



PUBLIC INFORMATION - FIND OUT MORE

Hunstanton Coastal Management Plan will set out the road map to deliver the Shoreline Management Plan policy for the Hunstanton frontage over the next 100 years, this will include:

- Managing cliff erosion in Unit A (the Cliffs) and developing a business case for a pilot erosion reduction scheme
- Managing and maintaining the existing coastal defences throughout Unit B (the Promenade)

The plan must:

- Work within The Wash Shoreline Management Plan policies
- Work within the National Flood and Coastal Erosion Risk Management Guidance in order to get government funding
- Not create negative impacts to other parts of the coast
- Be able to obtain necessary consents and approvals e.g. Planning, Marine, Environment Agency, Coast Protection
- Be deliverable within the funding available

From this event we would like you to:

- Understand the need for coastal management and what is and is not possible
- Be aware of the process to obtain funds for a coast protection scheme
- Provide feedback on the short list of coast protection options which are being considered
- Understand what will happen next
- Think about how the community can contribute to the scheme to help make it happen
- Find out how you can keep updated





Hunstanton – Coastal Protection Options – the long and short list

A 'long list' of coast protection approaches and options is being considered. The long list includes schemes which may be considered as desirable, but would not be achievable because they would not gain the necessary consents or be affordable. The outline approaches and options are detailed; these are split between those being considered for Unit A and those for Unit B. Following this consultation, some of the long-list options will be discounted and those which are shortlisted will be considered further.

UNIT A

The 'long-list' of potential management options being considered for a potential pilot study covers:

No Active Intervention: where the cliff is allowed to continue to erode and no capital works are undertaken; and

New Defences: where capital works are undertaken to the existing frontage to reduce or remove its vulnerability to erosion caused by wave action.

These are broken down as follows:

No Active Intervention

1. Do nothing
2. Do minimum

New Defences

3. Cliff bolting
4. Netting to base of cliff
5. Rock revetment/Sill
6. Timber Revetments
7. Sand bags/Geotubes
8. Gabions
9. Cliff drainage
10. Seawall
11. Offshore breakwaters
12. Beach nourishment
13. Groynes (rock or timber)
14. Cliff stabilisation through re-grading
15. Relocation of key assets



Unit A – Shortlisted Options

Each of the long list options have been subjected to an initial qualitative multi-criteria feasibility appraisal, where each of the long list options were assessed in terms of the following parameters:

- Functionality (technical performance)
 - SMP compliance
 - Buildability
 - Future maintenance
 - Environmental impacts/benefits
- Comparative (indicative) costing
 - Health and Safety
 - Risks
 - Public acceptance (including feedback received from the last consultation)

Following this initial assessment of the ‘long list’ options the long list has been reduced to a shortlist of the most practicable that have been investigated further.

The options shortlisted for further investigation for Unit A include:

1. Rock armour revetment
 2. Timber revetment
 3. Geotubes/ Sandbags
4. Beach re-nourishment
 5. Relocation of key assets

Each of these potential options has been presented in more detail:

1. Rock Armour Revetment/Sill

This option involves placing rock armour protection on the foreshore in front of the cliff along the length of the frontage protecting the cliff from wave action.

The advantages and disadvantages of this option are:

Advantages	Disadvantages
<ul style="list-style-type: none">• Prioritises areas most in need of additional protection.• Effective at dissipating wave energy therefore reducing the amount of wave energy impacting the cliff.• Will have only a limited impact on the main area of frontage used by the public• Rock is relatively easy to move around, can be repositioned if displaced or required elsewhere.• Requires little maintenance.• The revetment will have a very long design life.• Can be designed to offer a continuous level of protection in line with climate change predictions.	<ul style="list-style-type: none">• Large amount of rock required.• Slowing cliff erosion will reduce sediment input into the environment and reduce sediment supply to the beach and other sites down drift.• This option will not assist in maintaining beach levels and would have to be implemented in conjunction with some form of beach management option.• Use of rock armour in this area is limited; this will lead to a change in aesthetics.• Rock works will potentially have a relatively large foot print on the beach



2. Timber Revetment

This option involves constructing a new tropical hardwood timber revetment. The outline design of the timber revetment considered has been based on the arrangement and dimensions of similar and existing timber revetments in North Norfolk.

It should be noted that the existing foreshore has a very limited beach and the underlying material is understood to be rock, therefore the installation of timber piles at this location will be challenging and expensive as a result.

The advantages and disadvantages of this option are:

Advantages	Disadvantages
<ul style="list-style-type: none">• This type of protection exists on the North Norfolk coastline and is very effective at breaking waves and protecting the cliffs• Tropical hardwood is comparatively more effective in marine environments (than local alternatives).• Known method of construction• Works will avoid impacting on the designated cliff face.• The revetment will create a smaller footprint in comparison to other options	<ul style="list-style-type: none">• Difficult to drive timber piles into a rocky foreshore• Although better than oak, tropical timber still has a relatively short residual life and as a consequence is expensive to maintain, as experienced with existing structure.• Environmental implications of importing tropical timber (and added cost of ensuring sustainable source).• Timber revetment structures have a relatively large foot print on the beach• Aesthetically very different to the existing frontage with potentially detrimental impacts on the visual landscape.

