



The National Trust
Mullion Harbour Study
Final Report
January 2006



Halcrow Group Limited and BSW Ltd



Halcrow

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The National Trust

Mullion Harbour Study

Final Report

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Executive Summary

Background

Mullion Harbour is located on the Lizard Peninsula in Cornwall. It comprises two stone block breakwaters (the Western Breakwater and the Southern Breakwater) and a quay (the

Northern Quay), both of which are approximately 115 years old. The breakwaters have suffered repeated damage from storms since their construction, the most recent episode being during the last decade. The repairs cost the National Trust some £1 million and have addressed the damage.

Mullion Harbour is owned by the National Trust. In 2004, the Trust commissioned the Mullion Harbour Study to investigate management strategies for the harbour for the next 100 years. The Study will assist the Trust in selecting an appropriate strategy for the future management of Mullion Cove. A stakeholder group including representatives from the local community, government agencies, local councils and other Cornwall harbours, has been established to liaise with the study team.

Issue

The harbour structures will continue to deteriorate as they age. In addition, sea level has risen since the structures were built and projected, accelerated sea level rise over the next century due to climate change will result in larger waves attacking the structures more frequently. Due to the effects of global warming and post-glacial rebound, sea level rise of 5mm per year is presently projected for the South-West region of the United Kingdom. If the water depth increases (due to sea level rise), so will the wave heights. It is expected that the wave heights approaching the harbour will increase by approximately 60% of the predicted increase in water level. By 2100, it is presently projected that the sea will have risen by 0.5m, and therefore the wave heights would be expected to increase by approximately 0.3m. The result of the structural deterioration, sea level rise and increased wave energy is that repair and maintenance costs for the harbour will increase over the next 100 years.

The National Trust has significant but limited resources with which to manage, repair and maintain the coastal properties and inland properties that it owns. It wishes to use these resources in the best way possible, in an effective and sustainable manner.

The potential conflict between increasing repair and maintenance costs and the Trust's ability to fund these costs is the key issue for Mullion Cove in the 21st century. The Trust is very mindful of the local community and environment, however. Associated concerns are therefore the impact of the Trust's management of the Cove on the local economy, community and the environment.

Options

Three fundamental approaches to managing Mullion Cove over the next century have been identified, as follows:

- Major works to protect the existing harbour structures (embellishment).
- Maintenance and repair.
- Allowing the existing harbour structures to be lost (retreat).

After discussions with the stakeholder group, the following options have been developed within these fundamental approaches:

- Construction of an offshore breakwater to provide shelter to the harbour.
- Maintenance and repair (frequent low-level maintenance plus regular repair of deterioration and damage).
- Managed retreat, as distinct from unmanaged, reactive retreat or a 'Do Nothing' approach.

During discussions between the Trust and the study consultants, while working through the above three options, it was felt worthwhile to consider a fourth, hybrid, option, which is as follows:

- Maintenance and repair for a period until the harbour suffers major damage and begins to fail, followed by a move to a managed retreat regime.

Description and Assessment of Options

Offshore breakwater

Two layout alternatives for the offshore breakwater option have been developed. Both layouts are surface piercing, low crested, reef-type structures located just seaward of the Western Breakwater. The offshore breakwater would be 50m by 7m wide at the crest, with sloping sides falling from the crest to the seabed. The offshore breakwater would be constructed from rock or man-made concrete armour units.

The offshore breakwater would reduce the loading on the harbour structures by approximately 10% to 30%. The offshore breakwater would be visible at all stages of the tide so would have adverse landscape impacts, in addition to adverse navigation impacts (during construction and operation) and ecological impacts (during construction).

The offshore breakwater would reduce harbour repair and maintenance costs but would itself require maintenance. Net maintenance costs over 100 years are estimated at approximately £3.2 million, which is a significant long-term funding commitment. Construction costs for the offshore breakwater would also be high (approximately £2.4 million to £3 million). Future costs (beyond the 100-year study timeframe) are estimated at £2.4 to £2.8 million. There are risks that the harbour condition could deteriorate more rapidly or significantly than expected and that sea level rise could be greater than predicted, reducing the beneficial effect of the offshore breakwater and resulting in increased storm damage.

Maintain and repair

For the maintain and repair option, initial repairs would be undertaken comprising concrete repairs and bagwork to the Western Breakwater and pressure pointing, repointing and grouting on most of the harbour structures (including the corner between the Western Breakwater and Northern Quay). A regime of regular maintenance and repair would then be followed, which is expected to be as follows:

Programme	Maintenance
Annually	<ul style="list-style-type: none"> • Repointing to the walls, copings, setts and slipway
5 yearly	<ul style="list-style-type: none"> • Local areas of pressure pointing to walls. • Bagwork to seaward face of Western Breakwater. • Concrete toe repair to end of Western Breakwater. • Handrail, ladder and fender maintenance/repair.
10 yearly	<ul style="list-style-type: none"> • Bagwork to seaward face of Southern Breakwater. • Localised grouting, based on observations. • Local areas of copings, setts and slipway re-laid.
25 yearly	<ul style="list-style-type: none"> • Widespread grouting

Programme	Repairs
Within 10 years	<ul style="list-style-type: none"> • Rebuild 30m of parapet (the remaining length not done in 1998). • Refurbish lamp house.
Within 50 years	<ul style="list-style-type: none"> • Re-pile toe at end of Western Breakwater.

