



CCATCH @ Solent Breezes: Community Workshop on 26th September 2013

Workshop report

Background to the CCATCH project

Part of the EU funded Coastal Communities 2150 project , led by the Environment Agency
Local delivery is via the CCATCH project, run by Hampshire County Council which has the following purpose.

“CCATCH - the Solent’ will raise awareness and understanding amongst Solent communities of coastal change and in particular sea level rise. It will help communities understand the process of coastal change to enable adaptation and increase resilience.”

5 communities selected: Southampton (St Deny’s,)), Yarmouth, Royal Victoria Country Park, Solent Breezes and Langstone.

Local Engagement Groups (LEG) have been set up for each of the CCATCH – the Solent Project sites. Including key representatives of the communities, they help guide the programme of activities to make it relevant to the specific requirements of the local area.

A meeting of the Local Engagement Group in April 2013 agreed the following aims & objectives for CCATCH at Solent Breezes

Aim: The whole community of Solent Breezes to be aware of implications of coastal change and be able to manage adaptation as the shoreline erodes.

Objectives

- To raise awareness of the current risks to different sectors of the community.
- To help the community understand the future options available to them in respect to protecting their properties from coastal erosion
- To explore the financial, legal and practical implications of those options to help identify a preferred option(s) and the actions required for implementation.
- To encourage partnership working among landowners.

A subsequent meeting held in July agreed to adopt a ‘joint fact finding’ approach to exploring the future options for the community. The CCATCH project would retain a consultant to firstly undertake a conditions assessment of the existing sea defences and then to work with the community to research and develop options for their consideration. It was agreed to hold a workshop to help identify what needed to be researched and hence help develop the consultants brief.



Introduction to the workshop

The workshop, held both on site at Solent Breezes and at the Warsash Sailing Club, was hosted by the CCATCH Project (<http://www.solentforum.org/current/CCATCH/>) was attended by 30 members of the local community and stakeholders from organisations who have a role in coastal change. This report aims to capture the essence of the discussion and is not meant to be a formal minute of the meeting.

The workshop was facilitated by Steve Evison and Mike King of Resources for Change who are working as part of the CCATCH project team. Present at the workshop were the following stakeholders

Peggy Lewis	Local Resident
Jerry Lewis	Local Resident
Geoff Mason	Chalet owner
Mark Fletcher	Chalet Owner
Derek Igglesden	Chalet Owner
Roy Igglesden	Chalet Owner
Edward Southwell	Chalet Owner
Nigel Butters	Chalet Owner
Ian Chatten	Chalet Owner
Mick Bye	Chalet Owner
Dennis Trimming	Chalet Owner
Mike Fenner	Chalet Owner
Mike Higgins	Chalet Owner
Rhona Smythe	Local Resident
Councillor Cartwright	Ward Councillor, Fareham Borough
Mark Stratton	East Solent Coastal Partnership
Rachael Gallagher	Hampshire County Council
Alan Frampton	CH2MHILL

Apologies were received from:

Councillor Evans	Hampshire County Council
Councillor Ford	Ward Councillor, Fareham Borough
Representative from Park Holidays	



Session 1: Site Visit

The majority of participants met on site where they were able to share their knowledge of both the historical and current situation regarding the eroding coastline. This helped everyone develop a common understanding of the issues.

Adam Frampton from CH2MHILL (formally Halcrow), the consultant commissioned by the CCATCH project gave an overview of Conditions Assessment he had undertaken. The Conditions Assessment report forms Appendix 1 of this report.

Session 2: Understanding the context

Mike King introduced the session by sharing his observations for having been involved, through the CCATCH project, with Solent Breezes for the last 9 months.

- Working within a Shoreline Management Plan policy of 'No active intervention' which means that it is very unlikely that you are going to get government help with defending your properties.
- However you have the right as landowners to protect your properties and that fact is acknowledged in the Shoreline Management Plan
- The site has layers of complexity linked to landownership, legal rights and responsibilities as well as the rules and regulations surrounding coastal defence and nature conservation
- There is uncertainty about the future environmental conditions; climate change, sea level rise and erosion rates.
- The community does not speak with one voice
- Poor historical relationships between the site owners and the chalet owners.
- Both parties appear very interested in the future of the coastline but there is not as yet a joined up approach.

The discussion that followed highlighted the following:

- ❖ The importance of getting Park Holidays involved as it will be very difficult to move forward without them.
- ❖ For 80% of the chalets, Park Holidays own the land between the property and the sea so they do not have the opportunity to defend their property like some of the chalets do.
- ❖ Communication of this workshop across all Chalet owners has not been good, therefore most are ill informed about what is going on. Currently finding it difficult to collect fees
- ❖ There is a Chalets Owners (Residents) Association in existence but it is currently not very active.



