Livermead Sea Wall and the Future of Sea Defences in Torbay

Background

A briefing report on the breach to the sea wall at Livermead was considered at the meeting of the Overview and Scrutiny Board in April 2013. The report answered five specific questions which had been raised by the Vice-chairman of the Board and gave a summary of the response to the incident. At that meeting, the Board agreed that it would carry out a review into the circumstances surrounding the collapse and the subsequent response to determine if lessons could be learnt.

A call for evidence was developed in consultation with members of the Board. The scope of the review is set out below.

Scope of the review

In terms of the collapse at Livermead in April 2013:

- To understand the decision making process up to the start of the contract to carry out works to the sea defences at Livermead.
- To review how the public were kept informed during the period of the collapse and subsequent discharge of sewage from Hope's Nose.

In relation to the sea defences generally:

- To consider the prioritisation of future works to Torbay's sea defences and the associated the budget position.

Findings

Torbay Council, South West Water, the Environment Agency and the National Oceanographic Centre (part of the Natural Environment Research Council) were asked to submit responses by 31 July 2013.

To date, a response has only been received from Torbay Council (collated by Patrick Carney) which is reproduced below.

A. Decision making process

1. When was the previous inspection of the sea wall at Livermead? How does the inspection report from May 2012 compare with the previous report?

A detailed inspection of all of the coastal assets in Torbay is carried out annually. In addition following severe storm conditions or as a result of reports of damage from members of the public or beaches team inspections are undertaken. Details of the inspections undertaken since 2010 for Livermead sea wall are detailed below:

2010 Inspection – Large voids identified in revetment. Short length of revetment completely destroyed. Stonework / pointing missing. Following

this inspection report limited works were carried out as permitted by budget constraints.

Late 2010. Large cavity in sea wall adjacent to access steps. Emergency repairs carried out using pumped and spray concrete.

2011 Inspection - The report identified pointing works required; parts of the revetment were missing as previous, evidence of voids within the remaining revetment. Following this inspection report further repair works were carried out as permitted by budget constraints. These works included some sprayed concrete works to the revetment south of the access steps.

March 2012 – Voids were identified in the base of the sea wall where revetment was previously destroyed. Emergency repairs carried out including filling voids with concrete, sand-bagging (concrete filled bags) to the wall at beach level.

2012 Inspection - Major work needed to revetment. Further large holes in base of sea wall where the revetment had previously been destroyed. Deep pointing required. As a result of this report major repair works were proposed.

2013 Inspection - No inspections carried out - major works in progress.

Prior to the major wall sea breach in April 2013, minor works continually being identified with only short-term solutions being implemented due to limited budgets.

2. Funding for the works was agreed in July 2012 but with an instruction to apply for match funding. Why was remedial work not carried out at that stage? Did the delay, caused by applying for match funding, mean further damage was caused to the wall contributing to its collapse?

Following approval of the Council funding being available for the repair works to Livermead Sea Wall from Scope in July 2012 detailed design works for the repair works was commenced. In addition, as the Council do not hold a select list of contractors for this type of repair works Procurement advertised the works and any contractor that expressed an interest was sent a pre qualification questionnaire (PQQ) to complete. Following receipt of the PQQ's, a detailed assessment was undertaken and the most suitable contractors were chosen.

On completion of the detailed design works and the production of the contract documents the successful contractors were invited to submit their tenders for this work. Following receipt of the tenders, a detailed tender review was undertaken including an assessment of the costs and the construction methods proposed. As a result of this detailed assessment the most economically advantageous contractor was chosen to undertake these works.

There was no delay in the project as a result of the application for match funding as this ran concurrently with the design and procurement process. With regards to the application to the Environment Agency for match funding, works commenced on preparing a detailed project appraisal report following approval of the Council's funding being in place. Prior to this the proposed repair works to the sea wall had been included within the Council's application for schemes to be identified on the EA's medium term financial plan.

