

Note / Memo

**HaskoningDHV UK Ltd.
Industry & Buildings**

To: Marine Scotland
From: Morwenna See
Date: 15 April 2019
Copy:
Our reference: PB8131-RHD-ZZ-XX-NT-Z-0002
Classification: Project related

**Subject: Coastal processes note for beach protection works at Dunbar East Beach
Version 2**

1 Introduction

This note outlines the potential environmental impacts of a proposed seawall defence project at Dunbar East Beach to support an EIA screening and marine licence application to Marine Scotland.

East Lothian Council is proposing construction of a seawall defence project to promote the natural regeneration of Dunbar East Beach. The works are to repair/replace an existing groyne at the south of the site that has fallen into disrepair alongside works to improve the exposure conditions in the bay to encourage any sediment that is in the local system to remain on foreshore. It is hoped by reducing the wave conditions at the beach combined with the refurbished groyne that the bay will retain more sediment and in the long term regain the amenity value that has been lost in recent years. Dunbar East Beach was a sandy beach as recently as 2013, however, following successive storms in 2014 the beach was almost entirely eroded and further storms in the subsequent years has left the frontage devoid of any sediment able to form a beach.

Works to enhance the retention of sediment on the foreshore have been proposed. A previous project with this aim, placing rock armour around an existing Scottish Water sewer outfall pipe, was undertaken in 2017. However, no change in sediment retention was identified. Further works are therefore necessary.

2 Baseline

2.1 General description

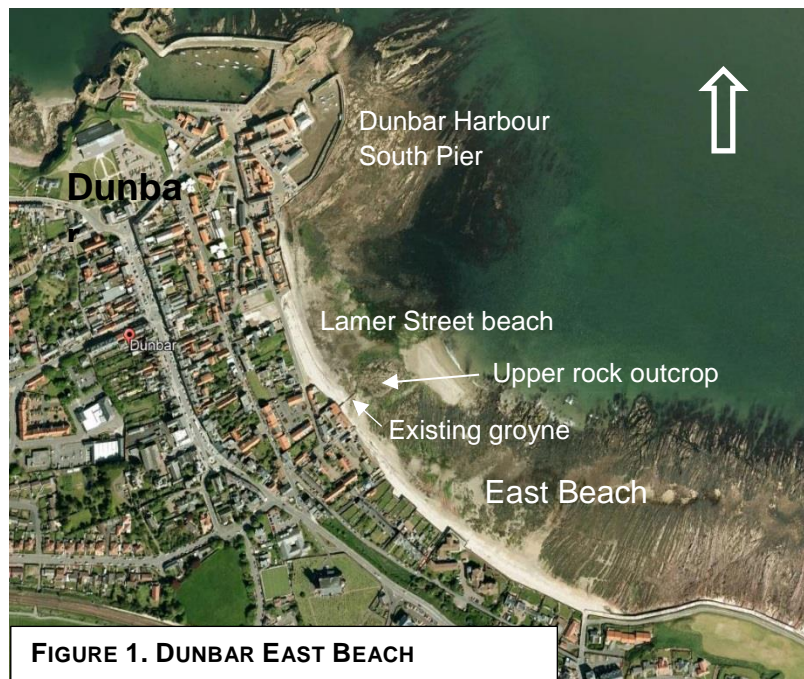
Dunbar East Beach extends between the Old Harbour and the Dunbar Golf Course (Figure 1). This frontage is largely characterised by a rocky shore platform that is predominantly absent of sediment cover, with a limited upper beach along sections of the frontage, backed by sea walls.

The proposed works are in the area of Lamer Street, where there has been a severe loss of upper beach over the last decade.

This Lamer Street Beach area is set slightly back from the general alignment of defences running south from the Harbour and running through to the southern section of East Beach.

To the north of the Lamer Street beach area is a pronounced return of the sea wall. At the southern end of this frontage is a locally high area of rock outcrop, with an old timber groyne (now largely ineffective) linking between the sea wall and the rock outcrop. This groyne used to extend out across the rock outcrop for a distance of around 145m, but this section of groyne has now been substantially lost. There is a Scottish Water sewer pipe, encased in concrete running across the whole frontage. This pipe has been further protected by a low rock mound.