- ❖ There is also a Sea Defence Association (covering Chalets 10-20) who put money into a fund for current and future defences in front of their properties.
- ❖ Not yet clear if all the Chalet owners would be supportive of contributing to future sea defences.
- ❖ Those chalet owners who are further back need to recognise that once the first Chalet falls in the sea the value and insurance cost of their properties will be adversely affected.
- ❖ There are issues to do with the slip way and the foreshore that impact upon safety and really need to be dealt with as a matter of priority.

Session 3: Getting organised

The session was introduced by the facilitator

“As with all sites in multiple ownership, there is a complex history. The result of different interventions by different groups has led to both positive and negative social, environmental, and coastal impacts both within the area and beyond. We need therefore to focus on how to move forwards by consensus if not complete agreement.”

Three groups were established to discuss this topic under the following headings

- Organisation
- Decision making
- Finance
- Responsibility
- Communication

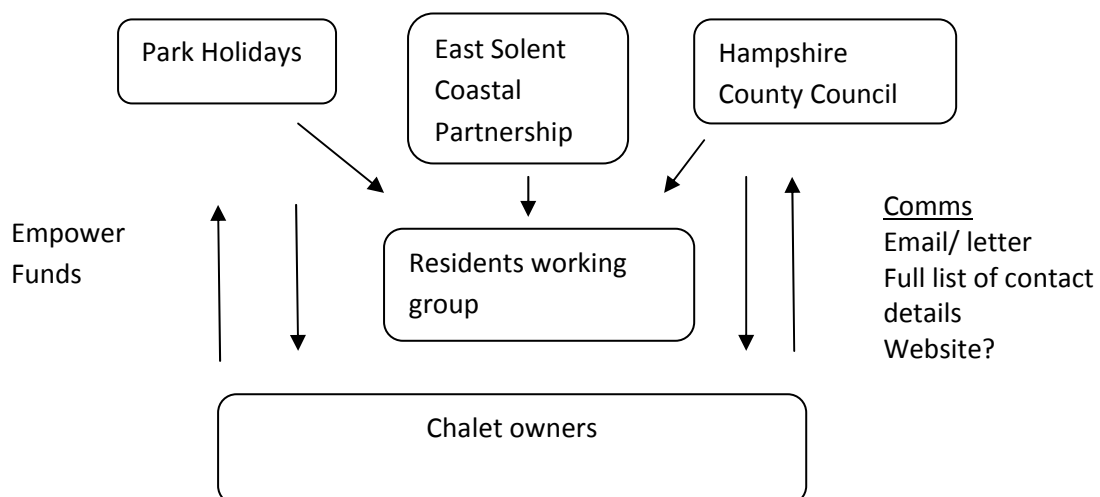
The following ideas emerged from the discussion.

Organisation

Group 1: Need a definitive list of contacts for chalet owners & other interested parties

Group 2: Resurrect Solent Breezes Chalet Owners Association and register as a charity.

Group 3: Establish working group for coastal defence (or firm up arrangements for Residents Association). Possible structure to look like:





Decision making

Group 1: The following need to be involved: Park Holidays, Chalet Residents Association, Sailing Club, Fareham Borough Council, Crown Estates, Hampshire County Council

Group 2: In the interim while the Solent Breezes Chalet Association is being resurrected set up an interim committee and include Park Holidays.

Finance

Group 1: Need to know what's required and at what cost first

Group 2: Establish a sliding scale of contributions for sea defences dependent upon how close to the coastline your chalet is. Apply for funding from various funds/ Lottery. Discuss 50% contribution from Park Holidays.

Responsibilities

Group 1: Someone/ organisation needs to take the lead in the future

Group 2: All Chalet owners and Park Holidays. We need to understand historical legal responsibilities and current legal restrictions

Group 3: Historically Haven assumed responsibility for the defences. Did subsequent owners assume/ inherit this? There is probably the need to get legal opinion about this which will cost money.

Can we do much of the same as to what we have already been doing within planning/ ecological policy boundaries?

Communication

Group 2: Feed down to members from the committee

Session 4: Identifying Options - what do we need to know more about?

This session started to address the options for coastal defence at Solent Breezes by identifying gaps in the current knowledge of what needs to be done and how it can be achieved. Discussion groups were asked to identify questions under the following headings:

- Legal
- Financial
- Engineering
- Planning
- Other

The following questions emerged from the discussion.



Legal

Group 2

- What is the situation relating to the following (historical) legal matters
 - Deeds
 - Precedents
 - Duty to Notify
 - Duty to Maintain
 - Duty of Freeholders/ Leaseholders

Group 3

- As Chalet owners what are we legally allowed to do?
- Various and numerous authorities to approach. Who needs to be involved in which elements?

Financial

Group 1:

- How much are Park Holidays prepared to put into future coastal defence?
- What grants are available?
- Would Chalet owners be prepared to contribute if: a good scheme was developed; if Park Holidays contributed?

