



High Speed Two Phase 2a (West Midlands - Crewe)

Background Information and Data

Ecology and biodiversity

Ecological baseline data - river habitat, river corridor and
ditch surveys (BID-EC-006-000)



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Department for Transport

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A report prepared for High Speed Two (HS2) Limited:

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Contents

1	Introduction	1
2	River corridor survey	3
2.1	Methodology	3
2.2	Deviations, constraints and limitations	3
2.3	Baseline data	5
2.4	Watercourses scoped out of the requirement for RCS	37
3	River habitat survey	41
3.1	Methodology	41
3.2	Deviations, constraints and limitations	41
3.3	Baseline	42
3.4	Watercourses scoped out of the requirement for RHS	50
4	Ditch vegetation	51
4.1	Methodology	51
4.2	Deviations, constraints and limitations	51
4.3	Baseline	52
5	References	54

List of figures

Figure 1: 000-RS1-188001Pyford Brook (CA1) river corridor survey sketch from field visit (from grid reference SK133147to SK130133)	8
Figure 2: 000-RS1-190001Bourne Brook (CA1) river corridor survey sketch from field visit (from grid reference SK116152 to SK119155)	12
Figure 3: 000-RS1-190001Bourne Brook (CA1) river corridor survey sketch from field visit (from grid reference SK119155to SK123156)	13
Figure 4: 000-RS1-191001 Crawley Brook (CA1) river corridor survey sketch from field visit (from grid reference SK113157 to SK114163)	17
Figure 5: 000-RS1-196001 Unnamed tributary of Bentley Brook (CA1) river corridor survey sketch from field visit (from grid reference SK074206 to SK074204)	20
Figure 6: 000-RS1-196001 Unnamed tributary of Bentley Brook (CA1) river corridor survey sketch from field visit (from grid reference SK075202 to SK075201)	21

Figure 7: 000-RS1-196001 Unnamed tributary of Bentley Brook (CA1) river corridor survey sketch from field visit (from grid reference SK079193 to SK081190)	22
Figure 8: 000-RS1-199001 Unnamed tributary of Moreton Brook (CA1) river corridor survey sketch from field visit (from grid reference SK058216 to SK057215)	25
Figure 9: 000-RS1-199001 Unnamed tributary of Moreton Brook (CA1) river corridor survey sketch from field visit (from grid reference SK050212 to SK053214)	26
Figure 10: 000-RS1-201001 Moreton Brook (CA1) river corridor survey sketch from field visit (from grid reference SK036220 to SK037218)	29
Figure 11: 000-RS1-201001 Moreton Brook (CA1) river corridor survey sketch from field visit (from grid reference SK037218 to SK039216)	30
Figure 12: 000-RS1-217001 Unnamed tributary of River Trent (CA3) river corridor survey sketch (from grid reference SJ900311 to SJ898306)	33
Figure 13: 000-RS1-243001 Unnamed tributary of Mere Gutter (CA5) river corridor survey sketch (from grid reference SJ727492 to SJ732492)	36

List of tables

Table 1: Summary of accessible locations where RCS survey was undertaken	3
Table 2: Summary of locations in CA1-CA5 that were scoped in but inadequate access was available for survey	4
Table 3: RCS results for Pyford Brook (CA1)	6
Table 4: RCS results for Bourne Brook (CA1)	10
Table 5: RCS results for Crawley Brook (CA1)	15
Table 6: RCS results for unnamed tributary of Bentley Brook (CA1)	18
Table 7: RCS results for unnamed tributary of Moreton Brook (CA1)	23
Table 8: RCS results for Moreton Brook (CA1)	27
Table 9: RCS results for Unnamed tributary of River Trent (CA3)	31
Table 10: RCS results for unnamed tributary of Mere Gutter (CA5)	34
Table 11: Summary of locations in CA1-CA5 where RCS survey was scoped out	37
Table 12: Summary of locations in CA1-CA5 that were scoped in but inadequate access was available for survey	41
Table 13: Desk study RHS data for watercourses within the land required for the construction of the Proposed Scheme in CA1	43
Table 14: Desk study RHS data for watercourses within the land required for the construction of the Proposed Scheme in CA2	45
Table 15: Desk study RHS data for watercourses within the land required for the construction of the Proposed Scheme in CA3	47
Table 16: Desk study RHS data for watercourses within the land required for the construction of the Proposed Scheme in CA4	48
Table 17: Desk study RHS data for watercourses within the land required for the construction of the Proposed Scheme in CA5	49
Table 18: Summary of ditch vegetation survey locations within the West Midlands to Crewe area	51
Table 19: Summary of locations where requirement for ditch survey was identified, but no access available for survey within the appropriate season	51
Table 20: A summary of the ditch vegetation baseline data	52

1 Introduction

1.1.1 This report presents a summary of the baseline data relating to:

- river corridor surveys;
- river habitat surveys; and
- ditches.

1.1.2 Ecological baseline data has been collected for the assessment of High Speed Rail (West Midlands - Crewe). The Proposed Scheme will pass through the following community areas (CA):

- CA1: Fradley to Colton;
- CA2: Colwich to Yarlet;
- CA3: Stone and Swynnerton;
- CA4: Whitmore Heath to Madeley; and
- CA5: South Cheshire.

1.1.3 This report should be read in conjunction with Map Series EC-02, EC-03, EC-04, EC-10 and EC-11 in the Background Information and Data, Ecology Map Books.

1.1.4 The following baseline ecology reports can also be referred to:

- Ecological baseline data - phase 1 habitat survey (Background Information and Data: BID-EC-002-000);
- Ecological baseline data - protected and or notable flora (Background Information and Data: BID-EC-003-000);
- Ecological baseline data - national vegetation classification and ancient woodland (Background Information and Data: BID-EC-004-000);
- Ecological baseline data – hedgerows (Background Information and Data: BID-EC-005-000);
- Ecological baseline data - amphibian and pond surveys (Background Information and Data: BID-EC-007-000);
- Ecological baseline data – reptiles (Background Information and Data: BID-EC-008-000);
- Ecological baseline data - breeding and wintering birds (Background Information and Data: BID-EC-009-000);
- Ecological baseline data - otter and water vole (Background Information and Data: BID-EC-010-000);
- Ecological baseline data – hazel dormouse (Background Information and Data: BID-EC-011-000);

- Ecological baseline data – bats (Background Information and Data: BID-EC-012-000);
- Ecological baseline data - white clawed crayfish and other invertebrate (Background Information and Data: BID-EC-013-000); and
- Ecological baseline data – fish (Background Information and Data: BID-EC-014-000).

1.1.5 Note that baseline data for badger is not made publically available due to the historic persecution of this species.

1.1.6 The ecological assessment is detailed in the High Speed Rail (West Midlands to Crewe) Environmental Statement (ES)¹:

- Volume 2 , Community area reports;
- Volume 3, Route-wide effects;
- Volume 4, Off-route effects; and
- Volume 5, Appendices.

¹ HS2 Ltd (2017), *High Speed Rail (West Midlands – Crewe) Environmental Statement (ES)*, www.gov.uk/hs2

2 River corridor survey

2.1 Methodology

- 2.1.1 Details of the standard methodology utilised for river corridor surveys (RCS) are provided in the Technical Note HS2 Ecological Surveys: Field Survey Methods and Standards (FSMS) included in the Scope and Methodology Report (SMR) Addendum (see Volume 5: Appendix CT-001-002).
- 2.1.2 Scoping visits to accessible stretches of watercourse were conducted during Water Framework Directive (WFD) walkover surveys. These visits were used to check the nature of each watercourse and determine if a detailed RCS was necessary. If so, this was undertaken during the WFD walkover visit for those sections of watercourse which were accessible at that time.
- 2.1.3 A summary of locations where the RCS scoping requirements outlined in the FSMS were met and at which a RCS was undertaken is provided in Table 1. This information is cross referenced to the accompanying Map Series EC- 10.

Table 1: Summary of accessible locations where RCS survey was undertaken

Ecology survey code	Watercourse name	Feature type	Survey date	CA	Distance from the Proposed Scheme (m) and orientation
000-RS1-188001	Pyford Brook	Main river	1 November 2016	CA1	Within
000-RS1-190001	Bourne Brook	Ordinary watercourse	1 November 2016	CA1	Within
000-RS1-191001	Crawley Brook	Ordinary watercourse	1 November 2016	CA1	Within
000-RS1-196001	Unnamed tributary of Bentley Brook	Ordinary watercourse	1 November 2016	CA1	Within
000-RS1-199001	Unnamed tributary of Moreton Brook	Ordinary watercourse	24 October 2016	CA1	Within
000-RS1-201001	Moreton Brook	Ordinary watercourse	24 October 2016	CA1	Within
000-RS1-217001	Unnamed tributary of River Trent	Ordinary watercourse	2 November 2016	CA3	Within
000-RS1-243001	Unnamed tributary of Mere Gutter	Drain	10 November 2016	CA5	Within

2.2 Deviations, constraints and limitations

- 2.2.1 Surveys undertaken were limited to locations where landowner permission had been obtained. This restricted the ability to survey the standard continuous 500m stretch of watercourse, therefore surveys were completed along the watercourse where access was granted.
- 2.2.2 A summary of locations where requirement for RCS was identified but where surveys were not conducted due to inadequate access is provided in Table 2.

Table 2: Summary of locations in CA1-CA5 that were scoped in but inadequate access was available for survey

Survey site name	Location	OS grid reference - crossing point of the Proposed Scheme	Description of proposed survey location	CA	Distance from the Proposed Scheme (m) and orientation
Unnamed tributary of River Trent	Staffordshire, Lionlodge Covert	SJ 985239	Ordinary watercourse (simple woodland drain)	CA2	Within
Unnamed tributary of River Trent	Staffordshire, Lionlodge Covert	SJ 986239	Ordinary watercourse (simple woodland drain)	CA2	Within
Unnamed tributary of River Lea	Staffordshire, within Whitmore Wood	SJ 791416	Ordinary watercourse (surface water flow path)	CA4	Within
Unnamed tributary of River Lea	Staffordshire, boundary of Whitmore Wood	SJ 789418	Ordinary watercourse (simple woodland drain)	CA4	Within
Unnamed tributary of River Lea	Staffordshire, within Hey Sprink	SJ 795429	Ordinary watercourse (woodland drain)	CA4	Within
Unnamed tributary of Mere Gutter	Cheshire, south of Den Lane	SJ 738475	Ordinary watercourse (heavily managed drain)	CA5	Within
Unnamed tributary of Mere Gutter	Cheshire, north of Den Lane	SJ 733483	Ordinary watercourse (watercourse along wooded field boundary)	CA5	Within
Basford Brook	Cheshire, south of Waybutt Lane	SJ 736494	Main River (brook)	CA5	Within
Basford Brook	Cheshire, Crotia Mill Farm	SJ 731512	Main River (brook)	CA5	Within
Unnamed tributary of Basford Brook	Cheshire, north of Newcastle Road	SJ 725514	Ordinary watercourse (heavily managed drain)	CA5	Within
Unnamed tributary of Gresty Brook	Cheshire, A500 north of Shavington Hall	SJ 710526	Ordinary watercourse (heavily managed ditch system)	CA5	Within
Basford Brook	Cheshire, west of David Whitby Way	SJ 722532	Main River (brook)	CA5	Within

Colwich to Yarlet (CA2)

2.2.3 Surveys were not undertaken at two unnamed tributaries of the River Trent within Lionlodge Covert due to access restrictions. Maps and aerial imagery suggest that both tributaries at this site are simple woodland drains and unlikely to be scoped in for RCS.

Whitmore Heath and Madeley (CA4)

- 2.2.4 Surveys were not undertaken at the unnamed tributary of River Lea within the woodland of Hey Sprink. Maps and aerial imagery suggest that the tributary is a woodland drain which may be suitable for RCS.
- 2.2.5 Surveys were not undertaken at the unnamed tributary of River Lea within Whitmore Wood due to access restrictions. Maps and aerial imagery suggest that the watercourse is a surface water flow path and unlikely to be scoped in for RCS. Surveys were also not undertaken at the unnamed tributary of River Lea to the north of Whitmore Wood due to access restrictions. Maps and aerial imagery suggest that the watercourse is a simple woodland drain and unlikely to be scoped in for RCS.

South Cheshire (CA5)

- 2.2.6 An unnamed tributary of Mere Gutter, south of Den Lane was not visited due to access restrictions. Maps and aerial imagery suggest that the watercourse is a heavily managed drain and unlikely to be scoped in for RCS.
- 2.2.7 An unnamed tributary of Basford Brook to the north of Den Lane was also not visited due to access restrictions. On examination of aerial imagery this stream appears suitable for RCS.
- 2.2.8 Surveys were not undertaken at Basford Brook to the south of Waybutt Lane where the watercourse is within the area required for the construction of the Proposed Scheme. Maps and aerial imagery suggest that Basford Brook may be suitable for RCS.
- 2.2.9 Surveys were not undertaken at Basford Brook near Crotia Mill Farm. Maps and aerial imagery suggest that Basford Brook at this location may be suitable for RCS.
- 2.2.10 Surveys were not undertaken at an unnamed tributary of Basford Brook, north of Newcastle Road. Maps and aerial imagery suggest that the watercourse is a simple heavily managed drain and unlikely to be scoped in for RCS.
- 2.2.11 An unnamed tributary of Gresty Brook A500 north of Shavington Hall was not visited due to access restrictions, though for this watercourse maps and aerial imagery show a heavily managed ditch system which is unlikely to be scoped in for RCS.
- 2.2.12 Surveys were not undertaken at Basford Brook to the west of David Whitby Way. Maps and aerial imagery suggest that Basford Brook at this location may be suitable for RCS.

2.3 Baseline data

- 2.3.1 Baseline data relating to the RCS for CA1 – CA5 are detailed below. Results for each watercourse are tabulated and accompanied by the river corridor survey sketch (field notes drafted during the site visit).

Pyford Brook (CA1)

- 2.3.2 River corridor habitats identified in CA1 along Pyford Brook (000-RS1-188001) are detailed in Table 3 and Figure 1.

