Dune Management at Piha

Review and

Proposed Management Plan

Prepared for Auckland Council

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1. Introduction

1.1 Purpose of Review

The study for this report is the area of Piha along Marine Parade South (south of Lion Rock) (Figure 1), one of New Zealand's most iconic beaches and a popular destination for surfing and swimming.

The high levels of use and strong onshore winds have, historically, resulted in significant damage to critical sand trapping vegetation on the natural dunes backing the beach, leading to problems with wind erosion damage and windblown sand. Historically, the dunes and back beach areas have also been altered by various human activities – including subdivision and development, roads and car parks, and stream training and reclamation.

Eco Nomos was engaged by Council to review dune management in this southern area of Piha Beach to date, identify further work required in the short term to improve the containment of the dune sand, and to produce a local dune management plan to guide future management and maintenance of the dunes. This local dune management plan is non-statutory and for guidance only. It should not be confused with a Reserve Management Plan which is a statutory document, the development of which must follow the Reserves Management Act.

1.2 Area Relevant to this Review

The area of Piha Beach relevant to this review is the area extending from the dunes on the southern side of Piha lagoon to the south end of Marine Parade (Figure 1). It includes:

- The dunes fronting the surf club car park and private properties to the north
- The Moana Stream entrance area
- The dunes fronting the southern car park and private properties to the south, as well as the large dune at the very southern end of the beach seaward of the boat launching access road. (The large dune at the south end, together with the access road and boat launching road are part of the Waitakere Ranges Regional Park).

The area is approximately 550 metres in length.

For this purposes of this review, this area is referred to as Piha Beach – with the areas north of Lion Rock referred to as North Piha. The study area is also sometimes referred to as South Piha but that term has been avoided in this report except where it appears in quotes from other sources.

Important community infrastructure (including the Surf Club, car parks, road access and stormwater drainage) and private properties occur directly landward of the dunes (Figure 1). These assets are located within what was originally the active dune system and have only a limited width of dune buffer to seaward (Figure 1). These areas have experienced issues with windblown sand.

Figure 1: Area of Piha Beach relevant to this review

1.3 Work Undertaken

The work undertaken during the review included:

- Site inspection and assessment of recent dune management works and present dune condition
- Review of dune condition and changes over time using historic photography
- Review of available information on coastal processes and trends – including the previous work by King et al (2006) and beach profile data held by Auckland Council (including surveys to October 2011)
- Consideration of earlier work - including the decision by Hearings Commissioner former Justice Arnold Turner decision in 1992 (often known locally as the Turner Decision), the Piha Coastal Management Plan completed in 2000 (WCC, 2000), Piha Reserves Management Plan and outcomes from the two 2009 Community Open Days on Piha Beach and dunes (WCC, 2009)
- Informal discussions with representatives and individuals from various stakeholder groups - including Piha Ratepayers and Residents, Piha Coastcare, Piha Boardriders, Piha Surf Life Saving Club

and a beachfront landowner. These informal meetings discussed matters related to dune management – including any concerns, activities and interests that need to be taken into account, and suggestions to ensure future dune management continues to improve and is widely supported.

- Review of the draft Management Plan by Council staff.
- Workshop with Local Board to outline and discuss proposed plan
- Community workshop held in Piha Saturday 25 August 2012 to discuss plan
- Community submissions/comments
- Follow up meetings with representatives of surfers (Sunday 14 October 2012) and Piha Ratepayers and Residents (Saturday 17 November 2012) to discuss particular concerns of these groups
- Revised plan forwarded to Council, Piha Coastcare and Piha Residents and Ratepayers for comment
- Revision and finalising of plan.

2. Coastal Processes and Shoreline Trends

This section discusses the coastal setting of Piha Beach and the consequent shoreline trends experienced – which have significant implications for dune and coastal management at Piha.

2.1 Description and Coastal Setting

Piha Beach is approximately 2.6-2.7 km long. The embayment in which the beach is contained (sometimes called Piha Bay) is formed by headlands at either end which extend approximately 300-500 m seaward from the beach. The beach is backed by dunes over most of its length, the total width of dunes varying from 20m to in excess of 200 m. The frontal dune system is vegetated in spinifex (*Spinifex sericeus* - also known as kowhangatara or silvery sand grass) and pingao (*Ficinia spiralis* - also known as golden sand sedge). These native species play a critical role in natural sand trapping and dune repair as well as preventing wind erosion. The dunes are backed by relict sea cliffs cut into the Waitakere Ranges. The isolated promontory of Lion Rock divides Piha Beach into Piha and North Piha.

The beach is characterised by high wave energy with a modal wave height somewhere between 1.5-2.5 m (up to 6.5 m in storms) and mean wave periods of 12 seconds (King et al., 2006). During storms, breaking waves can extend more than 500 m offshore. The seaward edge of the active beach system and cross-shore sand transfer probably extends to water depths of at least 6-8m and possibly deeper.

Piha Beach is part of a large scale interconnected sand system that extends from Taranaki to North Cape. The beach sands along this coast, including those at Piha, are ultimately derived primarily from erosion of andesitic volcanic materials in Taranaki – over time undergoing a net northwards movement

by waves. There may also have been significant historic contribution to west coast sands from the Taupo Volcanic Zone via the Waikato River but this is now minimal as the river is dammed in upper regions.

