

SOUTHEAST REGIONAL COASTAL MONITORING PROGRAMME

SPECIFICATION AND BRIEF FOR AERIAL PHOTOGRAPHY AND PHOTOGRAMMETRY SURVEYS

This document amplifies and amends the RICS Vertical aerial photography and digital imagery guidance and must be read in conjunction with these specifications

Tender Submission Date: See the invitation to tender letter

Contract Completion Date: 31 March 2022

Site Conditions/Restrictions, Access and Public Relations: A letter of introduction will be provided which should be presented as a matter of course, and without it being demanded, at all meetings with landowners or the public

The Standard Technical Specifications which shall apply to this Contract: RICS Vertical aerial photography and digital imagery 5th edition guidance notes (2009) or as amended herein.

| 1 Survey Brief | |
|------------------------------|--|
| 1.1 Project designation | <p>Southeast Regional Coastal Monitoring Programme – aerial surveys Reference No. XXXX</p> <p>Provision of aerial survey data for:</p> <ul style="list-style-type: none"> • Work package ASE03 – Isle of Grain to Selsey Bill • Work Package ASE04 – Selsey Bill to Portland Bill |
| 1.1.1 Purpose of survey | <p>The aerial surveys are to be used as part of a long-term programme of coastal monitoring, specifically designed to analyse coastal processes and provide data for operational and strategic shoreline management. The digital images will be used alongside other data to determine coastal evolutionary trends and morphological change.</p> <p>The ortho-rectified imagery will be used to define the geographical extent and change of coastal erosion and coastal maritime habitats along the coastal fringe and intertidal areas. This will provide data to support DEFRA Outcome Measures, Shoreline Management Plans, and will inform planning relating to both the protection and creation of nationally and internationally important coastal habitats and biodiversity.</p> |
| 1.1.2 End Products | <p>Under this Project the following is to be produced by the Consultant:</p> <ul style="list-style-type: none"> • Digital photographs (Clause 6) • Co-ordinates and attitude of camera at each exposure (Clause 3) • Aerial survey flight index • Geo-referenced photographs (Clause 6) • Digital mosaics (Clause 6) • Digital orthophotography (Clause 6) • Colour Infrared orthophotography (Clause 6) |
| 1.1.3 Employer provisions | <p>The areas to be covered by photography are given the in the Survey Brief Supplementary Information paragraph 1.</p> |

| 1 Survey Brief | |
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| | <p>Camera exposure co-ordinates shall be based upon the national survey control framework.</p> <p>A DTM and GPS control network may be supplied by the Employer, as detailed in the Survey Brief Supplementary Information.</p> <p>A template metadata *.xlsx file will be supplied to the awarded Consultant. An example is given in the Survey Brief Supplementary Information paragraph 4.</p> |
| <p>1.1.4 Project constraints</p> | <p>Photography shall be flown to capture inter-tidal areas above Mean Low Water Springs (MLWS) level, as defined in the Survey Brief Supplementary Information. It is the responsibility of the Consultant to meet this elevation requirement. To achieve this, it is expected that photography of the lower inter-tidal zone will need to be captured within 30 minutes of Low Water on spring tides. The Consultant shall make appropriate allowances for weather related modifications to tidal elevations to ensure capture of the required elevation during drying periods.</p> <p>Note that survey polygons need not be flown in their entirety in one sortie. If, however, the survey extent includes inter-tidal areas, the entire inter-tidal area (of a given stretch of coastline within a polygon) shall be flown in a single tidal window <i>i.e.</i> the lower and upper beach sections must be flown in the same tide; the area above Highest Astronomical Tide (HAT) may be flown within ± 3 days of the inter-tidal section.</p> <p>Photography shall be taken under flying conditions specified in Clause 3.4.</p> <p>The flying window for data capture is defined in the Survey Brief Supplementary Information paragraph 2.</p> <p>It is the Consultant's responsibility to obtain flight permission from air traffic control authorities. It is the Consultant's responsibility to obtain flight permission in areas where security clearance is required.</p> <p>The Employer has an agreement with Office for Civil Nuclear Security regarding over-flights of nuclear power stations – contact details will be supplied to Consultant on award of contract. All pixels which cover the nuclear power plant, its grounds and outflow pipes <u>must be removed</u> from the imagery at the earliest stage in processing, including from any back-ups held by the Consultant. Nuclear power station sites where this data removal is required are given in the Survey Brief Supplementary Information paragraph 3.</p> <p>The Employer is unaware of any special hazards other than those normally associated with aerial surveying. 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</p> |

