

**ANGUS COUNCIL**

**ROADS COMMITTEE  
27 APRIL 2000**

**PLANNING AND TRANSPORT POLICY COMMITTEE  
27 APRIL 2000**

**COASTAL DEFENCES AT CARNOUSTIE  
DESK STUDY REPORT BY CONSULTANT**

**REPORT BY THE DIRECTOR OF ROADS**

**ABSTRACT**

This Report summarises the conclusions of the consultants (HR Wallingford) with respect to increasing erosion problems in the central part of Carnoustie Beach.

**1 RECOMMENDATIONS**

It is recommended that the Committee agree to:

- (i) note that the final version of the desk study prepared by HR Wallingford on coastal defences at Carnoustie is available for inspection in the Members' Lounge;
- (ii) note that there will be an ongoing maintenance cost of approximately £20K year on year to preserve the integrity of the existing gabion revetment at Carnoustie;
- (iii) note that a considerable capital sum will be required to replace the gabion revetment within a timescale of 2 – 5 years depending on erosion rates;
- (iv) note that a further report on detailed financial implications and sources of funding for future years will be brought forward in 2000/01 financial year.

**2 INTRODUCTION**

HR Wallingford were appointed by the Director of Roads in May 1999 to carry out a desk study of the coastal defences at Carnoustie between the Barry Burn and the rock platform to the north. They were appointed on the basis of their worldwide expertise and because of their design involvement with the Barry Buddon rock armour revetment scheme carried out for the MOD to the south of the present study area in the 1990s. The existing coastal defences are giving concern with particular regard to the residual life of the gabion section of the revetment and the significant overtopping occurring on a regular basis.

### 3 DETAILS

#### (i) Study Brief

The main requirements of the Brief may be summarised as follows:-

- (a) Analysis and evaluation of existing coastal processes in relation to the section of Carnoustie Bay between Barry Burn and the rock platform to the north.
- (b) Carry out a back-analysis on all beach profile surveys for the Carnoustie frontage, from 1989 to 1995 (provided by Angus Council), and reporting trends and drift rates as appropriate.
- (c) Rank and discuss options to extend the life of the existing gabions by approximately 5 years from economic/environmental/engineering considerations.
- (d) Consider longer-term defences likely to be necessary in this area, in their own right and in relation to proposed short-term measures.

#### (ii) Beach Changes in Response to Coastal Processes

From historical evidence it appears that recent problems of beach erosion both north and south of the Barry Burn are not part of a continuing, long established pattern. This pattern has been for sand accumulation in the area since about 1865 up to the mid 1970s.

Tidal currents appear to be the likely cause of beach changes within Carnoustie Bay. The ebb tide out of the Tay Estuary causes an anti-clockwise gyre in the area north of the Gaa Spit and this produces southward running flows along the south eastern shoreline of Barry Links. This is the same direction as the flows during the flood tide. This net tidal flow will add to the tendency for a longshore transport of sand to the south, mainly along the nearshore seabed.

Surveys dated 1969 and 1988 found that the nearshore seabed had been lowered by about 1 metre over the northern part of Carnoustie Bay. The consultants conclude that a reasonable explanation for these changes to the tidal currents in Carnoustie Bay is the changing orientation of the entrance channel to the Tay Estuary and the present problems may continue for some years, possibly decades, until the entrance channel changes its orientation again.

#### (iii) Present Problems With Coastal Defences

The greatest concern is the gabion revetment which has suffered increasing damage in recent years due to the bursting of the wire baskets and slumping due to scour beneath the structure. Such structures exposed to high wave energy environments such as at Carnoustie rarely last more than ten years.

These problems have gradually worsened because water depths at the toe of the revetment have increased since 1989, allowing larger waves to reach, and break on, the revetment.

This problem has also led to considerable overtopping of the sea defences and in particular the gabion section. An experimental wave return wall was constructed prior to the summer of 1999 to help assess any amended height for a reconstructed revetment.

The rock armour revetments either side of the gabion section have been reinforced in 1999, one section (to the south) using surplus rock from the GlaxoWellcome protection works at Montrose (Report No 281/99).

(iv) **Short Term Options**

The consultant outlined three main options:-

- (a) Beach reprofiling ie bringing sand mechanically from the bottom part of the beach to the upper beach. This was tried for the first time in early July 1999 but has only given short term benefit.
- (b) Construction of a low groyne at the north end of the gabion defences to help to reduce toe scour.
- (c) Beach nourishment by bringing sand from elsewhere and depositing it on the beach at Carnoustie.

With or without the above options the consultant outlines suggested ways of strengthening the gabions when repair work is being carried out.

(v) **Long Term Impacts**

The need to improve coastal defences at Carnoustie apart from the natural beaches and dunes depends on a number of factors, as follows:-

- (a) Changes in sea level.
- (b) Impact of pipeline development behind the defences.
- (c) Changes in beach level.
- (d) Changes in intensity and frequency of storms.

Of the long term solutions outlined in the Report the Consultant's view is that a rock armour revetment would provide the most cost effective long term solution to protecting the frontage at Carnoustie. This solution would have environmental implications but alternative blockwork type revetments would have much higher associated costs.

The Consultant's report makes it clear that the gabions will need to be replaced in the near future. If the best value option of replacing the gabions with rock armour is acceptable environmentally then the likely estimated cost of this would be £400K. However, if a blockwork type revetment is considered appropriate as an enhancement to the seafront the likely estimated cost would rise to between £700K and £900K.

#### 4 FINANCIAL IMPLICATIONS

##### (i) Revenue

The average annual cost of repairing the gabions is presently in the region of £20,000 and this can be contained within the 2000/01 revenue budget for coast protection.

##### (ii) Capital

There is currently no provision in the Financial Plan for Coast Protection Works at Carnoustie but a detailed report on financial implications and sources of funding will be reported to Committee in due course.

#### 5 CONSULTATION

The Chief Executive, the Director of Law and Administration, the Director of Planning and Transport and the Director of Finance have been consulted in the preparation of this Report.

#### 6 CONCLUSION

The main conclusions of the Report are:-

- (a) In the short-term continue to effect immediate repairs to the gabions but use a more durable gabion mesh or double thickness mesh.
- (b) In the short-medium (2-5yrs) term major re-construction of the gabion section of the revetment will be necessary. A further report will be submitted to Committee on financial implications and funding options.

Dr Bob McLellan  
DIRECTOR OF ROADS

#### NOTE

The following background papers, as defined by Section 50D of the Local Government (Scotland) Act 1973 (and not containing confidential or exempt information) were relied on to a material extent in preparing the above Report:-

Report No 281/99 – GlaxoWellcome Coast Protection Works – Temporary Beach Closure - Angus Council Roads Committee – 11 March 1999.

7 January 2000  
REPORTS/coastal.def.car