Group2:

- Are Park Holidays willing to work in partnership?
- Are all Chalet owners/ Neighbours willing to contribute/fund

Group 3:

- What is the likelihood of getting even some money from external sources

Engineering

Group 1

- How much would it cost to put in Rock Revetments along the total length?
- Would like to know the cost per metre per life span (i.e £100 per metre will last 20yrs whilst £1000 per metre will last 100yrs) for all options?

Group2

- What is the indicative cost for different options?
- What are the costs of maintenance (of current defences) v Renewal

Group 3

- Could we sheet pile all along?
- It would appear that land drainage is contributing to the erosion. What are the drainage issues?



Planning

Group 1

- What are Park Holidays plans for the Park for the future?

Group2

- What are the environmental constraints?
- Are there issues to do with the changing footprint of the defences?

Other

Group 2

- What happens when CCATCH finishes?
- Key question for Park Holidays
“Are you prepared to discuss the matter (of sea defences) as a joint venture?”

Session 5: Next steps

It was agreed that the CCATCH project would host another workshop early November.

Between now and then the following would be taking place:

- ❖ Development of Costed options for the ongoing defence of the Solent Breezes frontage (Adam Frampton)
- ❖ Research to answer the other questions posed by the community (CCATCH & Adam Frampton)
- ❖ Discussion with Park Holidays regarding their participation in this project going forward (CCATCH)

The November workshop would review the results of this work and look to start to shape them into a draft plan for adapting to coastal change at Solent Breezes.



Appendix 1

Solent Breezes Coastal Defence Assessment

PREPARED FOR: Hampshire County Council

COPY TO: Rachael Gallagher

PREPARED BY: J Pang & A Frampton

DATE: September 24, 2013

1 Introduction

The 'Coastal Communities Adapting to Change (CCATCH) – the Solent' project forms part of a larger European funded project led by the Environment Agency (EA) titled 'Coastal Communities 2150 and Beyond' (CC2150). CC2150 is primarily a communications project which will engage with communities who are at risk from coastal change.

'CCATCH - the Solent' will raise awareness and understanding amongst Solent communities of coastal change and in particular sea level rise. It will help communities understand the process of coastal change to enable adaptation and increase resilience. The Objectives of CCATCH the Solent are:

- To engage the local community in all aspects of coastal change and how it will impact on existing residents, businesses and visitors.
- Explore the full range of hazards and risks to which coastal communities may be exposed i.e. flooding by the sea, coastal erosion and coastal instability.
- To provide educational and interpretational opportunities that can communicate coastal change and build a high level of understanding within the local community.
- To raise awareness of long term sea level rise amongst politicians and elected Members.

One of the six CCATCH sites that have been identified is the community at Solent Breezes, on the stretch of largely undeveloped coast between Hook and Titchfield Haven (Figure 1).



Figure 1: Solent Breezes – the study area

A Local Engagement Group (LEG) has been set up at which includes approximately 10 members of the community. The LEG identified the need to develop coastal defence options for the stretch of coast fronting Solent Breezes so that they could better understand the costs and issues. This request for ‘options development’ work has been discussed with the East Solent Coastal Partnership whose advice was to align the options work with the forthcoming development of a Coastal Defence Strategy for this stretch of coast, which will avoid conflicting guidance. The Strategy will provide the most up-to-date information relevant to Solent Breezes and it is important that the community engages with the developing strategy. The LEG thought that the consideration of options for the Solent Breezes Coastline still provided a valid way forward for the CCATCH project at Solent Breezes, recognising that the work undertaken needed to be within the context of the emerging coastal defence strategy.

It is within this broader strategic setting that CH2M HILL was employed to provide expert coastal engineering advice to the community at Solent Breezes, specifically to:

Assess the condition and residual life of the various defence assets along the Solent Breezes frontage;
 Identify outline options for maintenance of the defences for the next 1-20 years; and
 Help the community to explore the potential options so that they (the community) can better understand the coastal defence options open to them as private landowners on a ‘no active intervention coastline’.

This report presents the findings of a condition assessment undertaken by CH2M HILL coastal engineers on a site visit on 12th September 2013, and outlines potential options for future maintenance of defences along the study area.

2 Defence Condition Assessment

The Solent Breezes frontage is approximately 300m in length and comprises a range of defence types and construction methods implemented over a period of several decades. A site visit was undertaken on 12th September 2013 to conduct a visual assessment of the existing defences along Solent Breezes frontage. The site visit identified nine succinct defence lengths which are indicated in Figure 2. There are two concrete outfalls at the north-western end of the frontage extent which are outside of this condition assessment.



