Adur District Council

A report in relation to trials of new technology FloodSax that took place on 14th August 2007 in Shoreham by Sea, West Sussex.

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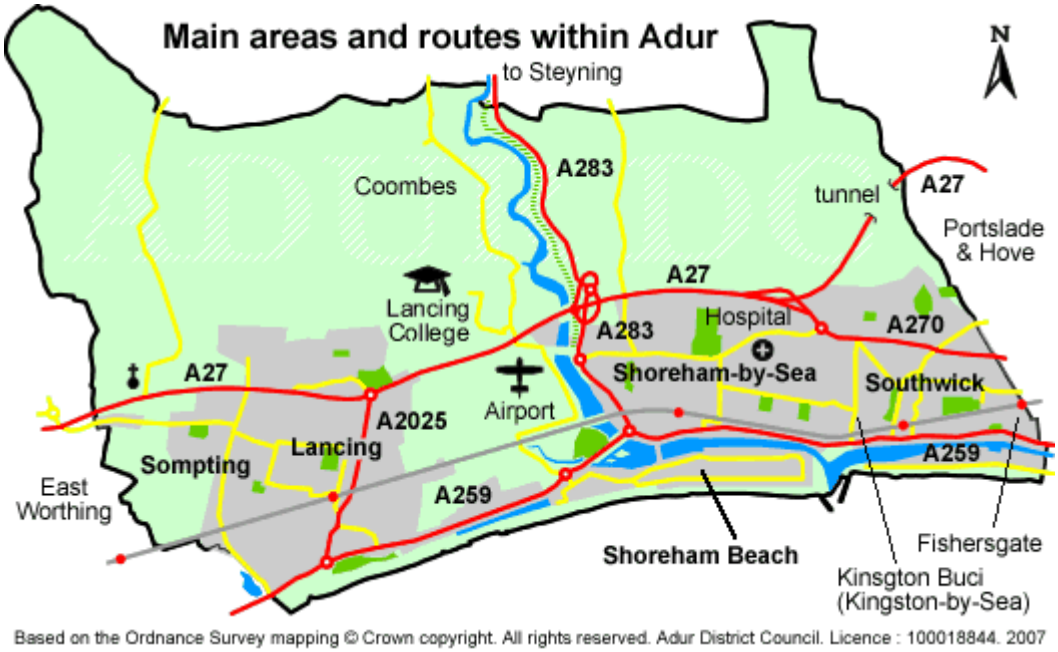
ADUR
DISTRICT COUNCIL

Background.

Adur District Council is a south coast authority of approximately 60,000 population situated on the West Sussex coast between Brighton & Hove and Worthing. It stretches inland from the coast to the South Downs. The District, although largely residential, has substantial industrial areas, a seaport and airport, Inland from the built-up area, most of the District is part of the Sussex Downs AONB (intended to become a national park).

Shoreham Beach to the south of the town is the shingle bank thrown up over the centuries by the sea. Converted railway carriages became summer homes around the turn of the century, and Bungalow Town, as it was then known, became home for a short time to a flourishing film industry. It was cleared for defence reasons during the Second World War and is now developed with modern houses. However the Church of the Good Shepherd, built in 1913, still stands.

The word 'Adur' is said to be of Celtic origin and comes from 'Dwyr' meaning 'water'. The District takes its name from the River Adur which divides Shoreham-by-Sea and Southwick in the east, from Lancing and Sompting in the west.



Flood and Coastal Defence

High level targets for flood and coastal defence Adur District Council's Policy Statement on Flood and Coastal Defence

In August 1998 the Agriculture Select Committee published its report on flood and coastal defence. The Government response required the Ministry of Agriculture Fisheries and Food, to produce a series of high level targets, which will be necessary in order to deliver its flood and coastal defence aims and objectives.

The targets apply primarily to flood and coastal defence operating authorities. Adur District Council is one of those authorities.

Extract from Council policy on flooding.

