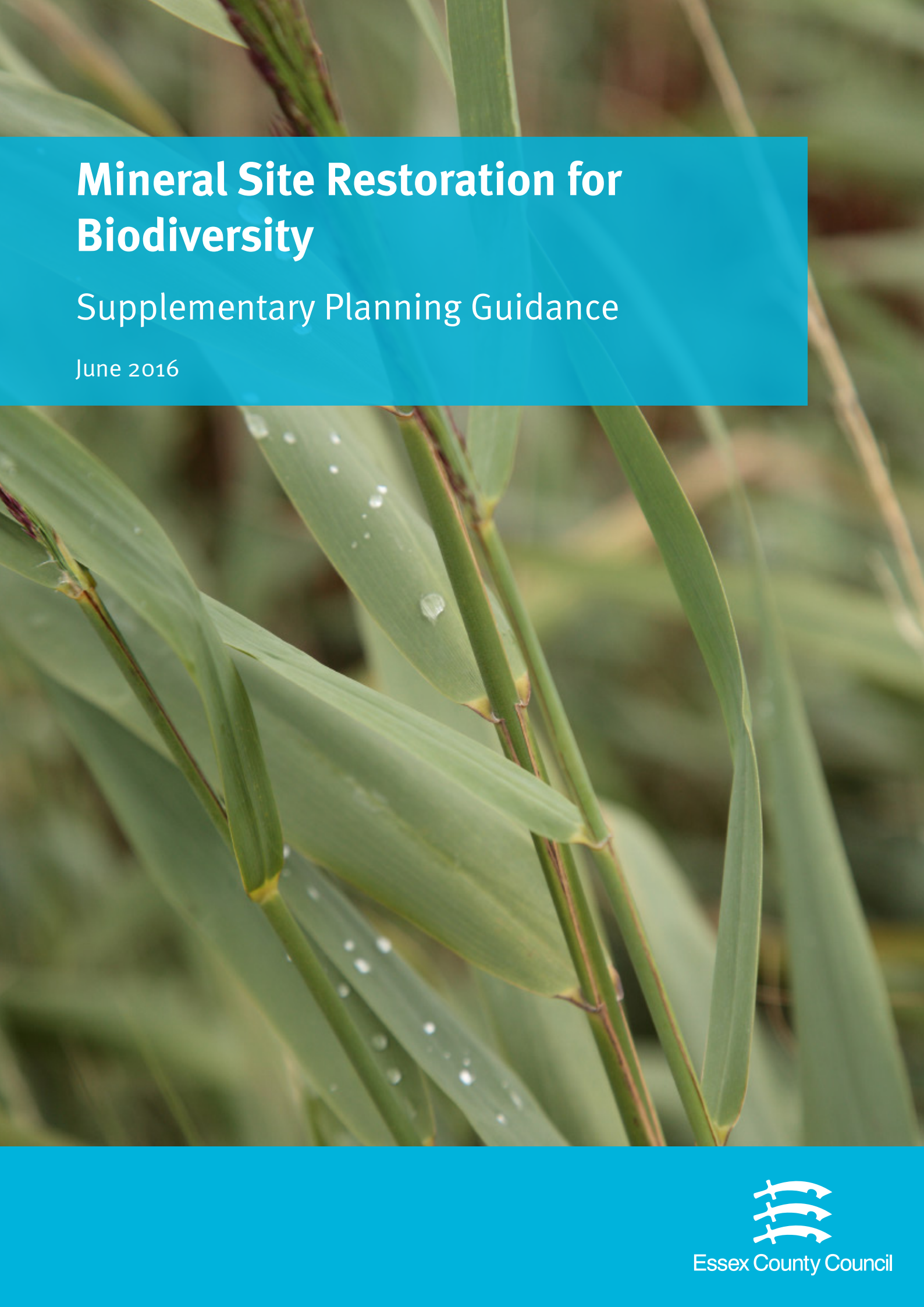

Mineral Site Restoration for Biodiversity

Supplementary Planning Guidance

June 2016

Essex County Council

Contents

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Summary

Sustainable development lies at the heart of the National Planning Policy Framework 2012 and is seen as a golden thread running through both plan-making and decision-taking. Biodiversity is an essential component of sustainable development and minerals restoration can play an important role enhancing it.

Supplementary Planning Guidance is produced to supplement local plan policies and provide further details on how the policies should be interpreted or applied in practice. This is useful where the level of detail exceeds what would appropriate for a development plan.

The Mineral Site Restoration for Biodiversity, Supplementary Planning Guidance (SPG) supports the Minerals Local Plan, which established a 'Target' for the creation of 200 hectares (ha) of new habitat considered a 'Priority' for conservation action by the Essex Biodiversity Project[1]. Specifically, the role of the SPG is to:

- Implement Policy S12 'Mineral Site Restoration and After-Use'.
- Establish a masterplan framework for 'Flagship Schemes'.
- Identify the detailed policy approach to habitat creation at mineral sites generally.

The SPG has been developed through a process of consultation and engagement with a wide-range of stakeholders including a Technical Advisory Group comprised of Natural England, RSPB, Nature After Minerals, Buglife, Essex Wildlife Trust, the Essex Biodiversity Project and the Minerals Products Association.

The SPG provides detailed advice and guidance about 'Biodiversity Enhancement and Habitat Creation' to help site operators make successful applications.

Implementation of the **Priority Habitat Creation Target** will ensure the Mineral Local Plan achieves a net-gain in biodiversity through making a substantial contribution to the Essex Biodiversity Action Plan and England's Biodiversity Strategy. Furthermore, it demonstrates that the Minerals Planning Authority has responded positively to the 'biodiversity duty' placed upon it by the 2006 Natural Environment and Rural Communities Act.

1 www.essexbiodiversity.org.uk

Structure of the Mineral Site Restoration for Biodiversity SPG

The Mineral Site Restoration for Biodiversity Supplementary Planning Guidance is split into five parts:

- **Part I** 'sets-the-scene' and explains how the SPG was developed, who we worked with and the rationale that underpins it;
- **Part II** describes the information that is required to help make a successful application;
- **Part III** presents indicative restoration plans for the five Flagship Schemes and explains the approach used to identify them;
- **Part IV** provides detailed guidance about design, maintenance and monitoring for the 6 priority habitats; and finally
- **Part V** includes supporting technical information and a glossary of terms.

PART I
SETTING THE SCENE

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PART I
1.0 Background

1.0 Background

1.1 Introduction

1.1.1 Essex County Council is the Minerals and Waste Planning Authority (MPA) for Essex. The County Council has a statutory responsibility to plan for future minerals supply and waste management, and to determine mineral and waste planning applications. It is fulfilling this responsibility by preparing separate Minerals and Waste Local Plans to support the achievement of sustainable development within the County.

1.2 Relationship to the Essex Minerals Local Plan

1.2.1 Adopted in July 2014, the Essex Minerals Local Plan provides a clear policy framework for all parties involved in future minerals and minerals related development as it provides a picture of how the Council see minerals development in the County taking place up to 2029, the steps needed to make this happen and the measures necessary to assess progress along the way.

1.2.2 The MLP is a positive 'spatial plan' that aims to deliver sustainable development. It has a central role in supporting economic growth in the County through the delivery of land, buildings and infrastructure. At the same time it ensures positive steps are taken to protect and enhance the County's unique natural, historic and environmental assets. It also has a key role to play in supporting the strong, vibrant and healthy communities in Essex to make them sustainable for the future.

1.2.3 The Mineral Site Restoration for Biodiversity Supplementary Planning Guidance adds further detail to the policies in the Local Plan, specifically S12 'Mineral Site Restoration and After-Use'. It provides further details on how the policy should be interpreted or applied in practice. This is a useful tool where the level of detail required would exceed that which would be appropriate for a development plan. The SPG will help applicants make successful applications and aid green infrastructure delivery. Supplementary planning guidance is capable of being a material consideration in planning decisions, but is not part of the development plan.

1.3 Flagship Schemes

1.3.1 The MLP identified five Flagship Schemes that represent those preferred and reserve sites considered to offer the greatest opportunity to deliver beneficial biodiversity after-use.

1.4 Other Development

1.4.1 The guidance in the SPG applies to all minerals development not just that associated with Flagship Schemes. All minerals development has the capacity to achieve a net-gain for biodiversity and contribute to the Priority Habitat Creation Target. Therefore, we would expect applicants to identify opportunities to integrate, where appropriate, the creation of Priority Habitats into their restoration.

1.4.2 However, it is recognised that whilst most minerals sites could support the creation of one or (on larger sites) more of the six identified Priority Habitat types; there may be instances where the creation of other Priority Habitats is more suitable due to the nature of the underlying geology, hydrological regime and/or character of surrounding habitats; or because they are more compatible with the proposed after-use. For example, where restoration is more likely to take place to that of commercial agriculture the creation of ponds, hedgerows and arable margins may be more appropriate.

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PART I
2.0 Supporting Biodiversity Conservation in Essex

2.0 Supporting Biodiversity Conservation in Essex

2.1 Introduction

2.1.1 The State of Nature Report [2] provides quantitative assessments of the population or distribution trends of 3,148 species. Of these, 60% have declined over the last 50 years and 31% have declined strongly. Half of the species assessed have shown strong changes in abundance or distribution, indicating that recent environmental changes are having a dramatic impact on the UK's wildlife.

2.1.2 There is also evidence to suggest that species with specific habitat requirements (i.e. those associated with Priority Habitats) are faring worse than generalist species (i.e. those associated with conventional farmland areas) that are better able to adapt to a changing environment.

2.1.3 Whilst there is no similar systematic account of the wildlife in Essex, it can be assumed that UK trends are replicated locally. Therefore, the Target to create new large areas of Priority Habitat through minerals restoration represents a significant contribution to both national and local efforts helping to reverse declines in wild plants and animals.

2.2 Vision

2.2.1 Biodiversity is key to the survival of life on Earth. Its loss deprives future generations of irreplaceable genetic information and compromises sustainability. Recent National Ecosystem Assessments[3] show just how much nature provides for people. For example, the enormous value of inland wetlands to water quality; the value of pollination to agriculture; the health benefits of experiencing nature; and, not least, how nature and wildlife enrich our lives.

2.2.2 The Council's vision is to make the Essex Minerals Local Plan a national exemplar for sustainable development. It will deliver significant long-term benefits for wildlife and people transforming intensive agricultural land to wildlife-rich habitats through positive planning of minerals development.

2.2.3 The guidance set-out in this SPG will ensure the Essex Mineral Local Plan assists in achieving a net-gain biodiversity.

(2) http://www.wildlifetrusts.org/publications#state-of-nature
(3) http://uknea.unep-wcmc.org

2.3 Contribution to Biodiversity Conservation in Essex

2.3.1 The relative contribution that biodiversity restoration schemes can make towards conserving scarce wildlife habitat is considerable. The 200 ha of land targeted for Priority Habitat creation within the MLP represents approximately 0.06% of the county's agricultural resource, but would represent a 1% increase in the land currently protected for wildlife; i.e. land designated as a Site of Special Scientific Interest (SSSI) or Local Wildlife Site (LWS).

2.3.2 If small (<20 ha in size) and coastal wildlife sites are omitted the importance of minerals restoration for biodiversity is greater still, and the 200 ha would represent a 2% increase in land managed primarily for wildlife in Essex. The creation of large sites is significant since bigger sites are generally more valuable for biodiversity. Survival in small isolated sites is difficult for many species especially in the long term. Large sites are more resilient and are more able to resist or recover from disturbance and damages caused by natural influences and human activity (e.g. climate change, pollution and invasive species)[4].

2.3.3 The SPG supports the Living Landscapes initiative[5]. Living Landscapes were developed by Essex Wildlife Trust in collaboration with a range of stakeholders as part of the Essex Local Area Agreement (2008-2011). Over 80 sites have been mapped highlighting the best landscapes for wildlife in the county and/or areas with significant potential to deliver biodiversity enhancements.

2.3.4 The Living Landscapes vision is to restore, recreate and reconnect wildlife habitats (including SSSIs, Local Wildlife Sites and Nature Reserves) so that the species living within them can move through the landscape more easily, and continue to survive and thrive long into the future. Living Landscapes are not only focused on wildlife they also seek to strengthen links with the people and businesses within them. Living Landscapes have been adopted within a number of district and borough authority spatial plans; and they have helped inform the identification of Flagship Schemes within this SPG.

2.4 Working in Partnership

2.4.1 The Target compliments national initiatives such as 'The Nature After Minerals Programme'[6] , which has established the benefits of wildlife restoration for local communities, as well as the financial 'value' of biodiversity after-uses to site owners themselves. Essex represents one of six counties in the UK specifically identified by the Nature After Minerals Programme as offering the greatest potential for the creation of Priority Habitats through the minerals planning system[7].

4 Biodiversity 2020: A strategy for England's wildlife and ecosystem services, Defra, 2011
5 http://www.essexwt.org.uk/living-landscapes
6 http://www.afterminerals.com
7 http://www.afterminerals.com

2.4.2 The Target seeks to work with the minerals industry to connect its own commitment to enhancing the natural environment[8] with the conservation priorities of the Council's partners as expressed in the second Essex Biodiversity Action Plan[9] (EBAP) published in 2011 by the Essex Biodiversity Project.

2.4.3 The EBAP - first published in 1999 - represents a list of national 'Priority Habitats' most in need of conservation action in the county. The EBAP sets targets for the creation of new areas of each habitat. The targets in the second EBAP were developed by the Essex Biodiversity Project in 2012 and adopted and approved by the Steering Group in 2013. The members of the Steering Group are shown in the box below.

Box 2.1: Members of the Essex Biodiversity Project Steering Group at the time of EBAP adoption (2013)

Basildon Borough Council	Farming and Wildlife Advisory Group
Brentwood Borough Council	Harlow Council
Chelmsford City Council	Natural England
Environment Agency	Maldon District Council
Essex and Suffolk Water	RSPB
Essex County Council	The Conservation Volunteers
Essex Field Club	Uttlesford District Council
Essex Wildlife Trust	

2.4.4 The Mineral Site Restoration for Biodiversity Supplementary Planning Guidance has been completed by the Council with assistance from relevant site operators together with specialist input from the following organisations:

- **Natural England**
  Natural England is the government's advisor on the natural environment. Providing practical advice on how best to safeguard England's natural wealth for the benefit of everyone. Its remit is to ensure sustainable stewardship of the land and sea so that people and nature can thrive. It has a responsibility to see that England's rich natural environment can adapt and survive intact for future generations to enjoy. Natural England work with farmers and land managers, business and industry, planners and developers, national and local government

8 See the Mineral Products Association's Biodiversity Strategy. Available on their website: www.mineralproducts.org

9 Available on the Essex Biodiversity Project website: www.essexbiodiversity.org.uk

interest groups and local communities to help them improve their local environment.

- **Minerals Products Association (MPA)**
  The Mineral Products Association (MPA) is the trade association for the aggregates, asphalt, cement, concrete, dimension stone, lime, mortar and silica sand industries. It has a growing membership of 480 companies and is the sectoral voice for mineral products. MPA membership is made up of the vast majority of independent Small and medium-sized enterprises (SMEs) throughout the UK, as well as the 9 major international and global companies.

- **Nature After Minerals (NAM)**
  The Nature After Minerals Programme is a partnership between Natural England and the RSPB, with support from the Mineral Products Association and the British Aggregates Association. The organisations work with mineral planners and industry to help nature during and after minerals extraction.

- **Buglife (The Invertebrate Conservation Trust)**
  Buglife is an organisation devoted to the conservation of all invertebrates. Buglife's aim is to halt the extinction of invertebrate species and to achieve sustainable populations of invertebrates.

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PART I
3.0 The Priority Habitat Creation Target

3.0 The Priority Habitat Creation Target

3.1 Introduction

3.1.1 The Target focuses on six Priority Habitats considered by the Council and its partners to be the most appropriate for minerals after-use in Essex. It seeks the creation of 200 hectares of new Priority Habitat as part of restoration schemes approved within the Minerals Local Plan period.

3.2 Target for each Priority Habitat

3.2.1 The Target is broken down by habitat (see **Table 3.1**). Individual targets are linked to those in the corresponding Habitat Action Plans of the EBAP. They have been further developed to reflect agricultural land classification, geological, hydrological and landscape information gathered about preferred sites during the Strategic Ecological Assessment process[10] . The targets were adopted following consultation with the Essex Biodiversity Project Steering Group in 2013.

Table 3.1: Habitat Creation Targets for each Priority Habitat

Priority Habitat Name	Essex Biodiversity Action Plan Target	MLP Habitat Target
Coastal and Floodplain Grazing Marsh	250 ha	20 ha
Lowland Heathland & Lowland Dry Acid Grassland (The two habitats are encompassed in a joint Action Plan in the EBAP)	20 ha	60 ha
Lowland Meadows	50 ha	35 ha
Open Mosaic Habitats on Previously Developed Land	There is no figure for the 'creation' of new habitat, only a target to achieve optimum biodiversity condition for 1,214 ha (70%) of the Essex resource.	35 ha
Reedbeds	100 ha	50 ha
Total	**420 ha**	**200 ha**

10 See Appendix 3: ECC Ecology Assessment Methodology of the Replacement Minerals Local Plan: pre-submission draft Site Assessment Report November 2012

3.3 Target for each Flagship Scheme

3.3.1 The Target is to be primarily achieved through a minimum of five 'Flagship Schemes' where a significant proportion (between 25%-100%) of the site area will aim to be restored primarily for biodiversity, together with the integration of the Priority Habitats into other restoration schemes where different after-uses are likely to predominate.

3.3.2 The Flagship Schemes represent those preferred and reserve sites considered to have the greatest potential to deliver beneficial biodiversity after-use. The selection criteria used to identify them is discussed further in **Section 2 Part III** of the SPG.

3.3.3 **Table 3.2** provides an indication of the likely date that biodiversity restoration will be completed at each Flagship Scheme. With the exception of two sites, one at Birch and another which forms part of the Bradwell Scheme, the majority of the Target will be delivered within the plan period.

Table 3.2: Flagship Schemes

MLP Ref.	Location	Estimated date of completion for biodiversity restoration [11]
A3-A7	Bradwell, Rivenhall	A3-5 2029 (28 hectares) A6 & A7 (22 hectares) are allocated as 'reserve sites'
A9	Broadfield Farm, Rayne	2029
A46	Colemans Farm	2028
A31	Maldon Road, Birch	2029
A20	Sunnymead, Alresford	2029

11 The estimated dates have been provided by site operators as part of the 'call for sites' and maybe liable to change.

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PART I
4.0 Policy Context

4.0 Policy Context

4.1 Introduction

4.1.1 This section provides an account of the key policies and legislation that underpin the Priority Habitat Creation Target.

4.1.2 The Essex Minerals Local Plan (MLP) states that:

> "All mineral site restoration should provide a net-gain in biodiversity and contribute towards establishing a coherent and resilient ecological network through the creation of priority habitat, integrating with landscape-scale conservation initiatives where appropriate. In order for ECC as the MPA to be compliant with the 'duty' placed upon it by the Natural Environment and Rural Communities Act 2006. The Plan proposes an ambitious target for the creation of a minimum of 200 ha of Priority Habitat Creation in Essex from the Preferred and Reserve Site allocations. Six Priority Habitats have been selected reflecting local conservation priorities as well as the geological and hydrological character of the Preferred and Reserve Sites."

