Annex 34.1

Cherry Cobb Sands Compensation Land Saltmarsh Survey Report

(Black & Veatch)

Cherry Cobb Sands Compensation Land

Saltmarsh Survey Report

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1 INTRODUCTION

1.1 BACKGROUND

1.1.1 As part of the Environmental Impact Assessment (EIA) for a compensation land site at Cherry Cobb Sands, Black & Veatch have undertaken a saltmarsh survey to map the extent and record the quality of this intertidal habitat along the frontage of the site. The proposed compensation site is located on the north bank of the Humber estuary in Yorkshire (central OS grid reference TA 224 209) (Figure 1).

Figure 1. Location of the proposed works.

1.1.2 Saltmarsh is listed as a habitat type under Annex I of the EC Habitats Directive which includes both 'Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)' and '*Salicornia* and other annuals colonising mud and sand' which are features of the Humber Estuary Special Area of Conservation (SAC). 'Coastal saltmarsh' is also a Biodiversity Action Plan (BAP) priority habitat and is therefore of national importance.

1.1.3 The purpose of this survey is to establish the extent and quality of the saltmarsh along the Cherry Cobb Sands frontage, in order to determine the optimum position to locate the breaches in the defence that are required to create compensatory intertidal habitat, and also to record a baseline for the impact assessment.

1.2 SALTMARSH MORPHOLOGY

1.2.1 A typical saltmarsh will exhibit three main zones as a result of varying exposure to salinity and frequency of inundation by the tide and the subsequent distribution of plant species on the foreshore. These zones are:

- *'Lower' or 'pioneer' saltmarsh*: Closest to the sea, this zone will be inundated for the longest period of time. This zone is comprised of saltmarsh interspersed by large areas of bare mud.
- *'Mid' saltmarsh*: Vegetation cover is greater and there are a higher number of species with less bare mud. Features such as creeks and saltmarsh pools are characteristic.
- *'Upper' or 'high' saltmarsh*: This zone includes more terrestrial plants which typically have complete coverage of the ground with no bare mud visible. This zone is elevated above that of the lower and mid saltmarsh and tidal inundation is much less frequent.

1.2.2 These zones are not static and will change over time; varying under differing conditions depending on sea level, sediment supply and management strategies. The Humber Estuary is a dynamic system with high suspended sediment loads. The saltmarshes play an integral within this estuarine system, providing nutrients for the mudflats and sandflats as well as feeding and roosting areas for nationally important waterfowl and waders (Natural England, 2004).

2 METHODOLOGY

2.1 SITE VISIT

2.1.1 A walkover survey was undertaken on the 22 and 23 November 2010 during spring tides with low water at Hull (King George Dock) at 12:35 GMT (1.3m) and 13:11 GMT (1.3m) on the 22 and 23 November respectively.

2.1.2 The weather was cool on both days of the survey with temperatures around 3-4°C. There was intermittent precipitation and moderate to strong wind on 22 November which continued into the morning of 23 November. From mid-morning on 23 November conditions changed and brighter conditions prevailed into the afternoon.

2.1.3 The southern extent of the site as far as Stone Creek (TA 235 188) was visited on 22 November and the northern extent of the site as far as the Outstray (TA 212 217) was visited on 23 November. An assessment of the extent was made by walking out to the edge of the saltmarsh and using GPS and a Personal Digital Assistant (PDA) to record the location of the edge of the saltmarsh. The extent of the saltmarsh was recorded in this manner in a number of locations along the length of the frontage including the location of the transition zones. A qualitative assessment was made of saltmarsh 'quality' including observations of accretion or erosion and plant species present.

2.2 CONSTRAINTS

2.2.1 Due to the limited time-scale for the Cherry Cobb Sands Compensation Land EIA, to allow for submission and consideration of this project as part of the main Marine Energy Park EIA, it was necessary to undertake the survey outside of optimum survey period which is suggested as being from May to October (JNCC, 2004). However given that the main purpose of this survey was to establish the extent and quality of the saltmarsh, rather than to quantitatively record plant species, it was deemed to be an acceptable time to undertake this survey. During the survey it was possible to identify the main species present; however due to the annual die back of some species it was not possible to identify all the species that would be apparent during the spring and summer.

