



National Network of Regional Coastal Monitoring Programmes of England

**SPECIFICATION FOR
TERRESTRIAL
ECOLOGICAL MAPPING**

**Version 1.2
September 2020**

Cover image: 2013 habitat mapping of the managed realignment site at Medmerry, West Sussex, pre-breach.

NATIONAL NETWORK OF REGIONAL COASTAL MONITORING PROGRAMMES**SPECIFICATION FOR TERRESTRIAL ECOLOGICAL MAPPING****Record of Changes**

| Version | Date | Status | Modifications |
|----------------|-------------|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.0 | 27/10/2015 | Final | - |
| 1.1 | 27/11/2017 | Final | Specification modified to use OpenStreetMap only |
| 1.2 | 07/10/2020 | Final | Specification updated to use IHS Definitions Version 2.001 Removed mention of GIS habitat mapping tool. Additions made to the template GIS table. |
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NATIONAL NETWORK OF REGIONAL COASTAL MONITORING PROGRAMMES OF ENGLAND

SPECIFICATION FOR TERRESTRIAL ECOLOGICAL MAPPING

1. Introduction

Habitat mapping is undertaken to provide coastal and terrestrial habitat extent data for use by Local Authorities, the Environment Agency and Natural England to contribute to their reporting and monitoring requirements for Natura 2000 sites (designated by the EU Habitat and Species Regulations, 2017¹), Biodiversity Action Plans (resulting from the Convention of Biological Diversity, 1992) and Sites of Special Scientific Interest (designated under the Countryside and Rights of Way Act, 2000 [CROW] Act).

The principal objectives are to provide priority habitat² extent data for:

- Identification and quantification of regional coastal change
- Assessing losses and gains for the Environment Agency's Regional Habitat Creation Programme
- To support the aims of the Environment Agency's 25 year plan
- Identification and strategic consideration of coastal flood and erosion risks
- Assisting development of Biodiversity Action Plans (BAPs)
- Providing contextual information to support Appropriate Assessments for Shoreline Management Plans, Flood and Coastal Defence Strategies and Flood and Coastal Defence Schemes

Provision is made for:

- Mapping the extent of all coastal and terrestrial priority habitats within the defined area
- Data management at local Biodiversity Record Centres

The output from the mapping will be freely available on the National Network of Regional Coastal Monitoring Programmes' website (www.coastalmonitoring.org).

2. General

2.1 Performance monitoring arrangements

A quarterly review will be undertaken by the Employer to examine the performance of the Consultant during the contract period. If the Consultant is shown to be failing in his obligations to comply with the terms of the KPI's in the NEC4 Contract, Specification or Scope, the Employer may exercise his rights under clause 90 to terminate the contract.

2.2 Quality control of data

The Consultant is responsible for undertaking quality control of the habitat mapping to ensure that the data meets the standards and requirements of the Specification and the Scope. The Employer will undertake quality

¹ <https://www.legislation.gov.uk/uksi/2017/1012/part/2/made>

² Formerly known as BAP Priority Habitats, they are now referred to as "priority habitats", as listed in Section 41 of the Natural Environment and Rural Communities Act (2006) <http://data.jncc.gov.uk/data/2728792c-c8c6-4b8c-9ccd-a908cb0f1432/UKBAP-PriorityHabitatDescriptions-Rev-2011.pdf>

control checks on the Consultant's data within 8 weeks of delivery of each Block of deliverables (as specified in the Scope). If corrections are required, the corrected data shall be supplied within 4 weeks of notification of failure.

2.3 Data ownership, copyright and intellectual property rights

All GIS scripts, GIS tools, data and accompanying documents and records, both working and fair, acquired or created in the course of the contract shall become the property and copyright of the Employer. Copyright and intellectual property rights will belong to the Employer.

2.4 Open source mapping

All new mapping must use OpenStreetMap in lieu of licence-restricted mapping. Historically, earlier habitat mapping may have involved the use of Ordnance Survey MasterMap, which meant that the results could be used only by organisations with a MasterMap licence. If the mapping tasks require the Contractor to use historic mapping which has used MasterMap, the Employer's OS licence for MasterMap will be supplied. This licence wording must be used on any products deriving from the historic mapping. MasterMap shall not be used for any new mapping.

3. Area to be mapped

The location and extent of the area to be mapped is given in the Scope.

4. Mapping tasks

The mapping tasks to be undertaken will depend on the availability of previous epochs of habitat mapping. If no previous mapping has been undertaken, the required mapping will be as described in Task A. Where historic mapping is available, additional mapping may be required, as described in Task B and/or Task C. The required mapping Tasks will be defined in the Scope.

The decision route for the mapping tasks is shown in [Figure 1](#).

