

# Mundesley

## Coast Management Scheme Options for the Future



# Mundesley Coast Management Scheme seeks to:

- Deliver the Shoreline Management Plan policy for Mundesley over the next 50 years
- Stop cliff erosion where possible and continue to slow the rate of losses elsewhere
- Manage and maintain the beach

## The scheme must:

- Work within the Shoreline Management Plan policies
- Work within the National Flood and Coastal 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
- Be deliverable within the funding available

## From this event we would like you to:

- Understand the need for the scheme and what is and is not possible
- Be aware of the process to obtain funds for a coast management scheme
- Provide feedback on the shortlist of coast management options which are being considered
- Be aware of 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

# A brief history of coastal defence at Mundesley

Mundesley has some of the most historic sea defences in North Norfolk with some sea walls dating back to the 19th Century. As you can see from our photographic archive, coast management is an ongoing process.

	<p><b>1948</b> The new sea wall and apron below the Manor Hotel. The wall was originally built by the hotel but is now in NNDC ownership. Note the low beach level.</p>	<p>Mundesley has some of the most historic sea defences in North Norfolk with some sea walls dating back to the 19th Century. As you can see from our photographic archive, coast management is an ongoing process.</p>
	<p><b>1982</b> Replacement of old groyne structures from metal tubes filled with concrete.</p>	
	<p><b>1987</b> Groyne works. The new timber piles and the very healthy beach levels.</p>	
	<p><b>1988</b> Construction of an 'Erpingham' style groyne. This design has proved durable with this example still in use.</p>	
	<p><b>1991</b> Very high beach levels.</p>	
	<p><b>1996</b> Note the importance of the impermeable groyne at the beach café and the River Mun outfall, these are essential in 'holding' the sandy beach.</p>	
	<p><b>2007</b> A scoured beach in the winter with metal sheet piling visible and timber piles in the beach from an old groyne structure.</p>	

# How are coastal management schemes planned and funded?

- ▶ North Norfolk District Council typically spends approximately £310,000 each year to maintain 21 miles of coastline - that's £14,700 a mile.
- ▶ On top of this defences require more substantial sums to be invested in order for them to continue to provide protection.
- ▶ To obtain this additional funding from central government, a coast management scheme must satisfy the Government's Flood and Coastal Erosion Risk Management Strategy, which includes the below.

## Shoreline Management Plan

Mundesley is included in SMP6 Kelling to Lowestoft Ness Shoreline Management Plan. It has a 'Hold the Line' of defences' policy until 2055 - this does not mean that they cannot last longer than that date.

The Shoreline Management Plan (SMP) is a policy document which outlines the risks to people and the environment posed by coastal change and how this should be managed. The SMP provides a large scale assessment of those risks aiming to manage them in a sustainable way.

## Partnership Funding for Flood and Coastal Erosion Risk Management Grant in Aid

Large scale coast management schemes can potentially be wholly or partially funded through central government (via the Environment Agency). This is called Grant in Aid Partnership Funding, more information is provided in the display leaflets.

The benefits of a defence scheme, for example the number and value of the homes protected - are compared with the costs of protection in a cost-benefit analysis so that schemes from across the region can be compared and prioritised.

There is a limited amount of funding available and it is highly competitive.

Often "partnership contributions" (local contributions) are required for a scheme to go ahead.

Due to the rural nature of the North Norfolk coast, few locations are likely to receive funding through this route, however, it has been highlighted that Mundesley is potentially eligible.

## Environment Agency Six Year Programme

Mundesley Coast Management Scheme is identified for delivery in the Six Year Programme and therefore it can progress to seek technical, financial and environmental approvals, alongside seeking community support.

The Environment Agency manages a six year programme of Flood and Coast Protection Schemes. The programme identifies the schemes which are intended to be delivered in a six-year timeframe, subject to technical, financial and environmental approvals.

## Strategy Study

Mundesley is included in the Cromer to Winterton Coastal Management Study which identified that a scheme for the continuing defence of Mundesley was economically justifiable, has the potential to attract some government funds and that it should be explored further.

# Current Stage: Developing the Outline Business Case

We are developing an outline business case for the Mundesley Scheme

The outline business case identifies and sets out the economic, environmental and technical case of a preferred option. It identifies funding opportunities and seeks Environment Agency technical and financial approval for the scheme.