4.1.3 Policy S12 of the MLP 'Mineral Site Restoration and After-Use' confirms that:

> "Mineral extraction sites shall provide biodiversity gain following restoration, demonstrating their contribution to Priority Habitat Creation and integration with local ecological networks".

4.2 National Planning Policy Framework

4.2.1 Paragraphs 109 and 143 of the NPPF state:

> [Para. 109]
>
> "The planning system should contribute to and enhance the natural environment by: Minimising impacts on biodiversity and providing net gains in biodiversity where possible, contributing to the Government's commitment to halt the overall decline in biodiversity [see England's Biodiversity Strategy below], including by establishing coherent ecological networks that are more resilient to current and future pressures…"

[Para. 143]

"In preparing [Minerals] Local Plans, local planning authorities should:
….put in place policies to ensure worked land is reclaimed at the earliest opportunity, taking account of aviation safety, and that high quality restoration and aftercare of mineral sites takes place, including for agriculture (safeguarding the long term potential of best and most versatile agricultural land and conserving soil resources), geodiversity, biodiversity, native woodland, the historic environment and recreation."

4.2.2 The NPPF establishes what this means in more detail in the following paragraphs:

[Paragraph 114]

"Local planning authorities should:
Set out a strategic approach in their Local Plans, planning positively for the creation, protection, enhancement and management of networks of biodiversity and green infrastructure…"

[Paragraph 117]

"To minimise impacts on biodiversity and geodiversity, planning policies should:
…promote the preservation, restoration and re-creation of priority habitats, ecological networks and the protection and recovery of priority species populations, linked to national and local targets…"

4.2.3 The National Planning Policy Guidance provides the following advice:

[Paragraph 037]

"When should site restoration and aftercare be considered?
The most appropriate form of site restoration to facilitate different potential after uses should be addressed in both local minerals plans, which should include policies to ensure …… that high quality restoration and aftercare of mineral sites takes place, and on a site-by-site basis following discussions between the minerals operator and the mineral planning authority"

4.3 The Natural Environment and Rural Communities Act 2006

4.3.1 Section 40 (S40) of the Act requires all public bodies to have regard to biodiversity conservation when carrying out their functions.

4.3.2 Section 41 (S41) of the Act requires the Secretary of State to publish a list of

habitats and species which are of **principal importance for the conservation of biodiversity** in England. The list is drawn up in consultation with Natural England, as required by the Act.

4.3.3 Natural England and Defra (Department for Environment, Food & Rural Affairs) state that the S41 list should be used to guide public bodies, including local planning authorities, in implementing their duty under S40 of the The Natural Environment and Rural Communities (NERC) Act.

4.3.4 56 habitats of principal importance are included on the S41 list. These are the habitats in England that were identified as requiring action in the **UK Biodiversity Action Plan (UK BAP)** and continue to be regarded as conservation priorities in the subsequent UK Post-2010 Biodiversity Framework[12].

4.3.5 Habitats of principal importance are referred to as **'Priority Habitats'** in the NPPF and this is the term used throughout the rest of this Supplementary Planning Guidance.

4.4 England's Biodiversity Strategy

4.4.1 In August 2011 Defra published: "Biodiversity 2020: A Strategy for England's Wildlife and Ecosystem Services[13]".

4.4.2 Biodiversity 2020 sets out how the quality of England's natural environment will be improved up to the year 2020, and develops policies introduced in the Natural Environment White Paper[14] (published in June 2011). It also represents the government's response to international commitments agreed at the 2011 UN Convention on Biological Diversity[15]. The strategy provides a detailed road map to halt the loss of biodiversity by 2020 and to strengthen and enhance ecosystem services. The importance of ecosystem services was highlighted in the UK National Ecosystem Assessment[16] also published in June 2011.

4.4.3 The mission for the strategy is: "to halt overall biodiversity loss, support healthy well-functioning ecosystems and establish coherent ecological networks, with more and better places for nature for the benefit of wildlife and people".

12 http://www.naturalengland.org.uk/ourwork/conservation/biodiversity/protectandmanage/ukactionplan.aspx
13 Available on the Government's website: www.gov.uk
14 Available on the Government's website: www.gov.uk
15 Aichi Biodiversity Targets (http://www.cbd.int/sp/targets)
16 http://uknea.unep-wcmc.org

4.4.4 To do this, the strategy has focused on four main themes:

- Theme 1 - A more integrated large-scale approach to conservation on land and at sea.
- Theme 2 - Putting people at the heart of biodiversity policy.
- Theme 3 - Reducing environmental pressures.
- Theme 4 - Improving our knowledge.

4.4.5 It has established a commitment to increase the overall extent of **Priority Habitat by 200,000 hectares**.

> Priority Action 1.1 of Theme 1 is to: *"Establish more coherent and resilient ecological networks on land that safeguard ecosystem services for the benefit of wildlife and people"*.

The Strategy expresses the Government's ambitions under this action as "better, bigger and more joined-up"[17] and summarises its aspirations for each as follows:

- **Better**: we will improve the quality of Priority Habitat both within and outside protected sites…
- **Bigger**: we will increase the size of remaining areas of Priority Habitat where appropriate
- **More**: we will **create new areas of Priority Habitat** where appropriate
- **Joined**: we will **enhance ecological connections** between, or join up, existing areas of Priority Habitat, increasing opportunity for wildlife to move around the landscape by making use of stepping stones, corridors and other features."

4.4.6 The Strategy refers to the importance of landscape-scale approaches to ecological restoration such as the Wildlife Trust's Living Landscapes[18]. Essex Wildlife Trust's Living Landscape map of the county has been used to inform the selection of Flagship Schemes targeted for biodiversity restoration.

17 The phrase was first used in Making Space for Nature: a review of England's wildlife sites and ecological network (2010). www.gov.uk

18 http://www.essexwt.org.uk/living-landscapes

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PART II
GUIDANCE FOR MAKING A SUCCESSFUL APPLICATION

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PART II
1.0 Information Requirements

1.0 Information Requirements

1.1 Introduction

1.1.1 This section describes the information required by the Minerals Planning Authority to help operators make a successful application. It should be read in conjunction with the Essex Biodiversity Validation Checklist[19]; which describes the information required by the minerals and waste planning authority for major developments.

1.1.2 The guidance set out in this SPG applies to **all** applications for minerals development submitted to the Minerals and Waste Planning Authority not just those sites identified as 'Flagship Schemes'.

1.2 Biodiversity Enhancement Plan

1.2.1 A long-term Biodiversity Enhancement Plan (BEP) would be provided as part of any planning application for a restoration scheme at a Flagship site. It would need to cover a period of no less than 25 years (commencing from the first year of statutory aftercare). **Box 1.1** details what a BEP should include.

1.2.2 A BEP should also be provided for all other minerals developments where:

- There is likely to be significant harm to biodiversity that will require substantive **mitigation** or **compensation**.
- A stated aim of the development is to achieve a beneficial biodiversity after-use and deliver substantive **enhancements** for the natural environment.

The BEP should make a clear and auditable distinction between mitigation, compensation and enhancement measures.

1.2.3 The BEP should allow for periodic review to reflect the cycle of Ecological Monitoring Reports (see Section 1.5).

19 www.essex.gov.uk

Box 1.1: Recommended content of a Biodiversity Enhancement Plan

i. Aims and objectives of the restoration scheme;

ii. Consistent with the requirements of the Essex Biodiversity Validation Checklist, an appraisal of the site's existing ecological value prior to extraction, and description of any necessary mitigation measures that will be incorporated into the restoration scheme to address unavoidable significant impacts to biodiversity features (such as to legally protected species) arising from the construction or operation of the quarry;

iii. Consistent with the requirements of the Essex Biodiversity Validation Checklist, a Biodiversity Offsetting Metric Calculation that expresses habitat losses and gains in Biodiversity Units[20];

iv. A description of the Priority Habitats (and associated Priority Species) targeted for enhancement and appropriate to the site with reference to conservation priorities set-out in local spatial plans such as Nature Improvement Areas or Living Landscapes;

v. A description of the specific techniques and practices for **establishing** each Priority Habitat;

vi. A description of the sources and provenance of seeds or other plant material to be used;

vii. Plans and tables that clearly show the extent, timing and location of proposed Priority Habitat **creation** works;

viii. A description of the specific management techniques and practices for **maintaining** each Priority Habitat;

ix. Plans and tables that clearly show the extent, timing and location of proposed Priority Habitat **management** operations;

x. A description of the personnel or management body responsible for carrying out the establishment and maintenance (Inc. monitoring) of the Priority Habitats during the lifetime of the BEP;

xi. A full breakdown of **costs** for implementing the BEP; and

xii. A monitoring framework that clearly describes the proposed approach to ecological **monitoring** during the lifetime of the BEP, and allows for the plan to be amended, where necessary, in light of the findings of Ecological Monitoring Reports (**Para 9.2**) *(The monitoring framework may need to include any features identified at ii. E.g. requiring long-term mitigation or compensation measures).*

20 Defra (April 2012) Technical paper: The metric for the biodiversity offsetting pilot in Eng land.

1.2.4 There is a considerable amount of national and local information available that can help prepare a successful Biodiversity Enhancement Plan. **Section 1** of **Part V** of the **SPG** provides references for the principal national guidance for each Priority Habitat, and **Box 1.2** highlights some of the key local sources of biodiversity data. These sources will help provide an understanding of the wildlife in the vicinity of the restoration site, and which should be used to guide the design and establishment process.

Box 1.2 – Sources of local biodiversity information

- SSSI Citations
  Available from Natural England's website.
  www.naturalengland.org.uk

- Local Wildlife Citations
  Available from the Essex Local Sites Partnership website.
  http://www.essexwtrecords.org.uk/LoWShome

- Biological Records (Including National & Essex Red Data Lists and Priority Species)
  Available from the Essex Field Club website. www.essexfieldclub.org.uk

- Priority Grassland Inventory for Essex (includes descriptions of Essex grassland types)
  Can be requested by going to: www.placeservices.co.uk/contact-us

- Tree Planting Palette for Essex
  Can be requested by going to: www.placeservices.co.uk/contact-us

1.3 Measuring net-gains in Biodiversity

1.3.1 The vision for the SPG is to leave a lasting positive benefit to biodiversity conservation through beneficial minerals after-use. To realise our strategic ambitions of achieving a net-gain for biodiversity, applicants should submit a Biodiversity Offsetting Metric calculation consistent with the technical guidance published by Defra. This calculation expresses habitat losses and gains in Biodiversity Units.

1.4 Ecological Monitoring Framework

1.4.1 The Minerals Local Plan has adopted a comprehensive suite of performance indicators[21] that will form the basis of the Annual Monitoring Report (AMR). Indicator number 11 'Amount of land newly restored for habitat creation' compliments Policy S12 and the 200 ha Priority Habitat Creation Target. Information for the AMR will be gathered from **Ecological Monitoring Reports** submitted to the Minerals Planning Authority.

1.5 Ecological Monitoring Reports

1.5.1 Site operators should complete Ecological Monitoring Reports to demonstrate that Priority Habitats have been successfully established and thereafter maintained. They should take the form of condition assessments and utilise the nationally recognized approach prescribed by Natural England for use as part of Higher Level Stewardship[22] and Biodiversity Offsetting[23]. The only exception is Open Mosaic Habitats on Previously Developed Land (OMH) for which no comparable assessment is available. For OMH the 'definition and criteria for field recognition of the habitat' published in the UK Priority Habitat Descriptions[24] has been adopted as the basis for the monitoring framework.

1.5.2 Ecological Monitoring Reports should need to be supplied in the 3rd, 5th, 10th, 15th, 20th and 24th year following commencement of the approved aftercare scheme.

1.6 Management Costs

1.6.1 A BEP should be fully costed to demonstrate sufficient resources are available to ensure its successful implementation over the plan period, it should cover:

- Habitat creation;
- Habitat management;
- Ecological monitoring; and
- Project management.

1.6.2 Guidance about the cost of labour, machinery and materials to undertake various agricultural activities can be found in the 'John Nix Farm Management Pocketbook'. Environment Stewardship handbooks published by Defra and Natural England can also be useful sources of indicative costs for land management operations.

21 Chapter 6 Implementation, Monitoring and Review
22 Natural England (Third Edition March 2010) Farm Environment Plan (FEP) Manual
23 Defra (April 2012) Technical paper: The metric for the biodiversity offsetting pilot in Eng land
24 UK Biodiversity Action Plan; Priority Habitat Descriptions. BRIG (ed. Ant Maddock) 2008. (Updated Dec 2011)

1.7 Security

1.7.1 To ensure the benefits to biodiversity achieved during the extended aftercare period are sustained a long-term commitment to maintain the restored land will be sought. This could take the form of a 'Conservation Covenant'* (or other suitable legal agreement) that protects the biodiversity value of the land.

**In 2014, the Law Commission made recommendations for the introduction of a new statutory scheme of conservation covenants in England and Wales including a draft Bill*[25]

1.8 Priority Habitat Technical Guidance

1.8.1 To help applicants prepare a BEP **Part IV** of the SPG provides detailed guidance on the creation, maintenance and monitoring of each Priority Habitat. This has been adapted from the 'Habitat Advice' published on the website[26] of the Nature After Minerals Programme. The original information was compiled by their national Technical Advisory Group, which comprises representatives from the Mineral Products Association, British Aggregates Association, Mineral Planning Authorities, the Environment Agency, as well as planners, geologists and land management advisors from both Natural England and RSPB.

1.8.2 The only exception is 'Open Mosaic Habitats on Previously Developed Land'. The guidance for this habitat has been based on 'The Value of Natural Regeneration' published by Buglife (The Invertebrate Conservation Trust) in 2014.

1.8.3 For each Priority Habitat the following information is provided:

- A Definition of the Priority Habitat Type[27] ;
- Design Principles;
- Establishment Techniques;
- Long-term Management Recommendations; and
- Monitoring Framework.

25 The Law Commission (LAW COM No 349) CONSERVATION COVENANTS Presented to Parliament pursuant to section 3(2) of the Law Commissions Act 1965 Ordered by the House of Commons to be printed on 23 June 2014

26 www.afterminerals.com

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

1.9 Off-site Priority Habitat Creation or Restoration

1.9.1 There may be situations where the creation of Priority Habitat on-site is not possible, or the operator/owner wishes to supplement the on-site biodiversity enhancements achieved as part of the restoration scheme. In these circumstances it would be beneficial to deliver Priority Habitat restoration inside, or within close proximity to and benefitting the conservation of, Local Wildlife Sites that are remote to the site. Preferably on adjacent land and no further than the administrative boundary of the parish in which the preferred site is located. The Biodiversity Offsetting Metric[28] shall be used to quantify such off-site enhancements.

1.9.2 Although not covered in this paper, which focuses on planning strategically to achieve 'net-gains' for biodiversity, off-site 'compensation' may also be required for sites where there are residual impacts upon biodiversity habitat arising from the initial minerals development. These will be addressed on a case-by-case basis during the development management process subject to the findings of Environmental Impact Assessment (EIA). Again, the Minerals Planning Authority would expect the use of the Biodiversity Offsetting Metric. However, it should be noted that the Offsetting Metric is not appropriate for legally protected sites and species.

1.10 Access and Priority Habitats

1.10.1 Disturbance from recreational pressure is an identified vulnerability to some Priority Habitats. Whilst the Minerals Planning Authority would encourage applicants to provide for public access within restored areas of Grazing Marsh, Lowland Heathland, Lowland Dry Acid Grassland, Reedbed and Open Mosaic Habitat, there might be conflicts with some legally protected and Priority Species and biodiversity overall. These impacts may include:

- Physical disturbance – i.e. erosion of sensitive grassland due to trampling. This could disrupt habitat connectivity and reduce the range of mobile species including reptiles;
- Indirect disturbance caused by visitor pressure could impact on uncommon bird species such as woodlark. Visitor pressure may also disrupt breeding locations, particularly for other ground nesting species including nightjar and curlew. Adults may be frightened away from their nests leaving fledglings more vulnerable to predation;
- Visitors may drop litter that could cause problems for a wide variety of wildlife;
- Where alterations to existing public rights of way are proposed or new permissive paths planned, they will need to be located away from sensitive habitats or screened by tall vegetation or through careful design of the landform; and

28 Defra (April 2012) Technical paper: The metric for the biodiversity offsetting pilot in England.

- Particularly sensitive areas may need to be fenced off with appropriate signage to restrict access and avoid damage especially where legally protected or priority species are known to be present.

Sources of Additional Guidance

- Liley, D. & Clarke, R.T. (2003). *The impact of urban development and human disturbance on the numbers of nightjar Caprimulgus europaeaus on heathlands in Dorset, England*. Biological Conservation, 114, 219-230.
- Underhill-Day, J.C.(2005). *A literature review of urban effects on lowland heaths and their wildlife*. English Nature Research Reports, No 623.
- Lake, S., Liley, D. & White, J. (2011). *New visitor infrastructure at Arne RSPB Reserve: Implications for visitor numbers and management of recreation pressure.* Footprint Ecology/RSPB.

PART II
2.0 Landscape and the Historic Environment

2.0 Landscape and the Historic Environment

2.1 Introduction

2.1.1 Well designed biodiversity restoration schemes should have consideration of the landscape in which they are located and avoid harm to the historic environment. This chapter sets-out the design principles that should be used by applicants to develop an after-use that is beneficial to the environment as a whole.

2.1.2 Mineral extraction is a temporary use of land, although on larger sites it may be a long-term activity. Sustainable mineral development aims to preserve and enhance the land's long term potential to support beneficial after-uses into the future through high standards of working and restoration.

2.2 Landscape Design

Policy Context

2.2.1 Policy S1

Presumption in favour of sustainable development, states that the Minerals Planning Authority 'will work proactively with applicants to find solutions' … 'and to secure minerals development that improves the economic, social and environmental conditions in the area'.

2.2.2 Policy S2

Policy S2 states that the strategy will (8b) provide beneficial after-use(s) that secure long lasting community and environmental benefits, including biodiversity, and (8C) protect the best and most versatile agricultural land.

2.2.3 Policy S10

Policy S10 – Protecting and enhancing the environment and local amenity. This states that applications for minerals development shall demonstrate that:

a) Appropriate consideration has been given to public health and safety, amenity, quality of life of nearby communities, and the natural, built and historic environment,

b) Appropriate mitigation measures shall be included in the proposed scheme of development, and

c) No unacceptable adverse impacts would arise and;

d) Opportunities have been taken to improve/enhance the environment and amenity.

2.2.4 The NPPF states that planning authorities should provide for site restoration and beneficial after-use at the earliest opportunity to be carried out to high environmental standards.

Restoration

2.2.5 Key factors in landscape design relating to minerals workings are landscape character, landscape pattern, landscape form, local distinctiveness, amenity, hydrology and soils.

Landscape Character

2.2.6 The proposed restoration should complement the landscape character of the area. Landscape character is assessed in the County Landscape Character Assessment[29] and in landscape character assessments at District and Borough levels. These documents together with an assessment of the site and its landscape are important in developing an understanding of the context for landscape restoration.