There is at present little upper beach width against the toe of the Lamer Street wall and some emergency rock armour has been placed at the toe to support the structure. Previously there was a good level of sand in this area, covering the sewer pipe. With beach loss, the pipe stands proud of the foreshore and there is ponding immediately in the lee of the pipe.



2.2 Coastal forcing processes

Water Levels

Mean High Water Spring (MHWS) water level for Dunbar is at 2.5m OD, with Mean Low Water Spring (MLWS) level of -1.9m OD, giving a spring tidal range of 4.4m.

Extreme water levels are reported in the EA boundary conditions report as being:

- 1 in 1 year (T1) = 3.25m OD
- 1 in 100 year (T100) = 3.74m OD

Tidal Currents

There are no direct measurements of tidal currents local to the area. However, from site inspection tidal flows across the area are expected to be low.

Wave Conditions

The dominant wave direction for the area is from the north-east sector, with the frontage being orientated to this direction. The area is, however, exposed to waves between north, east and to a degree the south.

Typically, the main wave approach during major storms acts normal to the shoreline, with slight variation under different storm events as waves are affected by the wider rock outcrops over the lower foreshore. It has been reported (Pontee 2005) that the present problem of beach lowering may be associated with a slight shift in the frequency of storm direction tending to result in an increased movement of sediment to the south-east.

Sediment Movement

It has been assessed that the main movement of sediment in the area tends to be in the on-shore off-shore direction with a slight tendency for sediment to be moved towards the south-east. There is evidence of sand occurring in places over the lower foreshore, as shown in Figure 1.

From observed evidence, while the beach across the Lamer Street frontage has largely disappeared, the beach to the south-east has remained relatively stable, with variation supporting the assessment that sediment is brought in and drawn down by different wave conditions.

Within the Lamer Street area, there has been movement of sediment from the main beach area, with the most significant loss at the northern end where waves interact with the sharp return in the alignment of the sea wall. Towards the southern end of this local frontage, some limited coarse sediment is retained by the influence of the remains of the groyne close to the sea wall but predominantly due to the additional protection afforded by the local higher upper beach rock outcrop. As beach levels have dropped against the sea wall over the whole local frontage, this will have increased the potential for wave reflection, tending accelerate draw down of beach sediment.

3 Influence of proposed works

3.1 Proposed works

The proposed works include for:

- The re-instatement of a short length of the existing groyne provided with a small rock head, providing improved structural integrity and locally limiting scour at the head of the groyne.
- Associated with this southern location, is the construction of a small rock mound, extending the influence of the natural protection of the existing rock outcrop. This structure placed just to the north of the existing groyne, some 65m seaward of the sea wall and extending, at its crest level some 25m north of the rock outcrop.

There are emerging plans for improving the general amenity value of the area, but these are at an early stage of development. As part of these plans there may be the opportunity to address the wave focussing effect at the northern return. However, these plans are not included as part of this current project. The main focus of the project, therefore, is in re-establishing the beach at the southern end as described above. These works look to replicate the affect of the old groyne system but in a more efficient manner taking account of the change that has occurred in terms of beach loss.

3.2 Influence

The re-instated section of the groyne would tend to retain upper beach sediment in a similar manner as at present against the seawall. The refurbished groyne is designed with a lower section towards its seaward end, allowing access to be maintained along the crest of the sewer pipe. This would continue to allow some sediment movement to the south-east.

The rock mound, to the north of the groyne will remove wave energy directly in its lee, tending to allow retention of sediment against the sea wall. Sediment accumulating in the area will tend to be sourced from the general on-shore, offshore movement of sediment, although tending also to reduce some longshore sediment to the south. The volume of sediment retained is assessed as being relatively small in comparison to the general movement of sediment over the wider foreshore area. It is therefore concluded that there would be no significant change in sediment supply to the beach area to the south.

Both the protection to the seaward end of the groyne and the rock mound structure will tend to reduce wave reflection locally and will not encourage scour. It is concluded, therefore, that these structures will not significantly alter the general impact of waves over the wider rock foreshore.

In summary, the proposed work would not have a significant impact on the general coastal processes in the broader area, only having a local influence on sediment behaviour over the upper beach and effecting wave action directly in the lee of each structure.