The following areas are being explored to develop the outline business case:

- Condition survey
- Environmental assessment
- Initial environmental assessment

Defence Ref.	Defence Description	Condition Grade - 2012	Current Condition Grade
G2	Timber Groynes	Good/ Fair	Fair
S2	Timber Revetment	Good	Good
G3	Timber Groynes	Good/ Fair	Good/ Fair
S3	Timber Revetment (Boat Pier)	Good	Good
G4	Timber Groynes	Good/ Fair	Good
S4	Concrete Seawall	Good	Good
G5	Timber Groynes (Concrete Outfall)	Good/ Fair	Good (Fair)
S5	Concrete Seawall	Good	Good
G6	Timber Groynes	Good/ Fair	Poor
S6	Concrete Seawall	Good	Fair
G7	Timber Groynes	Good/ Fair	Poor
S7	Concrete Seawall	Good	Fair
S7	Framed Structure	Poor	Poor
G8	Timber Groynes	Good/ Fair	Fair
S8	Framed Structure	Poor	Fair
G9	Timber Groynes	Good/ Fair	Good
S9	Framed Structure	Poor	Poor
G10	Timber Groynes	Good/ Fair	Fair
S10	Framed Structure	Poor	Poor
S10	Timber Revetment	Good	Fair
G11	Timber Groynes	Good/ Fair	Good
S11	Timber Revetment	Good	Good
G12	Timber Groynes	Good/ Fair	Good
S12	Timber Revetment	Good	Fair
G13	Timber Groynes	Good/ Fair	Good / (Poor at the seaward end)
S13	Timber Revetment	Good	Good
G14	Timber Groynes (Piped Outfall)	Good/ Fair	Good/ Fair

## Condition Survey

A condition survey of the existing coastal defences has been completed.

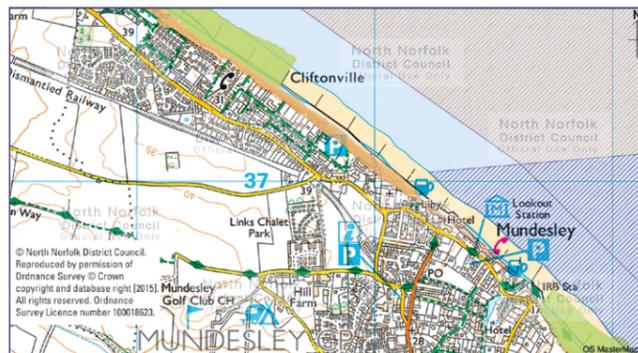
It has shown that the defences are in varying condition and there is a need for further investment to provide the target level of protection. This will help to direct where the highest priorities are for investment in the scheme.

The table left outlines the condition of defences at Mundesley.

## Environmental Assessment

Any Mundesley scheme will need to consider the Environmental Designations on or next to the coastal frontage.

The map below highlights the designations which have been identified.



- Green** Site of Special Scientific Interest - Mundesley Cliffs
- Brown** County Wildlife Site - Mundesley Cliffs
- Blue Hatched** 'Possible' Special Area of Conservation - Harbour Porpoises
- Orange Hatched** Marine Conservation Area - Cromer Shoal Chalk Beds

Key

## Initial Economic Assessment

An initial economic assessment helps calculate how much Grant in Aid funding could be provided.

This assessment involves estimating the potential economic damages associated with continued erosion, including identifying the number of homes at risk and calculating the potential value of other assets at risk and comparing this with the cost of providing protection over a period of time.

## What's included?

Important assets such as homes and businesses contribute to the assessment, as does infrastructure such as roads, utilities, public toilets, Anglian Water assets etc. It is also possible to include a value for the recreational benefits of the coast, but, national guidance does not allow for counting the value of tourism to the area, but it does count as an 'intangible benefit'.

# Coast Management Options

## The Long and the Short List

A 'long list' of coast management approaches and options were considered. The long list included 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 detailed, are split between those which have at this point been discounted, and those which have been shortlisted and will be considered further.

### Key Message

One solution will not be suitable for the whole frontage, it will be necessary to create a scheme with a mix of options

#### APPROACH A

### Do Nothing

The Do Nothing approach is a baseline against which all other options will be compared. This approach would involve no further management of the existing defences, ceasing all maintenance and capital expenditure activities and allowing nature to take its course.