Landscape Pattern

2.2.7 The field pattern and its definition by hedgerows and woodlands create a pattern that contributes to the scale and character of the landscape. Sizes and shapes of fields are both important. Opportunities should be looked for to improve on the existing landscape pattern in restoration plans. Typically hedges with hedgerow trees link small woodlands in many areas of the county creating a patchwork.

29 http://www.essex.gov.uk/AnalyticsReports/CB_LCA_Essex_2002.pdf

Landscape Form

2.2.8 The landscape form consists of the proposed contours and their relationship to the existing contours of the area. The contours should be carefully designed to create the new landform. Contours should be shown at 0.5 metre intervals on proposed restoration plans and adequate sections provided to show the relationship of existing and proposed landform. Gradients should be designed to provide the right conditions for biodiversity, agriculture and amenity.

Local Distinctiveness

2.2.9 New landscape features, such as the targeted Priority Habitats, can be created which contribute to the local landscape – ponds and wetlands, native woodlands, flower-rich grasslands, heathland, hedges and ditches. These new features together with the landform and pattern will create local distinctiveness.

Amenity

2.2.10 Benefits to the local communities through improved access to the countryside by permissive paths and public rights of way and public open space should be developed where appropriate. The opportunity to connect with existing rights of way to increase access in the countryside should be explored.

Hydrology

2.2.11 Hydrological information showing water levels that will be achieved and how water levels will be regulated in low-level restoration should be used to encourage habitats to develop.

Soils

2.2.12 The retention and storage of soils on site is highly desirable to ensure satisfactory restoration. Soils are likely to be used to screen views into the site and the separation of topsoil and subsoil is essential. Calculations of soil are an important data set to ensure that there are adequate soils of the required types for restoration.

2.3 Historic Environment

Restoration

2.3.1 Inappropriate restoration, aftercare and after-use of mineral sites can have adverse impacts on the setting of heritage assets, and may significantly reduce the 'legibility' of the landscape and its historic character. However, restoration can also provide opportunities to enhance areas of the historic environment by improving the setting of historic buildings, monuments and designed landscapes; by strengthening the historic character of the landscape, and by improving accessibility of the historic

environment through interpretation and physical access. Key considerations relating to the historic environment during restoration of minerals workings include: the setting of heritage assets, the historic character of the landscape, the archaeology of the former extraction site itself, and of adjacent areas.

Setting of Heritage Assets

2.3.2 The NPPF defines the setting of heritage assets as: "The surroundings in which a heritage asset is experienced. Its extent is not fixed and may change as the asset and its surroundings evolve. Elements of a setting may make a positive or negative contribution to the significance of an asset, may affect the ability to appreciate that significance or may be neutral."

2.3.3 The extent and importance of setting is often expressed by reference to visual considerations, including views of or from a heritage asset, but the way in which people experience an asset in its setting will also be influenced by spatial associations, and by the understanding of historic relationships between places. The setting of a heritage asset can enhance its significance, whether or not it was designed to do so, and the contribution that setting makes to the significance does not depend on the ability to access or experience that setting. Understanding the significance of a heritage asset and the contribution that its setting makes to its significance, is an essential first step in guiding the formulation of restoration proposals for mineral sites, which should seek to maintain, and where possible enhance, the setting of designated heritage assets, including historic buildings, archaeological sites and designed landscapes.

2.3.4 The English Heritage publication: The Setting of Heritage Assets (2011), provides guidance on managing change within the settings of heritage assets, and should be used to assess the implications of restoration proposals for mineral extraction sites. The following broad approach to the assessment of restoration proposals on the setting of heritage assets can be applied to individual mineral extraction sites:

- Identify which heritage assets and their settings are affected by the proposals;
- Assess whether, how and to what degree these settings make a contribution to the significance of the heritage asset(s);
- Assess the effects of the proposed restoration, whether beneficial, harmful or minimising harm; and
- Make and document the decision and monitor outcomes.

2.3.5 The Essex Historic Environment Record[30] is an important source of information to support this assessment process and, will be able to provide information on the wider historic landscape context of the heritage asset, as well as on the asset itself. Landscape Character Assessment and Historic Landscape Character guidance are particularly important sources in this regard. Some designated heritage assets may have a Conservation Management Statement or full Conservation Management Plan written for them, which should include an assessment of the contribution of setting to the assets significance.

Historic Landscape Character

2.3.6 Historic Landscape Characterisation and Landscape Character Assessment can inform decision-making and enable appropriate restoration that reflects or harmonises with the historic dimension of the current rural landscape. Historic Landscape Character has been assessed in the Essex Historic Landscape Character project, and is available from the Essex Historic Environment Record, and online via the Archaeology Data Service[31] . The resulting information has, in turn, formed an important element of Historic Environment Characterisation projects in the county, which complement the Historic Landscape Characterisation with archaeological and historic building information. Good Landscape Character Assessments at District and Borough level will also include details of the historic character of key landscape elements, such as field boundaries, as well as historic management techniques e.g. coppicing of woodland. The results of archaeological investigation, undertaken in advance of, and during extraction programmes, can also provide evidence of past land use and environment.

2.3.7 These sources, together with knowledge of the extraction site and its surrounding landscape, are important in developing an understanding of the context for restoration, to inform decisions on appropriate future land use, including the creation, maintenance and management of habitats and semi-natural landscape features. Restoration and aftercare should provide the means to maintain or, in some circumstances, enhance the historic character and local distinctiveness of land and landscapes affected by mineral extraction. In areas that fall within the scope of restoration proposals, but which have not been affected by extraction, historic landscape features should be retained, strengthened and enhanced as appropriate, with decisions guided by professional judgement and the sources described above.

30 Contact enquiries@placeservices.co.uk
31 http://archaeologydataservice.ac.uk/archives/view/essex_hlc_2013/

The Historic Environment of former mineral sites and adjacent areas

2.3.8 Where possible, restoration schemes should improve the accessibility and conservation of the historic environment by interpreting the discoveries from archaeological investigations undertaken in advance of, or during programmes of mineral extraction. They can enhance geo-archaeological and geomorphological deposits through exposure and maintenance of important sections. Information on archaeological discoveries will be held on the Essex Historic Environment Record[32] . Interpretation via appropriate media can represent an important resource for both formal and informal education, where restored sites are intended to be used for recreational purposes.

2.3.9 Where areas of important below ground archaeological remains have been retained and protected during mineral extraction, or have the potential to survive around the periphery of a site, but will be included within the scope of restoration proposals, habitat creation will necessarily be limited to operations and habitat types that involve minimal or no ground disturbance e.g. lowland acid grassland or lowland meadows established through natural colonisation, or hay strewing. The impact of restoration proposals on the hydrology of an extraction area should also evaluate the potential for the presence of important waterlogged archaeological remains, and palaeo-environmental deposits surviving in adjacent areas, which may be negatively affected by desiccation resulting from changes to the hydrological regime.

32 Contact enquiries@placeservices.co.uk

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PART III
FLAGSHIP SCHEMES

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PART III
1.0 Restoration Plans for Flagship Schemes

1.0 Restoration Plans for Flagship Schemes

1.1 Introduction

1.1.1 The Minerals Local Plan expects all minerals developments to achieve a net-gain in biodiversity and contribute to the enhancement of priority habitats and the local ecological network. It specifically seeks the creation of 200 ha of 6 Priority Habitats at 5 Flagship Schemes – see **Table 1.1.**

Table 1.1: Area of Priority Habitat to be created at each Flagship Scheme

MLP Ref.	Location	Minimum area of Priority Habitat Creation at each preferred or reserve site
A3-A7	Bradwell, Rivenhall	50 ha (A3-5 'preferred sites': 28ha; A6-7 'reserve sites': 22 ha)
A9	Broadfield Farm, Rayne	50 ha
A46	Colemans Farm	20 ha
A31	Maldon Road, Birch	23 ha
A20	Sunnymead, Alresford	50 ha

1.1.2 A masterplan framework approach has been adopted and **indicative restoration plans** have been agreed with the operators of the five Flagship Schemes. These are reproduced from **Section 1.3** and show the location and extent of the Priority Habitats to be created at each site. The plans reflect the preference in the Minerals Local Plan for low-level restoration.

1.1.3 The Pre-Submission Essex and Southend Replacement Waste Local Plan (submitted to the Planning Inspectorate June 2016) identified site A20 Sunnymead as a preferred site for inert landfilling, which may lead to the area to be restored to terrestrial habitat being greater than that shown on the indicative restoration plan (see 1.3.5, page 58). However, this will have a positive biodiversity benefit since the proportion of Priority Habitats, such as Lowland Meadow, will increase relative to open water.

1.1.4 The Plans are indicative and may be subject to change in light of the findings of further detailed investigations as part of any subsequent planning application. Whilst the Minerals Planning Authority accepts the need to maintain some flexibility in determining the final mix and location of Priority Habitats, subsequent deviations should be clearly justified; and the minimum hectare requirement of Priority Habitat should strive to be implemented either as part of the approved restoration scheme, an 'offset' remote from the site or a combination of the two.

1.2 Biodiversity Offsetting at Flagship Schemes

1.2.1 As part of the Essex Biodiversity Offsetting Pilot (2012-2014)[33] the Council worked with the Minerals Products Association to explore the potential of offsetting to incentivise biodiversity-orientated after-uses. For example, site operators/owners could provide biodiversity offsets for non-mineral developments by creating appropriate Priority Habitats within their estate or through restoration schemes. Using house-building as an example, the developer would 'buy' sufficient biodiversity 'units' from the operator/owner to compensate for any residual impacts upon biodiversity at the original housing development site. The resulting income would then contribute to the costs associated with establishment and management of new Priority Habitats at the mineral restoration site.

1.2.2 It should be noted that 'Units' could only be sold to offset other types of development on land not required to deliver the minimum area of Priority Habitat Creation in accordance with this Supplementary Planning Guidance document and Policy S12 of the Mineral Local Plan. **Areas suitable for biodiversity 'offsetting'** are clearly shown on the indicative restoration plans.