The beach also lies only a short distance north of the large Manukau Harbour entrance. The harbour entrance disrupts the northwards longshore movement of sediment – with the sediment tending to accumulate and bypass the entrance in large "slugs" of sand. This has a significant effect on shoreline trends observed at Piha – as discussed in more detail below.

2.2 Shoreline Trends at Piha Beach over the last 70-80 Years

Piha Beach has been undergoing an overall trend for shoreline advance since at least the 1930's (and possibly earlier). While periods of erosion have occurred within this period, the overall trend has been for net shoreline advance (NIWA, 1999; King et al., 2006).

This shoreline advance reflects the northward alongshore movements of colossal volumes of sand bypassed past the Manukau Harbour entrance to Whatipu over the last 150 years.

The earliest recorded period of shoreline advance occurred at Whatipu between 1844 and 1910 when the shoreline prograded several hundred metres from the cliffs behind. This was followed by a period of erosion. A second and even more significant period of shoreline advance has occurred since the mid 1930's, causing the shoreline at Whatipu to advance seaward by up to approximately 1400 m between the 1935 and 1954 (Williams, 1977).

The very large volumes of sand which have accumulated at Whatipu over this period are evident in aerial photographs of this area (Figure 2). Prior to this accumulation the shoreline lay along the rocky cliffs behind.

The large volumes of sand that have bypassed the Manukau Harbour to Whatipu are being progressively moved northwards causing shoreline advance at both Karekare and Piha.

For instance, several years ago access from Karekare to Whatipu was only possible at low tide. However, the shoreline has now built out to the point that it is now possible to walk from Karekare to Whatipu even at high tide.

Photographs in Sandra Coney's book "Piha - A History in Images" (Coney, 1997) suggest the shoreline advance at Piha had commenced by the 1930's and perhaps even earlier.

King et al (2006) investigated shoreline changes at Piha between 1940 and 2000 and noted considerable net shoreline advance over this period, notwithstanding periods of erosion. There was also considerable variability noted in average shoreline accretion rates – both between different areas of the beach and over time (i.e. spatially and temporally).

Figure 2: Sand accumulation at Whatipu

In the period from 1940-2000 as a whole, the net shoreline advance was most significant at the northern end of the beach where the average rate of shoreline advance over the period varied from 0.8-1.1 m/yr. Central areas of the beach exhibited considerable variation with net shoreline advance averaging 0.5 m/yr over the 60 years, but including a high average accretion rate (1.2 m/yr) in the period from 1940-60 and erosion of about 8.3 m in the period 1991-93. The southern end of the beach, the focus of the present study, exhibited the greatest variability – with an average net shoreline advance of 0.5 m/yr over the 60 year period but including periods of erosion from 1960-80 and 1991-93. In other words, over the 60-year period, the southern end of the beach experienced periods of quite marked shoreline advance as well as periods of erosion – with an overall trend for net advance.

King et al (2006) presented data showing the area of net accretion over the entire length of Piha Beach for the periods 1940-60, 1960-80 and 1980-2000 and this data is shown plotted in Figure 3. It can be seen that relatively high rates of net accretion occurred in the period from 1940-1960 and from 1980-2000, whereas the net rate was lower in the intervening period from 1960-80. The reasons for the variability in net shoreline advance over time – within and between different areas of the beach and over the beach as a whole are not yet known and are likely to be complex.

Given the very significant implications of the ongoing alongshore sand flux for future changes at Karekare, Piha, Te Henga (Bethells) and Muriwai beaches it is critical to have further research investigating the nature of the alongshore transfers from Whatipu and the various controlling factors. This will help better predict future changes and may also assist with understanding past changes. The research required is significant and is more suited to FoRST-funded work than smaller-scale research (occasional PhD or Master's study) otherwise likely to be funded. It is recommended that Auckland Council should lobby for further investigation in this area. Ideally, the research would involve a partnership between NIWA, Auckland Council and local research institutions (particularly Auckland University). There is also a strong case for a major FoRST-funded research programme for the west coast sandy system from Taranaki-Cape Reinga given the inter-connected nature of this sand system, the large temporal and spatial timescales of change on this coast, the poorly understood nature of these changes and dynamic links and the increasing demands on the coast. Auckland Council could liaise with Taranaki, Waikato and Northland regional councils and other relevant parties (including tangata whenua) with a view to lobbying central government science agencies for this work.

Beach profile monitoring at the southern end of Piha Beach by Auckland Council indicate that this shoreline is continuing to advance seaward in front of the surf club (Figure 4) and the landward end of the southern car park. The shoreline in front of the surf club has in fact grown seaward at an average rate of about 1 m/yr over the period of the beach profile record (Figure 4) – similar to the high rates observed in some periods in central and northern areas of the beach by King et al (2006).