Task A: Full mapping of new imagery using OpenStreetMap

Task B: Re-classify historic mapping into revised categories and extend boundaries of historic mapping to match those of task A

Task C: Map priority habitat change between last and current surveys – Further details to be provided in the scope

Figure 1: Habitat mapping tasks

5. Habitat classification

The habitat classification system to be used is the Integrated Habitat System (IHS) version 2. The IHS originated from the Somerset Environmental Record Centre and integrates UK Priority habitats and Annex 1 classes within a hierarchical structure. It also relates to the National Vegetation Classification system (NVC) and EUNIS. Definitions of the habitats are available in the accompanying [ihs-brief-definitions-2-100.htm](#), with corresponding EUNIS codes given at IHS Brief Definitions Version “[ihs-brief-definitions-2-100.htm](#)”.

The habitats to be mapped will be defined in the Scope, as one or more of the following categories:

- Priority and some supporting habitats listed in [Table 1](#)
- Habitat complexes listed in [Table 2](#)

Contractors must use the below table for all analysis – in particular any change analysis outlined in the scope. If the scope also specifies using lower tiers in the hierarchy this must also be provided.

| Broad priority habitat | Priority habitat | Supporting habitat |
|-------------------------------------|---------------------------------------|---------------------------------|
| Broadleaved, Mixed and Yew Woodland | | WB1 Mixed Woodland |
| | | WB2 Scrub Woodland |
| | | WB3 Broadleaved woodland |
| | WB31 Upland oakwood | |
| | WB32 Upland mixed ashwoods | |
| | WB331 Lowland Beech and yew woodlands | |
| | WB34 Wet woodland | |
| | WB35 Upland birch woodland | |
| | WB36 Lowland mixed deciduous woodland | |
| | | WB3Z Other broadleaved woodland |
| Coniferous Woodland | WC1 Native pine woodlands | |
| | | WCZ Other coniferous woodland |
| Acid Grassland | GA1 Lowland dry acid grassland | |
| Calcareous Grassland | GC1 Lowland calcareous grassland | |
| | GC2 Upland calcareous grassland | |
| Neutral Grassland | GN1 Lowland meadows | |
| | GN2 Upland hay meadows | |
| | GN4 Grazing marsh pasture | |
| | | GNZ Other neutral grassland |
| Improved Grassland | GI0 Improved Grassland | |
| Bracken | BR0 Bracken | BRZ Other continuous bracken |
| Dwarf Shrub Heath | HE0 Dwarf Shrub Heath | |

| Broad priority habitat | Priority habitat | Supporting habitat |
|---------------------------------|----------------------------------------------------------|---------------------------------------------------|
| Bogs | EO1 Blanket bog [Blanket bogs] | |
| | EO2 Lowland raised bog | |
| Fen, Marsh and Swamp | EM11 Reedbeds | |
| | | EM1Z Other Swamp Vegetation |
| | EM31 Fens [lowland] | |
| | EM32 Fens [upland] | |
| | EM4 Purple moor grass and rush pastures | |
| Standing Open Waters and Canals | | AS0 Standing open water and canals |
| | AS11 Natural dystrophic lakes and ponds | |
| | AS21 Oligotrophic lakes | |
| | AS3 Mesotrophic standing waters | |
| | AS31 Mesotrophic lakes | |
| | AS4 Eutrophic standing waters | |
| | AS6 Brackish Standing water with no sea connection | |
| | AS7 Aquifer fed naturally fluctuating water bodies | |
| | AP1 Pond | |
| Rivers and Streams | AR0 Rivers and streams | |
| Arable and Horticulture | CR61 Arable field margins | |
| Boundary and Linear Features | LF11 Hedgerows | |
| Supralittoral Sediment | SS1 Coastal sand dunes | |
| | | SS1Z Other sand dunes |
| | SS31 Coastal vegetated shingle | |
| | | SS3Z Unvegetated shingle above the high tide mark |
| Littoral Rock | LR1 Littoral chalk | |
| | LR3 Sabellaria alveolata reefs | |
| | | LRZ Other littoral rock |
| Littoral Sediment | LS2 Seagrass beds - Zostera noltii adjacent to saltmarsh | |
| | LS3 Coastal saltmarsh | |
| | LS4 Intertidal mudflats | |
| | LS5 Sheltered muddy gravels | |
| | | LSZ Other littoral sediment |