1.3 Indicative Restoration Plans

1.3.1 Maldon Road, Birch

1.3.2 Bradwell, Rivenhall

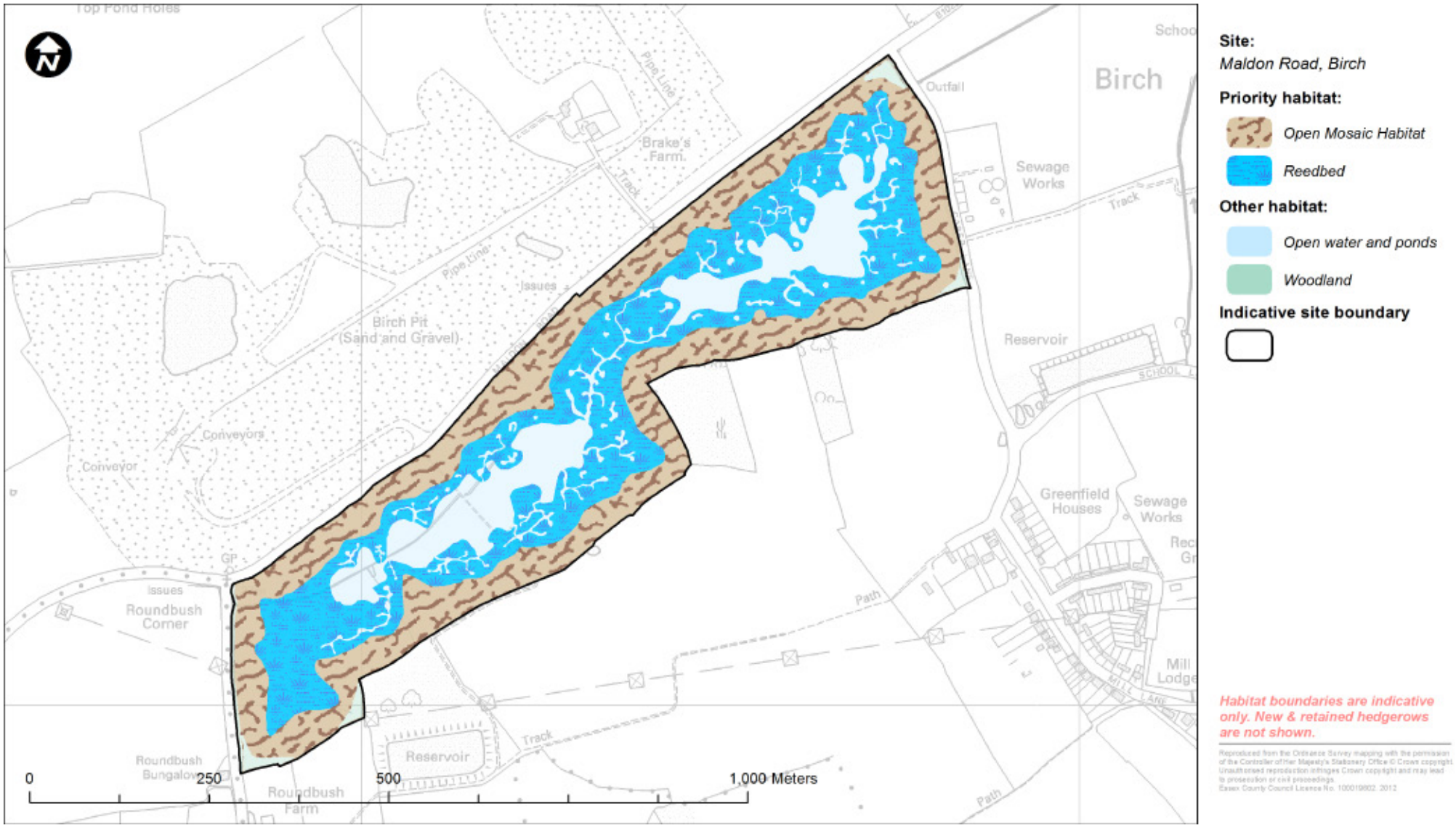
1.3.3 Broadfield Farm, Rayne

1.3.4 Colemans Farm, Witham

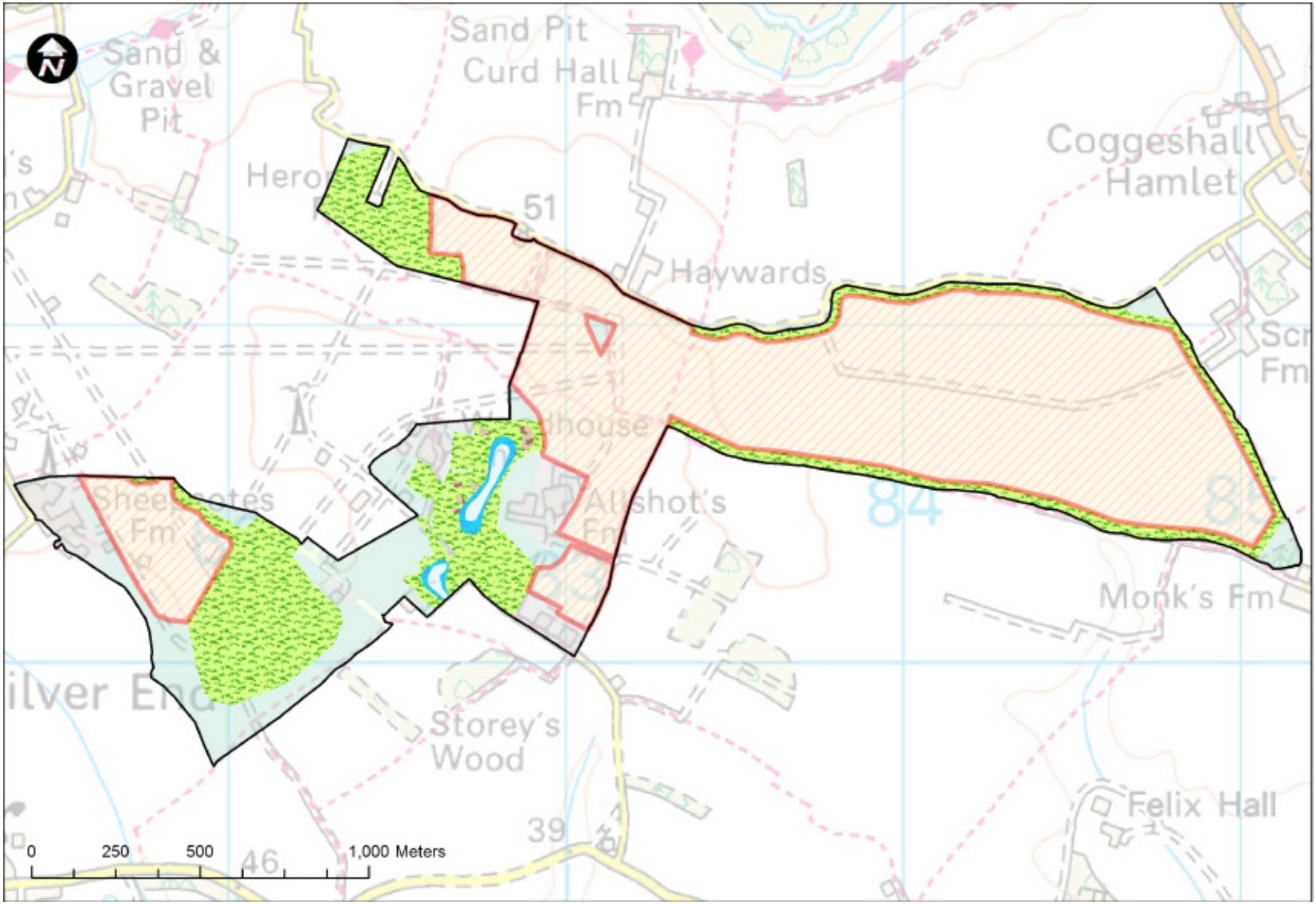
1.3.5 Sunnymead, Wivenhoe

33 https://www.gov.uk/biodiversity-offsetting

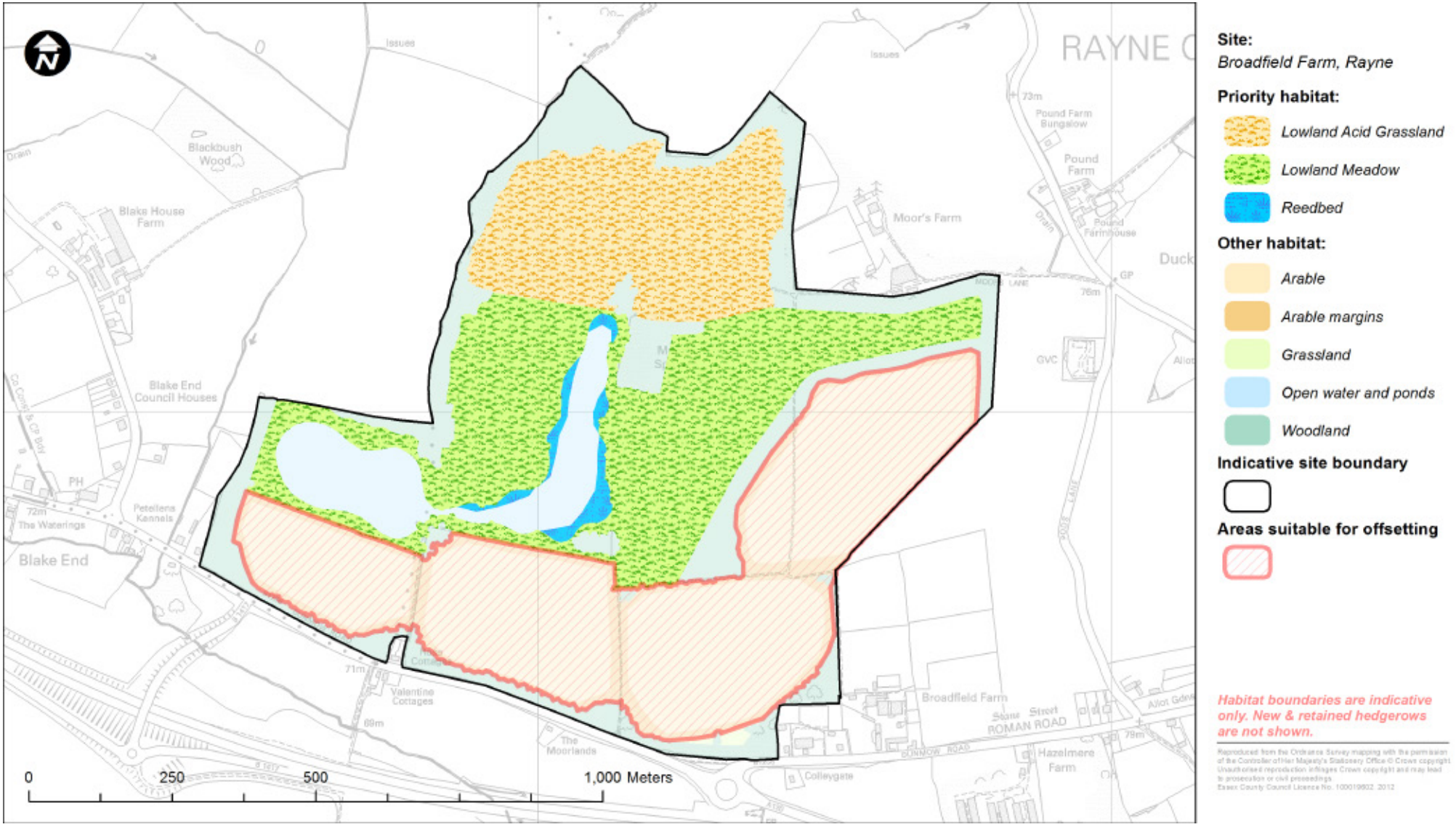
1.3.1 Maldon Road, Birch



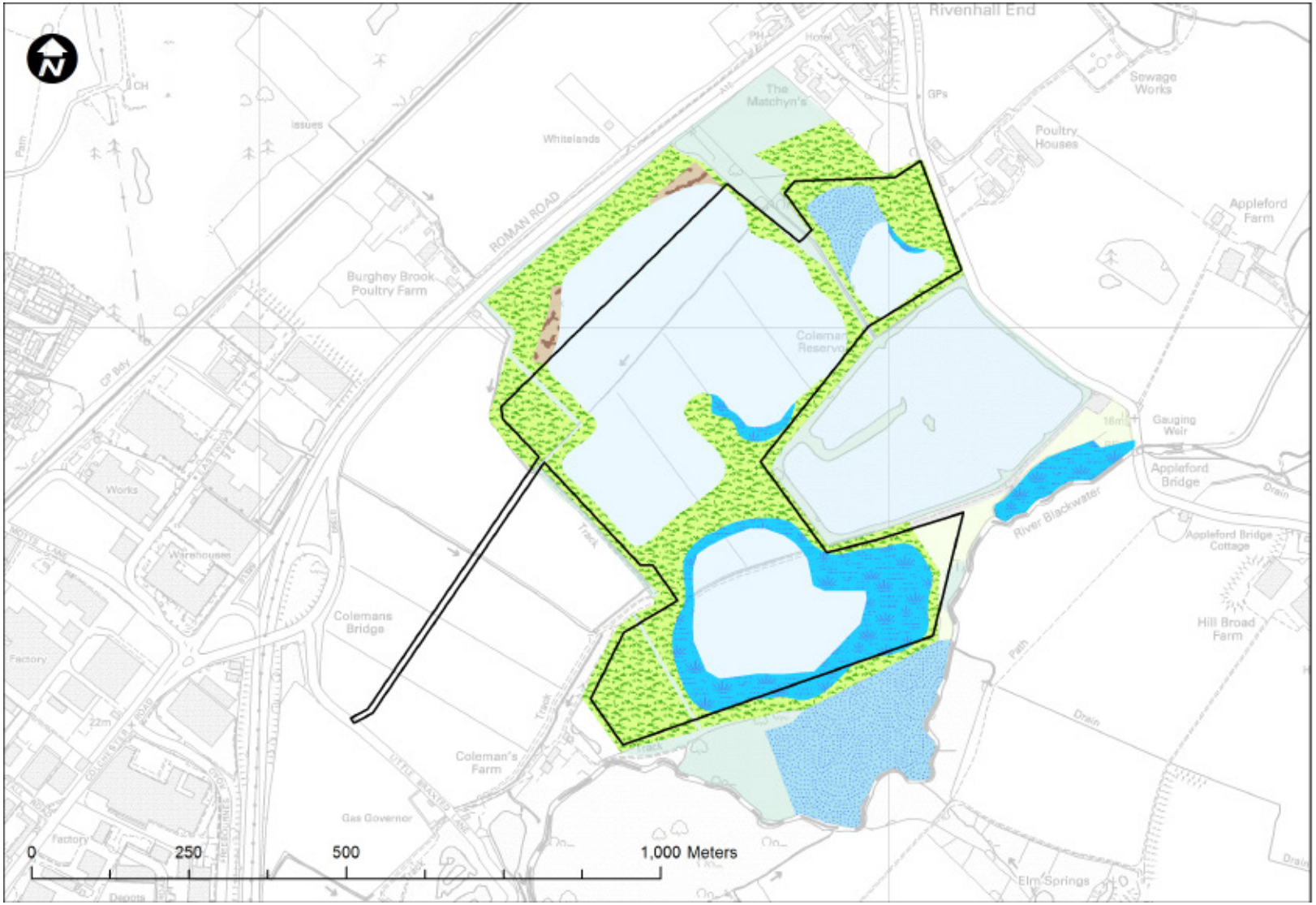
1.3.2 Bradwell, Rivenhall



1.3.3 Broadfield Farm, Rayne



1.3.4 Colemans Farm, Witham



Site:
Colemans Farm

Priority habitat:
- *Floodplain Grazing Marsh*
- *Lowland Meadow*
- *Open Mosaic Habitat*
- *Reedbed*

Other habitat:
- *Grassland*
- *Open water and ponds*
- *Woodland*
- *Other*

Indicative site boundary

Habitat boundaries are indicative only. New & retained hedgerows are not shown.

1.3.5 Sunnymead, Wivenhoe

Site:
Sunnymead, Alresford

Priority habitat:

- *Lowland Acid Grassland*
- *Lowland Meadow*
- *Open Mosaic Habitat*
- *Reedbed*

Other habitat:

- *Arable*
- *Arable margins*
- *Grassland*
- *Open water and ponds* *
- *Woodland*

Indicative site boundary

Areas suitable for offsetting

* The extent of open water may change subject to the findings of the Essex Waste Local Plan (see Para 1.1.3.)

Habitat boundaries are indicative only. New & retained hedgerows are not shown.

PART III
2.0 Selection Criteria used to select Flagship Schemes

2.0 Selection Criteria used to select Flagship Schemes

2.1 Introduction

2.1.1 The Minerals Local Plan identified 5 'Flagship Schemes' this section summarises the criteria that were used to inform the selection process.

2.2 Size

2.2.1 Bigger sites offer greater benefit to biodiversity; they are more resilient and are more able to resist or recover from disturbance and damages caused by natural influences and human activity (e.g. climate change, pollution and invasive species). [34]

2.3 Agricultural Land Classification (ALC)

2.3.1 Agricultural Land Classification data[35] obtained from Natural England was used to identify the relative cover of ALC soil grades at each preferred site. Sites with a significant proportion (25% or above) of ALC grade 3 soils are likely to provide more appropriate conditions for the establishment of Priority Habitats. They are typically less productive and more suited to biodiversity after-use; and this approach will ensure sites with higher-grade soils are safeguarded for future agricultural production.

2.4 Position in Ecological Network

2.4.1 Better joined-up wildlife sites are a key aspiration of England's Biodiversity Strategy and underpins the concept of Ecological Networks. In Essex the Ecological Network is defined by the Living Landscapes Map (see **Figure 2.1**).

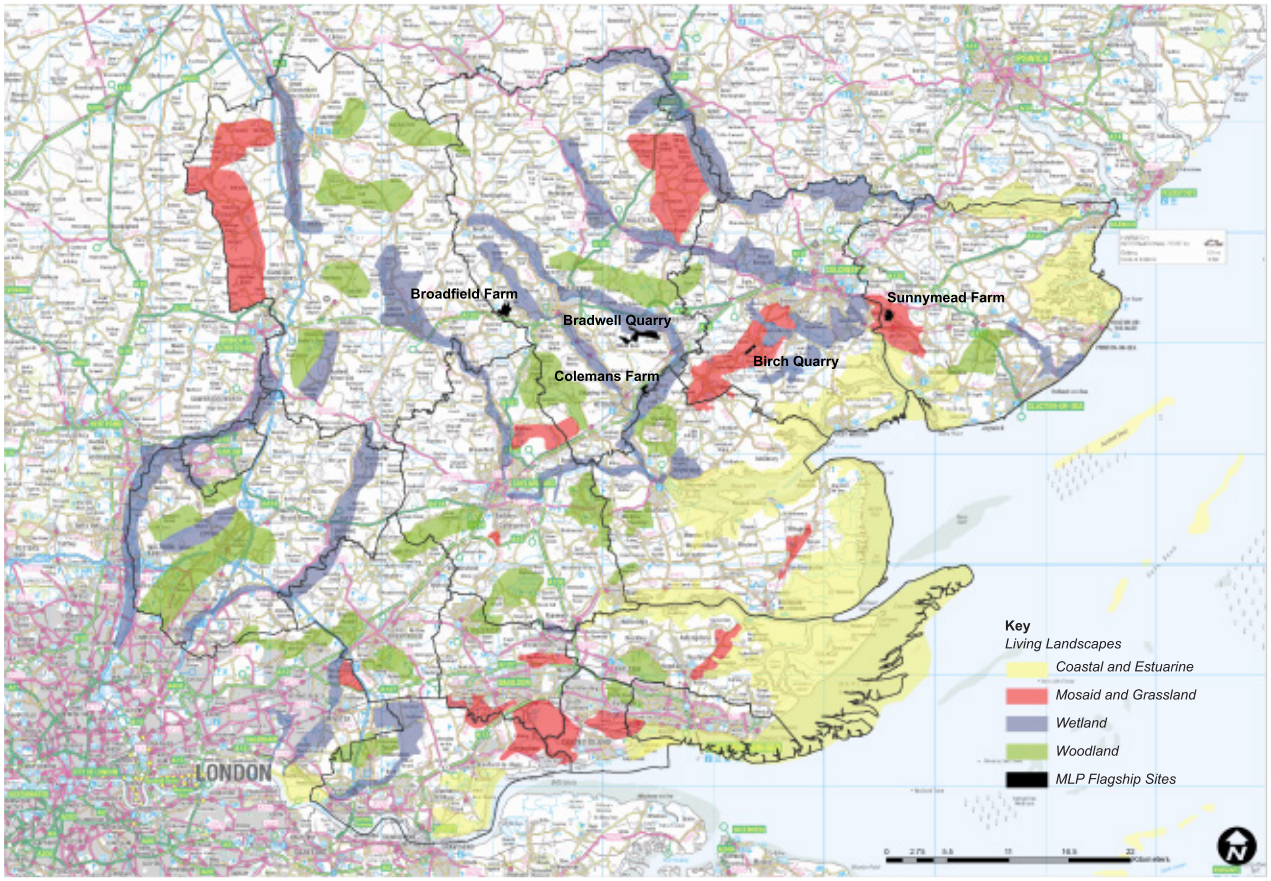
2.4.2 Living Landscapes for Essex were developed by Essex Wildlife Trust (EWT) in collaboration with a range of stakeholders as part of the Essex Local Area Agreement (2008-2011). They highlight the best landscapes for wildlife in the county and/or areas with significant potential to deliver biodiversity enhancements.

34 Size thresholds are adopted from Natural England's Accessible Natural Green Space Standards - see Report No. 526 Accessible Natural Green Space Standards in Towns and Cities: A Review and Toolkit for their Implementation

35 http://publications.naturalengland.org.uk/publication/35012

2.4.3 Living Landscapes have been adopted because they represent the best available local ecological evidence-base encompassing all administrative areas in Essex and operating at an appropriate landscape-scale.

Figure 2.1: Location of Flagship Sites in relation to the Living Landscapes Ecological Network



2.5 Proximity to Wildlife Sites

2.5.1 Restoration to biodiversity in locations with existing wildlife sites (defined as SSSI or LoWS) is beneficial for a number of reasons. Not only is colonisation of the restored site by plants and animals from neighbouring wildlife sites likely to enhance its long term biodiversity value; the restored site also has the potential to function as a protective buffer for neighbouring wildlife sites and act as a corridor or stepping stone for animals moving through the landscape.

2.6 Proposed Restoration Scheme

2.6.1 Restoration to biodiversity can be more technically challenging than other after-uses such as agricultural or open water. Restored sites also require on-going management; and the ability to secure income from conventional commercial activities such as arable farming or fishing is likely to be reduced. Therefore, initial positive commitments from site operators/owners have been considered when identifying Flagship Schemes. This information was gathered from the details submitted to the planning authority as part of the call for sites in previous consultation stages of the MLP.

PART IV
PRIORITY HABITATS

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PART IV
1.0 Coastal and Floodplain Grazing Marsh

1.0 Coastal and Floodplain Grazing Marsh

1.1 Definition

1.1.1 The Mineral Site Restoration for Biodiversity Supplementary Planning Guidance only encompasses 'Floodplain' Grazing Marsh, which is defined as periodically inundated pasture or meadow with ditches, which maintain the water levels and contain standing freshwater. The ditches are especially rich in plants and invertebrates. Almost all areas are grazed and some are cut for hay, haylage or silage. Sites may contain seasonal water-filled hollows and permanent ponds with emergent swamp communities; and may abut with Fen and Reedbed Priority Habitats.

1.1.2 The exact extent of Grazing Marsh in England is not known, but it is possible that there may be a total of 200,000 ha. Only a small proportion of this grassland is semi-natural - supporting a high diversity of native plant species (an estimated 5,000 ha in England) – the bulk has received some form of modern agricultural improvement.

1.1.3 Grazing marshes are particularly important for the number of breeding waders such as snipe, lapwing and curlew they support. Internationally important populations of wintering wildfowl also occur including Brent geese. The associated drainage channels can have significant nature conservation value, supporting uncommon aquatic plants and insects. The interest of Grazing Marshes is further increased when they form part of a mixture of other wetland habitats, such as reedbeds and open water.

Figure 1.1 – Coastal and Floodplain Grazing Marsh

1.2 Design Principles

1.2.1 Landforming should create conditions where the water-table is close to the surface for most of the year and allow for shallow flooded areas to occur during the winter months.

1.2.2 Seek to avoid flat field topography; instead develop a mixture of numerous small humps and hollows across each field. Varying micro-topography in this way creates conditions for a variety of sward heights and textures to develop. It also benefits soil-dwelling invertebrates, which are themselves food for birds including breeding waders.

1.2.3 Seek to avoid compaction when placing soil and especially when digging ditches; this can seriously affect the movement of water through the soil. In permeable soils, the water table may be controlled by adjusting the water level in the surrounding ditches and by ensuring that the ditches are closely spaced. In less permeable soils, foot drains and occasional surface inundation are necessary to manage soil wetness.

1.2.4 Hydrological regime requirements vary between different types of grazing marsh grassland. Inundation grassland types can tolerate flooding for long periods in the winter and occasionally in the spring and summer, whereas more species-rich wet grasslands will not tolerate prolonged flooding, particularly in the late spring and summer. Site-specific hydrological regimes should be developed with support from an appropriate specialist.

1.2.5 Size is an important consideration when designing grazing marsh grassland for breeding and wintering birds. They require large open areas, devoid of power lines, which can cause collisions or provide perches for predatory birds. Larger areas allow colonies of breeding waders to establish, which collectively may be more able to deter predators.

1.2.6 Human disturbance should be kept to a minimum as this can significantly reduce use by wintering and breeding waterfowl. Blocks of at least 10 ha should be open, with no surrounding trees, tall shrubs or single trees, within or on the edges as this provides perching opportunities for crows and other predators.

1.2.7 Some birds, such as barn owls, small mammals and some invertebrates, will benefit from less intensively managed swards of tall damp grassland. Small areas of tall grassland should be allowed to develop and managed by cutting on rotation every three years.

1.2.8 The initial design should consider the location and installation of the necessary infrastructure to allow successful future management. This might include:

- Access for mowing machinery or vehicles to transport livestock on site;
- Fencing and handling facilities for livestock; and
- Water pipes and troughs for livestock.

1.3 Establishment Techniques

1.3.1 Creating a floristically rich sward is not essential to achieving the desired outcomes for this Priority Habitat where the emphasis for grassland management is upon providing foraging and breeding opportunities for wading birds. However, efforts to introduce wildflowers that can tolerate regular inundation are encouraged and will be beneficial for other wildlife.

1.3.2 Weeds can be a major obstacle to successful grassland creation. Species such as common couch, broad-leaved dock, stinging nettle and creeping thistle can be very difficult to eradicate and may cause problems with sward establishment. The use of herbicides once the sward is established may be detrimental to any target plant species that have colonised or been sown. The weed burden should be reduced to a manageable level prior to establishment of the sward.

1.3.3 The control of weeds upon land adjacent to the biodiversity restoration area - from which seeds could be wind-blown – should also be undertaken where possible, particularly while the sward is establishing. Methods of reducing the weed burden are outlined in Natural England's Technical Information Note *TIN067 – Arable reversion to species rich grassland: establishment of a sown sward.*

Soil preparation

1.3.4 Where topsoil exists, soil preparation can be undertaken with agricultural techniques and machinery. Chisel ploughs will break up compacted surface layers.

1.3.5 Scarify the soil with disc harrows for natural colonisation, hay strewing or broadcast seeding.

Natural colonisation

1.3.6 Natural colonisation is most likely to produce species-rich habitats appropriate to local conditions, and will be more natural than created grassland. If natural colonisation has started, assess its development, and if a good cover is establishing there is probably no need to continue with other methods.

1.3.7 Colonisation will usually succeed where a suitable seed bank is present, or existing suitable grassland is adjacent. A suitable seed bank may survive in the

restoration topsoil if it supported the grassland type previously and was properly conserved. This can be tested for by growing samples under glass.