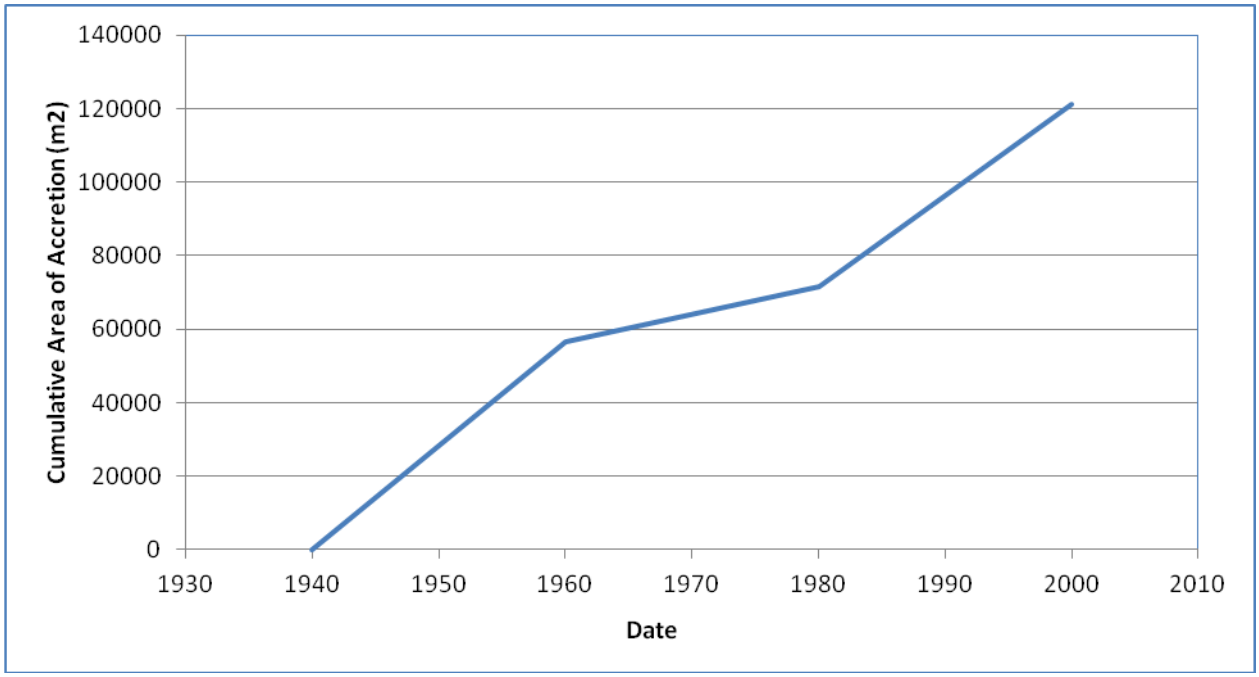


Figure 3: Rate of increase in shoreline area at Piha Beach (over the entire beach) between 1940 and 2000. (Data from King et al., 2006 - Table 3, p 1365).

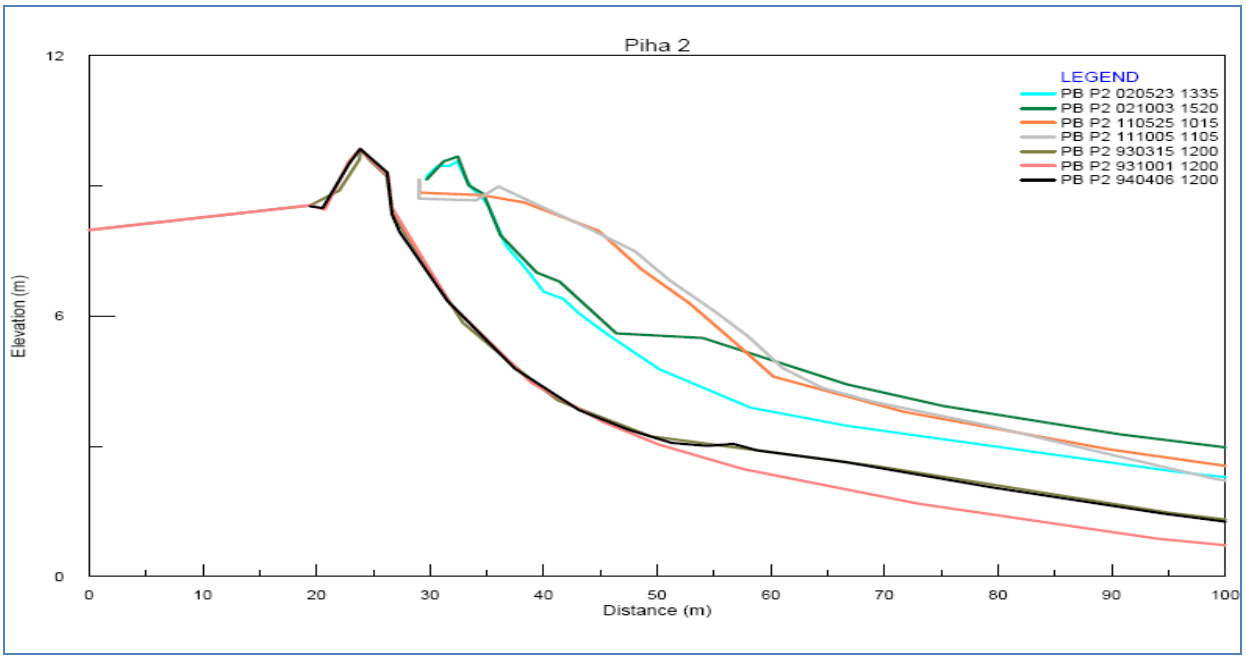
Overall, despite considerable temporal and spatial variability, net shoreline advance has been experienced along the entire length of the beach since at least 1940. King et al (2006) estimated that the total area of foredunes increased by just over 121,000 square metres between 1940 and 2000.