| Broad priority habitat | Priority habitat | Supporting habitat |
|----------------------------|----------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|
| Sublittoral Sediment | IR7 Horse mussel beds | |
| | IS2 Subtidal sands and gravels [inshore] | |
| | IS3 Seagrass beds - <i>Zostera marina</i> & <i>Z. angustifolia</i> located on mid to lower foreshore and sub littoral zone | |
| | IS4 Maerl beds | |
| | IS5 Saline Lagoons with restricted sea connection | |
| | IS6 Serpulid reefs | |
| Sublittoral Rock | CS1 Cold-water coral reefs (<i>Lophelia pertusa</i> reefs) | |
| | IR2 <i>Sabellaria spinulosa</i> reefs | |
| | IR5 Tide-swept channels | |
| | IR6 Subtidal chalk | |
| Inland Rock | PI1 Calaminarian grasslands of the <i>Violetalia Calaminariae</i> | |
| Built-up Areas and Gardens | | UR0 Built-up areas and Gardens ³ |
| Scrub | | SC0 Scrub |
| Arable | | CR6 Arable and horticulture |
| Dwarf Shrub Heath | | HE0 Dwarf shrub heath |

Table 1: Priority and supporting habitats

| Habitat complex | Habitat complex code |
|--------------------------------------|------------------------------------------|
| Coastal and floodplain grazing marsh | CF1 Coastal and floodplain grazing marsh |
| Maritime cliff and slopes | MC1 Maritime cliff and slopes |
| Lowland Heathland | HL1 Lowland Heathland |
| Upland Heathland | HU1 Upland Heathland |
| Limestone Pavement | LP1 Limestone pavement |
| Estuary | ES1 Estuary |

Table 2: Habitat complexes

³ Buildings, infrastructure and gardens are to be coded as UR0 Built-up areas and gardens

6. Methods

Contractors will use OpenStreetMap for the terrestrial mapping. The following data sources will be supplied by the Employer:

- Aerial ortho-photography of the coastal region, from the relevant Regional Coastal Monitoring Programme
- False Colour Infra-Red imagery may be available in some Regions
- Remote sensing for intertidal areas may be available in some Regions
- Environment Agency saltmarsh layer
- Previous habitat mapping may be provided, as outlined in the Scope

The supplied Environment Agency saltmarsh layer may be used as a base layer to aid interpretation. However, prior to use the Consultant must ensure that it meets the digitizing standards and Minimum Mappable Units in [Table 5](#). The method used by the Environment Agency to map the saltmarsh layer is given in [Appendix 1](#).

6.1 Shapefile attributes

Polygon fields shall all be populated in accordance with the descriptions shown in [Table 3](#). Where there is no data to add to a field, the field shall be populated with the code 'Null'.

| Attribute heading | Description | See section |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|
| FID | Unique, non-static polygon number. Virtual attribute generated by ArcMap; only visible when viewing file in ESRI software (i.e. not visible in MapInfo) | |
| Shape | GIS file type (polygon) | |
| OBJECT_ID | Unique polygon number assigned to polygons prior to dataset splitting | |
| OS_GRID | OS grid reference taken from polygon centroid <i>e.g.</i> SZ39 | |
| MASTERMAP_ | Coded 'Null' unless OS MasterMap is used for the historic mapping | |
| OSM_ | Original OpenStreetMap TOID unique ID | |
| CMP_FRAGID | A number unique for each fragment of an original OS MasterMap TOID, set to zero if the polygon has not been split | |
| SEA_LIMIT | Extent of aerial photography <i>or</i> MLWS | |
| HAB_CD_YY | IHS habitat code from previous mapping (if applicable) | Task C only |
| HABITAT_CD | IHS habitat code from updated mapping | |
| HABITAT_DES | IHS habitat description from updated mapping | |
| MATRIX1_CD | IHS habitat matrix codes <i>e.g.</i> TS01 Broadleaves | |
| MATRIX2_CD | Optional IHS habitat matrix codes | |
| FORMATION_ | Column to provide optional IHS habitat details <i>e.g.</i> WF0 woodland formation, AP0 open water form | |
| MANAGEMENT | Column to provide optional code for management and use of habitat <i>e.g.</i> WM0 Undetermined woodland management, UA32 gardens, GM0 Undetermined grassland management | |

