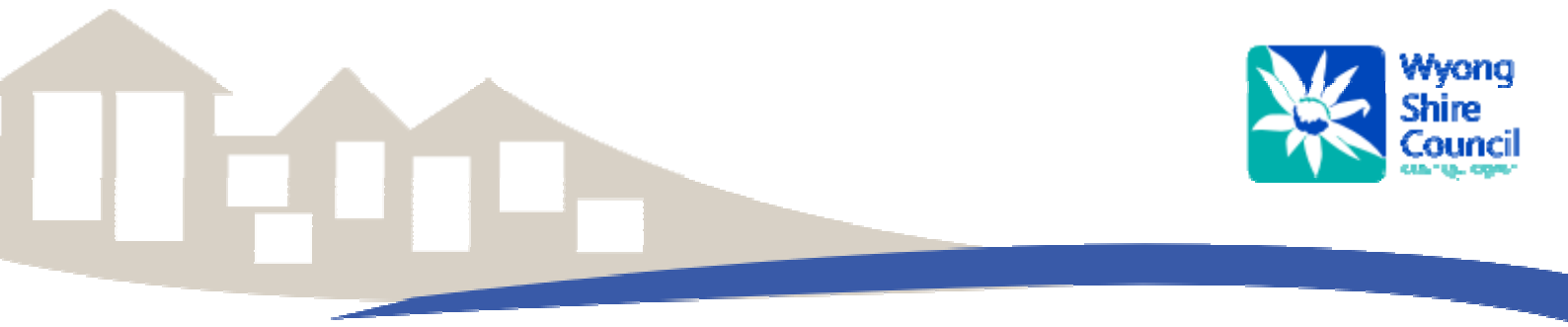


Wyong Shire Council

## Ordinary Meeting

### Enclosures

Wednesday, 27 January, 2010



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**WYONG SHIRE COUNCIL**  
ENCLOSURES TO THE  
**ORDINARY MEETING**  
TO BE HELD IN THE COUNCIL CHAMBER,  
WYONG CIVIC CENTRE, HELY STREET, WYONG  
ON WEDNESDAY, 27 JANUARY 2010 ,  
COMMENCING AT 5:00:00 PM

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**WYONG SHIRE COUNCIL**

14 May 2008  
To the Ordinary Meeting of Council

Director's Report  
Shire Planning Department

**194 Geotextile Bag Investigations**

F2007/00876 GW

**SUMMARY**

Update report on Notice of Motion by Councillors G P Best and D J Eaton at the Ordinary Meeting of Council held on 27 February 2008.

**RECOMMENDATION**

*That the report be received and the information noted.*

**ORDINARY MEETING HELD ON 14 MAY 2008**

**RESOLVED unanimously on the motion of Councillor BEST and seconded by Councillor VEUGEN:**

- 1 That the report be received and the information noted.**
- 2 That this report be referred to the Peak Manufacturers of this technology Geofabrics Australasia to provide a current product performance update for Council's consideration.**

**BACKGROUND**

At its meeting held on 27 February 2008, Council resolved as follows:

*"RESOLVED unanimously on the motion of Councillor BEST and seconded by Councillor EATON:*

*That staff investigate and report on the emerging technology and use of geotextile sandbags for dune stabilisation as temporary/permanent solutions to assist in maintaining effective management of our estuary and coastal environments."*

**Geotextile Sandbags**

Geotextile sandbags are mechanically filled textile containers sometimes used to replace rock structures in environmentally sensitive areas. They have been used with limited success as short term solutions in the construction of sea walls to guard against wave erosion as well as in the construction of groynes and river bank stabilisation works. Local examples include the construction of small seawalls at both Stockton Beach in NSW (48m long by 4.5 m high and containing over 400, 2 tonne bags) and Maroochy Beach in Queensland (200m long and 2.5m high). Groynes have also been constructed at Maroochy Beach (100m long and 2.5m high) to trap sand.

14 May 2008  
To the Ordinary Meeting of Council

Director's Report  
Shire Planning Department

## **Geotextile Bag Investigations (contd)**

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Council previously investigated the use of geotextile sandbags in the late 1980's and early 1990's. The bags were initially proposed to be stacked to form training walls as part of The Entrance channel training scheme. There was also an examination of using jet pumps to move sand across the mouth.

