Natural Capital Solutions

Buckinghamshire biodiversity assessment

- Baseline condition, biodiversity units and assessment of potential impact of development

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1   Introduction

A natural capital basemap was prepared for Buckinghamshire in 2020 and gives a good indication of the extent and spatial configuration of habitats across the county. However, it is also important to understand the condition of these habitats, but this information is not generally available. Accurate assessment of habitat condition usually requires a site visit, but this is time-consuming, costly, and not always possible due to access restrictions. We have therefore developed an approach to mapping habitat condition at a landscape scale using existing data, inferences and targeted surveying of local sites by volunteer recorders.

The need for such condition data is increasing. In January 2024, it will become mandatory for all new developments larger than single householder applications to deliver biodiversity net gain (BNG) of at least 10%. Condition data is required in order to calculate biodiversity units, which underpin assessment of BNG. Buckinghamshire Council is interested in determining the potential need for biodiversity units as a result of allocations under the existing local plan, and this can also be extended to assess potential future allocations. Furthermore, Local Nature Recovery Networks, the new Environmental Land Management system (ELMs), and emerging natural capital markets all present new requirements for a better understanding of natural capital and its condition across landscapes.

The key objectives of this project were therefore to:

- Determine a biodiversity baseline for the county, by determining habitat condition and biodiversity units for the whole area (Section 2).

- To assess the potential impact of development at allocated sites on habitats, and to give an indication of the biodiversity units that may be required to fulfil requirements for biodiversity net gain at these sites (Section 3).

2   Assessment of condition and biodiversity units

2.1   Approach

A habitat basemap was obtained from a previous study[1]. This used Ordnance Survey MasterMap polygons as the underlying mapping unit and then utilised a series of different data sets to classify each polygon to a detailed habitat type (see report[1] for full details of methodology). The final basemap covered an area of 156,500 ha or 1,565 km^2 and contained 985,000 polygons, each of which was classified to an appropriate habitat type.

To establish a biodiversity baseline for Buckinghamshire, we calculated 'biodiversity units' for each polygon in the basemap, based on the Biodiversity Metric, a relatively simple metric developed by Natural England (2023)[2,3]. The biodiversity unit score is based on the area of the habitat, its distinctiveness, and its condition. Habitats that have a high distinctiveness, are in good condition and cover a greater area will achieve a higher biodiversity unit score than smaller areas, with lower distinctiveness and condition scores.

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[1] Rouquette, J.R. (2020). Mapping natural capital, ecosystem services and opportunities for habitat creation in Buckinghamshire. Report for Buckinghamshire Council, Natural Capital Solutions.

[2] Panks, S., White, N., Newsome, A., Potter, J., Heydon, A., Mayhew, E., Alvarez, M., Russell., Scott, S. J., Heaver, M., Scott, S.H., Treweek, J., Butcher, B., & Stone, D. (2023) Biodiversity metric 4.0: Auditing and accounting for biodiversity. Natural England, Peterborough.

[3] Biodiversity scores were initially calculated using version 3.1, but have been checked against version 4.0.

Using the metric at a landscape scale is useful (i) to predict how changes in habitats or in habitat management within parks and greenspaces, or across the wider area, will impact biodiversity, (ii) to assess progress towards the target of enhancing or doubling nature, (iii) to provide a baseline score from which to work out the BNG of any developments in the region, and (iv) to identify parcels of land to be managed as biodiversity off-sets purchased by a developer so they can achieve BNG on their development.

Note, however, that an accurate assessment of condition (and hence biodiversity units) requires a site visit and a detailed assessment, based on set criteria for each habitat type. This is not practical at a landscape scale, but it is possible to use existing data and inferences to give a good indication of condition for much of the area. A method to do this was developed and agreed in a previous project, with expert consultation[4], and this was supplemented in Buckinghamshire by some volunteer appraisals of condition at some local sites. However, it is important to bear in mind that the results are indicative of the likely condition and biodiversity units, and would require ground truthing at specific sites of interest, or for use in calculating offsetting for a proposed development. More detail of the steps taken is provided below.

2.2 Assigning distinctiveness scores

The first step was to assign distinctiveness scores to each polygon in the Buckinghamshire basemap. These are set scores in the Biodiversity Metric, and range from low (given a score of 2) for improved habitats such as arable and improved grassland, up to very high (scoring 8) for highly threatened, internationally scarce habitats such as intact fens. Built habitats score 0. The area and percentage cover for each distinctiveness score are shown in Table 1, with results shown spatially in Figure 1.

Table 1: Area and percentage cover for each distinctiveness category in Buckinghamshire.

Distinctiveness score	Area (ha)	Area (%)
0	9,845	6.3
2	117,743	75.2
4	12,378	7.9
6	15,409	9.9
8	1,114	0.7

Note that **ancient woodlands** are classified as "irreplaceable habitats" under the Biodiversity Metric. According to Biodiversity Metric guidance, irreplaceable habitats cannot be accounted for through the metric and require separate consideration, although their enhancement may contribute towards the calculation of biodiversity units. However, as the aim of the current project is to develop a biodiversity baseline covering the whole of the county, it is important that these areas are not ignored. The guidance also states that ancient woodland is not a discrete habitat type and can fit a range of woodland habitat types that are included in the metric. We have therefore classified the habitat without reference to whether it is an ancient woodland, but also highlight these areas on the map (Figure 1). Most (but not all) of these areas have been given a distinctiveness score of 6. In total there are 6,696 ha of ancient woodland across Buckinghamshire, representing 4.3% of the county.

