ATTACHMENT B: TECHNICAL APPENDIX 8-8 BAT ACTIVITY BASELINE SURVEY REPORT DEFRA STUDY – CORRECTED APPENDIX A, TABLE 4

DEFRA LOCAL SCALE EFFECTS SURVEY DETAILS

The Batlogger settings were as follows;

Trigger Mode: Continuous
Trigger Mode: Crest Adv
Trig_Autorec: Auto
Trig_PAR6: min.Crest = 7
Trig_PAR7: minimum: 15 kHz
Trig_PAR8: maximum: 155 kHz

Infrared camera setup was as follow;

Camera model: Canon xA30
Lamp specification: 60^{o} angle, 100m distance

Table 1 - Transforming activity information- worked examples

Example comment from the survey proforma	Decision
No comment on type of activity provided	One commuting pass
'Constant activity' within a range of time	One pass, unless stated 'passing back and forth', then two passes
'Constant foraging'	One pass
'Constant activity' with 'multiple bats'	Four passes; two passes (one for each direction) for two bats (more than 1 from multiple)
'Multiple bats' within a range of time, e.g. Ppip x 3	Three passes
'Distant bats'	One commuting pass
'Multiple passes'	If the same bat (seen) then two passes
'Quiet calls'	One commuting pass
'Signal calls'	Not a pass
'Foraging and commuting'	One pass
'Foraging back and forth'	If no direction information then two passes
'Foraging briefly'	One pass

Table 2 – Crossing point locations

Crossing point	Location X	Location Y	Scheme Option	Habitat Feature
1	498035	106860	5A	Woodland edge
2	498249	106727	5A	Hedgerow
3	498452	106459	5A	Hedgerow
4	498723	106172	5A	Hedgerow
5	498943	106032	5A	Woodland edge
6	499252	105924	5A	Single track lane
7	499341	105908	5A	Woodland edge
8	499626	105895	5A	Hedgerow
9	499768	105904	5A	Hedgerow
10	499978	105898	5A	Hedgerow
11	500144	105952	5A	Hedgerow-lined lane
12	500050	106158	3	Woodland edge
13	499849	106650	3	Footpath within woodland
14	499803	106807	3	Lane within woodland
15	499660	107047	3	Track within woodland
16	499511	107187	3	Woodland edge
17	499317	107357	3	Woodland edge
18	500681	105726	5A, 3	Hedgerow-lined lane
19	500866	105699	5A, 3	Hedgerow
20	501074	105716	5A, 3	Hedgerow
21	501240	105752	5A, 3	Hedgerow-lined ditch
22	501486	105805	5A, 3	Hedgerow-lined ditch
23	501568	105824	5A, 3	Hedgerow-lined ditch

Crossing point	Location X	Location Y	Scheme Option	Habitat Feature
24	501683	105850	5A, 3	Hedgerow-lined ditch
25	502047	105928	5A, 3	Hedgerow-lined ditch
26	502218	105951	1	Railway
27	502278	106070	5A, 3	Railway
28	502633	105945	5A, 3, 1	Hedgerow
29	501982	106340	1	Hedgerow
30	501910	106430	1	Hedgerow-lined lane
31	501760	106574	1	Hedgerow-lined lane
32	501884	105924	5A, 3,	Hedgerow-lined ditch
33	501823	105895	5A, 3,	Hedgerow-lined ditch
34	502395	105942	5A, 3, 1	Hedgerow

Table 3 - Survey data

CP 1

Visit Number	Date	Start time		Sunset/Sunrise time	Temperature		Cloud cover	(%)	Wind	(Beaufort)	Rain	
					Start	End	Start	End	Start	End	Start	End
1	26/06/17	21:20		21:20	18	11	10	10	0	0	0	0
1 Dawn	27/06/17	02:50		04:50	16.5	14.4	50	100	0	0	0	0
2	06/07/17	21:17		21:17	26	20	10	10	0	0	0	0
2 Dawn	07/07/17	02:57		04:57	20	17	25	20	0	0	0	0
3	15/07/17	20:26		20:26	-	-	-	-	-	-	-	-
4	29/08/17	19:54		19:54	-	-	-	-	-	-	-	-
5	06/09/17	19:39		19:39	-	-	-	-	-	-	-	-

6	18/09/17	19:11		19:11	-	-	-	-	-	-	-	-	

CP 2

Visit Number	Date	Start time		Sunset/Sunrise time	Temperature		Cloud cover	(%)	Wind	(Beaufort)	Rain	
					Start	End	Start	End	Start	End	Start	End
1	18/06/18	21:19		21:30	17	16	100	100	0	0	0	0
1 Dawn	19/06/18	02:30		94:48	17	16	100	100	0	0	0	0
2	04/07/28	21:16		21:16	19	17	5	5	0	0	0	0
2 Dawn	05/07/18	02:55		04:55	17	16	100	100	0	1	0	0
3	19/07/18	21:00		21:07	21	20	50	60	0	1	0	0
4	01/08/18	20:48		20:48	18	16	5	5	0	0	0	0
5	13/08/18	20:27		20:27	20	20	5	10	1	1	0	0
6	11/09/18	19:26		19:26	18	18	100	100	1	1	0	0

CP 3

Visit Number	Date	Start time		Sunset/Sunrise time	Temperature		Cloud cover	(%)	Wind	(Beaufort)	Rain	
					Start	End	Start	End	Start	End	Start	End
1	26/06/17	21:20		21:20	16.4	12.9	40	-	0	0.1	no	no
1 Dawn	27/06/17	02:50		04:50	14	12.9	80	100	0	0.1	no	light

2	06/07/17	21:17		21:17	27	17	10	5	0	0	no	no
2 Dawn	07/07/17	02:57		04:58	16	14	0	20	0	0	no	no
3	15/07/17	20:25		20:25	-	-	-	-	-	-	-	-
4	24/08/17	20:04		20:04	15	14	5	100	0	0	no	no
5	07/09/17	19:34		19:34	-	-	-	-	-	-	-	-
6	20/09/17	19:05		19:05	-	-	-	-	-	-	-	-

CP 4

Visit Number	Date	Start time		Sunset/Sunrise time	Temperature		Cloud cover	(%)	Wind	(Beaufort)	Rain	
					Start	End	Start	End	Start	End	Start	End
1	18/06/18	21:18		21:18	17	16	8	8	1	0	0	0
1 Dawn	19/06/18	02:22		04:48	17	16	8	8	1	0	light	0
2	02/07/18	21:17		21:17	20	18	5	5	2	2	0	0
2 Dawn	03/07/18	02:55		04:55	16	16	0	10	1	1	0	0
3	18/07/18	21:07		21:07	19	18	5	0	1	1	0	0
4	01/08/18	20:47		20:47	10	16	30	10	0	0	0	0
5	13/08/18	20:27		20:28	21	18	20	40	1	1	0	0
6	11/09/18	19:26		19:26	18	18	100	100	2	2	0	0

CP 5

Visit Number	Date	Start time		Sunset/Sunrise time	Temperature		Cloud cover	(%)	Wind	(Beaufort)	Rain	
					Start	End	Start	End	Start	End	Start	End
1	28/06/17	21:19		21:19	16.5	14.8	100	100	0	0	no	no
1 Dawn	29/06/17	02:49		04:51	12.5	11.5	100	100	0	0	light	no
2	12/07/17	21:13		21:13	-	-	-	-	-	-	-	-
2 Dawn	13/07/17	03:03		05:03	-	-	-	-	-	-	-	-
3	16/08/17	20:20		20:20	18	17	95	75	0	0	0	0
4	30/08/17	19:52		19:52	-	-	-	-	-	-	-	-
5	11/09/17	19:28		19:28	-	-	-	-	-	-	-	-
6	19/09/17	19:10		19:10	-	-	-	-	-	-	-	-

CP 6

Visit Number	Date	Start time		Sunset/Sunrise time	Temperature		Cloud cover	(%)	Wind	(Beaufort)	Rain	
					Start	End	Start	End	Start	End	Start	End
1	29/06/17	21:20		21:20	16.5	13.6	100	100	0	0	0	0

1 Dawn	30/06/17	02:52		04:52	15.9	14	95	100	0	0	0	0
2	12/07/17	21:11		21:11	-	-	-	-	-	-	-	-
2 Dawn	13/07/17	03:04		05:04	-	-	-	-	-	-	-	-
3	16/08/17	20:20		20:20	17	16	80	90	0	0	0	0
4	30/08/17	19:52		19:52	-	-	-	-	-	-	-	-
5	11/09/17	19:26		19:26	-	-	-	-	-	-	-	-
6	19/09/17	19:10		19:10	-	-	-	-	-	-	-	-

CP 7

Visit Number	Date	Start time		Sunset/Sunrise time	Temperature		Cloud cover	(%)	Wind	(Beaufort)	Rain	
					Start	End	Start	End	Start	End	Start	End
1	26/06/18	21:20		21:20	18	14	10	0	0	0	0	0
1 Dawn	27/06/18	02:50		04:50	10	10	0	0	0	0	0	0
2	03/07/18	21:17		21:17	24	20	5	0	0	0	0	0
2 Dawn	04/07/18	02:50		04:40	14	14	80	70	1	0	0	0
3	18/07/18	21:07		21:07	18	16	5	0	0	0	0	0
4	02/08/18	20:47		20:47	23	21	5	0	0	0	0	0
5	14/08/18	20:25		20:25	21	20	5	50	1	0	0	0

6	10/09/18	19:26		19:26	17	17	10	5	2	2	0	0

CP 8

Visit Number	Date	Start time		Sunset/Sunrise time	Temperature		Cloud cover	(%)	Wind	(Beaufort)	Rain	
					Start	End	Start	End	Start	End	Start	End
1	28/06/17	21:20		21:20	-	-	-	-	-	-	-	-
1 Dawn	29/06/17	02:50		02:50	-	-	-	-	-	-	-	-
2	12/07/17	21:13		21:13	18	16	40	50	0	0	0	0
2 Dawn	13/07/17	03:00		03:00	17	16	80	80	0	0	no	no
3	21/08/17	20:10		20:10	21	19	100	100	0	0	0	0
4	31/08/17	19:50		19:50	-	-	-	-	-	-	-	-
5	14/09/17	19:20		19:20	-	-	-	-	-	-	-	-
6	26/09/17	18:51		18:51	-	-	-	-	-	-	-	-

CP 9

Visit Number	Date	Start time	End time	Sunset/Sunrise time	Temperature		Cloud cover	(%)	Wind	(Beaufort)	Rain	
					Start	End	Start	End	Start	End	Start	End

1	21/06/17	21:20		21:20	-	-	-	-	-	-	-	-
1 Dawn	22/06/17	02:49		04:49	19.1	18.5	0	95	0	0	0	0
2	04/07/17	21:18		21:18	17.7	14.8	5	60	0	0	0	0
2 Dawn	05/07/17	02:56		04:56	14.4	9.5	0	0	0	0	0	0
3	21/08/17	20:10		20:10	-	-	-	-	-	-	-	-
4	31/08/17	19:50		19:50	-	-	-	-	-	-	-	-
5	14/09/17	19:19		19:19	-	-	-	-	-	-	-	-
6	28/09/17	18:50		18:50	-	-	-	-	-	-	-	-

CP 10

Visit Number	Date	Start time	End time	Sunset/Sunrise time	Temperature		Cloud cover	(%)	Wind	(Beaufort)	Rain	
					Start	End	Start	End	Start	End	Start	End
1	21/06/17	21:20		21:20	19.9	19	20	25	0.1	0	0	0
1 Dawn	22/06/17	02:50		04:50	19.1	18.5	5	95	0	0	0	0
2	04/07/17	21:18		21:18	20.5	15.7	15	95	0	0	0	0
2 Dawn	05/07/17	02:55		04:55	14.8	11.7	0	10	0	0.5	0	0
3	17/08/17	20:20		20:20	-	-	-	-	-	-	-	-

4	04/09/17	19:39		19:39	-	-	-	-	-	-	-	-
5	13/09/17	19:21		19:21	-	-	-	-	-	-	-	-
6	28/09/17	18:50		18:50	-	-	-	-	-	-	-	-

CP 11

Visit Number	Date	Start time		Sunset/Sunrise time	Temperature		Cloud cover	(%)	Wind	(Beaufort)	Rain	
					Start	End	Start	End	Start	End	Start	End
1	21/06/18	21:21		21:21	16	12	10	10	0	0	0	0
1 Dawn	26/06/18	02:50		05:50	12	13	0	5	0	0	0	0
2	02/07/18	21:19		21:19	20	18	30	0	1	1	0	0
2 Dawn	03/07/18	02:54		04:54	16	16	0	2	1	1	0	0
3	19/07/18	21:00		21:06	21	18	15	0	0	0	0	0
4	02/08/18	20:46		20:46	22	19	0	0	0	0	0	0
5	14/08/18	20:25		20:25	20	18	10	5	2	1	0	0
6	10/09/18	21:28		21:28	18	17	50	0	1	1	0	0

CP 12

Visit Number	Date	Start time		Sunset/Sunrise time	Temperature		Cloud cover	(%)	Wind	(Beaufort)	Rain	
					Start	End	Start	End	Start	End	Start	End
1	21/06/17	21:00		21:20	25.7	18	5	5	0	0	0	0
1 Dawn	22/06/17	02:49		04:49	17.3	18	100	100	0	0	0	0
2	04/07/17	21:18		21:18	19	15	5	25	0	0	0	0
2 Dawn	05/07/17	02:54		04:54	-	-	-	-	-	-	-	-
3	21/08/17	20:11		20:11	-	-	-	-	-	-	-	-
4	04/09/17	19:39		19:39	-	-	-	-	-	-	-	-
5	13/09/17	19:21		19:21	-	-	-	-	-	-	-	-
6	28/09/17	18:50		18:50	-	-	-	-	-	-	-	-

CP 13

Visit Number	Date	Start time		Sunset/Sunrise time	Temperature		Cloud cover	(%)	Wind	(Beaufort)	Rain	
					Start	End	Start	End	Start	End	Start	End
1	22/06/17	21:20		21:20	22.8	22.9	80	100	0	0	0	0
1 Dawn	23/06/17	02:49		04:49	15.8	13.9	0	85	0	0	0	0
2	05/07/17	21:17		21:17	22.5	18.3	0	0	0	0	0	0
2 Dawn	06/07/17	02:57		04:55	18.8	16.6	0	20	0	0	0	0

3	22/08/17	20:10		20:10	-	-	-	-	-	-	-	-
4	05/09/17	19:40		19:40	-	-	-	-	-	-	-	-
5	18/09/17	19:10		19:10	15	15	100	100	0	0	0	Light
6	25/09/17	18:55		18:55	-	-	-	-	-	-	-	-

CP 14

Visit Number	Date	Start time		Sunset/Sunrise time	Temperature		Cloud cover	(%)	Wind	(Beaufort)	Rain	
					Start	End	Start	End	Start	End	Start	End
1	21/06/17	21:20		21:20	-	-	-	-	-	-	-	-
1 Dawn	22/06/17	02:49		04:49	21.2	15.7	90	0	0	0	0	0
2	04/07/17	21:17		21:17	-	-	-	-	-	-	-	-
2 Dawn	05/07/17	02:57		04:57	-	-	-	-	-	-	-	-
3	21/08/17	20:10		20:10	-	-	-	-	-	-	-	-
4	04/09/17	19:39		19:39	-	-	-	-	-	-	-	-
5	13/09/17	19:10		19:10	-	-	-	-	-	-	-	-
6	28/09/17	18:51		18:51	-	-	-	-	-	-	-	-

CP 15

Visit Number	Date	Start time		Sunset/Sunrise time	Temperature		Cloud cover	(%)	Wind	(Beaufort)	Rain	
					Start	End	Start	End	Start	End	Start	End
1	22/06/17	21:20		21:20	20.6	16	75	75	0	0	0	0
1 Dawn	23/06/17	04:49		04:49	17.3	16.2	60	90	0	0	0	0
2	05/07/17	21:18		21:18	-	-	-	-	-	-	-	-
2 Dawn	06/07/17	02:55		04:54	19.8	17.2	75	80	0	0	0	0
3	24/08/17	20:04		20:04	-	-	-	-	-	-	-	-
4	06/09/17	19:38		19:38	16	13	100	70	0	0	0	0
5	14/09/17	19:19		19:19	-	-	-	-	-	-	-	-
6	29/09/17	18:44		18:44	-	-	-	-	-	-	-	-

CP 16

Visit Number	Date	Start time		Sunset/Sunrise time	Temperature		Cloud cover	(%)	Wind	(Beaufort)	Rain	
					Start	End	Start	End	Start	End	Start	End
No Access												

CP 17

Visit Number	Date	Start time		Sunset/Sunrise time	Temperature		Cloud cover	(%)	Wind	(Beaufort)	Rain	
					Start	End	Start	End	Start	End	Start	End
1	22/06/17	21:20		21:20	17.4	15	30	20	0	0	0	0
1 Dawn	23/06/17	02:49		04:49	-	-	-	-	-	-	-	-
2	05/07/17	21:18		21:18	23	19	20	75	0	0	0	0
2 Dawn	06/07/17	02:55		04:55	-	-	-	-	-	-	-	-
3	-	-		-	-	-	-	-	-	-	-	-
4	-	-		-	-	-	-	-	-	-	-	-
5	-	-		-	-	-	-	-	-	-	-	-
6	-	-		-	-	-	-	-	-	-	-	-

CP 18

Visit Number	Date	Start time		Sunset/Sunrise time	Temperature		Cloud cover	(%)	Wind	(Beaufort)	Rain	
					Start	End	Start	End	Start	End	Start	End
1	29/06/17	21:20		21:20	18.5	15	100	100	0	0	0	0
1 Dawn	30/06/17	02:50		04:50	17.5	15.4	100	100	0	0	0	0

2	13/07/17	21:12		21:12	21.5	17	80	-	0	0	0	0
2 Dawn	14/07/17	03:05		05:05	16	12	20	20	0	0	0	0
3	-	-		-	-	-	-	-	-	-	-	-
4	-	-		-	-	-	-	-	-	-	-	-
5	-	-		-	-	-	-	-	-	-	-	-
6	-	-		-	-	-	-	-	-	-	-	-

CP 19

Visit Number	Date	Start time		Sunset/Sunrise time	Temperature		Cloud cover	(%)	Wind	(Beaufort)	Rain	
					Start	End	Start	End	Start	End	Start	End
1	29/06/17	21:20		21:19								
1 Dawn	30/06/17	02:50		04:50	16	14.7	90	95	0.1	0.1	0	0
2	13/07/17	21:12		21:12	17	17	80	95	0	1	0	0
2 Dawn	14/07/17	03:05		05:05	16	10	100	30	0	0	0	0
3	-	-		-	-	-	-	-	-	-	-	-
4	-	-		-	-	-	-	-	-	-	-	-
5	-	-		-	-	-	-	-	-	-	-	-
6	-	-		-	-	-	-	-	-	-	-	-

CP 20

Visit Number	Date	Start time		Sunset/Sunrise time	Temperature		Cloud cover	(%)	Wind	(Beaufort)	Rain	
					Start	End	Start	End	Start	End	Start	End
1	18/06/18	21:19		21:19	17	14	5	0	2	1	0	0
1 Dawn	19/06/18	02:48		04:48	16	16	100	100	0	0	light	0
2	03/07/18	21:17		21:17	19	16	10	0	0	0	0	0
2 Dawn	04/07/18	02:55		04:55	17	16	30	100	0	0	0	0
3	23/07/18	21:01		21:01	21	19	20	20	0	0	0	0
4	13/08/18	20:27		20:27	20	19	<5	60	0	0	0	0
5	28/08/18	19:57		19:57	16	12	1	1	0	0	0	0
6	18/09/18	19:10		19:10	20	20	10	80	0	0	0	0

CP 21

Visit Number	Date	Start time		Sunset/Sunrise time	Temperature		Cloud cover	(%)	Wind	(Beaufort)	Rain	
					Start	End	Start	End	Start	End	Start	End
1	18/06/18	21:19		21:19	17	14	5	0	2	1	0	0

1 Dawn	19/06/18	02:48		04:48	16	16	100	100	0	0	light	0
2	03/07/18	21:17		21:17	19	16	10	0	0	0	0	0
2 Dawn	04/07/18	02:55		04:55	17	16	30	100	0	0	0	0
3	23/07/18	21:01		21:01	21	19	20	20	0	0	0	0
4	13/08/18	20:27		20:27	20	19	<5	60	0	0	0	0
5	28/08/18	19:57		19:57	16	12	1	1	0	0	0	0
6	18/09/18	19:10		19:10	20	20	10	80	0	0	0	0

CP 22

Visit Number	Date	Start time		Sunset/Sunrise time	Temperature		Cloud cover	(%)	Wind	(Beaufort)	Rain	
					Start	End	Start	End	Start	End	Start	End
1	18/06/18	21:19		21:19	17	14	5	0	2	1	0	0
1 Dawn	19/06/18	02:48		04:48	16	16	100	100	0	0	light	0
2	03/07/18	21:17		21:17	19	16	10	0	0	0	0	0
2 Dawn	04/07/18	02:55		04:55	17	16	30	100	0	0	0	0
3	23/07/18	21:01		21:01	21	19	20	20	0	0	0	0
4	13/08/18	20:27		20:27	20	19	<5	60	0	0	0	0
5	28/08/18	19:57		19:57	16	12	1	1	0	0	0	0

6	18/09/18	19:10		19:10	20	20	10	80	0	0	0	0

CP 23

Visit Number	Date	Start time		Sunset/Sunrise time	Temperature		Cloud cover	(%)	Wind	(Beaufort)	Rain	
					Start	End	Start	End	Start	End	Start	End
1	18/06/18	21:19		21:19	17	14	5	0	2	1	0	0
1 Dawn	19/06/18	02:48		04:48	16	16	100	100	0	0	light	0
2	03/07/18	21:17		21:17	19	16	10	0	0	0	0	0
2 Dawn	04/07/18	02:55		04:55	17	16	30	100	0	0	0	0
3	23/07/18	21:01		21:01	21	19	20	20	0	0	0	0
4	13/08/18	20:27		20:27	20	19	<5	60	0	0	0	0
5	28/08/18	19:57		19:57	16	12	1	1	0	0	0	0
6	18/09/18	19:10		19:10	20	20	10	80	0	0	0	0

CP 24

Visit Number	Date	Start time		Sunset/Sunrise time	Temperature		Cloud cover	(%)	Wind	(Beaufort)	Rain	
					Start	End	Start	End	Start	End	Start	End
1	18/06/18	21:19		21:19	17	14	5	0	2	1	0	0
1 Dawn	19/06/18	02:48		04:48	16	16	100	100	0	0	light	0

2	03/07/18	21:17		21:17	19	16	10	0	0	0	0	0
2 Dawn	04/07/18	02:55		04:55	17	16	30	100	0	0	0	0
3	23/07/18	21:01		21:01	21	19	20	20	0	0	0	0
4	13/08/18	20:27		20:27	20	19	<5	60	0	0	0	0
5	28/08/18	19:57		19:57	16	12	1	1	0	0	0	0
6	18/09/18	19:10		19:10	20	20	10	80	0	0	0	0

CP 25

Visit Number	Date	Start time		Sunset/Sunrise time	Temperature		Cloud cover	(%)	Wind	(Beaufort)	Rain	
					Start	End	Start	End	Start	End	Start	End
1	29/06/17	21:19		21:19	17.2	17.9	90	90	0	0	0	0
1 Dawn	30/06/17	02:45		04:49	14.6	14.6	90	90	0	0	0	0
2	13/07/17	21:12		21:12	-	-	-	-	-	-	-	-
2 Dawn	14/07/17	21:12		21:12	-	-	-	-	-	-	-	-
3	-	-		-	-	-	-	-	-	-	-	-
4	-	-		-	-	-	-	-	-	-	-	-
5	-	-		-	-	-	-	-	-	-	-	-
6	-	-		-	-	-	-	-	-	-	-	-

CP 26

Visit Number	Date	Start time	End time	Sunset/Sunrise time	Temperature		Cloud cover	(%)	Wind	(Beaufort)	Rain	
					Start	End	Start	End	Start	End	Start	End
1	03/07/17	21:18		21:18	-	-	-	-	-	-	-	-
1 Dawn	04/07/17	02:54		04:54	15.4	10.3	5	5	0	0	0	0

CP 27

Visit Number	Date	Start time		Sunset/Sunrise time	Temperature		Cloud cover	(%)	Wind	(Beaufort)	Rain	
					Start	End	Start	End	Start	End	Start	End
1	18/06/18	21:19		21:19	17	14	5	0	2	1	0	0
1 Dawn	19/06/18	02:48		04:48	16	16	100	100	0	0	light	0
2	03/07/18	21:17		21:17	19	16	10	0	0	0	0	0
2 Dawn	04/07/18	02:55		04:55	17	16	30	100	0	0	0	0
3	23/07/18	21:01		21:01	21	19	20	20	0	0	0	0
4	13/08/18	20:27		20:27	20	19	<5	60	0	0	0	0
5	28/08/18	19:57		19:57	16	12	1	1	0	0	0	0

6	18/09/18	19:10		19:10	20	20	10	80	0	0	0	0

CP 28

Visit Number	Date	Start time		Sunset/Sunrise time	Temperature		Cloud cover	(%)	Wind	(Beaufort)	Rain	
					Start	End	Start	End	Start	End	Start	End
1	18/06/18	21:19		21:19	17	14	5	0	2	1	0	0
1 Dawn	19/06/18	02:48		04:48	16	16	100	100	0	0	light	0
2	03/07/18	21:17		21:17	19	16	10	0	0	0	0	0
2 Dawn	04/07/18	02:55		04:55	17	16	30	100	0	0	0	0
3	23/07/18	21:01		21:01	21	19	20	20	0	0	0	0
4	13/08/18	20:27		20:27	20	19	<5	60	0	0	0	0
5	28/08/18	19:57		19:57	16	12	1	1	0	0	0	0
6	18/09/18	19:10		19:10	20	20	10	80	0	0	0	0

CP 29

Visit Number	Date	Start time	End time	Sunset/Sunrise time	Temperature		Cloud cover	(%)	Wind	(Beaufort)	Rain	

					Start	End	Start	End	Start	End	Start	End
1	03/07/17	21:18		21:18	17.1	15.1	10	10	0.3	0.3	0	0
1 Dawn	04/07/17	02:55		04:55	17	10.7	0	0	0	0	0	0

CP 30

Visit Number	Date	Start time	End time	Sunset/Sunrise time	Temperature		Cloud cover	(%)	Wind	(Beaufort)	Rain	
					Start	End	Start	End	Start	End	Start	End
No Access												

CP 31

Visit Number	Date	Start time	End time	Sunset/Sunrise time	Temperature		Cloud cover	(%)	Wind	(Beaufort)	Rain	
					Start	End	Start	End	Start	End	Start	End
1	03/07/17	21:18		21:18	18.4	12.6	5	0	0	0	0	0
Dawn 1	04/07/17	02:55		04:55	-	-	-	-	-	-	-	-
2	13/07/17	21:11		21:11	-	-	-	-	-	-	-	-
Dawn 2	14/07/17	03:00		05:04	-	-	-	-	-	-	-	-

CP 32

Visit Number	Date	Start time		Sunset/Sunrise time	Temperature		Cloud cover	(%)	Wind	(Beaufort)	Rain	
					Start	End	Start	End	Start	End	Start	End
1	18/06/18	21:19		21:19	17	14	5	0	2	1	0	0
1 Dawn	19/06/18	02:48		04:48	16	16	100	100	0	0	light	0
2	03/07/18	21:17		21:17	19	16	10	0	0	0	0	0
2 Dawn	04/07/18	02:55		04:55	17	16	30	100	0	0	0	0
3	23/07/18	21:01		21:01	21	19	20	20	0	0	0	0
4	13/08/18	20:27		20:27	20	19	<5	60	0	0	0	0
5	28/08/18	19:57		19:57	16	12	1	1	0	0	0	0
6	18/09/18	19:10		19:10	20	20	10	80	0	0	0	0

CP 33

Visit Number	Date	Start time		Sunset/Sunrise time	Temperature		Cloud cover	(%)	Wind	(Beaufort)	Rain	
					Start	End	Start	End	Start	End	Start	End
1	18/06/18	21:19		21:19	17	14	5	0	2	1	0	0
1 Dawn	19/06/18	02:48		04:48	16	16	100	100	0	0	light	0
2	03/07/18	21:17		21:17	19	16	10	0	0	0	0	0
2 Dawn	04/07/18	02:55		04:55	17	16	30	100	0	0	0	0

3	23/07/18	21:01		21:01	21	19	20	20	0	0	0	0
4	13/08/18	20:27		20:27	20	19	<5	60	0	0	0	0
5	28/08/18	19:57		19:57	16	12	1	1	0	0	0	0
6	18/09/18	19:10		19:10	20	20	10	80	0	0	0	0

CP 34

Visit Number	Date	Start time		Sunset/Sunrise time	Temperature		Cloud cover	(%)	Wind	(Beaufort)	Rain	
					Start	End	Start	End	Start	End	Start	End
1	18/06/18	21:19		21:19	17	14	5	0	2	1	0	0
1 Dawn	19/06/18	02:48		04:48	16	16	100	100	0	0	light	0
2	03/07/18	21:17		21:17	19	16	10	0	0	0	0	0
2 Dawn	04/07/18	02:55		04:55	17	16	30	100	0	0	0	0
3	23/07/18	21:01		21:01	21	19	20	20	0	0	0	0
4	13/08/18	20:27		20:27	20	19	<5	60	0	0	0	0
5	28/08/18	19:57		19:57	16	12	1	1	0	0	0	0
6	18/09/18	19:10		19:10	20	20	10	80	0	0	0	0

Local effects survey proforma comment examples

Example comment from the survey proforma	Decision
No comment on type of activity provided	One commuting pass
‘Constant activity’ within a range of time	One pass, unless stated ‘passing back and forth’, then two passes
‘Constant foraging’	One pass
‘Constant activity’ with ‘multiple bats’	Four passes; two passes (one for each direction) for two bats (more than 1 from multiple)
‘Multiple bats’ within a range of time, e.g. Ppip x 3	Three passes
‘Distant bats’	One commuting pass
‘Multiple passes’	If the same bat (seen) then two passes
‘Quiet calls’	One commuting pass
‘Signal calls’	Not a pass
‘Foraging and commuting’	One pass
‘Foraging back and forth’	If no direction information then two passes
‘Foraging briefly’	One pass

DEFRA LANDSCAPE SCALE EFFECTS SURVEY DETAILS

The Batlogger settings were as follows;

Trigger Mode: Continuous
Trigger Mode: Crest Adv
Trig_Autorec: Auto
Trig_PAR6: min.Crest = 7
Trig_PAR7: minimum: 15 kHz
Trig_PAR8: maximum: 155 kHz

Table 4 - Survey data

Transect Route	Repetition Number	Route option	Direction	Date	Sunset	Time Start	Time End (Min)	Total Hours
T1	1	Option 5A	Towards	17/07/17	21:09	21:30	23:27	1.57
T2	1	Option 5A	Away	17/07/17	21:08	21:38	23:42	02:04
T3	1	Option 5A	Towards	17/07/17	21:10	21:30	23:30	02:00
T4	1	Option 5A	Away	17/07/17	21:10	21:30	23:28	01:58
T5	1	Option 5A	Away	17/07/17	21:09	21:35	23:36	02:01
T6	1	Option 3, 5A	Towards	17/07/17	21:07	21:27	23:27	02:00
T7	1	Option 3, 5A	Away	17/07/17	21:10	21:30	23:36	02:06
T8	-	Option 1, 3, 5A	-	-	-	-	-	-

Transect Route	Repetition Number	Route option	Direction	Date	Sunset	Time Start	Time End (Min)	Total Hours
T9	1	Option 1, 3, 5A	Towards	17/07/17	21:10	21:30	23:07	01:37
T10	1	Option 3, 5A	Away	17/07/17	21:10	21:30	23:30	02:00
T11	1	Option 3	Towards	24/07/17	21:00	21:30	23:39	02:09
T12	1	Option 3	Away	24/07/17	20:59	21:29	23:31	02:02
T13	1	Option 3	Away	24/07/17	20:59	21:29	23:54	02:25
T14	1	Option 3	Towards	24/07/17	20:59	21:29	23:52	02:23
T15	1	Option 3	Away	24/07/17	21:00	21:30	23:46	02:16
T16	1	Option 1	Towards	24/07/17	20:59	21:29	23:39	02:10
T17	1	Option 1	Away	31/07/17	20:50	21:20	23:33	02:13
T18	1	Option 1	Towards	31/07/17	20:50	21:20	23:23	02:03
T19	1	Option 1	Towards	31/07/17	20:50	21:20	23:28	02:08
T20	1	Option 1	Away	31/07/17	20:50	21:20	00:23	03:03
T21	1	Option 1	Away	31/07/17	20:50	21:20	23:24	02:04
T22	1	Option 1	Towards	31/07/17	20:50	21:20	23:27	02:07

Transect Route	Repetition Number	Route option	Direction	Date	Sunset	Time Start	Time End (Min)	Total Hours
T23	1	Option 1	Towards	3107/17	20:50	21:20	23:44	02:24
T1	2	Option 5A	Away	03/08/17	20:44	21:14	23:19	02:05
T2	2	Option 5A	Towards	07/08/17	20:38	21:08	23:23	02:15
T3	2	Option 5A	Away	07/08/17	20:48	21:08	23:23	02:15
T4	2	Option 5A	Towards	07/08/17	20:38	21:08	23:12	02:04
T5	2	Option 5A	Towards	01/08/17	20:50	21:20	23:23	02:03
T6	2	Option 3, 5A	Away	01/8/17	20:48	21:18	23:26	02:08
T7	2	Option 3, 5A	Towards	07/08/17	20:38	21:08	23:16	02:08
T8	-	Option 1, 3, 5A	-	-	-	-	-	-
T9	2	Option 1, 3, 5A	Away	07/08/17	20:38	21:08	23:21	02:13
T10	2	Option 3, 5A	Towards	07/08/17	20:38	21:08	23:20	02:12
T11	2	Option 3	Away	08/08/17	20:38	21:08	23:17	02:09
T12	2	Option 3	Towards	10/08/17	20:32	21:02	23:09	02:07

Transect Route	Repetition Number	Route option	Direction	Date	Sunset	Time Start	Time End (Min)	Total Hours
T13	2	Option 3	Towards	14/08/17	20:25	20:55	23:06	02:11
T14	2	Option 3	Towards	14/08/17	20:25	20:55	22:57	02:02
T15	2	Option 3	Towards	14/08/17	20:25	20:55	23:04	02:09
T16	2	Option 1	Towards	07/08/18	20:38	21:08	23:10	02:02
T17	2	Option 1	Towards	10/08/27	20:31	21:01	23:06	02:05
T18	2	Option 1	Away	14/08/17	20:25	20:55	22:57	02:02
T19	2	Option 1	Away	14/08/17	20:26	20:56	23:01	02:05
T20	2	Option 1	Towards	14/08/17	20:28	20:55	23:34	02:39
T21	2	Option 1	Towards	21/08/17	20:11	20:41	22:42	02:01
T22	2	Option 1	Away	21/08/17	20:11	20:41	22:47	02:06
T23	2	Option 1	Towards	21/08/17	20:11	20:44	22:41	01:57

DESK STUDY: - BAT RECORDS WITHIN 6 KM

Scientific name	Vernacular name	Grid Reference		Year	Type
		X	Y		
Barbastella barbastellus	Western Barbastelle	494500	106500	2015	Radio-Tracked
Barbastella barbastellus	Western Barbastelle	494500	107500	2015	Radio-Tracked
Barbastella barbastellus	Western Barbastelle	494500	108500	2015	Radio-Tracked
Barbastella barbastellus	Western Barbastelle	495500	104500	2015	Radio-Tracked
Barbastella barbastellus	Western Barbastelle	495500	107500	2015	Bat Survey
Barbastella barbastellus	Western Barbastelle	495500	107500	2015	Radio-Tracked
Barbastella barbastellus	Western Barbastelle	495500	108500	2015	Bat Survey
Barbastella barbastellus	Western Barbastelle	495500	108500	2015	Radio-Tracked
Barbastella barbastellus	Western Barbastelle	496500	104500	2015	Radio-Tracked
Barbastella barbastellus	Western Barbastelle	496500	105500	2015	Radio-Tracked
Barbastella barbastellus	Western Barbastelle	496500	106500	2015	Radio-Tracked
Barbastella barbastellus	Western Barbastelle	496500	107500	2015	Bat Survey
Barbastella barbastellus	Western Barbastelle	496500	107500	2015	Radio-Tracked
Barbastella barbastellus	Western Barbastelle	496500	108500	2015	Bat Survey
Barbastella barbastellus	Western Barbastelle	496500	108500	2015	Radio-Tracked

Barbastella barbastellus	Western Barbastelle	497500	107500	2015	Radio-Tracked
Barbastella barbastellus	Western Barbastelle	494500	107500	2014	Radio-Tracked
Barbastella barbastellus	Western Barbastelle	494500	108500	2014	Radio-Tracked
Barbastella barbastellus	Western Barbastelle	495500	107500	2014	Radio-Tracked
Barbastella barbastellus	Western Barbastelle	495500	107500	2014	Unknown
Barbastella barbastellus	Western Barbastelle	495500	108500	2014	Radio-Tracked
Barbastella barbastellus	Western Barbastelle	495500	108500	2014	Unknown
Barbastella barbastellus	Western Barbastelle	496500	107500	2014	Radio-Tracked
Barbastella barbastellus	Western Barbastelle	496500	107500	2014	Unknown
Barbastella barbastellus	Western Barbastelle	496500	108500	2014	Radio-Tracked
Barbastella barbastellus	Western Barbastelle	495500	107500	2013	Unknown
Barbastella barbastellus	Western Barbastelle	495500	108500	2013	Unknown
Barbastella barbastellus	Western Barbastelle	496500	107500	2013	Unknown
Barbastella barbastellus	Western Barbastelle	495329	108398	2013	Bat Trap
Barbastella barbastellus	Western Barbastelle	498790	106550	2016	Radio-Tracked
Chiroptera	Bat sp.	496250	108350	2015	Droppings
Chiroptera	Bat sp.	498705	105725	2014	Roost Exit Count
Chiroptera	Bat sp.	496950	108050	2013	Building Inspection
Chiroptera	Bat sp.	496150	108450	2013	Building Inspection

Chiroptera	Bat sp.	495550	108250	2013	Building Inspection
Chiroptera	Bat sp.	495950	108550	2013	Building Inspection
Chiroptera	Bat sp.	496350	108450	2013	Building Inspection
Chiroptera	Bat sp.	495975	108515	2013	Building Inspection
Chiroptera	Bat sp.	496150	108450	2012	Building Inspection
Chiroptera	Bat sp.	496250	108450	2012	Building Inspection
Chiroptera	Bat sp.	496550	108350	2011	Building Inspection
Chiroptera	Bat sp.	495950	108950	2011	Building Inspection
Chiroptera	Bat sp.	496450	108350	2011	Building Inspection
Chiroptera	Bat sp.	496350	107950	2011	Building Inspection
Chiroptera	Bat sp.	502050	107850	2010	Unknown
Chiroptera	Bat sp.	496850	107750	2010	Building Inspection
Chiroptera	Bat sp.	496150	108350	2010	Building Inspection
Chiroptera	Bat sp.	496350	108150	2010	Building Inspection
Chiroptera	Bat sp.	496350	108150	2010	Building Inspection
Chiroptera	Bat sp.	496450	108250	2010	Building Inspection
Chiroptera	Bat sp.	496350	108150	2010	Building Inspection
Chiroptera	Bat sp.	496550	108350	2010	Building Inspection
Chiroptera	Bat sp.	495850	108550	2010	Building Inspection

Chiroptera	Bat sp.	495850	108550	2010	Building Inspection
Chiroptera	Bat sp.	496150	108350	2010	Building Inspection
Chiroptera	Bat sp.	500350	104050	2008	Waterway transect
Chiroptera	Bat sp.	500350	104050	2008	Waterway transect
Chiroptera	Bat sp.	495950	104750	2007	Sunrise Survey
Eptesicus serotinus	Serotine	496166	108284	2016	Aural bat detector
Eptesicus serotinus	Serotine	499050	106450	2015	Aural bat detector
Eptesicus serotinus	Serotine	501665	107265	2014	Droppings
Eptesicus serotinus	Serotine	502950	105150	2014	Aural bat detector
Eptesicus serotinus	Serotine	501585	107285	2014	Droppings
Eptesicus serotinus	Serotine	502950	105150	2014	Aural bat detector
Eptesicus serotinus	Serotine	495329	108398	2013	Bat Trap
Eptesicus serotinus	Serotine	502150	107950	2010	Field Observation
Eptesicus serotinus	Serotine	496450	108250	2010	Building Inspection
Eptesicus serotinus	Serotine	502050	108050	2009	Field Observation
Eptesicus serotinus	Serotine	496003	104230	2016	Radio-Tracked
Eptesicus serotinus	Serotine	496012	104226	2016	Radio-Tracked
Eptesicus serotinus	Serotine	496041	104244	2016	Radio-Tracked
Eptesicus serotinus	Serotine	496013	104190	2016	Radio-Tracked

Myotis	Myotis Bat	500250	103750	2015	Aural bat detector
Myotis alcathoe	Alcathoe Bat	498920	106490	2016	Radio-tracking
Myotis alcathoe	Alcathoe Bat	499280	106920	2016	Radio-tracking
Myotis alcathoe	Alcathoe Bat	502950	105150	2014	Aural bat detector
Myotis alcathoe	Alcathoe Bat	495329	108398	2013	Bat Trap
Myotis bechsteinii	Bechstein's Bat	501922	107189	2012	Visual
Myotis bechsteinii	Bechstein’s Bat	500356	107029	2017	Radio-Tracked
Myotis bechsteinii	Bechstein’s Bat	500422	106960	2017	Radio-Tracked
Myotis bechsteinii	Bechstein’s Bat	499771	106159	2016	Radio-Tracked
Myotis brandtii	Brandt's Bat	495500	108500	2013	Bat Trap
Myotis brandtii	Brandt's Bat	495245	108005	2013	Bat Trap
Myotis daubentonii	Daubenton's Bat	499150	106350	2015	Aural bat detector
Myotis daubentonii	Daubenton's Bat	499250	106150	2015	Aural bat detector
Myotis daubentonii	Daubenton's Bat	502950	105150	2014	Aural bat detector
Myotis daubentonii	Daubenton's Bat	502250	107950	2013	Visual
Myotis daubentonii	Daubenton's Bat	502050	108050	2010	Unknown
Myotis daubentonii	Daubenton's Bat	502350	108250	2010	Unknown
Myotis daubentonii	Daubenton's Bat	502050	108050	2010	Unknown
Myotis daubentonii	Daubenton's Bat	502050	108050	2009	Field Observation

Myotis mystacinus	Whiskered Bat	495500	108500	2013	Bat Trap
Myotis mystacinus	Whiskered Bat	495245	108005	2013	Bat Trap
Myotis mystacinus/brandtii	Whiskered/Brandt's	498950	106150	2015	Aural bat detector
Myotis mystacinus/brandtii	Whiskered/Brandt's	499150	106350	2015	Aural bat detector
Myotis mystacinus/brandtii	Whiskered/Brandt's	500250	107050	2015	Aural bat detector
Myotis mystacinus/brandtii	Whiskered/Brandt's	502950	105150	2014	Aural bat detector
Myotis mystacinus/brandtii	Whiskered/Brandt's	495850	108550	2013	Building Inspection
Myotis nattereri	Natterer's Bat	499250	106150	2015	Aural bat detector
Myotis nattereri	Natterer's Bat	502950	105150	2014	Aural bat detector
Myotis nattereri	Natterer's Bat	495500	108500	2013	Bat Trap
Myotis nattereri	Natterer's Bat	495850	108450	2010	Hibernacula Survey
Myotis nattereri	Natterer's Bat	495850	108450	2010	Hibernacula Survey
Nyctalus noctula	Noctule Bat	503450	106050	2016	Aural bat detector
Nyctalus noctula	Noctule Bat	503855	106447	2015	Bat Survey
Nyctalus noctula	Noctule Bat	502950	105150	2014	Aural bat detector
Nyctalus noctula	Noctule Bat	502050	108050	2010	Unknown
Pipistrellus	Pipstrelle sp.	495250	107050	2015	Roost Exit Count
Pipistrellus	Pipstrelle sp.	501665	107265	2014	Droppings
Pipistrellus	Pipstrelle sp.	501585	107285	2014	Droppings

Pipistrellus	Pipstrelle sp.	502450	104850	2013	Droppings
Pipistrellus	Pipstrelle sp.	496350	108150	2013	Building Inspection
Pipistrellus	Pipstrelle sp.	502050	107850	2010	Unknown
Pipistrellus	Pipstrelle sp.	496350	108150	2010	Building Inspection
Pipistrellus	Pipstrelle sp.	502150	107950	2009	Field Observation
Pipistrellus	Pipstrelle sp.	501950	107850	2009	Field Observation
Pipistrellus nathusii	Nathusius's Pipistrelle	500250	103750	2015	Aural bat detector
Pipistrellus nathusii	Nathusius's Pipistrelle	500250	103750	2015	Aural bat detector
Pipistrellus nathusii	Nathusius's Pipistrelle	502950	105150	2014	Aural bat detector
Pipistrellus pipistrellus	Common Pipistrelle	496166	108284	2016	Aural bat detector
Pipistrellus pipistrellus	Common Pipistrelle	498950	106150	2015	Aural bat detector
Pipistrellus pipistrellus	Common Pipistrelle	500250	107050	2015	Aural bat detector
Pipistrellus pipistrellus	Common Pipistrelle	499250	106150	2015	Aural bat detector
Pipistrellus pipistrellus	Common Pipistrelle	500250	103750	2015	Aural bat detector
Pipistrellus pipistrellus	Common Pipistrelle	495250	107050	2015	Re-entry survey
Pipistrellus pipistrellus	Common Pipistrelle	495250	107050	2015	Re-entry survey
Pipistrellus pipistrellus	Common Pipistrelle	495250	107050	2015	Roost Exit Count
Pipistrellus pipistrellus	Common Pipistrelle	495250	107050	2015	Roost Exit Count
Pipistrellus pipistrellus	Common Pipistrelle	503855	106445	2015	Roost Exit Count

Pipistrellus pipistrellus	Common Pipistrelle	503855	106447	2015	Bat Survey
Pipistrellus pipistrellus	Common Pipistrelle	497450	107050	2014	Visual
Pipistrellus pipistrellus	Common Pipistrelle	502950	105150	2014	Aural bat detector
Pipistrellus pipistrellus	Common Pipistrelle	502950	105150	2014	Aural bat detector
Pipistrellus pipistrellus	Common Pipistrelle	502950	105150	2014	Aural bat detector
Pipistrellus pipistrellus	Common Pipistrelle	501850	106050	2014	Field Observation
Pipistrellus pipistrellus	Common Pipistrelle	495500	108500	2013	Bat Trap
Pipistrellus pipistrellus	Common Pipistrelle	495500	108500	2013	Bat Trap
Pipistrellus pipistrellus	Common Pipistrelle	495500	108500	2013	Bat Trap
Pipistrellus pipistrellus	Common Pipistrelle	495500	108500	2013	Bat Trap
Pipistrellus pipistrellus	Common Pipistrelle	502050	108150	2013	heard
Pipistrellus pipistrellus	Common Pipistrelle	501450	107350	2012	Building Inspection
Pipistrellus pipistrellus	Common Pipistrelle	501950	107950	2011	Field Observation
Pipistrellus pipistrellus	Common Pipistrelle	501950	107950	2011	Field Observation
Pipistrellus pipistrellus	Common Pipistrelle	502050	108050	2010	Unknown
Pipistrellus pipistrellus	Common Pipistrelle	501950	107950	2010	Unknown
Pipistrellus pipistrellus	Common Pipistrelle	502150	108150	2010	Unknown
Pipistrellus pipistrellus	Common Pipistrelle	496050	107750	2010	Aural bat detector
Pipistrellus pipistrellus	Common Pipistrelle	502050	108050	2010	Unknown

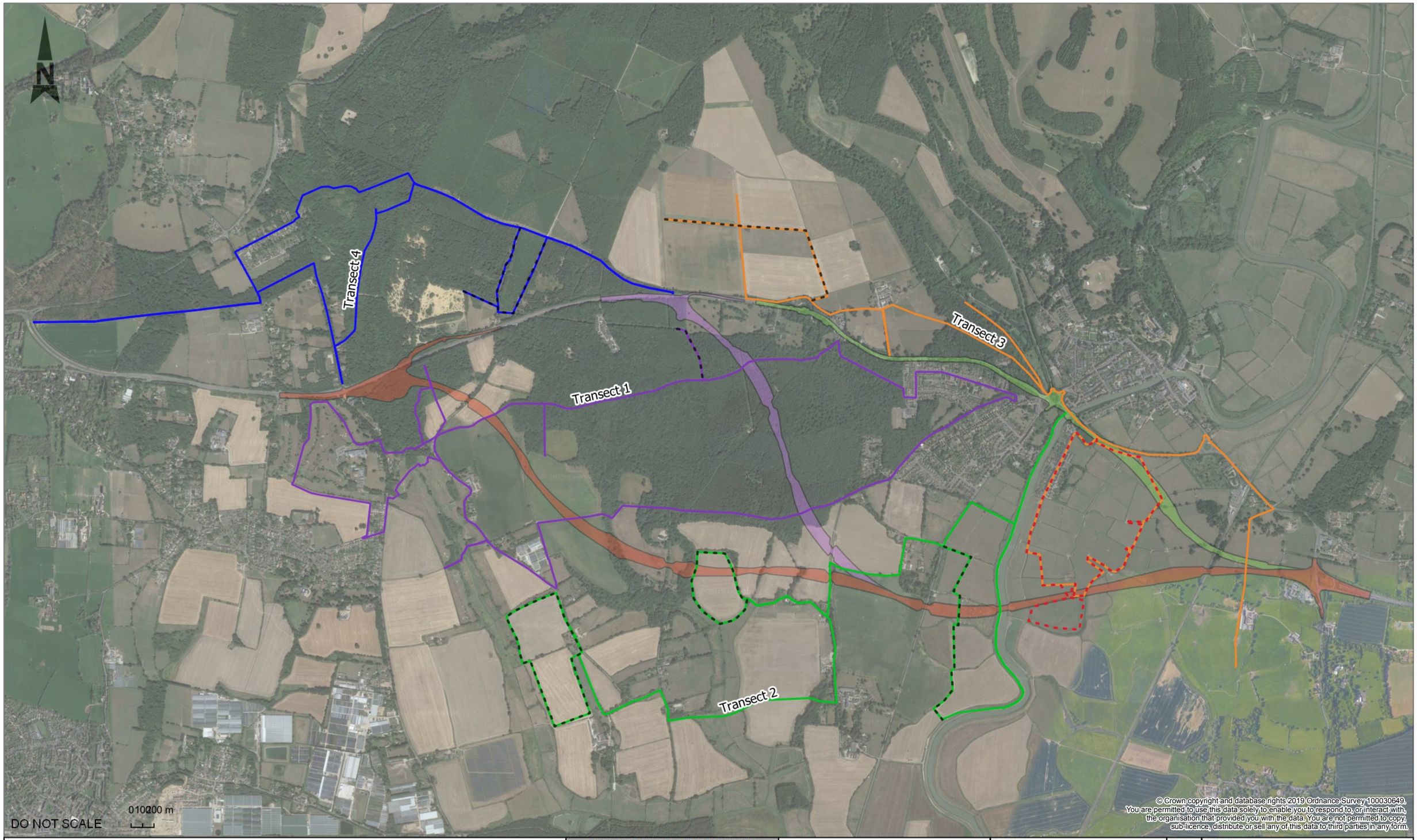
Pipistrellus pygmaeus	Soprano Pipstrelle (55 kHz)	496166	108284	2016	Aural bat detector
Pipistrellus pygmaeus	Soprano Pipstrelle (55 kHz)	503450	106050	2016	Aural bat detector
Pipistrellus pygmaeus	Soprano Pipstrelle (55 kHz)	498950	106150	2015	Aural bat detector
Pipistrellus pygmaeus	Soprano Pipstrelle (55 kHz)	500250	107050	2015	Aural bat detector
Pipistrellus pygmaeus	Soprano Pipstrelle (55 kHz)	499250	106150	2015	Unkown
Pipistrellus pygmaeus	Soprano Pipstrelle (55 kHz)	500250	103750	2015	Aural bat detector
Pipistrellus pygmaeus	Soprano Pipstrelle (55 kHz)	497150	105750	2015	Unspecified
Pipistrellus pygmaeus	Soprano Pipstrelle (55 kHz)	502950	105150	2014	Aural bat detector
Pipistrellus pygmaeus	Soprano Pipstrelle (55 kHz)	502950	105150	2014	Aural bat detector
Pipistrellus pygmaeus	Soprano Pipstrelle (55 kHz)	502950	105150	2014	Aural bat detector
Pipistrellus pygmaeus	Soprano Pipstrelle (55 kHz)	497150	105750	2014	Unspecified
Pipistrellus pygmaeus	Soprano Pipstrelle (55 kHz)	495500	108500	2013	Bat Trap
Pipistrellus pygmaeus	Soprano Pipstrelle (55 kHz)	502250	108050	2013	Visual

Pipistrellus pygmaeus	Soprano Pipstrelle (55 kHz)	495345	108205	2013	Bat Trap
Pipistrellus pygmaeus	Soprano Pipstrelle (55 kHz)	495385	108285	2013	Bat Trap
Pipistrellus pygmaeus	Soprano Pipstrelle (55 kHz)	497150	105750	2013	Unspecified
Pipistrellus pygmaeus	Soprano Pipstrelle (55 kHz)	502150	107950	2010	Unknown
Pipistrellus pygmaeus	Soprano Pipstrelle (55 kHz)	502150	107950	2010	Unknown
Pipistrellus pygmaeus	Soprano Pipstrelle (55 kHz)	502150	107950	2010	Unknown
Pipistrellus pygmaeus	Soprano Pipstrelle (55 kHz)	502150	107950	2010	Unknown
Pipistrellus pygmaeus	Soprano Pipstrelle (55 kHz)	502050	108050	2010	Unknown
Pipistrellus pygmaeus	Soprano Pipstrelle (55 kHz)	502150	107950	2010	Unknown
Pipistrellus pygmaeus	Soprano Pipstrelle (55 kHz)	502150	107950	2010	Unknown
Pipistrellus pygmaeus	Soprano Pipstrelle (55 kHz)	502050	108050	2009	Field Observation
Pipistrellus pygmaeus	Soprano Pipstrelle (55 kHz)	502150	107950	2009	Field Observation
Pipistrellus pygmaeus	Soprano Pipstrelle (55 kHz)	502050	108050	2009	Field Observation

Pipistrellus pygmaeus	Soprano Pipstrelle (55 kHz)	502150	107950	2009	Field Observation
Pipistrellus pygmaeus	Soprano Pipstrelle (55 kHz)	502150	107950	2009	Field Observation
Pipistrellus pygmaeus	Soprano Pipstrelle (55 kHz)	502250	108050	2008	Field Observation
Plecotus	Long-eared sp.	496250	108250	2015	Droppings
Plecotus	Long-eared sp.	500250	103750	2015	Building Inspection
Plecotus	Long-eared sp.	501585	107285	2014	Droppings
Plecotus	Long-eared sp.	499050	107050	2014	Field Observation
Plecotus	Long-eared sp.	494335	107635	2013	Droppings
Plecotus	Long-eared sp.	503350	107350	2008	Building Inspection
Plecotus	Long-eared sp.	496350	108350	2007	Building Inspection
Plecotus auritus	Brown Long-eared Bat	495500	107500	2014	Unknown
Plecotus auritus	Brown Long-eared Bat	496500	107500	2014	Unknown
Plecotus auritus	Brown Long-eared Bat	501665	107265	2014	Droppings
Plecotus auritus	Brown Long-eared Bat	496950	107650	2014	Bat Survey
Plecotus auritus	Brown Long-eared Bat	495500	107500	2013	Unknown
Plecotus auritus	Brown Long-eared Bat	496500	107500	2013	Unknown
Plecotus auritus	Brown Long-eared Bat	495500	108500	2013	Bat Trap
Plecotus auritus	Brown Long-eared Bat	501595	107265	2013	Droppings

Plecotus auritus	Brown Long-eared Bat	495245	108005	2013	Bat Trap
Plecotus auritus	Brown Long-eared Bat	495385	108285	2013	Bat Trap
Plecotus auritus	Brown Long-eared Bat	495385	108285	2013	Bat Trap
Plecotus auritus	Brown Long-eared Bat	496005	108475	2013	Building Inspection
Plecotus auritus	Brown Long-eared Bat	501450	107350	2012	Building Inspection
Plecotus auritus	Brown Long-eared Bat	497550	106050	2012	Building Inspection
Plecotus auritis	Brown Long-eared Bat	496450	108250	2010	Building Inspection

ATTACHMENT C: TECHNICAL APPENDIX 8-10 BREEDING BIRD BASELINE SURVEY – CORRECTED MAP IN APPENDIX F BREEDING BIRD TRANSECT MAPS



KEY:

TRANSECT ROUTES
- 1
- 2
- 3
- 4

2018 COVERAGE - TRANSECT 3

AREAS OF PARTIAL OR LIMITED ACCESS

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATON

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made to the design hazard log).

Construction

Maintenance / Cleaning

Use

Decomissioning / Demolition

Rev.	Date	Description	By	Chk'd	App'd

Drawing Status: FINAL

Suitability: S0

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Client: Working on behalf of highways england

Project Title: REGIONAL INVESTMENT PROGRAMME
A27 ARUNDEL BYPASS

Drawing Title: BREEDING BIRDS
APPENDIX F:
TRANSECT DESIGN & COVERAGE

Scale	Drawn	Checked	Aproved	Authorised
1:30,861	AP	ZC	AR	PA
Original Size: A3	Date: 15/08/19	Date: 15/08/19	Date: 15/08/19	Date: 15/08/19

Drawing Number: Project 70052558 | Originator WSP | Volume -GEN | Location A27AR | Type -FI | Role -GIS | Number 0500

Project Ref. No.: 70052558

Revision: P01

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ATTACHMENT D: CORRECTED VERSION OF TECHNICAL APPENDIX 8-13 AMPHIBIAN BASELINE SURVEY

A27 Arundel Bypass Amphibian 2019 Update Survey Report

Appendix 8-13: Amphibian 2019 Update Survey Report

19 August 2019

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Executive Summary

Highways England is proposing the replacement of an existing single carriageway on the A27 road with a dual carriageway bypass. Three Scheme options are being considered: Option 1, Option 3 and Option 5A.

WSP was commissioned by Highways England to establish baseline conditions for amphibian species, including great crested newt, to inform an ecological assessment of the A27 Arundel Bypass scheme, Arundel, West Sussex. This report sets out the results of the interim baseline surveys and makes recommendations as to how proposals should account for amphibian species with respect to legislation, planning and biodiversity policy.

A desk study was undertaken in 2017 and updated in 2018, to identify suitable aquatic and terrestrial habitat for great crested newts and to establish whether this species is present or likely to be absent. The study area chosen comprised all Scheme option footprints and a two kilometres zone from the outer boundary of each one.

Data reviewed as part of a desk study included amphibian records, waterbody locations and previous ecological survey reports. These resources were used to identify and refine the scope of field surveys carried out in 2017 and 2018. A Rapid Risk Assessment was undertaken during the desk study stages to calculate which waterbodies were likely to provide habitat for great crested newt and other amphibians within the field study area associated with the A27 scheme.

Field Surveys undertaken in 2017 and 2018 included the use of Habitat Suitability Index assessments, conventional presence / likely absence surveys (bottle trapping, torching, egg searches and refuge searches) and environmental DNA (eDNA) methods. Surveys carried out by WSP in 2017 and 2018 field seasons have confirmed the likely absence of great crested newts from waterbodies surveyed. However, there are 1~~0~~60 ponds and 31 ditches (4~~1~~17 waterbodies in total - ponds and ditches) identified in the Field Survey Area that ~~still~~ may require survey. All waterbodies surveyed were located within 0.25 kilometres of the original four Scheme option footprints (1, 3 and 5A).

1 Introduction

1.1 Project Background

1.1.1.1 The scope of the A27 Arundel Bypass scheme as described in the Road Investment Strategy[1] is:

"The replacement of the existing single carriageway road with a dual carriageway bypass, linking together the two existing dual carriageway sections of the road".

