Design Manual for Roads and Bridges

Sustainability & Environment
Design

LD 118
Biodiversity design

(formerly LA 118 which superseded HA 59/92, HA 67/93, HA 80/99, HA 81/99, HA 84/01, HA 97/01, HA 98/01, HA 116/05, IAN 116/08, IAN 116/08(W))

Revision 0

Summary
This document sets out the requirements for ecological survey and design of biodiversity measures on highways projects.

Application by Overseeing Organisations
Any specific requirements for Overseeing Organisations alternative or supplementary to those given in this document are given in National Application Annexes to this document.

Feedback and Enquiries
Users of this document are encouraged to raise any enquiries and/or provide feedback on the content and usage of this document to the dedicated Highways England team. The email address for all enquiries and feedback is: Standards_Enquiries@highwaysengland.co.uk

This is a controlled document.

Contents

Release notes

Version	Date	Details of amendments
0	Mar 2020	LD 118 replaces LA 118 which superseded HA 59/92, HA 67/93, HA 80/99, HA 81/99, HA 84/01, HA 97/01, HA 98/01, HA 116/05, IAN 116/08 and IAN 116/08(W). This full document has been re-written to make it compliant with the new Highways England drafting rules. LD 118 was originally published as LA 118 in November 2019 and is now republished as LD 118 as the requirements are design requirements (D) and it was incorrectly coded as appraisal requirements before this time (A).

Foreword

Publishing information

This document is published by Highways England.

This document supersedes the following documents, which are withdrawn:

1) Volume 10, Section 3:
   a) Part 1, HA 67/93 The Wildflower Handbook.
2) Volume 10, Section 4:
   a) Part 1, HA 84/01 Nature Conservation and Biodiversity;
   b) Part 2 HA 59/92 Mitigating Effects on Badgers;
   c) Part 3 HA 80/99 Nature Conservation Advice in Relation to Bats;
   d) Part 4 HA 81/99 Nature Conservation Advice in Relation to Otters;
   e) Part 5 HA 97/01 Nature Conservation Advice in Relation to Dormice;
   f) Part 6 HA 98/01 Nature Conservation Advice in Relation to Amphibians;
   g) Part 7 HA 116/05 Part 4 Nature Conservation Advice in Relation to Reptiles and Roads;
3) IAN 116/08 Nature conservation advice in relation to bats;
4) IAN 116/08 (W) Nature Conservation Advice in relation to Bats.

HA 67/93 The Wildflower Handbook, has been transferred to industry Plantlife [Ref 5.I].

Contractual and legal considerations

This document forms part of the works specification. It does not purport to include all the necessary provisions of a contract. Users are responsible for applying all appropriate documents applicable to their contract.

Introduction

Background

This document provides principles for the biodiversity design and ecological survey for the construction, improvement and maintenance of motorways and all-purpose trunk roads.

Assumptions made in the preparation of this document

The assumptions made in GG 101 [Ref 6.N] apply to this document.

Abbreviations

Abbreviations

Abbreviation	Definition
CIEEM	Chartered Institute of Ecology and Environmental Management

Terms and definitions

Terms and definitions

Term	Definition
Biodiversity design	Ecological survey and its influence on design decisions, adoption of the mitigation hierarchy and the design of mitigation and enhancement measures.
Biodiversity resource	Ecological receptors that are present in the surrounding environment LA 108 [Ref 1.N].
Compensation	Measures taken to offset the loss of, or permanent damage to, ecological features despite mitigation. NOTE: Compensation addresses adverse effects which are residual, after avoidance and mitigation have been considered CIEEM (Guidelines) [Ref 2.I].
Ecosystem services	The benefits people obtain from ecosystems.
Elements	Features relevant to achieving environmental objectives in respect of auditory amenity, biodiversity, and water quality.
Enhancement	Enhancement is improved management of a biodiversity resource or provision of new ecological features, resulting in a net benefit to biodiversity, which is unrelated to a negative impact or is 'over and above' that required to mitigate/compensate for an impact LA 108 [Ref 1.N].
Environmental element	Features relevant to achieving non-landscape environmental objectives in respect of auditory amenity, biodiversity, and water quality.
Environmental factor	1) Population and human health; 2) Biodiversity; 3) Land, soil, water, air and climate; 4) Material assets, cultural heritage, and landscape; 5) The interaction between the factors listed above LA 104 [Ref 2.N].
Environmental net gain	An approach to development that aims to leave the natural environment in a measurably better state LA 108 [Ref 1.N].
Mitigation	Measures taken to avoid or reduce adverse impacts and effects. Measures can include: 1) locating the development and its working areas and access routes away from areas of high ecological interest; 2) fencing off sensitive areas during the construction period, or timing works to avoid sensitive periods. NOTE 1: An example of a reduction measure is a reed bed silt trap that is designed to minimise the amount of polluted water running directly into an ecologically important watercourse. NOTE 2: Depending on circumstances, mitigation measures can be located within or outside the project site CIEEM (Guidelines) [Ref 2.I].

