NICHOLAS PEARSON ASSOCIATES

ENVIRONMENTAL PLANNERS
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Inglewood, Paignton

Greater Horseshoe Bats 2019

A Report on behalf of Deeley Freed Estates

November 2019

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1.0 INTRODUCTION

1.1 An outline planning application (Torbay Council Planning Reference P/2017/1133) for a residential led development of up to 400* dwellings, together with the means of vehicular and pedestrian/cycle access, the principle of a public house, primary school with nursery, internal access roads and the provision of public open space (formal and informal) and strategic mitigation, was submitted in November 2017. *This has now been amended to "up to 373 dwellings".

1.2 The application was supported by bat surveys (which were predominantly undertaken in 2016 and the results reported in Ecological Baseline Report, NPA May 2017). At the time of writing the planning application has yet to be determined. Given the age of the surveys that initially informed the application update bat surveys have been undertaken in 2019.

1.3 This report details the methods and results of those surveys in relation to Greater Horseshoe Bats (GHS) *Rhinolophus ferrumequinum*. GHS are a primary reason for the designation of the South Hams Special Area of Conservation (SAC), a component of which (Berry Head to Sharkham Point) is 5km south of the planning application site (hereafter referred to as Site). The Site is within the GHS sustenance zone for the SAC.

2.0 METHODS

2.1 A series of activity surveys for bats were conducted to assess the use of the Site by bats. The surveys consisted of manual activity surveys and deployment of automated bat detectors over a series of nights. These surveys were undertaken in accordance with the Bat Conservation Trust's Bat Surveys for Professional Ecologists (Collins, J, 2016).

2.2 All activity manual surveys were undertaken in suitable weather conditions (no or little rain, no strong wind above Beaufort 4, and moderate temperature, typically not below 10^{0}C). During manual surveys temperature (^{0}C), cloud cover (%), wind (Beaufort) and intensity of rain were recorded at hourly intervals. Deployment of automated detectors was targeted for periods of suitable weather conditions. Whilst the automated detectors recorded temperature, additional weather information was taken from a weather station[1] based in St Mary's Brixham, approximately 4km south east of the Site.

[1] https://wow.metoffice.gov.uk/observations/details/20170119catkqds6gae6pfybyyguicqpgo

Manual Activity Surveys

2.3 Two surveys were undertaken in each month from April to October 2019 (inclusive). This included a dusk and dawn survey on the 11th and 12th of September.

2.4 The dusk activity surveys consisted of walking three (occasionally 2) transects routes which covered a cross-section of habitats present on Site (See Bat Survey Plan 2019). Each transect began prior to sunset and continued for 2-3 hours after sunset. Each surveyor remained static for the first hour post sunset and then walked the transect route at a steady pace stopping at pre-defined listening points for at least 5 minutes to record bat activity. Incidental records of bats in-between listening points were also made.

2.5 The dawn survey in September started at 2hrs prior to sunrise and lasted until at least sunrise. This was undertaken by 3 surveyors who remained static for the duration of the survey at strategic points within the Site.

2.6 When a bat was encountered the time, species and notes on activity were recorded. Bat echolocation was recorded using full spectrum bat detectors.

Automated Surveys

2.7 Automated bat detectors (AnaBat Express) were also deployed across the Site (See Bat Survey Plan 2019). The detectors were placed approximately 1-1.5m off the ground and left in position for at least five nights (dusk-dawn). They were programmed to come on 15 minutes before sunset and turn off 15 minutes after sunrise.

2.8 Recorded echolocation calls were run through filters for GHS within AnaLookW to identify likely GHS calls (see Table 1 below for filter parameters). These were then analysed manually to verify if they were attributable to GHS.

Table 1: GHS Filter Parameters

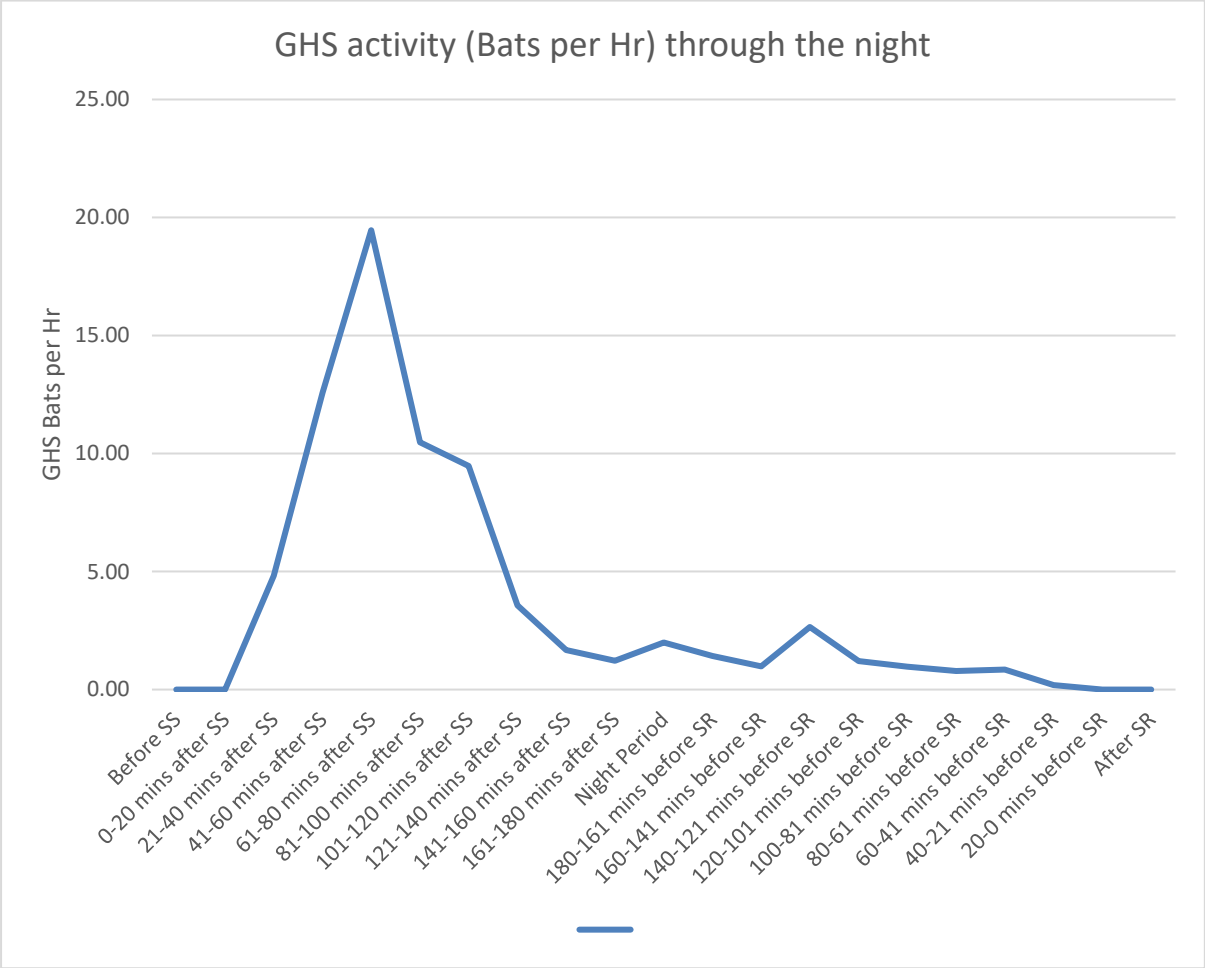
	Greater Horseshoe Bat
Characteristic Frequency (KHz)	75-90
Call Duration (ms)	0.2-100

3.0 RESULTS

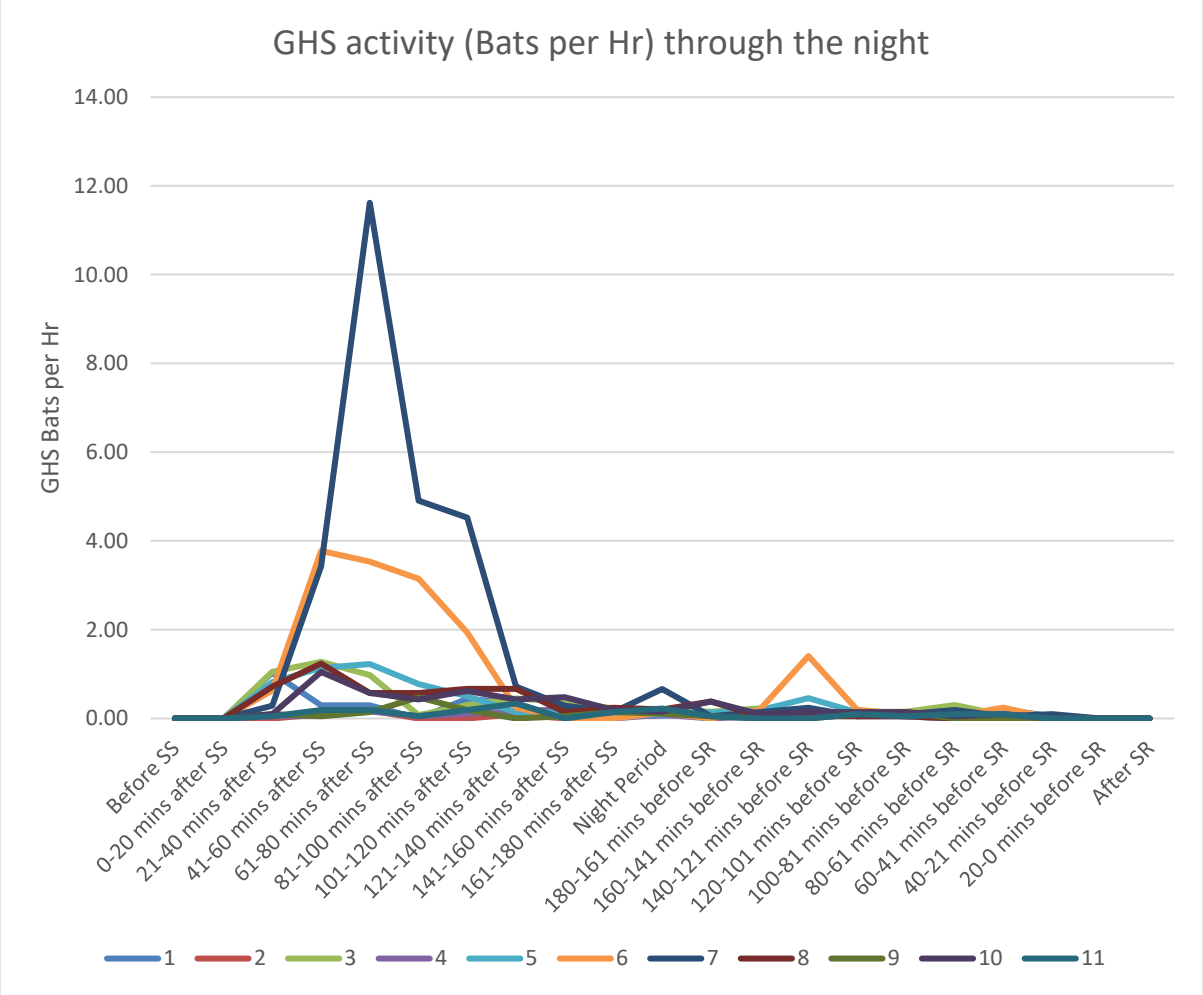
Roosting

3.1 As discussed in the initial reporting that supported the application there are no structures on Site suitable for GHS to roost in. There nearest GHS roosts previously recorded were in derelict farm buildings to the north of Site (which supported low numbers of day and night roosting GHS). During the course of 2019 these buildings were demolished under the terms of a Natural England mitigation license, with a purpose-built structure/small barn being built to the west (as shown on the Bat Survey Plan 2019).