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[4] Rouquette, J. (2020) Testing approaches to mapping habitat quality and ecosystem condition. Natural Capital Solutions.
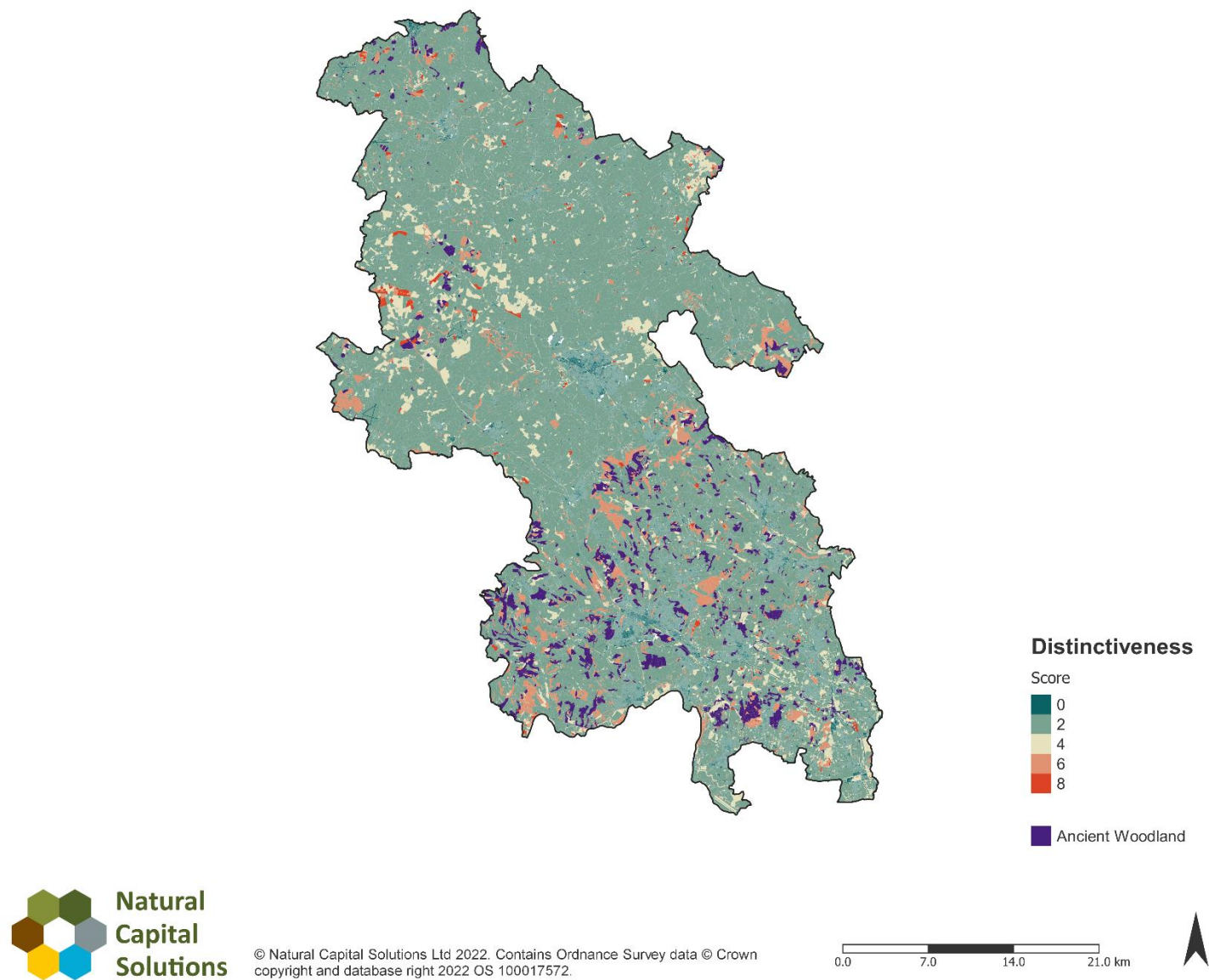
Figure 1: Habitat distinctiveness across Buckinghamshire. The location of ancient woodland, which is counted as irreplaceable habitat, is also shown.

2.3   Initial assignment of condition scores

The second step was to assign a habitat condition to each of the habitat polygons. This assigns categories from 'good' to 'poor' and also includes two N/A categories for agriculture and other (non-natural) habitats. When used in the metric, these categories are also given a score from 0-3 (Table 2).

Table 2: Biodiversity Metric 3.1 condition categories and associated scores.

Category	Multiplier
Good	3
Fairly Good	2.5
Moderate	2
Fairly Poor	1.5
Poor	1
N/A – Agriculture	1
N/A - Other	0

Low quality habitats

This includes all built habitats such as buildings and infrastructure (N/A – other), arable (N/A – Agriculture), improved grassland (poor), gardens (poor), amenity grasslands (poor) and active quarries and mineral extraction sites. An area of 10,789 ha (6.9%) of Buckinghamshire fell into the N/A-other category, and so received a score of 0. The arable land cover, amenity grasslands and gardens scored 1 and covered 113,002 ha (72.2%) of the county.

Habitats of conservation interest

We used existing assessments of habitats of conservation interest to guide an estimate of habitat condition. Data from Natural England on SSSI condition was used and translated into the Biodiversity Metric condition categories (see Rouquette 2020 for methodology[5]). SSSI data gave us condition data for approximately 2,456 ha (1.6%) of Buckinghamshire. Data on the condition of Local Wildlife Sites was largely missing or considered unreliable.

2.4   Local site assessment

To enhance the accuracy of the condition mapping, local volunteer biological recorders were asked to take part in surveys of their local sites to record habitat, management and condition data. To do this, an interactive web map was set up[6] and a GIS layer was created showing all Local Wildlife Sites and additional semi-natural habitats that had not been assigned a condition score at this stage of the process. Very small polygons were removed, and all sites and remaining polygons were assigned a unique ID. People viewing the website could pan and zoom into the map and click on a site/polygon of interest to select it. Once selected, a link would appear which would open up an online survey form already pre-populated with the unique site ID. The questionnaire was developed in conjunction with BMERC (Buckinghamshire and Milton

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[5] Rouquette, J. (2020) Testing approaches to mapping habitat quality and ecosystem condition. Natural Capital Solutions.
[6] Mapping portal set up on MangoMap by Exegesis.

