

Samantha Taylor
Principal Planning Officer
West Northamptonshire Council

Bioscan (UK) Ltd
The Old Parlour
Little Baldon Farm
Little Baldon
Oxford
OX44 9PU

BY E-MAIL ONLY

Tel: +44 (0) 1865 341321
bioscan@bioscanuk.com
www.bioscanuk.com

6th July 2023

Our Ref: DW/E2167/ST-060723

Dear Ms Taylor

Re: WNS/2022/1741/EIA: Application for full planning permission for the erection of 9 x employment units comprising circa 69,744sqm GIA. of floorspace within Class B2 or B8 Uses, with ancillary class E(g)(i) offices and E(g)(ii) research and development, together with country park, ground re-profiling in the country park, new vehicular access from the A508 and associated site infrastructure, including lorry parking. Application accompanied by an Environmental Statement.

Bioscan was instructed by Cosgrove Parish Council and the Furtho Development Opposition Group to carry out an independent review of the submission material on ecology in respect of the above application, and to advise whether it provides a robust and informed basis for planning determination. In response, we have carried out a review of the documents available on the West Northamptonshire Council planning portal under reference WNS/2022/1741/EIA, have carried out some ancillary desk-based work and the author (Dominic Woodfield) undertook a site visit on 27th June 2023, where the independent survey information summarised here and presented more fully in the attached annexes was collected. This letter and the attached annexes set out the overall results of our review.

In summary, a number of critical deficiencies in the submission material on ecology have been identified which raise important issues of national and local policy compliance, and which also engage with statutory obligations and procedural requirements related to the presence of 'priority' habitats and protected species on the site. Specifically:

- The applicant's ecological surveys, habitat classifications and condition assessments are subject to significant and demonstrable error;
- These errors include omission of any recognition of the presence of 'Priority' habitat types, recognised by statute and policy as of elevated interest and importance, and which support at least one county rare plant;
- When the errors in the applicant's ecology material are duly and properly corrected, the Biodiversity Net Gain (BNG) calculation for the site shows significant net loss of biodiversity, even if taking an uncritical view of the enhancements proposed;
- In consequence the development proposals fail to accord with the policy objectives set out by NPPF paras 174 and 180 and as set out in the adopted and emerging local plan;
- The applicant's ecology surveys also missed a number of protected species and species formally identified in statute as of principal importance to the conservation of biodiversity, and capable of being material considerations in planning determination.

We believe that these errors, omissions and shortfalls require, at minimum, the submission of further and substantially corrected habitat and botanical classifications and survey information, and also necessitate the submission of further survey information on reptiles and invertebrates. As we demonstrate below, in the absence of

such information, the Council is not in a sufficiently informed position about the ecological impacts of the scheme, as required by planning practice guidance, in order to make a robust planning determination. We further believe that the submission of properly corrected detail on ecological impacts will, at the very least, establish that the scheme design requires to be amended or re-submitted with very substantially improved mitigation and compensation proposals, as well as further justifications related to the mitigation hierarchy in connection with protected species, in order for the scheme to be capable of being determined as policy and legally compliant. In the alternative, we believe the scheme should be refused for failing to comply with (in particular) the National Planning Policy Framework (paras 174 and 180 thereof).

Further detail on these matters is provided in the pages and annexes that follow:

Gross errors in habitat classification and condition assessment and their implications for BNG assessment

In general, we observe that the habitat and botanical survey information submitted with the application and presented in the various iterations of the ecological impact assessment is not of a good standard. There are various consequences of this, but the most critical is that the presence, in areas that will be directly lost to development, of a 'Priority' habitat type (also known as Habitat of Principal Importance, as listed further to sections 40-41 of the NERC Act 2006) which has failed to be recognised or documented in the applicant's submissions. Further, the condition assessment presented for the modified grasslands dominating the remaining balance of the development areas, ("poor" condition) is demonstrably incorrect. The applicant has also failed to adequately document the baseline position in respect of the ex-arable habitat component in the east of the site. In short, nearly every habitat classification and/or condition assessment used to inform the applicant's assessment of ecological impacts, and their BNG calculation, is at best questionable, and at worst demonstrably and significantly wrong. The two principal errors are explored further below:

1: Failure to identify presence of significant expanse of important ('Priority') habitat

This error relates to the areas in the west of the site identified by Aspect ecology as 'Other Neutral Grassland' on Plan 6187/BNGA1 at page 10 of ES Appendix 8.2: Biodiversity Net Gain Survey (link to document [here](#)). In total this covers some 9ha.

We provide descriptions and photographs of this habitat, including representative species, as taken from our site visit on 27th June, at Annex 1. By reference to the UKHab definitions from which the classification 'Other Neutral Grassland' is derived, the dominant habitat in this area is not, on any remotely informed assessment, 'Other Neutral Grassland'. It is in fact a mosaic comprised of sparse, herb-rich vegetation, dominated by drought tolerant species of low fertility substrates, pockets of ruderals and scrub and areas of bare ground and substrate exposures. A number of notable plant species are present, including a number of calcareous species, and a county rarity. The history of this area is understood to be one of past industrial processes, including the deposition of sandy and ferrous-rich material believed (at least in part) to derive from wastes from the former oxide works at nearby Deanshanger. Other materials, including clinker, sand and rubble also form part of the surface make-up, and there are topographical variations attendant with past episodes of tipping, tracking and compaction. The cessation of such processes and subsequent colonisation has led to the habitat present today.

Parts of (and arguably the entirety of) this area comfortably meet the criteria for classification as Open Mosaic Habitat on Previously Developed Land (OMHPDL) – a habitat assigned 'Priority' status under the NERC Act and identified as of 'Principal Importance' to the conservation of biodiversity. Annex 2 presents the accepted official definition of this habitat and shows how the qualifying criteria are met. The elevated value of such habitats, conveyed

by their 'Priority' status and by the very significant weighting they are given in the Biodiversity Metric used to give quantitative calculations of biodiversity loss/gain, is due to such habitats often acting as significant repositories for the survival of species of plants, invertebrates and other taxa that have become rare in the wider countryside. In this context, the failure of the applicant's ecologists to identify the presence of this habitat (or apparently even to consider the question of whether it is present), is a failure of professional standards. It is further compounded by the lack of any follow up surveys of this area to determine its value for scarce plants or invertebrates. On my visit on 27th June, I noted the county rarity early hair grass (*Aira praecox*) and various other indicators of elevated interest including evidence of significant solitary bee/wasp populations. This triggers a need for further more detailed and specialist survey. In particular, numerous burrows of solitary Hymenoptera were noted in inclined exposures of sandy substrate, and on bare compacted sandy ground.

We appreciate that to many people, potentially including planning officers and councillors, this type of habitat may invoke negative connotations of 'waste ground'. To inform how such perceptions can mask significant biodiversity interest, Annex 3 contains illustrated literature from the invertebrate conservation charity Buglife which further demonstrates how closely this part of the site accords with definitions and other examples of OMHPDL, and how/why such habitats are of value.

2: Failure to apply correct condition assessment to modified grasslands

Much of the rest of the area proposed for development (5.24ha) comprises modified (agriculturally 'improved') grassland fields, as shown on Plan 6187/BNGA1 at page 10 of ES Appendix 8.2: Biodiversity Net Gain Survey (link to document [here](#)). Whilst the classification of these grasslands as 'Modified' is not in dispute, the applicant's ecologists have erred again in attributing a condition of 'poor' to these habitats.

Independently collected quadrat data¹ is presented at Annex 4 to this letter, along with the formal Metric 3.1 condition assessment criteria² required to be applied to these data. This demonstrates that in accordance with the Metric 3.1 methodology used by the applicant, these grasslands should be classified not as in 'poor' condition, but actually (and strictly applying the Metric 3.1 criteria) in "good" condition. In consequence, the applicant's Metric 3.1 calculation inputs for these parts of the site, and the outputs arising, are once again exposed as demonstrably and irrefutably incorrect.

Policy implications

Your Council will wish to understand the significance of these habitat classification and condition assessment errors in planning terms. This is illustrated amply by Annex 5, in which the process and effect of correcting the applicant's BNG calculation to address these errors is laid out. The resulting Metric 3.1 output is shown to be a clear net loss of biodiversity and a failure of the proposals to comply with the 'trading rules' of the BNG system.

This significant net loss of biodiversity outcome squarely places the proposals in contravention of the requirements of the NPPF (paras 174 and 180).

NPPF174 requires that *"planning policies and decisions should contribute to and enhance the natural and local environment by ... minimising impacts on and providing net gains for biodiversity, including by establishing coherent ecological networks that are more resilient to current and future pressures"*. NPPF para 180 requires that *"if*

¹ 5no 1x1m quadrat samples collected by the author on 27th June 2023

² i.e. the same system as used by the applicant

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”.

In short, the errors in the applicant’s ecological submissions wholly and demonstrably undermine the validity of the applicant’s case that the development proposals do not offend national and local planning policy on nature conservation (and indeed related statutory obligations under the NERC Act 2006 and Environment Act 2021). It should be noted that the above applies even without correction of the applicant’s errors in respect of ex-arable land, without interrogation of the hedgerow or river unit calculations, and without consideration of the practical achievability of certain of the claimed habitat enhancements on the site. From the perspective of long experience of grassland habitats, we question, for example, whether seeding onto ex-arable land is likely, of itself, to generate grassland of the quality being claimed (Other Neutral Grassland – ‘good’ condition). Were the proven or anticipated additional errors in the applicant’s calculation to be corrected, and a more realistic and conservative future position built into the BNG calculation, the degree of net loss of biodiversity indicated by the calculation will worsen still further.

Whilst BNG assessments are only one tool of ecological evaluation, it should be noted that the corrected significant ‘net loss’ outcome is not an aberration here – it is entirely consistent with our more subjective expert assessment of the transformation of the baseline habitats here, including a locally significant representation of OMHPDL, into a densely developed site. The limited-scale ‘enhancement’ of the eastern fields to a ‘country park’ is shown by the Metric to be insufficient to counterbalance this significant loss. For a net neutral position, or the higher bar of a 10% net gain, consistent with the requirements of the Environment Act 2021 to be achieved, a substantial reduction in development density or significant improvement in the on and/or offsite habitat creation and enhancement provision would be necessary. Given the sensitivity of this site, adjoining and encompassing a LWS and important wildlife corridor, and containing locally rare representations of OMHPDL, we suggest that a 10% net gain requirement is the minimum that should apply to any development here, even in advance of the secondary legislation that will shortly make it mandatory in any event.

Omissions in respect of faunal surveys

The significance of the applicant’s failure to recognise the presence of habitats capable of being locally or regionally important for invertebrate conservation, and its consequent failure to conduct any invertebrate survey work, is discussed above. However, this is not the only omission from the coverage of protected and otherwise notable fauna in the submission material.

In respect of reptiles, whilst the applicant has carried out a reptile survey, the ‘nil’ result it returned is wholly inconsistent with local knowledge and strongly suggests there were flaws in survey design and/or execution. Amongst other things, the disused canal that runs through the site is a well-known locality for grass snake, as are the adjoining fields.