Environmental Assessment

Key positive effects	Key negative effects	Mitigation or enhancement opportunities
<ul style="list-style-type: none">• No significant impacts to the foreshore (will not reduce access/amenity use of the beach).• Will slow the cliff receding and therefore protect socio-economic receptors against erosion.• The rock armour is a natural material• Rock Armour will potentially create a new habitat along the frontage• Will not inhibit tourism• The location of the rock armour away from the cliff will avoid any significant impact on the habitats located on the cliff.	<ul style="list-style-type: none">• Use of rock armour in this area is limited; this will lead to a significant change in landscape aesthetics.• By slowing cliff erosion sediment inputs into the environment will be reduced and therefore reduce sediment supply to the beach and other sites down drift.• Rock works will potentially have a relatively large foot print on the beach	<ul style="list-style-type: none">• Reduces the need for regular maintenance of timber defences.

Capital Cost Estimate

Description	Price /m	250m Stretch to protect key assets	Entire Frontage (1375m)
Rock armour revetment/sill	£2046	£511k	£2.813M
Rationalised Costs	£2.05k	£0.51M	£2.8M

Note – This is capital costs only and does not consider whole life maintenance costs



Environmental Assessment

Key positive effects	Key negative effects	Mitigation or enhancement opportunities
<ul style="list-style-type: none">• No significant impacts to the foreshore (will not significantly impact access or amenity use of the beach).• Will slow the cliff receding and therefore protect socio-economic receptors against erosion.• Will not inhibit tourism• The location of the timber revetments away from the cliff will avoid any significant impact on the habitats located on the cliff.	<ul style="list-style-type: none">• By slowing cliff erosion sediment inputs into the environment will be reduced and therefore reduce sediment supply to the beach and other sites down drift.• Timber revetments will have a foot print on the beach• Tropical hardwoods have to be imported with significant carbon footprint.• Sourcing sustainably managed tropical hardwood is difficult/expensive• Aesthetically very different to the existing frontage with potentially detrimental impacts on the visual landscape.	<ul style="list-style-type: none">• By opting for tropical hardwood it reduces the impact of future maintenance activities when compared to oak.

Capital Cost Estimate

Description	Price /m	250m Stretch to protect key assets	Entire Frontage (1375m)
Timber Revetment	£2033	£508k	£2.79M
Rationalised Costs	£2.0k	£0.5M	£2.8M

Note – This is capital costs only and does not consider whole life maintenance costs

HUNSTANTON COASTAL MANAGEMENT PLAN



3. Geotube/sandbag revetment

The geotube/sandbag option involves placing two Tencate Geotube units (or similar) in front of the cliff. The two geotubes will be stacked to provide the required protection. The existing foreshore profile will be prepared and where necessary infilled with 60-300kg rock. The geotube units will be hydraulically filled in situ with local sand to provide a mass-gravity structure that is erosion resistant.

The advantages and disadvantages of this option are:

Advantages	Disadvantages
<ul style="list-style-type: none">Relatively easy to install.Easy to transport due to light weight materialDoes not involve the importation of significant quantities of rock exploitation, timber or concrete.Effective at dissipating wave energy therefore reducing the amount of wave energy impacting the cliff.Will have only a limited impact on the main area of the frontage used by the public	<ul style="list-style-type: none">Can be easily damaged during installation and service period, potentially requiring a comprehensive maintenance regimeVulnerable to vandalism.Comparatively short residual life.Construction assumes there is a large local source of beach material available.May not be aesthetically pleasing.Slowing cliff erosion will reduce sediment input into the environment and reduce sediment supply to the beach and other sites down drift.This option will not assist in maintaining beach levelsUse of geotubes in this area is limited; this will lead to a change in aesthetics.Geotubes will have a foot print on the foreshore.

Environmental Assessment

Key positive effects	Key negative effects	Mitigation or enhancement opportunities
<ul style="list-style-type: none">No significant impacts to the foreshore (will not significantly impact access or amenity use of the beach).Will slow the cliff receding and therefore protect socio-economic receptors against erosion.Will not inhibit tourismThe location of the geotubes away from the cliff will avoid any significant impact on the habitats located on the cliff.	<ul style="list-style-type: none">By slowing cliff erosion sediment inputs into the environment will be reduced and therefore reduce sediment supply to the beach and other sites down drift.Geotubes will have a foot print on the beachAesthetically very different to the existing frontage with potentially detrimental impacts on the visual landscape.	<ul style="list-style-type: none">The area of beach immediately behind the geotubes will be protected from wave action and new habitats could develop there

Capital Price Estimate

Description	Price /m	250m Stretch to protect key assets	Entire Frontage (1375m)
Geotubes	£2065	£516k	£2.84M
Rationalised Costs	£2.06K	£0.52M	£2.84M

Note – This is capital costs only and does not consider whole life maintenance costs



4. Beach Nourishment

The beach nourishment/recharge option involves the addition of new material to the beach to increase the level of the beach. The beach recharge would supply material via spraying from an offshore vessel (on neighbouring frontages). The increase in level of beach will cause waves to break ‘earlier’ and therefore the amount of wave energy reaching the cliff is reduced. The outline design of the option includes increasing the level of the top of the beach to a greater height than the water level of 1 in 200 year event (annual exceedance probability). The scheme will also require additional periodic beach recharge or ‘top-ups’ to maintain the required beach levels.