Patterson Britton carried out a design report on the restraining wall in April 1990. The then Public Works Department (PWD) reviewed this report and noted concerns about lack of confidence in the design; examples of failures overseas; difficulties with providing scour protection to stop undermining; increased costs (figures of \$1.12M quoted in 1990) and the problem of possible vandalism.

A technical brief was subsequently prepared by the PWD after agreement with Council, for the design and documentation for construction of a mobile dredge system (Council's dredge was commissioned in February 1993). The technical brief said, in part:

*"Detailed design and documentation of the entrance restraining wall commenced in early 1990. This work was subsequently terminated due to the relatively high cost of the structure and the Department's concern at the adequacy of the scour protection system."*

Subsequent to that, Council officers carried out an inspection of relevant geotextile walls in-situ in south-eastern Queensland.

The bags are made of a non-woven geotextile material, with needle punches at regular intervals to allow moisture to enter and exit the bag, as this is necessary in the marine environment. The bags are durable and constructed from vandal proof material (to avoid the bags being easily cut and the loss of sand filling). The bags are usually sealed by mechanical sewing using specialised machines. The bags need to be filled with sand compatible to the environment in which they will be located as they can be holed and the sand escape to the beach. Mining of the beach sand for this purpose would be subject to Department of Environment and Climate Change (DECC) approval and is currently not supported by DECC.

The bags also require specialised handling and placement using modified grabs attached to large long reach excavators. Their filling and placement requires both trained and experienced operators, as well as appropriate coastal engineering design and advice. Adequate foundations and "keying in" of the structure into the beach sands is mandatory to provide even a short term structure. This will require significant excavation at the back of the beach. Consequently, their use as emergency protection measure during a storm event would not be feasible as no stable foundation could be provided in which to key the structure. In addition, wave action would constantly re-arrange the bags within the wash zone and many bags, if not all, would be lost or broken.

14 May 2008  
To the Ordinary Meeting of Council

Director's Report  
Shire Planning Department

### **Geotextile Bag Investigations (contd)**

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Current technical specifications indicate that the retaining walls made from geotextile bags can only withstand waves of up to 1.5m. This tends to limit their application to protected areas of beaches or estuaries. There is also no current design criteria for their use that provides the same certifiable level of protection as other means such as rock seawalls or groynes. Consequently, their use as planned seawall measures to protect properties against wave erosion along beaches can be questionable for any given situation and no certifiable level of protection can be given.

The bags may also be used in dune rehabilitation projects where they could be stacked at right angles to the beach front. This would provide a base for sand to accumulate to cover the bags and re-build the dune to an appropriate height and depth. This would be followed by re-vegetation of the dune and the rebuilding of the beach face using natural coastal processes. The eventual beach profile and dune system could then be in a better position to protect any houses during future storm events. Whilst this has not occurred to date it does provide a possible means of "fast tracking" dune restoration following large storm events.

The cost of the bags is relatively inexpensive but they do require significant expertise and equipment in their use. Experience on projects to date indicates that the cost associated with using geotextile bags could be approximately half of that using more traditional materials, such as rock. Should they be used by Council, the bags and appropriate filling sand would need to be stockpiled, and appropriate machinery hired or purchased. Sand material deposited by the dredge could provide the filling but this would be subject to relevant approvals from DECC and Lands Department. Coastal engineering design and advice can be sourced from available consultants.

## WYONG SHIRE COUNCIL

23 July 2008  
To the Ordinary Meeting of Council

Director's Report  
Shire Planning Department

**343 Geotextile Bag Investigations**

F2007/00876

**SUMMARY**

At its Ordinary meeting of Council held on 14 May 2008, Council considered a report on the use of geotextile bags for dune stabilisation as a temporary/permanent measure to assist in maintaining effective management of our estuary and coastal environments. Council subsequently resolved, inter alia, that the report be referred to the Peak Manufacturers of this technology, Geofabrics Australasia Pty Ltd, to provide a current product performance update for Council's consideration. This report provides the information sought by Council's previous resolution.

**RECOMMENDATION**

*That the report be received and the information noted.*

**ORDINARY MEETING HELD ON 23 JULY 2008**

MS MARLENE PENNINGS, REPRESENTING COASTCARE, ADDRESSED THE MEETING AT 5.21 PM, ANSWERED QUESTIONS AND RETIRED AT 5.34 PM.