The volumes of sand required to effect shoreline advance of this scale along Piha Beach are huge - as the seaward edge of the beach system lies over 500 m offshore and the entire beach width has to build. King et al (2006) estimated the additional volume of sand stored above mean sea level alone (i.e. about mid tide) between 1940 and 2000 at about 700,000 cubic metres. Given that the seaward edge of the beach system at Piha extends over 500 m seaward to depths of at least 6 m below mean sea level (probably deeper), the total volumes of sand causing the observed shoreline change were even larger. For instance, assuming the seaward edge of the beach system is as shallow as only 6m, formulae used to calculate beach nourishment volumes suggest that at least 1.2 million cubic metres of sand were required to cause the increase in shoreline area noted between 1940 and 2000 alone (i.e. the volume of sand accumulating at Piha averaged about 20,000 cubic metres per year). If the seaward edge of the beach system is deeper than 6m (quite possible), then the calculated volumes would be even larger.

2.3 Likely Future Shoreline Trends at Piha

It is difficult to reliably estimate how much longer the Piha Beach shoreline will continue to prograde. However, there are still very large volumes of sand stored at Whatipu (Figure 2) and it is possible that, ultimately, most of the sand stored here will move northwards. Accordingly, it seems likely that Piha Beach will continue to experience an overall trend for net seaward advance (albeit with occasional periods of erosion) for some time, probably several decades and possibly even longer.

It is also difficult on the basis of existing information to estimate how much further seaward Piha Beach will ultimately advance and the rates of this advance. However, based on the historic rates noted above, it is possible that the beach will continue to grow seaward at an average rate of 0.5-1 m/yr when averaged over long periods of time. However, as in the past, there is likely to be considerable spatial and temporal variability in the rate of net shoreline advance. As discussed in King et al (2006) there is finite sand storage space in the Piha littoral cell, and the current phase of accretion will not continue forever i.e. it must slow or reach capacity at some stage in the future.



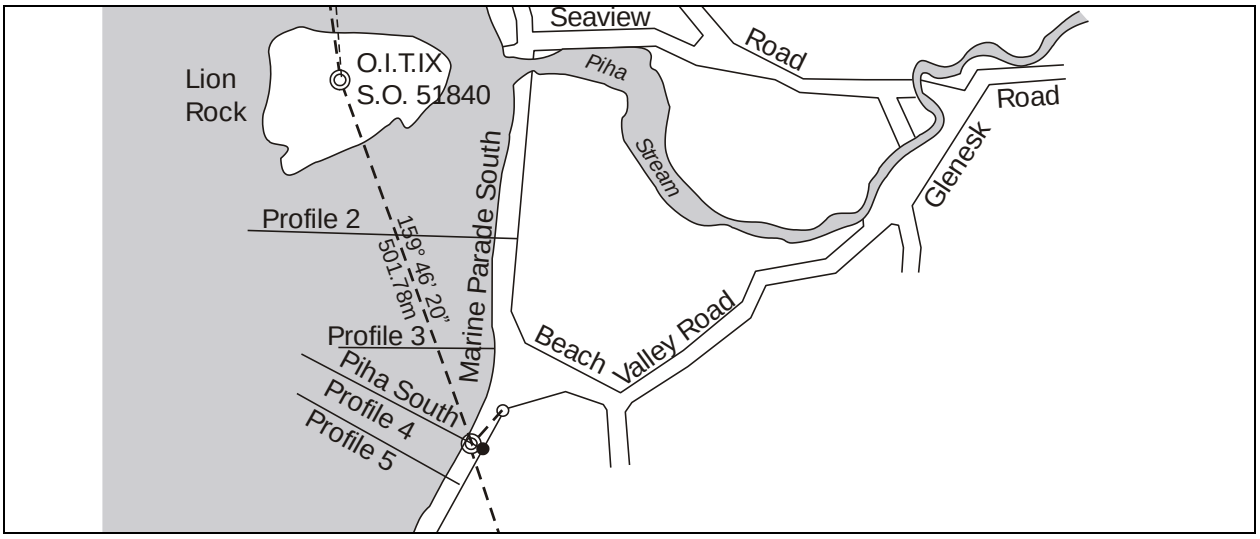


Figure 4: Selected surveys conducted at Auckland Council beach profile site Piha 2 (top) showing progressive shoreline advance over time since surveys commenced in 1993. The most landward profiles are from 1993 and 1994; the mid profiles from 2002 and the most seaward profiles date from May and October 2011. The beach profile monitoring site is located near the surf club as shown in the location map (bottom) – where it is labelled "Profile 2".

2.4 Implications of Ongoing Shoreline Advance for Piha Beach

The ongoing shoreline advance has significant implications for Piha Beach.

