

Aberdeen North Beach Coastal Defence

Phase 1 Desk Study

20 January 2017

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1 Introduction

1.1 Background and Scope

Aberdeen City Council (ACC) have commissioned Mott MacDonald Ltd (MML) to undertake an initial assessment of the condition of the coastal embankment and sea defences at North Beach and produce a Stage 1 Desk Study as part of a feasibility study for the site. The coastal embankment is located between the mouth of the River Don and Aberdeen Beach Esplanade, herein referred to as the site. The site location is shown in Figure 1.1.

Figure 1: Indicative Site Boundary



Source: Contains OS Data @ Crown Copyright 2016 Licence No. 100026791

The aim of this report is to present the findings of an initial Desk Study review, including development of a ground model for the site and recommendations as to further work required.

The objectives of this Desk Study are to:

- Review readily available existing information.
- Assess the ground conditions at the site.
- Advise of requirements for further work.

1.2 Sources of Information

The following sources of information summarised below have been used to compile this Desk Study report and are summarised in Section 2.

- National Library of Scotland, online historical map viewer (Ref. 1)
- British Geological Survey (BGS) Geology of Britain Online Viewer (Ref. 2)
- BGS GeoIndex Map Viewer (Ref. 3)
- BGS Hydrogeological Map of Scotland (Ref. 4)
- Scottish Environmental Protection Agency (SEPA) River and Basin Management Plan (RBMP) Online Viewer (Ref. 5)
- Coal Authority Gazetteer and Interactive Map (Refs. 6 and 7)
- BGS Non Coal Mine Plans Portal (Ref. 8)
- Zetica UXO Pre Desk Study Assessment (Ref. 9)
- ACC website, nature reserve maps (Ref. 10)
- Scottish Natural Heritage (SNH) interactive map (Ref. 11)
- Historic Environment Scotland (HES), Canmore database (Ref. 12)
- Google aerial imagery (Ref.13)
- Bing aerial imagery (Ref. 14)
- ACC tender information (Ref. 15)

2 Desk Study

2.1 Introduction

A desk-based assessment of the site and ground conditions has been undertaken using information from readily available sources outlined in Section 1.2.

2.2 Site Description

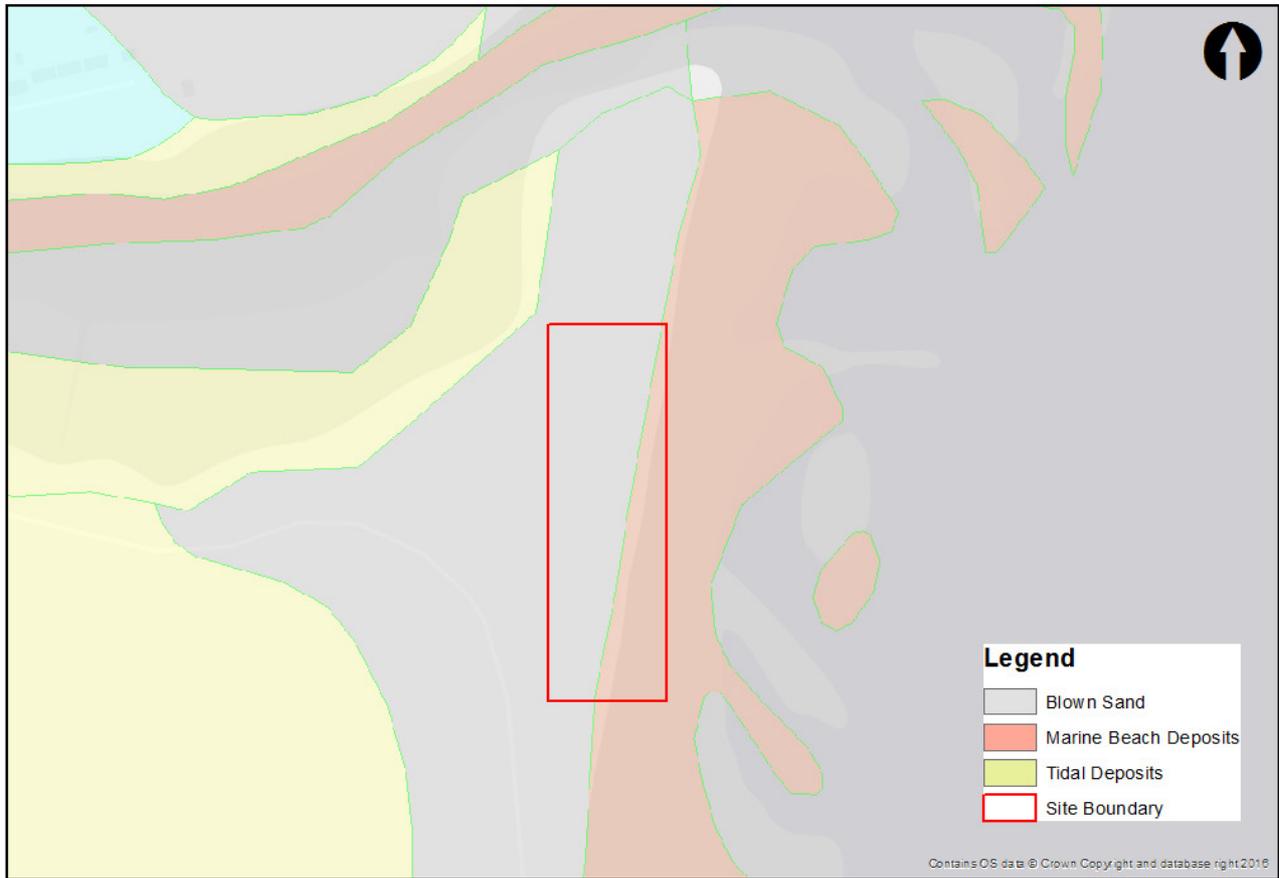
A summary of pertinent site details is presented in Table 2.1.