Objective (b):
To encourage the provision of adequate, economically, technically and environmentally sound and sustainable flood and coastal defence measures.
Adur District Council will:
□□provide an adequate, economically, technically and environmentally sound approach to providing the flood and coastal defence service. We will:
□□adopt a strategic approach to provision of flood and coastal defences, particularly by assessing any potentially wider effects of proposed defences. To this end, we will continue to play a full role in Shoreline Management Plans, and Local Environment Agency Plans, for our area;
□□aim to provide sustainable flood and coastal defences which provide social and/or economic benefits to people whilst taking account of natural processes and which avoid committing future generations to inappropriate defence options;

Flood and coastal defence responsibilities
3.1 Apart from certain obligations to protect internationally important habitats under the EU Habitats Directive, all flood and coastal defence works are undertaken under permissive powers. This means that operating authorities, such as Adur District Council, are not normally obliged to carry out flood and coastal defence works. **It is also important to note that the Council does not normally accept responsibility for maintenance of flood defences on private land; this is the responsibility of the landowner.**

Action to reduce or manage flood risks
3.8 The main means by which flood risks will be managed is through the Environment Agency's flood warning dissemination plan of September 2000. This makes arrangements for warnings to be provided in coastal and main rivers within this Council's area, including individual warnings

to high risk properties. The Environment Agency hold plans and can advise on areas of risk. Adur District Council has included plans for responding to both major and minor flooding in its emergency planning procedures and has arrangements for cascading warnings received from the Environment Agency to relevant Council services.

.*Extract from Hansard* 22 Jan 2002 : Column 211WH

Tim Loughton MP

Shoreham beach in my constituency—a densely populated spit of land with many thousands of residents—is very low lying. The Shoreham and Lancing coastlines are all low lying but densely populated. We are not talking about pleasure beaches, holiday homes or caravan sites, but about the thousands of people whose homes are located within several yards of the sea, and they are exceedingly vulnerable. The Sussex coastline, from Brighton to Bognor Regis, is a built-up, urban strip, where the vast majority of people in south Sussex live.

The Minister knows that my constituency and the constituencies of many of my hon. Friends in that area are bordered to the north by the downs and to the south by the sea, where it is impossible to build. We are squeezed between those two natural features. If sea waters rose significantly, large parts of my constituency would be engulfed. We would require not what is called a managed retreat, but a retreat for many thousands of people.

We need to ensure that local authorities receive a proper share of funding for flood defence work. Some years ago, Adur District Council received less from central Government for its flood prevention work and coastal defence work than did Crawley Borough Council, which is some 20 miles north and well inland.

Recent history of flooding in Adur District.

Coastal flooding – Sea

The major works undertaken by the Environment Agency to protect the coastline in Adur District have resulted in little or no recorded flooding from the sea in the past five years. Whilst there have been a number of incidents that have been recorded as overtopping of the beach defences these have not resulted in the flooding of properties on the beach or in the district.

Fluvial / Pluvial

Flooding from the River Adur in the past five years has been mainly restricted to the flood plains and meadows alongside the River. There have been instances where the main road leading north from Shoreham (A283) has been subject to light flooding during each of the past five years, there are no recorded incidents of flooding requiring evacuation of houses or businesses associated directly with the River Adur failing to keep within its banks.

In 1999 and again in 2000 and 2001 there were a number of flooding incidents in the District most of which were associated with either flash flooding or flooding as a result of groundwater levels rising. This was particularly so in the Southwick area and areas of lancing. On two occasions during this period the A27 Trunk Road was either closed or partially closed due to the effects of flooding from groundwater and spring water rising in close proximity to the road. Flash floods have occurred in the areas of Sompting, North Shoreham Road and Southwick affecting both properties and roads. It is of interest that the areas subjected to flooding on these occasions do not appear in the Environment Agency flood map produced for the District. The latest flood events took place in July 2007 when heavy and persistent rain resulted in a number of properties being flooded at basement and ground levels. None of these flooding incidents required evacuation of properties or business failures.

Council sandbag policy.

The Adur District Council sandbag policy is an agreed policy document adopted by local authorities in Sussex. See ww.adur.gov.uk sandbags policy

It can be seen from the policy that emphasis is placed on protection of strategic infrastructure and with a stock of 200 sandbags the levels of protection are limited.

Civil Contingencies Act.

Adur District Council acknowledges its duties under the Civil Contingencies Act and has produced business continuity plans supported by financial resources to implement the plans. It also acknowledges that it has a duty to support business continuity within the District and it is to that end that the Council has been undertaking trials to ascertain if there is an alternative to traditional sandbags that could provide an initial protection to businesses in domestic properties in the District commensurate with the risk.

Community Risk Register.

The Community Risk Register for the District and the Register for Sussex indicates that there is a high risk of flooding resulting from the hazards associated with high tides, severe weather and fluvial flooding associated with the rivers and water courses.

Other considerations.