**DISCOUNTED** as an approach but used as a baseline to judge other options

#### APPROACH B

### Do Minimum

The Do Minimum approach involves continuing with routine maintenance works to reduce the health and safety risk to the public, retain the structural integrity and thereby extend the current defence life as far as possible without undertaking capital works. The Do Minimum approach is therefore in effect a delayed 'Do Nothing'.

**DISCOUNTED** because this approach does not meet any of our stated objectives and it is anticipated that a scheme is viable

#### APPROACH C

### Maintain Existing Defences - maintain what's already there

This involves the continued monitoring and maintenance of the existing defences throughout the life of the scheme. This approach allows for the like-for-like replacement of failed or failing structures, however, this option does not include enhancing or improving the defences.

#### Advantages

- Relatively inexpensive
- Will focus resources on most at risk areas
- Will not increase footprint of defences - use of beach will not change

#### Disadvantages

- Cliff erosion rates will increase
- Not compliant with SMP policy
- Health and safety risks
- Unlikely to meet public expectations
- Ongoing maintenance cost
- Does not allow for expected increases in sea level, storm size or frequency

**SHORTLISTED** - This approach may be suitable for some defences on the frontage and specific options will be considered further - see options right

#### APPROACH D

### Maintain Existing Protection - keeping the protection level the same

This involves monitoring and maintaining existing defences as well as raising or enlarging the current defences to keep the protection level the same.

#### Advantages

- Will extend the life of existing structures
- Will enhance defences to allow for expected increases in sea level, storm size and frequency.
- Spreads the cost of capital expense

#### Disadvantages

- Cliff erosion rates will remain the same
- Ongoing maintenance costs
- Unlikely to meet public expectations

#### SHORTLISTED -

Options for this approach are to be explored further - see options right



OPTION 1

## CONCRETE SEAWALL

This involves protecting the existing cliff from wave action by building a reinforced concrete seawall along the front; the wall will be built on sheet-piled foundations to limit the effect of variable beach levels.

### Advantages

- Will prevent erosion in the long term
- Potential opportunities for recreational/amenity benefits
- Most effective defence at preventing wave action impacting cliffs

### Disadvantages

- Very expensive
- Will change what the coast looks like
- Does not include beach management
- Not good for the environment
- Will prevent sediment from cliff entering environment - potentially altering coastal processes

**DISCOUNTED** - Construction of new sections of sea wall would be too expensive and unlikely to obtain consents  
**SHORTLISTED** - Heavy maintenance of existing sea walls



OPTION 2

## OFF-SHORE BREAKWATER

This would mean putting in several rock armour breakwaters off-shore to reduce the energy of the waves. This option would protect the cliffs and may also mean the beach levels are higher behind the structures, which protects the cliffs.

### Advantages

- Will absorb wave energy reducing erosion
- Potentially increase beach levels
- Reduced rate of cliff erosion
- Creates off-shore habitat

### Disadvantages

- Will impact offshore environment and coastal processes
- Very expensive
- Potentially have to be combined with other beach management options
- Environmentally intrusive
- Will not eliminate erosion

**DISCOUNTED** - Construction of an offshore breakwater would be too expensive and unlikely to obtain consent



OPTION 3

## ROCK ARMOUR REVETMENT

This involves protecting the existing cliff from wave action by constructing a large revetment at the toe of the cliff with a rock armour outer layer.

### Advantages

- Will significantly reduce cliff erosion by dissipating wave energy
- Requires little maintenance
- Can be repositioned if displaced or required elsewhere

### Disadvantages

- Large quantity of rock required
- Typically rock is not used in the area - change in aesthetics
- Will prevent sediment from cliff entering environment - potentially changing coastal processes.
- Potential health and safety risk - people climbing on revetment
- Does not include beach management

**DISCOUNTED** - Construction of a rock armour revetment would be too expensive



OPTION 4

## CONCRETE BLOCK REVETMENT

This involves protecting the existing cliff from wave action by building a large revetment at the toe the cliff with a concrete mattress outer layer.