To maximise effectiveness the scheme will require the addition of beach control structure (such as groynes) to maintain the beach levels, which are not included in the cost estimate at this stage.

The advantages and disadvantages of this option are:

Advantages	Disadvantages
<ul style="list-style-type: none">Raising beach levels will reduce the wave climates at the toe of the cliffs and therefore reduce the potential erosion.It is perceived to be a more ‘natural’ approach to coastal defence, when compared to introducing hard structures.Likely to have appositive impact on the local landscape.Will be beneficial for recreation/ amenity use and could potentially enhance local tourism.Introducing additional sediment to this frontage will be a benefit for down drift locations.•Very popular with the general public.•Aesthetically pleasing.	<ul style="list-style-type: none">Beach re-nourishment activities are very expensive and will create significant disruption to the beach during construction.The beach is likely to return to its natural level over time, therefore continued management and ‘top-ups’ will be required.Will need to be delivered in conjunction with enhancements to the existing groynes resulting in additional costs.Will potentially impact negatively on local environment by changing habitats.Will interfere with existing coastal processes.Further modelling studies would be required to determine the long term effectiveness.Due to the dynamic nature of beaches even with modelling there will be an element of uncertainty, potentially one large storm event might return the beach to original levels.•Re-nourishment of a 250m section (to protect key assets is unlikely to be effective)

Environmental Assessment

Key positive effects	Key negative effects	Mitigation or enhancement opportunities
<ul style="list-style-type: none">Likely to have a positive impact on the local landscape.Will enhance the amenity use of the beach.Enhanced beach levels will offer the cliffs greater protection and therefore protect socio-economic receptors against erosion.Enhancing beach levels will benefit local tourism (beyond construction)Works will not directly impact on the designated cliffs.Introducing additional sediment to this frontage will be a benefit for down drift locations.	<ul style="list-style-type: none">Re-nourishment activities are likely to have a negative impact on local environment by changing habitats.Re-nourishment activities are likely to interfere with existing coastal processes.Significant disruption during construction	<ul style="list-style-type: none">Increased levels are likely to enhance the amenity value of the beach and enhance local tourism.Likely to have a positive impact on the local landscape.

Capital Price Estimate

Description	Price /m	250m Stretch to protect key assets	Entire Frontage (1375m)
Beach Nourishment	£6591	£1.318M	£8.733M
Rationalised Costs	£6.6k	£1.3M	£8.7M

Note – This is capital costs only and does not consider whole life maintenance costs

5. Relocation of key assets

This option involves the relocation of the key assets along the frontage which are currently at risk of erosion. The most prominent of these are the lighthouse and the ruins of St Edmunds chapel, but also includes the Coastguard Lookout (holiday let) and the Lighthouse café.

High level estimated costs for moving the lighthouse inland by 15-20m are approximately £750k. It has therefore been assumed that similar proportionate costs will be incurred for moving the other structures as well.

The cost estimates do not include appraisal or land purchase costs which could increase this cost further. In addition, moving the assets inland would not prevent future erosion, only delay the impact and it is likely that repeat interventions would be required to continue to prevent the assets from eroding in the future.

The approach does not provide a long term solution as continued erosion of the cliff and the presence of properties behind the seafront road ensure that space for additional asset moves in the future are limited.

The advantages and disadvantages of this option are:

Advantages	Disadvantages
<ul style="list-style-type: none">• Key assets maintained and removed from immediate erosion risk.• Will protect the historically significant assets currently at risk from erosion	<ul style="list-style-type: none">• It will be very difficult to implement• Assumes that new land will be available• Only postpones the problem• Historically significant assets likely to be damaged during the transition• Potentially cliff stability issues, if removing a significant structure from the clifftop• Assets are privately owned and will require consent• Potential planning and other stakeholder consenting issues• Cost estimates are very subjective at this stage.

Capital Price Estimates

Description	Approx. Cost *
Relocate lighthouse	£750k
Relocate other Properties (Coastguard Lookout & Lighthouse Café)	£800k (2x £400k)
Ruins of St Edmund’s Chapel	£750k

*Please note that these are only approximate estimates at this stage and do not include land purchase costs.





UNIT B

The management approaches being considered include:

- **No Active Intervention:** where only minimal repairs for health and safety purposes are carried out and no other works are undertaken. The condition of the defences will decrease over time and eventually the existing defences will be allowed to fail.
- **Maintain Existing Defences:** where the existing defences are maintained through undertaking works to improve their residual lives. These options could range from low-scale patch and repair operations to large-scale planned defence refurbishment. Although the SoP offered by the defence will ultimately be reduced over time due to the impacts of predicted climate change.
- **Sustain Existing Defences:** where the existing level of protection offered by the defences is sustained by undertaking works to progressively enhance the defences in line with climate change projections.
- **Enhance or Improve the Defences:** where capital works are undertaken to either enhance the level of protection offered by the existing defences or replace the existing defences with new enhanced defences.