| Attribute heading | Description | See section |
|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|
| COMPLEX_CD | IHS habitat complexes <i>e.g.</i> CF1. Where complexes are not required the attribute table shall be coded 'Null' | |
| SUMMARY | Summary of codes in columns 'HABITAT_CD', 'MATRIX1_CD', 'MATRIX2_CD', 'MATRIX3_CD', 'FORMATION_', 'MANAGEMENT' and 'COMPLEX_CD' | |
| PROCESS | Code denoting the data source: M (Base Map) A (aerial photography) F (field survey) R (habitat records) L (Lidar) T (Topographic) FCIR (False Colour Infra-red) | |
| MODIFIED_D | Date file modified | |
| MODIFIED_U | User who modified file | |
| CHANGE | Codes are used to represent changes in the data: HC_YYYY to indicate that the polygon required a habitat change BC_YYYY to indicate that the polygon required a boundary change RC_YYYY to indicate "real" change since the last dataset (only used when actual change exceeds a percentage within a polygon and is not due to a previous mapping error – this value if required will be specified in the scope) ME_YYYY used to indicate change due to a previous mapping error If no change is recorded then "Null" is inserted | |
| KEYWORDS | Additional description to describe management or features <i>e.g.</i> caravan, water sports, flood embankments | |
| COMMENT | Comments relating to the polygon and additional information such as 'no aerial photo cover'. Use code GS followed by DD_MM_YYYY to indicate those polygons that were subject to a field survey. Where a polygon is split or polygons merged, the word, "split" or "merged" should be recorded accordingly. If no comment then "Null" is inserted | |
| GRND_SURVEY | Date of the ground survey (YYYY-MM-DD). Where no survey took place 'Null' is inserted | |
| PHOTOGRAPHY_DATE | Date the aerial photography was flown. | |
| SHAPE LENG | Perimeter of original polygon (m) | |
| SHAPE_AREA | Area of original polygon (m ²) | |

Table 3: Template attribute table for GIS

The additional attribute fields listed in [Table 4](#) must also be added and populated. The supplied Lookup table (Appendix 3) can be joined to the attribute table to assist with this task (See Appendix 3 for a note on joining the lookup and attribute tables). Note that this process need not be undertaken until quality control of the mapping has been completed by the Employer.

| Title | IHS habitat code type |
|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Source | Joined from supplied lookup table lookup.mdb. "PHT" = Priority Habitat, "AN1" = Annex I, "TT" = Tidal Thames, "IC" = Inverse Category, "PH1" = Phase 1, "BHT" = Biodiversity Broad Habitat Type, "SC" = SERC categories, "AAHMP" = AA ⁴ Habitat Monitoring Programme If it is not possible to utilise the lookup table with your system the corresponding codes will be included as a field in the GIS attribute table manually. |
| NVC_codes | Corresponding NVC codes |
| EUNIS_code | Corresponding EUNIS code |
| Corine_biotype | Corresponding Corine biotype code |

Table 4: Additional attribute fields for Lookup table

6.2 Slithers, gaps and overlapping polygons

Slither polygons and other similar features shall be removed from the dataset. There shall be no gaps or overlapping polygons in excess of the cluster tolerance, which is 0.5 m for gaps and 1.5 m for overlaps.

6.4 Habitat legend

The Consultant will generate a MapInfo legend to correspond with the supplied ArcGIS layer file if requested in the scope.

⁴ Where AA represents the Regional Coastal Monitoring area code *i.e.* NE, ER, An, SE, SW or NW

7. Digitising accuracy

The accuracy of the mapping will vary according to the digitisation scale and MMU. Habitats will be mapped at a digitisation scale shown in Table 5. Table 5 also lists the Minimum Mappable Unit (MMU) for each habitat.

The contractor should ensure that they analyse each habitat to the MMU level of detail specified in table 5. If the habitats are mapped at higher resolution than the listed MMUs the data must also be provided down sampled to the MMU defined. This ensures consistency of change analysis. A GIS tool may be available to undertake the down sampling process and will be specified in the scope.

The measurable difference between the position of the digitised habitat polygon and the habitat extent on the aerial photography shall not exceed ± 0.5 m for 1:500 scale mapping or ± 1 m for 1:1250 scale mapping.