2.2.2 A major drainage creek, approximately 2m deep and 3m wide, runs parallel to the existing flood defence, forming a boundary between the lower and mid saltmarsh. It was not possible to cross this creek and therefore the lower saltmarsh could only be observed from the edge of the mid saltmarsh.

3 RESULTS

3.1.1 The following sections present the findings of the saltmarsh habitat survey.

3.2 SALTMARSH EXTENT

3.2.1 The extent of the saltmarsh is shown in Appendix A, Figure 1 and is described below.

Upper Saltmarsh

3.2.2 From Stone Creek (TA 235 188) to just south of the Outstray (TA 214 211), the upper saltmarsh forms a band approximately 5 to 10 metres wide which extends from the bottom of the seaward side of the flood embankment, to the edge of the mid saltmarsh. The width of the upper saltmarsh zone is greater (up to 50 metres) where freshwater drains into the saltmarsh, at TA 219 205 and TA 222 201. In the northern part of the frontage, from TA 214 211 to TA 212 217, this zone is markedly wider and at its widest extent, where the flood embankment is set further back compared to the south, the upper saltmarsh zone is approximately 330m wide. A distinct boundary was observed between the upper and mid saltmarsh and in some places a ledge had developed between the zones (Appendix B, Photo 1).

Mid Saltmarsh

3.2.3 In the southern part of the frontage the mid saltmarsh extends 60-70m from the edge of the upper saltmarsh. The width of this zone is relatively uniform from Stone Creek (TA 235 188) to just south of the Outstray (TA 214 211). The only deviation from this is where freshwater drains into the saltmarsh at TA 219 205 and TA 222 201 where the upper saltmarsh zone is wider and consequently the mid saltmarsh zone is reduced to between 20 and 30m. In the northern part of the frontage from TA 214 211 to TA 212 217, the mid saltmarsh zone is wider, up to approximately 300m at the Outstray where the flood embankment is set further inland compared to the south.

Lower Saltmarsh

3.2.4 A major drainage creek, approximately 2m deep and 3m wide, runs parallel to the existing flood defence, forming a boundary between the lower and mid saltmarsh zones, creating a clear distinction between these zones (Appendix B, Photo 2). It was not possible to cross this creek and therefore the extent of the lower saltmarsh was not recorded using GPS. From observations made from the edge of the mid saltmarsh zone, and from aerial photographs (Google Inc., 2010), it appears that the lower saltmarsh zone is quite extensive and stretches up to the edge of the main channel of the Humber estuary, between 600 and 800m from the boundary of the mid saltmarsh zone, being wider in the southern part of the frontage where the mid and upper saltmarsh zones are narrower.

3.2.5 Natural England (2010) note that the saltmarsh in this area (SSSI unit 74) is undergoing a period of 'expansion and encroachment downshore' and therefore this lower saltmarsh zone is likely to be accreting.

3.3 SALTMARSH QUALITY

Upper Saltmarsh

3.3.1 Throughout the study area, Sea couch grass *Elytrigia atherica (Elymus pycnanthus)* saltmarsh community is dominant in the upper saltmarsh. Other species of note in this zone include Sea plantain *Plantago maritima*, Red fescue *Festuca rubra* and *Orache atriplex sp.* (Appendix B, Photo 3). The quality of the upper saltmarsh is good, with high plant coverage and very few bare patches. Whilst the vegetation is of good quality, there is a large amount of rubbish and flotsam, comprising both natural and anthropogenic debris along the whole of the frontage, which may have contributed to the 'unfavourable recovering' status of SSSI units 77 and 78 (Natural England, 2010) (Appendix B, Photo 4).