The resulting management options are:

No Active Intervention

1. Do nothing
2. Do minimum

Maintain Existing Defences

3. Patch and repair maintenance of seawall, promenade and floodwall.
4. Re-facing of the seawall, promenade and floodwall
5. Repair/replacement of groynes
6. Eventual replacement of defences maintaining existing crest height.

Sustain Existing Defences

7. Raise existing seawall, promenade and floodwall in line with climate change
8. Re-facing and raise the seawall and promenade
9. Repair of groynes
10. Eventual replacement of defences elevating crest levels in line with climate change.

Enhance or Replace Existing Defences

11. Rock revetment
12. Sand bags / Geotubes
13. Gabions
14. Replacement seawall, promenade and floodwall
15. Offshore breakwater
16. Enhanced beach
17. Groyne replacement/enhancement
18. Timber revetments
19. Rock groynes



Unit B – Shortlisted Options

Like Unit A each of these options has been subjected to an initial qualitative multi-criteria feasibility appraisal, where each option has been assessed in terms of the following parameters:

- Functionality (technical performance)
 - SMP compliance
 - Buildability
 - Future maintenance
 - Environmental impacts/benefits
- Comparative (indicative) costing
 - Health and Safety
 - Risks
 - Public acceptance (including feedback received from the last consultation)

Following this initial assessment of the ‘longlist’ options the list has been reduced to a shortlist of the most practicable that have been investigated further for comparison purposes as detailed below:

1.Do Nothing

The Do Nothing option represents a hypothetical ‘walk away’ scenario which is used as a baseline against which to appraise various ‘Do Something’ management options.

Under the Do Nothing option the existing defences will be abandoned in terms of maintenance or repair, and no remedial or additional protection works will be carried out. In addition, adaptation to sea level rise or other climate change responses will not be addressed.

With this approach the existing defences along the frontage will fail at the end of their residual service life and the land behind will be subject to erosion and flooding.

Please note that the Do Nothing scenario is only being considered in accordance with Defra guidance for comparison purposes and is not being considered for implementation by BCKLWN.

The advantages and disadvantages of the Do Nothing option are:

Advantages	Disadvantages
<ul style="list-style-type: none">• No further investment required• Long term transition to unprotected natural coastline• Will allow nature to take its course once the existing defences fail.	<ul style="list-style-type: none">• Significant erosion risk resulting in significant damage, loss of infrastructure and potential loss of life and injuries.• Failure of defences will potentially lead to additional health and safety risks.• Additional flood risk leading to flood damages to commercial properties• Economic damages to local area and also the wider region• Unsustainable / unfeasible management approach• Does not support the SMP ‘Hold the Line’ policy

2. Do Minimum

The Do Minimum option essentially represents the existing ‘status quo’. Under this approach, small scale reactive maintenance and patch repair work, as well as activities to maintain Health and Safety compliance will be undertaken. Doing Minimum will help to increase the residual life of the assets and delay the point at which they are expected to fail. For the purpose of the economic assessment it has been assumed that the residual life of the defences will be extended by 5-10 years compared to the Do Nothing scenario. However, once the defences fail it is assumed that no further works will take place.

In addition, with the Do Minimum approach the flood gates along the rear floodwall on the promenade will continue to operate until the defences fail which will reduce the flood risk along the frontage (compared to Do Nothing). Do Minimum does not allow for any adaptation to sea level rise or other climate change responses (i.e. by crest raising) so flood risk through overtopping of the defences is expected to increase in the future.

The advantages and disadvantages of the Do Minimum option are:

Advantages	Disadvantages
<ul style="list-style-type: none">• Minimal investment required• Delayed failure of defences so loss of properties later on in appraisal period (compared to Do Nothing option).• Reduced flood risk by closing flood gates during storm events• Will eventually allow nature to take its course once the existing defences fail.	<ul style="list-style-type: none">• Whilst erosion damages are delayed, they will still occur, resulting in significant damage, loss of infrastructure and potential loss of life and injuries.• Failure of defences will potentially lead to additional health and safety risks.• Unlikely to be considered a feasible long term approach• Does not support the SMP ‘Hold the Line’ policy in the long term

Do Nothing & Do Minimum Options Initial Environmental Assessment

Key positive effects	Key negative effects
<ul style="list-style-type: none">• Will allow nature to take its course.• Potential expansion of the intertidal area• Avoids construction works	<ul style="list-style-type: none">• Significant loss of habitats and amenity areas.• Significant social and economic damage

Estimated Whole Life Cost

Option	Cash (£k)	PV (£k)
Do Nothing	£0	£0
Do Minimum	2,150	641

Please note all Do Nothing and Do Minimum Option costs include 60% optimism bias (risk) at this stage.

3. Maintain

The Maintain option represents a proactive approach to maintenance and refurbishment and involves scheduled capital refurbishments of the existing defences to extend the life of the defences throughout the entire 100 year appraisal period. The approach will require increased investment compared to the existing ‘status quo’.

The Maintain approach will ensure that the existing line of defences is kept in place at its current height for the duration of the appraisal period and will support the SMP Hold the Line policy. This will provide significant erosion benefits to the study area.