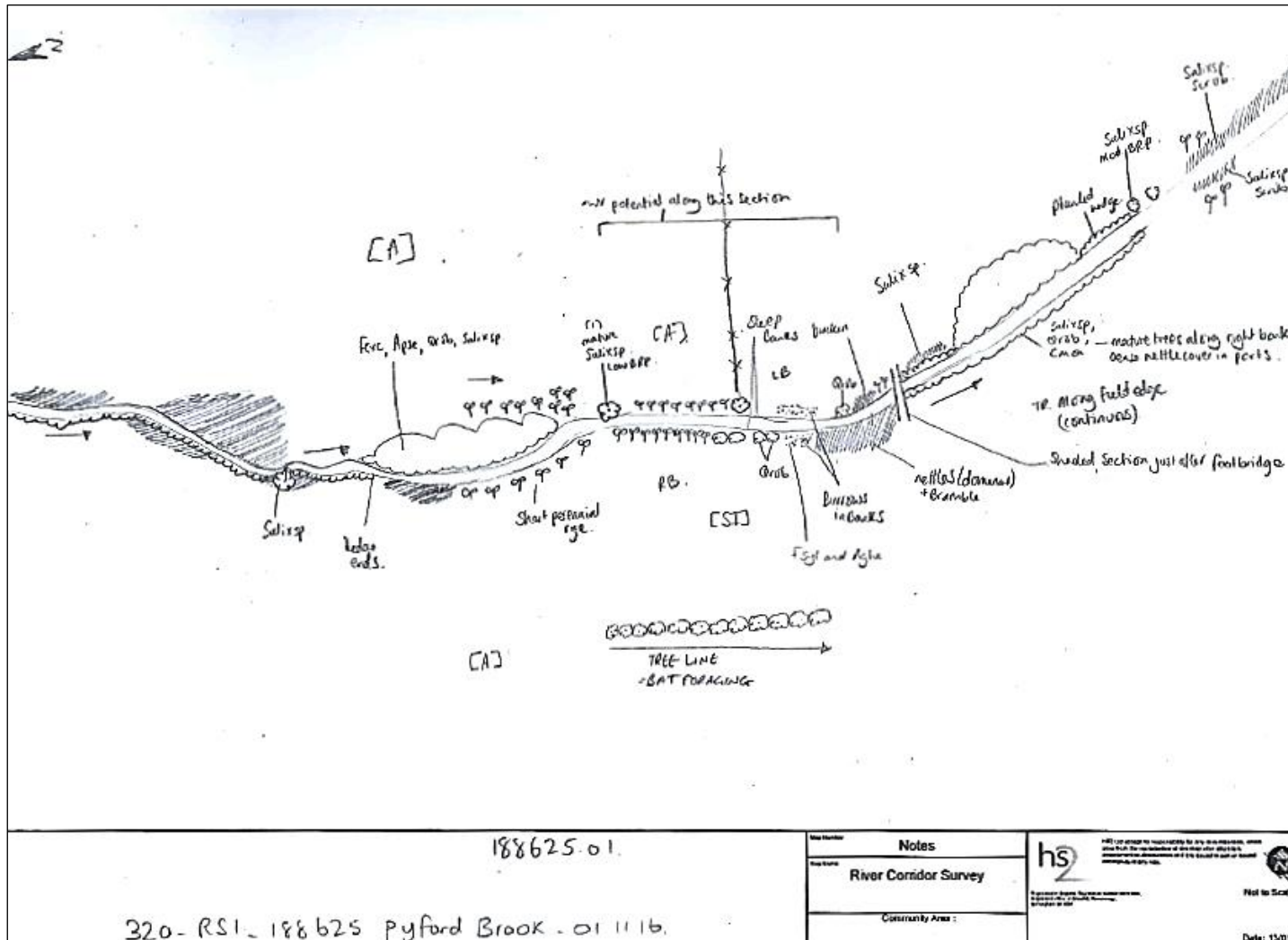
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Table 3: RCS results for Pyford Brook (CA1)

Ecology survey code	000-RS1-188001		
Name of watercourse	Pyford Brook.		
Surveyor(s)	MN, LF, IL-A	Date	01.11.2016
Survey start (24 hr clock)	15:00	Survey finish (24 hr clock)	16:30
Weather conditions(description)	4% cloud. Dry and slightly overcast. No rain. Low wind.		
Crossing Point OS Grid Ref	SK130140 and SK130140		
OS Grid Ref (6 digit)	Start Section	SK133147	
	End Section	SK130133	
Photo Ref(s)	No photos available.		
Average channel width(m)	1.5-2m.		
Average channel depth(m)	0.5-1m.		
Brief description of channel	Pyford Brook flows from north to south. Good habitat quality with variations in flow, bank profiles and vegetation diversity. Wooded areas include species such as ash, sycamore, oak and willow sp. Encroaching scrub to both banks and tall ruderal vegetation. Dense continuous scrub in some areas including species such as bramble, nettle, hawthorn, hogweed, dock and willow scrub. Some sandstone blocks to the right bank. There are a number of scattered trees along and set back from the banks for much of this watercourse.		
Base substrate	Unknown		
Bank type (include height, angle and extent of erosion)	LB	Variations in flow and bank profiles in Pyford Brook.	
	RB	Variations in flow and bank profiles in Pyford Brook.	
Notable channel features	LB	No notable channel features. Wetland plant species present in the channel and surround include: wild angelica (<i>Angelica sylvestris</i>), a water-starwort (<i>Callitriche sp.</i>), Nuttall's waterweed (<i>Elodea nuttallii</i>), great willowherb (<i>Epilobium hirsutum</i>), meadowsweet (<i>Filipendula ulmaria</i>), common reed (<i>Phragmites australis</i>) and water figwort (<i>Schrophularia auriculata</i>).	
	RB	No notable channel features. Wetland plant species present in the channel and surround include: wild angelica (<i>Angelica sylvestris</i>), a water-starwort (<i>Callitriche sp.</i>), Nuttall's waterweed (<i>Elodea nuttallii</i>), great willowherb (<i>Epilobium hirsutum</i>), meadowsweet (<i>Filipendula ulmaria</i>), common reed (<i>Phragmites australis</i>) and water figwort (<i>Schrophularia auriculata</i>).	
Marginal vegetation (Description)	LB	Pyford Brook is surrounded by dense continuous scrub including nettles and bramble. There is some tall ruderal vegetation and short perennial rye-grass.	
	RB	Pyford Brook is surrounded by dense continuous scrub including nettles and bramble. There is some tall ruderal vegetation and short perennial rye-grass.	
Bank zone habitats (Description)	LB	Much of Pyford Brook is lined with planted hedges, tall ruderal vegetation and short perennial rye-grass. In some areas, dense nettles and bramble are dominant. Many mature trees of different species along Pyford Brook.	
	RB	Much of Pyford Brook is lined with planted hedges, tall ruderal vegetation and short perennial rye-grass. In some areas, dense nettles and bramble are dominant. Many mature trees of different species along Pyford Brook.	
Adjacent land use	LB	Arable land and sections of woodland.	

	RB	Arable land and sections of woodland.
Fauna of interest (State LB or RB if specific to single bank)		Invertebrate and macrophyte potential at Pyford Brook. Dense scrub and tall ruderal vegetation will require nesting bird consideration. Numerous scattered mature trees require ground based assessment for bats. A single mature willow (1) has low bat roost potential. Kingfisher observed during survey - possibly nesting in this section. Some potential for water vole associated with suitable banks for burrow building - requires further survey. Pyford Brook watercourse and surrounding habitat provides foraging and commuting bat habitat.
Recreation features		n/a
Existing management		n/a
Observed or potential threats to conservation value (e.g. crop spraying, scrub invasion etc.)		n/a
Suggestions for habitat improvement		n/a

Figure 1: 000-RS1-188001Pyford Brook (CA1) river corridor survey sketch from field visit (from grid reference SK133147to SK130133)



Bourne Brook (CA1)

- 2.3.3 River corridor habitats identified in CA1 along Bourne Brook (000-RS1-190001) are detailed in Table 4 and in Figure 2 to Figure 3.

BID-EC-006-000

Table 4: RCS results for Bourne Brook (CA1)

Ecology survey code	000-RS1-190001		
Name of watercourse	Bourne Brook.		
Surveyor(s)	MN, LF, IL-A	Date	01.11.2016
Survey start (24 hr clock)	12:30	Survey finish (24 hr clock)	13:30
Weather conditions (description)	4% cloud. Dry and slightly overcast. No rain. Low wind.		
Crossing Point OS Grid Ref	SK117154		
OS Grid Ref (6 digit)	Start Section	SK116152	
	End Section	SK123156	
Photo Ref(s)	No photos available.		
Average channel width(m)	Approximately 2m - viewed from road.		
Average channel depth(m)	Approximately 0.5m - viewed from road.		
Brief description of channel	Watercourse which flows under road and through semi-natural broad-leaved woodland. Good habitat quality along wooded corridor. Scattered scrub down to channel on both banks (nettle, hawthorn, holly, thistle). Overhanging of trees. Good water quality. Could not access fully, surveyed from road. The culvert under the A515 was up to 3m across with a depth of approximately 1m.		
Base substrate	Unknown as viewed from the road. Mud, sand, gravel and stone possible. Second visit revealed a gravel base with a typical riffle and pool composition.		
Bank type (include height, angle and extent of erosion)	LB	Approximately 0.5m - viewed from road and 80°. Erosion unknown as could not walk along length and survey.	
	RB	Approximately 0.5m - viewed from road and 80°. Erosion unknown as could not walk along length and survey.	
Notable channel features	LB	Unknown as viewed from the road. A second visit revealed that at the eastern end of the water course next to Crawley Lane, the water course looked to have been historically straightened into a drainage ditch and was <2m in width at this point with a depth of 0.5 – 1m.	
	RB	Unknown as viewed from the road. A second visit revealed that at the eastern end of the water course next to Crawley lane, the water course looked to have been historically straightened into a drainage ditch and was <2m in width at this point with a depth of 0.5 – 1m.	
Marginal vegetation (Description)	LB	Unknown as viewed from the road. At point of survey little emergent vegetation was evident, this may vary along the length of the waterbody, further assessment is required. A second visit revealed that the watercourse was mostly covered by a line of semi natural woodland. There was some minor bank side vegetation but largely the banks were bare and open with a steep profile.	
	RB	Unknown as viewed from the road. At point of survey little emergent vegetation was evident, this may vary along the length of the waterbody, and further assessment is required. A second visit revealed that the watercourse was mostly covered by a line of semi natural woodland. There was some minor bank side vegetation but largely the banks were bare and open with a steep profile.	
Bank zone habitats (Description)	LB	Unknown as viewed from the road. Appeared to be scattered scrub down to channel on both banks including nettle, bramble, hawthorn, holly and thistle. Full length of waterbody was not walked so bank profile is likely to change.	

	RB	Unknown as viewed from the road. Appeared to be scattered scrub down to channel on both banks including nettle, bramble, hawthorn, holly and thistle. Full length of waterbody was not walked so bank profile is likely to change.
Adjacent landuse	LB	Arable with sections of semi-natural broad-leaved woodland.
	RB	Arable with sections of semi-natural broad-leaved woodland.
Fauna of interest (State LB or RB if specific to single bank)		Fish, invertebrates, macrophytes potential. Fish survey also likely to be required. A number of trees with bat roost potential may be present along the length of the waterbody. Potential suitability for aquatic invertebrates, water vole and otter - requires further survey. Kingfisher and other birds should be considered, particularly with regard to vegetation clearance and work that impacts on banks. Good water quality, but possibly too fast for GCN. Limited access as could only access at road crossing points near Rileyhill Farm - Shaw Lane and at A515. Additionally, this was confirmed during the second visit. Low potential for the watercourse to support crayfish, there were no large rocks for cover but the banks could be dug into for cover and the water was fast flowing. There is also no obvious reason why it couldn't support fish or a diverse invert population.
Recreation features		n/a
Existing management		n/a
Observed or potential threats to conservation value (e.g. crop spraying, scrub invasion etc.)		Invasive species not observed but full length of waterbody was not surveyed and species may possibly be present. Needs further survey.
Suggestions for habitat improvement		n/a

Figure 2: 000-RS1-190001 Bourne Brook (CA1) river corridor survey sketch from field visit (from grid reference SK116152 to SK119155)

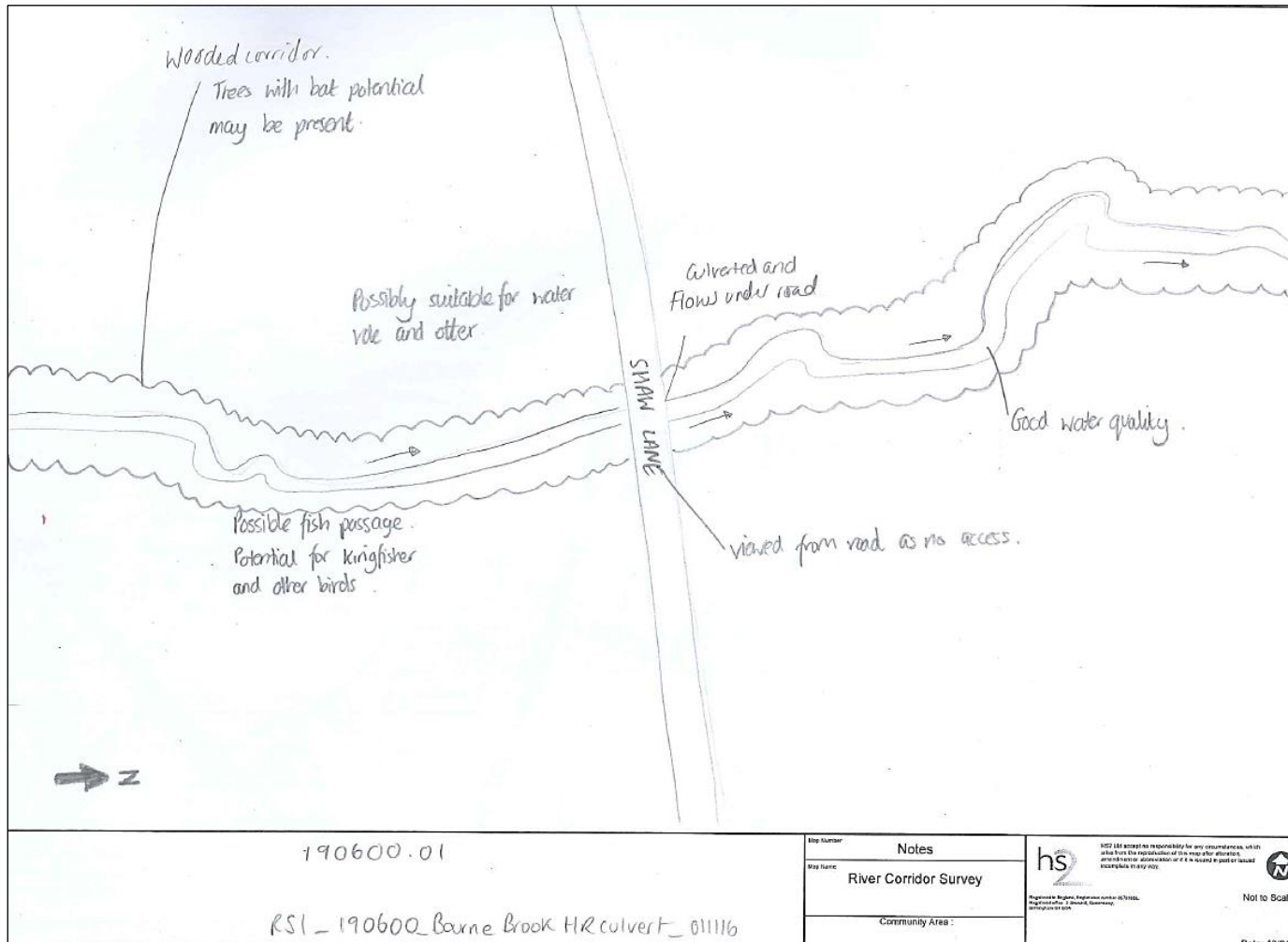
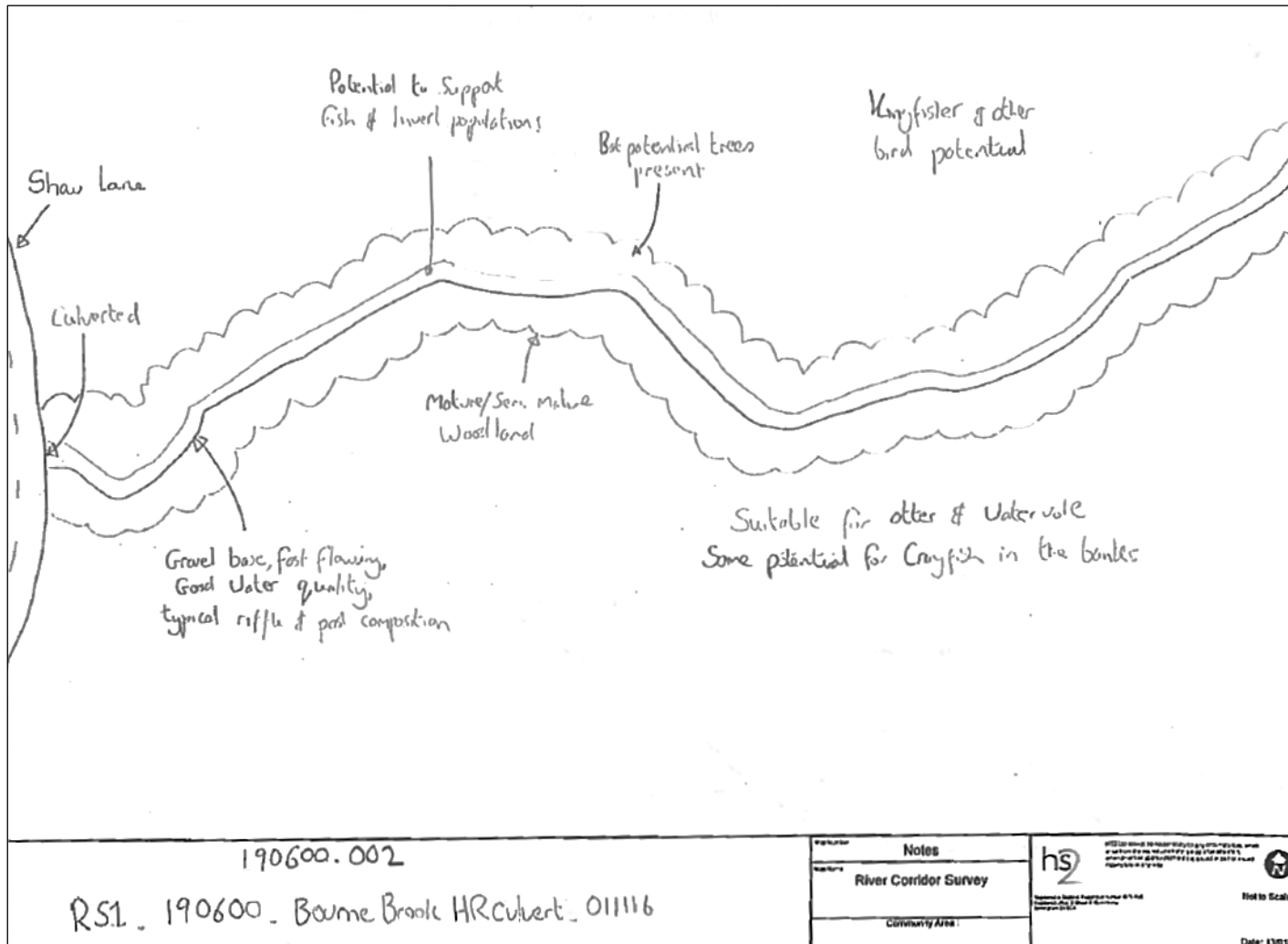