3.2 The records from the automated detectors, as shown in the GHS activity through the night graph below (combined for all detectors for all the months) shows GHS activity was highest between 20 minutes and 2hrs after sunset, which is typically when GHS are at their most active, with activity peaking in the period 61-80 minutes after sunset.



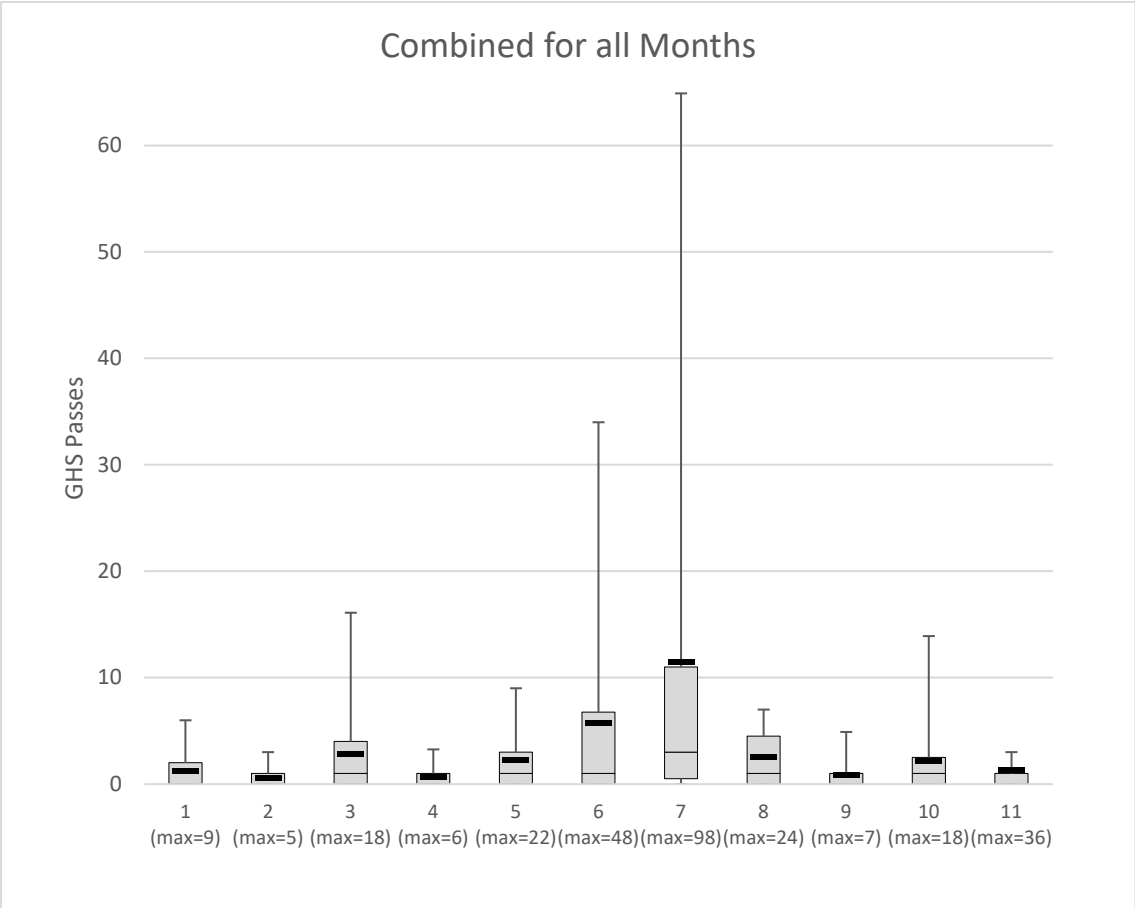
3.3 The peak in the above graph is driven to a large extent by the activity in this period at location 7 and also to a lesser extent by the activity at location 6 (see graph below). During these times there were several concentrated bouts of activity/ likely intense feeding activity by single or low number of GHS.



3.4 Of the 28 records of GHS made during the manual surveys (see Appendix I and GHS Manual Records plan) only 5 were made within 1 hour of sunset/sunrise, with the earliest being 30 minutes after sunset at listening point 8 on transect 1.

Activity Location

3.5 The location of activity recorded by the automated detectors is shown on the automated detector activity figures (April-October), associated pivot tables in Appendix II and the box plots shown below.



(Whiskers = 5th and 95th percentiles)

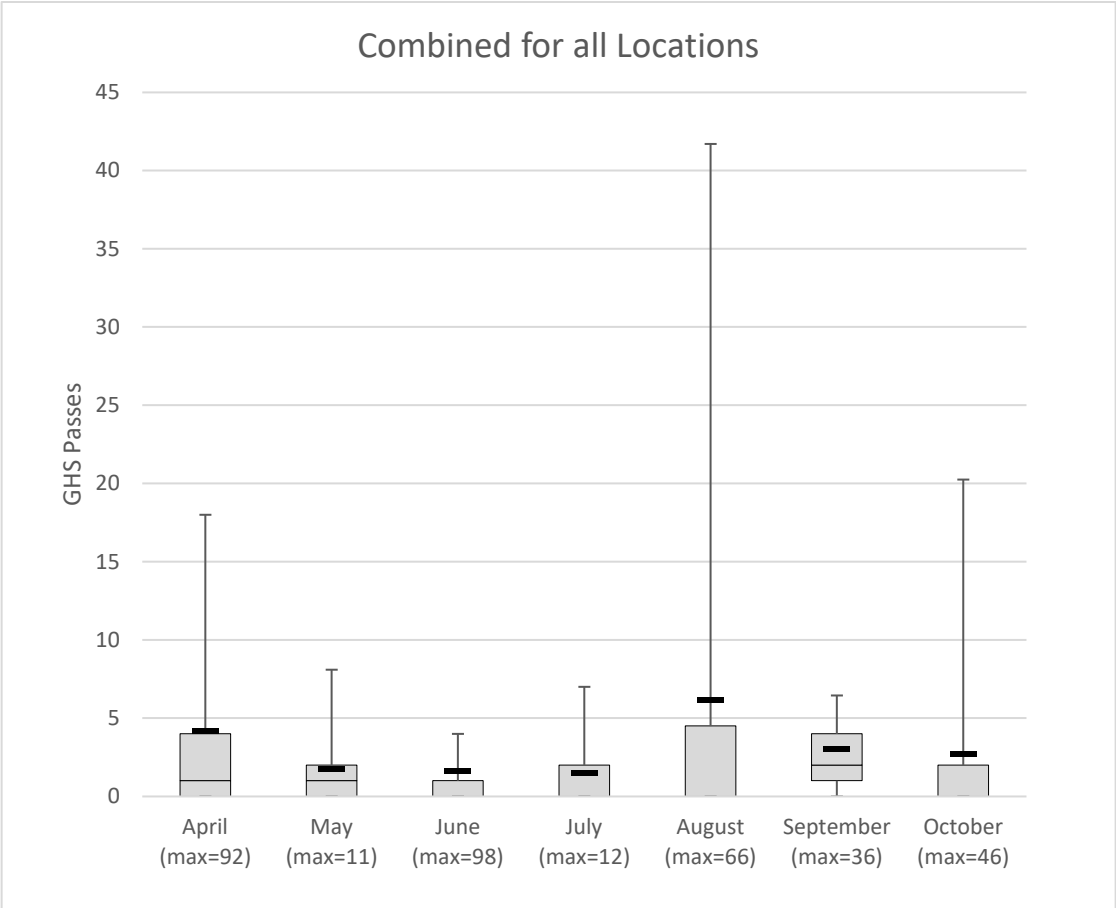
3.6 The activity at location 7 was significantly higher (p=<0.05[2]) than at locations 1, 2, 4, 5, 9, 10 or 11. With the activity recorded at locations 6 and 8 significantly higher (p=<0.05[1]) than at locations 2, 4, 9 or 11.

3.7 The majority of GHS activity records during the manual surveys were towards the south west of the Site *i.e.* where the greatest activity was recorded by the automated detectors.

Seasonality

3.8 The automated detector activity figures (April-October) and the box plots below show where GHS were recorded by month.

[2] Shapiro-Wilk test for normality identified the data to be not normally distributed, therefore the non-parametric Kruskal-Wallis analysis with post-hoc testing was utilised to detect differences. All following quoted p values relate to the same method of analysis. See analysis in Appendix 1V



(Whiskers = 5th and 95th percentiles)

3.9 The activity recorded in September was significantly higher (p=<0.05[3]) than in June, July or October. The activity recorded in August was largely recorded at locations 7 and 6 (see pivot tables in Appendix II, box plots in Appendix III and automated activity figures). The activity recorded in June was significantly lower (p=<0.05[2]) than in April, May or September.

3.10 Half of the manual records were recorded in July, with no records in June and the other records being reasonably well spread across the remaining months.