As with the Do Minimum approach, the flood gates along the rear wave return wall at the back of the promenade will remain operational throughout the appraisal period which will reduce the flood risk along the frontage (compared to Do Nothing). However, the Maintain option does not allow for any adaptation to sea level rise or other climate change responses (i.e. the crest of the defences will not be raised during capital refurbishment works) so flood risk through overtopping of the defences is expected to increase in the future.

The advantages and disadvantages of the Maintain option are:

Advantages	Disadvantages
<ul style="list-style-type: none">• Support of the SMP ‘Hold the Line’ policy throughout appraisal period• Significant erosion benefits through the protection of residential and commercial properties in the long term• Reduced flood risk by closing flood gates during events (compared to Do Nothing option)	<ul style="list-style-type: none">• Does not provide adaptation to sea level rise or other climate changes responses therefore increased flood risk in the long term

The shortlisted approach to implementing the capital refurbishments of the existing defences as part of the Maintain involves encasing the face of the existing seawall with a reinforced concrete layer. This is expected to extend the service life of the defences by approximately 30 years.

In addition the capital refurbishments of the seawall this option will also include for the significant refurbishment of the timber groynes and the modification of the concrete groynes along the frontage, although included in the whole life cost estimate for the Maintain Option, the proposed groyne options are discussed on a later exhibition board.

The initial capital refurbishments of the seawall and the groynes will be carried out towards the end of the residual of the existing structures.

The advantages and disadvantages of the concrete encasement are:

Advantages	Disadvantages
<ul style="list-style-type: none">• Will protect the existing structure and extend its residual life.• No significant change in footprint of structure.• Visual landscape of the frontage will be unaffected.• Has already been successfully implemented elsewhere on the frontage.• Standard formwork and shuttering can be efficiently used across several locations.• Allows for the prioritisation of works according to condition assessment.	<ul style="list-style-type: none">• Works will disrupt public access to promenade and beach throughout the works.• Different seawall profiles will potentially require different shuttering for each type.• In-situ concrete works present an environmental risk in the tidal environment. Precast concrete could reduce this risk, but is not suitable in this application.• Works will not improve the level of protection offered by the seawall.• Construction works will be exposed to tidal activity.• Design relies on the structural stability of the existing structure• Unlikely to have as long a service life as new structures therefore interventions required more frequently

Initial Environmental Assessment

Key positive effects	Key negative effects
<ul style="list-style-type: none">• Will enable the seawall to continue protecting socio-economic receptors against erosion• Likely to be supported by the public.• No significant change in the footprint/aesthetic of the structure.	<ul style="list-style-type: none">• Some disruption to public access of the promenade and beach during the construction works.• Potential release of contaminants during construction.• Will not enhance the natural environment.

Whole Life Cost Estimate

Option	Cash (£k)	PV (£k)
Seawall & Groynes	30,983	8,109

*Please note all Maintain Option costs include 60% optimism bias (risk) at this stage





4.Sustain

The Sustain option involves raising the crest level of the defences over time to keep pace with sea level rise and ensure that the flood risk does not increase (compared to the existing Standards of Protection). In addition, the approach to maintaining the defences as outlined in the Maintain Option will also be implemented to prolong the residual life of the existing seawall ensuring that the defences remain structurally sound and continue to protect against erosion.

By maintaining the position of the defences and sustaining the Standard of Protection (SoP) this option provides both erosion and flood risk benefits in the future. The approach will support the SMP policy of Hold the Line for the duration of the appraisal period.

The advantages and disadvantages of the Sustain option are:

Advantages	Disadvantages
<ul style="list-style-type: none">• Support of the SMP ‘Hold the Line’ policy throughout appraisal period• Significant erosion benefits through the protection of residential and commercial properties in the long term• Reduced flood risk by raising the crest of the defences to keep pace with sea level rise	<ul style="list-style-type: none">• Crest raising of the existing defences has the potential to create visual and landscape impacts.• Design relies on the structural stability of the existing structure• Impacts to public amenity space on promenade• Potential planning or consenting issues.

For the purpose of costing it has been assumed that the crest levels of the defences will be raised in three intervals over the appraisal period. It has been assumed that these will coincide with the timings of refurbishing the defences as per the Maintain Option (i.e. every 30 years). By adopting this approach it ensures that the Sustain option is adaptive and means that future heights of raising can be adjusted based on the rates of sea level rise that are observed / predicted in the future.

The shortlisted approach to raising the existing defences as part of the Sustain option involves either raising the raising the height of the seawall or the floodwall at the rear of the promenade which could be achieved by installing additional a reinforced concrete capping on top of the existing defence.

Like the Maintain Option, this option also includes for the significant refurbishment of the timber groynes and the modification of the concrete groynes along the frontage and although included in the whole life cost estimate for the Sustain Option, the proposed groyne options are discussed on a later exhibition board.

The advantages and disadvantages of raising the existing defence are:

Advantages	Disadvantages
<ul style="list-style-type: none">• Lower cost relative to construction of a new defence• Requires little additional maintenance• Combined with the Maintain Option this option will protect the existing structure and extend its residual life.• No significant change in footprint of structure.• Has already been successfully implemented elsewhere on the frontage.• Standard formwork and shuttering can be efficiently used across several locations.• Allows for the prioritisation of works according to condition assessment and flood risk.	<ul style="list-style-type: none">• Works will disrupt public access to promenade and beach throughout the works.• Different seawall profiles will potentially require different shuttering for each type.• In-situ concrete works present an environmental risk in the tidal environment.• Construction works will be exposed to tidal activity.• Unlikely to have as long a service life as new structures therefore interventions required more frequently• Raised walls have the potential to create visual and landscape impacts.

