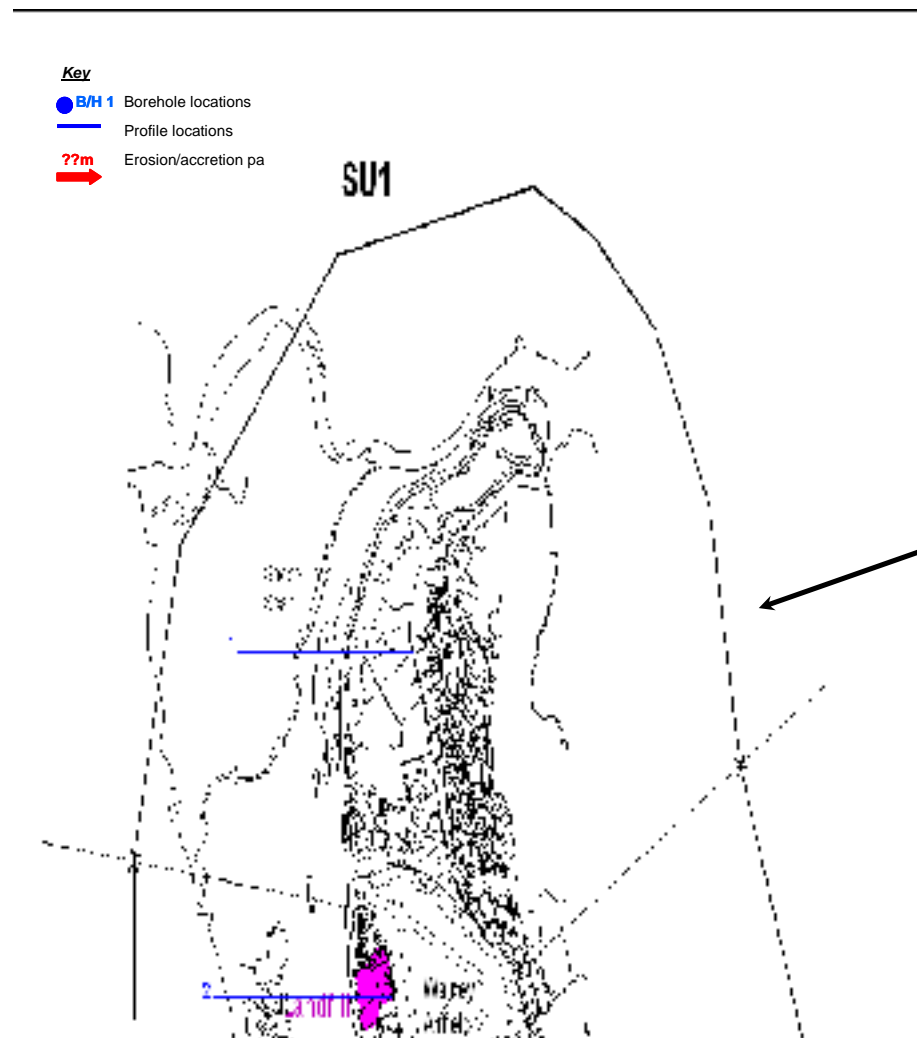


3 Strategic Unit Descriptions and Key Issues

The Strategy subdivides the study frontage into discreet lengths known as **Strategic Units (SU's)**. These are developed from those presented in Stage 1 and are selected to represent differences in land-use, morphological or hydro-dynamical characteristics, or on the basis that their management may have strategic implications for adjacent areas. The study area is divided into 4 main SU's with subdivisions as shown in Figure 3.1 to 3.7. SU3 has linkages between east and west coast which need to be considered holistically (e.g. flood risk linkage between Biggar Bank and Middle Hill).

Figures 3.1 to 3.7 (not drawn to scale) summarise Stage 1 knowledge on each SU, supplemented by the more recent work carried out for Stage 2 including consultation responses received on key issues, opportunities and constraints for each SU. These are focused specifically to local defence issues and risks that may need addressing at a strategic level (FCDPAG2 compliance) within later sections of Volume 2.

A key constraint on the coastal management strategy for Walney Island is the landfill areas. Three waste disposal licences exist for sites in the north, middle and south of Walney Island. The nature of the material dumped in the North Walney site from the late 1950s to 1977 is unknown, although since this time there are records of the waste disposal licences granted for both the North and South Walney landfill sites. This material includes household, commercial and industrial wastes, including asbestos and contaminated soil. Although the content of the landfill area in the middle site (Bent Haw) on Walney Island is unknown, it is possible that it contains similar material. The nature of this material is such that will not become inert within the timeframe of this Strategy. Household domestic waste requires at least 100 years to breakdown and other substances such as industrial effluent, contaminated soil and asbestos may never become inert. The implications of this are discussed in section 6.4 and 8.1.



Key Processes

- Dynamically stable system of dunes, shingle bank and saltmarsh.
- Movement of sand and shingle from south to north driven by wave activity.
- Natural accretion of shingle at North End Haws.
- Siltation and salt marsh formation along the east side of the island.
- The coastal processes in this unit are influenced more by the Duddon Estuary than Morecambe Bay.
- The area on the north-eastern tip of the island accreted between 1963 and 1997. Northerly littoral drift may also result in a loss of sediment into Duddon Estuary, and back to the north of Walney through circulation.



View looking west from mainland towards Walney

Current Coastal Defences (incl. coastal protection and flood defence)

- There are no artificial defences in this unit at present, nor have there been in the past.
- Natural coastal defence to the mainland is provided by a natural shingle bank backed by dunes and heath on the seaward facing coast.

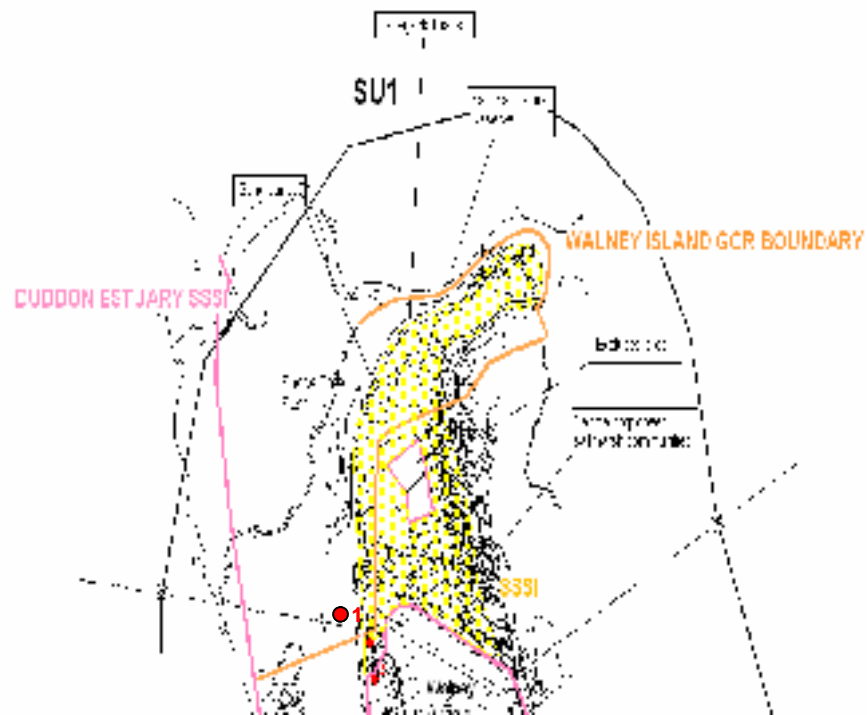
Figure 3.1a Key Issues / Risks Within SU1 – North End of Walney Island