Figure 2: Solent Breezes defence lengths identified during the site visit (image copyright: Google Earth)

2.1 Condition Assessment Methodology

The visual assessment was undertaken in accordance with the Environment Agency's Condition Assessment Manual (CAM). The CAM provides a set of visual indicators in order to assess the integrity and performance of a structure and includes the visible surface defects as well as the asset's surroundings. The indicators allow a condition grade to be determined, of which there are five, ranging from 'very good' to 'very poor'. For each structure type there is a set of visual indicators based on the specific failure mechanisms for the structure and these are outlined in proceeding sections. As a generic approach, the condition grades are based on the descriptions shown in Table 1 below (Environment Agency, 2006).

Table 1: General condition grades for structures in accordance with the CAM

Grade	Rating	Description
1	Very Good	Cosmetic defects that will have no effect on performance
2	Good	Minor defects that will not reduce the overall performance of the asset
3	Fair	Defects that could reduce the performance of the asset
4	Poor	Defects that would significantly reduce the performance of the asset
5	Very Poor	Severe defects resulting in complete performance failure

Each of the defence lengths identified in Figure 2 have been appraised in accordance with the CAM. The results are presented in the following sections. In some sections, potential options have been identified to maintain the life of the existing defence where appropriate over the next 1-20 years, in accordance with the SMP policy.

2.2 Defence Length 1 – Eastern extent of Solent Breezes

Chainage: 0 – 45m (refer to Figure 2)

Description: Defence Length 1 is characterised by historical failed defences comprising of gabions, concrete piling and cliff stabilisation netting. Fly tipping may have occurred in this area and there are remains of various failed defences.



Figure 3: *general arrangement of Defence Length 1, including a detailed image of waste*

Condition Description: The gabions are showing substantial loss of stone, failure of wire mesh, washout and movement of units, misalignment, crest reduction and are beyond economic repair. Whilst the concrete piles are intact they are no longer serving a defence function as the gabion units they once stabilised have failed. The cliff stabilisation netting is torn and disconnected, no longer serving any defensive function.

Condition Grade: 5 - Very Poor, severe defects resulting in complete performance failure

General Comments: This frontage length has considerable waste materials such as concrete blocks, wire mesh, old damaged geotextile, cliff netting and concrete piling. The waste is unsightly and a health and safety and environmental concern. The failed defences appear to be acting as a barrier to alongshore sediment transport and a headland is developing at the south-eastern end of the frontage. Site clearance in this location may promote some north-westwards movement of local beach material, although the amounts are uncertain given the sediment transport drift divide that is understood to be present in this area.

Maintenance and Defence Options:

Option 1: Site clearance and construction of a rock toe - Site clearance will facilitate a clear and consistent frontage length on which to build upon. The defence line would also be brought back to the foot of the cliff as opposed to the foot of the existing failed defences. A rock toe will provide protection to the foot of the cliffs from erosion and reduce cliff recession.

Option 2: Construction of a king pile wall – site clearance could be minimised by providing a king pile wall consisting of steel piles and concrete railway sleepers, similar to those in defence length 6 (later discussed). The piled wall will provide a wave and erosion protection at the foot of the cliffs and suitable waste materials (such as concrete blocks and rock) can be placed behind the wall.

Option 3: Extend the adjacent gabion wall with mass concrete toe (Defence Length 2)

2.3 Defence Length 2 – Eastern chalets to concrete slipway

Chainage: 45m – 75m (refer to Figure 2)

Description: Defence Length 2 consists of an approximately 3 – 4m high gabion wall with an approximately 1m high mass concrete toe wall.



Figure.4: *general arrangement of Defence Length 2, including detailed images of undercutting, damage and corrosion*

Condition Description: The gabion wall is showing good rock packing with no noticeable loss of stone for the majority of units. There are no signs of settlement or bulging. The wire mesh is showing signs of corrosion and the mass concrete toe wall has evidence of undercutting. At chainage 45m (adjacent to Defence Length 1) where the gabion wall begins, there is increased cliff erosion and a unit has failed (see Figure 4).

Condition Grade: 3 – Fair, defects that could reduce the performance of the asset

Maintenance and Defence Options:

Option 1: Sheet pile with mass concrete backfill or rock armour toe protection – the undercutting of the mass concrete toe wall threatens the overall stability of the gabion wall structure and without protection, may lead to failure (See Defence Length 4).

Option 2: Rock armouring to the gabion wall/cliff interface at chainage 45m – exposure in this region may give rise to progressive failure of the gabion wall, a unit has already failed during a short time frame. Rock armour will protect the edge of the gabion wall and reduce cliff erosion at this location, providing a graduation between the soft cliffs and the hard defence structure.

Option 3: Replacement of gabion wall wire mesh – the structure is showing visible corrosion of the wire mesh and in time this will lead to damaged units, a loss of stone fill and the beginning of gradual collapse in the form of crest reduction and bulging.

All of the above measures would lead to an improved life span of this defence and given its recent installation and the defects identified; consideration of all or a combination thereof is advised.