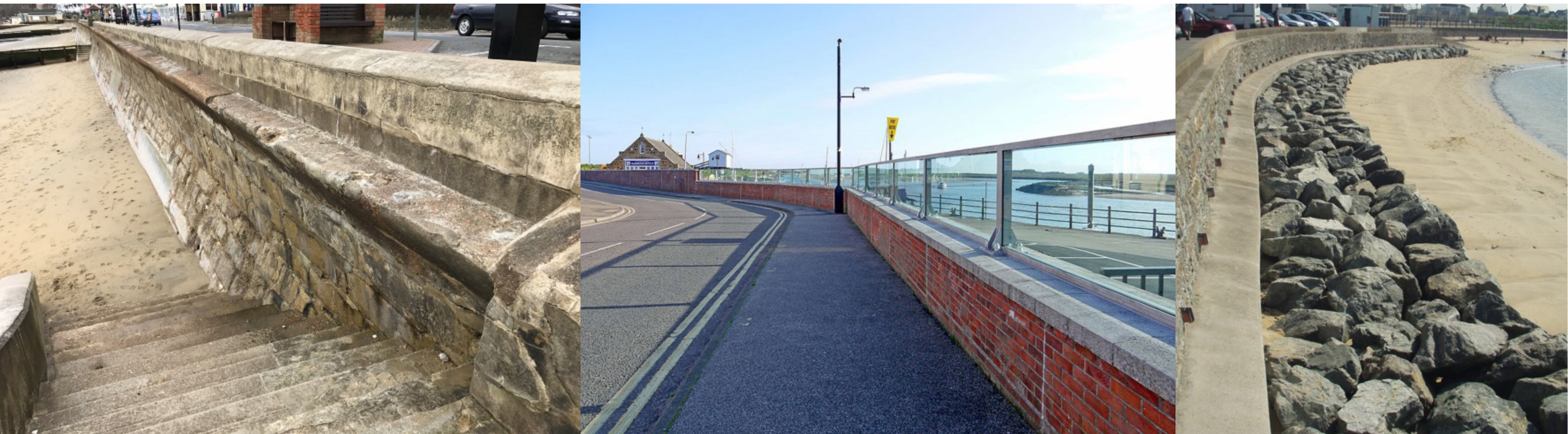
Initial Environmental Assessment

Key positive effects	Key negative effects
<ul style="list-style-type: none">• Will enable the seawall to provide the same level of flood protection to socio-economic receptors in spite of climate change predictions• Will enable the seawall to continue protecting against erosion risk• No significant change in the footprint/aesthetic of the structure.	<ul style="list-style-type: none">• Some disruption to public access of the promenade and beach during the construction works.• Potential release of contaminants during construction.• Will not enhance the natural environment.• Will potentially impact on visual and landscape aesthetics.

Whole Life Cost Estimate

Option	Cash (£k)	PV (£k)
Seawall & Groynes	36,640	9,464

*Please note all Sustain Option costs include 60% optimism bias (risk) at this stage



5.Enhance

The improve option involves actively improving the standard of protection against flooding and erosion. This approach requires the greatest investment of the management options but will deliver the highest SoP and the largest economic benefits.

The Improve option is precautionary in that crest levels will be raised in one implementation (rather than in multiple interventions as in the Sustain option). It has been assumed for costing purposes that this will be undertaken toward the end of the residual life of the existing defences.

The advantages and disadvantages of the Improve option are:

Advantages	Disadvantages
<ul style="list-style-type: none">• Support of the SMP ‘Hold the Line’ policy throughout appraisal period• Significant erosion benefits through the protection of residential and commercial properties in the long term• Reduced flood risk by improving the SoP of the defences up-front (in advance of the Sustain Option).	<ul style="list-style-type: none">• New higher defences have the potential to create environmental impacts, such as visual and landscape impacts• Precautionary approach, which leads to a risk of over-investment (i.e. designing to a high future standard which may be unnecessary should sea levels not rise as fast / as much as expected).

The shortlisted approach to implementing the Enhance Option involves the construction of a new seawall along the frontage, in place of the existing defences. In addition, where there are currently groynes present, these will be replaced with new structures at the end of their residual life. Although included in the whole life cost estimate for the Enhance Option, the proposed groyne options are discussed on a later exhibition board.

The advantages and disadvantages of a new seawall are:

Advantages	Disadvantages
<ul style="list-style-type: none">• Long service life• Requires little ongoing maintenance after construction• Design could utilise the latest advances in coastal construction.• Designs could potentially enhance the public amenity spaces• Requires little additional maintenance• Allows for the prioritisation of works according to condition assessment and flood risk.	<ul style="list-style-type: none">• New defences will potentially inhibit access to the beach/promenade.• Potential for new defence to have a larger footprint and encroach on the intertidal area.• Designs could potentially be detrimental to the public amenity spaces• Works will disrupt public access to existing promenade and beach throughout the works.• In-situ concrete works present an environmental risk in the tidal environment.• Construction works will be exposed to tidal activity.• Raised walls have the potential to create visual and landscape impacts.• Comparatively expensive.