1.1.1.2 This corresponds to the six kilometres section of the A27 from the A284 Crossbush junction (east of Arundel) to the west of Yapton Lane (west of Arundel). The A27 currently goes through the South Downs National Park and the town of Arundel passing over the River Arun and crossing the railway line.

1.1.1.3 The Scheme options taken forward to the Public Consultation were Options 1, Option 3 and Option 5A. These are briefly described individually below.

- **Option 1** consists of new dual carriageway from Crossbush junction south of the current A27 to the south-west of Arundel railway station, which connects with an upgraded A27 Ford Road junction, with a new bridge over the River Arun alongside the existing bridge. From Ford Road roundabout, which will be signalised, the existing A27 would be widened to dual carriageway.
- **Option 3** is an off-line route from the existing A27 alignment. Option 3 would consist of a new dual carriageway corridor along its entire length. The proposed alignment will then be joined to the existing A27 via an extension of the existing infrastructure at Crossbush Junction. The alignment then runs westwards across the floodplain south of Tortington Priory and requires two new overbridges, firstly over the Arun Valley Railway Line and secondly over the River Arun. Its alignment diverges north through the Binsted Woods Complex Local Wildlife Site (LWS), Tortington Common and South Downs National Park, re-joining the existing A27 at Havenwood Park. It requires four new underbridges at Old Scotland Lane, Binsted Lane, Tortington Lane and at Ford Road.

[1] Road Investment Strategy: for the 2015/2016 – 2019/2020 Road Period, Department for Transport, March 2015.

- **Option 5A** is a new dual carriageway from Crossbush junction south of the current A27. The alignment crosses the Arun Valley Railway, continuing west across the floodplain, over Ford Road, running south of Tortington Priory Scheduled Monument before going north through the Binsted Woods Complex LWS and the South Downs National Park, re-joining the existing A27 at a new junction near Yapton Lane.

1.1.1.4 When referred to the combined footprint of the Scheme (all options), the term 'Scheme options' is used in this report. When discussing the footprint of any single option, it is referred to be its number i.e. Option 1, Option 3 or Option 5A.

1.1.1.5 In October 2018, Highways England announced that a further, non-statutory public consultation would be undertaken on the Scheme (the Further Consultation) and that the Scheme would return to PCF Stage 2 (Option Selection). Through the additional studies and surveys, Highways England came across new and important information. Highways England wishes to ensure that forthcoming decision on the preferred route is made taking this new information into account and that consultees are given a fair opportunity to comment on the options on the basis of the information available. The further PCF Stage 2 work (Option Selection) (2018/2019) work included the identification of a suite of potential new Scheme options. The process for identifying and short-listing the new set of Scheme options for consideration in PCF Stage 2, is set out in Chapter 3 of the Environmental Assessment Report.

1.1.1.6 Ecological field survey data is not available for the western sections of Options 4/5AV1 and 5BV1. This is because these sections were previously too far west of the study area to necessitate a survey. Additional survey work targeting these areas is ongoing in 2019 and will be reported on in winter 2019. The information collected for Options 1, Option 3 and Option 5A in 2017 and 2018 will be used to inform an assessment of the six Scheme options and Scheme option selection.

1.2 Ecological Background

1.2.1.1 The proposed A27 Arundel Bypass scheme is located to the south of Arundel, West Sussex and encompasses a large area comprising natural, semi-natural and man-made habitats. The central area of the Scheme options footprint is dominated by broad-leaved woodland, set within mixed-use farmland composed of arable/pastoral fields bordered with hedgerows. Floodplains are in the east of the Scheme options footprint, bordering the town of Arundel. The River Arun bisects the Scheme options footprint from north to south, with wet ditches and ponds scattered throughout the landscape. The habitats present within 0.25 kilometres of the Scheme options footprint are considered suitable to support native amphibian populations.

These include aquatic and terrestrial habitats such as ponds, ditches, woodland, grassland and arable field margins with hedgerows.

1.2.1.2 A Preliminary Ecological Appraisal[2], comprising a desk study and extended Phase 1 Habitat Survey, was undertaken by WSP in January 2016 (and revised in March 2017) to inform the Project Control Framework Stage 1 report for the proposed improvements to the A27. The study identified records of common toad (*Bufo bufo*), common frog (*Rana temporaria*), smooth newt (*Lissotriton vulgaris*), palmate newt (*Lissotriton helveticus*) and great crested newt (GCN) (*Triturus cristatus*) within 0.25 kilometres of the Scheme options footprint.

1.2.1.3 An ecological survey of the Mid-Arun Valley was commissioned by Mid Arun Valley Environmental Survey (MAVES) in October 2016[3] and a supplementary document containing additional ecological information was produced in March 2017. MAVES also commissioned an ecological impact report in October 2017[4]. All MAVES surveys and reports were reviewed by WSP and have informed the ongoing ecological survey and assessment of the A27 Arundel highway scheme.

1.2.1.4 Highways England is undertaking an Environmental Impact Assessment of the Scheme options, which will seek to avoid and minimise impacts on sensitive habitats and species, and to identify possible mitigation requirements. Survey data for amphibians will be used to inform Scheme option selection and ultimately an Environmental Impact Assessment of the single Scheme option.

1.3 Aims and Objectives

1.3.1.1 The overall aim of the study is to gather baseline information on amphibians within and around the Scheme options footprint.

1.3.1.2 This will be achieved through the following objectives:

- A detailed desk study of amphibian records within two kilometres of the proposed Scheme options footprint and suitable habitat within 0.25 kilometres of the proposed Scheme options footprint; and
- Field surveys to establish the presence of GCN, including; a Habitat Suitability Index (HSI) assessment of all waterbodies present, eDNA surveys and conventional GCN surveys to determine presence / likely absence of GCN.

[2] A27 Arundel Bypass Preliminary Ecological Appraisal (2017) WSP.

[3] Thompson, J. (October, 2016). An ecological survey of the Mid Arun Valley. Wildlife Splash on behalf of the Mid-Arun Environmental Survey.

[4] Thompson, J. (October, 2017). *The mid Arun Valley 2015 – 2017 A27 Arundel bypass Road Options 1, 3 and 5A Ecological Impact Report (using current data)*. Wildlife Splash on behalf of the Mid Arun Environmental Survey.

1.3.1.3 The results of this survey, and subsequent recommendations, are included within this report (see **Figure 1** for proposed A27 Scheme options 1, 3 and 5A and 0.25 kilometres Field Survey Area).

2 Methods

2.1 Study Area

2.1.1 Study Area, Survey Area and Zone of Influence

2.1.1.1 The following study areas were used for desk study and field survey work:

- **Desk Study Area** – a zone of two kilometres from the outer boundary of the Scheme options footprint was selected to gather information on the presence of amphibians. This area encompassed the entire Scheme options footprint and the wider landscape to gather information about amphibian populations within the vicinity of the scheme. The review of desk study information was extended out to two kilometres from the Scheme options to allow for scheme design development in the future.
- **Field Survey Area** – the Scheme options footprint and adjacent land to 0.25 kilometres from the scheme boundary was subject to GCN survey work. This followed a desk study to determine the extent of amphibian habitat surrounding the Scheme options footprint, including terrestrial habitat from any potential breeding ponds or waterbodies. Although 0.5 kilometres distance for GCN home-range is referred to in The Great Crested Newt Mitigation Guidelines[5], a reduced 0.25 kilometres zone of influence has been used in keeping with a proportionate and risk-based approach using reasonable boundaries when considering pond suitability, habitat suitability, anticipated negative effects and dispersal barriers associated with linear schemes. The area was assumed likely to be directly affected by construction, and affected by indirect impacts from construction and operation, such as hydrological disturbance, habitat severance and air quality impacts [5].

2.1.1.2 The extent of both the Desk Study Area and the Field Survey Area are shown in **Figure 2.**

[5] Highways Agency (2007) Design Manual for Roads and Bridges, Volume 11, Section 3, Part 1: Air Quality.

2.2 Desk Study

2.2.1 Overview

2.2.1.1 A desk study was initially undertaken in May 2017 to review existing baseline information, available in the public domain and relevant third parties, on amphibian populations in the landscape surrounding the scheme. In March 2019, an update to the desk study was undertaken to account for any new amphibian records. Data was requested from the following sources:

- Sussex Biodiversity Records Centre was contacted to provide a data search report with biological records including; habitats and species present within the Desk Study Area. These records were reviewed for information on amphibian species occurring within and in close proximity to the Scheme options footprint. The records are discussed in the updated Preliminary Ecological Appraisal[2] and are valid for two years after their release.
- The MAVES reports and documents have been reviewed and their findings are considered in this report.
- The Sussex Amphibian and Reptile Group (Sussex ARG) was also contacted for information on species records, but did not provide a response.
- Publicly available maps and aerial photography were consulted for information regarding the presence of habitats with suitability to support amphibian populations, as well as online database resources including Multi Agency Geographic Information for the Countryside and the Joint Nature Conservation Committee.
- WSP UK Ltd ecological reports for Aquatic Surveys[6] in 2017, for information on waterbodies within the current Scheme options footprint and to 0.25 kilometres.
- An Ecological Impact Assessment undertaken by the Department of Transport in 1991[7],[8].

2.2.1.2 The desk study was carried out by an ecologist with over five years ‘experience in ecological consultancy, a graduate member of the Chartered Institute for Ecology and Environmental Management and holds a Natural England GCN Level 2 Survey Licence.

[6] A27 Aquatic Surveys Interim Letter Report (2017).

[7] Department of Transport (1991). Ecological Impact Assessment: A27 Arundel By-pass, West Sussex.

[8] Although this falls outside the 10-year cut off for consideration of data, this EIA describes the landscape of Arundel in 1991 and details the species assemblages that were present at the time. The purpose for review of this was to provide historical data on habitats and species within the wider environment and forms a background to the assessment, and was not used for inclusion with the desk study assessment

2.2.2 Waterbody Identification

2.2.2.1 Habitat considered suitable to support amphibians across the Zone of Influence was identified by using Ordnance Survey[9] mapping and aerial photography facilitated through Geographic Information Systems. All types of waterbodies e.g. ponds, ditches, streams etc. were identified and considered in the assessment. In addition, results from previous ecological surveys were reviewed for information on the presence of aquatic habitats throughout the Field Survey Area. Suitable aquatic habitat was identified within the Field Survey Area, and marked out with a series of zones, measuring 100, 250 and 500 square metres from its centre point. **Appendix A** contains photographs of ~~all~~ selected waterbodies ~~visited~~.

2.2.2.2 The Risk Assessment Tool provided in the Natural England Method Statement for great crested newt mitigation licence[10] was applied and a rapid risk assessment was undertaken (on ponds only) to calculate which ponds are likely to trigger an offence in relation to GCN and their interaction with the Scheme options footprint. The risk assessment result categories are as follows:

- **Green:** offence highly unlikely – indicating that the development activities are of such a type, scale and location that it is highly unlikely any offence would be committed (with regard to GCN) should the development proceed;
- **Amber:** offence likely – indicating that the development activities are of such a type, scale and location that an offence is likely. In this case, alternative design measures will be explored so as to avoid or minimise the effects on GCN; and
- **Red:** offence highly likely – indicating that the development activities are of such a type, scale and location that an offence is highly likely. If avoidance measures cannot be implemented, all works in these instances are licensable.

[9] © Crown copyright and database rights (2018) Ordnance Survey.

[10] Natural England (2015) Template for Method Statement to support application for licence under Regulation 53(2)e of The Conservation of Habitats and Species Regulations 2010 (as amended) in respect of great crested newts *Triturus cristatus*. Form WML-A14-2.

2.2.2.3 Only land parcels containing suitable waterbody habitat (i.e. ponds and ditches) were included for detailed assessment, and this was further informed by the presence of desk study records of amphibian species. Subsequently, waterbodies identified within the Field Survey Area and where an offence was likely following the rapid risk assessment, were included for assessment of their suitability to support GCN, using the standard HSI assessment method[11],[12]).

2.3 Field Survey

2.3.1 Habitat Suitability Index Assessments for GCN

2.3.1.1 HSI surveys for GCN were undertaken, and ponds were assessed and scored on ten key variables which are known to influence breeding populations of GCN, in accordance with standard methods (ARG UK, 2010). These variables are:

- geographic location;
- waterbody area;
- waterbody permanence;
- water quality;
- waterbody shading;
- impact of waterfowl;
- fish stocks;
- number of waterbodies within one kilometre;
- terrestrial habitat around the waterbody; and
- macrophyte cover of the waterbody.

2.3.1.2 Scores for each of the above variables were used to calculate an overall HSI value for each waterbody. The scores were then cross referenced with the guidelines[12] to assign the pond to one of five categories: poor; below average; average; good; or excellent. Index calculation is not a failsafe method of identifying whether a waterbody supports GCN, therefore professional judgement and availability of records of GCN in the locality has also been used to inform the requirement for further survey.

2.3.1.3 GCN are known to inhabit ditches, as stated in the scientific literature and guidance available, and will utilise ditches as habitat features, in other words, "*ditches may also provide extra breeding sites and dispersal routes*"[13]. As such, Ditch Suitability Assessments (DSI) were undertaken across the ditch network on the Arun Floodplains in the east of the Field Study Area to assess the likelihood of these waterbodies to support GCN.

[11] Amphibian and Reptile Groups of the United Kingdom, (2010) ARG UK Advice Note 5: Great Crested Newt Habitat Suitability Index. ARG UK, UK.

[12] Oldham R. S., Keeble J., Swan M. J. S., and Jeffcote M., (2000) Evaluating the suitability of habitat for the great crested newt. Herpetological Journal 10: 143-155.

[13] Langton, T.E.S., Beckett, C.L., and Foster, J.P. (2001), Great Crested Newt Conservation Handbook, Froglife, Halesworth.

2.3.1.4 The HSI methodology was adopted and a bespoke habitat suitability assessment or DSI was applied for use on ditches across the Field Survey Area.

2.3.1.5 The DSI used the following variables to score ditch suitability for GCN:

- Water flow;
- Water permanence;
- Water quality;
- Fish presence; and
- Macrophyte cover.

2.3.1.6 Each of these factors above were given a score between 1 to 3 (3 being a high score), and ditch suitability was a result of these scores added together. Scores of between 5 – 8 are considered (Low), 9 – 11 (Moderate) and 12 – 15 (High).

2.3.1.7 As such, DSI assessments were included in the spring 2018 survey programme.

2.3.1.8 Due to there being a large number of other aquatic habitats, it was decided that only a portion of these waterbodies would be drawn from the dataset to undergo eDNA survey. This was decided by selecting all ditches scoring high for GCN suitability~~;~~, selecting half of the ditches with moderate suitability (~~,~~sampled moderate ditches were spread evenly across the field survey area); and scoping out any ditches with low or poor suitability scores as they are already unlikely to support GCN.

2.3.2 Conventional Presence / Likely Absence Survey

2.3.2.1 Waterbodies found to provide suitable habitat for GCN, and where access was permitted, were subject to further survey to determine the presence or likely absence of GCN. Four waterbodies (see **section 2.4** for limitations and constraints), were not included within the presence / likely absence survey because at the time, access could not be obtained.

2.3.2.2 The surveys comprised four visits to each waterbody, undertaken in accordance with the Herpetofauna Workers' Manual[14]. However, not all presence/absence surveys were undertaken during the standard GCN survey season (mid-March to mid-June, with at least two of the visits falling between mid-April and mid-May). The optimal survey period was extended by Natural England in 2017 due to favourable weather conditions (namely temperature) which were within an optimal range for surveying GCN. As such, all presence / absence surveys were undertaken during this extension period. The deviation from the standard survey guidance is not considered to be a significant limitation when interpreting the survey results.

[14] Gent, A. and Gibson, S. (2003) Herpetofauna Workers Manual, Joint Nature Conservation Committee, Peterborough.

2.3.2.3 Survey visits were completed under suitable weather conditions, when overnight temperatures were above 5°C, and wind and rain were not sufficient to affect the torchlight survey results (as a result of disturbance to the water surface).

2.3.2.4 At least three survey techniques were used during each survey visit to search for the presence of GCN in line with good practice guidance[15]; these included:

- **Torchlight searching** – each waterbody was searched systematically for amphibians after dark using a bright torch; all amphibians observed were recorded, with number of male, female and juvenile newts noted. The duration of the torchlight survey was determined by the time taken to walk slowly around the waterbody perimeter, or a maximum of 15 minutes per survey visit;
- **Bottle-trapping** – each waterbody was trapped using bottle traps constructed and set in accordance with standard guidance[14]. Traps were set at a ratio of one for every two metres of waterbody perimeter with a maximum of 50 per waterbody. The traps were set prior to dusk, and checked and removed the following morning;
- **Egg searching** – suitable vegetation in each waterbody was searched for newt eggs which are laid on submerged or floating leaves and folded around the egg. The duration of the egg search was either the amount of time required to search thoroughly all vegetation present, or a maximum of 15 minutes per survey visit[16];
- **Refuge searching** – pond edges, log piles, rubble/rock piles and other suitable areas around the waterbodies were carefully searched for amphibians (that may be present) using them as places of shelter. This method was undertaken alongside bottle-trapping during hours of daylight. Searches were undertaken for no longer than 15 minutes per waterbody.

2.3.2.5 All the methods outlined above are valid for surveying amphibians.

2.3.3 eDNA Survey

2.3.3.1 The eDNA water sample collection was undertaken in accordance with eDNA guidance[17]. The sampling kits were provided by The University of Sheffield, who also performed the real-time polymerase chain reaction (qPCR) eDNA testing in accordance with the Technical advice note.

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[15] English Nature (2001). Great Crested Newt Mitigation Guidelines. English Nature, Peterborough.

[16] Once a great crested newt egg had been recorded, no egg searching occurred on subsequent visits to avoid unnecessary uncovering of eggs which would then be at an increased risk of predation.

[17] Biggs, J., Ewald, N., Valentini, A., Gaboriaud, C., Griffiths, R. A., Foster, J., Wilkinson, J., Arnett, A., Williams, P. & Dunn, F. (2014). Analytical and methodological development for improved surveillance of the

2.3.3.2 Two water samples were taken, one from each ditch (13 and 14) on 26 June 2017 during suitable weather conditions. Samples were taken as deep as possible without disturbing the sediment. Care was taken to prevent cross contamination of the waterbodies and gloves and sterile equipment were used to collect the samples. These were then pooled in to six 15 millilitre sub-samples and stored in sterile tubes containing ethanol to preserve the eDNA. The samples were then kept refrigerated at 2-4°C until delivery to the laboratory.

2.3.3.3 The laboratory testing was conducted in two parts. Firstly, all six samples of each waterbody were pooled together for the extraction process. This pooled sample was tested with real time PCR (qPCR) which amplified the selected part of the DNA to allow it to be detected and measured, giving a positive or negative result. Each pooled sample was replicated eight times to ensure accurate results.

2.3.3.4 Where results are returned as positive for GCN, eDNA concludes that the species is present. If the results are negative, eDNA concludes that GCN are absent from the pond and indicates that no further surveys are required.

2.3.4 Biosecurity

2.3.4.1 In recent years, there has been a significant increase in prevalence of amphibian diseases, particularly amphibian chytridiomycosis, (caused by the fungus *Batrachochytrium dendrobatidis*).

2.3.4.2 As a result, standard biosecurity measures, as set out in the ARG-UK Advice note 4[18] are adhered to when on site. This includes disinfection measures using "Virkon™" at appropriate dilution levels and ensuring that any re-usable survey equipment such as bottle traps are retained for use in a single pond location throughout a survey season.

2.3.5 Dates of Surveys and Personnel

2017 Surveys

2.3.5.1 The GCN surveys in 2017 were led and completed by an experienced surveyor, with seven years' experience in ecological and amphibian survey, who holds a Natural England GCN Level 1 class survey licence (number: 2017-29798-CLS-CLS). Other supporting ecologists were checked for their competencies and deemed to have adequate survey experience for GCN survey.

Great crested Newt. Appendix 5. Technical advice note for field and laboratory sampling of great crested newt (*Triturus cristatus*) environmental DNA. Freshwater Habitats Trust, Oxford [online] Available at: http://randd.defra.gov.uk [accessed 13th June 2015].

[18] ARG-UK Advice note 4 (2008) Amphibian disease precautions: a guide for UK fieldworkers.

2.3.5.2 Dates of all surveys (HSI, presence / absence and eDNA) and surveyor initials are summarised in **Table 2-1** below. Blank entries (-) account for waterbodies that could not be surveyed in 2017. **Figure 4** shows the locations of ~~all~~ the waterbodies ~~identified~~ surveyed in 2017 across the Scheme options. ~~Blank entries ( ) account for waterbodies that could not be surveyed in 2017.~~

Table 2-1 - Survey information 2017

Water body	WSP reference	HSI visit	eDNA visit	Presence / absence survey visit			
				1	2	3	4
Pond 7	10415_AA_TE_PD7	11/05/17 (DS & SH)	No survey	11/05/17	17/05/17	06/06/17	12/06/17
Pond 10	10685_AA_TE_PD10	12/05/17 (OS & MB)	No survey	16/05/17	25/05/17	06/06/17	12/06/17
Pond 12	10735_AA_TE_PD12	12/05/17 (OS & MB)	No survey	11/05/17	18/05/17	07/06/17	12/06/17
Pond 14	11250_AA_TE_PD14	15/05/17 (DM & SC)	No survey	15/05/17	18/05/17	24/05/17	05/06/17
Pond 15	11250_AA_TE_PD15	15/05/17 (DM & SC)	No survey	15/05/17	18/05/17	24/05/17	05/06/17
Pond 16	11250_AA_TE_PD16	15/05/17 (DM & SC)	No survey	15/05/17	18/05/17	24/05/17	05/06/17
Pond 17	11250_AA_TE_PD17	15/05/17 (DM & SC)	No survey	15/05/17	18/05/17	24/05/17	05/06/17
Pond 18	11445_AA_TE_PD18	15/05/17 (DM & SC)	No survey	15/05/17	24/05/17	05/06/17	08/06/17
Pond 19	11765_AA_TE_PD19	16/05/17 (DM & SC)	-	-	-	-	-
Pond 20	11765_AA_TE_PD20	16/05/17 (DM & SC)	-	-	-	-	-
Pond 21	12260_AA_TE_PD21	13/07/15 (OS & SCH)	-	-	-	-	-
Pond 22	10860_AA_TE_PD22	15/05/17 (OS & SCH)	-	-	-	-	-
Pond 23	10860_AA_TE_PD23	15/05/17 (OS & SCH)	-	-	-	-	-
Pond 24	10860_AA_TE_PD24	15/05/17 (OS & SCH)	-	-	-	-	-
Pond 25	10490_AA_TE_PD25	12/05/17 (DS & SH)	No survey	16/05/17	25/05/17	07/06/17	13/06/17
Pond 26	10710_AA_TE_PD26	12/05/17 (DS & SH)	-	-	-	-	-
Pond 27	10955_AA_TE_PD27	12/05/17 (OS & MB)	No survey	16/05/17	25/05/17	07/06/17	13/06/17
Pond 28	10940_AA_TE_PD28	12/05/17 (OS & MB)	-	-	-	-	-
Pond 29	11765_AA_TE_PD29	13/07/15 (OS & SCH)	-	-	-	-	-
Pond 30	12260_AA_TE_PD30	13/07/15 (OS & SCH)	-	-	-	-	-

Water body	WSP reference	HSI visit	eDNA visit	Presence / absence survey visit			
				1	2	3	4
Pond 31	10765_AA_TE_PD31	11/05/17 (OS & MB)	No survey	17/05/17	25/05/17	07/06/17	13/06/17
Pond 32	11765_AA_TE_PD32	16/05/17 (OS & SCH)	-	-	-	-	-
Ditch 13	12275_AA_TE_DT13	26/06/17 (OS & MF)	26/06/17 (OS & MF)	N/A	N/A	N/A	N/A
Ditch 14	12275_AA_TE_DT14	26/06/17 (OS & MF)	26/06/17 (OS & MF)	N/A	N/A	N/A	N/A

2018 Surveys

2.3.5.3 The GCN surveys in 2018 were led and completed by an ecologist, with over five years' experience in ecological and amphibian survey, who holds a Natural England GCN level 2 class survey licence (number: 2016-20219-CLS-CLS). Other supporting ecologists were checked for their competencies and deemed to have adequate survey experience for GCN survey.

2.3.5.4 Dates of ~~all~~ pond surveys (HSI, presence / absence and eDNA) and surveyor initials are summarised in **Table 2-2** below. **Figure 5** shows the locations of ~~all~~ the ~~waterbodies~~ ponds surveyed in 2018 ~~identified~~ across the Scheme options. ~~Blank entries (-) in the table below, are where gaps exist in the survey data, the reasons for this are outlined in **Section 2.5**~~.

~~2.3.5.4~~2.3.5.5 Waterbody~~courses~~ surveys were undertaken in May 2018, those subject to DSI survey are listed in Table 3-8 and those that were subject to eDNA survey are listed in Table 3-11.

Table 2-2 - Survey information 2018

Waterbody	WSP reference	HSI visit	eDNA visit	Presence / absence survey visit			
				1	2	3	4
Pond 11	12765_AA_TE_PD11	14/03/18 (CH & KM)	01/05/18 (CH & KJ)	N/A	N/A	N/A	N/A
Pond 19	11765_AA_TE_PD19	15/03/18 (CH & KM)	-	-	-	-	-
Pond 20	11765_AA_TE_PD20	15/03/18 (CH & KM)	-	-	-	-	-
Pond 21	12260_AA_TE_PD21	15/03/18 (CH & KM)	-	-	-	-	-
Pond 22	10860_AA_TE_PD22	14/03/18 (CH & KM)	-	-	-	-	-

Waterbody	WSP reference	HSI visit	eDNA visit	Presence / absence survey visit			
				1	2	3	4
Pond 23	10860_AA_TE_PD23	14/03/18 (CH & KM)	-	-	-	-	-
Pond 24	10860_AA_TE_PD24	14/03/18 (CH & KM)	-	-	-	-	-
Pond 29	11765_AA_TE_PD29	15/03/18 (CH & KM)	02/05/18 (CH & GL)	-	-	-	-
Pond 30	12260_AA_TE_PD30	15/03/18 (CH & KM)	02/05/18 (CH & GL)	-	-	-	-
Pond 32	11765_AA_TE_PD32	15/03/18 (CH & KM)	02/05/18 (CH & GL)	-	-	-	-
Pond 44	10615_AA_TE_PD44	14/03/18 (CH & KM)	-	-	-	-	-
Pond 45	10735_AA_TE_PD45	14/03/18 (CH & KM)	01/05/18 (CH & KJ)	-	-	-	-
Pond 47	10630_AA_TE_PD47	14/03/18 (CH & KM)	01/05/18 (CH & KJ)	-	-	-	-
Pond 48	10615_AA_TE_PD48	14/03/18 (CH & KM)	-	-	-	-	-
~~Pond 49~~	~~10860_AA_TE_PD49~~	~~14/03/18 (CH & KM)~~	~~-~~	~~-~~	~~-~~	~~-~~	~~-~~
Pond 50	10905_AA_TE_PD50	14/03/18 (CH & KM)	-	-	-	-	-
Pond 51	11765_AA_TE_PD51	15/03/18 (CH & KM)	02/05/18 (CH & GL)	-	-	-	-

2.4 Assumptions and limitations

2.4.1 2017 Surveys

2.4.1.1 Following HSI assessment of Pond 21 and Pond 32 in 2017, it was confirmed that safe access was not possible, and therefore further surveys that year were not undertaken for health and safety reasons (see **Table 2-3** below for further details). In 2018 the health and safety hazards were resolved and surveys of these ponds were possible. See **Figure 4** for a map showing pond locations.

2.4.1.2 Where baseline information was not collected due to access or health and safety reasons, future survey is recommended to inform impact assessment and possible licence requirements. For the purposes of an interim assessment, waterbodies should assume presence of GCN as a precaution in the absence of survey data.

2.4.1.3 A total of 8497 other aquatic habitats were identified after initial GCN survey work was undertaken in 2017. These are listed in **Table 3-52-4** and were included for assessment within the 2018 survey works programme. ~~Most of the waterbodies identified in 2018 are a result of late discovery during survey work and are included within this report (see further survey recommendations **section 4.2**).~~ As some ponds are ephemeral in nature, ponds identified as dry in 2017 (i.e. ponds 26, 28, 29 and 30) were revisited in 2018 for reassessment.

2.4.1.4 The eDNA results are not a reliable indicator of population size. Detailed population assessment using conventional survey methods may also be required depending on the extent, scale and potential impacts of the development proposals. Recommendations for further survey are provided in this report.

2.4.1.5 The desk study returned species records for common toad and common frog (see **section 3.1**). However, during the presence / absence surveys for GCN in 2017, of these two species only common frog was recorded. This is likely due to the targeted methods used for GCN presence / absence survey e.g. bottle-trapping, which is designed to capture newts and does not target frogs and toads. Torching can reveal frog and toad presence from eye-shine. However, the widespread distribution of these amphibians across the UK means that it is highly likely that these species are present within suitable habitat across the Field Survey Area.

Table 2-3 - Waterbodies not fully assessed in 2017

Water body	Site reference	HSI Completed	Reason
Pond 11	12765~~10195~~_AA_TE_PD11	No	Permission to access land not obtained
Pond 21	~~10195~~12260_AA_TE_PD21	Yes	Health and safety
Pond 32	~~10195~~11765_AA_TE_PD32	Yes	Health and safety

2.4.2 2018 Surveys

2.4.2.1 In 2018, as a result of a change in the Proposed Scheme design, an instruction was given to only undertake survey work in relation to specific Scheme options (1 and 5A) and to postpone all survey work for waterbodies that fall within Scheme option 3 and 0.25 kilometres from its boundary. Subsequently, 9 ponds were discounted in 2018 associated with Scheme option 3 see **Table 2-4** below. Ten watercourses were also discounted from the 2018 surveys (AQ068 to AQ077).

2.4.2.2 Pond 46 was not visited due to access permissions in 2018.

Table 2-4 - ~~Waterbodies~~ Ponds discounted from the assessment in 2018

Water body	Site reference	HSI Completed	Reason
Pond 26	10710_AA_TE_PD26	Yes (in year 2017)	Option 3 withdrawn
Pond 28	10940_AA_TE_PD28	Yes (in year 2017)	Option 3 withdrawn
Pond 36	10790_AA_TE_PD36	No	Option 3 withdrawn
Pond 37	10790_AA_TE_PD37	No	Option 3 withdrawn
Pond 39	10790_AA_TE_PD39	No	Option 3 withdrawn
Pond 40	10710_AA_TE_PD40	No	Option 3 withdrawn
Pond 42	10790_AA_TE_PD42	No	Option 3 withdrawn
Pond 43	10790_AA_TE_PD43	No	Option 3 withdrawn
Pond 46	12575_AA_TE_PD46	No	Permission to access land not obtained

2.4.2.3 An additional six ponds (Ponds 35, 52, 54, 55, 56, 57) were identified after the completion of the surveys in 2018. These were not subject to survey (see Table 4-2).

3 Results

3.1 Desk Study

3.1.1 Biological Records

3.1.1.1 Five species of native amphibian were identified within two kilometres of the Scheme options footprint from biological records held by Sussex Biodiversity Records Centre. A total of 110 amphibian records were returned (**Table 3-1**).

Table 3-1 - Total counts of amphibian species records within the Desk Study Area

Amphibian species	Total count	Closest record (km)	Most recent record (year)
Common toad	29	Within Scheme options footprint and to 0.25 km	2016
Common frog	37	Within Scheme options footprint and to 0.25 km	2015
Smooth newt	22	Within Scheme options footprint and to 0.25 km	2013
Palmate newt	16	Within Scheme options footprint and to 0.25 km	2012
Great crested newt	6	1.1 km associated with Lazy W pond just to the south of Walberton (record dates 2005).	2017 (record is two km from Scheme option 5A, near Barnham)
Grand Total	**110**	**-**	**-**

3.1.1.2 Most of these records were located beyond 0.25 kilometres from the Scheme options footprint, and were associated with the Walberton area and the Wildfowl and Wetlands Trust centre to the north-east of Arundel. However, a number of amphibian records were located within the footprints of “Option 1”, “Option 3” and “Option 5A” and within 0.25 kilometres of their respective boundaries. These include common toad, common frog, smooth newt, and palmate newt. None of the six records of GCN occur within 0.25 kilometres of the Scheme options footprint (**Figure 3** shows the distribution of amphibian records).

3.1.1.3 A single record of natterjack toad (*Bufo calamita*) was returned approximately 23 kilometres north-west of the Scheme options footprint near Petersfield, West Sussex.

3.1.1.4 Natterjack toads are rare amphibians that are confined to approximately 60 sites[19] across the country. No records or known populations of natterjack toad occurred within, or anywhere near to, the Scheme options footprint and therefore this species is not considered further in this report.

3.1.2 MAVES Information

3.1.2.1 Reports commissioned by MAVES were also consulted as part of the desk study review. These studies found that in 2015, common toad was present and that there were circa. 200,000 toad tadpoles in Madonna pond (Pond 10 in **Figure 46)** at Binsted (located at grid ref: SU 99263 06171) as well as in Walberton and Barnham. This species was also recorded during the spring of 2016 in Sandy Hole Pond (Pond 7 in **Figure 46**) (grid ref: SU 98188 06943) and tadpoles were seen in Tortington Rife (grid ref: SU 9942 0564). It was also noted that the Arun and Rother Connections project[20] have contacted MAVES with the prospect of adding the local lanes to their Toad Watch programme[21].

3.1.2.2 Smooth and palmate newts were observed by the MAVES group during spring 2016 in the Madonna pond, Sandy Hole Pond and the pond at Meadow Lodge (Pond 12 in **Figure 64**) (Meadow Lodge grid ref: SU 99253 05685).

3.1.2.3 The 2015 MAVES results summary also recorded GCN breeding just outside the area in Lazy W Pond, (grid ref: SU 97413 05378), which is approximately 0.85 kilometres to the west of Binsted Rife. This was also confirmed by the Sussex Biodiversity Records Centre data. The MAVES report stated that there were no barriers to dispersal and that the presence of GCN in the surrounding area cannot be discounted.

3.1.3 Ponds Within the Field Survey Area

2017 Surveys

3.1.3.1 A total of 23 ponds were originally identified within 14 land parcels ~~(**Figure 4**)~~ in the initial survey area that included Scheme options 1, 3 and 5A, and these ponds were included for assessment within the field survey area (see **Table 3-2**).

[19] Amphibian and Reptile Conservation (2018) *Natterjack Toad* [Online]. Available at: https://www.arc-trust.org/natterjack-toad. Accessed 27th February 2018.

[20] *Arun and Western Streams Catchment*. [Online]. Available at: http://arunwesternstreams.org.uk/projects/arc. Accessed 13th February 2018.

[21] *Toadwatch*. [Online]. Available at: http://toadwatch.org/default.htm. Accessed 13th February 2018.

Table 3-2 - Ponds within 0.25 kilometres of the Scheme options footprint (Options 1 3 & 5A)

Water body	WSP reference	Location (within 250m of Option)	Land Parcel	Rapid Risk Assessment[22]
Pond 7	10415_AA_TE_PD7	Option 5A	10415	Offence likely
Pond 10	10685_AA_TE_PD10	Option 5A	10685	Offence likely
Pond 11	12765_AA_TE_PD11	Option 5A	12765	Offence likely
Pond 12	10735_AA_TE_PD12	Option 5A	10735	Offence likely
Pond 14	11250_AA_TE_PD14	Options 3 & 5A	11250	Offence highly likely
Pond 15	11250_AA_TE_PD15	Options 3 & 5A	11250	Offence highly likely
Pond 16	11250_AA_TE_PD16	Options 3 & 5A	11250	Offence highly likely
Pond 17	11250_AA_TE_PD17	Options 3 & 5A	11250	Offence highly likely
Pond 18	11445_AA_TE_PD18	Options 3 & 5A	11445	Offence likely
Pond 19	11765_AA_TE_PD19	Option 1	11765	Offence likely
Pond 20	11765_AA_TE_PD20	Option 1	11765	Offence likely
Pond 21	12260_AA_TE_PD21	Options 3 & 5A	12260	Offence highly likely
Pond 22	10860_AA_TE_PD22	Option 1	10860	Offence likely
Pond 23	10860_AA_TE_PD23	Option 1	10860	Offence highly unlikely
Pond 24	10860_AA_TE_PD24	Option 1	10860	Offence likely
Pond 25	10490_AA_TE_PD25	Option 3	10490	Offence highly unlikely
Pond 26	10710_AA_TE_PD26	Option 3	10710	Offence likely
Pond 27	10955_AA_TE_PD27	Option 1	10955	Offence highly likely
Pond 28	10940_AA_TE_PD28	Options 1 & 3	10940	Offence highly likely
Pond 29	11765_AA_TE_PD29	Options 3 & 5A	11765	Offence highly likely
Pond 30	12260_AA_TE_PD30	Options 3 & 5A	12260	Offence likely
Pond 31	10765_AA_TE_PD31	Options 3 & 5A	10765	Offence highly likely
Pond 32	11765_AA_TE_PD32	Options 3 & 5A	11765	Offence likely

[22] The wording in the table is taken from Natural England guidance which refers to the likelihood of a pond being impacted upon if the road scheme options are to go ahead. This should not be taken out of context, and is only advisory with regard to the distance of a pond from a development, on the assumption that GCN could be present within that pond, as to whether further surveys should be undertaken. The findings of those subsequent studies would then inform whether or not GCN are likely to be at risk from the proposals.

2018 Surveys

3.1.3.3 In 2018, a further 13~~16~~ waterbodies were recorded during survey work for other protected species within the Scheme options footprint and 0.25 kilometres buffer zone (see **Table 3-3** below). ~~In addition, Ponds 38, 41, 48 and 49 were later discounted from the assessment as they were found to be outside of the revised Scheme options footprint and 0.25 kilometres of its boundaries.~~

3.1.3.4 These waterbodies were included for assessment in 2018, and were subject to HSI assessment and eDNA water sampling for the presence of GCN.

Table 3-3 - Ponds within 0.25 kilometres of the Scheme options footprint (Options 1 3 & 5A)

Water body	WSP reference	Location (within 250m of Option)	Land Parcel	Rapid Risk Assessment[22]
Pond 36	10790_AA_TE_PD36	Options 1 & 3	10790	Offence likely
Pond 37	10790_AA_TE_PD37	Options 1 & 3	10790	Offence likely
~~Pond 38~~	~~Scoped out of assessment – outside of Scheme options footprint and 0.25 kilometres of its boundaries~~			
Pond 39	10790_AA_TE_PD39	Option 3	10790	Offence highly likely
Pond 40	10710_AA_TE_PD40	Option 3	10710	Offence likely
~~Pond 41~~	~~Scoped out of assessment – outside of Scheme options footprint and 0.25 kilometres of its boundaries~~			
Pond 42	10790_AA_TE_PD42	Options 1 & 3	10790	Offence likely
Pond 43	10790_AA_TE_PD43	Options 1 & 3	10790	Offence likely
Pond 44	10615_AA_TE_PD44	Option 5A	10615	Offence likely
Pond 45	10735_AA_TE_PD45	Option 5A	10735	Offence likely
Pond 46	12575_AA_TE_PD46	Option 5A	12575	Offence likely
Pond 47	10630_AA_TE_PD47	Option 5A	10630	Offence likely
Pond 48	10615_AA_TE_PD48	Option 5A	10615	Offence likely
~~Pond 48~~	~~Scoped out of assessment – outside of Scheme options footprint and 0.25 kilometres of its boundaries~~			
~~Pond 49~~	~~Scoped out of assessment – outside of Scheme options footprint and 0.25 kilometres of its boundaries~~			
Pond 50	10905_AA_TE_PD50	Options 1 & 3	10905	Offence likely
Pond 51	11765_AA_TE_PD51	Options 1, 3 & 5A	11765	Offence likely

3.1.4 Other Aquatic Habitat Within the Field Survey Area

2017 Surveys

3.1.4.1 ~~A total of 97 other aquatic habitats were identified including several ditches and streams across the Field Survey Area. Most of these waterbodies were later identified as part of the Aquatic Survey[6] scope, as well as incidentally recorded during other protected species surveys. As such, these waterbodies were not included in the 2017 assessment but were included in the 2018 survey programme. These other aquatic habitats are listed in the next section.~~

3.1.4.2 Two ditch waterbodies were included in the 2017 GCN survey programme (named Ditch 13 and Ditch 14). ~~The~~In 2018 these were sub-divided into 6 watercourse references to align with other ecological survey works ~~Aquatic surveys categorised Ditch 13 and 14 into the following~~; Ditch 13 (AQ038, AQ039 and AQ040) and Ditch 14 (AQ035, AQ036 and AQ037), see **Table 3-4** below for further information. These ditch networks were subject to eDNA testing in 2017 which resulted in a negative (absence of GCN) reading. ~~In addition, 12 ditches were discovered to have dried out during survey work in 2017.~~

Table 3-4 - Ditches 13 and 14 and their corresponding AQ number references

Aquatic survey reference no.	Water body	Location (within 0.25 km of Option)	Land Parcel	Habitat Type	Year surveyed
AQ035	Ditch 14	Option 1	12275	Ditch (wet)	2017
AQ036	Ditch 14	Option 1	12275	Ditch (wet)	2017
AQ037	Ditch 14	Option 1	12275	Ditch (wet)	2017
AQ038	Ditch 13	Option 1	12275	Ditch (wet)	2017
AQ039	Ditch 13	Option 1	12275	Ditch (wet)	2017
AQ040	Ditch 13	Option 1	12275	Ditch (wet)	2017

2018 Surveys

3.1.4.3 There are ~~87~~ 84 other waterbodies that do not qualify as ponds, and so were categorised as 'other aquatic habitats'. These ditches and streams were included for assessment within the 2018 survey programme for GCN, and were not subject to survey in 2017.

3.1.4.4 The other aquatic habitats identified for survey work in 2018, to establish their potential to support GCN are shown in **Table 3-5** below**. Figure~~s~~ 6~~3 and 4~~** show the locations of these waterbodies.

Table 3-5 - Other aquatic habitat within 0.25 kilometres of the Scheme options footprint

Water body	Location (within 0.25 kilometres of Option)	Land Parcel	Habitat Type	Survey work in 2018
AQ001	Options 3 and 5A	11765	Floodplain ditch	DSI and/or eDNA
AQ002	Options 3 and 5A	11765	Floodplain ditch	DSI and/or eDNA
AQ003	Options 3 and 5A	11765	Floodplain ditch	DSI and/or eDNA
AQ004	Options 3 and 5A	11765	Floodplain ditch	DSI and/or eDNA
AQ005	Options 3 and 5A	11765	Floodplain ditch	DSI and/or eDNA
AQ006	Options 3 and 5A	11765	Floodplain ditch	DSI and/or eDNA
AQ007	Options 3 and 5A	11765	Floodplain ditch	DSI and/or eDNA
AQ008	Options 3 and 5A	12260	Floodplain ditch	DSI and/or eDNA
AQ009	Options 3 and 5A	12260	Floodplain ditch	DSI and/or eDNA
AQ010	Options 3 and 5A	12260	Floodplain ditch	DSI and/or eDNA
AQ011	Options 3 and 5A	11765	Floodplain ditch	DSI and/or eDNA
AQ012	Options 3 and 5A	12260	Floodplain ditch	DSI and/or eDNA
AQ013	Options 3 and 5A	12260	Floodplain ditch	DSI and/or eDNA
AQ014	Options 1, 3 and 5A	11765	Floodplain ditch	DSI and/or eDNA
AQ015	Options 1, 3 and 5A	11765	Floodplain ditch	DSI and/or eDNA
AQ017	Options 3 and 5A	11765	Floodplain ditch	DSI and/or eDNA
AQ018	Options 1, 3 and 5A	11765	Floodplain ditch	DSI and/or eDNA
AQ019	Options 3 and 5A	12830	Floodplain ditch	DSI and/or eDNA
AQ020	Option 1	11765	Floodplain ditch	DSI and/or eDNA
AQ021	Option 1	11765	Floodplain ditch	DSI and/or eDNA
AQ022	Option 1	11765	Floodplain ditch	DSI and/or eDNA
AQ023	Option 1	11765	Floodplain ditch	DSI and/or eDNA
AQ024	Option 1	11765	Floodplain ditch	DSI and/or eDNA
AQ025	Option 1	11765	Floodplain ditch	DSI and/or eDNA
AQ026	Option 1	11765	Floodplain ditch	DSI and/or eDNA
AQ027	Option 1	11765	Floodplain ditch	DSI and/or eDNA
AQ028	Option 1	11765	Floodplain ditch	DSI and/or eDNA

Water body	Location (within 0.25 kilometres of Option)	Land Parcel	Habitat Type	Survey work in 2018
AQ029	Option 1	11765	Floodplain ditch	DSI and/or eDNA
AQ030	Option 1	11765	Floodplain ditch	DSI and/or eDNA
AQ031	Option 1	11765	Floodplain ditch	DSI and/or eDNA
AQ032	Option 1	11765	Floodplain ditch	DSI and/or eDNA
AQ034	Option 1	11765	Floodplain ditch	DSI and/or eDNA
~~AQ035~~	~~Option 1~~	~~12275~~	~~Ditch (wet)~~	~~Survey completed 2017~~
~~AQ036~~	~~Option 1~~	~~12275~~	~~Ditch (wet)~~	~~Survey completed 2017~~
~~AQ037~~	~~Option 1~~	~~12275~~	~~Ditch (wet)~~	~~Survey completed 2017~~
~~AQ038~~	~~Option 1~~	~~12275~~	~~Ditch (wet)~~	~~Survey completed 2017~~
~~AQ039~~	~~Option 1~~	~~12275~~	~~Ditch (wet)~~	~~Survey completed 2017~~
~~AQ040~~	~~Option 1~~	~~12275~~	~~Ditch (wet)~~	~~Survey completed 2017~~
AQ041	Option 1	12729	Ditch	DSI and/or eDNA
AQ042	Option 1	12729	A27 road side ditch	DSI and/or eDNA
AQ043	Option 1	11765	Floodplain ditch	DSI and/or eDNA
AQ044	Options 3 and 5A	11235	Stream	DSI and/or eDNA
AQ045	Options 3 and 5A	11235	Stream	DSI and/or eDNA
AQ046	Options 3 and 5A	11235	Stream	DSI and/or eDNA
AQ047	Options 3 and 5A	11235	Ditch	DSI and/or eDNA
AQ048	Options 3 and 5A	11235	Stream	DSI and/or eDNA
AQ049	Options 3 and 5A	11235	Stream	DSI and/or eDNA
AQ050	Options 3 and 5A	11235	Stream	DSI and/or eDNA
AQ051	Options 3 and 5A	11035	Ditch	DSI and/or eDNA
AQ052	Options 3 and 5A	11035	Ditch	DSI and/or eDNA
AQ053	Options 3 and 5A	10765	Ditch	DSI and/or eDNA
AQ054	Option 5A	10765	Ditch	DSI and/or eDNA
AQ055	Options 3 and 5A	10765	Ditch	DSI and/or eDNA

Water body	Location (within 0.25 kilometres of Option)	Land Parcel	Habitat Type	Survey work in 2018
AQ056	Options 3 and 5A	10800	Ditch	DSI and/or eDNA
AQ057	Options 3 and 5A	10765	Stream	DSI and/or eDNA
AQ058	Option 5A	10765	Ditch	DSI and/or eDNA
AQ059	Options 3 and 5A	12790	Ditch	DSI and/or eDNA
AQ064	Option 5A	12670	Stream	DSI and/or eDNA
AQ065	Option 5A	12670	Stream	DSI and/or eDNA
AQ066	Option 5A	10685	Stream	DSI and/or eDNA
AQ067	Option 5A	10490	Stream	DSI and/or eDNA
AQ068	Option 3	10800	Ditch	DSI and/or eDNA
AQ069	Option 3	10800	Ditch	DSI and/or eDNA
AQ070	Option 3	10890	Ditch	DSI and/or eDNA
AQ071	Option 3	10945	Ditch	DSI and/or eDNA
AQ072	Option 3	10790	Ditch	DSI and/or eDNA
AQ073	Option 3	10790	Ditch	DSI and/or eDNA
AQ074	Option 3	10790	Ditch	DSI and/or eDNA
AQ075	Option 3	10790	Ditch	DSI and/or eDNA
AQ076	Option 3	10790	Ditch	DSI and/or eDNA
AQ077	Option 3	10710	Ditch	DSI and/or eDNA
AQ078	Option 5A	10490	Ditch	DSI and/or eDNA
AQ085	Option 1	11790	Ditch	DSI and/or eDNA
AQ086	Option 1	11790	Ditch	DSI and/or eDNA
AQ087	Option 1	11780	Ditch	DSI and/or eDNA
AQ088	Option 1	11777	Ditch	DSI and/or eDNA
AQ089	Option 1	11775	Ditch	DSI and/or eDNA
AQ091	Option 5A	10765	Ditch	DSI and/or eDNA
AQ092	Option 1	12729	Ditch	DSI and/or eDNA
AQ093	Options 1, 3 and 5A	12300	Ditch	DSI and/or eDNA
AQ095	Option 1	12729	Ditch	DSI and/or eDNA
AQ096	Option 1	12605	Ditch	DSI and/or eDNA
AQ097	Options 1, 3 and 5A	11765	Ditch	DSI and/or eDNA

Water body	Location (within 0.25 kilometres of Option)	Land Parcel	Habitat Type	Survey work in 2018
AQ098	Options 1, 3 and 5A	11765	Ditch	DSI and/or eDNA
AQ099	Option 1	11765	Ditch	DSI and/or eDNA
AQ100	Option 5A	12736	River/stream	DSI and/or eDNA
AQ1101	Options 1, 3 and 5A	10790	River/stream	DSI and/or eDNA
AQ1102	Option 1 5A	10685	River/stream	DSI and/or eDNA
AQ113	Option 1	11765	Floodplain ditch	DSI and/or eDNA
AQ200	Options 1, 3 and 5A	11220	River	DSI and/or eDNA

3.2 Field Survey

3.2.1 Habitat Suitability Index Assessment

2017 Surveys

3.2.1.1 In 2017, an HSI assessment was undertaken at 22 waterbodies (Ponds) and two ditches identified within the Field Survey Area (see **Table 3-6** below). The HSI scores obtained were as follows; five scored of "poor" suitability (<0.50), ~~ten~~ eight scored "below average" (0.50 – 0.59), ~~nine~~ six scored "average" (0.60 – 0.69), ~~five~~ three scored "good" (0.70 – 0.79) and ~~four~~ two scored "excellent" (>0.80).

3.2.1.2 Four waterbodies were subject to HSI and later discovered to be dry in 2017. These were Pond 26, 28, 29 and 30.

3.2.1.3 An HSI score and category was not obtained for Pond 11 during the 2017 surveys and so was included in the 2018 survey programme.

Table 3-6 - Summary of Habitat Suitability Index Results 2017

Water body	Score	Category	Survey information	Photo reference
Pond 7	0.59	Below average	Farm pond. Included for Presence/ Absence survey in 2017.	10415_AA_TE_ PD7_P1_110517
Pond 10	0.85	Excellent	Woodland pond. Included for Presence/ Absence survey in 2017.	10685_AA_TE_ PD10_P1_120517
Pond 12	0.86	Excellent	Woodland pond. Included for Presence/ Absence survey 2017.	10735_AA_TE_ PD12_P1_110517
Pond 14	0.68	Average	Residential pond. Included for Presence/ Absence survey in 2017.	11250_AA_TE_ PD14_P1_150517
Pond 15	0.66	Average	Residential pond. Included for Presence/ Absence survey in 2017.	11250_AA_TE_ PD15_P1_150517
Pond 16	0.47	Poor	Residential pond. Included for Presence/ Absence survey in 2017.	11250_AA_TE_ PD16_P1_150517
Pond 17	0.53	Below average	Residential pond. Included for Presence/ Absence survey in 2017.	11250_AA_TE_ PD17_P1_150517
Pond 18	0.75	Good	Residential pond. Included for Presence/ Absence survey in 2017.	11445_AA_TE_ PD18_P1_150517

Water body	Score	Category	Survey information	Photo reference
Pond 19	0.53	Below average	**Stocked fishing pond**. Not included for Presence/ Absence survey in 2017.	11765_AA_TE_ PD19_P1_160517
Pond 20	0.51	Below average	**Stocked fishing pond**. Not included for Presence/ Absence survey in 2017.	11765_AA_TE_ PD20_P1_160517
Pond 21	0.37	Poor	Farm pond. Not included for Presence/Absence survey in 2017	12260_AA_TE_ PD21_P1_160517
Pond 22	0.57	Below average	**Stocked fishing pond**. Not included for Presence/Absence survey in 2017.	10860_AA_TE_ PD22_P1_150517
Pond 23	0.50	Poor	**Stocked fishing pond**. Not included for Presence/Absence survey in 2017.	10860_AA_TE_ PD23_P1_150517
Pond 24	0.57	Below average	**Stocked fishing pond**. Not included for Presence/ Absence survey in 2017.	10860_AA_TE_ PD24_P1_150517
Pond 25	0.66	Average	Woodland pond. Included for Presence/ Absence survey in 2017.	10490_AA_TE_ PD25_P1_120517
Pond 26	0.51	Below average	Woodland pond. **Desiccated.** Not included for Presence/ Absence survey in 2017.	10710_AA_TE_ PD26_P1_120517
Pond 27	0.72	Good	Woodland pond. Included for Presence/ Absence survey in 2017.	10955_AA_TE_ PD27_P1_120517
Pond 28	0.52	Below average	Woodland pond. **Desiccated.** Not included for Presence/ Absence survey in 2017.	10940_AA_TE_ PD28_P1_120517
Pond 29	0.36	Poor	Farm pond. **Desiccated.** Not included for Presence/ Absence survey in 2017.	11765_AA_TE_ PD29_P1_160517
Pond 30	0.38	Poor	Farm pond. **Desiccated.** Not included for Presence/ Absence survey in 2017.	12260_AA_TE_ PD30_P1_160517
Pond 31	0.62	Average	Woodland pond. Included for Presence/ Absence survey in 2017.	10765_AA_TE_ PD31_P1_170517
Pond 32	0.75	Good	Farm pond. Not included for Presence/ Absence survey in 2017	11765_AA_TE_ PD32_P1_160517
Ditch 13	0.67	Average	Ditch. Included for eDNA assessment for GCN in 2017.	12275_AA_TE_ DT13_P1_260617

Water body	Score	Category	Survey information	Photo reference
Ditch 14	0.70	Average	Ditch. Included for eDNA assessment for GCN in 2017.	12275_AA_TE_DT14_P1_260617

2018 Surveys

3.2.1.4 The HSI assessments discovered several ponds to be heavily stocked with fish and in use as commercial fishing lakes. These waterbodies are considered highly unlikely to support viable GCN breeding populations due to a combination of predation and lack of suitable habitat features e.g. suitable plants for egg laying, and therefore, ponds 19, 20, 22, 23 and 24 were not carried forward for survey and are not considered further in this report.

3.2.1.5 **Table 3-7** shows the results of the HSI assessment on ponds within the Scheme options footprint, with raw data provided in **Appendix B. Table 3-8** shows the results of the DSI assessments on 'other aquatic habitats' (ditches) within the Scheme options footprint.

Table 3-7 - Summary of Habitat Suitability Index results 2018

Water body	Score	Category	Survey information	Photo reference
Pond 11	0.78	Good	Woodland pond. Included for eDNA survey in 2018.	12765_AE_CH_PD11_P1_150318~~12765_AE_CH_Pond_11_P1_150318~~
Pond 19	0.33	Poor	Floodplain pond. Scoped out ~~Included for eDNA survey in 2018.~~	11765_AA_TE_PD19_P1_160517~~11765_AE_CH_Pond_19_P1_150318~~
Pond 20	0.33	Poor	Floodplain pond. Scoped out ~~Included for eDNA survey in 2018.~~	11765_AA_TE_PD20_P1_160517~~11765_AE_CH_Pond_20_P1_150318~~
Pond 21	0.25	Poor	Floodplain pond. Scoped out ~~Included for eDNA survey in 2018.~~	12260_AA_TE_PD21_P1_160517~~12260_AE_CH_Pond_21_P1_150318~~

Water body	Score	Category	Survey information	Photo reference
Pond 22	0.31	Poor	Fishery pond. Scoped out ~~Included for eDNA survey in 2018.~~	10860_AA_TE_PD22_P1_150517~~10860_AE_CH_Pond_22_P1_150318~~
Pond 23	0.31	Poor	Fishery pond. Scoped out ~~Included for eDNA survey in 2018.~~	10860_AA_TE_PD23_P1_150517~~10860_AE_CH_Pond_23_P1_150318~~
Pond 24	0.31	Poor	Fishery pond. Scoped out ~~Included for eDNA survey in 2018.~~	10860_AA_TE_PD24_P1_150517~~10860_AE_CH_Pond_24_P1_150318~~
Pond 28	0.60	Average	Pond at arboretum. Scoped out ~~Included for eDNA survey in 2018.~~	10940_AE_CH_PD28_P1_150318~~10940_AE_CH_Pond_28_P1_150318~~
Pond 29	0.44	Poor	Floodplain pond. Included for eDNA survey in 2018.	11765_AA_TE_PD29_P1_160517~~11765_AE_CH_Pond_29_P1_150318~~
Pond 30	0.42	Poor	Floodplain pond. Included for eDNA survey in 2018.	12260_AA_TE_PD30_P1_160517~~12260_AE_CH_Pond_30_P1_150318~~
Pond 32	0.48	Poor	Floodplain pond. Included for eDNA survey in 2018.	11765_AA_TE_PD32_P1_160517~~11765_AE_CH_Pond_32_P1_150318~~
Pond 44	0.34	Poor	Large waterfowl pond. Scoped out ~~Included for eDNA survey in 2018.~~	10615_AE_CH_PD44_140

Water body	Score	Category	Survey information	Photo reference
				318~~10615_AE_CH_Pond_44_P1_150318~~
Pond 45	0.84	Excellent	Woodland pond. Included for eDNA survey in 2018.	10735_AE_CH_PD45_P2_150318~~10735_AE_CH_Pond_45_P1_150318~~
Pond 46	Not surveyed – no access permitted			
Pond 47	0.55	Below average	Woodland pond. Included for eDNA survey in 2018.	10630_AE_CH_PD47_P2_150318~~10630_AE_CH_Pond_47_P1_150318~~
Pond 50	0.79	Good	Pond at arboretum (toads present). Included for eDNA survey in 2018 but no completed as there was no land access.	10905_AE_CH_PD50_P1_150318~~10905_AE_CH_Pond_50_P1_150318~~
Pond 51	0.49	Poor	Floodplain pond. Included for eDNA survey in 2018.	11765_AE_CH_PD51_P1_150318~~11765_AE_CH_Pond_51_P1_150318~~

Table 3-8 - Summary of Ditch Suitability Index results 2018

Water body	Score	Category	Survey information	Photo reference
AQ001	9	Moderate	Floodplain ditch	11765_AE_CH_AQ001_P1_150318
AQ002	Desiccated			11765_AE_CH_AQ002_P1_150318
AQ003	Desiccated			11765_AE_CH_AQ003_P1_150318
AQ004	8	Low	Floodplain ditch	11765_AE_CH_AQ004_P1_150318
AQ005	8	Low	Floodplain ditch	11765_AE_CH_AQ005_P1_150318
AQ006	9	Moderate	Floodplain ditch	11765_AE_CH_AQ006_P1_150318
AQ007	8	Low	Floodplain ditch	11765_AE_CH_AQ007_P1_150318
AQ008	10	Moderate	Floodplain ditch	12260_AE_CH_AQ008_P1_150318
AQ009	11	Moderate	Floodplain ditch	12260_AE_CH_AQ009_P1_150318
AQ010	8	Low	Floodplain ditch	12260_AE_CH_AQ010_P1_150318
AQ011	Desiccated			11765_AE_CH_AQ011_P1_150318
AQ012	13	High	Floodplain ditch	11765_AE_CH_AQ012_P1_150318
AQ013	11	Moderate	Floodplain ditch	12260_AE_CH_AQ013_P1_150318
AQ014	10	Moderate	Floodplain ditch	11765_AE_CH_AQ014_P1_150318
AQ015	12	High	Floodplain ditch	11765_AE_CH_AQ015_P1_150318
AQ017	10	Moderate	Floodplain ditch	11765_AE_CH_AQ017_P1_150318
AQ018	9	Moderate	Floodplain ditch	11765_AE_CH_AQ018_P1_150318
AQ019	7	Low	Floodplain ditch	N/A
AQ020	10	Moderate	Floodplain ditch	11765_AE_CH_AQ020_P1_150318
AQ021	10	Moderate	Floodplain ditch	11765_AE_CH_AQ021_P1_150318

Water body	Score	Category	Survey information	Photo reference
AQ022	11	Moderate	Floodplain ditch	11765_AE_CH_AQ022_P1_150318
AQ023	11	Moderate	Floodplain ditch	11765_AE_CH_AQ023_P1_150318
AQ024	11	Moderate	Floodplain ditch	11765_AE_CH_AQ024_P1_150318
AQ025	8	Low	Floodplain ditch	11765_AE_CH_AQ025_P1_150318
AQ026	8	Low	Floodplain ditch	11765_AE_CH_AQ026_P1_150318
AQ027	Desiccated			11765_AE_CH_AQ027_P1_150318
AQ028	Desiccated			11765_AE_CH_AQ028_P1_150318
AQ029	11	Moderate	Floodplain ditch	11765_AE_CH_AQ029_P1_150318
AQ030	8	Low	Floodplain ditch	11765_AE_CH_AQ030_P1_150318
AQ031	8	Low	Floodplain ditch	11765_AE_CH_AQ031_P1_150318
AQ032	9	Moderate	Floodplain ditch	11765_AE_CH_AQ032_P1_150318
AQ034	8	Low	Floodplain ditch	11765_AE_CH_AQ034_P1_150318
AQ042	10	Moderate	Floodplain ditch	12729_AE_CH_AQ042_P1_150318
AQ047	Desiccated			12729_AE_CH_AQ047_P1_150318
AQ051	Desiccated			11035_AE_CH_AQ051_P1_150318
AQ052	Desiccated			11035_AE_CH_AQ052_P1_150318
AQ053	Desiccated			10765_AE_CH_AQ053_P1_150318
AQ058	Desiccated			10765_AE_CH_AQ058_P1_150318
AQ064	10	Moderate	Slow flowing stream	12670_AE_CH_AQ064_P1_150318
AQ065	10	Moderate	Slow flowing stream	12670_AE_CH_AQ065_P1_150318
AQ066	10	Moderate	Slow flowing stream	10685_AE_CH_AQ066_P1_150318

Water body	Score	Category	Survey information	Photo reference
AQ067	11	Moderate	Slow flowing stream	10490_AE_CH_AQ067_P1_150318
AQ078	11	Moderate	Part of ditch system	10490_AE_CH_AQ078_P1_150318
AQ091	Desiccated			10765_AE_CH_AQ058_P1_150318
AQ093	Desiccated			12300_AE_CH_AQ058_P1_150318
AQ097	12	High	Floodplain ditch	11765_AE_CH_AQ097_P1_150318
AQ098	8	Low	Floodplain ditch	11765_AE_CH_AQ098_P1_150318
AQ099	8	Low	Floodplain ditch	11765_AE_CH_AQ099_P1_150318
AQ100	8	Low	Woodland brook (slow flow)	12736_AE_CH_AQ100_P1_150318
AQ111	8	Low	Woodland brook (slow flow)	N/A
AQ1102	8	Low	Woodland brook (slow flow)	10685_AE_CH_AQ1102_P1_150318
AQ113	7	Low	Floodplain ditch	N/A
AQ200	9	Moderate	River	N/A

3.2.2 Conventional Presence / Likely Absence Survey

2017 Surveys

3.2.2.1 The results of the 2017 surveys indicate the likely absence of GCN from 11 ponds within the 2017 Scheme options footprint and 250 metres of its boundaries. No signs of GCN presence (i.e. eggs and larvae) or individuals were recorded during any of the presence / absence surveys in 2017.