Terms and definitions (continued)

Term	Definition
Zone of influence	The area(s) over which biodiversity resources can be affected by biophysical changes as a result of the proposed project and associated activities LA 108 [Ref 1.N].

1. Scope

Aspects covered

1.1 This document shall be used to specify the requirements for biodiversity design, which includes ecological survey and the design of biodiversity mitigation and biodiversity elements on highways projects.

NOTE *This document includes general requirements for biodiversity survey and biodiversity design, but does not provide detailed survey and biodiversity design requirements.*

1.2 The scope of ecological survey and biodiversity design shall be informed by relevant survey and design information collated for all other environmental factors.

1.2.1 The study area and specifically the zone of influence of the project on individual biodiversity resources should be used to establish the extent of ecological surveys in accordance with the requirements within LA 108 [Ref 1.N].

1.3 The design of biodiversity mitigation and biodiversity elements shall be used to inform the assessment of other environmental factors, where appropriate.

1.4 Biodiversity mitigation and biodiversity elements shall meet "The principles of good road design" in accordance with GG 103 [Ref 4.N].

NOTE *The goals of sustainable development are overarching principles and it is expected that they are considered in the biodiversity design. For example the whole life cost of materials and maintenance can influence the design of biodiversity elements.*

1.5 Biodiversity design shall identify and respond to opportunities for biodiversity enhancements, as well as addressing risks to sites, habitats and species.

NOTE *Biodiversity enhancements can also deliver improvements in ecosystem services.*

Implementation

1.6 This document shall be implemented forthwith on all projects on the Overseeing Organisations' motorway and all-purpose trunk roads according to the implementation requirements of GG 101 [Ref 6.N].

Use of GG 101

1.7 The requirements contained in GG 101 [Ref 6.N] shall be followed in respect of activities covered by this document.

2. Principles and purpose

2.1 Ecological surveys shall be used to identify and assess the requirements of sites, habitats, and species, and the systems on which they depend in accordance with LA 108 [Ref 1.N].

NOTE *The systems on which sites, habitats, and species depend can include hydrology, climate, topography and appropriate soil type.*

2.2 Ecological surveys shall identify and report on constraints and opportunities to inform the development of project design.

2.2.1 Opportunities for delivering environmental enhancement should be assessed in line with the requirements in LA 104 [Ref 2.N].

2.2.2 Ecological surveys should be designed to support reporting of the scale and nature of biodiversity changes in accordance with LA 108 [Ref 1.N].

2.3 The principles of good road design established within GG 103 [Ref 4.N] shall be used to guide the development of biodiversity elements.

2.4 The design of biodiversity elements shall be an iterative process that is considered at each stage of the project life-cycle.

2.4.1 The design of biodiversity elements should be refined in response to:

1) the development of the project design;
2) the availability of additional baseline information; and
3) the assessment of impacts on biodiversity resources in accordance with LA 108 [Ref 1.N].

2.5 The elements of biodiversity design shall be reported in the environmental masterplan in accordance with requirements in LD 117 [Ref 7.N].

NOTE *Where applicable, Overseeing Organisation specific requirements are provided in the National Application Annexes to LD 117 [Ref 7.N].*

2.6 The elements of biodiversity design in environmental masterplans shall adopt the relevant coding in accordance with LD 117 [Ref 7.N].

NOTE *Where applicable, Overseeing Organisation specific requirements are provided in the National Application Annexes to LD 117 [Ref 7.N].*

General principles for surveying

2.7 Study areas and zones of influence shall be informed by study area requirements within LA 108 [Ref 1.N].

2.8 The timing and duration of surveys shall be appropriate to the habitats and species of interest and the nature of the potential impacts.

