



Coastal Assessment Survey Ullapool to Lochinver

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Volume 1



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by



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in association with



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Cover: View of Camas Beag, looking south east towards Dun Canna (NC 10 SW 1). This sheltered inlet is enclosed by a fish trap (NC 2111 9009), just visible at centre left (compare with Figure 12).

Abstract

In August 1996 a coastal assessment survey was conducted along a 115 km stretch of the north western coastline of mainland Scotland between the towns of Ullapool and Lochinver. The principal aims of the survey were to document the archaeology of the coastal zone and assess the impact of coastal related processes on the cultural environment. The survey involved an inspection of both the intertidal zone and a 50m wide coastal strip above the high water mark.

In summary 192 sites were inspected, of which 136 were new recordings. The sites primarily consisted of structures and field systems associated with 18th-19th century crofting townships, however several structures and deposits dating back to the prehistoric and medieval periods were also recorded. A total of 5 sites were considered to be actively eroding, including the most significant site recorded, the multi-period structural complex and midden deposits at Achnahair Sands (NC 01 SW 2).

Overall the coastline was considered to eroding, though generally at a rate negligible for the purposes of cultural resource management. It was noted that a significant proportion of the recorded sites exist in exposed and low lying positions and are thus highly vulnerable to marine transgression or erosion under extreme conditions.

This is Volume 1 of the report, which contains the methodology, results and conclusions derived from the field survey. Volume 2 principally comprises a site gazetteer.

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Finally, the successful execution of the fieldwork has only been possible through the untiring efforts of the project team who daily faced the trials of toiling through wet, tick-infested 'vertical heather' along some sections of very rugged and inaccessible coastline. I would like to thank Jenny Lee, Fred Stevenson, Vanessa Edmonds and Harvey Johnston for their eager participation and high standard of recording.

The project owes its existence to the hard work, enthusiasm and faith of Maree Lee Smith, who helped enormously in the early stages of project design. I would like to extend a particular thank you to her.

The photographs, maps and plans used in the report were produced by Jenny Lee, Fred Stevenson and Andrew Long. Any errors, opinions and misinterpretations contained within this report are the sole responsibility of the author.

Abbreviations

ALS:	Afforestable Land Survey	NMAS:	National Museum of Antiquities of Scotland
ASL:	Above Sea Level	NMRS:	National Monuments Record of Scotland
GUAD:	Glasgow University Archaeology Department	RCAHMS:	Royal Commission on the Ancient & Historical Monuments of Scotland
GUDGTS:	Glasgow University Department of Geography & Topographic Science	SIMS:	Scottish Institute of Maritime Studies
HS:	Historic Scotland	SNH:	Scottish Natural Heritage
HWM:	High Water Mark (mean)	SSS:	School of Scottish Studies, Edinburgh University
LWM:	Low Water Mark (mean)		
MOLARS:	Medieval or Later Rural Settlement		

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1. Introduction

1.1 Background

This report presents the results of a rapid coastal erosion assessment between the towns of Ullapool and Lochinver on the north west coastline of mainland Scotland. The principal aim of the project was to assess the affects of coastal erosion, coastal related processes (e.g. sand dune deflation), human interference and developmental impacts upon the archaeology and built heritage of the coastal zone in a cost effective manner. The investigations were part of a wider project initiated by Historic Scotland to characterise the threat of coastal erosion for each region and its implications for the management of the cultural heritage of Scotland in general. To achieve these objectives the project complements previous studies undertaken as part of this scheme (Robertson 1996; James 1996; Gilbertson *et al* 1996), and conforms to Historic Scotland coastal assessment procedures (Historic Scotland 1996). The survey has been conducted as part of a post-graduate research programme at Glasgow University.

The fieldwork was undertaken by Mr Andrew Long (Consultant Archaeologist) in association with Glasgow University Archaeology Department (GUAD) in August 1996. The project was funded by Historic Scotland by means of a grant to GUAD. The project was managed by Mr Patrick Ashmore (HS) and Dr Alex Morrison (GUAD).

1.2 Project Aims

Ashmore (1994) has summarised the background to the general problem of erosion on the wider Scottish coastline, and as a response the present project has been designed to address the specific issues raised in that introductory paper. The central concerns cited were the affects of sea level change, the ability of the sea to erode the coast edge, the instability of fragile coastal dune systems, the human impact on the coastline (*Ibid.*, 5-9), and the perceived worsening of these threats as demonstrated by prior fieldwork.