Initial Environmental Assessment

Key positive effects	Key negative effects
<ul style="list-style-type: none">• Will enhance the level of flood protection to socio-economic receptors.• Will enable the seawall to continue protecting against erosion risk• Could potentially enhance the public amenity space	<ul style="list-style-type: none">• Some disruption to public access of the promenade and beach during the construction works.• Potential for new defence to have a larger footprint and encroach on the intertidal area• Potential release of contaminants during construction.• Will not enhance the natural environment.• Will potentially impact on visual and landscape aesthetics.• Could potentially be detrimental to the public amenity spaces

Whole Life Cost Estimate

Option	Cash (£k)	PV (£k)
Seawall & Groynes	52,669	21,511

*Please note all Enhance Option costs include 60% optimism bias (risk) at this stage



Groynes

1.Timber Groynes

The existing timber groynes on the frontage (Sections A-F) currently appear to perform well and act to hold beach material in front of the seawall, despite being in a mixed state of repair.

Therefore for appraisal and pricing purposes the Maintain and Sustain options look to prolong the life of the existing timber groynes through refurbishment at regular intervals throughout the appraisal period. This will include replacing the various timber elements that are either damaged or missing with a like-for-like tropical hardwood replacement. No significant changes would be made to the design of the groynes and they would remain permeable. Typically, the majority of the timber elements that need replacing are located at the seaward end of the groynes. Future works will also include for the continuation of on-going routine maintenance on an annual basis.

Under the Enhance option it is assumed that the existing groynes will be replaced with a new groyne field that will be designed to optimise their performance, yet minimising their impact on the amenity areas of the beach.

Timber Groynes - Advantages and Disadvantages

Advantages	Disadvantages
<ul style="list-style-type: none">Existing structure is very effective at maintaining beach levels in front of the seawall, refurbishing or replacing will prolong the life of the existing structures.Refurbishing or replacing the existing groynes will improve their performance retaining beach levels.Construction can be staggered; through condition assessment as different elements/groynes can be prioritised and planned at intervals.The additional structure will be similar in appearance to the existing defence and therefore will have only limited impact on the visual landscape.Known construction methodologyTropical hardwood is comparatively more effective in marine environments than locally sourced oak.Works will avoid impacting on the promenade	<ul style="list-style-type: none">Refurbishing/replacing the existing groynes will increase their ability to retain material and therefore reduces the amount of sediment available for down drift locations.Refurbishment can be technically challenging particularly with the groynes partially hidden beneath the beach.The groynes extend far down the beach which means that there will be a reduced tidal window to work in which has an impact on safety and cost through an extended programme.Although better than oak, tropical timber still has a relatively short residual life and as a consequence is expensive to maintain.Environmental implications of importing tropical timber (and added cost of ensuring sustainably sourced).

Initial Environmental Assessment

Key positive effects	Key negative effects
<ul style="list-style-type: none">The continued use of permeable groynes will avoid interfering with existing coastal processesAesthetically similar in appearance to the existing defences, i.e. will not significantly impact on the existing landscape.No significant change to the footprint of the structureNo significant impacts to the amenity use of the beach.Will enable the groynes to continue to retain beach levels to protect the seawall and therefore protect socio-economic receptors against erosion.Maintaining beach level will benefit local tourism (beyond construction)	<ul style="list-style-type: none">Rock armoured toe could potentially impact on existing coastal processes.Tropical timbers are likely to be sourced internationally with large carbon footprints.Construction will cause significant disruption on the beach.

Whole Life Cost Estimate

Option	Cash (£k)	PV (£k)
Refurbishing the existing Timber Groynes	5,460	1,792
Replace the existing groynes*	9,487	3,245

*Design to be confirmed cost estimates have been based on EA price guide that is based on previous examples.

Please note all timber groyne costs include 60% optimism bias (risk) at this stage





2. Concrete Groynes

The existing concrete groynes at the northern end of the frontage (Section G) are considerably shorter than the timber alternatives (Sections A-F) and currently do not appear to be functioning as well (i.e. failing to effectively hold material on the foreshore in front of the seawall).

Although refined beach modelling has not yet been undertaken for this specific section of the frontage; for option appraisal and costing purposes the following options have been considered for modifying/replacing the existing groynes to improve their performance.

- 1. Double the length of the existing groynes.
- 2. Replace the existing groynes with an extended timber alternative in keeping with those found to the south (Sections A-F).
- 3. Replace the existing groynes with an extended rock armour alternative.