	<ul style="list-style-type: none"> • Rebuild Western Breakwater steps. • Replace Southern Breakwater ties. • Replace concrete access bridges to Southern Breakwater.
Within 100 years	<ul style="list-style-type: none"> • Replace some Western Breakwater ties

There would be no major adverse environmental impacts associated with this option and the harbour structures would be preserved.

This option would require a significant long-term commitment on the Trust's part to fund the maintenance and repair costs for the next 100 years (estimated at £3 million). Future costs (beyond the 100-year study timeframe) are estimated at £1.3 million. There are risks that the harbour condition could deteriorate more rapidly or significantly than expected and that sea level rise and therefore storm damage could be greater than predicted.

Managed retreat

With the managed retreat option, essentially no maintenance would be undertaken and it is likely that the Southern and Western Breakwaters would be damaged to the extent they would need to be demolished and removed after 10 to 20 years. However, the life of the harbour structures could be extended by grouting the Northern Quay/Western Breakwater corner: the Western and Southern Breakwaters would need to be demolished and removed after 25 to 50 years if this grouting were undertaken.

Managed retreat would result in loss of the harbour structures so would have adverse heritage impacts in addition to the potential for some increase in storm damage to the small number of harbourfront properties, and greater difficulty in boat launching under some sea conditions.

The cost of this option (with and without grouting) is estimated to be approximately £1.5 million to £1.6 million, distributed over the remaining harbour lifetime (10 to 20, or 25 to 50 years).

Maintain and repair until failure

For the maintain and repair until failure option, the harbour would be maintained while maintenance costs were sustainable in the immediate future but this option would recognise that a point might be reached when the maintenance costs were not sustainable, at which time the management regime would move to managed retreat. This would be the case particularly if there were a series of severe storms during which it was not possible to carry out any maintenance or repair work and substantial damage/collapse caused by the storms. The maintain and repair and managed retreat elements of this option would be as described in the preceding sub-sections, noting that the grouting of the Northern Quay/Western Breakwater corner would be carried out as initial works.

The impacts of the option are less than for the managed retreat option as it would allow property owners and harbour users time to adjust to long-term loss of the harbour and is expected to preserve the heritage structures for several decades further.

The cost of this option depends on when the move to a managed retreat option occurs: if it happens after 50 years, which is the most likely scenario given the present harbour condition and anticipated deterioration, the cost is estimated at approximately £2.8 million; if it happens after 20 years, the cost is estimated at approximately £2 million. The risks that the harbour condition could deteriorate more rapidly/significantly than expected and that sea level rise and therefore storm damage could be greater than predicted would be managed by bringing forward the implementation of managed retreat.

Selection of Option

The result of the technical, cost, environmental and risk assessments, which are summarised above, have been used to guide the selection of the preferred strategy option. A quantitative ranking process has been used to differentiate the options. Specific consideration has been given to the heritage, socio-economic, landscape and ecology aspects under the broader heading of environmental assessment. From the results of this ranking process the options described above have been divided into 3 groups:

- Strongly unfavoured: both offshore breakwater option alternatives due to the risks, technical difficulties and costs. The offshore breakwater also does not score well from an environmental perspective.
- Unfavoured: managed retreat option (with and without grouting alternatives). The environmental disadvantages and the risk for both alternatives against it.
- Favoured: maintain and repair until failure and maintain and repair options, both of which score well, with the maintain and repair until failure scoring better on costs grounds and the maintain and repair option obtaining a higher heritage score.

Conclusions and Recommendations

The study identified that the maintain and repair until failure option is the preferred management strategy for Mullion Cove for the next 100 years. The study is endorsed by the stakeholder group, which has made a significant contribution to this project and its findings, as well as the Mullion Harbour Association, Mullion Parish Council and the Trust's Projects and Acquisitions committee,

The option provides a viable management strategy for the future which enables the community and the Trust to balance the environmental, technical, risk and economic considerations associated with Mullion Harbour. It will allow the community, visitors and Trust members to enjoy the harbour for as long as practicable, while recognising that the Trust does not have the resources to sustain the harbour indefinitely and that there will come a time when the harbour is damaged beyond repair.

It is therefore recommended that the maintain and repair until failure strategy is implemented by the Trust, including:

- The suite of initial works identified in this study.
- An inspection and maintenance programme, including both general and structural maintenance at regular intervals.
- Five yearly review of the management strategy, taking into consideration developments in climate change, changes in the harbour structures, community and environment.