Natural Environment

- The dune slacks and salt marsh provide habitats for Natterjack toads, a priority species in the Cumbria BAP. Rabbits graze the dune grassland. Saltmarsh provides important breeding, roosting and feeding grounds for waders.
- The inter-tidal zone and hinterland is designated of international and national importance (NNR, SSSI, Duddon SPA, Ramsar and Morecambe Bay European Marine site) with habitats of interest including intertidal scar communities, vegetated shingle, vegetated pools and dunes.
- A reduction in grazing pressure has resulted in scrub encroachment (and loss of open dune habitat) thereby aiding stabilization of the dune system.
- The habitat audit completed for this study in Sept. 2001 revealed dunes are very disturbed with blow-outs in many of the fore dunes. The audit also identified sporadic distribution of pioneer shingle communities on the upper reaches of the shingle beach (site 1).
- A large area within this unit is designated as a Geological Conservation Review site by virtue of its morphological features.

Key
 ● 1 Habitat Audit sites

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SUMMARY OF POSSIBLE MANAGEMENT RESPONSES

- No artificial intervention as dune system to north east shown to be accreting.
- Monitor conservation areas and future geomorphological change.
- Possible source of material for the other strategy units
- Beach Response Management System (BRMS)

Socio-economic

- There are no tangible assets at risk.
- Public access to the dunes should be minimized.

Main Objectives / Opportunities

- Maintain integrity of natural sea defence provided to the mainland.
- Monitoring is required to study the impact of sea level rise and increased storminess.
- Any coastal management policy should allow salt marsh habitats to keep pace with rising sea level by, for example, allowing landward migration.
- Possible local source of material for the other strategy units.

Constraints

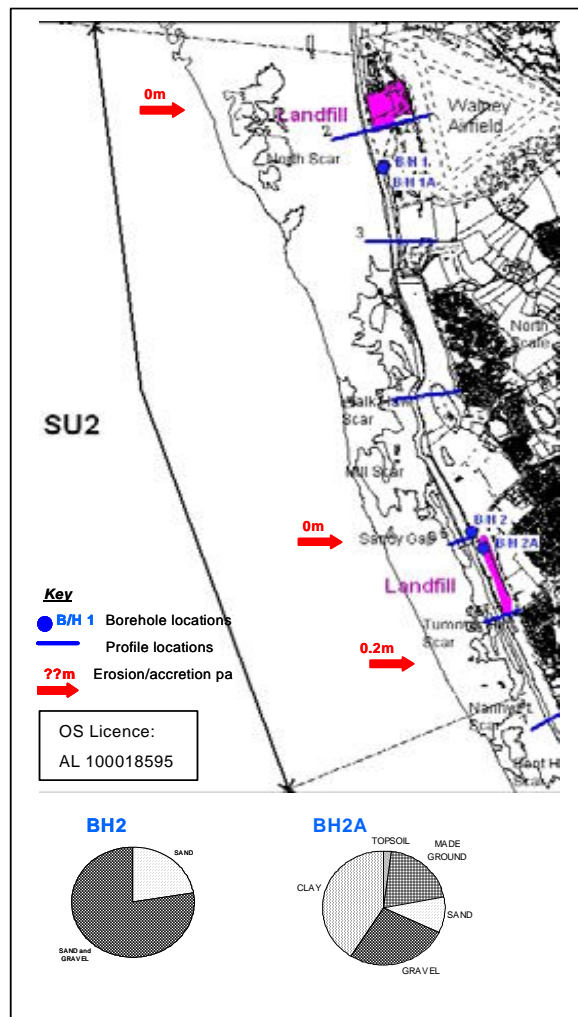
- It is of paramount importance to conserve the geomorphological features and designated areas of conservation within the unit. This may limit intervention options in other SUs.

Consultation-Raised Issues

- None

Figure 3.1b Key Issues / Risks Within SU1 – North End of Walney Island

KEY ISSUES/RISKS WITHIN STRATEGY UNIT 2 – WALNEY AIRFIELD TO MILL SCAR (WEST COAST)



Key Processes

- Coastal defences significantly modify natural processes in the south of this unit (see below).
- Potential movement of the sediment drift divide further south (see SU3).
- Shoreline is stable (erosion is only recorded south of Sandy Gap). There is concern over the erosion rate around the Round House at Tummer Hill. Instead of 0.2m/yr, anecdotal evidence suggests that at least 50 yards has been eroded over 50 years (circa 0.8m/yr).
- Sea level rise and increased storminess may have an adverse impact on defences in this unit in the longer term due to beach lowering. The unprotected reaches may be subject to increased erosion, but this is difficult to assess without improved knowledge of coastal processes.
- Ground investigation work (boreholes 2 and 2A) reveal strata predominantly composed of sands and gravels and sandy clay. These underlying Quaternary drift deposits are highly susceptible to erosion. Note, the borehole pie charts display the relative proportion of material recorded in the boreholes and are not displayed in any stratigraphic order.

Current Defences

- T groyne at Earnse Point and revetment (460m long) was constructed in 1993/4 to reinforce a failing masonry wall and prevent erosion of Furness Golf Club (on higher ground) and West Shore Park (semi-permanent holiday type homes). Currently in a good condition. The groyne reduces northerly longshore drift. Any loss in supply may have an adverse impact on geomorphological features and designated conservation areas in SU1 and could also threaten shoreline stability in front of the landfill site by Walney Airfield (relative stability at present). Since 1997 (most recently on 5 Feb 2002) erosion of backshore has been taking place north of Earnse groyne.
- The groyne has had a stabilizing effect on the beach to the south between Earnse Point and Walk Haw Scar (0.1m/yr accretion measured at profile 4 between 1963 and 1997). Beach levels in front of West Shore Park change seasonally, likely to be due to storm direction approach (Plate 2 - post storm event Feb 2002), and may not be representative of long term shoreline evolution. The defences here provide a high standard of protection.
- The remaining defences to the south (to the Golf Club, total length 750m) are 50 years old, but not showing signs of distress at the present time, but could fail if conditions changed. Residual life of defences is unknown.

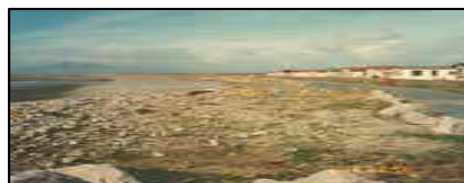


Plate 1
 View looking north from adjacent to groyne and holiday park – Earnse Bay



Plate 2
 View looking north from adjacent to groyne and holiday park Earnse Bay (following Feb 2002 storm event) – Note significant retreat.