The primary aim of this study was therefore to define the geomorphological characteristics and the erosional condition of the coastline between Ullapool and Lochinver, and the influence of these factors on the long term stability of the cultural heritage of the coastal zone. In essence the study was required to produce a resource document for use as the basis for coastal archaeological site management in the study area over an extended period, such as the next 100 years or so. With this in mind the emphasis of the study has been to attempt a prediction of the potential affects and implications of coastal erosion into the future and beyond, rather than merely documenting the present erosional state of the cultural environment.

A secondary aim of the study was to provide a regional archaeological background to the study area, which has until recently been neglected from the perspective of systematic archaeological investigations (see Section 1.5). The fieldwork was designed to complement the RCAHMS Afforestation Land Survey (ALS) of the Achiltibuie area (see Section 2). As such this report is more detailed than its predecessors (Robertson 1996; James 1996) and a greater emphasis was placed on

recording site contents, dimensions and documentary associations, particularly in the case of fragile sites experiencing active degradation.

1.3 Report Format

The study as presented in this document is based on stage 1 of a proposal submitted to Historic Scotland in March 1996 (Long 1996). The report has been presented in 2 volumes;

Volume 1 contains introductory information (Section 1), study methodology (Section 2), and a series of annotated colour maps reflecting geomorphology, erosional condition and archaeology for each section of the study area (Maps 1-11). Each map is preceded by a summary containing general environmental and archaeological information for each stretch of coastline (Section 3). A comparison and analysis of this data is presented (Section 4), and summarised with appropriate recommendations (Section 5). References for both volumes are located at the rear of Volume 1. A list of abbreviations used in this report and acknowledgements are cited at the start of this volume.

Volume 2 consists of appendices containing supplementary information. A gazetteer provides more detailed site information (Appendix 1). Specialised terms used in the report are defined (Appendix 2), a list of sources, organisations and individuals consulted during the course of this study (Appendix 3) and a catalogue of new sites recorded in the field for the first time (Appendix 4) are also presented.

The basic field data (site recording sheets, maps, plans and photographs) contains more expansive information, and is located within a project archive held by the RCAHMS.

1.4 The Study Area

1.4.1 Introduction

The project study area consists of the mainland coastal strip between the tidal limit of the Ullapool River, Loch Broom Parish, Ross & Cromarty District (NH 2124 8944) and the tidal limit of the Culag River, Assynt Parish, Sutherland District (NC 2094 9222) (Figure 1). The survey area did not include offshore islands, unless they were accessible on foot at low tide.

1.4.2 Extent and Dimensions

For the purposes of this study the coastal strip is defined as the intertidal zone (the area exposed between the mean high (HWM) and low water marks (LWM)), and a 50m wide corridor above the high water mark. The width of this corridor varied according to the density and distribution of archaeological features and the extent of the influence of coastal processes, such as the formation and erosion of aeolian dune systems. The point at which the high water mark impacts upon the hinterland is termed the 'coast edge', and this varies in position and width depending on local topography, fluctuations in tidal range and other geomorphological, marine and climatic factors. It is generally considered that the greatest potential threat to