2.4 Defence Length 3 – Concrete slipway

Chainage: 75m – 81m (refer to Figure 2)

Description: Defence Length 3 is a concrete slipway with ancillary gabion units providing edge protection to the back shore. Whilst the structures function is for beach access for boats and the local public, the structure is providing a defensive function through erosion protection.



Figure 5: general arrangement of Defence Length 3, including detailed images of undercutting and gabion damage

Condition Description: The structure is showing signs of localised spalling, lengthy cracking and some movement (particularly at the edges). There are signs of localised undermining around the slipways edges and slumping. The gabions are showing some signs of settlement and distortion with reasonable packing and small loss of stone. There is a unit which has failed (shown in Figure 5) and mild corrosion of the gabion mesh is evident.

Condition Grade: 3 – Fair, defects that could reduce the performance of the asset

General Comments: The access slope from the slipway to the western frontage appears to have been removed or damaged. This would have provided some defence to the gabion units behind which are becoming damaged as well as safe access. Sheet piles have been used at the immediate toe of the slipway to counter scour and undermining.

Maintenance and Defence Options:

Option 1: Sheet piling and mass concrete backfill to edges of slipway - this will help to protect the edges of the slipway which over time will continue to be undermined, leading to further cracking and spalling.

Option 2: Repair to gabion units – where entire units have been lost these should be replaced as it introduces an area of structural weakness which could rapidly develop and lead to progressive failure if not corrected.

Option 3: Replacement of gabion wall wire mesh – the structure is showing visible corrosion of the wire mesh and in time this will lead to damaged units, a loss of stone fill and the beginning of gradual collapse.

All of the above measures would lead to an improved life span of this defence.

2.5 Defence Length 4 – Concrete slipway to western chalets

Chainage: 81m – 121m (refer to Figure 2)

Description: Defence Length 4 consists of an approximately 4m high gabion wall with an approximately 1m high mass concrete toe wall.



Figure 5: *general arrangement of Defence Length 4, including detailed images of undercutting and large toe wall cracks*

Condition Description: The gabion wall appears to have suffered an overturning failure which is thought to be the cause of undermining to the mass concrete toe wall. The gabion wall should have been built to stand free of the toe wall, it is uncertain as to whether the structural arrangement of the gabion units is sufficient for stability during the long term. The toe wall is exhibiting large tension cracks and undermining (see Figure 5 above). The wire mesh is showing signs of corrosion but the stone packing is good and most of the gabion units are intact.

Condition Grade: 4 – Poor, defects that would significantly reduce the performance of the asset

General Comments: The gabion wall is exhibiting instability and is considered a health and safety concern. In addition, a large storm may result in complete failure and loss of the existing structural components, reducing or preventing re-use of the existing structure.

Maintenance and Defence Options:

Option 1: Salvage gabion units and re-construct gabion and toe wall – most of the gabion units are intact and could be re-used to construct a gabion wall with greater stability. A new toe wall will protect the bottom gabion units from corrosion and wave attack. The new toe wall should extend sufficiently below bed level to provide contingency for future scour.

Option 2: Gabions used for repairs to other defence lengths and a continuation of the king pile wall – the gabion units could be salvaged to repair/defend other areas and defence length 6 extended to the slipway.

Option 3: Replacement of gabion wall wire mesh – the structure is showing visible corrosion of the wire mesh and in time this will lead to damaged units, a loss of stone fill and the beginning of gradual collapse.

A combination of options should be considered. This defence needs repairs to fulfil its function in the immediate future and will require continued maintenance to wire mesh on an ongoing basis.

2.6 Defence Length 5 – Gabion and mass concrete toe wall to king pile wall

Chainage: 121m – 133m (refer to Figure 2)

Description: Defence Length 4 consists of an approximately 4m high gabion wall with a rock revetment formed from concrete blocks. The structure is forming a connection between Defence Lengths 4 and 6.



Figure 6: general arrangement of Defence Length 5, including images of protruding bars and broken gabions

Condition Description: The gabion wall has broken units with complete loss of stone fill along the toe where the structure is regularly subjected to the tide. Scour and undermining at the toe has begun and whilst the structure is not showing signs of crest settlement, the structure will rapidly deteriorate over the short term. The gabion wall thickness is severely reduced and the wire mesh is corroded. Structural movement is anticipated to follow. The concrete block revetment has some displaced units from the core structure but appears stable.

Condition Grade: 2 – Poor, defects that would significantly reduce the performance of the asset

General Comments: Steel reinforcement bars were witnessed protruding from the ground and are a health and safety and environmental concern. These would ideally be removed or at least cut back so as to reduce the hazard present. The concrete units which have become displaced would be usefully placed back into the revetment structure.

Maintenance and Defence Options:

Option 1: Replace gabion units at the toe and provide a mass concrete toe wall – the existing gabion wall could be maintained and additional units placed at the toe to replace those broken. A mass concrete toe wall (such as Defence Length 4) would help to protect the wall from corrosion and wave attack at the toe of the structure.