***RESOLVED unanimously on the motion of Councillor BEST and seconded by Councillor ROSE:***

- 1 That Council (including the role of the Estuary Management Committee) in partnership with the local North Entrance Coastcare Group and Department of Environmental and Climate Change, Council facilitate a Dune Stabalisation trial utilising the new Geotextile Bag Technology.***
- 2 That prior to any such trial staff report to Council on indicative cost and locality details.***

**BACKGROUND**

At its meeting held on 14 May 2008, Council resolved as follows:

***"RESOLVED unanimously on the motion of Councillor BEST and seconded by Councillor VEUGEN:***

- 1 That the report be received and the information noted.***
- 2 That this report be referred to the Peak Manufacturers of this technology Geofabrics Australasia to provide a current product performance update for Council's consideration".***

23 July 2008  
To the Ordinary Meeting of Council

Director's Report  
Shire Planning Department

## **Geotextile Bag Investigations (contd)**

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Council's report to the 14 May 2008 is provided as Attachment 1 to this report. The report by Geofabrics Australasia Pty Ltd is provided in full as an Enclosure to this report.

### **Comments on Geofabric's Report**

In providing the following comments, Department of Environment and Climate Change (DECC) was consulted with the objective of obtaining independent advice on the comments provided by Geofabrics Australasia Pty Ltd.

While some specifics may differ, there is general agreement between Geofabrics, (DECC) and Council that Geotextile sand filled bags have been used with mixed success over the last 20 years and that recent improvements in fabrics and design changes for the bags have produced a more robust product. There is also agreement that their value may lie in their use for appropriate applications such as dune stabilisation and levee construction to prevent inundation.

However, their use in open coastal and high energy environments is still questionable. In some regards this is similar to most of the rock structures, such as groynes and breakwalls, along our coast. Whilst many of these structures have met a primary purpose of enabling navigation or beach nourishment, virtually all have secondary impacts affecting other areas of the coast or estuary and this is why DECC now consider any such proposals with extreme caution.

In regard to the example used by Geofabrics in their report, DECC considers that the longevity of the sandbag structure at Stockton Beach is due to the fact that the beach profile has not been affected and the structure has not been put under any severe erosive forces. They also indicate that if the beach profile were to recede then the structure may fail.

DECC also consider that rocks have a higher specific gravity, i.e. they are heavier for their given size and are more stable than the larger, lighter geobags subject to large waves. Rock structures are more of a known quantity with specific design criteria well established, such that designs can be certified. This certification is necessary to provide indemnity should the structure fail and life or property affected. However, certifiable designs are not currently available for geobag structures.

Should they be used for temporary structures, DECC will still require proper design and environmental documentation for each application. Approval or otherwise from DECC would be based on the merit of the project which would need to be demonstrated through the design and environmental documentation. Basically, there are no shortcuts as structural failure could be due to the design as well as the inherent nature of the geobags.

23 July 2008  
To the Ordinary Meeting of Council

Director's Report  
Shire Planning Department

**Geotextile Bag Investigations (contd)**

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In reference to information supplied by Geofabrics on the maximum wave that the geobags can resist, it should be noted that the information has been derived through model testing and not long-term in situ performance monitoring. The consultant's report on this modelling is to be supplied to DECC in the near future and is subject to its verification. It should also be noted that the maximum wave heights that the geobags can resist is still around 2-3 metres. Average wave heights off-shore along the central coast in certain regular storm conditions can reach up to 5-6 metres, again indicating that even temporary geobag seawalls may not be suitable for open coastal applications, such as Cabbage Tree Harbour or the Entrance.

In summary, and although not obvious on first reading, there is common agreement that geobags can provide a useful basis for construction of retaining walls, groynes and levees in appropriate low energy applications. Their main forte may well be in their use in dune stabilisation and dune rebuilding and discussions are already occurring with dunecare groups and DECC with a view to setting up small trials in an appropriate location.

**Attachment 1**                      **Report to 14 May 2008 Ordinary Meeting (3 pages)**

**Enclosure**                      **Report received from Geofabrics Australasia Pty Ltd**



23 July 2008  
To the Ordinary Meeting of Council

Director's Report  
Shire Planning Department

## **Geotextile Bag Investigations (Attachment 1)**

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14 May 2008  
To the Ordinary Meeting of Council

Director's Report  
Shire Planning Department

### **194 Geotextile Bag Investigations**

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F2007/00876 GW

#### **SUMMARY**

Update report on Notice of Motion by Councillors G P Best and D J Eaton at the Ordinary Meeting of Council held on 27 February 2008.