Adur District Council in common with other businesses has a number of duties including those under the Health and Safety at Work Act and the Manual Handling Regulations to assess and where possible eliminate or reduce the risks associated with manual handling. A manual handling assessment associated with sandbags indicated that efforts should be made to mitigate or reduce the risk to council employees involved in the transportation and distribution of sandbags.

In common with other councils in Sussex there is a reducing the number of Direct Labour employees capable of being called upon, especially out of hours, to facilitate the provision of sandbag defences. The recent request to supply sandbags to a neighbouring authority was observed and measured. It required 2 employees to be diverted from other tasks, a forklift truck, a small lorry and a total two hours to deliver 100 sandbags at a true cost of £498. In addition the same bags had to be unloaded by hand and carried in difficult conditions across hazardous areas before being deposited for use in the flooding incident.

Previous trials.

The council has previously undertaken a small trial involving polymer-based FloodSax that had been manufactured in the same shape and style as a traditional sandbag. This trial showed that there was a future for this type of technology to replace or supplement traditional sandbags. The trial provided evidence that the manual handling risks associated with sandbags could be reduced along with the storage and transportation costs. These early versions absorbed some 9 litres of water and it was recognised that they could be used as an immediate first aid for blocking of air bricks and, in quantity, offering some protection to doorways. These bags had some limitations in relation to building of walls or structures and did not perform at all well in seawater trials.

Background to present trial.

At the Emergency Planning Society Conference (2007) in Torquay, contact was made with a national emergency equipment supplier (www.EDSlimited.co.uk) that led to preparations for a trial of new technology FloodSax. The trial was arranged for August 14, 2007, a day when there would be predicted spring tide of 6.2 m and it was hoped that the long-awaited summer would have arrived.

Representatives of responders under the Civil Contingencies Act in the southeast of England were invited to the trials to obtain first hand knowledge of a product which if successful and taken up by local businesses and the community could improve flood preparedness. A total of 76 observers attended the trials.

Emergency Planning and Business Continuity.

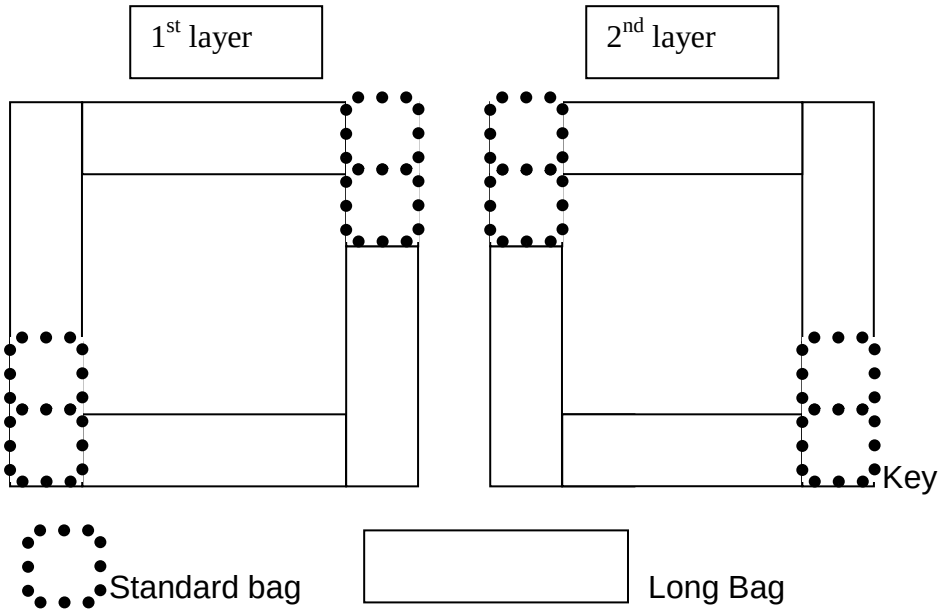
Responsibility for Emergency Planning and Business Continuity falls within the remit of the Corporate and Public Safety Unit of the District Council. The unit manager is John Rodway, a registered risk practitioner, member of the Emergency Planning Society and the International Institute of Risk and Safety Managers. He is the author of this report and responsible for the coordination and planning of the trials in relation to new technology FloodSax.

Trial 1.

Purpose. To demonstrate that the bags could be built to form a structure capable of holding a body of water.

Trial. To build a structure of several layers to demonstrate that the bags would not collapse under their own weight and would not be easily moved by weight or pressure of water.