| Broad priority habitat | Priority habitat | Scale | MMU (ha) |
|-------------------------------------|-----------------------------------------|--------|----------|
| Broadleaved, Mixed and Yew Woodland | WB1 Mixed Woodland | 1:1250 | 0.25 |
| | WB2 Scrub Woodland | 1:1250 | 0.25 |
| | WB3 Broadleaved woodland | 1:1250 | 0.25 |
| | WB31 Upland oakland | 1:1250 | 0.25 |
| | WB32 Upland mixed ashwoods | 1:1250 | 0.25 |
| | WB331 Lowland beech and yew woodlands | 1:1250 | 0.25 |
| | WB34 Wet woodland | 1:1250 | 0.25 |
| | WB35 Upland birch woodland | 1:1250 | 0.25 |
| | WB36 Lowland mixed deciduous woodland | 1:1250 | 0.25 |
| | WB3Z Other broadleaved woodland | 1:1250 | 0.25 |
| Coniferous Woodland | WC1 Native pine woodlands | 1:1250 | 0.25 |
| | WCZ Other coniferous woodland | 1:1250 | 0.25 |
| Acid Grassland | GA1 Lowland dry acid grassland | 1:1250 | 0.25 |
| Calcareous Grassland | GC1 Lowland calcareous grassland | 1:1250 | 0.25 |
| | GC2 Upland calcareous grassland | 1:1250 | 0.25 |
| Neutral Grassland | GN1 Lowland meadows | 1:1250 | 0.25 |
| | GN2 Upland hay meadows | 1:1250 | 0.1 |
| | GN4 Grazing marsh pasture | 1:1250 | 0.1 |
| | GNZ Other neutral grassland | 1:1250 | 0.1 |
| Improved Grassland | GI0 Improved Grassland | 1:1250 | 0.1 |
| Bracken | BR0 Bracken | 1:1250 | 0.1 |
| | BRZ Other continuous bracken | 1:1250 | 0.1 |
| Bogs | EO1 Blanket bog [Blanket bogs] | 1:1250 | 0.25 |
| | EO2 Lowland raised bog | 1:1250 | 0.25 |
| Fen, Marsh and Swamp | EM11 Reedbeds | 1:1250 | 0.1 |
| | EM1Z Other Swamp Vegetation | 1:1250 | 0.1 |
| | EM31 Fens [lowland] | 1:1250 | 0.1 |
| | EM32 Fens [upland] | 1:1250 | 0.1 |
| | EM4 Purple moor grass and rush pastures | 1:1250 | 0.1 |

| Broad priority habitat | Priority habitat | Scale | MMU (ha) |
|---------------------------------|--------------------------------------------------------------------------------------------------------------|--------|----------|
| Standing Open Waters and Canals | AS0 Standing open water and canals | 1:1250 | 0.25 |
| | AS11 Natural dystrophic lakes and ponds | 1:1250 | 0.25 |
| | AS21 Oligotrophic lakes | 1:1250 | 0.25 |
| | AS3 Mesotrophic standing waters | 1:1250 | 0.25 |
| | AS31 Mesotrophic lakes | 1:1250 | 0.25 |
| | AS4 Eutrophic standing waters | 1:1250 | 0.25 |
| | AS6 Brackish Standing water with no sea connection | 1:1250 | 0.25 |
| | AS7 Aquifer fed naturally fluctuating water bodies | 1:1250 | 0.25 |
| | AP1 Pond | 1:1250 | 0.25 |
| Rivers and Streams | AR0 Rivers and streams | 1:1250 | 0.25 |
| Arable and Horticulture | CR61 Arable field margins | 1:1250 | 0.25 |
| Boundary and Linear Features | LF11 Hedgerows | 1:1250 | 0.1 |
| Supralittoral Rock | SR1 Maritime cliff and slopes | 1:1250 | 0.25 |
| Supralittoral Sediment | SS1 Coastal sand dunes | 1:500 | 0.1 |
| | SS1Z Other sand dunes | 1:500 | 0.1 |
| | SS31 Coastal vegetated shingle | 1:500 | 0.1 |
| | SS3Z Other/unvegetated shingle above high tide mark | 1:500 | 0.1 |
| Littoral Rock | LR1 Littoral chalk | 1:1250 | 0.1 |
| | LR3 Sabellaria alveolata reefs | 1:500 | 0.1 |
| | LRZ Other littoral rock | 1:500 | 0.1 |
| Littoral Sediment | LS2 Seagrass beds - Zostera noltii adjacent to saltmarsh | 1:500 | 0.1 |
| | LS3 Coastal saltmarsh | 1:500 | 0.01 |
| | LS4 Intertidal mudflats | 1:500 | 0.1 |
| | LS5 Sheltered muddy gravels | 1:500 | 0.1 |
| | LSZ Other littoral sediment | 1:500 | 0.1 |
| Sublittoral Sediment | IR7 Horse mussel beds | 1:1250 | 0.1 |
| | IS2 Subtidal sands and gravels [inshore] | 1:1250 | 0.1 |
| | IS3 Seagrass beds - Zostera marina & Z. angustifolia located on mid to lower foreshore and sub littoral zone | 1:1250 | 0.1 |
| | IS4 Maerl beds | 1:1250 | 0.1 |
| | IS5 Saline lagoons with restricted sea connection | 1:1250 | 0.1 |
| | IS6 Serpulid reefs | 1:1250 | 0.1 |