Option 2: Gabions used for repairs to other defence lengths and a continuation of the king pile wall – the gabion units could be salvaged to repair/defend other areas and defence length 6 extended to the slipway.

Option 3: Replacement of gabion wall wire mesh – the structure will over time develop corrosion to the wire mesh and this will lead to damaged units, a loss of stone fill and the beginning of gradual collapse.

A combination of options should be considered. This defence needs repairs to fulfil its function in the immediate future and will require continued maintenance to wire mesh on an ongoing basis.

2.7 Defence Length 6 – western chalets to beach access steps

Chainage: 133m – 199m (refer to Figure 2)

Description: Defence Length 6 is a propped king pile wall consisting of steel I-columns used for props and piles with sheet piles used to support the lower end of the prop and concrete railway sleepers placed between the column flanges to form the wall. Rock armour has been placed at the toe of the wall in a discrete section of the overall defence length. The wall has been backfilled with concrete blocks and rock.



Figure 7: *general arrangement of Defence Length 6, including images of corrosion and rock armoured toe*

Condition Description: The wall has good alignment with minor slump and heave and minor lateral movement. There is evidence of localised scour (see Figure 7) and a minor loss of backfill in locations. There is extensive corrosion visible but no holes were present, suggesting a minor loss of material thickness. Nearly all railway sleepers remain intact with exception to a few (as shown in Figure 7). There are gaps developing between sleepers, allowing water ingress and backfill to be washed out.

Condition Grade: 3 – Fair, defects that could reduce the performance of the asset

Maintenance and Defence Options:

Option 1: Place additional sleepers – in areas there are gaps developing which would ideally be closed and additional sleepers placed to form a full height wall. This will reduce loss of backfill.

Option 2: Rock armour toe protection – this will reduce scour at the toe of the structure and reduce further loss of backfill

Option 3: Monitoring of the wall and ad hoc repairs – in some areas there are not props and loss of backfill has begun, as well as scour. A monitoring program will help to identify if there are any local damage/failures which could be repaired before further damage results. Repairs could be providing further props, welding plates where corrosion has created holes, replacing concrete sleepers and moving displaced rock armour back to the toe of the wall.

All of the above measures would lead to an improved life span of this defence. Monitoring is essential in maintaining this defence which appears to be functioning well.

2.8 Defence Length 7 – beach access steps

Chainage: 199m – 214m (refer to Figure 2)

Description: Defence Length 7 consists of a sheet pile wall with pinned railway sleepers forming the structures crest. Behind lies a series of gabions which have been capped with a mass concrete pour. The structure supports a set of steel and timber access steps. The structures western extent (chainage 214m) has had a continuation of the mass concrete pour to form a concrete apron to protect the edge of the defence length.



Figure 8: *general arrangement of Defence Length 7, including images of mass concrete pours and gabions*

Condition Description: There is extensive corrosion throughout the sheet pile wall. The timber railway sleepers are cracked in places but in general are in reasonable condition. There are no signs of localised scour, slump or heave and the wall is not deformed. The wall has minor vertical and lateral movement. The concrete placed behind the wall is of pour quality and it is uncertain as to how long it will last.

Condition Grade: 3 – Fair, defects that could reduce the performance of the asset

General Comments: In the longer term the structure would benefit from a more formalised end condition on the western extent (Chainage 214m) to prevent the structure weakening due to corrosion, localised erosion (increasing outflanking) and wave attack. The existing mass concrete looks of low quality and will erode, leading to a loss of protection at the structures' western end. Also, a more suitably placed fence would improve health and safety measures in this location. The timber steps appeared to be in poor condition and their structural integrity and safety is uncertain.

Maintenance and Defence Options:

Option 1: Rock armour end protection – the western end would benefit from some rock armour protection to prevent erosion and wave attack, reducing the likelihood of a weakness in the structure developing that could lead to progressive collapse.

Option 2: Fencing improvements – the existing fencing is in poor condition and is positioned randomly due to the ad hoc arrangement of the defence lengths end. Replacing this fencing is advised for health and safety given the location is a point of access.

Option 3: Replacing timber steps – timber steps should be replaced to enable safe access in the long term to the beach, the current steps appear to be in poor condition.

2.9 Defence Length 8 – beach access steps to most western chalet

Chainage: 214m – 248m (refer to Figure 2)

Description: Defence Length 8 consists of a steel wire fence with gabion units placed in front.



Figure 9: *general arrangements of Defence Length 8*

Condition Description: The gabions are showing substantial loss of stone, failure of wire mesh, washout and movement of units, misalignment, crest reduction and are beyond economic repair.

