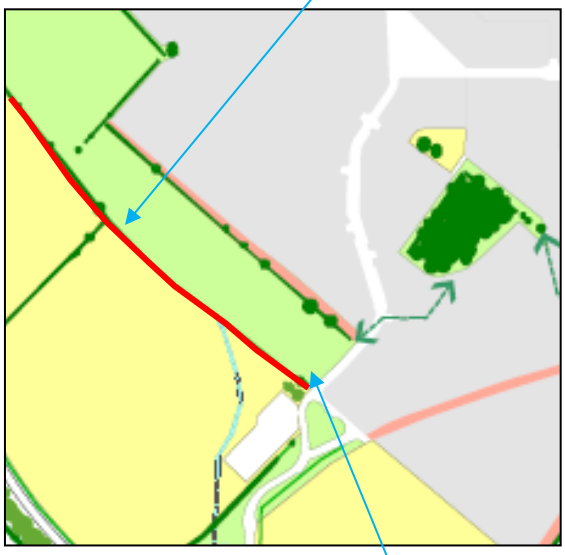


2018

Hedgerow 7

2017

2018



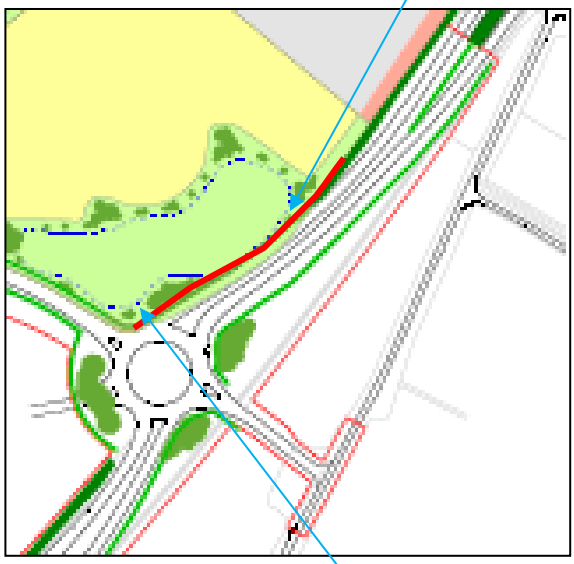
2017

2018

Hedgerow 8

2017

2018



2017

2018

Appendix VI: Fixed-point photography of Pingle Brook and wetland areas

Pingle Brook, lake A and lake B

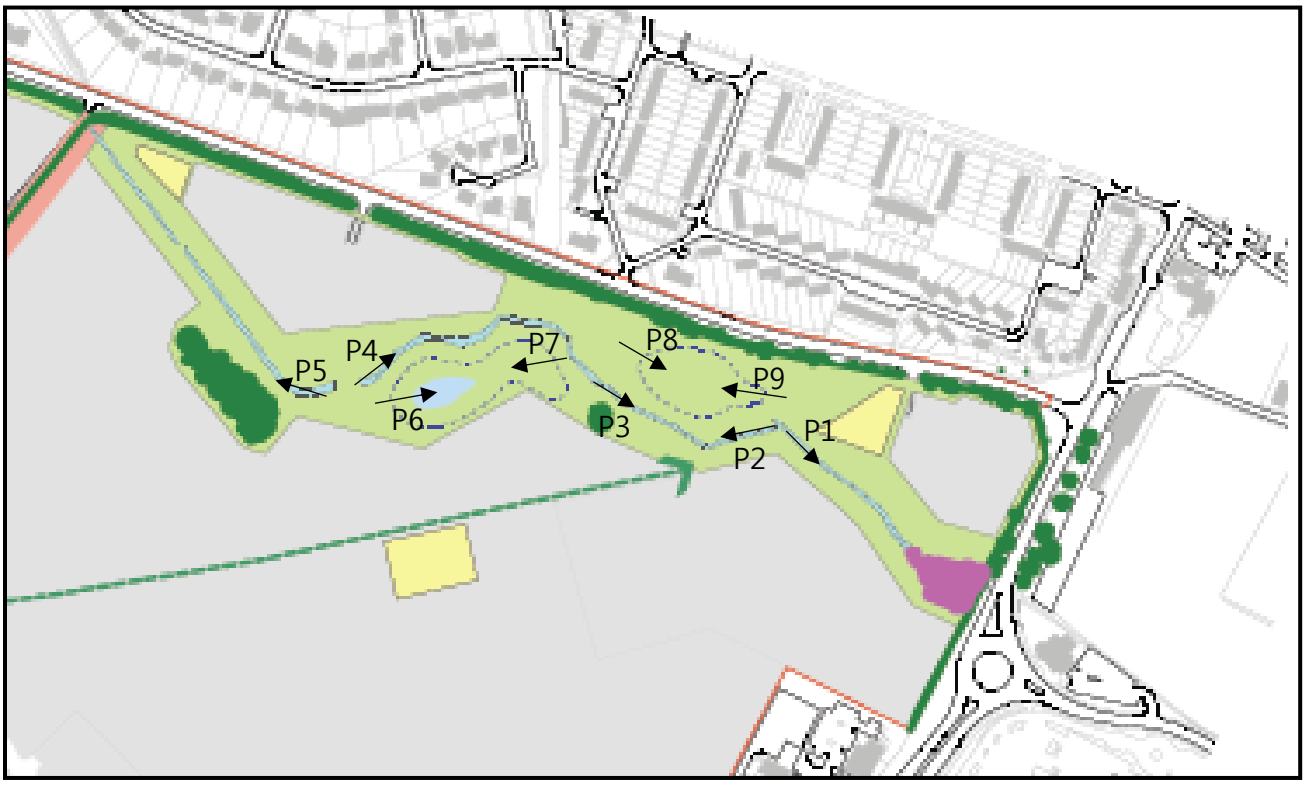


Photo 1 – 2017

Photo 1 – 2018

Photo 2 – 2017

Photo 2 – 2018

Photo 3 – 2017

Photo 3 – 2018

Photo 4 – 2017

Photo 4 – 2018

Photo 5 – 2017

Photo 5 – 2018

Photo 6 (Lake A) – 2017

Photo 6 (Lake A) – 2018

Photo 7 (Lake A) – 2017

Photo 7 (Lake A) – 2018

Photo 8 (Lake B) – 2017

