

2 Additional Work Undertaken for Stage 2

2.1 Introduction

This section briefly describes the additional work carried out to complete Volume 2. Appendices B, C and D present in more detail work carried out. This is summarised below for completeness.

The primary aims of the development of Stage 2 were to:

- ◆ Improve the understanding of coastal process/shoreline interaction.
- ◆ Provide a more accurate prediction of the effects of the do-nothing scenario.
- ◆ Review and develop the options for future coastal management.
- ◆ Produce a working Strategy Plan document.

Stage 2 work (presented within Volume 2) can be split down into four discrete elements, as follows:

- ◆ Terrestrial field exercises
- ◆ Hydrodynamic exercises
- ◆ Data analysis studies
- ◆ Shoreline evolution definition and Strategy development

The flow chart below explains how the additional work undertaken for Stage 2 informed the development of the Strategy.

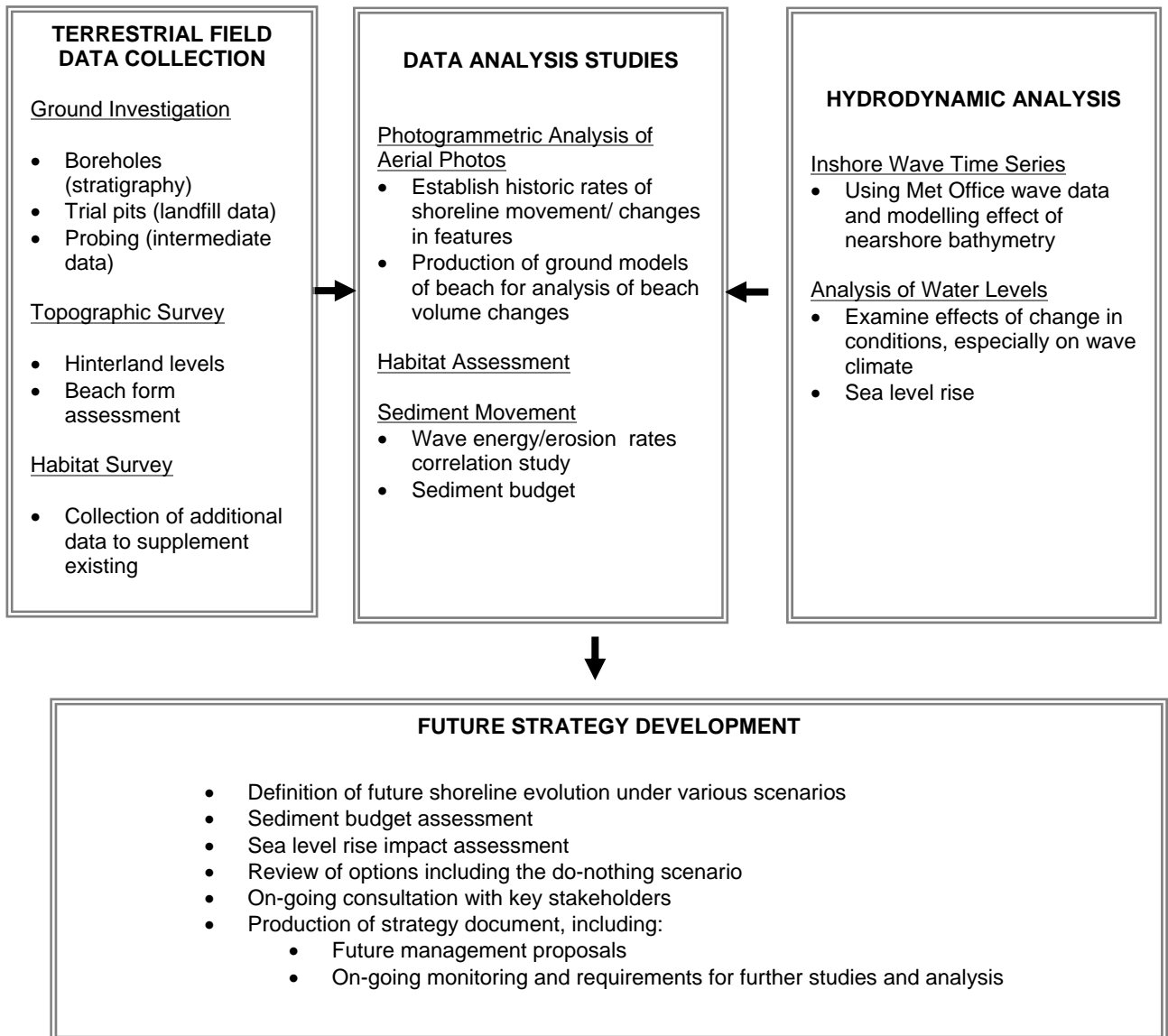


Figure 2.1 Flow Chart Showing Stage 2 Tasks

2.2 Ground Investigation

The main drivers for carrying out ground investigation were:

- ◆ To establish the longshore and cross-shore variation in hinterland drift geology to allow assessment of future shoreline erosion potential; and
- ◆ To establish the extent and to a limited degree content of the historic tip areas.