3.2.2.2 All presence / likely absence surveys were completed in favourable weather conditions, with overnight minimum temperatures ranging between 12°C and 25°C (see **Appendix C** for raw data on waterbody and weather conditions on each survey visit). Waterbodies were subject to at least three conventional presence / absence survey methods (survey results are presented in **Table 3-9** below).

Table 3-9 - Summary of presence / likely absence survey results 2017

Water body	Adult GCN Peak Count	Breeding Activity Recorded	GCN Population Size Class	Other Amphibian Species Recorded during survey
Pond 7	0	No	N/A	37 x Smooth Newt 64 x Palmate Newt
Pond 10	0	No	N/A	14 x Smooth Newt 123 x Palmate Newt
Pond 12	0	No	N/A	5 x Palmate Newt 4 x Palmate Newt
Pond 14	0	No	N/A	1 x Smooth Newt 21 x Palmate Newt
Pond 15	0	No	N/A	8 x Smooth Newt 10 x Palmate Newt
Pond 16	0	No	N/A	1 x Smooth Newt
Pond 17	0	No	N/A	7 x Smooth Newt 5 x Palmate Newt
Pond 18	0	No	N/A	3 x Smooth Newt 2 x Palmate Newt
Pond 25	0	No	N/A	2 x Palmate Newt
Pond 27	0	No	N/A	None
Pond 31	0	No	N/A	4 x Smooth Newt 62 x Palmate Newt

2018 Surveys

3.2.2.3 No conventional presence / likely absence surveys were undertaken in 2018 due to negative eDNA results as presented in **Table 3-11**.

3.2.3 eDNA Survey

2017 Surveys

3.2.3.1 The 2017 results of the eDNA survey for ditches (Ditch 13 and Ditch 14) indicate a likely absence of GCN. The eDNA results show a "negative" reading for GCN detection (see **Table 3-10** below and **Appendix D** for Great Crested Newt eDNA test report, dated 17 July 2017).

Table 3-10 - Results table for eDNA surveys in 2017

Waterbody Ref.	eDNA score[1]	GCN detection	DNA Inhibition	DNA degradation
Ditch 13	0	Negative	No	No
Ditch 14	0	Negative	No	No

[1]the number out of 12 qPCR replicates in which DNA was detected.

2018 Surveys

3.2.3.2 In 2018, the results of the eDNA surveys provided only "negative" readings for GCN detection (see Appendix D). **Table 3-11** below details the full results of the eDNA surveys across all ponds and other aquatic habitats surveyed in 2018. Pond 50 was initially scoped in for eDNA survey but land access was refused after the HSI survey, therefore no eDNA survey was undertaken.

Table 3-11 - Results table for eDNA surveys in 2018

Waterbody Ref.	eDNA score[1]	GCN detection	DNA Inhibition	DNA degradation
Pond 11	0	Negative	No	No
Pond 29	0	Negative	No	No
Pond 30	0	Negative	No	No
Pond 32	0	Negative	No	No
Pond 45	0	Negative	No	No
Pond 47	0	Negative	No	No
Pond 51	0	Negative	No	No
AQ001	0	Negative	No	No
AQ006	0	Negative	No	No
AQ008	0	Negative	No	No
AQ009	0	Negative	No	No
AQ012	0	Negative	No	No
AQ013	0	Negative	No	No
AQ015	0	Negative	No	No

Waterbody Ref.	eDNA score[1]	GCN detection	DNA Inhibition	DNA degradation
AQ017	0	Negative	No	No
AQ064	0	Negative	No	No
AQ066	0	Negative	No	No
AQ067	0	Negative	No	No
AQ078	0	Negative	No	No
AQ097	0	Negative	No	No

3.2.4 Other Amphibians Recorded

2017 Surveys

3.2.4.1 No GCN adults (male or female), juveniles, larvae or eggs were recorded during the presence / absence surveys across 11 waterbodies within the Field Survey Area. However, other newt species were identified across multiple ponds visited during the surveys in 2017. These species include smooth newt and palmate newt (the numbers of adult individuals recorded during site visits are recorded in **Table 3-9**).

3.2.4.2 During surveys a small number of eggs of smooth and palmate newt were discovered at Ponds 7 and 15. Common frog was also spotted during torching along with tadpoles at Ponds 7 and 25.

2018 Surveys

3.2.4.3 No GCN recorded or detected during various survey visits across the Field Survey Area in 2018. However, common toad was recorded in very large numbers at Pond 50, during the common toad breeding season (see **Appendix A**, 10905_AE_CH_PDond_50_P1_150318).

4 Discussion and Recommendations

4.1 Discussion

4.1.1 Great Crested Newt Survey Summary

4.1.1.1 Surveys to investigate presence / likely absence of GCN within the Field Survey Area were undertaken in 2017 and 2018 field seasons, and the results of this survey work has been compiled and discussed within this baseline report.

4.1.1.2 Historic records of GCN were returned across the Scheme options footprint and are shown within the desk study section of this report. The most recent GCN record is dated 2017 and the closest GCN record to the scheme is situated approximately 1.1 kilometres from the Scheme options footprint.

4.1.1.3 The surveys undertaken in 2017 and 2018 have to date, found no evidence of GCN presence within any waterbodies assessed across the Field Survey Area. GCN are therefore concluded to be likely absent from 18 ponds, two ditches and 1~~3~~9 other waterbodies surveyed across the Field Survey Area, which have been assessed using either conventional presence / absence methods or eDNA water sampling techniques. These methods are considered to be suitable and reliable ways to establish presence or absence of GCN populations.

4.1.1.4 Although no GCN were recorded during the 2017 and 2018 survey seasons, there are still 16~~10~~ ponds and 31 other waterbodies within the Field Survey Area that require survey, as they fall within the Field Survey Area and the Scheme options footprint (see Table 4-2).

~~4.1.1.4~~4.1.1.5 **Table 4-1** below shows the findings to date from all ~~ponds~~ waterbodies. ~~and at which ponds further surveys are still required.~~

Table 4-1 - Great crested newt survey results summary 2017 & 2018 (all waterbodies)

Waterbody (Land parcel)	HSI or DSI Score / Category	P/A (Conventional or eDNA)	GCN Present?	Conclusion	Year Surveyed	Further survey? Reason?
Pond 7 (10415)	0.59 / Below average	Yes (Conventional)	No	Likely absence	2017	Survey Complete
Pond 10 (10685)	0.85 / Excellent	Yes (Conventional)	No	Likely absence	2017	Survey Complete
Pond 11 (12765)	0.78 / Good	Yes (eDNA)	No	Likely absence	2018	Survey Complete
Pond 12 (10735)	0.86 / Excellent	Yes (Conventional)	No	Likely absence	2017	Survey Complete
Pond 14 (11250)	0.68 / Average	Yes (Conventional)	No	Likely absence	2017	Survey Complete
Pond 15 (11250)	0.66 / Average	Yes (Conventional)	No	Likely absence	2017	Survey Complete
Pond 16 (11250)	0.47 / Poor	Yes (Conventional)	No	Likely absence	2017	Survey Complete
Pond 17 (11250)	0.53 / Below Average	Yes (Conventional)	No	Likely absence	2017	Survey Complete
Pond 18 (11445)	0.75 / Good	Yes (Conventional)	No	Likely absence	2017	Survey Complete
Pond 19 (11765)	0.53 / Below average	No – Scoped out	Highly unlikely	Likely absence	2017	Survey complete
	0.33 / Poor	No - Scoped out	Highly unlikely	Likely absence	2018 (HSI only)	Not required - Scoped out
Pond 20 (11765)	0.51 / Below average	No – Scoped out	Highly unlikely	Likely absence	2017	Survey complete

Waterbody (Land parcel)	HSI or DSI Score / Category	P/A (Conventional or eDNA)	GCN Present?	Conclusion	Year Surveyed	Further survey? Reason?
	0.33 / Poor	No - Scoped out	Highly unlikely	Likely absence	2018 (HSI only)	Not required - Scoped out
Pond 21 (12260)	0.37 / Poor	No – Health and safety	Highly unlikely	Likely absence	2017	Survey complete
	0.25 / Poor	No - Scoped out	Highly unlikely	Likely absence	2018 (HSI only)	Not required - Scoped out
Pond 22 (10860)	0.57 / Below average	No – Scoped out	Highly unlikely	Likely absence	2017	Survey complete
	0.31 / Poor	No - Scoped out	Highly unlikely	Likely absence	2018 (HSI only)	Not required - Scoped out
Pond 23 (10860)	0.50 / Poor	No – Scoped out	Highly unlikely	Likely absence	2017	Survey complete
	0.31 / Poor	No - Scoped out	Highly unlikely	Likely absence	2018 (HSI only)	Not required - Scoped out
Pond 24 (10860)	0.57 / Below average	No – Scoped out	Highly unlikely	Likely absence	2017	Survey complete
	0.31 / Poor	No - Scoped out	Highly unlikely	Likely absence	2018 (HSI only)	Not required - Scoped out
Pond 25 (10490)	0.66 / Average	Yes (Conventional)	No	Likely absence	2017	Survey Complete
Pond 26 (10710)	0.51 / Below Average	No – Dry, later in season of 2017	Unknown	Unknown	2017	**Required**
Pond 27 (10955)	0.72 / Good	Yes (Conventional)	No	Likely absence	2017	Survey Complete

Waterbody (Land parcel)	HSI or DSI Score / Category	P/A (Conventional or eDNA)	GCN Present?	Conclusion	Year Surveyed	Further survey? Reason?
Pond 28 (10940)	0.52 / Below Average	No – Dry, later in season of 2017	Unknown	Unknown	2017	**Required**
Pond 29 (11765)	0.36 / Poor	No – Dry	No	Likely absence	2017	Survey complete
	0.44 / Poor	Yes (eDNA)	No	Likely absence	2018	Survey Complete
Pond 30 (12260)	0.38 / Poor	No – Dry	No	Likely absence	2017	Survey complete
	0.42 / Poor	Yes (eDNA)	No	Likely absence	2018	Survey Complete
Pond 31 (10765)	0.62 / Average	Yes (Conventional)	No	Likely absence	2017	Survey Complete
Pond 32 (11765)	0.75 / Good	No – Health and safety	No	Likely absence	2017	Survey complete
	0.48 / Poor	Yes (eDNA)	No	Likely absence	2018	Survey Complete
Pond 36 (10790)	-	-	-	Unknown	-	**Required**
Pond 37 (10790)	-	-	-	Unknown	-	**Required**
~~Pond 38 (10710)~~	~~-~~	~~-~~	~~-~~	~~Unknown~~	~~-~~	~~Not required - Scoped out~~
Pond 39 (10790)	-	-	-	Unknown	-	**Required**
Pond 40 (10710)	-	-	-	Unknown	-	**Required**
~~Pond 41 (10710)~~	~~-~~	~~-~~	~~-~~	~~Unknown~~	~~-~~	~~Not required - Scoped out~~

Waterbody (Land parcel)	HSI or DSI Score / Category	P/A (Conventional or eDNA)	GCN Present?	Conclusion	Year Surveyed	Further survey? Reason?
Pond 42 (10790)	-	-	-	Unknown	-	**Required**
Pond 43 (10790)	-	-	-	Unknown	-	**Required**
Pond 44 (10615)	0.34 / Poor	No - Scoped out	Highly unlikely	Likely absence	2018 (HSI only)	Not required
Pond 45 (10735)	0.84 / Excellent	Yes (eDNA)	No	Likely absence	2018	Survey Complete
Pond 46 (12575)	-	-	-	Unknown	-	**Required**
Pond 47 (10630)	0.55 / Below Average	Yes (eDNA)	No	Likely absence	2018	Survey Complete
Pond 48 (10615)	0.61 / Average	No - Scoped out	Highly unlikely	Likely absence	2018 (HSI only)	Not required
~~Pond 49 (10680)~~	~~0.83 / Excellent~~	~~-~~	~~-~~	~~Unknown~~	~~2018 (HSI only)~~	~~Not required - Scoped out~~
Pond 50 (10905)	0.79 / Good	-	-	Unknown	2018 (HSI only)	**Required**
Pond 51 (11765)	0.49 / Poor	Yes (eDNA)	No	Likely absence	2018	Survey Complete
AQ001 (11765)	9 / Moderate	Yes (eDNA)	No	Likely absence	2018	Survey Complete
AQ002 (11765)	Desiccated (Scoped out)			Likely absence	2018	Not required
AQ003 (11765)	Desiccated (Scoped out)			Likely absence	2018	Not required
AQ004 (11765)	8 / Low	Scoped out	Highly unlikely	Likely absence	2018	Not required
AQ005 (11765)	8 / Low	Scoped out	Highly unlikely	Likely absence	2018	Not required

Waterbody (Land parcel)	HSI or DSI Score / Category	P/A (Conventional or eDNA)	GCN Present?	Conclusion	Year Surveyed	Further survey? Reason?
AQ006 (11765)	9 / Moderate	Yes (eDNA)	No	Likely absence	2018	Survey Complete
AQ007 (11765)	8 / Low	Scoped out	Highly unlikely	Likely absence	2018	Not required
AQ008 (12260)	10 / Moderate	Yes (eDNA)	No	Likely absence	2018	Survey Complete
AQ009 (12260)	11 / Moderate	Yes (eDNA)	No	Likely absence	2018	Survey Complete
AQ010 (12260)	8 / Low	Scoped out	Highly unlikely	Likely absence	2018	Not required
AQ011 (11765)	Desiccated (Scoped out)			Likely absence	2018	Not required
AQ012 (12260)	13 / High	Yes (eDNA)	No	Likely absence	2018	Survey Complete
AQ013 (12260)	11 / Moderate	Yes (eDNA)	No	Likely absence	2018	Survey Complete
AQ014 (11765)	10 / Moderate	Scoped out	Highly unlikely	Likely absence	2018	Not required
AQ015 (11765)	12 / High	Yes (eDNA)	No	Likely absence	2018	Survey Complete
AQ017 (11765)	10 / Moderate	Yes (eDNA)	No	Likely absence	2018	Survey Complete
AQ018 (11765)	9 / Moderate	Scoped out	Highly unlikely	Likely absence	2018	Not required
AQ019	7 / Low	Scoped out	Highly unlikely	Likely absence	2018	Not required
AQ020 (11765)	10 / Moderate	Scoped out	Highly unlikely	Likely absence	2018	Not required
AQ021 (11765)	10 / Moderate	Scoped out	Highly unlikely	Likely absence	2018	Not required
AQ022 (11765)	11 / Moderate	Scoped out	Highly unlikely	Likely absence	2018	Not required

Waterbody (Land parcel)	HSI or DSI Score / Category	P/A (Conventional or eDNA)	GCN Present?	Conclusion	Year Surveyed	Further survey? Reason?
AQ023 (11765)	11 / Moderate	Scoped out	Highly unlikely	Likely absence	2018	Not required
AQ024 (11765)	11 / Moderate	Scoped out	Highly unlikely	Likely absence	2018	Not required
AQ025 (11765)	8 / Low	Scoped out	Highly unlikely	Likely absence	2018	Not required
AQ026 (11765)	8 / Low	Scoped out	Highly unlikely	Likely absence	2018	Not required
AQ027 (11765)	Desiccated (Scoped out)			Likely absence	2018	Not required
AQ028 (11765)	Desiccated (Scoped out)			Likely absence	2018	Not required
AQ029 (11765)	11 / Moderate	Scoped out	Highly unlikely	Likely absence	2018	Not required
AQ030 (11765)	8 / Low	Scoped out	Highly unlikely	Likely absence	2018	Not required
AQ031 (11765)	8 / Low	Scoped out	Highly unlikely	Likely absence	2018	Not required
AQ032 (11765)	9 / Moderate	Scoped out	Highly unlikely	Likely absence	2018	Not required
AQ034 (11765)	Desiccated (Scoped out)			Likely absence	2018	Not required
AQ035 (12275)	Originally part of 'Ditch 14' from 2017 survey work. eDNA negative.			Likely absence	2017	Survey Complete
AQ036 (12275)	Originally part of 'Ditch 14' from 2017 survey work. eDNA negative.			Likely absence	2017	Survey Complete
AQ037 (12275)	Originally part of 'Ditch 14' from 2017 survey work. eDNA negative.			Likely absence	2017	Survey Complete
AQ038 (12275)	Originally part of 'Ditch 13' from 2017 survey work. eDNA negative.			Likely absence	2017	Survey Complete
AQ039 (12275)	Originally part of 'Ditch 13' from 2017 survey work. eDNA negative.			Likely absence	2017	Survey Complete
AQ040 (12275)	Originally part of 'Ditch 13' from 2017 survey work. eDNA negative.			Likely absence	2017	Survey Complete
AQ041 (12729)	-	-	-	Unknown	-	**Required**
AQ042 (12729)	Desiccated (Scoped out)			Likely absence	2018	Not required - Scoped out
AQ043 (11765)	-	-	-	Unknown	-	**Required**
AQ044 (11235)	-	-	-	Unknown	-	**Required**

Waterbody (Land parcel)	HSI or DSI Score / Category	P/A (Conventional or eDNA)	GCN Present?	Conclusion	Year Surveyed	Further survey? Reason?
AQ045 (11235)	-	-	-	Unknown	-	**Required**
AQ046 (11235)	-	-	-	Unknown	-	**Required**
AQ047 (12729)	Desiccated (Scoped out)			Likely absence	2018	Not required
AQ048 (11235)	-	-	-	Unknown	-	**Required**
AQ049 (11235)	-	-	-	Unknown	-	**Required**
AQ050 (11235)	-	-	-	Unknown	-	**Required**
AQ051 (11035)	Desiccated (Scoped out)			Likely absence	2018	Not required
AQ052 (11035)	Desiccated (Scoped out)			Likely absence	2018	Not required
AQ053 10765)	Desiccated (Scoped out)			Likely absence	2018	Not required
AQ054 (10765)	-	-	-	Unknown	-	**Required**
AQ055 (10765)	-	-	-	Unknown	-	**Required**
AQ056(10800)	-	-	-	Unknown	-	**Required**
AQ057 (10765)	-	-	-	Unknown	-	**Required**
AQ058 (10765)	Desiccated (Scoped out)			Likely absence	2018	Not required
AQ059 (12790)	-	-	-	Unknown	-	**Required**
AQ064 (12670)	10 / Moderate	Yes (eDNA)	No	Likely absence	2018	Survey Complete
AQ065 (12670)	10 / Moderate	Scoped out	Highly unlikely	Likely absence	2018	Not required
AQ066 (10685)	10 / Moderate	Yes (eDNA)	No	Likely absence	2018	Survey Complete
AQ067 (10490)	11 / Moderate	Yes (eDNA)	No	Likely absence	2018	Survey Complete
AQ068 (10800)	-	-	-	Unknown	-	**Required**
AQ069 (10800)	-	-	-	Unknown	-	**Required**

Waterbody (Land parcel)	HSI or DSI Score / Category	P/A (Conventional or eDNA)	GCN Present?	Conclusion	Year Surveyed	Further survey? Reason?
AQ070 (10890)	-	-	-	Unknown	-	**Required**
AQ071 (10945)	-	-	-	Unknown	-	**Required**
AQ072 (10790)	-	-	-	Unknown	-	**Required**
AQ073 (10790)	-	-	-	Unknown	-	**Required**
AQ074 (10790)	-	-	-	Unknown	-	**Required**
AQ075 (10790)	-	-	-	Unknown	-	**Required**
AQ076 (10790)	-	-	-	Unknown	-	**Required**
AQ077 (10710)	-	-	-	Unknown	-	**Required**
AQ078(10490)	11 / Moderate	Yes (eDNA)	No	Likely absence	2018	Survey Complete
AQ085 (11790)	-	-	-	Unknown	-	**Required**
AQ086 (11790)	-	-	-	Unknown	-	**Required**
AQ087(11780)	-	-	-	Unknown	-	**Required**
AQ088(11777)	-	-	-	Unknown	-	**Required**
AQ089(11775)	-	-	-	Unknown	-	**Required**
AQ091(10765)	Desiccated (Scoped out)			Likely absence	2018	Not required
AQ092(12729)	-	-	-	Unknown	-	**Required**
AQ093(12300)	Desiccated (Scoped out)			Likely absence	2018	Not required
AQ095(12729)	-	-	-	Unknown	-	**Required**
AQ096(12605)	-	-	-	Unknown	-	**Required**
AQ097(11765)	12 / High	Yes (eDNA)	No	Likely absence	2018	Survey Complete
AQ098(11765)	8 / Low	Scoped out	Highly unlikely	Likely absence	2018	Not required
AQ099(11765)	8 / Low	Scoped out	Highly unlikely	Likely absence	2018	Not required
AQ100(12736)	8 / Low	Scoped out	Highly unlikely	Likely absence	2018	Not required

Waterbody (Land parcel)	HSI or DSI Score / Category	P/A (Conventional or eDNA)	GCN Present?	Conclusion	Year Surveyed	Further survey? Reason?
AQ11~~0~~1(10790)	8 / Low	Scoped out	Highly unlikely	Likely absence	2018	Not required
AQ11~~0~~2(10685)	8 / Low	Scoped out	Highly unlikely	Likely absence	2018	Not required
AQ113	7 / Low	Scoped out	Highly unlikely	Likely absence	2018	Not required
AQ200 River Arun	~~Scoped out~~9 / Moderate	Scoped out	Highly unlikely	Likely absence	2018	Not required - Scoped out (unsuitable GCN habitat)

4.2 Further Survey Recommendations

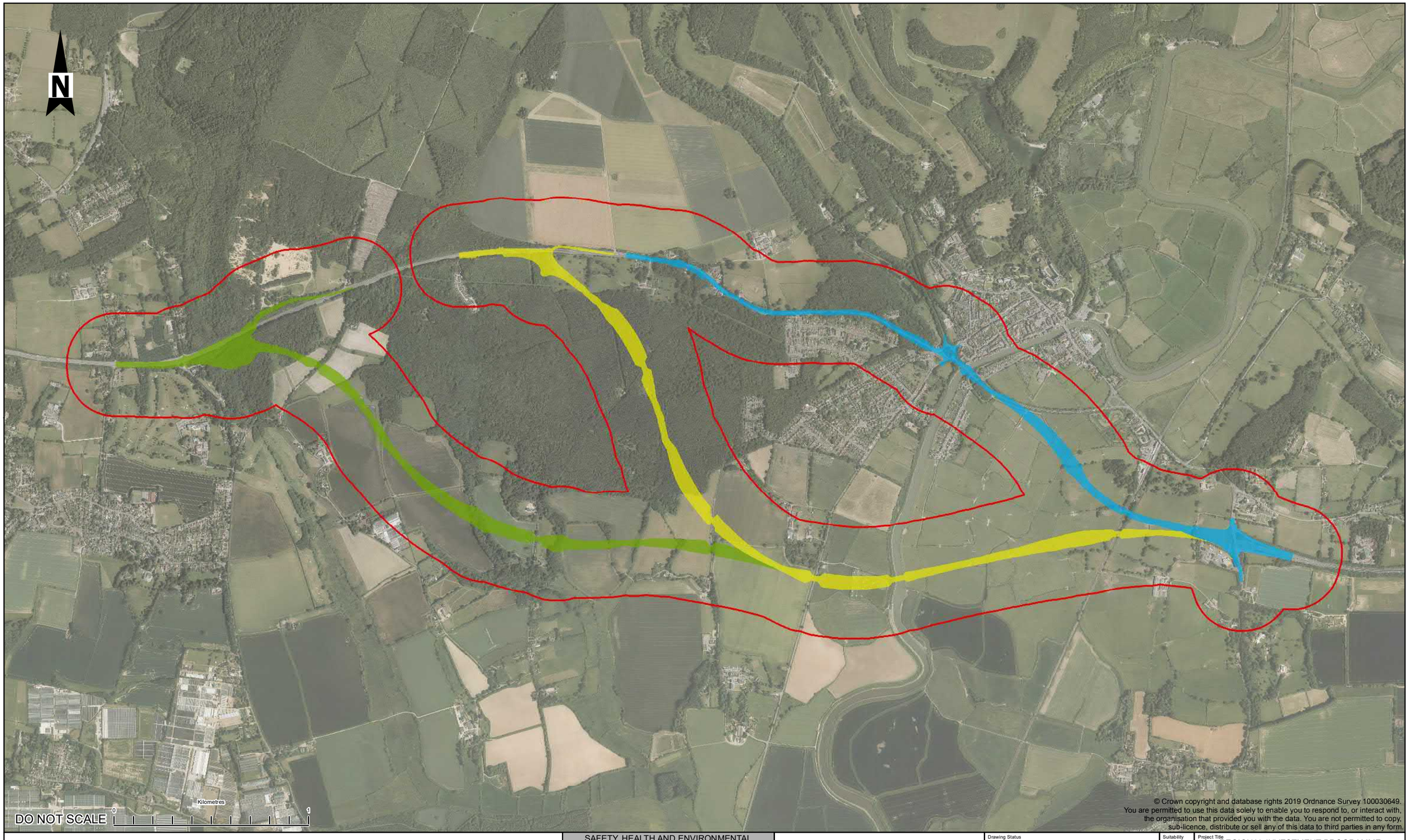
4.2.1.1 Surveys taken place over the course of 2017 and 2018 have covered many of the waterbodies present across the Scheme Options footprint. However, waterbodies listed in **Table 4-23** below still require a survey ~~in 2019~~ (see figures 6 and 7).

Table 4-2 - Waterbodies without survey coverage to date

Waterbody (Land parcel)	Habitat Type	Further Survey ~~2019~~
Pond 26(10710)	Woodland pond	HSI + eDNA still required
Pond 28(10940)	Woodland pond	HSI + eDNA still required
Pond 35 (11445)	Residential pond	HSI + eDNA still required
Pond 36(10790)	Woodland pond	HSI + eDNA still required
Pond 37(10790)	Woodland pond	HSI + eDNA still required
Pond 39(10790)	Woodland pond	HSI + eDNA still required
Pond 40(10710)	Woodland pond	HSI + eDNA still required
Pond 42(10790)	Woodland pond	HSI + eDNA still required
Pond 43(10790)	Woodland pond	HSI + eDNA still required
Pond 46(12575)	Woodland pond	HSI + eDNA still required
Pond 50(10905)	Pond at Arboretum	eDNA required
Pond 52	Residential pond	HSI + eDNA still required
Pond 54 (10441)	Woodland pond	HSI + eDNA still required
Pond 55 (10441)	Woodland pond	HSI + eDNA still required
Pond 56 (10320)	Residential pond	HSI + eDNA still required
Pond 57 (11275)	Residential pond	HSI + eDNA still required
AQ041(12729)	Floodplain ditch	DSI + eDNA still required
AQ043(11765)	Floodplain ditch	DSI + eDNA still required
AQ044(11235)	Floodplain ditch	DSI + eDNA still required
AQ045(11235)	Floodplain ditch	DSI + eDNA still required
AQ046(11235)	Floodplain ditch	DSI + eDNA still required
AQ048(11235)	Floodplain ditch	DSI + eDNA still required
AQ049(11235)	Floodplain ditch	DSI + eDNA still required
AQ050(11235)	Floodplain ditch	DSI + eDNA still required
AQ054(10765)	Floodplain ditch	DSI + eDNA still required
AQ055(10765)	Floodplain ditch	DSI + eDNA still required
AQ056(10800)	Floodplain ditch	DSI + eDNA still required
AQ057(10765)	Floodplain ditch	DSI + eDNA still required

Waterbody (Land parcel)	Habitat Type	Further Survey ~~2019~~
AQ059(12790)	Floodplain ditch	DSI + eDNA still required
AQ068(10800)	Floodplain ditch	DSI + eDNA still required
AQ069(10800)	Floodplain ditch	DSI + eDNA still required
AQ070(10890)	Floodplain ditch	DSI + eDNA still required
AQ071(10945)	Floodplain ditch	DSI + eDNA still required
AQ072(10790)	Floodplain ditch	DSI + eDNA still required
AQ073(10790)	Floodplain ditch	DSI + eDNA still required
AQ074(10790)	Floodplain ditch	DSI + eDNA still required
AQ075(10790)	Floodplain ditch	DSI + eDNA still required
AQ076(10790)	Floodplain ditch	DSI + eDNA still required
AQ077(10710)	Floodplain ditch	DSI + eDNA still required
AQ085(11790)	Floodplain ditch	DSI + eDNA still required
AQ086(11790)	Floodplain ditch	DSI + eDNA still required
AQ087(11780)	Floodplain ditch	DSI + eDNA still required
AQ088(11777)	Floodplain ditch	DSI + eDNA still required
AQ089(11775)	Floodplain ditch	DSI + eDNA still required
AQ092(12729)	Floodplain ditch	DSI + eDNA still required
AQ095(12729)	Floodplain ditch	DSI + eDNA still required
AQ096(12605)	Floodplain ditch	DSI + eDNA still required

5 FIGURES



KEY:

- OPTION 1
- OPTION 3
- OPTION 5A
- 250M FIELD SURVEY AREA

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATON

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made to the design hazard log).

Construction

Maintenance / Cleaning

Use

Decomissioning / Demolition

Rev.	Date	Description	By	Chk'd	App'd
P01.1	---	First Issue	---	---	---

Drawing Status: FINAL

Suitability: S0

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70 Chancery Lane
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Client: Working on behalf of highways england

Project Title: REGIONAL INVESTMENT PROGRAMME
A27 ARUNDEL

Drawing Title: GCN FIGURE 1
PROPOSED A27 SCHEME OPTIONS AND FIELD SURVEY AREA

Scale	Drawn	Checked	Approved	Authorised
1:18,000	CB	CH	AB	PA
Original Size	**Date**	**Date**	**Date**	**Date**
A3	15/08/19	15/08/19	15/08/19	15/08/19

Drawing Number: Project | Originator | Volume | Location | Type | Role | Number
HE551523 -WSP - GEN - A27AR- FI - GIS - 0000

Project Ref. No.: 70052558

Revision: P01

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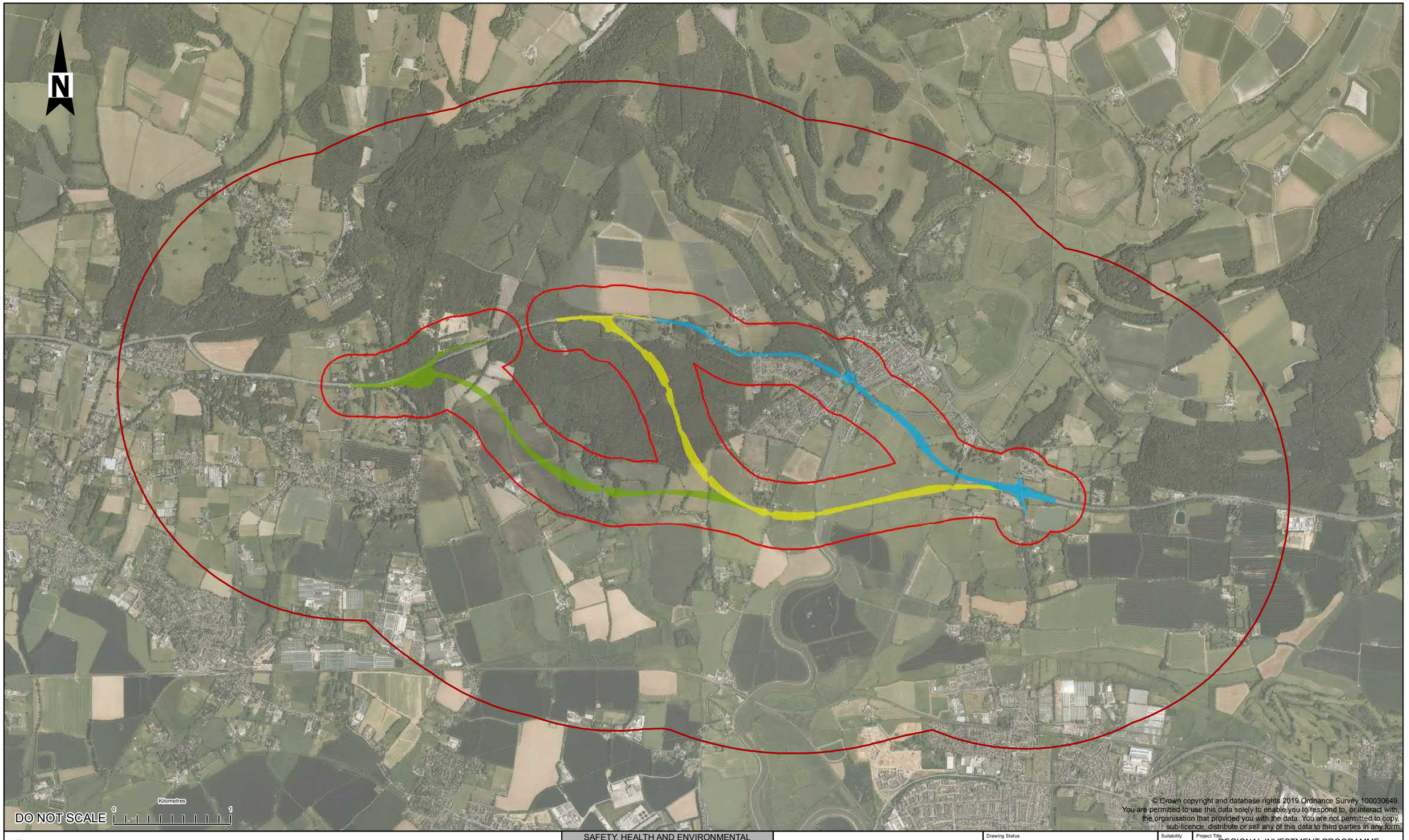

KEY:

- OPTION 1
- OPTION 3
- OPTION 5A
- 250M FIELD SURVEY AREA
- 2KM DESK STUDY AREA

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATON

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made to the design hazard log).

Construction

Maintenance / Cleaning

Use

Decomissioning / Demolition

Rev.	Date	Description	By	Chk'd	App'd
P01.1	---	First Issue	---	---	---

Drawing Status: FINAL

Suitability: S0

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Project Title: REGIONAL INVESTMENT PROGRAMME
A27 ARUNDEL

Drawing Title: GCN FIGURE 2
DESK STUDY AND
FIELD SURVEY AREAS

Scale	Drawn	Checked	Approved	Authorised
1:30,000	CB	CH	AB	PA
Original Size	**Date**	**Date**	**Date**	**Date**
A3	15/08/19	15/08/19	15/08/19	15/08/19

Drawing Number: Project | Originator | Volume | Location | Type | Role | Number
HE551523 -WSP - GEN - A27AR- FI - GIS - 0000

Project Ref. No.: 70052558

Revision: P01

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Kilometres

0 1

DO NOT SCALE

KEY:

- RECORDS OF AMPHIBIANS
- OPTION 1
- OPTION 3
- OPTION 5A
- 2KM DESK STUDY AREA

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATON

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made to the design hazard log).

Construction

Maintenance / Cleaning

Use

Decomissioning / Demolition

Rev.	Date	Description	By	Chk'd	App'd
P01.1	---	First Issue	---	---	---

Drawing Status: FINAL

Suitability: S0

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Project Title: REGIONAL INVESTMENT PROGRAMME
A27 ARUNDEL

Drawing Title: GCN FIGURE 3
MAP OF AMPHIBIANS
RECORDS

Scale	Drawn	Checked	Approved	Authorised
1:30,000	CB	CH	AB	PA

Original Size	Date	Date	Date	Date
A3	15/08/19	15/08/19	15/08/19	15/08/19

Drawing Number: Project | Originator | Volume
HE551523 -WSP - GEN -
A27AR- FI - GIS - 0000
Location | Type | Role | Number

Project Ref. No.: 70052558

Revision: P01

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N

Rewell Wood

Foxes Cottages

Pond 7

Slindon Common

Avisford Park House

Binsted

Avisford

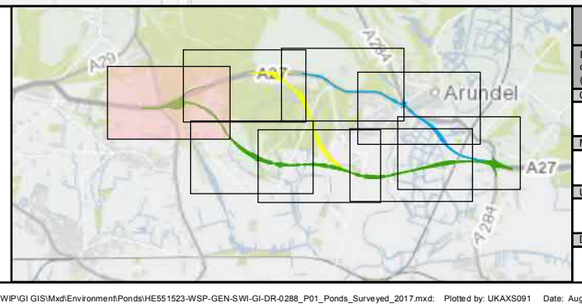
DO NOT SCALE

Metres

0 100

KEY:

- OPTION 1
- OPTION 3
- OPTION 5A
- POND SURVEYED IN 2017



SAFETY, HEALTH AND ENVIRONMENTAL INFORMATON

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made to the design hazard log).

Construction

Maintenance / Cleaning

Use

Decomissioning / Demolition

Rev.	Date	Description	By	Chk'd	App'd
P01.1	---	First Issue	---	---	---

Drawing Status: FINAL

Suitability: S0

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WC2A 1AF
Tel: +44 (0)20 7314 5000
www.wsp.com

Client: Working on behalf of highways england

Project Title: REGIONAL INVESTMENT PROGRAMME
A27 ARUNDEL BYPASS

Drawing Title: FIGURE 4:
PONDS SURVEYED IN 2017
1 OF 8

Scale	Drawn	Checked	Approved	Authorised
1:5,000	AS	CH	AB	PA
Original Size	**Date**	**Date**	**Date**	**Date**
A3	23/08/19	23/08/19	23/08/19	23/08/19

Drawing Number
Project | Originator | Volume | Location | Type | Role | Number
HE551523-WSP-GEN-SWI-GI-DR-0288

Project Ref. No.: 70052558

Revision: P01

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N

Binsted

Pond 10

Binsted Manor

The Old Rectory

Kents Cottage

Pond 12

Walberton Farm

Oakley Cottages

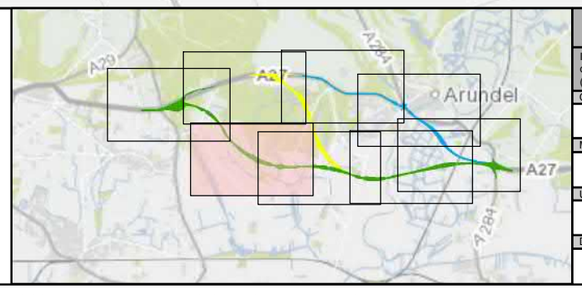
Metres

0 100

DO NOT SCALE

KEY:

- OPTION 1
- OPTION 3
- OPTION 5A
- POND SURVEYED IN 2017



SAFETY, HEALTH AND ENVIRONMENTAL INFORMATON

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Drawing Status: FINAL

Suitability: S0

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Client: Working on behalf of highways england

Project Title: REGIONAL INVESTMENT PROGRAMME
A27 ARUNDEL BYPASS

Drawing Title: FIGURE 4:
PONDS SURVEYED IN 2017
2 OF 8

Scale	Drawn	Checked	Approved	Authorised
1:5,000	AS	CH	AB	PA

Original Size	Date	Date	Date	Date
A3	23/08/19	23/08/19	23/08/19	23/08/19

Drawing Number: Project | Originator | Volume
HE551523-WSP-GEN-SWI-GI-DR-0288
Location | Type | Role | Number

Project Ref. No.: 70052558

Revision: P01

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Pond 10

Binsted Manor

Pond 31

Priory Manor

Pond 18

Pond 14

Pond 16

Pond 17

Pond 15

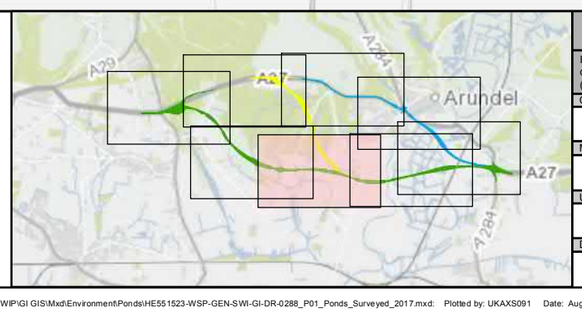
Kents Cottage

Pond 12

Broad
Green
Cottages

Metres
0 100
DO NOT SCALE

KEY:
- OPTION 1
- OPTION 3
- OPTION 5A
- POND SURVEYED IN 2017



SAFETY, HEALTH AND ENVIRONMENTAL INFORMATON

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Use

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Project Title: REGIONAL INVESTMENT PROGRAMME
A27 ARUNDEL BYPASS

Drawing Title: FIGURE 4:
PONDS SURVEYED IN 2017
3 OF 8

Scale	Drawn	Checked	Approved	Authorised
1:5,000	AS	CH	AB	PA
Original Size	Date	Date	Date	Date
A3	23/08/19	23/08/19	23/08/19	23/08/19

Drawing Number
Project | Originator | Volume | Location | Type | Role | Number
HE551523-WSP-GEN-SWI-GI-DR-0288

Project Ref. No.: 70052558
Revision: P01

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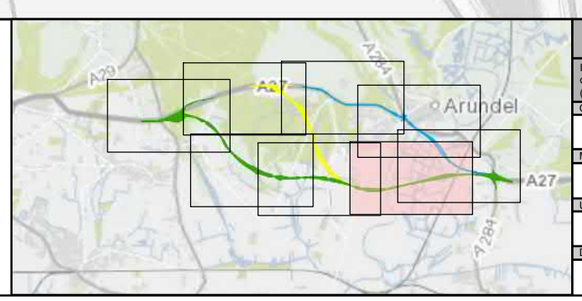
Pond 19
Pond 20
Priory Farm
Priory Manor
Pond 18
Pond 14
Pond 16
Pond 17
Pond 15
Pond 21
Pond 29
Pond 30
Pond 32

Metres
0 100
DO NOT SCALE

KEY:
- OPTION 1
- OPTION 3
- OPTION 5A
- POND SURVEYED IN 2017



SAFETY, HEALTH AND ENVIRONMENTAL INFORMATON

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Construction

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Use

Decomissioning / Demolition

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Project Title: REGIONAL INVESTMENT PROGRAMME
A27 ARUNDEL BYPASS

Drawing Title: FIGURE 4:
PONDS SURVEYED IN 2017
4 OF 8

Scale	Drawn	Checked	Approved	Authorised
1:5,000	AS	CH	AB	PA
Original Size: A3	Date: 23/08/19	Date: 23/08/19	Date: 23/08/19	Date: 23/08/19

Drawing Number: Project | Originator | Volume | Location | Type | Role | Number
HE551523-WSP-GEN-SWI-GI-DR-0288

Project Ref. No.: 70052558
Revision: P01

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N

Pond 19

Pond 20

Priory Farm

Pond 21

Pond 29

Pond 30

Pond 32

Broomhurst Farm

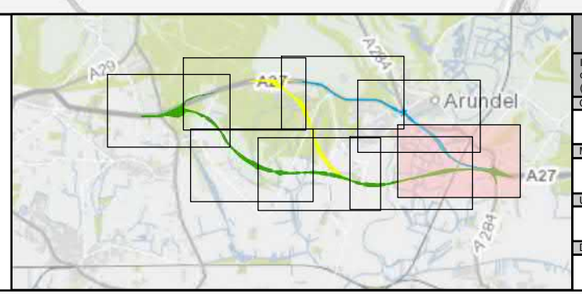
Metres

0 100

DO NOT SCALE

KEY:

- OPTION 1
- OPTION 3
- OPTION 5A
- POND SURVEYED IN 2017



SAFETY, HEALTH AND ENVIRONMENTAL INFORMATON

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Construction

Maintenance / Cleaning

Use

Decommissioning / Demolition

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P01.1	---	First Issue	---	---	---

Drawing Status: FINAL

Suitability: S0

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Project Title: REGIONAL INVESTMENT PROGRAMME
A27 ARUNDEL BYPASS

Drawing Title: FIGURE 4:
PONDS SURVEYED IN 2017
5 OF 8

Scale	Drawn	Checked	Approved	Authorised
1:5,000	AS	CH	AB	PA

Original Size	Date	Date	Date	Date
A3	23/08/19	23/08/19	23/08/19	23/08/19

Drawing Number: Project | Originator | Volume | Location | Type | Role | Number
HE551523-WSP-GEN-SWI-GI-DR-0288

Project Ref. No.: 70052558

Revision: P01

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N

Goblestubb's Copse

Rewell Wood

Pond 25

Havenwood Park

Pond 26

Paine's Wood

Foxes Cottages

Pond 7

Pinewoods

Binsted Wood

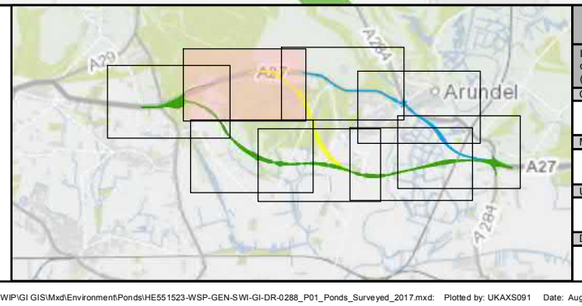
Metres

DO NOT SCALE

0 100

KEY:

- OPTION 1
- OPTION 3
- OPTION 5A
- POND SURVEYED IN 2017



SAFETY, HEALTH AND ENVIRONMENTAL INFORMATON

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Construction

Maintenance / Cleaning

Use

Decomissioning / Demolition

Rev.	Date	Description	By	Chk'd	App'd
P01.1	---	First Issue	---	---	---

Drawing Status: FINAL

Suitability: S0

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Project Title: REGIONAL INVESTMENT PROGRAMME
A27 ARUNDEL BYPASS

Drawing Title: FIGURE 4:
PONDS SURVEYED IN 2017
6 OF 8

Scale	Drawn	Checked	Approved	Authorised
1:5,000	AS	CH	AB	PA
Original Size	**Date**	**Date**	**Date**	**Date**
A3	23/08/19	23/08/19	23/08/19	23/08/19

Drawing Number: Project | Originator | Volume | Location | Type | Role | Number
HE551523-WSP-GEN-SWI-GI-DR-0288

Project Ref. No.: 70052558

Revision: P01

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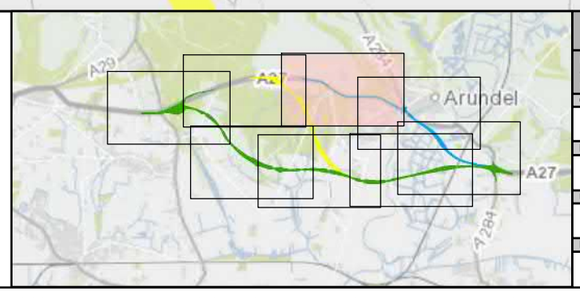
N

Pond 27
Pond 28
Pond 23
Pond 24
Pond 22
Park Farm
The Arundel Lodge
Scotland Barn
The Waterwoods
Stewards Copse
Pinewoods

Metres
0 100
DO NOT SCALE

KEY:
- OPTION 1
- OPTION 3
- OPTION 5A
- POND SURVEYED IN 2017



SAFETY, HEALTH AND ENVIRONMENTAL INFORMATON

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Construction

Maintenance / Cleaning

Use

Decommissioning / Demolition

Rev.	Date	Description	By	Chk'd	App'd
P01.1	---	First Issue	---	---	---

Drawing Status: FINAL
Suitability: S0

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Project Title: REGIONAL INVESTMENT PROGRAMME
A27 ARUNDEL BYPASS

Drawing Title: FIGURE 4:
PONDS SURVEYED IN 2017
7 OF 8

Scale	Drawn	Checked	Approved	Authorised
1:5,000	AS	CH	AB	PA
Original Size: A3	Date: 23/08/19	Date: 23/08/19	Date: 23/08/19	Date: 23/08/19

Drawing Number: Project | Originator | Volume | Location | Type | Role | Number
HE551523-WSP-GEN-SWI-GI-DR-0288

Project Ref. No.: 70052558

Revision: P01

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Pond 23

Pond 24

Pond 22

The Waterwoods

ARUNDEL

Pond 19

Pond 20

Priory Farm

N

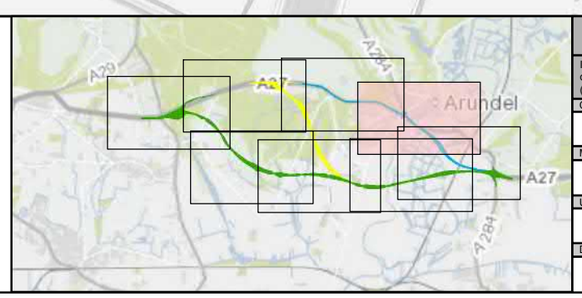
Metres

0 100

DO NOT SCALE

KEY:

- OPTION 1
- OPTION 3
- OPTION 5A
- POND SURVEYED IN 2017



SAFETY, HEALTH AND ENVIRONMENTAL INFORMATON

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Construction

Maintenance / Cleaning

Use

Decomissioning / Demolition

Rev.	Date	Description	By	Chk'd	App'd
P01.1	---	First Issue	---	---	---

Drawing Status: FINAL

Suitability: S0

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Client: Working on behalf of highways england

Project Title: REGIONAL INVESTMENT PROGRAMME
A27 ARUNDEL BYPASS

Drawing Title: FIGURE 4:
PONDS SURVEYED IN 2017
8 OF 8

Scale	Drawn	Checked	Approved	Authorised
1:5,000	AS	CH	AB	PA
Original Size	**Date**	**Date**	**Date**	**Date**
A3	23/08/19	23/08/19	23/08/19	23/08/19

Drawing Number
Project | Originator | Volume | Location | Type | Role | Number
HE551523-WSP-GEN-SWI-GI-DR-0288

Project Ref. No.: 70052558

Revision: P01

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Rewell Wood

Foxes Cottages

Slindon Common

Avisford Park House

Binsted

Avisford

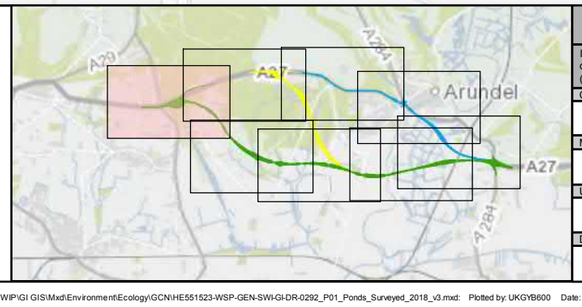
Metres

0 100

DO NOT SCALE

KEY:

- OPTION 1
- OPTION 3
- OPTION 5A
- POND SURVEYED IN 2018



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Maintenance / Cleaning

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Drawing Status: FINAL

Suitability: S0

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Client: Working on behalf of highways england

Project Title: REGIONAL INVESTMENT PROGRAMME
A27 ARUNDEL BYPASS

Drawing Title: FIGURE 5:
PONDS SURVEYED IN 2018
1 OF 8

Scale	Drawn	Checked	Approved	Authorised
1:5,000	GB	CH	AB	PA
Original Size	**Date**	**Date**	**Date**	**Date**
A3	27/01/20	27/01/20	27/01/20	27/01/20

Drawing Number: Project | Originator | Volume | Location | Type | Role | Number
HE551523-WSP-GEN-SWI-GI-DR-0288

Project Ref. No.: 70052558

Revision: P01

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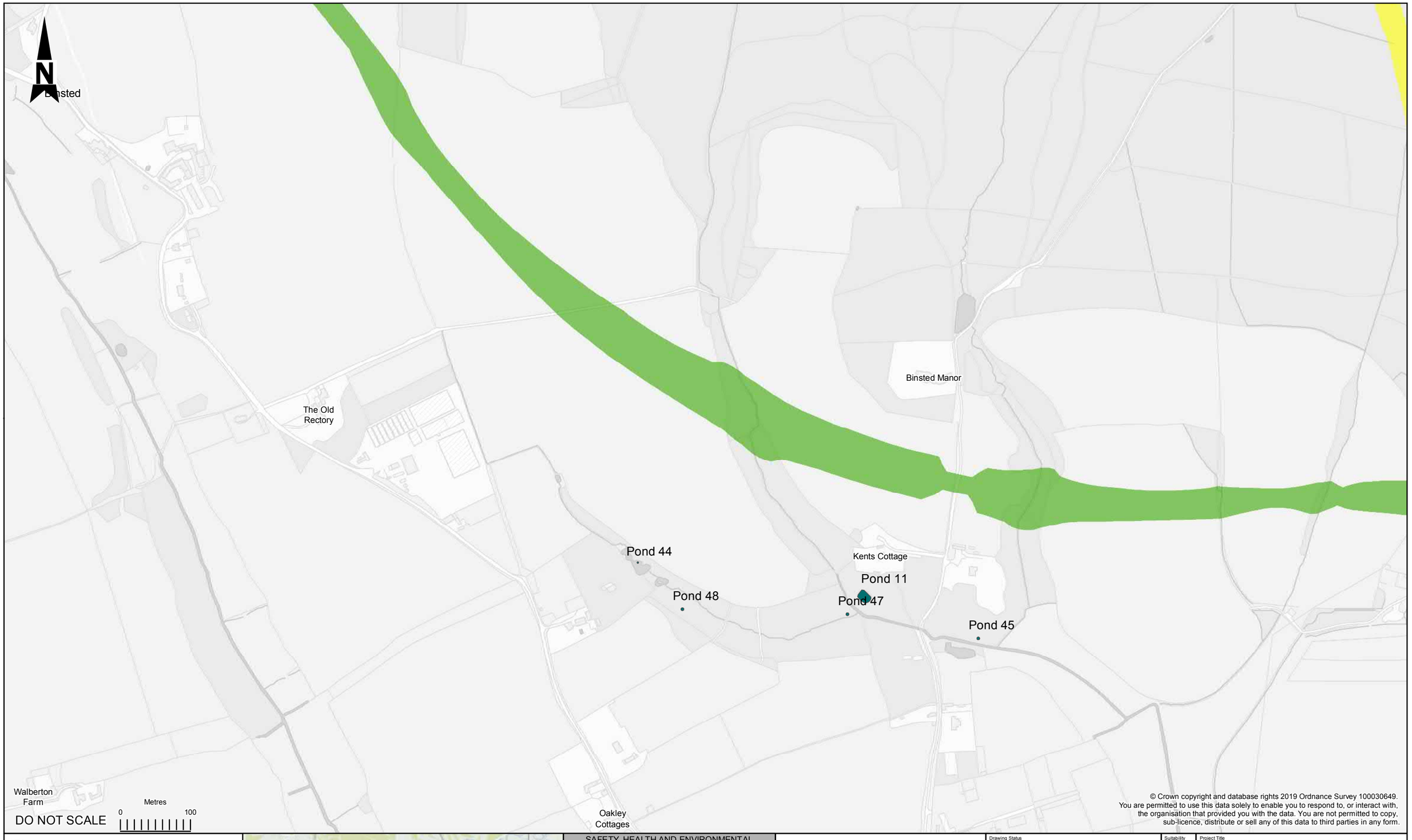
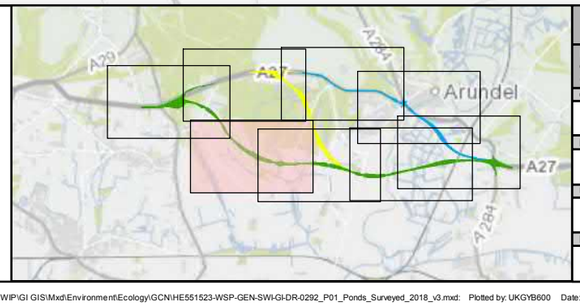


KEY:

- OPTION 1
- OPTION 3
- OPTION 5A
- POND SURVEYED IN 2018



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Construction

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P01.1	---	First Issue	---	---	---

Drawing Status: FINAL

Suitability: S0

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Project Title: REGIONAL INVESTMENT PROGRAMME
A27 ARUNDEL BYPASS

Drawing Title: FIGURE 5:
PONDS SURVEYED IN 2018
2 OF 8

Scale	Drawn	Checked	Approved	Authorised
1:5,000	GB	CH	AB	PA

Original Size	Date	Date	Date	Date
A3	27/01/20	27/01/20	27/01/20	27/01/20

Drawing Number Project | Originator | Volume
HE551523-WSP-GEN-SWI-GI-DR-0288
Location | Type | Role | Number

Project Ref. No.: 70052558

Revision: P01

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Binsted Manor

Priory Manor

Kents Cottage

Pond 11

Pond 47

Pond 45

Broad Green Cottages

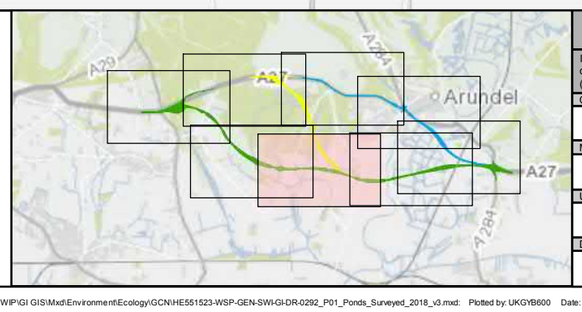
Metres

0 100

DO NOT SCALE

KEY:

- OPTION 1
- OPTION 3
- OPTION 5A
- POND SURVEYED IN 2018



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Construction

Maintenance / Cleaning

Use

Decomissioning / Demolition

Rev.	Date	Description	By	Chk'd	App'd
P01.1	---	First Issue	---	---	---

Drawing Status: FINAL

Suitability: S0

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Client: Working on behalf of highways england

Project Title: REGIONAL INVESTMENT PROGRAMME
A27 ARUNDEL BYPASS

Drawing Title: FIGURE 5:
PONDS SURVEYED IN 2018
3 OF 8

Scale	Drawn	Checked	Approved	Authorised
1:5,000	GB	CH	AB	PA
Original Size: A3	Date: 27/01/20	Date: 27/01/20	Date: 27/01/20	Date: 27/01/20

Drawing Number: Project | Originator | Volume | Location | Type | Role | Number
HE551523-WSP-GEN-SWI-GI-DR-0288

Project Ref. No.: 70052558

Revision: P01

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Pond 19
Pond 20
Priory Farm
Pond 51
Priory Manor
Pond 21
Pond 29
Pond 30
Pond 32

Metres
DO NOT SCALE 0 100

KEY:
- OPTION 1
- OPTION 3
- OPTION 5A
- POND SURVEYED IN 2018

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATON

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Rev.	Date	Description	By	Chk'd	App'd
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Drawing Status: FINAL
Suitability: S0

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Client: Working on behalf of highways england

Project Title: REGIONAL INVESTMENT PROGRAMME
A27 ARUNDEL BYPASS

Drawing Title: FIGURE 5:
PONDS SURVEYED IN 2018
4 OF 8

Scale	Drawn	Checked	Approved	Authorised
1:5,000	GB	CH	AB	PA

Original Size	Date	Date	Date	Date
A3	27/01/20	27/01/20	27/01/20	27/01/20

Drawing Number: Project | Originator | Volume | Location | Type | Role | Number
HE551523-WSP-GEN-SWI-GI-DR-0288

Project Ref. No.: 70052558
Revision: P01

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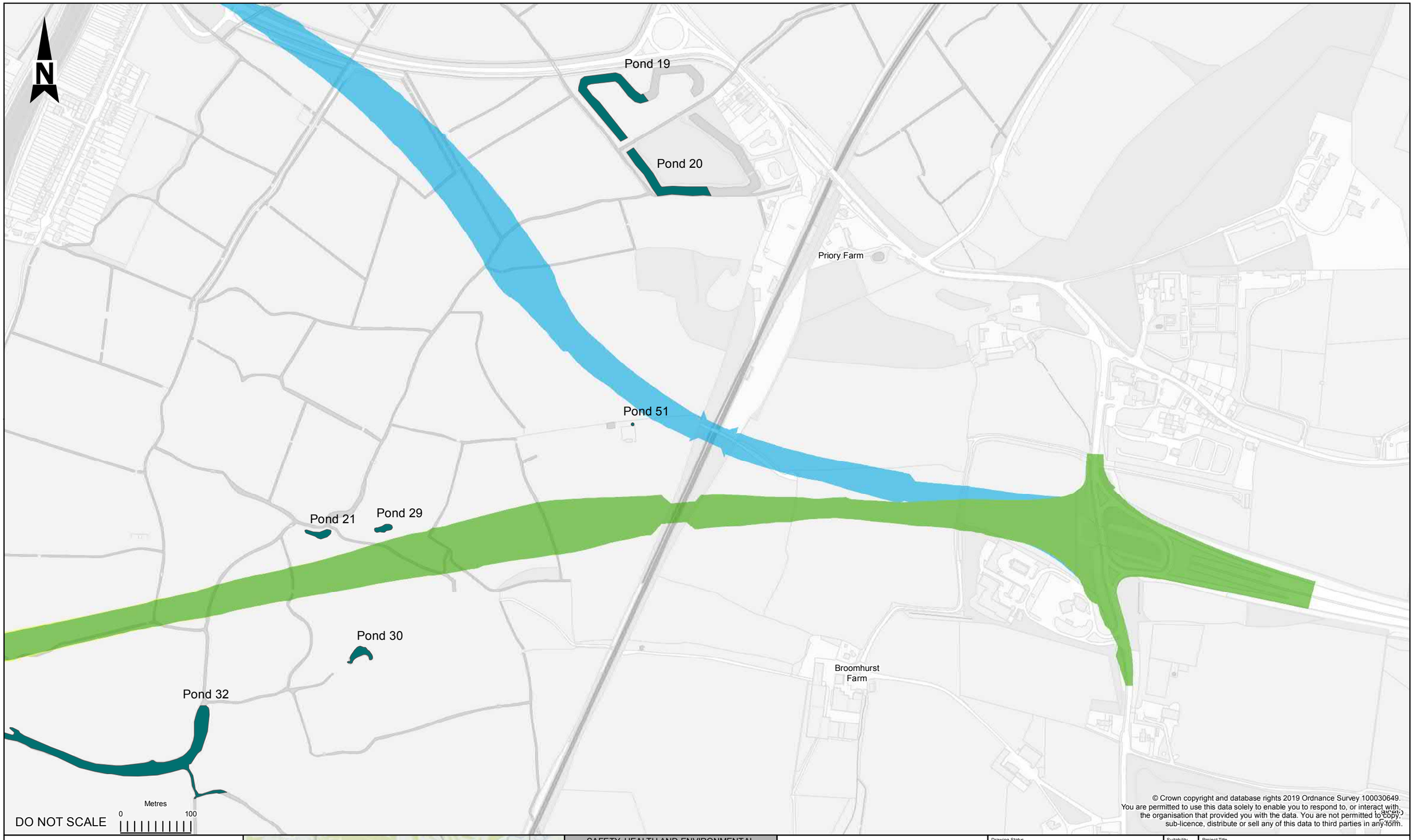
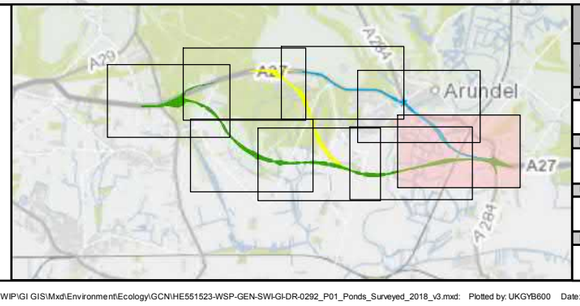


KEY:

- OPTION 1
- OPTION 3
- OPTION 5A
- POND SURVEYED IN 2018



SAFETY, HEALTH AND ENVIRONMENTAL INFORMATON

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made to the design hazard log).