Double length of existing groynes

Advantages	Disadvantages
<ul style="list-style-type: none">Extending the existing structure will potentially increase its ability to trap material, maintain beach level and protect the seawall.The additional structure will be similar in appearance to the existing groynes and therefore will have only limited impact on the visual landscape.Very durable and therefore low maintenance compared to timber alternativesKnown construction methodology	<ul style="list-style-type: none">Increasing the performance of the groynes will increase their ability to retain material and therefore reduces the amount of sediment available for down drift locations.Construction can be technically challenging particularly with the groynes extended into the intertidal zoneThe groynes will extend far down the beach which means that there will be a reduced tidal window to work in which has an impact on safety and cost through an extended programme.Potential planning and consenting issues

New extended timber alternative

Advantages	Disadvantages
<ul style="list-style-type: none">A new timber structure will be similar in appearance to the neighbouring groynes and therefore will have only limited impact on the visual landscape.Tropical hardwood is comparatively more effective in marine environments than locally sourced oakKnown construction methodologyLonger timber groynes will potentially increase their ability to trap material, maintain beach level and protect the seawall.	<ul style="list-style-type: none">Increasing the performance of the groynes will increase their ability to retain material and therefore reduces the amount of sediment available for down drift locations.The groynes will extend far down the beach which means that there will be a reduced tidal window to work in which has an impact on safety and cost through an extended programme.Construction can be technically challenging particularly with the groynes extended into the intertidal zoneAlthough better than oak, tropical timber still has a relatively short residual life and as a consequence is expensive to maintain, as experienced with existing structure.Environmental implications of importing tropical timber (and added cost of ensuring sustainably sourced).Potential planning and consenting issues

New extended rock alternative

Advantages	Disadvantages
<ul style="list-style-type: none">Very durable and therefore low maintenance compared to timber alternativesRock can easily be relocated or adjusted to optimise their positionLonger rock groynes will potentially increase their ability to trap material, maintain beach level and protect the seawall.Easy to construct.Deliveries via the sea prevent any disruption to the town (traffic etc.)Rock armour has the potential to create some new habitats in the intertidal zone.	<ul style="list-style-type: none">Increasing the performance of the groynes will increase their ability to retain material and therefore reduces the amount of sediment available for down drift locations.The groynes will extend far down the beach which means that there will be a reduced tidal window to work in which has an impact on safety and cost through an extended programme.Construction can be technically challenging particularly with the groynes extended into the intertidal zoneEnvironmental implications of importing rockAesthetically different to the existing structures on the frontage, potential visual and landscape impact.Potential planning and consenting issues

Initial Environmental Assessment

Key positive effects	Key negative effects
<ul style="list-style-type: none">Depending on the type could be aesthetically similar in appearance to the existing groynes, i.e. may not significantly impact on the existing landscape.Will potentially enhance the amenity use of the beach.Will enable the groynes to retain beach levels to protect the seawall and therefore protect socio-economic receptors against erosion.Maintaining beach levels will benefit local tourism (beyond construction)Rock armour has the potential to create some new habitats in the intertidal zone.	<ul style="list-style-type: none">Using rock groynes will impact on the visual landscape of the frontage.Extending the groynes will potentially impact on existing coastal processes.Both tropical timbers and rock armour are likely to be sourced internationally with large carbon footprints.Construction will cause significant disruption on the beach.Options will significantly change the footprint of the structure and will encroach on the intertidal zone.

Whole Life Cost Estimate

Option	Cash (£k)	PV (£k)
Extend existing Groynes (100%)*	4,164	1,499
Replace with full length timber**	8,583	3,301
Rock alternative	4,538	2,069

*Used in Maintain and Sustain options

**Used in Enhance option

Please note all groyne costs include 60% optimism bias (risk) at this stage



TIMELINE FOR THE CMP PROJECT

Date	Milestone
August 2017	Selection of AECOM as the consultant to complete the Hunstanton Coastal Management Plan
September - October 2017	AECOM start background work. This includes: <ul style="list-style-type: none">• initial site walkover• a review of existing data• an update of existing condition assessment
November 2017	AECOM continue to complete background work including: <ul style="list-style-type: none">• initial economic assessment (base case)• overview of coastal processes and erosion
December 2017	<ul style="list-style-type: none">• issue and review of interim report and long-list options by Project Team• Options Workshop number one (identifying short-listed options)• give update to borough council senior management
January - February 2018	<ul style="list-style-type: none">• Project Team review feedback from Stakeholder Forum• development of shortlisted options• commence full economic appraisal
February 2018	<ul style="list-style-type: none">• Project Team to review shortlisted option development• second Stakeholder Forum consultation• first public drop-in consultation• Project Team review feedback from stakeholders and public consultation• Options Workshop number two (preferred option selection)
April 2018	<ul style="list-style-type: none">• third Stakeholder Forum consultation• second public drop-in consultation
April - May 2018	Project Team finalise: <ul style="list-style-type: none">• Options Appraisal Report• Management Plan (MP)• Develop Outline Business Case (OBC)
May - June 2018	Present finalised MP and OBC to senior management
June onwards 2018	Submit CMP and potential OBC for consideration by relevant approval authority



We value your feedback

Please place a sticker in response to the following questions:

	Yes	No	Don't Know
Did you find the information informative and easy to understand?			
Did you make any contributions where requested?			
Did you find the staff helpful and were they easy to understand?			
Do you agree with the following statements?			
The Hunstanton Coastal Management Plan is progressing and will seek to maintain coastal defences			
Any potential coastal protection schemes are dependent on finding an appropriate solution which can be funded and gain consent			
I support the scheme and the proposed way forward			
Do you have any other comments?			