Figure 3: 000-RS1-190001 Bourne Brook (CA1) river corridor survey sketch from field visit (from grid reference SK119155 to SK123156)



Crawley Brook (CA1)

- 2.3.4 River corridor habitats identified in CA1 along Crawley Brook (000-RS1-191001) are detailed in Table 5 and Figure 4.

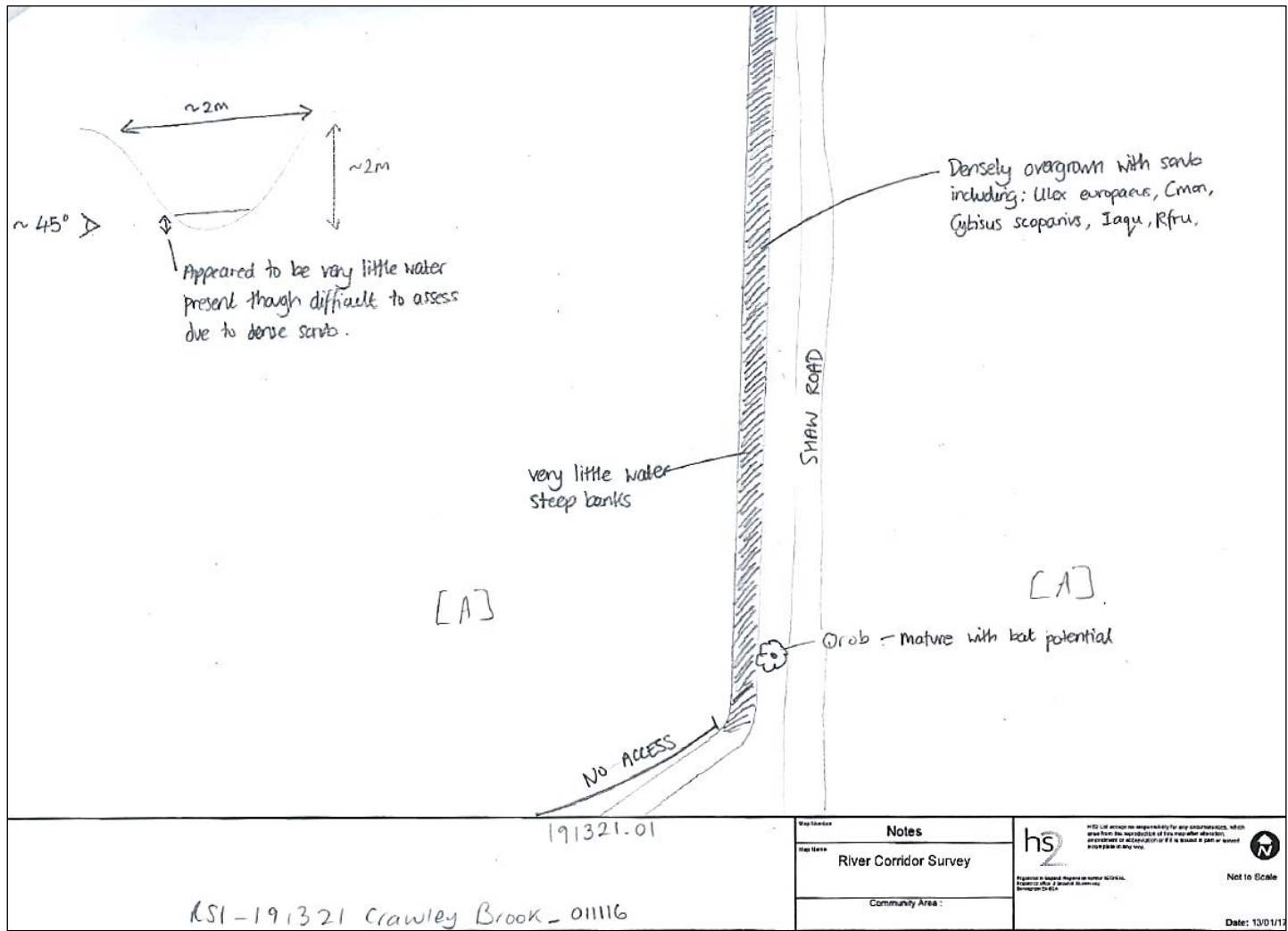
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Table 5: RCS results for Crawley Brook (CA1)

Ecology survey code	000-RS1-191001		
Name of watercourse	Crawley Brook.		
Surveyor(s)	MN, LF, IL-A	Date	01.11.2016
Survey start (24 hr clock)	14:30	Survey finish (24 hr clock)	13:00
Weather conditions(description)	4% Cloud cover, dry and slightly overcast 12°C.		
Crossing Point OS Grid Ref	SK113159		
OS Grid Ref (6 digit)	Start Section	SK113157	
	End Section	SK113163	
PhotoRef(s)	No photos available.		
Average channel width(m)	Approximately 2m.		
Average channel depth(m)	Approximately 2m.		
Brief description of channel	Very little water along watercourse. The brook had steep banks and was densely vegetated with scrub (gorse, bramble, holly, hawthorn, broom), making it difficult to determine true width and water flow. Mature trees with Bat Potential are located along the road and brook boundary. The brook may provide amphibians with a passage through adjacent arable fields.		
Base substrate	Unknown - obscured by scrub.		
Bank type (include height, angle and extent of erosion)	LB	Unknown as bank was obscured by scrub mostly, possibly approximately 2m high and 2m wide. Very little water evident though exact depth unknown as mostly obscured by scrub. Steep banks with slope angle approximately 45°. Erosion of channel unknown.	
	RB	Unknown as bank was obscured by scrub mostly, possibly approximately 2m high and 2m wide. Very little water evident though exact depth unknown as mostly obscured by scrub. Steep banks with slope angle approximately 45°. Erosion of channel unknown.	
Notable channel features	LB	Completely obscured by scrub in section accessed for survey.	
	RB	Completely obscured by scrub in section accessed for survey.	
Marginal vegetation(Description)	LB	Dense scrub in section accessed including gorse, bramble, holly, hawthorn and broom.	
	RB	Dense scrub in section accessed including gorse, bramble, holly, hawthorn and broom.	
Bank zone habitats (Description)	LB	Dense scrub in section accessed including gorse, bramble, holly, hawthorn and broom.	
	RB	Dense scrub in section accessed including gorse, bramble, holly, hawthorn and broom.	
Adjacent land use	LB	Arable fields.	
	RB	Arable fields.	

Fauna of interest (State LB or RB if specific to single bank)	No potential for water vole/ otter/ fish/ crayfish/ aquatic invertebrates as not enough water or flow. Densely overgrown section of watercourse. Very little water. Nesting bird check required. Numerous trees with bat roost potential along Shaw Lane. Limited access, could only view from roadside.
Recreation features	n/a
Existing management	n/a
Observed or potential threats to conservation value (e.g. crop spraying, scrub invasion etc.)	n/a
Suggestions for habitat improvement	n/a

Figure 4: 000-RS1-191001 Crawley Brook (CA1) river corridor survey sketch from field visit (from grid reference SK113157 to SK114163)



Unnamed tributary of Bentley Brook (CA1)

2.3.5 River corridor habitats identified in CA1 along the Unnamed tributary of Bentley Brook (000-RS1-196001) are detailed in Table 6 and in Figure 5, Figure 6 and Figure 7.

Table 6: RCS results for unnamed tributary of Bentley Brook (CA1)

Ecology survey code	000-RS1-196001		
Name of watercourse	Unnamed tributary of Bentley Brook.		
Surveyor(s)	LR, LF & IL-A	Date	11.01.2016
Survey start (24 hr clock)	08:00	Survey finish (24 hr clock)	09.00
Weather conditions(description)	4% Cloud cover, dry and slightly overcast 12 °C.		
Crossing Point OS Grid Ref	SK075202, SK078194, SK075200andSK081195		
OS Grid Ref (6 digit)	Start Section (1)	SK074206	
	End Section (1)	SK074204	
	Start Section (2)	SK075202	
	End Section (2)	SK075201	
	Start Section (3)	SK079193	
	End Section (3)	SK081190	
PhotoRef(s)	RS1_196055_Ordinary Watercourse_011116_P1, RS1_196055_Ordinary Watercourse_011116_P2, RS1_196055_Ordinary Watercourse_011116_P3, RS1_196055_Ordinary Watercourse_011116_P4a, RS1_196055_Ordinary Watercourse_011116_P4b, RS1_196055_Ordinary Watercourse_011116_P4c, RS1_196055_Ordinary Watercourse_011116_P5, RS1_196055_Ordinary Watercourse_011116_P6, RS1_196055_Ordinary Watercourse_011116_P7, RS1_196055_Ordinary Watercourse_011116_P8, RS1_196055_Ordinary Watercourse_011116_P9, RS1_196055_Ordinary Watercourse_011116_P10, RS1_196055_Ordinary Watercourse_011116_P11, RS1_196055_Ordinary Watercourse_011116_P12, RS1_196055_Ordinary Watercourse_011116_P13		
Average channel width(m)	Unknown.		
Average channel depth(m)	2m		
Brief description of channel	Stream that runs through semi-natural broad-leaved woodland with several trees surrounding (Crack-willow, Ash, Sycamore, Elder, Holly, Hazel, Beech, Rowan, Willow sp., English Oak, Blackthorn and Alder). Stream run from west to east and become heavily shaded by a double hedgerow and dense scrub at the eastern end.		
Base substrate	Unknown		
Bank type (include height, angle and extent of erosion)	LB	Approximately 1.5m in height with an angle of 45°. The bank is lined with mainly mature broadleaved trees including Ash, Crack-willow, Sycamore, Elder, Hazel, Willow sp., Rowan, Alder, Beech, English Oak and Holly. Hedgerows line the majority of the ditch, but becomes heavily shaded by a double hedgerow and dense scrub which entirely covers the ditch at the eastward end of the ditch.	
	RB	Approximately 1.5m in height with an angle of 45°. The bank is lined with mainly mature broadleaved trees including Ash, Crack-willow, Sycamore, Elder, Hazel, Willow sp., Rowan, Alder, Beech, English Oak and Holly. Hedgerows line the majority of the ditch, but becomes heavily shaded by a double hedgerow and dense scrub which entirely covers the ditch at the eastward end of the ditch.	