Construction

Maintenance / Cleaning

Use

Decomissioning / Demolition

Rev.	Date	Description	By	Chk'd	App'd
P01.1	---	First Issue	---	---	---

Drawing Status: FINAL

Suitability: S0

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Tel: +44 (0)20 7314 5000
www.wsp.com

Client: Working on behalf of highways england

Project Title: REGIONAL INVESTMENT PROGRAMME
A27 ARUNDEL BYPASS

Drawing Title: FIGURE 5:
PONDS SURVEYED IN 2018
5 OF 8

Scale	Drawn	Checked	Approved	Authorised
1:5,000	GB	CH	AB	PA
Original Size: A3	Date: 27/01/20	Date: 27/01/20	Date: 27/01/20	Date: 27/01/20

Drawing Number: HE551523-WSP-GEN-SWI-GI-DR-0288
(Project | Originator | Volume | Location | Type | Role | Number)

Project Ref. No.: 70052558

Revision: P01

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Goblestubb's Copse

Rewell Wood

Havenwood Park

Paine's Wood

Foxes Cottages

Pinewoods

Binsted Wood

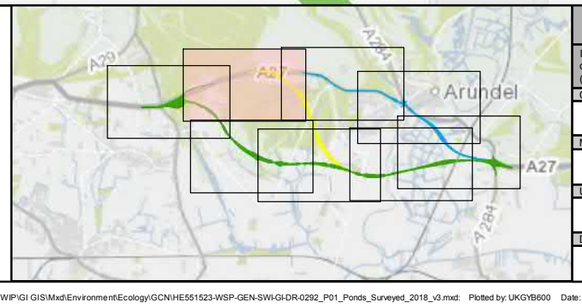
Metres

0 100

DO NOT SCALE

KEY:

- OPTION 1
- OPTION 3
- OPTION 5A
- POND SURVEYED IN 2018



SAFETY, HEALTH AND ENVIRONMENTAL INFORMATON

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made to the design hazard log).

Construction

Maintenance / Cleaning

Use

Decomissioning / Demolition

Rev.	Date	Description	By	Chk'd	App'd
P01.1	---	First Issue	---	---	---

Drawing Status: FINAL

Suitability: S0

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Client: Working on behalf of highways england

Project Title: REGIONAL INVESTMENT PROGRAMME
A27 ARUNDEL BYPASS

Drawing Title: FIGURE 5:
PONDS SURVEYED IN 2018
6 OF 8

Scale	Drawn	Checked	Approved	Authorised
1:5,000	GB	CH	AB	PA
Original Size	**Date**	**Date**	**Date**	**Date**
A3	27/01/20	27/01/20	27/01/20	27/01/20

Drawing Number: Project | Originator | Volume | Location | Type | Role | Number
HE551523-WSP-GEN-SWI-GI-DR-0288

Project Ref. No.: 70052558

Revision: P01

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Park Farm

Pond 50

The Arundel Lodge

Scotland Barn

Pond 23

Pond 24

Pond 22

Park Bottom

The Waterwoods

Stewards Copse

Pinewoods

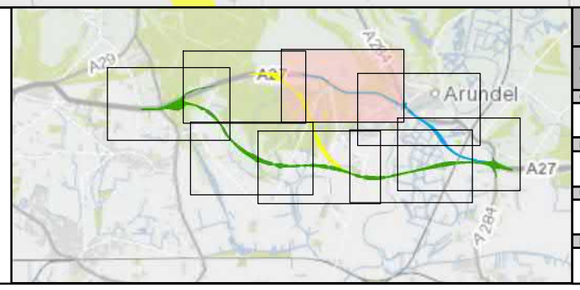
Metres

DO NOT SCALE

0 100

KEY:

- OPTION 1
- OPTION 3
- OPTION 5A
- POND SURVEYED IN 2018



SAFETY, HEALTH AND ENVIRONMENTAL INFORMATON

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Construction

Maintenance / Cleaning

Use

Decomissioning / Demolition

Rev.	Date	Description	By	Chk'd	App'd
P01.1	---	First Issue	---	---	---

Drawing Status: FINAL

Suitability: S0

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Project Title: REGIONAL INVESTMENT PROGRAMME
A27 ARUNDEL BYPASS

Drawing Title: FIGURE 5:
PONDS SURVEYED IN 2018
7 OF 8

Scale	Drawn	Checked	Approved	Authorised
1:5,000	GB	CH	AB	PA
Original Size	Date	Date	Date	Date
A3	27/01/20	27/01/20	27/01/20	27/01/20

Drawing Number: Project | Originator | Volume | Location | Type | Role | Number
HE551523-WSP-GEN-SWI-GI-DR-0288

Project Ref. No.: 70052558

Revision: P01

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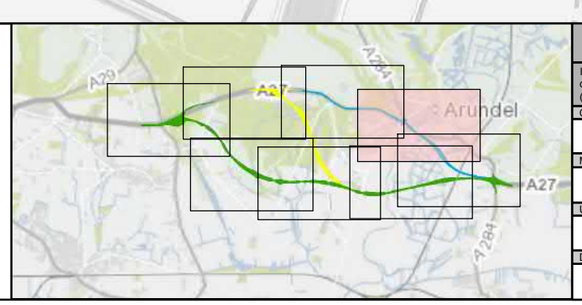
Pond 23
Pond 24
Pond 22
Park Bottom
The Waterwoods
ARUNDEL
Pond 19
Pond 20
Priory Farm

DO NOT SCALE

Metres
0 100

KEY:
- OPTION 1
- OPTION 3
- OPTION 5A
- POND SURVEYED IN 2018



SAFETY, HEALTH AND ENVIRONMENTAL INFORMATON

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Construction

Maintenance / Cleaning

Use

Decomissioning / Demolition

Rev.	Date	Description	By	Chk'd	App'd
P01.1	---	First Issue	---	---	---

Drawing Status: FINAL
Suitability: S0

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Client: Working on behalf of highways england

Project Title: REGIONAL INVESTMENT PROGRAMME
A27 ARUNDEL BYPASS

Drawing Title: FIGURE 5:
PONDS SURVEYED IN 2018
8 OF 8

Scale	Drawn	Checked	Approved	Authorised
1:5,000	GB	CH	AB	PA
Original Size	**Date**	**Date**	**Date**	**Date**
A3	27/01/20	27/01/20	27/01/20	27/01/20

Drawing Number
Project | Originator | Volume
HE551523-WSP-GEN-SWI-GI-DR-0288
Location | Type | Role | Number

Project Ref. No.: 70052558
Revision: P01

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KEY:

- OPTION 1
- OPTION 3
- OPTION 5A

WATERCOURSES

- DSI ONLY
- DSI + eDNA
- DESICCATED
- REQUIRED SURVEY
- SURVEYED IN 2017

DO NOT SCALE

Kilometres 0 1

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATON
In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made to the design hazard log).
Construction
Maintenance / Cleaning
Use
Decomissioning / Demolition

Rev.	Date	Description	By	Chk'd	App'd
P01.1	---	First Issue	---	---	---

Drawing Status: FINAL

Suitability: S0

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Client: Working on behalf of highways england

Project Title: REGIONAL INVESTMENT PROGRAMME
A27 ARUNDEL BYPASS

Drawing Title: FIGURE 6:
OTHER WATERBODIES

Scale	Drawn	Checked	Aproved	Authorised
1:16,000	GB	CH	AB	PA
Original Size: A3	Date: 27/01/20	Date: 27/01/20	Date: 27/01/20	Date: 27/01/20

Drawing Number: HE551523-WSP-GEN-SWI-GI-DR-0293
Project | Originator | Volume | Location | Type | Role | Number

Project Ref. No.: 70052558

Revision: P01

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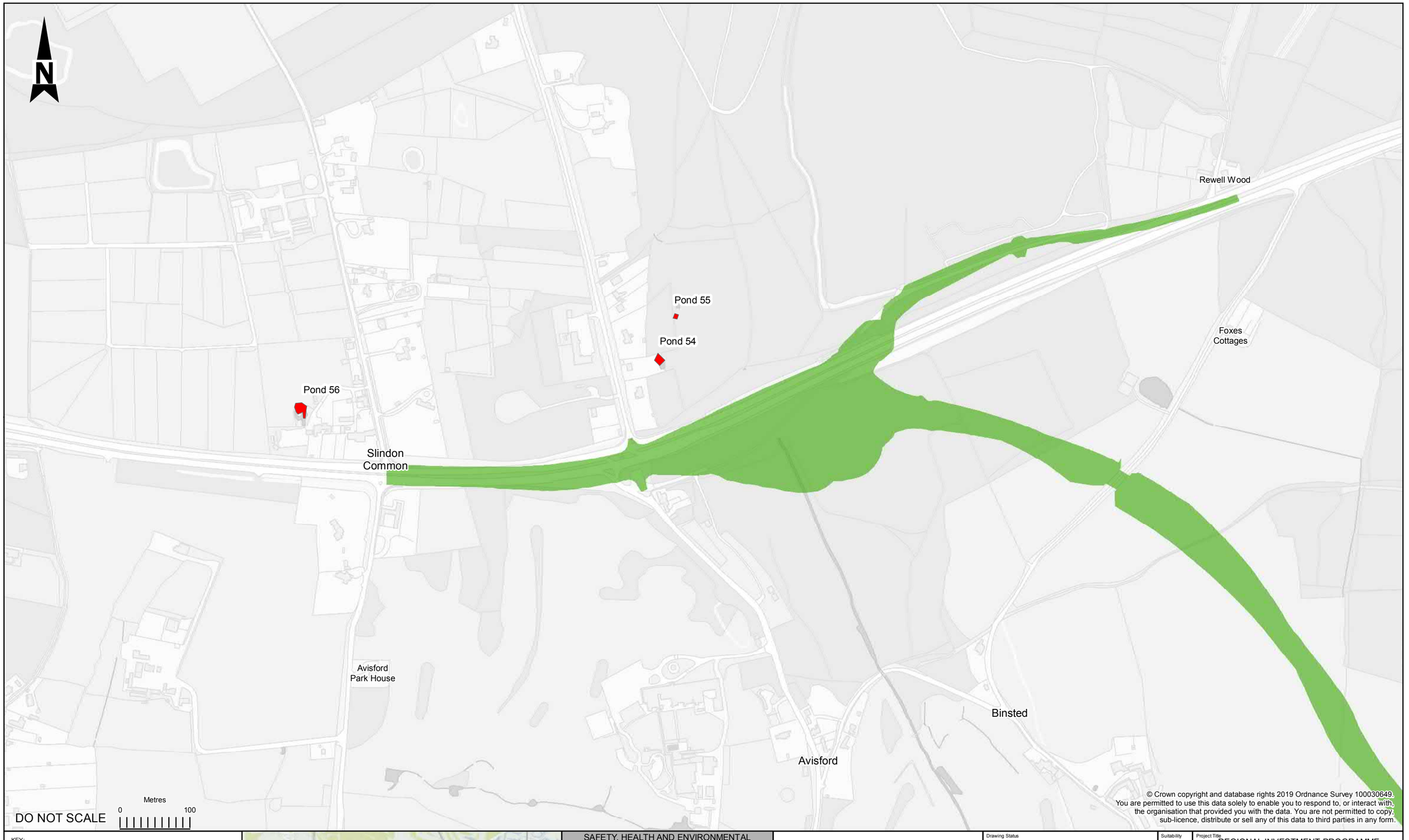
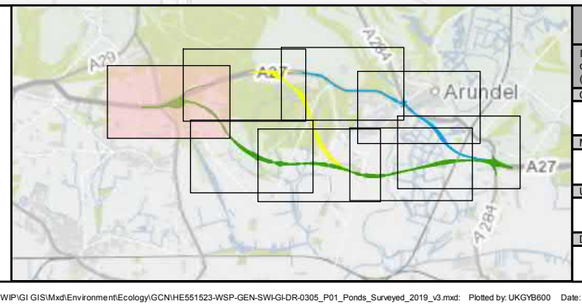


KEY:

- OPTION 1
- OPTION 3
- OPTION 5A
- POND TO BE SURVEYED



SAFETY, HEALTH AND ENVIRONMENTAL INFORMATON

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made to the design hazard log).

Construction

Maintenance / Cleaning

Use

Decomissioning / Demolition

Rev.	Date	Description	By	Chk'd	App'd
P01.1	---	First Issue	---	---	---

Drawing Status: FINAL

Suitability: S0

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Client: Working on behalf of highways england

Project Title: REGIONAL INVESTMENT PROGRAMME
A27 ARUNDEL BYPASS

Drawing Title: FIGURE 7:
PONDS TO BE SURVEYED
1 OF 8

Scale	Drawn	Checked	Approved	Authorised
1:5,000	GB	CH	AB	PA
Original Size	**Date**	**Date**	**Date**	**Date**
A3	27/01/20	27/01/20	27/01/20	27/01/20

Drawing Number: Project | Originator | Volume | Location | Type | Role | Number
HE551523-WSP-GEN-SWI-GI-DR-0305

Project Ref. No.: 70052558

Revision: P01

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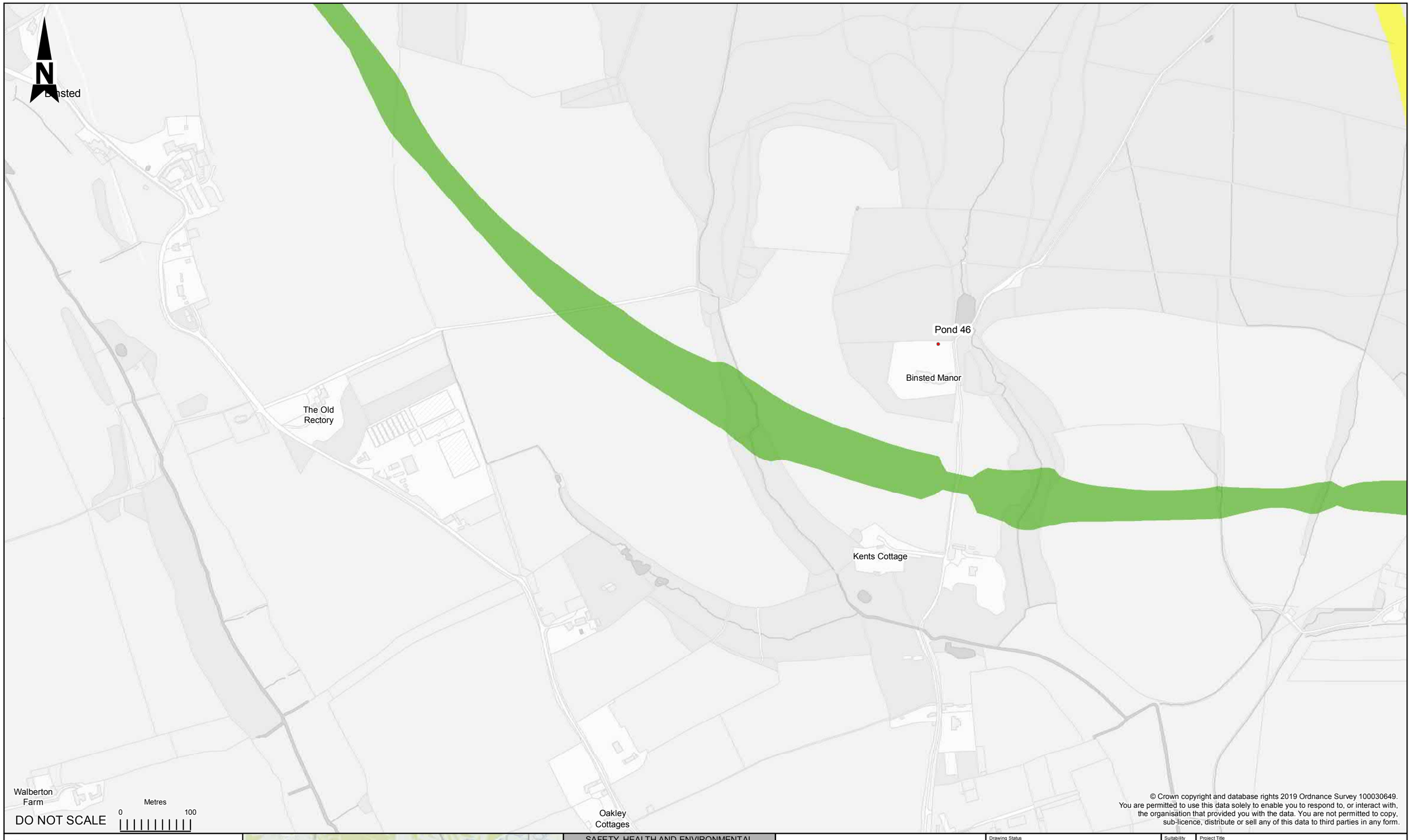

KEY:

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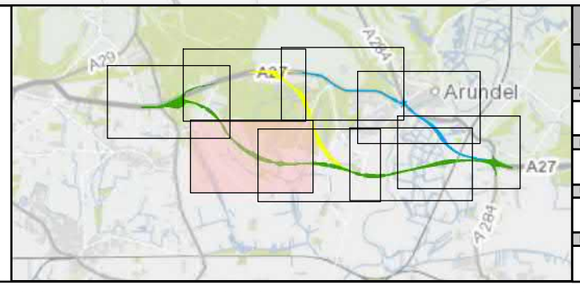
- OPTION 3
- OPTION 5A
- POND TO BE SURVEYED



SAFETY, HEALTH AND ENVIRONMENTAL INFORMATON

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made to the design hazard log).

Construction

Maintenance / Cleaning

Use

Decomissioning / Demolition

Rev.	Date	Description	By	Chk'd	App'd
P01.1	---	First Issue	---	---	---

Drawing Status: FINAL

Suitability: S0

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Client: Working on behalf of highways england

Project Title: REGIONAL INVESTMENT PROGRAMME
A27 ARUNDEL BYPASS

Drawing Title: FIGURE 7:
PONDS TO BE SURVEYED
2 OF 8

Scale	Drawn	Checked	Approved	Authorised
1:5,000	GB	CH	AB	PA
Original Size	**Date**	**Date**	**Date**	**Date**
A3	27/01/20	27/01/20	27/01/20	27/01/20

Drawing Number Project | Originator | Volume | Location | Type | Role | Number: HE551523-WSP-GEN-SWI-GI-DR-0305

Project Ref. No.: 70052558

Revision: P01

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Pond 46

Binsted Manor

Kents Cottage

Broad Green Cottages

Priory Manor

Pond 57

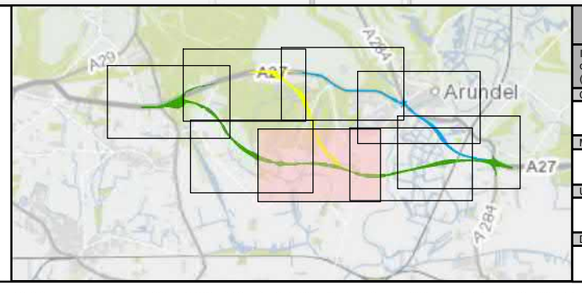
Pond 35

Metres

DO NOT SCALE 0 100

KEY:

- OPTION 1
- OPTION 3
- OPTION 5A
- POND TO BE SURVEYED



SAFETY, HEALTH AND ENVIRONMENTAL INFORMATON

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Construction

Maintenance / Cleaning

Use

Decomissioning / Demolition

Rev.	Date	Description	By	Chk'd	App'd
P01.1	---	First Issue	---	---	---

Drawing Status: FINAL

Suitability: S0

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Project Title: REGIONAL INVESTMENT PROGRAMME
A27 ARUNDEL BYPASS

Drawing Title: FIGURE 7:
PONDS TO BE SURVEYED
3 OF 8

Scale	Drawn	Checked	Approved	Authorised
1:5,000	GB	CH	AB	PA
Original Size: A3	Date: 27/01/20	Date: 27/01/20	Date: 27/01/20	Date: 27/01/20

Drawing Number: Project | Originator | Volume | Location | Type | Role | Number
HE551523-WSP-GEN-SWI-GI-DR-0305

Project Ref. No.: 70052558

Revision: P01

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Priory Farm

Pond 35

Priory Manor

Pond 57

Metres

DO NOT SCALE

0 100

KEY:

- OPTION 1
- OPTION 3
- OPTION 5A
- POND TO BE SURVEYED

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATON

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Construction

Maintenance / Cleaning

Use

Decomissioning / Demolition

Rev.	Date	Description	By	Chk'd	App'd
P01.1	---	First Issue	---	---	---

Drawing Status: FINAL

Suitability: S0

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Project Title: REGIONAL INVESTMENT PROGRAMME
A27 ARUNDEL BYPASS

Drawing Title: FIGURE 7:
PONDS TO BE SURVEYED
4 OF 8

Scale	Drawn	Checked	Approved	Authorised
1:5,000	GB	CH	AB	PA

Original Size	Date	Date	Date	Date
A3	27/01/20	27/01/20	27/01/20	27/01/20

Drawing Number: Project | Originator | Volume | Location | Type | Role | Number
HE551523-WSP-GEN-SWI-GI-DR-0305

Project Ref. No.: 70052558

Revision: P01

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N

Priory Farm

Pond 52

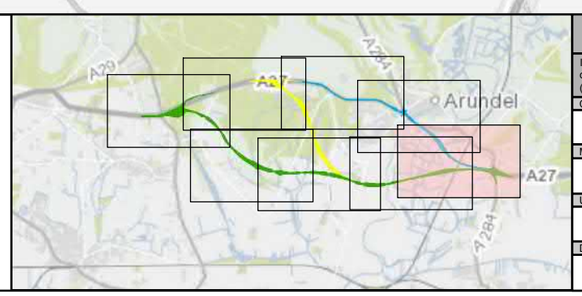
Broomhurst Farm

DO NOT SCALE

Metres
0 100

KEY:

- OPTION 1
- OPTION 3
- OPTION 5A
- POND TO BE SURVEYED



SAFETY, HEALTH AND ENVIRONMENTAL INFORMATON

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Construction

Maintenance / Cleaning

Use

Decomissioning / Demolition

Rev.	Date	Description	By	Chk'd	App'd
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Drawing Status: FINAL

Suitability: S0

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Project Title: REGIONAL INVESTMENT PROGRAMME
A27 ARUNDEL BYPASS

Drawing Title: FIGURE 7:
PONDS TO BE SURVEYED
5 OF 8

Scale	Drawn	Checked	Approved	Authorised
1:5,000	GB	CH	AB	PA
Original Size: A3	Date: 27/01/20	Date: 27/01/20	Date: 27/01/20	Date: 27/01/20

Drawing Number Project | Originator | Volume | Location | Type | Role | Number
HE551523-WSP-GEN-SWI-GI-DR-0305

Project Ref. No.: 70052558

Revision: P01

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Goblestubb's Copse

Rewell Wood

Havenwood Park

Paine's Wood

Pond 26

Pond 39

Pond 40

Foxes Cottages

Pinewoods

Binsted Wood

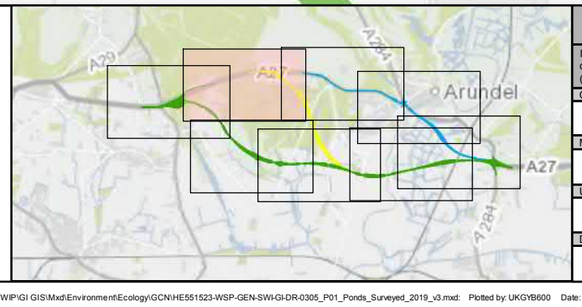
Metres

0 100

DO NOT SCALE

KEY:

- OPTION 1
- OPTION 3
- OPTION 5A
- POND TO BE SURVEYED



SAFETY, HEALTH AND ENVIRONMENTAL INFORMATON

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Construction

Maintenance / Cleaning

Use

Decomissioning / Demolition

Rev.	Date	Description	By	Chk'd	App'd
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Drawing Status: FINAL

Suitability: S0

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Client: Working on behalf of highways england

Project Title: REGIONAL INVESTMENT PROGRAMME
A27 ARUNDEL BYPASS

Drawing Title: FIGURE 7:
PONDS TO BE SURVEYED
6 OF 8

Scale	Drawn	Checked	Approved	Authorised
1:5,000	GB	CH	AB	PA
Original Size	**Date**	**Date**	**Date**	**Date**
A3	27/01/20	27/01/20	27/01/20	27/01/20

Drawing Number: Project | Originator | Volume | Location | Type | Role | Number
HE551523-WSP-GEN-SWI-GI-DR-0305

Project Ref. No.: 70052558

Revision: P01

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Park Farm

Pond 28

Pond 50

The Arundel Lodge

Scotland Barn

The Waterwoods

Park Bottom

Pond 39

Pond 36

Pond 37

Pond 43

Pond 42

Pond 40

Stewards Copse

Pinewoods

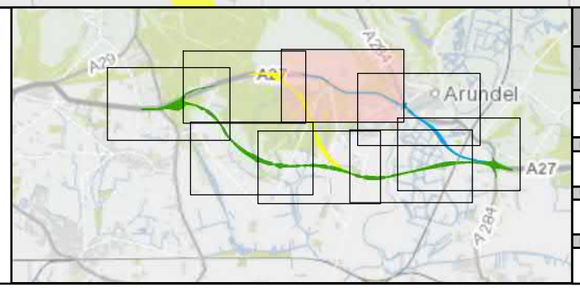
Metres

DO NOT SCALE

0 100

KEY:

- OPTION 1
- OPTION 3
- OPTION 5A
- POND TO BE SURVEYED



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Maintenance / Cleaning

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Decomissioning / Demolition

Rev.	Date	Description	By	Chk'd	App'd
P01.1	---	First Issue	---	---	---

Drawing Status: FINAL

Suitability: S0

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Client: Working on behalf of highways england

Project Title: REGIONAL INVESTMENT PROGRAMME
A27 ARUNDEL BYPASS

Drawing Title: FIGURE 7:
PONDS TO BE SURVEYED
7 OF 8

Scale	Drawn	Checked	Approved	Authorised
1:5,000	GB	CH	AB	PA
Original Size: A3	Date: 27/01/20	Date: 27/01/20	Date: 27/01/20	Date: 27/01/20

Drawing Number: Project | Originator | Volume | Location | Type | Role | Number
HE551523-WSP-GEN-SWI-GI-DR-0305

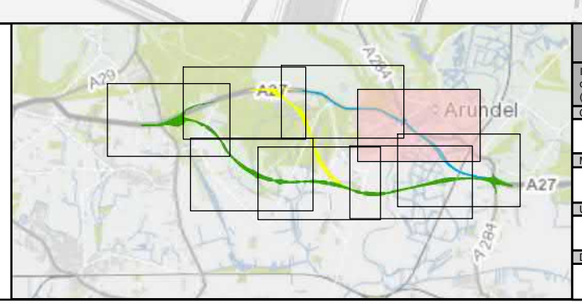
Project Ref. No.: 70052558

Revision: P01

Path: \\uk.wspgroup.com\central data\Projects\700525xx\70052558 - CDF A27 AB Further Consultation\02 WIP\GI GIS\Mxd\Environment\Ecology\GCN\HE551523-WSP-GEN-SWI-GI-DR-0305_P01_Ponds_Surveyed_2019_v3.mxd: Plotted by: UKGYB600 Date: Jan 27, 2020 - 06:08PM

KEY:

- OPTION 1
- OPTION 3
- OPTION 5A
- POND TO BE SURVEYED



SAFETY, HEALTH AND ENVIRONMENTAL INFORMATON

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made to the design hazard log).

Construction

Maintenance / Cleaning

Use

Decomissioning / Demolition

Rev.	Date	Description	By	Chk'd	App'd
P01.1	---	First Issue	---	---	---

Drawing Status: FINAL

Suitability: S0

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A27 ARUNDEL BYPASS

Drawing Title: FIGURE 7:
PONDS TO BE SURVEYED
8 OF 8

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Original Size	**Date**	**Date**	**Date**	**Date**
A3	27/01/20	27/01/20	27/01/20	27/01/20

Drawing Number
Project | Originator | Volume
HE551523-WSP-GEN-SWI-GI-DR-0305
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Appendix A - Photographs of Waterbodies

Pond ref.	Image	Description / Comment
10415_AA_TE_PD7_P1_110517		Farm pond.
10685_AA_TE_PD10_P1_120517		Woodland pond.
10735_AA_TE_PD12_P1_110517		Woodland pond.

Pond ref.	Image	Description / Comment
11250_AA_TE_PD14_P1_150517		Residential pond with a dam in middle separating the two sides.
11250_AA_TE_PD15_P1_150517		Residential pond.
11250_AA_TE_PD16_P1_150517		Residential pond.

Pond ref.	Image	Description / Comment
11250_AA_TE_PD17_P1_150517		Residential pond
11445_AA_TE_PD18_P1_150517		Residential pond
11765_AA_TE_PD19_P1_160517		Fish farm / stocked with fish as a fishing pond.

Pond ref.	Image	Description / Comment
11765_AA_TE_PD20_P1_160517		Fish farm / stocked with fish as a fishing pond.
12260_AA_TE_PD21_P1_160517		Farm pond – dried out with reed and rush growing from pond footprint.
10860_AA_TE_PD22_P1_150517		Fish farm / stocked with fish as a fishing pond.

Pond ref.	Image	Description / Comment
10860_AA_TE_PD23_P1_150517		Fish farm / stocked with fish as a fishing pond.
10860_AA_TE_PD24_P1_150517		Fish farm / stocked with fish as a fishing pond.
10490_AA_TE_PD25_P1_120517		Woodland pond.

Pond ref.	Image	Description / Comment
10710_AA_TE_PD26_P1_120517		Woodland pond.
10955_AA_TE_PD27_P1_120517		Woodland pond.
10940_AA_TE_PD28_P1_120517		Woodland pond.

Pond ref.	Image	Description / Comment
11765_AA_TE_PD29_P1_160517		Farm pond – dry pond. Vegetation growing in pond footprint.
12260_AA_TE_PD30_P1_160517		Farm pond – pond dry.
10765_AA_TE_PD31_P1_170517		Woodland pond – surrounding land is arable.

Pond ref.	Image	Description / Comment
11765_AA_TE_PD32_P1_160517		Farm pond.
12275_AA_TE_DT13_P1_260617		Ditch.
12275_AA_TE_DT14_P1_260617		Ditch.

Pond ref.	Image	Description / Comment
10490_AE_CH_AQ067_P1_150318		Ditch.
10490_AE_CH_AQ078_P2_150318		Ditch.

Pond ref.	Image	Description / Comment
10615_AE_CH_PD44_140318		Pond (Waterfowl present)
10615_AE_CH_PD48_P2_150318		Pond
10630_AE_CH_PD47_P2_150318		Pond

Pond ref.	Image	Description / Comment
10685_AE_CH_AQ066_P2_150318		Ditch
10685_AE_CH_AQ102_P1_150318		Ditch

Pond ref.	Image	Description / Comment
10735_AE_CH_PD45_P2_150318		Pond
10860_AE_CH_PD22_P2_150318		Pond
10860_AE_CH_PD23_P1_150318		Pond
10860_AE_CH_PD24_P1_150318		Pond

Pond ref.	Image	Description / Comment
~~10860_AE_CH_PD49_P1_150318~~		~~Pond~~
10905_AE_CH_PD50_P1_150318		Pond
10940_AE_CH_PD28_P1_150318		Pond

Pond ref.	Image	Description / Comment
12670_AE_CH_AQ064_P3_150318		Ditch
12736_AE_CH_AQ100_P1_150318		Ditch
12765_AE_CH_PD11_P1_150318		Pond

Pond ref.	Image	Description / Comment
11765_AE_CH_PD51_P1_150318		Pond

Appendix B - HSI & DSI Calculations and Raw Data 2017 & 2018

Pond Ref.	S1: Geographic Location	S2: Waterbody Area	S3: Water Body Permanence	S4: Water Quality	S5: % Shade (1m From Bank)	S6: Impact Of Waterfowl	S7: Fish Stocks	S8: No. Of Waterbodies	S9: Terrestrial Habitat	S10: Macrophyte Cover (%Cover)	HSI Score	HSI Category
10415_AA_TE_PD7	1.00	0.92	1.00	1.00	1.00	0.01	0.67	0.85	1.00	0.90	0.59	Below Average
10685_AA_TE_PD10	1.00	0.93	1.00	1.00	1.00	0.67	0.67	1.00	0.67	0.70	0.85	Excellent
12765_AA_TE_PD11	1.00	0.43	0.9	0.67	1	0.67	1	0.95	1	0.5	0.78	Good
10735_AA_TE_PD12	1.00	1.00	1.00	1.00	1.00	1.00	0.67	1.00	0.67	0.50	0.86	Excellent
11250_AA_TE_PD14	1.00	0.60	0.90	0.67	0.80	0.67	0.33	1.00	0.67	0.50	0.68	Average
11250_AA_TE_PD15	1.00	0.60	0.90	0.67	1.00	0.67	0.33	1.00	0.33	0.60	0.66	Average
11250_AA_TE_PD16	1.00	0.95	0.90	0.67	1.00	0.01	0.33	1.00	0.67	0.40	0.47	Poor
11250_AA_TE_PD17	1.00	-	0.90	0.67	1.00	0.01	0.33	1.00	0.67	0.60	0.49	Poor
11445_AA_TE_PD18	1.00	1.00	0.90	0.67	1.00	0.67	0.33	1.00	0.67	0.60	0.75	Good
11765_AA_TE_PD19	1.00	-	0.90	0.67	1.00	0.01	0.01	0.95	0.67	0.45	0.33	Poor
11765_AA_TE_PD20	1.00	-	0.90	0.67	1.00	0.01	0.01	0.95	0.67	0.45	0.33	Poor
12260_AA_TE_PD21	1.00	0.40	0.10	0.01	1.00	1.00	1.00	0.95	0.01	0.30	0.25	Poor
10860_AA_TE_PD22	1.00	-	0.90	1.00	1.00	0.01	0.01	0.85	0.33	0.35	0.31	Poor
10860_AA_TE_PD23	1.00	0.88	0.90	1.00	1.00	0.01	0.01	0.85	0.33	0.35	0.31	Poor
10860_AA_TE_PD24	1.00	-	0.90	1.00	1.00	0.01	0.01	0.85	0.33	0.35	0.31	Poor
10490_AA_TE_PD25	1.00	0.40	0.50	0.67	0.60	1.00	1.00	0.70	1.00	0.30	0.66	Average
10710_AA_TE_PD26	1.00	0.30	0.10	0.33	0.40	1.00	1.00	0.93	1.00	0.30	0.51	Below Average
10955_AA_TE_PD27	1.00	0.50	0.50	0.67	1.00	0.67	0.67	0.83	0.67	0.90	0.72	Good
10940_AA_TE_PD28	1.00	0.60	0.10	0.67	0.40	1.00	1.00	1.00	1.00	0.35	0.60	Average
11765_AA_TE_PD29	1.00	0.40	0.50	0.67	1.00	0.67	1.00	0.95	0.01	0.30	0.44	Poor

Pond Ref.	S1: Geographic Location	S2: Waterbody Area	S3: Water Body Permanence	S4: Water Quality	S5: % Shade (1m From Bank)	S6: Impact Of Waterfowl	S7: Fish Stocks	S8: No. Of Waterbodies	S9: Terrestrial Habitat	S10: Macrophyte Cover (%Cover)	HSI Score	HSI Category
12260_AA_TE_PD30	1.00	0.60	0.50	0.33	1.00	0.67	1.00	0.95	0.01	0.30	0.42	Poor
10765_AA_TE_PD31	1.00	0.30	0.50	0.33	0.80	1.00	1.00	1.00	0.67	0.30	0.62	Average
11765_AA_TE_PD32	1.00	-	0.90	0.67	1.00	0.01	0.67	0.90	0.33	0.55	0.48	Poor
12275_AA_TE_DT13	1.00	0.90	1.00	0.33	0.40	0.67	0.67	1.00	0.33	1.00	0.67	Average
12275_AA_TE_DT14	1.00	0.92	1.00	0.33	0.60	0.67	0.67	1.00	0.33	1.00	0.70	Average
10615_AE_CH_PD44	1.00	1.00	0.9	0.67	1	0.01	0.01	0.95	1	0.35	0.34	Poor
10735_AE_CH_PD45	1	1	0.9	1	1	0.67	0.67	0.95	1	0.45	0.84	Excellent
10630_AE_CH_PD47	1	0.05	0.1	0.67	1	1	1	0.95	1	0.8	0.55	Below Average
10615_AE_CH_PD48	1	0.13	0.9	0.67	1	0.67	0.67	0.95	0.67	0.35	0.61	Average
~~10860_AE_CH_PD49~~	~~1~~	~~0.8~~	~~1~~	~~1~~	~~0.8~~	~~0.67~~	~~1~~	~~0.85~~	~~1~~	~~0.45~~	~~0.83~~	~~Excellent~~
10905_AE_CH_PD50	1	0.3	1	1	1	1	1	1	0.33	0.9	0.79	Good
11765_AE_CH_PD51	1	0.13	1	1	1	0.67	1	0.95	0.01	1	0.49	Poor

Ditch Ref.	S1: Water flow	S2: Waterbody permanence	S3: Water quality	S4: Fish presence	S5: Macrophyte cover	DSI Score	DSI Category
11765_AE_CH_AQ001	2.00	3.00	1.00	2.00	1.00	9.00	Moderate
11765_AE_CH_AQ002	Ditch dry on survey (desiccated)						
11765_AE_CH_AQ003	2.00	3.00	1.00	1.00	1.00	8.00	Low
11765_AE_CH_AQ004	2.00	3.00	1.00	1.00	1.00	8.00	Low
11765_AE_CH_AQ005	2.00	3.00	1.00	1.00	1.00	8.00	Low
11765_AE_CH_AQ006	2.00	3.00	1.00	2.00	1.00	9.00	Moderate
11765_AE_CH_AQ007	2.00	3.00	1.00	1.00	1.00	8.00	Low
12260_AE_CH_AQ008	2.00	3.00	1.00	3.00	1.00	10.00	Moderate
12260_AE_CH_AQ009	2.00	2.00	2.00	3.00	2.00	11.00	Moderate
12260_AE_CH_AQ010	2.00	1.00	1.00	3.00	1.00	8.00	Low
11765_AE_CH_AQ011	2.00	3.00	1.00	1.00	1.00	8.00	Low
11765_AE_CH_AQ012	3.00	2.00	2.00	3.00	3.00	13.00	High
12260_AE_CH_AQ013	2.00	2.00	1.00	3.00	3.00	11.00	Moderate
11765_AE_CH_AQ014	2.00	1.00	1.00	3.00	3.00	10.00	Moderate
11765_AE_CH_AQ015	2.00	2.00	2.00	3.00	3.00	12.00	High
11765_AE_CH_AQ017	1.00	3.00	1.00	3.00	2.00	10.00	Moderate
11765_AE_CH_AQ018	1.00	3.00	1.00	3.00	1.00	9.00	Moderate
12830_AE_CH_AQ019	1	2	1	2	1	7	Low
11765_AE_CH_AQ020	2.00	3.00	1.00	3.00	1.00	10.00	Moderate

Ditch Ref.	S1: Water flow	S2: Waterbody permanence	S3: Water quality	S4: Fish presence	S5: Macrophyte cover	DSI Score	DSI Category
11765_AE_CH_AQ021	2.00	2.00	2.00	3.00	1.00	10.00	Moderate
11765_AE_CH_AQ022	2.00	2.00	2.00	3.00	2.00	11.00	Moderate
11765_AE_CH_AQ023	2.00	2.00	2.00	3.00	2.00	11.00	Moderate
11765_AE_CH_AQ024	2.00	2.00	2.00	3.00	2.00	11.00	Moderate
11765_AE_CH_AQ025	2.00	1.00	1.00	3.00	1.00	8.00	Low
11765_AE_CH_AQ026	1.00	1.00	1.00	3.00	2.00	8.00	Low
11765_AE_CH_AQ027	Ditch dry on survey (desiccated)						
11765_AE_CH_AQ028	2.00	1.00	1.00	3.00	1.00	8.00	Low
11765_AE_CH_AQ029	2.00	1.00	2.00	3.00	3.00	11.00	Moderate
11765_AE_CH_AQ030	2.00	2.00	1.00	3.00	1.00	9.00	Moderate
11765_AE_CH_AQ031	2.00	2.00	1.00	3.00	1.00	9.00	Moderate
11765_AE_CH_AQ032	2.00	2.00	1.00	3.00	1.00	9.00	Moderate
11765_AE_CH_AQ034	2.00	2.00	1.00	3.00	1.00	9.00	Moderate
11765_AE_CH_AQ042	2.00	1.00	2.00	3.00	2.00	10.00	Moderate
12729_AE_CH_AQ047	Ditch dry on survey (desiccated)						
11035_AE_CH_AQ051	Ditch dry on survey (desiccated)						
11035_AE_CH_AQ052	Ditch dry on survey (desiccated)						
10765_AE_CH_AQ053	Ditch dry on survey (desiccated)						
10765_AE_CH_AQ058	Ditch dry on survey (desiccated)						
12670_AE_CH_AQ064	1.00	3.00	3.00	2.00	1.00	10.00	Moderate

Ditch Ref.	S1: Water flow	S2: Waterbody permanence	S3: Water quality	S4: Fish presence	S5: Macrophyte cover	DSI Score	DSI Category
12670_AE_CH_AQ065	1.00	3.00	3.00	2.00	1.00	10.00	Moderate
10685_AE_CH_AQ066	1.00	3.00	3.00	2.00	1.00	10.00	Moderate
10490_AE_CH_AQ067	2.00	3.00	3.00	2.00	1.00	11.00	Moderate
10490_AE_CH_AQ078	2.00	2.00	2.00	3.00	2.00	11.00	Moderate
10765_AE_CH_AQ091	Ditch dry on survey (desiccated)						
12729_AE_CH_AQ093	Ditch dry on survey (desiccated)						
11775_AE_CH_AQ097	2.00	2.00	2.00	3.00	3.00	12.00	High
11765_AE_CH_AQ098	2.00	2.00	1.00	2.00	1.00	8.00	Low
11765_AE_CH_AQ099	2.00	2.00	1.00	2.00	1.00	8.00	Low
12736_AE_CH_AQ100	2.00	2.00	2.00	1.00	1.00	8.00	Low
10790_AE_CH_AQ111	2.00	2.00	2.00	1.00	1.00	8.00	Low
10685_AE_CH_AQ112	2.00	2.00	2.00	1.00	1.00	8.00	Low
11765_AE_CH_AQ113	1	2	1	2	1	7	Low
11220_AE_CH_AQ200	1	3	3	1	1	9	Moderate

Appendix C - Presence / Likely Absence Raw Data and Weather Conditions 2017

Waterbody		Pond 7						
Date	GCN detected	Peak adult count	GCN Eggs or Larvae present	Air Temp (°C)	Vegetation Cover (0-5)	Turbidity (0-5)	Other Amphibians Recorded	GCN Population Size Class
11/05/17	No	-	No	14	4	1	Smooth and Palmate Newt	N/A
17/05/17	No	-	No	15	4	1	Smooth and Palmate Newt	
06/06/17	No	-	No	13	4	1	Smooth and Palmate Newt	
12/06/17	No	-	No	14	4	1	Smooth and Palmate Newt	

Waterbody		Pond 10						
Date	GCN detected	Peak adult count	GCN Eggs or Larvae present	Air Temp (°C)	Vegetation Cover (0-5)	Turbidity (0-5)	Other Amphibians Recorded	GCN Population Size Class
16/05/17	No	-	No	15	3	3	Smooth and Palmate Newt	N/A
25/05/17	No	-	No	20	3	3	Palmate Newt	
06/06/17	No	-	No	13	3	3	Palmate Newt	
12/06/17	No	-	No	14	3	3	No	

Waterbody		Pond 12						
Date	GCN detected	Peak adult count	GCN Eggs or Larvae present	Air Temp (°C)	Vegetation Cover (0-5)	Turbidity (0-5)	Other Amphibians Recorded	GCN Population Size Class
11/05/17	No	-	No	13	2	1	Smooth and Palmate Newt	N/A
18/05/17	No	-	No	12	2	1	Smooth and Palmate Newt	
07/06/17	No	-	No	13	2	1	Palmate Newt	
12/06/17	No	-	No	14	2	1	No	

Waterbody		Pond 14						
Date	GCN detected	Peak adult count	GCN Eggs or Larvae present	Air Temp (°C)	Vegetation Cover (0-5)	Turbidity (0-5)	Other Amphibians Recorded	GCN Population Size Class
15/05/17	No	-	No	14	2	2	Palmate Newt	N/A
18/05/17	No	-	No	12	2	2	Palmate Newt	
24/05/17	No	-	No	22	2	2	No	
05/06/17	No	-	No	13	2	2	Smooth and Palmate Newt	

Waterbody		Pond 15						
Date	GCN detected	Peak adult count	GCN Eggs or Larvae present	Air Temp (°C)	Vegetation Cover (0-5)	Turbidity (0-5)	Other Amphibians Recorded	GCN Population Size Class
15/05/17	No	-	No	14	1	2	Smooth and Palmate Newt	N/A
18/05/17	No	-	No	12	1	2	Palmate Newt	
24/05/17	No	-	No	22	1	2	No	
05/06/17	No	-	No	13	1	2	Smooth and Palmate Newt	

Waterbody		Pond 16						
Date	GCN detected	Peak adult count	GCN Eggs or Larvae present	Air Temp (°C)	Vegetation Cover (0-5)	Turbidity (0-5)	Other Amphibians Recorded	GCN Population Size Class
15/05/17	No	-	No	14	1	3	No	N/A
18/05/17	No	-	No	12	1	3	Smooth Newt	
24/05/17	No	-	No	22	1	3	No	
05/06/17	No	-	No	13	1	3	No	

Waterbody		Pond 17						
Date	GCN detected	Peak adult count	GCN Eggs or Larvae present	Air Temp (°C)	Vegetation Cover (0-5)	Turbidity (0-5)	Other Amphibians Recorded	GCN Population Size Class
15/05/17	No	-	No	15	1	2	Smooth and Palmate Newt	N/A
18/05/17	No	-	No	12	1	2	Palmate Newt	
24/05/17	No	-	No	25	1	2	Smooth Newt	
05/06/17	No	-	No	13	1	2	No	

Waterbody		Pond 18						
Date	GCN detected	Peak adult count	GCN Eggs or Larvae present	Air Temp (°C)	Vegetation Cover (0-5)	Turbidity (0-5)	Other Amphibians Recorded	GCN Population Size Class
15/05/17	No	-	No	15	1	1	Smooth Newt	N/A
24/05/17	No	-	No	25	1	1	Smooth and Palmate Newt	
05/06/17	No	-	No	13	1	1	No	
08/06/17	No	-	No	14	1	1	No	

Waterbody		Pond 25						
Date	GCN detected	Peak adult count	GCN Eggs or Larvae present	Air Temp (°C)	Vegetation Cover (0-5)	Turbidity (0-5)	Other Amphibians Recorded	GCN Population Size Class
16/05/17	No	-	No	17	1	4		N/A
25/05/17	No	-	No	20	1	4	Palmate Newt	
07/06/17	No	-	No	14	1	4	No	
13/06/17	No	-	No	21	1	4	Palmate Newt	

Waterbody		Pond 27						
Date	GCN detected	Peak adult count	GCN Eggs or Larvae present	Air Temp (°C)	Vegetation Cover (0-5)	Turbidity (0-5)	Other Amphibians Recorded	GCN Population Size Class
16/05/17	No	-	No	17	4	2	No	N/A
25/05/17	No	-	No	20	4	2	Palmate Newt	
07/06/17	No	-	No	14	4	2	No	
13/06/17	No	-	No	21	4	2	Palmate Newt	

Waterbody		Pond 31						
Date	GCN detected	Peak adult count	GCN Eggs or Larvae present	Air Temp (°C)	Vegetation Cover (0-5)	Turbidity (0-5)	Other Amphibians Recorded	GCN Population Size Class
17/05/17	No	-	No	12	0	4	Smooth and Palmate Newt	N/A
25/05/17	No	-	No	25	0	4	Palmate Newt	
07/06/17	No	-	No	13	0	4	Smooth and Palmate Newt	
13/06/17	No	-	No	14	0	4	Palmate Newt	

Appendix D - Environmental DNA (eDNA) Results 2017 & 2018

The University Of Sheffield.

Great crested newt eDNA test report – 17th July 2017

Ms Lily Tamara
Thomson Ecology

Project ID: EWSP-113-005

Information on eDNA testing procedure:

eDNA was extracted from pond water samples and analysed using qPCR in order to determine the presence or absence of great crested newts (GCN) in each pond. The analysis was carried out following the methodology outlined in Biggs *et al.* 2014 (Analytical and methodological development for improved surveillance of the Great Crested Newt, Defra Project WC1067, Freshwater Habitats Trust: Oxford).

We have demonstrated that the sensitivity of GCN detection achieved in our laboratory matches that in Biggs *et al.* (2014). The limit of quantification was 3 * 10^{-3} ng/µL, determined by analysing a serial dilution of known concentrations of tissue-extracted *Triturus cristatus* DNA. In addition, samples from a pond known to contain great crested newts and from one known to be free from them were analysed and gave results as expected.

The results of the eDNA test can be **positive** (GCN DNA was detected), **negative** (GCN DNA was not detected) or **inconclusive** (sample inhibited or degraded – assessed by analysing artificial DNA control).

It is not possible to quantify GCN numbers from eDNA analysis, and the eDNA score (the number out of 12 replicate qPCR tests for which DNA was detected) is provided for information only. A negative result does not exclude the possibility that DNA is present below the limit of detection for this test.

Results:

All sample containers were intact upon receipt and contained the expected 50 ml of liquid.

A 100 bp length artificial DNA marker was included in the sample kit and amplified successfully by qPCR, indicating that no sample degradation had occurred and PCR was not inhibited.

The results indicate that no GCN DNA was detected in either of the two samples. Negative DNA and negative and positive qPCR controls were included in the analysis and gave results as expected.

Pond test sample results:

TE pond no.	Our sample ref.	eDNA score[1]	GCN detection	DNA Inhibition	DNA degradation
Ditch 14	EWSP-113-005 S17	0	Negative	No	No
Ditch 13	EWSP-113-005 S18	0	Negative	No	No

[1] the number out of 12 qPCR replicates in which DNA was detected.

18169-WS-CH-1 Order number: WSP-05-CH

Great Crested Newt eDNA Results

Company:	WSP
Address:	6 Devonshire Square, London, EC2M 4YE
Contact:	Chris Horley
Project code|Task code:	70038257-25L | Option 5A
Date of Report:	21 May 2018
Number of samples:	20

Thank you for sending your samples for analysis by NatureMetrics. Your samples have been processed in accordance with the protocol set out in Appendix 5 of Biggs et al. (2014).

DNA was precipitated via centrifugation at 14,000 x g and then extracted using Qiagen Blood and Tissue extraction kits.

qPCR amplification was carried out in 12 replicates per sample, using the primers and probe described by Biggs et al. (2014), in the presence of both positive and negative controls.

Results indicate GCN absence in your samples. No degradation or inhibition was detected, and all controls performed as expected. Conclusive results are therefore presented.

Results are based on the samples as supplied by the client to the laboratory. Incorrect sampling methodology may affect the results. Note that a negative result does not preclude the presence of Great Crested Newts at a level below the limits of detection.

Sample	Pond ID	Date arrived	Inhibition	Degradation	eDNA score	GCN status
GCN18-1291	'AQ001'	09-May-18	No	No	0	Negative
GCN18-1282	'AQ006'	09-May-18	No	No	0	Negative
GCN18-1301	'AQ008'	09-May-18	No	No	0	Negative
GCN18-1299	'AQ009'	09-May-18	No	No	0	Negative
GCN18-1288	'AQ012'	09-May-18	No	No	0	Negative
GCN18-1283	'AQ013'	09-May-18	No	No	0	Negative
GCN18-1303	'AQ015'	09-May-18	No	No	0	Negative
GCN18-1293	'AQ017'	09-May-18	No	No	0	Negative
GCN18-1284	'AQ064'	09-May-18	No	No	0	Negative

GCN18-1289	'AQ066'	09-May-18	No	No	0	Negative
GCN18-1302	'AQ067'	09-May-18	No	No	0	Negative
GCN18-1285	'AQ078'	09-May-18	No	No	0	Negative
GCN18-1292	'AQ097'	09-May-18	No	No	0	Negative
GCN18-1294	'Pond 11'	09-May-18	No	No	0	Negative
GCN18-1286	'Pond 29'	09-May-18	No	No	0	Negative
GCN18-1290	'Pond 30'	09-May-18	No	No	0	Negative
GCN18-1298	'Pond 32'	09-May-18	No	No	0	Negative
GCN18-1300	'Pond 45'	09-May-18	No	No	0	Negative
GCN18-1295	'Pond 47'	09-May-18	No	No	0	Negative
GCN18-1287	'Pond 51'	09-May-18	No	No	0	Negative

End of report

Report issued by: Dr. Cuong Tang

Contact: ct@naturemetrics.co.uk | 01491 829042

Understanding your results

Positive: GCN DNA has been detected in this sample, meaning that at least one of the 12 replicates has amplified. Remember that this is not a quantitative test, so you should not interpret a high eDNA score (e.g. 12/12) as necessarily indicating a larger population of GCN than a low eDNA score (e.g. 1/12).

Negative: No GCN DNA has been detected in this sample, and the internal and external controls worked as expected. This tells us that if there had been GCN DNA in the sample, we would have detected it, so we can be confident in its absence from the sample provided.

Inconclusive: No GCN DNA was detected in the sample, but the internal controls failed to amplify as expected. This means that any GCN DNA in the sample might also have failed to amplify properly, so we cannot have confidence in this negative result. Inconclusive results can be caused by degradation of the DNA (when the DNA marker contained in the ethanol in the kits fails to amplify) or by inhibition of the reaction (when the marker added in the lab fails to amplify) caused by certain chemicals or organic compounds that may be present in the water sample.