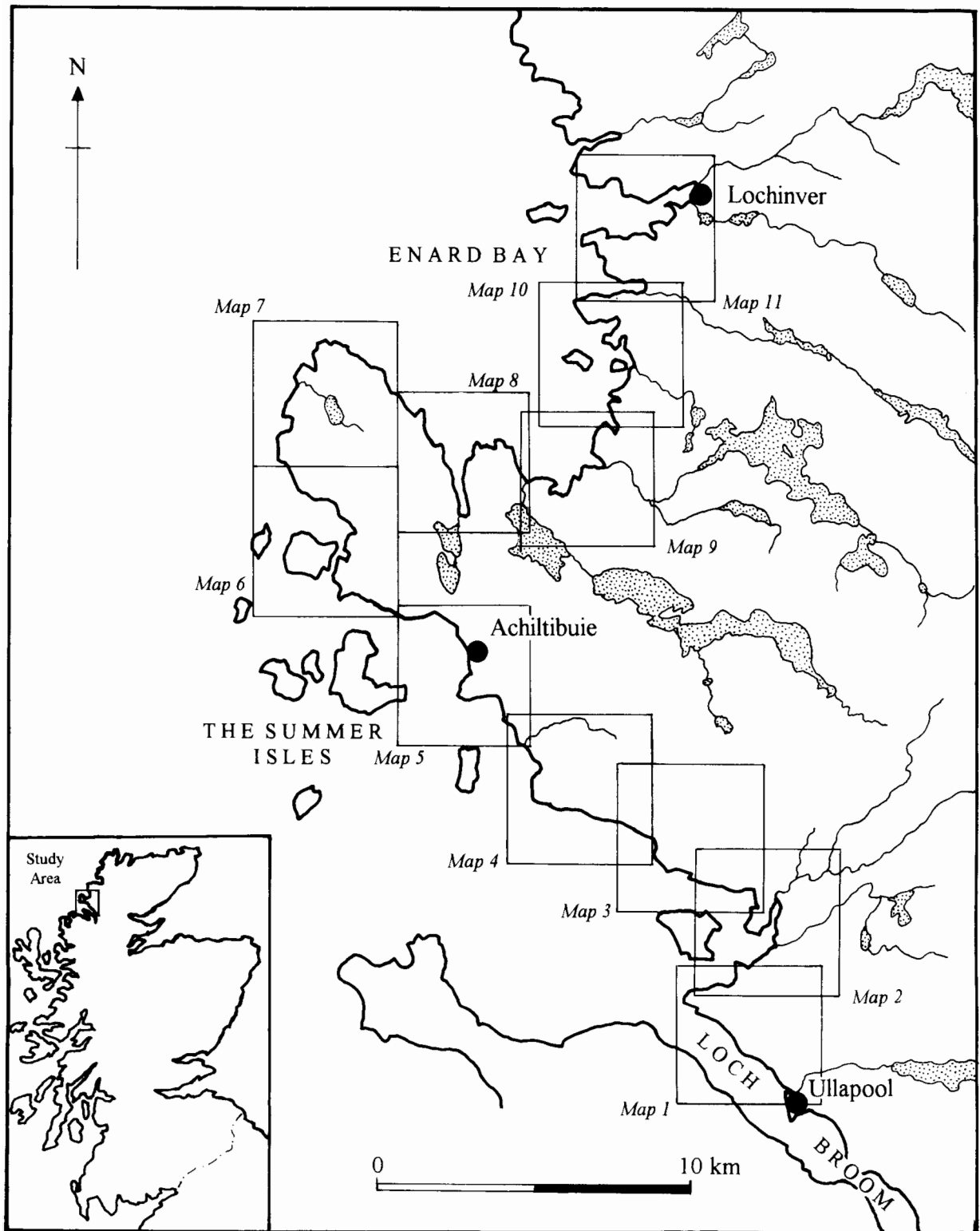


Figure 1: Study Area Location, showing Key to Maps 1-11.

archaeological remains exists at this point, and it was therefore here that the main focus of the survey was directed.

The survey did not extend to the marine zone (defined as the area of sea floor continuously covered by water under normal circumstances), though some previously documented shipwrecks have been included in the site catalogue. Furthermore, some features observed within the marine zone from the coast edge (e.g. boat remains or slipways) were accordingly noted.

The difficulties involved in measuring the length of a given stretch of coastline have been highlighted elsewhere (Ashmore 1994, 25-27). This study area is no exception, particularly in the north (Maps 9-11) where the underlying glaciated Lewisian gneiss topography has produced a highly fractal coastline. At a scale of 1:25,000 the length of the coast edge has been measured as approximately 116 km, however it is likely to be greater than this figure for the practical purposes of fieldwork on the ground. The intertidal zone was generally restricted in width owing to the steep topography and is estimated at a mean of extent 20-30m perpendicular to the shoreline.

1.4.3 Description

The study area has been divided into 11 sections for the purposes of producing a series of 1:25,000 maps (Figure 1), each reflecting the coastal geomorphology, erosional state and archaeology of the coastal zone. These are described from south to north as follows;

- Map 1: *Ullapool to Ardmair* (7.0 km)

The study area starts at the tidal limit of the Ullapool River and follows the north west side of the river to its mouth, then follows pebble beaches along the north east side of the fjord of Loch Broom to its mouth at the headland of Rubha Cadail. The coast then curves east around the base of the steep rocky hill of Meall Mór to the pebble beaches of Ardmair Bay.