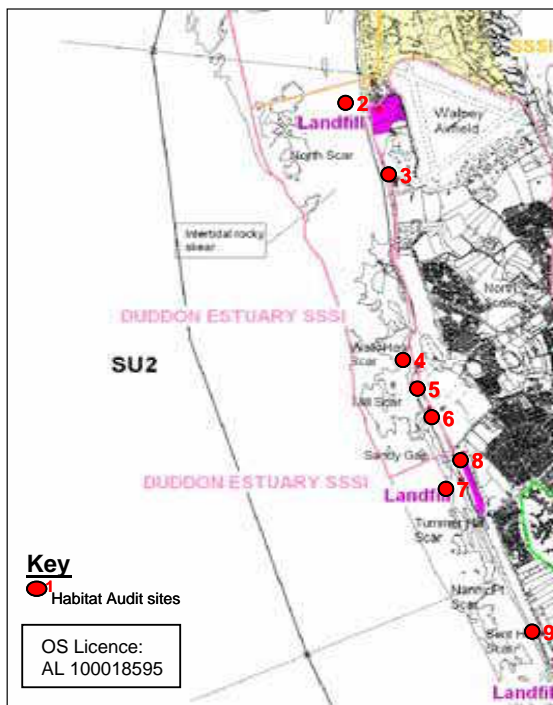
Figure 3.2a Key Issues / Risks Within SU2 – Airfield to Mill Scar (West Coast)

Natural Environment

- The west coast within the unit is designated a SSSI below high water. The intertidal zone north of Sandy Gap is designated as a SSSI, SPA, cSAC and Ramsar Site. Habitats and interests of particular importance include intertidal sand flats, rocky scars communities, sand dunes and vegetated shingle. Poor quality grassland has colonised the old landfill sites. Vegetated shingle at Earnse Point and Sandy Gap are designated Priority BAP Habitats. Area falls within Duddon Estuary European Marine Site (EMS).
- As mean sea level rises, in the long term there will be risk of exposure of pollutants from the landfill seaward of Walney Airfield.

Socio-economic

- Existing defences provide protection to the Golf Club and to a lesser extent West Shore Park. There is a possibility of erosion of the golf course due to the risk of localised failure of the Walk Haw Scar defences.
- At present there is no risk to the main urban settlement at North Scale as it is well inland.
- However, there are assets on the coast (holiday park and golf course) and protection of these need to be examined in the defence strategy. Several pitches at West Shore Park were damaged during the surge event in Feb 2002.
- The seasonal down drift erosion caused by the defence works at Earnse Point results in a potential risk of loss of access to the north end and loss of chalet sites (refer plate 1).



- POSSIBLE MANAGEMENT RESPONSES**
- *Selective managed realignment / do nothing*
 - *Rock revetments*
 - *Re-design of T-shaped groyne to assist in reinstating upper beach drift*
 - *Shingle recycling to maintain foreshore levels*
 - *Beach Response Management System (BRMS)*
 - *Maintenance of existing defences*
 - *Reduce vehicle access*
 - *Remove and relocate tip*

Main Objectives

- To take appropriate measures to prevent pollution of the shoreline from landfill.
- To maintain in favorable condition, subject to natural change, all habitats in the Unit and those in SU1.
- Establish if there is justification for the maintenance /replacement of ageing defences.
- Review the performance and impact of the T-groyne at West Shore Park.

Opportunities

- Managed realignment of the existing coastline.
- Opportunities for habitat creation in a narrow band along the west coast, including, progressive roll back of coastal habitats

Constraints

- Designated areas of conservation, and GCR site in SU1.
- Any defence intervention should allow for public access to beach
- Low value of land at risk and public objections and loss of amenity resulting from abandoning defences.
- Landfill sites containing foundry sand, building and construction waste, excavation wastes, paper, packaging, sweepings, scarp items, asbestos, slag, ashes, bentonite, stones, hardcore, subsoil, topsoil and possibly other unknown waste.

Consultation Raised Issues

- Emergency access issues raised in Public Meeting July 2000 (Consultation 1).

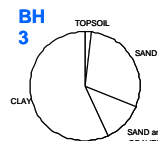
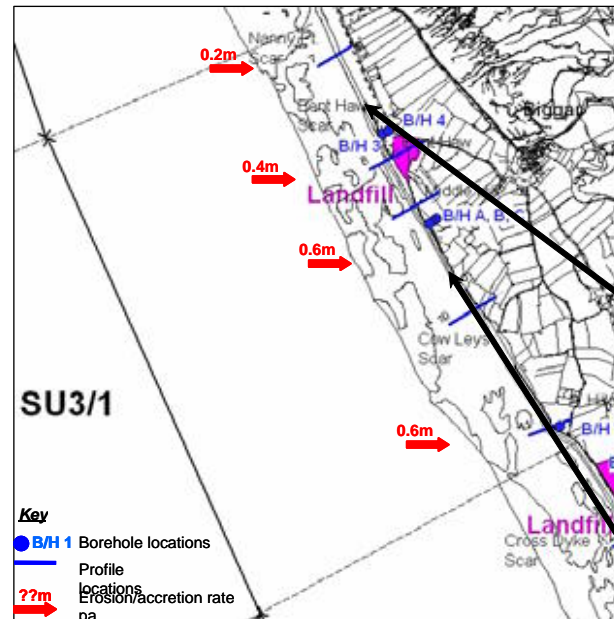
Figure 3.2b Key Issues / Risks Within SU2 – Airfield to Mill Scar (West Coast)

Key Processes

- Recent erosion rates are low (0.2m/yr) increasing to 0.6m/yr to the south of the unit.
 - Such rates may increase at unprotected locations with sea level rise and increased storminess on the till cliffs supplying potentially more sediment to fronting foreshores. Scars would also extend landward with the more seaward parts being lowered.
 - The sediment drift divide on the upper beach may have moved further south (between Bent Haw and Hillock Whins).
 - Investigations work indicates that ground conditions (boreholes 3 and 4) reveal strata predominantly composed of sands and gravels underlain by sandy clay. The pie chart depicts this overall particle size variation (not in stratigraphic order).
 - The underlying Quaternary drift deposits are highly susceptible to erosion creating a long term threat to Tummer Hill and Bent Haw.
 - As erosion continues, coastal flooding is likely to increase in this area due to topographic changes between Tummer Hill and Biggar (interaction here with SU3/3).
- Note: boreholes A, B and C are extra boreholes taken during May 2002.

Current Defences

- Need to review the benefits of upgrading defences at Bent Haw, Middle Hill and Cow Leys – 280m, 180m and 600m lengths of rock revetment respectively, built in 1988 to reduce flooding to the low lying hinterland (1 in 5 yr estimated standard).
- Residents recorded that the Feb 2002 flood events resulted in defences at Middle Hill being breached, resulting in the flooding of 'low grade' agricultural land south of Biggar.
- The defences at Bent Haw have no filter layers and the construction is vulnerable to disruption from water movement.
- The effectiveness of the defences is questionable and maintenance is an ongoing liability.
- Although subject to some outflanking and being poorly designed, the defences appear in reasonable structural condition.
- Cost-effectiveness of maintaining existing defences to protect landfill sites.



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Socio-economic

- Risk of erosion and coastal flooding to properties at Biggar Village and Tummer Hill. Frequency may increase to 1:5 years
- Inundation on agricultural land. Frequency may increase to 1 in 5 years (20% p.a.)
- Access to Biggar and South Walney will be more frequently disrupted as defences are overtopped and outflanked with time.
- Flood risk link across the island to Biggar Dyke defences.