| 1 Survey Brief | |
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| | <p>forwarded to the Employer’s Representative by email, at least 48 hours before the commencement of survey operations.</p> <p>The Consultant shall comply with all relevant legislation and bylaws when carrying out the Survey. Aircraft, 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 aircraft, 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, including aircraft hire and demurrage will be borne by the Consultant.</p> |
| 1.1.5 Proposed start/end dates | <p>The project start date is [date] (subject to tender award) Completion date for the project is [date] (subject to tender award) Interim deliveries are required as follows within 15 days of completion of each survey polygon:</p> <ul style="list-style-type: none"> • Chartlet with track line of aircraft and flying height • “Quickview” images: 1m resolution JPEG images of the RGB and NIR data including a shapefile with their centre-points. These do not need to be georeferenced. |
| 1.1.6 Progress reports | <p>Progress reports shall be submitted at significant milestones:</p> <ul style="list-style-type: none"> • 8 weeks prior to the commencement of the flying season, an outline programme of planned flights shall be provided to the Employer. • On commencement of flying, the Consultant shall supply, by email, a weekly report outlining progress of data collection, processing and derivation of products. A spreadsheet will be supplied to the Consultant for this purpose. |
| 1.1.7 Project Report | <p>A project Report of Survey shall be delivered by the Consultant upon completion of the Work Package(s). The Report of Survey shall contain, as a minimum:</p> <ul style="list-style-type: none"> • Camera File • Camera Identification, including manufacturer, model, lens serial number and date calibrated • Camera attributes, including focal length, X and Y offset to principal point, and location of fiducial points • Exterior orientation (omega, kappa, phi, exposure centre etc.) • Date photography was flown • Flight height • Scale of photography • Ground Sample Distance (GSD) of digital imagery • Camera Calibration Certificate • IMU instrumentation and calibration certificate • Survey Control, including base stations used, observation periods, PDOP, HDOP and VDOP (as graphs), standard deviation of horizontal and vertical positions, details of cycle slips • Flight plans and log including paths flown, direction of flight, flying speed and height, footprint and times of data collection of each run |

| 1 Survey Brief | |
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| | <ul style="list-style-type: none"> • Details of method used for orthorectification, including Digital Terrain Model • Estimated accuracy of imagery • Explanation of accuracy estimate |
| 1.1.8 Form of contract | <p>This specification is based upon "Vertical Aerial Photography and Digital Imagery: Client Specification and Guidelines" published by the Royal Institution of Chartered Surveyors. ISBN: 0 85406 997 6</p> <p>Terms and conditions of contract are NEC3 Professional Services Contract (June 2005, with amendments 2006).</p> |
| 1.1.9 Ownership and copyright | All digital data acquired or created in the contract shall become the property and copyright of the Employer on completion and final payment of the contract. All data collected under this contract will be made freely available under the Open Government Licence, via the internet. |
| 1.2 Project contacts | The principal contact names and addresses relating to this project are given in the clauses which follow. |
| 1.2.1 Primary Employer | New Forest District Council |
| 1.2.2 Employer representative for matters concerning the project | <p>Mr Steve Cook New Forest District Council, Appletree Court, Beaulieu Road, Lyndhurst, Hampshire SO43 7PA 02380 285588 Steve.Cook@NFDC.gov.uk</p> |
| 1.2.3 Employer contact for day-to-day contact | <p>Dr Travis Mason Channel Coastal Observatory, National Oceanography Centre, European Way, Southampton SO14 3ZH 02380 598467 Travis.Mason@noc.soton.ac.uk</p> |
| 1.2.4 Finance department for invoicing | As Clause 1.2.2 |
| 1.2.5 Others | N/A |