Many of the surfing and swimming values of Piha Beach in particular relate to the embayed nature of this area and to the partial sheltering from (and refraction of) the prevailing southwesterly swell around the southern headland. These values have already been adversely impacted by natural shoreline

advance and further changes are likely to be experienced with continuation of these natural trends in the future.

For instance, a long-standing Piha surfer advises that shoreline advance to date has already eliminated a very popular surf break that used to exist between Pakiti and the shore (Mr Barry Davis, pers. comm.), a break variously known as the “reform” or the “ditch”. Mr Davis notes there was a strong current that ran through this area, landward and southwards around Pakiti and then out to sea - creating a deep gully and providing a useful surf break as well as an important fishing area. With the very large volumes of sand that have moved into this area from Whatipu in recent decades, the beach has now built out and it is no longer possible to surf this area. The rip is now seaward of Pakiti.

Long term residents also advise that the “blue pool” which used to form in the area landward of the Gap no longer occurs at low tide due to infilling of the area with sand. The Piha Ratepayers and Residents, in anecdotal evidence provided with their submission and in a subsequent meeting, noted that while the pool historically used to fill in to less than 1 m depth, the sand would later be discharged and pool depths increase to as much as 2 m. In the last 20 years, the infilling due to natural coastal processes has persisted and a valued natural feature has been lost.

Lifeguards advise that the shallowing of the beach has made the situation around the rocks at the south end more dangerous because the areas have become more accessible. They also note that it has been much easier to walk around some seaward areas of Lion Rock in recent years.

As the southern end of Piha Beach continues to advance seaward over time, surfing and swimming values are likely to continue to alter and may be adversely affected. The seaward advance will also result in the width of the dunes increasing over time, which will improve the natural protection these features provide to adjacent infrastructure and assets. .

2.5 Can the Shoreline Advance be stopped by Human Intervention?

In a word, no. The sand volumes being moved alongshore into Piha are simply huge and the scale of these natural changes is beyond reasonable human control.

2.6 Will the Shoreline Advance cease Naturally?

Yes - eventually. While the Piha shoreline seems likely to continue to advance seaward for the foreseeable future for the reasons noted above, a point will eventually be reached when the volumes of sand moving northwards alongshore out of Piha exceed the volumes arriving. The shoreline will then cease advancing.

Piha is not the final destination of the large ‘slug’ of sand gradually being moved alongshore from Whatipu. This slug of sand will eventually move past Piha. As it does so, the shoreline at Piha will eventually experience a sustained period of shoreline erosion. In the longer term, there is also potential for projected sea level rise to cause coastal erosion.

The work by King et al (2006) suggests that this future period of retreat may well remove most or even all of the sand that has accumulated over the last 80 years or more. Accordingly, as emphasized in the Piha Coastal Management Plan, it is not appropriate to assume the dunes will also be there. . It is important to realize that the dunes provide important protection to these public and private assets. In the long term, serious erosion may necessitate private development and infrastructure in these areas to be retreated landward.

It is very difficult to usefully predict when this sustained period of erosion will commence – but it does not seem likely within the next few decades, given the large volumes of sand still stored at Whatipu.

2.7 Has Dune Planting caused the Beach to Advance?

In discussions and submissions it was noted over and again that there is a strongly held view by some parties that past dune work has contributed to the beach changes that resulted in loss of important amenity values such as the Pakiti surf break and the infilling of the "blue pool". This has resulted in controversy and division over Coastcare and dune restoration at Piha.

In general, these concerns relate to the fact that early dune works broadly coincided in time with more rapid advance of the shoreline at the southern end of the beach.

The rate of shoreline advance has varied significantly in space and time along Piha Beach (King et al. (2006) as discussed in section 2.2). While the reasons for this would require detailed research, they do not relate to dune planting and restoration. Any coincidence in timing between beach advance and dune management is only that - as it is simply not possible to cause beach advance by planting dunes.

Significant net shoreline advance as observed at Piha requires the input of very large volumes of sand to the beach system. Net shoreline advance occurs when the volume of sand input to the beach system exceeds that removed. Dunes form when sand already in the beach system is blown landward and trapped by natural vegetation. No matter how much sand is trapped in the dunes by natural vegetation, this will not contribute at all to beach advance.

The situation is in fact the exact reverse – beach advance causes dune advance, not the other way round. If the beach advances seaward over time (as is occurring at Piha due to longshore inputs from Whatipu) then the dune will also advance. Conversely, if the beach retreats or is severely eroded by a storm, then the dune will also erode. Dunes follow beaches, not the other way round. Dunes can only be formed where there is sufficient width of high tide beach to permit this.

Natural vegetated dunes at Piha Beach are evident in the earliest photos of this area (see Section 3) and these dunes have played no role whatsoever in the changes to the surf break. Dunes are natural features and occur simply because sand blown landward from the beach is trapped by vegetation.

The concern with the loss of the surf breaks and other values is entirely understandable. However, the link drawn between the dunes and the loss of these values is incorrect. The beach advance and consequent impact on surfing breaks and other values relate to the natural longshore input of very large

volumes of sediment from Whatipu. That natural process is likely to continue in the foreseeable future for the reasons discussed above.