The project appraisal report that is required to be submitted to the EA's project appraisal board to secure grant in aid funding is a very detailed document that requires specific information relating to the reasons why the scheme is required, the history of problems being encountered, all options that have been considered, a comparison of the options and justification why the proposed option has been chosen, the estimated cost of all the options, an assessment of the damages that will occur if no works are undertaken and the benefits that all options will provide. This report was due to be submitted to the EA in late spring however as a result of the breach occurring to the sea wall on Easter Monday it was agreed that an report could be submitted to the project appraisal board in May 2013 using a reduced project appraisal report. The scheme was considered at the project appraisal board on 21st May 2013 and following detailed questioning of Torbay Councils representative the scheme was approved for grant in aid funding.

3. How did South West Water engage with contractors and at what stage? Could this have been carried out earlier (i.e. before the contract was awarded)?

South West Water were reluctant to make decisions regarding approval for the proposed method of working the Contractor wished to use at Livermead passing this process to their consultants. This took several weeks to reach an agreement. We are not aware that any of the six tenderers sought approval of their method from South West Water in advance of contract award..

Within the contract documentation the contractor was required to speak to all statutory undertakers with regards to the scheme. Due to the location of the rising main under the pavement behind Livermead sea wall, prior to the breach and the contract commencing, the Contractor was made fully aware of their obligations to contact SWW and agree their proposed temporary works.

4. The Board received the summary of the incident response at its meeting in April 2013. Was this in accordance with the Council's emergency procedures? Have those procedures been reviewed to take account of any lessons learnt?

The response to the incident was in accordance with the Council's emergency procedures. However, a Lessons Learnt exercise has been carried out and identified two issues:-

1) The Council had the South West Water contact numbers for their customer contact centre rather than their emergency control centre.

2) Whilst the incident mainly involved officers from Resident and Visitor Services an emergency management team could have been formed to manage the incident.

5. How much have the emergency works cost compared to the costs anticipated for the managed works? How will these additional costs be met?

The emergency works have cost in the region of £130k. The entire contract including the emergency works cost £523K. The original contract value was for approximately £350K. These costs are only for the physical works

undertaken on site and do not include for the detailed design and supervision of the works, site investigations, surveys or the cost of the repairs to the rising mains.

It should be noted that the original contract was for the repair of only 40m of revetment at the base of the sea wall. Due to the breach and the additional damage to the revetment the entire length of revetment has been strengthened. This equates to a length of over 4 times the original length of repairs for an additional cost of only £43K.

The additional cost of the works has been included within the application to the Environment Agency which received approval for grant in aid funding at the meeting in May 2013.

B. Communication

6. Do you believe the community could have been better advised about the spill? Why was there no general release of information as to whether swimming was safe?

Torbay Council and South West Water went to great lengths to provide public information relating to the road and sea wall problems and the associated release of sewage. This was done via news releases, website updates, social media and the display of warnings on Torbay beaches. Warning measures were put in place on Tuesday morning, following the decision taken by South West Water to activate the screened overflow system at Hope's Nose. The decision was taken for signs to be deployed at all the designated bathing waters around the Bay as a precautionary measure. This action began mid-morning. The sewer line failed at Livermead just before midday on Tuesday 2 April when signs were already being put in place.

A news message describing the incident and its effect was placed on the Torbay Council website on Tuesday 2 April. This appeared on the main Beaches page and also under the separate page for Bathing Water Quality, and was periodically updated on 2, 3, 5, 8 and 10 April.

News releases, member briefings and media enquiry responses were issued over a period of several days. The Communications Teams in Torbay Council and South West Water also co-ordinated various radio and television filming and interview requests from the BBC and ITV Westcountry to ensure that all the relevant public information was presented via the media.

7. Who took responsibility for informing the public about the sewage in the water? Where both South West Water and the Council clear about those responsibilities?

South West Water and Torbay Council both took responsibility for informing the public about the sewage in the water. On the morning of Tuesday 2 April 2013, Torbay Council's Communications Team was advised of the collapse of part of Torbay Road and the hole in the sea wall, and was given information for the preparation of a news release.