| 2 Camera Equipment | |
|---------------------------|--|
| 2.1 Camera | A photogrammetric-quality digital frame air survey camera or a "pushbroom" sensor capable of meeting the requirements of the contract shall be used. |

| 3 Flying and Photo Coverage | |
|--|--|
| 3.1 Flight lines | Flight lines shall be the most economical or appropriate with respect to the terrain and in particular to minimise shadowing. Where only one flight line is required, the centre of the flight line shall be seaward of Mean High Water (MHW). |
| 3.2 Overlap | <p>The forward overlap between successive exposures in each run shall be flown with a minimum of 55% fore and aft overlap</p> <p>The lateral overlap (sidelap) between adjacent strips must be a minimum of 20% (with 25% sidelap in urban areas)</p> <p>Pushbroom sensors must be flown in a continuous swathe along flight lines with a minimum sidelap of 20% (with 25% in urban areas)</p> |
| 3.4 Flying conditions | <p>The photography must be captured with the sun angle being 20 degrees to the horizon or greater. The extent of shadows caused by flying with a relatively low sun angle may be tolerated so long as detail, such as road markings, are clearly visible within the shadow.</p> <p>Cloud and snow cover must be less than 3% per 5 km by 5 km block, and less than 5% per 1 km image. Any detail within the 1 km image that is obscured must not be of high significance (examples of low significance being buildings near the landward boundary of the survey polygon).</p> |
| 3.4.1 Timing and Special Conditions for Photography | Photography shall reach seawards to at least the Mean Low Water Springs (MLWS) contour under dry conditions, as defined in Survey Brief Supplementary Information Table 2. |
| 3.5 Airborne GNSS and Inertial Measurement Unit (IMU) | <p>The survey geodesy shall be OSGB36. If data are captured using WGS84, they shall be transformed to OSGB36 using OSTN15/OSGM15.</p> <p>GNSS coupled with observations from an inertial measurement unit may be used for in flight navigation and for photo control purposes in accordance with RICS Specification clause 3.5 (b), where the required GSD of the end product is 20cm or larger.</p> <p>Photo identifiable ground control is required for photo control purposes where the GSD of the end product is better than 20cm. The Consultant should demonstrate that adequate control has been used to achieve the required accuracy of the end product. Details of existing ground control data available for the site is provided in the Survey Brief Supplementary Information section 4. Any supplementary ground control required to achieve the required accuracy will be provided by the Consultant. Details of additional ground control produced by the Consultant, including co-ordinates and witness diagrams, will be provided to the Employer.</p> |
| 3.6 Index plots | Indexing of the photographs shall be by means of digital index plots in *.shp format, as defined in the Supplementary Information |

| 4 Film and Photographic Products | |
|----------------------------------|-----------------|
| 4 | Section deleted |

| 5 Digital Imagery | |
|--|--|
| 5.1 Scale of photography/ GSD | Photography shall be flown with a ground sampled distance (GSD) of 10cm or smaller. The GSD of flown data must never exceed the output GSD of the end product. |
| 5.2 Areas to be photographed | The areas to be covered by photography are defined on the Contract maps supplied with this specification (See Survey Brief Supplementary Information paragraph 1 below) |
| 5.3 Digital camera data processing | <p>The absolute accuracy of the ortho-rectified imagery will be consistent with the required GSD <i>e.g.</i> for 10cm GSD, the Root Mean Square error shall be no more than ± 10 cm.</p> <p>The Consultant shall supply a copy of the provisional data (as given in section 1.1.5) and final deliverables as detailed in Survey Brief Supplementary Information paragraphs 5 and 6. Data shall be delivered on a removable hard disk drive or via an FTP site.</p> <p>Consultant shall retain a copy (incl. GNSS/IMU data) for 2 years from final acceptance of data for security purposes.</p> |
| 5.4 Sortie reports | Clause deleted |