| Broad priority habitat | Priority habitat | Scale | MMU (ha) |
|--------------------------------------|-------------------------------------------------------------------|--------|----------|
| Sublittoral Rock | CS1 Cold-water coral reefs (<i>Lophelia pertusa</i> reefs) | 1:1250 | 0.1 |
| | IR2 Sabellaria spinulosa reefs | 1:500 | 0.1 |
| | IR5 Tide-swept channels | 1:1250 | 0.1 |
| | IR6 Subtidal chalk | 1:1250 | 0.1 |
| Inland rock | PI1 Calaminarian grasslands of the <i>Violetalia Calaminariae</i> | 1:1250 | 0.1 |
| Built-up areas and gardens | UR0 Built-up areas and gardens | 1:1250 | 0.1 |
| Scrub | SC0 Scrub | 1:1250 | 0.1 |
| Arable | CR6 Arable and horticulture | 1:1250 | 0.1 |
| Dwarf Shrub Heath | HE0 Dwarf shrub heath | 1:1250 | 0.1 |
| Habitat complex | Habitat complex code | | |
| Coastal and floodplain grazing marsh | CF1 Coastal and floodplain grazing marsh | 1:1250 | 0.1 |
| Maritime cliff and slopes | MC1 Maritime cliff and slopes | 1:1250 | 0.25 |
| Lowland Heathland | HL1 Lowland Heathland | 1:1250 | 0.1 |
| Upland Heathland | HU1 Upland Heathland | 1:1250 | 0.1 |
| Limestone Pavement | LP1 Limestone pavement | 1:1250 | 0.1 |
| Estuary | ES1 Estuary | | |

Table 5: Scale and MMU for each habitat to be mapped

In summary, the Minimum Mappable Unit (MMU) is:

- 0.01 ha (100 m²) for saltmarsh
- 0.1 ha (1,000 m²) for grazing marsh, reedbeds, hedgerows, sand dunes, vegetated shingle, mudflat, seagrass beds, chalk habitats, saline lagoons and reefs
- 0.25 ha (2,500 m²) for broader land use categories such as woodland, grassland, bogs, lakes, standing waters and maritime cliff and slope habitats
- Saltmarsh creeks should be mapped only where they are wider than 2 m.

The example given in Figure 2 shows inter-tidal mudflat and saltmarsh polygons superimposed upon an aerial photograph. The two black rectangles provide examples of the MMU requirements for saltmarsh habitats, demonstrating that any saltmarsh greater in area than 0.01 ha should be mapped. Any fragments of saltmarsh smaller than 0.01 ha (shaded pink in Figure 2) need not be mapped as saltmarsh. In this example they are coded as inter-tidal mudflat.

Where False Colour Infra-red imagery is used for the habitat mapping, polygons smaller in area than the MMU will automatically be detected. These should be removed from the dataset and supplied as a separate layer for future comparisons (see section 12.3)



Figure 2: Example of saltmarsh Minimum Mappable Unit

8. Ground (field) surveys

Field surveys will be undertaken to ground-truth and validate the results of the mapping. A representative number of field surveys will be undertaken at a minimum of 8 sites across the full survey area as specified in the scope. These will be undertaken within a 2 year time frame from aerial capture and must be undertaken in the same season. I.e. if aerials are captured in September the ground surveys must be undertaken in the late summer/early autumn. Before undertaking ground surveys, the Consultant shall contact Natural England and the appropriate Local Record Centre to request the most up-to-date ground surveys for the region, in order to prevent unnecessary duplication. The contractor will also utilize other validation data (i.e. lidar, topographic data feature codes –to be provided by the client) for areas where field surveys are not possible/to supplement field survey.

Ground surveys shall be targeted towards:

- areas where priority habitats cannot be interpreted confidently from aerial photography alone (and where existing ground surveys are inadequate to validate the mapping results). This might include transitional habitats and complexes such as saltmarsh, vegetated shingle, coastal grazing marsh *etc.*
- areas of suspected change to aid validation of the mapping.
- areas which provide a good representation of priority habitat types

A template recording form for the ground survey results is given at Appendix 4. All ground surveys used for validation (existing and new) will be logged in the attribute table of the appropriate database along with other validation data – i.e. lidar and topographic data. (Table 3).

8.1 Health & Safety

The Consultant shall comply with all relevant legislation and bylaws when carrying out any ground surveys. Equipment and survey personnel provided by the Consultant for work in connection with the contract shall be the Consultant's responsibility at all times. The said equipment and survey personnel and any loss, injury or damage suffered or caused by them shall be at the Consultant's risk throughout. All risks of data acquisition will be borne by the Consultant.

The Employer is unaware of any special hazards other than those normally associated with ground surveying in coastal, tidally dominated areas and cliff tops. Extra caution should be exercised when surveying mudflat and saltmarsh given the soft nature of the sediment, and when ground-truthing vegetation on eroding cliff tops or landsliding areas.

The Consultant shall carry out a full Risk Assessment before each survey and shall prepare a Safe System of Working/Survey Management Plan based on the Assessment. All survey personnel provided by the Consultant shall adhere to laid down safety procedures at all times. A copy of the Survey Management Plan shall be forwarded to the Employer's Representative by email, at least 72 hours before the commencement of survey operations.