This information included the fact that the council was working with colleagues in South West Water as some utility apparatus had been exposed,

In line with standard practice when a partner agency is involved, a Torbay Council Communications Officer contacted South West Water's Communications Team to discuss the best way forward with the management of publicity.

It was agreed that the council would handle the public information relating to the road closure and a description of what had occurred, whilst South West Water would deal separately with public information relating to its infrastructure, the problems for Torquay's sewage system and the use of the overflow system at Hope's Nose.

There was a clear understanding between Torbay Council and South West Water on their respective responsibilities.

8. Why did the Council not inform the public of the consequences of the decision to turn off the sewage pumps in the press release issued on the Tuesday following the collapse (2 April 2013)?

The response to Item 7 explains the reason why this information was not included in Torbay Council's news release.

C. Future works

9. Whose responsibility is it to maintain the sea defences in Torbay?

Policy responsibility for all flood and coastal defences lies with the Environment Agency (EA). However, this responsibility is often cascaded down to maritime authorities as land owners, as is the case with Torbay.

10. What is the current condition of the sea defences in Torbay? How are these monitored?

The sea defences in Torbay are under continuous attack from the prevailing easterlies and are subject to erosion. They are visually inspected annually by the cliff inspectors.

Additional inspections of the known vulnerable locations are carried out following storms. Sites will also be inspected following reports of concerns / failures from other sources.

11. What impact will the (apparently) changing weather patterns have on the condition of the sea defences?

Unprecedented stormy / rain conditions, rising sea levels and wind strengths are predicted. This will increase the risk of severe damage and collapse to many of our vital sea defence walls, many of which were built by the Victorians well over 100 years ago.

A significant percentage of the coastal geology of the bay is soft sandstone / breccias / mudstone sandwiched within layers of limestone. The softer material will erode faster and absorb more moisture causing it to slide and or topple. With predicted climate change, these materials will erode faster and absorb more moisture causing them to slide or topple.

Scouring, caused by future aggressive sea conditions will erode the foundations of sea walls and the bases of cliffs, potentially causing loss of stability and eventual collapse. Rising sea levels will also cause a phenomena referred to as 'coastal squeeze'. This will lead to less and less beach area being exposed by the sea, even at low tide.

12. Will the monitoring arrangements change as a result of the collapse at Livermead and/or the changing weather patterns?

Unlikely due to constraints on current resources resulting from funding pressures on this discretionary budget.

13. What arrangements are in place for the repair and maintenance of the sea defences?

Sea defences inspected annually through the maintenance contract with TOR2. The inspectors provide reports to the Engineering Division indicating any works they consider necessary. Areas will be assessed by the Engineer. Depending on the scope of works required, orders will be placed with TOR 2 to carry out the necessary remedial works.

If substantial remedial works, or emergency works have been identified, estimates are prepared. Cases are then put forward to secure funding. Depending on values and if TOR2 decline, tenders will be sent to competent contractors, which are evaluated. Award of contract made to the successful contractor.

14. How are repairs and maintenance to the sea defences funded? What is the current budget provision set aside for this issue?

There are various different funding streams that are used to try and secure funding for the repairs and maintenance of the sea defences. These include internal funding through the Council capital budgets, EA grant in aid funding, local levy funding, occasional private / community funding and developer funding through Section 106 or the community infrastructure levy (when commenced).

Where grant in aid funding is applied for from the EA the scheme must first be included in their medium term financial plan. Applications for schemes to be included on the medium term financial plan are submitted annually. Once a scheme has been include on then medium term financial plan the detailed business case (project appraisal report) has to be submitted to the EA's project appraisal board. As part of this process a detailed cost benefit analysis is required to be completed identifying the assets that will benefit from the scheme and the estimate of these benefits compared to the do nothing scenario.

It should be noted that as a result of changes to the grant in aid funding mechanism all scheme will in the future require an element of partnership funding. Before the grant in aid funding is released this partnership funding must be secured.

The current revenue budgets in place for maintenance of sea walls and coastal areas are as follows:-

General Coastal works	£12,100 (to serve in excess of 60 sites)
Livermead & Meadfoot Sea Wall(s)	£19,800 (Highways Budget)

Currently Torbay have submitted the following schemes to the Environment Agency for inclusion on their Medium Term Financial Plan for coastal defences.