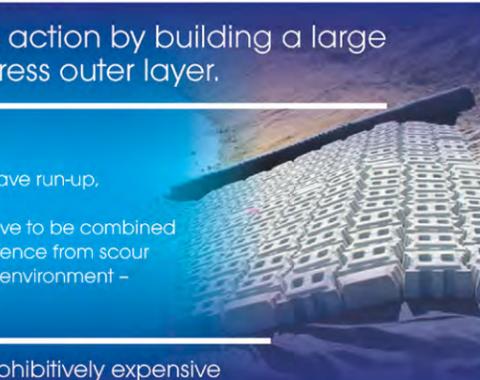
### Advantages

- Will protect the toe of the cliff
- Requires little maintenance

### Disadvantages

- Smooth surface of defence promotes wave run-up, not suitable for steep cliff
- Offers no beach management, it will have to be combined with another option to protect toe of defence from scour
- Will prevent sediment from cliff entering environment - potentially altering coastal processes

**DISCOUNTED** - Construction concrete block revetment would be prohibitively expensive



OPTION 5

## PLACED ROCK ARMOUR PROTECTION

This involves the strategic placement of rock armour along the frontage at the top of the beach, these rock mounds will act to break wave energy before they impact upon the cliff.

### Advantages

- Will significantly reduce cliff erosion by dissipating wave energy
- Requires little maintenance
- Can be repositioned if displaced or required elsewhere
- Will impact on beach management

### Disadvantages

- Large quantity of rock required
- Typically rock is not used in the area - change in aesthetics
- Will have a footprint on the beach that will potentially impact recreation areas/ activities/amenity of beach
- Will impact on beach management
- Will affect coastal processes
- Will potentially create health and safety risks

**SHORTLISTED** - Options for this approach are to be explored further



OPTION 6

## EXTEND/ENHANCE/REPLACE TIMBER REVETMENTS

This involves extending and potentially enhancing the existing timber revetments to break wave energy before they impact upon the cliff. These new timber revetments will be founded on a sheet-piled foundation to limit the effect of variable beach levels.

### Advantages

- Will trap more sediment to increase beach levels and absorb wave action
- Popular structure type on North Norfolk Coast - will not change appearance of frontage

### Disadvantages

- There will still be some erosion as recorded with the existing structures
- Reduced amenity area
- Will require continuous maintenance
- Will impact on beach management

**SHORTLISTED** - Options for this approach are to be explored further



OPTION 7

## EXTEND/ENHANCE/REPLACE STEEL FRAMED CONCRETE BLOCKS

This involves extending and potentially enhancing the existing steel framed concrete blocks to break wave energy before they impact the cliff.

### Advantages

- Relatively inexpensive compared to other forms of revetment
- Matches existing defences
- Simple construction method
- Will act to protect cliffs from wave and slow rate of erosion

### Disadvantages

- There will still be some erosion as recorded with the existing structures
- Reduced amenity area
- Will require continuous maintenance
- Will impact on beach management
- Additional visual impact

**SHORTLISTED** - Options for this approach are to be explored further



OPTION 8

## ENHANCE/REPLACE EXISTING TIMBER GROUYNE FIELD

This involves building new enhanced groynes which would retain more sediment on the beach, providing extra protection for the cliff.

### Advantages

- Construction can be staggered
- Will trap more sediment to increase beach levels and absorb wave action
- In keeping with existing defences
- Will improve amenity area of the beach

### Disadvantages

- Will further disturb natural movement of sediment - could cause problems elsewhere
- Potential health and safety issues with large changes in beach levels over groynes
- Further modelling studies would be required to determine effectiveness

**SHORTLISTED** - Options for this approach are to be explored further



## ROCK ARMOUR GROYNES

This involves constructing new rock armour groynes to improve the ability to hold sediment on the beach, which in turn protects the cliff from wave energy.

### Advantages

- Will trap more sediment to increase beach levels and absorb wave action
- Potentially create new habitats
- Will improve amenity area of the beach

### Disadvantages

- Will impact offshore environment
- Further modelling studies would be required to determine effectiveness
- Can create health and safety risks, changing beach levels
- Will impact aesthetics of landscape
- Will affect coastal processes
- Large quantity of rock required

**SHORTLISTED** - Options for this approach will be explored further but it's unlikely that a new rock groyne field would be affordable or acceptable, therefore investigations will consider the use of rock in composite groyne structures

## GABION SCOUR PROTECTION

This involves protecting the existing cliff from wave action by constructing a large gabion revetment at the toe the cliff to protect it from wave action.