| 6 Digital Imagery Product Details | |
|-------------------------------------|--|
| 6.1.1 Mosaic layout | <p>Digital mosaics shall be produced to the following specification:</p> <ul style="list-style-type: none"> • Colour orthophotography and colour infrared • GSD as specified in Clause 5.1 • Digital data as specified in Clause 6.2 |
| 6.1.2 Digital Ortho- photography | <p>Digital orthophotography shall be produced as specified in Survey Brief Supplementary Information paragraph 6</p> <p>Colour orthophotography and colour infrared</p> <p>GSD as specified in Clause 5.1</p> <p>Digital terrain model representing the ground surface used for ortho-rectification</p> <p>Digital data as specified in Clause 6.2</p> |
| 6.1.3 Radiometric values | <p>Imagery shall conform to the following:</p> <p>Blank areas shall be shown as white (not black)</p> <p><u>Urban/built topography</u></p> <p>The mean histogram (luminosity) has a value between 90 and 141</p> <p>Red band mean = $107 \pm 18\%$ (89 to 126); standard deviation >30 and <60</p> <p>Green band mean = $118 \pm 15\%$ (100 to 136); standard deviation >28 and <58</p> <p>Blue band mean = $94 \pm 21\%$ (74 to 115); standard deviation >15 and <53</p> <p>Colour band must conform across the whole block that is supplied</p> |

| 6 Digital Imagery Product Details | |
|-----------------------------------|---|
| | <p><u>Mixed rural topography</u></p> <p>In areas of mixed rural topography where the above specification cannot be met, the mean values should remain the same. To reflect the nature of the topography, the standard deviation values are lowered to produce acceptable imagery:</p> <p>The mean histogram (luminosity) has a value between 90 and 141 Red band mean = $107 \pm 18\%$ (89 to 126); standard deviation >20 and <50 Green band mean = $118 \pm 15\%$ (100 to 136); standard deviation >20 and <48 Blue band mean = $92 \pm 20\%$ (74 and 110); standard deviation >9 and <43 Colour band must conform across the whole block that is supplied</p> <p><u>Monotone topography</u></p> <p>In areas of monotone rural, moorland and mountainous topography where the above standard deviation cannot be met, the mean values should remain the same. To reflect the nature of the topography, the standard deviation values are not applicable and are replaced by the image appearance criteria. The radiometric test for these areas is specified below:</p> <p>The mean histogram (luminosity) has a value between 90 and 141 Red band mean = $107 \pm 18\%$ (89 to 126) Green band mean = $118 \pm 15\%$ (100 to 136) Blue band mean = $92 \pm 20\%$ (74 to 110) Colour band must conform across the whole of the block that is supplied</p> |
| 6.2.1 Hardcopy | Clause of the RICS Specification deleted |
| 6.2.2 Digital imagery | <p>Consultant shall supply all vertical imagery in *.ecw format, with associated *.eww files and *.tab files. If required *.tif files shall also be supplied.</p> <p>Supplementary ground control (if applicable).</p> <p>Metadata is to be completed for all supplied data in accordance with FGDC standards. A template metadata *.xlsx file will be supplied to the awarded Consultant. An example is given in the Survey Brief Supplementary Information paragraph 5.3. One metadata form is required per survey polygon, providing the information is appropriate for all survey files submitted.</p> <p>All files are to be named using the pre-defined naming structure, as detailed in Survey Brief Supplementary Information section 5.</p> <p>All captured photography will be delivered but areas outside the shape file need not be colour-balanced or fully rectified.</p> <p>Raw aerial imagery must be stored by the contractor for 2 years following final acceptance of data. At the end of that period the contractor may apply to the client for permission to delete the raw imagery.</p> |
| 6.2.3 Data format | Data format shall be *.ecw and/or *.tif; details are given in Survey Brief Supplementary Information section 5. |

| 6 Digital Imagery Product Details | |
|--|--|
| 6.2.4 Compression | Data shall be compressed for *.ecw files using 5:1 compression. |
| 6.2.5 Transfer medium | The data shall be supplied on removable hard drive or via an FTP site. |

SURVEY BRIEF SUPPLEMENTARY INFORMATION

1. Location and extent of survey

The Southeast coastline is divided into two Work Packages, each of which is sub-divided further into a number of survey polygons for the purpose of data capture, illustrated in [Figure 1](#). The extents of the Work Packages and survey polygons for aerial survey are given in the accompanying shape file ASE.shp. The landward and lateral extents of the survey area are defined by the polygons. The seaward extent, however, is defined as the XY position of the elevation above which the data shall not contain seawater *i.e.* the tide level at time of data capture must be to seaward of the seaward limit. In most cases, the minimum elevation to be achieved is MLWS. The seaward limit shown in the polygons is the position of MLWS from the most recent survey and is included for planning purposes, but the over-riding requirement for the seaward boundary is the elevation given in [Table 1](#).