2.8.1 The timing and duration of surveys should be identified and assessed for suitability in project schedules.

NOTE *Some surveys have seasonal restrictions which can present a constraint to project schedules if not considered in advance.*

2.9 Surveys shall be undertaken by competent experts as defined in LA 101 [Ref 5.N].

NOTE *Criteria for the knowledge, skills and experience required by ecologists undertaking a range of species survey work in a professional capacity can be found in CIEEM's CIEEM (Competencies) [Ref 1.I].*

2.10 Surveys shall be undertaken in compliance with the requirements of LA 101 [Ref 5.N].

2.11 Projects shall report survey scope, methodology and results in accordance with the requirements within LA 104 [Ref 2.N].

2.12 Survey information shall also be shared with the wider project team and network managers to support statutory compliance.

General principles for biodiversity design

2.13 Design proposals shall incorporate mitigation measures using a hierarchical system to addressing impacts on biodiversity resources in accordance with requirements in LA 104 [Ref 2.N], including:

1) loss or destruction of sites, habitats, and species;
2) fragmentation of sites, habitats, or populations of species;
3) loss of connectivity between biodiversity resources or introduction of barriers to movement;
4) disturbance and damage to sites, habitats or species, including emissions, noise, visual and pollution;
5) changes to the systems on which sites, habitats and species depend;
6) the effects of climate change.

2.13.1 Biodiversity design elements should be specific to the biodiversity resources that have the potential to be impacted by a project, where identified by the biodiversity assessment LA 108 [Ref 1.N].

2.14 Projects shall provide opportunities for the enhancement and creation of habitats.

NOTE *Biodiversity design can offer opportunities to encourage a natural succession of habitats where appropriate.*

2.15 Biodiversity design elements shall include ongoing maintenance, management and safety requirements.

2.15.1 The design of biodiversity elements should assess operational management responsibilities and whole-life costs.

2.15.2 Biodiversity elements should be reported within an environmental management plan in accordance with LA 120 [Ref 3.N].

2.16 The development of biodiversity design elements shall follow the consultation requirements within LA 104 [Ref 2.N].

2.17 The relevant environmental function and environmental or landscape element codes shall be used to identify environmental mitigation and enhancement measures in accordance with the requirements within LD 117 [Ref 7.N].

NOTE *Where applicable, Overseeing Organisation specific requirements are provided in the National Application Annexes to LA 117.*

3. Surveying to inform design

General approach to surveying

Desk studies

3.1 Desk studies shall be undertaken during the relevant stages of the project life-cycle to inform option selection and identify the need for ecological surveys.

3.1.1 Desk studies should follow the approach outlined in Guidelines for Preliminary Ecological Appraisal CIEEM (Preliminaries) [Ref 3.I].

Preliminary surveys

3.2 Where desk studies identify the need for preliminary surveys, these shall be undertaken following current published technical guidance and standards.

3.2.1 Proposed survey methods should be reported in the scoping report produced in accordance with the requirements in LA 104 [Ref 2.N].

3.2.2 Proposed survey methods should be consulted on in accordance with the requirements in LA 104 [Ref 2.N].

3.2.3 Environmental assessment reports should report on alignment with and variation from the technical standards and guidance followed in undertaking any survey work.

3.2.4 The expertise of surveyors should be reported in accordance with the requirements in LA 101 [Ref 5.N].

NOTE *Lists of current published technical guidance and standards can be accessed from the relevant governments and their statutory agencies as illustrated in Table 3.2.4N.*

Table 3.2.4N Indicative sources of technical guidance and standards

Country	Source
England	Standing advice for protected species NE Protected Species [Ref 8.I]
Northern Ireland	Standing advice for development of land that can affect Natural Heritage Interests DAERA [Ref 7.I]
Scotland	Protected species A-Z guide SNH Protected Species [Ref 6.I]
Wales	UK protected species Natural Resources (W) [Ref 9.I]

3.2.5 Where surveys for badgers or reptiles are required and these are not covered by the technical standards and guidance sources in Table 3.2.4N, the survey methods in Appendix A should be followed.

3.2.6 Projects should seek opportunities for efficiencies in combining surveys, e.g. undertaking species potential surveys at the same time as phase 1 habitat surveys.

3.2.7 Projects should include a survey of baseline biodiversity units within preliminary surveys.

NOTE *The surveying of baseline biodiversity units includes assigning condition scores and areas to habitats identified within preliminary surveys.*

Further surveys

3.3 Where desk studies and preliminary surveys identify the need for further surveys, these shall be undertaken in line with current published technical guidance and standards.