In this trial FloodSax were inflated to form a tank capable of holding water,



The bags were initially energised / inflated by placing 2 bags in a standard dustbin filled with water. The standard bags took about 2 minutes to energise and when inflated weighed 20Kgs and 20.5kgs. The long bags took about 3 minutes to fully inflate and weighed 29Kgs when inflated. This process continued until sufficient bags had been inflated to form the base of the structure.

Picture shows structure being filled and bag inflating

The initial state of the bags is a soft outer cover containing a series of packets containing a super absorbent polymer mixed with other water retaining substances. In dry conditions the bags weigh 0.2Kg (2Kg per box of 10)

The bags mitigated or eliminated the risks associated with manual handling.

The internal area was then used as a reservoir to hold water and inflate bags by use of a hose played on the bags until they inflated. Within 10 minutes it was possible to inflate 20 bags and commence building of the structure.
Observers were then invited to place dry bags into the structure and watch the process of inflation. They were invited to remove bags and add them to the structure. In total 50 bags were inflated in this trial and the structure was built up to 4 levels. The structure remained stable and it was possible to fill the inside area with water to a depth of 400mm without collapse.

Picture shows bags being added to the structure during the trial

This trial was successful.

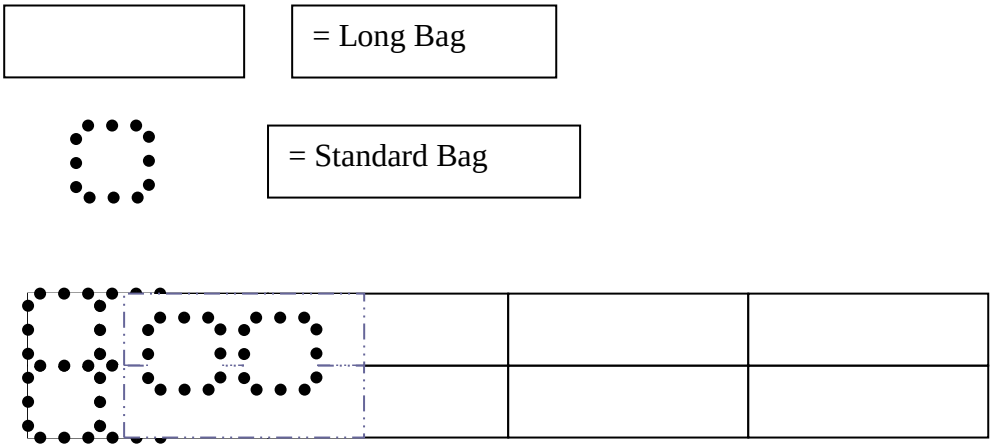
It showed that it was possible to build a stable structure capable of holding back water.

Trial 2.

Purpose. To demonstrate that the bags could be built to form a wall capable of diverting flowing water.

Trial. To build a wall of several layers to demonstrate that the bags would not collapse under their own weight and would not be easily moved by weight or pressure of water.

In this trial FloodSax that were inflated to form the tank in Trial 2 were used.



Picture shows the ‘wall’ built for Trial 2

In this trial a 64 mm open hose connected to a fire engine pump was used to create a flow of water towards the structure.

The water was easily diverted by the wall.

This trial was successful.

A further test was then devised to test the resilience of the wall when placed under greater pressure.

In this test a total of 2,500 litres was directed at a pressure of 10bar (150 psi) (1 bar = 1000,000 Pascal's – 1 Pascal = I Newton per metre) from a 64 mm hose connected to a fire engine pump fitted with a nozzle to direct the water.

Picture shows high pressure water stream directed at the structure.

This trial was successful and indicated that the inflated bags would divert flowing water and when the water pressure was increased the structure remained stable and continued to divert water.

Picture shows Shoreham Airport Fire Service engine used for the trial

Trial 3.

Purpose. To demonstrate that the bags could be built to form a structure capable of holding back a body of rising water.

Trial. To build a structure of several layers to demonstrate that the bags would not collapse under their own weight and would not be easily moved by weight or pressure of water.

In this trial FloodSax were inflated to form a wall capable of holding back water,

The trial took place in Shoreham town centre in an area known as Ropetackle. At this location there is a public slipway leading to the River Adur which at this point is tidal.

The slipway at the trial point is 11 metres wide and constructed of concrete with wooden side walls.