Table 2: GHS Manual Records by Month

Month	April	May	June	July	August	September	October	Total
Count of GHS	4	2	0	14	3	3	2	28

[3] See analysis in Appendix V

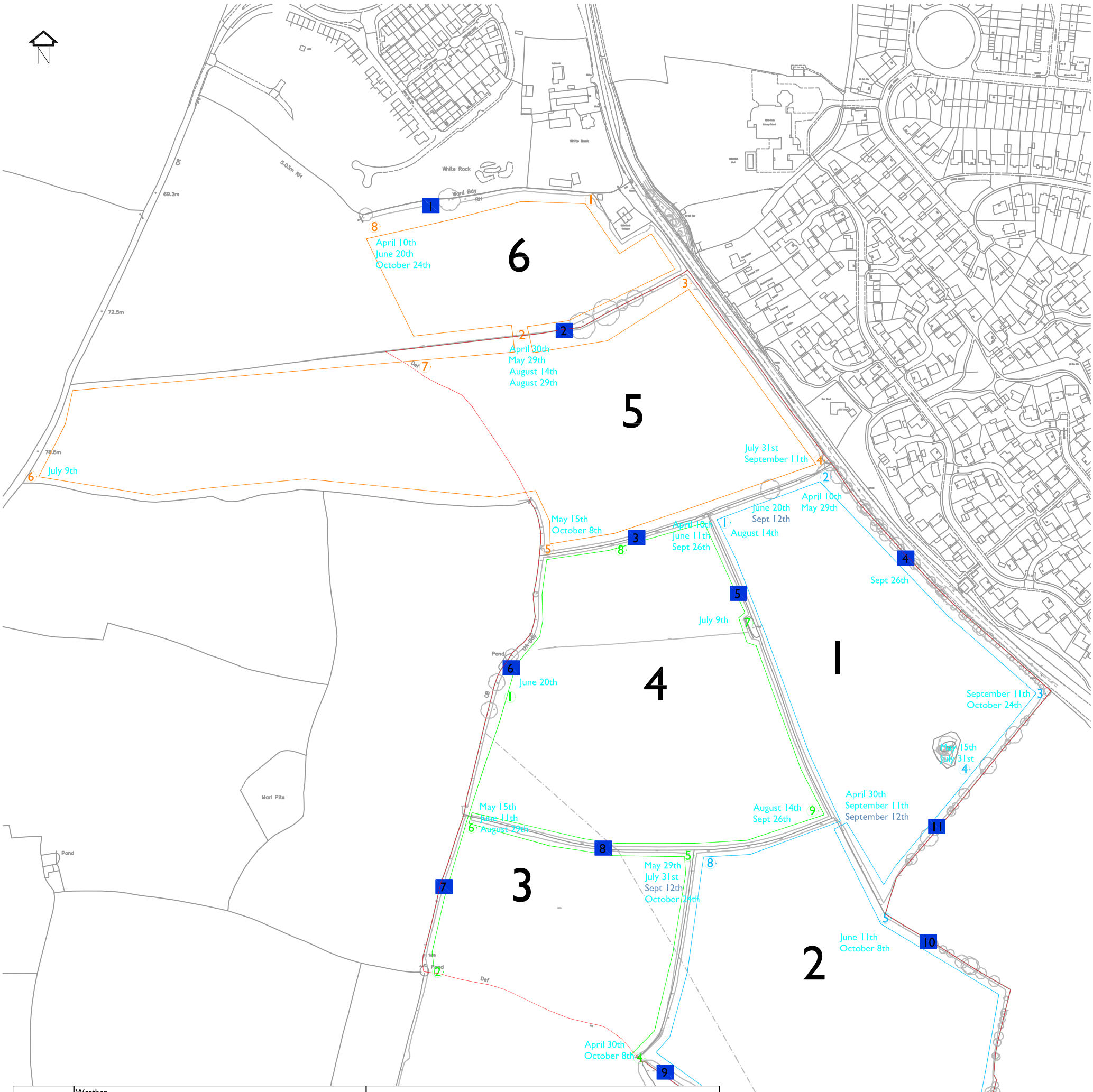
4.0 CONCLUSIONS

4.1 There are no GHS roosts on Site, but there are likely to be roosts within close proximity, with the closest potential roost being the bat house that was constructed for the White Rock development in 2019, approximately 175m north of Site.

4.2 GHS activity appears highest towards the west of the Site (locations 3, 6, 7 and 8), with the activity at location 7 (where a large buffer to built development is proposed) being significantly higher than the majority of other automated detector locations (1, 2, 4, 5, 9, 10 or 11).

4.3 As in 2016, GHS activity does appear to be higher at the start (April/May) and towards the later part of the season (August/September/October) with reduced activity in the middle of the season (June/July).

4.4 Given the above it is considered that the conclusions with regards to GHS in the ecology chapter of the Environmental Statement (Stride Treglown, November 2017) that supported the application remain valid *i.e.* that the provision of a robust mitigation package, which includes no net loss of cattle gazed pasture, a coherent network of hedgerows connected to the wider landscape and habitat enhancement measures around the south and west of the proposed built development, would avoid residual negative impact to GHS during construction and would result in a significant positive impact in the long term.



Date	Weather				Notes/Constraints
	Temp (°C)	Cloud Cover (%)	Wind (Beaufort Scale)	Rain	
April 10th	10	20	1	Dry	Transect 2 started @ 21:00 due to detecotr issue. Did not cover Field 3 due to presence of bull.
April 30th	14	90	1	Dry	
May 15th	14	15	1	Dry	
May 29th	15	80	3	Dry	
June 11th	11	100	2-3	Dry	
June 20th	13	0	1	Dry	
July 9th	18	5	0	Dry	2 surveyors used. Transect 1 + Field 1; Transect 2 + Field 2
July 31st	16	60	0-1	Dry	
August 14th	16	100	1-2	Dry	
August 29th	16	5	1-2	Dry	2 surveyors used. Transect 1 + Field 1; Transect 2 + Field 2
September 11th	17	100	2-3	Intermittent light	
September 12th	16	100	2-3	Intermittent light	
September 26th	16	60	2-3	Dry	
October 8th	14	25	3	Dry	
October 24th	11	30	1	Showers between 19:15-30	

Planning application boundary

5 Field Reference

5 AnaBat Location

June 20th Activity start point

Sept 12th Dawn static

Transect 1

Transect 2

Transect 3

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Bat Survey Plan 2019

November 2019

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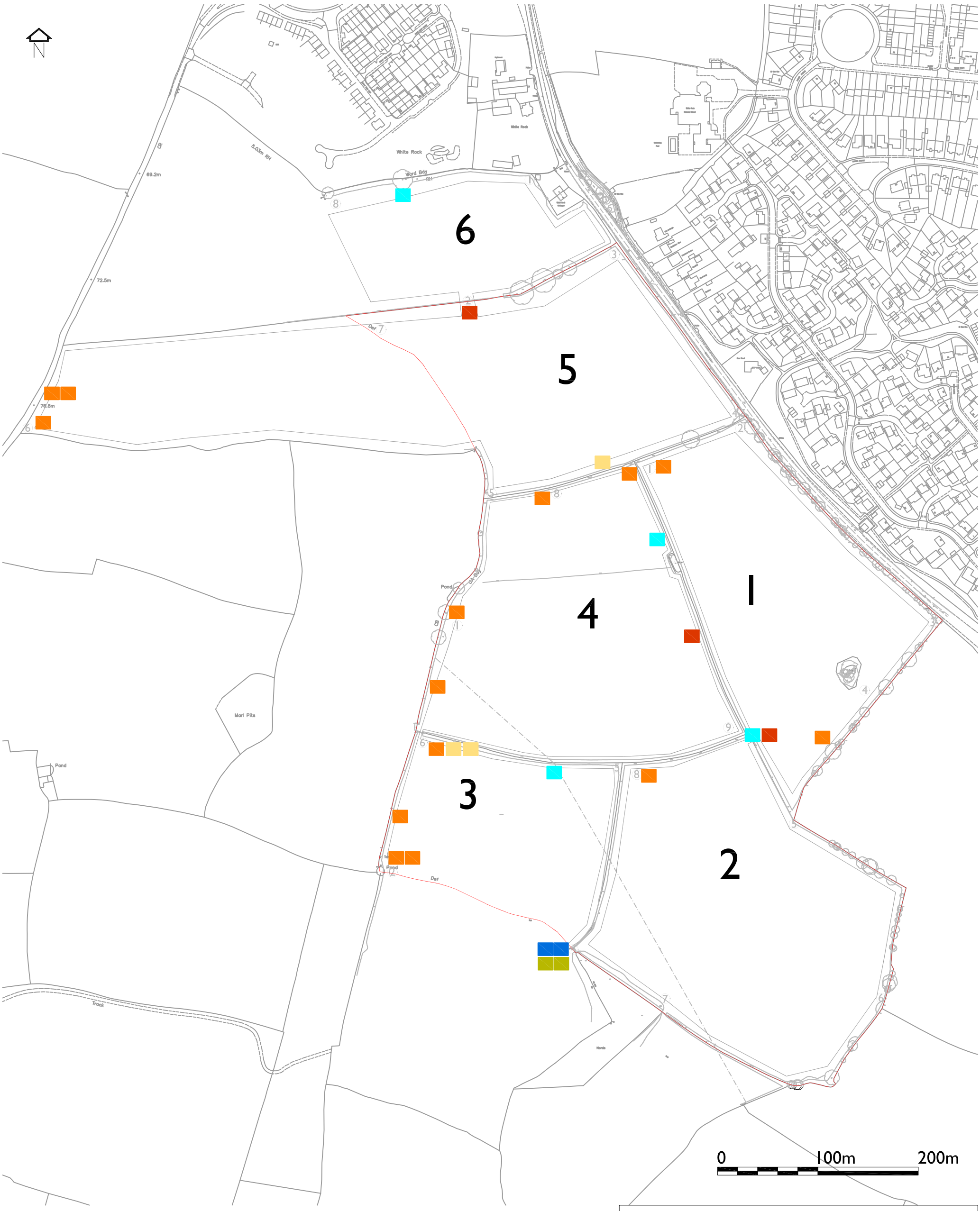

Planning application boundary

5 Field Reference

April

May

July

August

September

October

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Automated detectors
April 2019