- Broadsands Sea Wall repairs £ 150,000
- Torbay Coastal defences £1,085,000 (over 5 years)
- Haldon and Princess Piers £5,989,000
- Meadfoot Sea Wall £ 155,000
- Victoria Breakwater £ 197,000

15. How are repairs and maintenance to the sea defences prioritised alongside other demands?

Dictated by both severity and location and within the budgets set by Full Council as part of the annual budget review.

16. What external funding opportunities are being pursued? What discussions are taking place with other authorities and central government about this issue?

Refer to 14 above.

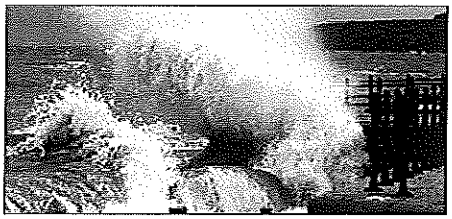
Whilst a response from the National Oceanographic Centre has not yet been received, the following article provides some background to how changing weather patterns are impacting on sea defences.

NATURAL ENVIRONMENT RESEARCH COUNCIL
NEWS FROM THE NATURAL WORLD
Planet Earth Online

FEATURES

Modelling water from clouds to coast

9 September 2009



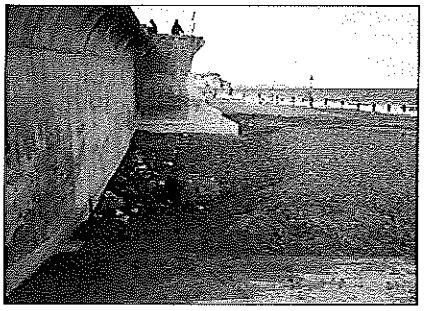
New research could help scientists provide better warnings ahead of natural disasters like coastal flooding. Qingping Zou and Dominic Reeve explain.

Flooding and erosion threaten four million people and properties in England and Wales. Within the UK, assets worth an estimated £132.2 billion are at risk from flooding by the sea and £7.8 billion more from coastal erosion. In contrast, assets at risk on river flood plains are valued at £81.7 billion.

These values are likely to grow significantly as the climate changes. Sea levels are rising and storms will become more frequent and more intense. Protecting coastal communities and cost-effective government spending on flood defences depend on being able to predict the impact of worst storms on sea defences and to quantify and manage flood risks.

In 2006 the Natural Environmental Research Council (NERC) launched a £8 million research programme called Flood Risk from Extreme Events (FREE). By an 'extreme event', we mean one with a return period of more than 50 years. The most devastating of storm surges, such as the 1953 event that killed 307 people along the east coast, had a return period of 250 years (return period is the expected time between events of the same severity. It is often used to define extreme events.) The idea is to improve the predictability and reliability of modelling systems from clouds to rivers to coasts.

The UK government spends around £325 million a year maintaining sea defences and shore protection along its 4300km coastline. Coastal flood defences are usually designed to withstand storms or floods with a return period of 50 to 200 years. It is too expensive for engineers to build defences that protect against all eventualities, so they design for all events that are likely to occur more than once every 50 years, or 200 years, depending on the policy.



Scour is the removal of sand at the base of the wall, leading to structural undermining and collapse.

Weighing the risks

The appropriate return periods are set through mutual agreement between the client and the consultant. Where the client is the government then protection levels for flood defence are usually specified in policy guidance documents. These are based on assessments of the level of risk that we communally call 'acceptable', given the perceived balance between the cost of constructing the defences and the possible consequences of not doing so.

So design periods are not immutable, but change over time according to public perceptions of risk. (This will often be higher after a major flooding incident, when public awareness of the risks is raised as a combination of direct experience and media coverage).

The return period for a particular scheme will depend on what is being defended and the cost of construction, or the 'benefit-cost ratio'. The return period for coastal defences is currently chosen within the range 50-200 years for all but the most exceptional cases - the Thames Barrier was designed to resist a 1-in-1000-year event.