Condition Grade: 5 – Very Poor, severe defects resulting in complete performance failure

General Comments: This frontage length has a considerable amount of wire mesh from broken gabion units. This is unsightly and a health and safety and environmental concern. The beach levels in this location healthier and local material is visible on the foreshore. The fencing appears to be in reasonable condition.

Maintenance and Defence Options:

Option 1: Site clearance and construction of a rock toe - site clearance will facilitate a clear and consistent frontage length on which to build upon. The defence line would also be brought back to the foot of the fencing as opposed to the foot of the existing failed defences. A rock toe will provide protection to the foot of the cliffs from erosion and reduce cliff recession.

Option 2: Beach re-cycling – an alternative defence could be to re-cycle beach material from Defence Length 9 to this section to bolster the natural protection provided by the beach in this area.

Option 3: Timber revetment – this could be installed along the defence length in front of the fencing. These will help reduce wave action and erosion and have a design life that is in accordance with the short term SMP policy of 1 – 20 years.

In this location the frontage is considered undefended and a defence measure is advised as well as removing the existing waste to reduce risk of outflanking to adjacent currently defended frontages.

2.10 Defence Length 9 – western chalet to eastern extent of frontage

Chainage: 248m – 303m (refer to Figure 2)

Description: Defence Length 9 consists of an approximately 2.5m high gabion wall. This wall is protecting a chalet immediately above.



Figure 10: general arrangement of Defence Length 9, including detailed images of mass concrete pours and gabions

Condition Description: The baskets are fully intact and secure with no evidence of undermining or toe scour. Minor bulging is visible at the eastern end of the defence length. There is visible corrosion, however, there is evidence that gabion wires have been replaced (See Figure 10). The baskets are well packed and are at maximum density with small distortions of baskets and alignment, minor crest settlement.

Condition Grade: 2 – Good, Minor defects that will not reduce the overall performance of the asset

General Comments: This defence length has healthier beach levels compared with other defence lengths, likely as result of the neighbouring outfalls which are behaving as large onshore groynes, trapping beach material in this area and preventing its further north-westwards transport along the shoreline. The defence has a poor eastern end condition (chainage 248m) which appears to be resulting in the start of structural defects.

Maintenance and Defence Options:

Option 1: Improvements to eastern end of defence length – replacement of damaged gabions and/or additional units placed at this location to prevent further damage which could lead to progressive failure and outflanking.

Option 2: Replacement of gabion wall wire mesh – the structure will over time develop corrosion to the wire mesh and this will lead to damaged units, a loss of stone fill and the beginning of gradual collapse.

3 Maintenance Options Summary

The defence condition assessment has provided an insight into the existing defence measures. The defence defects and potential options for managing these defences over the next 1-20 years have been identified. This section summarises the options identified for each defence length and provides outline costs as well as a priority weighting. The priority weighting is based on the following criteria:

- High – measures advised to be undertaken within the next year
- Medium – measures advised to be undertaken in the next 1 – 5 years
- Low – measures advised to be undertaken in the next 5 – 20 years
- N/A – As and when appropriate to be guided by ongoing monitoring

Costs for each option have been developed using SPONS construction cost indices (SPONS, 2013), CH2M Hill past project data and costs provided by a local resident from recent experience of implementing works along parts of the frontage between 2005 and 2013. These costs are to only be used as a broad-level guideline; they may not represent the true cost of the various proposed construction activities which may attract additional costs associated with, for example, licensing and consenting of any works.

Table 2 presents this summary.

Defence Length	Defence/Maintenance Option	Priority	Estimated Cost range (£k)	Comment
1	Site clearance and rock armour toe	Medium	25 – 39	Site clearance has high cost due to nature of waste to be disposed of. Rock armour may become displaced and would benefit from monitoring and maintenance.
	Construction of a king pile wall	Medium	45 - 58	Waste materials could be left behind wall and additional backfill placed.
	Gabion wall with mass concrete toe	Medium	30 - 50	This includes a toe wall to extend below beach level for scour allowance, reducing undermining risk observed in Defence Lengths 2 and 4.
2	Sheet pile with mass concrete backfill toe protection	High	6 – 10	Considered high priority as Defence Length 4 appears to have failed as a result of undermining (which this measure aims to prevent).
	Rock armour toe protection	High	5 – 8	Potentially a lower cost solution to that proposed above but less robust. Units will become displaced leading to local exposure (unless maintained).
	Rock armouring to the gabion wall/cliff interface	High	2 – 3.5	This will help reduce the possibility of progressive failure of the defence and reduce local cliff erosion. Rock may be displaced in long term.
	Replacement of gabion wall wire mesh	N/A	2 – 3	This cost reflects one replacement. This may be required every 5 years. Gabion wire should be monitored for corrosion and damage.
3	Sheet piling and mass concrete backfill to edges of slipway	Medium	4 - 7k	This item is not considered a high priority as it is not a critical defence. Repair is important in medium term for access reasons.
	Repair to gabion units	High	1.5 – 3	This will help reduce the possibility of progressive failure of the defence. Without works the defence could last less than 5 years.
	Replacement of gabion wall wire mesh	N/A	1 – 1.5	This cost reflects one replacement. This may be required every 5 years. Gabion wire should be monitored for corrosion and damage.
4	Salvage gabion units and re-construct gabion and toe wall	High	20 – 32	This cost is based on a new wall being built from existing gabions and a new toe wall being constructed. Available materials have been assumed but are uncertain.
	Gabions used for repairs to other defence lengths and a continuation of the king pile wall	High	40 – 52	Option leads to a saving on gabion repairs (estimated £8.5k saving on material). This could be used in other areas to perform repairs, reducing estimated costs.
	Replacement of gabion wall wire mesh	N/A	2.5 – 4	This cost reflects one replacement. This may be required every 5 years. Gabion wire should be monitored for corrosion and damage.
5	Replace gabion units at the toe and provide a mass concrete toe wall	High	5.5 - 9	This will help reduce the possibility of progressive failure of the defence. Without works the defence could last less than 5 years.