In respect of birds, a suite of Priority bird species (Species of Principal Importance) was noted on the site on 27th June, including breeding kingfisher (specially protected under Schedule 1 of the Wildlife and Countryside Act 1981) along the Dogsmouth Brook (family group observed). Also observed were the ‘Priority’ species skylark, dunnoek, linnnet and bullfinch, and a number of other Red and Amber Listed species. The applicant’s ecological assessment failed to carry out any substantive bird survey work and noted none of these species. Given the statutory obligations around Priority species associated with the NERC Act 2006, and the requirement for decision makers to consider

impacts on protected and Priority Species and Habitats in accordance with the biodiversity duty, we question whether this is an adequate approach for validation or determination.

Conclusions

Our review of the submission material on ecology has found particularly critical flaws in the habitat and botanical information which have led to gross errors in the applicant's assessment of biodiversity loss/gain. Correcting these independently has determined that the development proposal fails to avoid net loss of biodiversity and indeed will result in significant net harm. Very substantial changes will need to be made to the scheme and/or the applicant's compensatory habitat creation offer if net loss of biodiversity is not to be the real-world outcome. A still larger uplift will be required for a 10% net gain to be indicated. We believe that a 10% net gain target is appropriate for this site not just because of the imminent adoption of this figure into statute (by means of secondary legislation pursuant to the Environment Act 2021), but also because of the presence on this site of representations of Open Mosaic Habitat with associated locally rare plants. Such habitat is a statutory priority for conservation, is not easily replaced and is otherwise scarce or absent from the locality.

In conclusion, we consider that the applicant needs to substantially change their development design and/or radically improve their on-site and off-site mitigation and compensation offer in order for the scheme to meet the minimum policy requirements of NPPF 174 and 180. Adopted Core Strategy policies S10 (j) (Sustainable Development Principles), and BN2 (Biodiversity) would also be offended. The proposals, despite claiming to deliver new Green Infrastructure, would also offend Core Strategy policy BN1 by failing to properly protect and enhance existing assets and by delivering net biodiversity loss. The emerging West Northamptonshire Plan (LDS) also enshrines the principles of avoiding biodiversity loss and delivering net gain and the proposals are therefore inconsistent with nascent emerging policy at local level. The changes required in order for the scheme to be made policy compliant will, at the very least, be likely to require a substantially amended application. The current application as it stands cannot, we contend, be concluded to be policy compliant.

Best regards



Dominic Woodfield CEcol CEnv MCIEEM
Director

Enc: Annex 1 - Habitat description and photos – open mosaic area
Annex 2 - Criteria for classification of OMHPDL
Annex 3 – Illustrated literature from Buglife re OMHPDL
Annex 4 – Quadrat data from modified grasslands
Annex 5 - Correction of applicant's BNG calculation

Annex 1: Description of habitats in western portion of the site

1. The area identified as 'other neutral grassland' in the applicant's ecologists' BNG assessment (and conversely as 'developing grassland/former ruderal vegetation' in the preceding Baseline Ecological Assessment (Appendices 8.2 and 8.1 of the ES respectively) has been misclassified and grossly undervalued, both in subjective assessment terms (e.g. by reference to industry standard criteria) and also via the quantitative approach enshrined in the biodiversity metric 3.1 version the applicant has employed.
2. To re-cap, the description of this area in the Baseline Ecological Assessment is reproduced below.

4.4 Developing Grassland/Formal Ruderal Vegetation

4.4.1 The western part of the site is formed by developing grassland/former ruderal vegetation. This habitat was previously (2017) recorded to be dominated by tall ruderal vegetation over disturbed soil, however by the time of the current survey this is predominantly better described as developing grassland, which supports a short, closed sward (apparently due to Rabbit grazing), albeit with ruderal elements and species remaining frequent throughout. Some evident vehicle tracking and compaction were noted in places, particularly (though not limited to) the north eastern areas in proximity to the hardstanding yard which are used for vehicle storage. More disturbed soils are generally associated with occasional Rabbit burrows and associated disturbance, particularly associated with earth bunds and embankments.

4.4.2 The majority of the developing grassland/former ruderal vegetation appears relatively uniform in nature, lacking in ponds, wetland features or patchy spatial distribution, albeit some disturbed areas and embankments appear to me maintained by Rabbit activity and to a lesser extent vehicle movements. This habitat was recorded to support a relatively uniform sward across much of the area, with common species typical of such habitats albeit likely provides opportunities for faunal species including invertebrates. Accordingly, overall this habitat is not considered to represent an important ecological feature.

3. It is a striking feature of this description that it contains no mention of individual component plant species. It is not clear whether this is a product of substandard survey effort or insufficient surveyor expertise, but the omission has clearly been instrumental in misclassifying the habitat as a much lower value baseline resource that is in fact the reality.
4. A more thorough and accurate description of the habitat, albeit based on limited access and time on site, is provided below. It should be noted that additional species of note would likely to be recorded with a full survey. Photographs are also provided to assist.
5. In contrast with the Aspect Ecology description, the area in fact comprises not just grassland, but a mosaic of (often sparse) grassland with developing scrub, ruderal and areas of bare or sparsely vegetated ground, all on low fertility sandy or gravelly substrates which appear to have been imported, and which in places include other materials such as clinker, rubble and more fertile earths. Annex 2 explains how much of this area meets the accepted definitions of the 'Priority' habitat Open Mosaic Habitats on Previously Developed Land (OMHPDL), and Annex 3 provides comparative examples.
6. The various components of this mosaic are illustrated with photographs and further described below:

Bare/sparsely vegetated ground and substrate exposures



7. Scattered throughout are pockets of sparsely vegetated or bare ground, with a more expansive focus of such habitat present in one central area. These bare or sparsely vegetated ground areas form a matrix with stands of ruderals, pockets of short grassland dominated by ephemerals, and stands of taller, more established, flower-rich grassland. A characteristic suite of species are associated with the sparsely vegetated ground, including houndstongue *Cynoglossum officinalis*, biting stonecrop *Sedum acre*, thyme-leaved sandwort *Arenaria serpyllifolia*, blue fleabane *Erigeron acer*, wall speedwell *Veronica arvensis* and changing forget-me-not *Myosotis discolor*. Example photographs of such habitat on the site are provided above, with *Arenaria*, *Cynoglossum* and *Sedum acre* all visible in the left-hand image.

8. There are also examples of inclined or vertical substrate exposures present and these were noted to have numerous burrows of solitary bees and wasps (example photographs below), pointing to likely elevated invertebrate interest. This is an obvious trigger for further consideration of likely invertebrate value and survey, however this was not picked up by the applicant's survey.



9. More completely vegetated but still patchily sparse areas are scattered more widely throughout the area, occurring in an intimate matrix with other habitat types. The photograph below left shows examples with frequent weld *Reseda luteola* overstanding sparse short-perennial habitat dominated by mat forming species such as mouse ear hawkweed *Pilosella officinarum* and creeping cinquefoil *Potentilla reptans*, with the example shown bottom right dominated by

perforate St John's wort *Hypericum perforatum* over similar short perennial vegetation, with pyramidal orchid *Anacamptis pyramidalis* visible (the pink flower spike in the foreground).



Flower-rich grassland

10. More established, though still generally rather sparse, grassland dominated by species of free draining soils occurs across significant parts of the site. This is striking by virtue of its high herb content, lending the community a flower-rich aspect (see photograph right). Prominent amongst the grasses are drifts of squirrel-tail fescue *Vulpia bromoides*, reflecting the somewhat sandy and nutrient poor nature of the substrates, with a suite of other grasses including early hair grass *Aira praeceox* (rare in Northants). The herbs include a suite of calcicolous or even acidophilous species, including common centaury *Centaureum erythraea*, blue fleabane *Erigeron acer*, ladies' bedstraw *Galium verum*, sheep's fescue *Festuca ovina* agg., bee orchid *Ophrys apifera*, musk mallow *Malva moschata*, hairy violet *Viola hirta*, parsley piert *Aphanes arvensis*, agrimony *Agrimonia eupatoria*, hairy tare *Vicia hirsuta* and so on.



Annex 2: BRIG criteria for identification and classification of Open Mosaic Habitats on Previously Developed Land (OMHPDL).

The document is reproduced here in full with **yellow highlight** used to denote the main qualifying physical and biological (i.e. species) characteristics identified at the former Furtho Pit site at Cosgrove.



UK Biodiversity Action Plan Priority Habitat Descriptions

Open Mosaic Habitats on Previously Developed Land (Updated July 2010)

From:

UK Biodiversity Action Plan; Priority Habitat Descriptions. BRIG (ed. Ant Maddock) 2008.

This document is available from:
<http://jncc.defra.gov.uk/page-5706>

For more information about the UK Biodiversity Action Plan (UK BAP) visit
<http://www.jncc.defra.gov.uk/page-5155>

Please note: this document was uploaded in November 2016, and replaces an earlier version, in order to correct a broken web-link. No other changes have been made. The earlier version can be viewed and downloaded from The National Archives:
<http://webarchive.nationalarchives.gov.uk/20150302161254/http://jncc.defra.gov.uk/page-5706>

Open Mosaic Habitats on Previously Developed Land

Correspondence with existing habitats

- UK BAP broad habitat: Built up areas and gardens.
- Phase 1: Quarry, Spoil, Mine, Ephemeral/short perennial, Bare Ground.
- NVC: Overall there is a poor fit to described communities and this weakness is identified in the review of coverage of the NVC communities (Rodwell *et al.*, 2000). Although some components of the habitat are characterised by annual/open vegetation plant communities described in the NVC (Rodwell *et al.*, 2000) others are allied to sclerotic associations better described in continental Europe. Grassland communities associated with this habitat complex include MG1–2, MG9, MG10, MG11, MG13; CG10 (Rodwell *et al.*, 1992); and U1–2, whilst the scrub communities W6 and W23 are also commonly encountered (Rodwell *et al.*, 1991). Complexes and mosaics can also include a range of aquatic plant communities (see Rodwell *et al.*, 1995) and swamp communities (Rodwell *et al.*, 1995).
- Annex I: None (Calaminarian grasslands are covered by another priority habitat proposal).
- Other: Poor fit to Shimwell (1983), but includes 3B and artificial-substrate equivalents of 7A
- The priority habitat is delimited by edaphic and other site conditions, and specific sites are likely to include elements of other priority habitats as minor components of the overall mosaic. With the specific exception of post-industrial substrates that are rich in heavy metal which would qualify as the proposed Calaminarian grassland priority habitat, sites with such mosaics will be considered as qualifying as ‘open mosaic habitats on previously developed land’ priority habitat.

Definition and criteria for field recognition of the habitat

The main source of evidence for this definition came from a Defra research project, Riding *et al.* (2009). Their proposed definition was very slightly amended by the inter-agency working group, in consultation with Defra and some members of their project steering group.

Each of these criteria must be met.