Currently, we don't have a robust and integrated 'clouds-to-coast' framework for coastal flood risk. The interactions between the atmosphere, oceans and coasts are poorly understood. There are large uncertainties in the performance of sea defences and predictions of coastal flood risk in extreme conditions.

Within the FREE programme, NERC has funded the Ensemble Prediction of Inundation Risk and Uncertainty arising from Scour (EPIRUS) project to bring together a team of hydrometeorologists, oceanographers and coastal engineers. Dr Qingping Zou is the principal investigator and co-investigators are Professor Dominic Reeve and Dr Shunqi Pan at the Coastal Engineering Research Group of University of Plymouth.

Predictions by ensemble

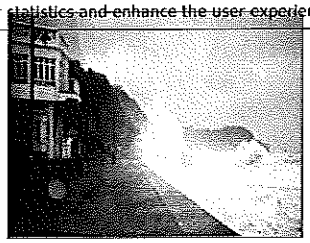
We are collaborating with a team from the University of Bristol led by Professor Ian Cluckie (now at Swansea University) and Proudman Oceanographic Laboratory as well as industrial and public-sector partners including the Halcrow Group and the New Forest District Council.

By bringing together models of atmospheric weather conditions, waves, surge and tide propagation, and physical changes near the shore, we hope to create a new way of predicting coastal flooding. The system will let us better quantify the risk that defences will fail during extreme storms. In particular, this project will focus on processes leading to flooding due to failure of defences; that is, toe scour and wave overtopping.

We use an 'ensemble' approach to improve predictions. The Monte Carlo simulation is one well-known example of an ensemble prediction system. These systems are now common in weather forecasting, but are not widely used in coastal engineering.

Weather forecasting systems are chaotic. A small error in the initial conditions, say wind speed or direction, or entering a slightly lower land-surface temperature in some areas, can

amplify rapidly with time. At present, we can forecast major weather patterns reasonably well up to about three days ahead. Beyond that



Overtopping is when water passes over the top of the sea defence crest line.

uncertainties in the forecasts can become so large that the forecast is no longer meaningful.

With ensemble forecasting, instead of running just a single forecast, we run the model many times from slightly different starting conditions. The complete set of forecasts is referred to as the ensemble and individual forecasts within it as ensemble members.

This type of ensemble prediction approach allows us to estimate the relative probabilities of different outcomes and so improve our understanding of the reliability of results. This approach also provides a measure of the uncertainty associated with predictions. Extreme events are rare, and ensemble predictions are more likely to capture them than conventional forecasts.

This three-year project started in early 2007 and consists of three strands: meteorological modelling; regional scale wave and surge modelling; and surf zone hydrodynamic and morphological modelling.

One of the issues is to make global climate predictions for this century meaningful to the UK. We are developing a linked set of numerical models to apply global atmospheric predictions to a UK scale. From this we want to predict the associated sea surges, tide and waves, simulate wave propagation into shallow water and show what happens when these waves hit sea walls and the beach. These models will be used to create a set of physically possible outcomes (the ensemble) from which uncertainties in flood predictions can be quantified.

Predictions of beach and sea defence response to each ensemble of storms will establish a statistical description of the ensemble coastal flood risk arising from overtopping and scour.

This ensemble system will then let us assess the uncertainty in predicting overtopping and scour as well as the associated coastal flooding, which is particularly large during extreme events. The modelling results will help evaluate how suitable the way we currently design coastal defences is for future extreme events. We will gain an improved understanding of the combined risks of scour and overtopping, together with a measure of the uncertainty in predicting them

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Next steps

Following your consideration of the attached information, members are asked to confirm if they wish to pursue this review further.

- Is there any specific further information that you require?

- Do you want to consider this matter at a meeting of the Board? If so, who do you wish to attend and what specific areas would you examine?

If you wish for this item to be included on the next agenda for the Overview and Scrutiny Board, please let me know by Wednesday 14 August 2013.

Kate Spencer
Overview and Scrutiny Lead

5 August 2013