BID-EC-006-000

Notable channel features	LB	None.
	RB	None.
Marginal vegetation (Description)	LB	Little marginal vegetation heavily shaded.
	RB	Little marginal vegetation heavily shaded.
Bank zone habitats (Description)	LB	Broad-leaved woodland and shaded by intact hedgerow to east.
	RB	Broad-leaved woodland and shaded by intact hedgerow to east.
Adjacent land use	LB	Arable grassland is present on the left bank
	RB	Arable grassland is present on the right bank
Fauna of interest (State LB or RB if specific to single bank)	<p>Trees may require removal and have bat and nesting bird constraints.</p> <p>Quality foraging habitat for bats, activity transects would be required in woodland, hedgerows, pond and arable. Hedgerows likely to be important with dormouse potential. Badger sett with at least ten active holes, hairs found within woodland along stream and in arable field as well as bedding. Water vole possible particularly if connected to ditches with populations further away, though heavily shaded with limited bank vegetation. Tawny owl noted flying along stream within trees, disturbed off perch. No requirement for aquatic invertebrate, otter, water vole, fish or white clawed crayfish surveys because no suitable habitat is present. The stream is heavily shaded by woodland and hedgerow with no marginal or emergent vegetation and little water flowing.</p>	
Recreation features	n/a	
Existing management	n/a	
Observed or potential threats to conservation value (e.g. crop spraying, scrub invasion etc.)	n/a	
Suggestions for habitat improvement	n/a	

Figure 5: 000-RS1-196001 Unnamed tributary of Bentley Brook (CA1) river corridor survey sketch from field visit (from grid reference SK074206 to SK074204)

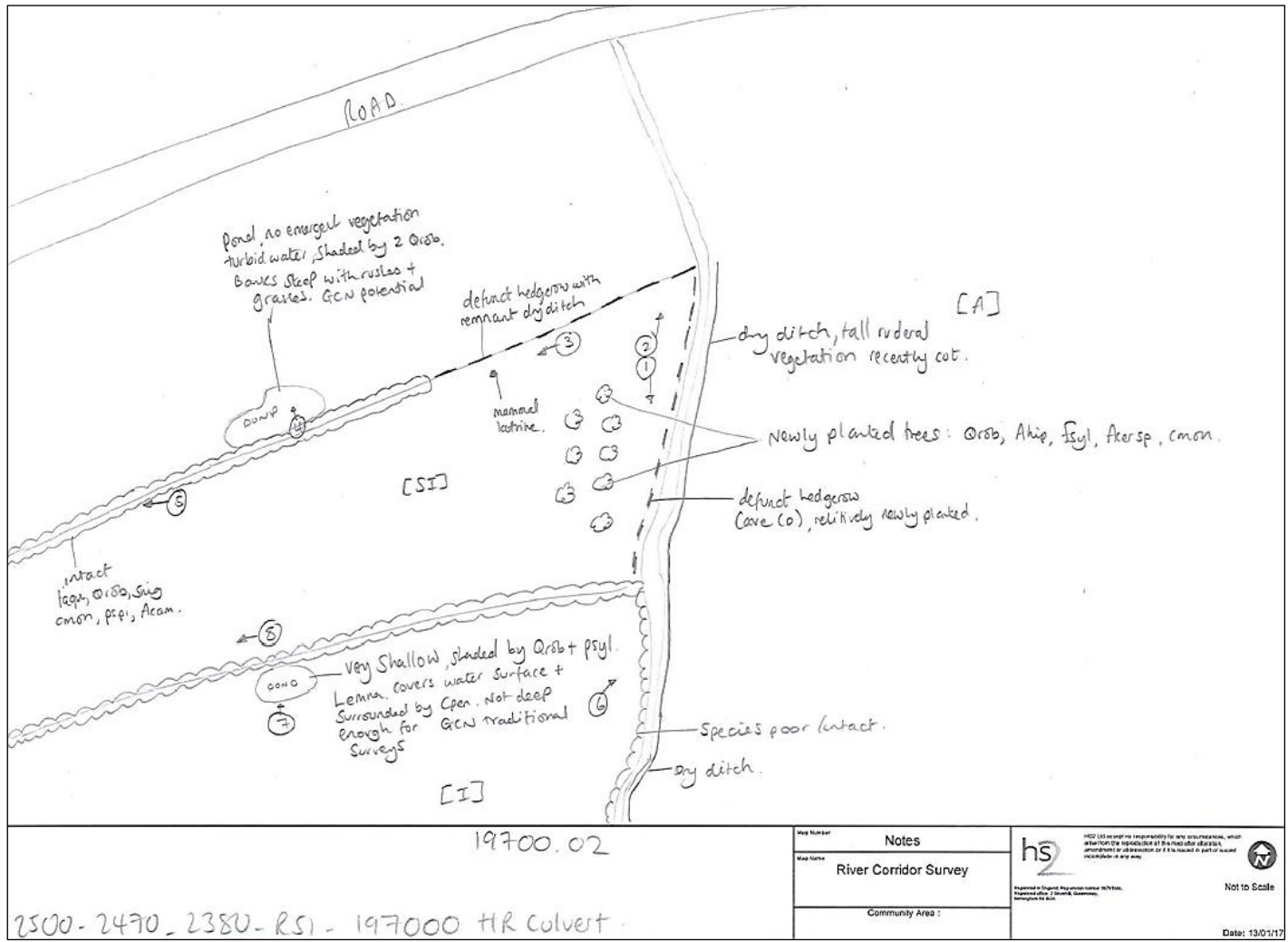


Figure 6: 000-RS1-196001 Unnamed tributary of Bentley Brook (CA1) river corridor survey sketch from field visit (from grid reference SK075202 to SK075201)

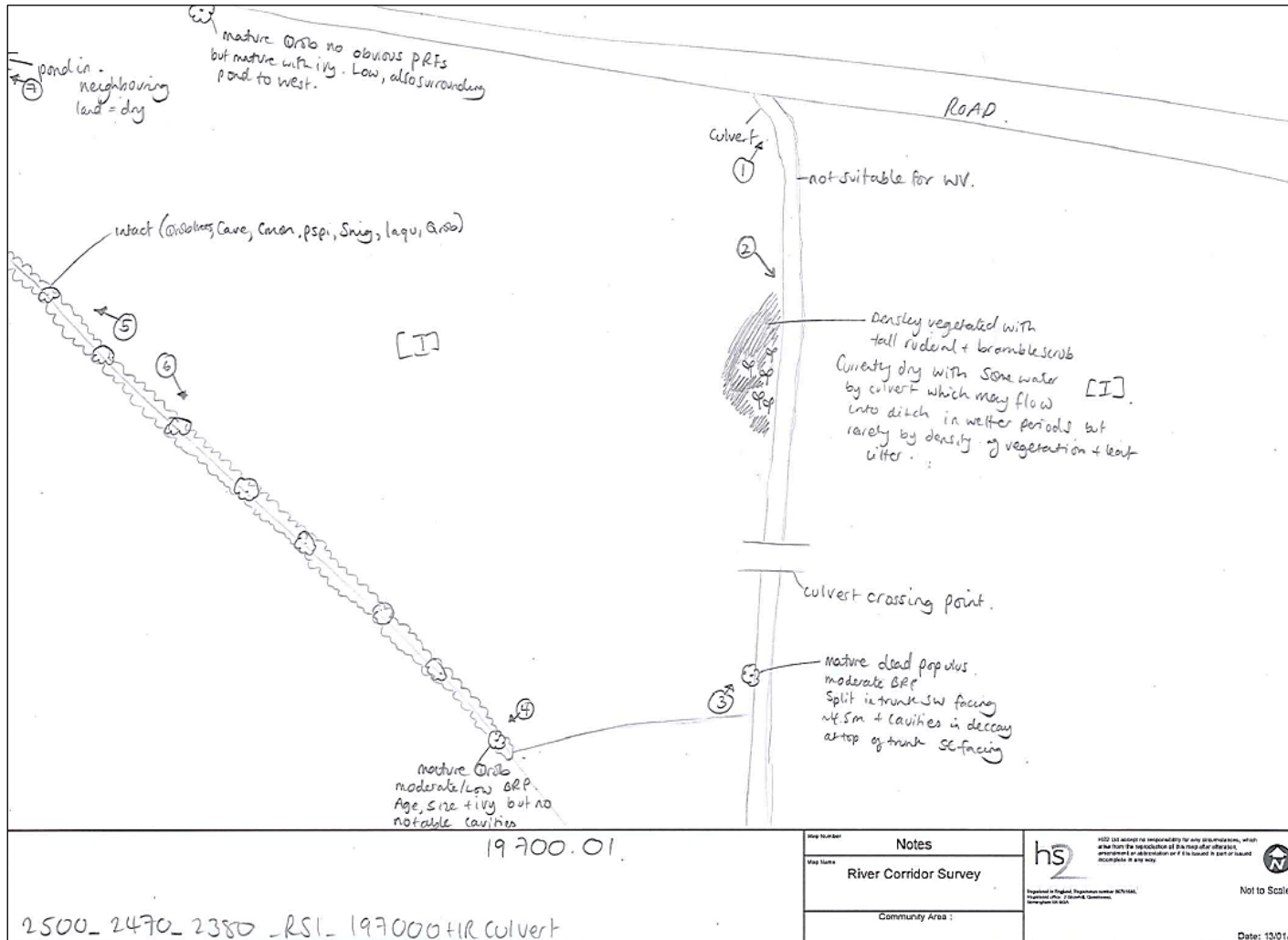
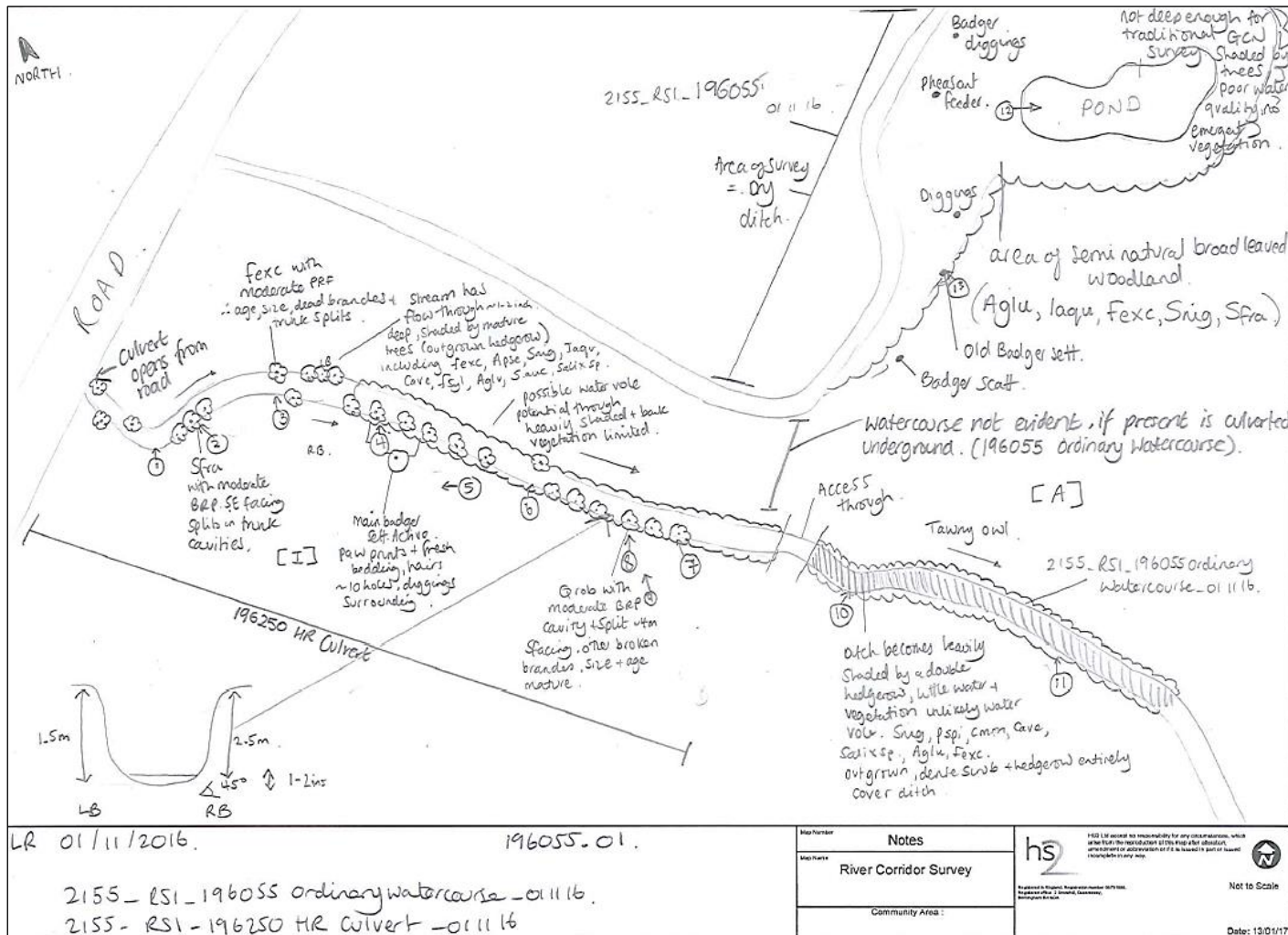


Figure 7: 000-RS1-196001 Unnamed tributary of Bentley Brook (CA1) river corridor survey sketch from field visit (from grid reference SK079193 to SK081190)



Unnamed tributary of Moreton Brook (CA1)

2.3.6 River corridor habitats identified in CA1 along the unnamed tributary of Moreton Brook (000-RS1-199001) are detailed in Table 7 and in Figure 8 Figure 8 to Figure 9.

Table 7: RCS results for unnamed tributary of Moreton Brook (CA1)

Ecology survey code	000-RS1-199001		
Name of watercourse	Unnamed tributary of Moreton Brook.		
Surveyor(s)	KOC, SG & LF	Date	24.10.2016
Survey start (24 hr clock)	09:00	Survey finish (24 hr clock)	12:30
Weather conditions (description)	100% cloud. Dry, overcast, light breeze. No rain. Low wind.		
Crossing Point OS Grid Ref	SK056214 and SK054214		
OS Grid Ref (6 digit)	Start Section (1)	SK058216	
	End Section (1)	SK057215	
	Start Section (2)	SK053214	
	End Section (2)	SK050212	
PhotoRef(s)	3180_RCS_F001_241016_P1, 3125_RCS_F001_241016_P1, 3065_RCS_F001_241016_P1, 3008_RCS_F001_241016_P1, 3008_RCS_F001_241016_P2, 2925_RCS_F001_241016_P1, 2925_RCS_F001_241016_P2, 2925_RCS_F001_241016_P3, 2925_RCS_F001_241016_P4, 2925_RCS_F001_241016_P5		
Average channel width(m)	1m.		
Average channel depth(m)	1m.		
Brief description of channel	<p>Access restrictions meant that the continuous stretch of the watercourse could not be walked. Surveyed sections shown on accompanying map. Walkover surveys indicated that the channel morphology would not be significantly different in the sections not surveyed.</p> <p>Watercourse begins with a dry ditch with gravel base and has a spring downstream which feeds the channel to create a running watercourse approx. 0.1m deep. Cows access watercourse in downstream section.</p>		
Base substrate	Gravel, pebble and silt.		
Bank type (include height, angle and extent of erosion)	LB	Sandy/soil bank, average 1m high, 70degree slope, little erosion.	
	RB	Sandy/soil bank, average 1m high, 60degree slope, little erosion.	
Notable channel features	LB	Spring feeds watercourse at 405819, 321641.	
	RB	Spring feeds watercourse at 405819, 321641.	
Marginal vegetation(Description)	LB	Moderately open with shaded areas of broadleaf mature trees (Alder, sycamore, salix sp.) scrub (elder, hawthorn) and understory of bramble/nettle.	
	RB	Moderately open with shaded areas of broadleaf mature trees (Alder, sycamore, salix sp.) scrub (elder, hawthorn) and understory of bramble/nettle.	
Bank zone habitats(Description)	LB	Bare soil and grassed banks with some nettle/bramble understory.	
	RB	Bare soil and grassed banks with some nettle/bramble understory.	

BID-EC-006-000

Adjacent land use	LB	Grazing pasture.
	RB	Grazing pasture.
Fauna of interest (State LB or RB if specific to single bank)	No fauna of interest features noted. Habitat considered to be unsuitable for fish, WCC, and aquatic invertebrates.	
Recreation features	n/a	
Existing management	n/a	
Observed or potential threats to conservation value (e.g. crop spraying, scrub invasion etc.)	n/a	
Suggestions for habitat improvement	Re-instate meandering channel when diverting channel during works near co-ordinates: 405335, 321435.	