- Map 2: *Ardmair to Camas Beag* (10.4 km)

This section starts at the south end of the pebble beaches of Ardmair Bay, which it follows to the north east, around the spit of Aird na h-Eighe into Loch Kanaird, to the mouth of the Kanaird Estuary. The east side of the River Kanaird is followed northwards to the tidal limit, then southwards along the west side to the rocky promontory of Rubha Meallain Bhuidhe. A series of short rocky headlands interspersed with open pebble beaches lead west and north to the enclosed inlet of Camas Beag.

- Map 3: *Camas Beag to Geodha Mór* (5.3 km)

This section starts at the east end of a series of very steep cliffs and rocky slopes at the base of Creag Dearg which are followed west and north west past occasional small, exposed bays around the flanks of Ben Mór Coigach to a point 700m west of Geodha Mór where a narrow coastal terrace begins.

- Map 4: *Geodha Mór to Badenscallie* (7.1 km)

This section starts at a point where the steep slopes of Ben Mór Coigach flatten off into an undulating coastal terrace flanked by rock platforms and low cliffs, interspersed with pebble beaches in small, open bays. The terrace continues westwards to the rocky headland of Rubha Dubh Ard, and continues beyond this point in a general north westerly direction to the start of

Badenscallie Bay, passing a small sandy beach in the mouth of the Allt Ach a' Bhraighe at Acheninver.

- Map 5: *Badenscallie to Polbain* (7.9 km)

This section starts at the south end of a pebble beach in Badenscallie Bay, follows a coastal terrace around a low rocky headland into a wide, sheltered pebble beach at Polglass to the north. The coastline curves to the west past the blocked mouth of a marshy loch, around the rocky promontory of Rubha Dùnan, returning to the east before continuing along the coastal terrace in a north westerly orientation, primarily following pebble beaches and rock platforms. At Badentarbat Bay the terrace swings west along rock platforms and low cliffs to Polbain.

- Map 6: *Polbain to Reiff Bay* (10.8 km)

This section starts at Polbain and follows an undulating coastal terrace westwards along small rocky headlands interspersed with pebble beaches to the mouth of Caolas Eilean Ristol, a sheltered channel between the mainland and Isle Ristol. The East side of this channel is followed northwards around the base of the steep hill of Meall Dearg, around the wide, enclosed harbour of Old Dorney Bay to Alltan Dubh. At this point the coast resumes a north westerly orientation along a peat covered terrace flanked by low cliffs and rock platforms to the steep sided inlet of Geodha na Glaiic Bàine at the southern end of Reiff Bay.

- Map 7: *Reiff to Rubha Dubh* (15.8 km)

This section starts at the south end of Reiff township, and follows sand and pebble beaches west around Reiff Bay, circumnavigating the edge of the almost entirely enclosed Loch of Reiff, before following steep cliffs north around the exposed headland of Roinn a' Mhill to the enclosed bay of Camas Eilean Ghlais. A very exposed stretch of steep cliffs is followed north and north east along wide rock platforms and boulder beaches to Rubha Còigeach. The coast then follows steep, high slopes and cliffs along rock platforms and boulder beaches to the small sea stack of Rubha Dubh.

- Map 8: *Rubha Dubh to Garvie Bay* (15.1 km)

This section starts at the small sea stack of Rubha Dubh and follows steep, high slopes and cliffs south east along rock platforms and boulder beaches to the long, sheltered estuary of Achnahaird Bay. The west side of Achnahaird Bay is followed encompassing the intertidal sands, salt marsh and adjacent dune system to the Allt Loch Raa which is followed around the east side of the bay along pebble beaches, then sloping rock slabs to Rubha Beag. An indented section of low cliffs is followed to the east along rock platforms, then past the tombolo of Rubh' a' Choin, to follow a series of rock platforms interspersed with storm beaches south to the outlet of the River Garvie.

- Map 9: *Garvie Bay to Lochan Sàl* (8.4 km)

This section starts at the River Garvie and follows a section of steep, low cliffs and rock platforms to sheltered pebble beaches in Lag na Saille. The coast then follows very steep, rocky slopes, occasional cliffs and rock platforms around the headland of Rubha na Mòine to the pebble beaches of Polly Bay. Steep rocky slopes and rock platforms continue to the north around the headland of Rubha Phollaidh and into the deep, sheltered fjord at Lochan Sàl.