Appendix E - UK Amphibian Species Protection and Legislation

Species Protection and Legislation

Both within and outside designated sites, individual Great Crested Newts (GCN), natterjack toads and the re-introduced northern clade pool frogs *Pelophylax lessonae* receive the highest degree of legislative protection afforded to species in England. GCN, natterjack toads and pool frogs are covered by the Conservation of Habitats and Species Regulations 2010. The Regulations make it an offence, with very few exceptions, to:

- Deliberately capture, injure or kill any wild animal of a European protected species;
- Deliberately disturb wild animals of any such species in such a way as to be likely:
  - to impair their ability to survive, to breed or reproduce, or to rear or nurture their young; or
  - in the case of animals of a hibernating or migratory species, to impair their ability to hibernate or migrate; or
  - to affect significantly the local distribution or abundance of the species to which they belong.
- Deliberately take or destroy eggs of any such wild animal;
- Damage or destroy a breeding site or resting place of such a wild animal;
- Keep, transport, sell or exchange, or offer for sale or exchange, any live or dead wild animal of a European protected species, or any part of, or anything derived from such an animal.

In addition to the protection given to GCN and natterjack toads under the Conservation of Habitats and Species Regulations 2010 already described, they are also partially protected in England under the Wildlife and Countryside Act, which adds the following offences (with certain exceptions):

- Disturbance while it is occupying a structure or place which is uses for shelter or protection; or
- Obstructing access to any structure or place used for shelter or protection.

The re-introduced northern clade pool frog receives full protection. It is an offence to kill, injure, capture or disturb them, and to damage or destroy pool frog habitats. It is also illegal to sell or trade pool frogs. Legal protection applies to all life-stages.

Offences under either Act may be punished through fines and/or custodial sentence at the discretion of the Court. If proposed work could cause killing, injury or disturbance to either of these species or damage to their habitats, appropriate mitigation which seeks to avoid these impacts should be devised and implemented under a development licence from Natural England.

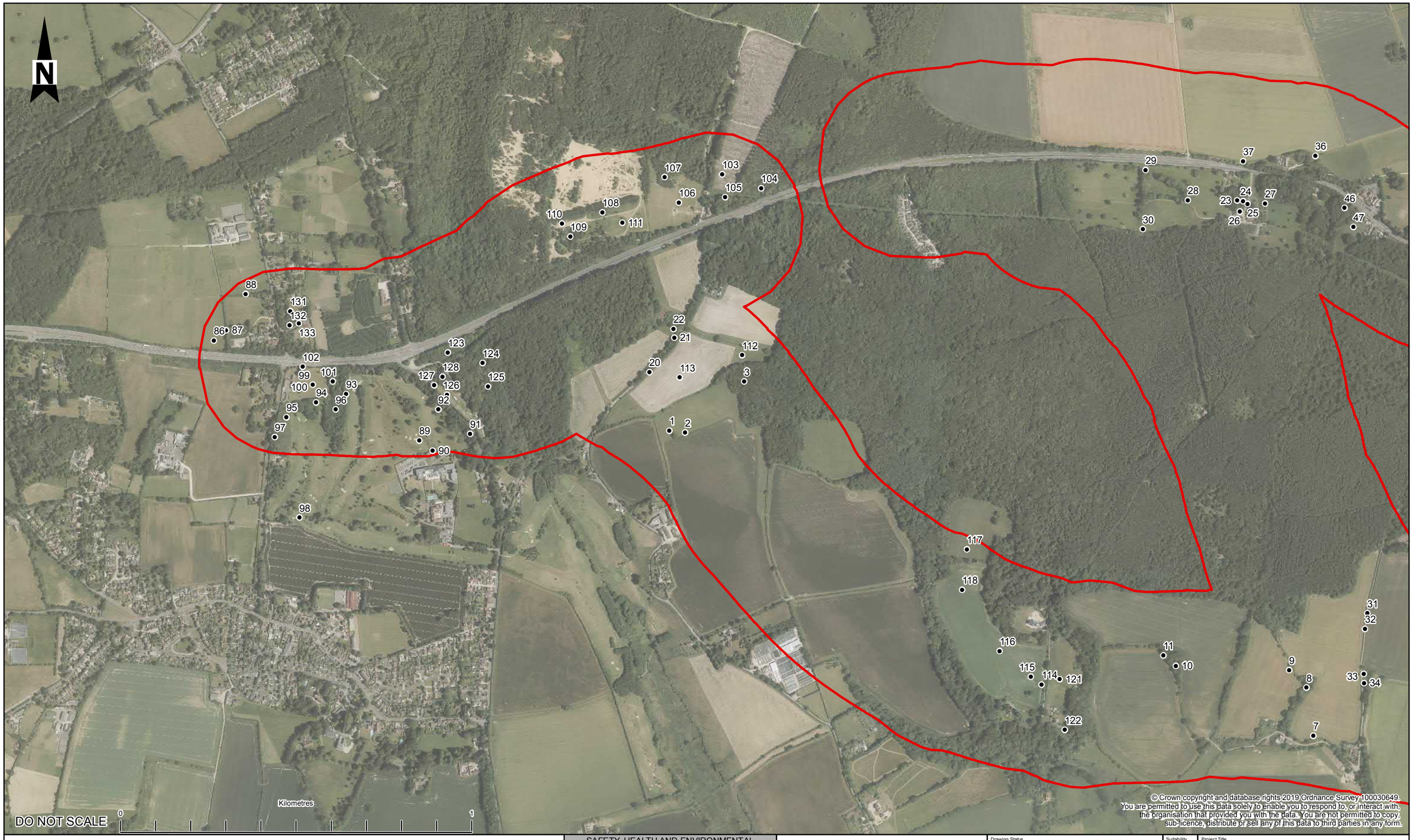
Smooth newts, palmate newts, common frog and common toad are not subject to European protection. However, these species are listed on Schedule 5 of the Wildlife and Countryside Act 1981 (as amended) and are subject to provisions of Section 9, which protect them from sale and trade only.

UK Post-2010 Biodiversity Framework and Species of Principle Importance

Published by the Joint Nature Conservation Committee (JNCC) and the Department for Environment, Farming and Rural Affairs (Defra) in July 2012, the UK Post-2010 Biodiversity Framework identifies UK-scale activities and priority works that are required to deliver the EU Biodiversity Strategy. Following a process of devolution, the framework is underpinned by country level strategies which are now largely responsible for continuing the work carried out under the former UK Biodiversity Action Plans (UK BAP). JNCC guidance dictates that UK BAP background information on priority species and habitats still remains relevant and it now forms the basis of country specific priority lists, which for England, are specified under Section 41 of the Natural Environment and Rural Communities (NERC) Act 2006. Targets for England's biodiversity strategy 'biodiversity 2020': A strategy for England's wildlife and ecosystem services, are informed by this list.

Great crested newts, natterjack toads, common toads and clade pool frogs have been adopted as Species of Principle Importance for the Conservation of Biodiversity in England. This places a duty on all government departments to have regard for the conservation of these species and on the Secretary of State to further, or promote others to further, the conservation of these species. Furthermore, the National Planning Policy Framework (NPPF) states that local planning authorities should promote the protection and recovery of priority species populations linked to national and local targets, which presumably means those listed under the Section 41 of the NERC Act, the former UK BAP and on Local Regional priorities species lists.

ATTACHMENT E: TECHNICAL APPENDIX 8-20 PHASE 1 HABITAT SURVEY BASELINE SURVEY – CORRECTED FIGURE 1 VEGETATION SAMPLE LOCATION MAP



KEY:

- VEGETATION SAMPLE (MAP SAMPLE NUMBER IN APPENDIX B)
- 250M FIELD STUDY AREA

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATON

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made to the design hazard log).

Construction

Maintenance / Cleaning

Use

Decommissioning / Demolition

Rev.	Date	Description	By	Chk'd	App'd
P01.1	---	First Issue	---	---	---

Drawing Status: FINAL

Suitability: S0

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Client: Working on behalf of highways england

Project Title: REGIONAL INVESTMENT PROGRAMME A27 ARUNDEL BYPASS

Drawing Title: FIGURE 4: PHASE 1 HABITAT VEGETATION SAMPLE LOCATIONS PAGE 1 OF 2

Scale	Drawn	Checked	Approved	Authorised
1:10,000	AS	GY	RG	PA
Original Size	**Date**	**Date**	**Date**	**Date**
A3	15/01/20	15/01/20	15/01/20	15/01/20

Drawing Number: Project | Originator | Volume | Location | Type | Role | Number
HE551523-WSP-GEN-SWI-GI-DR-0556

Project Ref. No.: 70052558

Revision: P01

Path: \\uk.wspgroup.com\central data\Projects\700525xx\70052558 - CDF A27 AB Further Consultation\02 WIP\GI GIS\Mxd\Environment\Ecology\Phase 1\HE551523-WSP-GEN-SWI-GI-DR-0556_P01_F4_Veg_Sample_Locations.mxd: Plotted by: UKAXS091 Date: Jan 15, 2020 - 04:09PM

KEY:

- VEGETATION SAMPLE (MAP SAMPLE NUMBER IN APPENDIX B)
- 250M FIELD STUDY AREA

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATON

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made to the design hazard log).

Construction

Maintenance / Cleaning

Use

Decomissioning / Demolition

Rev.	Date	Description	By	Chk'd	App'd
P01.1	---	First Issue	---	---	---

Drawing Status: FINAL

Suitability: S0

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Client: Working on behalf of highways england

Project Title: REGIONAL INVESTMENT PROGRAMME A27 ARUNDEL BYPASS

Drawing Title: FIGURE 4: PHASE 1 HABITAT VEGETATION SAMPLE LOCATIONS PAGE 2 OF 2

Scale	Drawn	Checked	Approved	Authorised
1:10,000	AS	GY	RG	PA
Original Size: A3	Date: 15/01/20	Date: 15/01/20	Date: 15/01/20	Date: 15/01/20

Drawing Number: HE551523-WSP-GEN-SWI-GI-DR-0556 (Project | Originator | Volume | Location | Type | Role | Number)

Project Ref. No.: 70052558

Revision: P01

Path: \\uk.wspgroup.com\central data\Projects\700525xx\70052558 - CDF A27 AB Further Consultation\02 WIP\GI GIS\Mxd\Environment\Ecology\Phase 1\HE551523-WSP-GEN-SWI-GI-DR-0556_P01_F4_Veg_Sample_Locations.mxd; Plotted by: UKAXS091 Date: Jan 15, 2020 - 04:09PM

ATTACHMENT F: TECHNICAL APPENDIX 8-23 PRELIMINARY ECOLOGICAL APPRAISAL – CORRECTED TARGET NOTE APPENDIX C

Target Note Number	Ecology Feature Type	Note	Grid reference
TN1	Horse paddock	Grass dominated sward. Tightly grazed, <10cm. Electric fencing, horse dung, eutrophication. Semi-improved neutral grassland.	SU 96606 07175
TN2	Ash	Potential ash die back. Trees have lost more leaves than would be expected for the time of year.	SU 96557 07192
	Bat	Bat roost potential. Several large oaks and a generally mature woodland.	
	Dormouse	Good understorey, food resources and connectivity. Large woodland block. Coppiced areas surrounding.	
	Ancient woodland	Indicators - butcher's broom, stinking iris, field maple. Broadleaved semi-natural - ash/oak canopy with hazel understorey.	
TN3	Horse paddock	Grass dominated sward. Tightly grazed, <10cm. Electric fencing, horse dung, eutrophication. Semi-improved neutral grassland.	SU 96608 06975
TN4	Horse paddock	Grass dominated sward. Tightly grazed, <10cm. Electric fencing, horse dung, eutrophication. Semi-improved neutral grassland.	SU 96508 06972
TN5	Road verge	Woodland strip - 3-5m high. Dogwood, hawthorn, hazel, field maple, bramble. Potentially planted for existing A27. Rank grassland - verge with occasional neutral grassland indicators: yarrow, black knapweed, toadflax	SU 96572 06901
	Dormouse	Good understorey and connectivity.	
TN6	Clearing	Clearing within woodland for electricity pilons. Braken and bramble.	SU 96448 07245

TN7	Arable	Ploughed arable field with rank grassland in north-east corner.	SU 96260 07203
TN8	Private road	Hedgerow on southern boundary. Scattered scrub along fence to north.	SU 96209 06896
	Bat	2 houses and industrial estate. May have potential for roosting bats.	
	Road verge	Woodland/Scrub - hazel and hawthorn. Native.	
	Amenity	Some amenity grassland outside of industrial estate and likely within residential gardens.	
TN9	Road verge	Very narrow (<2m), native scrub - hawthorn, field maple, sycamore. Rank grassland on road side.	SU 96588 06854
	Lane	Road running parallel to A27 in a westerly direction.	
	Arable	Arable field to the south east of the A27. Ploughed. Rough grassland north-west corner of field.	
	Bat	Old (potentially veteran) trees in far side of field (south-east). May have bat roost potential.	
	Bridle way	Running south away from A27. Linear scrub between bridleway and arable field.	
TN10	Woodland	Broadleaved semi-natural. AWIS - butcher's broom. Oak, ash canopy. Some areas coppiced.	SU 96591 06761
	Bat	Mature woodland. Some trees may have bat roost potential.	
	Dormouse	Good understorey and connectivity. Hazel.	
TN11	Arable	To north-west of location. Ploughed with little to no filed boundary. What is there is rank grassland.	SU 97020 06460

	Hedgerow (west)	Intact - hawthorn dominant with hazel. Managed. 2m high. A couple of trees within.	
	Hedgerow (east)	Mature, intact - hazel, blackthorn, beech, ivy, spindle. Species rich. Managed but not regularly. 3-6m high.	
	Verge	Semi-improved neutral grassland (or better). Several indicators. Rank. Dactylis and Lolium dominant. Black knapweed, yarrow, meadow buttercup, meadow vetchling, ribwort plantain.	
TN12	Horse paddock	Horse grazed. Unable to stop in car to take a photo (unsafe on foot).	SU 96970 06263
TN13	Arable	To north-west of location. Recently cut. No field boundarys (<1m).	SU 97583 06054
	Oaks	Potentially veteran.	
	Fence/scrub	Bordering road and arable. Bramble, common nettle, rough grassland.	
TN14	Amenity	Tightly mown amenity grassland (<5cm). Recreational - cricket grounds.	SU 97433 06004
	Hedgerow	Intact, managed. Several mature trees within. Oak, ivy and hawthorn.	
TN15	Arable	Arable fields to north and south. Very narrow field margins (<1m).	SU 97957 05863
	Buffer strip	Located between two arable fields. Poor semi-improved grassland.	
	Hedgerow	Mature, well maintained hedgerow - hawthorn, dogwood, field maple, rose.	
TN16	Golf course	Amenity grassland. Mown intensively (<10cm).	SU 98029 05894

	Woodland	Patch of woodland within golf course. Broadleaved plantation- hazel, elder, field maple. Nettle. Managed - tree guards.	
TN17	Mire/fen	NVC data available for mire type habitat to south of foot bridge. Wetland.	SU 98117 05972
	Ruderal	Mix of nettle, great willow herb, thistle, bulrush, hemlock water dropwort, iris, reed canary grass. To north of foot bridge.	
TN18	Grassland	Poor semi-improved. Dactylis, hogweed, nettle. Some broadleaved herb diversity - black knapweed	SU 98193 06030
	Woodland	Plantation and semi-natural	
	Scrub	Scrub lines the edges of the mire valley	
TN19	Arable	Crop cut. Very narrow field margins.	SU 98238 06065
	Hedgerows	2 mature hedgerows. Species richness unknown. Intact - hawthorn, clematis, privet, ivy, elm, hazel.	
TN20	Woodland copse	Small area of semi-natural mixed - common lime, ash, horse chestnut, yew, elm and holly	SU 98270 06011
TN21	Arable	Ploughed arable field. Narrow field margins. Bordered by hedgerows.	SU 98443 05882
	Hedgerow (east of arable field)	Intact (small areas defunct) - elm, field maple, blackthorn. Species poor.	
	Hedgerow (east of road)	Intact - elm, holly, hawthorn. Flailed. Some larger ash trees. *both hedges have high number of species (5-10) but not within 30m. Elm locally dominant.	
TN22	Bats	House. May have some bat roost potential.	SU 98752 05714

TN23	Field	Semi-improved neutral grassland (likely improved). Shiny green, lolium. Short sward <20cm. Bails in field.	SU 98581 05763
TN24	Arable	Arable field. Re-seeded. Narrow grassy strip along boundary. Bordered by hedgerows.	SU 98643 05665
TN25	Arable (1)	Crop present within field. Narrow grassy boundary. Hedgerows along all boarders.	SU 98768 05431
	Improved (2)	Lolium is dominant. Lines on grass show it has been cut.	
	Arable (3)	Same as Arable (1)	
TN26	Grassland	Rank - false oat grass, cock's foot, tall fescue. Poor semi-improved. Sward 50-60cm. Unmanaged.	SU 98786 05458
	Barn owl	Good foraging grounds for barn owl. Potentially type 1 habitat.	
	Reptiles	Good potential. Tusocky grassland, open areas and debris to bask under.	
	Building	May have bat roost potential.	
TN27	Arable	Arable field with wide margins of rank grassland. New hedgerow planted on northern boundary.	SU 98931 05497
	Hedgerow (north)	Blackthorn, oak, ash, hawthorn, rose - species rich. Intact. With trees.	
	Bats	Tress may have some bat roost potential.	
TN28	Woodland	Poplar sp., horse chestnut, conifer cyprus, yew plantation mix. Nettle, hazel understorey. Not managed.	SU 99180 05603
	Dormouse	Good connectivity, some understorey, connected to hedgerows.	

	Shed	Some bat roost potential. Building fairly new.	
	Wood piles	Potential reptile/newt hibernacula	
	Houses	Bat roost potential. 2 houses.	
TN29	Allotment	Good reptile potential, buildings have some bat roost potential.	SU 99232 05523
TN30	Field (1)	Shiny green grassland. Likely improved.	SU 99183 05370
	Field (2)	Horse paddock. Grazed (<10cm). Some tusocky areas. Likely semi-improved neutral.	SU 99203 05283
	Houses (3)	Several buildings/houses with some bat roost potential.	SU 99214 05340
TN31	Road verges	Linear scrub - bramble, bracken, nettle, leylandii, elm. Varying width along road (1m - 5m). Not managed. Ditch within.	SU 99215 05240
		Amenity lawn with rank areas - great willowherb, hemlock water dropwort, nettle	
TN32	Field (1)	Improved. Dominant - perennial rye.	SU 99616 05271
	Field (2)	Pasture - Cattle feeding station within. Likely improved but map as semi-improved until surveyed.	SU 99609 05338
TN33	Arable	Arable field. Ploughed. Very narrow field margins of rank grass.	SU 99652 05377
	Hedgerow (west of arable)	Intact. Unknown species. Treat as rich.	
TN34	Wet woodland	Broadleaved semi-natural woodland - Oak, hazel, sycamore, alder, ash, hawthorn. Understorey - bramble, hart's tongue fern, iris, ivy. Bog/wet ground.	TQ 00080 05191

TN35	Amenity	Mown amenity grassland. Grounds of housing complex. <10cm sward	TQ 00230 05302
TN36	Arable	Arable field. Ploughed. Very narrow field margins of rank grass. Scrub boundary to south - bramble with trees, hawthorn, oak	TQ 00321 05373
TN37	Tree line	West of road. Mature lines of horse chestnut. Some Cherry laurel	TQ 00178 05341
	Woodland strip	East of road. Horse chestnut, non-native conifer, lime, field maple, ash	
TN38	Hedge with trees/treeline	East of road. Mature hedge, narrow. Oak, ash, bramble, field maple, hawthorn, hazel, species rich. Ditch running parallel on both sides of road	TQ 00178 05421
	Linear woodland	West of road. Wider strip of hedge/woodland. Mature trees. Sp - oak, hawthorn, blackthorn, holly, rose	
	Bats	Both treelines have mature trees with good bat roost potential.	
TN39	Paddock	Grazed field with stables and horses adjacent. Map as semi-improved neutral grassland.	TQ 00126 05507

ATTACHMENT G: TECHNICAL APPENDIX 8-23 PRELIMINARY ECOLOGICAL APPRAISAL – CORRECTED APPENDIX B, DESK STUDY DATA

Sussex Biodiversity Records Centre - Bat Records (April 2019)

[Note - Grid references redacted in compliance with data usage rights]

TaxonName	CommonName	RecDate	RecYear	Location	Abundance	AbundCount	SampleType
Barbastella barbastellus	Western Barbastelle	17/08/2018 - 18/08/2018	2018	Binsted Grove Cottage	18 Pass(es)	18	Aural bat detector
Barbastella barbastellus	Western Barbastelle	2015	2015	Unspecified locations within the parish of Walberton	Present	1	Radio-Tracked
Chiroptera	Bat sp.	25/06/2014	2014	Millball, Binsted	40 Bat(s)	40	Roost Exit Count
Eptesicus	Eptesicus Bat species	17/08/2018 - 18/08/2018	2018	Binsted Grove Cottage	2 Pass(es)	2	Aural bat detector
Eptesicus serotinus	Serotine	17/08/2018 - 18/08/2018	2018	Binsted Grove Cottage	5 Pass(es)	5	Aural bat detector
Myotis	Myotis Bat	17/08/2018 - 18/08/2018	2018	Binsted Grove Cottage	7 Pass(es)	7	Aural bat detector
Myotis daubentonii	Daubenton's Bat	17/08/2018 - 18/08/2018	2018	Binsted Grove Cottage	10 Pass(es)	10	Aural bat detector
Myotis mystacinus	Whiskered Bat	17/08/2018 - 18/08/2018	2018	Binsted Grove Cottage	4 Pass(es)	4	Aural bat detector
Myotis nattereri	Natterer's Bat	17/08/2018 - 18/08/2018	2018	Binsted Grove Cottage	5 Pass(es)	5	Aural bat detector
Nyctalus	Nyctalus Bat species	17/08/2018 - 18/08/2018	2018	Binsted Grove Cottage	2 Pass(es)	2	Aural bat detector
Nyctalus leisleri	Lesser Noctule	17/08/2018 - 18/08/2018	2018	Binsted Grove Cottage	1 Pass(es)	1	Aural bat detector
Pipistrellus	Pipstrelle sp.	17/08/2018 - 18/08/2018	2018	Binsted Grove Cottage	53 Pass(es)	53	Aural bat detector
Pipistrellus pipistrellus	Common Pipistrelle	17/08/2018 - 18/08/2018	2018	Binsted Grove Cottage	422 Pass(es)	422	Aural bat detector
Pipistrellus pipistrellus	Common Pipistrelle	29/06/1993	1993	Beam Ends Tea Room, Binsted, Arundel	28 Present	28	Unspecified
Pipistrellus pygmaeus	Soprano Pipstrelle (55 kHz)	17/08/2018 - 18/08/2018	2018	Binsted Grove Cottage	60 Pass(es)	60	Aural bat detector
Plecotus auritus	Brown Long-eared Bat	17/08/2018 - 18/08/2018	2018	Binsted Grove Cottage	4 Pass(es)	4	Aural bat detector
Plecotus auritus	Brown Long-eared Bat	04/02/2012	2012	Private property, Avisford Park Road, Walberton	<Null>	0	Building Inspection

Sussex Biodiversity Records Centre - Bird Records (April 2019)

[Note - Grid references redacted in compliance with data usage rights]

TaxonName	CommonName	RecDate	RecYear	Location	Abundance
Cygnus olor	Mute Swan	23/06/2015	2015	Wick Brook Barn Farm	23 Present
Cygnus olor	Mute Swan	01/06/2015	2015	Wick Brook Barn Farm	11 Present
Cygnus olor	Mute Swan	28/05/2015	2015	Wick Brook Barn Farm	13 Present
Cygnus olor	Mute Swan	20/11/2014	2014	Arun Valley (Arundel-Lhampton)	7 Present
Cygnus olor	Mute Swan	18/09/2014	2014	Arun Valley (Arundel-Lhampton)	32 Present
Cygnus olor	Mute Swan	06/08/2014	2014	Arun Valley (Arundel-Lhampton)	12 Present
Cygnus olor	Mute Swan	08/07/2014	2014	Arun Valley (Arundel-Lhampton)	35 Present
Cygnus olor	Mute Swan	02/07/2014	2014	Arun Valley (Arundel-Lhampton)	28 Present
Cygnus olor	Mute Swan	14/05/1983	1983	Arundel Watermeadows	3 Present
Tadorna tadorna	Common Shelduck	28/05/2015	2015	Wick Brook Barn Farm	2 Present
Anas platyrhynchos	Mallard	23/06/2015	2015	Arun Valley (Arundel-Lhampton)	1 Present
Anas platyrhynchos	Mallard	01/06/2015	2015	Arun Valley (Arundel-Lhampton)	4 Present
Anas platyrhynchos	Mallard	28/05/2015	2015	Arun Valley (Arundel-Lhampton)	9 Present
Anas platyrhynchos	Mallard	08/09/2014	2014	Arun Valley (Arundel-Lhampton)	6 Present
Anas platyrhynchos	Mallard	08/07/2014	2014	Arun Valley (Arundel-Lhampton)	6 Present
Anas platyrhynchos	Mallard	30/06/1999	1999	Binsted Barns Copse	1 Present
Anas platyrhynchos	Mallard	01/06/1992	1992	Binsted Barns Copse	1 Present
Anas platyrhynchos	Mallard	25/05/1983	1983	Arundel Watermeadows	4 Present
Egretta garzetta	Little Egret	01/08/2014	2014	Arun Valley (Arundel-Lhampton)	3 Present
Egretta garzetta	Little Egret	15/07/2014	2014	Arun Valley (Arundel-Lhampton)	3 Present
Egretta garzetta	Little Egret	14/07/2014	2014	Arun Valley (Arundel-Lhampton)	3 Present
Perdix perdix	Grey Partridge	<Null>	1993	Binsted nr Arundel,	<Null>
Perdix perdix	Grey Partridge	11/06/1993	1993	Binstead Meadow Lodge	2 Present
Tachybaptus ruficollis	Little Grebe	10/02/2014	2014	Arun Valley (Arundel-Lhampton)	1 Present
Milvus milvus	Red Kite	22/05/2017	2017	Binsted Wood complex, Binsted	1 Present
Milvus milvus	Red Kite	30/07/2016	2016	Lyminster CP, Lyminster	1 Present
Milvus milvus	Red Kite	14/04/2015	2015	Arun Valley (Arundel-Lhampton)	1 Present
Milvus milvus	Red Kite	10/04/2015	2015	Arun Valley (Arundel-Lhampton)	1 Present
Milvus milvus	Red Kite	23/03/2015	2015	Arun Valley (Arundel-Lhampton)	1 Present
Milvus milvus	Red Kite	22/03/2015	2015	Arun Valley (Arundel-Lhampton)	1 Present
Milvus milvus	Red Kite	14/03/2015	2015	Arun Valley (Arundel-Lhampton)	1 Present
Milvus milvus	Red Kite	12/03/2015	2015	Arun Valley (Arundel-Lhampton)	4 Present
Milvus milvus	Red Kite	10/03/2015	2015	Arun Valley (Arundel-Lhampton)	1 Present
Milvus milvus	Red Kite	05/03/2015	2015	Arun Valley (Arundel-Lhampton)	1 Present
Milvus milvus	Red Kite	27/03/2014	2014	Arun Valley (Arundel-Lhampton)	1 Present
Falco tinnunculus	Kestrel	30/07/2016	2016	Lyminster CP, Lyminster	1 Present
Falco tinnunculus	Kestrel	30/07/2015	2015	Arun Valley (Arundel-Lhampton)	1 Present
Falco tinnunculus	Kestrel	28/05/2015	2015	Arun Valley (Arundel-Lhampton)	2 Present
Falco tinnunculus	Kestrel	11/05/2015	2015	Arun Valley (Arundel-Lhampton)	1 Present
Falco tinnunculus	Kestrel	07/05/2015	2015	Arun Valley (Arundel-Lhampton)	1 Present
Falco tinnunculus	Kestrel	04/05/2015	2015	Arun Valley (Arundel-Lhampton)	2 Present
Falco tinnunculus	Kestrel	01/05/2015	2015	Arun Valley (Arundel-Lhampton)	1 Present
Falco tinnunculus	Kestrel	08/07/2014	2014	Arun Valley (Arundel-Lhampton)	1 Present
Falco tinnunculus	Kestrel	02/07/2014	2014	Arun Valley (Arundel-Lhampton)	2 Present
Falco tinnunculus	Kestrel	15/05/2003	2003	Walberton nr Arundel	4 Present
Falco tinnunculus	Kestrel	01/06/1992	1992	Binsted Barns Copse	1 Present
Falco subbuteo	Hobby	12/08/2015	2015	Arun Valley (Arundel-Lhampton)	1 Present
Falco subbuteo	Hobby	04/05/2015	2015	Arun Valley (Arundel-Lhampton)	2 Present
Falco subbuteo	Hobby	29/04/2015	2015	Arun Valley (Arundel-Lhampton)	1 Present
Falco subbuteo	Hobby	28/06/2001	2001	Walberton nr Arundel	1 Present
Haematopus ostralegus	Oystercatcher	01/06/2015	2015	Arun Valley (Arundel-Lhampton)	2 Present
Haematopus ostralegus	Oystercatcher	28/05/2015	2015	Arun Valley (Arundel-Lhampton)	2 Present
Haematopus ostralegus	Oystercatcher	15/07/2014	2014	Arun Valley (Arundel-Lhampton)	4 Present
Haematopus ostralegus	Oystercatcher	08/07/2014	2014	Arun Valley (Arundel-Lhampton)	2 Present
Haematopus ostralegus	Oystercatcher	02/07/2014	2014	Arun Valley (Arundel-Lhampton)	5 Present
Haematopus ostralegus	Oystercatcher	27/04/2014	2014	Arun Valley (Arundel-Lhampton)	4 Present
Haematopus ostralegus	Oystercatcher	14/04/2014	2014	Arun Valley (Arundel-Lhampton)	2 Present
Haematopus ostralegus	Oystercatcher	11/04/2014	2014	Arun Valley (Arundel-Lhampton)	2 Present
Charadrius dubius	Little Ringed Plover	14/04/2015	2015	Arun Valley (Arundel-Lhampton)	1 Present
Charadrius dubius	Little Ringed Plover	02/05/2014	2014	Arun Valley (Arundel-Lhampton)	1 Present
Vanellus vanellus	Lapwing	23/06/2015	2015	Arun Valley (Arundel-Lhampton)	9 Present
Vanellus vanellus	Lapwing	01/06/2015	2015	Arun Valley (Arundel-Lhampton)	2 Present
Vanellus vanellus	Lapwing	28/05/2015	2015	Arun Valley (Arundel-Lhampton)	43 Present
Vanellus vanellus	Lapwing	11/05/2015	2015	Arun Valley (Arundel-Lhampton)	12 Present
Vanellus vanellus	Lapwing	07/05/2015	2015	Arun Valley (Arundel-Lhampton)	10 Present
Vanellus vanellus	Lapwing	04/05/2015	2015	Arun Valley (Arundel-Lhampton)	11 Present
Vanellus vanellus	Lapwing	01/05/2015	2015	Arun Valley (Arundel-Lhampton)	14 Present
Vanellus vanellus	Lapwing	30/04/2015	2015	Arun Valley (Arundel-Lhampton)	7 Present

TaxonName	CommonName	RecDate	RecYear	Location	Abundance
Vanellus vanellus	Lapwing	29/04/2015	2015	Arun Valley (Arundel-Lhampton)	6 Present
Vanellus vanellus	Lapwing	28/04/2015	2015	Arun Valley (Arundel-Lhampton)	19 Present
Vanellus vanellus	Lapwing	28/04/2015	2015	Arun Valley (Arundel-Lhampton)	30 Present
Vanellus vanellus	Lapwing	26/04/2015	2015	Arun Valley (Arundel-Lhampton)	11 Present
Vanellus vanellus	Lapwing	25/04/2015	2015	Arun Valley (Arundel-Lhampton)	14 Present
Vanellus vanellus	Lapwing	24/04/2015	2015	Arun Valley (Arundel-Lhampton)	7 Present
Vanellus vanellus	Lapwing	20/04/2015	2015	Arun Valley (Arundel-Lhampton)	14 Present
Vanellus vanellus	Lapwing	18/04/2015	2015	Arun Valley (Arundel-Lhampton)	10 Present
Vanellus vanellus	Lapwing	16/04/2015	2015	Arun Valley (Arundel-Lhampton)	18 Present
Vanellus vanellus	Lapwing	15/04/2015	2015	Arun Valley (Arundel-Lhampton)	4 Present
Vanellus vanellus	Lapwing	14/04/2015	2015	Arun Valley (Arundel-Lhampton)	9 Present
Vanellus vanellus	Lapwing	12/04/2015	2015	Arun Valley (Arundel-Lhampton)	9 Present
Vanellus vanellus	Lapwing	11/04/2015	2015	Arun Valley (Arundel-Lhampton)	21 Present
Vanellus vanellus	Lapwing	10/04/2015	2015	Arun Valley (Arundel-Lhampton)	19 Present
Vanellus vanellus	Lapwing	06/04/2015	2015	Arun Valley (Arundel-Lhampton)	4 Present
Vanellus vanellus	Lapwing	03/04/2015	2015	Arun Valley (Arundel-Lhampton)	4 Present
Vanellus vanellus	Lapwing	01/04/2015	2015	Arun Valley (Arundel-Lhampton)	4 Present
Vanellus vanellus	Lapwing	23/04/2014	2014	Arun Valley (Arundel-Lhampton)	2 Present
Vanellus vanellus	Lapwing	17/04/2014	2014	Arun Valley (Arundel-Lhampton)	1 Present
Vanellus vanellus	Lapwing	14/04/2014	2014	Arun Valley (Arundel-Lhampton)	2 Present
Actitis hypoleucos	Common Sandpiper	20/08/2014	2014	Arun Valley (Arundel-Lhampton)	5 Present
Actitis hypoleucos	Common Sandpiper	04/08/2014	2014	Arun Valley (Arundel-Lhampton)	9 Present
Actitis hypoleucos	Common Sandpiper	08/07/2014	2014	Arun Valley (Arundel-Lhampton)	5 Present
Actitis hypoleucos	Common Sandpiper	02/07/2014	2014	Arun Valley (Arundel-Lhampton)	3 Present
Actitis hypoleucos	Common Sandpiper	02/05/2014	2014	Arun Valley (Arundel-Lhampton)	2 Present
Actitis hypoleucos	Common Sandpiper	23/04/2014	2014	Arun Valley (Arundel-Lhampton)	1 Present
Actitis hypoleucos	Common Sandpiper	25/05/1983	1983	Arundel Watermeadows	3 Present
Gallinago gallinago	Snipe	18/04/2015	2015	Arun Valley (Arundel-Lhampton)	1 Present
Numenius arquata	Curlew	14/05/1983	1983	Arundel Watermeadows	3 Present
Scolopax rusticola	Woodcock	01/06/2013	2013	Arundel Rewell Wood	4 Present
Scolopax rusticola	Woodcock	27/04/2008	2008	Binsted Barns Copse	1 Present
Scolopax rusticola	Woodcock	23/05/1994	1994	Arundel Rewell Wood	2 Present
Scolopax rusticola	Woodcock	28/06/1992	1992	Arundel Rewell Wood	2 Present
Scolopax rusticola	Woodcock	24/05/1992	1992	Arundel Rewell Wood	4 Present
Scolopax rusticola	Woodcock	17/05/1990	1990	Arundel Tortington	2 Present
Scolopax rusticola	Woodcock	01/08/1987	1987	Arundel Tortington	1 Present
Scolopax rusticola	Woodcock	26/05/1987	1987	Arundel Tortington	3 Present
Scolopax rusticola	Woodcock	01/06/1985	1985	Arundel Tortington	4 Present
Scolopax rusticola	Woodcock	27/05/1984	1984	Binsted nr Arundel	3 Present
Tringa totanus	Redshank	25/07/2015	2015	Arun Valley (Arundel-Lhampton)	1 Present
Tringa totanus	Redshank	23/06/2015	2015	Arun Valley (Arundel-Lhampton)	2 Present
Tringa totanus	Redshank	28/05/2015	2015	Arun Valley (Arundel-Lhampton)	1 Present
Tringa totanus	Redshank	11/05/2015	2015	Arun Valley (Arundel-Lhampton)	1 Present
Tringa totanus	Redshank	07/05/2015	2015	Arun Valley (Arundel-Lhampton)	4 Present
Tringa totanus	Redshank	04/05/2015	2015	Arun Valley (Arundel-Lhampton)	4 Present
Tringa totanus	Redshank	01/05/2015	2015	Arun Valley (Arundel-Lhampton)	1 Present
Tringa totanus	Redshank	30/04/2015	2015	Arun Valley (Arundel-Lhampton)	3 Present
Tringa totanus	Redshank	29/04/2015	2015	Arun Valley (Arundel-Lhampton)	1 Present
Tringa totanus	Redshank	28/04/2015	2015	Arun Valley (Arundel-Lhampton)	1 Present
Tringa totanus	Redshank	26/04/2015	2015	Arun Valley (Arundel-Lhampton)	3 Present
Tringa totanus	Redshank	25/04/2015	2015	Arun Valley (Arundel-Lhampton)	2 Present
Tringa totanus	Redshank	24/04/2015	2015	Arun Valley (Arundel-Lhampton)	3 Present
Tringa totanus	Redshank	20/04/2015	2015	Arun Valley (Arundel-Lhampton)	2 Present
Tringa totanus	Redshank	18/04/2015	2015	Arun Valley (Arundel-Lhampton)	4 Present
Tringa totanus	Redshank	16/04/2015	2015	Arun Valley (Arundel-Lhampton)	1 Present
Tringa totanus	Redshank	14/04/2015	2015	Arun Valley (Arundel-Lhampton)	2 Present
Tringa totanus	Redshank	12/04/2015	2015	Arun Valley (Arundel-Lhampton)	4 Present
Tringa totanus	Redshank	11/04/2015	2015	Arun Valley (Arundel-Lhampton)	2 Present
Tringa totanus	Redshank	10/04/2015	2015	Arun Valley (Arundel-Lhampton)	3 Present
Tringa totanus	Redshank	06/04/2015	2015	Arun Valley (Arundel-Lhampton)	3 Present
Tringa totanus	Redshank	03/04/2015	2015	Arun Valley (Arundel-Lhampton)	2 Present
Tringa totanus	Redshank	01/04/2015	2015	Arun Valley (Arundel-Lhampton)	4 Present
Tringa totanus	Redshank	15/07/2014	2014	Arun Valley (Arundel-Lhampton)	2 Present
Tringa totanus	Redshank	06/05/2014	2014	Arun Valley (Arundel-Lhampton)	2 Present
Tringa totanus	Redshank	02/05/2014	2014	Arun Valley (Arundel-Lhampton)	2 Present
Tringa totanus	Redshank	29/04/2014	2014	Arun Valley (Arundel-Lhampton)	1 Present
Tringa totanus	Redshank	28/04/2014	2014	Arun Valley (Arundel-Lhampton)	2 Present
Tringa totanus	Redshank	27/04/2014	2014	Arun Valley (Arundel-Lhampton)	2 Present

TaxonName	CommonName	RecDate	RecYear	Location	Abundance
Tringa totanus	Redshank	24/04/2014	2014	Arun Valley (Arundel-Lhampton)	2 Present
Tringa totanus	Redshank	23/04/2014	2014	Arun Valley (Arundel-Lhampton)	2 Present
Tringa totanus	Redshank	17/04/2014	2014	Arun Valley (Arundel-Lhampton)	2 Present
Tringa totanus	Redshank	11/04/2014	2014	Arun Valley (Arundel-Lhampton)	1 Present
Larus melanocephalus	Mediterranean Gull	14/10/2014	2014	Arun Valley (Arundel-Lhampton)	15 Present
Larus canus	Common Gull	06/08/2014	2014	Arun Valley (Arundel-Lhampton)	3 Present
Larus canus	Common Gull	04/08/2014	2014	Arun Valley (Arundel-Lhampton)	8 Present
Larus canus	Common Gull	01/08/2014	2014	Arun Valley (Arundel-Lhampton)	3 Present
Chroicocephalus ridibundus	Black-headed Gull	08/09/2014	2014	Arun Valley (Arundel-Lhampton)	190 Present
Chroicocephalus ridibundus	Black-headed Gull	09/08/2014	2014	Arun Valley (Arundel-Lhampton)	30 Present
Columba oenas	Stock Dove	30/07/2016	2016	Lyminster CP, Lyminster	3 Present
Columba oenas	Stock Dove	29/07/2015	2015	Arun Valley (Arundel-Lhampton)	1 Present
Columba oenas	Stock Dove	26/07/2015	2015	Arun Valley (Arundel-Lhampton)	4 Present
Columba oenas	Stock Dove	25/07/2015	2015	Arun Valley (Arundel-Lhampton)	1 Present
Columba oenas	Stock Dove	28/05/2015	2015	Arun Valley (Arundel-Lhampton)	3 Present
Columba oenas	Stock Dove	11/05/2015	2015	Arun Valley (Arundel-Lhampton)	3 Present
Columba oenas	Stock Dove	07/05/2015	2015	Arun Valley (Arundel-Lhampton)	4 Present
Columba oenas	Stock Dove	01/05/2015	2015	Arun Valley (Arundel-Lhampton)	6 Present
Columba oenas	Stock Dove	14/07/2014	2014	Arun Valley (Arundel-Lhampton)	3 Present
Columba oenas	Stock Dove	08/07/2014	2014	Arun Valley (Arundel-Lhampton)	3 Present
Streptopelia turtur	Turtle Dove	08/06/2016	2016	Rewell Wood Goblestubbs Copse	1 Present
Streptopelia turtur	Turtle Dove	14/07/2014	2014	Arun Valley (Arundel-Lhampton)	1 Present
Streptopelia turtur	Turtle Dove	21/07/1987	1987	Arundel Tortington	2 Present
Streptopelia turtur	Turtle Dove	16/07/1986	1986	Arundel Tortington	2 Present
Cuculus canorus	Cuckoo	13/06/2017	2017	Binsted Wood complex, Binsted	1 Present
Cuculus canorus	Cuckoo	06/06/2017	2017	Binsted Wood complex, Binsted	1 Present
Cuculus canorus	Cuckoo	04/05/2017	2017	Binsted Wood complex, Binsted	1 Present
Cuculus canorus	Cuckoo	23/06/2015	2015	Arun Valley (Arundel-Lhampton)	1 Present
Cuculus canorus	Cuckoo	28/05/2015	2015	Binsted Rife	Present
Cuculus canorus	Cuckoo	26/05/2015	2015	Top of Binssted Rife	Present
Cuculus canorus	Cuckoo	02/07/2014	2014	Arun Valley (Arundel-Lhampton)	1 Present
Cuculus canorus	Cuckoo	01/06/1992	1992	Binsted Barns Copse	1 Present
Cuculus canorus	Cuckoo	14/05/1983	1983	Arundel Watermeadows	2 Present
Tyto alba	Barn Owl	03/07/2017	2017	Binsted Wood complex, Binsted	1 Present
Tyto alba	Barn Owl	21/05/2017	2017	Binsted Wood complex, Binsted	1 Present
Tyto alba	Barn Owl	07/11/2016	2016	Near Tortington	1 Present
Tyto alba	Barn Owl	30/09/2016	2016	Binsted Wood complex, Binsted	1 Present
Tyto alba	Barn Owl	08/08/2016	2016	Binsted Wood complex, Binsted	1 Present
Tyto alba	Barn Owl	24/07/2016	2016	Binsted Wood complex, Binsted	1 Present
Tyto alba	Barn Owl	12/12/2015	2015	Binsted Rife	1 Present
Strix aluco	Tawny Owl	17/06/2004	2004	Arundel Rewell Wood	2 Present
Strix aluco	Tawny Owl	11/06/1993	1993	Binstead Meadow Lodge	1 Present
Strix aluco	Tawny Owl	21/05/1988	1988	Arundel Tortington	1 Present
Strix aluco	Tawny Owl	01/05/1987	1987	Arundel Tortington	2 Present
Caprimulgus europaeus	Nightjar	31/05/2000	2000	Slindon Woods	3 Present
Caprimulgus europaeus	Nightjar	23/05/1994	1994	Arundel Rewell Wood	1 Present; 3 Male
Caprimulgus europaeus	Nightjar	11/06/1992	1992	Arundel Rewell Wood	6 Present
Caprimulgus europaeus	Nightjar	25/05/1992	1992	Arundel Rewell Wood	6 Present
Caprimulgus europaeus	Nightjar	15/06/1991	1991	Arundel Rewell Wood	2 Present
Caprimulgus europaeus	Nightjar	28/06/1990	1990	Arundel Rewell Wood	1 Present
Caprimulgus europaeus	Nightjar	19/06/1989	1989	Arundel Rewell Wood	3 Present
Caprimulgus europaeus	Nightjar	23/05/1988	1988	Arundel Rewell Wood	3 Present
Caprimulgus europaeus	Nightjar	23/07/1987	1987	Arundel Tortington	2 Present
Caprimulgus europaeus	Nightjar	29/05/1986	1986	Arundel Tortington	1 Present
Alcedo atthis	Kingfisher	18/07/2016	2016	Binsted Wood complex, Binsted	1 Present
Alcedo atthis	Kingfisher	23/08/2015	2015	Arun Valley (Arundel-Lhampton)	2 Present
Alcedo atthis	Kingfisher	17/08/2015	2015	Arun Valley (Arundel-Lhampton)	2 Present
Alcedo atthis	Kingfisher	16/08/2015	2015	Arun Valley (Arundel-Lhampton)	1 Present
Alcedo atthis	Kingfisher	15/08/2015	2015	Arun Valley (Arundel-Lhampton)	1 Present
Alcedo atthis	Kingfisher	11/08/2015	2015	Arun Valley (Arundel-Lhampton)	1 Present
Alcedo atthis	Kingfisher	01/08/2015	2015	Arun Valley (Arundel-Lhampton)	2 Present
Alcedo atthis	Kingfisher	26/07/2015	2015	Arun Valley (Arundel-Lhampton)	1 Present
Alcedo atthis	Kingfisher	23/06/2015	2015	Arun Valley (Arundel-Lhampton)	1 Present
Alcedo atthis	Kingfisher	19/08/2014	2014	Arun Valley (Arundel-Lhampton)	1 Present
Alcedo atthis	Kingfisher	18/08/2014	2014	Arun Valley (Arundel-Lhampton)	1 Present
Alcedo atthis	Kingfisher	15/08/2014	2014	Arun Valley (Arundel-Lhampton)	1 Present
Alcedo atthis	Kingfisher	09/08/2014	2014	Arun Valley (Arundel-Lhampton)	1 Present
Alcedo atthis	Kingfisher	06/08/2014	2014	Arun Valley (Arundel-Lhampton)	1 Present

TaxonName	CommonName	RecDate	RecYear	Location	Abundance
Alcedo atthis	Kingfisher	29/08/1995	1995	Binstead Meadow Lodge,	2 Present
Picus viridis	Green Woodpecker	15/04/2010	2010	Arundel Tortington	<Null>
Picus viridis	Green Woodpecker	06/04/2010	2010	Arundel Tortington	1 Present
Picus viridis	Green Woodpecker	26/05/1987	1987	Arundel Tortington	1 Present
Dendrocopos minor	Lesser Spotted Woodpecker	03/09/1998	1998	Binsted Barns Copse	1 Present
Dendrocopos minor	Lesser Spotted Woodpecker	29/03/1991	1991	Binsted Barns Copse,	1 Present
Dendrocopos minor	Lesser Spotted Woodpecker	06/08/1987	1987	Arundel Tortington	1 Present
Dendrocopos minor	Lesser Spotted Woodpecker	20/07/1987	1987	Arundel Tortington	1 Present
Dendrocopos minor	Lesser Spotted Woodpecker	17/07/1987	1987	Arundel Tortington	1 Present
Dendrocopos minor	Lesser Spotted Woodpecker	04/01/1987	1987	Arundel Tortington	1 Present
Dendrocopos minor	Lesser Spotted Woodpecker	21/07/1986	1986	Arundel Tortington	1 Present
Dendrocopos minor	Lesser Spotted Woodpecker	17/06/1981	1981	Arundel	1 Present
Cettia cetti	Cetti's Warbler	01/06/2017	2017	Arundel Tortington	1 Present
Cettia cetti	Cetti's Warbler	01/08/2015	2015	Arun Valley (Arundel-Lhampton)	1 Present
Cettia cetti	Cetti's Warbler	23/06/2015	2015	Arun Valley (Arundel-Lhampton)	2 Present
Cettia cetti	Cetti's Warbler	01/06/2015	2015	Arun Valley (Arundel-Lhampton)	2 Present
Cettia cetti	Cetti's Warbler	28/05/2015	2015	Arun Valley (Arundel-Lhampton)	3 Present
Cettia cetti	Cetti's Warbler	11/05/2015	2015	Arun Valley (Arundel-Lhampton)	2 Present
Cettia cetti	Cetti's Warbler	07/05/2015	2015	Arun Valley (Arundel-Lhampton)	3 Present
Cettia cetti	Cetti's Warbler	04/05/2015	2015	Arun Valley (Arundel-Lhampton)	2 Present
Cettia cetti	Cetti's Warbler	01/05/2015	2015	Arun Valley (Arundel-Lhampton)	1 Present
Cettia cetti	Cetti's Warbler	30/04/2015	2015	Arun Valley (Arundel-Lhampton)	3 Present
Cettia cetti	Cetti's Warbler	29/04/2015	2015	Arun Valley (Arundel-Lhampton)	2 Present
Cettia cetti	Cetti's Warbler	28/04/2015	2015	Arun Valley (Arundel-Lhampton)	1 Present
Cettia cetti	Cetti's Warbler	26/04/2015	2015	Arun Valley (Arundel-Lhampton)	3 Present
Cettia cetti	Cetti's Warbler	24/04/2015	2015	Arun Valley (Arundel-Lhampton)	4 Present
Cettia cetti	Cetti's Warbler	20/04/2015	2015	Arun Valley (Arundel-Lhampton)	3 Present
Cettia cetti	Cetti's Warbler	18/04/2015	2015	Arun Valley (Arundel-Lhampton)	3 Present
Cettia cetti	Cetti's Warbler	16/04/2015	2015	Arun Valley (Arundel-Lhampton)	1 Present
Cettia cetti	Cetti's Warbler	15/04/2015	2015	Arun Valley (Arundel-Lhampton)	4 Present
Cettia cetti	Cetti's Warbler	12/04/2015	2015	Arun Valley (Arundel-Lhampton)	2 Present
Cettia cetti	Cetti's Warbler	11/04/2015	2015	Arun Valley (Arundel-Lhampton)	2 Present
Cettia cetti	Cetti's Warbler	10/04/2015	2015	Arun Valley (Arundel-Lhampton)	3 Present
Cettia cetti	Cetti's Warbler	03/04/2015	2015	Arun Valley (Arundel-Lhampton)	1 Present
Cettia cetti	Cetti's Warbler	23/03/2015	2015	Arun Valley (Arundel-Lhampton)	1 Present
Cettia cetti	Cetti's Warbler	22/03/2015	2015	Arun Valley (Arundel-Lhampton)	1 Present
Cettia cetti	Cetti's Warbler	14/03/2015	2015	Arundel Tortington	1 Present
Cettia cetti	Cetti's Warbler	10/03/2015	2015	Arun Valley (Arundel-Lhampton)	2 Present
Cettia cetti	Cetti's Warbler	27/08/2014	2014	Arun Valley (Arundel-Lhampton)	1 Present
Cettia cetti	Cetti's Warbler	15/08/2014	2014	Arun Valley (Arundel-Lhampton)	1 Present
Cettia cetti	Cetti's Warbler	09/08/2014	2014	Arun Valley (Arundel-Lhampton)	1 Present
Cettia cetti	Cetti's Warbler	08/08/2014	2014	Arun Valley (Arundel-Lhampton)	2 Present
Cettia cetti	Cetti's Warbler	14/07/2014	2014	Arun Valley (Arundel-Lhampton)	1 Present
Cettia cetti	Cetti's Warbler	02/07/2014	2014	Arun Valley (Arundel-Lhampton)	1 Present
Cettia cetti	Cetti's Warbler	29/04/2014	2014	Arun Valley (Arundel-Lhampton)	3 Present
Cettia cetti	Cetti's Warbler	28/04/2014	2014	Arun Valley (Arundel-Lhampton)	3 Present
Cettia cetti	Cetti's Warbler	27/04/2014	2014	Arun Valley (Arundel-Lhampton)	1 Present
Cettia cetti	Cetti's Warbler	24/04/2014	2014	Arun Valley (Arundel-Lhampton)	3 Present
Cettia cetti	Cetti's Warbler	23/04/2014	2014	Arun Valley (Arundel-Lhampton)	3 Present
Cettia cetti	Cetti's Warbler	14/04/2014	2014	Arun Valley (Arundel-Lhampton)	4 Present
Cettia cetti	Cetti's Warbler	27/03/2014	2014	Arun Valley (Arundel-Lhampton)	1 Present
Phylloscopus sibilatrix	Wood Warbler	30/07/2015	2015	Arun Valley (Arundel-Lhampton)	1 Present
Phylloscopus sibilatrix	Wood Warbler	17/04/1993	1993	Arundel Tortington	1 Present
Phylloscopus sibilatrix	Wood Warbler	20/08/1990	1990	Arundel Tortington	1 Present
Phylloscopus sibilatrix	Wood Warbler	31/05/1985	1985	Arundel Tortington	1 Present
Phylloscopus trochilus	Willow Warbler	08/08/2014	2014	Arun Valley (Arundel-Lhampton)	8 Present
Alauda arvensis	Skylark	30/07/2015	2015	Arun Valley (Arundel-Lhampton)	3 Present
Alauda arvensis	Skylark	29/07/2015	2015	Arun Valley (Arundel-Lhampton)	4 Present
Alauda arvensis	Skylark	23/06/2015	2015	Arun Valley (Arundel-Lhampton)	2 Present
Alauda arvensis	Skylark	01/06/2015	2015	Arun Valley (Arundel-Lhampton)	1 Present
Alauda arvensis	Skylark	28/05/2015	2015	Arun Valley (Arundel-Lhampton)	2 Present
Alauda arvensis	Skylark	11/05/2015	2015	Arun Valley (Arundel-Lhampton)	2 Present
Alauda arvensis	Skylark	07/05/2015	2015	Arun Valley (Arundel-Lhampton)	3 Present
Alauda arvensis	Skylark	04/05/2015	2015	Arun Valley (Arundel-Lhampton)	2 Present
Alauda arvensis	Skylark	01/05/2015	2015	Arun Valley (Arundel-Lhampton)	2 Present
Alauda arvensis	Skylark	30/04/2015	2015	Arun Valley (Arundel-Lhampton)	4 Present
Alauda arvensis	Skylark	29/04/2015	2015	Arun Valley (Arundel-Lhampton)	2 Present
Alauda arvensis	Skylark	28/04/2015	2015	Arun Valley (Arundel-Lhampton)	3 Present

TaxonName	CommonName	RecDate	RecYear	Location	Abundance
Alauda arvensis	Skylark	26/04/2015	2015	Arun Valley (Arundel-Lhampton)	4 Present
Alauda arvensis	Skylark	25/04/2015	2015	Arun Valley (Arundel-Lhampton)	Present
Alauda arvensis	Skylark	24/04/2015	2015	Arun Valley (Arundel-Lhampton)	4 Present
Alauda arvensis	Skylark	20/04/2015	2015	Arun Valley (Arundel-Lhampton)	4 Present
Alauda arvensis	Skylark	18/04/2015	2015	Arun Valley (Arundel-Lhampton)	4 Present
Alauda arvensis	Skylark	16/04/2015	2015	Arun Valley (Arundel-Lhampton)	4 Present
Alauda arvensis	Skylark	12/04/2015	2015	Arun Valley (Arundel-Lhampton)	6 Present
Alauda arvensis	Skylark	11/04/2015	2015	Arun Valley (Arundel-Lhampton)	3 Present
Alauda arvensis	Skylark	10/04/2015	2015	Arun Valley (Arundel-Lhampton)	4 Present
Alauda arvensis	Skylark	06/04/2015	2015	Arun Valley (Arundel-Lhampton)	4 Present
Alauda arvensis	Skylark	03/04/2015	2015	Arun Valley (Arundel-Lhampton)	4 Present
Alauda arvensis	Skylark	01/04/2015	2015	Arun Valley (Arundel-Lhampton)	3 Present
Alauda arvensis	Skylark	01/10/2014	2014	Arun Valley (Arundel-Lhampton)	30 Present
Alauda arvensis	Skylark	21/09/2014	2014	Arun Valley (Arundel-Lhampton)	11 Present
Alauda arvensis	Skylark	18/09/2014	2014	Arun Valley (Arundel-Lhampton)	7 Present
Alauda arvensis	Skylark	14/07/2014	2014	Arun Valley (Arundel-Lhampton)	Present
Alauda arvensis	Skylark	08/07/2014	2014	Arun Valley (Arundel-Lhampton)	3 Present
Alauda arvensis	Skylark	14/04/2014	2014	Arun Valley (Arundel-Lhampton)	Present
Alauda arvensis	Skylark	10/02/2014	2014	Arun Valley (Arundel-Lhampton)	3 Present
Alauda arvensis	Skylark	<Null>	1993	Binsted nr Arundel,	<Null>
Riparia riparia	Sand Martin	08/09/2014	2014	Arun Valley (Arundel-Lhampton)	8 Present
Hirundo rustica	Swallow	19/10/2014	2014	Arun Valley (Arundel-Lhampton)	10 Present
Hirundo rustica	Swallow	14/09/2014	2014	Arun Valley (Arundel-Lhampton)	10 Present
Hirundo rustica	Swallow	12/09/2014	2014	Arun Valley (Arundel-Lhampton)	15 Present
Hirundo rustica	Swallow	20/08/2014	2014	Arun Valley (Arundel-Lhampton)	30 Present
Hirundo rustica	Swallow	06/08/2014	2014	Arun Valley (Arundel-Lhampton)	9 Present
Delichon urbicum	House Martin	19/08/2014	2014	Arun Valley (Arundel-Lhampton)	5 Present
Delichon urbicum	House Martin	06/08/2014	2014	Arun Valley (Arundel-Lhampton)	5 Present
Anthus pratensis	Meadow Pipit	14/10/2014	2014	Arun Valley (Arundel-Lhampton)	20 Present
Motacilla flava	Yellow Wagtail	06/05/2014	2014	Arun Valley (Arundel-Lhampton)	1 Present
Luscinia megarhynchos	Nightingale	<Null>	1989	Slindon Woods	4 Present
Luscinia megarhynchos	Nightingale	12/05/1987	1987	Binsted nr Arundel	9 Present
Luscinia megarhynchos	Nightingale	11/05/1986	1986	Slindon CP, Slindon nr Arundel	5 Present
Turdus philomelos	Song Thrush	06/04/2010	2010	Arundel Tortington	<Null>
Turdus viscivorus	Mistle Thrush	15/04/2010	2010	Arundel Tortington	<Null>
Sylvia communis	Whitethroat	24/04/2014	2014	Arun Valley (Arundel-Lhampton)	2 Present
Regulus ignicapilla	Firecrest	26/05/2012	2012	Walberton nr Arundel	1 Present
Poecile montana	Willow Tit	31/07/1987	1987	Arundel Tortington	1 Present
Poecile montana	Willow Tit	<Null>	1987	Arundel Tortington	1 Present
Poecile montana	Willow Tit	<Null>	1986	Arundel Tortington	1 Present
Poecile palustris	Marsh Tit	27/04/2006	2006	Walberton CP, Binsted Brickkiln Copse	1 Present
Poecile palustris	Marsh Tit	05/04/2006	2006	Binsted Barns Copse	2 Present
Poecile palustris	Marsh Tit	16/07/2003	2003	Walberton nr Arundel	2 Present
Poecile palustris	Marsh Tit	11/04/2003	2003	Binsted nr Arundel	1 Present
Poecile palustris	Marsh Tit	30/06/1999	1999	Binsted Barns Copse	2 Present
Poecile palustris	Marsh Tit	12/06/1998	1998	Potwell Copse,	<Null>
Poecile palustris	Marsh Tit	01/06/1992	1992	Binsted Barns Copse	4 Present
Poecile palustris	Marsh Tit	21/07/1987	1987	Arundel Tortington	2 Present
Sturnus vulgaris	Starling	14/10/2014	2014	Arun Valley (Arundel-Lhampton)	200 Present
Sturnus vulgaris	Starling	15/08/2014	2014	Arun Valley (Arundel-Lhampton)	4 Present
Sturnus vulgaris	Starling	03/08/2014	2014	Arun Valley (Arundel-Lhampton)	10 Present
Sturnus vulgaris	Starling	01/08/2014	2014	Arun Valley (Arundel-Lhampton)	7 Present
Passer domesticus	House Sparrow	06/04/2010	2010	Arundel Tortington	<Null>
Linaria cannabina	Linnet	08/09/2014	2014	Arun Valley (Arundel-Lhampton)	7 Present
Linaria cannabina	Linnet	06/08/2014	2014	Arun Valley (Arundel-Lhampton)	8 Present
Linaria cannabina	Linnet	17/04/2014	2014	Arun Valley (Arundel-Lhampton)	2 Present
Linaria cannabina	Linnet	27/03/2014	2014	Arun Valley (Arundel-Lhampton)	1 Present
Pyrrhula pyrrhula	Bullfinch	15/04/2010	2010	Arundel Tortington	<Null>
Coccothraustes coccothraustes	Hawfinch	04/10/1984	1984	Walberton nr Arundel	3 Present
Emberiza citrinella	Yellowhammer	24/04/2014	2014	Arun Valley (Arundel-Lhampton)	1 Present
Emberiza citrinella	Yellowhammer	26/05/2012	2012	Binsted nr Arundel	2 Present
Emberiza schoeniclus	Reed Bunting	04/08/2014	2014	Arun Valley (Arundel-Lhampton)	8 Present
Emberiza schoeniclus	Reed Bunting	03/08/2014	2014	Arun Valley (Arundel-Lhampton)	8 Present
Emberiza schoeniclus	Reed Bunting	05/07/2010	2010	Lyminster CP, Lyminster	<Null>
Emberiza schoeniclus	Reed Bunting	25/05/1983	1983	Arundel Watermeadows	6 Present