	Criterion
1.	The area of open mosaic habitat is at least 0.25ha in size.
2.	Known history of disturbance at the site or evidence that soil has been removed or severely modified by previous use(s) of the site. Extraneous materials/substrates such as industrial spoil may have been added.
3.	The site contains some vegetation. This will comprise early successional communities consisting mainly of stress-tolerant species (e.g. indicative of low nutrient status or drought). Early successional communities are composed of (a) annuals, or (b) mosses/liverworts, or (c) lichens, or (d) ruderals, or (e) inundation species, or (f) open grassland, or (g) flower-rich grassland, or (h) heathland.
4.	The site contains unvegetated, loose bare substrate and pools may be present.
5.	The site shows spatial variation, forming a mosaic of one or more of the early successional communities (a)–(h) above (criterion 3) plus bare substrate, within 0.25ha.

Definition: explanatory notes

The criteria are for guidance but cannot cover all potential scenarios and an element of expert judgement is therefore needed. It is assumed that the user will be able to recognise plant communities and the key component species.

1. The minimum size refers to the potential open mosaic habitat (OMH), which might be a part of a larger site containing other habitats such as woodland or developed land.
2. Disturbance refers to that resulting from major historical industrial use or development.
 - 2.1 Extraneous materials refer to extensive additions of spoil rather than incidental dumping of litter, broken glass, etc.
 - 2.2 There might be evidence of heavy metal contamination but extensive stands of Calaminarian grasslands are specifically excluded as that is a distinct Priority Habitat.
3. Brief descriptions of the early successional communities:
 - (a) Annual communities are those comprised mainly of stress tolerant ruderals, which are short in stature and suited to low nutrient availability. Typical examples would be *Arenaria serpyllifolia*, *Centaureum erythrea*, *Linum catharticum* or *Trifolium arvense*.
 - (b) Moss/liverwort communities can contain both acrocarpous (i.e. usually unbranched, tufted) and pleurocarpous (usually branched, carpeted) mosses and are usually relatively open and less luxuriant than in more mature habitats, often with bare ground present in a fine-grained mosaic. They can occur in discrete patches or interspersed in other communities such as open grassland or heathland. Common species are usually present such as the mosses *Brachythecium rutabulum*, *Dicranum scoparium* or *Hypnum cupressiforme*, and the liverworts *Lophocolea heterophylla* or *Ptilidium ciliare*.
 - (c) Lichen communities are likely to occur in extensive patches or interspersed with other communities such as open grassland or heathland. Species with a range of growth forms might be present, for example foliose (leaf-like), crustose (crust) or fruticose (shrubby and branched).
 - (d) Ruderal communities are those composed mainly of taller annuals, biennials or short-lived perennials and typical of slightly more nutrient-rich, or less disturbed conditions than the annual communities. Typical examples would be *Daucus carota*, *Linaria vulgaris*, *Medicago lupulina* or *Reseda luteola*.
 - (e) Inundation communities are comprised of species suited to periodic, often seasonal flooding. Vegetation is usually interspersed with bare areas of mud which can have a caked surface during dry periods and can result in annuals establishing. Typical species would be *Alopecurus geniculatus*, *Juncus bufonius*, *Persicaria maculosa* or *Ranunculus flammula*.
 - (f) Open grassland is comprised mainly of perennial, stress-tolerant species of short stature with patches of bare ground at very fine-grained scale and often with a significant number of annual species or lichens in the sward. Typical species would be *Festuca ovina*, *Hypochaeris radicata*, *Pilosella officinarum* or *Rumex acetosella*.
 - (g) Flower-rich grassland is a more typical, mature community with fewer gaps and characterised by more robust mesotrophic forbs such as *Centaurea nigra*, *Lotus corniculatus*, *Ranunculus acris* or *Trifolium pratense*.
 - (h) Heathland communities are composed mainly of dwarf shrubs, often interspersed or in mosaics with graminoids, bryophytes or lichens. On OMH they tend to have a more open structure with less plant litter and other organic matter build up on the substrate than in more typical heathlands. Typical

species include *Calluna vulgaris*, *Deschampsia flexuosa*, *Festuca ovina* or *Nardus stricta*.

- 3.1 Annex I shows species of vascular plant known to be associated with, but not confined to, the habitat in certain areas and/or substrates.
 - 3.2 Other plant species associated with the particular edaphic conditions might also be present, for example ericaceous species on acidic sites. Species composition will also vary with geographic location and site age.
 - 3.3 One of the principal reasons for the habitat being a priority is its importance for invertebrates. Many have very precise requirements for habitat 'niches' within their landscape. As well as areas of bare ground and food plants, these may be for sheltered places at various times of the year, or for rough vegetation or cover at others. At any particular site, features such as scrub may be essential to maintain the invertebrate value of the main habitat. Therefore, scattered scrub (up to 10–15% cover) may be present and adds to the conservation value of the site. Other communities or habitats might also be present (e.g. reed swamp, open water), but early successional communities should comprise the majority of the area.
4. 'Loose bare' substrate is intended to separate substrate potentially colonisable by plants from large expanses of sealed surface (concrete, tarmac, etc) where vegetation could only establish if it is broken up or heavily weathered.
 - 4.1 Bare substrate can occur at a range of spatial scales, from unvegetated patches easily seen from a distance, to small, open spaces between individual plants within a community. On some substrates, for example coal spoil, the patches of bare ground may be 10cm across or less. A site with a wide variety of patch sizes could also qualify.
 - 4.2 Bare substrate also implies absence of organic matter accumulation.
 5. A mosaic is defined as an area where a range of contiguous plant community types occur in transition with one another, usually with ecotone habitat gradients and repeated occurrences of each community, and often at a small scale.
 - 5.1 The mosaic could comprise either:
 - a mixture of one of the habitats (a)–(c) or (e)–(h) plus bare ground together forming a mosaic;
 - a mixture of two or more of the habitats (a)–(h) in a mosaic, with adjacent bare ground;
 - a mixture of two or more of the habitats (a)–(h) plus bare ground together forming a mosaic.
 - 5.2 Continuous blocks of a closed plant community greater than 0.25ha would be classified as a habitat other than OMH, although those containing very fine-grained mosaics might qualify.

Background Information

The information in this section comes from the submission to the BAP species and Habitats review in 2006–07 (http://jncc.defra.gov.uk/PDF/UKBAP_Species-HabitatsReview-2007.pdf). It has been edited.

These are generally primary successions, and as such unusual in the British landscape, especially the lowlands. The vegetation can have similarities to early/pioneer communities (particularly grasslands) on more 'natural' substrates but, due to the edaphic conditions, the habitat can often persist (remaining relatively stable) for decades without active management (intervention). Stands of vegetation commonly comprise small patches and may vary over relatively small areas, reflecting small-scale variation in substrate and topography.

Plant assemblages are unusual, selected by propagule supply as well as site conditions (Ash *et al.* (1991) for several waste types, Shaw (1994) on Pulverized Fuel Ash (PFA)). The habitat supports a range of notable vascular plant, moss and lichen species. These often include species declining in the wider countryside such as *Ophrys apifera*, *Gymnadenia conopsea* (alkaline wastes), *Epipactis youngiana* (acid waste), *Osmunda regalis* (acid sandstone quarries), *Peltigera rufescens* (lime waste, PFA), *Cladonia pocillum* (calcareous wastes), *Diploschistes muscorum* (PFA) and a UK BAP priority liverwort, *Petalophyllum ralfsii* (PFA). Exotic plant species, which are well adapted to the prevailing environmental conditions, are a characteristic component of associated plant assemblages.

Invertebrate faunas can be species-rich and include many uncommon species (Eyre *et al.*, 2002, 2004). Between 12% and 15% of all nationally-rare and nationally-scarce insects are recorded from brownfield sites, which will include many post-industrial examples (Gibson, 1998; Jones, 2002) (see below). Exotic plants provide for an extended flowering season and, with the floristic and structural diversity of the habitat mosaic, contribute to the value of the habitat for invertebrates (see Bodsworth *et al.*, 2005).

Some areas are important for birds that are primarily associated with previously developed or brownfield land, such as little ringed plover (in 1984 97% of LRP nests in England were in 'man-made' habitats), as well as more widespread, but UK BAP priority species, including skylark and grey partridge. The habitat provides secure breeding and feeding areas commonly absent from land under agricultural management.

The heterogeneity within the habitat mosaic reflects chemical and physical modification by former development or previous industrial processes, including the exposure of underlying substrates and the tipping of wastes and spoils. Features such as ditches, other exposures, spoil mounds and even the relicts of built structures provide topographical heterogeneity at the macro- and micro-scale. Sealed surfaces and compaction add further variation and contribute to the modified hydrology of such habitats resulting in areas of impeded and accelerated drainage. Stochastic factors also have a significant influence in shaping the habitat.

Edaphic conditions for this habitat are severely limiting on plant growth. Examples are substrates with extreme pH, whether alkaline (e.g. chemical wastes) or acid (e.g. colliery spoils); deficiency of nitrogen (PFA), or available phosphate (highly calcareous Leblanc waste, blast furnace slag and calcareous quarry spoil); or water-deficient (dry gravel and sand pits). Other typical situations where such conditions arise include disused quarries, former railway sidings, extraction pits and landfill sites.

The habitat is concentrated in urban, urban fringe and large-scale former industrial landscapes, especially in the lowlands, though more isolated examples can be found on previously developed land in more remote rural areas.

References

Ash, H.J., Gemmill, R.P. & Bradshaw, A.D. (1991) The introduction of native plant species on industrial waste heaps: a test of immigration and other factors affecting primary succession. *Journal of Applied Ecology*, **31**, 74–8.

Bodsworth, E., Shepherd, P. & Plant, C. (2005) Exotic plant species on brownfield land: their value to invertebrates of nature conservation importance. Peterborough, English Nature.

Eyre, M.D., Luff, M.L. & Woodward, J.C. (2002) Rare and notable Coleoptera from post-industrial and urban sites in England. *Coleopterist*, **11**, 91–101.

Eyre, M.D., Luff, M.L. & Woodward, J.C. (2004) Beetles (Coleoptera) on brownfield sites in England: an important conservation resource? *Journal of Insect Conservation*, **7**, 223–231.

Gibson, C.W.D. (1998) *Brownfield: red data. The values of artificial habitats have for uncommon invertebrates*. Peterborough, English Nature.

Jones, R. (2002) Brown can be beautiful. *Urbio*, **2**, 12–13.

Rodwell & Cooch (1997) Red Data Book of British Plant Communities. Unpublished report to WWF.

Riding, A., Critchley, N., Wilson, L. & Parker, J. (2009) *Definition and mapping of open mosaic habitats on previously developed land: Phase 1 Final Report*. ADAS UK Ltd, December 2009. Available from: [http://randd.defra.gov.uk/Default.aspx?Menu=Menu&Module=More&Location=None&ProjectID=16067&FromSearch=Y&Publisher=1&SearchText=open mosaic habitats&SortString=ProjectCode&SortOrder=Asc&Paging=10#Description](http://randd.defra.gov.uk/Default.aspx?Menu=Menu&Module=More&Location=None&ProjectID=16067&FromSearch=Y&Publisher=1&SearchText=open%20mosaic%20habitats&SortString=ProjectCode&SortOrder=Asc&Paging=10#Description) [Accessed 20 July 2010].