- Map 10: *Lochan Sàl to Loch Kirkaig* (16.5 km)

This section starts at north side of the mouth of Lochan Sàl and follows an extremely complex, indented coastline to the north and north west, past the sheltered bay of Loch an Eisg-Brachaidh, to the headland of Rubha na Brèige, before following the south shore of Loch Kirkaig east to the mouth of the River Kirkaig. The coast edge comprises steep, rocky and wooded slopes flanked by rock platforms and occasional cliffs along the extent of this section, with the occurrence pebble beaches restricted to Loch an Eisg-Brachaidh.

- Map 11: *Loch Kirkaig to Lochinver* (13.2 km)

This section starts at the mouth of the River Kirkaig at Inverkirkaig and follows the head of Loch Kirkaig along a wide pebble and sand intertidal flat before following the north side of the loch west and north west along steep, rocky slopes, occasional cliffs and rock platforms past occasional narrow inlets to the headland of Kirkaig Point. The South shore of Loch Inver is followed under similar topography to the east, past pebble beaches in the enclosed bays at Badnaban, Strathan, and Lady Constance Bay to Aird Ghlas at the entrance to Lochinver harbour. The recently constructed harbour walls and piers of Lochinver are followed to the tidal limit of the Culag River where the study area ends.

1.5 Previous Archaeological Research

Prior to 1994 no previous systematic archaeological research had been conducted in the study area, though limited field survey had been undertaken within the wider study region (Long 1995, 7-8). The small number of recorded sites were the result of casual recording and reports from the general public. The eroding dune system of Achnahaird (NC 01 SW 2) has been the subject of attention from various enthusiastic amateur archaeologists, and has been monitored on an informal basis since 1989 (*Ibid.*, 4-6).

In 1994-95 however two systematic archaeological investigations directly relevant to the study were conducted. Firstly the RCAHMS conducted an afforestation land survey (ALS) of the Achiltibuie area, specifically the Coigach peninsula west of easting NC 205 (Rubha Lag na Saille to Achduart) (Piers Dixon, pers. comm. 1996). The details of the field survey have not been published to date, however the basic data was accessible to the project team prior to the start of the fieldwork. The survey recorded a total of 585 individual structures (e.g. buildings, enclosures, burnt mounds and burial cairns) and mapped a large number of landscape elements (e.g. field boundaries, lazy bed cultivation plots and clearance cairns) on a series of 1:10,000 mapsheets. Detailed mapping of selected landscapes and structures was conducted at scales up to 1:100, including Building 2 at Achnahaird Sands (NC 01 SW 2), Achnahaird dun (NC 01 SW 3) and the broch and post-broch complex at Achlochlan (NC 00 NW 3).

The ALS methodology was based on an examination of aerial photographs and first edition (1875) Ordnance Survey coverage of the area, combined with systematic field walking in extensive areas of the peninsula. The emphasis of the survey was focused on the recording of ruinous structures and field systems, and was not totally compatible with the recording required for a coastal assessment survey, in that site condition reports and coastal geomorphology were not documented in detail (see Section 2.3.1).

A separate, but related project was conducted by the Department of Environmental Science, Stirling University in association with AOC (Scotland) Ltd on the field systems of the Badentarbat Estate (McCullagh 1995), and has produced valuable data from an individual site complex in the study area. The fieldwork involved the mapping of an extensive dyke network, soils, drainage and vegetation in the area of the pre-clearance township of Badentarbat, complemented by the collection of environmental material from a series of trial trenches (*Ibid.*, 1-2). A preliminary analysis of results has suggested a sequence of landuse dating to *ca.* 3000 BC, indicating that the pattern of field systems evident in the landscape today is the result

of evolution over a very long period of time, rather than purely an expression of the last phase of pre-clearance agricultural activity (Rod McCullagh, pers. comm. 1996).

In addition, the RCAHMS has also documented a number of farmsteads and townships in the wider region identified purely through an examination of the early Ordnance Survey coverage and the RCAHMS architectural photograph collection (Lesley Ferguson, David Easton pers. comm. 1996). This project was entirely desk-based and involved no field checking.