Sussex Biodiversity Records Centre - Invasive Species Records (April 2019)

[Note - Grid references redacted in compliance with data usage rights]

TaxonGroup	TaxonName	CommonName	RecDate	RecYear	Location	Abundance
Birds	Aix galericulata	Mandarin Duck	08/12/2015	2015	Arundel The Waterwoods	8 Present
Birds	Aix galericulata	Mandarin Duck	04/12/2015	2015	Arundel The Waterwoods	4 Present
Birds	Aix galericulata	Mandarin Duck	15/11/2015	2015	Arundel The Waterwoods	2 Present
Birds	Aix galericulata	Mandarin Duck	08/11/2015	2015	Arundel The Waterwoods	4 Present
Birds	Aix galericulata	Mandarin Duck	11/05/2015	2015	Wick Brook Barn Farm	2 Present
Birds	Aix galericulata	Mandarin Duck	16/04/2015	2015	Wick Brook Barn Farm	2 Present
Birds	Aix galericulata	Mandarin Duck	28/03/2007	2007	Walberton nr Arundel	2 Present
Birds	Aix galericulata	Mandarin Duck	15/02/2001	2001	Binsted nr Arundel	2 Present
Birds	Aix galericulata	Mandarin Duck	09/04/1998	1998	Binsted nr Arundel	2 Present
Birds	Aix galericulata	Mandarin Duck	04/10/1997	1997	Binsted nr Arundel	7 Present
Birds	Aix galericulata	Mandarin Duck	25/09/1997	1997	Binsted nr Arundel	10 Present
Birds	Aix galericulata	Mandarin Duck	18/09/1997	1997	Binsted nr Arundel	13 Present
Birds	Aix galericulata	Mandarin Duck	27/04/1991	1991	Binsted Barns Copse	1 Male; 1 Present
Birds	Aix galericulata	Mandarin Duck	29/03/1991	1991	Binsted Barns Copse	1 Male
Birds	Aix sponsa	Wood Duck	18/04/1988	1988	Walberton nr Arundel	2 Present
Birds	Branta canadensis	Canada Goose	30/07/2016	2016	Lyminster CP, Lyminster	6 Present
Birds	Branta canadensis	Canada Goose	03/09/2015	2015	Wick Brook Barn Farm	4 Present
Birds	Branta canadensis	Canada Goose	02/09/2015	2015	Wick Brook Barn Farm	1 Present
Birds	Branta canadensis	Canada Goose	24/08/2015	2015	Wick Brook Barn Farm	32 Present
Birds	Branta canadensis	Canada Goose	23/08/2015	2015	Wick Brook Barn Farm	22 Present
Birds	Branta canadensis	Canada Goose	18/08/2015	2015	Wick Brook Barn Farm	36 Present
Birds	Branta canadensis	Canada Goose	17/08/2015	2015	Wick Brook Barn Farm	15 Present
Birds	Branta canadensis	Canada Goose	16/08/2015	2015	Wick Brook Barn Farm	Present
Birds	Branta canadensis	Canada Goose	15/08/2015	2015	Wick Brook Barn Farm	28 Present
Birds	Branta canadensis	Canada Goose	12/08/2015	2015	Wick Brook Barn Farm	12 Present
Birds	Branta canadensis	Canada Goose	11/08/2015	2015	Wick Brook Barn Farm	12 Present
Birds	Branta canadensis	Canada Goose	29/07/2015	2015	Wick Brook Barn Farm	9 Present
Birds	Branta canadensis	Canada Goose	28/05/2015	2015	Wick Brook Barn Farm	1 Present
Birds	Branta canadensis	Canada Goose	11/05/2015	2015	Wick Brook Barn Farm	4 Present
Birds	Branta canadensis	Canada Goose	07/05/2015	2015	Wick Brook Barn Farm	2 Present
Birds	Branta canadensis	Canada Goose	04/05/2015	2015	Wick Brook Barn Farm	9 Present
Birds	Branta canadensis	Canada Goose	01/05/2015	2015	Wick Brook Barn Farm	1 Present
Birds	Branta canadensis	Canada Goose	30/04/2015	2015	Wick Brook Barn Farm	9 Present
Birds	Branta canadensis	Canada Goose	29/04/2015	2015	Wick Brook Barn Farm	18 Present
Birds	Branta canadensis	Canada Goose	28/04/2015	2015	Wick Brook Barn Farm	4 Present
Birds	Branta canadensis	Canada Goose	26/04/2015	2015	Wick Brook Barn Farm	11 Present
Birds	Branta canadensis	Canada Goose	25/04/2015	2015	Wick Brook Barn Farm	6 Present
Birds	Branta canadensis	Canada Goose	24/04/2015	2015	Wick Brook Barn Farm	4 Present
Birds	Branta canadensis	Canada Goose	20/04/2015	2015	Wick Brook Barn Farm	2 Present
Birds	Branta canadensis	Canada Goose	18/04/2015	2015	Wick Brook Barn Farm	3 Present
Birds	Branta canadensis	Canada Goose	16/04/2015	2015	Wick Brook Barn Farm	4 Present
Birds	Branta canadensis	Canada Goose	15/04/2015	2015	Wick Brook Barn Farm	3 Present
Birds	Branta canadensis	Canada Goose	14/04/2015	2015	Wick Brook Barn Farm	18 Present
Birds	Branta canadensis	Canada Goose	12/04/2015	2015	Wick Brook Barn Farm	20 Present
Birds	Branta canadensis	Canada Goose	11/04/2015	2015	Wick Brook Barn Farm	23 Present
Birds	Branta canadensis	Canada Goose	10/04/2015	2015	Wick Brook Barn Farm	21 Present
Birds	Branta canadensis	Canada Goose	06/04/2015	2015	Wick Brook Barn Farm	23 Present
Birds	Branta canadensis	Canada Goose	03/04/2015	2015	Wick Brook Barn Farm	10 Present
Birds	Branta canadensis	Canada Goose	01/04/2015	2015	Wick Brook Barn Farm	6 Present
Birds	Branta canadensis	Canada Goose	23/03/2015	2015	Wick Brook Barn Farm	6 Present
Birds	Branta canadensis	Canada Goose	22/03/2015	2015	Wick Brook Barn Farm	5 Present
Birds	Branta canadensis	Canada Goose	20/11/2014	2014	Arun Valley (Arundel-Lhampton)	32 Present
Birds	Branta canadensis	Canada Goose	18/11/2014	2014	Arun Valley (Arundel-Lhampton)	40 Present
Birds	Branta canadensis	Canada Goose	12/11/2014	2014	Arun Valley (Arundel-Lhampton)	106 Present
Birds	Branta canadensis	Canada Goose	05/11/2014	2014	Arun Valley (Arundel-Lhampton)	106 Present
Birds	Branta canadensis	Canada Goose	19/10/2014	2014	Arun Valley (Arundel-Lhampton)	59 Present
Birds	Branta canadensis	Canada Goose	14/10/2014	2014	Arun Valley (Arundel-Lhampton)	55 Present
Birds	Branta canadensis	Canada Goose	10/10/2014	2014	Arun Valley (Arundel-Lhampton)	45 Present
Birds	Branta canadensis	Canada Goose	09/10/2014	2014	Arun Valley (Arundel-Lhampton)	84 Present
Birds	Branta canadensis	Canada Goose	03/10/2014	2014	Arun Valley (Arundel-Lhampton)	45 Present
Birds	Branta canadensis	Canada Goose	01/10/2014	2014	Arun Valley (Arundel-Lhampton)	38 Present
Birds	Branta canadensis	Canada Goose	24/09/2014	2014	Arun Valley (Arundel-Lhampton)	Present
Birds	Branta canadensis	Canada Goose	22/09/2014	2014	Arun Valley (Arundel-Lhampton)	16 Present
Birds	Branta canadensis	Canada Goose	21/09/2014	2014	Arun Valley (Arundel-Lhampton)	16 Present
Birds	Branta canadensis	Canada Goose	14/09/2014	2014	Arun Valley (Arundel-Lhampton)	35 Present
Birds	Branta canadensis	Canada Goose	08/09/2014	2014	Arun Valley (Arundel-Lhampton)	28 Present
Birds	Branta canadensis	Canada Goose	01/09/2014	2014	Arun Valley (Arundel-Lhampton)	13 Present
Birds	Branta canadensis	Canada Goose	27/08/2014	2014	Arun Valley (Arundel-Lhampton)	20 Present
Birds	Branta canadensis	Canada Goose	20/08/2014	2014	Arun Valley (Arundel-Lhampton)	20 Present
Birds	Branta canadensis	Canada Goose	19/08/2014	2014	Arun Valley (Arundel-Lhampton)	33 Present
Birds	Branta canadensis	Canada Goose	18/08/2014	2014	Arun Valley (Arundel-Lhampton)	2 Present
Birds	Branta canadensis	Canada Goose	15/08/2014	2014	Arun Valley (Arundel-Lhampton)	15 Present
Birds	Branta canadensis	Canada Goose	09/08/2014	2014	Arun Valley (Arundel-Lhampton)	16 Present
Birds	Branta canadensis	Canada Goose	04/08/2014	2014	Arun Valley (Arundel-Lhampton)	17 Present
Birds	Branta canadensis	Canada Goose	03/08/2014	2014	Arun Valley (Arundel-Lhampton)	20 Present
Birds	Branta canadensis	Canada Goose	01/08/2014	2014	Arun Valley (Arundel-Lhampton)	28 Present
Birds	Cygnus atratus	Black Swan	19/02/2015	2015	Wick Brook Barn Farm	2 Present
Birds	Cygnus atratus	Black Swan	17/02/2015	2015	Wick Brook Barn Farm	2 Present
Birds	Cygnus atratus	Black Swan	15/02/2015	2015	Wick Brook Barn Farm	Present
Higher Plants - Flowering Plants	Cotoneaster frigidus x salicifolius = C. x watereri	Waterer's Cotoneaster	<Null>	1990	Arundel	Present
Higher Plants - Flowering Plants	Crassula helmsii	New Zealand Pigmyweed	06/05/2005	2005	Madonna Pond, Binsted,	present
Higher Plants - Flowering Plants	Lemna minuta	Least Duckweed	03/04/2006	2006	Tortington Manor	Present
Higher Plants - Flowering Plants	Myriophyllum aquaticum	Parrot's-feather	06/05/2005	2005	Madonna Pond, Binsted,	present
Higher Plants - Flowering Plants	Prunus laurocerasus	Cherry Laurel	18/07/2008	2008	Potwell Copse,	O DAFOR
Higher Plants - Flowering Plants	Prunus laurocerasus	Cherry Laurel	18/07/2008	2008	Ash Beds,	R DAFOR
Higher Plants - Flowering Plants	Rhododendron ponticum	A Flowering Plant	18/07/2008	2008	Potwell Copse,	O DAFOR
Higher Plants - Flowering Plants	Rhododendron ponticum	A Flowering Plant	09/04/2008	2008	Tortington Common Copse,	R DAFOR

Higher Plants - Flowering Plants	Rhododendron ponticum	A Flowering Plant	12/06/1998	1998	Potwell Copse,	<Null>
Invertebrates - Beetles	Harmonia axyridis	Harlequin Ladybird	05/05/2017	2017	Little Danes Wood	Present Adult
Invertebrates - Beetles	Harmonia axyridis	Harlequin Ladybird	11/05/2016	2016	Binsted Wood - Hedgerow 2	1 Present
Invertebrates - Beetles	Harmonia axyridis	Harlequin Ladybird	22/08/2015	2015	Binstead Rife	Present Adult

Sussex Biodiversity Records Centre - All Other Species Records (April 2019)

[Note - Grid references redacted in compliance with data usage rights]

TaxonGroup	TaxonName	CommonName	Location
Amphibians	Bufo bufo	Common Toad	Oakleys Cottage, Binsted
Amphibians	Bufo bufo	Common Toad	Binsted Wood complex, Binsted
Amphibians	Bufo bufo	Common Toad	Binsted Wood complex, Binsted
Amphibians	Bufo bufo	Common Toad	Binstead Pond
Amphibians	Lissotriton helveticus	Palmate Newt	Madonna Pond, Binsted,
Amphibians	Lissotriton helveticus	Palmate Newt	Madonna Pond, Binsted,
Amphibians	Lissotriton helveticus	Palmate Newt	Madonna Pond, Binsted,
Amphibians	Lissotriton helveticus	Palmate Newt	Madonna Pond, Binsted, Madonna Pond, Binste
Amphibians	Lissotriton vulgaris	Smooth Newt	Madonna Pond, Binsted,
Amphibians	Lissotriton vulgaris	Smooth Newt	Madonna Pond, Binsted,
Amphibians	Lissotriton vulgaris	Smooth Newt	Madonna Pond, Binsted,
Amphibians	Lissotriton vulgaris	Smooth Newt	Walberton CP, Walberton
Amphibians	Lissotriton vulgaris	Smooth Newt	Singleton, Manser Road, Walkerton
Amphibians	Rana temporaria	Common Frog	Little Danes Wood
Amphibians	Rana temporaria	Common Frog	Madonna Pond, Binsted,
Amphibians	Rana temporaria	Common Frog	West Sussex
Amphibians	Rana temporaria	Common Frog	Walberton CP, Walberton
Amphibians	Rana temporaria	Common Frog	Garraway, Copse Lane, Walberton
Amphibians	Rana temporaria	Common Frog	Singleton, Manser Road, Walkerton
Fungi	Leccinum albostipitatum	A Fungus	Binstead Pond
Fungi	Macrotyphula fistulosa var. fistulosa	Pipe Club	Binstead Pond
Higher Plants - Flowering Plants	Arum italicum subsp. neglectum	A Flowering Plant	Binstead
Higher Plants - Flowering Plants	Arum italicum subsp. neglectum	A Flowering Plant	Arundel Causeway (A27)
Higher Plants - Flowering Plants	Buxus sempervirens	Box	Arundel area
Higher Plants - Flowering Plants	Buxus sempervirens	Box	Arundel
Higher Plants - Flowering Plants	Carex vesicaria	Bladder-sedge	Binsted nr Arundel,
Higher Plants - Flowering Plants	Cruciata laevipes	Crosswort	Binsted Wood complex,
Higher Plants - Flowering Plants	Fragaria vesca	Wild Strawberry	Binsted Wood complex,
Higher Plants - Flowering Plants	Galium uliginosum	Fen Bedstraw	Binsted: meadow W side Binsted Rife
Higher Plants - Flowering Plants	Galium uliginosum	Fen Bedstraw	Binsted Rife area
Higher Plants - Flowering Plants	Hieracium sabaudum	Yellow-glandular Hawkweed	Fontwell area
Higher Plants - Flowering Plants	Hyacinthoides non-scripta	Bluebell	Withy Woods,
Higher Plants - Flowering Plants	Hyacinthoides non-scripta	Bluebell	Potwell Copse,
Higher Plants - Flowering Plants	Hyacinthoides non-scripta	Bluebell	Ash Beds,
Higher Plants - Flowering Plants	Hyacinthoides non-scripta	Bluebell	Tortington Common Copse,

TaxonGroup	TaxonName	CommonName	Location
Higher Plants - Flowering Plants	Hyacinthoides non-scripta	Bluebell	Potwell Copse,
Higher Plants - Flowering Plants	Hyacinthoides non-scripta	Bluebell	Binsted Wood complex,
Higher Plants - Flowering Plants	Hyacinthoides non-scripta	Bluebell	Madonna Pond, Binsted
Higher Plants - Flowering Plants	Juncus subnodulosus	Blunt-flowered Rush	Binsted: meadow W side Binsted Rife
Higher Plants - Flowering Plants	Oxalis acetosella	Wood-sorrel	Madonna Pond, Binsted,
Higher Plants - Flowering Plants	Ranunculus hederaceus	Ivy-leaved Crowfoot	Binsted
Higher Plants - Flowering Plants	Ranunculus hederaceus	Ivy-leaved Crowfoot	Binsted Wood complex,
Higher Plants - Flowering Plants	Silene flos-cuculi	Ragged-Robin	Binsted Wood complex,
Higher Plants - Flowering Plants	Veronica officinalis	Heath Speedwell	Madonna Pond, Binsted,
Higher Plants - Flowering Plants	Veronica officinalis	Heath Speedwell	Potwell Copse,
Invertebrates - Ants, Bees, Sawflies & Wasps	Andrena (Andrena) apicata	Large Sallow Mining Bee	A27 Tortington
Invertebrates - Ants, Bees, Sawflies & Wasps	Andrena (Andrena) varians	Backthorn Mining Bee	A27 Tortington
Invertebrates - Ants, Bees, Sawflies & Wasps	Andrena (Hoplandrena) bucephala	Big-headed Mining Bee	A27 Tortington
Invertebrates - Ants, Bees, Sawflies & Wasps	Andrena (Hoplandrena) trimmerana	Trimmer's Mining Bee	A27 Tortington
Invertebrates - Ants, Bees, Sawflies & Wasps	Andrena (Leucandrena) argentata	Small Sandpit Mining Bee	Rewell Sand Pit
Invertebrates - Ants, Bees, Sawflies & Wasps	Andrena (Leucandrena) argentata	Small Sandpit Mining Bee	Rewell Sand Pit
Invertebrates - Ants, Bees, Sawflies & Wasps	Andrena (Plastandrena) bimaculata	Large Gorse Mining Bee	Rewell Sand Pit
Invertebrates - Ants, Bees, Sawflies & Wasps	Andrena (Plastandrena) bimaculata	Large Gorse Mining Bee	A27 Tortington
Invertebrates - Ants, Bees, Sawflies & Wasps	Andrena (Poecilandrena) labiata	Red-girdled Mining Bee	Little Danes Wood
Invertebrates - Ants, Bees, Sawflies & Wasps	Andrena (Simandrena) congruens	Long-fringed Mining Bee	A27 Tortington
Invertebrates - Ants, Bees, Sawflies & Wasps	Andrena (Simandrena) congruens	Long-fringed Mining Bee	Rewell Sand Pit
Invertebrates - Ants, Bees, Sawflies & Wasps	Arachnospila (Ammosphex) wesmaeli	An Ant, Bee, Sawfly or Wasp	A27 Tortington
Invertebrates - Ants, Bees, Sawflies & Wasps	Arachnospila (Ammosphex) wesmaeli	An Ant, Bee, Sawfly or Wasp	Rewell Sand Pit
Invertebrates - Ants, Bees, Sawflies & Wasps	Bombus ruderarius	Red-shanked Carder-bee	A27 Tortington
Invertebrates - Ants, Bees, Sawflies & Wasps	Ceratina (Euceratina) cyanea	Little Carpenter Bee	A27 Tortington
Invertebrates - Ants, Bees, Sawflies & Wasps	Ceratina (Euceratina) cyanea	Little Carpenter Bee	Rewell Sand Pit
Invertebrates - Ants, Bees, Sawflies & Wasps	Crossocerus (Blepharipus) leucostomus	White Mouthed Digger Wasp	A27 Tortington
Invertebrates - Ants, Bees, Sawflies & Wasps	Crossocerus (Crossocerus) exiguus	An Ant, Bee, Sawfly or Wasp	A27 Tortington
Invertebrates - Ants, Bees, Sawflies & Wasps	Lasioglossum (Dialictus) leucopus	White-footed Furrow Bee	A27 Tortington
Invertebrates - Ants, Bees, Sawflies & Wasps	Lasioglossum (Evylaeus) malachurum	Sharp-collared Furrow Bee	Rewell Sand Pit
Invertebrates - Ants, Bees, Sawflies & Wasps	Mimesa bruxellensis	An Ant, Bee, Sawfly or Wasp	A27 Tortington
Invertebrates - Ants, Bees, Sawflies & Wasps	Nysson trimaculatus	An Ant, Bee, Sawfly or Wasp	A27 Tortington
Invertebrates - Ants, Bees, Sawflies & Wasps	Osmia (Melanosmia) pilicornis	Fringe-horned Mason Bee	A27 Tortington
Invertebrates - Ants, Bees, Sawflies & Wasps	Osmia (Neosmia) bicolor	Red-tailed Mason Bee	A27 Tortington
Invertebrates - Ants, Bees, Sawflies & Wasps	Pemphredon (Cemonus) lethifera	Little Black Wasp	A27 Tortington

TaxonGroup	TaxonName	CommonName	Location
Invertebrates - Ants, Bees, Sawflies & Wasps	Smicromyrme rufipes	Small Velvet Ant	A27 Tortington
Invertebrates - Ants, Bees, Sawflies & Wasps	Sphecodes longulus	Little Sickle-jawed Blood Bee	A27 Tortington
Invertebrates - Beetles	Anthocomus fasciatus	A Beetle	Binstead Rife
Invertebrates - Beetles	Caenoscelis subdeplanata	A Beetle	Binsted Wood - Hedgerow 2
Invertebrates - Beetles	Cantharis fusca	A Beetle	Binsted Wood - Hedgerow 2
Invertebrates - Beetles	Cercyon (Cercyon) obsoletus	A Beetle	Binsted Wood - Hedgerow 2
Invertebrates - Beetles	Cerylon fagi	A Beetle	Slindon Estate (National Trust property), Ashbe
Invertebrates - Beetles	Cerylon fagi	A Beetle	Slindon Estate (National Trust property), Ashbe
Invertebrates - Beetles	Colon (Myloechus) brunneum	A Beetle	Binsted Wood - Hedgerow 2
Invertebrates - Beetles	Conopalpus testaceus	A Beetle	Binsted Wood - Hedgerow 2
Invertebrates - Beetles	Euglenes oculatus	A Beetle	Binsted Wood - Hedgerow 2
Invertebrates - Beetles	Lucanus cervus	Stag Beetle	West Walberton Lane, Arundel
Invertebrates - Beetles	Lucanus cervus	Stag Beetle	Walberton CP, Walberton
Invertebrates - Beetles	Lucanus cervus	Stag Beetle	Unspecified location in the parish of Slindon
Invertebrates - Beetles	Lucanus cervus	Stag Beetle	Unspecified location in the parish of Walberton
Invertebrates - Beetles	Lucanus cervus	Stag Beetle	Unspecified location in the parish of Walberton
Invertebrates - Beetles	Melasis buprestoides	A Beetle	Binsted Wood - Hedgerow 2
Invertebrates - Beetles	Meligethes rotundicollis	A Beetle	Binsted Wood - Hedgerow 2
Invertebrates - Beetles	Mordella holomelaena	A Beetle	West Sussex (VC13)
Invertebrates - Beetles	Mordellistena (Mordellistena) neuwaldeggi	A Beetle	Binsted Wood - Hedgerow 2
Invertebrates - Beetles	Platystomos albinus	A Beetle	Binsted Wood - Hedgerow 2
Invertebrates - Beetles	Pycnomerus fuliginosus	A Beetle	Binsted Wood - Hedgerow 2
Invertebrates - Beetles	Pycnomerus fuliginosus	A Beetle	Binsted Wood - Lake Copse
Invertebrates - Beetles	Pyrochroa coccinea	Black-headed Cardinal Beetle	Binstead Pond
Invertebrates - Beetles	Tachinus proximus	A Beetle	Binsted Wood - Hedgerow 2
Invertebrates - Beetles	Trichosirocalus barnevillei	A Beetle	Binstead Rife
Invertebrates - Butterflies	Apatura iris	Purple Emperor	Rewell Wood
Invertebrates - Butterflies	Apatura iris	Purple Emperor	Madonna Pond, Binsted
Invertebrates - Butterflies	Apatura iris	Purple Emperor	Binsted Wood
Invertebrates - Butterflies	Boloria euphrosyne	Pearl-bordered Fritillary	Rewell Wood
Invertebrates - Butterflies	Boloria euphrosyne	Pearl-bordered Fritillary	Rewell Wood
Invertebrates - Butterflies	Boloria euphrosyne	Pearl-bordered Fritillary	Rewell Wood South
Invertebrates - Butterflies	Boloria euphrosyne	Pearl-bordered Fritillary	Rewell Wood South
Invertebrates - Butterflies	Boloria euphrosyne	Pearl-bordered Fritillary	Rewell Wood
Invertebrates - Butterflies	Boloria euphrosyne	Pearl-bordered Fritillary	Rewell Wood, South-central

TaxonGroup	TaxonName	CommonName	Location
Invertebrates - Butterflies	Boloria euphrosyne	Pearl-bordered Fritillary	Rewell Wood, South-central
Invertebrates - Butterflies	Boloria euphrosyne	Pearl-bordered Fritillary	Rewell Wood, South-central
Invertebrates - Butterflies	Boloria euphrosyne	Pearl-bordered Fritillary	Rewell Wood: south-central
Invertebrates - Butterflies	Boloria euphrosyne	Pearl-bordered Fritillary	Rewell Wood: south-central
Invertebrates - Butterflies	Boloria euphrosyne	Pearl-bordered Fritillary	Rewell Wood (South Central)
Invertebrates - Butterflies	Boloria euphrosyne	Pearl-bordered Fritillary	Rewell Wood (South Central)
Invertebrates - Butterflies	Boloria euphrosyne	Pearl-bordered Fritillary	Rewell Wood: central-west
Invertebrates - Butterflies	Boloria euphrosyne	Pearl-bordered Fritillary	Rewell Wood (South Central)
Invertebrates - Butterflies	Boloria euphrosyne	Pearl-bordered Fritillary	Rewell Wood (central)
Invertebrates - Butterflies	Boloria euphrosyne	Pearl-bordered Fritillary	Rewell Wood (central)
Invertebrates - Butterflies	Boloria euphrosyne	Pearl-bordered Fritillary	Rewell Wood FC
Invertebrates - Butterflies	Boloria euphrosyne	Pearl-bordered Fritillary	Rewell Wood FC
Invertebrates - Butterflies	Boloria euphrosyne	Pearl-bordered Fritillary	Rewell Wood Complex, Arundel, Rewell Wood
Invertebrates - Butterflies	Boloria euphrosyne	Pearl-bordered Fritillary	Rewell Wood Complex, Arundel, Rewell Wood
Invertebrates - Butterflies	Boloria euphrosyne	Pearl-bordered Fritillary	Rewell Wood (south-central)
Invertebrates - Butterflies	Boloria euphrosyne	Pearl-bordered Fritillary	Rewell Wood (central)
Invertebrates - Butterflies	Boloria euphrosyne	Pearl-bordered Fritillary	Rewell Wood (SC)
Invertebrates - Butterflies	Boloria euphrosyne	Pearl-bordered Fritillary	Rewell Wood (SC)
Invertebrates - Butterflies	Boloria euphrosyne	Pearl-bordered Fritillary	Rewell Wood (SC)
Invertebrates - Butterflies	Boloria euphrosyne	Pearl-bordered Fritillary	Rewell Wood (SC)
Invertebrates - Butterflies	Boloria euphrosyne	Pearl-bordered Fritillary	Rewell Wood (SC)
Invertebrates - Butterflies	Boloria euphrosyne	Pearl-bordered Fritillary	Rewell Wood (SC)
Invertebrates - Butterflies	Boloria euphrosyne	Pearl-bordered Fritillary	Rewell Wood (SC)
Invertebrates - Butterflies	Boloria euphrosyne	Pearl-bordered Fritillary	Slindon/Rewell (SW) Woods
Invertebrates - Butterflies	Boloria euphrosyne	Pearl-bordered Fritillary	Rewell Wood Complex, Arundel,
Invertebrates - Butterflies	Coenonympha pamphilus	Small Heath	Rewell Wood Complex, Arundel, Rewell Wood
Invertebrates - Butterflies	Coenonympha pamphilus	Small Heath	Rewell Wood (SC)
Invertebrates - Butterflies	Coenonympha pamphilus	Small Heath	Rewell Wood (SC)
Invertebrates - Butterflies	Coenonympha pamphilus	Small Heath	Slindon/Rewell (SW) Woods
Invertebrates - Butterflies	Limenitis camilla	White Admiral	Binstead Pond
Invertebrates - Butterflies	Limenitis camilla	White Admiral	Land in Arundel parish
Invertebrates - Butterflies	Limenitis camilla	White Admiral	Arundel Court (1km sq)
Invertebrates - Butterflies	Limenitis camilla	White Admiral	Binstead Wood (south-east)
Invertebrates - Butterflies	Limenitis camilla	White Admiral	Rewell Wood Complex, Arundel, Rewell Wood
Invertebrates - Butterflies	Limenitis camilla	White Admiral	Binsted/Paine's Wood

TaxonGroup	TaxonName	CommonName	Location
Invertebrates - Butterflies	Limenitis camilla	White Admiral	Rewell Wood Complex, Arundel, Rewell Wood
Invertebrates - Butterflies	Limenitis camilla	White Admiral	Rewell Wood Complex, Arundel, Rewell Wood
Invertebrates - Butterflies	Limenitis camilla	White Admiral	Arundel Hotel Area
Invertebrates - Butterflies	Limenitis camilla	White Admiral	Rewell Wood (south-central)
Invertebrates - Butterflies	Limenitis camilla	White Admiral	Rewell Wood (SC)
Invertebrates - Butterflies	Limenitis camilla	White Admiral	Rewell Wood (SC)
Invertebrates - Butterflies	Limenitis camilla	White Admiral	Rewell Wood (SC)
Invertebrates - Butterflies	Limenitis camilla	White Admiral	Tortington Lane (N)
Invertebrates - Butterflies	Limenitis camilla	White Admiral	Slindon Estate (National Trust property), Ashbe
Invertebrates - Butterflies	Limenitis camilla	White Admiral	Rewell Wood (SC)
Invertebrates - Butterflies	Limenitis camilla	White Admiral	Rewell Wood (SC)
Invertebrates - Butterflies	Pyrgus malvae	Grizzled Skipper	Rewell Wood
Invertebrates - Butterflies	Pyrgus malvae	Grizzled Skipper	Rewell Wood South
Invertebrates - Butterflies	Pyrgus malvae	Grizzled Skipper	Rewell Wood South
Invertebrates - Butterflies	Pyrgus malvae	Grizzled Skipper	Rewell Wood, South-central
Invertebrates - Butterflies	Pyrgus malvae	Grizzled Skipper	Rewell Wood, South-central
Invertebrates - Butterflies	Pyrgus malvae	Grizzled Skipper	Rewell Wood (central)
Invertebrates - Butterflies	Pyrgus malvae	Grizzled Skipper	Rewell Wood FC
Invertebrates - Butterflies	Pyrgus malvae	Grizzled Skipper	Rewell Wood Complex, Arundel, Rewell Wood
Invertebrates - Butterflies	Pyrgus malvae	Grizzled Skipper	Rewell Wood (SC)
Invertebrates - Butterflies	Pyrgus malvae	Grizzled Skipper	Rewell Wood (SC)
Invertebrates - Butterflies	Pyrgus malvae	Grizzled Skipper	Rewell Wood (SC)
Invertebrates - Butterflies	Pyrgus malvae	Grizzled Skipper	Rewell Wood (SC)
Invertebrates - Butterflies	Pyrgus malvae	Grizzled Skipper	Rewell Wood (SC)
Invertebrates - Butterflies	Pyrgus malvae	Grizzled Skipper	Slindon/Rewell (SW) Woods
Invertebrates - Butterflies	Pyrgus malvae	Grizzled Skipper	Slindon/Rewell (SW) Woods
Invertebrates - Grasshoppers & Crickets	Metrioptera roeselii	Roesel's Bush-cricket	Binstead Rife
Invertebrates - Moths	Acronicta rumicis	Knot Grass	Walberton nr Arundel, West Walberton Lane
Invertebrates - Moths	Acronicta rumicis	Knot Grass	Walberton nr Arundel, West Walberton Lane
Invertebrates - Moths	Amphipyra tragopoginis	Mouse Moth	Potwell Copse
Invertebrates - Moths	Amphipyra tragopoginis	Mouse Moth	Walberton nr Arundel, West Walberton Lane
Invertebrates - Moths	Anania verbascalis	Golden Pearl	Rewell Wood
Invertebrates - Moths	Apoda limacodes	Festoon	Slindon CP, Slindon
Invertebrates - Moths	Apoda limacodes	Festoon	Rewell Wood Complex, Arundel, Rewell Wood
Invertebrates - Moths	Atolmis rubricollis	Red-necked Footman	Rewell Wood Complex, Arundel, Rewell Wood

TaxonGroup	TaxonName	CommonName	Location
Invertebrates - Moths	Caradrina morpheus	Mottled Rustic	Rewell Wood Complex, Arundel, Rewell Wood
Invertebrates - Moths	Caradrina morpheus	Mottled Rustic	Walberton nr Arundel, West Walberton Lane
Invertebrates - Moths	Catocala sponsa	Dark Crimson Underwing	West Walberton Lane, Walberton
Invertebrates - Moths	Cepphis advenaria	Little Thorn	Rewell Wood Complex, Arundel, Rewell Wood
Invertebrates - Moths	Crambus silvella	Wood Grass-veneer	Walberton CP, Walberton
Invertebrates - Moths	Diarsia rubi	Small Square-spot	Walberton nr Arundel, West Walberton Lane
Invertebrates - Moths	Eilema sororcula	Orange Footman	Rewell Wood Complex, Arundel, Rewell Wood
Invertebrates - Moths	Eilema sororcula	Orange Footman	Rewell Wood Complex, Arundel, Rewell Wood
Invertebrates - Moths	Elaphria venustula	Rosy Marbled	Rewell Wood Complex, Arundel, Rewell Wood
Invertebrates - Moths	Elaphria venustula	Rosy Marbled	Rewell Wood Complex, Arundel, Rewell Wood
Invertebrates - Moths	Elegia similella	White-barred Knot-horn	Rewell Wood Complex, Arundel, Rewell Wood
Invertebrates - Moths	Ennomos fuscantaria	Dusky Thorn	Potwell Copse
Invertebrates - Moths	Epinotia demarniana	Birch Bell	Rewell Wood Complex, Arundel, Rewell Wood
Invertebrates - Moths	Epinotia demarniana	Birch Bell	Rewell Wood Complex, Arundel, Rewell Wood
Invertebrates - Moths	Ethmia dodecea	Dotted Ermel	Rewell Wood Complex, Arundel, Rewell Wood
Invertebrates - Moths	Ethmia dodecea	Dotted Ermel	Rewell Wood Complex, Arundel, Rewell Wood
Invertebrates - Moths	Ethmia dodecea	Dotted Ermel	Rewell Wood Complex, Arundel, Rewell Wood
Invertebrates - Moths	Ethmia dodecea	Dotted Ermel	Rewell Wood Complex, Arundel, Rewell Wood
Invertebrates - Moths	Eucosmomorpha albersana	Honeysuckle Bell	Rewell Wood Complex, Arundel, Rewell Wood
Invertebrates - Moths	Eucosmomorpha albersana	Honeysuckle Bell	Rewell Wood Complex, Arundel, Rewell Wood
Invertebrates - Moths	Eudonia pallida	Marsh Grey	Rewell Wood Complex, Arundel, Rewell Wood
Invertebrates - Moths	Eupithecia inturbata	Maple Pug	Walberton nr Arundel, West Walberton Lane
Invertebrates - Moths	Hepialus humuli	Ghost Moth	Rewell Wood Complex, Arundel, Rewell Wood
Invertebrates - Moths	Hoplodrina blanda	Rustic	Walberton nr Arundel, West Walberton Lane
Invertebrates - Moths	Hydraecia micacea	Rosy Rustic	Walberton nr Arundel, West Walberton Lane
Invertebrates - Moths	Hydria cervinalis	Scarce Tissue	West Walberton Lane
Invertebrates - Moths	Hydria cervinalis	Scarce Tissue	West Walberton Lane
Invertebrates - Moths	Leucania comma	Shoulder-striped Wainscot	Walberton nr Arundel, West Walberton Lane
Invertebrates - Moths	Malacosoma neustria	Lackey	Walberton nr Arundel, West Walberton Lane
Invertebrates - Moths	Melanthia procellata	Pretty Chalk Carpet	Rewell Wood Complex, Arundel, Rewell Wood
Invertebrates - Moths	Moma alpium	Scarce Merveille du Jour	Rewell Wood Complex, Arundel, Rewell Wood
Invertebrates - Moths	Mompha terminella	Enchanters Cosmet	Rewell Wood
Invertebrates - Moths	Oncocera semirubella	Rosy-striped Knot-horn	Walberton CP, Walberton
Invertebrates - Moths	Oncocera semirubella	Rosy-striped Knot-horn	Walberton CP, Walberton
Invertebrates - Moths	Pammene germmana	Black Piercer	Rewell Wood Complex, Arundel, Rewell Wood

TaxonGroup	TaxonName	CommonName	Location
Invertebrates - Moths	Pammene germmana	Black Piercer	Rewell Wood Complex, Arundel, Rewell Wood
Invertebrates - Moths	Paracrania chrysolepidella	Small Hazel Purple	Rewell Wood Complex, Arundel, Rewell Wood
Invertebrates - Moths	Peribatodes secundaria	Feathered Beauty	Walberton
Invertebrates - Moths	Perizoma albulata	Grass Rivulet	Rewell Wood Complex, Arundel, Rewell Wood
Invertebrates - Moths	Ptilodon cucullina	Maple Prominent	Rewell Wood Complex, Arundel, Rewell Wood
Invertebrates - Moths	Scopula rubiginata	Tawny Wave	Walberton
Invertebrates - Moths	Spatalistis bifasciana	Small Purple Button	Rewell Wood Complex, Arundel, Rewell Wood
Invertebrates - Moths	Spatalistis bifasciana	Small Purple Button	Rewell Wood Complex, Arundel, Rewell Wood
Invertebrates - Moths	Spatalistis bifasciana	Small Purple Button	Rewell Wood
Invertebrates - Moths	Spatalistis bifasciana	Small Purple Button	Rewell Wood Complex, Arundel, Rewell Wood
Invertebrates - Moths	Spilosoma lubricipeda	White Ermine	Rewell Wood Complex, Arundel, Rewell Wood
Invertebrates - Moths	Spilosoma lubricipeda	White Ermine	Walberton nr Arundel, West Walberton Lane
Invertebrates - Moths	Spilosoma lutea	Buff Ermine	Binsted Wood complex, Binsted
Invertebrates - Moths	Spilosoma lutea	Buff Ermine	Rewell Wood Complex, Arundel, Rewell Wood
Invertebrates - Moths	Spilosoma lutea	Buff Ermine	Walberton nr Arundel, West Walberton Lane
Invertebrates - Moths	Spilosoma lutea	Buff Ermine	Walberton nr Arundel, West Walberton Lane
Invertebrates - Moths	Teleiodes wagae	Hazel Groundling	Rewell Wood Complex, Arundel, Rewell Wood
Invertebrates - Moths	Teleiodes wagae	Hazel Groundling	Rewell Wood Complex, Arundel, Rewell Wood
Invertebrates - Moths	Teleiodes wagae	Hazel Groundling	Rewell Wood
Invertebrates - Moths	Teleiodes wagae	Hazel Groundling	Rewell Wood Complex, Arundel, Rewell Wood
Invertebrates - Moths	Teleiodes wagae	Hazel Groundling	Rewell Wood Complex, Arundel, Rewell Wood
Invertebrates - Moths	Teleiodes wagae	Hazel Groundling	Rewell Wood Complex, Arundel, Rewell Wood
Invertebrates - Moths	Teleiodes wagae	Hazel Groundling	Rewell Wood Complex, Arundel, Rewell Wood
Invertebrates - Moths	Tetheella fluctuosa	Satin Lutestring	Rewell Wood Complex, Arundel, Rewell Wood
Invertebrates - Moths	Tetheella fluctuosa	Satin Lutestring	Rewell Wood Complex, Arundel, Rewell Wood
Invertebrates - Moths	Timandra comae	Blood-vein	Rewell Wood Complex, Arundel, Rewell Wood
Invertebrates - Moths	Timandra comae	Blood-vein	Walberton nr Arundel, West Walberton Lane
Invertebrates - Moths	Timandra comae	Blood-vein	Walberton nr Arundel, West Walberton Lane
Invertebrates - Moths	Tyria jacobaeae	Cinnabar	Binstead Rife
Invertebrates - Moths	Tyria jacobaeae	Cinnabar	Binstead Rife
Invertebrates - Moths	Tyria jacobaeae	Cinnabar	Rewell Wood Complex, Arundel, Rewell Wood
Invertebrates - Moths	Tyria jacobaeae	Cinnabar	Rewell Wood Complex, Arundel, Rewell Wood
Invertebrates - Moths	Tyria jacobaeae	Cinnabar	Rewell Wood, Slindon, woodland ride N of A27
Invertebrates - Moths	Watsonalla binaria	Oak Hook-tip	Walberton nr Arundel, West Walberton Lane
Invertebrates - Moths	Watsonalla binaria	Oak Hook-tip	Walberton nr Arundel, West Walberton Lane

TaxonGroup	TaxonName	CommonName	Location
Invertebrates - True Flies	Liriomyza pascuum	A True Fly	Rewell Wood
Invertebrates - True Flies	Liriomyza pascuum	A True Fly	Rewell Wood
Invertebrates - True Flies	Volucella inanis	A True Fly	Binstead Rife
Invertebrates - True Flies	Volucella zonaria	A True Fly	Binstead Rife
Lichens	Thelopsis rubella	A Lichen	Park Bottom
Lichens	Verrucaria polysticta	A Lichen	Binsted Churchyard
Lower Plants - Mosses	Tortula protobryoides	Tall Pottia	Binsted church
Mammals - Terrestrial (excl. bats)	Arvicola amphibius	European Water Vole	Binsted Golf Course
Mammals - Terrestrial (excl. bats)	Arvicola amphibius	European Water Vole	Binsted Golf Course
Mammals - Terrestrial (excl. bats)	Arvicola amphibius	European Water Vole	Binsted Golf Course
Mammals - Terrestrial (excl. bats)	Arvicola amphibius	European Water Vole	Binsted Golf Course
Mammals - Terrestrial (excl. bats)	Erinaceus europaeus	West European Hedgehog	Arundel
Mammals - Terrestrial (excl. bats)	Erinaceus europaeus	West European Hedgehog	Binsted Wood complex, Binsted
Mammals - Terrestrial (excl. bats)	Erinaceus europaeus	West European Hedgehog	Binsted Wood complex, Binsted
Mammals - Terrestrial (excl. bats)	Erinaceus europaeus	West European Hedgehog	Unspecified Location Within Walberton CP
Mammals - Terrestrial (excl. bats)	Erinaceus europaeus	West European Hedgehog	Unspecified Location Within Walberton CP
Mammals - Terrestrial (excl. bats)	Erinaceus europaeus	West European Hedgehog	B2132 Walberton
Mammals - Terrestrial (excl. bats)	Lepus europaeus	Brown Hare	Binsted Wood complex, Binsted
Mammals - Terrestrial (excl. bats)	Lepus europaeus	Brown Hare	Binsted Wood complex, Binsted
Mammals - Terrestrial (excl. bats)	Micromys minutus	Harvest Mouse	Meadow Cottage, Binsted
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Potwell Copse NDMP Site, Box No.2
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Potwell Copse NDMP Site, Box No.2
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Potwell Copse NDMP Site, Box No.35
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Potwell Copse NDMP Site, Box No.35
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Unspecified location within the parish of Walbe
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Potwell Copse NDMP Site, Box No.36
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Potwell Copse NDMP Site, Box No.42
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Potwell Copse NDMP Site, Box No.6
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Potwell Copse NDMP Site, Box No.6
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Unspecified location within the parish of Walbe
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Potwell Copse NDMP Site, Box No.36
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Potwell Copse NDMP Site, Box No.36
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Potwell Copse NDMP Site, Box No.6
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Potwell Copse NDMP Site, Box No.A8
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Potwell Copse NDMP Site, Box No.A8

TaxonGroup	TaxonName	CommonName	Location
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Unspecified location within the parish of Walbe
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Potwell Copse NDMP Site, Box No.4
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Potwell Copse NDMP Site, Box No.A8
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Unspecified location within the parish of Walbe
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Potwell Copse
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Potwell Copse
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Potwell Copse
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Potwell Copse
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Potwell Copse
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Potwell Copse
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Potwell Copse
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Unspecified location within the parish of Walbe
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Potwell Copse
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Potwell Copse
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Potwell Copse
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Potwell Copse
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Potwell Copse NDMP Site, Box No.29
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Potwell Copse NDMP Site, Box No.7
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Potwell Copse NDMP Site, Box No.9
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Potwell Copse
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Potwell Copse NDMP Site, Box No.42
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Potwell Copse NDMP Site, Box No.42
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Potwell Copse NDMP Site, Box No.42
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Potwell Copse NDMP Site, Box No.46
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Potwell Copse
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Potwell Copse NDMP Site, Box No.22
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Potwell Copse
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Potwell Copse NDMP Site, Box No.33
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Potwell Copse NDMP Site, Box No.33
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Potwell Copse
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Potwell Copse NDMP Site, Box No.46
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Potwell Copse NDMP Site, Box No.7
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Potwell Copse NDMP Site, Box No.7
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Potwell Copse
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Potwell Copse NDMP Site, Box No.47

TaxonGroup	TaxonName	CommonName	Location
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Potwell Copse NDMP Site, Box No.5
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Potwell Copse NDMP Site, Box No.5
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Potwell Copse NDMP Site, Box No.39
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Potwell Copse NDMP Site, Box No.48
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Potwell Copse NDMP Site, Box No.14
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Potwell Copse NDMP Site, Box No.32
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Potwell Copse NDMP Site, Box No.48
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Potwell Copse
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Potwell Copse NDMP Site, Box No.36
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Potwell Copse NDMP Site, Box No.36
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Unspecified location within the parish of Walbe
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Potwell Copse NDMP Site, Box No.36
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Potwell Copse NDMP Site, Box No.36
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Potwell Copse NDMP Site, Box No.6
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Potwell Copse,
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Potwell Copse NDMP Site, Box No.37
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Potwell Copse, Potwell Copse, Walberton
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Potwell Copse NDMP Site, Box No.14
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Potwell Copse NDMP Site, Box No.20
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Potwell Copse NDMP Site, Box No.37
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Potwell Copse NDMP Site, Box No.12
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Potwell Copse NDMP Site, Box No.36
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Potwell Copse NDMP Site, Box No.32
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Potwell Copse NDMP Site, Box No.35
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Potwell Copse NDMP Site, Box No.35
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Potwell Copse NDMP Site, Box No.4
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Potwell Copse NDMP Site, Box No.3
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Potwell Copse NDMP Site, Box No.3
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Potwell Copse NDMP Site, Box No.32
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Potwell Copse NDMP Site, Box No.32
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Potwell Copse NDMP Site, Box No.48
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Potwell Copse NDMP Site, Box No.6
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Potwell Copse
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Potwell Copse NDMP Site, Box No.16
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Potwell Copse NDMP Site, Box No.30

TaxonGroup	TaxonName	CommonName	Location
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Potwell Copse NDMP Site, Box No.16
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Potwell Copse NDMP Site, Box No.20
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Potwell Copse NDMP Site, Box No.30
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Potwell Copse NDMP Site, Box No.7
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Potwell Copse,
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Potwell Copse NDMP Site, Box No.14
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Potwell Copse NDMP Site, Box No.33
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Potwell Copse NDMP Site, Box No.4
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Potwell Copse NDMP Site, Box No.42
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Potwell Copse NDMP Site, Box No.22
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Potwell Copse NDMP Site, Box No.23
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Potwell Copse NDMP Site, Box No.35
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Potwell Copse NDMP Site, Box No.42
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Potwell Copse NDMP Site, Box No.44
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Potwell Copse NDMP Site, Box No.7
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Potwell Copse NDMP Site, Box No.22
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Potwell Copse NDMP Site, Box No.22
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Potwell Copse NDMP Site, Box No.32
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Potwell Copse NDMP Site, Box No.7
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Potwell Copse NDMP Site, Box No.20
Mammals - Terrestrial (excl. bats)	Muscardinus avellanarius	Hazel Dormouse	Potwell Copse NDMP Site, Box No.32
Mammals - Terrestrial (excl. bats)	Mustela putorius	Polecat	Walberton, West Sussex
Reptiles	Anguis fragilis	Slow-worm	Walberton Nr Arundel
Reptiles	Natrix helvetica	Grass Snake	Binsted Wood complex, Binsted
Reptiles	Natrix helvetica	Grass Snake	Binsted Wood complex, Binsted
Reptiles	Natrix helvetica	Grass Snake	Binsted Wood complex, Binsted
Reptiles	Natrix helvetica	Grass Snake	Garden Pond, Walburton
Reptiles	Natrix helvetica	Grass Snake	Garden Pond, Walburton
Reptiles	Natrix helvetica	Grass Snake	West Sussex
Reptiles	Natrix helvetica	Grass Snake	Madonna Pond, Binsted
Reptiles	Natrix helvetica	Grass Snake	West Walberton Lane, Walberton
Reptiles	Vipera berus	Adder	Madonna Pond, Binsted
Reptiles	Zootoca vivipara	Common Lizard	Binsted Wood complex, Binsted
Reptiles	Zootoca vivipara	Common Lizard	Binsted Wood complex, Binsted
Reptiles	Zootoca vivipara	Common Lizard	Binsted

TaxonGroup	TaxonName	CommonName	Location
Reptiles	Zootoca vivipara	Common Lizard	West Walberton Lane, Walberton

ATTACHMENT H: CORRECTED VERSION OF TECHNICAL APPENDIX 8-25: BIODIVERSITY NET GAIN ASSESSMENT

A27 Arundel Bypass Biodiversity Net Gain Assessment

Appendix 8-25: Biodiversity Net Gain Assessment

27 August 2019

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Executive Summary

Biodiversity net gain (BNG) is the result of a process applied to development so that overall, there is a positive outcome for biodiversity. The process itself follows the mitigation hierarchy, which sets out that everything possible must be done to firstly avoid, secondly minimise and thirdly restore / rehabilitate losses of biodiversity on site.

The A27 Arundel Bypass Scheme has adopted the Defra metric (Defra, 2012a, b and c) to quantify the biodiversity baseline of six potential Scheme options (as shown in **Appendix D)**.

After establishing the baseline biodiversity value of each potential Scheme Option, Defra's post-development biodiversity unit calculation was used to determine the area and type of habitats required for each Scheme Option to achieve:

1. Biodiversity net gain for Habitats of Principal Importance (HPIs)
2. No net loss (NNL) of biodiversity for non-HPIs.

The post-development calculations have quantified the areas and lengths of habitats required for each Scheme Option to achieve the aims outlined above whilst maintaining the "like-for-like or better" principal for habitat compensation (Appendix B – Principle 6).

This assessment is undertaken for the Design Fix 2 Scheme designs, prepared in February 2019. These were the most up-to-date designs available at the time of the BNG Assessment. It is recommended that the results of biodiversity unit calculations presented in this report should be used to inform option selection and on-going design refinements. In addition, it is recommended that, once a preferred Scheme Option is selected, the area of compensation identified within this report is used to inform the boundary of the Scheme.

A full Biodiversity Net Gain Assessment should be undertaken focusing on a selected Scheme Option, to be completed on provision of a post-development landscape and ecological mitigation plan. The full BNG Assessment will meet the requirements of the Chief Highway Engineer (CHE) Memo. It is advised that the post-development mitigation plan for the preferred Scheme Option is produced in collaboration with an ecologist with a thorough understanding of the biodiversity net gain process.

This biodiversity net gain assessment of Design Fix 2 has identified that all Scheme options will impact irreplaceable ancient woodland habitat. However subsequent design refinements completed at Design Fix 2a have resulted in Option 5BV1 avoiding direct impacts on Ancient Woodland. Scheme options that impact ancient woodland cannot achieve a scheme-wide biodiversity net gain or no net loss, irrespective of the levels of compensation for impacts on non-irreplaceable habitats. This Biodiversity Net Gain Assessment report does not cover the requirements of the Scheme arising from potential impacts on ancient woodland. This information is covered within the Stage 2 EAR.

1 Introduction

1.1 Project Background

1.1.1.1 The scope of the A27 Arundel Bypass scheme as described in the Road Investment Strategy is:

"The replacement of the existing single carriageway road with a dual carriageway bypass, linking together the two existing dual carriageway sections of the road".

1.1.1.2 This corresponds to the six-kilometre section of the A27 from the A284 Crossbush junction (east of Arundel) to the west of Yapton Lane (west of Arundel). The A27 currently goes through the South Downs National Park and the town of Arundel passing over the River Arun and crossing the railway line.

1.1.1.3 Highways England commenced the PCF process for the Scheme in 2015, with the publication of the A27 Corridor Feasibility Study. The Scheme progressed through PCF Stage 0 (Strategy, Shaping and Prioritisation) through to PCF Stage 2 (Option Selection). In the 2017/2018 PCF Stage 2 the options under consideration were Scheme options 1, 3 and 5A, culminating in a Preferred Route Announcement in May 2018.

1.1.1.4 Following that Preferred Route Announcement, Highways England began carrying out further studies and surveys of the then preferred route and surrounding area to progress preliminary design for the Scheme.

1.1.1.5 In October 2018, Highways England announced that a further, non-statutory public consultation would be undertaken on the Scheme (the Further Consultation) and that the Scheme would return to PCF Stage 2 (Option Selection). Through the additional studies and surveys mentioned in paragraph 1.1.1.4, Highway's England came across new and important information. Highway's England wishes to ensure that a forthcoming decision on the preferred route is made taking this new information into account and that consultees are given a fair opportunity to comment on the options on the basis of the information available.

1.1.1.6 The further PCF Stage 2 work (Option Selection) (2018/2019) work included the identification of a suite of potential new Scheme options. The process for identifying and short-listing the new set of Scheme options for consideration in PCF Stage 2, is set out in Chapter 3 of the Environmental Assessment Report (EAR). Ecological field survey data is not currently available for the western sections of Options 4/5AV1 and 5BV1. This is because these sections were previously too far west of the study area to necessitate a survey. Additional survey work targeting these areas is ongoing in 2019 and will be reported on in winter 2019. The information collected for Options 1, 3 and 5A in 2017 and 2018 will be used to inform an assessment of the six Scheme options and scheme option selection.

1.1.1.7 When referring to the combined footprint of the Scheme (all options), the term 'Scheme options' is used in this report. When discussing the footprint of any single option, it is referred to by its number i.e. Option 1V5, Option 1V9, Option 3V1, Option 4/5AV1, Option 4/5AV2 and Option 5BV1.

1.1.1.8 The A27 Arundel Bypass Scheme has adopted the Defra metric (Defra, 2012a, 2012b, 2012c) to undertake a baseline unit calculation to quantify the biodiversity baseline of six potential Scheme options:

- Option 1V5
- Option 1V9
- Option 3V1
- Option 4/5AV1
- Option 4/5AV2
- Option 5BV1

1.1.1.9 The assessment is based on the Design Fix 2 Scheme designs, prepared in February 2019. These were the most up-to-date designs available at the time of the BNG Assessment.

1.2 Ecological Background

1.2.1 Biodiversity Net Gain

1.2.1.1 Highways England's biodiversity strategy document: 'Our plan to protect and increase biodiversity' (Highway England, 2015) states that "Highways England is committed to reducing the net loss of biodiversity across the Strategic Road Network (SRN) by 2020 and to achieving no net loss of biodiversity by 2025". To help realise this commitment, Highways England commissioned WSP to undertake a Biodiversity Net Gain assessment of six potential Scheme options for the A27 Arundel Bypass Scheme.

1.2.1.2 BNG is the end result of a process applied to development so that overall, there is a positive outcome for biodiversity. The process itself follows the mitigation hierarchy, which sets out that everything possible must be done to firstly avoid, secondly minimise and thirdly restore / rehabilitate losses of biodiversity on site. Only as a last resort, residual losses are compensated for using biodiversity offsets, which are distinguished from other forms of mitigation in that they are off the development site and require measurable conservation outcomes.

1.2.1.3 Adopting a BNG approach can account for biodiversity losses not fully covered by legal and planning systems. Whilst some species are extensively protected, many are not; with the consequence that development can be 'legally compliant' but still result in biodiversity loss. The BNG approach guards against this, enabling development to contribute towards the national and global target of halting biodiversity loss by 2020 and towards local and national strategies for conserving and enhancing wildlife.

1.2.1.4 In terms of nature conservation, business as usual for the Proposed Scheme (i.e. without BNG) would follow the standard Ecological Impact Assessment (EcIA) model (CIEEM,2016) of mitigating losses, compensating for losses and then enhancement.

1.2.1.5 Under this model, mitigating losses and impacts required by UK and EU nature conservation legislation is only required for impacts to Important Ecological Features (IEFs) assessed as of local importance or above. BNG therefore goes beyond this, accounting for all direct losses of habitats from development.

1.2.1.6 For BNG to be used appropriately and to generate long-term gains for nature, the good practice principles established by the Business and Biodiversity Offset Programme (BBOP, 2012) can be used. These principles have been established in the context of UK development by the Construction Industry Research and Information Association (CIRIA), the Chartered Institute for Ecology and Environmental Management (CIEEM) and the Institute of Environmental Management and Assessment (IEMA) (see **Appendix B**). The BNG process for the A27 Arundel Bypass Scheme adheres to the implementation of these principles.

1.3 Aims and Objectives

1.3.1.1 WSP was commissioned by Highways England to carry out a BNG assessment using the DEFRA metric and produce a report that:

1. Establishes the baseline biodiversity units of habitats within the footprint of the six potential Scheme options

2. Provides an estimate of how many hectares of compensation habitat and which habitat types will be required for each Scheme option to achieve:
    - Biodiversity net gain for habitats of principal importance (HPIs)
    - No net loss (NNL) of biodiversity for non-HPIs
3. Informs environmental mitigation proposals and scheme design by highlighting likely impacts upon biodiversity for each Scheme option and the compensation required to offset these impacts.

1.3.1.2 This assessment will influence the Environmental Assessment Report (EAR) by providing a quantitative benchmark to inform the size and type of habitat compensation requirements.

1.3.1.3 Once one Scheme option is selected, the Defra metric will be used to assess the biodiversity impacts and opportunities of the specific scheme design. This will inform avoidance, minimisation and compensation measures to contribute to the delivery of the targets set in Highways England's biodiversity strategy.

1.3.1.4 Only impacts within the operational footprint of each Scheme option have been considered at this stage. The biodiversity unit calculations do not account for temporary and / or indirect impacts to habitats outside of the operational Scheme option footprints arising during construction. If there are additional impacts resulting from, for example, compound sites or access routes used during development these will need to be addressed at a later stage.

1.3.1.5 Please note that the Biodiversity Net Gain report does not cover requirements of the Scheme arising from potential impacts on protected species and designated sites. This information is covered within the Stage 2 EAR.

1.4 Biodiversity Net Gain Policy

1.4.1.1 **Appendix A** outlines relevant Biodiversity Net Gain policy, including:

- Highways England BNG policy
- The National Policy Statement for National Networks (NPSNN) (2014)
- The National Planning Policy Framework (NPPF) (2019)
- Local Policy and Legislation.

2 Methods

2.1 Overview

2.1.1.1 WSP has produced a six-step process for carrying out a BNG assessment of a Proposed Scheme (see Appendix C for the full six step process). The work set out in this report is covered by steps two and three.