Figure 8: 000-RS1-199001 Unnamed tributary of Moreton Brook (CA1) river corridor survey sketch from field visit (from grid reference SK058216 to SK057215)

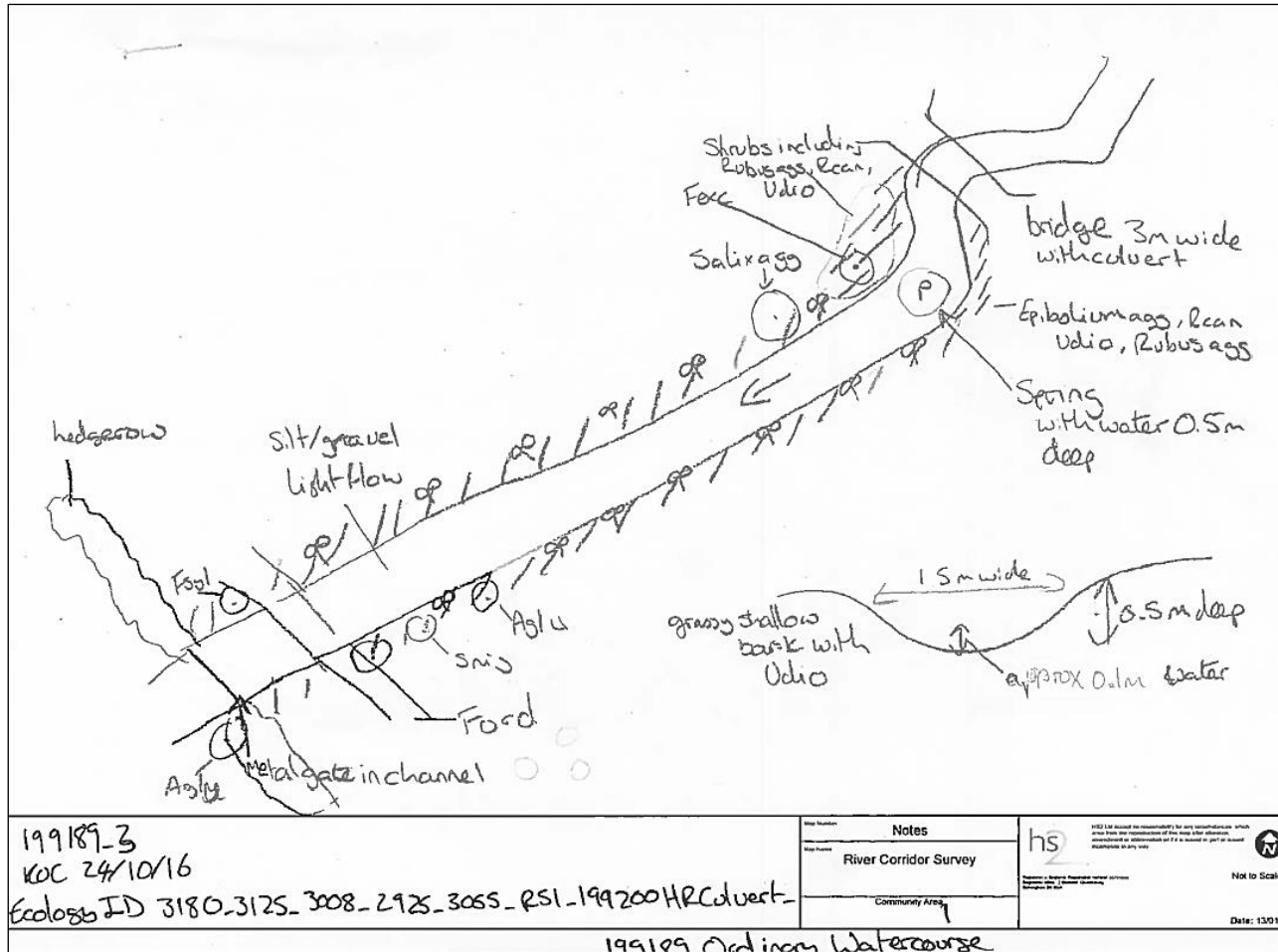
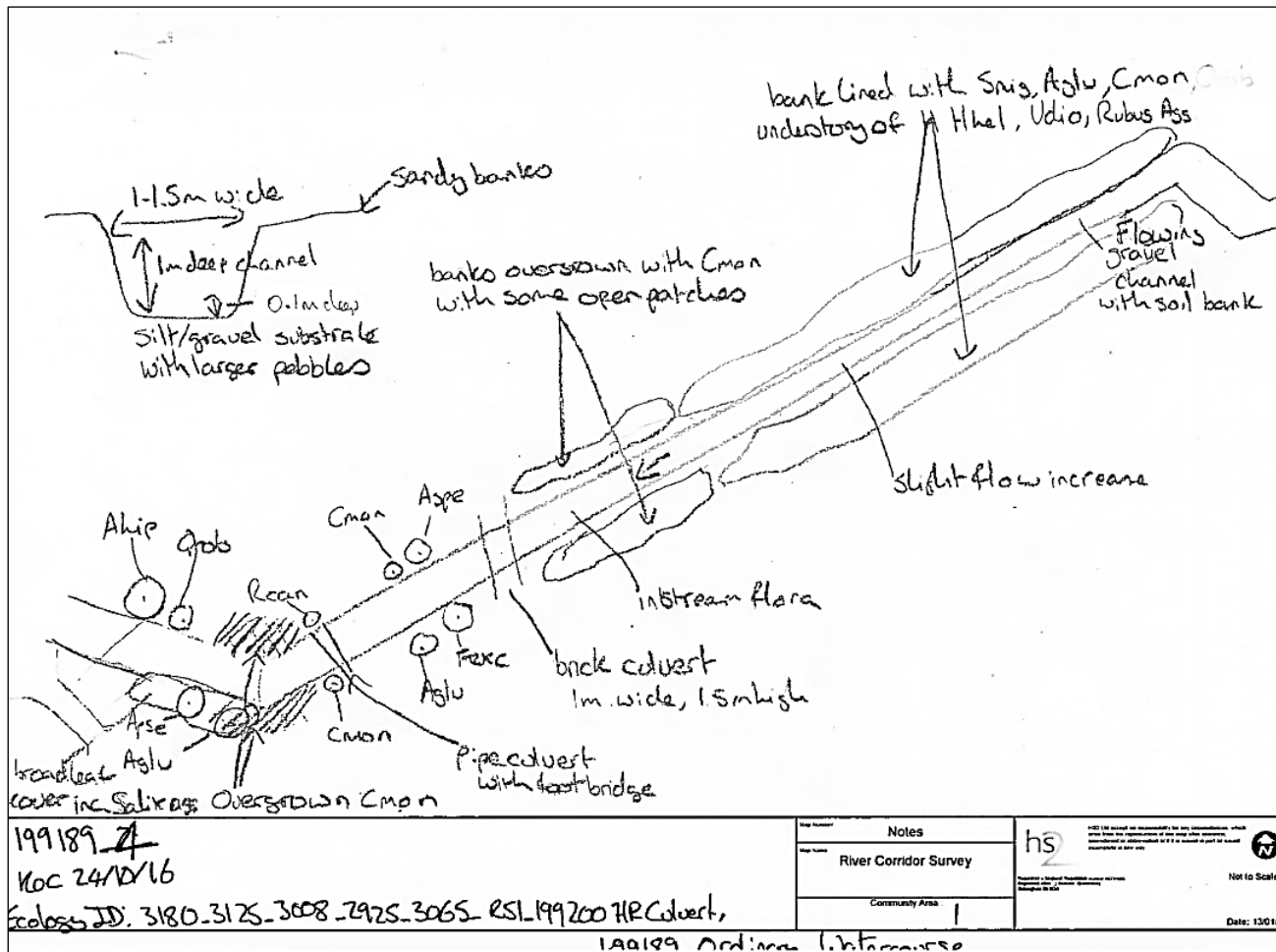


Figure 9: 000-RS1-199001 Unnamed tributary of Moreton Brook (CA1) river corridor survey sketch from field visit (from grid reference SK050212 to SK053214)



Moreton Brook (CA1)

2.3.7 River corridor habitats identified in CA1 along Moreton Brook (000-RS1-201001) are detailed in Table 8 and in Figure 10 to Figure 11.

Table 8: RCS results for Moreton Brook (CA1)

Ecology survey code	000-RS1-201001		
Name of watercourse	Moreton Brook.		
Surveyor(s)	KOC, SG & LF	Date	24.10.2016
Survey start (24 hr clock)	13:30	Survey finish (24 hr clock)	15:30
Weather conditions (description)	100% cloud, dry, overcast, light breeze. No rain. Low wind.		
Crossing Point OS Grid Ref	SK038221 and SK040222		
OS Grid Ref (6 digit)	Start Section	SK042227	
	End Section	SK039216	
Photo Ref(s)	3054_RS1_F001_241016_P1, 3054_RS1_F001_241016_P2, 3054_RS1_F001_241016_P3, 3054_RS1_F001_241016_P4, 3054_RS1_F001_241016_P5, 3054_RS1_F001_241016_P6		
Average channel width(m)	2.5m.		
Average channel depth(m)	1m.		
Brief description of channel	<p>Access restrictions meant that the continuous stretch of the watercourse could not be walked. Surveyed sections consisted of Moreton Brook shown on the accompanying map.</p> <p>Moreton Brook is a flowing watercourse with approx. 0.75m water depth, some pools and mixture of gravel and silt substrate. Solid banks lined with broadleaf trees. Poaching by cows in the upper and mid-section surveyed.</p>		
Base substrate	Silty with some areas of gravel substrate.		
Bank type (include height, angle and extent of erosion)	LB	Soil bank with some vegetated areas, average 1m high, 50degree slope, little erosion.	
	RB	Sandy/soil bank , average 1m high, 40degree slope, little erosion.	
Notable channel features	LB	approx. 2.5m wide and 1m deep.	
	RB	approx. 2.5m wide and 1m deep.	
Marginal vegetation (Description)	LB	Predominantly shaded with broadleaf mature trees - mainly Alder with Hawthorn and Elder scrub present. Understory of ivy, dog rose, bramble and nettle.	
	RB	Predominantly shaded with broadleaf mature trees - mainly Alder with Hawthorn and Elder scrub present. Understory of ivy, dog rose, bramble and nettle.	
Bank zone habitats (Description)	LB	Bare soil with some nettle/bramble/ivy understory.	
	RB	Bare soil with some nettle/bramble/ivy understory.	
Adjacent land use	LB	Grazing pasture - semi improved grassland.	

BID-EC-006-000

	RB	Grazing pasture - semi improved grassland.
Fauna of interest (State LB or RB if specific to single bank)		Fish seen in channel and invertebrate sampling recommended.
Recreation features		n/a
Existing management		n/a
Observed or potential threats to conservation value (e.g. crop spraying, scrub invasion etc.)		Himalayan Balsam present on bank.
Suggestions for habitat improvement		If channel to be moved then recommend creating a meandering path.

Figure 10: 000-RS1-201001 Moreton Brook (CA1) river corridor survey sketch from field visit (from grid reference SK036220 to SK037218)

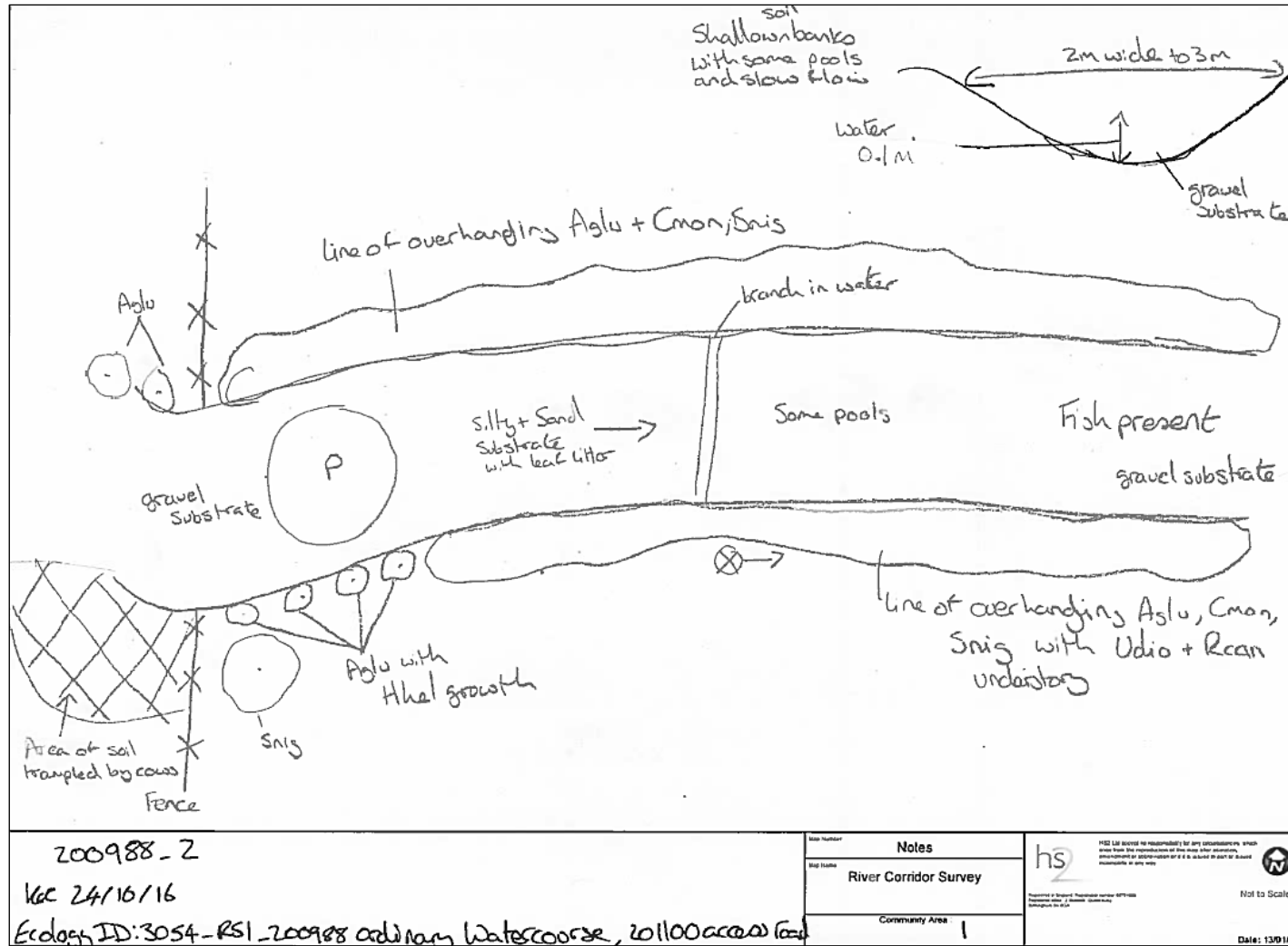
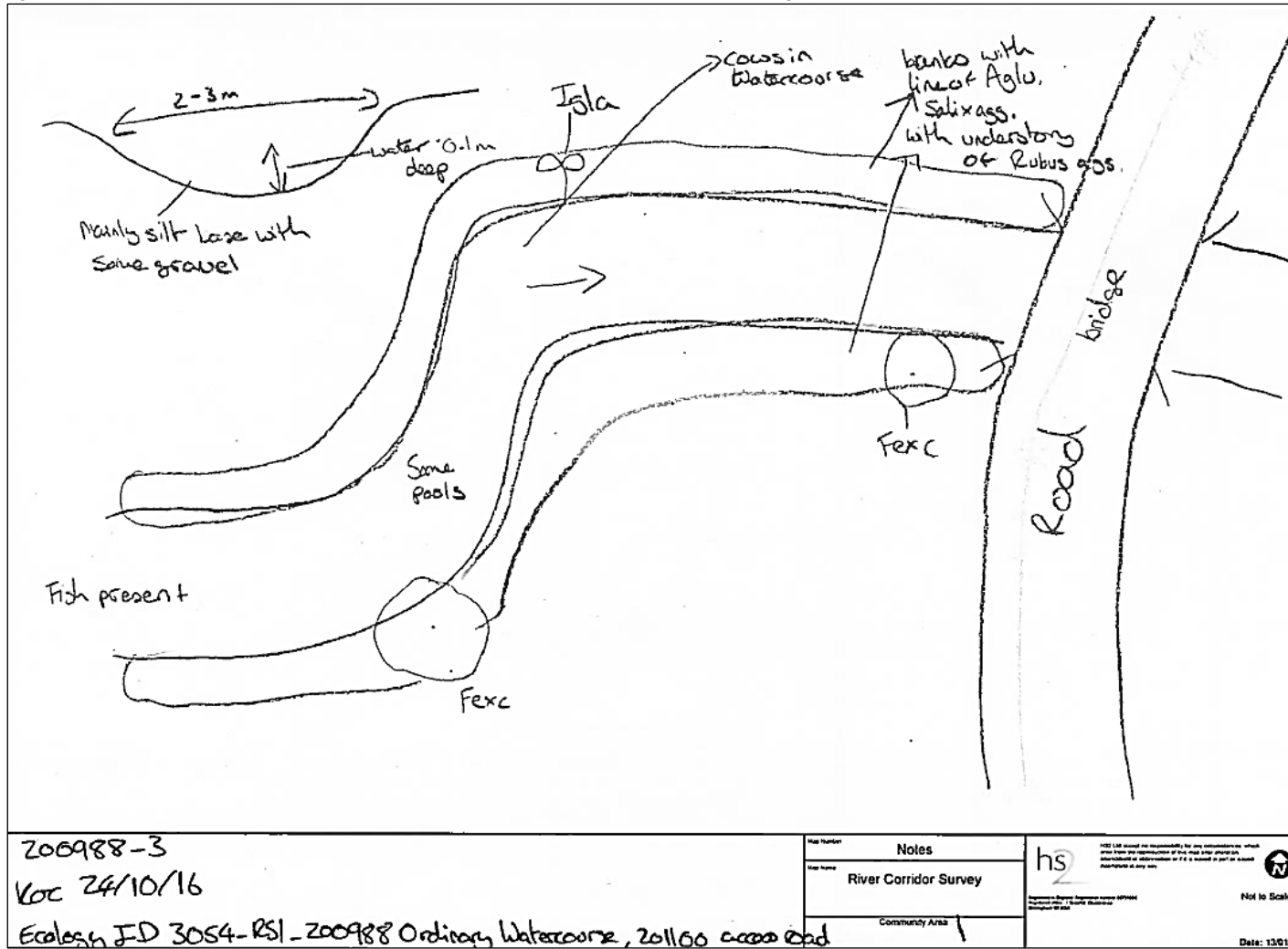