This study was carried out using the following methodology:

- ◆ Limited desk study to check if any records were available on the disused tips.
- ◆ Limited cable percussion boreholes at strategic positions e.g. Sandy Gap, Bent Haw, Middle Hill, Cow Leys, Hillock Whins, Cross Lane and Pho Hill.
- ◆ Dynamic probing to establish intermediate variation between boreholes.
- ◆ Trial pits at or near known or suspected tip positions.
- ◆ Sampling and testing of materials including chemical analysis, where appropriate, of materials from tip areas.

The geotechnical report summarising the findings of the investigative work are included in Appendix B. This data was used to inform the Shoreline Evolution Report included in Appendix D, and Risk Registers in Appendix G.

2.3 Topographic Survey

Existing topographic data (OS Landline and 1:10,000 sheets) provided limited spot height data on the elevation of the hinterland; however, this was judged to be insufficient to provide a reasonable analysis of:

- ◆ flood risk areas,
- ◆ site investigation locations and levels, and
- ◆ composition of material feeding into (and out of) the littoral drift regime on the west coast.

LiDAR data was obtained from the Environment Agency during Stage 1, but this data only covered the northern half of the island and required processing and selective spot checking with conventional survey data before it could be used.

Wide area topographic data was obtained for the whole island by photogrammetric analysis of vertical aerial photographs (see Section 2.6). 'Ground truthing' by GPS survey was required to improve the reliability of this data. In order to assess flood risk at key locations (where accuracy beyond that possible with photogrammetric techniques was imperative), a GPS survey data collection exercise was also collected. This also covered areas which were subject to a specific storm surge coastal flood event which took place during the project (February 2002). The GPS data collected is included in Appendix B.

In summary, the additional land elevation information collected for Stage 2 was obtained by:

- ◆ Physical recording of data using GPS techniques (Survey Operations Ltd).
- ◆ Photogrammetric analysis of the most recent set of aerial photographs.

2.4 Habitat Audit

The basis of establishing the effects on the natural environment of adopting any course of action stems from an adequate assessment of the existing habitats. With much of the shoreline, and the hinterland to a lesser extent, being nationally or internationally designated, any assessment of future management actions needs to take due account of the requirements of the 'Conservation (Natural Habitats) Regulations 1994 hereafter known as the 'Habitats Regulations'. Barrow BC are Competent Authority for Habitat Regulations under Regulation 48. The completion of an 'Appropriate Assessments' by the competent authority (that are required as part of the Habitats Regulations), does not form part of the Strategy development. However, a preliminary Habitat Audit was completed to supplement the existing database of information.

The key elements of the habit audit assessment were:

- ◆ Review the existing Phase 1 mapping of existing habitats (provided by English Nature).
- ◆ Assessment of the effects of sea level rise on habitat evolution.
- ◆ Assessment of the impact of coast defence options (including the do-nothing scenario).
- ◆ Commentary on the displacement / re-creation of habitats where appropriate.

Appendix C details the methodological approach and findings of this work.

2.5 Hydrodynamic Exercises

2.5.1 Wave Climate

The analysis of storm and annual wave conditions off the west coast of Walney carried out within Stage 1 identified essentially uniform behaviour along the shoreline, largely as a result of the reasonably uniform bathymetry that occurs off Walney Island. However, this finding was based on an assessment of storm events only and did not include assessment of data from the Met Office European Waters Wave Model. The data from this model is based on real data and provides a time series of offshore wave data from 1987 to 1999. To provide a meaningful understanding of wave energy closer to the shore, this data was transferred inshore allowing wave energy impacting on Walney Island's west coast to be correlated against shoreline retreat over a similar period. This has provided a valuable insight into key coastal processes of the study area.

The wave climate assessment is presented in the Shoreline Evolution Report in Appendix D.

2.5.2 Water Level

Assessments of water level data and the interaction of waves and extreme water levels were completed to complement and develop the wave data analysis presented above. An analysis that included water level data allowed an assessment of the wave energy striking the cliffs along the west coast (the toe of cliffs is relatively high up the beach, at approximately 5mAOD).

The water level assessment is presented in the Shoreline Evolution Report in Appendix D.

2.6 Contemporary and Future Shoreline Evolution using Aerial Photographs

As described in the Stage 1 report, there are several photographic datasets of the island covering the second half of the 20th century. The most useful datasets, providing the most complete and reliable spatial coverage, were recorded in 1963, 1992 and 1997 and this data was subject to detailed analysis in Stage 2 to extract information on recent coastal change and island topography.

The objectives of the work were:

- ◆ To identify the extent and rates of shoreline recession along the west facing coast.
- ◆ To correlate shoreline behaviour with the primary coastal process forcing mechanisms (i.e. wave energy).
- ◆ To extrapolate short term data over longer historical timescales by reference to the older sets of photos to define historical wave energy inputs that have occurred and to use this as the basis for prediction of future behaviour.
- ◆ To analyse changes in beach volumes along the west coast.
- ◆ To identify changes in the beach formations with particular reference to saltmarsh, scars, sand ridges and runnels, and upper beach shingle and coarser sand.

The methodology used and results obtained are presented in the Shoreline Evolution Report in Appendix D.