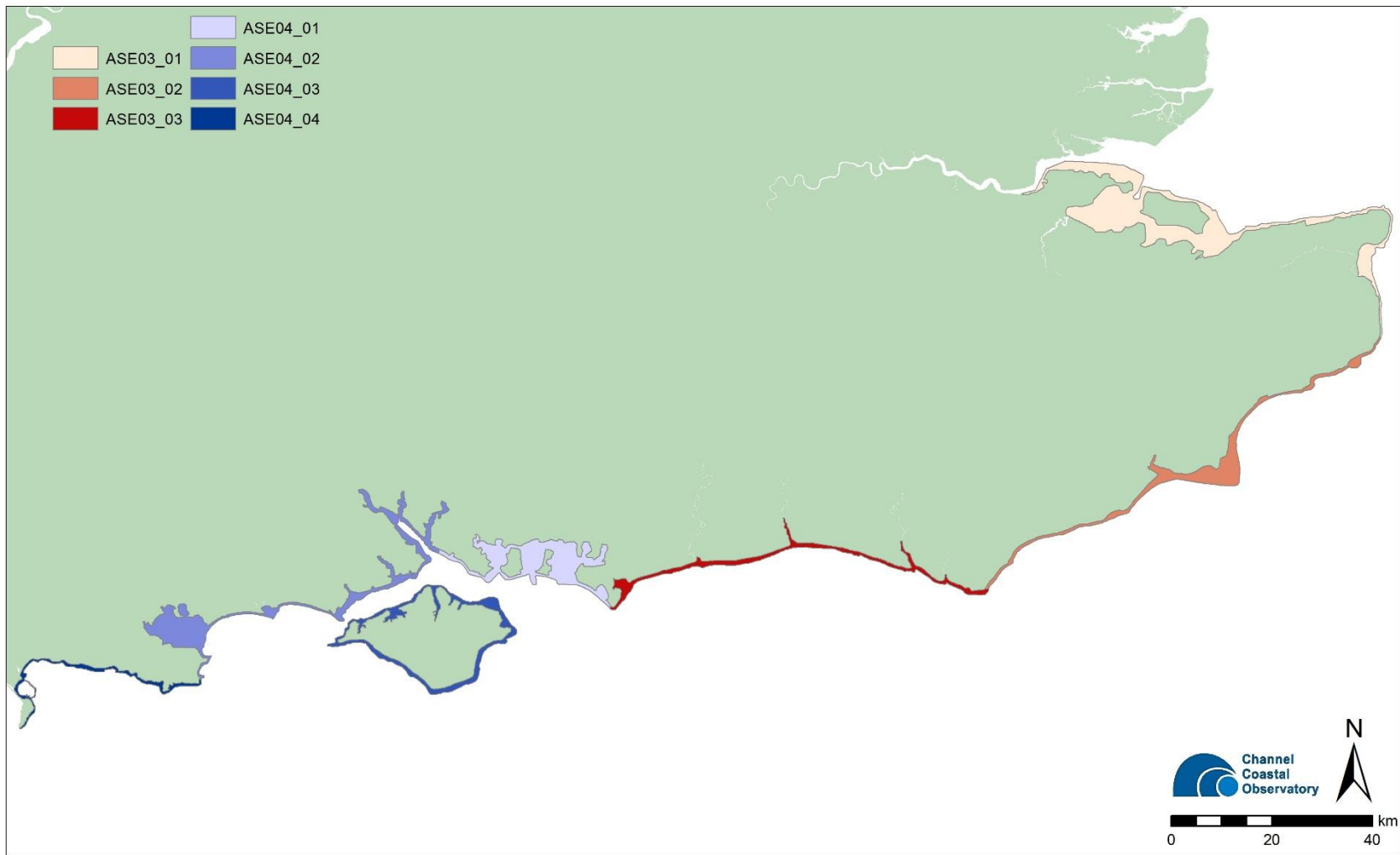


Figure 1: Work Packages and survey polygons

| Polygon No. | Port | Seaward boundary | |
|--|-----------------------------|------------------|---------|
| | | MLWS CD | MLWS OD |
| Work Package ASE01 – Isle of Grain to Selsey Bill | | | |
| 01-01 Gravesend to Kingsdown | TILBURY | 0.5 | -2.6 |
| | SHEERNESS | 0.6 | -2.3 |
| | Upnor | 0.5 | -2.3 |
| | Grovehurst Jetty | 0.5 | -2.4 |
| | Whitstable | 0.5 | -2.2 |
| | Herne Bay | 0.5 | -2.2 |
| | MARGATE | 0.5 | -2.0 |
| | Broadstairs | 0.4 | -2.0 |
| | Ramsgate | 0.6 | -2.0 |
| | Richborough | 0.1 | -1.2 |
| | Deal | 0.8 | -2.6 |
| 01-02 Kingsdown to Beachy Head | Deal | 0.8 | -2.6 |
| | DOVER | 0.8 | -2.9 |
| | Folkestone | 0.7 | -3.1 |
| | Dungeness | 0.9 | -3.2 |
| | Hastings | 0.7 | -3.1 |
| | Eastbourne | 0.7 | -3.0 |
| 01_03 Beachy Head to Selsey Bill | Newhaven | 0.4 | -3.1 |
| | Brighton Marina | 0.7 | -2.7 |
| | SHOREHAM | 0.6 | -2.7 |
| | Worthing | 0.6 | -2.6 |
| | Littlehampton Entrance | 0.4 | -2.7 |
| | Bognor Regis | 0.5 | -2.6 |
| | Pagham | 0.5 | -2.6 |
| | Selsey Bill | 0.8 | -2.1 |
| Work Package ASE02 – Selsey Bill to Portland Bill | | | |
| 02_01 Selsey Bill to Titchfield | Selsey Bill | 0.8 | -2.1 |
| | CHICHESTER HARBOUR ENTRANCE | 0.9 | -1.8 |