3.3.1 Proposed survey methods should be reported in the scoping report produced in accordance with the requirements in LA 104 [Ref 2.N].

3.3.2 Proposed survey methods should be consulted on in accordance with the requirements in LA 104 [Ref 2.N].

3.3.3 Environmental assessment reports should report on alignment with and variation from the technical standards and guidance followed in undertaking any survey work.

3.3.4 Variations in survey from the technical standards and guidance identified above, should be justified and agreed with the Overseeing Organisation.

NOTE *Further surveys can include vegetation classification, species specific surveys, and habitat condition assessments.*

3.3.5 Where further surveys for badgers or reptiles are required and these are not covered by the technical standards and guidance sources in Table 3.2.4N, the survey methods in Appendix A should be followed.

4. Designing for biodiversity

Design measures

4.1 Biodiversity design shall incorporate measures in accordance with the hierarchical system described in LA 104 [Ref 2.N].

4.1.1 The timing of the delivery of biodiversity design measures should be assessed for suitability in projects, as in some cases design measures need to be in place before an adverse impact occurs.

Avoidance and prevention measures

4.2 Biodiversity design shall address adverse impacts on biodiversity resources as far as possible through the use of a hierarchical system for the identification and assessment of impacts in accordance with requirements in LA 104 [Ref 2.N].

NOTE *Examples of measures to avoid or prevent impacts include consideration of alternative route corridors, or alternative design options, to avoid sensitive sites.*

4.3 Project programmes shall be informed by seasonal survey constraints in order to avoid or prevent adverse impacts.

4.3.1 Project design should avoid and prevent indirect effects on biodiversity resources including changes to the systems on which sites, habitats and the species depend.

Reduction

4.4 Where the use of a hierarchical system for the identification and assessment of impacts in accordance with requirements in LA 104 [Ref 2.N] does not resolve all identified adverse impacts, mitigation measures shall be identified.

4.4.1 Mitigation measures should be specific and proportionate to the nature, magnitude and duration of the impact.

4.5 Only mitigation measures that are effective and proven shall be included in project design.

4.6 Where innovative or unproven mitigation measures are proposed, evidence of the consideration of uncertainty in accordance with the requirements of LA 104 [Ref 2.N] shall be submitted to the Overseeing Organisation.

Compensation measures

4.7 Biodiversity compensation measures shall provide replacement ecological resources or functions that are of a similar type and an equivalent or higher value than those being impacted.

NOTE 1 *There is inherent uncertainty in the success of biodiversity compensation measures, particularly in cases which require ecological restoration, habitat creation, or translocation of species or habitats, therefore designing for higher replacement ratios can improve confidence in outcomes.*

NOTE 2 *Compensation measures requirements for European Sites are set out in LA 115 [Ref 4.I].*

4.8 Where the use of a hierarchical system for the identification and assessment of impacts in accordance with requirements in LA 104 [Ref 2.N] does not resolve all identified residual impacts, compensation measures shall be developed.

4.8.1 Biodiversity compensation measures should be specific and proportionate to the nature, magnitude, duration and location of the impact.

4.8.2 Biodiversity compensation measures should prioritise, where practical, delivery on or near to the site of impact.

NOTE *The delivery of compensation measures in close proximity to the impact site can support the reduction of the difficulty of delivery and associated risks.*

Enhancement measures

4.9 Biodiversity enhancement opportunities shall be identified and assessed in accordance with the requirements in LA 108 [Ref 1.N].

4.9.1 Environmental assessment reports should identify opportunities to address historic impacts from motorway and all-purpose trunk roads on biodiversity resources.

4.9.2 The existing baseline ecological value of any potential enhancement areas should be assessed in accordance with LA 108 [Ref 1.N] when developing the design of biodiversity elements.

4.9.3 Biodiversity elements should include changes to the management of existing resources to provide biodiversity benefits, or the creation of new resources.

NOTE 1 Biodiversity elements can be delivered alongside mitigation measures for other environmental effects.

NOTE 2 Biodiversity elements can be designed to deliver biodiversity objectives that are specified in relevant policy documents.

Specific approaches to design

4.10 Biodiversity design shall be undertaken in line with current published technical guidance and standards.

4.10.1 Any variation from current published technical guidance and standards should be justified and agreed with the Overseeing Organisation.