However, this is not to deny that some early works (e.g. those in the Moana Stream entrance discussed below) were unnecessary. Many people with concerns noted that they were not against dune restoration per se but simply against unnecessary works. The recommended restoration plan (Section 4) attempts to provide improved guidance in this respect.

What about the "Artificial Dunes" across Moana Stream entrance?

There are some long term Piha residents and visitors who argue that the beach advance and loss of the surfing breaks was wholly or partly caused by the training of Moana Stream in the 1980's (Figure 5), the later construction of dunes across the originally flared stream estuary (Figure 6), and the decrease in stream flows since stormwater from Rayner Road was diverted into Piha Stream rather than into Moana Stream. They note that the stream lowered the beach to seaward and the original flared stream entrance (e.g. see Figures 7 and 12 later in this report) allowed large volumes of wave run-up and surge to wash into the area during storms. They argue that the outflows reinforced the rip formed at the south end of the beach, helping to prevent sediment accumulating in the embayment between Lion Rock and the southern end of Piha Beach. It is their view that training of the stream and decreased stream flows was largely responsible for beach advance.

The training of the Moana Stream and associated work was unnecessary as made clear in the 1992 Turner decision. There is also no question that the works significantly altered the natural and human use values of the area. It is unlikely however that the infilling and reclamation of the former flared stream entrance played a significant role in the beach advance. Breaking waves transport large volumes of water into the Piha Beach embayment every day and it is the return of this water to the sea that generates the very strong longshore currents and rips. The big swells surging in and out of Moana Stream, while undoubtedly impressive, were only occasional events and would only ever have been a small component of the wave generated circulation in the embayment south of Lion Rock. The works in the Moana Stream entrance are therefore not likely to have significantly affected the volumes of water circulating through the embayment. It is agreed that any impact on this aspect would certainly have been negative (i.e. reduced flows) rather than positive but the effect on the total volumes of water circulating through the embayment would have been very small. The human- built dune shown in Figure 6 would also not have survived if the beach had not already advanced seaward because of the large volumes of sand being moved into Piha Beach from areas further south. In fact, it is probable that a natural dune would have developed over part of the area in response to the beach advance – though a flared stream entrance would have remained in the absence of the stream training works.

Figure 5: Moana Stream in 31 March 1991 subsequent to training (concrete lining) of stream (1984-5) which eliminated the earlier flared entrance to create a larger grassed amenity area. This photo was taken prior to construction of the along dunes along seaward margin and it can be clearly seen that beach views from the reserve were then quite expansive (Photo supplied by Mr Barry Davis).

Figure 6: Photograph a few months later (31 May 1991) shortly after human construction of dune across the seaward margin of Moana Stream. This dune diminished views of the beach reserve and may also have impacted on sea views from the adjacent road and some private properties. The dune has however also enhanced amenity by providing a sheltered area that folk can picnic in during the common periods of winds from westerly directions. (Photo supplied by Mr Barry Davis).

It would be possible to restore a flared entrance to the Moana Stream entrance if the community as a whole wished to pursue this – as discussed later (see discussion in Section 4.5). However, this work would not restore the surf break that once existed and is also unlikely to have any measurable effect on future shoreline advance. Nonetheless, the work could be desirable because it would restore some of the natural character and landscape values that have been modified, contribute to restoring stream function and natural values. The work could probably also be designed to enhance public use and amenity values in this area (see Section 4 for further comment).

Implications of Shoreline Advance

The ongoing trend for natural beach advance will continue to alter the offshore beach profile and waves at the southern end of the beach as discussed above. This has implications for surfing values in this area (as discussed above) but will also have implications for the dunes, including:

- **Increased width of dunes**: Existing dunes will widen further seaward over time, even though they may be periodically cut back by storm events.
- **Reduced issues with windblown sand**: The increasing dune width will progressively reduce issues with windblown sand as the width of sand trapping vegetation increases.
- **Create backdune space for amenity**: Wider dunes will eventually create sufficient space behind the critically important sand trapping vegetation that can be used for amenity (e.g. see Section 4.4).
- **Impacts on sea views**. Ongoing seaward advance will help limit dune height - a stationary dune would grow higher over time because more sand is added to the dune face and crest. However, in the longer term, the increased width of the dunes may impact on sea views – as has occurred in central and northern areas of the beach where the shoreline was originally just across the road shortly after original subdivision.
- Erosion: In general, the beach advance will lessen erosion risk to adjacent roads and car parks. However, the dunes on the immediate northern side of the Moana Stream entrance (often referred to locally as “artificial dunes” as they were man-made and occupy an area that was previously part of the stream entrance) may tend to push the stream entrance into the dunes fronting the southern car park. This may cause some erosion of these narrow dunes (particularly towards the eastern end of the car park). However, as discussed later in the report, there are means of addressing this and potential to return the stream entrance to a more natural state.

3. Review of Dune Management to Date

3.1 Dunes and Dune Vegetation at Piha

Dunes and dune vegetation are natural features on this coast, evident at the southern end of Piha Beach since the earliest photographs in the late 1800's and early 1900's.

Early historic photographs indicate two separate areas of natural vegetated dunes within this area of Piha (Figure 7):

- The area between Piha lagoon and the former embayed Moana Stream entrance
- The area between the southern side of the Moana Stream entrance and the south end of the beach

The photos indicate a relatively extensive cover of spinifex over the dune areas and patches of darker vegetation further landward, with little to no evidence of human damage (Figure 7).