Figure 3.3a Key Issues / Risks Within SU3/1 – West Coast of Walney Island

KEY ISSUES/RISKS WITHIN STRATEGY UNIT 3/1 - WEST COAST OF WALNEY ISLAND Cont'd

Natural Environment

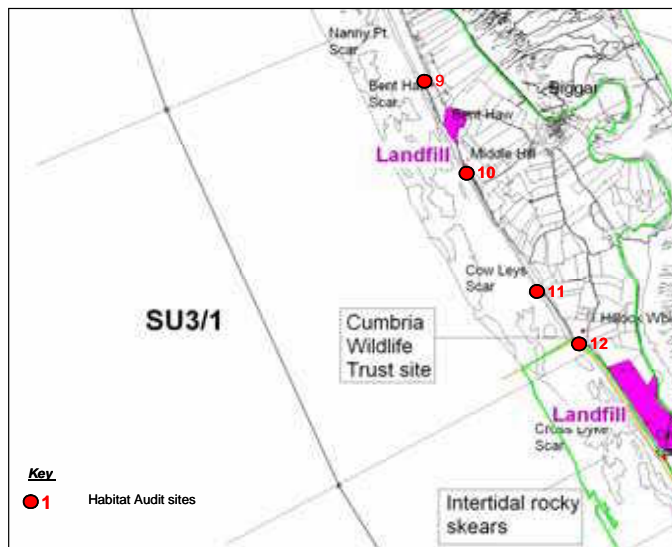
- A small section of the intertidal zone in the south is designated as international and national importance in this unit.
- There is a Nature Reserve at Hillock Whins.
- Risk of pollution from the landfill tips at Tummer Hill and Bent Haw. Even without erosion of the tips, leachates may still damage intertidal cobble skear communities, vegetated shingle and also migrate across boundaries into other SU's.
- The habitat audit (Sept. 2001) identified a dune grassland area of ecological significance owing to its relatively high diversity of flowering species (site 9).
- The vegetated shingle behind the sea defence at Cow Leys Scar has been designated a priority habitat.
- Continued pollution from the landfill site could cause retraction of the *S. Alveolata* reefs (important reef-forming species around the British coastline).
- Poor quality grassland has colonised the tips.

Main Objectives

- To examine the level of flood/erosion risk to the urban settlement at Tummer Hill.
- Prevention of pollution of the shoreline from tips.
- To maintain Walney Island as a strategic defence to the Port of Barrow.
- To provide an appropriate level of flood defence for low-lying agricultural areas.

Opportunities

- Habitat creation behind the west coast in lower areas.
- Re-use of rock from defences deemed to be inappropriate.
- There may be justification for a flood bund set back from the west coast in order to protect farmland from flooding as erosion continues.



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Constraint

- Potential conflict between providing defences to protect land at risk from inundation (refer above) and allowing natural geomorphological processes to continue unrestrained, particularly between Bent Haw and Hillock Whins.
- Low land values mean that widescale intervention is unlikely to be justified.
- Any coastal defence structure should not have an adverse impact on habitats and interests of particular importance.
- *S. Alveolata* reefs are a Priority Habitat in the UK Biodiversity Action Plan.
- Landfill site relocation. No record of the type or quantity of fill material.

Consultation-raised Issues

- Erosion concerns around the vicinity of Biggar, raised in Public Meeting consultation 3 and consultation letter 1.
- Flooding concerns of low level agricultural land at Biggar raised in Public Meeting July 2000 (consultation 1).
- Flooding and erosion issues between Middle Hill and Hillock Whins raised in consultations 1, 3, 7, 8 and 9.
- Concerns over pollution of foreshore from historic landfill tip at Bent Haw raised at Public Meeting (consultation 1).
- Emergency access concerns raised in Public Meeting (consultation 1).

SUMMARY OF POSSIBLE MANAGEMENT RESPONSES

- *Shingle recycling of material*
- *Selective managed realignment / do nothing*
- *Possible removal / relocation of landfill tips*
- *Scar reinforcement by artificial raising to accentuate the effect of attenuating wave energy*
- *Maintenance of existing defences to enhance hydraulic effectiveness and maintain structural integrity*
- *Beach Response Management System (BMRS)*
- *Flood bund landward of existing defences*
- *Rock armour and groyne defences*