Rodwell, J.S., Dring, J.C., Averis, A.B.G., Proctor, M.C.F., Malloch, A.J.C., Schaminee, J.N.J. & Dargie, T.C.D. (2000) Review of coverage of the National Vegetation Classification. *JNCC Report*, No. 302. Peterborough, JNCC. Available from: <http://jncc.defra.gov.uk/page-2312> [Accessed 20 July 2010].

Shaw, P. (1994) Orchid woods and floating islands – the ecology of fly ash. *British Wildlife*, **6**, 149–57.

Shimwell, D.W. (1983) *A conspectus of urban vegetation types*. Manchester, School of Geography, University of Manchester.

ANNEX 1: CHARACTERISTIC SPECIES

NOTE: these are provisional working lists, from February 2010. As more sites are surveyed and mapped, more up-to-date lists are likely to become available. Please check the UK BAP website <http://jncc.defra.gov.uk/page-5155> for updates.

Species	Common Name	Southern	N. England	Scotland	S. Wales colliery sites	Thames area (species important for invertebrates)
<i>Achillea millefolium</i>	Yarrow					x
<i>Agrimonia eupatoria</i>	Agrimony					x
<i>Agrostis vineale</i>	Brown Bent				x	
<i>Aira caryophyllea</i>	Silver Hair-grass				x	
<i>Aira praecox</i>	Early Hair-grass				x	
<i>Anthemis arvensis</i> *	Corn Chamomile				x	
<i>Anthemis cotula</i> *	Stinking Chamomile				x	
<i>Anthyllis vulneraria</i>	Kidney Vetch					x
<i>Arctium lappa</i> *	Greater Burdock				x	
<i>Arctium minus</i>	Lesser Burdock				x	
<i>Armeria maritima</i>	Thrift					x
<i>Artemisia absinthium</i> *	Wormwood	x			x	
<i>Artemisia verlotiorum</i> *	Chinese Mugwort	x				
<i>Artemisia vulgaris</i> *	Mugwort	x	x	x		
<i>Aster novi-belgii</i> *	Confused Michaelmas-daisy	x	x	x		
<i>Atriplex patula</i>	Common Orache				x	
<i>Atriplex prostrata</i> *	Spear-leaved Orache				x	
<i>Ballota nigra</i> *	Black Horehound				x	
<i>Barbilophozia floerkei</i>	Common Pawwort				x	
<i>Beta vulgaris</i>	Beet				x	
<i>Blackstonia perfoliata</i>	Yellow-wort	x	x			
<i>Calluna vulgaris</i>	Heather				x	
<i>Campanula glomerata</i>	Clustered Bellflower					x
<i>Campanula rotundifolia</i>	Harebell					x
<i>Carduus crispus</i>	Wetted Thistle				x	
<i>Carduus nutans</i>	Musk Thistle				x	
<i>Carduus tenuiflorus</i>	Slender Thistle				x	
<i>Carex arenaria</i>	Sand Sedge				x	
<i>Carex otrubae</i>	False Fox-sedge				x	
<i>Carex pilulifera</i>	Pill Sedge				x	
<i>Catapodium rigidum</i>	Fern-grass				x	
<i>Centaurea cyanus</i>	Cornflower				x	
<i>Centaurea nigra</i>	Common Knapweed	x	x	x		x
<i>Centaureum erythraea</i>	Common Centaury	x	x			
<i>Centranthus ruber</i> *	Red Valerian					x
<i>Cerastium fontanum</i>	Common Mouse-ear	x	x	x		
<i>Chaenorhinum minus</i> *	Small Toadflax				x	
<i>Chenopodium album</i>	Fat-hen				x	

<i>Chenopodium bonus-henricus</i> *	Good-King-Henry					x	
<i>Chenopodium ficifolium</i> *	Fig-leaved Goosefoot					x	
<i>Chenopodium hybridum</i> *	Maple-leaved Goosefoot					x	
<i>Chenopodium polyspermum</i> *	Many-seeded Goosefoot					x	
<i>Chenopodium rubrum</i>	Red Goosefoot					x	
<i>Chrysanthemum segetum</i> *	Corn Marigold					x	
<i>Cichorium intybus</i> *	Chicory	x	x	x		x	
<i>Clinopodium acinos</i>	Basil Thyme						x
<i>Clinopodium vulgare</i>	Wild Basil						x
<i>Conium maculatum</i> *	Hemlock	x	x	x			
<i>Conyza canadensis</i> *	Canadian Fleabane	x					
<i>Conyza sumatrensis</i> *	Guernsey Fleabane	x					
<i>Crepis biennis</i>	Rough Hawk's-beard	x	x			x	
<i>Crepis capillaris</i>	Smooth Hawk's-beard	x	x	x		x	
<i>Dactylorhiza praetermissa</i>	Southern Marsh-orchid	x	x				
<i>Daucus carota</i> ssp. <i>sativus</i> *	Carrot	x	x				
<i>Deschampsia flexuosa</i>	Wavy Hair-grass	x	x			x	
<i>Dianthus armeria</i>	Deptford Pink						x
<i>Dianthus deltoides</i>	Maiden Pink						x
<i>Diplotaxis tenuifolia</i> *	Perennial Wall-rocket	x					
<i>Dipsacus fullonum</i>	Wild Teasel					x	
<i>Echium vulgare</i>	Viper's-bugloss	x	x	x			x
<i>Equisetum arvense</i>	Field Horsetail	x	x	x			
<i>Erica cinerea</i>	Bell Heather					x	
<i>Erigeron acer</i>	Blue Fleabane	x	x				x
<i>Erodium cicutarium</i>	Common Stork's-bill						x
<i>Euphrasia</i> spp.	Eyebright	x	x				
<i>Festuca ovina</i>	Sheep's-fescue					x	
<i>Filago minima</i>	Small Cudweed					x	
<i>Filago vulgaris</i>	Common Cudweed					x	
<i>Galega officinalis</i> *	Goat's-rue	x					
<i>Galeopsis bifida</i>	Bifid Hemp-nettle					x	
<i>Galeopsis speciosa</i> *	Large-flowered Hemp-nettle					x	
<i>Galeopsis tetrahit</i>	Common Hemp-nettle					x	
<i>Galium verum</i>	Lady's Bedstraw						x
<i>Geranium molle</i>	Dove's-foot Crane's-bill						x
<i>Glaucium flavum</i>	Yellow Horned-poppy						x
<i>Gnaphalium uliginosum</i>	Marsh Cudweed					x	
<i>Helianthemum nummularium</i>	Common Rock-rose						x
<i>Hieraceum aurantiacum</i> *	Fox-and-cubs						x
<i>Hieracium sabaudum</i>	Autumn Hawkweed	x	x				
<i>Hypericum perforatum</i>	Perforate St John's-wort	x	x	x			x
<i>Hypochaeris radicata</i>	Cat's-ear	x	x	x			
<i>Juncus inflexus</i>	Hard Rush	x	x	x			

<i>Kickxia elatine*</i>	Sharp-leaved Fluellen					x	
<i>Kickxia spuria*</i>	Round-leaved Fluellen					x	
<i>Knautia arvensis</i>	Field Scabious						x
<i>Lactuca serriola*</i>	Prickly Lettuce					x	
<i>Lactuca virosa</i>	Great Lettuce					x	
<i>Lamium amplexicaule*</i>	Henbit Dead-nettle					x	
<i>Lamium hybridum*</i>	Cut-leaved Dead-nettle					x	
<i>Lathyrus latifolius*</i>	Broad-leaved Everlasting-pea						x
<i>Leontodon autumnalis</i>	Autumn Hawkbit						x
<i>Leontodon hispidus</i>	Rough Hawkbit						x
<i>Lepidium ruderale*</i>	Narrow-leaved Pepperwort	x					
<i>Leucanthemum vulgare</i>	Oxeye Daisy						x
<i>Linaria purpurea*</i>	Purple Toadflax	x	x				x
<i>Linaria repens*</i>	Pale Toadflax	x	x			x	
<i>Linaria vulgaris</i>	Common Toadflax	x	x	x		x	x
<i>Linum catharticum</i>	Fairy Flax	x	x	x			
<i>Lophozia ventricosa</i>	A liverwort					x	
<i>Lotus corniculatus</i>	Common Bird's-foot-trefoil					x	x
<i>Lotus glaber</i>	Narrow-leaved Bird's-foot-trefoil	x					
<i>Malva moschata</i>	Musk-mallow						x
<i>Marrubium vulgare*</i>	White Horehound					x	
<i>Matricaria matricarioides</i>	Pineapple Weed	x	x	x			
<i>Matricaria recutita*</i>	Scented Mayweed					x	
<i>Medicago lupulina</i>	Black Medick	x	x	x			x
<i>Medicago sativa</i>	Lucerne	x					
<i>Melilotus altissimus*</i>	Tall Melilot	x	x				
<i>Melilotus officinalis*</i>	Ribbed Melilot	x	x				
<i>Mentha arvensis</i>	Corn Mint					x	
<i>Misopates orontium*</i>	Weasel's-snout					x	
<i>Nardus stricta</i>	Mat-grass	x	x				
<i>Odontites vernus</i>	Red Bartsia	x	x	x			
<i>Oenothera spp.*</i>	Evening Primrose	x	x				
<i>Ononis spinosa</i>	Spiny Restharrow						x
<i>Onopordum acanthium*</i>	Cotton Thistle					x	
<i>Ophrys apifera</i>	Bee Orchid	x	x				
<i>Origanum vulgare</i>	Wild Marjoram						x
<i>Orobanche minor</i>	Common Broomrape					x	
<i>Parentucellia viscosa</i>	Yellow Bartsia					x	
<i>Picris echioides*</i>	Bristly Oxtongue	x	x			x	
<i>Picris hieracioides</i>	Hawkweed Oxtongue	x	x				
<i>Pilosella officinarum agg</i>	Mouse-ear-hawkweed					x	x
<i>Pilosella praealta*</i>	Tall Mouse-ear-hawkweed	x					
<i>Plantago coronopus</i>	Buck's-horn Plantain					x	
<i>Plantago lanceolata</i>	Ribwort Plantain	x	x	x			
<i>Plantago media</i>	Hoary Plantain						x
<i>Poa compressa</i>	Flattened Meadow-grass					x	
<i>Primula veris</i>	Cowslip						x
<i>Prunella vulgaris</i>	Selfheal						x
<i>Ptilidium ciliare</i>	Ciliated Fringewort					x	