3.3.2 The upper saltmarsh has a network of saltmarsh creeks running through it as well as areas of standing water (Appendix B, Photo 5). The saltmarsh creeks feed into either the major drainage creek running between the mid and lower saltmarsh to the south, or directly into the Humber via the lower saltmarsh zone. Saltmarsh creeks vary in size, with some being as deep as 2-3 metres and other around 0.5 metres (Appendix B, Photo 6).

Mid Saltmarsh

3.3.3 The majority of the mid saltmarsh is also dominated by Sea couch grass, although some small patches of mid saltmarsh are colonised instead by Sea purslane *Atriplex portulacoides* (Appendix B, Photo 7). Other species identified in this zone include Sea aster *Aster tripolium*, Common scurvy grass *Cochlearia officinalis* and English scurvy grass *Cochlearia anglica.* The quality of the mid saltmarsh is generally good, with the exception of a small number of locations where bare patches were noted (Appendix A, Figure 1 and Appendix B, Photo 8). These patches may be due to a die-off of annual species, which would be expected at this time of year, or it may be where mud has been washed up onto the saltmarsh causing smothering (see target note 5 in Appendix A, Figure 1). There are also a number of places where freshwater drains from the landward side of the embankment out into the estuary. In some places these drains have cut creeks in the saltmarsh (see target notes 6 in Appendix A, Figure 1; Appendix B, Photo 9).

Lower Saltmarsh

3.3.4 The major drainage creek that runs parallel along the edge of the mid saltmarsh creates a distinctive divide between the mid and lower zones of saltmarsh. It was not possible to cross this creek and therefore the lower saltmarsh was only observed from the edge of the mid saltmarsh. The lower saltmarsh zone is defined by 'clumps' of saltmarsh vegetation interspersed by bare mud, with plant coverage far

less than the mid and upper saltmarsh zones (Appendix B, Photo 10). The plant species likely to be present in this area are 'pioneer' species including annual glasswort *Salicornia europea agg.* and common cord grass *Spartina anglica* (Natural England, 2010).

4 DISCUSSION

4.1.1 The distribution of Sea couch grass throughout the mid and upper saltmarsh is not typical of most saltmarshes as this species is generally found only in the upper saltmarsh or above high water (Natural England, 2004).

4.1.2 In order to gain an understanding of the stability of the existing saltmarsh, the observations made on site were compared with aerial photographs from 2007 obtained from Google Earth. The upper and mid saltmarsh zones appear to be relatively stable and do not appear to have increased or decreased significantly in their extent since 2007. No signs of erosion were recorded and the saltmarsh is of good quality throughout these zones.

4.1.3 Although the extent of the lower saltmarsh was not mapped precisely, it is thought likely that this zone is gradually accreting as substantially more vegetation was observed on site compared to aerial photographs from 2007, although without a time-series of aerial photographs it is difficult to have certainty in this conclusion.

4.1.4 Hemingway *et al.* (2008) note that the lower saltmarsh of the Humber estuary is dominated by Common cord grass. This species is now considered invasive as it was initially introduced to combat coastal erosion, but has spread quickly in some locations. It is known to play a role in the trapping of sediment (JNCC, 2004) which may explain the possible trend of accretion within the lower zone.

5 *RECOMMENDATIONS*

5.1.1 The location of the breaches should be carefully considered to reduce the impact of the creation of compensation land on the existing saltmarsh and maintain the existing geomorphology as far as possible.

5.1.2 The extent of saltmarsh is greatest in the north of the Cherry Cobb Sands frontage and if possible cutting of a channel across this part of the saltmarsh should be avoided, given that this would lead to disturbance and loss of a significant area of saltmarsh. From south of the Outstray to Stone Creek the saltmarsh band is narrower than in the north and is relatively uniform in width and therefore breaches could be located at any point along this length. Use of existing saltmarsh creeks or freshwater drains to drain the compensation land should be considered.

5.1.3 It is likely that the saltmarsh along the frontage would regenerate relatively quickly following any disturbance, given that there are no signs of erosion and that die-off appears to be constrained to the annual species which is expected at this time of year.