Figure 3.3b Key Issues / Risks Within SU3/1 – West Coast of Walney Island

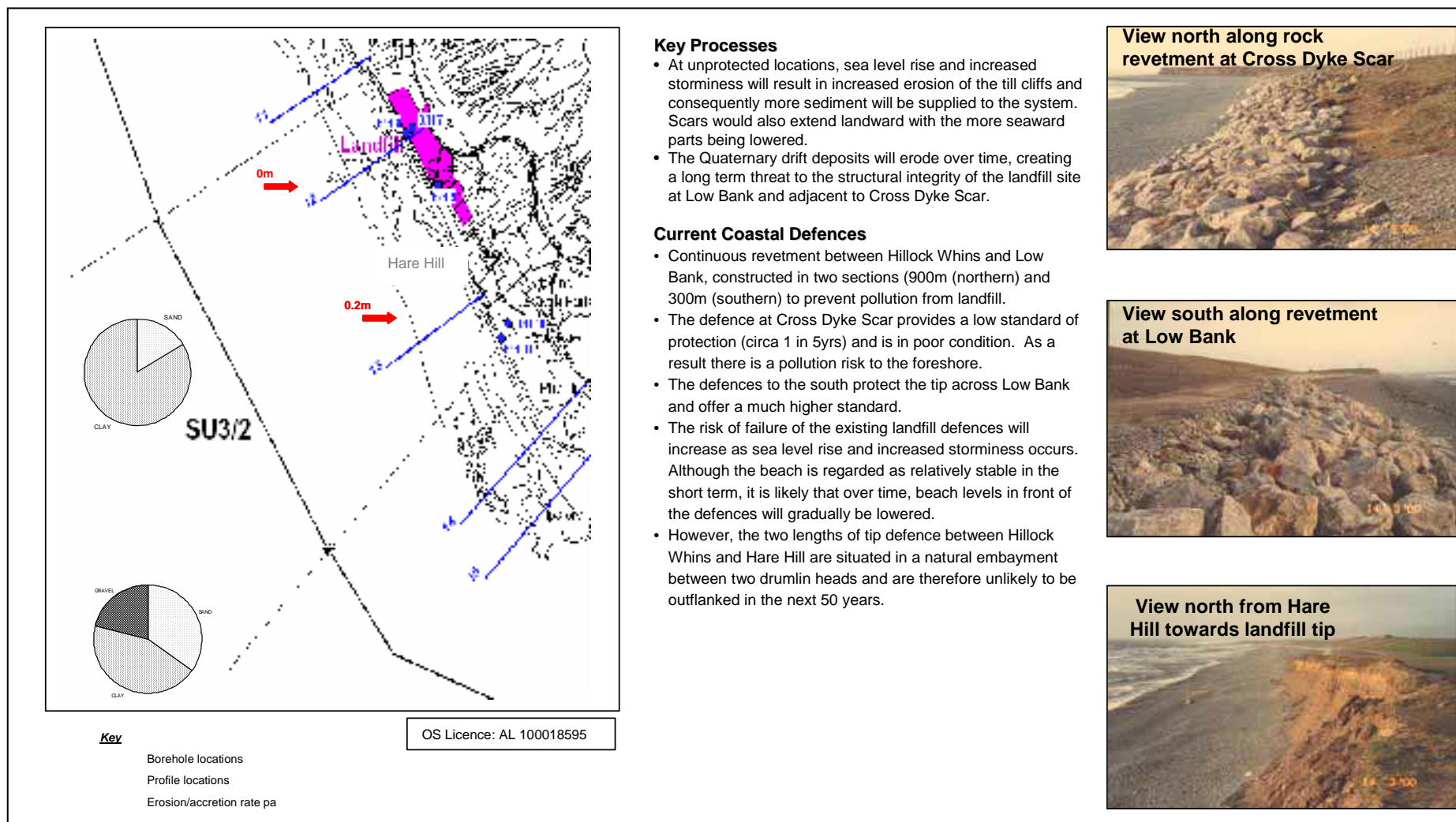


Figure 3.4a Key Issues / Risks Within SU3/2 – South End Farm Landfill Site

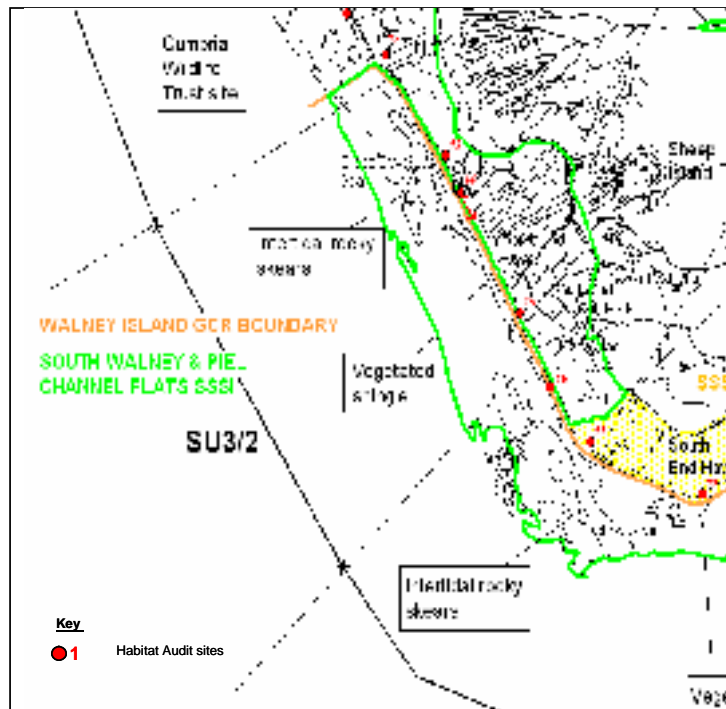
KEY ISSUES/RISKS WITHIN STRATEGY UNIT 3/2 – SOUTH END FARM LANDFILL SITE cont'd

Natural Environment

- Much of the inter-tidal zone is designated of international and national importance – SSSI, SPA, cSAC and Ramsar. Important habitats exist, such as the vegetated shingle (important nesting area for sandwich terns) and boulder and cobble scar communities (home to mussel beds and the nationally scarce *S. Alveolata*).
- The area around Pho Hill is a Nature Reserve and SSSI. The dune grassland is home to many bird species.
- The low standard provided by the defences at Hillock Whins to Honeypot Lane is resulting in exposure of the landfill, putting habitats at risk.
- As the beach lowers due to erosion the landfill will become increasingly vulnerable to further exposure. Continued pollution from the landfill could cause retraction of the *S. Alveolata* reefs.

Socio-economic

- Any long term risk of a breach in the island and consequential damage to Barrow has been effectively eliminated by the landfill site due to the need to protect it from erosion.



Main Objectives

- To take appropriate long term measures to prevent pollution of the shoreline from landfill sites. Removal of the landfill is unlikely to be desirable.
- To maintain Walney Island as a strategic defence to Barrow and the surrounding area.

Opportunities

- Possible management responses: selective managed realignment, do nothing or progressive rollback of habitats.

Constraints

- Designated areas of conservation (intertidal zone and shingle habitats). Any intervention must not impair the value of habitats and interests of particular importance.
- The sediment supply to the south should not be inhibited, thereby ensuring feed to the morphological features to the south (designated a GCR site).
- *S. Alveolata* reefs are a Priority Habitat in the UK Biodiversity Action Plan.
- Landfill site containing domestic refuse, commercial and industrial waste, construction/building waste and special waste, including asbestos, industrial effluent treatment sludge, contaminated soil and gully emptyings.

Consultation Raised Issues

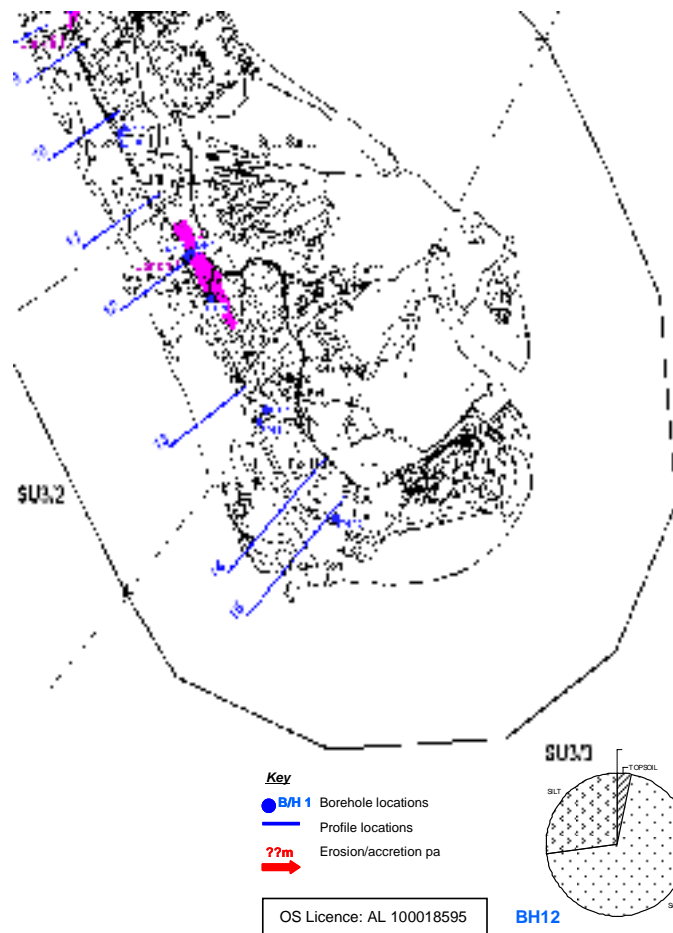
- Erosion issues between Hare Hill and Hilpsford Point raised in Consultation letters 2, 3 and 4 over failing groynes.
- Damage to vegetated shingle by vehicles raised in Public Meeting in July 2000 (consultation 1).
- Emergency access concerns raised in Public Meeting (consultation 1).