Keynes Environmental Records Centre) and contained questions on habitats, positive and negative management practices, relationship to the site and a number of other questions, and crucially for the current project, their opinion of the condition of the site for supporting biodiversity[7]. A screenshot of the interactive mapping and the questionnaire is shown in Figure 2.
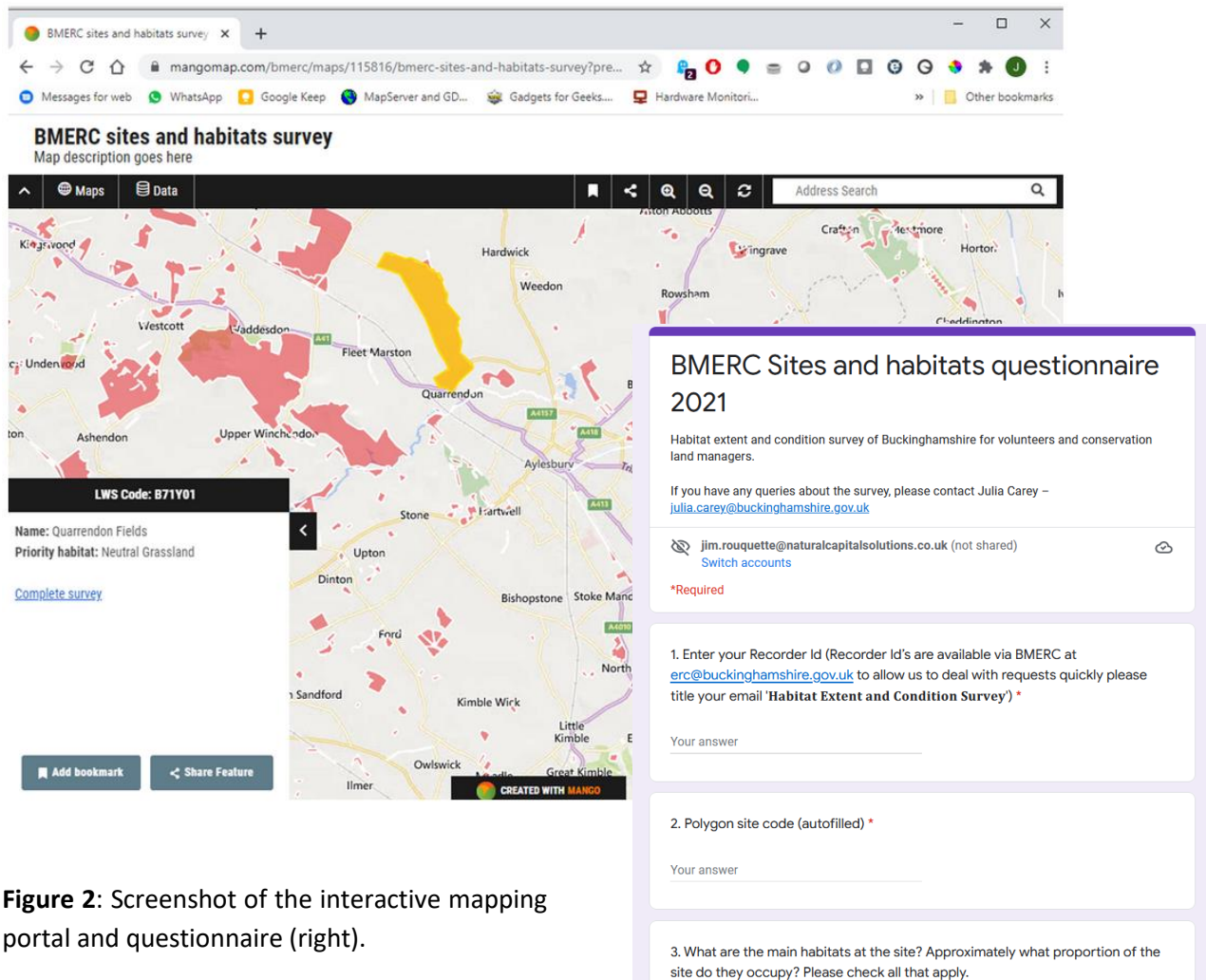

Figure 2: Screenshot of the interactive mapping portal and questionnaire (right).

A link to the interactive map was sent to volunteer recorders across the county by BMERC and each recorder was issued with a unique Recorder ID. The recorders were all knowledgeable amateur naturalists and were aware of broad ideas about condition. However, they did not receive any specific training on recording condition and were not sent any specific methodology to follow (such as the biodiversity metric condition assessment spreadsheet).

In total, 19 different recorders filled in the questionnaire, providing data on 152 unique sites. Recorders provided reports on between 1 and 33 sites each, with four providing assessments of more than 10 sites each. Of the 152 sites, 144 were reported on once, two reports were received on 6 sites, and three reports

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[7] The question wording was: "In your opinion, what is the condition of the habitats at the site (in terms of supporting biodiversity)?" Answer options were: "Good, Fairly good, Moderate, Fairly Poor, Poor, Destroyed or not semi-natural habitat".

were received on two sites. Where there was more than one assessment for a site, we took the average if there was disagreement, and in two cases where that was not possible, used the recorder who visited more regularly.

In total, only 15% of sites (23 sites) were considered to be in good condition, although this rose to 54% when grouping good and fairly good categories together. Only 2% of sites were considered to be in poor condition, although 14% were in fairly poor condition. Results are shown in Table 3.

Table 3: Summary of condition assessment results, reported by local recorders.

Condition assessment	Number of sites	% of sites
Good	23	15.1
Fairly good	59	38.8
Moderate	44	28.9
Fairly Poor	21	13.8
Poor	3	2.0
Destroyed or not semi-natural habitat	2	1.3
Total	**152**	**100**

2.5   Assigning a condition score to remaining habitat

For some remaining habitats, it was possible to infer condition based on national datasets. This method was discussed and decided at a workshop and through expert consultation[5].

i. **Woodlands outside sites of conservation interest:** it was possible to estimate the condition of woodland habitats that had not been previously assigned a condition score, using national data sets. Broadleaved woodland was assumed to be in moderate condition, as NFI Condition data[8] suggests that 92% of broadleaved woodland in England receives an intermediate condition score. All coniferous woodland is assumed to be in poor condition according to the Biodiversity Metric guidelines. Mixed woodland that falls within ancient woodlands (identified using the Ancient Woodland Inventory data) were assumed to be in moderate condition, and remained unclassified otherwise. Overall, this assigned a condition to approximately a further 13,678 ha (8.9%) of the county, although there was some overlap with the category above.

ii. **Quarries / mineral extraction sites:** currently active quarries, landfill sites and mineral extraction sites were classified as N/A - Other. Sites being restored or recovering were not classified.

iii. **Water:** Water Framework Directive (WFD) overall waterbody class was used to assign condition to water habitats. WFD categories of high, good, moderate, poor, and bad, were translated directly into good, fairly good, moderate, fairly poor, and poor condition categories, respectively. We were able to classify 1,176 ha (0.8%) of the county using this approach.