Table 2.1: Site Details

Aspect	Comments
Site Name	Aberdeen North Beach Coastal Defence
Site Area	Approx. 1.5ha
National Grid Reference (NGR)	NJ 95384, 09240 (approx. centre of site)
Local Authority	Aberdeen City Council (ACC)
Location	Between the mouth of the River Don and the north end of the existing concrete sea defences at Aberdeen Beach Esplanade.
Current Land Use and Surface Conditions	Coastal embankment with sea defences that are in a state of disrepair. Current sea defences are comprised of gabion baskets, rock armour and concrete walls. This area is used recreationally and there are informal footpaths. There is a battery / solar powered Harbour Board navigation light present to the crest of the coastal embankment.
Topography	The eastern part of the site is a flat lying sandy beach. West of the coastal embankment (approx. 2 - 3 m high), there is a slightly undulating dune landscape.
Surrounding Area	The site is coastal with the North Sea lying to the east. North of the site, the River Don flows eastwards into the North Sea. Inland of the embankment immediately to the west there is reclaimed land which was infilled by demolition rubble.
Historical Site Use (Ref.1)	<p>The earliest available historical map, dated 1868, shows the site to be undeveloped marshy coastal land. The site was surrounded by the River Don to the north, the North Sea to the east, coastal land to the south, and Tilt Burn to the west with undeveloped agricultural land beyond. There is an 'Old Breakwater' noted to the north of the site.</p> <p>The 1925-1926 map indicates that Tilt Burn to the west has been infilled, and a road called 'Esplanade' has been constructed over reclaimed marshy coastal land, oriented parallel with the western site boundary. There was also a shelter shown to the south west of the site.</p> <p>The 1955-1956 map indicates that coastal defences have been put in place to the south of the site (i.e. groynes). It is not clear when the coastal embankment was constructed, however it is first shown clearly in the large scale 1975 map, with no significant change on site to the present day.</p>
Published Geology (Refs. 2 and 3)	<p><u>Superficial Deposits</u></p> <p>The eastern half of the site (the beach) is indicated to be underlain by Marine Beach Deposits described as clay, silt, sand and gravel. The western half of the site is shown to be underlain by Blown Sand described as fine-grained and uncemented. Tidal deposits are present beyond the site boundary.</p> <p>Although not recorded on the geological maps, made ground of unknown thickness is anticipated to be present to the west of the site, associated with the infilled reclaimed land and embankment construction.</p> <p><u>Bedrock Geology</u></p> <p>The solid geology beneath the site is conglomerate and sandstone of the Brig O'Balgownie Formation.</p> <p>There is no evidence of faulting within the site or the surrounding area.</p>
Please refer to Figure 2.1: Superficial Geology Plan	