<i>Pulsatilla vulgaris</i>	Pasqueflower					x
<i>Ranunculus acris</i>	Meadow Buttercup					x
<i>Ranunculus bulbosus</i>	Bulbous Buttercup					x
<i>Reseda lutea</i>	Wild Mignonette	x	x	x		x
<i>Reseda luteola*</i>	Weld	x	x	x		
<i>Rumex acetosa</i>	Common Sorel					x
<i>Salvia pratensis</i>	Meadow Clary					x
<i>Sanguisorba minor</i>	Salad Burnet					x
<i>Saponaria officinalis*</i>	Soapwort	x	x	x		
<i>Scabiosa columbaria</i>	Small Scabious					x
<i>Scrophularia nodosa</i>	Common Figwort					x
<i>Senecio squalidus*</i>	Oxford Ragwort	x	x	x		
<i>Silene vulgaris</i>	Bladder Campion	x	x	x		x
<i>Spergularia rubra</i>	Sand Spurrey					x
<i>Tanacetum vulgare</i>	Tansy					x
<i>Teucrium scorodonia</i>	Wood Sage					x
<i>Thymus polytrichus</i>	Wild Thyme					x
<i>Thymus serpyllum</i>	Breckland Garden					x
<i>Tragopogon pratensis</i>	Goat's-beard	x	x	x	x	
<i>Trifolium arvense</i>	Hare's-foot Clover	x	x	x		x
<i>Trifolium campestre</i>	Hop Trefoil	x	x	x	x	x
<i>Trifolium dubium</i>	Lesser Trefoil	x	x	x		
<i>Trifolium hybridum*</i>	Alsike Clover	x	x	x		
<i>Trifolium medium</i>	Zigzag Clover	x	x	x		
<i>Trifolium micranthum</i>	Slender Trefoil					x
<i>Trifolium pratense</i>	Red Clover	x	x	x		
<i>Trifolium scabrum</i>	Rough Clover					x
<i>Trifolium striatum</i>	Knotted Clover					x
<i>Trisetum flavescens</i>	Yellow Oat-grass	x	x	x		
<i>Tussilago farfara</i>	Colt's-foot	x	x	x	x	
<i>Vaccinium myrtillus</i>	Bilberry					x
<i>Valerianella carinata*</i>	Keeled-fruited Cornsalad					x
<i>Valerianella locusta</i>	Common Cornsalad					x
<i>Verbascum nigrum</i>	Dark Mullein	x				x
<i>Verbascum thapsus</i>	Great Mullein					x
<i>Veronica agrestis*</i>	Green Field-speedwell					x
<i>Vicia cracca</i>	Tufted Vetch	x	x	x		
<i>Vicia hirsuta</i>	Hairy Tare	x	x	x		
<i>Vicia tetrasperma</i>	Smooth Tare	x				
<i>Vulpia bromoides</i>	Squirreltail Fescue					x
<i>Vulpia myuros*</i>	Rat's-tail Fescue					x

*introduced species of lower biodiversity value but still characteristic of OMH sites. Species lists from Riding *et al.* (2009) (*Open Mosaic Habitats on Previously Developed Land, site identification guide* December 2009 ADAS UK Ltd). Sources of information about status: species represented in columns 2–4 – ADAS 2009 as above; other vascular species – status from BSBI's New Atlas CD-ROM, species always introduced in Wales (col 5) or in England (col 6).

Annex 3: Factsheets from Buglife providing descriptions and photographic examples of Open Mosaic Habitats on Previously Developed Land (OMHPDL). Compare with Annex 1 and Annex 2.



© Jamie Robins

Identifying open mosaic habitat

Open mosaic habitat on brownfield sites can be extremely diverse, supporting a wide range of terrestrial and aquatic habitats. This diversity has made them increasingly important within ecological networks for rare and scarce invertebrates as well as lichens, plants, birds, reptiles and amphibians of conservation concern. However, this same diversity can make them challenging to define, identify and assess appropriately. Without being properly identified, wildlife-rich brownfields supporting open mosaic habitat are vulnerable to being poorly assessed, increasing the likelihood of loss to development or inappropriate restoration.

An introduction to open mosaic habitat on previously developed land

Open mosaic habitats can be extremely diverse, including such wide ranging sites as railway sidings, quarries, former industrial works, slag heap, bings and brick pits. Brownfields with open mosaic habitats show evidence of previous disturbance, either through soil being removed or severely modified by previous use, or the addition of materials such as industrial spoil, with spatial variation developing across the site. The resultant variation allows for a mosaic of different habitats to be supported in close proximity. This habitat diversity can support rich assemblages of invertebrates, which has led to 'open mosaic habitats on previously developed land' being added to the UK Biodiversity Action Plan (UK BAP) as a Priority habitat listed on Section 41 of the Natural Environment and Rural Communities Act 2006 (NERC Act). Its

inclusion in Section 41 is to guide decision makers in implementing their duty under Section 40 of the NERC Act to have regard for conservation of biodiversity, including making it a material consideration in planning decisions.

The value of open mosaic habitats for invertebrates

Brownfields supporting open mosaic habitats have become refuges for rare and scarce invertebrates due to the decline of more natural habitats such as wildflower-rich meadows, heathland, and chalk and acid grasslands. The altered nature of open mosaic habitats leads to fine-scale changes in hydrology, pH and topography, allowing a range of habitats to develop alongside each other. The diversity of habitats is ideal for species which require two or more habitats near to each other to complete their life cycle, while also attracting specialists for each habitat type alongside more generalist species. Many brownfield sites are low nutrient, preventing



Disused sand pit © Jamie Robins



Flower-rich brownfield © Jamie Robins

Criteria for identification of open mosaic habitat on previously developed land priority habitat (Rising *et al.* 2010)

Criterion 1	The site is at least 0.25 ha in size This minimum size may be part of a much larger site containing other habitats or developed land.
Criterion 2	Known history of disturbance at the site or evidence that soil has been removed or severely modified by previous use(s) of the site. Extraneous materials/substrates such as industrial spoil may have been added.
Criterion 3	The site contains some vegetation. This will comprise early successional communities consisting mainly of stress tolerant species (e.g. indicative of low nutrient status or drought). Early successional communities are composed of 1) annuals <i>or</i> b) mosses/liverworts <i>or</i> c) lichens <i>or</i> d) ruderals <i>or</i> e) inundation species <i>or</i> f) open grassland <i>or</i> g) flower-rich grassland <i>or</i> h) heathland
Criterion 4	The site contains unvegetated, loose bare substrate and pools may be present
Criterion 5	The site shows spatial variation, forming a mosaic of one or more of the early successional communities plus bare substrate, within 0.25ha

rapid succession and allowing open vegetation mosaics to develop. Of particular importance is the presence of bare ground, which creates warm microclimates for thermophilic invertebrates to bask, including those at the northerly limit of their range. Bare areas also provide nesting opportunities for ground nesting species and areas for active predators to hunt. Low nutrient sites tend also to have a strong assemblage of nectar-rich, stress tolerant annuals, which provide an abundance of forage. An absence of management provides yet further opportunities by allowing invertebrates to overwinter in seeds, flower heads, leaves and stems, which is increasingly difficult in the modern day highly managed landscape. A number of UK Priority species are strongly associated with brownfields, making their conservation highly dependent on the presence of a network of high quality brownfields to allow their movement throughout the landscape.

However, every brownfield site is different, dependent on its individual character, land use history and location, making definition and identification difficult. During Phase 1 habitat assessments, open mosaic habitats frequently demonstrate a poor fit to traditionally described Natural Vegetation Classification (NVC) communities. This has led to poor site

Examples of UK BAP invertebrates strongly associated with brownfields

Dingy skipper (*Erynnis tages*), Grayling (*Hipparchia semele*), Shrill carder bee (*Bombus sylvarum*), Brown-banded carder bee (*Bombus humilis*), Distinguished jumping spider (*Sitticus distinguendus*), Five-banded weevil wasp (*Cerceris quinquefasciata*), Four-banded weevil wasp (*Cerceris quadricincta*), Saltmarsh shortspur beetle (*Anisodactylus poeciloides*), Streaked bombardier beetle (*Brachinus sclopeta*), Phoenix fly (*Dorycera graminum*), Black-headed mason wasp (*Odynerus melanocephalus*), Horehound longhorn moth (*Nemophora fasciella*)

assessments and a tendency for sites to be extremely undervalued in terms of their biodiversity potential, and the loss of swathes of wildlife-rich brownfields.

Criteria for open mosaic habitat qualification

To help identify which brownfield sites support open mosaic habitat, a set of criteria have been produced which must be met for a site to qualify as supporting UK BAP habitat (see text box above). These criteria will help in identifying high quality habitat, ensuring that sites are appropriately assessed for their value for rare and scarce invertebrates.

Identifying open mosaic habitat on brownfields

A wide range of habitats feature in open mosaic habitat, often appearing in unusual combinations. A selection of images showing open mosaic habitats follow, with key features identified. It is important to note that not all potential habitat types are shown, but the selection of images is intended to be a guide to recognising the presence of open mosaic habitat and particular features of value for invertebrates.

Not all brownfields will support open mosaic habitats, particularly where hardstanding areas dominate, providing only limited opportunities for vegetation or exposed friable material. Brownfield sites which have not undergone significant disturbance or have been disturbed in a similar nature site-wide will often support homogenous habitats such as rough species poor grassland. In addition, where disturbance has been sufficiently historic, sites may have been subject to succession for many years, developing into solid blocks of scrub or woodland. Although such sites may be of some raised wildlife value, they do not present the habitat diversity of open mosaic habitats or have the potential to support as valuable invertebrate assemblages.



- ① Rough grassland
- ② Scrub
- ③ Reedbed
- ④ Bare Pulverised Fuel Ash (PFA)
- ⑤ Sparsely vegetated ground
- ⑥ Topographical variation

© Steven Falk



- ① Bare ground
- ② Herb-rich, short sward grassland
- ③ Open water
- ④ Emergent aquatic vegetation
- ⑤ Scrub
- ⑥ Tall ruderal vegetation

© Steven Falk

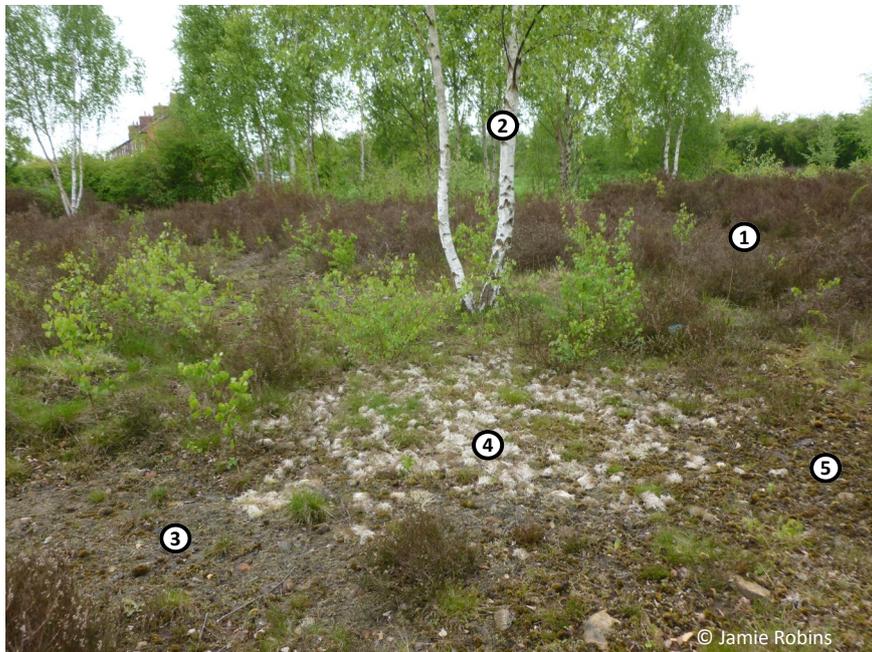


- ① Stepped vertical sand faces
- ② Acidic scrub species
- ③ Scrub
- ④ Drought-stressed bramble
- ⑤ Sparsely vegetated bare ground