### Advantages

- Will absorb wave action
- Relatively inexpensive
- Usually less intrusive, can be removed and relocated if required
- Simple to construct
- Gabions placed behind existing defences could have improved lifespan and be more effective than if left exposed to wave climate

### Disadvantages

- Gabions' lifespan dependent on wave climate, typically short in strong wave climates
- Potentially expensive to maintain
- Will prevent sediment from cliff entering environment - potentially altering coastal processes.
- Offers no beach management

**DISCOUNTED** - It is not considered Gabion structures would provide long term protection on this high energy frontage  
**SHORTLISTED** - For consideration as scour protection behind the existing seawall

## BEACH NOURISHMENT

This involves increasing the level of sediment along the front, which will improve the beach's ability to protect the cliff from wave energy.

### Advantages

- Will increase beach levels - a more natural approach to protection
- Aesthetically pleasing (no hard structures)
- Potentially beneficial for recreation/amenity

### Disadvantages

- Expensive
- Will require continuous monitoring and maintenance
- Likely to be required on multiple occasions throughout life of the scheme
- To prolong the effectiveness it must be combined with other beach management techniques
- Will alter coastal processes
- Will potentially impact on local ecology
- Further modelling studies would be required to determine effectiveness
- Due to the dynamic nature of sediment its performance can be unpredictable

**SHORTLISTED** - Options for this approach are to be explored further however it is unlikely to be affordable

## CLIFF STABILISATION

This involves installing 'soil nails' or 'ground anchors' and steel mesh to stabilise the cliff.

### Advantages

- Will reduce amount of material lost from cliff due to weathering erosion
- Will not have a footprint on the beach
- Relatively cheap (on its own)

### Disadvantages

- Will have to be combined with another option to protect the toe of the cliff from wave action
- Will cover cliff face - location of geological interest
- Aesthetically poor
- Health and safety risks during construction
- Environmentally detrimental to cliff

**DISCOUNTED** - It is not considered Cliff stabilisation would provide long term protection without substantial cliff toe protection structures, it would therefore not be effective

**SHORTLISTED** - For consideration as scour protection behind the existing seawall

## Contributions towards the scheme

### The Mundesley Coast Protection Scheme will rely on National Flood and Coastal Erosion funding.

This funding route seeks to ensure that any national funding is also supported by local contributions towards the scheme. If local contributions can be secured, it helps the case for national funds. Contributions to the scheme or future maintenance can be financial or 'in kind'.

- North Norfolk District Council has committed £300,000 towards the construction of the scheme.
- The Regional Flood and Coast Defence Committee (Eastern) through the Local Levy has provided funding for the development of the Outline Business Case.
- Anglian Water is being approached for a contribution to support the scheme.
- Mundesley Inshore Lifeboat has been providing a place for the Mundesley Coast Protection Scheme Local Liaison Group to meet.

### How can you help?

The community can offer to help the scheme and this 'contribution' can be included in the case for Government funding. For example you may be able to offer beach access or provide a site for a construction compound or contribute to future maintenance.

Contributions can be in kind or financial. Even if a contribution is a small, it will help to demonstrate local support. Please speak to a member of the team.

### What will happen next?

**A Local Liaison Group** made up from Members of the Parish Council, District Councillors, Mundesley Inshore Lifeboat, Local Fishing Fraternity, Local Businesses and Anglian Water has been set up. The liaison group will help to keep people informed, ensure local knowledge and feedback is included and ensure that the scheme is sensitive to local circumstances. Please speak to a member of the team for contact details.

**Developing the shortlist of options** - The short list of options, economic and environmental assessment and potential contributions will be developed further following this event.

**Sharing the final preferred scheme** - A preferred scheme will then be presented to the village and other stakeholders in the spring for a final opportunity for people to put their input into the scheme.

**Decision** - It is anticipated that the scheme will be finalised and presented to the Environment Agency in the late Spring 2017.

### If the Outline Business Case is approved these are the next steps:

- Detailed Design of the Coast Protection Scheme
- Consenting for the construction of the scheme
- Procurement of the Construction Contract (deciding who will build it)
- Construction of the scheme - possibly 2018
- Ongoing monitoring and maintenance

### Would you like to be kept informed?

If you would like to be kept informed about the Mundesley Scheme, please contact the Coastal Management Team via the contact details on the back of this booklet.

## Contacts



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