Photo 8 (Lake B) – 2018

Photo 9 (Lake B) – 2017

Photo 9 (Lake B) – 2018

Lake C and lake D

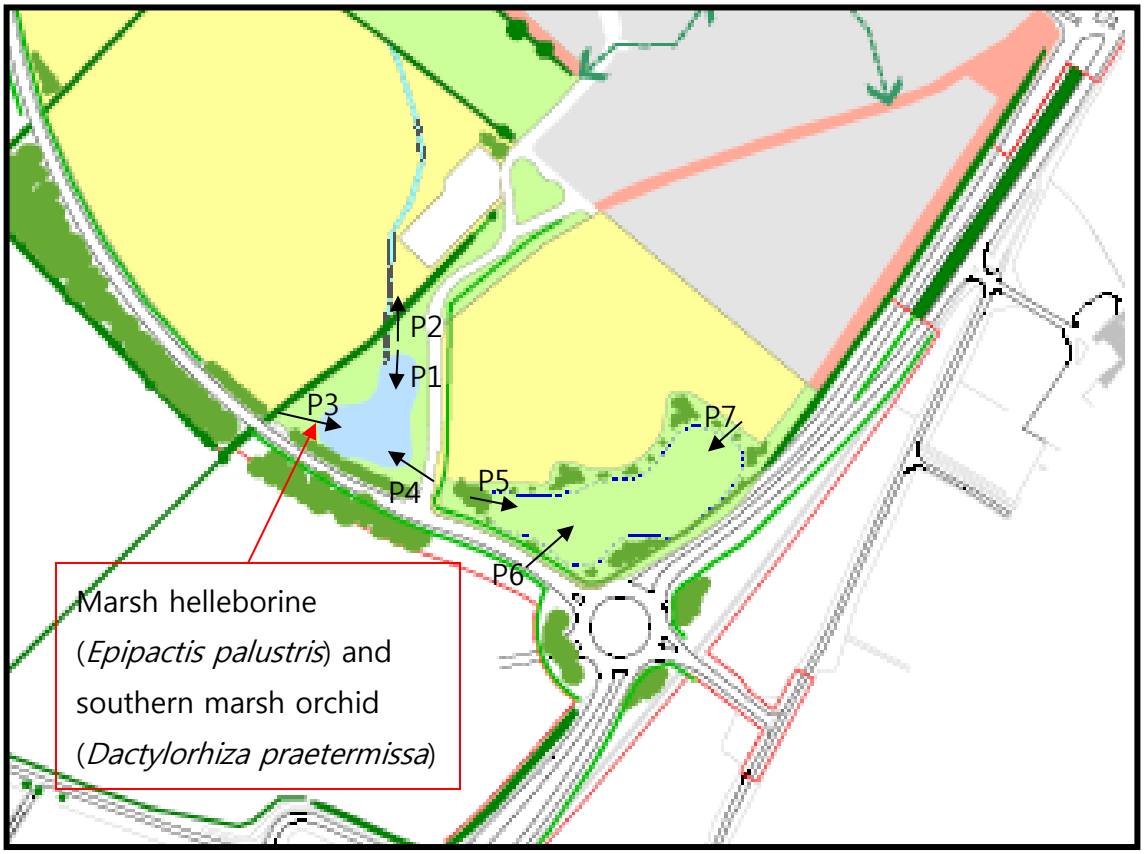


Photo 1 (Lake C) – 2017

Photo 1 (Lake C) – 2018

Photo 2 (Lake C) - 2017

Photo 2 (Lake C) - 2018

Photo 3 (Lake C) - 2017

Photo 3 (Lake C) - 2018

Photo 4 (Lake C) – 2017

Photo 4 (Lake C) - 2018

Marsh helleborine (*Epipactis palustris*) recorded on the south-western margin of Lake C

Photo 5 (Lake D) - 2017

Photo 5 (Lake D) - 2018

Photo 6 (Lake D) - 2017

Photo 6 (Lake D) - 2018

Photo 7 (Lake D) - 2017

Photo 7 (Lake D) - 2018