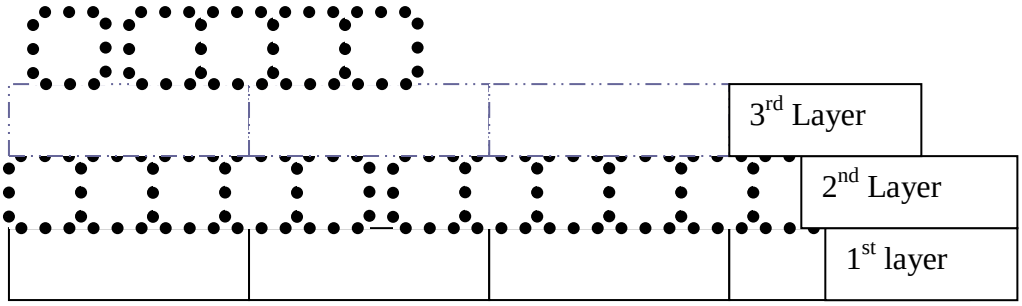
The predicted tide height was 6.2 metres at the point of trial the depth of water intended to be held back was estimated to be ½ metre (500 mm). A calculation kindly provided by Mr Tony Parker Port Engineer for Shoreham Port Authority showed that at a depth of 500 mm of water the sideway force was 0.5 tonnes per square metre at the base of the structure. This would provide a sideways pressure on the structure of 2.75 tonnes.

The previously long awaited start to summer did not materialise on the day of the trial. Prior to the start of the trial a severe weather warning was issued for the Shoreham area predicting winds gusting to over 50 mph accompanied by heavy and persistent rain with up to 25 mm in places during a short duration. The observers attending this trial can testify that the severe weather forecast was correct and was present throughout the trial.

With knowledge of the severe weather warning an early decision was made to continue the trial, it being typical of the conditions that often lead to flash flooding and represented a trial in extreme conditions.

As a result of reduced atmospheric pressure, the predicted tide height was in excess of the 6.2 metres and accompanied by high wind creating waves that increased the tide height even further.

The trial consisted of placing inflated bags across the slipway. A total of 100 bags were used in this trial.



Picture shows inflated bags being placed across the slipway.

The incoming tide reached the structure placed across the slipway some 15 minutes ahead of the high tide forecast. The tide rose rapidly and within 20 minutes and reached the top of the structure

Picture shows media crews and observers watching the incoming tide against the structure

Picture shows rising tide against structure.

At this stage of the trial it would have been an easy decision to stop the trial and allow the incoming tide through the barrier and up the slipway.

As the Emergency Planning Officer for the District, the author indicated to the manufacturer and supplier that he wished to test the barrier to destruction to observe the performance of the bags when overwhelmed by the incoming sea water. The other parties agreed to this acknowledging that there may be a risk to the product and future credibility.

Picture show the rising tide starting to overwhelm the structure.

After overwhelming the structure and starting to break up the layers it was possible to recover the FloodSax and rebuild the structure 2 metres further back and hold back water up to 100mm.

This trial was partially successful, the test to hold back a rising flood was demonstrated and showed that over 500 mm of water with a pressure of 2.75 tonnes could be resisted.

The trial did however indicate that the Superabsorbing Polymer (Sodium Polarcrylate cross linked) had an adverse reaction when subjected to sea water under pressure. This was of particular interest to manufacturer who immediately made arrangements for Research and Development testing to provide a remedy. Previous tests using a 3% saline solution failed to expose this problem and there is an assumption that the complex constituency of seawater would need to be analysed.

Conclusions.

The trials showed that the new technology FloodSax have a place in flooding preparedness and could be considered for initial protection of domestic buildings and small to medium business units.

In the freshwater trials they performed very well and resisted water at a high rate of flow and pressure.

They appear to be suitable for flooding events such as flash floods, rising ground water, river flooding and domestic flooding due to water pipe failures etc.

In the rising flood water trial the bags performed well until overwhelmed by the weight of seawater. This trial was partially successful, the test to hold back a rising flood was demonstrated and showed that over 500 mm of water with a pressure of 2.75 tonnes could be resisted It was also observed that the bags performed less well in seawater and the manufacturer needs to undertake tests to ascertain why this should occur.

Disclaimer.

Adur District Council undertook these trials in a public arena with open invitations to responders under the Civil Contingencies Act.

It is not the purpose of this trial report to recommend products or to advise other bodies as to purchase or acquisition of products.

Readers of this trial report are invited to make their own arrangements for testing, acquisition and use of the product.

Acknowledgements.

The report author recognises the support given to the trials by:

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Employees and Elected Members of Adur District Council

The Management and Staff of Shoreham Airport and the Directors of Erinaceous Plc

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The Directors of Berkeley Homes for provision of parking facilities.

The District Commander Sussex Police Adur District