© Jamie Robins



- ① Early successional vegetation
- ② Hardstanding
- ③ Tall ruderals
- ④ Bramble
- ⑤ Scrub
- ⑥ Moss cover



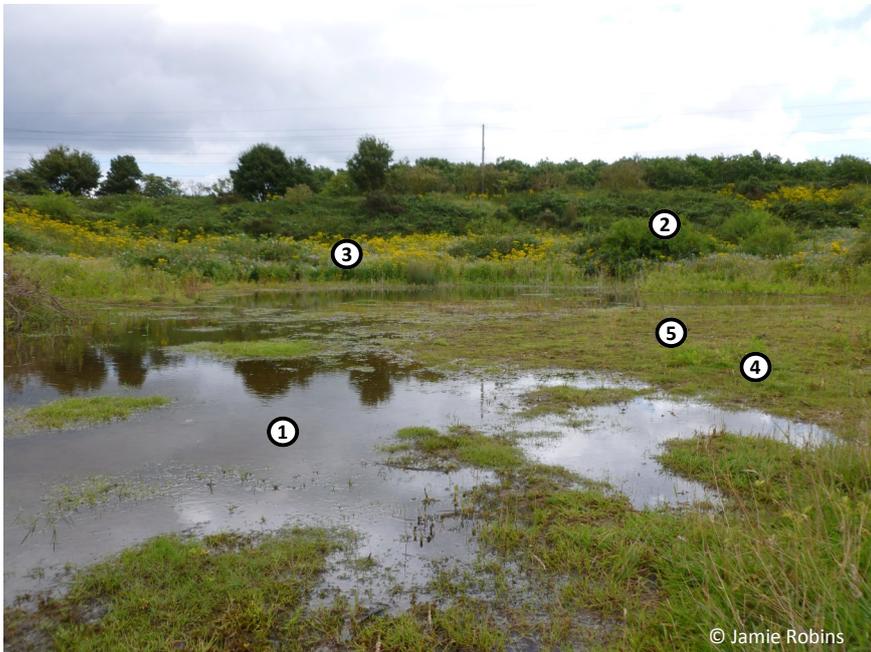
- ① Dwarf shrub heath
- ② Scrub
- ③ Bare ground
- ④ Lichen heath
- ⑤ Moss cover



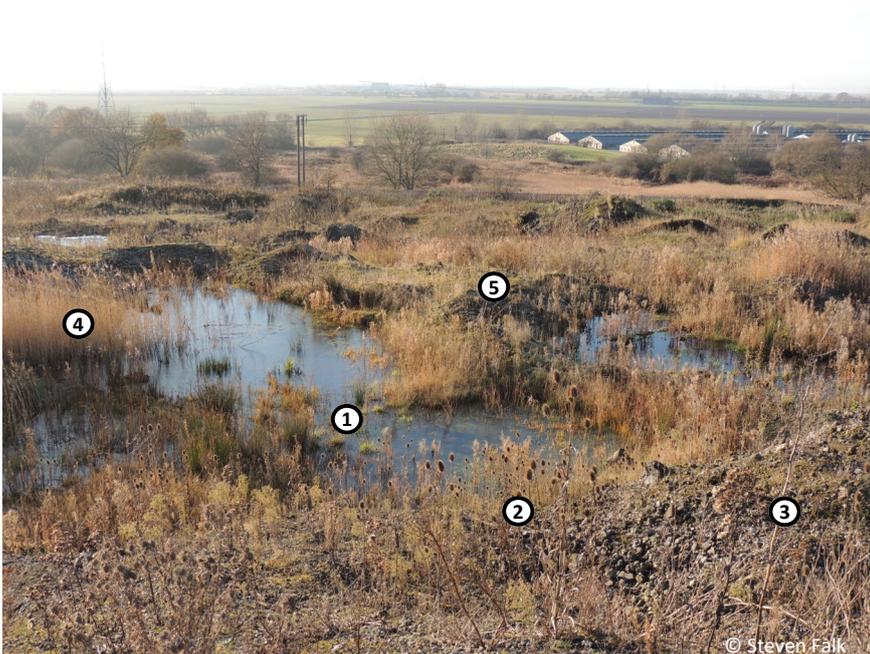
- ① Rubble piles
- ② Tall ruderals
- ③ Sparsely vegetated gravels
- ④ Moss cover



- ① Sparsely vegetated sands
- ② Tall ruderals
- ③ Acidic scrub species
- ④ Bare sandy ground
- ⑤ Scrub



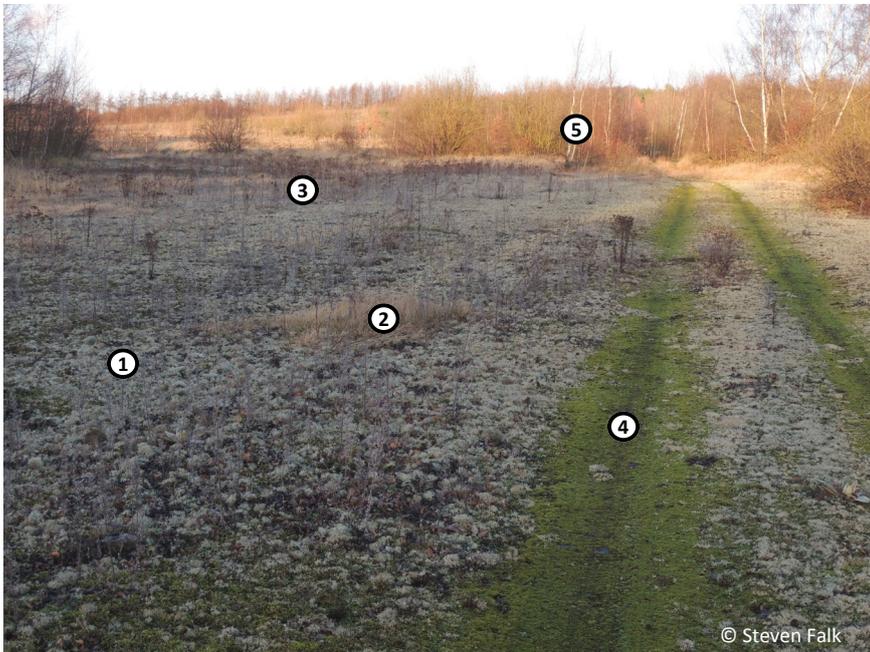
- ① Seasonal pool
- ② Scrub
- ③ Tall ruderals
- ④ Herb-rich short sward grassland
- ⑤ Moss cover



- ① Seasonal pools
- ② Tall ruderals
- ③ Sparsely vegetated gravels
- ④ Reedbed
- ⑤ Topographic variation



- ① Sparsely vegetated ground
- ② Bare Pulverised Fuel Ash (PFA)
- ③ Tall ruderals
- ④ Scrub
- ⑤ Topographical variation



- ① Lichen heath
- ② Herb-rich, short sward grassland
- ③ Tall ruderals
- ④ Moss cover
- ⑤ Scrub

Further information

- Open mosaic habitat field assessment form
- Maddock, A. (ed.), 2008. UK Biodiversity Action Plan Priority Habitat Descriptions: Open Mosaic Habitat on Previously Developed Land. Biodiversity Information and Recording Group (Updated July 2010). Joint Nature Conservancy Committee, Peterborough ([link](#))
- Lush, M.J., Kirby, P., Shepherd, P., 2013. Open Mosaic Habitat Survey Handbook. ExeGesIS Spatial Data Management Ltd, Powys ([link](#))

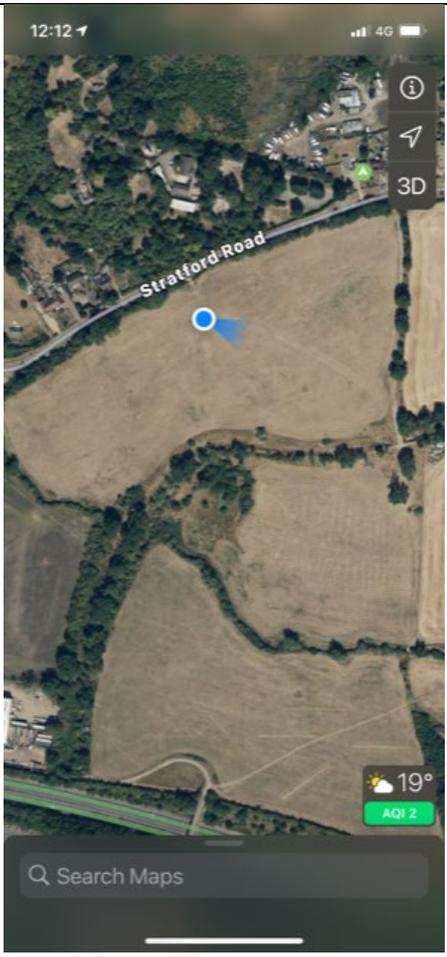
buglife.org.uk 01733 201210 @buzz_dont_tweet

Buglife The Invertebrate Conservation Trust is a registered charity at
Bug House, Ham Lane, Orton Waterville, Peterborough, PE2 5UU
Registered Charity No: 1092293, Scottish Charity No: SC040004, Company No: 4132695

Annex 4

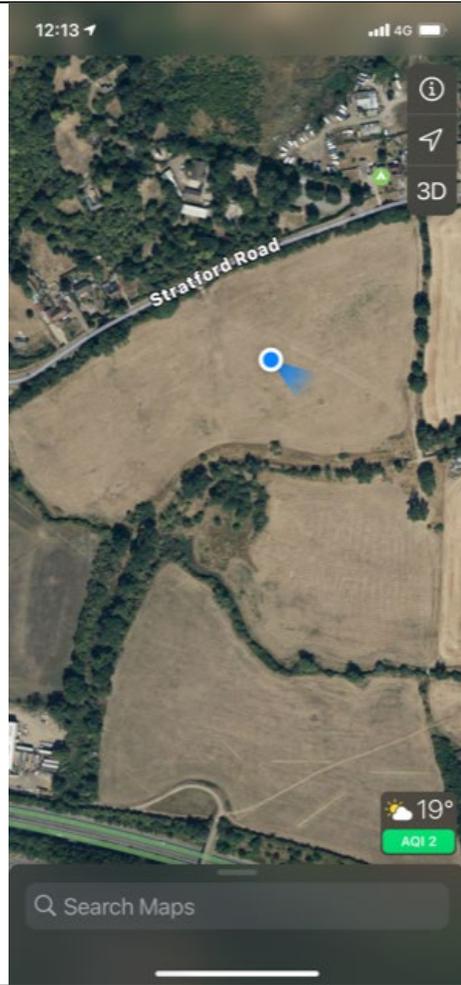
Modified Grassland Quadrat Data and Metric 3.1 Condition Assessment

Surveyor – Dominic Woodfield CEcol, CEnv, MCIEEM. Survey date 27th June 2023.