1.3.8 Prevent rank grass species from suppressing the establishment of new species. Where they occur, cutting and collecting, grazing or selective herbicides can be used. Early introduction of grazing, especially during the spring, has been shown to promote species diversity in new grasslands. On nutrient-poor soils, natural regeneration produces sparse but diverse floras, and may not require management for some time, especially if grazed by rabbits.

Hay strewing

1.3.9 Hay that is cut and collected, with minimal turning, from local donor sites[36] after flowering will contain seeds from many of the plants present. Most grassland species set seed between June and August. Cutting in early July should mean that most of the seeds are still attached. A second cut would catch later seeding species. Actual timing of cuts will depend on location and species composition.

1.3.10 More seed may be lost when collecting using a forage harvester than with hay making, but the choice of method will depend on the availability of machinery.

1.3.11 The hay should be spread as soon as possible after its collection to minimise seed loss during storage through composting or rot. Information on hay spreading is given in Natural England's Technical Information Note *TIN063 – Sward enhancement: diversifying grassland by spreading species-rich green hay.*

Seeding

1.3.12 Seeds may be collected from a local donor site using a brush harvester, or acquired from commercial sources – but if so, ensure the seeds have native provenance and are from a local source (see Flora Locale and Plantlife's Code of Practice www.floralocale.org). Only a restricted range of species is commercially available. These can be used as a starter sward as other species will colonise over time. Suitable seed mixes are supplied by Emorsgate Seeds[37] and a combination of EM8 – Meadow mixture for wetlands and EP1 – Pond Edge Mixture would be appropriate for the establishment of Grazing Marsh.

36 Contact the *Essex Biodiversity Project* for information about suitable donor sites.
37 www.wildseed.co.uk

1.3.13 The following method should be used to introduce seeds:

- Use a moderately fine and firm seedbed;
- Fertiliser is not required;
- Control perennial weeds before they seed: let them germinate in spring / summer and treat with glyphosate;
- Sow seed in September/October at 10-15 kg per ha depending on fertility and the urgency for green cover; and
- Encourage light at ground level by repeated cutting; this relieves competition for wildflower seedlings. Three cuts may be necessary on fertile soils, less or none at all on the poorest. Remove arisings.

1.3.14 Broadcasting is a cost effective method that uses conventional tractor-mounted spreaders. Mix with inert material such as sand to prevent seeds of different sizes sorting in the hopper. Broadcast by hand on small, steep or inaccessible areas.

1.3.15 Detailed guidance about establishing Priority Habitat grasslands from seed is provided in Natural England's Technical Information Note *TIN038 Seed sources for grassland restoration and re-creation in Environmental Stewardship.*

Using container-grown plants and plugs

1.3.16 This is only applicable for introducing uncommon species such as orchids that:

- do not grow easily from seed;
- spread vegetatively; and/or
- flower only after a number of years.

1.3.17 Plant out from September to mid-November or mid-February to early April on bare or sparsely vegetated areas, in combination with seeding or to complement natural colonisation. Keep plugs moist, dig a hole the same shape as the plugs and water in. Manage competing species by cutting above the height of the inserted plants and removing cut material.

1.3.18 Appropriate planting density depends on a variety of factors, including the species ability to spread and the density of cover in the sward, and varies between 2 and 10 plants m^2. Plantings of 5-10 species, planted in drifts covering 30-50% of an area will produce a natural effect if combined with seeding. Planting designs should reflect the natural distribution of species as much as possible.

1.3.19 Further information is provided in Natural England's Technical Information Note TIN065 Sward enhancement: diversifying grassland using pot-grown wildflowers or seedling plugs.

1.4 Long-term Management Recommendations

1.4.1 Grazing marsh grasslands are typically managed by summer grazing and/or cropping for hay, haylage or silage. Undertaking grazing at low stocking levels avoids trampling of birds nests and maintains a structured sward. Stocking rates depend on sward productivity and are best prescribed locally and reviewed at regular intervals in light of the results of Ecological Monitoring. Natural England guidance[38] suggests daily stocking levels of circa 20 Livestock Units per hectare (LU/ha) may be required in mid-summer where no grazing has occurred during the preceding winter and spring.

1.4.2 Livestock should be removed in autumn when water levels are high and returned to the site in May. Where early summer grazing isn't available, a hay-cut could be implemented in July/August, with livestock turned-out afterwards to graze the aftermath; the short turf will favour geese and ducks arriving in winter.

1.5 Monitoring Framework

1.5.1 Priority Habitat status has been achieved when all of the following apply:

- Cover of rushes is less than 40% and on the remainder the cover of grass or sedge tussocks is between 5% and 60%. (A tussock is a single plant or a clump of plants at least 15 cm wide that is more than 3 cm taller than the surrounding vegetation);
- The average sward height during April and May is between 5 cm and 15 cm, unless the land has been shut for hay. (The sward should consist of patches of taller and shorter vegetation); and
- The ground is wet between March and May (so that either: water lies continually on the surface of more than 5% of the field; or a 6-inch nail can easily be pushed into the ground on more than 10% of the field).

38 Kirkham, F, W. Mole, M. Gardner, S. M. and Wilson, D,W. (2003). *Review of Stocking Levels Recommended for Semi-natural Lowland Grasslands*. English Nature, CCW and SNH.

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PART IV
2.0 Lowland Dry Acid Grassland

2.0 Lowland Dry Acid Grassland

2.1 Definition

2.1.1 Lowland acid grassland typically occurs on nutrient-poor, generally free-draining soils with pH ranging from 4 to 5.5 overlying acid rocks or superficial deposits such as sands and gravels. It often occurs as an integral part of lowland heath landscapes, in parklands and locally on coastal cliffs and shingle. It is normally managed as pasture.

2.1.2 Acid grassland is characterised by a range of plant species such as heath bedstraw, sheep`s-fescue, common bent, sheep`s sorrel, sand sedge, wavy hair-grass, brown bent and tormentil. Dwarf shrubs such as heather can also occur but at low abundance. Lowland acid grassland often forms a mosaic with Lowland Heathland. Acid grasslands can have a high cover of bryophytes and parched acid grassland can be rich in lichens and ephemeral annual plants. Acid grassland is very variable in terms of species richness and stands can range from relatively species-poor (less than 5 species per 4m²) to species-rich (in excess of 25 species per 4m²).

2.1.3 The bird fauna of acid grassland is very similar to that of other lowland dry grasslands which collectively are considered to be a priority habitat for conservation action. Bird species of conservation concern which utilise acid grassland for breeding or wintering include woodlark, nightjar, skylark, and green woodpecker. Lowland Dry Acid Grassland also provides important habitat for reptile species including slow-worm, viviparous lizard and adder. All of which are Priority Species.

2.1.4 Many of the invertebrates that occur in acid grassland are specialist species which do not occur in other types of grassland. The open parched acid grasslands on sandy soils in particular, can support a considerable number of ground-dwelling and burrowing invertebrates such as solitary bees and wasps. A number of rare and scarce species are associated with the habitat, including many Priority Species such as the four-banded weevil-wasp.

2.1.5 As with other lowland semi-natural grassland types, acid grassland has undergone substantial decline in the 20th century although there are no figures available on rates of loss. The decline is mostly due to agricultural intensification although locally afforestation has been significant. It is estimated that less than 30,000 ha of Lowland Dry Acid grassland now remain in UK.

2.2 Design Principles

2.2.1 High species diversity is encouraged by mineral nutrient stress, which prevents domination by a few aggressive agricultural species. The most interesting communities develop by natural colonisation. It may be desirable to maintain some of these by rotational scraping of the substrate in a small-scale mosaic.

2.2.2 Restoration topsoil should only be used if it contains low available nutrients. Otherwise, seek to establish the habitat directly on the substrate. Note that for nature conservation, high productivity grassland is not desirable. When trying to create Lowland Dry Acid Grassland, soil phosphorus (P) status is critical. Where available P is high, growth of grasses and white clover is likely to be vigorous, making it difficult for wildflowers to compete. In general when attempting to create species-rich grassland the 'P index' should be: 0 or 1; a score of 2 indicates success is likely to be marginal and 3 or above unlikely.

2.2.3 Knowledge of soil total nitrogen (N) status is useful for judging the history of a field, and the likelihood of problems of low productivity. Total soil N is closely related to organic matter. Low organic matter and total N indicate long term arable cultivation. Knowledge of soil pH and inherent soil type assists with determining an appropriate seed mix and target vegetation type.

2.2.4 Soil analysis of restoration soils should be determined using the methods outlined in Natural England's Technical Information Note *TIN035 Soil sampling for habitat recreation and restoration in agri-environment schemes*. Further guidance on interpreting soil analysis results is given in Technical Information Note *TIN036 Soils and agri-environment schemes: interpretation of soil analysis.*

2.2.5 When establishing Lowland Dry Acid Grassland it is important to bear in mind that success depends on meeting a number of physical criteria:

- Lowland Dry Acid Grassland creation is only viable on acidic soils with a pH 4-5.5;
- It is important to create topography that replicates the natural landform, including variations in slope and aspect as appropriate. Retain some bare ground features where possible;
- Wet varieties of Acid Grassland establish where seasonal waterlogging with base poor water occurs; and
- Mire vegetation develops where waterlogging is permanent.

2.2.6 The initial design should consider the location and installation of the necessary infrastructure to allow successful future management. This might include:

- Access for mowing machinery or vehicles to transport livestock on site;
- Fencing and handling facilities for livestock; and
- Water pipes and troughs for livestock.

2.3 Establishment Techniques

2.3.1 Weeds can be a major obstacle to successful grassland creation. Species such as common couch, broad-leaved dock, stinging nettle and creeping thistle can be very difficult to eradicate and may cause problems with sward establishment. The use of

herbicides once the sward is established may be detrimental to any target plant species that have colonised or been sown. The weed burden must be reduced to a manageable level prior to establishment of the sward.

2.3.2 The control of weeds upon land adjacent to the biodiversity restoration area - from which seeds could be wind-blown – should also be undertaken where possible, particularly while the sward is establishing. Methods of reducing the weed burden are outlined in Natural England's Technical Information Note *TIN067 Arable reversion to species rich grassland: establishment of a sown sward.*

Soil preparation

2.3.3 This can be undertaken with agricultural techniques and machinery on slopes shallower than 20%, and where the substrate is not too hard or stony. Chisel ploughs will break up compacted surface layers and stony ground. Sub-soiling may be needed for deeply compacted soil.

2.3.4 Prepare the soil with disc harrows for natural regeneration, hay strewing or broadcast seeding.

Natural colonisation

2.3.5 Natural colonisation is most likely to produce species-rich habitats appropriate to local conditions, and will be more natural than created grassland. If natural colonisation has already started – in accordance with the monitoring framework below - assess its development before continuing with other methods.

2.3.6 Colonisation will usually succeed where a suitable seed bank is present, or existing suitable grassland is adjacent. A suitable seed bank may exist in the restoration topsoil if it supported Lowland Dry Acid Grassland previously and was properly conserved. This can be tested for by growing samples under glass.

2.3.7 Prevent rank grass species from suppressing the establishment of new species. Where such species occur, cutting and collecting, grazing or selective herbicides can be used. Early introduction of grazing, especially during the spring, has been shown to promote species diversity in new grasslands. Natural regeneration on nutrient-poor soils produces sparse, diverse floras, so may not require management for some time, especially if grazed by rabbits.

2.3.8 Any target species 'missing' after several years (see **Box 2.1**) could be selectively introduced, but note that many species only colonise slowly under natural circumstances.

Seeding

2.3.9 Seeds may be collected from a local donor site using a brush harvester, or purchased from commercial sources – but if so, ensure the seeds have native

provenance and are from a local source (see Flora Locale and Plantlife's Code of Practice www.floralocale.org). Only a restricted range of species is commercially available. These can be used as a starter sward, other species will colonise over time.

2.3.10 The following method should be used to introduce seeds:

- Use a moderately fine and firm seedbed;
- Fertiliser is not required;
- Control perennial weeds pre-seeding: let them germinate in spring / summer and treat with glyphosate;
- Sow seed in September/October at 10-15 kg per ha depending on fertility and the urgency for green cover; and
- Encourage light at ground level by repeated cutting; this relieves competition for wildflower seedlings. Three cuts may be necessary on fertile soils, less or none at all on the poorest. Remove arisings.

2.3.11 Broadcasting is a cheap and usually suitable technique, using conventional tractor-mounted spreaders. Mix with inert material such as sand to prevent seeds of different sizes sorting in the hopper. Broadcast by hand on small, steep or inaccessible areas.

2.3.12 Detailed guidance about establishing Priority Habitat grasslands from seed is provided in Natural England's Technical Information Note *TIN038 Seed sources for grassland restoration and re-creation in Environmental Stewardship.*

Using container-grown plants and plugs

This is only applicable for introducing species that:

- do not grow easily from seed;
- spread vegetatively; and/or
- flower only after a number of years.

2.3.13 Plant out from September to mid-November or mid-February to early April on bare or sparsely vegetated areas, in combination with seeding or to complement natural colonisation. Keep plugs moist, and water in. Dig a hole the same shape as the plugs. Manage competing species by cutting them above the height of the inserted plants and removing cut material.

2.3.14 Appropriate planting density depends on a variety of factors, including the species ability to spread and the density of cover in the sward, and varies between 2 and 10 plants m^2. Plantings of 5-10 species, planted in drifts covering 30-50% of an area will produce a natural effect if combined with seeding. Planting designs should reflect the natural distribution of species as much as possible.

2.3.15 Further information is provided in Natural England's Technical Information Note *TIN065 Sward enhancement: diversifying grassland using pot-grown wildflowers or seedling plugs.*

2.4 Long-term Management Recommendations

2.4.1 Lowland Dry Acid Grasslands are typically managed by grazing (including rabbits), which can be year round if at low stocking rates. Stocking rates depend on sward productivity and are best prescribed locally and reviewed at regular intervals in light of the results of Ecological Monitoring.

2.4.2 Where grazing is not an option, or is insufficient, cutting and collecting the grass may be necessary. Do this after flowering in mid to late summer and remove arisings from site, possibly using the material to extend the habitat elsewhere as part of the phased restoration plan. Selective rotational scraping of top-soil (no more than 1-2% of the area) can help create opportunities for ephemeral annuals associated with Acid Grassland, and maintain the desired cover of bare ground.

2.4.3 Herbicide may be necessary to control bracken, and can be used to control gorse, birch and other weeds. Bracken will require application of the herbicide Asulam by prescribed methods. For others, a weed-wipe application of relevant herbicide will avoid damage to target flowering plants. Rushes may be a problem on wet or compacted soils, but are controllable by herbicide via weed-wipe or by mowing. Selective scrub removal may also be necessary to maintain the desired cover of trees and shrubs.

2.5 Monitoring Framework

2.5.1 Refer to **Section 2** of **Part V** for detailed guidance. Priority Habitat status has been achieved when:

- At least one indicator species is frequent and three are occasional (**see Box 2.1**);
- and 3 out of the following 4 criteria are met:

1. Cover of undesirable species (creeping thistle, spear thistle, curled dock, broad-leaved dock, common ragwort, common nettle, rosebay willowherb, marsh thistle, musk thistle and greater plantain) less than 5%.

2. Cover of bare ground (including localised areas, for example, rabbit warrens) less than 10%.

3. Cover of bracken less than 20% and cover of scrub and bramble less than 5%.

4. Cover of coarse grass species, such as Yorkshire-fog and cock's- foot, less than 20%.

Box 2.1 - Lowland Acid Grassland Indicator Species

bell heather
betony
bilberry
bird's-foot- trefoil
biting stonecrop
bitter-vetch
blue fleabane
buck's-horn plantain
common centaury
common rock- rose
common stork's- bill
devil's-bit scabious
harebell
heath bedstraw
heath speedwell
heather
lady's bedstraw
lichens
lousewort
milkworts
mouse-ear hawkweed
parsley pierts
pignut
rough/lesser hawkbit
sheep's sorrel
thymes
tormentil
violets
wild strawberry
wood anemone
wood sage

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PART IV
3.0 Lowland Heathland

3.0 Lowland Heathland

3.1 Definition

3.1.1 Lowland Heathland is described as a broadly open landscape on impoverished, acidic mineral and shallow peat soil, which is characterised by the presence of plants such as heathers and dwarf gorses. Areas of heathland in good condition should consist of an ericaceous layer of varying heights and structures, plus some or all of the following additional features:

- Scattered and clumped trees and scrub (including gorze);
- Areas of bare ground;
- Areas of Lowland Dry Acid grassland; and
- Small pools & ponds.

3.1.2 Lowland heathland is a dynamic habitat which undergoes significant changes in different successional stages, from bare ground and grassy stages, to mature, dense heath. These different stages often co-exist on a site. Lowland Heathland supports a distinctive assemblage of birds, reptiles, invertebrates, vascular plants, bryophytes and lichens many of which are Priority Species.

3.1.3 In terms of distinguishing between Lowland Heathland and Lowland Dry Acid Grassland, less than 25% dwarf shrub cover should be assessed as grassland, over 25% as heathland.

3.1.4 Former mineral workings can be ideal opportunities for creation. It will take several years for the full assemblage of heathland vegetation and features to develop, but a heath-like sward can be achieved in 3-5 years in favourable circumstances.

Figure 3.1 – Lowland Heathland (Tiptree Heath, Essex)

3.2 Design Principles

3.2.1 Restoration topsoil should only be used if it contains low available nutrients. Otherwise, seek to establish the habitat directly on the substrate. Note that for conservation, high productivity grassland is not desirable.

3.2.2 When establishing Lowland Heathland success will depend on meeting a number of physical criteria:

- Soil fertility must be very low. Test soils before developing detailed plans. The availability of soil phosphorous (P) is critical. This should be less than 10 mg per kg to avoid competition from weeds;
- Lowland heathland creation is only viable on acidic soils with a pH 3-5;
- Establish heathland appropriate to the local area. If inappropriate species or strains are introduced, they could permanently damage existing heathland. Source seeds and turfs from the same vegetation communities as the target community;
- It is important to create topography that replicates the natural heathland landform, including variations in slope and aspect as appropriate. Retain some bare ground features where possible;
- Wet heath establishes where seasonal waterlogging with base poor water occurs; and
- Mire vegetation develops where waterlogging is permanent.

3.2.3 Which method is used will depend on local circumstances, such as the availability of local seed material. It is very important to establish heathland and not just heather - heather may be only a relatively small part of the typical community.

3.2.4 The initial design should consider the location and installation of the necessary infrastructure to allow successful future management. This might include:

- Access for mowing machinery or vehicles to transport livestock on site;
- Fencing and handling facilities for livestock; and
- Water pipes and troughs for livestock.

3.3 Establishment Techniques

Soil preparation

3.3.1 Topsoil should only be used where it was recovered from a heathland in good condition prior to mineral extraction. Otherwise establish heathland on mineral substrates that are very low in available nutrients.

Natural colonisation

3.3.2 Natural colonisation will occur on very nutrient-poor soils, where an adjacent seed source is available. Seeds blown from adjacent heathland will be very slow to establish, as ericaceous seeds are not adapted for wind-blown dispersal. This is an appropriate method if plenty of time is available to establish the habitat.

3.3.3 Weed species (birch/pine seedlings, bracken, rough grasses) need to be kept at low thresholds. Even where only scattered ericaceous plants have established in the first few years, heathland may still develop if competition is kept low, as these plants will flower and seed within the first three to five years of life.