Unclassified habitat

Based on all the steps outlined in Sections 2.3-2.5, we were able to assign condition to 93.2% of Buckinghamshire. In the remaining areas, where there was no data available to guide the condition assessment, we assigned a condition score of moderate (score 2). The alternative was to leave these areas

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[8] Forestry Commission (2020). NFI woodland ecological condition in England. National Forest Inventory.

blank and the rationale for doing each approach was discussed with Buckinghamshire Council. Assigning a moderate score was chosen as it enabled completeness of the mapping, as leaving the areas blank will mean they are effectively treated as zero, so the biodiversity unit scores would be lower than they really are. Assigning a moderate condition was considered to be a fairly safe assumption and would be slightly cautions as it will possibly slightly overestimate condition and biodiversity units (which is better than underestimating). This applied to 10,700 ha (6.8%) of Buckinghamshire. The habitats falling within this category were mainly semi-natural grasslands, but also some scattered trees/parkland, mixed woodland, scrub, fen, marsh and swamp, and heathland.

2.6   Final condition scores

The final condition scores are shown in Figure 3, with the total area and percentage cover of each condition level provided in Table 4. A large proportion (72.2%) of the habitats of Buckinghamshire (Figure 3) are in poor condition (a score of 1, blue areas), and a further 6.9% of built and artificial surfaces score 0. This is mainly due to the dominance of agricultural habitats in the region. However, there are a number of areas of moderate condition (16.9% of the region) scattered throughout the county (score 2, pale orange). Much of this is woodland, for example Penn Wood to the east of High Wycombe. Habitat in fairly good or good condition is relatively rare, taking up 3.6% (score 2.5 or 3, red) and is scattered across the region, although it is more concentrated to the south of the county. Areas of most notable size include Burnham Beeches, Shabbington Woods to the southeast of Oakley, Ashridge Common and Woods adjacent to Ashridge Golf Course, and Great Wood to the west of Marlow.

Table 4: Area in ha and percentage area for each habitat condition category in Buckinghamshire.

Condition level	Area (ha)	Area (%)
0	10,783	6.9
1	112,928	72.2
1.5	603	0.4
2	26,489	16.9
2.5	2,336	1.5
3	3,232	2.1
NA	117	0.1

Condition Score
- 0
- 1
- 2
- 3
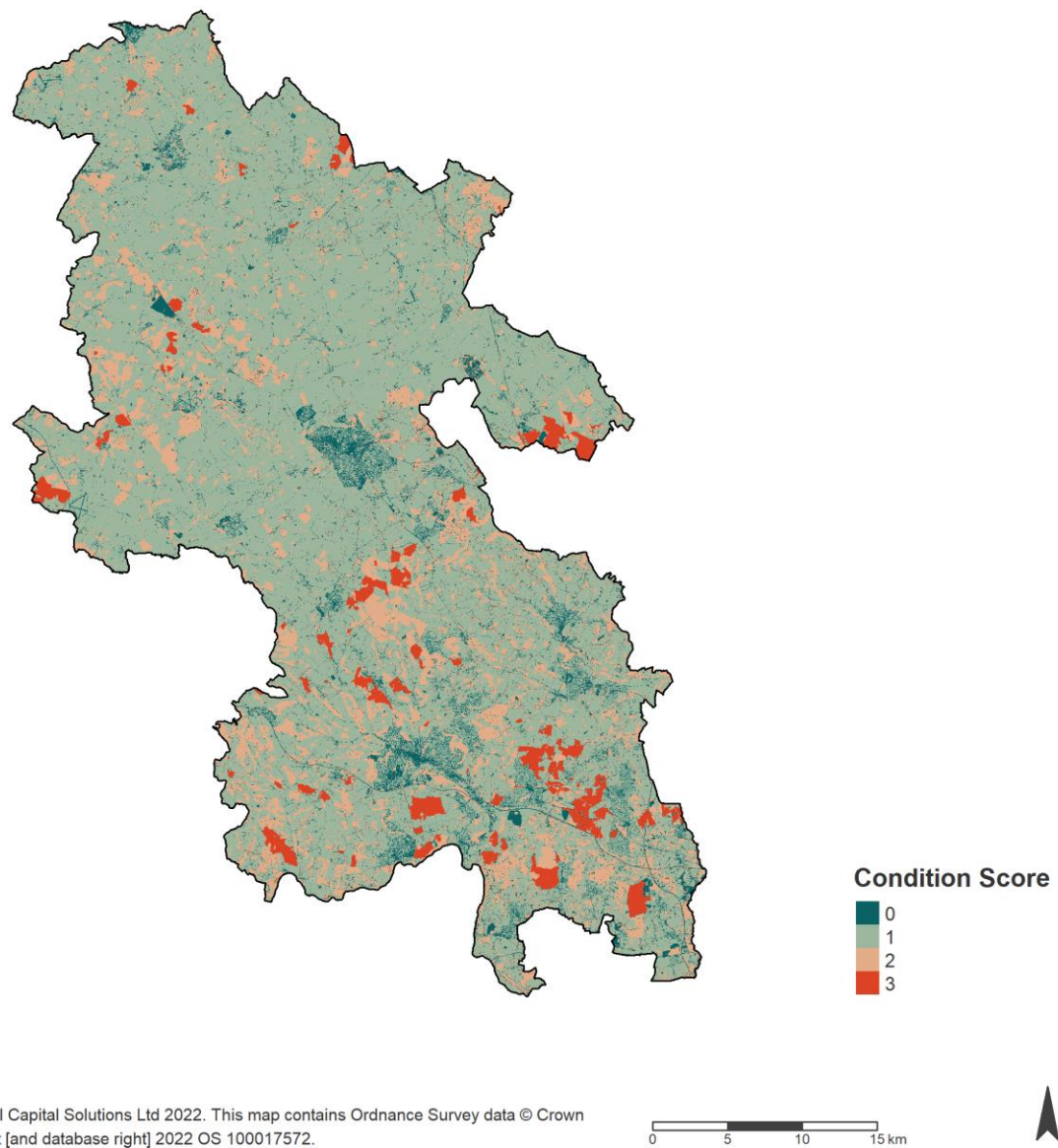
© Natural Capital Solutions Ltd 2022. This map contains Ordnance Survey data © Crown copyright [and database right] 2022 OS 100017572.