Google Inc. (2010) Google Earth (Version 5.2.1.1588) [Software]

Hemingway, K.L., Cutts, N.D., Allen, J.H. & S. Thomson (2008). *Habitat Status of the Humber Estuary, UK*. Institute of Estuarine & Coastal Studies (IECS), University of Hull, UK. Report produced as part of the European Interreg IIIB HARBASINS project.

JNCC (2004). *Common Standard Monitoring Guidance for Saltmarsh Habitats*. August 2004

Natural England (2004). *Humber Estuary Site of Special Scientific Interest Citation*.

Natural England (2010). *Humber Estuary: Condition of Site of Special Scientific Interest Units – compiled 01 Nov 2010.* Available from: http://www.sssi.naturalengland.org.uk/Special/sssi/reportAction.cfm?report=sdrt13&category=S&reference=2000480 [Accessed 29 Nov 2010]

APPENDICES

Appendix A - Figure
Appendix B - Photos
Appendix C - SSSI Unit Assessment

Appendix A - Figure

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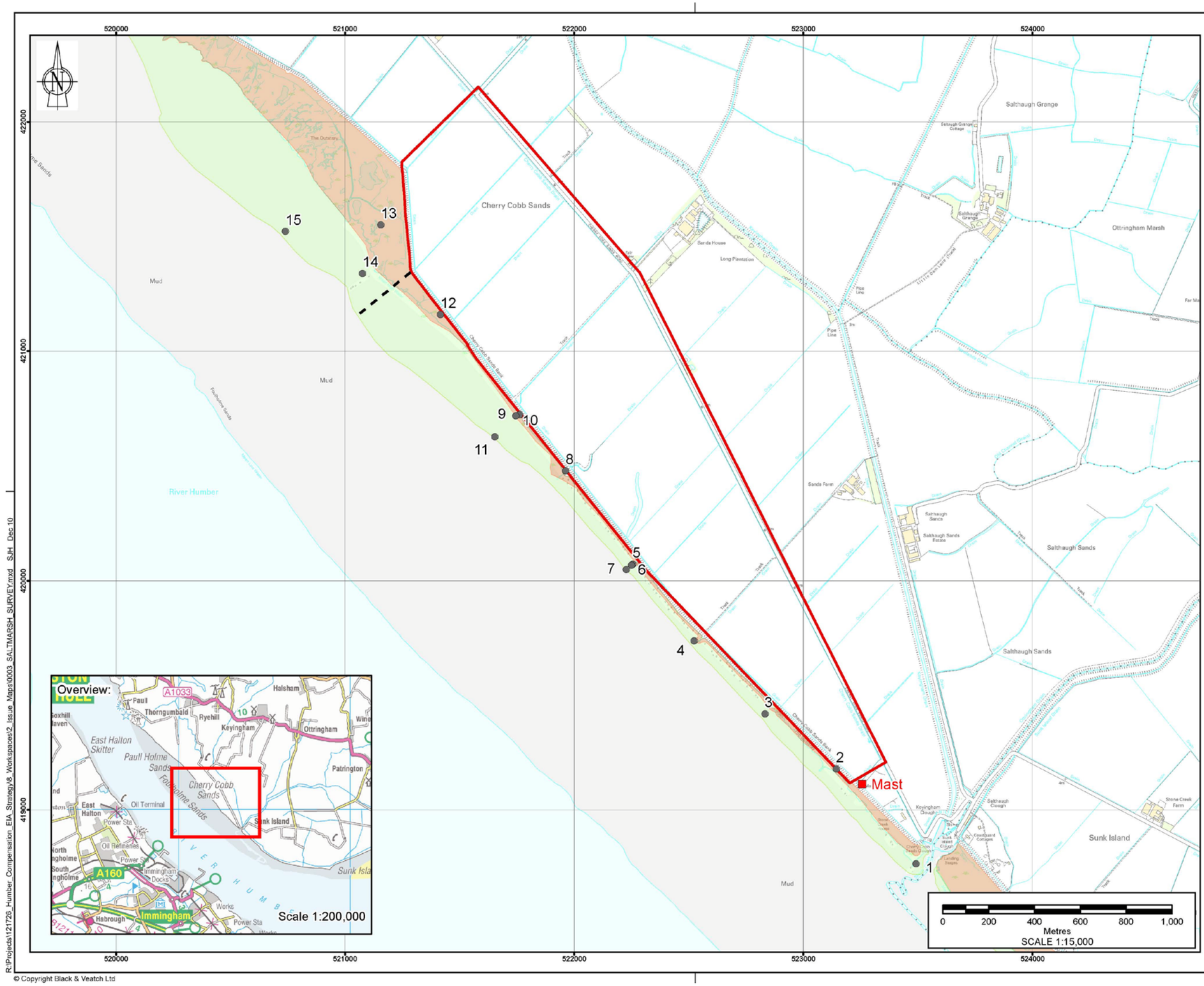

