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COASTAL DUNE MANAGEMENT:  
DIRECTIONS FOR LOCAL AND REGIONAL COUNCILS

A research study submitted by:

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## 1.0 INTRODUCTION

Currently the majority of active dune management practiced by Territorial Local Authorities is unsustainable. This includes their approach to the entire coastal environment. The predominant problem is how to adequately deal with conservation values, as well as public amenities and access within the same area. The following study of sand dune management provides a good example of how correct coastal management policies should be implemented. The Resource Management Act 1991 (R.M Act) largely promotes 'damage prevention' in respect to coastal hazard policy. This is implemented by avoiding or mitigating adverse effects to the coastal environment such as open space zoning and building codes. Councils generally provide protective zoning, coastal hazard lines, and rules to restrict inappropriate development as required by legislation. This however does not always adequately address the problems of conservation versus recreational development. The purpose of this research is to tackle this problem looking specifically at dune management.

This research initially describes the ecology of dunes, their evolving processes and the importance of preserving sand dunes as a dynamic buffer zone between the land and the sea. A full description of the dune system is in appendix 1. A legislative overview then examines all the requirements in depth. The R.M Act places a national priority on preserving the natural character of the coastal environment and the National Coastal Policy Statement 1994 is referred to throughout. Various policy approaches are then analysed in relation to protecting the coastal environment. 'Event protection' policy uses 'hard' structural modifications such as sea walls or groynes or 'soft' modifications such as beach nourishment and dune stabilisation. Damage prevention policy seeks to avoid or mitigate any potential risk. This includes measures such as preventing development or developing new policy and rules to relocate existing buildings where necessary. Policy on loss distribution is analysed, spelling out implications for individual and community insurance policies. Risk acceptance is another policy which means to do nothing and also must be given some consideration. The last policy option mentioned is a unified approach combining a mixture of all the policies to suit a specified area. When a mixture of coastal hazard policies and effective community participation are integrated together sustainable dune management then becomes possible. Thus a unified approach can effectively promote conservation values while providing public access and amenity in the dune system and the wider coastal environment. The Community Dune Care Management programme is extensively covered for the purpose of this research. It is seen as a mechanism to actively involve the community to accept responsibility in the decision making process. This leads to a more effective and

efficient decision making process and has the potential to lead local residents into other coastal management issues.

### 1.1 Dune Characteristics

The importance of dune systems for preserving our coastal environment cannot be over emphasised. They create a natural buffer zone in which the sea and the land can interact dynamically, accreting and eroding over time. Sand dunes are formed by waves and wind and when unstabilized, are extremely vulnerable to the same forces. The hardy grasses that grow in this environment are the pioneers in preserving and managing this system. "They are astonishingly tolerant to high salinity, extreme glare, soils lacking humus, and an oscillating supply of water." (McHarg, 1960, p.10) Thriving in these conditions the stems extend below ground and the leaves rise from the sand. The dune grasses catch the sand carried by the wind gathering around the neck of the plants. The dune continues to grow as the leaves entrap sand to anchor it above ground level. The end result is a dense mat of roots that stabilise the dune below. The stabilised dune can then accept the ocean waves reducing its velocity by absorbing its muted forces.

The dune itself is an especially fragile part of the coastal environment and destruction of the dune has to be avoided. Dune grasses are extremely vulnerable to such uses as "trampling from pedestrian usage, grazing stock, and vehicle access" (Gibb, 1981). Initially destruction of vegetative areas of the dune results in bare areas on the dune. Strong winds complete this destruction process by creating mobile dunes, finally the completely unstable dune system moves inland with prevailing sea breezes. These mobile dunes systems cover anything in their path, potentially resulting in serious property damage. There is also an increased risk of coastal hazards without the dynamic buffer dune zone.

### 1.2 Coastal Erosion

Erosion of our coastal environment is a natural hazard which may adversely affect human life, property or other aspects of the environment. Councils are obliged under the R.M Act and the Building Act 1991 to take steps where necessary to avoid or mitigate this natural hazard. The impact of this natural process may also be increased by human activities, especially in developed areas. For example clearance of vegetation, earthworks, removing dunes (for views), and building on unstable land.

Erosion of the dune system, although spasmodic can be very severe, with many metres of land lost in a single storm. This can be followed by long periods of little or no erosion. Depending on the track a storm will take, "temporary flooding and erosion will take place anywhere along a region's coastline" (Gisborne's RCPS 1992). This has the potential to damage buildings and other developments.