0 5 10 15 km

Figure 3: Habitat condition across Buckinghamshire.

2.7 Calculating biodiversity units

To calculate biodiversity units, the score for distinctiveness (out of 8) is multiplied by the score for condition (out of 3). This was therefore calculated for each polygon in the basemap and the results are shown in Figure 4. The majority of the area scores two biodiversity units, as this comprises arable and improved grassland, which is of low distinctiveness and poor condition. However, higher scoring habitats are clearly distinguishable, particularly in the south of the county and across the Chilterns Area of Outstanding Natural Beauty (AONB).

Note that when calculating biodiversity units using the Biodiversity Metric, a further factor is also considered: strategic significance. This can uplift the scores by a maximum factor of 1.15. This was not included here, but would be relatively straightforward to apply. Polygons showing areas of high and medium strategic significance across the study area could be defined and overlain onto the basemap, and where these did overlay, a weighting of 1.15 and 1.1 could be applied to the scores respectively.

2.8 Biodiversity units results and discussion

Nearly three quarters of Buckinghamshire (71.5%) has a biodiversity unit score of 2 (Table 5 and blue areas, Figure 4). This is mostly improved grassland and arable land. Habitats with higher scores are mostly to the south of the county, particularly Burnham Beeches, Hodgemoor Wood and Park Wood, shown in orange and red. Areas that have the highest score are largely unimproved grassland and some small patches of swamp, almost exclusively occurring within SSSI sites such as Rushbeds Wood to the west of the county and Kingcup Meadows to the west of Uxbridge. As stated in Section 2.2, ancient woodlands have not been classified separately, so this understates their value.

Table 5: Area in ha and percentage area for each combination of Biodiversity Units per ha category in Buckinghamshire.

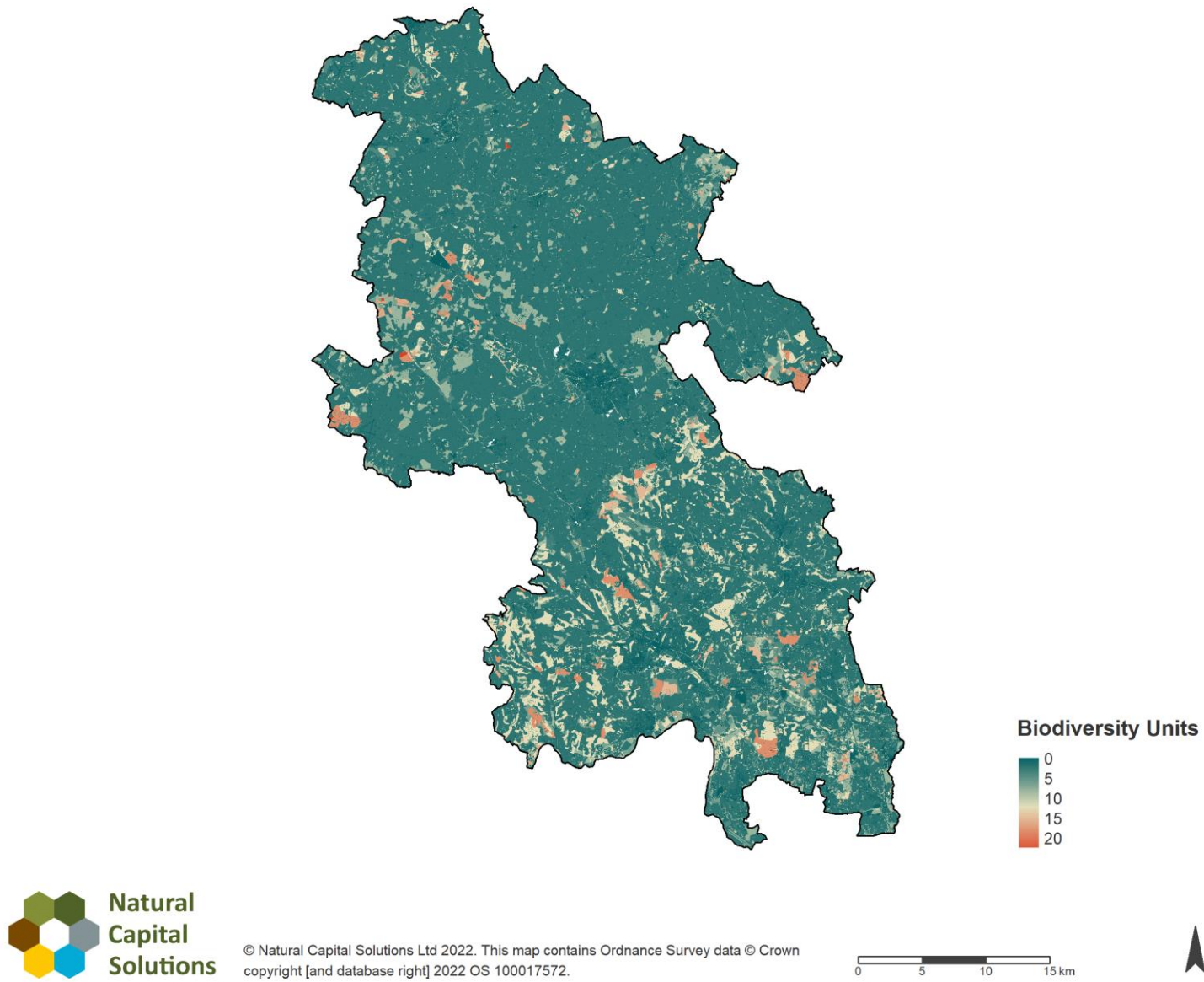| Biodiversity units per ha	Area (ha)	Area (%)
0	10,780	6.9
2	111,848	71.5
3	426	0.3
4	2,289	1.5
5	1,565	1.0
6	1,868	1.2
8	11,348	7.3
9	208	0.1
10	322	0.2
12	11,860	7.6
15	798	0.5
16	1,039	0.7
18	1,873	1.2
20	15	0.01
24	55	0.04
NA	194	0.1

Figure 4: Biodiversity units across Buckinghamshire.

It is important, when interpreting the map, to note that the habitat units have been assigned to polygons, rather than sites. If a habitat, or site, consists of numerous polygons in the basemap, they may display multiple different unit scores. To reflect the unit value of a whole site, the units will have to be summed over the polygons that make up the site.