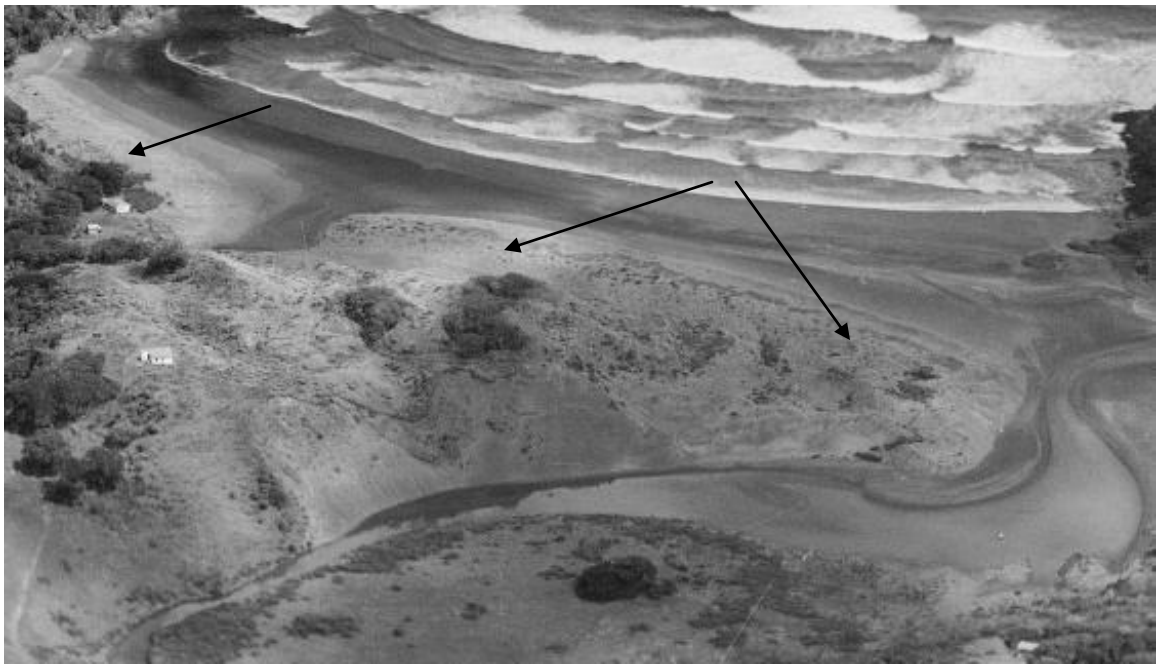


Figure 7: Photograph of Piha Beach dating from the early 1930's showing areas of natural dunes (arrowed) – also evident in earlier photos. (Photograph from Alexander Turnbull Library).

The dunes at Piha Beach are often referred to as "artificial dunes", even within parts of the Piha Coastal Management Plan. However, it is clear from this historic photography that vegetated dunes are natural to this area of Piha – except in the immediate vicinity of the Moana Stream entrance where dune building would have been naturally restricted by stream flow discharging across the upper beach with alongshore migration of the stream channel. The latter are the only artificial (i.e. man-made) dunes. Long-time residents/visitors to Piha recount that the large dune at the extreme south end of the beach

(adjacent to the boat launching area) was first constructed by humans – but a dune would have developed in this area naturally as the beach advanced creating an increased width of high tide beach.

In their natural state, the most seaward or frontal dune was dominated by native sand trapping vegetation – particularly spinifex with a lesser component of pingao (Esler, 1975). This vegetation is of sufficient height to slow the wind in areas close to the ground where the highest concentrations of windblown sand occur. This decreases sand transport capacity of the wind, causing sand to be deposited.

This sand trapping vegetation plays a number of critically important roles in natural dune function and character, including:

- The sand trapping process is critical to natural dune building and repair. For instance, after storm erosion, spinifex grows down the seaward face of the eroded dune - trapping windblown sand and naturally repairing the erosion.
- Significant reduction in problems with windblown sand further landward
- Prevention of wind erosion damage to dunes
- Ecological values – pingao, one of the key sand trapping species, was almost eliminated from New Zealand dunes by historic human and animal damage and is still relatively rare on this coast

The native sand trapping vegetation on the seaward dune is however vulnerable to damage from human trampling. Once the vegetation is damaged or destroyed, windblown sand simply passes straight up and over the dune and is deposited further landward – causing issues with windblown sand. In addition, damage to the native sand trapping vegetation causes bare areas of sand to appear and opens the dune to wind erosion damage.

Low vegetation such as exotic perennial grasses (e.g. kikuyu) and iceplant are often more resistant to human trampling. However, these are too low to be effective sand trapping species. They are far less effective than the native species at reducing windblown sand and in natural repair of dunes. Exotic perennial grasses (e.g. kikuyu twitch) also compete with spinifex and invasion of spinifex areas by this vegetation needs to be managed.

Inland of the frontal dune, spinifex and pingao gradually gives way to other plant communities of increasing diversity and height. Immediately inland of the spinifex zone, common native vegetation can include pohuehue and knobby club rush. Further inland, trees and shrubs start to appear – such as the karo dominated shrubland evident at North Piha.