To date the only comparable survey in terms of similarities in study area and archaeological record conducted in northern mainland Scotland was a coastal erosion assessment of the eastern coast of Caithness (Batey 1982), situated 100km to the north east. A recent 'coastal-erosion archaeological-hazard' reconnaissance study has been conducted on the southern islands of the Outer Hebrides (Gilbertson *et al* 1996), and this has proved useful for comparative purposes.

2. Methodology

2.1 Introduction

In this section the research methodology and field recording techniques are briefly described. A supplementary aim of the project was to complement existing survey coverage in the area, in particular the RCAHMS afforestable land survey (ALS) (see Section 1.5), and produce a site management assessment for each site recorded in the coastal zone. The methodology employed was designed to fulfil this additional aim, and as a result involved more detailed site recording than previous coastal assessment studies.

2.2 Background Research

A background study complying to the methodology specified in the Historic Scotland coastal zone survey procedures (Historic Scotland 1996, 9-11) was conducted prior to the start of fieldwork, as stipulated in the project research design (Long 1996, 3). The principal purpose of this study was to identify areas of archaeological sensitivity, and review the geological, geomorphological and historical context to facilitate the interpretation of the fieldwork results.

The ALS fieldwork results were examined closely in order to identify sites and landscape elements in the study area for which unpublished documentation existed. A full list of information sources, organisations and individuals consulted during the course of this study is located in Appendix 3. To aid collation of the results, ALS field numbers have been noted on the field record sheets where appropriate.

Prior to fieldwork the locations of all previously recorded sites were marked on a series of 1:10,000 survey maps for checking in the field. These maps were used as the basis for all fieldwork documentation¹.

2.3 Fieldwork

2.3.1 Field Techniques

The fieldwork was conducted by two independent teams, each consisting of 2-3 field workers to satisfy health and safety requirements associated with work in the intertidal zone (Historic Scotland 1996, 8). It is not considered necessary to document the survey logistics in detail, however some comment is provided to facilitate further studies in this area.

As stated above (Section 1.4.2) the study area consisted of the intertidal zone and a 50m wide inland zone bordering the HWM. This area was surveyed from two parallel transects, one following the HWM, the other following the first break of slope above the HWM. In this way an adequate appraisal was made of both the intertidal zone and the immediate hinterland. Major difficulties encountered included impassable sections

¹ Archival note: The numbers on these maps correspond to the field record sheets, and not the published site designations in this report.

of intertidal zone (e.g. the base of steep cliffs at low tide), modern fencelines and dense vegetation, which could only be overcome by deviations in land.

Individual sites were recorded following a rapid procedure which involved defining the site boundaries and individual features, and measuring the maximum site dimensions and significant elements. A brief description of the remains, their condition and any perceived threats were noted and a site sketch plan was made in the field. In the case of site elements previously recorded by the RCAHMS as part of the ALS, the survey team plotted the extent of remains contained within the coastal zone, and recorded the site condition and threats only. This variation was made on the basis that detailed structural dimensions, description and mapping had already been conducted. In some cases additional recording was necessary as the ALS did not necessarily record all elements present at a site (e.g. occupied buildings and slipways).

Generally all significant sites were documented by a series of black and white prints, though in some cases colour prints were also taken. All sites, as well as the required geomorphological and erosion information, were plotted on the 1:10,000 survey maps.

In general each survey team completed 3-7 km of coastline in this fashion each day, depending on the nature of the terrain, accessibility of the coastline and density of archaeological features.

Two site complexes (Achnahaird Sands, (NC 01 SW 2) and Old Dorney Bay (NB 1985 9113)) were investigated in greater detail as part of a wider research program at Glasgow University. Achnahaird Sands in particular was at high risk from imminent erosion, and it was considered highly important to salvage scientific information immediately before loss through degradation of the dune system. A quantified, selective surface collection was conducted, and the sites were mapped at the scales of 1:500 and 1:100 respectively. The results of this work are summarily documented in Volume 2, and will be detailed elsewhere (Long in prep.).

The primary survey records are archived at the RCAHMS, John Sinclair House, 16 Bernard Terrace, Edinburgh EH8 9NX (0131-662-1456).