Aspect	Comments
	<p><u>BGS Landslip Records</u> The British Geological Survey (BGS) do not hold any records of historical landslips.</p> <p><u>BGS Boreholes</u> There are no BGS borehole scans located within the site or the immediate surrounding area.</p>
Hydrogeology (Ref. 4)	<p>The BGS GeoIndex Map Viewer indicates the site to be underlain by a 'Moderately productive aquifer' which is locally important. It is also noted to be an area where the chloride ion concentration exceeds 1000 mg/l above -80m above Ordnance Datum (OD).</p> <p>The SEPA RBMP website records the 'Lower Don Valley Sand and Gravel' groundwater body to be present beneath the site (Water Body No: 150371). A groundwater body is considered to be potentially capable of sustaining a water supply of 10m³ per day or 50 people on a continuous basis. It is considered to be a potential receptor with regards to contaminated land.</p> <p>In 2008, SEPA classified this groundwater body as having an overall status of 'Good with High confidence'.</p>
Hydrology (Ref. 5)	<p>The River Don (Water Body No: 200104) is located within 100m of the northern site boundary, where it flows east into the North Sea. In 2008, SEPA classified this water body as having an overall status of 'High with Medium confidence'.</p> <p>The site is coastal, with the North Sea (Water Body No: 200105) immediately to the east of the site. In 2008, SEPA gave this water body an overall status of 'Good with Medium confidence'.</p>
Mining and Quarrying (Refs. 1, and 6 to 8)	<p>Aberdeen is not located within a Coal Authority Reporting Area. Consequently, the risk associated with abandoned mine workings below the site is considered to be negligible.</p> <p>There are no records of quarrying activity within, or in the vicinity of, the site.</p>
Unexploded Ordnance (UXO) (Ref.9)	<p>The Pre Desk Study Assessment (PDSA) for the site indicates a low risk of encountering UXO at the site.</p>
Designated Areas (Refs. 5, 10 and 11)	<p>The majority of the site is located within the Donmouth Local Nature Reserve (with the exception of the south east corner). The site is also within a nitrate vulnerable zone.</p> <p>There are no Scottish Natural Heritage protected areas within the site or the immediate surrounding area.</p>
Archaeology (Ref. 12)	<p>There are no Historic Environment Scotland (HES) features within the site, however a breakwater (Canmore ID: 134455) i.e. a sea defence barrier, is located approx. 100m north west of the northern site boundary.</p> <p>There are a further two features located approx. 300m to the north, both relating to armed forces in the 20th century.</p>
Aerial Photography Interpretation (Refs. 13 to 15)	<p>A review of historic and recent photographs of the site reveals that the concrete toe wall of the sea defences has been buried by deposition of sand deposits through wave and wind action. The gabion baskets above have been entirely buried / collapsed in places and are in a state of disrepair in others (burst). The breach of the sea defences has caused erosion of the coastal embankment, with significant slope instability and regression visible. Material from the embankment has been deposited on the beach.</p>
ACC Tender Information (Ref. 15)	<p>The information provided by ACC indicates that the area west of the embankment is reclaimed land which has been infilled by demolition rubble including building rubble, blocks and bricks. It also mentions that there are several unofficial footpaths in this area.</p> <p>Various sea defences have been implemented in the area to protect the coastal embankment. Currently, the sea defences at the site consist of rock filled gabion baskets, rock armour and concrete walls, all in varying states of disrepair. Extending southwards from the south end of the site there is a groynes field i.e. a series of barriers extending into the sea.</p>
Utilities	<p>Freely available utilities information indicates there are no utilities present at the site.</p>