Nov 2019

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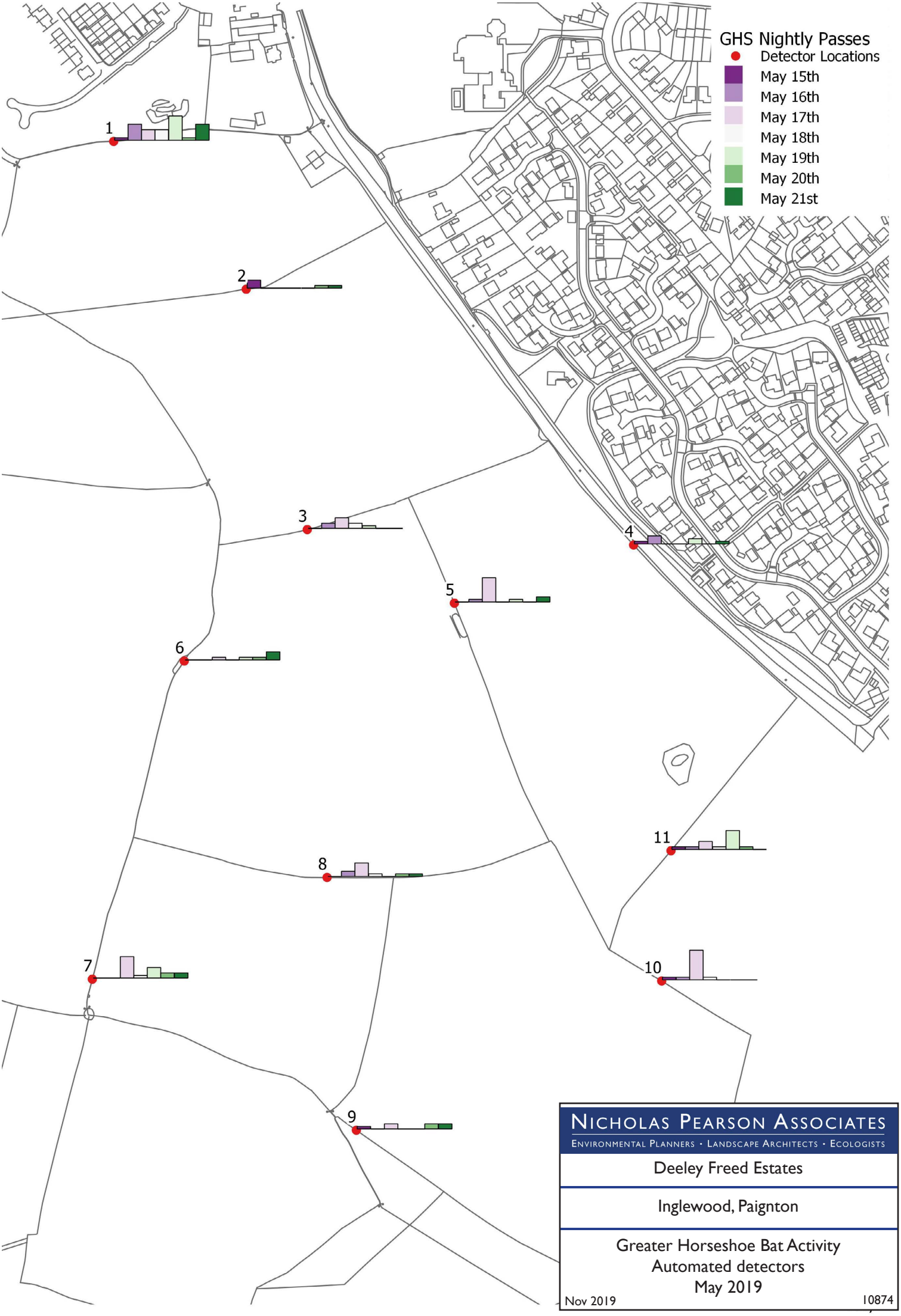

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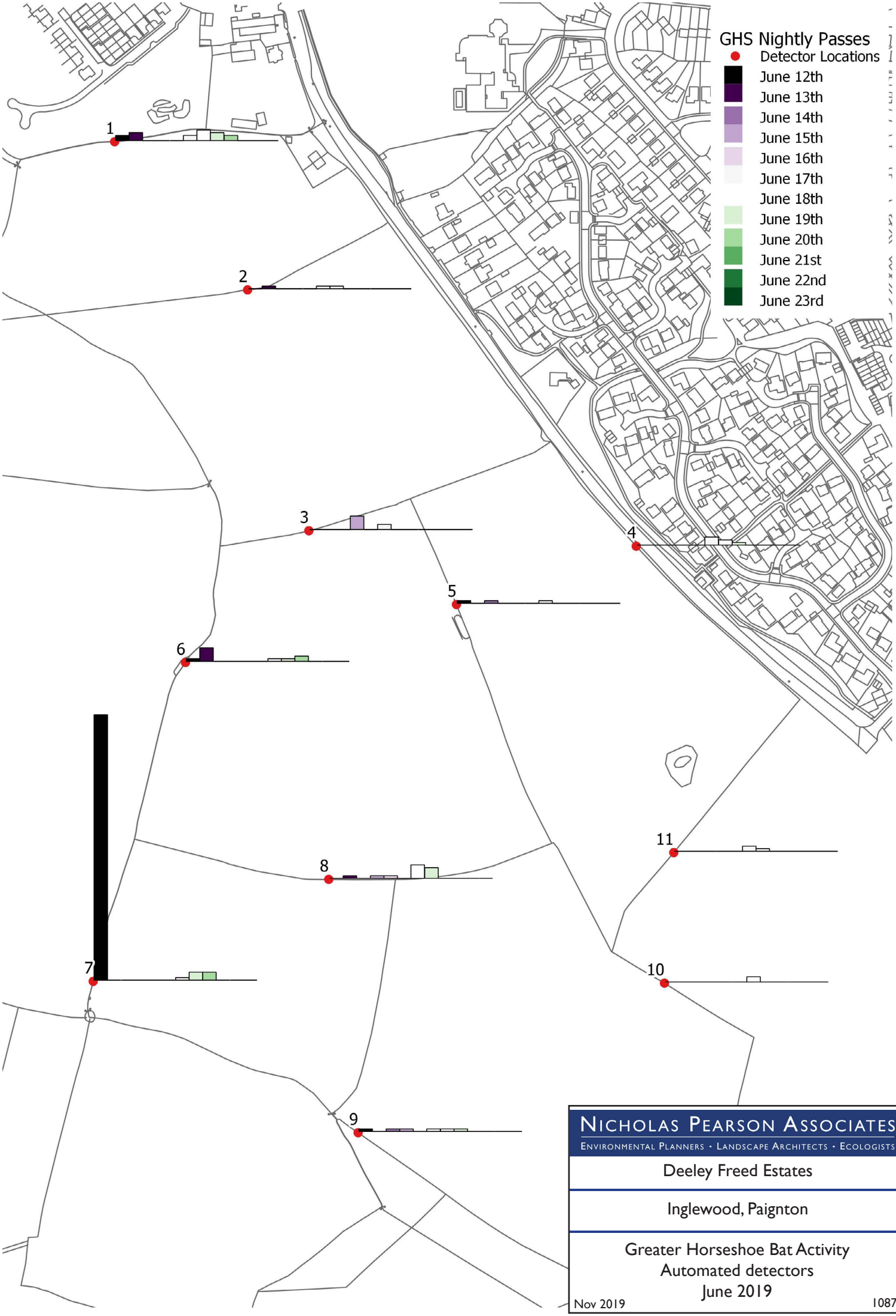

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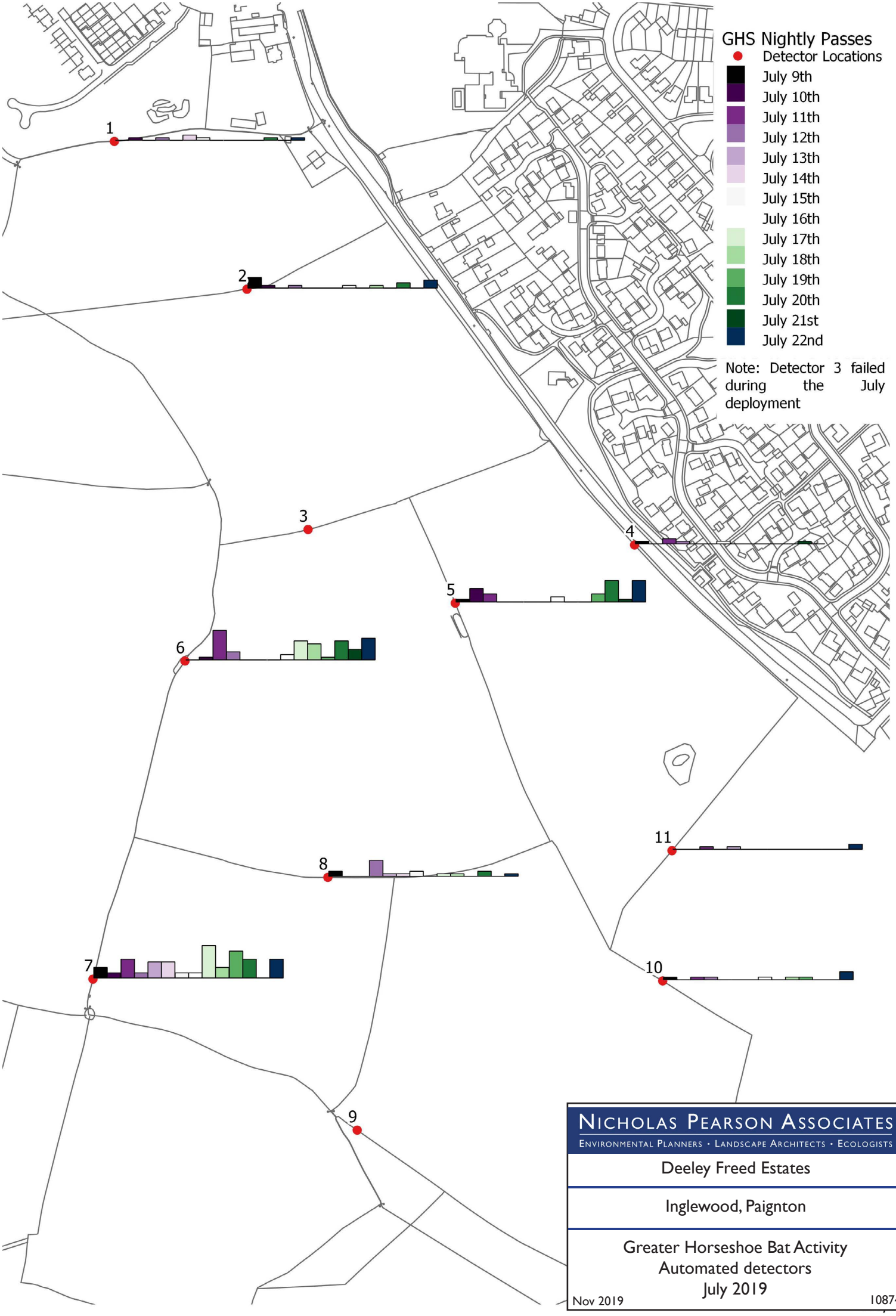