2.3.2 Recording Criteria

In the report a distinction is made between discrete sites or structural complexes contained within the coastal zone (e.g. buildings, boat nausts and other landuse foci) and wider cultural landscapes (e.g. townships, field systems and cultivation), which invariably extended across considerable areas outside the coastal zone. Recording sheets were compiled for all sites in the former category, while relevant elements of the latter category were marked on a series of 1:10,000 survey maps. Site record sheets were compiled for cultural landscapes during the analysis stage, drawing additionally on early map sources and aerial photographs to define the probable extent of the remains.

The relationship between individual structural foci and the wider cultural landscape is reflected on the survey maps contained within this report (see Maps 1-11). For example, the building and boat naust at NH 2133 8955 (Map 1, Site 7.1) is considered

both a discrete site for the purposes of assessing coastal threat, but also an element of the crofting township of Morefield (Map 1, Site 7), which is less specifically affected by proximity to the coast. If there was any doubt concerning the connection between a site element and the wider cultural landscape, the element was recorded separately.

For the purposes of the survey a site was defined as any visible focus of human activity within the study area, regardless of condition, state of occupancy, scale or age. Exceptions to this definition were late 20th century structures (e.g. bungalows, chalets and harbour walls) which have been constructed as part of a documented planning process. Modern sites reflecting a traditional lifestyle or technology (e.g. boat nausts or peat cuttings) were invariably recorded. It is possible that the evidence of modern activity at these sites merely represents the latest phase of usage. Hulks were recorded irrespective of age, though only if they had been demonstrably abandoned.

2.3.3 Survey Conditions

The survey was conducted in late summer during a reputedly dry year (Mike Kelly pers. comm. 1996), and very little field time was lost through bad weather conditions. The principal seasonal factor affecting the survey was the widespread occurrence of tall bracken throughout the coastal zone, which made the relocation of ALS recorded structures and unobtrusive site types difficult (e.g. Map 6, NB 1983 9101 & NB 1984 9102).

2.3.4 Survey Coverage and Effectiveness

There were no significant gaps in survey coverage in the study area, and an estimated 9.3 km² of coast edge was examined along the 116 km stretch, including both the intertidal and 50m wide coastal strip. The coastal strip was significantly expanded at particular locations to encompass the full extent of some site complexes and land affected by coastal processes (e.g. Achnahaird Sands).

Given the high degree of vegetation cover, lack of ground surface exposures in the coastal strip and in some cases subsequent sediment accumulation, the percentage of ground surface meaningfully examined within the study area was very small and difficult to calculate. For this reason the results of the survey are heavily biased towards later, obtrusive structures, such as stone buildings and field boundaries, which are sufficiently upstanding above the ground surface to detect under normal conditions. The identification of prehistoric and medieval sites, particularly unobtrusive scatters of cultural material, turf or heavily reduced stone buildings was highly problematical and these sites are not adequately represented in the survey results. The principal exception to this is the site of Achnahaird Sands (NC 01 SW 2), which is well exposed in a degraded sand dune system. Other putative early structures have only been exposed as a result of potentially damaging recent land use practices, such as peat cutting (poss. hut circle, NB 1975 9131), controlled burn-offs (Old Dorney Bay, NB 1982 9113, (Frances Ross, pers. comm. 1996)) and sand excavations (Acheninver, NC 00 NW 22).

In contrast to this observation, however, the intertidal zone was largely free of ground cover, with the obvious exception of coastal sediments and seaweed. It is considered

that the archaeological record of this zone is perhaps more reflective of a longer period use than the 18th-20th centuries. Some of the more robust intertidal and coast edge features such as boat nausts, slipways and fish traps recorded may well be earlier in origin than the latest phases of activity suggest. The coast edge is indisputably a comparatively limited zone and irrespective of time this strip would constitute an obvious focus for these activities. Particularly in the case of a coastline such as this, which is considered relatively stable and has not apparently changed markedly since the 1750s (see Section 4.2.2). Shipwrecks and hulks are, by nature of their fragile fabric, less robust and susceptible to rapid disintegration by wave action and the continuous process of submersion and exposure. It is probably for this reason that the majority of recorded hulks were 20th century in date, though a possible 19th century vessel was noted at the mouth of the Ullapool River (NH 2123 8947).

3. Study Results

In this section the results of the field survey are presented in conjunction with the geomorphological and erosional condition studies. Each coastal section (Maps 1-11) is preceded by a brief summary and analysis, which are in turn synthesised later in this volume (Section 4). The categories used in describing the coastline are in accordance with the established procedure for coastal assessment survey in Scotland (Historic Scotland 1996, 12-18).