#### **RECOMMENDATION**

*That the report be received and the information noted.*

#### **BACKGROUND**

At its meeting held on 27 February 2008, Council resolved as follows:

*"RESOLVED unanimously on the motion of Councillor BEST and seconded by Councillor EATON:*

*That staff investigate and report on the emerging technology and use of geotextile sandbags for dune stabilisation as temporary/permanent solutions to assist in maintaining effective management of our estuary and coastal environments."*

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Council previously investigated the use of geotextile sandbags in the late 1980's and early 1990's. The bags were initially proposed to be stacked to form training walls as part of The Entrance channel training scheme. There was also an examination of using jet pumps to move sand across the mouth.

Patterson Britton carried out a design report on the restraining wall in April 1990. The then Public Works Department (PWD) reviewed this report and noted concerns about lack of confidence in the design; examples of failures overseas; difficulties with providing scour protection to stop undermining; increased costs (figures of \$1.12M quoted in 1990) and the problem of possible vandalism.

23 July 2008  
To the Ordinary Meeting of Council

Director's Report  
Shire Planning Department

### **Geotextile Bag Investigations (Attachment 1) (contd)**

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14 May 2008  
To the Ordinary Meeting of Council

Director's Report  
Shire Planning Department

### **Geotextile Bag Investigations (contd)**

---

A technical brief was subsequently prepared by the PWD after agreement with Council, for the design and documentation for construction of a mobile dredge system (Council's dredge was commissioned in February 1993). The technical brief said, in part:

*"Detailed design and documentation of the entrance restraining wall commenced in early 1990. This work was subsequently terminated due to the relatively high cost of the structure and the Department's concern at the adequacy of the scour protection system."*

Subsequent to that, Council officers carried out an inspection of relevant geotextile walls in-situ in south-eastern Queensland.

The bags are made of a non-woven geotextile material, with needle punches at regular intervals to allow moisture to enter and exit the bag, as this is necessary in the marine environment. The bags are durable and constructed from vandal proof material (to avoid the bags being easily cut and the loss of sand filling). The bags are usually sealed by mechanical sewing using specialised machines. The bags need to be filled with sand compatible to the environment in which they will be located as they can be holed and the sand escape to the beach. Mining of the beach sand for this purpose would be subject to Department of Environment and Climate Change (DECC) approval and is currently not supported by DECC.

The bags also require specialised handling and placement using modified grabs attached to large long reach excavators. Their filling and placement requires both trained and experienced operators, as well as appropriate coastal engineering design and advice. Adequate foundations and "keying in" of the structure into the beach sands is mandatory to provide even a short term structure. This will require significant excavation at the back of the beach. Consequently, their use as emergency protection measure during a storm event would not be feasible as no stable foundation could be provided in which to key the structure. In addition, wave action would constantly re-arrange the bags within the wash zone and many bags, if not all, would be lost or broken.

Current technical specifications indicate that the retaining walls made from geotextile bags can only withstand waves of up to 1.5m. This tends to limit their application to protected areas of beaches or estuaries. There is also no current design criteria for their use that provides the same certifiable level of protection as other means such as rock seawalls or groynes. Consequently, their use as planned seawall measures to protect properties against wave erosion along beaches can be questionable for any given situation and no certifiable level of protection can be given.

23 July 2008  
To the Ordinary Meeting of Council

Director's Report  
Shire Planning Department

**Geotextile Bag Investigations (Attachment 1) (contd)**

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14 May 2008  
To the Ordinary Meeting of Council

Director's Report  
Shire Planning Department

**Geotextile Bag Investigations (contd)**

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The bags may also be used in dune rehabilitation projects where they could be stacked at right angles to the beach front. This would provide a base for sand to accumulate to cover the bags and re-build the dune to an appropriate height and depth. This would be followed by re-vegetation of the dune and the rebuilding of the beach face using natural coastal processes. The eventual beach profile and dune system could then be in a better position to protect any houses during future storm events. Whilst this has not occurred to date it does provide a possible means of "fast tracking" dune restoration following large storm events.