Figure 11: 000-RS1-201001 Moreton Brook (CA1) river corridor survey sketch from field visit (from grid reference SK037218 to SK039216)



Unnamed tributary of River Trent (CA3)

2.3.8 River corridor habitats identified in CA3 along the unnamed tributary of River Trent (000-RS1-217001) are detailed in Table 9 and in Figure 12.

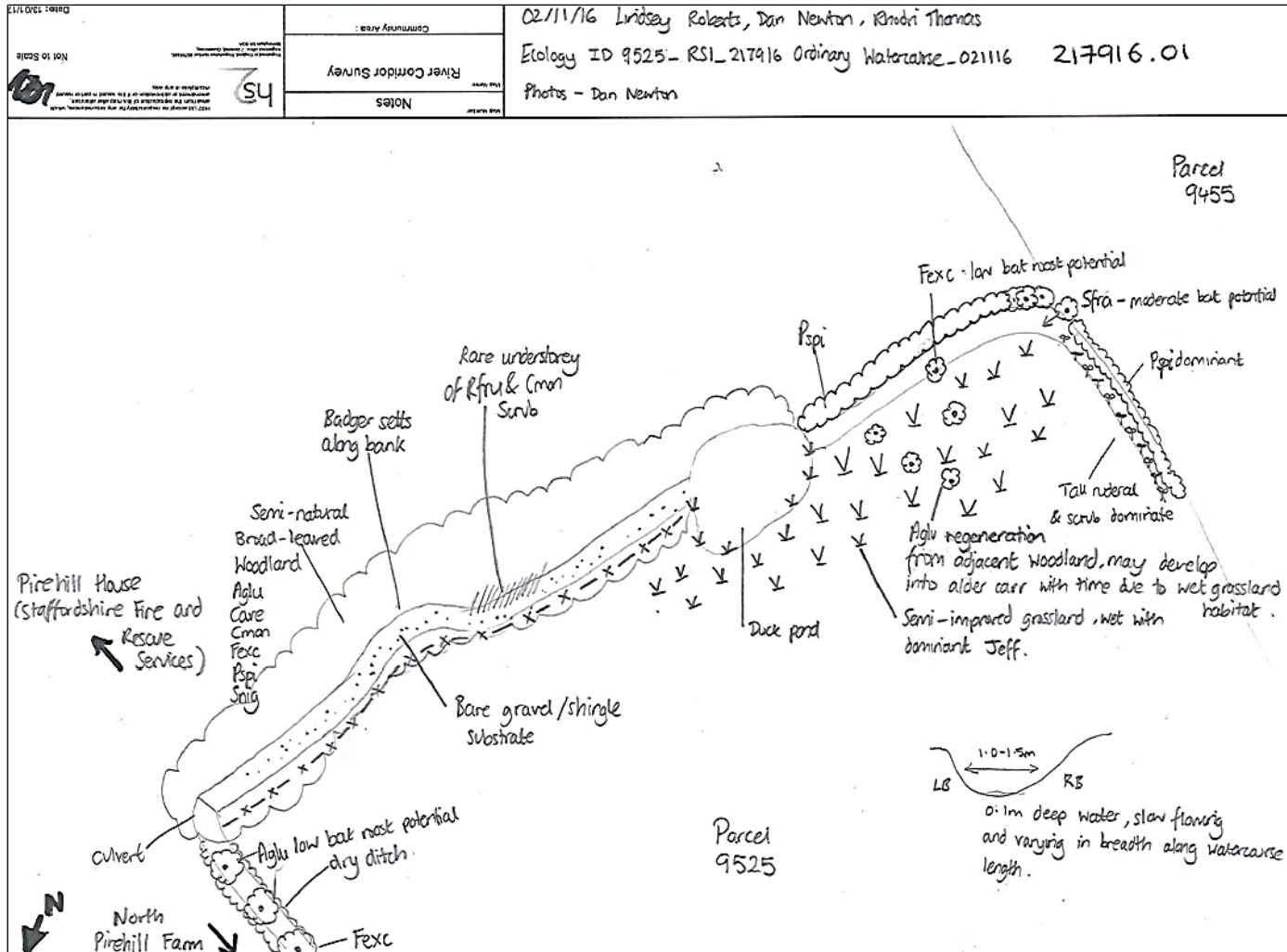
Table 9: RCS results for Unnamed tributary of River Trent (CA3)

Ecology survey code	000-RS1-217001.		
Name of watercourse	Unnamed tributary of River Trent.		
Surveyor(s)	DN, RT, LR	Date	02.11.2016
Survey start (24 hr clock)	13:30	Survey finish (24 hr clock)	16:00
Weather conditions(description)	30% cloud, Dry, sunny with some cloud. No rain. Low wind.		
Crossing Point OS Grid Ref	SJ899306		
OS Grid Ref (6 digit)	Start Section	SJ900311	
	End Section	SJ898306	
Photo Ref(s)	No Photos.		
Average channel width(m)	1.5m.		
Average channel depth(m)	0.1m.		
Brief description of channel	Low flowing watercourse with soil banks, leaf litter and bare gravel and shingle substrate in parts. The watercourse is shaded along its length by semi-natural broad-leaved woodland and outgrown hedgerow to the south of the pond. The watercourse flows into the adjacent pond and continues westwards along the field boundary with diminished flow, before being culverted. The ditch at this point is dense with scrub and tall ruderal vegetation. Areas of the watercourse surveyed are shown on the accompanying map and the morphology of the channel is not considered likely to change.		
Base substrate	Silt, pebble and gravel base.		
Bank type (include height, angle and extent of erosion)	LB	Soil banks mostly bare due to canopy shading by semi-natural broad-leaved woodland. The watercourse is adjacent to improved pasture and the left bank is steeper than that opposite. There are some patches of scrub mainly consisting of bramble. The bank is 1.0-1.5m high on average with approximately 45° slope though not measured.	
	RB	Soil banks mostly bare due to canopy shading by semi-natural broad-leaved woodland. There are some patches of scrub mainly consisting of bramble. The bank is 1.0-1.5m high on average with approximately 20° slope though not measured. The bank is not as steep as the left bank, is more graduated in slope and is within the centre of the strip of semi-natural broad-leaved woodland. The right bank has more mud and silt deposits than the left.	
Notable channel features	LB	Approximately 1.5m wide and 0.1m deep. Though the breadth of the water flowing through the channel varies along its length from 0.5m-1.0m.	
	RB	Approximately 1.5m wide and 0.1m deep. Though the breadth of the water flowing through the channel varies along its length from 0.5m-1.0m.	
Marginal vegetation (Description)	LB	Marginal vegetation is very limited due to shading by adjacent mature trees. There is no emergent vegetation in the channel only leaf litter and bare gravel/shingle.	
	RB	Marginal vegetation is very limited due to shading by adjacent mature trees. There is no emergent vegetation in the channel only leaf litter and bare gravel/shingle.	
Bank zone habitats (Description)	LB	At edge of improved pasture within semi-natural broad-leaved woodland including	

BID-EC-006-000

		some mature trees and trees with bat roost potential. Species include alder, ash, elm, hazel, elder, salix sp. and hawthorn, bramble and dog rose scrub.
	RB	Dense covering of semi-natural broad-leaved woodland including some mature trees and trees with bat roost potential. Species include alder, ash, elm, hazel, elder, salix sp. and hawthorn, bramble and dog rose scrub.
Adjacent landuse	LB	Improved grazing pasture is present to the west of the watercourse. The watercourse is within a strip of semi-natural broad-leaved woodland. Marshy grassland is present to the south of the watercourse adjacent to the south of the connecting pond including some planted alder carr and wet rush pasture.
	RB	Arable farmland is present to the south-east of the watercourse. The watercourse is within a strip of semi-natural broad-leaved woodland which has several pheasant feeders located on banks along the watercourse.
Fauna of interest (State LB or RB if specific to single bank)		No potential for otter/ fish/ crayfish/ aquatic invertebrates as not enough water. GCN survey recommended in large duck pond though may have abundant fish - GCN HSI and survey, if not already been done. Watercourse runs through semi-natural broad-leaved woodland with several trees with potential roost features for bats. Trees may require removal and have bat and nesting bird constraints. Quality foraging habitat for bats, activity transects would be required in woodland and small area of marshy grassland, rush pasture. Water vole possible particularly if connected to ditches with populations further away. Hedgerow along ditch to north of site if removed will need replacement planting, connectivity to other hedgerows and seven woody species along length with trees.
Recreation features		Connecting pond appears to be used for fishing with old nets present on banks, this needs to be confirmed with regard to GCN surveys. Semi-natural broad-leaved woodland surrounding pond also used for game cover and rearing.
Existing management		n/a
Observed or potential threats to conservation value (e.g. crop spraying, scrub invasion etc.)		n/a
Suggestions for habitat improvement		n/a

Figure 12: 000-RS1-217001 Unnamed tributary of River Trent (CA3) river corridor survey sketch (from grid reference SJ900311 to SJ898306)



Unnamed tributary of Mere Gutter (CA5)

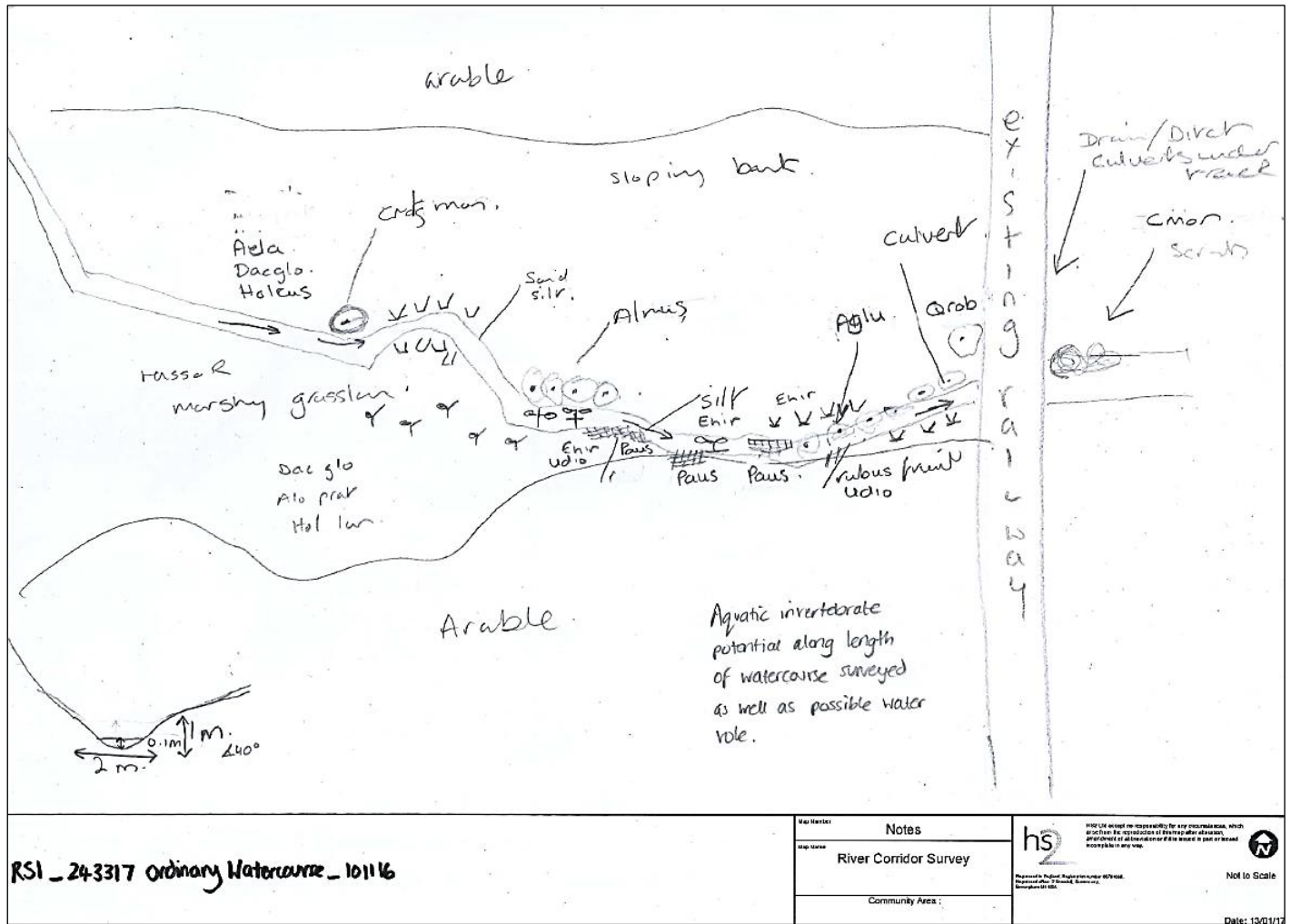
2.3.9 River corridor habitats identified in CA5 along the Unnamed tributary of Mere Gutter (000-RS1-243001) are detailed in Table 10 and Figure 13.