Quadrat 1		
Location	Photo	
		
Species	Common name	Domin
<i>Lolium perenne</i>	Perennial rye grass	8
<i>Alopecurus pratensis</i>	Meadow foxtail	5
<i>Agrostis stolonifera</i>	Creeping bent	5
<i>Poa trivialis</i>	Rough meadow-grass	3
<i>Rumex acetosa</i>	Common sorrel	1
<i>Taraxacum officinale agg.</i>	Dandelion	1
<i>Festuca rubra</i>	Red fescue	1
Total vascular plant spp: 7		

Quadrat 2

Location



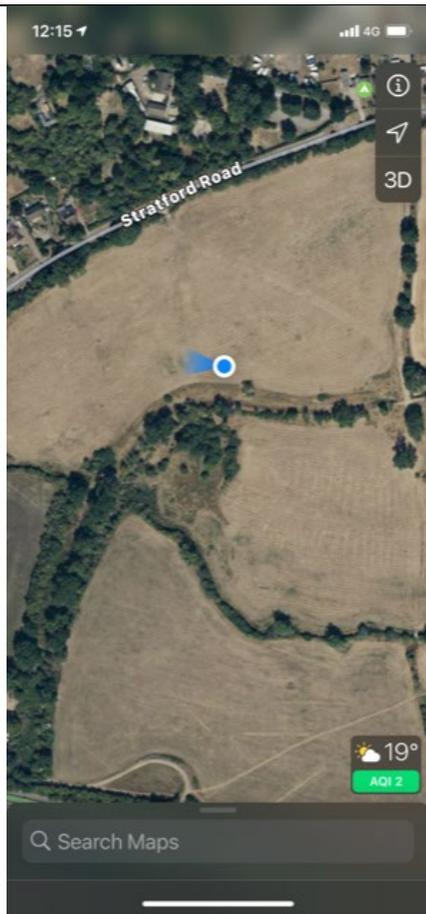
Photo



Species	Common name	Domin
<i>Lolium perenne</i>	Perennial rye grass	7
<i>Alopecurus pratensis</i>	Meadow foxtail	5
<i>Bromus hordaceus</i>	Soft brome	5
<i>Geranium dissectum</i>	Cut-leaved crane's-bill	4
<i>Agrostis stolonifera</i>	Creeping bent	3
<i>Trifolium repens</i>	White clover	1
<i>Kindbergia praelonga</i>	Common feather moss	1
Total vascular plant spp: 6		

Quadrat 3

Location



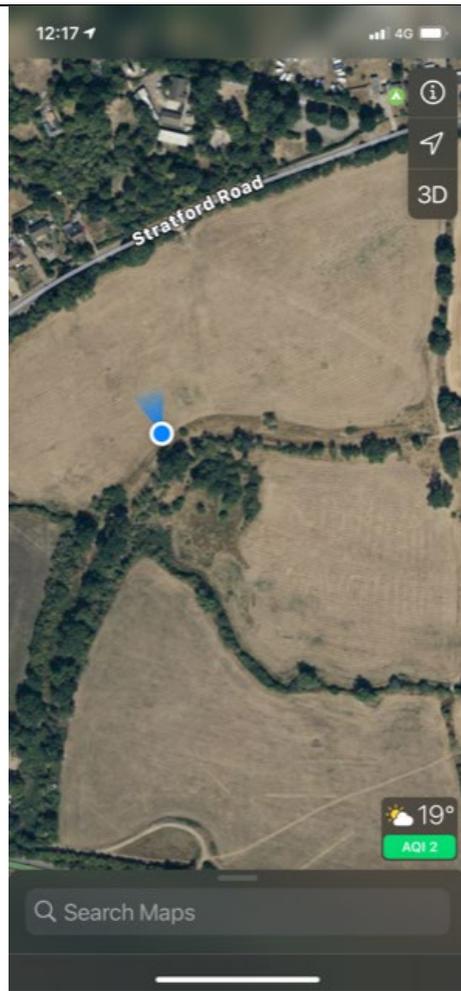
Photo



Species	Common name	Domin
<i>Lolium perenne</i>	Perennial rye grass	7
<i>Agrostis stolonifera</i>	Creeping bent	5
<i>Holcus lanatus</i>	Yorkshire fog	5
<i>Festuca rubra</i>	Red fescue	3
<i>Dactylis glomerata</i>	Cock's-foot	1
<i>Poa trivialis</i>	Rough meadow-grass	1
Total vascular plant spp: 6		

Quadrat 4

Location



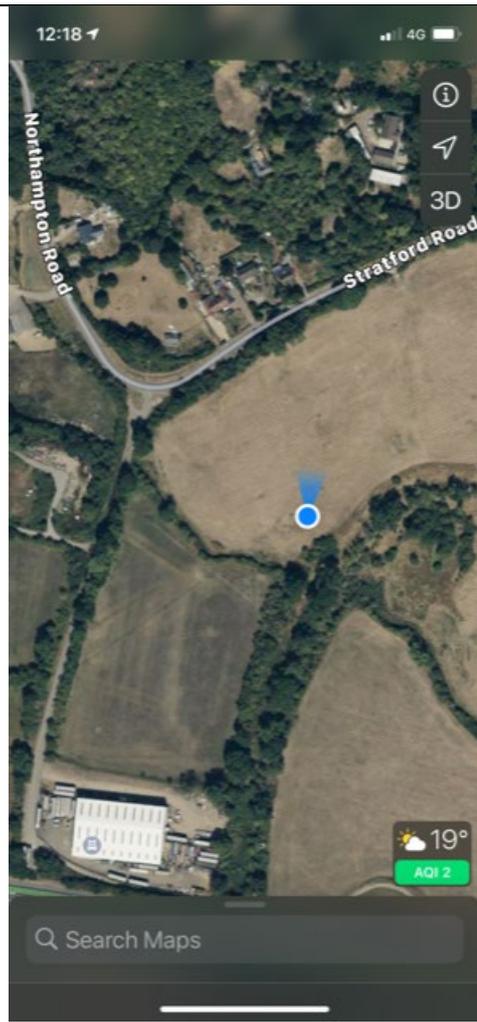
Photo



Species	Common name	Domin
<i>Lolium perenne</i>	Perennial rye-grass	7
<i>Hordeum secalinum</i>	Meadow barley	4
<i>Agrostis stolonifera</i>	Creeping bent	4
<i>Festuca rubra</i>	Red fescue	4
<i>Phleum bertolonii</i>	Small timothy	3
<i>Ranunculus acris</i>	Meadow buttercup	1
<i>Kindbergia praelonga</i>	Common feather moss	1
Total vascular plant spp: 6		

Quadrat 5

Location



Photo



Species	Common name	Domin
<i>Lolium perenne</i>	Perennial rye-grass	5
<i>Potentilla reptans</i>	Creeping cinquefoil	5
<i>Alopecurus pratensis</i>	Meadow foxtail	3
<i>Festuca rubra</i>	Red fescue	2
<i>Hordeum secalinum</i>	Meadow barley	1
<i>Helminthotheca echioides</i>	Bristly ox-tongue	1
<i>Crepis capillaris</i>	Smooth hawk's-beard	1
Total vascular plant spp: 7		

Condition Sheet: GRASSLAND Habitat Type (low distinctiveness)

UKHab Habitat Type(s)

Grassland - Modified grassland

Site name/location	Land at Cosgrove	Onsite/offsite	
Central grid reference of habitat	SP 78346 41865	Unique polygon reference	
Limitations (if applicable)	Recently cut and arisings taken for silage/haylage. Most grass identification therefore vegetative. No. of spp per m2 may therefore have been under-estimated.	Metric 3.0 survey reference (if condition assessment of this polygon relates to a wider habitat)	

Habitat Description

Improved grassland on largely flattish ground with steeper slopes southwards towards Dogsmouth Brook and gentler slopes towards Buckingham Arm disused canal. Recently cut for hay/silage on day of survey.

[See UKHab](#)

Condition Assessment Criteria	Condition Achieved (Y/N)	Notes/Justification
1 There must be 6-8 species per m2. If a grassland has 9 or more species per m2 it should be classified as a medium distinctiveness grassland habitat type. NB - this criterion is essential for achieving moderate condition.	Y	Average across all samples = 6.4spp./m2 (not including bryophytes).
2 Sward height is varied (at least 20% of the sward is less than 7 cm and at least 20% is more than 7 cm) creating microclimates which provide opportunities for insects, birds and small mammals to live and breed.	N	Condition assessment for this criterion hindered by recent cutting, but sward likely to be fairly uniform
3 Some scattered scrub (including bramble) may be present, but scrub accounts for less than 20% of total grassland area. Note - patches of shrubs with continuous (more than 30%) cover should be classified as the relevant scrub habitat type.	Y	No scrub due to management
4 Physical damage is evident in less than 5% of total grassland area. Examples of physical damage include excessive poaching, damage from machinery use or storage, erosion caused by high levels of access, or any other damaging management activities.	Y	No evidence of physical damage
5 Cover of bare ground is between 1% and 10%, including localized areas (for example, a concentration of rabbit warrens).	Y	Localised areas of bare ground but overall significantly < 10%
6 Cover of bracken less than 20%.	Y	No bracken
7 There is an absence of invasive non-native species (as listed on Schedule 9 of WCA, 1981).	Y	No INNS

Essential criterion 1 achieved (Y/N) Y

Number of criteria passed 6

Condition Assessment Re:	Condition Assessment Score	Score Achieved
Passes 6 or 7 of 7 criteria including passing essential criterion 1	Good (3)	Y
Passes 4 or 5 of 7 criteria including passing essential criterion 1	Moderate (2)	
Passes 0, 1, 2 or 3 of 7 criteria; OR 4, 5 or 6 of criteria but failing criterion 1	Poor (1)	

Suggested enhancement interventions to improve condition score

< > ...