3.3.4 The mosaic of Lowland Dry Acid grassland, bare ground and developing Lowland Heathland that occurs in the interim can have significant wildlife benefits. Bare and sparsely vegetated ground is host to specialist early pioneer species of plants, invertebrates and birds. Maintaining bare ground habitat should therefore also be planned into the design and maintenance of the site.

Brash transfer

3.3.5 Collecting vegetation containing viable seed of a range of heathland plants is relatively cheap, non-destructive, and repeatable.

Cutting and spreading

- Prepare a relatively compact seedbed on the receptor site - any roughness will help shelter young plants from desiccating winds. A nurse crop should not be necessary on reasonably flat ground as the chopped brash shelters the seedlings;
- On the donor area, cut heath that is well grown but not old to ground level with cut and collect machinery e.g. a double-chop forage harvester – cutting then baling sheds many seeds and thereby reduces success;
- Cut between late September and late November when ripe seeds are in the capsules. Small amounts of topsoil are inevitably picked up, which imports heathland soil microbes and the mycorrhizal fungal associate that is thought to benefit establishment of ericaceous species;

- Transport the cut material to the receptor site and spread it immediately. Store if necessary in low piles to prevent heating;
- Spread the material with a clean manure-spreader. Tease apart any clods with a light harrow. Use a Cambridge roller to press seeds into the ground to promote better rooting;
- To establish a quick dense cover, spread material 1 cm deep. Approximately one hectare cut will provide for two hectares of spread. Spread more thinly for less dense cover and the material will go further; and
- Heather germination rates are variable - some germinate within six months, others over two years – wait to assess success. Mature ericaceous shrubs can produce thousands of seeds per metre square, and the new seedlings are very small.

Harvesting and sowing seed from donor sites

3.3.6 Seed harvesting is usually done by specialist contractors. It limits the number of species imported, but it does ensure good establishment of heather. Machines brush the seeds from the plants and collect them with limited damage to the vegetation. The seed is usually cleaned and heat or smoke treated to increase germination. Collection is expensive, but transport and spreading costs will be relatively low because volumes are low. Compared to other methods it will produce uniform stands of heather with limited species richness.

3.3.7 Ericaceous seeds are extremely small and light, so a nurse crop of fine grasses may be necessary on exposed areas.

Sowing commercially available seed

3.3.8 Unless local provenance can be guaranteed (see Flora Locale and Plantlife's Code of Practice www.floralocale.org) it is recommended that commercial seed is not used.

Planting out seedlings and plants

3.3.9 For Heathland, this is labour intensive and consequently expensive. Seedlings have to be collected or grown from seed, grown on, then hardened-off before transplanting. Once planted, they need plenty of care to avoid drought and suppress competition. Many thousands of plants are needed to cover even a small area. Fewer plants are needed at relatively wide spacing's, and once established they seed into, and fill, the gaps (competition will need to be managed). This method could be used to introduce 'target' species after monitoring of early regeneration.

3.4 Long-term Management

3.4.1 Establishing Heathland should be kept free from competing plants, and to keep soil fertility low. Management should avoid introducing nutrients through incorporation of organic matter from cut material.

3.4.2 Management options include:

- Light spring and early summer grazing
  Grazing can help control competing grasses. Timing of introduction is not critical, and can be left until a problem with the level of competition is identified through monitoring;
- Rabbit browsing (if intensive, can inhibit heather development)
  The heather will have a prostrate growth, which with bare ground is a valuable pioneer community for plants, invertebrates and birds like woodlark;
- Rabbit-proof fencing
  If fencing is deemed necessary, maintain for about five years until heath vegetation is established;
- Mowing and removing cuttings
  Mowing can help reduce grass dominance. The heather will survive in a prostrate form. Mowing should take place in autumn and only 1/3 of the site should be cut in any single year; and
- Rotational scraping of top-soil
  Limited clearance of 1-3% of the Heathland area can help re-start Heathland succession and maintain the desired range of age classes.

3.4.3 Herbicide may be necessary to control bracken, and can be used to control gorse, birch and other weeds. Bracken will require application of the herbicide Asulam by prescribed methods. For others, a weed-wipe application of relevant herbicide will avoid damage to heather. Rushes may be a problem on wet or compacted soils, but are controllable by herbicide via weed-wipe or by mowing. Selective scrub removal may also be necessary to maintain the desired cover of trees and shrubs.

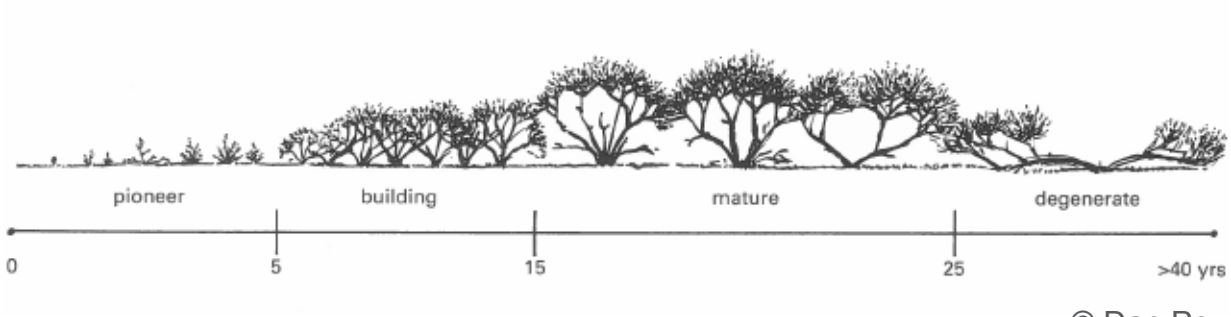
3.5 Monitoring Framework

3.5.1 Priority Habitat status has been achieved when all of the following apply:

- Cover of dwarf shrubs is between 25% and 95%, with at least two species frequent (**see Section 2 of Part V** 'How to assess whether a plant species is rare, occasional or frequent');
- There is a range of age classes of heather present, with cover of young (pioneer stage) heather between 10% and 15% and cover of old (late-mature/degenerate stages) between 10% and 30% (**see Figure 3.2**);

- Cover of undesirable species (bracken, injurious weeds and invasive non-native plants) is less than 10%; and
- Cover of trees and/or scrub is less than 15%.

Figure 3.2 – Illustration of Heather Age Classes[39] (after Gimingham (1972)



39 Reproduced from Symes N C and Day J (2003) *A practical guide to the restoration and management of lowland heathland*. The RSPB, Sandy.

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PART IV
4.0 Lowland Meadows

4.0 Lowland Meadows

4.1 Definition

4.1.1 Lowland Meadows are taken to include most forms of unimproved neutral grassland across the enclosed lowland landscapes of the UK. Not restricted to grasslands cut for hay, but also encompassing unimproved neutral pastures where livestock grazing is the main land use. On many farms in different parts of the UK, use of particular fields for grazing pasture and hay cropping changes over time, but the characteristic plant community may persist with subtle changes in floristic composition.

4.1.2 Unimproved neutral grassland habitat underwent a remarkable decline in the 20th century, almost entirely due to changing agricultural practice. It is estimated that by 1984 in lowland England and Wales, semi-natural grassland had declined by 97% over the previous 50 years to approximately 0.2 million ha. Losses continued during the 1980s and 1990s, and have been recorded at 2 -10% per annum in some parts of England. Recent conservation survey findings in Britain and Northern Ireland reveal that the impact has been pervasive, and an estimated extent of less than 15,000 ha of species-rich neutral grassland is currently believed to occur in the UK.

4.1.3 Lowland Meadows (and pastures) are associated with low-input nutrient regimes, and cover neutral grasslands that have a specialist group of scarce and declining plant species. Among flowering plants, these include Dyer`s greenweed, green-winged orchid and pepper saxifrage. Lowland Meadows and pastures are important habitats for skylark and a number of other uncommon farmland birds.

4.1.4 The overall outcome of habitat change in the lowland agricultural zone is that ‘crested dogs-tail – common knapweed’ grassland, the mainstream community of unimproved hay meadows and pastures over much of Britain, is now highly localised, fragmented and in small stands. Recent estimates for cover in England and Wales indicate that there is between 5,000 and 10,000 ha of this community in total.

4.1.5 Agricultural intensification has led to the extensive development of nutrient-demanding, productive grasslands. These are managed for grazing and also silage production, which has widely replaced traditional hay-making. Where fertiliser input is relaxed or in swards which have only been partially improved, ‘perennial rye-grass – crested dogs-tail’ grassland is common; in many respects this is intermediate between improved and unimproved lowland neutral grasslands, but has few uncommon species and is generally of low botanical value.

Figure 4.1 – Lowland Meadow (Oxley Meadow, Essex)

© Place Services

4.2 Design Principles

4.2.1 Lowland Meadows are found on moist, low fertility, mineral soils with a pH of 5-7. Former mineral workings can provide ideal opportunities for creation.

4.2.2 Topsoil should only be used if this is low in available nutrients. Otherwise, seek to establish the habitat directly on the substrate. Note that for nature conservation, high productivity grassland is not desirable. When trying to create Lowland Meadow Priority Habitat, soil phosphorus (P) status is critical. Where available P is high, growth of grasses and white clover is likely to be vigorous, making it difficult for wildflowers to compete. In general, when attempting to create species-rich grassland the 'P index' should be: 0 or 1; a score of 2 indicates success is likely to be marginal and 3 or above unlikely.

4.2.3 Knowledge of soil total nitrogen (N) status is useful for judging the history of a field, and the likelihood of problems of low productivity. Total soil N is closely related to organic matter. Low organic matter and total N indicate long term arable cultivation. Knowledge of soil pH and inherent soil type assists with determining an appropriate seed mix and target vegetation type.

4.2.4 Soil analysis of restoration soils should be determined using the methods outlined in Natural England's Technical Information Note *TIN035 Soil sampling for habitat recreation and restoration in agri-environment schemes.* Further guidance on interpreting soil analysis results is given in Technical Information Note *TIN036 Soils and agri-environment schemes: interpretation of soil analysis.*

4.2.5 With appropriate management, lowland meadows will support flower-rich grassland. This would involve hay-cutting and aftermath grazing for hay meadows and grazing only for pasture. Interesting communities develop by natural colonisation.

4.2.6 Landforming should aim to create a suitable topography to enable hay-making machinery to operate effectively across most of the grassland area. More varied conditions, including sloping ground, small pools and scrapes can be accommodated in peripheral areas.

4.2.7 The initial design should consider the location and installation of the necessary infrastructure to allow successful future management. This might include:

- Access for mowing machinery or vehicles to transport livestock on site;
- Fencing and handling facilities for livestock;
- Water pipes and troughs for livestock; and
- 'Dump' locations for grass than cannot be sold as hay.

4.3 Establishment Techniques

4.3.1 Weeds can be a major obstacle to successful grassland creation. Species such as common couch, broad-leaved dock, stinging nettle and creeping thistle can be very difficult to eradicate and may cause problems with sward establishment. The use of herbicides once the sward is established may be detrimental to any target plant species that have colonised or been sown. The weed burden must be reduced to a manageable level prior to establishment of the sward.

4.3.2 The control of weeds upon land adjacent to the biodiversity restoration area - from which seeds could be wind-blown – should also be undertaken where possible, particularly while the sward is establishing. Methods of reducing the weed burden are outlined in Natural England's Technical Information Note *TIN067 – Arable reversion to species rich grassland: establishment of a sown sward.*

Soil preparation

4.3.3 This can be undertaken with agricultural techniques and machinery on slopes shallower than 20%, and where the substrate is not too hard or stony. Chisel ploughs will break up compacted surface layers and stony ground. Sub-soiling may be needed for deeply compacted soil.

4.3.4 Prepare the soil with disc harrows for natural regeneration, hay strewing or broadcast seeding.

Natural colonisation

4.3.5 Natural colonisation is most likely to produce species-rich habitats appropriate to local conditions, and will be more natural than created grassland. If natural colonisation has already started – in accordance with the monitoring framework below - assess its development before continuing with other methods.

4.3.6 Colonisation will usually succeed where a suitable seed bank is present, or existing suitable grassland is adjacent. A suitable seed bank may exist in the restoration topsoil if it supported Lowland Meadow grassland previously and was conserved. This can be tested for by growing samples under glass.

4.3.7 Prevent rank grass species from suppressing the establishment of new species. Where such species occur, cutting and collecting, grazing or selective herbicides can be used. Early introduction of grazing, especially during the spring, has been shown to promote species diversity in new grasslands. Natural regeneration on nutrient-poor soils produces sparse, diverse floras, so may not require management for some time, especially if grazed by rabbits.

4.3.8 Any target species 'missing' after several years (**see Box 4.1**) could be selectively introduced, but note that many species only colonise slowly under natural circumstances.

Hay strewing

4.3.9 Hay that is cut and collected, with minimal turning, from local donor sites[40] after flowering will contain seeds from many of the plants present. Most grassland species set seed between June and August. Cutting in early July should mean that most of the seeds are still attached. A second cut would catch later seeding species. Actual timing of cuts will depend on location and species composition.

4.3.10 More seed may be lost when collecting using a forage harvester than with hay making, but the choice of method will depend on the availability of machinery.

40 Contact the Essex Biodiversity Project for information about suitable donor sites.

4.3.11 The hay should be spread as soon as possible after its collection to minimise seed loss during storage through composting or rot. Information on hay spreading to enhance existing grassland is given in Natural England's Technical Information Note *TIN063 – Sward enhancement: diversifying grassland by spreading species-rich green hay.*

Seeding

4.3.12 Seeds may be collected from a local donor site using a brush harvester, or purchased from commercial sources – but if so, ensure the seeds have native provenance and are from a local source (see Flora Locale and Plantlife's Code of Practice www.floralocale.org). Only a restricted range of species are commercially available. These can be used as a starter sward, other species will colonise over time. The following seed mixtures supplied by Emorsgate Seeds[41] are appropriate for different soil conditions:

- EM4 Meadow Mixture for Clay Soils
- EM5 Meadow Mixture for Loamy Soils
- EM7 Meadow Mixture for Sandy Soils

4.3.13 The following method should be used to introduce seeds:

- Use a moderately fine and firm seedbed.
- Fertiliser is not required.
- Control perennial weeds pre-seeding: let them germinate in spring/summer and treat with glyphosate.
- Sow seed in September/October at 10-15 kg per ha depending on fertility and the urgency for green cover.
- Encourage light at ground level by repeated cutting; this relieves competition for wildflower seedlings. Three cuts may be necessary on fertile soils, less or none at all on the poorest. Remove arisings.

4.3.14 Broadcasting is a cheap and usually suitable technique, using conventional tractor-mounted spreaders. Mix with inert material such as sand to prevent seeds of different sizes sorting in the hopper. Broadcast by hand on small, steep or inaccessible areas.

4.3.15 Detailed guidance about establishing Priority Habitat grasslands from seed is provided in Natural England's *T*echnical Information Note *TIN038 Seed sources for grassland restoration and re-creation in Environmental Stewardship.*

41 www.wildseed.co.uk

Using container-grown plants and plugs

4.3.16 This is only applicable for introducing uncommon species such as orchids that:

- do not grow easily from seed;
- spread vegetatively; and
- and/or flower only after a number of years.

4.3.17 Plant out from September to mid-November or mid-February to early April on bare or sparsely vegetated areas, in combination with seeding or to complement natural colonisation. Keep plugs moist, and water in. Dig a hole the same shape as the plugs. Manage competing species by cutting them above the height of the inserted plants and removing cut material.

4.3.18 Appropriate planting density depends on a variety of factors, including the species ability to spread and the density of cover in the sward, and varies between 2 and 10 plants per m^2. Plantings of 5-10 species, planted in drifts covering 30-50% of an area will produce a natural effect if combined with seeding. Planting designs should reflect the natural distribution of species as much as possible.

4.3.19 Further information is provided in Natural England's *Technical Information Note TIN065 Sward enhancement: diversifying grassland using pot-grown wildflowers or seedling plugs.*

4.4 Long-term Management

4.4.1 These are typically managed either by grazing or hay cutting. Grazing can be year round if at low stocking rates. Stocking rates depend on sward productivity and are best prescribed locally and reviewed at regular intervals in light of the results of Ecological Monitoring. For all year round grazing, Natural England guidance[42] suggests average daily stocking levels of 0.35 Livestock Units per hectare.

4.4.2 Hay-making should be done after flowering in mid to late summer (typically July-September). Ideally, this should be followed with aftermath grazing in late summer-autumn which helps suppress vigorous grass species. Aftermath grazing can be replicated by spring mowing (and removal of arisings) - cutting should occur on no more than 1/3 of the site in any given year.

42 Kirkham, F, W. Mole, M. Gardner, S. M. and Wilson, D,W. (2003). *Review of Stocking Levels Recommended for Semi-natural Lowland Grasslands*. English Nature, CCW and SNH.

4.5 Monitoring Framework

4.5.1 Refer to **Section 2 of Part V** for detailed guidance. Priority Habitat status has been achieved when:

- At least two indicator species is frequent and two are occasional (**see Box 4.1**); and
- 3 out of the following criteria are met:

  1. Cover of undesirable species (creeping thistle, spear thistle, curled dock, broad-leaved dock, common ragwort, common nettle, marsh ragwort, cow parsley and bracken) less than 5%.

  2. Cover of wildflowers and sedges throughout the sward (excluding the undesirable species listed above and creeping buttercup and white clover) more than 20%.

  3. Cover of bare ground (including localised areas, for example, rabbit warrens) less than 10%.

  4. Cover of invasive trees and shrubs less than 5%, and indicators of water logging (such as large sedges, rushes, reeds) less than 30%.

Box 4.1 - Lowland Meadow Indicator Species

agrimony
autumn hawkbit
betony
bird's- foot-trefoil
black knapweed
bugle
burnet saxifrage
common bistort
cowslip
devil's-bit scabious
dropwort
Dyer's greenweed
eyebright
field scabious
goat's-beard
greater bird's-foot-trefoil
lady's bedstraw
marsh/fen bedstraw
marsh marigold
meadow vetchling
meadowsweet
milkworts
narrow- leaved water- dropwort
orchids
ox-eye daisy
pepper- saxifrage
pignut
ragged robin
rough hawkbit
salad burnet
sneezewort
tormentil
water mint
yellow rattle
small blue-green sedges (glaucous, common, carnation).

PART IV
5.0 Open Mosaic Habitats on Previously Developed Land

5.0 Open Mosaic Habitats on Previously Developed Land

5.1 Definition

5.1.1 Open Mosaic Habitats on Previously Developed Land are generally primary successional habitats, 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 poor soil conditions, the habitat can often persist for decades without active management. Stands of vegetation commonly comprise small patches and may vary over relatively small areas, reflecting small-scale variation in substrate and topography.

5.1.2 The habitat can support a range of notable vascular plant, moss and lichen species. These often include species declining in the wider countryside. Exotic plant species, which are well adapted to the prevailing environmental conditions, are a characteristic component of the plant assemblage.

5.1.3 Invertebrate faunas can be species-rich and include many uncommon species. It is estimated that between 12% and 15% of all nationally-rare and nationally-scarce insects are recorded from brownfield examples of Open Mosaic Habitats. 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.