| | PORTSMOUTH | 0.8 | -1.9 |
| | Lee-on-the-Solent | 1.0 | |
| 02_02 Titchfield to Peverill Point | SOUTHAMPTON | 0.5 | -2.2 |
| | Calshot Castle | 0.8 | -1.9 |
| | Stansore Point | 0.7 | -1.7 |
| | Lymington | 0.7 | -1.3 |
| | Hurst Point | 0.7 | -1.1 |
| | Christchurch Entrance | 0.6 | -0.3 |
| | Bournemouth | 0.5 | -0.9 |
| | Poole Entrance | 0.6 | -0.8 |
| Swanage | 0.5 | -0.9 | |
| 02_03 Isle of Wight | COWES | 0.8 | -1.8 |
| | Foreland | 0.9 | -1.8 |
| | Ryde | 0.9 | -1.8 |
| | Yarmouth | 0.8 | -1.2 |
| | Totland Bay | 0.7 | -1.1 |

| Polygon No. | Port | Seaward boundary | |
|---|------------|------------------|---------|
| | | MLWS CD | MLWS OD |
| | Freshwater | 0.8 | -1.0 |
| | Ventnor | 1.0 | -1.4 |
| | Sandown | 0.8 | -1.6 |
| 02_04 Peveerill Point to Portland Bill | Swanage | 0.5 | -0.9 |
| | PORTLAND | 0.1 | -0.8 |

Table 1: Elevation of seaward boundary

2. Flying window

Photography shall be captured between [date] and 30 [date].

3. Nuclear power stations

Nuclear power station sites where data removal is required:

- Dungeness

4. Existing survey control

The Regional Coastal Monitoring Programmes' control network of E1 and E2 stations may be used for ground control. Full witness diagrams of the points can be found on www.coastalmonitoring.org.