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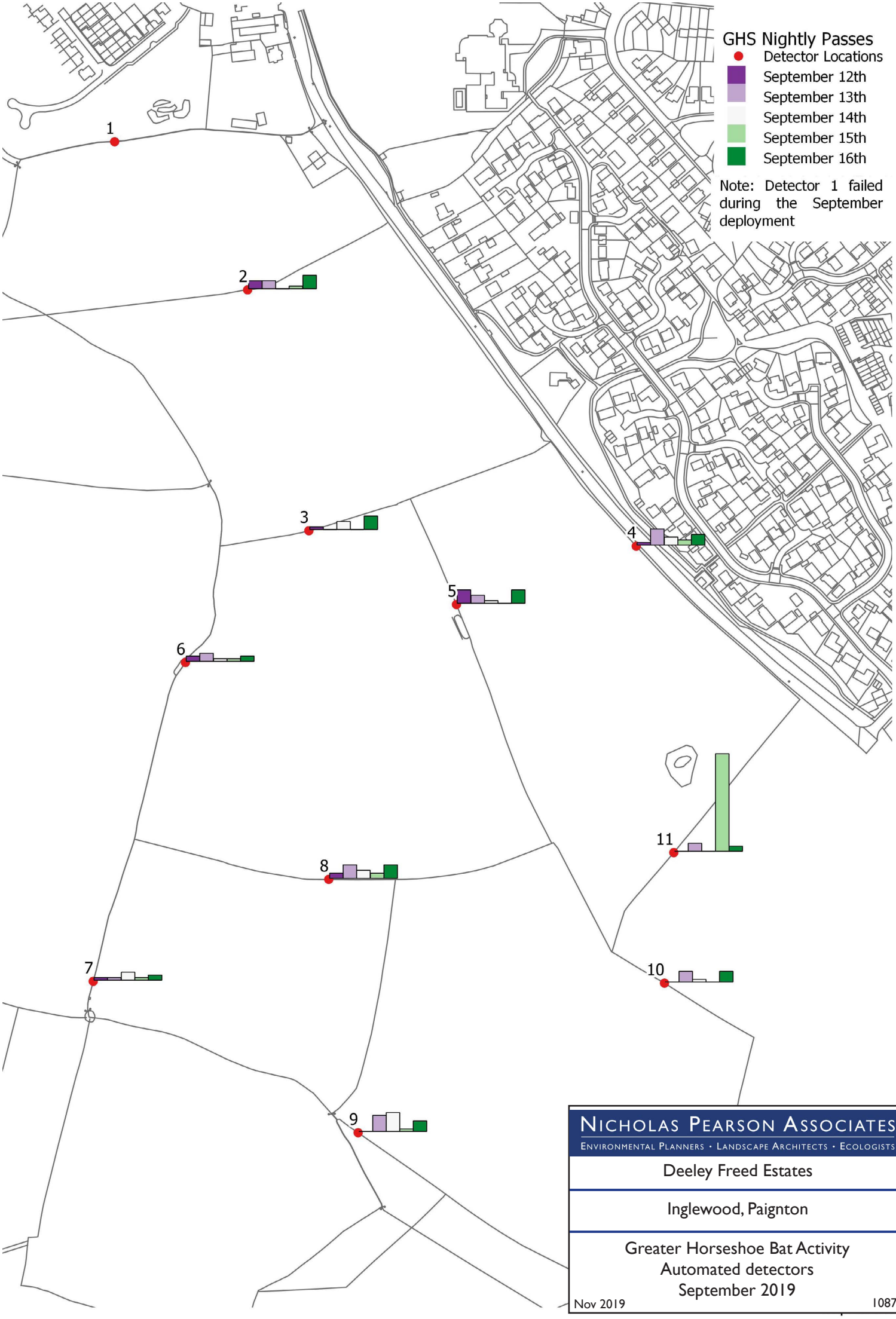

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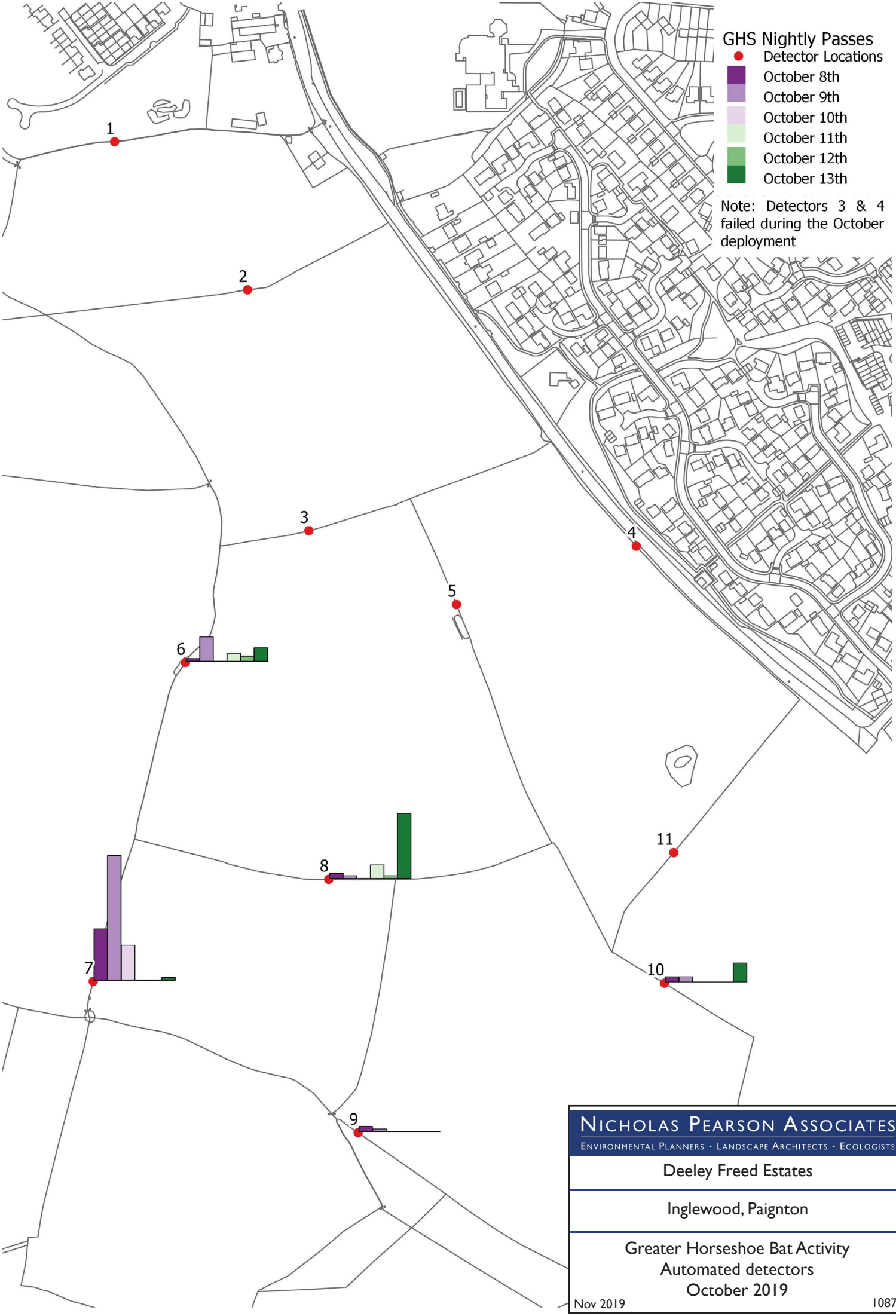

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APPENDIX 1: GHS Manual Records 2019

Month	Date	Transect	Point count	Time	Number	Activity*	Feature**	Notes	Sunset/ Sunrise
April	10/04/2019	1	8	20:30	1	C	H		20:00
April	30/04/2019	2	5-6	21:40	1	C	H		20:32
April	30/04/2019	2	7	22:33	1	C	-		20:32
April	30/04/2019	3	4-5	21:07	1	C	H		20:32
May	15/05/2019	2	4	22:55	1	C	Wd		20:55
May	29/05/2019	2	4	22:07	1	C	Wd		21:13
July	09/07/2019	3	1	23:05	1	C	-		21:25
July	31/07/2019	3	4	21:48	1	C	H		21:01
July	31/07/2019	3	8	22:52	1	C	H		21:01
July	31/07/2019	2	6	22:18	1	Fc	Fd/H	>10 passes around gateway	21:01
July	31/07/2019	2	2-6	22:24	1	C	-		21:01
July	31/07/2019	2	2	22:29	1	C	-		21:01
July	31/07/2019	2	2	22:31	1	C	-		21:01
July	31/07/2019	2	2-1	22:33	1	C	-		21:01
July	31/07/2019	2	1	22:36	1	C	H		21:01
July	31/07/2019	2	8	22:45	1	C	-		21:01
July	31/07/2019	2	8-7	22:51	1	C	-		21:01
July	31/07/2019	1	6	22:24	1	C	R/H	On roadside of hedge	21:01
July	31/07/2019	1	6-7	22:28	1	C	R/H	On roadside of hedge	21:01
July	31/07/2019	1	6-7	22:31	1	C	R/H	On roadside of hedge	21:01
August	14/08/2019	2	6	21:43	1	C	-	Faint	20:36

August	14/08/2019	2	6	21:46	1	C	-		20:36
August	29/08/2019	1	4-5	21:47	1	C	H		20:06
September	12/09/2019	2	4-5	04:52	1	C	H		06:24
September	26/09/2019	1	2	21:03	1	C	Fe/H		19:04
September	26/09/2019	2	7-9	21:08	1	C	-		19:04
October	08/10/2019	2	4	19:22	1	C	-	Faint	18:38
October	08/10/2019	2	4	19:28	1	C	-	Faint	18:38