POSSIBLE MANAGEMENT RESPONSES

- *Hold the current line. In the short term to protect the landfill sites through maintenance of present defences. Maintenance or improving the existing defences (raising the crest level between Hillock Whins and Honeypot Lane) may offer increased protection and improve the hydraulic efficiency and structural integrity of the structure. Fix the defence line to protect landfill site to the south.*
- *Scar reinforcement by artificial raising to accentuate the effect of attenuating wave energy, thereby slowing down erosion.*
- *Beach Response Management System (BRMS).*

Figure 3.4b Key Issues / Risks Within SU3/2 – South End Farm Landfill Site

KEY ISSUES/RISKS WITHIN STRATEGY UNIT 3/3 – SOUTHERN END OF WALNEY ISLAND



Key Processes

- The erosion rate along the west-facing coast is an average of 0.1m pa between 1963 and 1997 (measured at profiles 12 and 13) increasing to 0.8m/yr further south.
- The south-facing coast is influenced by oblique wave exposure and consequential longshore drift behaviour. This results in accretion at South End Haws and influences the shingle and dune habitats in this area. Between 1963 and 1997 Haws Point Spit's northern end has lengthened by 75m.
- Site visits have revealed significant erosion of the upper beach to the north-west of Hilpsford Point, resulting in irrecoverable erosion of the underlying clay. The loss of upper beach material may have resulted from an interruption to the longshore drift due to shingle over-spilling up-drift defences and being removed from the drift regime.
- Other figures suggest up to 10m has been lost in South Walney over the past 2 years.
- It is uncertain what role the failing groynes to the south of the island are having on reducing/exacerbating erosion towards South End Haws. This needs to be brought into the wider strategic approach for this area.
- Quiescent waters in the lee of Walney Island have allowed the formation of valuable salt marsh habitats. They also provide an important natural defence in this sub unit by attenuating wave energy and providing a base for additional flood defence measures.
- Sea level rise and increased storminess may have an impact on the integrity of the salt marsh on the east coast. Sea level rise may lead to increased accretion rates at South End Haws, due to the predicted increased erosion and sediment supply from the west coast, leading to increased growth of shingle ridges and dunes.

Current Defences

- Derelict groyne field at Hilpsford Scar used to retain the shingle, however they are now in a state of disrepair.
- A low bund (1.6km long) is located at the easterly end of South End Haws. The flood defence function of this defence is questionable and the structure is likely to become redundant as new shingle banks and dunes form.

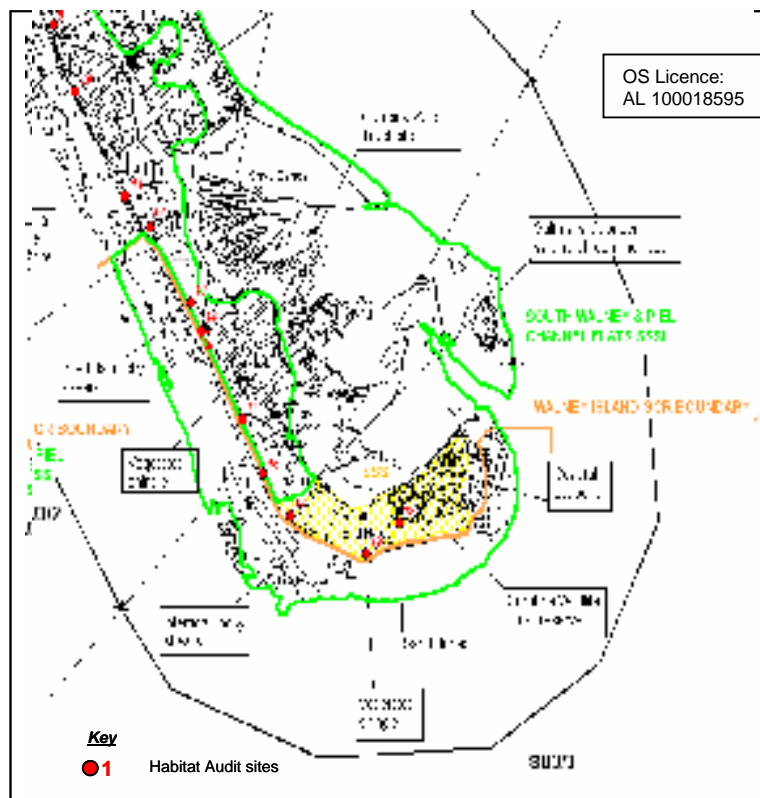
Socio-economic

- There is a high risk of flooding and erosion of agricultural land (near Pho Hill).
- EN/Landowners have re-engineered tidal flats to allow inundation east of Mulgreys Field.

Figure 3.5a Key Issues / Risks Within SU3/3 – Southern End of Walney Island

Natural Environment

- Much of the SU is designated of international or national importance owing to the sand dune, vegetated shingle and lagoon habitats. The area is also a GCR site.
- There is a Nature Reserve at Hillock Whins, Pho Hill and on Hilpsford Scar. The spit is home to large colonies of breeding birds. Low Bank and Cow Leys Scar are Priority Habitats.
- The spit provides sheltered conditions allowing salt marsh accretion. The two most southerly marshes have extended since the 1960s due to the extensive colonisation of *Spartina anglica*.
- There is a potential risk of overgrazing on the salt marsh which may lead to a reduction in the effectiveness of this natural defence and the destruction of salt marsh and lagoon habitats. Human activities can also have a detrimental impact (e.g. trampling/quad bikes).
- Maintenance dredging of Walney Channel occurs on an infrequent ad hoc basis to meet the requirements of anticipated ship movements (last dredge occurred in 1998).
- The historical average of the amount of material removed to maintain the design depth of the channel is 500,000 cubic metres sediment (mianly silt).
- Dredge material is released into Defra licenced disposal sites in Morecambe Bay so material is not lost to the coastal system.
- Dredging of Walney Channel may pose some risk to the integrity of marine communities, natural coastal process behaviour and the communities that rely on the hard substrata within the channel.
- Sand and gravel extraction within the hinterland should not be encouraged.



POSSIBLE MANAGEMENT RESPONSES

- Selected managed realignment.
- To inhibit active erosion of the scar at Hilpsford Point, it would be beneficial to investigate the options for restablising the upper beach section of the groyne (currently damaged and ineffective) and the use of shingle recycling to cover the eroding clay.
- Beach Response Management System (BRMS) including monitoring of upper beach section of the Hilpsford Point Groyne.
- Need detailed work to assess other sources of material for recycling

Main Objectives

- To evaluate whether it is appropriate to provide flood protection to low-lying land vulnerable to tidal inundation.
- To maintain Walney Island as a strategic defence to Barrow.

Opportunities

- Habitat creation, including progressive rollback of salt marsh habitats on the east coast and providing further opportunities for habitat growth, such as wet grazing marsh from increased flooding on the west coast.
- Re-cycling of shingle to limit erosion elsewhere.