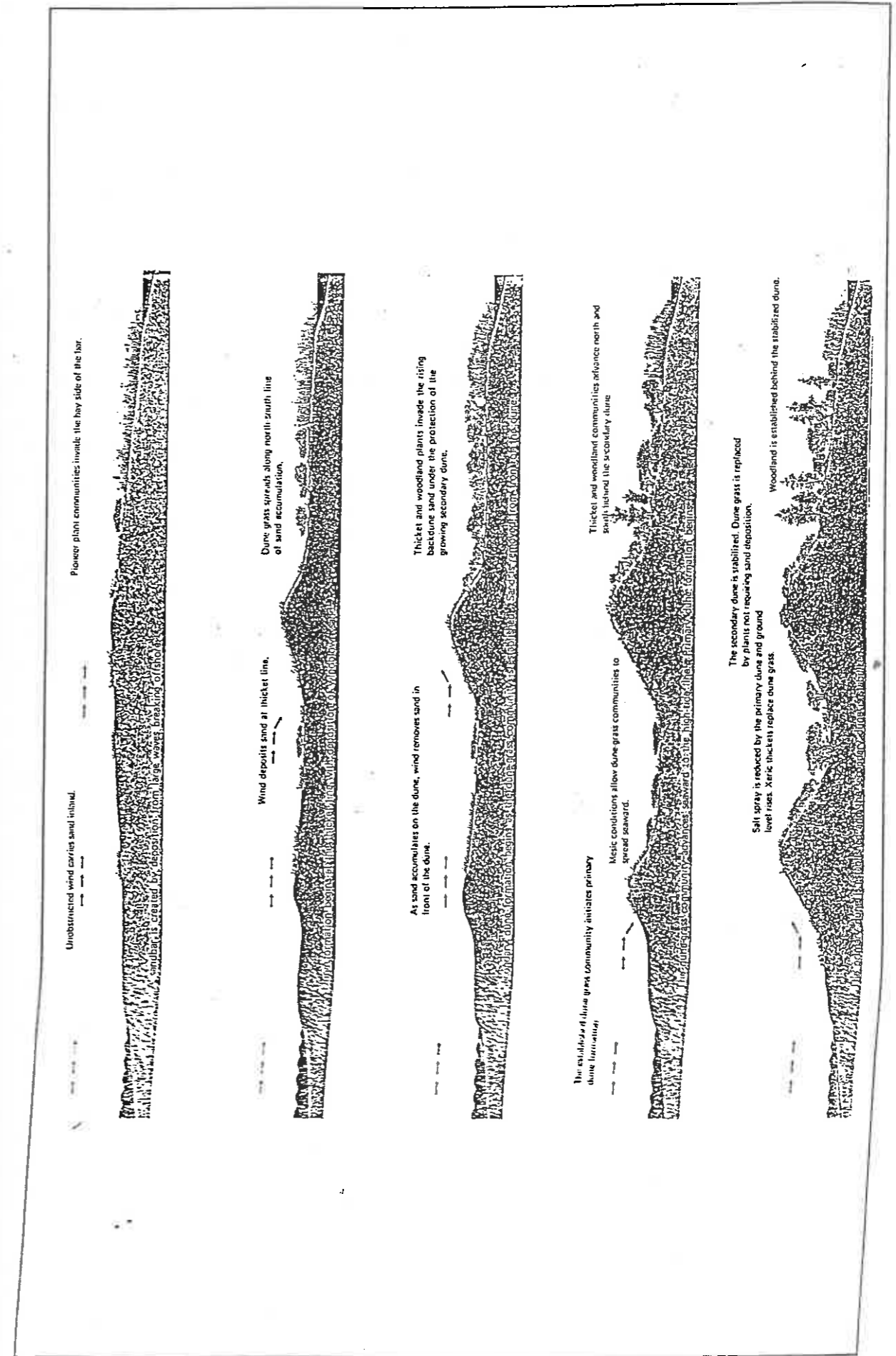


Figure 1. Dune Characteristics from Ian McHarg, Design By Nature

### 1.3 Historical development in the coastal dune environment

Past planning practices such as the Second Schedule, clause 8a of the Town and Country Planning Act 1977 aimed at controlling coastal development through the use of Coastal Hazard Zones. Strict control of urban development within these zones was the objective with the provisions of Section 641 of the local Government Act 1979. Evidently these provisions in the past have not been enough to curb unnecessary development in the erosion prone areas of the coastline, particularly along beach fronts. Councils previously had a lack of knowledge and consequently we are faced with their existing problems today. These historical coastal developments are usually residential dwellings built within the dynamic buffer zone of the beach (on or around the dunes). Problems appear over time with the coastline naturally accreting and eroding within this dynamic buffer zone. If erosion control structures (such as a sea wall) are constructed along the front of the fore dune, the dunes natural function is prevented. Wave reflection off the wall generally prevents accretion of sand onto the beach. Sometimes these structural methods of erosion control work temporarily for the purpose intended but often create other problems outside the localised area. Sea currents and movement of sand are often redirected causing accretion or erosion problems elsewhere up or down the coast.