Overall, the habitats of Buckinghamshire provide a total of approximately 555,300 biodiversity units. Note, however, that this is an approximate score, as the habitats for which we were unable to assign a condition have been given a moderate score. The total unit value can be recalculated when condition data is available for these areas. In addition, this score does not take into account ancient woodlands, which cannot be given a sperate score under the Biodiversity Metric.

The total biodiversity units supplied by each broad habitat type is shown in Table 6 (below) and the average biodiversity units per habitat is shown in Figure 5 (overleaf). The habitat providing the most biodiversity units in total is broadleaved woodland (169,000 units), with an average of 10.6 units per hectare. Although improved grassland only scores 2 biodiversity units per hectare, because it the dominant habitat across Buckinghamshire, it delivers 115,000 biodiversity units in total.

Fen, marsh and swamp provides the highest average units per hectare at 16.2, but only contributes 1,300 units across Buckinghamshire, as it is a relatively rare habitat type. This is also the case for heathland which provides an average of 14.5 units per hectare and contributes 2,500 units across the county. The most frequent habitat that could not be assigned by existing data, inferences or site assessments was semi-natural grassland where 7,500 ha (89%) of this habitat was not assigned a condition score by the classification methods. These unclassified areas were assigned a moderate score, giving semi-natural grassland an average of 8.9 units per hectare and 74,800 units across the county, but note that this is very approximate.

Table 6: Total biodiversity units scored for each broad habitat type.

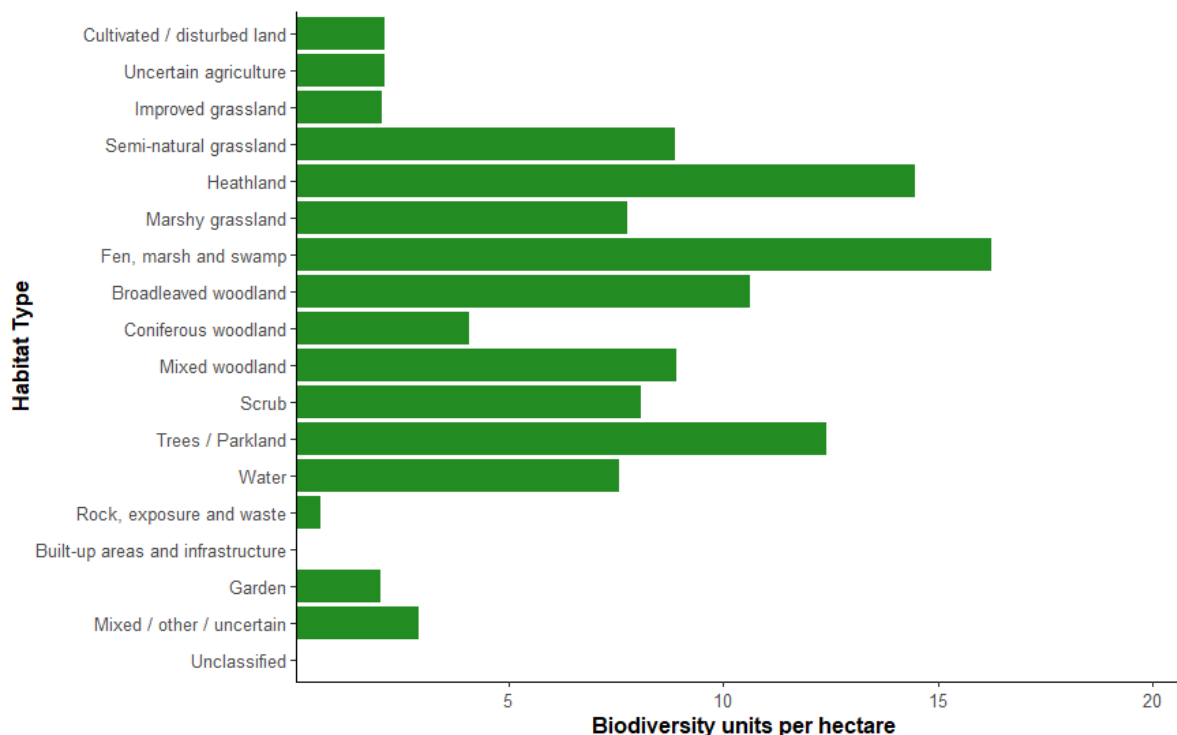| Habitat Type	Biodiversity units
Cultivated land (arable)	98,786
Uncertain agriculture	1,846
Improved grassland	115,148
Semi-natural grassland	74,758
Heathland	2,466
Marshy grassland	1,723
Fen, marsh and swamp	1,342
Broadleaved woodland	169,448
Coniferous woodland	9,428
Mixed woodland	21,870
Scrub	2,814
Trees / Parkland	21,328
Water	9,624
Rock, exposure and waste	166
Built-up areas and infrastructure	0
Garden	19,091
Mixed / other / uncertain	5,462
Unclassified	0
All habitats	**555,300**

Figure 5: Average biodiversity units per hectare for each broad habitat type.

The biodiversity baseline score in and of itself is not particularly informative. The power of this score lies in its comparison with past or future scenarios. If re-calculated, for example, following changes in management of certain habitats or sites, or after development, it will indicate whether these changes have increased (a net gain) or decreased biodiversity across the county. A way of increasing the biodiversity score is to focus on increasing the condition of the habitats that are in poor or moderate condition. This is particularly relevant where there are sites of conservation interest that fall below good condition, as well as for enhancing management of woodland (see Biodiversity Metric 4.0 guidance[9] for what constitutes a woodland in good condition), creating field margins and riparian buffer strips in agricultural areas, or through creating new habitats of high distinctiveness where the ecological opportunities lie, e.g. within the nature recovery network mapped through the LNRS (Local Nature Recovery Strategy) process and as part of ELMs.

It is difficult to accurately compare the biodiversity units delivered under the baseline in Buckinghamshire with other counties as there are slight differences in methodologies used, but it is possible to give an indication. Rough comparison with Cambridgeshire and Northamptonshire, shows that Buckinghamshire is delivering less biodiversity units in total, as it is a smaller county, but is delivering more per hectare. This occurs because there is more semi-natural habitat in Buckinghamshire compared to the other two counties, particularly woodland, and hence BU scores per hectare are higher.