The cost of the bags is relatively inexpensive but they do require significant expertise and equipment in their use. Experience on projects to date indicates that the cost associated with using geotextile bags could be approximately half of that using more traditional materials, such as rock. Should they be used by Council, the bags and appropriate filling sand would need to be stockpiled, and appropriate machinery hired or purchased. Sand material deposited by the dredge could provide the filling but this would be subject to relevant approvals from DECC and Lands Department. Coastal engineering design and advice can be sourced from available consultants.



## SUMMARY

As per Council's email dated 25<sup>th</sup> June 2008 from Greg White Manager, Natural Resources, Wyong Shire Council has requested Geofabrics Australasia Pty Ltd review and provide comments on the Directors report dated 14 May 2008.

This follows the Council resolution of 27 February 2008 that staff investigate and report on the emerging technology and use of geotextile sandbags for dune stabilisation as temporary/permanent solutions to assist in maintaining effective management of our estuary and coastal environments.

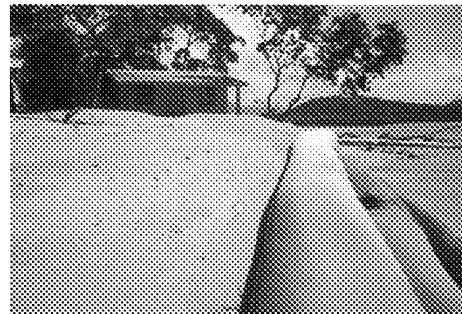
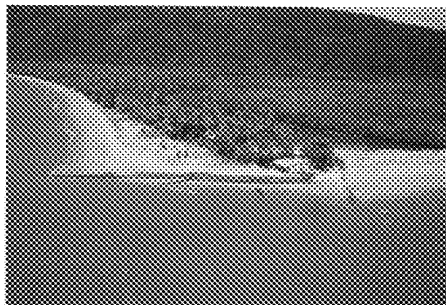
## RESPONSE

### 194 Geotextile Bag Investigations

On receipt of the above mentioned report, Geofabrics Australasia Pty Ltd have responded to statements made in the report

*1. They have been used with limited success as short term solutions in the construction of sea walls.....*

Geotextile container systems have been used with great success in the past 10 -15 years. The technology was first introduced in the mid 1980's and was primarily based on long, small volume, hydraulically filled tubes, employing a trial and error design methodology. The long term performance of these initial structures was mixed, some examples are Russell Heads groyne constructed in 1993-94 using 1.2m diameter tubes which is still performing well, however Kirra Groyne constructed in 1985 using 1.2m diameter tubes failed. The lessons learnt from the initial works has lead to the development of systems which are better suited to the dynamic coastal environment. This has meant a move away from large/long tubes to smaller individual units designed to withstand the specific conditions encountered at the site. It should also be noted that geotextile manufacture and sewing technology has improved significantly since the first geotextile containers were trialed in the 1980's allowing designers to make use of the containers in longer term projects.



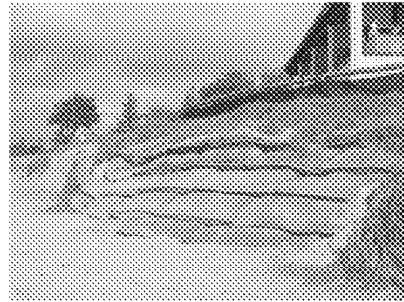
Russell Heads 2002



Stockton Beach in NSW was constructed in 1996 with 0.75m<sup>3</sup> containers, with no vandal deterrent covering. The initial design requirement was for a 6-month design life.



1999



2008

Maroochy Beach emergency sea wall was constructed in 1999 using 0.75m<sup>3</sup> containers, with no vandal deterrent covering.



1999



January 2002

Maroochy beach groynes - 4 x 100m long groynes were constructed in 2001 and 2002 using 2.5m<sup>3</sup> containers. The vandal deterrent geotextiles were developed specifically for this project.



2002



2008



*2. Council previously investigated the use of geotextile sandbags in the late 1980's and early 1990's...*

The report by Patterson Britton carried out in April 1990 is no longer relevant to modern geotextile container structures.