Note: The limits, including the height and depths of the Works, shown in this drawing are not to be taken as limiting the obligations of the contractor under Contract.

Legend

- Target Note
- Mast
- Fence
- Upper Saltmarsh
- Mid Saltmarsh
- Study Area

Target Notes:

1 - Dominated by Sea couch grass. Sea aster, Common scurvy grass and English scurvy grass also present
2 - Saltmarsh creek from upper zone to main channel
3 - Dominated by Sea couch grass
4 - Dominated by Sea purslane. Marker post and buoys present at the edge of mid saltmarsh
5 - Area of saltmarsh annual die-back - Sea spurry or Sea blite
6 - Saltmarsh creek from upper zone to main channel
7 - Edge of mid saltmarsh, dominated by Sea couch grass
8 - Drain and navigational marker post. Upper saltmarsh extends approx. 10m at this point (compared to 5m to north and south of this point)
9 - Sea purslane and Sea plantain
10 - Numerous saltmarsh creeks, approx. 0.5m wide.
11 - Edge of mid saltmarsh. Large saltmarsh creek (3m wide x 2m deep) discharges into main channel at this location
12 - Grassy patch, 5m x 5m, may be where freshwater drains from fields
13 - Pools of standing water present within upper saltmarsh
14 - Large saltmarsh creek
15 - Edge of mid saltmarsh, pioneer saltmarsh appears to extend to the main navigation channel

Safety Health and Environment Information
In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following:
Construction.
Maintenance / Clearing / Operation.
Decommissioning / Demolition.

Rev	Drawn	Chkd	Rvwd	Apprvd	Date	Description
A	SJH	LVI	EC	NM	16/12/2010	DRAFT FOR COMMENT

Designed by: SJH Date: Dec 10

Client: able www.ableuk.com

Client Drawing No.: 73242 - 4000 - 0001 Revision:

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Drawing title: SALTMARSH SURVEY

Drawing scale: 1:15,000 @ A3 Sheet size: A3

Drawing no.: 121726-4000-0001 Revision: A

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Appendix B - Photos

Photo 1. Ledge that has formed between upper and mid saltmarsh zones in some places.

Photo 2. Major drainage creek running north-west to south-east between mid and lower saltmarsh.

Photo 3. Upper saltmarsh.

Photo 4. Flotsam and rubbish at edge of upper saltmarsh next to flood embankment.

Photo 5. Standing water in upper saltmarsh in the north of the Cherry Cobb Sands frontage.

Photo 6. Saltmarsh creek.

Photo 7. Sea purslane (foreground).

Photo 8. Area of die-back within mid saltmarsh.

Photo 9. A creek that has been cut into the saltmarsh where freshwater drains out from behind the embankment.

Photo 10. Lower saltmarsh characterised by patches of vegetation interspersed by bare mud.

Appendix C - SSSI Unit Assessment

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Table 1. SSSI Unit Assessment (source: Natural England, 2010).