There are a number of caveats associated with this approach. Engaging with local recorders to assess the condition of local sites was a novel approach adopted for this project. It was good at engaging the local biological recoding community, but although data was collected from over 150 sites, large gaps remained. Furthermore, it was difficult to achieve consistency in assessments from different

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[9] The Biodiversity Metric 4.0 -Technical Annex 1: Condition Assessment Sheets and Methodology (2023) Natural England Joint Publication JP039.

individuals. The project team did discuss providing a detailed protocol (the Biodiversity Metric methodology), but it was decided that this approach would have been difficult to follow without training, time-consuming and would have reduced uptake.

Using condition scores collected for different purposes and in different ways, will be prone to error. Biodiversity Merric guidance for condition assessment is very detailed and specific for use within the biodiversity metric, whereas condition assessment for SSSI's is collected in a different way, and the condition assessments provided by local recorders was simply an overall impression and will be the most subjective. SSSI and local recorder assessments are usually applied to sites that contain a mix of habitats, and applying one condition score across all of these does not pick up variation in condition across habitats at a site. For example, it is possible that woodland within a local wildlife site is of moderate condition but the grassland habitats there are in poor condition. Despite these caveats, this approach has delivered reasonable estimates of condition for a large proportion of Buckinghamshire. It is certainly a good first attempt at setting a baseline for condition and biodiversity units that can give an indication of what can be improved and where. It can now be ground-truthed and added to as data is collected in the future.

To give an indication of the degree of confidence in the results, we established rules around how confident we were in assigning condition scores to different habitats, and results are shown on Table 7. This shows that for almost 78% of Buckinghamshire, confidence is high, as these are generally arable, improved grassland and urban habitats which we have high confidence are in poor condition for biodiversity. Habitats for which we have medium confidence include those assigned through the processes described in Section 2.3-2.5 and account for 15.3% of Buckinghamshire. The remaining 6.8% are those semi-natural habitats that could not be assigned and were given an arbitrary condition score, and these are the ones with low confidence.

Table 7: Confidence levels for habitat condition assigned and area in ha and percentage of each category of confidence in Buckinghamshire.

Confidence level	Area (ha)	Area (%)
High	121,856	77.9
Medium	23,939	15.3
Low	10,694	6.8

Note that if a moderate condition score had not been assigned to the 6.8% of habitats that we could not determine more accurately, the overall number of biodiversity units delivered by Buckinghamshire would be 432,100, compared to 555,300. Thus, assigning condition to these habitats gives a 28.5% increase in biodiversity units and shows that it is important to include these habitats if a more complete understanding of biodiversity units is required.

Overall, the approach used to map condition and biodiversity units used here provides useful results but will always be prone to some error. The maps and scores can be used for strategic decision-making at the landscape scale, but at a local scale or if precise estimates are required, site surveys and assessment will still be required. The results should be seen as indictive and are best used to provide guidance at a Ward or landscape, catchment or county scale and are not a substitute for field surveys at a local or site scale.

3   The potential impact of allocated sites on biodiversity

As a result of development activities, semi-natural and other habitats will be lost. An important application of the Buckinghamshire biodiversity baseline is to determine the potential impact on biodiversity of sites allocated for development under the local plan and the requirement for biodiversity net gain (BNG). To do this, shapefiles were obtained and joined together, showing allocations under the various local plans within Buckinghamshire, as well as the HS2 Safeguarding Zone (the area impacted by the HS2 route). These comprised: Chiltern and South Bucks site (housing and employment) and retail allocations; Wycombe housing, employment and non-residential mixed allocations; Vale of Aylesbury housing allocations, institutional allocations, Enterprise Zones, and commitments under the previous local plan; and the HS2 safeguarding zone. Some of the allocations overlapped in area (e.g. some housing allocations were also assigned to the HS2 line).

As the local plans have been in place for a number of years, a significant proportion of the allocated sites have already been developed. Therefore, allocated areas were compared with google satellite imagery and those areas where the development was 90% complete were considered to be developed, while areas where the development stage was less than 90% complete were considered not developed. A level of uncertainty was associated with this process: while in areas where the development had not started it was easy to assign a non-developed stage, in areas where some fields remained undeveloped it was not easy to understand whether those fields would have gone through the development process eventually or not.

Asset registers were created for currently undeveloped lands within allocated sites, and we also separately report the asset register for the HS2 zone. There are a number of overlaps among the allocation layers, particularly between the local plan allocations and the HS2 zone. To avoid double counting, these overlaps were removed before calculating the total, hence the total is not simply the sum of the two development types.

Results are shown in Table 8 (overleaf) and show that there is currently 2,800 ha of land that is allocated under local plans but currently undeveloped, 1,881 ha under the HS2 safeguarded zone, with a total of 4,461 ha under plans for development either under a local plan allocation or HS2. Of this total, 3,128 ha (approximately 70%) of the undeveloped land either under local plan allocations or the HS2 zone is currently arable, improved agricultural grassland or uncertain agricultural land. However, 249 ha (5.6%) is currently semi-natural grassland, 189 ha (4.2%) is broadleaved woodland, and a further 80 ha (1.8%) are other woodland, scrub or tree habitats. In total, 12.7 ha of the woodland is ancient woodland, which is classified as an irreplaceable habitat, although nationally significant infrastructure projects such as HS2 apply slightly different rules and can build on such land in exceptional circumstances. The ancient woodland is found entirely in the HS2 safeguarding zone.

A higher proportion of the land under the HS2 safeguarded zone is agriculture compared to under the allocations (78% compared to 67%). Within the more biodiversity rich habitats, results are mixed, with more semi-natural grassland under the allocations but more broadleaved woodland under the HS2 zone.

Table 8: Asset register of all undeveloped land under local plan allocations and within the HS2 safeguarded zone, and the overall total.