Figure 2.1: Superficial Geology Plan



Source: BGS Opensource Data NERC

2.2.1 Preliminary Ground Model

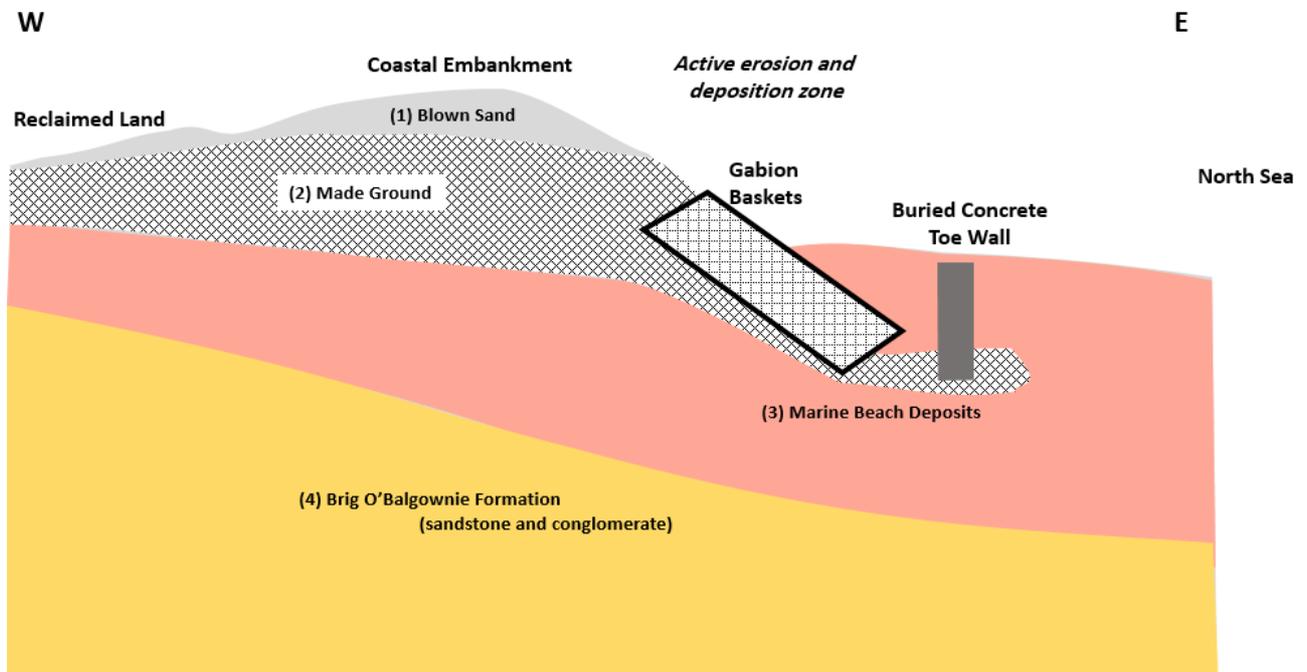
The preliminary ground model for the site has been compiled using available published information, and it is shown in Table 2.2 and Figure 2.2.

There is active erosion at the site due to its coastal location, as well as deposition, with made ground material deposited on the beach from erosion of the embankment and typical beach blown sand deposition.

Table 2.2: Preliminary Ground Model

Strata ID	Thickness (m)	Description	Comment
(1) Blown Sand	Unknown	Fine-grained uncemented sand	-
(2) Made Ground	Unknown	-	Associated with sea defences i.e. rock filled gabions, coastal embankment construction and infilled reclaimed land i.e. demolition rubble
(3) Marine Beach Deposits	Unknown	Gravel, sand, silt and clay	-
(4) Brig O'Balgownie Formation	Unknown	Conglomerate and sandstone	-

Figure 2.2: Illustrative Preliminary Ground Model



Do not scale

3 Summary and Conclusions

3.1 Site and Ground Conditions

The desk study has identified the potential for made ground in the western area of the site, associated with the infilled reclaimed land and the sea defences. It is understood that demolition rubble has been used as infill in this area.

The superficial soils at the site are understood to comprise Blown Sand in the west of the site and Marine Beach Deposits (gravel, sand, silt and clay) in the east of the site (the beach). The underlying bedrock of the Brig O'Balgownie Formation consists of sandstone and conglomerate.

Tender information and aerial imagery indicates that the existing sea defences consist of rock filled gabion baskets, rock armour and concrete walls. Historic and recent photography indicates that the concrete toe wall and parts of the gabion defences are buried or have collapsed, with the remaining visible gabions not buried / collapsed being in a state of disrepair. This breach of the sea defences has caused significant erosion and instability of the coastal embankment slopes, leading to regression and deposition of embankment material on the beach.

3.2 Recommendations for Further Work

Based on the above assessment, it is recommended that a site walkover is undertaken to map areas of erosion or damage to the coastal embankment and assess the condition of the sea defences including the historic breakwater. This information can then be used to assess the risk of instability along the coastal defences, and determine the requirement for remedial measures and ground investigation at the site.

Should remedial measures be required at the site, consideration may need to be given to site constraints such as; the sites location within a nature reserve and any associated permissions or consents, the presence of made ground and the potential for aquifer protection measures of the underlying locally important aquifer.

4 References

1. National Library of Scotland, online mapping viewer, <http://maps.nls.uk/geo/explore> (accessed: December 2016)
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14. Bing aerial imagery, <https://www.bing.com/maps> (accessed: December 2016)
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