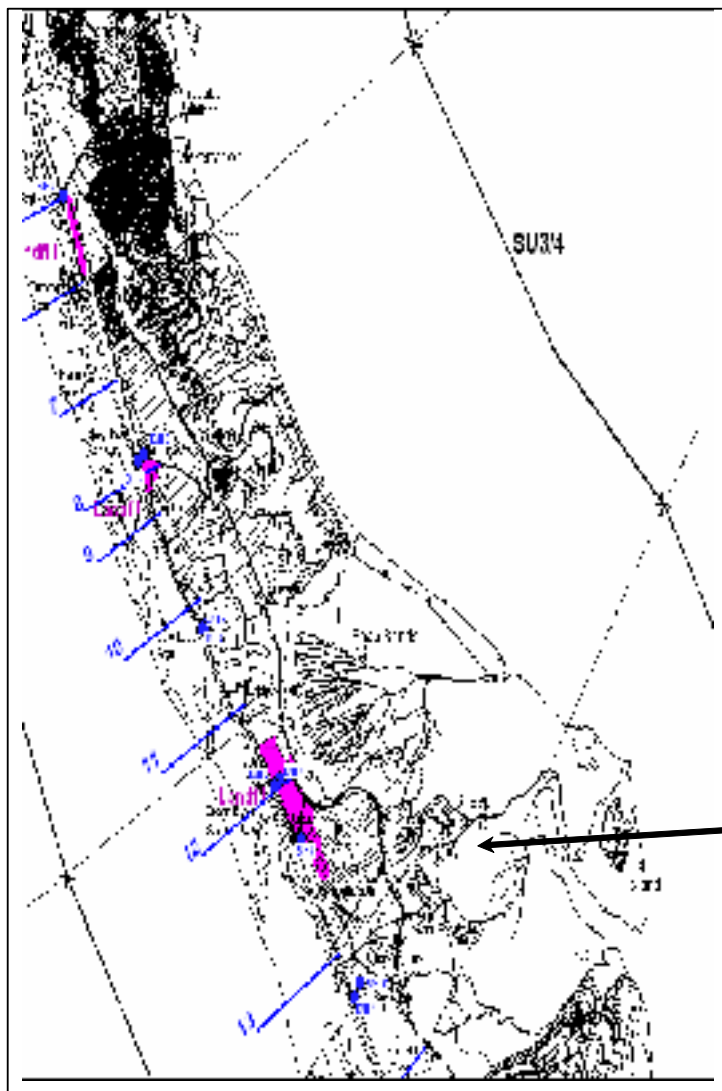
Constraints

- Designated conservation areas.
- Minimise the effect that artificial coastal defences have on the natural behaviour of coastal and geomorphological processes.
- Any coastal management policy should allow for salt marsh and lagoon habitats to keep pace with rising sea level by allowing landward migration at a similar rate. It is important to preserve this habitat as the natural defence of the salt marsh dictates the level of flood defence to the sub-unit.

Consultation Raised Issues

- Erosion issues between Hare Hill and Hilpsford Point raised in Consultation letters 2 and 4 and Public Meeting March 2002 (consultation 3) over failing groynes.
- Damage to vegetated shingle by vehicles raised in Public Meeting July 2000 (consultation 1).
- Emergency access concerns raised in Public Meeting July 2000 (consultation 1).

Figure 3.5b Key Issues / Risks Within SU3/3 – Southern End of Walney Island



Key Processes

- The protection provided by Walney Island allows quiescent waters during flood tides across this unit. As a result, valuable salt marsh habitats have formed. The salt marsh also provides an important natural defence in this sub unit by attenuating wave energy and providing a base for additional flood defence measures.
- Sea level rise and increased storminess may have an impact on the integrity of the salt marsh. With sea level rise, the marsh may develop a seaward cliff that would retreat landwards reducing the salt marsh extent. Any coastal management scheme should allow salt marsh and coastal lagoon habitats to keep pace with rising sea level, and allow for landward migration at a similar rate.
- There is a linkage with the coastal flooding and erosion risk from the west coast.
- During storms the shingle upper beach is reported to be removed in front of the roadside, opposite South End Caravan Park.

Current Defences

- Three lengths of tidal embankments are located to the south of this SU at Rape Haw, Wylock Marsh and Creepshaw Marsh (south of Biggar) (length 500m, 630m and 200m respectively). The defences are privately maintained and none provide a significant standard of service (all should be overtopped on every high tide).
- Biggar Dyke (an embankment) is a more significant flood defence (length 1200m, crest level 6.3mAOD) that protects the low lying agricultural land around Biggar from flooding. This remains a strategically important defence in terms of access to Biggar and the south of the island.



Plate 1 – Aerial view of South End Farm and Caravan Park, Oct 97

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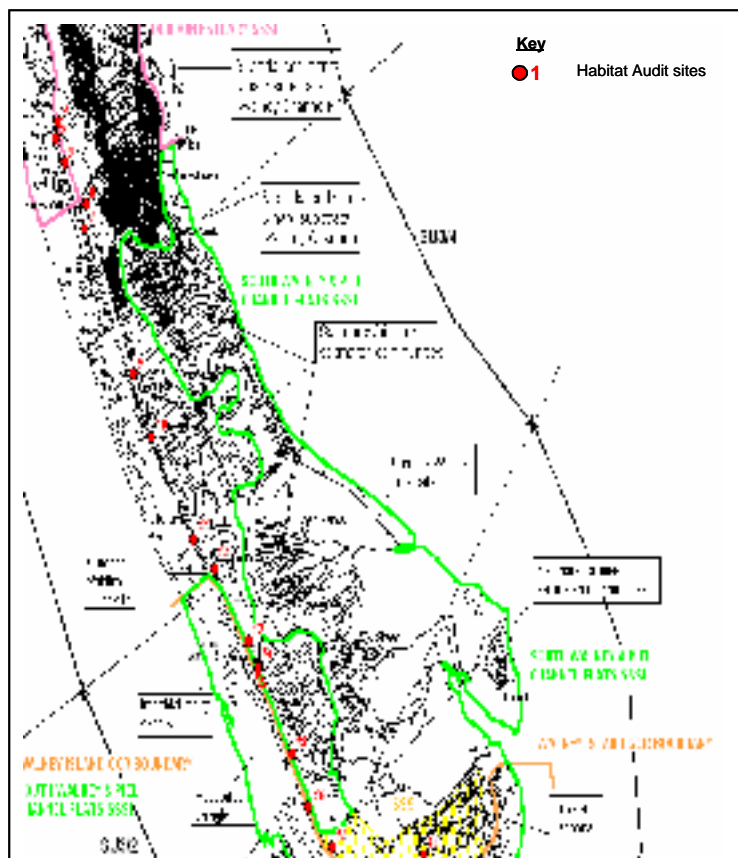
Figure 3.6a Key Issues / Risks Within SU3/4 – South End to Tummer Hill (East Coast)

Natural Environment

- The intertidal zone is designated of international or national importance by virtue of its intertidal mud and sand flat communities and pioneer salt marsh communities.
- There is potential future risk if overgrazing/rights to graze on salt marsh leading to a reduction in the effectiveness of natural defences and destruction of habitat.
- Dredging of Walney Channel may pose some risk to the integrity of marine communities, natural coastal process behaviour.

Socio-economic

- Topography dictates that much of SU4 is at flood risk.
- There is a low risk of flooding to properties at Tummer Hill.
- The agricultural land in this unit is low-lying and at flood risk. Biggar Dyke defence tends to breach during smaller events. This also results in Biggar and the rest of the south of the island being cut off during very high tides.
- South End Caravan Park is also at risk from flooding. At present there are no specific defences protecting the site.