8.2 Site Conditions/Restrictions, Access and Public Relations

It is the Consultant's responsibility to obtain permission from landowners prior to undertaking surveys. The Consultant shall be responsible for obtaining all permissions needed for use of equipment associated with the work and for adhering to government legislation regarding permits to survey and for entry on to private land. In respect of authorities to be consulted, the Consultant's particular attention is drawn to the procedures to be adopted when obtaining permits for surveys undertaken on or where access is required over designated areas, railway property, or involving MOD property.

9. Internal consistency checks

On completion of the mapping Tasks, the Consultant shall undertake a review to check that all aspects of the specification have been met. The internal consistency checks shall include, but are not limited to:

- Completeness of dataset, including full population of attributes
- Miss-attribution of habitat types
- Spatial errors
- Duplicates and overlaps
- Data shifts *i.e.* horizontal accuracy

10. Data analysis

The following data analysis will be undertaken:

10.1 Habitat extent

A spreadsheet will be produced, populated with the quantities (ha) of priority habitat mapped. Totals shall be produced per county for all habitats mapped, from which the total per region will be derived as the sum of county results. Totals for supporting habitats shall be shown on a separate worksheet of the spreadsheet. Quantities of habitat shall be reported in hectares, to 3 decimal places.

10.2 Change analysis (Task C only)

A spreadsheet of habitat quantities will be produced for the earlier mapping (as per paragraph 10.1). A further spreadsheet will be populated with the “real” habitat change (as coded in Table 3 “Change” attribute) from the earlier to the current mapping. Real habitat change in this case is defined as actual change in habitat classification or extent, not changes resulting from analysis, mapping or re-interpretation error. Where the contractor believes real change to be apparent due to a change in habitat extent (The scope may specify a % change to work to) please indicate it as statistically significant. Habitat gain should be indicated as a +positive value, and habitat loss as a -negative.

11. Mapping reports

The habitat mapping report shall contain, as a minimum:

- Description of area covered
- Diagram showing the aerial photography tiles and flight date
- List of habitats mapped and corresponding codes
- Minimum Mappable Units
- Scale of mapping and associated error
- Explanation of accuracy estimate
- Detailed description of method used
- Description of fields in the attribute table
- Any problems or observations associated with the mapping
- List of datasets used for verification of habitat
- Ground survey reports
- Details of amendments made to previous dataset, where applicable
- Priority habitat extent and change since the previous mapping, where applicable
- Quality assessment

12. Data management

Habitat mapping results will be in 10 km² tiles, split along OS tile boundaries. Individual habitats will be provided as whole-region polygons. There must be no overlap between tiles or between habitat polygons. Quantities of habitat shall be reported in hectares, to 3 decimal places.

Results will be delivered as databases (*.mdb) and shapefiles (*.shp, *.shx *.sbx, *.sbn. and *.dbf) compatible with ArcGIS 10.0 and newer. Shapefiles shall be fully populated with the required attributes. Results may also be requested in as MapInfo tables as defined in the scope.

File names shall not contain spaces. Filenames will be based around the following conventions:

| | |
|-----------------|-------------------------------------------------------------------------------------------|
| YYYY | is the year of the photography used for the mapping |
| MM | is the month of the photography used for the mapping |
| NNNN | is the Ordnance Survey 10 km ² tile name <i>e.g.</i> SU46 |
| AA ⁵ | represents the Regional Coastal Monitoring area code <i>i.e.</i> NE, ER, An, SE, SW or NW |
| TTT | is the IHS habitat code (variable number of digits) |

12.1 10 km² tiles

File names for 10 km² tiles are:

NNNN_YYYYMM_XXX.*

where:

xxx is a suffix used to denote:

| | |
|----------|-----------------------------------------------------------------|
| EcoBuild | for mapping which includes buildings, road networks and gardens |
| Eco | for mapping excluding buildings, road networks and gardens |

Examples: SU46_201407_Eco.mdb
SU46_201407_EcoBuild.tab

12.2 Individual habitats

Individual habitat polygons shall contain results for the entire region being mapped, and named:

AA_TTT_YYYYMM.*

Example: NW_IS3_201407.shp
SW_LS4_201406.map
NE_AR0_201407.mdb

12.3 Extracted data

Extracted data files shall contain all polygons smaller than the specified MMU which have been removed from habitat deliverables. Files will be supplied as databases and named: (MapInfo tables may also be requested as defined in the scope)

AA_YYYYMM_MMU.*

Example: SE_201407_MMU.mdb
SE_201407_MMU.dat

⁵ Where a Region's mapping has been split into more than one work package, the work package identifier will be added preceded by an underscore *i.e.* SW_EMSW01