2.1.2 Irreplaceable Habitats

2.1.2.1 It is important to note that a scheme-wide biodiversity net gain or no net loss cannot be achieved for the scheme as a whole if there are negative impacts on irreplaceable habitats.

2.1.2.2 Following Defra guidance, irreplaceable habitats have been excluded from this biodiversity unit calculation. The following habitats recorded within the Scheme option footprints are considered irreplaceable:

- Ancient Semi-Natural Woodland (ASNW)[1,2]
- Plantation on Ancient Woodland Site (PAWS)[3].

2.1.2.3 The National Policy Statement for National Networks (NPSNN) makes the following statement relating to the need for avoidance of Ancient Woodland and 'aged or veteran trees':

- *"Ancient woodland is a valuable biodiversity resource both for its diversity of species and for its longevity as woodland. Once lost it cannot be recreated. The Secretary of State should not grant development consent for any development that would result in the loss or deterioration of irreplaceable habitats including ancient woodland and the loss of aged or veteran trees found outside ancient woodland, unless the national need for and benefits of the development, in that location, clearly outweigh the loss. Aged or veteran trees found outside ancient woodland are also particularly valuable for biodiversity and their loss should be avoided. Where such trees would be affected by*

[1] Ancient Woodland in England is defined as an area that has been wooded continuously since at least 1600 AD. Ancient Woodland is divided into ancient semi-natural woodland (ASWN) and plantation on ancient woodland sites (PAWS). Both types of woodland are regarded as Ancient Woodlands after Kirby, K. & Goldberg, E. (2006). Ancient woodland: guidance material for local authorities. English Nature [now Natural England], Peterborough.

[2] Ancient Semi-natural stands are those that are composed predominantly of trees and shrubs native to the site that do not obviously originate from planting. They include stands that may have been managed by coppicing or pollarding in the past, as well as those where the tree and shrub layer has grown up by natural regeneration.

[3] Plantations on Ancient Woodland Sites (also called Ancient replanted woodland sites) are areas of Ancient Woodland where the original native tree cover has been felled and replaced by planted stock most commonly of a species not native to the site, for example conifers such as Norway spruce *Picea abies* or Corsican pine *Pinus nigra var. maritima,* but also broadleaves such as sycamore *Acer pseudoplatanus* or sweet chestnut *Castanea sativa.*

development proposals, the applicant should set out proposals for their conservation or, where their loss is unavoidable, the reasons for this".

2.1.2.4 The area of irreplaceable habitat (comprising ASNW and PAWS) within each Scheme option footprint was identified. In these situations, Defra guidance dictates that any compensation offered to address impacts on irreplaceable habitats should be agreed directly with the statutory nature conservation agency (in this case Natural England (NE)). The baseline habitat which is identified for such compensation and the biodiversity units resulting from this compensation should also be excluded from biodiversity unit calculations.

2.1.2.5 Following Defra guidance, impacts on irreplaceable habitats and their compensation have been excluded from this biodiversity unit calculation (**Appendix B** – Principle 2). The assessment of impacts to ancient woodland are assessed in the Stage 2 EAR – **Chapter 8 - Biodiversity**.

2.1.2.6 Unavoidable impacts on irreplaceable habitats should not undermine the BNG process for the other habitats. Projects in this situation should aim to achieve BNG or NNL of non-irreplaceable habitats.

2.1.3 Habitats of Principal Importance

2.1.3.1 Of the non-irreplaceable habitats found within the Scheme options, a number were defined as HPIs using Natural England Priority Habitat datasets.

2.1.4 Linear Habitats

2.1.4.1 Defra recognise that hedgerows are a very important feature in terms of biodiversity value: "*Their contribution, by area, to biodiversity in the landscape is far greater than even the most biodiversity rich habitats*" (Defra, 2012a). Hedgerows therefore cannot be treated as other area-based habitats and are considered in terms of linear units (LU) rather than biodiversity units (BU), both are arbitrary units which are not directly comparable with each other.

2.1.4.2 Under the Defra 2012 metric there is no means of incorporating habitat condition in to the BNG assessment for G2.1 Running water habitat, as there is no accurate method of assessing their condition. Consequently, the length of these habitats in metres are reported as a distinct type of LU which is specific to this habitat. As with BU and LU generated from other habitats, the LU generated for Running water are treated as arbitrary and are not comparable with BU or LU from other habitats.

2.2 Baseline Biodiversity Unit Calculation

2.2.1 Extent and Sources of Baseline Habitat Data

2.2.1.1 The baseline biodiversity net gain assessment was based on habitat data collected during the extended Phase 1 Habitat survey (**Appendix D**) undertaken by WSP in July to September 2017 and May to October 2018. The survey followed JNCC (2010) and CIEEM (2017) best practice guidance. Where access restrictions prevented full Phase 1 Habitat survey from being undertaken, habitats were mapped from Public Rights of Way (PRoW). For areas not covered by Phase 1 Habitat survey or PRoW, habitat types were inferred by an experienced habitat surveyor using publicly available aerial imagery[4].

2.2.1.2 In addition to Phase 1 Habitat survey and PRoW survey, Hedgerow surveys were undertaken and is considered the primary data source for hedgerows. Hedgerow surveys were undertaken following Hedgerow Regulations best practice methodology.

2.2.1.3 Habitat condition assessment (HCA) data was gathered by WSP during the extended Phase 1 Habitat surveys. Where there were gaps in primary HCA data, for example from limited access to land, professional judgement was applied to retrospectively assess habitat condition. Both Phase 1 Habitat survey and HCA datasets were used to quantify the baseline biodiversity value of the six potential Scheme options.

2.2.1.4 Identification of baseline habitats was based on a digitised Phase 1 Habitat layer used to inform the Stage 2 EAR. The BNG calculation covered all habitats (linear and non-linear) within each Scheme option footprint. The following Phase 1 Habitat typologies were excluded from the BNG calculation because in the context of BNG they are not considered to be habitats that have an intrinsic biodiversity value[5]:

- Buildings
- Hardstanding
- Fence

2.2.1.5 These habitat typologies do not generate BU or LU and so are excluded from BNG calculations. However, the total areas of buildings and hardstanding are reported in results tables to show the total area of each Scheme option has been considered in both baseline and post-development calculations.

[4] This approach was deemed suitable for a preliminary BNG assessment as the design is still in the options appraisal stage. However, if a detailed biodiversity unit calculation is undertaken at a later date when the ecological and landscape mitigation plans are finalised, it will be necessary to survey these areas to ensure the information provided in the updated report is accurate and up to date.

[5] Any biodiversity value associated with these habitats (e.g. bat roosts, badger setts) is accounted for under the Environmental Assessment Report.

2.2.1.6 For the baseline assessment and post-development habitat compensation requirements assessment, the length (m) and area (ha) of running water are both reported and expected to be consistent in both assessments. The length is reported as an indicator of the biodiversity value of running water habitats within each Scheme option, and expressed as LU. The area is reported as the River Arun is a wide watercourse and its inclusion in the area-based habitat table allows for complete habitat area coverage for each Scheme option, though no area-based BU are calculated from this habitat type.

2.2.1.7 For area-based habitats, hectares are reported to two decimal places. For linear habitats, length is reported to the nearest half metre.

2.2.2 Baseline Biodiversity Unit Calculation

2.2.2.1 A baseline biodiversity unit calculation was completed for all habitats (excluding watercourses) within the footprint of each Scheme option. Habitat area or length, distinctiveness and condition were used to calculate baseline BU and LU, providing a measure of the biodiversity within each Scheme option before development. This calculation is in accordance with Defra's technical paper, guidance for developers and guidance for offset providers (Defra 2012 a, b and c). This is the standard metric used for calculating BU and LU in the UK.

2.2.2.2 Distinctiveness and condition are given numerical 'scores' which are multiplied, together with hectares (ha) or length in metres (m) of habitat to give the number of baseline biodiversity units.

2.2.3 Distinctiveness

2.2.3.1 Habitat distinctiveness is defined as a collective measure of biodiversity and includes parameters such as the number and variety of species found within the habitat (richness and diversity), how rare the species are, and how many species the habitat supports that are not common elsewhere.

2.2.3.2 To determine habitat distinctiveness, Phase 1 Habitat types were transposed into the standard habitat distinctiveness typology and bands issued by Defra ('the Defra habitat type'). For some habitat types, multiple distinctiveness bands can apply, depending on the quality of the habitat. Decisions on which distinctiveness band to assign were based on criteria listed in Appendix C of the Building Research Establishment's (BRE) Guidance Note 36: BREEAM, CEEQUAL and HQM Ecology Calculation Methodology – Route 2 (BRE, 2018). This document enables consistent assessment of distinctiveness for all habitats

2.2.3.3 The Defra distinctiveness bands and associated scores are described in **Table 2-1**.

Table 2-1 – Habitat distinctiveness bands and scores

Distinctive-ness Band	Distinctive-ness Score	Habitat Types Included
High	6	HPIs i.e. those which meet the criteria to qualify as habitats of principle importance (JNCC, 2011). This excludes ancient woodland and other habitats which are considered irreplaceable.
Medium	4	Other semi-natural habitats that do not fall within the scope of HPI definitions, i.e. all other areas of woodland (e.g. broadleaved plantation), other grassland (e.g. species poor semi-improved), other uncultivated field margins, road verge and railway embankments (excluding those that are intensively managed).
Low	2	Improved grassland, arable fields (excluding any uncultivated margins), domestic gardens, regularly disturbed bare ground (e.g. quarry floor, landfill sites etc.), verges associated with transport corridors.

2.2.3.4 All hedgerows are assumed to be of High distinctiveness because the vast majority of hedgerows will meet HPI criteria. For this reason, distinctiveness is not included as part of the linear unit calculation. This follows the approach set out by Defra.

2.2.4 Condition

2.2.4.1 Condition, in the context of BNG, is defined as the quality of a particular habitat. For example, a habitat is in poor condition if it fails to support the rare or notable species for which it is valued, or if it is degraded as a result of pollution, erosion, invasive species or other factors.

2.2.4.2 The Defra metric requires habitat condition to be assessed using the system presented in Natural England's Farm Environment Plan (FEP) manual (Natural England, 2010).

2.2.4.3 Habitat condition scores were assigned based on the criteria in **Table 2-2**.

Table 2-2 – Habitat condition bands and scores

Condition Band	Condition Score	Criteria for Assessing Condition
Good	3	Any habitat which passes all FEP criteria.
Moderate	2	Any habitat which fails one FEP criterion.
Poor	1	Any habitat which fails two or more FEP criteria.

2.2.4.4 Where primary condition assessment data were not available (i.e. for habitats identified via PRoW and aerial capture) habitat condition was assigned using expert opinion and based on the assumptions listed in Section 3.

2.2.5 Deriving the Total Number of Biodiversity Units

2.2.5.1 Following the scoring of all habitat parcels for habitat distinctiveness and condition, the total number of baseline BU was calculated for each area-based habitat using the following formula:

BASELINE BIODIVERSITY UNITS = *Distinctiveness x Condition x Area (ha)*

2.2.5.2 The scores generated by each individual habitat parcel were then summed to provide the total number of BU generated by the baseline habitat parcels. It is important to set out the BU for the individual habitats so that these can be compared with the post-development BU for the same habitat type.

2.2.5.3 The number of baseline LU were calculated for hedgerows as follows:

BASELINE HEDGEROW LINEAR UNITS = *Length of linear habitats lost (m) x Condition*

2.2.5.4 The number of baseline LU for watercourses simply equate to the length of watercourses

BASELINE WATERCOURSE LINEAR UNITS = *Length of watercourse habitats lost (m)*

2.3 Post-Development Biodiversity Unit Calculation

2.3.1.1 For each of the six potential Scheme options, habitat types and post-development compensation requirement areas and lengths have been calculated to meet the projects aims. The calculation of these post-development compensation requirement areas and length are detailed in the sections below. For each Scheme option bespoke habitat area and length values are calculated based on the baseline habitats and their associated biodiversity value.

2.3.2 Linear Habitats

2.3.2.1 In the post-development compensation habitat requirement calculation, linear habitats have been kept separate from area-based habitats; this mirrors the approach for baseline unit calculations. The risk factors described below are only applicable to the area-based habitat calculation. They are not included in the calculation for linear habitats. This is because the risks associated with creating hedgerows are considered to be taken into account within the condition multiplier used to calculate the baseline LU.

2.3.2.2 The post-development LU from hedgerow habitats and watercourse units created are expressed simply as a length in metres.

POST-DEVELOPMENT LINEAR UNITS *= Length of linear habitat (m)*

2.3.3 Applying Risk Factors to the Post-Development Calculation

2.3.3.1 Post-development biodiversity units are calculated in a similar way to baseline biodiversity units. However, in addition to area, condition and distinctiveness of the proposed habitats, the key risks to delivery are taken into account through incorporation of risk factors. The Defra metric sets out three risk factors: distance from the Scheme (Spatial Risk); time taken for created or enhanced habitats to reach target condition (Temporal Risk); and how difficult it is to create or enhance any given habitat (Delivery Risk).

Spatial risk

2.3.3.2 The Spatial Risk is the risk associated with delivering compensation for the loss of a habitat at a distance from that loss. The further from the site of the loss, the greater the risk. Spatial Risk has not been included in the preliminary post-development calculation as it is assumed that habitat compensation and retention will be delivered within the same ecological network as the loss occurs (**Table 2-3**).

Table 2-3 – Defra spatial risk factors

Location of Creation or Enhancement	Spatial Risk Factor
Habitat being created or enhanced is within 500 m of the area of loss, or in the same ecological network identified in a local (county or equivalent) biodiversity, green infrastructure or offsetting strategy.	1
Habitat type being created or enhanced contributes to and is in a location identified within a local (county or equivalent) biodiversity, green infrastructure or offsetting strategy.	2
Habitat being created or enhanced is not making a contribution to local (county or equivalent) biodiversity, green infrastructure or offsetting strategy.	3

Temporal risk

2.3.3.3 In delivering compensation for loss of habitats, the timing of impact may not coincide with the new habitat reaching the required quality or level of maturity which could result in loss of biodiversity for a period of time. This risk is accounted for by applying a 'temporal risk' multiplier to the biodiversity unit calculations. Defra has no set guidance on the time taken to reach a specific condition for each habitat type. Therefore, this information was taken from Appendix C of the Building Research Establishment's (BRE) Guidance Note 36: BREEAM, CEEQUAL and HQM Ecology Calculation Methodology – Route 2 (BRE, 2018) and Defra's Guidance to Offset Providers as outlined in **Tables 2-4** to **2-6**.

Table 2-4 – Defra temporal risk factors

Years to Target Condition	Temporal Risk Factor
0	1.0
1 – 5	1.2
6 – 10	1.4
11 – 15	1.7
16 – 20	2.0
21 – 25	2.4
26 – 30	2.8
31+	3.0

Table 2-5 – Temporal risk factors for created habitats

HPI Type	Post-development JNCC Habitat Type	Yrs to Target Condition	Temporal Risk Factor
Ponds	G1.1 Standing water - eutrophic	0	1.0
Coastal saltmarsh	H2.4 Saltmarsh-scattered plants	6 – 10	1.4
N/A	F1 Swamp	1 – 5	1.2

Table 2-6 – Temporal risk factors for enhanced habitats

HPI Type	Baseline JNCC Habitat Type	Post-development JNCC Habitat Type	Yrs to Target Condition	Temporal Risk Factor
Lowland deciduous woodland	B4 Improved Grassland	A1.1.1 Broadleaved woodland - semi-natural	31+	3.0
Coastal and floodplain grazing marsh	B4 Improved Grassland	B2.2 Neutral grassland - semi-improved	6 – 10	1.4
N/A	B4 Improved Grassland	A2.1 Scrub - dense / continuous	1 – 5	1.2
N/A	B4 Improved Grassland	B2.1 Neutral grassland - unimproved	6 – 10	1.4
N/A	B4 Improved Grassland	B2.2 Neutral grassland - semi-improved	1 – 5	1.2
N/A	B4 Improved Grassland	B5 Marsh / marshy grassland (low)	1 - 5	1.2

Delivery risk

2.3.3.4 Delivery risk is the risk associated with the difficulty to create or restore any specific habitat. Appendix C of the Building Research Establishment's (BRE) Guidance Note 36: BREEAM, CEEQUAL and HQM Ecology Calculation Methodology – Route 2 (BRE, 2018) and Defra's guidance to offset providers (Defra 2012c) was used to determine the appropriate level of delivery risk and associated risk factor for each habitat type. **Tables 2-7** to **2-9** show the risk factors assigned to each level of delivery risk and type of habitat created or restored across the six Scheme options.

Table 2-7 – Defra delivery risk factors

Difficulty of Creation or Enhancement	Delivery Risk Factor
Very High	10.0
High	3.0
Medium	1.5
Low	1.0

Table 2-8 – Delivery risk factors for created habitats

HPI Type	Post-development JNCC Habitat Type	Difficulty of Creation	Delivery Risk Factor
Ponds	G1.1 Standing water - eutrophic	Low	1.0
Coastal saltmarsh	H2.4 Saltmarsh - scattered plants	Medium	1.5
N/A	F1 Swamp	Low	1.0

Table 2-9 – Delivery risk factors for enhanced habitats

HPI Type	Baseline JNCC Habitat Type	Post-development JNCC Habitat Type	Difficulty of Enhance-ment	Delivery Risk Factor
Lowland deciduous woodland	B4 Improved Grassland	A1.1.1 Broadleaved woodland - semi-natural	Medium	1.5
Coastal and floodplain grazing marsh	B4 Improved Grassland	B2.2 Neutral grassland - semi-improved	Low	1.0
N/A	B4 Improved Grassland	A2.1 Scrub - dense / continuous	Low	1.0
N/A	B4 Improved Grassland	B2.1 Neutral grassland - unimproved	Low	1.0

HPI Type	Baseline JNCC Habitat Type	Post-development JNCC Habitat Type	Difficulty of Enhance-ment	Delivery Risk Factor
N/A	B4 Improved Grassland	B2.2 Neutral grassland - semi-improved	Low	1.0
N/A	B4 Improved Grassland	B5 Marsh / marshy grassland (low)	Low	1.0

2.3.4 Difference Between Habitat Creation and Habitat Enhancement

2.3.4.1 Habitat creation consists of creating new habitat where none was previously present (including bare earth), or following removal or loss of existing habitat. For example, removing scrub in order to create a wetland habitat or removing hardstanding to create grassland.

2.3.4.2 Habitat enhancement consists of improving the condition of an existing habitat and thereby increasing the ecological value of a habitat type. The habitat enhancement approach aims to improve a habitats biodiversity capacity by increasing the diversity of species that can be supported by a habitat. For example, habitat enhancement could include managing improved grassland so that it becomes semi improved grassland.

2.3.4.3 To calculate losses or gains in biodiversity and linear units, the post-development units are divided by the baseline units to give a relative measure of biodiversity value. Post-development biodiversity units are calculated as follows:

2.3.4.4 **Creation**: If the habitat is being created and all existing habitat will be lost, or if the habitat is being created on bare earth or by removing hardstanding, the equation for habitat creation is:

$$\textit{HABITAT CREATION BIODIVERSITY UNITS} = \frac{\textit{Potential Biodiversity Units}}{\textit{(Spatial Risk x Temporal Risk x Delivery Risk)}}$$

2.3.4.5 **Enhancement**: For areas of habitat enhancement, the risks to delivery need only be applied to the change resulting from the enhancement. As a result, the post-development units (enhancement) are calculated as follows:

$$\textit{HABITAT ENHANCEMENT BIODIVERSITY UNITS} = \frac{\textit{(Potential Biodiversity Units – Baseline Biodiversity Units)}}{\textit{(Spatial Risk x Temporal Risk x Delivery Risk)}}$$

Where:

POTENTIAL BIODIVERSITY UNITS =

Target Habitat Area (ha) x Distinctiveness x Target Condition

2.3.5 Compensatory Habitat Area Requirements

2.3.5.1 Compensatory habitat area requirement ratios are used to calculate the area (ha) of compensatory habitat that will be required to compensate for the loss of specific habitats within each Scheme option. This is expressed as a Biodiversity Unit per habitat area (ha) for the compensation areas to allow the area required to meet No Net Loss or Net Gain as a result of the impact of the Scheme option to be calculated.

2.3.5.2 The Defra metric and associated guidance has been used as the basis of these ratios (Defra 2012a, 2012b, 2012c). **Appendix E** details the calculations used for each post-development habitat that would be required to meet the BNG best practice principles (**Appendix B**).

2.3.5.3 Hedgerows are measured by length (metres) and the replacement ratio is a function of the condition of the lost habitat i.e. good condition requires 3:1, moderate 2:1 and poor only 1:1.

2.3.5.4 Rivers, streams and wet ditches are measured by length (metres) and the compensation ratio is 1:1.

2.3.5.5 The baseline biodiversity units and the habitat areas and lengths required to compensate for their loss post-development due to construction (excluding irreplaceable habitats and their compensation) for each Scheme option were calculated. This quantification of habitat compensation requirements, following the “like-for-like or better” BNG principle (**Appendix B** – Principle 6), allows Scheme options to be directly compared. This was further broken down within Scheme options for HPIs and non-HPIs to demonstrate whether each subgroup achieves a BNG or NNL, respectively.

2.3.5.6 Quantitative outcomes of the baseline BNG assessment calculations for each Scheme option and the habitat compensation requirements to compensate for the loss of baseline biodiversity value due to construction were reported with reference to **Table 2-10**. However, where a Scheme option had a likely significant effect on ancient woodland habitat, a scheme-wide outcome could not be assigned.

Table 2-10 – Quantitative outcomes of BNG calculations

Calculation Result	Predicted Scheme-wide Outcome
Less than 95% of the baseline value	Net loss (NL) of biodiversity
95% - 104% of baseline value	No net loss (NNL) of biodiversity
105% or more of baseline value	Biodiversity net gain (BNG)

2.4 Assumptions and Limitations - Baseline Biodiversity Assessment

2.4.1 Data

2.4.1.1 Phase 1 Habitat survey data maps and HPI distribution maps were used in conjunction to identify where baseline habitat types were potentially of HPI quality. Based on Appendix C of the BRE Guidance Note 36, an area of habitat which had a Phase 1 Habitat type which could be considered descriptive of the HPI was defined as HPI quality. The corresponding baseline HPI types and JNCC habitat types are listed in **Table 2-11**.

2.4.1.2 Phase 1 Habitat survey data maps and the Natural England Ancient Woodland inventory maps, including both ancient semi-natural woodland (ASNW) and planted ancient woodland sites (PAWS), were used in conjunction to identify areas of ancient woodland for each Scheme option. For each of the six Scheme options, the total area attributed to ancient woodland was subtracted from moderate condition A1.1.1 Broadleaved woodland - semi-natural, and therefore removed from the baseline biodiversity calculation. This follows Principle 2 of the CIRIA, CIEEM and IEMA Best Practice Principles (**Appendix B**).

2.4.2 Distinctiveness

2.4.2.1 The baseline area-based HPIs within each Scheme option and their attributed Phase 1 Habitat types are listed in **Table 2-11** alongside their assumed distinctiveness and condition categories:

Table 2-11 – Baseline HPI and their associated baseline Phase 1 Habitat types

Baseline HPI Type	JNCC Habitat Type	Distinctive-ness	Condition
Lowland deciduous woodland	A1.1.1 Broadleaved woodland - semi-natural	High (6)	Moderate (2)
Coastal and floodplain grazing marsh	B2.2 Neutral grassland - semi-improved	High (6)	Moderate (2)
			Poor (1)
Ponds	G1.1 Standing water - eutrophic	High (6)	Moderate (2)
Coastal salt marsh	H2.4 Saltmarsh - scattered plants	High (6)	Good (3)

2.4.2.2 The baseline non-irreplaceable area-based Phase 1 Habitats types within each Scheme option are listed in Table **2-12** alongside their assumed distinctiveness and condition categories:

Table 2-12 – Baseline non-HPI and their associated baseline Phase 1 Habitat types

JNCC Habitat Type	Distinctive-ness	Condition
A1.1.1 Broadleaved woodland - semi-natural	High (6)	Moderate (2)
		Poor (1)
A1.1.2 Broadleaved woodland - plantation	Medium (4)	Moderate (2)
		Poor (2)
A1.3.1 Mixed woodland - semi-natural	High (6)	Moderate (2)
A1.3.2 Mixed woodland - plantation	Medium (4)	Good (3)
A2.1 Scrub - dense / continuous	Medium (4)	Moderate (2)
		Poor (1)
A3.1 Parkland / scattered trees – broadleaved	Medium (4)	Moderate (2)
		Poor (1)
B2.1 Neutral grassland - unimproved	High (6)	Moderate (2)
B2.2 Neutral grassland - semi-improved	Medium (4)	Moderate (2)
B4 Improved grassland	Low (2)	Poor (1)
B5 Marsh / marshy grassland	Low (2)	Poor (1)
B6 Poor semi-improved grassland	Low (2)	Poor (1)
C3.1 Other tall herb and fern - ruderal	Low (2)	Poor (1)
F1 Swamp	High (6)	Good (3)
H2.4 Saltmarsh - scattered plants	High (6)	Good (3)
J1.1 Cultivated / disturbed land - arable	Low (2)	Poor (1)
J1.2 Cultivated / disturbed land - amenity grassland	Low (2)	Poor (1)
J1.3 Cultivated / disturbed land - ephemeral / short perennial	Low (2)	Poor (1)
J1.4 Cultivated / disturbed land - introduced shrub	Low (2)	Moderate (2)

2.4.3 Condition

2.4.3.1 Primary HCA data was not available for all habitat polygons and lines. Where habitat condition data had not been collected in the field, habitat condition was assumed using expert opinion guided by **Appendix C** of the Building Research Establishment's (BRE) Guidance Note 36: BREEAM, CEEQUAL and HQM Ecology Calculation Methodology – Route 2. The following assumptions on habitat condition were made:

- All Low distinctiveness habitats were allocated a condition score of Poor.
- All Medium and High distinctiveness habitats were allocated a condition score of Moderate.
- In the absence of HCA data for hedgerows, hedgerows were assumed to be in Good condition. The exception to this rule is defunct hedgerows. Defunct hedgerows fail one of the FEP condition assessment criteria by nature of being defunct, therefore all defunct hedgerows were assumed to be in Moderate condition.

2.5 Assumptions and Limitations - Post-Development Compensation Habitat Area Assessment

2.5.1 Area-based habitats

2.5.1.1 The assumptions made for post-development biodiversity unit ratios for compensatory habitat areas and types suggested across all Scheme options are detailed in **Appendix E**.

2.5.1.2 The assumed target conditions and risk factors applied to these post-development habitat types were based on **Appendix C** of the Building Research Establishment's (BRE) Guidance Note 36: BREEAM, CEEQUAL and HQM Ecology Calculation Methodology – Route 2. The values within Appendix C of GN36 were modified using expert opinion to ensure that compensatory habitat types adhered to the "like-for-like or better" best practice principle (**Appendix B**).

2.5.2 Hedgerows

2.5.2.1 Baseline hedgerow habitat types recorded across all Scheme options are assumed to be compensated for using the post-development habitat types detailed in **Table 2-13**.

Table 2-13 – Baseline hedgerow habitats and their associated post-development hedgerow habitat types.

Baseline JNCC Habitat Type	Condition	Compensation Ratio	Post-development JNCC Habitat Type
J2.1.1 Hedgerows (intact) - native species rich	Good	3	J2.1.1 Hedgerows (intact) - native species rich
J2.1.2 Hedgerows (intact) - native species poor	Good	3	
	Moderate	2	
	Poor	1	
J2.2.1 Hedgerows (defunct) - native species rich	Moderate	2	
J2.2.2 Hedgerows (defunct) - native species poor	Good	3	
	Moderate	2	
J2.3.1 Hedgerows with trees - native species rich	Good	3	J2.3.1 Hedgerows with trees - native species rich
	Moderate	2	
J2.3.2 Hedgerows with trees - native species poor	Good	3	
	Moderate	2	

2.5.3 Assumptions and Limitations

2.5.3.1 Any amendments to the Scheme options used to inform this BNG assessment will necessitate re-running the biodiversity unit calculations to determine the biodiversity impacts of the Scheme option. Equally, the selected Scheme option will need a post-development habitat plan producing and a full BNG assessment running once designs have been finalised. Subsequently, the biodiversity values reported in this document should only be used to inform the options appraisal stage.

2.5.3.2 The BU and LU calculations do not account for indirect impacts to habitats outside of the Proposed Scheme footprint as a result of the proposed works.

3 Results

3.1 Summary of Baseline Biodiversity Assessment

3.1.1.1 This biodiversity net gain assessment of Design Fix 2 has identified that all Scheme options would impact irreplaceable ancient woodland habitat. However subsequent design refinements completed at Design Fix 2a have resulted in Option 5BV1 avoiding direct impacts on Ancient Woodland. Scheme options that impact ancient woodland cannot achieve a scheme-wide biodiversity net gain or no net loss, irrespective of the levels of compensation for impacts on non-irreplaceable habitats. The most up to date assessment of the Scheme's impacts on Ancient Woodland are provided by the Stage 2 EAR as they are excluded from the biodiversity calculations within this report. **Table 3-1** identifies the HPIs found across all the potential Scheme options based on the baseline Phase 1 Habitat plan. These are identified throughout the results tables and summarised at the end.

Table 3-1 – JNCC Phase 1 Habitat types and their associated HPI description

JNCC Phase 1 Habitat Type	Habitat of Principal Importance
A1.1.1 Broadleaved woodland - semi-natural	Lowland deciduous woodland
B2.2 Neutral grassland - semi-improved	Coastal and floodplain grazing marsh
G1.1 Standing water - eutrophic	Coastal saltmarsh
G2.1 Running water - eutrophic	Rivers
H2.4 Saltmarsh - scattered plants	Ponds

3.1.1.2 **Table 3-2** summarises baseline biodiversity units for each Scheme option generated from the calculations for both HPI and non-HPI habitats.

Table 3-2 – Summary of BU generated for each Scheme option for both HPI and non-HPI habitats

Option	Habitat Category	Area (ha)	Baseline BU
1V5	HPI	0.41	4.92
	Non-HPI	30.50	125.74
1V9	HPI	0.48	5.76
	Non-HPI	30.93	123.92
3V1	HPI	0.79	9.48
	Non-HPI	32.20	89.98
4/5AV1	HPI	0.74	8.88

Option	Habitat Category	Area (ha)	Baseline BU
	Non-HPI	48.69	148.28
4/5AV2	HPI	0.84	10.08
	Non-HPI	46.52	109.14
5BV1	HPI	0.74	8.88
	Non-HPI	54.91	169.80

3.1.1.3 **Table 3-3** summarises baseline linear units for each Scheme option generated from the calculations for hedgerow habitats.

Table 3-3 – Summary of LU generated for each Scheme option for hedgerow habitats.

Option	Habitat Category	Length (m)	Baseline LU
1V5	Hedgerows	6260.0	17609.5
1V9	Hedgerows	6392.5	18007.0
3V1	Hedgerows	6301.5	16983.5
4/5AV1	Hedgerows	12604.0	36667.5
4/5AV2	Hedgerows	9734.0	27841.5
5BV1	Hedgerows	16394.0	48201.0

3.1.1.4 **Table 3-4** summarises the length of watercourse habitat (equal to watercourse LU) present within each Scheme option footprint.

Table 3-4 – Length of watercourse / watercourse LU within each Scheme option

Option	Habitat Category	Baseline Length (m) / Watercourse LU
1V5	Watercourses	1889.5
1V9	Watercourses	1889.5
3V1	Watercourses	4197.0
4/5AV1	Watercourses	4826.0
4/5AV2	Watercourses	4320.0
5BV1	Watercourses	5664.0

3.2 Option 1V5

3.2.1 Irreplaceable Habitat

3.2.1.1 Ancient woodland is present within the Scheme option footprint. As an irreplaceable habitat, this area has been extracted from the total habitat area and is not included within biodiversity unit calculations.

3.2.2 Area-Based Habitats

HPIs

3.2.2.1 **Table 3-5** below outlines baseline habitat types, areas, distinctiveness and condition of non-irreplaceable HPI habitats within Option 1V5. The table also presents the baseline biodiversity units generated by these habitats.

Table 3-5 – Summary of baseline habitats and BU for non-irreplaceable HPI habitats: Option 1V5

HPI	JNCC Habitat Type	Distinctive-ness	Condition	Area (ha)	Baseline BU
Lowland deciduous woodland	A1.1.1 Broadleaved woodland - semi-natural	High (6)	Moderate (2)	0.25	3.00
Coastal and floodplain grazing marsh	B2.2 Neutral grassland - semi-improved	High (6)	Moderate (2)	0.15	1.80
Ponds	G1.1 Standing water - eutrophic	High (6)	Moderate (2)	0.01	0.12
			Total	**0.41**	**4.92**

Non-HPIs

3.2.2.2 **Table 3-6** below outlines baseline habitat types, areas, distinctiveness and condition of non-irreplaceable non-HPI habitats within Option 1V5. The table also presents the baseline biodiversity units generated by these habitats.

Table 3-6 – Summary of baseline habitats and BU for non-irreplaceable non-HPI habitats: Option 1V5

JNCC Habitat Type	Distinctiveness	Condition	Area (ha)	Baseline BU
A1.1.1 Broadleaved woodland - semi-natural	High (6)	Moderate (2)	4.76	57.12
A1.1.2 Broadleaved woodland - plantation	Medium (4)	Moderate (2)	0.08	0.64
A1.1.2 Broadleaved woodland - plantation	Medium (4)	Poor (1)	0.73	2.92
A2.1 Scrub - dense / continuous	Medium (4)	Moderate (2)	0.24	1.92

JNCC Habitat Type	Distinctiveness	Condition	Area (ha)	Baseline BU
A2.1 Scrub - dense / continuous	Medium (4)	Poor (1)	0.18	0.72
B2.2 Neutral grassland - semi-improved	Medium (4)	Moderate (2)	4.44	35.52
B4 Improved grassland	Low (2)	Poor (1)	6.96	13.92
B5 Marsh / marshy grassland	Low (2)	Poor (1)	0.03	0.06
B6 Poor semi-improved grassland	Low (2)	Poor (1)	1.99	3.98
C3.1 Other tall herb and fern - ruderal	Low (2)	Poor (1)	0.69	1.38
J1.1 Cultivated / disturbed land - arable	Low (2)	Poor (1)	2.63	5.26
J1.2 Cultivated / disturbed land - amenity grassland	Low (2)	Poor (1)	0.88	1.76
J1.3 Cultivated / disturbed land - ephemeral / short perennial	Low (2)	Poor (1)	0.27	0.54
J3.6 Buildings	NA	NA	0.57	0.00
J5 Hardstanding	NA	NA	6.05	0.00
		Total	**30.50**	**125.74**

Linear Habitats

Hedgerow HPI

3.2.2.3 **Table 3-7** below outlines the baseline habitat type, length, condition and linear units for hedgerow habitat within Option 1V5. The table also presents baseline LU generated by these habitats.

Table 3-7 – Summary of baseline habitats and LU for hedgerow Habitats of Principle Importance: Option 1V5

JNCC Habitat Type	Condition	Length (m)	Baseline LU
J2.1.1 Hedgerows (intact) - native species rich	Good (3)	133.0	399.0
J2.1.2 Hedgerows (intact) - native species poor	Good (3)	2277.0	6831.0

JNCC Habitat Type	Condition	Length (m)	Baseline LU
J2.1.2 Hedgerows (intact) - native species poor	Moderate (2)	709.5	1419.0
J2.1.2 Hedgerows (intact) - native species poor	Poor (1)	48.0	48.0
J2.2.2 Hedgerows (defunct) - native species poor	Moderate (2)	365.0	730.0
J2.3.1 Hedgerows with trees - native species rich	Good (3)	1132.0	3396.0
J2.3.2 Hedgerows with trees - native species poor	Good (3)	1595.5	4786.5
	Total	**6260.0**	**17609.5**

Watercourses

3.2.2.4 **Table 3-8** below outlines the habitat type and length of watercourse habitat (equal to watercourse LU) within Option 1V5.

Table 3-8 – Summary of baseline watercourse length watercourse / watercourse LU: Option 1V5

HPI	JNCC Habitat Type	Length (m) or Watercourse LU
Rivers	G2.1 Running water – eutrophic	1889.5
	Total	**1889.5**

3.3 Option 1V9

3.3.1 Irreplaceable Habitat

3.3.1.1 Ancient woodland is present within the Scheme option footprint.

3.3.1.2 As an irreplaceable habitat, this area has been extracted from the total habitat area and is not included within biodiversity unit calculations.

3.3.2 Area-Based Habitats

HPIs

3.3.2.1 **Table 3-9** below outlines baseline habitat types, areas, distinctiveness and condition of non-irreplaceable HPI habitats within Option 1V9. The table also presents the baseline biodiversity units generated by these habitats.

Table 3-9 – Summary of baseline habitats and BU for non-irreplaceable HPI habitats: Option 1V9

HPI	JNCC Habitat Type	Distinctive-ness	Condition	Area (ha)	Baseline BU
Lowland deciduous woodland	A1.1.1 Broadleaved woodland - semi-natural	High (6)	Moderate (2)	0.32	3.84
Coastal & floodplain grazing marsh	B2.2 Neutral grassland - semi-improved	High (6)	Moderate (2)	0.15	1.80
Ponds	G1.1 Standing water - eutrophic	High (6)	Moderate (2)	0.01	0.12
			Total	0.48	5.76

Non-HPIs

3.3.2.2 **Table 3-10** below outlines baseline habitat types, areas, distinctiveness and condition of non-irreplaceable non-HPI habitats within Option 1V9. The table also presents the baseline biodiversity units generated by these habitats.

Table 3-10 – Summary of baseline habitats and BU for non-irreplaceable non-HPI habitats: Option 1V9

JNCC Habitat Type	Distinctive-ness	Condition	Area (ha)	Baseline BU
A1.1.1 Broadleaved woodland - semi-natural	High (6)	Moderate (2)	4.73	56.76
A1.1.2 Broadleaved woodland - plantation	Medium (4)	Moderate (2)	0.09	0.72
A1.1.2 Broadleaved woodland - plantation	Medium (4)	Poor (1)	0.73	2.92
A2.1 Scrub - dense / continuous	Medium (4)	Moderate (2)	0.24	1.92
A2.1 Scrub - dense / continuous	Medium (4)	Poor (1)	0.18	0.72
A3.1 Parkland / scattered trees - broadleaved	Medium (4)	Moderate (2)	0.08	0.64
B2.2 Neutral grassland - semi-improved	Medium (4)	Moderate (2)	4.16	33.28
B4 Improved grassland	Low (2)	Poor (1)	6.90	13.80
B5 Marsh / marshy grassland	Low (2)	Poor (1)	0.03	0.06
B6 Poor semi-improved grassland	Low (2)	Poor (1)	2.42	4.84

JNCC Habitat Type	Distinctive-ness	Condition	Area (ha)	Baseline BU
C3.1 Other tall herb and fern - ruderal	Low (2)	Poor (1)	0.69	1.38
J1.1 Cultivated / disturbed land - arable	Low (2)	Poor (1)	2.63	5.26
J1.2 Cultivated / disturbed land - amenity grassland	Low (2)	Poor (1)	0.54	1.08
J1.3 Cultivated / disturbed land - ephemeral / short perennial	Low (2)	Poor (1)	0.27	0.54
J3.6 Buildings	NA	NA	0.50	0.00
J5 Hardstanding	NA	NA	6.74	0.00
Total			**30.93**	**123.92**

3.3.3 Linear Habitats

Hedgerow HPI

3.3.3.1 **Table 3-11** below outlines the baseline habitat type, length, condition and linear units for hedgerow habitat within Option 1V9. The table also presents baseline LU generated by these habitats.

Table 3-11 – Summary of baseline habitats and LU for hedgerow habitats: Option 1V9

HPI	JNCC Habitat Type	Condition	Length (m)	Baseline LU
Hedgerow	J2.1.1 Hedgerows (intact) - native species rich	Good (3)	167.0	501.0
	J2.1.2 Hedgerows (intact) - native species poor	Good (3)	2277.0	6831.0
	J2.1.2 Hedgerows (intact) - native species poor	Moderate (2)	709.5	1419.0
	J2.1.2 Hedgerows (intact) - native species poor	Poor (1)	48.0	48.0
	J2.2.2 Hedgerows (defunct) - native species poor	Moderate (2)	365.0	730.0
	J2.3.1 Hedgerows with trees - native species rich	Good (3)	1230.5	3691.5
	J2.3.2 Hedgerows with trees - native species poor	Good (3)	1595.5	4786.5

HPI	JNCC Habitat Type	Condition	Length (m)	Baseline LU
		Total	6392.5	18007.0

Watercourses

3.3.3.2 **Table 3-12** below outlines the habitat type and length of watercourse habitat (equal to watercourse LU) within Option 1V9.

Table 3-12 – Summary of baseline watercourse length watercourse / watercourse LU: Option 1V9

HPI	JNCC Habitat Type	Length (m) or Watercourse LU
Rivers	G2.1 Running water - eutrophic	1889.5
	Total	**1889.5**

3.4 Option 3V1

3.4.1 Irreplaceable habitat

3.4.1.1 Ancient woodland is present within the Scheme option footprint. As an irreplaceable habitat, this area has been extracted from the total habitat area and is not included within biodiversity unit calculations.

3.4.2 Area-based habitats

HPIs

3.4.2.1 **Table 3-13** below outlines baseline habitat types, areas, distinctiveness and condition of non-irreplaceable HPI habitats within Option 3V1. The table also presents the baseline biodiversity units generated by these habitats.

Table 3-13 – Summary of baseline habitats and BU for non-irreplaceable HPI habitats: Option 3V1

HPI	JNCC Habitat Type	Distinctive-ness	Condition	Area (ha)	Baseline BU
Lowland deciduous woodland	A1.1.1 Broadleaved woodland - semi-natural	High (6)	Moderate (2)	0.77	9.24
Coastal and floodplain grazing marsh	B2.2 Neutral grassland - semi-improved	High (6)	Poor (1)	0.01	0.06

HPI	JNCC Habitat Type	Distinctive-ness	Condition	Area (ha)	Baseline BU
Coastal salt marsh	H2.4 Saltmarsh - scattered plants	High (6)	Good (3)	0.01	0.18
			Total	**0.79**	**9.48**

Non-HPIs

3.4.2.2 **Table 3-14** below outlines baseline habitat types, areas, distinctiveness and condition of non-irreplaceable non-HPI habitats within Option 3V1. The table also presents the baseline biodiversity units generated by these habitats

Table 3-14 – Summary of baseline habitats and BU for non-irreplaceable non-HPI habitats: Option 3V1

JNCC Habitat Type	Distinctiveness	Condition	Area (ha)	Baseline BU
A1.1.1 Broadleaved woodland - semi-natural	High (6)	Moderate (2)	1.50	18.00
A1.1.2 Broadleaved woodland - plantation	Medium (4)	Moderate (2)	0.08	0.64
A1.1.2 Broadleaved woodland - plantation	Medium (4)	Poor (1)	0.73	2.92
A1.3.1 Mixed woodland - semi-natural	High (6)	Moderate (2)	0.19	2.28
A1.3.2 Mixed woodland - plantation	Medium (4)	Good (3)	0.02	0.24
A2.1 Scrub - dense / continuous	Medium (4)	Moderate (2)	0.17	1.36
A2.1 Scrub - dense / continuous	Medium (4)	Poor (1)	0.18	0.72
B2.2 Neutral grassland - semi-improved	Medium (4)	Moderate (2)	2.51	20.08
B4 Improved grassland	Low (2)	Poor (1)	10.54	21.08
B5 Marsh / marshy grassland	Low (2)	Poor (1)	0.37	0.74
B6 Poor semi-improved grassland	Low (2)	Poor (1)	4.78	9.56
C3.1 Other tall herb and fern - ruderal	Low (2)	Poor (1)	0.68	1.36

JNCC Habitat Type	Distinctiveness	Condition	Area (ha)	Baseline BU
F1 Swamp	High (6)	Good (3)	0.09	1.62
H2.4 Saltmarsh - scattered plants	High (6)	Good (3)	0.02	0.36
J1.1 Cultivated / disturbed land - arable	Low (2)	Poor (1)	4.18	8.36
J1.2 Cultivated / disturbed land - amenity grassland	Low (2)	Poor (1)	0.06	0.12
J1.3 Cultivated / disturbed land - ephemeral / short perennial	Low (2)	Poor (1)	0.27	0.54
J3.6 Buildings	NA	NA	0.02	0.00
J5 Hardstanding	NA	NA	5.81	0.00
		Total	**32.20**	**89.98**

3.4.3 Linear Habitats

Hedgerow HPI

3.4.3.1 **Table 3-15** below outlines the baseline habitat type, length, condition and linear units for hedgerow habitat within Option 3V1. The table also presents baseline LU generated by these habitats.

Table 3-15 – Summary of baseline habitats and LU for hedgerow habitats: Option 3V1

HPI	JNCC Habitat Type	Condition	Length (m)	Baseline LU
Hedgerow	J2.1.1 Hedgerows (intact) - native species rich	Good (3)	140.5	421.5
	J2.1.2 Hedgerows (intact) - native species poor	Good (3)	3404.5	10213.5
	J2.1.2 Hedgerows (intact) - native species poor	Moderate (2)	1404.5	2809.0
	J2.2.2 Hedgerows (defunct) - native species poor	Moderate (2)	298.5	597.0
	J2.3.1 Hedgerows with trees - native species rich	Good (3)	361.0	1083.0
	J2.3.2 Hedgerows with trees - native species poor	Good (3)	474.5	1423.5

HPI	JNCC Habitat Type	Condition	Length (m)	Baseline LU
	J2.3.2 Hedgerows with trees - native species poor	Moderate (2)	218.0	436.0
		Total	**6301.5**	**16983.5**

Watercourses

3.4.3.2 **Table 3-16** below outlines the habitat type and length of watercourse habitat (equal to watercourse LU) within Option 3V1.

Table 3-16 – Summary of baseline watercourse length watercourse / watercourse LU: Option 3V1

HPI	JNCC Habitat Type	Length (m) or Watercourse LU
Rivers	G2.1 Running water - eutrophic	4197.0
	Total	**4197.0**

3.5 Option 4/5AV1

3.5.1 Irreplaceable habitat

3.5.1.1 Ancient woodland is present within the Scheme option footprint. As an irreplaceable habitat, this area has been extracted from the total habitat area and is not included within biodiversity unit calculations.

3.5.2 Area-based habitats

HPIs

3.5.2.1 **Table 3-17** below outlines baseline habitat types, areas, distinctiveness and condition of non-irreplaceable non-HPI habitats within Option 4/5AV1. The table also presents the baseline biodiversity units generated by these habitats.

Table 3-17 – Summary of baseline habitats and BU for non-irreplaceable HPI habitats: Option 4/5AV1

HPI	JNCC Habitat Type	Distinctive-ness	Condition	Area (ha)	Baseline BU
Lowland deciduous woodland	A1.1.1 Broadleaved woodland - semi-natural	High (6)	Moderate (2)	0.55	6.60
Coastal and floodplain grazing marsh	B2.2 Neutral grassland - semi-improved	High (6)	Moderate (2)	0.16	1.92

HPI	JNCC Habitat Type	Distinctive-ness	Condition	Area (ha)	Baseline BU
Coastal and floodplain grazing marsh	B2.2 Neutral grassland - semi-improved	High (6)	Poor (1)	0.01	0.06
Ponds	G1.1 Standing water - eutrophic	High (6)	Moderate (2)	0.01	0.12
Coastal salt marsh	H2.4 Saltmarsh - scattered plants	High (6)	Good (3)	0.01	0.18
			Total	**0.74**	**8.88**

Non-HPIs

3.5.2.2 **Table 3-18** below outlines baseline habitat types, areas, distinctiveness and condition of non-irreplaceable non-HPI habitats within Option 4/5AV1. The table also presents the baseline biodiversity units generated by these habitats.

Table 3-18 – Summary of baseline habitats and BU for non-irreplaceable non-HPI habitats: Option 4/5AV1

JNCC Habitat Type	Distinctive-ness	Condition	Area (ha)	Baseline BU
A1.1.1 Broadleaved woodland - semi-natural	High (6)	Moderate (2)	2.40	28.80
A1.1.1 Broadleaved woodland - semi-natural	High (6)	Poor (1)	0.34	2.04
A1.1.2 Broadleaved woodland - plantation	Medium (4)	Moderate (2)	1.17	9.36
A1.1.2 Broadleaved woodland - plantation	Medium (4)	Poor (1)	0.71	2.84
A2.1 Scrub - dense / continuous	Medium (4)	Moderate (2)	0.64	5.12
A2.1 Scrub - dense / continuous	Medium (4)	Poor (1)	0.18	0.72
B2.1 Neutral grassland – unimproved	High (6)	Moderate (2)	0.07	0.84
B2.2 Neutral grassland - semi-improved	Medium (4)	Moderate (2)	3.27	26.16
B4 Improved grassland	Low (2)	Poor (1)	9.25	18.50
B5 Marsh / marshy grassland	Low (2)	Poor (1)	0.56	1.12
B6 Poor semi-improved grassland	Low (2)	Poor (1)	4.31	8.62

JNCC Habitat Type	Distinctive-ness	Condition	Area (ha)	Baseline BU
C3.1 Other tall herb and fern - ruderal	Low (2)	Poor (1)	0.98	1.96
F1 Swamp	High (6)	Good (3)	0.12	2.16
H2.4 Saltmarsh - scattered plants	High (6)	Good (3)	0.02	0.36
J1.1 Cultivated / disturbed land - arable	Low (2)	Poor (1)	15.25	30.50
J1.2 Cultivated / disturbed land - amenity grassland	Low (2)	Poor (1)	4.32	8.64
J1.3 Cultivated / disturbed land - ephemeral / short perennial	Low (2)	Poor (1)	0.27	0.54
J3.6 Buildings	NA	NA	0.26	0.00
J5 Hardstanding	NA	NA	4.57	0.00
		Total	**48.69**	**148.28**

3.5.3 Linear Habitats

Hedgerow HPI

3.5.3.1 **Table 3-19** below outlines the baseline habitat type, length, condition and linear units for hedgerow habitat within Option 4/5AV1. The table also presents baseline LU generated by these habitats.

Table 3-19 – Summary of baseline habitats and LU for hedgerow Habitats of Principle Importance: Option 4/5AV1

JNCC Habitat Type	Condition	Length (m)	Baseline LU
J2.1.1 Hedgerows (intact) - native species rich	Good (3)	1725.0	5175.0
J2.1.2 Hedgerows (intact) - native species poor	Good (3)	4014.0	12042.0
J2.1.2 Hedgerows (intact) - native species poor	Moderate (2)	220.0	440.0
J2.2.2 Hedgerows (defunct) - native species poor	Moderate (2)	298.5	567.0
J2.3.1 Hedgerows with trees - native species rich	Good (3)	4117.5	12352.5

JNCC Habitat Type	Condition	Length (m)	Baseline LU
J2.3.1 Hedgerows with trees - native species rich	Moderate (2)	378.0	756.0
J2.3.2 Hedgerows with trees - native species poor	Good (3)	1633.0	4899.0
J2.3.2 Hedgerows with trees - native species poor	Moderate (2)	218.0	436.0
Total		**12604.0**	**36667.5.5**

Watercourses

3.5.3.2 **Table 3-20** below outlines the habitat type and length of watercourse habitat (equal to watercourse LU) within Option 4/5AV1.

Table 3-20 – Summary of baseline watercourse length watercourse / watercourse LU: Option 4/5AV1

HPI	JNCC Habitat Type	Length (m) or Watercourse LU
Rivers	G2.1 Running water - eutrophic	4826.0
Total		**4826.0**

3.6 Option 4/5AV2

3.6.1 Irreplaceable habitat

3.6.1.1 Ancient woodland is present within the Scheme option footprint. As an irreplaceable habitat, this area has been extracted from the total habitat area and is not included within biodiversity unit calculations.

3.6.2 Area-based habitats

HPIs

3.6.2.1 **Table 3-21** below outlines baseline habitat types, areas, distinctiveness and condition of non-irreplaceable HPI habitats within Option 4/5AV2. The table also presents the baseline biodiversity units generated by these habitats.

Table 3-21 – Summary of baseline habitats and BU for non-irreplaceable HPI habitats: Option 4/5AV2

HPI	JNCC Habitat Type	Distinctive-ness	Condition	Area (ha)	Baseline BU
Lowland deciduous woodland	A1.1.1 Broadleaved woodland - semi-natural	High (6)	Moderate (2)	0.58	6.96
Coastal & floodplain grazing marsh	B2.2 Neutral grassland - semi-improved	High (6)	Moderate (2)	0.13	1.56
Coastal & floodplain grazing marsh	B2.2 Neutral grassland - semi-improved	High (6)	Poor (1)	0.01	0.06
Ponds	G1.1 Standing water - eutrophic	High (6)	Moderate (2)	0.11	1.32
Coastal salt marsh	H2.4 Saltmarsh - scattered plants	High (6)	Good (3)	0.01	0.18
			Total	**0.84**	**10.08**

Non-HPIs

3.6.2.2 **Table 3-22** below outlines baseline habitat types, areas, distinctiveness and condition of non-irreplaceable non-HPI habitats within Option 4/5AV2. The table also presents the baseline biodiversity units generated by these habitats.

Table 3-22 – Summary of baseline habitats and BU for non-irreplaceable non-HPI habitats: Option 4/5AV2

JNCC Habitat Type	Distinctive-ness	Condition	Area (ha)	Baseline BU
A1.1.1 Broadleaved woodland - semi-natural	High (6)	Moderate (2)	1.16	13.92
A1.1.2 Broadleaved woodland – plantation	Medium (4)	Moderate (2)	0.20	1.60
A1.1.2 Broadleaved woodland - plantation	Medium (4)	Poor (1)	0.71	2.84
A1.3.1 Mixed woodland - semi-natural	High (6)	Moderate (2)	0.06	0.72
A2.1 Scrub - dense / continuous	Medium (4)	Moderate (2)	0.25	2.00
A2.1 Scrub - dense / continuous	Medium (4)	Poor (1)	0.18	0.72

JNCC Habitat Type	Distinctive-ness	Condition	Area (ha)	Baseline BU
B2.2 Neutral grassland - semi-improved	Medium (4)	Moderate (2)	0.90	7.20
B4 Improved grassland	Low (2)	Poor (1)	10.90	21.80
B5 Marsh / marshy grassland	Low (2)	Poor (1)	0.37	0.74
B6 Poor semi-improved grassland	Low (2)	Poor (1)	6.83	13.66
C3.1 Other tall herb and fern - ruderal	Low (2)	Poor (1)	0.68	1.36
F1 Swamp	High (6)	Good (3)	0.11	1.98
H2.4 Saltmarsh - scattered plants	High (6)	Good (3)	0.02	0.36
J1.1 Cultivated / disturbed land - arable	Low (2)	Poor (1)	18.89	37.78
J1.2 Cultivated / disturbed land - amenity grassland	Low (2)	Poor (1)	0.42	0.84
J1.3 Cultivated / disturbed land - ephemeral / short perennial	Low (2)	Poor (1)	0.27	0.54
J1.4 Cultivated / disturbed land - introduced shrub	Low (2)	Moderate (2)	0.27	1.08
J3.6 Buildings	NA	NA	0.11	0.00
J5 Hardstanding	NA	NA	4.19	0.00
		Total	**46.52**	**109.14**

3.6.3 Linear Habitats

Hedgerow HPI

3.6.3.1 **Table 3-23** below outlines the baseline habitat type, length, condition and linear units for hedgerow habitat within Option 4/5AV2. The table also presents baseline LU generated by these habitats.

Table 3-23 – Summary of baseline habitats and LU for hedgerow Habitats of Principle Importance: Option 4/5AV2

JNCC Habitat Type	Condition	Length (m)	Baseline LU
J2.1.1 Hedgerows (intact) - native species rich	Good (3)	314.0	942.0
J2.1.2 Hedgerows (intact) - native species poor	Good (3)	3798.5	11395.5

JNCC Habitat Type	Condition	Length (m)	Baseline LU
J2.1.2 Hedgerows (intact) - native species poor	Moderate (2)	375.0	750.0
J2.2.2 Hedgerows (defunct) - native species poor	Moderate (2)	389.5	779.0
J2.3.1 Hedgerows with trees - native species rich	Good (3)	2479.0	7437.0
J2.3.1 Hedgerows with trees - native species rich	Moderate (2)	378.0	756.0
J2.3.2 Hedgerows with trees - native species poor	Good (3)	1782.0	5346.0
J2.3.2 Hedgerows with trees - native species poor	Moderate (2)	218.0	436.0
	Total	**9734.0**	**27841.5**

Watercourses

3.6.3.2 **Table 3-24** below outlines the habitat type and length of watercourse habitat (equal to watercourse LU) within Option 4/5AV2.

Table 3-24 – Summary of baseline watercourse length watercourse / watercourse LU: Option 4/5AV2

HPI	JNCC Habitat Type	Length (m) or Watercourse LU
Rivers	G2.1 Running water - eutrophic	4320.0
	Total	**4320.0**

3.7 Option 5BV1

3.7.1 Irreplaceable Habitat

3.7.1.1 Ancient woodland was present and due to be impacted by this Option at Design Fix 2. Design refinements completed for Design Fix 2a resulted in this option being able to avoid direct impacts to ancient woodland.

3.7.2 Area-Based Habitats

HPIs

3.7.2.1 **Table 3-25** below outlines baseline habitat types, areas, distinctiveness and condition of non-irreplaceable HPI habitats within Option 5BV1. The table also presents the baseline biodiversity units generated by these habitats.

Table 3-25 – Summary of baseline habitats and BU for non-irreplaceable HPI habitats: Option 5BV1

HPI	JNCC Habitat Type	Distinctive-ness	Condition	Area (ha)	Baseline BU
1.Lowland deciduous woodland	A1.1.1 Broadleaved woodland - semi-natural	High (6)	Moderate (2)	0.57	6.84
2.Coastal and floodplain grazing marsh	B2.2 Neutral grassland - semi-improved	High (6)	Moderate (2)	0.15	1.80
2.Coastal and floodplain grazing marsh	B2.2 Neutral grassland - semi-improved	High (6)	Poor (1)	0.01	0.06
4. Coastal salt marsh	H2.4 Saltmarsh - scattered plants	High (6)	Good (3)	0.01	0.18
			Total	**0.74**	**8.88**

Non-HPIs

3.7.2.2 **Table 3-26** below outlines baseline habitat types, areas, distinctiveness and condition of non-irreplaceable non-HPI habitats within Option 5BV1. The table also presents the baseline biodiversity units generated by these habitats.

Table 3-26 – Summary of baseline habitats and BU for non-irreplaceable non-HPI habitats: Option 5BV1

JNCC Habitat Type	Distinctiveness	Condition	Area (ha)	Baseline BU
A1.1.1 Broadleaved woodland - semi-natural	High (6)	Moderate (2)	3.15	37.80
A1.1.2 Broadleaved woodland - plantation	Medium (4)	Moderate (2)	0.08	0.64
A1.1.2 Broadleaved woodland - plantation	Medium (4)	Poor (1)	0.73	2.92
A2.1 Scrub - dense / continuous	Medium (4)	Moderate (2)	1.21	9.68

JNCC Habitat Type	Distinctiveness	Condition	Area (ha)	Baseline BU
A2.1 Scrub - dense / continuous	Medium (4)	Poor (1)	0.18	0.72
A3.1 Parkland / scattered trees - broadleaved	Medium (4)	Moderate (2)	0.16	1.28
A3.1 Parkland / scattered trees - broadleaved	Medium (4)	Poor (1)	0.61	2.44
B2.2 Neutral grassland - semi-improved	Medium (4)	Moderate (2)	4.54	36.32
B4 Improved grassland	Low (2)	Poor (1)	9.21	18.42
B5 Marsh / marshy grassland	Low (2)	Poor (1)	0.65	1.30
B6 Poor semi-improved grassland	Low (2)	Poor (1)	3.18	6.36
C3.1 Other tall herb and fern - ruderal	Low (2)	Poor (1)	1.13	2.26
F1 Swamp	High (6)	Good (3)	0.12	2.16
H2.4 Saltmarsh - scattered plants	High (6)	Good (3)	0.02	0.36
J1.1 Cultivated / disturbed land - arable	Low (2)	Poor (1)	17.74	35.48
J1.2 Cultivated / disturbed land - amenity grassland	Low (2)	Poor (1)	5.56	11.12
J1.3 Cultivated / disturbed land - ephemeral / short perennial	Low (2)	Poor (1)	0.27	0.54
J3.6 Buildings	NA	NA	0.33	0.00
Hardstanding	NA	NA	6.04	0.00
		Total	**54.91**	**169.8**

3.7.3 Linear Habitats

Hedgerow HPI

3.7.3.1 **Table 3-27** below outlines the baseline habitat type, length, condition and linear units for hedgerow habitat within Option 5BV1. The table also presents baseline LU generated by these habitats.