- POSSIBLE MANAGEMENT RESPONSES**
- *Inland secondary flood defences to protect land and infrastructure*
 - *Do nothing*
 - *Improved flood warning and emergency planning*

Main Objectives

- To maintain Walney Island as a strategic defence to Barrow.
- To minimize the effect of hard coastal defences
- To provide an appropriate level of flood defence and warning to the developed areas of Biggar, Tummer Hill, South End Caravan Park and the emergency access to Biggar village

Opportunities

- Progressive roll-back of coastal habitats (salt marsh).
- Development of wet grazing marsh from increased flooding

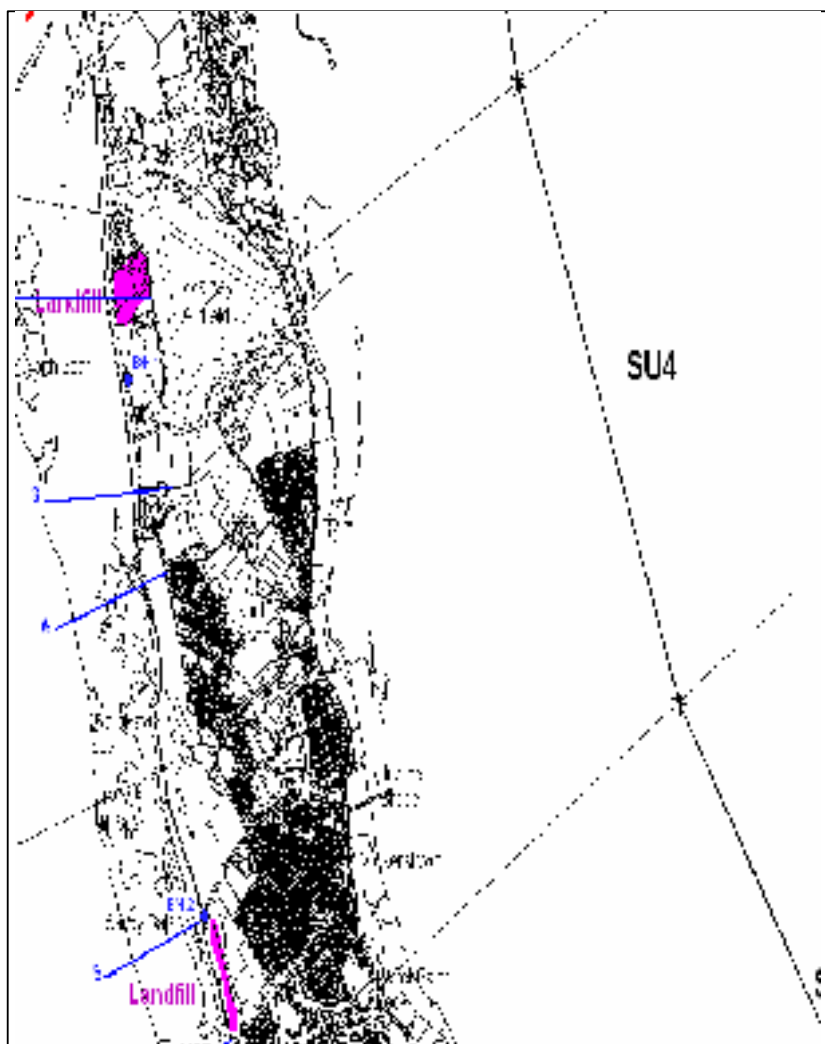
Constraints

- Low value of assets at risk outside urban settlements.
- Designated areas of conservation (predominantly salt marsh habitats) and cSAC.

Consultations

- Flooding concerns of low level agricultural land at Biggar raised in Public Meeting July 2000 (Consultation 1).
- Emergency access concerns raised in Public Meeting (Consultation 1).

Figure 3.6b Key Issues / Risks Within SU3/4 – South End to Tummer Hill (East Coast)



Key Processes

- The dominant process for consideration is tidal water levels.
- The topography dictates that most, but not all, of Vickerstown and North Scale are subject to no flood risk. An area of flood risk exists immediately north of Jubilee Bridge and this is currently subject to a high flood risk (e.g. 5 Feb 2002 flood event), but relatively few properties are affected.

Current Defences

- The defences to the north of Jubilee Bridge were constructed in 1930 and provide a footing to a footpath and highway (the Promenade). The structure appears in no immediate risk of failure, but the defences will require regular maintenance to provide on-going structural integrity and reasonable residual life.
- Defences between Water Garth Nook and North Scale have a dual role to protect against flooding and from erosion.
- Sea level rise may increase the vulnerability of areas to tidal inundation.
- Potential risk for coastal slope slippage as a result of extreme event impacts and/or coastal defence failure to North Scale frontage.
- Flood warning during Feb 2002 surge event was poor and requires reviewing.



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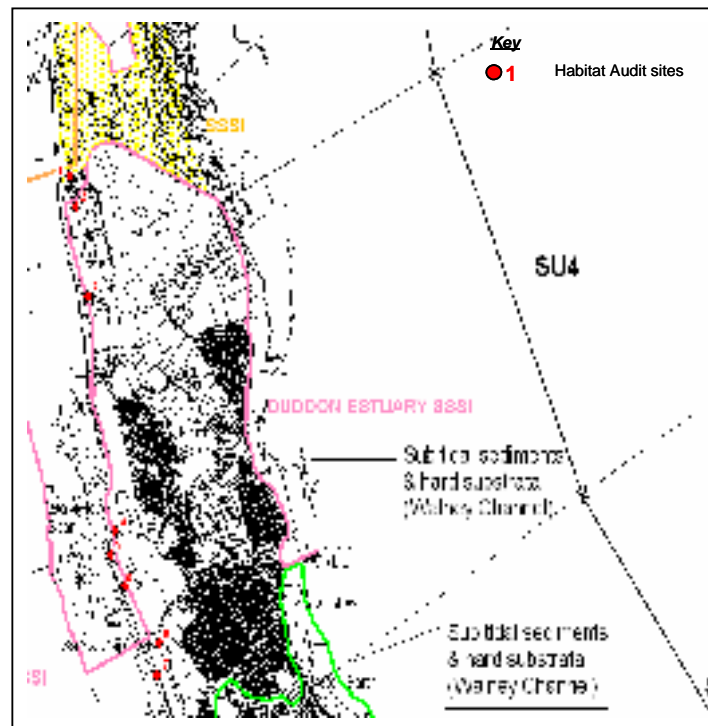
Figure 3.7a Key Issues / Risks Within SU4 – North East Coast Walney Island

Natural Environment

- The intertidal and subtidal zone is of conservational importance due to the subtidal boulder and scar communities in the Walney Channel.
- The bathing water standards and wider pollution problems emanating from inadequate sewerage treatment should be addressed so as not to compromise the amenity value of the area and prove detrimental to the coastal habitats.
- Continued Walney Channel dredging should not risk the integrity of the communities that rely on hard substrata within channel as these features are of designated international and national importance within the unit.

Socio -economic

- Flooding to Vickerstown has an annual probability of 5-10%, causing damage to the highway and property flooding immediately north of Jubilee Bridge.
- In a do-nothing scenario there is also potential coastal slope slippage and loss of further elevated property to the north.
- Emergency access needs to be reviewed.



Main Objectives

- To provide an appropriate level of flood defence and flood warning to the developed areas of Vickerstown and North Scale.

Opportunities

- Improved flood defence to urban areas.

Constraints

- Designated areas for conservation (intertidal zone in Walney Channel).
- Developed frontages at North Scale and Vickerstown.

Consultation - Raised Issues

- Flood protection issues at North Scale raised in Public Meeting March 2002 (Consultation 3).
- Emergency Access raised in Public Meeting July 2000 (Consultation 1)

Further studies on the impact of dredging in Walney Channel requested by NE (2004).

POSSIBLE MANAGEMENT RESPONSES

- *Hold existing line due to almost solely developed hinterland by maintaining or improving the existing defences.*
- *Do nothing along undeveloped sections of east coast.*
- *Monitoring of the stability of the coastline should be integrated into a management plan to prevent the risk of subsidence to properties and infrastructure where the value of the coastal land warrants.*
- *Increase elevation of highway.*
- *Improved flood warning, self help and emergency access arrangements*

Figure 3.7b Key Issues / Risks Within SU4 – North East Coast Walney Island