12.4 Analysis results

Analysis results (*.xlsx) shall contain quantities of habitat (ha) for each area, as defined in the Scope *e.g.* Block or county, summed to provide totals for the Region. Each spreadsheet shall contain two worksheets, one with results for priority habitats, and the second with results for supporting habitats. Spreadsheets will be named:

AA_YYYYMM_Eco.xlsx

Example: SW_201407_Eco.xlsx

Analysis files containing habitat change data shall be named using years of mapping only, for example:

SW_2009_2014_Eco.xlsx

12.5 Tile index

The tile index (*.shp, *.dat) shall contain the outline of the 10 km² tiles, with the associated attribute data:

- Filename
- OS tile
- Date of mapping
- Reference to related mapping report

Files shall be named:

Index_Eco_AA_YYYYMM.*

Example: Index_Eco_SE_201407.shp

12.6 Boundary polygon

This polygon (*.shp, *.dat) shall provide the boundary of the area which required mapping, as defined in the Scope (note that this is not the extent of the mapped habitats).

Bound_Eco_AA_YYYYMM.*

Example: Bound_Eco_SE_201407.shp

Bound_Eco_SE_201407.dat

12.7 Legends

If required these will be requested in the scope.

MapInfo legends (*.vcp) will be named:

Layer_Eco_AA_YYYYMM.vcp

Example: Layer_Eco_SE_201407.vcp

12.8 Mapping Report

The habitat mapping report shall encompass the whole region being mapped, and named:

Report_Eco_AA_YYYYMM.pdf

Example: Report_Eco_SE_201407.pdf
Report_Eco_NW_201308.pdf

12.9 Metadata

A template metadata form (*.xlsx) will be supplied by the Employer, containing the information shown in Table 6. Only one metadata form is required per set of tiles providing the information is appropriate for all tiles submitted with the metadata form. Files shall be named:

Meta_Eco_AA_YYYYMM.xlsx

Example: Meta_Eco_SW_201407.xlsx

| Theme | Content | Habitat mapping |
|----------------------------|------------------------------------------------------|-----------------|
| Year photography was flown | YYYY | |
| Name of mapping report | *.pdf | |
| Recorder interpreter | Name of Consultant capturing the data | |
| Verified | Flag for verification (0=verified, 1 = not verified) | |
| Verifier | Name of person verifying the data | |

Table 6: Metadata information

12.10 Delivery media

Data delivery will be specified in the scope, and may be digital or on physical media. Digital delivery will be via sftp or digital file transfer. If delivered on physical media, the following labelling shall apply:

Hard drives/DVD shall be labelled:

Label: Habitat mapping
Name of area mapped
Date of delivery
CD/DVD x of y
Consultant
Delivery reference number

Example: Habitat mapping
Southeast
201407
Hard drive 1 of 2
Consultant 1
Delivery reference 12345

13. Deliverables

The following habitat mapping results shall be delivered, in the formats given in Section 12:

- 10 km² tiles of all habitats (including buildings, road networks, gardens *etc.*)
 - Database
 - Shapefiles
 - MapInfo tables (if requested in the scope)

- 10 km² tiles of all habitats (excluding buildings, road networks, gardens *etc.*)
 - Database
 - Shapefiles
 - MapInfo tables (if requested in the scope)

- Individual habitat classes (whole region)
 - Database
 - Shapefiles
 - MapInfo tables (if requested in the scope)

- Extracted data (whole region)
 - Database
 - Shapefiles
 - MapInfo table (if requested in the scope)

- Analysis results
 - *.xlsx

- Tile index for outline of each 10 km² tile mapped
 - Shapefiles
 - MapInfo tables (if requested in the scope)

- Boundary polygon
 - Shapefiles
 - MapInfo tables (if requested in the scope)

- MapInfo Legend (if requested in the scope)
 - *.vcp

- Mapping report
 - *.pdf

- Metadata
 - *.xlsx

The Contractor will maintain an FTP site which will be used for delivery of data.

14. Tender information

As part of the Method Statement, the Consultant will provide full details to show that the technical requirements of the Specification and Scope can be met. The Method Statement shall, as a minimum, make reference to:

- The method to be used to map the habitats
- The expected accuracies from the method (digitizing and Minimum Mappable Unit)
- Proposed procedure for ground surveys and instrumentation to be used
- Quality control procedures
- Outline programme

Accompanying Documents

APPENDIX 1: Environment Agency saltmarsh mapping method

APPENDIX 2: Lookup table

APPENDIX 3: Ground survey record template (*.docx)

APPENDIX 4: IHS Definitions Version 2.001

Boundary file of required extent of mapping