The maps for each section reflect three classes of information, each of which is preceded by an annotated list describing individual features and local variations or sub-sections within each coast section (1, 2, 3 etc.). The individual sub-sections are generally defined through morphological similarity, though in the case where highly complex local variation exists, a more arbitrary approach was taken for simplicity and ease of description (e.g. Achnahaird Bay, Map 8).

Each coast section is defined according to the following categories, which are defined in detail in Volume 2 (Appendix 2):

1. Hinterland Geology and Coastal Geomorphology:

The following characteristics have been listed for each sub-section:

Name, grid reference, approximate length, coastal geomorphological characteristics, coast edge type, hinterland geology and general description.

This reflects the underlying characteristics of the coastal landscape as determined through previous geological mapping, local studies (Crofts & Mather 1972; Steers 1973; Price 1983, 1991; Johnstone & Mykura 1989) and field observations. This assists in the formulation of site predictive and long term erosional models. The following changes have been made to the established categories used in the defining these characteristics (Historic Scotland 1996) to allow for regional variations not previously observed in coastal assessment studies. These are:

- 'Peat / soil over bedrock' replaces the category 'Drift, boulder clay over visible rock'. Comparatively few substantial deposits of glacial drift were observed, though extensive peat deposits and glaciated rock exposures were common throughout the study area. This category therefore defines any soft, surficial material overlying a harder bedrock.
- 'Mainly rock platform / boulders' replaces the category 'Mainly rock platform'. Extensive water washed boulder deposits often occurred in association with rock platforms.
- 'Mainly shingle / cobbles / boulders' has been introduced to represent the predominance of coarse beach material in foreshore composition throughout the region.

Note, no section of coastline was dominated by intertidal deposits of mud, and this category was omitted from the survey maps. However, occasional intertidal mud banks do occur in areas of complex coastal geomorphology. These areas are marked on the maps in brown.

One problem associated with the geological and geomorphological aspects of the study was the lack of recent, detailed drift mapping and other studies. The latest available geological drift map series (British Geological Survey, Edinburgh, 6½":1 mile 2nd edition Ordnance Survey series 1912) was outdated both in terms of geomorphological theory and the accuracy of the mapping. Another problem was the overall lack of ground surface exposures to enable the survey team to determine the precise nature and origin of drift deposits (e.g. raised beach material as opposed to glacial till) or soils, which

will ultimately effect any interpretation of the landscape history. Given the lack of detailed, reliable information, the geomorphological aspects of this study have been based primarily on the 1912 mapping supplemented by basic coastal descriptions (Steers 1973, 67-70) and field observations where available. This situation must be considered when assessing the overall accuracy of the study.

2. Erosion Class:

The following characteristics have been listed for each sub-section:

Name, grid reference, approximate length, erosion class and general description.

This defines the current and predicted erosional condition of the coastline, based on field observations, previous coastal assessment studies in the region (Bryan 1994; Gilbertson *et al* 1996) and geomorphological theory (Hamblin 1985; Hansom 1988). In addition all land below 10m ASL is noted to indicate areas most at risk in the event of sea level rise.

3. Built Heritage and Archaeology:

The following characteristics have been listed for each site:

Name, site type, grid reference, site condition, action required.

This is a listing of archaeological sites and buildings inspected during the survey. Sites located in the intertidal zone and at the coast edge are numbered on the seaward side. Conversely sites located in the hinterland strip are numbered on the landward side. Sites have been divided into two principal categories;

- Extensive site complexes containing several elements both inside and outside the study area (e.g. crofting townships and field systems). These are marked as orange outlines, with dashed lines indicating undetermined boundaries.
- Individual sites and elements of site complexes (e.g. boat naust and buildings clusters) situated within the study area are marked as discrete symbols. Where these sites are more extensive than the symbol, the entire surface area is shaded (e.g. NC 01 SW 2 & NC 2010 9097).

Site dates have been indicated in rough terms of approximate centuries or periods of occupation based on current archaeological thinking, comparative research and local documentary sources. There is likely to be considerable variation to these approximate dates when more detailed studies are undertaken (e.g. Badentarbat field systems; McCullagh 1995).

Site descriptions, dimensions and more detailed recommendations are contained in Volume 2 of this report (Appendix 1).