5.1.4 Open Mosaic Habitat can be important for birds that are primarily associated with previously developed or brownfield land such as little ringed plover, as well as Priority Species, including skylark. The habitat provides secure breeding and feeding areas commonly absent from land under agricultural management.

5.1.5 The heterogeneity within the habitat mosaic reflects chemical and physical modification by 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 variety. Sealed surfaces and compaction add further variation and contribute to the modified hydrology of such habitats resulting in areas of impeded and accelerated drainage.

5.1.6 Edaphic conditions for this habitat are severely limiting on plant growth. Examples are substrates with extreme pH; available phosphate; or water-deficient (dry gravel and sand). Typical situations where such conditions arise include disused quarries, former railway sidings, extraction pits and landfill sites.

Figure 5.1 – Open Mosaic Habitats (Villa Farm Quarry, Essex)

5.2 Design Principles

5.2.1 Low-level restoration is likely to provide a range of suitable conditions for the creation of Open Mosaic Habitats. Sites with a range of topographic features such as cliffs, banks, hollows and pools of different dimensions and aspects provide a greater diversity of invertebrate habitat than those that are more homogenous or “neat”. Steep slopes provide natural slippages which keep patches of bare ground open and reduce the need for on-going management. South-facing cliffs and slopes can be of particular value to warmth-loving invertebrates such as mining bees and tiger beetles. These features should be retained wherever possible in restoration schemes, consistent with the requirements of health and safety.

5.2.2 Complexity on a small scale benefits invertebrates. Micro-topography can have an incredible influence on the suitability of a site to support certain invertebrate species – small depressions, low cliffs, small ponds, even puddles in wheel ruts can be useful

habitats. The topography of a site creates a variety of micro-environments due to varying exposure to sun, wind and rain. A varied topography also produces hydrological variation, ranging from dry soils to areas of marsh, seasonal pools, and more permanent water. Retaining or creating a range of micro-habitats on a site, with varied environmental conditions promotes species diversity since many invertebrates have restricted thermal and hydrological requirements. Micro-topographical variation can also contribute to plant biodiversity on a site.

5.2.3 Varied topography can also help to buffer sites and populations against climatic variation; for example hollows and pits can retain areas of moisture during drought years. The bowl shape of quarries provides good shelter and a warm microclimate so can offer warmer conditions to invertebrates in cooler years, and earlier in the season.

Cliffs and slopes

5.2.4 As long as 'rollover' slopes have not been constructed over the quarried faces, once the material has been extracted from a quarry there is likely to be a large number of soft-cliff faces or steep slopes.

5.2.5 These cliffs and steep slopes are of greater value to invertebrates than smooth, contoured slopes. The reason for this is that cliffs and steep slopes exhibit features of exposed minerals interspersed with bare ground and cracks in which invertebrates can exploit. Where soil is present, it is often thin and nutrient poor and encourages the development of specialist flowering plants. 'Smoothed' rollover slopes tend to be topped with nutrient rich topsoil that often becomes colonised by aggressive ruderal plants (plants that thrive in nutrient rich disturbed ground such as nettles, thistles, docks). More natural cliffs and steep slopes heat up quickly and can help retain heat. The lack of soil covering the mineral substrate can make colonisation by plants very slow. Where plants do grow they are often flowering species beneficial to many insect groups.

5.2.6 Steep slopes may be unstable and periodically slip exposing fresh bare ground. This slippage is a natural feature in hilly parts of the county and can be replicated very effectively in restoration schemes.

5.2.7 Furthermore, extensive slippage can result in loose deposits, particularly in sand extraction sites. This is a niche habitat largely associated with coastal sand dunes. Inland this is a rarer habitat largely confined to sandstone quarries but also, occasionally, heathland sites. Where this niche is present inland a suite of coastal species can establish.

5.2.8 **Figure 5.2** shows a shallow cliff face that periodically becomes unstable resulting in areas of small-scale slippage. This exposes more minerals and bare ground providing nesting opportunities for bees and wasps. This is also the situation where one would find a parasite of the solitary bees – the bee-fly. The Priority Species heath bee-fly exploits certain solitary bees on heathland and early successional habitat.

Figure 5.2 – Cliff-face

© Andy Jukes

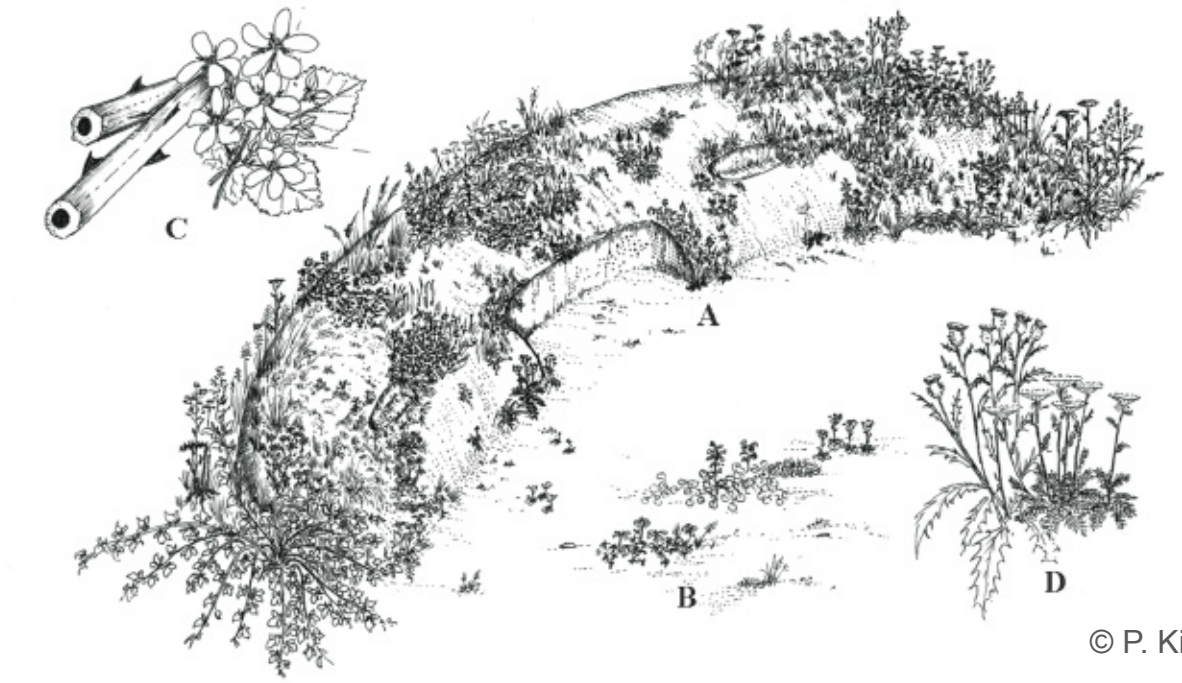
Bee Banks

5.2.9 The construction of artificial bee banks should form an integral part of restoration schemes seeking to create Open Mosaic Habitat. They are generally made from spoil or other waste material. **Figure 5.3** illustrates an example design. They are frequently used by uncommon invertebrates and can increase the niche diversity on a site.

The construction of these bee banks can create new bare ground habitat and add topographic interest to sites.

5.2.10 They can be incorporated into or constructed as bunds. Those that are constructed of topsoil will only function for a short period of time since they will relatively quickly become dominated by rank vegetation. To retain them, they will need to be re-scraped at regular intervals. Subsoils, or a mixture of subsoils and scalpings, will produce bunds that will provide beneficial features for a longer period of time before they require management. Furthermore, the presence of scalpings will result in varied particle size and weathering may produce small scale slumping. This is not detrimental, but will introduce new, fresh bare features for exploitation by bare-ground nesting species.

Figure 5.3 - A Bee Bank design



A. Bare ground and a varied structure provide a wide range of foraging and nesting opportunities.

B. Open-structured vegetation in front of the bank provides extra habitat and does not shade the bank.

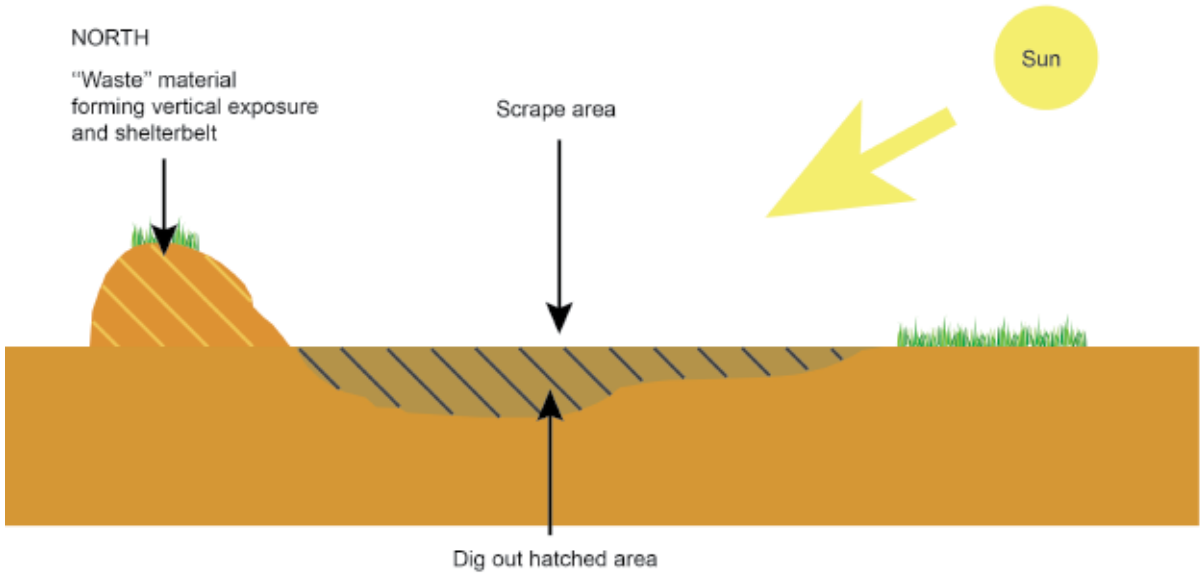
C. Taller flower-rich vegetation nearby provides important foraging areas.

D. Bramble and other scrub in the vicinity provides a nectar and foraging resource, broken stems can provide nesting sites for stem nesting species.

Bee Scrapes

5.2.11 **Figure 5.4** shows another feature of Open Mosaic Habitats that could be incorporated in restoration schemes. Creation of bee scrapes produces excess material. This can be piled up on the northern side of the scrape to create vertical features. Not only does this small bunded feature provide additional nesting opportunities for solitary bees and wasps, but acts as a wind break, partially protecting the scraped area. The compaction of the material should be fairly firm to avoid bank-collapse though not so great as to make burrowing by invertebrates impossible.

Figure 5.4 – Bee Scrape



5.3 Establishment Techniques

Soil preparation

5.3.1 Establish Open Mosaic Habitat on mineral substrates that are very low in available minerals (should never use topsoil).

Natural colonisation

5.3.2 Natural colonisation on very nutrient-poor soils is a defining characteristic of Open Mosaic Habitat. Therefore, it is the recommended method of establishment.

5.4 Long-term Management

5.4.1 The advantage of low-level restoration is that the harsh conditions presented by mineral soils (lack of nutrients, instability, drought and heat-stressed conditions) can

suppress or delay natural succession, maintaining open habitats for extended periods. This is one reason why so many former minerals sites are of high ecological interest for invertebrates. However, bare ground will eventually vegetate, open grassland swards will close up, and coarse grasses and scrub will come to dominate.

5.4.2 Therefore management of Open Mosaic Habitat should aim to 'reset' the process of natural colonisation by re-profiling cliffs (in imitation of the original extraction process) clearing banks or scraping back vegetation to expose the bare mineral once more. Such management should be targeted at areas of low ecological interest and should be completed on rotation to maintain a continuity of stages from bare mineral soil to fully vegetated areas.

5.4.3 A proportion of scrub and young trees is beneficial, but this should be maintained at less than 15% cover overall and should not be allowed to dominate any one area; scattered bushes are much more important than dense blocks of scrub. Once an area becomes heavily invaded by trees and scrubs it is time to re-profile or scrape it.

5.5 Monitoring Framework

5.5.1 Priority Habitat status has been achieved when the following apply:

- The area of open mosaic habitat is at least 0.25 ha in size.
- Early successional communities are present, consisting mainly of stress-tolerant species (e.g. indicative of low nutrient status or drought).
  Early successional communities are composed of:
  a) annuals;
  b) mosses/liverworts;
  c) lichens;
  d) ruderals;
  e) inundation species;
  f) open grassland;
  g) flower-rich grassland; or
  h) heathland.
- The site contains unvegetated, loose bare substrate and pools may be present.
- The site shows spatial variation, forming a mosaic of one or more of the early successional communities (a)–(h) above plus bare substrate, within 0.25 ha.

5.5.2 Refer to **Part V Section 2** of the SPG for technical guidance to help apply the criteria above.

5.5.3 The criteria are for guidance and may not cover all restoration scenarios; therefore an element of expert judgement will be required when developing the final monitoring framework for individual sites.

PART IV
6.0 Reedbeds

6.0 Reedbeds

6.1 Definition

6.1.1 Reedbeds are wetlands dominated by stands of the common reed, wherein the water table is at or above ground level for most of the year. They tend to incorporate areas of open water and ditches, and small areas of wet grassland and carr woodland may be associated with them. There are about 5,000 ha of reedbeds in the UK, but of the 900 or so sites contributing to this total, only about 50 are greater than 20 ha, and these make a large contribution to the total area.

6.1.2 Reedbeds are amongst the most important habitats for birds in the UK. They support a distinctive breeding bird assemblage including nationally rare birds such as the bittern, marsh harrier and Cetti's warbler. They provide roosting and feeding sites for many migratory species and are used as roost sites for several raptor species in winter. A number of nationally rare invertebrates are also closely associated with reedbeds such as the flame wainscot.

Figure 6.1 – Reedbed (Essex)

6.2 Design Principles

6.2.1 Reedbeds can be created anywhere there is:

- Sufficient, reliable water supply to maintain flow, and up to 300 mm of depth in spring;
- Level ground or very shallow gradient;
- An available, vigorous reed source; and
- Access for management.

6.2.2 Larger reedbeds tend to support more species. Some species require extensive reedbeds, e.g. the bittern and marsh harrier. Value is added if the reedbed forms part of a larger complex of swamp, open water and wet woodland. The reedbed-to-open water edge is very productive as aquatic life can penetrate into the reedbed. These areas support more birds than the equivalent area just covered in reed. **Figure 6.2** below shows a restoration scheme where the design has maximised the available 'edge' habitat for wildlife.

Figure 6.2 – Optimal Reedbed Design

Tarmac and RSPB Langford Lowfields © RSPB

6.2.3 The ability to vary water levels is important. Adequate water supply is needed during summer, flooding in spring is necessary to control competing terrestrial weed species, and dry periods allow access to manage and encourages oxidation of litter to make nutrients available and prolonging the reedbed's life.

6.2.4 A subtly undulating landform with a variety of water depths across the reedbed is ideal. The soil required to create the unevenness is often available from the construction of ditches and excavation of meres.

6.2.5 Where commercial harvesting is planned, more even topography is needed, otherwise reed quality will vary and it will be difficult to harvest.

6.2.6 Management is required to prevent succession. This can be achieved through sustainable commercial cutting for reed thatching or bio-fuel. This should be considered in the design, for example to ensure machinery access if necessary.

Bed Preparation

6.2.7 The extent of bed preparation depends on the establishment technique, soil type and the condition of the bed.

6.2.8 Reed can be established on most soil types, though clays and silts are better. Oxidised peat may need pre-flooding and drawdown to de-acidify it pre-planting.

6.2.9 Bed preparation involves controlling competing vegetation. Strip existing vegetation and litter during land-forming. Alternatively, control with herbicides, rotovation, ploughing or flooding. Note that rotovation and ploughing can expose weed seedbanks and favour rush invasion. Reed should be introduced as soon as water levels are suitable.

6.2.10 Fine scale control of water levels is needed during early establishment: low enough to promote establishment, but high enough to discourage competition from other plants. Young reed is vulnerable to both dehydration and drowning. Therefore, soils must be kept damp until the reed shoots; and then water-levels should be raised to ensure that the top 1/3 of the plants are above the surface. Reducing the extent of open water present during establishment can help restrict damage by coots and geese.

6.3 Establishment Techniques

6.3.1 It is not necessary to plant the whole site; creating clusters of reeds encourages spread into appropriately managed areas. Expansion rates are affected by temperature and water depth, and vary from 1 to 10m per year or faster in exceptional circumstances. The plant material – seeds, rhizomes and shoots - should be sourced from the site, or if not possible, then from similar local sites. This increases the chances of successful establishment.

Sowing seed

6.3.2 The following factors need to be considered:

- Seed viability should be tested before sowing;
- Sowing should take place in still wind conditions;
- The soil should be saturated but not flooded;
- The bed should be flat and free of vegetation;
- Sowing should take place in May-June, when daytime temperatures range from 10-25°C and nights are frost-free; and
- Fragments of the seed head should be pressed gently into the seedbed to ensure good contact. Rollers are rarely suitable; instead compression boards or trampling should be used.

6.3.3 Sow at densities between 10-125 viable seeds m^2 on bare, wet soil. Germination takes 3-4 days in good conditions. Keep the seedbed wet without over-topping seedlings. Once shoots reach 100-200mm, the bed can be flooded to 50mm.

Planting seedlings

6.3.4 This is the most successful method of establishing reedbed as seedlings can compete and survive adverse weather. Nursery-grown material is expensive so it may be more cost-effective to grow your own.

6.3.5 Planting out by hand is slow; densities of $4m^2$ take circa 540 person hours per hectare, but mechanisation is only at an experimental stage. Plant in June, or as early as possible after the last frosts, but before competitors emerge. Water levels should be at or just above the soil surface.

6.3.6 Water levels can be used to suppress weeds. Seedlings <1 year old tolerate water levels up to 200mm over the shoots. Reedmace and rushes can be difficult to remove, but reed will usually out-compete them eventually.

Spreading soil containing rhizomes

6.3.7 This involves transferring the top 300-500mm of rhizome-rich soil from an existing reedbed to a prepared recipient site. Such material is often excavated during maintenance of drainage channels or during bed lowering.

6.3.8 The following points should be considered:

- Spread soil at least 250mm deep and flood to 200mm;
- Do not let the soil dry out;

- Minimal soil manipulation will reduce rhizome damage, and do not store the material for long periods;
- Excavate and spread the material in the winter: November to February;
- Dig to just below the rhizome level; the depth varies according to the site; and
- It may be necessary to pre-excavate the recipient site to achieve desired water levels.

6.3.9 This, and turf transplanting (see below), will import litter and soil invertebrates, and other plants to the site, accelerating colonisation.

6.3.10 2,500m^3 of material is required per hectare and transportation costs can be high, so it is sensible to spread 'loads' at regular intervals rather than aiming for continuous cover.

Turf transplant

6.3.11 Digging out complete rhizome mats is very successful - it minimises damage and reduces the volume of material to transport.