5. Data management

Ortho-rectified imagery shall be delivered in 1km Ordnance Survey tiles. Imagery shall also be supplied as mosaics. Each tile will have three or four associated files (as defined in Final Deliverables section below):

- Enhanced Compressed Wavelet image file with the extension *.ecw
- Supporting *eww file
- MapInfo table with the extension *.tab
- *tif with associated *.tfw file

5.1 File names and contents

Filenames shall not contain spaces. Filenames for the imagery are based on Ordnance Survey 1km tiles and the date of capture. If imagery was captured within 2 or 3 consecutive days, the filename should use the last day of data capture. If flights more than 4 or 5 days separated batches data capture, each batch should be named separately. For example, for orthophotography:

OSOSOS_YYYYMMDDortho.*

where: OSOSOS is the Ordnance Survey 1km grid square name
 YYYY is the year of the flight (4 digits)
 MM and DD are the month and day of the flight respectively (2 digits)
 Ortho is a suffix representing the data type

Examples: [SU4700_20100813ortho.ecw](#)
[ST1234_20110513ortho.eww](#)
[TQ1289_20090813ortho.tab](#)

Filenames for the FCIR orthophotography shall be the same as for the orthophotography, with the file suffix "FCIR" replacing "ortho":

Example: [SU4700_20100813FCIR.ecw](#)

Filenames for image mosaics shall be based on the Work Package, survey polygon and the date flown:
WP_xx_YYYYMMDDortho.*

where: WP is the Work Package name (variable number of letters and digits)
 xx is the survey polygon

Examples: [ASE03_01_20100813ortho.ecw](#)
 [ASE04_02_20100813FCIR.ecw](#)

The image tile index (*.shp) will contain the extent of each orthorectified image tile of the relevant flight. The file is named according to the Work Package/survey polygon and the date:

Example: [Index_ortho_ASE01_02_20111027.shp](#)

Each tile will have the following attribute data associated:

- Ordnance Survey tile reference
- Date of data collection
- ground sample resolution
- Bounding co-ordinates (Xmin, Ymin, Xmax, Ymax)

The Report of Survey (*.pdf) is named according to the Work Package/survey polygon and the date:

Example: [Report_ortho_ASE01_02_20111027.pdf](#)

5.2 File formats

ECW files (*.ecw)

ECW orthophotography files shall contain 3-band (RGB). FCIR orthophotography files shall contain adjusted 3 band false colour imagery.

The ECW files must contain all the information required to georeference them, comprising the actual transformation parameters and the coordinate system. The coordinate system as referenced by the EPSG (European Petroleum Survey Group) id 27700 must be embedded in the ECW files:

```
PROJCS["OSGB 1936 / British National Grid",  
  GEOGCS["OSGB 1936",  
    DATUM["OSGB_1936",  
      SPHEROID["Airy 1830",6377563.396,299.3249646,  
        AUTHORITY["EPSG","7001"]],  
      AUTHORITY["EPSG","6277"]],  
    PRIMEM["Greenwich",0,  
      AUTHORITY["EPSG","8901"]],
```

```

UNIT["degree",0.01745329251994328,
  AUTHORITY["EPSG","9122"]],
AUTHORITY["EPSG","4277"]],
PROJECTION["Transverse_Mercator"],
PARAMETER["latitude_of_origin",49],
PARAMETER["central_meridian",-2],
PARAMETER["scale_factor",0.9996012717],
PARAMETER["false_easting",400000],
PARAMETER["false_northing",-100000],
UNIT["metre",1,
  AUTHORITY["EPSG","9001"]],
AUTHORITY["EPSG","27700"]]

```

EWV files (*.eww)

The associated EWW files must contain the X and Y pixel size and the coordinates of the upper left corner of the image.

Example:

```

0.10
0.00
0.00
-0.10
561500.05
100999.95

```

Tab files (*.tab)

The associated tab files must be a MapInfo-compatible version of the ecw files, containing an image and any information necessary for the image to be displayed in the correct geographic location.

