Scottish Natural Heritage
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MILTON NESS
Site of Special Scientific Interest

SITE MANAGEMENT STATEMENT

Site code: 1162

Address: Inverdee House, Baxter Street, Torry, Aberdeen AB11 9QA
Tel: 01224 266500
email: Tayside_grampian@snh.gov.uk

Purpose

This is a public statement prepared by SNH for owners and occupiers of the SSSI. It outlines the reasons it is designated as an SSSI and provides guidance on how its special natural features should be conserved or enhanced. This statement does not affect or form part of the statutory notification and does not remove the need to apply for consent for operations requiring consent.

We welcome your views on this statement.

Description of the site

The rock exposed in the coast and cliffs at Milton Ness is important for the study of fossil carbonate soils in a rock type often referred to as 'Old Red Sandstone', because red sandstone makes up much of the rock type. Old Red Sandstone is mostly of Devonian age (416-359 million years old) but ranges from late Silurian (422-416 million years ago) to early Carboniferous (359-345 million years ago). The rock at Milton Ness is late Devonian to early Carboniferous in age and forms part of a rock sequence known as the Kinnesswood Formation. This rock formed from sediment deposited by river systems migrating across an alluvial plain. The majority of the sediment was mud and sand that now forms mudstone and the characteristic red sandstone.

Around 359 million years ago when these sediments were being deposited, Scotland lay south of the equator and the climate was hot, semi-arid and seasonally wet. This climate, combined with low sedimentation rates from what appears to have been a relatively small river catchment, led to the conditions necessary for 'calcrete', also known as 'caliche', to form within the soil profile. Calcrete occurred as nodules or layers of hardened natural calcium carbonate, and these calcrete structures are formed to this day in semi-arid and arid regions (for example central Australia, and the Kalahari Desert). The fossil soil layer at Milton Ness is one of the best examples of calcrete in any Old Red Sandstone rocks in Scotland. It is also one of the very few examples of Old Red Sandstone soil in Britain where calcrete has developed to the stage of layered 'hardpan' (as opposed to nodules).

Dissolution (the dissolving of carbonate by mildly acidic rain water) and weathering of the calcrete horizon must have occurred while it was at the surface, as cavities typical of karst landscapes (such as limestone pavements) have been recorded, and fragments of broken calcrete drape the tops of these. Roots encased in the hardened calcium carbonate, and known as 'rhizoliths', are also exposed. They were the first rhizoliths identified in Old Red Sandstone rocks and are some of the finest examples seen in any rocks of the whole Palaeozoic era (542-251 million years ago).

The exposed headland at Milton Ness, is important for studies of late glacial (Late Devensian), and post-glacial (Holocene) sea-level change in the Montrose area over at least the last 14 700 years. The site represents important facets of the coastal evolution of eastern Scotland including an intertidal rock platform, two late glacial (Late Devensian) raised beaches and a post-glacial (Holocene) raised beach. On the south side of Milton Ness, the internal structure of

two of the raised beaches is exposed where the present cliff line cuts across them. This combination of clear raised shoreline shape (geomorphology) and exposure of internal (sedimentary) structure is rare. The site provides a complementary record of sea-level changes to the raised estuarine sediment record preserved within the Montrose Basin.

The oldest feature, a pre-Late Devensian rock platform (the Low Rock Platform) was cut more than 14 700 years ago, but the processes which facilitated the formation of this wide and regionally extensive platform are uncertain.

Between about 14 700 and 12 500 years ago ice withdrew from the Montrose Basin area. The land had been pressed down under the ice, but 'rebounded' and rose once the ice melted. This rise outpaced global sea-level rise, and resulted in an apparent gradual fall in local sea level. Beach terraces were cut by the sea then left high and dry as sea level fell, leaving a series of raised beach terraces. Sections of two of these are visible on the landward side of Milton Ness.

Between 12 500 and 11 500 years ago, the climate deteriorated again, and an ice cap formed over part of Scotland centred on Rannoch Moor. The land was once more pressed down by the weight of ice and consequently the sea flooded inland again. This last ice cap melted around 11 500 years ago at the start of the current interglacial period, known as the Holocene. Initial rebound of the land raised the old beaches high above the then sea level. However, rebound of the land was eventually outpaced by global sea level rise. Consequently marine waters re-flooded, or 'transgressed' the lower coastal areas, below the older beach terraces, resulting in the cutting of a new shoreline. This is known as the Main Post-glacial transgression and it resulted in a final raised shoreline at Milton Ness, lying at about 5.2-5.5m above current sea level and rising to 6-7m above current sea level at Montrose. It is believed to have been formed about 6 500 years ago at the peak of this transgression. All the raised beaches at Milton Ness are excellent examples of glacial and post-glacial processes, which allow study of their sedimentology (internal structure) and morphology (external shape), and comparison with other landforms in the Montrose area.

A comprehensive description of this site can be found in the SNH's Earth Science Documentation Series for Milton Ness (Mactaggart 1998).

Natural Features of Milton Ness SSSI	**Feature Condition (date monitored)**
Non-marine Devonian	Not yet assessed
Quaternary of Scotland	Favourable Maintained (October 2001)

The Quaternary of Scotland feature was in favourable condition at the last site condition monitoring visit and no significant threats to the feature were noted.

Past and present management

No evidence of past management is visible within the site. However, the remains of Kaim of Mathers Castle on an adjacent cliff (NO764649) suggest the cliff top terraces may have been cultivated in the past.

The site is currently used as a fishing station with a small concrete run-up located on the beach face just outwith the site boundary. A house (NO766649) and the Rock Hall fishing station building (NO766648) are located on the surface of the upper Late Devensian terrace. A row of cottages, Tangleha', is located on the Holocene raised beach (NO771649). A small stretch of *ad hoc* coastal protection works (gabion baskets and concrete blocks) is located along the eroding coastal edge which fronts the cottages. The Late Devensian and Holocene raised beach terraces are enclosed and cultivated for agricultural crops. In addition, by Tangleha', a strip of ground between the field and the shore is now also being cultivated as garden ground.

Objectives for management (and key factors influencing the condition of natural features)

We wish to work with the owners and occupiers to protect the site and to maintain and where necessary enhance its features of special interest. SNH aims to carry out site survey, monitoring and research as appropriate, to increase our knowledge and understanding of the site and its natural features.

1. **To maintain the physical and visual integrity of the rocks, sediments, shoreline terraces and Low Rock Platform**

   The main interest of the site is in the rock cliffs, shore platforms, sediment stratigraphy and landform morphology. The superficial landform morphology provides a context to the sedimentological interest of the site. Development or changes in landuse, such as afforestation or mineral extraction, in particular from the shoreline terrace fragments or from intertidal rock platform, could affect the integrity of the total landform assemblage or the subsurface and exposed sediments.

   Management of the site needs to be directed towards avoiding obscuring rock outcrop and minimising any significant loss of material from the raised beach sections, either as a result of natural or artificial causes, though cultivation of the raised beaches poses no threat to the special interest. The eroded cliff and coastal sections provide the best exposures of rock outcrop and raised beach sediment sequence. Coastal erosion of the site is not a serious problem at present as it is not affecting the site's scientific value. Indeed, continued low-level erosion is regarded as necessary to maintain both the rock exposures and also the exposure of the raised beach and till sediments, and hence their accessibility for study.

   The necessary defences at Tangleha' Cottages are preventing fresh sections of the Holocene raised beaches being exposed by wave action. However, some excellent sections through these sediments are present to the south, nearer Milton Ness.

2. **To maintain access to the site**

Date last reviewed: 24 February 2017.