* Fc=Feeding Constant C=Commuting
** Fe-Fence, Fd-Field, H-Hedge, R-Road, Wd-Woodland

APPENDIX II: GHS Automated Records 2019 – Pivot Tables

April

Night	1	2	3	4	5	6	7	8	9	10	11	GHS Count
20190411	0	0	0	0	0	0	0	0	0	0	0	0
20190412	0	0	0	0	0	0	0	0	0	0	0	0
20190413	0	0	0	0	0	0	0	0	0	0	0	0
20190414	0	0	0	0	0	0	0	0	0	0	0	0
20190415	0	0	0	0	2	1	0	0	0	2	0	5
20190416	1	1	10	0	22	40	19	7	1	5	0	106
20190417	4	0	2	0	6	3	7	5	0	3	1	31
20190418	2	0	4	0	7	34	3	6	4	8	3	71
20190419	1	2	10	1	8	11	3	5	2	14	1	58
20190420	2	0	7	1	9	x	12	4	5	14	3	57
20190421	1	0	3	0	4	x	9	2	1	4	1	25
20190422	3	0	16	0	9	x	92	9	3	13	3	148
20190423	3	0	18	1	7	x	25	1	2	18	3	78
Total	**17**	**3**	**70**	**3**	**74**	**89**	**170**	**39**	**18**	**81**	**15**	**579**

May

Night	1	2	3	4	5	6	7	8	9	10	11	GHS Count
20190515	1	3	0	1	0	0	0	0	1	1	1	8
20190516	6	0	2	3	1	0	0	2	0	1	1	16
20190517	4	0	4	0	9	1	8	5	2	11	3	47
20190518	4	0	2	0	0	0	1	1	0	1	1	10
20190519	9	0	1	2	1	1	4	0	0	0	7	25
20190520	1	1	0	0	0	1	2	1	2	0	1	9
20190521	6	1	0	1	2	3	2	1	2	0	0	18
Total	**31**	**5**	**9**	**7**	**13**	**6**	**17**	**10**	**7**	**14**	**14**	**133**

June

Night	1	2	3	4	5	6	7	8	9	10	11	GHS Count
20190612	2	0	0	0	1	1	98	0	1	0	0	103
20190613	3	1	0	0	0	5	0	1		0	0	10
20190614	0	0	0	0	1	0	0	0	1	0	0	2
20190615	0	0	5	0	0	0	0	1	1	0	0	7
20190616	0	0	0	0	0	0	0	1	0	0	0	1
20190617	2	1	2	3	0	0	0	0	1	0	2	11
20190618	4	1	x	2	1	1	1	5	1	2	1	19
20190619	3	0	x	1	0	1	3	4	1	0	0	13
20190620	2	0	x	0	0	2	3	0	0	0	0	7
20190621	0	0	x	x	0	0	x	x	x	x	x	0
20190622	0	0	x	x	0	0	x	x	x	x	x	0
20190623	0	0	x	x	0	0	x	x	x	x	x	0
Total	**16**	**3**	**7**	**6**	**3**	**10**	**105**	**12**	**6**	**2**	**3**	**173**

July

Night	1	2	3	4	5	6	7	8	10	11	GHS Count
20190709	0	4	x	1	1	0	4	2	1	0	13
20190710	1	1	x	0	5	1	2	0	0	0	10
20190711	0	0	x	2	3	11	7	0	1	1	25
20190712	1	1	x	1	0	3	2	6	1	0	15
20190713	0	0	x	0	0	0	6	1	0	1	8
20190714	2	0	x	0	0	0	6	1	0	0	9
20190715	1	0	x	1	0	0	2	2	0	0	6
20190716	0	1	x	0	2	2	2	0	1	0	8
20190717	0	0	x	0	0	7	12	1	0	0	20
20190718	0	1	x	0	0	6	4	1	1	0	13
20190719	0	0	x	0	3	1	10	0	1	0	15
20190720	1	2	x	0	8	7	7	2	0	0	27
20190721	0	0	x	1	1	4	0	0	0	0	6
20190722	1	3	x	0	8	8	7	1	3	2	33
Total	**7**	**13**	x	**6**	**31**	**50**	**71**	**17**	**9**	**4**	**208**

August

Night	1	2	3	5	6	7	8	10	11	GHS Count
20190805	0	0	5	1	17	22	3	0	0	48
20190806	0	0	4	5	19	41	7	1	0	77
20190807	1	1	0	3	34	66	6	3	1	115
20190808	0	0	0	0	0	0	0	0	0	0
20190809	0	0	0	0	0	0	0	0	0	0
20190810	0	0	0	0	9	8	1	0	0	18
20190811	1	0	1	0	48	29	5	3	0	87
20190812	0	0	1	1	11	55	3	1	0	72
20190813	0	0	0	1	23	30	3	0	0	57
Total	**2**	**1**	**11**	**11**	**161**	**251**	**28**	**8**	**1**	**474**

September

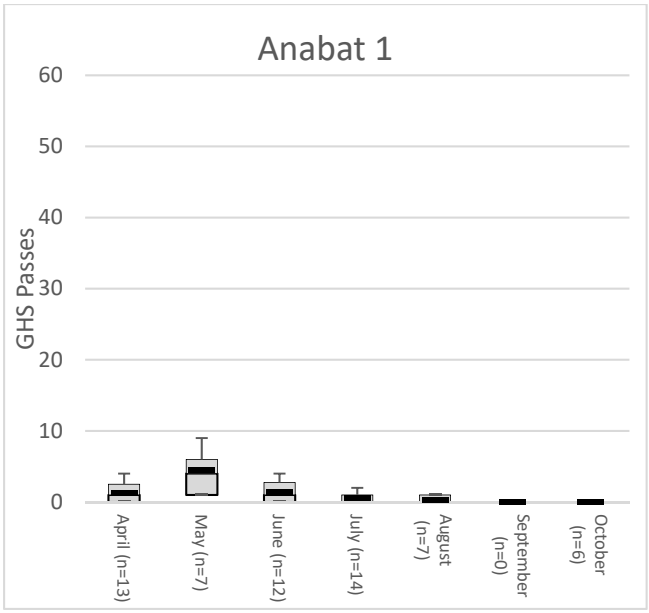
Night	1	2	3	4	5	6	7	8	9	10	11	GHS Count
20190912	x	3	1	1	5	2	1	2	0	0	0	15
20190913	x	3	0	6	3	3	1	5	6	4	3	34
20190914	x	0	3	3	1	1	3	3	7	1	0	22
20190915	x	1	0	2	0	1	1	2	1		36	44
20190916	x	5	5	4	5	2	2	5	4	4	2	38
Total	**x**	**12**	**9**	**16**	**14**	**9**	**8**	**17**	**18**	**9**	**41**	**153**

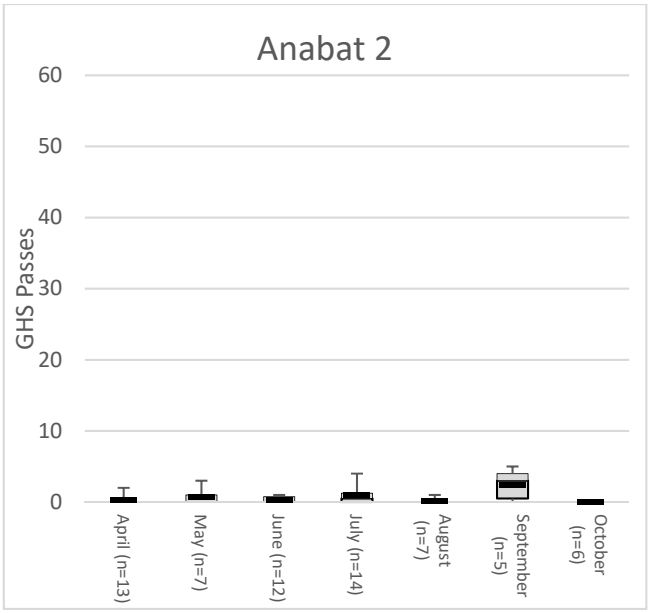
October

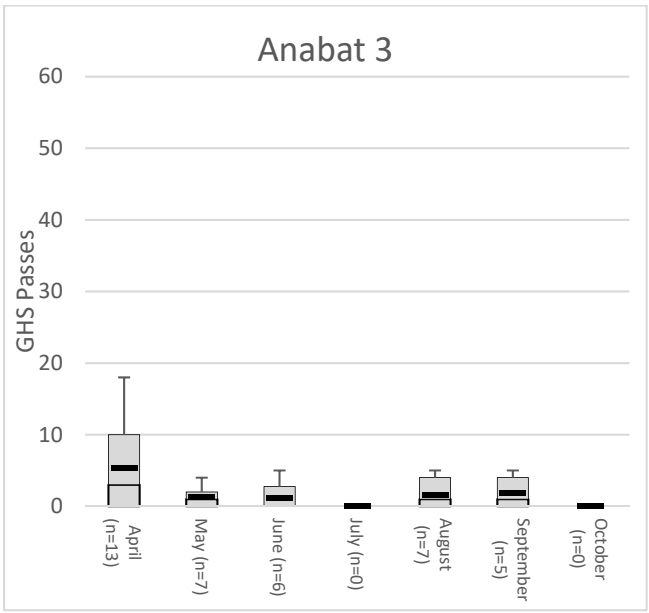
Night	1	2	3	4	5	6	7	8	9	10	11	GHS Count
20191008	0	0	x	x	0	1	19	2	2	2	0	26
20191009	0	0	x	x	0	9	46	1	1	2	0	59
20191010	0	0	x	x	0	0	13	0	0	0	0	13
20191011	0	0	x	x	0	3	0	5	0	0	0	8
20191012	0	0	x	x	0	2	0	1	0	0	0	3
20191013	0	0	x	x	0	5	1	24	0	7	0	37
Total	**0**	**0**	**x**	**x**	**0**	**20**	**79**	**33**	**3**	**11**	**0**	**146**