Table 10: RCS results for unnamed tributary of Mere Gutter (CA5)

Ecology survey code	000-RS1-243001.		
Name of watercourse	Unnamed tributary of Mere Gutter.		
Surveyor(s)	LG, IL-A	Date	10.11.2016
Survey start (24 hr clock)	09:30	Survey finish (24 hr clock)	11:00
Weather conditions (description)	80% cloud, dry, overcast. No rain. Low wind.		
Crossing Point OS Grid Ref	SJ730492		
OS Grid Ref (6 digit)	Start Section	SJ727492	
	End Section	SJ732492	
Photo Ref(s)	No photos.		
Average channel width (m)	2m.		
Average channel depth (m)	1m-1.5m.		
Brief description of channel	Ditch with slow flow and abundant aquatic vegetation which appeared diverse. The ditch appeared to be blocked near the railway. The ditch then disappears, presumably culverted underground towards Mere Gutter. The culverted section surfaces in the middle of the arable field to the east of the railway where a woodland strip begins, however, at this point the ditch is dry.		
Base substrate	Silt / pebble / gravel base.		
Bank type (include height, angle and extent of erosion)	LB	Soil banks with patches covered by vegetation, average 1m high, 40° slope.	
	RB	Heavily vegetated banks, average 1.5m high, 40° slope.	
Notable channel features	LB	Approximately 1m wide and 1m deep.	
	RB	Approximately 1m wide and 1m deep.	
Marginal vegetation (Description)	LB	No trees on left bank, mainly occasional patches of common reed, willowherb on water's edge.	
	RB	Sparse covering of broadleaf mature trees -Oak, ash, alder, salix sp., hawthorn, hazel.	
Bank zone habitats (Description)	LB	Vegetated/overgrown banks: Willowherb, nettle, bramble, elder, grasses, dog rose.	
	RB	Vegetated/overgrown banks: Willowherb, nettle, bramble, elder, grasses, dog rose.	
Adjacent land use	LB	Marshy grassland, broadleaf woodland and semi improved grazing pasture.	
	RB	Marshy grassland, broadleaf woodland and semi improved grazing pasture.	
Fauna of interest (State LB or RB if	Potential for fish, inverts and macrophytes; some watercress present. Bankside		

specific to single bank)	vegetation has potential to support nesting birds, for which mitigation may be required. Water vole presence is possible as bankside vegetation and bank profile offers suitability. Potential for otter to be present. The section of the watercourse surveyed was slow flowing and would provide suitable habitat for a range of aquatic invertebrates, further survey will be required.
Recreation features	n/a
Existing management	n/a
Observed or potential threats to conservation value (e.g. crop spraying, scrub invasion etc.)	n/a
Suggestions for habitat improvement	n/a

Figure 13: 000-RS1-243001 Unnamed tributary of Mere Gutter (CA5) river corridor survey sketch (from grid reference SJ727492 to SJ732492)



RS1_243317 Ordinary Watercourse - 101116

Map Name:	Notes
Map Name:	River Corridor Survey
Community Area:	

hs

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Prepared by: Project Support Group (PSG)

Approved by: Planning & Environment, Devon County Council

Not to Scale

Date: 13/01/17

2.4 Watercourses scoped out of the requirement for RCS

2.4.1 Watercourses for which the need for RCS was scoped out are listed in Table 11 with reasons for the exclusions in each case.

Table 11: Summary of locations in CA1-CA5 where RCS survey was scoped out

Watercourse name	Location	OS grid reference – crossing point of the Proposed Scheme	Feature type (and reason for scoping out)	CA	Distance from the Proposed Scheme (m) and orientation
Unnamed tributary of Pyford Brook	Staffordshire, east of Woodend Common Barn	SK130140	Ordinary watercourse (heavily managed/overgrown field boundary ditch)	CA1	Within
Ashby Stitch	Staffordshire, west of Common Farm	SK124148	Ordinary watercourse (heavily managed field boundary ditch)	CA1	Within
Ashby Stitch	Staffordshire, east of Common Farm	SK136154	Ordinary watercourse (heavily managed field boundary ditch)	CA1	Within
Trent and Mersey Canal	Staffordshire, Kings Bromley Marina	SK114149	Canal (watercourse is artificial and will be spanned by viaduct)	CA1	Within
Unnamed tributary of River Trent	Staffordshire, Manor Park	SK108165	Ordinary watercourse (to be spanned by viaduct)	CA1	Within
Unnamed tributary of River Trent	Staffordshire, Manor Park Sailing Club	SK107168	Ordinary watercourse (to be spanned by viaduct)	CA1	Within
Unnamed tributary of River Trent	Staffordshire, Kings Bromley Lane	SK103172	Ordinary watercourse (to be spanned by viaduct)	CA1	Within
River Trent	Staffordshire, Pipe Ridware	SK100174	Main river (to be spanned by viaduct)	CA1	Within
Luth Burn	Staffordshire, Pipe Wood Lane	SK095178	Ordinary watercourse (to be spanned by viaduct)	CA1	Within
Unnamed tributary of Bentley Brook	Staffordshire, south of Blithbury	SK081195	Ordinary watercourse (overgrown ditch with seasonal flow only)	CA1	Within
Unnamed tributary of Moreton Brook	Staffordshire, Lea Hall Farm	SK044220	Ordinary watercourse (heavily managed field boundary ditch)	CA1	Within
Unnamed	Staffordshire, Lea	SK040222	Ordinary watercourse	CA1	Within

Watercourse name	Location	OS grid reference – crossing point of the Proposed Scheme	Feature type (and reason for scoping out)	CA	Distance from the Proposed Scheme (m) and orientation
tributary of Moreton Brook	Hall Farm		(heavily managed field drain)		
Unnamed tributary of Moreton Brook	Staffordshire, Upper Moreton	SK031225	Ordinary watercourse (indistinct field drain with no flow)	CA1	Within
Unnamed tributary of Moreton Brook	Staffordshire, Moreton Grange	SK027227	Ordinary watercourse (indistinct/overgrown field drain)	CA2	Within
Unnamed tributary of River Trent	Staffordshire, Downstream Tithebarn Covert	SK009233	Ordinary watercourse (seasonal drainage line in arable field)	CA2	Within
Unnamed tributary of River Trent	Staffordshire, south of Tolldish Lane	SK009231	Ordinary watercourse (culverted watercourse)	CA2	Within
Unnamed tributary of River Trent	Staffordshire, south of Tolldish Lane	SK004234	Ordinary watercourse (heavily managed/overgrown field boundary ditch)	CA2	Within
Unnamed tributary of River Trent	Staffordshire, south of Tolldish Lane	SK003233	Ordinary watercourse (heavily managed/overgrown field boundary ditch)	CA2	Within
Trent and Mersey Canal	Staffordshire, West of Great Haywood	SJ996237	Canal (watercourse is artificial and will be spanned by viaduct)	CA2	Within
River Trent	Staffordshire, Kings Bromley Lane	SJ995237	Main river (to be spanned by viaduct)	CA2	Within
Unnamed tributary of River Trent	Staffordshire, south of Hoomill Lane	SJ992236	Ordinary watercourse (still water ditch- no flow)	CA2	Within
Unnamed tributary of River Trent	Staffordshire, Lionlodge Covert	SJ985239	Ordinary watercourse (simple woodland drain)	CA2	Within
Unnamed tributary of River Trent	Staffordshire, Lionlodge Covert	SJ986239	Ordinary watercourse (simple woodland drain)	CA2	Within

Watercourse name	Location	OS grid reference – crossing point of the Proposed Scheme	Feature type (and reason for scoping out)	CA	Distance from the Proposed Scheme (m) and orientation
Unnamed tributary of Kingston Brook	Staffordshire, downstream of Weetman's Plantation	SJ959249	Ordinary watercourse (dry/ponded ditch, no flow)	CA2	Within
Unnamed tributary of Kingston Brook	Staffordshire, Lower House Farm, Hopton	SJ945257	Ordinary watercourse (field boundary drain with negligible flow)	CA2	Within
Unnamed tributary of River Trent	Staffordshire, south of Hollytree Farm	SJ930275	Ordinary watercourse (heavily managed/overgrown field drain)	CA2	Within
Unnamed tributary of River Trent	Staffordshire, Marston Lane	SJ925275	Ordinary watercourse (culverted/dry field boundary ditch)	CA2	Within
Unnamed tributary of River Trent	Staffordshire, Yarlet Wood	SJ914287	Ordinary watercourse (overgrown drain)	CA2	Within
Unnamed drain	Staffordshire, south of Eccleshall Road	SJ896320	Ordinary watercourse (dry ditch)	CA3	Within
Filly Brook	Staffordshire, Pool House Farm	SJ882332	Ordinary watercourse (to be spanned by viaduct)	CA3	Within - watercourse will be spanned by viaduct
Unnamed tributary of Filly Brook	Staffordshire, east of M6	SJ876334	Ordinary watercourse (dry ditch)	CA3	Within
Unnamed tributary of Filly Brook	Staffordshire, north-east of Pool House Farm	SJ883335	Ordinary watercourse (dry ditch)	CA3	Within
Filly Brook Millstream (tributary of Filly Brook)	Staffordshire, Pool House Farm	SJ881332	Ordinary watercourse culvert (heavily managed/overgrown ditch)	CA3	Within
Unnamed tributary of Filly Brook	Staffordshire, east of Swynnerton Grange	SJ870347	Ordinary watercourse (dry drain)	CA3	Within
Unnamed tributary of Filly Brook	Staffordshire, east of Swynnerton Grange	SJ870347	Ordinary watercourse (dry drain)	CA3	Within
Unnamed drain	Staffordshire, east of Swynnerton	SJ861356	Ordinary watercourse (indistinct woodland drain)	CA3	Within
Unnamed	Staffordshire,	SJ855359	Ordinary watercourse	CA3	Within

Watercourse name	Location	OS grid reference – crossing point of the Proposed Scheme	Feature type (and reason for scoping out)	CA	Distance from the Proposed Scheme (m) and orientation
tributary of River Trent	south of Sandyford Farm		(dry drain)		
Unnamed tributary of River Trent	Staffordshire, Sandyford Farm Pond (upper)	SJ856361	Ordinary watercourse (man-made ditch associated with pond)	CA3	Within
Unnamed tributary of Meece Brook	Staffordshire, north of Common Lane	SJ832379	Ordinary watercourse (dry drain)	CA3	Within
Meece Brook	Staffordshire, West of Bent Lane	SJ810399	Ordinary watercourse (to be spanned by viaduct)	CA4	Within
Unnamed tributary of River Lea	Staffordshire, Snape Hall Road	SJ794414	Ordinary watercourse (isolated drain/surface water flow path)	CA4	Within
Unnamed tributary of River Lea	Staffordshire, west of Hey Sprink	SJ781425	Ordinary watercourse (heavily managed boundary drain <1m wide)	CA4	Within
Unnamed tributary of River Lea	Staffordshire, west of Hey Sprink	SJ780426	Ordinary watercourse (to be spanned by viaduct)	CA4	Within
River Lea	Staffordshire, west of Hey Sprink	SJ779426	Main river (to be spanned by viaduct)	CA4	Within
River Lea	Staffordshire, west of Wrinehill Mill	SJ749459	Main River (to be spanned by viaduct)	CA4	Within
Checkley Brook	Staffordshire, near Wrinehill Hall	SJ749459	Main river (to be spanned by viaduct)	CA5	Within

3 River habitat survey

3.1 Methodology

- 3.1.1 Details of the standard methodology utilised for the river habitat surveys (RHS) are provided in Technical Note HS2 Ecological Surveys: Field Survey Methods and Standards (FSMS) included in the Scope and Methodology Report (SMR) Addendum (see Volume 5: Appendix CT-001-002).
- 3.1.2 Desk study records for RHS in the vicinity of the Proposed Scheme were obtained through an information request submitted to the Environment Agency.
- 3.1.3 No RHS surveys have been undertaken to date due to inadequate access within the required survey window (Section 1.3). RHS survey requires continuous access to 500m sections of watercourse covering the area potentially affected by the Proposed Scheme.

3.2 Deviations, constraints and limitations

- 3.2.1 A summary of locations where requirement for RHS was identified but where surveys were not conducted due to inadequate access is provided in Table 12.

Table 12: Summary of locations in CA1-CA5 that were scoped in but inadequate access was available for survey

Watercourse name	Location	OS grid reference – crossing point of the Proposed Scheme	Feature type	CA	Distance from the Proposed Scheme (m) and orientation
Pyford Brook	Staffordshire, north of Alrewas Hayes	SK136147	Main river	CA1	Within
Bourne Brook	Staffordshire, Rileyhill	SK117153	Ordinary watercourse	CA1	Within
Crawley Brook	Staffordshire, Shaw Lane	SK113160	Ordinary watercourse	CA1	Within
Unnamed tributary of Bentley Brook	Staffordshire, north of Rugley	SK079195	Ordinary watercourse	CA1	Within
Moreton Brook	Staffordshire, Upper Moreton	SK033225	Ordinary watercourse	CA1	Within
Unnamed tributary of Moreton Brook	Staffordshire, Stockwell Heath	SK056214	Ordinary watercourse	CA1	Within
Unnamed tributary of River Trent	Staffordshire, east of Pirehill Lane	SJ899306	Ordinary watercourse	CA3	Within
Filly Brook	Staffordshire, north of Fox Covert	SJ870346	Ordinary Watercourse	CA3	Within

Watercourse name	Location	OS grid reference – crossing point of the Proposed Scheme	Feature type	CA	Distance from the Proposed Scheme (m) and orientation
Unnamed tributary of Meece Brook	Staffordshire, Shelton under Harley Farm	SJ815395	Ordinary watercourse	CA3	Within
Unnamed tributary of River Lea	Staffordshire, east of Wrinehill Wood	SJ752455	Ordinary watercourse	CA4	Within
Unnamed tributary of River Lea	Staffordshire, north of Wrinehill Wood	SJ752456	Ordinary watercourse	CA4	Within
Unnamed tributary of Mere Gutter'	Cheshire, north of Den Lane	SJ733483	Ordinary watercourse	CA5	Within
Unnamed tributary of Mere Gutter	Cheshire, west of Waybutt Lane	SJ729492	Ordinary watercourse	CA5	Within
Basford Brook	Cheshire, Weston	SJ725521	Main river	CA5	Adjacent
Basford Brook	Cheshire, Croatia Mill Farm	SJ731512	Main river	CA5	Adjacent
Basford Brook	Cheshire, west of David Whitby Way	SJ722532	Main river	CA5	Within
Basford Brook	Cheshire, west of Savoy Road	SJ716536	Main river	CA5	30m east

3.3 Baseline

Desk study

Fradley to Colton (CA1)

- 3.3.1 Past Environment Agency RHS data exist for Pyford Brook downstream of the land required for the Proposed Scheme, Bourne Brook upstream of the Proposed Scheme and the River Trent upstream of the land required for the Proposed Scheme in CA1. This data is outlined in Table 13. On examination of aerial imagery, the areas of habitat surveyed appear similar to the habitat on those watercourses within the land required for the construction of the Proposed Scheme.