5. GRASSLAND LOW

6. GRASSLAND MED HIGH & V.HIGH

7. HEATHLAND

Annex 5: Correction of Applicant's BNG Calculations

- The applicant's submitted Metric 3.1 calculation (ES Appendix 8.2 – Biodiversity Net Gain survey page 21) presents the following inputs to the baseline habitat unit value of the proposed development site (Tab A-1 of the Excel Metric Tool):

Land at former Furtho Pit, Stony Stratford A-1 Site Habitat Baseline												
Condense / Show Columns			Condense / Show Rows									
Main Menu			Instructions									
Ref	Habitats and areas			Distinctiveness		Condition		Strategic significance			Suggested action to address habitat losses	Ecological baseline Total habitat units
	Broad Habitat	Habitat Type	Area (hectares)	Distinctiveness	Score	Condition	Score	Strategic significance	Strategic significance	Strategic Significance multiplier		
1	Cropland	Cereal crops	3.38	Low	2	Condition Assessment N/A	1	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	Same distinctiveness or better habitat required =>	6.76
2	Grassland	Modified grassland	5.24	Low	2	Poor	1	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	Same distinctiveness or better habitat required =>	10.48
3	Grassland	Other neutral grassland	9.02	Medium	4	Moderate	2	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	Same broad habitat or a higher distinctiveness habitat required (2)	72.16
4	Urban	Developed land, sealed surface	0.86	V.Low	0	NA - Other	0	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	Compensation Not Required	0.00
5	Headland and shrub	Bramble scrub	0.2	Medium	4	Condition Assessment N/A	1	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	Same broad habitat or a higher distinctiveness habitat required (2)	0.80
6	Urban	Developed land, sealed surface	0.01	V.Low	0	NA - Other	0	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	Compensation Not Required	0.00
7	Cropland	Cereal crops	14.25	Low	2	Condition Assessment N/A	1	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	Same distinctiveness or better habitat required =>	28.50
8	Grassland	Modified grassland	2.77	Low	2	Poor	1	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	Same distinctiveness or better habitat required =>	5.54
9	Woodland and forest	Other woodland, mixed	0.02	Medium	4	Moderate	2	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	Same broad habitat or a higher distinctiveness habitat required (2)	0.16
10	Urban	Developed land, sealed surface	0.06	V.Low	0	NA - Other	0	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	Compensation Not Required	0.00
12	Urban	Developed land, sealed surface	0.01	V.Low	0	NA - Other	0	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	Compensation Not Required	0.00
13	Headland and shrub	Mixed scrub	1.02	Medium	4	Moderate	2	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	Same broad habitat or a higher distinctiveness habitat required (2)	8.16
14	Grassland	Lowland meadows	0.21	V.High	8	Fairly Good	2.5	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	Require compensation only in the Local Plan	4.20
15	Headland and shrub	Bramble scrub	0.01	Medium	4	Condition Assessment N/A	1	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	Same broad habitat or a higher distinctiveness habitat required (2)	0.04
16	Headland and shrub	Mixed scrub	0.94	Medium	4	Moderate	2	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	Same broad habitat or a higher distinctiveness habitat required (2)	7.52
18	Woodland and forest	Other woodland, mixed	0.24	Medium	4	Moderate	2	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	Same broad habitat or a higher distinctiveness habitat required (2)	1.92
19	Woodland and forest	Other woodland, mixed	0.4	Medium	4	Poor	1	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	Same broad habitat or a higher distinctiveness habitat required (2)	1.60
20												
21												

- The applicant's condition assessments of 'poor' for both of the modified grasslands on the site which are to be lost to development (rows 2 and 8) are circled in red. These condition assessments attract a multiplier score of '1' for this habitat.
- The 'Headline Results' tab of the spreadsheet (see screengrab below, again taken from the applicant's ES Appendix 8.2, page 20) indicates the effect of this on the overall calculation, which is given as an area based policy-compliant output of +20.94% - i.e. a significant net gain (outlined red). Note that a positive figure in each of the habitat, hedgerow and river units is required in order for an overall and policy compliant net gain result to be achieved. At this stage we have not interrogated the hedgerow or river unit figures.

Land at former Furtho Pit, Stony Stratford		Return to results menu	
Headline Results			
On-site baseline	<i>Habitat units</i>	147.84	
	<i>Hedgerow units</i>	23.48	
	<i>River units</i>	20.32	
On-site post-intervention <small>(Including habitat retention, creation & enhancement)</small>	<i>Habitat units</i>	178.80	
	<i>Hedgerow units</i>	25.96	
	<i>River units</i>	20.32	
On-site net % change <small>(Including habitat retention, creation & enhancement)</small>	<i>Habitat units</i>	20.94%	
	<i>Hedgerow units</i>	10.57%	
	<i>River units</i>	0.26%	
Off-site baseline	<i>Habitat units</i>	0.00	
	<i>Hedgerow units</i>	0.00	
	<i>River units</i>	0.00	
Off-site post-intervention <small>(Including habitat retention, creation & enhancement)</small>	<i>Habitat units</i>	0.00	
	<i>Hedgerow units</i>	0.00	
	<i>River units</i>	0.00	
Total net unit change <small>(including all on-site & off-site habitat retention, creation & enhancement)</small>	<i>Habitat units</i>	30.96	
	<i>Hedgerow units</i>	2.48	
	<i>River units</i>	0.05	
Total on-site net % change plus off-site surplus <small>(including all on-site & off-site habitat retention, creation & enhancement)</small>	<i>Habitat units</i>	20.94%	
	<i>Hedgerow units</i>	10.57%	
	<i>River units</i>	0.26%	
Trading rules Satisfied?		Yes ✓	

- As can be seen from the quadrat data and Metric 3.1 condition assessment presented in Annex 4, this input is incorrect.
- To correct this, we firstly need to replicate the applicant's inputs which we have done in Metric 3.1. Then, we firstly correct the condition to "good" by returning to tab A-1 of the Metric Tool. We can see below (circled red) that this now attracts a multiplier of 3 to the baseline score for this habitat.

Land at former Furtho Pits, Old Cosgrove Rd							
A-1 Site Habitat Baseline							
Condense / Show Columns				Condense / Show Rows			
Main Menu				Instructions			
Ref	Habitats and areas			Distinctiveness		Condition	
	Broad Habitat	Habitat Type	Area (hectares)	Distinctiveness	Score	Condition	Score
1	Cropland	Cereal crops	3.38	Low	2	Condition Assessment N/A	1
2	Grassland	Modified grassland	5.24	Low	2	Good	3
3	Grassland	Other neutral grassland	9.02	Medium	4	Moderate	2
4	Urban	Developed land; sealed surface	0.86	V.Low	0	N/A - Other	0
5	Heathland and shrub	Bramble scrub	0.2	Medium	4	Condition Assessment N/A	1
6	Urban	Developed land; sealed surface	0.01	V.Low	0	N/A - Other	0
7	Cropland	Cereal crops	14.25	Low	2	Condition Assessment N/A	1
8	Grassland	Modified grassland	2.77	Low	2	Good	3
9	Woodland and forest	Other woodland; mixed	0.02	Medium	4	Moderate	2
10							
11	Urban	Developed land; sealed surface	0.06	V.Low	0	N/A - Other	0
12	Urban	Developed land; sealed surface	0.01	V.Low	0	N/A - Other	0
13	Heathland and shrub	Mixed scrub	1.02	Medium	4	Moderate	2
14	Grassland	Lowland meadows	0.21	V.High	8	Fairly Good	2.5
15	Heathland and shrub	Bramble scrub	0.01	Medium	4	Condition Assessment N/A	1
16							
17	Heathland and shrub	Mixed scrub	0.94	Medium	4	Moderate	2
18	Woodland and forest	Other woodland; mixed	0.24	Medium	4	Moderate	2
19	Woodland and forest	Other woodland; mixed	0.4	Medium	4	Poor	1

6. The effect of this correction on the 'Headline Result' output, is as per the screengrab below. It can be seen that a net loss of area-based biodiversity (-0.60%) is now indicated, and furthermore that the balance of losses versus gains now fails the trading rules. Such a net loss of biodiversity fails the 'no net loss' test of NPPF 174 and 180.

On-site baseline	<i>Habitat units</i>	179.88
	<i>Hedgerow units</i>	0.00
	<i>River units</i>	0.00
On-site post-intervention <small>(Including habitat retention, creation & enhancement)</small>	<i>Habitat units</i>	178.80
	<i>Hedgerow units</i>	0.00
	<i>River units</i>	0.00
On-site net % change <small>(Including habitat retention, creation & enhancement)</small>	<i>Habitat units</i>	-0.60%
	<i>Hedgerow units</i>	0.00%
	<i>River units</i>	0.00%
Off-site baseline	<i>Habitat units</i>	0.00
	<i>Hedgerow units</i>	0.00
	<i>River units</i>	0.00
Off-site post-intervention <small>(Including habitat retention, creation & enhancement)</small>	<i>Habitat units</i>	0.00
	<i>Hedgerow units</i>	0.00
	<i>River units</i>	0.00
Total net unit change <small>(including all on-site & off-site habitat retention, creation & enhancement)</small>	<i>Habitat units</i>	-1.08
	<i>Hedgerow units</i>	0.00
	<i>River units</i>	0.00
Total on-site net % change plus off-site surplus <small>(including all on-site & off-site habitat retention, creation & enhancement)</small>	<i>Habitat units</i>	-0.60%
	<i>Hedgerow units</i>	0.00%
	<i>River units</i>	0.00%
Trading rules Satisfied?	No - Check Trading Summary ▲	

- If we go on to correct the applicant's habitat classification error in respect of the main part of the development site (i.e. the 9.02ha of what the applicant has identified as 'other neutral grassland' but which is in fact, at least in part, a representation of the Priority habitat 'Open Mosaic Habitats on Previously Developed Land'), then the scheme is shown to deliver a net loss of biodiversity that is even further from a policy compliant position.
- To do this, we first return to Tab A-1. We need to decide what proportion of this area (shown below) unequivocally qualifies as OMHPDL in the baseline state.

10. The effect of this correction and adjustment on the applicant’s calculation is that the proposed development is indicated to achieve a negative biodiversity loss figure approaching minus ten percent, as shown in the ‘Headline Results’ tab below¹.

Land at former Furtho Pits, Old Cosgrove		Return to results menu	
Headline Results			
On-site baseline	Habitat units	197.92	
	Hedgerow units	0.00	
	River units	0.00	
On-site post-intervention <small>(including habitat retention, creation & enhancement)</small>	Habitat units	178.80	
	Hedgerow units	0.00	
	River units	0.00	
On-site net % change <small>(including habitat retention, creation & enhancement)</small>	Habitat units	-9.66%	
	Hedgerow units	0.00%	
	River units	0.00%	
Off-site baseline	Habitat units	0.00	
	Hedgerow units	0.00	
	River units	0.00	
Off-site post-intervention <small>(including habitat retention, creation & enhancement)</small>	Habitat units	0.00	
	Hedgerow units	0.00	
	River units	0.00	
Total net unit change <small>(including all on-site & off-site habitat retention, creation & enhancement)</small>	Habitat units	-19.12	
	Hedgerow units	0.00	
	River units	0.00	
Total on-site net % change plus off-site surplus <small>(including all on-site & off-site habitat retention, creation & enhancement)</small>	Habitat units	-9.66%	
	Hedgerow units	0.00%	
	River units	0.00%	
Trading rules Satisfied?	No - Check Trading Summary ▲		

11. It should be stressed that these adjustments stop short of the wholesale correction of the applicant’s BNG calculation that, on the basis of our own site visit, are necessitated. For example, the applicant’s classification of long-established set aside in the eastern part of the site as ‘cropland’ is clearly erroneous. The above corrections merely serve at this stage to demonstrate to the LPA and interested parties that the applicant’s BNG calculation and its positive ‘net gain’ output is wholly unrepresentative of the real impact of this scheme on local biodiversity, and to demonstrate that the proposals as they currently stand are not compliant with NPPF 174 and 180, nor indeed local adopted and emerging policy.

¹ If the whole of the area with OMHPDL features were classed as this habitat, the net loss figure would double to around -17%.