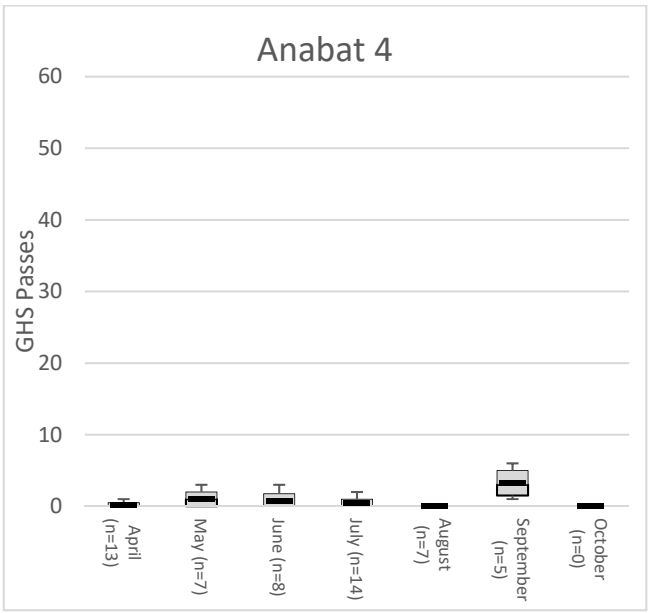
x: Detector was not recording

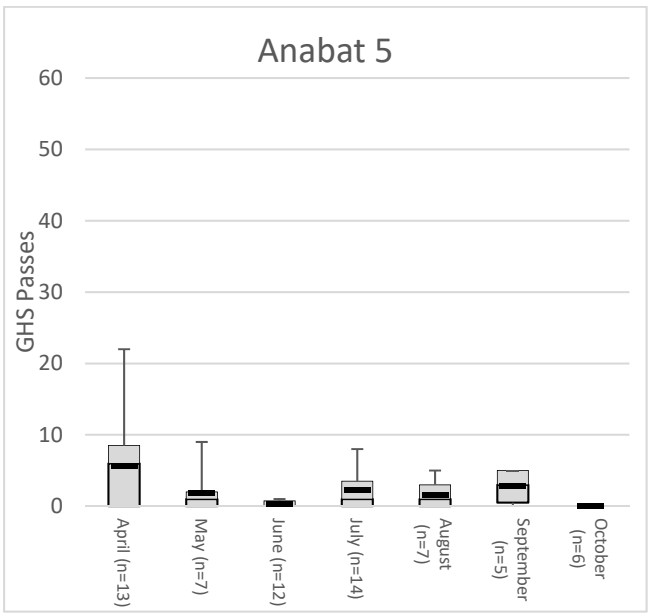
APPENDIX III: GHS Automated Records 2019 – Box Plots for each Location

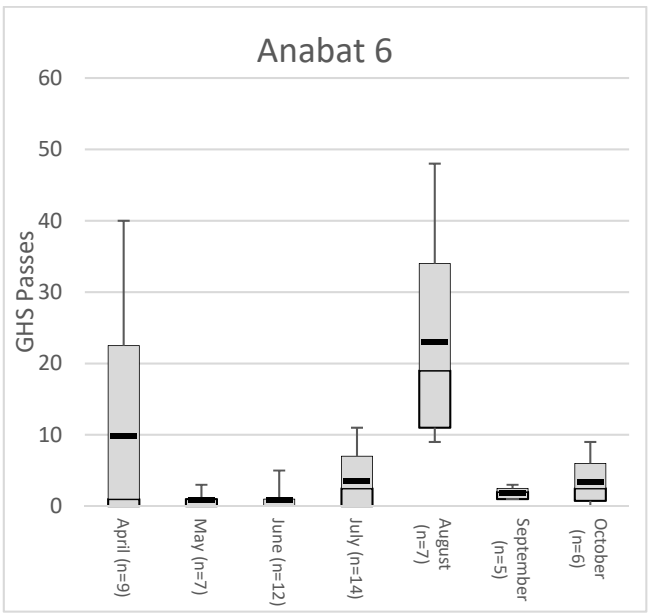

Anabat 1
GHS Passes
60
50
40
30
20
10
0
April (n=13)
May (n=7)
June (n=12)
July (n=14)
August (n=7)
September (n=0)
October (n=6)

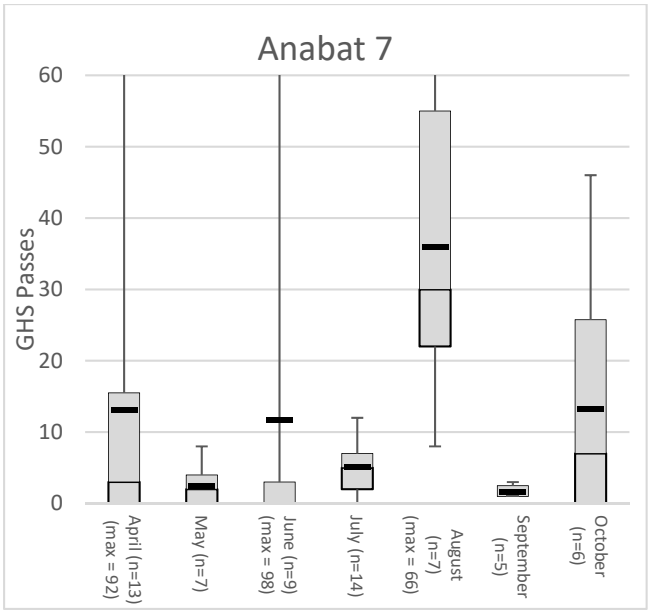

Anabat 2
GHS Passes
60
50
40
30
20
10
0
April (n=13)
May (n=7)
June (n=12)
July (n=14)
August (n=7)
September (n=5)
October (n=6)

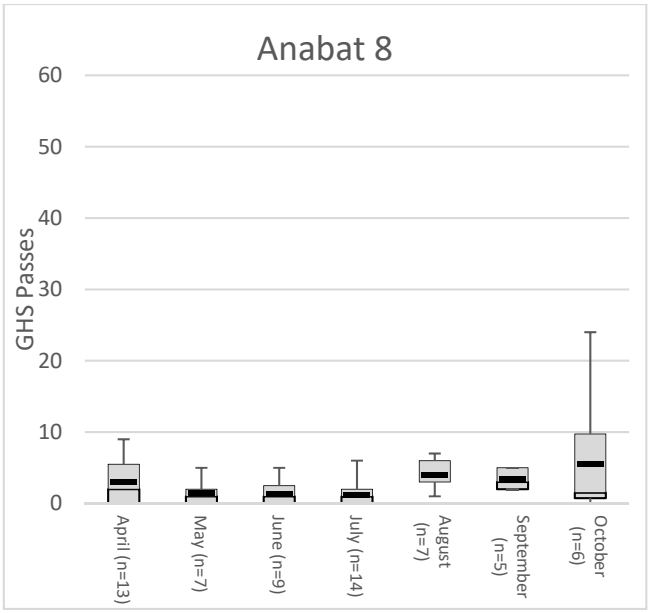

Anabat 3
GHS Passes
60
50
40
30
20
10
0
April (n=13)
May (n=7)
June (n=6)
July (n=0)
August (n=7)
September (n=5)
October (n=0)

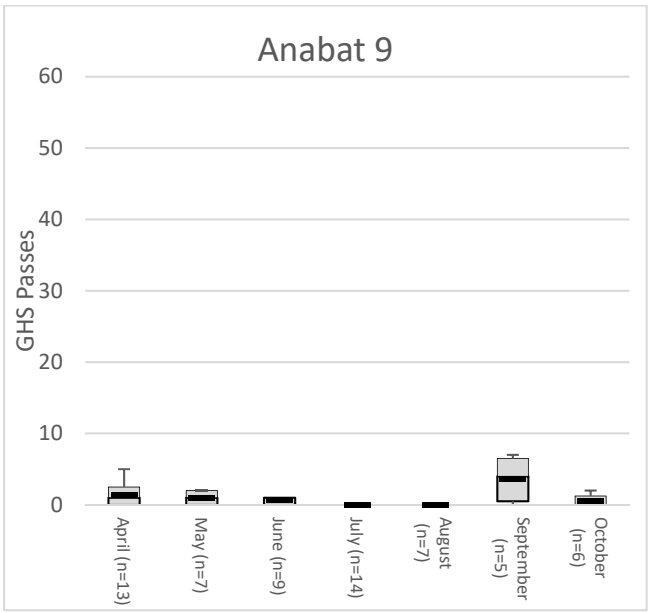

Anabat 4
GHS Passes
60
50
40
30
20
10
0
April (n=13)
May (n=7)
June (n=8)
July (n=14)
August (n=7)
September (n=5)
October (n=0)

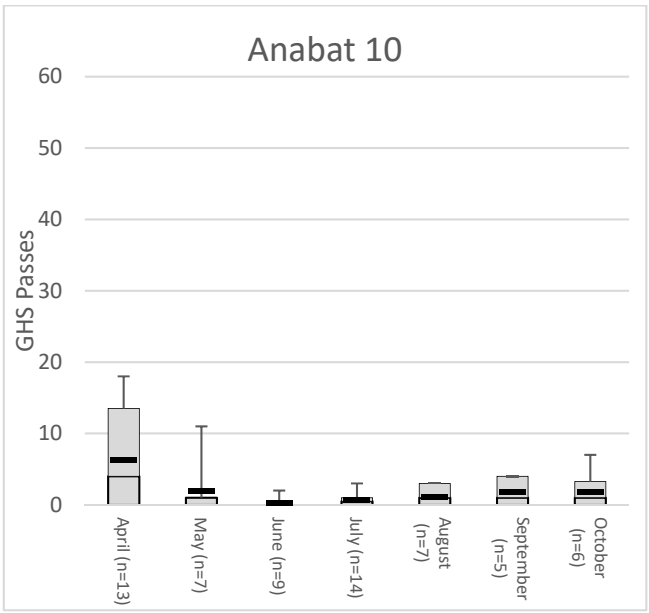

Anabat 5
GHS Passes
60
50
40
30
20
10
0
April (n=13)
May (n=7)
June (n=12)
July (n=14)
August (n=7)
September (n=5)
October (n=6)