Unit no.	Unit ID	Unit area (ha)	Main habitat	Latest assessment date	Assessment description	Condition assessment comment
74	1028334	781.15	Littoral sediment	30 Mar 2010	Favourable	Large stretch of mudflat from infront of Paul Holme managed realignment site stretching seaward to Cherry Cobb Sands. Extensive saltmarsh biotopes mixed with areas of mud/muddy sand. Saltmarsh is undergoing a period of expansion and encroachment downshore. No significant signs of disturbance relating to human activities. For a detailed report on the site, including species/biotope lists and PSA sediment analysis see ABPMer (2010) Biological survey of the intertidal sediments of the Humber Estuary and the summary condition assessment filenote.
76	1028336	47.47	Fen, marsh and swamp - lowland	22 Jul 2003	Unfavourable declining	Site visit with Tom Mallows to assess condition of saltmarsh. The manager of the site, accompanied us to the site initially. The saltmarsh has historically been grazed with cattle but no grazing has taken place since before foot & mouth ie 2000. The manager is still building up his suckler herd after f&m but agreed to re-introduce grazing asap, if not later this year, then in 2004. The saltmarsh is c140 acres in extent and a valuable grazing resource. It is grazed in conjunction with 30/40 acres of grass connected to the saltmarsh. Up to 40/50 cattle have grazed the site in the past but more likely to be c25 in the future. Rabbits are controlled on the floodbank and shooting of wildfowl occurs on the marsh infrequently. This is carried out by the manager and friends. The saltmarsh communities are relatively extensive in terms of the Humber and would benefit from grazing, the SM 24 (Elymus dominated marsh) was very rank where it occurred. SM6 (Spartina anglica) dominates along the front of the saltmarsh and is encroaching in small clumps onto the mudflat. Other saltmarsh communities eg SM16a, SM16 and SM12 support a number of positive indicator species and there are several open pools. Overall the structure and composition of the saltmarsh is good but grazing is now needed to ensure that this continues. No obvious signs of coastal squeeze were seen on the site although SMP modeling states that this area is squeezed and has therefore been assessed as unfav - declining.
77	1028337	5.97	Fen, marsh and swamp - lowland	14 Jul 2010	Unfavourable recovering	Good areas of Saltmarsh e.g: Pioneer spp: Glasswort + Spartina Low-Mid: Sea Aster + Red Fescu Mid - Upper: Sea Plantain, Marsh Arrowgrass, Sea Purselane, Atriplex hastata. Notes: Some Sea Couch in places but relatively low coverage when compared to adjacent units. The lower areas of spartina are becoming species rich with many many different salt marsh species. There are also areas where the spartina stretches out very far estuary-ward. There is Scrub growing on the landward side of the floodbanks - Hawthorn bushes etc. There is a lot of Rubbish against the estuary side of the flood bank in places. This rubbish is tidal and has been washed up - it would be worth monitoring the level of rubbish in this unit in future. The appears to be landward accretion of mud in places.
78	1028338	7.20	Fen, marsh and swamp - lowland	14 Jul 2010	Unfavourable recovering	Where present, areas of saltmarsh were good e.g: Pioneer: Glasswort, Spartina, Sea Aster. Low-Mid: Sea arrowgrass, Sea Purselane, Red Fescue Mid-Upper: Sea Couch, Sea Plantain, Red Fescue. There is lots of Sea Couch. Recommend grazing as a management option. The cutting of the floodbank was only half done - lots of thistles. Rubbish that has been washed up at the bottom of the floodbank in places. There has been an expansion of saltmarsh. Lots of creeks and pans.
79	1028339	1.57	Fen, marsh and swamp - lowland	16 Aug 2010	Unfavourable recovering	A small unit which is predominantly mudflat at stone creek with some associated saltmarsh. Some tidal litter on the unit (leaf litter/rubbish). The saltmarsh is predominantly upper marsh communities. With increased diversity in the low-mid marsh at the seaward edge of the unit.