NOTE Sources of design mitigation technical guidance and standards can be found in Table 3.2.4N.

5. Normative references

The following documents, in whole or in part, are normative references for this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

Ref 1.N	Highways England. LA 108, 'Biodiversity'
Ref 2.N	Highways England. LA 104, 'Environmental assessment and monitoring'
Ref 3.N	Highways England. LA 120, 'Environmental management plans'
Ref 4.N	Highways England. GG 103, 'Introduction and general requirements for sustainable development and design'
Ref 5.N	Highways England. LA 101, 'Introduction to environmental assessment'
Ref 6.N	Highways England. GG 101, 'Introduction to the Design Manual for Roads and Bridges'
Ref 7.N	Highways England. LD 117, 'Landscape design'

6. Informative references

The following documents are informative references for this document and provide supporting information.

Ref 1.I	https://cieem.net/resource/competencies-for-species-survey-css/. CIEEM. CIEEM (Competencies), 'Competencies for Species Surveys'
Ref 2.I	Chartered Institute of Ecology and Environmental Management, Winchester. CIEEM. CIEEM (Guidelines), 'Guidelines for ecological impact assessment in the UK and Ireland. Terrestrial, freshwater, coastal and marine'
Ref 3.I	CIEEM. Chartered Institute of Ecology and Environmental Management. CIEEM (Preliminaries), 'Guidelines for preliminary ecological appraisal'
Ref 4.I	Highways England. LA 115, 'Habitats Regulations assessment'
Ref 5.I	Plantlife. Plantlife, 'Managing grassland road verges: a best practice guide.'
Ref 6.I	https://www.nature.scot/professional-advice/safeguarding-protected-areas-and-species/protected-species/protected-species-z-guide. Scottish Natural Heritage. SNH Protected Species, 'Protected species A-Z guide'
Ref 7.I	https://www.daera-ni.gov.uk/publications/standing-advice-development-land-may-affect-natural-heritage-interests. Department of Agriculture, Environment and Rural Affairs. DAERA, 'Standing advice for development of land that may affect Natural Heritage Interests'
Ref 8.I	https://www.gov.uk/guidance/protected-species-how-to-review-planning-applications-#standing-advice-for-protected-species. Natural England. NE Protected Species, 'Standing advice for protected species'
Ref 9.I	https://naturalresourceswales.gov.uk/guidance-and-advice/environmental-topics/wildlife-and-biodiversity/uk-protected-species/?lang=en. Natural Resources Wales. Natural Resources (W), 'UK protected species'

Appendix A. Species specific approaches to surveying

A1 Badger surveys

A1.1 Survey area

A corridor of approximately 500m (i.e. 250m either side of the centre-line of the road) is usually sufficient, widened to 1km as necessary to locate nearby setts or other features of importance. The status and activity of each sett within the corridor should be assessed along with the most well-used badger paths which cross the route line.

It is occasionally necessary to widen the survey area considerably in order to properly determine the status of setts (by locating other neighbouring setts), where required by local conditions/circumstances. This is usually undertaken in a later design stage of the project life-cycle, when it has been confirmed that the sett in question would be affected by construction.

Badger setts that would be affected during construction, should be re-surveyed immediately prior to construction to update the original survey and adjust the proposed mitigation as necessary.

A1.2 Data publishing

Specialist badger reports produced as part of the environmental assessment should not be made publicly available in a form that would allow sett locations to be identified. Requests for such information should be managed in accordance with the relevant statutory requirements.

A2 Reptile surveys

A2.1 Use of artificial refuges

An appropriate weight of heat-absorptive material should be used as artificial refuges beside operational roads. The weight and placement of artificial refuges should be sufficient to prevent displacement by the draught of passing vehicles. Other lighter and/or stiffer materials (corrugated metal for example) may pose a hazard to road users when placed adjacent to the carriageway.

For reptile surveys away from the live carriageway, where artificial refuges will not represent a hazard to passing traffic or members of the public, the use of corrugated metal and heavy gauge rubber is recommended for at least some of the refuges.

A2.2 Population estimates

Estimating population sizes or densities accurately requires sampling a relatively large proportion of a resident population. There are welfare considerations associated with repeated handling of reptiles and other intrusive techniques. Survey techniques that require handling should be restricted to those situations where, on the basis of the magnitude of the predicted impacts and the importance of the population, consultation with the relevant stakeholders confirms the requirement for population data.