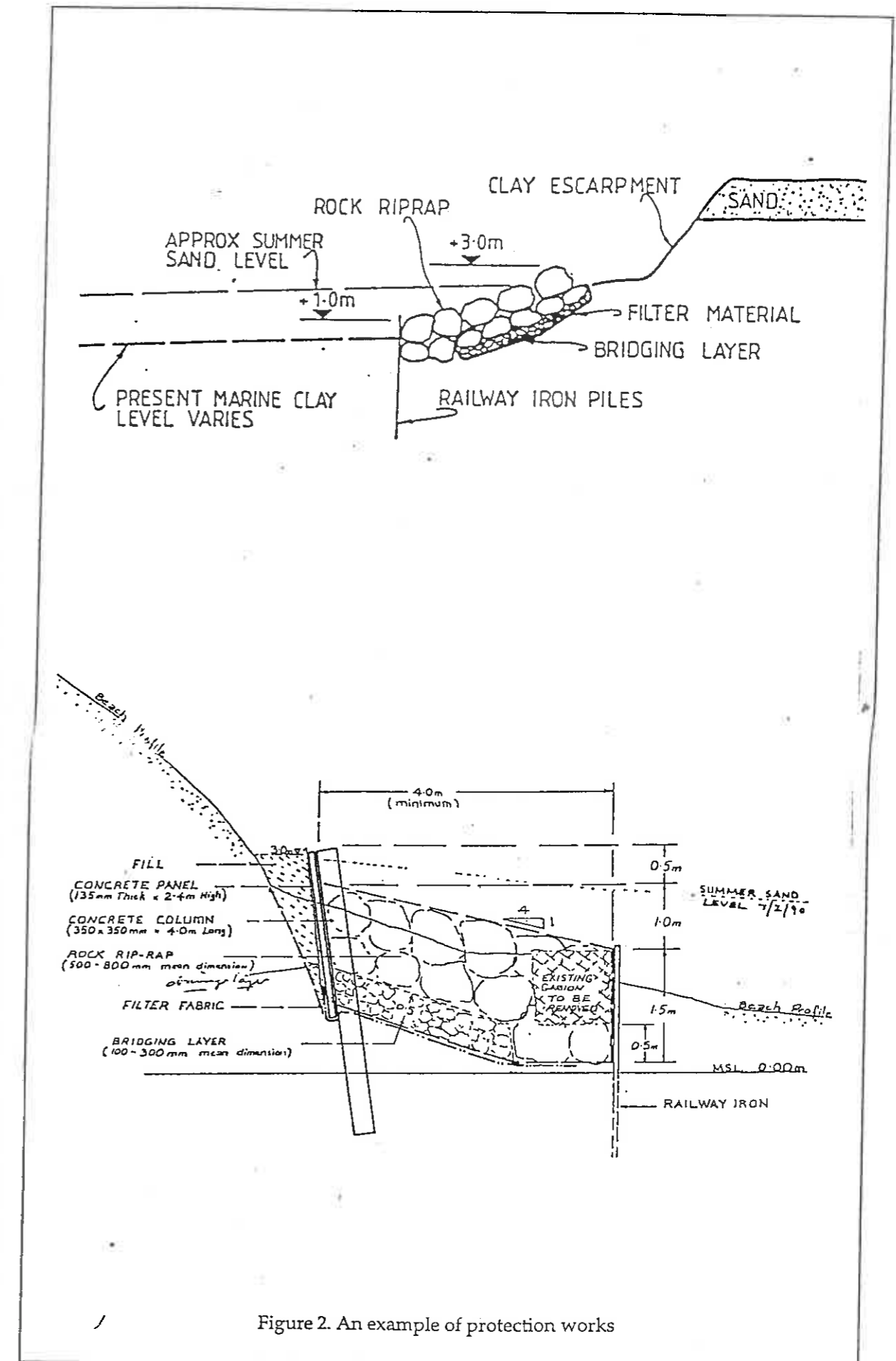


Figure 2. An example of protection works

## 9.0 CONCLUSIONS

The dune system is part of a natural evolving process unique to the biodiversity of the coastal environment in which the coastline accretes and erodes over time. It is not a stable piece of land on which to build or to strictly control, but must be viewed as a dynamic buffer zone which is ever capable of change. Providing for dynamic changes in the coastal environment and enhancing the biodiversity within the coastal area is the true test of sustainability and should be the measure of any policy to be undertaken.

Erosion of beaches, cliffs and dunes is now recognised as a major natural hazard. Man-made alteration of the natural coastline has often created unexpected responses from the sea. Deflection of normal sea currents is thought to result in the accretion and erosion of sand to different areas. This in the past has normally been associated with costly and unsightly structures or works to protect the coastline, particularly when development is situated close to the shoreline. These structures such as gabions, spur-groynes, and rip-rap rock layers have the capability during storm conditions and high tides to create more erosion. They can create scouring around the structures breaking them up and consequently leaving the beach unsightly. The 'hard' structural supports have also encouraged more development to occur where coastal hazards is most likely to occur. We should not hesitate to implement conservative actions where science has shown us there is a need for caution. Ideally a more precautionary approach is recommended with soft environmental alternatives as opposed to 'hard' structural engineering that cannot fully counter consequences of natural forces.

Previous legislation to combat coastal hazards was previously reactive and crisis oriented rather than preventative and only came into effect after the damage had been done. It relied on the threat of punishment to create the desired land use behaviour. Councils often refused to administer these requirements. Following this the regulatory approach legislation relied more on education, attitude, ethic, assistance and discretionary action by administration and the land holder. Both regulatory and discretionary methods of controlling land use often proved ineffectual to achieve sustainable land use management practices. "Even when supported with assistance, when action by council and landowners is left optional it has still not produced sustainable effective land conservation." (Henriques,1993) A balance between these measures is required and the R.M Act provides this with definite guidance of what has to be achieved while allowing flexibility for local community involvement and in decision making.