Table 13: Desk study RHS data for watercourses within the land required for the construction of the Proposed Scheme in CA1

Watercourse name	Distance from the Proposed Scheme (m) and orientation	Survey parameters	Results
Pyford Brook	Approximately 500m downstream of the land required for the construction of the Proposed Scheme.	Grid reference	SK 14700 15300
		Date	22/06/1994
		Predominant valley form	Asymmetrical valley with no distinct flat valley bottom.
		Number of riffles, pools and point bars	One pool, three riffles, no point bars.
		Realigned channel	Not recorded.
		Over-deepened channel	Not recorded.
		Impoundments	Not recorded.
		Bank top land use and vegetation structure	Isolated/scattered trees on left bank, semi-continuous trees on right bank.
		Channel dimensions	Left banktop height 1.5m. Right banktop height 1.3m. Channel bankfull width 4m. Channel water depth 0.15m. Channel water width 3m.
		Location of channel measurements	Riffle.
		Embankments	None present.
		Trashline	None visible.
		Bed material	Consolidated.
		Invasive species	None recorded.
		Habitat Modification Score	250
Habitat Quality Assessment Score	23		
Habitat Modification Class	3: obviously modified.		
Bourne Brook	1.8km upstream of the land required for the construction of the Proposed Scheme	Grid reference	SK 09500 12500
		Date	15/06/1995
		Predominant valley form	Asymmetrical valley with no distinct flat valley bottom.
		Number of riffles, pools and point bars	7 pools, 15 riffles, one un-vegetated point bar.

		Realigned channel	Not recorded.
		Over-deepened channel	Not recorded.
		Impoundments	None present.
		Bank top land use and vegetation structure	Continuous trees on left bank, isolated/scattered trees on right bank.
		Channel dimensions	Left banktop height 1m. Right banktop height 1.2m. Channel bankfull width 7m . Channel water depth 0.2m. Channel water width 1.2m.
		Location of channel measurements	Riffle.
		Embankments	None present.
		Trashline	None visible.
		Bed material	Consolidated.
		Invasive species	Himalayan balsam on banktops.
		Habitat Modification Score	0
		Habitat Quality Assessment Score	52
		Habitat Modification Class	1: semi-natural.
River Trent	Approximately 700m upstream of the land required for the construction of the Proposed Scheme	Grid reference	SK 09100 16700
		Date	27/09/2001
		Predominant valley form	Symmetrical floodplain, no distinct flat valley bottom.
		Number of riffles, pools and point bars	None present.
		Realigned channel	Not recorded.
		Over-deepened channel	Not recorded.
		Impoundments	None present.
		Bank top land use and vegetation structure	Occasional tree clumps on left bank, isolated/scattered trees on right bank.
		Channel dimensions	Left banktop height 1.5m. Right banktop height 1.5m. Channel bankfull width 36.5m. Channel water depth not recorded. Channel water width 36m.

		Location of channel measurements	Run/glide.
		Embankments	3.5m embankment height on both banks.
		Trashline	None visible.
		Bed material	Not visible.
		Invasive species	Himalayan balsam on bank tops.
		Habitat Modification Score	1022
		Habitat Quality Assessment Score	39
		Habitat Modification Class	4: significantly modified.

Colwich to Yarlet (CA2)

3.3.3 Past Environment Agency RHS data exist for the River Trent in CA2. The data for the most relevant site, which is immediately adjacent to the land required for the construction of the Proposed Scheme, is presented in Table 14.

Table 14: Desk study RHS data for watercourses within the land required for the construction of the Proposed Scheme in CA2

Watercourse name	Distance from the Proposed Scheme (m) and orientation	Survey parameters	Results
River Trent	Immediately adjacent to the land required for the construction of the Proposed Scheme.	Grid reference	SJ 99417 23222
		Date	26/07/2010
		Predominant valley form	No obvious valley sides or flat valley bottom.
		Number of riffles, pools and point bars	One pool, one riffle, no point bars
		Realigned channel	Yes, >=33%.
		Over-deepened channel	No.
		Impoundments	None.
		Bank top land use and vegetation structure	Occasional tree clumps on both banks.
		Channel dimensions	Left banktop height 3m. Right banktop height 2m. Channel bankfull width 19m. Channel water depth: 0.4m. Channel water width 15m.
Location of channel measurements	Riffle.		

		Embankments	None.
		Trashline	None visible.
		Bed material	Unconsolidated.
		Invasive species	Himalayan balsam on bank tops and bank faces.
		Habitat Modification Score	370
		Habitat Quality Assessment Score	40
		Habitat Modification Class	3: obviously modified.

Stone and Swynnerton (CA3)

3.3.4 Past Environment Agency RHS data exist for an unnamed tributary of Filly Brook in CA3. The data for the site, which is immediately adjacent to the land required for the construction of the Proposed Scheme, is presented in Table 15.

Table 15: Desk study RHS data for watercourses within the land required for the construction of the Proposed Scheme in CA3

Watercourse name	Distance from the Proposed Scheme (m) and orientation	Survey parameters	Results
Unnamed tributary of Filly Brook	Immediately adjacent to the land required for the construction of the Proposed Scheme.	Grid reference	SJ 88635 33063
		Date	25/08/2007
		Predominant valley form	Shallow vee with no distinct flat valley bottom.
		Number of riffles, pools and point bars	No pools, riffles or point bars.
		Realigned channel	Yes, >=33%.
		Over-deepened channel	Yes, >=33%.
		Impoundments	None.
		Bank top land use and vegetation structure	Occasional tree clumps on both banks.
		Channel dimensions	Left banktop height 1.3m. Right banktop height 1.6m. Channel bankfull width 1.5m. Channel water depth: 0.05m. Channel water width 0.4m.
		Location of channel measurements	Run/glide.
		Embankments	None.
		Trashline	None visible.
		Bed material	Unconsolidated.
		Invasive species	Himalayan balsam on bank tops and bank faces.
Habitat Modification Score	3385		
Habitat Quality Assessment Score	36		
Habitat Modification Class	5: severely modified.		

Whitmore Heath and Madeley (CA4)

3.3.5 Past Environment Agency RHS data exist for the River Lea in CA4. The data for the site, which is within the land required for the construction of the Proposed Scheme, is presented in Table 16.

Table 16: Desk study RHS data for watercourses within the land required for the construction of the Proposed Scheme in CA4

Watercourse name	Distance from the Proposed Scheme (m) and orientation	Survey parameters	Results
River Lea	Within the land required for the construction of the Proposed Scheme	Grid reference	SJ 75267 45765
		Date	21/08/2013
		Predominant valley form	Shallow vee with distinct flat valley bottom.
		Number of riffles, pools and point bars	Two pools, seven riffles, no point bars.
		Realigned channel	Yes, <33%.
		Over-deepened channel	No.
		Impoundments	None.
		Bank top land use and vegetation structure	Occasional tree clumps on both banks.
		Channel dimensions	Left banktop height 3m. Right banktop height 0.7m. Channel bankfull width 13.4m. Channel water depth: 0.4m. Channel water width 3.5m.
		Location of channel measurements	Riffle.
		Embankments	None.
		Trashline	None visible.
		Bed material	Consolidated.
		Invasive species	Himalayan balsam on bank tops and bank faces.
		Habitat Modification Score	345
Habitat Quality Assessment Score	42		
Habitat Modification Class	3: obviously modified.		

South Cheshire (CA5)

3.3.6 Past Environment Agency RHS data exist for Checkley Brook downstream of the Proposed Scheme and an unnamed tributary of Mere Gutter within the land required for the construction of the Proposed Scheme in CA5. This data is outlined in Table 17. On examination of aerial imagery, the areas of habitat surveyed appear similar to the habitat on those watercourses within the land required for the construction of the Proposed Scheme.

Table 17: Desk study RHS data for watercourses within the land required for the construction of the Proposed Scheme in CA5

Watercourse name	Distance from the Proposed Scheme (m) and orientation	Survey parameters	Results
Checkley Brook	Approximately 700m upstream of the land required for the construction of the Proposed Scheme	Grid reference	SJ 75900 46700
		Date	29/05/1996
		Predominant valley form	Shallow vee with no distinct flat valley bottom.
		Number of riffles, pools and point bars	Four pools, ten riffles, no point bars.
		Realigned channel	Not recorded.
		Over-deepened channel	Not recorded.
		Impoundments	None.
		Bank top land use and vegetation structure	Continuous trees along both banks.
		Channel dimensions	Left banktop height 0.3m. Right banktop height 0.3m. Channel bankfull width 3.7m. Channel water depth 0.05m. Channel water width 3.5m.
		Location of channel measurements	Riffle.
		Embankments	None.
		Trashline	None visible.
		Bed material	Unconsolidated.
		Invasive species	Himalayan balsam on bank tops.
		Habitat Modification Score	230
Habitat Quality Assessment Score	52		
Habitat Modification Class	3: obviously modified.		
Unnamed tributary of Mere Gutter	Within the land required for the construction of the Proposed Scheme	Grid reference	SJ 73631 48552
		Date	23/05/2008
		Predominant valley form	Shallow vee with distinct flat valley bottom.
		Number of riffles, pools and point bars	Three pools, two riffles, two unvegetated point bars.
		Realigned channel	No.

		Over-deepened channel	No.
		Impoundments	None.
		Bank top land use and vegetation structure	Occasional tree clumps on both banks.
		Channel dimensions	Left banktop height 1m. Right banktop height 1m. Channel bankfull width 2m. Channel water depth 0.2m. Channel water width 0.5m.
		Location of channel measurements	Riffle.
		Embankments	None.
		Trashline	None visible.
		Bed material	Unconsolidated.
		Invasive species	None.
		Habitat Modification Score	730
		Habitat Quality Assessment Score	46
		Habitat Modification Class	4: significantly modified.

Survey data

3.3.7 Due to inadequate access to the required continuous 500m survey sections, no RHS survey data has been collected for those watercourses where a requirement for RHS survey has been identified.

3.4 Watercourses scoped out of the requirement for RHS

3.4.1 Watercourses for which the need for RHS was scoped out are the same as those watercourses scoped out for RCS survey and are listed in Table 11.

4 Ditch vegetation

4.1 Methodology

- 4.1.1 Details of the standard methodology utilised for ditch vegetation survey are provided in the Technical Note HS2 Ecological Surveys: Field Survey Methods and Standards (FSMS) included in the Scope and Methodology Report (SMR) Addendum (see Volume 5: Appendix CT-001-002).
- 4.1.2 The quality of the surveyed ditches was assessed using the evaluation criteria as described in Buglife 2013².
- 4.1.3 No ditches were identified for survey in CA1-CA4.
- 4.1.4 Vegetation surveys were undertaken at two ditches which were not included in the River Corridor Survey. A summary of locations at which ditch surveys were undertaken is provided in Table 18. This information is cross referenced to the accompanying map series EC- 10.

Table 18: Summary of ditch vegetation survey locations within the West Midlands to Crewe area

Ecology survey code	Survey site name	Centroid OS grid reference	Survey date	CA	Distance from the Proposed Scheme (m) and orientation
000-DS1-244001	Cheshire, east of Chorlton Lane	SJ726506	3 October 2016	5	45m north-east
000-DS1-246001	Cheshire, south-east of Weston Lane	SJ724524	7 October 2016	5	97m north-east

4.2 Deviations, constraints and limitations

- 4.2.1 The principle constraint was the limitation of access to undertake field surveys and the ability to adequately scope survey requirements within the appropriate survey season of May to August.
- 4.2.2 Five locations where the requirements for ditch vegetation surveys was identified but were not accessible for survey within the appropriate season are provided in Table 19.

Table 19: Summary of locations where requirement for ditch survey was identified, but no access available for survey within the appropriate season

Survey site name	Survey location	Centroid OS grid reference	Description	CA	Distance from the Proposed Scheme (m) and orientation
Tolldish Meadow	East of Great Haywood	SK004235	Tributary of the River Trent adjacent to lowland meadow.	2	Within
Great Haywood	West of Great	SJ994237	Tributary of the River	2	Within

² Buglife (2013), *Manual for the Survey and Evaluation of the Aquatic Plant and invertebrate Assemblages of Grazing Marsh Ditch, Systems*, Version 6

Survey site name	Survey location	Centroid OS grid reference	Description	CA	Distance from the Proposed Scheme (m) and orientation
Floodplain	Haywood		Trent adjacent to floodplain grazing marsh.		
Highlow Meadows	South-east of Swynnerton	SJ870347	Tributary of the Filly Brook adjacent to marshy grassland.	3	Within
Meece Meadows	South of Whitmore	SJ808400	Tributary of the Meece Brook adjacent to marshy grassland.	4	Within
Whitmore	North of Madeley Park	SJ781426	Tributary of the River Lea adjacent to marshy grassland.	4	Within

4.3 Baseline

4.3.1 A summary of the ditch vegetation surveys is presented in Table 20 below.

Table 20: A summary of the ditch vegetation baseline data

Ecology survey code	Centroid OS grid reference	Survey date	Description	CA	Distance from the Proposed Scheme (m) and orientation
000-DS1-244001	SJ726506	3 October 2016	Isolated, unmanaged ditch to the west of the railway, east of Chorlton Lane. The ditch has approx. 15cm depth of water. Adjacent land comprises of poor semi-improved grassland and amenity grassland. Six species were recorded, including great willowherb (<i>Epilobium hirsutum</i>), reedmace (<i>Typha latifolia</i>), fool's water-cress (<i>Apium nodiflorum</i>), soft-rush (<i>Juncus effusus</i>) and hard rush (<i>Juncus inflexus</i>).	5	45m north-east
000-DS1-246001	SJ724524	7 October 2016	A wide boundary drain which flows north under Weston Lane. The drain has approx. 10cm depth of water with woodland on the eastern bank and fenced horse-grazed pasture on the western bank. Fourteen species were recorded, including: fool's water-cress (<i>Apium nodiflorum</i>), great willowherb (<i>Epilobium hirsutum</i>), common duckweed (<i>Lemna minor</i>), reed canary-grass (<i>Phalaris arundinacea</i>) and branched bur-reed (<i>Sparganium erectum</i>).	5	97m north-east

Fradley to Colton (CA1)

4.3.2 No ditch habitat was identified within or adjacent to the land required for the construction of the Proposed Scheme.

Colwich to Yarlet (CA2)

- 4.3.3 Ditch habitat was identified for survey at Tolldish Meadow and Great Haywood Floodplain but could not be surveyed as access was not available.

Stone and Swynnerton (CA3)

- 4.3.4 Ditch habitat was identified for survey at Highlow Meadows but could not be surveyed as access was not available.

Whitmore Heath and Madeley (CA4)

- 4.3.5 Ditch habitat was identified for survey at Meece Meadows and Whitmore (north of Madeley Park) but could not be surveyed as access was not available.

South Cheshire (CA5)

- 4.3.6 Vegetation surveys were conducted at two ditches within CA5 (no aquatic invertebrate survey was conducted at either ditch):
- the isolated, unmanaged ditch 000-DS1-244001, to the east of Chorlton Lane. No notable species were recorded during the survey although it is not possible to rule out the presence of species of interest as the survey was conducted in October, outside the optimum survey period; and
 - the drain 000-DS1-246001 to the south-east of Weston Lane, parallel to Basford Brook. No notable species were recorded during the survey although it is not possible to rule out the presence of species of interest as the survey was conducted in October, outside the optimum survey period.

5 References


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