Tiff files (*.tif)

TIF orthophotography files shall contain 3-band (RGB). FCIR orthophotography files shall contain adjusted 3 band false colour imagery.

The TIFF files must contain all the information required to georeference them, comprising the actual transformation parameters and the coordinate system. The coordinate system as referenced by the EPSG (European Petroleum Survey Group) id 27700 must be embedded in the TIFF header files using tags and GeoKeys:

- Tag 33550 (model pixel scale tag)
- Tag 33922 (model tie point tag)
- Tag 34735 (GeoKey directory tag)

TFW files (*.tfw)

The associated TIFF world files must contain the X and Y pixel size and the coordinates of the upper left corner of the image.

Example: 0.10
 0.00
 0.00
 -0.10
 561500.05
 100999.95

5.3 Metadata

Metadata information shall be supplied with the data files; a template metadata *.xlsx will be supplied by the Employer (see example below). One metadata form is required per survey polygon, providing the information is appropriate for all survey files submitted. If multiple instruments were used to capture a polygon, multiple metadata forms are required.

| METADATA FORM FOR ORTHORECTIFIED AERIAL PHOTOGRAPHY | | |
|--|----------------------|---------------------------|
| General Information | | |
| Name of the camera manufacturer | | |
| Camera model | | |
| Serial number of lens | | |
| Date of calibration (dd/mm/yyyy) | | |
| Focal length (mm) | | |
| Offset from focal point (mm) | | |
| Average flight height | | |
| Specify DTM used for rectification | | |
| Scale of photography | | |
| Start date (dd/mm/yyyy) | | |
| End date (dd/mm/yyyy) | | |
| Quality Information | | |
| Ground sampling size (pixel size) | | |
| Estimated accuracy of dataset | positional accuracy | +/- ?m |
| | elevational accuracy | +/- ?m |
| Explanation of accuracy estimate | | |
| Name of survey report | | Report_ortho_*.pdf |
| Metadata Information | | |
| Data has been collected by | | <i>Name of Consultant</i> |
| Comments | | |

Filename: Meta_ortho_WP_xx_YYYYMMDD.xls
Example: Meta_ortho_ASE03_02_20160517.xls

Note: The medium on which the data is delivered is to be labelled as follows:

Label: Orthophotos
SurveyAreaName or Work Package No.
YYYYMMDD
No. of medium
Consultant
Delivery reference no.

Example: Orthophotos
Christchurch Bay – ASE04
20160813
Hard Drive 1 of 3
Consultant
Delivery Ref. no. 12345

6. Final deliverables

Per survey polygon

- 3-band (RGB) orthorectified photography tiles (*.ecw, *.eww, *.tab)
- 3-band adjusted FCIR orthorectified photography tiles (*.ecw, *.eww, *.tab)
- Flight index (*.shp)
- Survey report (*.pdf)
- Metadata (*.xlsx)

Final deliverables shall be sent to the Employer (Clause 1.2.3) within 6 weeks of completion of all flying for a survey polygon.

7. Payment Schedule

Preliminary data (Clause 1.1.5) data will be assessed by the Employer, within 15 days of receipt, as a trigger for Payment Stage 1. Note that the assessment will be merely a preliminary check that the approximate extent of the survey area has been flown; acceptance of preliminary data will *not* imply that the seaward limit has been successfully achieved – full checks that the inter-tidal beach above the required elevation has been captured will be carried out as part of the Employer's checks on the final deliverables.

For each Work Package:

- Payment Stage 1 35% on acceptance by the Employer of preliminary data
- Payment Stage 2 35% on delivery of processed data, survey report and metadata
- Payment Stage 3 30% on final acceptance of data by the Employer

8. Method Statement

As part of the method statement, the Consultant will provide full details to show that the technical requirements of the Specification and Brief can be met. The method statement shall make reference to:

- The method to be used to obtain the position of the aircraft
- Instrumentation to be used
- Instrument calibration certification
- Methodology for flight planning, including how to meet seaward boundaries
- Methodology for orthorectification
- Quality control procedures
- Outline programme for achieving survey within the given time frame