Habitat type	Local Plan Allocations		HS2 Safeguarding Zone		Total	
	Area (ha)	Area %	Area (ha)	Area %	Area (ha)	Area %
Cultivated (arable) land	992.4	35.4	948.0	50.4	1,804.8	40.5
Uncertain agriculture	38.0	1.4	10.4	0.6	48.3	1.1
Improved grassland	834.4	29.8	500.8	26.6	1,275.0	28.6
Amenity grassland	145.4	5.2	86.7	4.6	227.5	5.1
Semi-natural grassland	156.4	5.6	92.4	4.9	248.8	5.6
Broadleaved woodland	101.3	3.6	90.8	4.8	189.3	4.2
Coniferous woodland	2.0	0.1	1.8	0.1	3.8	0.1
Mixed woodland	16.7	0.6	5.0	0.3	21.7	0.5
Scrub	17.6	0.6	6.0	0.3	19.3	0.4
Trees / Parkland	19.3	0.7	17.5	0.9	35.3	0.8
Water	14.3	0.5	10.5	0.6	23.8	0.5
Built-up areas and infrastructure	265.4	9.5	59.9	3.2	320.5	7.2
Garden	88.6	3.2	13.7	0.7	102.3	2.3
Rock, exposure and waste	-	-	3.4	0.2	3.4	0.1
Mixed / other / uncertain	35.0	1.2	33.3	1.8	63.1	1.4
Unclassified	73.2	2.6	1.2	0.1	74.1	1.7
TOTAL	**2,800**	**100**	**1,881**	**100**	**4,461**	**100**

Biodiversity units (BU) were then calculated for all undeveloped areas by extracting these from the basemap created in Section 2 and summing across the allocations. The total units are shown in Table 9 and reveals that 7,422 biodiversity units occur under the baseline in the yet to be developed local plan allocations, 5,354 in the HS2 Safeguarding Zone, with a total of 12,273 BU. On a per hectare basis, this equates to 2.65, 2.85, and 2.75 BU per ha for local plan allocations, HS2, and total respectively. This compares to 3.55 BU per hectare for Buckinghamshire as a whole, indicating that these areas are slightly less rich for biodiversity than average.

Table 9: Baseline biodiversity units in development areas.

Development type	Biodiversity units
Local plan allocations	7,422
HS2 Safeguarding Zone	5,354
TOTAL	**12,273**

NB. There were overlaps between the local plan allocations and the HS2 Safeguarding Zone, hence total is smaller than the sum of these.

To achieve the mandatory target of 10% biodiversity net gain, these areas will need to deliver 10% more BU post development than is shown under the baseline. Therefore, **the local plan allocations will need to deliver 8,164 BU, HS2 will need to deliver 5,890 BU** (not taking into account the ancient woodland), **and the total BNG requirement will be 13,500.**

3.1 Buckinghamshire Council landholdings within allocations

A layer identifying areas owned by Buckinghamshire Council was created[10]. The allocated sites layers and HS2 layer were then intersected with the council owned areas and asset registers created for this subset. This therefore identified areas that were subject to development, that were owned by the local authority.

The asset register (Table 10) shows that a total of 71.5 ha of Council owned land falls under a local plan allocation, 46 ha falls within the HS2 Safeguarding Zone, with a total of 118 ha under one or the other. In total, 45 ha (38%) is amenity grassland, 30 ha (25%) is improved agricultural grassland, and 7.4 ha (6%) is arable land. There is therefore much more land down as amenity grassland and less as arable than across the wider county. In addition, there is nearly 12 ha (10%) of semi-natural grassland and 6.6 ha (5.6%) of broadleaved woodland, which are both higher proportions than for the developments across the county. Of the woodland, 1.7 ha is ancient woodland, and hence classified as irreplaceable habitat, but all of this is in the HS2 safeguarding zone.

Table 10: Asset register of all council owned undeveloped land under local plan allocations, within the HS2 safeguarded area, and the total.

Habitat type	Local Plan Allocations		HS2 Safeguarding Zone		Total	
	Area (ha)	Area %	Area (ha)	Area %	Area (ha)	Area %
Cultivated (arable) land	6.1	8.5	1.3	3.0	7.4	6.3
Uncertain agriculture	1.7	2.4	0.4	0.9	2.1	1.8
Improved grassland	17.0	23.8	12.9	27.5	29.9	25.2
Amenity grassland	22.9	32	22.1	47.1	45.0	38.0
Semi-natural grassland	9.0	12.5	2.6	5.7	11.6	9.8
Broadleaved woodland	5.8	8.1	0.8	1.8	6.6	5.6
Scrub	0.6	0.8	0.2	0.5	0.7	0.7
Trees / Parkland	0.8	1.2	1.2	2.6	2.0	1.7
Water	0.5	0.7	0.4	1.0	1.0	0.8
Built-up areas and infrastructure	5.5	7.6	4.1	8.7	9.5	8.1
Garden	0.1	0.1	0.04	0.1	0.1	0.1
Mixed / other / uncertain	1.0	1.5	0.4	1.0	1.5	1.3
Unclassified	0.6	0.9	0.01	0.0	0.6	0.5
TOTAL	**71.5**	**100**	**46.4**	**100**	**118.0**	**100**

Biodiversity units were then calculated for the subset of undeveloped land that is council owned (Table 11). This shows that council owned land under local plan allocations is currently delivering 268 BU, council owned land under the HS2 safeguarding zone is currently delivering 126 BU and the total is 394 BU. **To deliver 10% biodiversity net gain, these areas will need to deliver 294, 138 and 433 biodiversity units post development respectively for allocated sites, HS2 and in total.** It is likely that the majority of these units will be delivered on-site as part of the developments, but some offsetting

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[10] This combined GIS layers covering the old Vale of Aylesbury, Wycombe, Chiltern and South Bucks, and Buckinghamshire County Council land holdings. Schools, and polygons identified as freehold disposed or lease surrendered were stripped out.

will be required. It is not possible to calculate the exact amount of offsetting that will be required without detailed masterplans for each site.

Table 11: Baseline biodiversity units in county owned development areas.

Development type	Biodiversity units
Local plan allocations	268
HS2 Safeguarding Zone	126
TOTAL	**394**

As outlined in Section 2, the results presented here are based on a number of assumptions and caveats, that mean that they come with a degree of error. The assignment of condition is the best available without extensive field survey, but remains approximate, and smaller areas of semi-natural habitats are likely to have been missed at sites, meaning that the biodiversity unit scores may be an underestimate. The biodiversity unit scores presented here, and the amount of BNG required, should therefore be seen as an indicative guide to future requirements, rather than an accurate audit. Site surveys will always be required when assessing BNG for individual developments or for accurate determination of BNG across the area.