6.3.12 Space the turfs depending on their size and the desired rate of spread of the reed. Generally, the following points are important:

- Larger turfs contain more undamaged material and establish more quickly;
- Water levels can fluctuate more – from just below the surface to up to 500mm - deep where the turfs have long, intact reed stems attached;
- Bed preparation is less critical, providing flooding occurs immediately to suppress competition;
- Do not stack turfs in transit or storage; this damages aerial stems which supply oxygen to the rhizomes; and
- Carry out work in winter, during drawdown of water levels;

Management during establishment of reedbeds

6.3.13 Keep establishing reedbed free from competition and from grazing in the first year. New reed is eaten by a variety of grazing animals, including geese, coots, deer, rabbits and livestock, which seriously inhibit reed growth/expansion. Some form of fencing may be essential: orange plastic netting with tape stretched over the enclosure has been successful at some sites, but needs to be combined with regular human disturbance to keep wildlife out.

6.3.14 Other possible solutions include:

- over-planting which may compensate for losses, but is expensive;
- minimising the area of open water to discourage geese & coots; and
- sowing strips of grass among the reed which will be grazed preferentially but can be removed by flooding later.

6.4 Longer-term management

6.4.1 Rotational cutting and removal of reed in the winter is the commonest method of management, it will:

- Reduce the rate of litter accumulation;
- Stimulate the production of new buds;
- Provide temporary open, wet habitat; and
- Control reed encroachment into other habitats.

6.4.2 Other management techniques include summer cutting and grazing ensuring that only a proportion is managed each year to conserve invertebrate populations. Old reedbeds may require lowering as litter levels build up.

6.5 Monitoring Framework

6.5.1 Priority Habitat status has been achieved when **all** of the following apply:

- Cover of scrub within the reedbed is less than 10%;
- The vegetation includes at least 60% reeds;
- Surface water is present over at least part of the reedbed for most of the year; and
- Cover of undesirable species (common nettle, docks, creeping/spear thistles, common ragwort and Himalayan balsam) is less than 10%.

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PART V
SUPPORTING INFORMATION

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PART V
1.0 Sources of Additional Management Guidance

1.0 Sources of Additional Management Guidance

General

- White, G. and Gilbert, J. (eds) (2003). *Habitat Creation Handbook for the Minerals Industry.* RSPB.
- Buglife. *Managing Priority Habitats for Invertebrates.* Online resource viewable here: http://www.buglife.org.uk/advice-and-publications/managing-priority-habitats-invertebrates

Coast and Floodplain Grazing Marsh

- Benstead, P. Drake, M. José, P. Mountford, O. Newbold, C. and Treweek, J. (1997). *The Wet Grassland Guide: Managing Floodplain and Coastal Wet Grasslands for Wildlife*. RSPB, English Nature and Institute of Terrestrial Ecology
- Benstead, P. José, P. Joyce, C. and Wade M. (1999). *European wet grassland, guidelines for management and restoration*, RSPB

Lowland Acid Grassland

- Sanderson, N.A. (1998). *A Review of the Extent, Conservation Interest and Management of Lowland Acid Grassland in England*. English Nature.

Lowland Heathland

- Gimingham, C. H. (1992). T*he Lowland Heath Management Handbook.* English Nature, Peterborough.
- Symes, N, C. and Day, J. (2003). *A Practical Guide to the Restoration and Management of Lowland Heathlands*. RSPB.

Lowland Meadows

- Crofts, A. and Jefferson, R. G. (eds) (1999). *The Lowland Grassland Management Handbook.* 2nd Edition. English Nature/The Wildlife Trusts, Peterborough.
- Walker, K. J. Manchester, S. J. Mountford, J. O. Stevens, P. A. and Pywell, R. F. (2001). *Methodology for Restoring and Re-creating Semi-natural Lowland Grassland. A review and quantitative model.* CCW Contract Science Report No 437.

Open Mosaic Habitats on Previously Developed Land

- Whitehouse, A. T. (2008). *Managing Aggregates Sites for Invertebrates: a Best Practice Guide.* Buglife - The Invertebrate Conservation Trust, Peterborough.
- Buglife. (2008). *Thames Gateway Brownfields: Invertebrate Diversity and Management.* Peterborough: Buglife – The Invertebrate Conservation Trust.

Reedbeds

- Hawke, C. J. Jose, P. V. (1996). *Reedbed Management for Commercial and Wildlife Interests.* RSPB.

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PART V
2.0 Technical Guidance to help prepare Monitoring Frameworks

2.0 Technical Guidance to help prepare Monitoring Frameworks

2.1 Assessing whether a created grassland is a Priority Habitat

2.1.1 The process of assessing whether created grassland can be considered to meet Priority Habitat definitions for either Lowland Dry Acid Grassland or Lowland Meadow follows the approach advocated by Natural England[43] .

2.1.2 This approach is closely aligned to the one described in the Higher Level Stewardship Farm Environment Plan (FEP) Handbook[44] . The main difference is that for the purposes of an HLS application both good quality and moderate quality (i.e. with less frequent indicator species) are identified, whereas when assessing whether grassland areas should count towards Priority Habitat targets only the areas that meet the **'good quality'** thresholds of indicator species frequency should be considered.

2.1.3 Assessing whether a sward can be considered a Priority Habitat is a 3-step process.

Step 1

2.1.4 Using the FEP key 2a, decide whether the sward meets the species-rich grassland definition or is semi-improved or improved grassland. If the grassland meets the definition of species-rich move to step 2.

Step 2

2.1.5 For grassland identified from key 2a as species-rich, identify the Priority Habitat to which the sward conforms by using:

- key 2b;
- the associated list of indicator species (see relevant monitoring framework); and
- knowledge of the site.

2.1.6 If the number and frequency of indicator species meets the habitat-specific threshold set out in the relevant monitoring framework, the sward can be considered to be good quality **Priority Habitat** and move on to step 3.

43 Natural England Technical Information Note TIN110 (First edition 22 June 2012) Assessing whether created or restored grassland is a BAP Priority Habitat
44 Natural England (Third Edition February 2010) Farm Environment Plan (FEP) Manual

2.1.7 Where indicator species are below the threshold number and frequency, the sward is of moderate quality. Further improvement would be needed before such swards can be counted towards the Priority Habitat Creation Target.

Step 3

2.1.8 For grasslands that meet the thresholds at step 2, assess the condition against criteria for the feature set-out under the Monitoring Framework for Lowland Dry Acid Grassland and Lowland Meadows.

2.1.9 Grassland meeting all condition criteria or failing one condition criterion, but meeting the indicator species frequency criterion are of sufficient quality and floristic diversity to be considered Priority Habitat.

2.1.10 Grassland failing two or more condition criteria should be subject to further improvement.

Field assessment

2.1.11 The field survey should take place in the summer months (May-August) when most species are in flower and, in the case of meadows, before they are cut for hay (usually July 1st onwards).

2.1.12 The field survey method for assessing Priority Habitats should follow those set out in the FEP manual, pages 56-59. In summary this involves a representative walk through the sward, making observations at a minimum of 10 stops. At each stop estimates are made within a sample 1m^2 area for:

- cover of rye grass and white clover;
- cover of wildflowers and sedges (excluding white clover, creeping buttercup and injurious weeds); and
- total number of species.

2.1.13 Wildflower indicator species from the target Priority grassland habitats are recorded, allowing a frequency to be calculated for each species. For lists of indicator species refer to the Monitoring Framework for Lowland Dry Acid Grassland (**Box 2.1**) and Lowland Meadows (**Box 4.1**).

2.1.14 Condition criteria, such as the cover of bare ground and of injurious weeds, should also be recorded.

2.2 How to assess whether a plant species is rare, occasional or frequent

2.2.1 The way to assess this is to walk around the habitat and stop at regular intervals or random points along the way. For most habitats, stopping ten times will be enough, but for very large blocks of similar vegetation you may need 20 stops.

2.2.2 Each time you stop, look at the vegetation within a square metre in front of you and take a note of the plant species present. If you already know roughly what type of habitat you are in, you only need to record the relevant indicator species for that habitat, rather than noting every single species.

- A species is rare if it occurs in one or two stops out of ten.
- It is occasional if it occurs in three or four stops out of ten.
- Frequent species occur in five or more stops out of ten.

2.3 Supporting notes for assessing whether created 'Open Mosaic Habitats on Previously Developed Land' is a Priority Habitat

2.3.1 This guidance has been reproduced from 'UK Biodiversity Action Plan; Priority Habitat Descriptions (2008 - updated 2011).

2.3.2 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.

2.3.3 **Disturbance** refers to that resulting from major historical industrial use or development.

2.3.4 **Extraneous materials** refer to extensive additions of spoil rather than incidental dumping of litter, broken glass, etc.

2.3.5 There might be evidence of heavy metal contamination but extensive stands of Calaminarian grasslands are specifically excluded, as that is a distinct Priority Habitat.

2.3.6 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, Centaurium 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.*

2.3.7 **Annex 1** on page 53 of the 'UK Biodiversity Action Plan Priority Habitat Descriptions' shows species of vascular plant that are known to be associated with, but not confined to, the habitat in certain areas and/or substrates.

2.3.8 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.

2.3.9 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 needing areas of bare ground and specific food plants, invertebrates may require sheltered places at various times of the year, or rough vegetation or cover at other times. 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.

2.3.10 '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.

- 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 10 cm across or less. A site with a wide variety of patch sizes could also qualify.
- Bare substrate also implies absence of organic matter accumulation.

2.3.11 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.

2.3.12 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.

2.3.13 Continuous blocks of a closed plant community greater than 0.25 ha would be classified as a habitat other than OMH, although those containing very fine-grained mosaics might qualify.

PART V
3.0 Glossary

3.0 Glossary

Afforestation
The establishment of a forest or stand of trees in an area.

Agri-environment
Agri-environment schemes are designed to encourage farmers and crofters to manage their land for the benefit of wildlife and habitats.

Agricultural land classification
The Agricultural Land Classification system forms part of the planning system in England and Wales. It classifies agricultural land in five categories according to versatility and suitability for growing crops. The top three grades, Grade 1, 2 and 3a, are referred to as 'Best and Most Versatile' land, and enjoy significant protection from development.

Arable reversion
Arable land can be reverted to grassland to increase the variety of habitat in predominantly arable areas. It may help to buffer or link up areas of important grassland, to protect and extend existing habitats, to strengthen farm landscapes or to protect underlying archaeological features.

Biodiversity offsetting
Biodiversity offsetting is a system used predominantly by planning authorities and developers to prevent biodiversity loss and, in some circumstances, create biodiversity gain through the planning process. Individuals or companies involved in arranging biodiversity offsets will use qualitative and quantitative measures to determine the amount, type and quality of habitat that is likely to be affected by a proposed project and calculate the financial compensation that would be required to re-create the same amount, type and quality of habitat at new locations, often called receptor sites. The type of environmental compensation provided by biodiversity offsetting is different from similar systems in that it must show both measurable and long-term biodiversity improvements.

Biofuel
A biofuel is a fuel that contains energy from geologically recent carbon fixation. These fuels are produced from living organisms. Examples of this carbon fixation occur in plants and microalgae. These fuels are made by a biomass conversion (biomass refers to recently living organisms, most often referring to plants or plant-derived materials).

Biological diversity
'Biodiversity' is a term commonly used to describe the variety of life on Earth. This encompasses the whole of the natural world and all living things with which we share the planet. It includes plants, animals, invisible micro-organisms and bacteria which, together, interact in complex ways with the inanimate environment to create living ecosystems.

Broadcast seeding
In agriculture, gardening, and forestry, broadcast seeding is a method of seeding that involves scattering seed, by hand or mechanically, over a relatively large area.

Brownfield land
In urban planning, a brownfield site (or simply a brownfield) is land previously used for industrial purposes or some commercial uses.

Bryophytes
Bryophyte is a traditional name used to refer to all embryophytes (land plants) that do not have true vascular tissue and are therefore called "non-vascular plants".

Conservation
Conservation is an ethic of resource use, allocation, and protection. Its primary focus is upon maintaining the health of the natural world, its fisheries, habitats, and biological diversity. Secondary focus is on materials conservation and energy conservation, which are seen as important to protect the natural world.

DEFRA
The Department for Environment, Food and Rural Affairs is the government department responsible for environmental protection, food production and standards, agriculture, fisheries and rural communities in the United Kingdom.

Desiccating
The process of extreme drying.

Dwarf shrub
A short woody plant.

Ecological networks
These link sites of biodiversity importance.

Ecological Restoration
The practice of renewing and restoring degraded, damaged, or destroyed ecosystems and habitats in the environment by active human intervention and action.

Ecosystem services
The multitude of ways humans benefit from ecosystems.

Edaphic
Edaphic is a nature related to soil. Edaphic qualities may characterize the soil itself, including drainage, texture, or chemical properties such as pH.

Emergent swamp communities
Emergent swamp communities occur along lower energy sections of rivers and major streams, ponds, and lakes.

Environmental impact assessment
A procedure to be followed for certain types of project to ensure that decisions are made in full knowledge of any likely significant effects on the environment.

Environment agency
The **Environment Agency (EA)** is a non-departmental public body, established in 1996 and sponsored by the United Kingdom government's Department for Environment, Food and Rural Affairs (DEFRA), with responsibilities relating to the protection and enhancement of the environment in England (and until 2013 also Wales).

Ericaceous
Acid loving (pH 1-7).

Essex biodiversity validation checklist
An interactive electronic checklist for developers covering all the biodiversity information required to ensure planning applications will be validated by the Minerals and Waste Planning Authority and other partner LPAs who adopt the checklist.

Geodiversity
Geodiversity is the variety of earth materials, forms and processes that constitute and shape the Earth, either the whole or a specific part of it.

Geological
The scientific study of the origin, history, and structure of the earth.

Green infrastructure
Green Infrastructure or Blue-green infrastructure is a network providing the "ingredients" for solving urban and climatic challenges by building with nature. The main components of this approach include storm water management, climate adaptation, less heat stress, more biodiversity, food production, better air quality, sustainable energy production, clean water and healthy soils, as well as the more anthropocentric functions such as increased quality of life through recreation and providing shade and shelter in and around towns and cities.

Hay strewing
Spreading green hay over designated areas at the right time of the year to introduce species of local seeds into an area.

Herbicides
Herbicides, also commonly known as weedkillers, are pesticides used to kill unwanted plants.

Heterogeneity
A substance composed of dissimilar or diverse parts.

High Level Stewardship
HLS aims to deliver significant environmental benefits in priority areas. It involves more complex environmental management requiring support and advice from our local advisers, to develop a comprehensive agreement that achieves a wide range of environmental benefits over a longer period of time. HLS agreements last for ten years.

Homogenous
A substance composed of similar parts.

Hydrological
The scientific study of the properties, distribution, and effects of water on the earth's surface, in the soil and underlying rocks, and in the atmosphere.

Inert material
Not chemically reactive.

Injurious weeds
Five weeds classified under the Weeds Act 1959: common ragwort (Senecio jacobaea), spear thistle (Cirsium vulgare), creeping or field thistle (Cirsium arvense), broad-leaved dock (Rumex obtusifolius) and curled dock (Rumex Crispus).

Inundation grassland
A flooded grassland.

Fledgling
A young bird.

Living Landscapes
Living Landscapes are large landscape-scale areas of the countryside, such as river valleys, estuaries, forested ridges, and grass and heath mosaics, which form ecological networks. The networks allow wildlife to move through them and increase their resilience to threats such as climate change, floods, drought, sea-level rise and development pressure. There are 80 Living Landscapes within Essex.

Local Wildlife site
Local Wildlife Sites (LWSs) are wildlife-rich sites selected for their local nature conservation value.

Mire
A mire or quagmire, is a wetland terrain dominated by living, peat-forming plants.

MLP Policy S12
A list of commitments for site minerals site restoration and after use.

MLP
Minerals Local Plan.

MPA
Minerals Planning Authority.

Mycorrhizal
A mycorrhiza is a symbiotic (generally mutualistic, but occasionally weakly pathogenic) association between a fungus and the roots of a vascular plant.

Native woodland
Native woodland consists mainly of native trees, that is those that have grown here naturally since the last Ice Age and have not been introduced by humans.

Natural England
Natural England is the non-departmental public body of the UK government responsible for ensuring that England's natural environment, including its land, flora and fauna, freshwater and marine environments, geology and soils, are protected and improved. It also has a responsibility to help people enjoy, understand and access the natural environment.

NERC Act 2006
The Natural Environment and Rural Communities (NERC) Act came into force on 1st Oct 2006. Section 40 of the Act requires all public bodies to have regard to biodiversity conservation when carrying out their functions. This is commonly referred to as the 'Biodiversity duty'.

Neutral pastures
Neutral pastures, also known as neutral grasslands or lowland meadows, are those with a soil pH between 5.5 and 7, often found on neutral clays, loams and silts. They tend to occur as enclosed fields, or less often as greens or commons. They are more often managed as hay meadows than acid or calcareous grasslands, but many are managed as pastures.

Niche (ecological)
An organisms unique position in the ecosystem.

NPPF 2012
National Planning Policy Framework. This document sets out the government's planning policies for England and how they are expected to be applied. It provides guidance for local planning authorities and decision-takers, both in drawing up plans and making decisions about planning applications.

Paleo-environmental
The past environment of an area during a given period of its history.

Pioneer species
Pioneer species are hardy species which are the first to colonize previously disrupted or damaged ecosystems, beginning a chain of ecological succession that ultimately leads to a more biodiverse steady-state ecosystem.

Predatory birds
Predatory birds, also known as raptors, hunt and feed on other animals.

Priority habitats and species
Species and Habitats of Principal Importance included in the England Biodiversity List published by the Secretary of State under section 41 of the Natural Environment and Rural Communities Act 2006.

Prostrate growth
A prostrate shrub is a woody plant, most of the branches of which lie upon or just above the ground, rather than being held erect as are the branches of most trees and shrubs. Prostrate growth may occur because the supporting tissues in stems are not strong enough to support the weight of the plant, causing the plant to bend until it reaches the ground.

Public bodies
A public body is a corporation created by statute. Their precise nature varies by jurisdiction thus they might be ordinary companies/corporations owned by a government with or without other shareholders, or they might be a body without shareholders which is controlled by national or sub-national government to the (in some cases minimal) extent provided for in the creating legislation.

Rank grass
Grassland growing coarsely or vigorously.

Reed thatching
The craft of building a roof with dry reeds, layering the vegetation so as to shed water away from the inner roof.

Rhizome
A modified subterranean stem of a plant that is usually found underground, often sending out roots and shoots from its nodes.

RSPB
Royal Society for the Protection of Birds.

Seed bank
A seed bank stores seeds as a source for planting in case seed reserves elsewhere are destroyed.

SSSI
Site of Special Scientific Interest.

Sward
Grass-covered soil.

The State of Nature report
The first of its kind to document the status and population trends of animals and plants in the United Kingdom and its Overseas Territories.

UK BAP
UK Biodiversity Action Plan.

Unimproved neutral grassland
Unimproved neutral grassland is usually present in the form of meadows and pastures that occur on soils that are neither markedly acid nor basic, and which have not been subject to any significant degree of agricultural intensification.

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