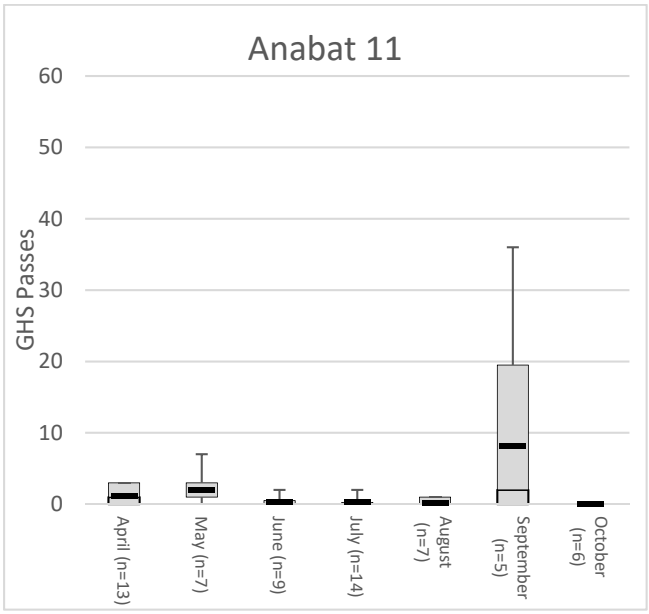

Anabat 6
GHS Passes
60
50
40
30
20
10
0
April (n=9)
May (n=7)
June (n=12)
July (n=14)
August (n=7)
September (n=5)
October (n=6)











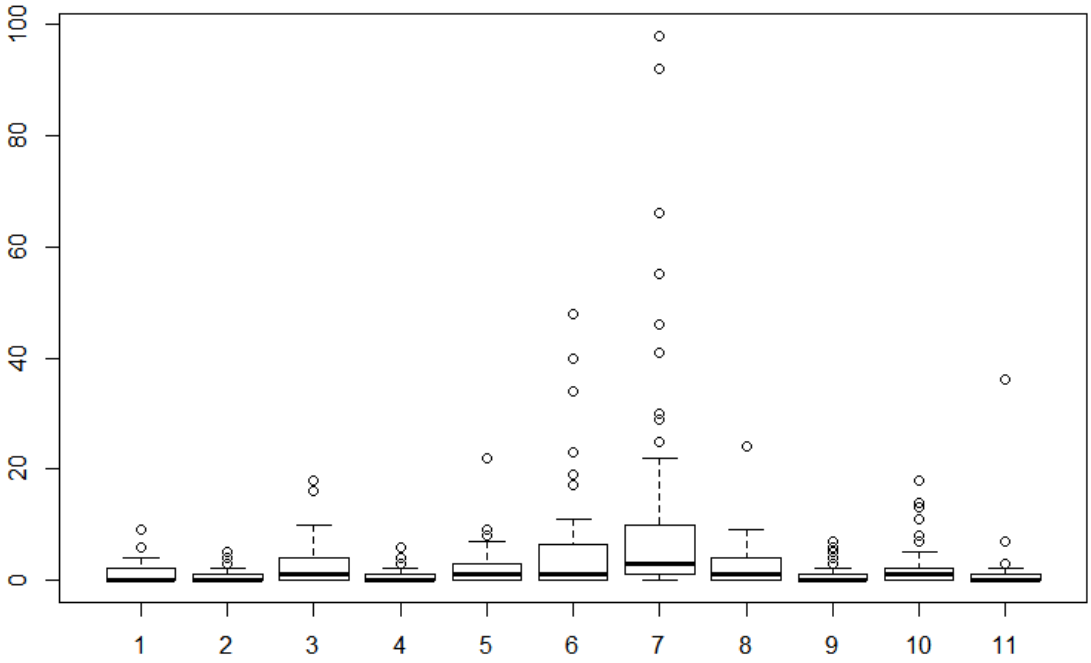
Notes: bold black lines = mean GHS passes per night

For individual Anabat plots, whiskers = max and min GHS passes per night

APPENDIX IV: Statistical Analysis of GHS Activity by Location

```
> kruskalmc(GHS~Location,data=GHSData)
```

Multiple comparison test after Kruskal-Wallis. p.value: 0.05



Summary of differences:
6>2,4,9,11
7>1,2,4,5,9,10,11
8>2,4,9,11
Or, another way, GHS activity at 6,7,8 was greater than at 2,4,9,11, and at 7 it was also greater than at 1,5,10.

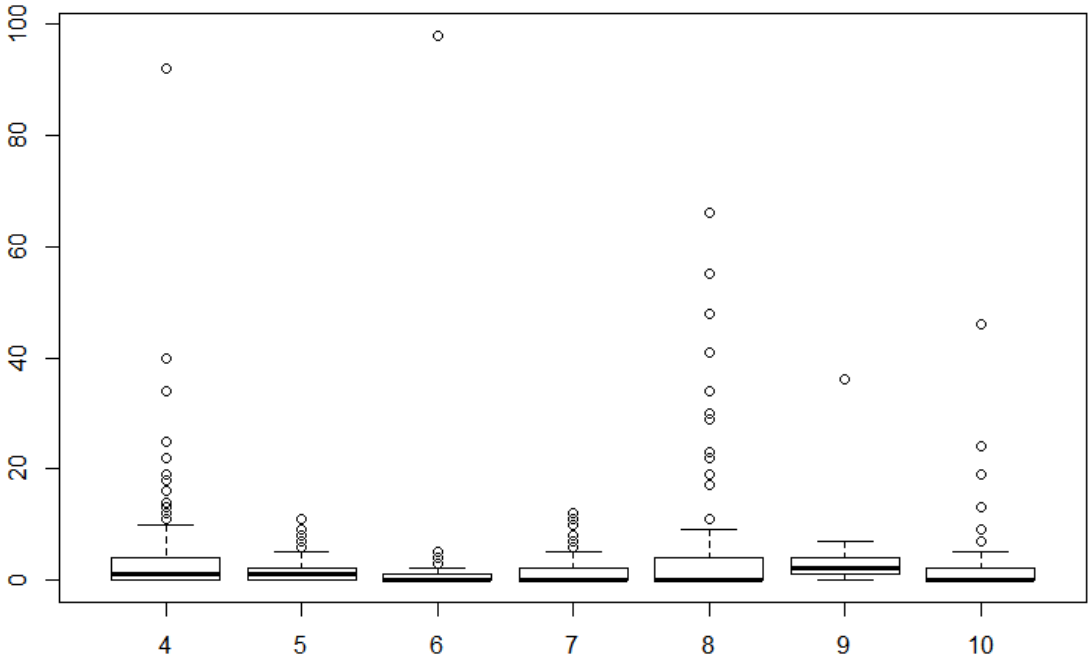
Comparisons: Locations	***Observed Dif***	***Critical Dif***	***Difference at p<0.05***
1-2	61.501457	111.3901	FALSE
1-3	48.144514	128.3743	FALSE
1-4	45.035311	116.2322	FALSE
1-5	27.053231	111.3901	FALSE
1-6	92.781356	113.1571	FALSE
1-7	**144.627258**	**112.6963**	**TRUE**
1-8	84.135454	112.6963	FALSE
1-9	38.315365	112.6963	FALSE
1-10	16.733815	112.6963	FALSE
1-11	42.528480	112.6963	FALSE
2-3	109.645970	126.3945	FALSE
2-4	16.466146	114.0418	FALSE
2-5	88.554688	109.1026	FALSE
2-6	**154.282812**	**110.9061**	**TRUE**
2-7	**206.128714**	**110.4359**	**TRUE**
2-8	**145.636911**	**110.4359**	**TRUE**
2-9	23.186091	110.4359	FALSE
2-10	78.235272	110.4359	FALSE

2-11	18.972976	110.4359	FALSE
3-4	93.179825	130.6818	FALSE
3-5	21.091283	126.3945	FALSE
3-6	44.636842	127.9545	FALSE
3-7	96.482744	127.5472	FALSE
3-8	35.990940	127.5472	FALSE
3-9	86.459879	127.5472	FALSE
3-10	31.410699	127.5472	FALSE
3-11	90.672994	127.5472	FALSE
4-5	72.088542	114.0418	FALSE
4-6	**137.816667**	**115.7684**	**TRUE**
4-7	**189.662568**	**115.3180**	**TRUE**
4-8	**129.170765**	**115.3180**	**TRUE**
4-9	6.719945	115.3180	FALSE
4-10	61.769126	115.3180	FALSE
4-11	2.506831	115.3180	FALSE
5-6	65.728125	110.9061	FALSE
5-7	**117.574027**	**110.4359**	**TRUE**
5-8	57.082223	110.4359	FALSE
5-9	65.368596	110.4359	FALSE
5-10	10.319416	110.4359	FALSE
5-11	69.581711	110.4359	FALSE
6-7	51.845902	112.2179	FALSE
6-8	8.645902	112.2179	FALSE
6-9	**131.096721**	**112.2179**	**TRUE**
6-10	76.047541	112.2179	FALSE
6-11	**135.309836**	**112.2179**	**TRUE**
7-8	60.491803	111.7532	FALSE
7-9	**182.942623**	**111.7532**	**TRUE**
7-10	**127.893443**	**111.7532**	**TRUE**
7-11	**187.155738**	**111.7532**	**TRUE**
8-9	**122.450820**	**111.7532**	**TRUE**
8-10	67.401639	111.7532	FALSE
8-11	**126.663934**	**111.7532**	**TRUE**
9-10	55.049180	111.7532	FALSE
9-11	4.213115	111.7532	FALSE
10-11	59.262295	111.7532	FALSE

APPENDIX V: Statistical Analysis of GHS Activity by Month

```
> kruskalmc(GHS~Month,data=GHSData)
```

Multiple comparison test after Kruskal-Wallis. p.value: 0.05



Summary of differences
6<4,5,9
9>6,7,10

Comparisons: Months	***Observed Dif***	***Critical Dif***	***Difference at p<0.05***
4-5	4.397272	80.29799	FALSE
4-6	**89.097660**	**72.69404**	**TRUE**
4-7	46.559609	67.68014	FALSE
4-8	15.546622	80.29799	FALSE
4-9	71.874676	93.21141	FALSE
4-10	72.937916	90.63688	FALSE
5-6	**84.700388**	**84.46995**	**TRUE**
5-7	42.162338	80.19569	FALSE
5-8	11.149351	91.09619	FALSE
5-9	76.271948	102.66019	FALSE
5-10	68.540645	100.32842	FALSE
6-7	42.538051	72.58103	FALSE
6-8	73.551038	84.46995	FALSE
6-9	**160.972336**	**96.82856**	**TRUE**
6-10	16.159744	94.35279	FALSE
7-8	31.012987	80.19569	FALSE
7-9	**118.434286**	**93.12330**	**TRUE**
7-10	26.378307	90.54626	FALSE
8-9	87.421299	102.66019	FALSE
8-10	57.391294	100.32842	FALSE
9-10	**144.812593**	**110.93417**	**TRUE**

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DOCUMENT CONTROL

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REVISION RECORD

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