- a. If designed and constructed correctly there is no risk of the structure becoming undermined, Geofabrics Australasia has developed scour protection systems which have proven effective on a number of projects around the country.
- b. The use of vandal deterrent geotextiles has vastly reduced the incidents of vandalism on the containers and has virtually eliminated long slices which are difficult to repair.

*3. Mining of the beach sand for this purpose would be subject to Department of Environment and Climate Change (DECC) approval and is currently not supported by DECC.*

We do not believe the term sand mining is correct in this application. When filling the containers with sand from the beach, sand is not being removed but rather redistributed to other areas to provide better protection and containing the sand so that it is not lost during erosion events. In-situ beach sand is utilised wherever possible (when working on the beach) as it both reduces costs and in the event containers are damaged, the sand is returned to the beach basically where it came from. Larger containers are hydraulically filled which could be from remote sand dredging operations. Installations could be co-ordinated with such operations to create significant cost savings.

*4. The bags also require specialised handling and placement using modified grabs attached to large long reach excavators...*

Creating similar structures in rock requires similar equipment (rock grabs/excavators). In addition, unlike sand containers, construction of rock structures significantly impact on local and arterial vehicular traffic and road infrastructure to and from the site in order to transport the rock.



5. Consequently, their use as an emergency protection measure during a storm event would not be feasible as no stable foundation could be provided in which to key the structure. In addition, wave action would constantly re-arrange the bags within the wash zone and many bags, if not all, would be lost or broken...

While we agree that construction during a storm event is not ideal we believe that a sand container structure will perform as well if not better than a rock structure constructed in similar conditions. The Maroochy beach wall was constructed under emergency conditions i.e. under wave attack which prevented the construction of what would normally be considered adequate toe protection. As a result of this a 35m section out of a total of 200m collapsed to form a rubble structure not dissimilar in appearance to a rock revetment (see photo below), it did not however result in loss or damage to the containers.

It should be noted that most of the emergency dyke repairs carried out in the aftermath of cyclone Katrina in New Orleans (and more recently during the Mississippi River floods in Clarkesville, Missouri) made use of large sand filled geotextile containers.



35m rubble section



6. Current technical specifications indicate that the retaining walls made from geotextile bags can only withstand waves of up to 1.5m....

The size of wave which the containers can resist is dependant on the size of the container, wave period and structure layout. Until recently very little rigorous scientifically research has been carried out on the stability of geotextiles and most of the results are based on limited testing and anecdotal evidence. However recent large scale wave flume testing carried out by the Water Research Laboratory<sup>1</sup> has resulted in the development of current design criteria which will allow engineers to certify a geotextile container structure with confidence. An example of the results of this research is as follows:

0.75m<sup>3</sup> container (10 sec wave period) – Hmax = 2.3m  
 2.5m<sup>3</sup> container (10 sec wave period) – Hmax =3.2m

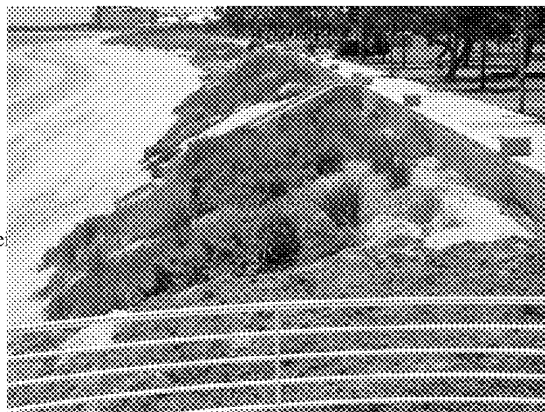
7. The cost of the bags is relatively inexpensive but they do require significant expertise and equipment in their use....

It is not a complicated process. This work is normally carried out by inexperienced teams and Geofabrics provides detailed training to all contractors or Council staff on the installation process free of charge. Geofabrics provides and maintains any specialised equipment requirements (be that frames/sewing machines etc), that makes for the successful, easier and more consistent installation.

8. The bags may also be used in dune rehabilitation projects where they could be stacked at right angles to the beach front.



We would agree that this application is an important role for sand containers in ongoing rehabilitation of sand dunes both in coastal and inland waters. By providing an improved beach profile and dune system, protection of assets would be achieved at an early stage and at an inexpensive cost compared to remedial structures based on longer term damage.



<sup>1</sup> A draft report on this testing is currently be