The dune systems protective buffer zones also create desirable recreational open spaces. A unified approach under the R.M Act makes it possible to enhance recreational use while preserving the conservation values of the coastal environment. The R.M Act spells out objectives and what it seeks to achieve in terms of sustainable use in the coastal environment. A definite program of action needs to be implemented involving local communities at all stages of the decision making process. This can allow for flexibility and maximum individual initiative by utilising local experience and applying different approaches to each area as required. This balance is achieved by taking a proactive approach of soft environmental options fulfilling all the requirements of section 6:

- "(a) .....Preservation of the natural character of the coastal environment.....and from inappropriate subdivision, use and development;**
- (b) ...protection of outstanding features and landscapes....;**
- (c) ...protection of areas of significant indigenous vegetation.....;**
- (d) The maintenance and enhancement of public access.....; and**
- (e) The relationship of Maori and their culture and traditions...."**

When reviewing legislation we have to stop thinking in terms of regulation and realise that degradation of land uses is a societal problem. Legislation needs to be seen as an organising preventative instrument which can utilise community knowledge and skill while ensuring a level of objectivity in the wider community interest. Councils efforts of providing for protective open space zoning, hazard lines, and development restrictions are a good base for sound coastal dune management. Special consideration needs to be given to Dune Care programs. These programs specifically address the problems of recreational use versus conservation values. This ideally will prevent destruction of dune vegetation from concentrated pedestrian usage, grazing by stock, and vehicle access. For intensively used areas, fencing off damaged or sensitive parts of the dune system, and provision for walkways to the beach with community involvement is recommended. The Queensland coast has made notable achievements in this field and now prefers to rebuild erosion prone areas with clean sand implementing nourishment and planting programs with community support. New Zealand is now also now beginning to make notable achievements in this field. Scientific information is now becoming available to Councils willing to undertake a more unified and consequently more sustainable approach to dune management.