Table 3-27 – Summary of baseline habitats and LU for hedgerow Habitats of Principle Importance: Option 5BV1

JNCC Habitat Type	Condition	Length (m)	Baseline LU
J2.1.1 Hedgerows (intact) - native species rich	Good (3)	4698.0	14094.0
J2.1.2 Hedgerows (intact) - native species poor	Good (3)	3421.0	10263.0
J2.1.2 Hedgerows (intact) - native species poor	Moderate (2)	220.0	440.0
J2.2.1 Hedgerows (defunct) - native species rich	Moderate (2)	244.5	489.0
J2.2.2 Hedgerows (defunct) - native species poor	Moderate (2)	298.5	597.0
J2.3.1 Hedgerows with trees - native species rich	Good (3)	6593.5	19780.5
J2.3.2 Hedgerows with trees - native species poor	Good (3)	700.5	2101.5
J2.3.2 Hedgerows with trees - native species poor	Moderate (2)	218.0	436.0
	Total	**16394.0**	**48201**

Watercourses

3.7.3.2 **Table 3-28** below outlines the habitat type and length of watercourse habitat (equal to watercourse LU) within Option 5BV1.

Table 3-28 – Summary of baseline watercourse length watercourse / watercourse LU: Option 5BV1

HPI	JNCC Habitat Type	Length (m) or Watercourse LU
Rivers	G2.1 Running water - eutrophic	5664.0
	Total	**5664.0**

4 Discussion and Recommendations

4.1.1.1 This biodiversity net gain assessment of Design Fix 2 has identified that all Scheme options will impact irreplaceable ancient woodland habitat. However subsequent design refinements completed at Design Fix 2a have resulted in Option 5BV1 avoiding direct impacts on Ancient Woodland. Scheme options that impact ancient woodland cannot achieve a scheme-wide biodiversity net gain or no net loss, irrespective of the levels of compensation for impacts on non-irreplaceable habitats.

4.1.1.2 This report assesses the extent of habitats required for each potential Scheme option to fulfil the project aim of achieving BNG for non-irreplaceable HPIs and NNL for non-irreplaceable non-HPI habitats.

4.2 Summary of Post-Development Habitat Compensation Requirements

4.2.1.1 **Table 4-1** below summarises the area required to compensate for the loss of baseline units, to achieve biodiversity net gain for HPI habitats and biodiversity no net loss for non-HPI habitats within each Scheme option.

4.2.1.2 It is to be noted that irreplaceable habitats have not been included within the post-development habitat compensation requirements. The requirements for these habitats will be covered within the Stage 2 EAR.

Table 4-1 – Summary of compensatory habitat requirements for each Scheme option for HPI and non-HPI area-based habitats

Option	Habitat Category	Area (ha) Required to Achieve BNG/NNL	Total Area (ha) Required to Achieve BNG/NNL
1V5	HPI	1.17	32.56
	Non-HPI	31.39	
1V9	HPI	1.41	32.45
	Non-HPI	31.04	
3V1	HPI	2.77	23.75
	Non-HPI	20.98	
4/5AV1	HPI	2.28	36.85
	Non-HPI	34.57	
4/5AV2	HPI	2.42	26.79
	Non-HPI	24.37	
5BV1	HPI	2.33	41.33

Option	Habitat Category	Area (ha) Required to Achieve BNG/NNL	Total Area (ha) Required to Achieve BNG/NNL
	Non-HPI	**39.00**	

4.2.1.3 **Table 4-2** below summarises the area required to compensate for the loss of hedgerow habitats within each Scheme option.

Table 4-2 – Summary of compensatory hedgerow habitat requirements for each Scheme option

Option	Habitat Category	Length (m) Required to Achieve BNG
1V5	Hedgerows	18490.0
1V9	Hedgerows	18907.5
3V1	Hedgerows	17832.5
4/5AV1	Hedgerows	38532.0
4/5AV2	Hedgerows	29234.0
5BV1	Hedgerows	50611.0

4.2.1.4 Although all six Scheme options can achieve the aims outlined above, Scheme options 1V9, 3V1 and 4/5AV2 have the lowest overall requirement for non-irreplaceable compensatory habitat. Of these, Scheme option 1V9 has the lowest requirement for the creation of new hedgerows to achieve net gain for hedgerow HPI.

4.2.1.5 For each Scheme option the design will not remove any watercourse habitat. As a result, no additional compensatory watercourse habitat is required. Watercourse habitats are not considered further within this report.

4.3 Option 1V5

4.3.1 Area-Based Habitats

HPIs

4.3.1.1 **Table 4-3** below outlines baseline habitat areas and associated BU, compensation ratios, and post-development habitat compensation requirements for Option 1V5 to achieve biodiversity net gain for non-irreplaceable HPI habitats.

Table 4-3 – Summary of habitat compensation requirements for non-irreplaceable HPI habitats: Option 1V5

HPI	Baseline JNCC Habitat Type	Baseline BU	Proposed post-development JNCC Habitat Type	Habitat Compensation Ratio[6] (BU/ha)	Post-development Area (ha) Required to Achieve BNG	Post-development BU
Lowland deciduous woodland	A.1.1 Broadleaved woodland - semi-natural	3.00	A1.1.1 Broadleaved woodland - semi-natural	3.56	0.89	3.16
Coastal and floodplain grazing marsh	B2.2 Neutral grassland - semi-improved	1.80	B2.2 Neutral grassland - semi-improved	7.14	0.27	1.93
Ponds	G1.1 Standing water - eutrophic	0.12	G1.1 Standing water - eutrophic	16.00	0.01	0.16
	Total	**4.92**		**Total**	**1.17**	**5.25**

[6] All Habitat Compensation Ratio calculations are presented for each habitat type within Table E-1 within Appendix E.

Non-HPIs

4.3.1.2 **Table 4-4** below outlines baseline habitat areas and associated BU, compensation ratios, and post-development habitat compensation requirements for Option 1V5 to achieve biodiversity no net loss for non-irreplaceable non-HPI habitats

Table 4-4 – Summary of habitat compensation requirements for non-irreplaceable non-HPI habitats: Option 1V5

Baseline JNCC Habitat Type	Baseline BU	Proposed Post-development JNCC Habitat Type	Habitat Compensation Ratio[7] (BU/ha)	Post-development Area (ha) Required to Achieve NNL	Post-development BU
A1.1.1 Broadleaved woodland - semi-natural	57.12	A1.1.1 Broadleaved woodland - semi-natural	3.56	17.92	63.72
A1.1.2 Broadleaved woodland - plantation	3.56				
A2.1 Scrub - dense / continuous	2.64	A2.1 Scrub - dense / continuous	8.33	0.34	2.83
B5 Marsh / marshy grassland	0.06	B5 Marsh / marshy grassland	1.67	0.04	0.07
B2.2 Neutral grassland - semi-improved	35.52	B2.2 Neutral grassland - semi-improved	5.00	13.09	65.45
B4 Improved grassland	13.92				
B6 Poor semi-improved grassland	3.98				
C3.1 Other tall herb and fern - ruderal	1.38				
J1.1 Cultivated / disturbed land - arable	5.26				
J1.2 Cultivated / disturbed land - amenity grassland	1.76				
J1.3 Cultivated / disturbed land - ephemeral / short perennial	0.54				
Total	**125.74**		**Total**	**31.39**	**132.07**

[7] All Habitat Compensation Ratio calculations are presented for each habitat type with Table E-2 within Appendix E.

4.3.2 Linear Habitats

Hedgerow HPI

4.3.2.1 **Table 4-5** below outlines baseline habitat lengths and associated LU, and post-development habitat compensation requirements for Option 1V5 to achieve biodiversity net gain for hedgerow HPI.

Table 4-5 – Summary of habitat compensation requirements for hedgerow HPI habitats: Option 1V5

Baseline JNCC Habitat Type	Baseline LU	Post-development JNCC Habitat Type	Post-development Length (m) Required to Achieve BNG
J2.1.1 Hedgerows (intact) - native species rich	9427.0	J2.1.1 Hedgerows (intact) - native species rich	9898.5
J2.1.2 Hedgerows (intact) - native species poor			
J2.2.2 Hedgerows (defunct) - native species poor			
J2.3.1 Hedgerows with trees - native species rich	8182.5	J2.3.1 Hedgerows with trees - native species rich	8591.5
J2.3.2 Hedgerows with trees - native species poor			
Total	**17609.5**	**Total**	**18490.0**

4.4 Option 1V9

4.4.1 Area-Based Habitats

HPIs

4.4.1.1 **Table 4-6** below outlines baseline habitat areas and associated BU, compensation ratios, and post-development habitat compensation requirements for Option 1V9 to achieve biodiversity net gain for non-irreplaceable HPI habitats.

Table 4-6 – Summary of habitat compensation requirements for non-irreplaceable HPI habitats: Option 1V9

HPI	Baseline JNCC Habitat Type	Baseline BU	Proposed post-development JNCC Habitat Type	Habitat Compensation Ratio[8] (BU/ha)	Post-development Area (ha) Required to Achieve BNG	Post-development BU
Lowland deciduous woodland	A.1.1 Broadleaved woodland - semi-natural	3.84	A1.1.1 Broadleaved woodland - semi-natural	3.56	1.13	4.02
Coastal and floodplain grazing marsh	B2.2 Neutral grassland - semi-improved	1.80	B2.2 Neutral grassland - semi-improved	7.14	0.27	1.93
Ponds	G1.1 Standing water - eutrophic	0.12	G1.1 Standing water - eutrophic	16.00	0.01	0.16
	Total	**5.76**		**Total**	**1.41**	**6.11**

Non-HPIs

4.4.1.2 **Table 4-7** below outlines baseline habitat areas and associated BU, compensation ratios, and post-development habitat compensation requirements for Option 1V9 to achieve biodiversity no net loss for non-irreplaceable non-HPI habitats.

Table 4-7 – Summary of habitat compensation requirements for non-irreplaceable non-HPI habitats: Option 1V9

Baseline JNCC Habitat Type	Baseline BU	Proposed Post-development JNCC Habitat Type	Habitat Compensation Ratio[9] (BU/ha)	Post-development Area (ha) Required to Achieve NNL	Post-development BU
A1.1.1 Broadleaved woodland - semi-natural	56.76	A1.1.1 Broadleaved woodland - semi-natural	3.56	18.02	64.07
A1.1.2 Broadleaved woodland - plantation	3.64				
A3.1 Parkland / scattered trees - broadleaved	0.64				

[8] All Habitat Compensation Ratio calculations are presented for each habitat type within Table E-1 within Appendix E.

[9] All Habitat Compensation Ratio calculations are presented for each habitat type with Table E-2 within Appendix E.

Baseline JNCC Habitat Type	Baseline BU	Proposed Post-development JNCC Habitat Type	Habitat Compensation Ratio[9] (BU/ha)	Post-development Area (ha) Required to Achieve NNL	Post-development BU
A2.1 Scrub - dense / continuous	2.64	A2.1 Scrub - dense / continuous	8.33	0.34	2.83
B5 Marsh / marshy grassland	0.06	B5 Marsh / marshy grassland	1.67	0.04	0.07
B2.2 Neutral grassland - semi-improved	33.28	B2.2 Neutral grassland - semi-improved	5.00	12.64	63.20
B4 Improved grassland	13.80				
B6 Poor semi-improved grassland	4.84				
C3.1 Other tall herb and fern - ruderal	1.38				
J1.1 Cultivated / disturbed land - arable	5.26				
J1.2 Cultivated / disturbed land - amenity grassland	1.08				
J1.3 Cultivated / disturbed land - ephemeral / short perennial	0.54				
Total	**123.92**	**Total**		**31.04**	**130.17**

4.4.2 Linear Habitats

Hedgerow HPI

4.4.2.1 **Table 4-8** below outlines baseline habitat lengths and associated LU, and post-development habitat compensation requirements for Option 1V9 to achieve biodiversity net gain for hedgerow HPI.

Table 4-8 - Summary of habitat compensation requirements for hedgerow HPI habitats: Option 1V9

Baseline JNCC Habitat Type	Baseline LU	Post-development JNCC Habitat Type	Post-development Length (m) Required to Achieve BNG
J2.1.1 Hedgerows (intact) - native species rich	9529.0	J2.1.1 Hedgerows (intact) - native species rich	10005.5
J2.1.2 Hedgerows (intact) - native species poor			
J2.2.2 Hedgerows (defunct) - native species poor			
J2.3.1 Hedgerows with trees - native species rich	8478.0	J2.3.1 Hedgerows with trees - native species rich	8902.0
J2.3.2 Hedgerows with trees - native species poor			
Total	**18007.0**	**Total**	**18907.5**

4.5 Option 3V1

4.5.1 Area-Based Habitats

HPIs

4.5.1.1 **Table 4-9** below outlines baseline habitat areas and associated BU, compensation ratios, and post-development habitat compensation requirements for Option 3V1 to achieve biodiversity net gain for non-irreplaceable HPI habitats.

Table 4-9 - Summary of habitat compensation requirements for non-irreplaceable HPI habitats: Option 3V1

HPI	Baseline JNCC Habitat Type	Baseline BU	Proposed post-development JNCC Habitat Type	Habitat Compensation Ratio10 (BU/ha)	Post-development Area (ha) Required to Achieve BNG	Post-development BU
Lowland deciduous woodland	A.1.1 Broadleaved woodland - semi-natural	9.24	A1.1.1 Broadleaved woodland - semi-natural	3.56	2.73	9.71

[10] All Habitat Compensation Ratio calculations are presented for each habitat type within Table E-1 within Appendix E.

HPI	Baseline JNCC Habitat Type	Baseline BU	Proposed post-development JNCC Habitat Type	Habitat Compensation Ratio10 (BU/ha)	Post-development Area (ha) Required to Achieve BNG	Post-development BU
Coastal and floodplain grazing marsh	B2.2 Neutral grassland - semi-improved	0.06	B2.2 Neutral grassland - semi-improved	7.14	0.01	0.07
Coastal salt marsh (from additional)	H2.4 Saltmarsh - scattered plants	0.18	H2.4 Saltmarsh - scattered plants	6.57	0.03	0.20
Total		**9.48**	**Total**		**2.77**	**9.98**

Non-HPIs

4.5.1.2 **Table 4-10** below outlines baseline habitat areas and associated BU, compensation ratios, and post-development habitat compensation requirements for Option 3V1 to achieve biodiversity no net loss for non-irreplaceable non-HPI habitats

Table 4-10 - Summary of habitat compensation requirements for non-irreplaceable non-HPI habitats: Option 3V1

Baseline JNCC Habitat Type	Baseline BU	Proposed Post-development JNCC Habitat Type	Habitat Compensation Ratio11 (BU/ha)	Post-development Area (ha) Required to Achieve NNL	Post-development BU
A1.1.1 Broadleaved woodland - semi-natural	18.00	A1.1.1 Broadleaved woodland - semi-natural	3.56	7.11	25.28
A1.1.2 Broadleaved woodland - plantation	3.56				
A1.3.1 Mixed woodland - semi-natural	2.28				
A1.3.2 Mixed woodland - plantation	0.24				
A2.1 Scrub - dense / continuous	2.08	A2.1 Scrub - dense / continuous	8.33	0.27	2.25

[11] All Habitat Compensation Ratio calculations are presented for each habitat type with Table E-2 within Appendix E.

Baseline JNCC Habitat Type	Baseline BU	Proposed Post-development JNCC Habitat Type	Habitat Compensation Ratio11 (BU/ha)	Post-development Area (ha) Required to Achieve NNL	Post-development BU
B5 Marsh / marshy grassland	0.74	B5 Marsh / marshy grassland	1.67	0.47	0.78
B2.2 Neutral grassland - semi-improved	20.08	B2.2 Neutral grassland - semi-improved	5.00	12.85	64.25
B4 Improved grassland	21.08				
B6 Poor semi-improved grassland	9.56				
C3.1 Other tall herb and fern - ruderal	1.36				
J1.1 Cultivated / disturbed land - arable	8.36				
J1.2 Cultivated / disturbed land - amenity grassland	0.12				
J1.3 Cultivated / disturbed land - ephemeral / short perennial	0.54				
F1 Swamp	1.62	F1 Swamp	8.00	0.22	1.76
H2.4 Saltmarsh - scattered plants	0.36	H2.4 Saltmarsh - scattered plants	6.57	0.06	0.39
Total	**89.98**	**Total**		**20.98**	**94.72**

4.5.2 Linear Habitats

Hedgerow HPI

4.5.2.1 **Table 4-11** below outlines baseline habitat lengths and associated LU, and post-development habitat compensation requirements for Option 3V1 to achieve biodiversity net gain for hedgerow HPI.

Table 4-11 - Summary of habitat compensation requirements for hedgerow HPI habitats: Option 3V1

Baseline JNCC Habitat Type	Baseline LU	Post-development JNCC Habitat Type	Post-development Length (m) Required to Achieve BNG
J2.1.1 Hedgerows (intact) - native species rich	14041.0	J2.1.1 Hedgerows (intact) - native species rich	14743.0
J2.1.2 Hedgerows (intact) - native species poor			
J2.2.2 Hedgerows (defunct) - native species poor			
J2.3.1 Hedgerows with trees - native species rich	2942.5	J2.3.1 Hedgerows with trees - native species rich	3089.5
J2.3.2 Hedgerows with trees - native species poor			
Total	**16983.0**	**Total**	**17832.5**

4.6 Option 4/5AV1

4.6.1 Area-Based Habitats

HPIs

4.6.1.1 **Table 4-12** below outlines baseline habitat areas and associated BU, compensation ratios, and post-development habitat compensation requirements for Option 4/5AV1 to achieve biodiversity net gain for non-irreplaceable HPI habitats.

Table 4-12 - Summary of habitat compensation requirements for non-irreplaceable HPI habitats: Option 4/5V1

HPI	Baseline JNCC Habitat Type	Baseline BU	Proposed post-development JNCC Habitat Type	Habitat Compensation Ratio12 (BU/ha)	Post-development Area (ha) Required to Achieve BNG	Post-development BU
Lowland deciduous woodland	A.1.1 Broadleaved woodland - semi-natural	6.60	A1.1.1 Broadleaved woodland - semi-natural	3.56	1.95	6.93

[12] All Habitat Compensation Ratio calculations are presented for each habitat type within Table E-1 within Appendix E.

HPI	Baseline JNCC Habitat Type	Baseline BU	Proposed post-development JNCC Habitat Type	Habitat Compensation Ratio12 (BU/ha)	Post-development Area (ha) Required to Achieve BNG	Post-development BU
Coastal and floodplain grazing marsh	B2.2 Neutral grassland - semi-improved	1.98	B2.2 Neutral grassland - semi-improved	7.14	0.29	2.07
Ponds	G1.1 Standing water - eutrophic	0.12	G1.1 Standing water - eutrophic	16.0	0.01	0.16
Coastal salt marsh (from additional)	H2.4 Saltmarsh - scattered plants	0.18	H2.4 Saltmarsh - scattered plants	6.57	0.03	0.20
Total		**8.88**	**Total**		**2.28**	**9.36**

Non-HPIs

4.6.1.2 **Table 4-13** below outlines baseline habitat areas and associated BU, compensation ratios, and post-development habitat compensation requirements for Option 4/5AV1 to achieve biodiversity no net loss for non-irreplaceable non-HPI habitats

Table 4-13 - Summary of habitat compensation requirements for non-irreplaceable non-HPI habitats: Option 4/5AV1

Baseline JNCC Habitat Type	Baseline BU	Proposed Post-development JNCC Habitat Type	Habitat Compensation Ratio13 (BU/ha)	Post-development Area (ha) Required to Achieve NNL	Post-development BU
A1.1.1 Broadleaved woodland - semi-natural	30.84	A1.1.1 Broadleaved woodland - semi-natural	3.56	12.71	45.19
A1.1.2 Broadleaved woodland - plantation	12.20				
A2.1 Scrub - dense / continuous	5.84	A2.1 Scrub - dense / continuous	8.33	0.74	6.17

[13] All Habitat Compensation Ratio calculations are presented for each habitat type with Table E-2 within Appendix E.

Baseline JNCC Habitat Type	Baseline BU	Proposed Post-development JNCC Habitat Type	Habitat Compensation Ratio13 (BU/ha)	Post-development Area (ha) Required to Achieve NNL	Post-development BU
B2.1 Neutral grassland - unimproved	0.84	B2.1 Neutral grassland - unimproved	7.14	0.13	0.93
B5 Marsh / marshy grassland	1.12	B5 Marsh / marshy grassland	1.67	0.71	1.18
B2.2 Neutral grassland - semi-improved	26.16	B2.2 Neutral grassland - semi-improved	5.00	19.93	99.65
B4 Improved grassland	18.50				
B6 Poor semi-improved grassland	8.62				
C3.1 Other tall herb and fern - ruderal	1.96				
J1.1 Cultivated / disturbed land - arable	30.50				
J1.2 Cultivated / disturbed land - amenity grassland	8.64				
J1.3 Cultivated / disturbed land - ephemeral / short perennial	0.54				
F1 Swamp	2.16	F1 Swamp	8.00	0.29	2.32
H2.4 Saltmarsh - scattered plants	0.36	H2.4 Saltmarsh - scattered plants	6.57	0.06	0.39
Total	**148.28**	**Total**		**34.57**	**155.83**

4.6.2 Linear Habitats

Hedgerow HPI

4.6.2.1 **Table 4-14** below outlines baseline habitat lengths and associated LU, and post-development habitat compensation requirements for Option 4/5AV1 to achieve biodiversity net gain for hedgerow HPI.

Table 4-14 - Summary of habitat compensation requirements for hedgerow HPI habitats: Option 4/5AV1

Baseline JNCC Habitat Type	Baseline LU	Post-development JNCC Habitat Type	Post-development Length (m) Required to Achieve BNG
J2.1.1 Hedgerows (intact) - native species rich	18254.0	J2.1.1 Hedgerows (intact) - native species rich	19166.5
J2.1.2 Hedgerows (intact) - native species poor			
J2.2.2 Hedgerows (defunct) - native species poor			
J2.3.1 Hedgerows with trees - native species rich	18443.5	J2.3.1 Hedgerows with trees - native species rich	19365.5
J2.3.2 Hedgerows with trees - native species poor			
Total	**36697.5**	**Total**	**38532.0**

4.7 Option 4/5AV2

4.7.1 Area-Based Habitats

HPIs

4.7.1.1 **Table 4-15** below outlines baseline habitat areas and associated BU, compensation ratios, and post-development habitat compensation requirements for Option 4/5AV2 to achieve biodiversity net gain for non-irreplaceable HPI habitats.

Table 4-15 – Summary of habitat compensation requirements for non-irreplaceable HPI habitats: Option 4/5AV2

HPI	Baseline JNCC Habitat Type	Baseline BU	Proposed post-development JNCC Habitat Type	Habitat Compensation Ratio[14] (BU/ha)	Post-development Area (ha) Required to Achieve BNG	Post-development BU
Lowland deciduous woodland	A.1.1 Broadleaved woodland - semi-natural	6.96	A1.1.1 Broadleaved woodland - semi-natural	3.56	2.06	7.32
Coastal and floodplain grazing marsh	B2.2 Neutral grassland - semi-improved	1.62	B2.2 Neutral grassland - semi-improved	7.14	0.24	1.71
Ponds	G1.1 Standing water - eutrophic	0.32	G1.1 Standing water - eutrophic	16.0	0.09	1.44
Coastal salt marsh (from additional)	H2.4 Saltmarsh - scattered plants	0.18	H2.4 Saltmarsh - scattered plants	6.57	0.03	0.20
	Total	**10.08**	**Total**		**2.42**	**10.67**

[14] All Habitat Compensation Ratio calculations are presented for each habitat type within Table E-1 within Appendix E.

Non-HPIs

4.7.1.2 Table 4-16 below outlines baseline habitat areas and associated BU, compensation ratios, and post-development habitat compensation requirements for Option 4/5AV2 to achieve biodiversity no net loss for non-irreplaceable non-HPI habitats.

Table 4-16 - Summary of habitat compensation requirements for non-irreplaceable non-HPI habitats: Option 4/5AV2

Baseline JNCC Habitat Type	Baseline BU	Proposed Post-development JNCC Habitat Type	Habitat Compensation Ratio[15] (BU/ha)	Post-development Area (ha) Required to Achieve NNL	Post-development BU
A1.1.1 Broadleaved woodland - semi-natural	13.92	A1.1.1 Broadleaved woodland - semi-natural	3.56	5.63	20.02
A1.1.2 Broadleaved woodland - plantation	4.44				
A1.3.1 Mixed woodland - semi-natural	0.72				
A2.1 Scrub - dense / continuous	2.72	A2.1 Scrub - dense / continuous	8.33	0.48	4.00
J1.4 Cultivated / disturbed land - introduced shrub	1.08				
B5 Marsh / marshy grassland	0.74	B5 Marsh / marshy grassland	1.67	0.47	0.78
B2.2 Neutral grassland - semi-improved	7.20	B2.2 Neutral grassland - semi-improved	5.00	17.47	87.35
B6 Poor semi-improved grassland	13.66				
C3.1 Other tall herb and fern - ruderal	1.36				
J1.1 Cultivated / disturbed land - arable	37.78				
J1.2 Cultivated / disturbed land - amenity grassland	0.84				
J1.3 Cultivated / disturbed land - ephemeral / short perennial	0.54				
F1 Swamp	1.98	F1 Swamp	8.00	0.26	2.08

[15] All Habitat Compensation Ratio calculations are presented for each habitat type with Table E-2 within Appendix E.

Baseline JNCC Habitat Type	Baseline BU	Proposed Post-development JNCC Habitat Type	Habitat Compensation Ratio[15] (BU/ha)	Post-development Area (ha) Required to Achieve NNL	Post-development BU
H2.4 Saltmarsh - scattered plants	0.36	H2.4 Saltmarsh - scattered plants	6.57	0.06	0.39
Total	**109.14**	**Total**		**24.37**	**114.63**

4.7.2 Linear Habitats

Hedgerow HPI

4.7.2.1 **Table 4-17** below outlines baseline habitat lengths and associated LU, and post-development habitat compensation requirements for Option 4/5AV2 to achieve biodiversity net gain for hedgerow HPI.

Table 4-17 - Summary of habitat compensation requirements for hedgerow HPI habitats: Option 4/5AV2

Baseline JNCC Habitat Type	Baseline LU	Post-development JNCC Habitat Type	Post-development Length (m) Required to Achieve BNG
J2.1.1 Hedgerows (intact) - native species rich	13866.5	J2.1.1 Hedgerows (intact) - native species rich	14560.0
J2.1.2 Hedgerows (intact) - native species poor			
J2.2.2 Hedgerows (defunct) - native species poor			
J2.3.1 Hedgerows with trees - native species rich	13975.0	J2.3.1 Hedgerows with trees - native species rich	14674.0
J2.3.2 Hedgerows with trees - native species poor			
Total	**27841.5**	**Total**	**29234.0**

4.8 Option 5BV1

4.8.1 Area-Based Habitats

HPIs

4.8.1.1 **Table 4-18** below outlines baseline habitat areas and associated BU, compensation ratios, and post-development habitat compensation requirements for Option 5BV1 to achieve biodiversity net gain for non-irreplaceable HPI habitats.

Table 4-18 - Summary of habitat compensation requirements for non-irreplaceable HPI habitats: Option 5BV1

HPI	Baseline JNCC Habitat Type	Baseline BU	Proposed post-development JNCC Habitat Type	Habitat Compensation Ratio[16] (BU/ha)	Post-development Area (ha) Required to Achieve BNG	Post-development BU
Lowland deciduous woodland	A.1.1 Broadleaved woodland - semi-natural	6.84	A1.1.1 Broadleaved woodland - semi-natural	3.56	2.02	7.18
Coastal and floodplain grazing marsh	B2.2 Neutral grassland - semi-improved	1.86	B2.2 Neutral grassland - semi-improved	7.14	0.28	2.00
Coastal salt marsh (from additional)	H2.4 Saltmarsh - scattered plants	0.18	H2.4 Saltmarsh - scattered plants	6.57	0.03	0.20
	Total	**8.88**		**Total**	**2.33**	**9.38**

Non-HPIs

4.8.1.2 **Table 4-19** below outlines baseline habitat areas and associated BU, compensation ratios, and post-development habitat compensation requirements for Option 5BV1 to achieve biodiversity no net loss for non-irreplaceable non-HPI habitats.

[16] All Habitat Compensation Ratio calculations are presented for each habitat type within Table E-1 within Appendix E.

Table 4-19 - Summary of habitat compensation requirements for non-irreplaceable non-HPI habitats: Option 5BV1

Baseline JNCC Habitat Type	Baseline BU	Proposed Post-development JNCC Habitat Type	Habitat Compensation Ratio[17] (BU/ha)	Post-development Area (ha) Required to Achieve NNL	Post-development BU
A1.1.1 Broadleaved woodland - semi-natural	37.80	A1.1.1 Broadleaved woodland - semi-natural	3.56	13.31	47.32
A1.1.2 Broadleaved woodland - plantation	3.56				
A3.1 Parkland / scattered trees - broadleaved	3.72				
A2.1 Scrub - dense / continuous	10.40	A2.1 Scrub - dense / continuous	8.33	1.31	10.92
B5 Marsh / marshy grassland	1.30	B5 Marsh / marshy grassland	1.67	0.82	1.37
B2.2 Neutral grassland - semi-improved	36.32	B2.2 Neutral grassland - semi-improved	5.00	23.21	116.05
B4 Improved grassland	18.42				
B6 Poor semi-improved grassland	6.36				
C3.1 Other tall herb and fern - ruderal	2.26				
J1.1 Cultivated / disturbed land - arable	35.48				
J1.2 Cultivated / disturbed land - amenity grassland	11.12				
J1.3 Cultivated / disturbed land - ephemeral / short perennial	0.54				
F1 Swamp	2.16	F1 Swamp	8.00	0.29	2.32
H2.4 Saltmarsh - scattered plants	0.36	H2.4 Saltmarsh - scattered plants	6.57	0.06	0.39
Total	**169.80**		**Total**	**39.00**	**178.37**

[17] All Habitat Compensation Ratio calculations are presented for each habitat type with Table E-2 within Appendix E.

4.8.2 Linear Habitats

Hedgerow HPI

4.8.2.1 **Table 4-20** below outlines baseline habitat lengths and associated LU, and post-development habitat compensation requirements for Option 5BV1 to achieve biodiversity net gain for hedgerow HPI.

Table 4-20 - Summary of habitat compensation requirements for hedgerow HPI habitats: Option 5BV1

Baseline JNCC Habitat Type	Baseline LU	Post-development JNCC Habitat Type	Post-development Length (m) Required to Achieve BNG
J2.1.1 Hedgerows (intact) - native species rich	25883.0	J2.1.1 Hedgerows (intact) - native species rich	27177.0
J2.1.2 Hedgerows (intact) - native species poor			
J2.2.2 Hedgerows (defunct) - native species rich			
J2.2.2 Hedgerows (defunct) - native species poor			
J2.3.1 Hedgerows with trees - native species rich	22318.0	J2.3.1 Hedgerows with trees - native species rich	23434.0
J2.3.2 Hedgerows with trees - native species poor			
Total	**48201.0**	**Total**	**50611.0**

4.9 Recommendations for Further Work

4.9.1.1 It is important to note that the non-priority habitats could be created on the verge of the road, decreasing the area of compensation required outside the estate managed by Highways England. In addition, all work to mitigate potential impacts on protected species outside the areas compensating for areas of ancient woodland impacts will contribute to the compensation needed that is identified in this report. Neither of these factors have been considered within this report. Future iterations of this assessment once the preferred Scheme option is selected will to take factors these on board.

4.9.1.2 Results of biodiversity unit calculations presented in this report should only be used to inform options appraisal stage. In addition, it is recommended that once a preferred Scheme option is selected, the area of compensation identified within this report is used to inform the boundary of the Scheme.

4.9.1.3 A full Biodiversity Net Gain Assessment should be undertaken focusing on a selected preferred Scheme option, to be completed on provision of a post-development landscape and ecological mitigation plan. The full BNG Assessment will meet the requirements of the CHE Memo. It is advised that the post-development mitigation plan for the preferred Scheme option is produced in collaboration with an ecologist with a thorough understanding of the biodiversity net gain process.

4.9.1.4 This Biodiversity Net Gain Assessment report does not include an assessment of the Scheme's potential impacts on ancient woodland and associated mitigation. This matter is to be addressed in the PCF Stage 2 EAR - **Chapter 8 Biodiversity**.

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Appendix A: Biodiversity Net Gain Policy

Appendix A - Biodiversity Net Gain Policy

Biodiversity Net Gain Policy

Highways England

Highways England manages England's strategic road network which covers an area of 25,000 ha including around 8,500 miles of road. The road network contains a range of protected habitats including species rich grasslands, woodlands and wetlands. It supports and affects a number of rare and protected flora and fauna, including peregrine falcon, dormouse, rare orchids and other wild plants. In 2015, Highways England published their biodiversity plan, which aims to ensure that the strategic road network positively supports the health of England's wildlife (Highways England, 2015).

The biodiversity net gain approach can help avoid, minimise and, as a last resort, compensate for residual adverse impacts on biodiversity arising from a development. The Government's Road Investment Strategy (RIS) (Department for Transport, 2015) states that by 2020, Highways England must deliver a reduction in the net loss of biodiversity on its estate and reach no net loss of biodiversity by 2025. By 2040 Highways England must deliver a net gain in biodiversity, which is reflected within their biodiversity plan (Highways England, 2015).

Highways England's RIS Delivery Plan 2018-2019 (Highways England, 2018) states "Highways England will achieve a reduction in the net loss of biodiversity by end of the first Road Period (2020) on an ongoing annual basis"; and that "we aim to reduce our network's impact on the environment whilst also seeking opportunities to operate more harmoniously with, and enhance, our surroundings".

National Policy Statement for National Networks

The National Policy Statement for National Networks (2014) (NPSNN) paragraph 5.23 states that:

"The applicant should show how the project has taken advantage of opportunities to conserve and enhance biodiversity and geological conservation interests."

Maintaining no net loss of biodiversity as a result of the Proposed Scheme is consistent with the policy aims of Paragraph 5.25 of the NPSNN, which states:

"As a general principle, and subject to the specific policies below, development should avoid significant harm to biodiversity and geological conservation interests, including through mitigation and consideration of reasonable alternatives. The applicant may also wish to make use of biodiversity offsetting in devising compensation proposals to counteract any impacts on biodiversity which cannot be avoided or mitigated. Where significant harm cannot be avoided or mitigated, as a last resort, appropriate compensation measures should be sought."

This sets out that any loss should be compensated for to achieve no net loss or net gain by replacing habitats, exploring the potential for enhancing them, and managing retained features.

National Planning Policy Framework

Although not currently a legal obligation, the revised National Planning Policy Framework (NPPF) (2019) refers to biodiversity and environmental net gains in the following paragraphs:

- Transport Infrastructure
  - Paragraph 102. "Transport issues should be considered from the earliest stages of plan-making and development proposals, so that: *d) the environmental impacts of traffic and transport infrastructure can be identified assessed and taken into account – including appropriate opportunities for avoiding and mitigating any adverse effects, and for* ***net environmental gains****."*
- Planning decisions
  - Paragraph 118 "*Planning decisions and planning policy should a) encourage multiple benefits from both urban and rural land … and taking opportunities to* ***achieve net environmental gains - such as developments that would enable new habitat creation***."
  - Paragraph 170 "*Planning policies and decisions should contribute to and enhance the natural and local environment by: … d) minimising impacts on and* ***providing net gains*** *for biodiversity, including by establishing coherent ecological networks that are more resilient to current and future pressures."*
  - Paragraph 174 "*To protect and enhance biodiversity and geodiversity plans should b) promote the conservation, restoration and enhancement of priority habitats, ecological networks and the protection and recovery of priority species; and identify and pursue opportunities for securing measurable net gains for biodiversity."*
  - Paragraph 175 "*When determining planning applications, local planning authorities should apply the following principles: a) if significant harm to biodiversity resulting from a development cannot be avoided (through locating on an alternative site with less harmful impacts) adequately mitigated, or, as a last resort, compensated for, then planning permission should be refused; … and d) … opportunities to incorporate biodiversity improvements in and around developments, especially where this can secure measurable net gains for biodiversity."*

In addition, on 14 March 2019, Her Majesty's Treasury confirmed that following consultation, the government will use the forthcoming Environment Bill to mandate BNG for development in England, ensuring that the delivery of much-needed infrastructure and housing is not at the expense of vital biodiversity. Additionally, the 25 Year Environment Plan states the UK Government intention to, "seek to embed a 'net environmental gain' principle for development to deliver environmental improvements".

Local Policy and Legislation

The Adoption Arun Local Plan 2011-2031 (July 2018) (Arun District Council, 2018) Policy ENV DM5 – Development and biodiversity states that:

- "Development schemes shall, in the first instance, seek to achieve a net gain in biodiversity and protect existing habitats on site."

Section 17.4.1 of the Adoption Arun Local Plan 2011-2031 (July 2018) (Arun District Council, 2018) further expands on this by stating that:

- "*All development should enhance the biodiversity of the site and the surrounding area by creating new habitats or improving existing ones. In certain circumstances, a new resource should be provided which is of at least equivalent value, where possible, to a site or feature which is lost as a result of development. This could include the creation of a new habitat on the site or elsewhere if this is more appropriate. However, in general, the loss of habitats should be strongly resisted.*"

Appendix B: CIEEM, CIRIA AND IEMA Good Practice

Appendix B - CIEEM, CIRIA and IEMA Good Practice

Biodiversity Net Gain

Good practice principles for development

Biodiversity Net Gain is development that leaves biodiversity in a better state than before. It is also an approach where developers work with local governments, wildlife groups, land owners and other stakeholders in order to support their priorities for nature conservation. These ten principles set out good practice for achieving Biodiversity Net Gain and must be applied all together, as one approach.

Principle 1. Apply the Mitigation Hierarchy

Do everything possible to first avoid and then minimise impacts on biodiversity. Only as a last resort, and in agreement with external decision-makers where possible, compensate for losses that cannot be avoided. If compensating for losses within the development footprint is not possible or does not generate the most benefits for nature conservation, then offset biodiversity losses by gains elsewhere.

Principle 2. Avoid losing biodiversity that cannot be offset by gains elsewhere

Avoid impacts on irreplaceable biodiversity - these impacts cannot be offset to achieve No Net Loss or Net Gain.

Principle 3. Be inclusive and equitable

Engage stakeholders early, and involve them in designing, implementing, monitoring and evaluating the approach to Net Gain. Achieve Net Gain in partnership with stakeholders where possible, and share the benefits fairly among stakeholders.

Principle 4. Address risks

Mitigate difficulty, uncertainty and other risks to achieving Net Gain. Apply well-accepted ways to add contingency when calculating biodiversity losses and gains in order to account for any remaining risks, as well as to compensate for the time between the losses occurring and the gains being fully realised.

Principle 5. Make a measurable Net Gain contribution

Achieve a measurable, overall gain[1] for biodiversity and the services ecosystems provide while directly contributing towards nature conservation priorities.

1 Net Gain has been described as a measurable target for development projects where impacts on biodiversity are outweighed by a clear mitigation hierarchy approach to first avoid and then minimise impacts, including through restoration and / or compensation. Adhering to these Net Gain principles (i.e. pursuing all principles together) will help in under-pinning good practice for achieving and sustaining Net Gain.

Principle 6. Achieve the best outcomes for biodiversity

Achieve the best outcomes for biodiversity by using robust, credible evidence and local knowledge to make clearly-justified choices when:

- Delivering compensation that is ecologically equivalent in type, amount and condition, and that accounts for the location and timing of biodiversity losses
- Compensating for losses of one type of biodiversity by providing a different type that delivers greater benefits for nature conservation
- Achieving Net Gain locally to the development while also contributing towards nature conservation priorities at local, regional and national levels
- Enhancing existing or creating new habitat
- Enhancing ecological connectivity by creating more, bigger, better and joined areas for biodiversity

Principle 7. Be additional

Achieve nature conservation outcomes that demonstrably exceed existing obligations (i.e. do not deliver something that would occur anyway).

Principle 8. Create a Net Gain legacy

Ensure Net Gain generates long-term benefits by:

- Engaging stakeholders and jointly agreeing practical solutions that secure Net Gain in perpetuity[2]
- Planning for adaptive management and securing dedicated funding for long-term management
- Designing Net Gain for biodiversity to be resilient to external factors, especially climate change
- Mitigating risks from other land uses
- Avoiding displacing harmful activities from one location to another
- Supporting local-level management of Net Gain activities

Principle 9. Optimise sustainability

Prioritise Biodiversity Net Gain and, where possible, optimise the wider environmental benefits for a sustainable society and economy.

Principle 10. Be transparent

Communicate all Net Gain activities in a transparent and timely manner, sharing the learning with all stakeholders.

2 Biodiversity compensation should be planned for a sustained Net Gain over the longest possible timeframe. For development in the UK, the expectation is that compensation sites will be secured for at least the lifetime of the development (e.g. often 25-30 years) with the objective of Net Gain management continuing in the future.

Appendix C: WSP Biodiversity Net Gain Process

Appendix C - WSP Biodiversity Net Gain Process

Step 1 – Set the Scope

i. **Produce a Biodiversity Net Gain strategy.** A short memo report setting out client commitments to BNG, scope of the BNG work, and the proposed steps required.

i. **Workshop 1 or 1-2-1 meetings – strategy meetings.** Early engagement with key stakeholders, likely to include local conservation NGOs, local authorities and government agencies such as Natural England. Early engagement is essential to present, discuss and develop the BNG strategy; including setting the BNG good practice principles into a scheme context and agreeing local priorities for biodiversity.

Step 2 – Initial Biodiversity Assessment

i. **Survey baseline habitats and their condition.** Ideally, a habitat condition assessment is undertaken during Phase 1 Habitat survey. If Phase 1 Habitat data has been collected prior to initiating the BNG process, condition assessment can be undertaken either a) retrospectively through interpretation of Phase 1 target notes, consultation with surveyors, or employing a number of assumptions; or b) during an additional site visit.

ii. **Identify irreplaceable habitat.** Following Defra guidance, irreplaceable habitats within the scheme boundary must be identified and excluded from the biodiversity unit calculations. It is important to note that biodiversity net gain or no net loss cannot be achieved for the scheme as a whole if there is a negative impact on an irreplaceable habitat

iii. **Calculate baseline biodiversity units using the biodiversity metric.** This calculation includes all habitats (minus irreplaceable habitats) within the scheme boundary prior to development, and is informed by Phase 1 Habitat data and results of the condition assessment. The baseline biodiversity unit calculation may be run on a number of Scheme options if the scheme is at options appraisal stage.

iv. **Calculate post-development biodiversity units using the biodiversity metric.** This calculation accounts for all of the proposed habitats (including retained habitat and habitat lost or created as a result of the development) within the scheme boundary post-development. The calculation is informed by scheme design, landscape plans, and proposed ecological mitigation. The assessment is based upon the target state (type, size and condition) of habitats being created.

v. **Produce an 'Initial Biodiversity Assessment' report.** The report sets out the BNG process in the context of the scheme, and includes the method and results of initial baseline and post-development biodiversity unit calculations.

Step 3 – Detailed Scheme Assessment

i. **Inform options appraisal.** If baseline biodiversity units have been calculated for a number of Scheme options, results will be used to inform options appraisal.

ii. **Inform the mitigation proposals.** Results of biodiversity unit calculations performed under Step 2 are used to inform the extent and habitat type of on-site ecological mitigation and compensation land required for the scheme to meet no net loss or net gain targets.

iii. **Update biodiversity unit calculations.** Following finalisation of the scheme design and ecological mitigation proposals, the biodiversity units are updated to reflect any changes. Calculations may also be re-run if updated Phase 1 Habitat data becomes available.

iv. **Estimate the biodiversity compensation required.** The difference between baseline and post-development biodiversity units indicates the number of units required for the scheme to deliver no net loss or net gain for biodiversity. This in turn can be used to identify the extent and habitat type of compensation required. A rough cost estimate for potential compensation can be provided at this stage.

v. **Workshop 2 – compensation / offset workshop.** Work with stakeholders to gather suggestions to identify candidate compensation sites and providers. These sites could be offset sites, which are compensation sites that are situated outside the project boundary. This workshop also provides an opportunity to update stakeholders on BNG progress.

Step 4 – Assessment of Candidate Offset Sites

i. **Initial assessment of feasibility.** Any candidate offset sites which are considered not feasible for any reason are scoped out at this stage.

ii. **Survey candidate offset sites** to identify existing habitat type, extent and condition.

iii. **Calculate potential biodiversity units** deliverable by each candidate offset. Using the same methods employed for calculating baseline and post-development biodiversity units for the scheme as a whole, calculate baseline and post-development biodiversity units for offset sites to determine potential biodiversity units deliverable.

iv. **Hold one-to-one meetings with potential offset providers to:**

a) Identify suitable locations for candidate offset sites and determine what habitats and species they could support;

b) Determine how offsets can contribute to local biodiversity objectives and fit within ecological networks;

c) Set out the type of agreement that would be acceptable to offset providers (e.g. long-term agreement for management of the land); and

d) Collate information to feed in to offset scoring templates and offset summary sheets.

v. **Score candidate offsets** using the offset scoring template. This takes into account ecological factors, financial factors, and wider benefits and opportunities.

vi. **Produce offset summary sheets** describing each offset site in its present state and the habitats and species the proposed offsets will support. Details of land ownership, access provisions and proposed management agreements are also included in summary sheets.

vii. **Panel review of potential offset sites** to include relevant stakeholders. Decisions are made as to which candidate offset sites to take forward.

Step 5 – Completion of Biodiversity Assessment

i. **Final update of biodiversity unit calculations.** If there have been changes to the scheme design (including environmental mitigation proposals) since calculations were last updated, biodiversity units are updated to reflect any changes.

ii. **Workshop 3 – final workshop.** A third stakeholder engagement workshop is recommended to update all stakeholders on BNG progress since the last workshop, and inform them of any decisions made.

iii. **Produce a 'Full Biodiversity Assessment' report and associated GIS data.** This will detail the approach and outcomes of Steps 1 to 4, importantly, how the project has met the BNG good practice principles. It will set out candidate offset sites and enable the client to decide which offsets to support and whether to aim for no net loss or net gain.

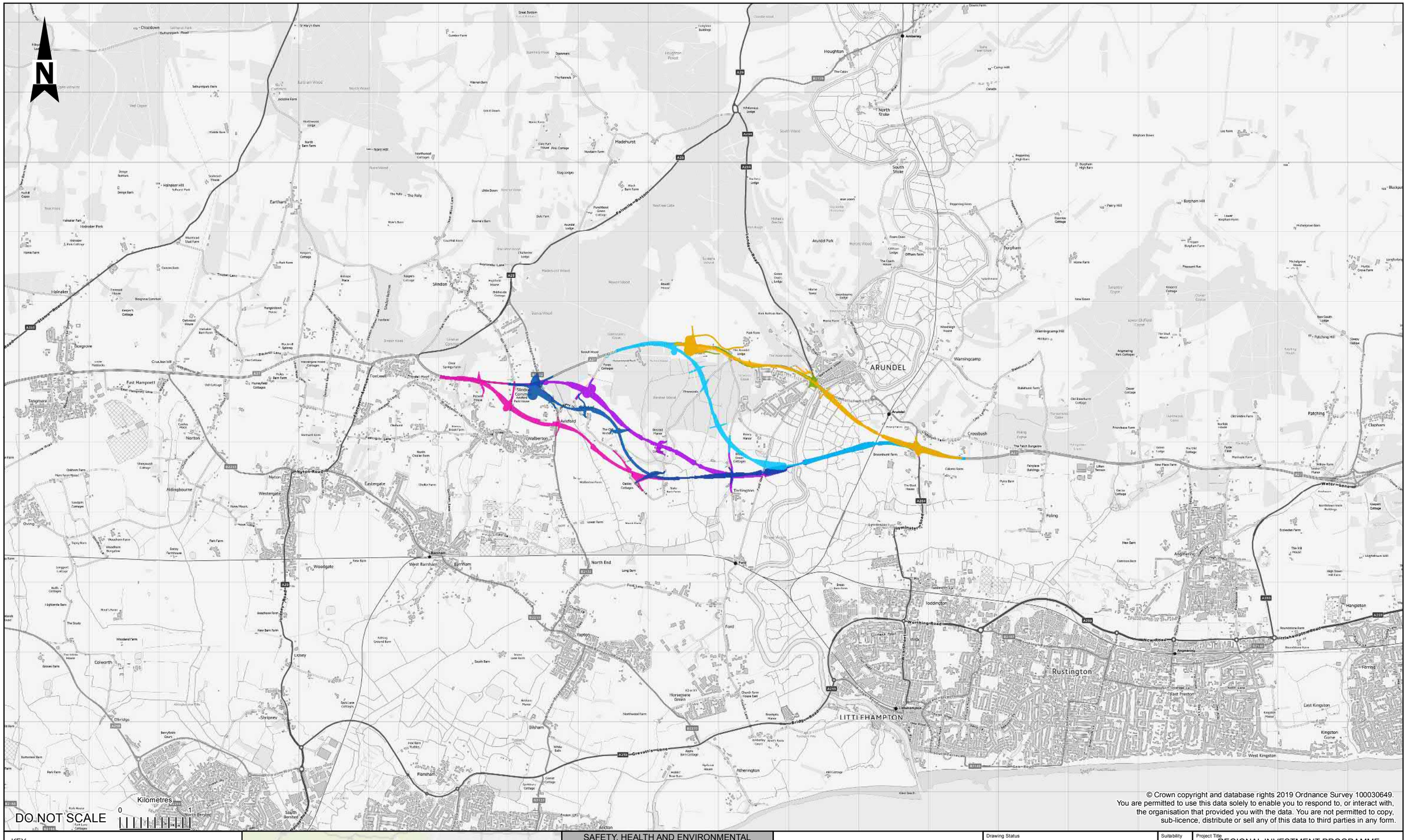
Step 6 – Delivering Biodiversity Net Gain

i. **Implement BNG during the construction phase.** This will involve: updating the biodiversity baseline; including BNG within construction documents; training key staff; reducing the time-lag between losses and gains; acting on risks and opportunities; and collecting evidence and data.

ii. **Set up offsets.** Once offset sites to be delivered have been selected, and fine details of the scope of each offset agreed, legal agreements will be set up with offset providers to manage offsets over a set time frame (generally between 15 and 30 years). Further information on the agreement types can be provided on request.

iii. **Monitor and report** to ensure the offsets are delivered to the standard required. Monitoring and reporting is undertaken at key points throughout the management agreement (e.g. once every two or three years).

Appendix D: Scheme Options and Baseline Habitats



KEY:

- OPTION 1V5
- OPTION 1V9
- OPTION 3V1
- OPTION 4/5AV1
- OPTION 4/5AV2
- OPTION 5BV1

The option footprints displayed are from the February 2019 Design Fix (Design Fix 2).

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATON

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made to the design hazard log).

Construction

Maintenance / Cleaning

Use

Decommissioning / Demolition

Rev.	Date	Description	By	Chk'd	App'd
P01.1	---	First Issue	---	---	---

Drawing Status: FINAL

Suitability: S0

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Client: Working on behalf of highways england

Project Title: REGIONAL INVESTMENT PROGRAMME
A27 ARUNDEL BYPASS

Drawing Title: BIODIVERSITY NET GAIN
FIGURE 1
SCHEME OPTIONS

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Drawing Number: Project | Originator | Volume | Location | Type | Role | Number
HE551523-WSP-GEN-SWI-GI-DR-0144

Project Ref. No.: 70052558

Revision: P01

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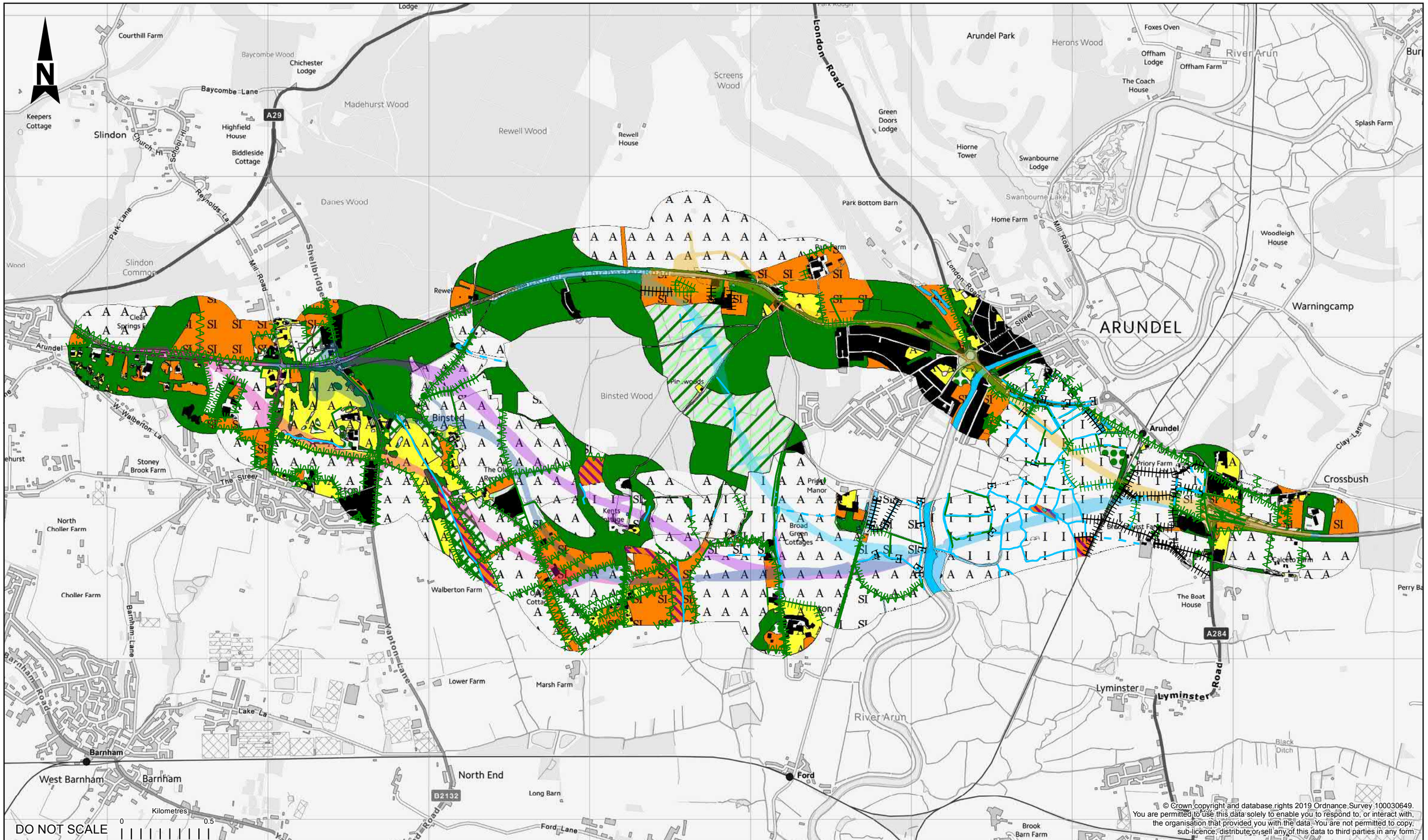


KEY:

OPTION 1V5
OPTION 1V9
OPTION 3V1
OPTION 4/5AV1
OPTION 4/5AV2
OPTION 5BV1

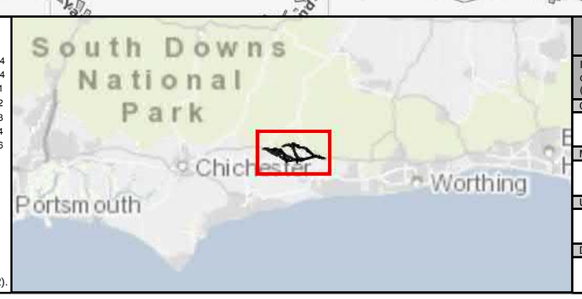
A3.1, G2, G2.1, J2.1.1, J2.1.2, J2.2.1, J2.2.2, J2.3.1, J2.3.2, J2.4, J2.6

A1.1.1, A1.1.2, A1.3.1, A1.3.2, A2.1, A2.2, A3.1, B2.1, B2.2

B4, B5, B6, C1.1, C3.1, F1, F2.2, G1, G1.1

G2, H2.4, H8.4, J1.1, J1.2, J1.3, J1.4, J3.6, J4, J5

The option footprints displayed are from the February 2019 Design Fix (Design Fix 2).



SAFETY, HEALTH AND ENVIRONMENTAL INFORMATON

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Rev.	Date	Description	By	Chk'd	App'd
P01.1	---	First Issue	---	---	---

Drawing Status: FINAL

Suitability: S0

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Client: Working on behalf of highways england

Project Title: REGIONAL INVESTMENT PROGRAMME
A27 ARUNDEL BYPASS

Drawing Title: BIODIVERSITY NET GAIN
FIGURE 2
BASELINE HABITATS

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Original Size	Date	Date	Date	Date
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Drawing Number
Project | Originator | Volume | Location | Type | Role | Number
HE551523-WSP-GEN-SWI-GI-DR-0144

Project Ref. No.: 70052558

Revision: P01

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Appendix E: Habitat Compensation Requirement Calculations

Appendix E - Habitat Compensation Requirement Calculations

Table E-1 – Compensation ratio calculations for HPIs

HPI	Post-development Phase 1 Habitat type	Offset Baseline				Action	Offset Target		Risk Factors		Units per ha
		Area (ha)	Distinctiveness	Condition	BU		Distinctiveness	Condition	Temporal	Delivery	
Lowland deciduous woodland	A1.1.1 Broadleaved woodland - semi-natural	1	Low (2)	Poor (1)	2.00	Enhance	High (6)	Good (3)	32+ years (3)	Medium (1.5)	3.56
Coastal and floodplain grazing marsh	B2.2 Neutral grassland - semi-improved	1	Low (2)	Poor (1)	2.00	Enhance	High (6)	Moderate (2)	6 - 10 years (1.4)	Low (1)	7.14
Coastal salt marsh	H2.4 Saltmarsh - scattered plants	1	Low (2)	Poor (1)	2.00	Create	High (6)	Good (3)	6 - 10 years (1.4)	Medium (1.5)	6.57
Ponds	G1.1 Standing water - eutrophic	1	Low (2)	Poor (1)	2.00	Create	High (6)	Good (3)	0 years (1)	Low (1)	16.00

Table E-2 – Compensation ratio calculations for non-HPIs

Post-development Phase 1 Habitat type	Offset Baseline				Action	Offset Target		Risk Factors		Units per ha
	Area (ha)	Distinctiveness	Condition	BU		Distinctiveness	Condition	Temporal	Delivery	
A1.1.1 Broadleaved woodland - semi-natural	1	Low (2)	Poor (1)	2.00	Enhance	High	Good	32+ (3)	Medium (1.5)	3.56
A2.1 Scrub - dense / continuous	1	Low (2)	Poor (1)	2.00	Enhance	Medium	Good	1 - 5 years (1.2)	Low (1)	8.33
B2.1 Neutral grassland - unimproved	1	Low (2)	Poor (1)	2.00	Enhance	High	Moderate	6 - 10 years (1.4)	Low (1)	7.14
B2.2 Neutral grassland - semi-improved	1	Low (2)	Poor (1)	2.00	Enhance	Medium	Moderate	1 - 5 years (1.2)	Low (1)	5.00
B5 Marsh / marshy grassland (low)	1	Low (2)	Poor (1)	2.00	Enhance	Low	Moderate	1 - 5 years (1.2)	Low (1)	1.67
F1 Swamp	1	Low (2)	Poor (1)	2.00	Create	Medium	Good	1 - 5 years (1.2)	Low (1)	8.00
H2.4 Saltmarsh - scattered plants	1	Low (2)	Poor (1)	2.00	Create	High	Good	6 - 10 years (1.4)	Medium (1.5)	6.57