Defence Length	Defence/Maintenance Option	Priority	Estimated Cost range (£k)	Comment
6	Gabions used for repairs to other defence lengths and a continuation of the king pile wall	High	16 - 26	Option leads to a saving on gabion repairs (estimated £1.5k saving on material). This could be used in other areas to perform repairs, reducing stated costs.
	Replacement of gabion wall wire mesh	N/A	0.8 – 1.2	This cost reflects one replacement. This may be required every 5 years. Gabion wire should be monitored for corrosion and damage.
	Place additional sleepers	Medium	7 - 11	Additional sleepers will bring the defence to full height in all areas and repair areas where gaps are developing.
	Rock armour toe protection	Medium	18 - 29	Whilst the scour and undermining at present is minimal, this poses the greatest risk to the long term stability of the defence. As such, further protection measures are advised.
	Monitoring of the wall and ad hoc repairs	N/A	N/A	Ad hoc repairs are advised such as placing additional props and plate welding corrosion holes. Costs will need evaluating as and when and be informed by monitoring.
7	Rock armour end protection	Medium	3 – 4.5	This will help prevent outflanking of the defence.
	Fencing improvements	Low	1.5 – 2.5	Cost is variable as uncertain ground conditions for the fence instalment.
	Replacing timber steps	Medium	0.3 – 0.6	Beneficial for safe beach access at low cost.
8	Site clearance and construction of a rock toe	Medium	23 - 37	Site clearance required to facilitate rock armour installation. High cost due to nature of waste to be disposed of. Rock armour may become displaced and would benefit from monitoring and maintenance.
	Beach re-cycling	Medium	10 - 16	This option has uncertainty as the frequency at which re-cycling of beach material would be required is hard to determine; it may be entirely removed in a single storm or it may remain in place for a long period. This may be required on more than one occasion.
	Construction of timber revetment	Medium	14 – 23	Uncertainty as to how well the timber will survive under wave conditions without a wave climate study to assess design wave conditions.
9	Improvements to eastern end of defence length	Medium	2 – 3.5	A few additional gabion units will help prevent progressive failure.
	Replacement of gabion wall wire mesh	Medium	3.5 - 6	This cost reflects one replacement. This may be required every 5 years. Gabion wire should be monitored for corrosion and damage.

4 Conclusions and Recommendations

4.1 Conclusions

The following conclusions are drawn from findings of the defence assessment presented in Sections 2 and 3:

- The defences are showing particular vulnerability at edges where one defence length meets another. Collaboration with neighbouring defence owners is advised for long term stability to agree on end conditions of defences.
- Undermining and scour are causing high risks of structural failure to the existing defences. Further defences/maintenance work should incorporate mitigation measures and allowance for scour.
- Where beach levels are lower and gabion walls are regularly exposed at the toe, a toe wall is necessary to reduce the rate of corrosion of the gabion wire. The lack of such a feature at present is leading to short defence lifecycles.
- There is a vast amount of waste from previous defences which is an environmental and health and safety concern.
- High loading from boats and vehicles is not advised above Defence Lengths 2 and 4 which are considered a health and safety concern due to their height and overall stability.
- The frontage would benefit from local collaboration to develop a consistent approach to future defence measures.

4.2 Recommendations

The following recommendations are advised:

- High priority works to be actioned as soon as practicable to minimise the immediate risk of defence failure.
- A consistent monitoring programme would assist in identifying defence defects and inform future maintenance needs in a timely manner. This should be developed and implemented by local defence asset owners.

References

- Environment Agency, 2006. Condition Assessment Manual (CAM), October 2006
- SPONS (2013). *Civil Engineering and Highways Works Price Book. 23rd Edition*. Taylor & Francis.