3.2 Historic Dunes Damage and Modification

Human damage to dune vegetation and resultant problems with wind erosion and windblown sand have been significant issues at Piha, especially adjacent to the high use car park areas that are located within

the active dune system. There has also been significant human modification of the natural dunes over time.

Early dune condition

Early photography suggests the natural vegetated dunes of Piha remained in a relatively undamaged state up until at least the early 1930's (Figure 7).

Dune damage and modification

However, following subdivision in the 1930's there is evidence of increasing damage to the natural dunes and stabilising dune vegetation, leading to consequent problems with wind erosion and windblown sand.

For instance, in the vicinity of the surf club, early subdivision extended seaward over the natural dunelands reducing the width of natural dunes further seaward. Photographs from the 1940's show poorly managed human use, with intense human pressure on the critical sand trapping vegetation on the seaward dune face (Figure 8)

Figure 8: Photograph of area in front of the former surf club. Note people sitting all over the seaward face of the frontal dune, damaging the sensitive native sand trapping vegetation. (Photograph from Alexander Turnbull Library).

By the 1950's, photos indicate that human disturbance of vegetation and consequent wind erosion was common with widespread use of brush wind break fences to minimise wind erosion and windblown sand (Figure 9).

In the mid 1950's, levelling of dunes in front of the surf club to create car parking commenced and this area was progressively extended into the 1960's (Figure 10). Long term residents advise that clay fill was also placed extensively over this area at the time (Helen Pearce, pers. comm.). The car parks also

encroached seaward, significantly further reducing the width of natural dunes seaward of the car park. The poor management of beach access resulted in the dune face seaward of the car park being largely devoid of vegetation at this time (Figure 10)

Historic photographs show a similar sequence of events at the southern end of the beach. By the early-mid 1950's, subdivision, roading and car park areas had encroached over the former natural dunelands – extending right to the top landward edge of the seaward dune face.

Parking occurred along the full length during high use periods and access to and from the beach was unmanaged – resulting in extensive disturbance of sand trapping vegetation on the seaward dune face by the early 1960's (Figure 11).

Figure 9: Photograph of Piha taken in January 1951 to the immediate north of the surf club showing brush fences (examples arrowed) erected to control wind erosion. (Whites Aviation photo – from Alexander Turnbull Library).

In the mid 1980's, the Moana Stream entrance was also significantly modified – including training the stream with a concrete-lined channel (Figure 12), reclamation of the former embayed stream entrance and construction of dunes across the head of the former embayment (these dunes often referred to locally as the "artificial dunes"). The modification of the Moana Stream entrance was controversial and was subsequently deemed unnecessary by the Turner decision.

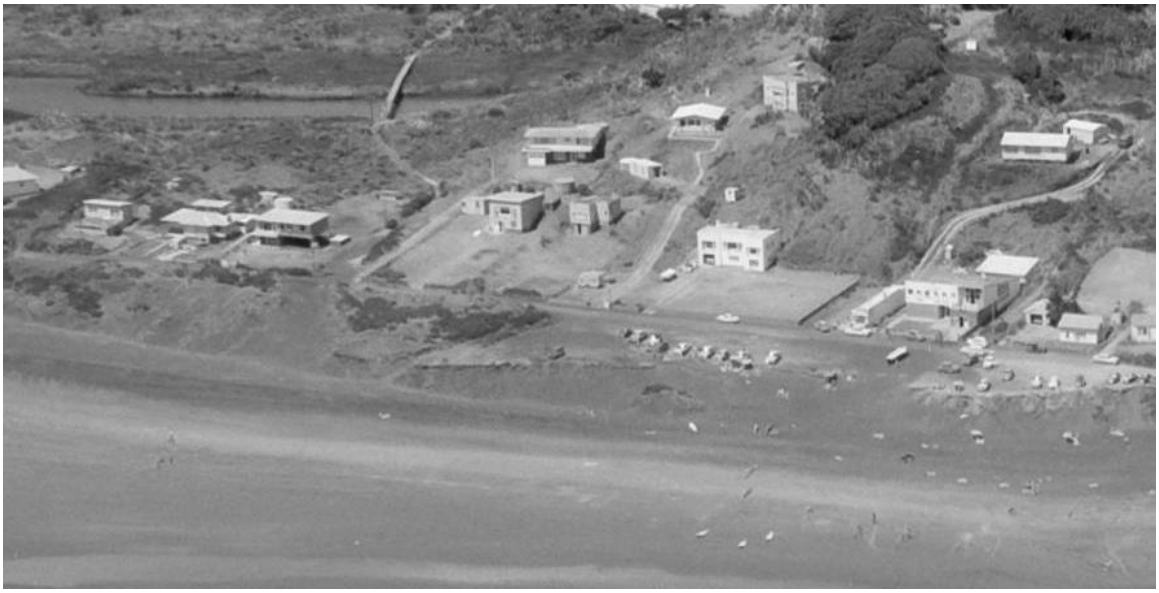


Figure 10: Photograph from 1963 showing area of Piha fronting surf club and areas to the north. Note that dunes fronting the surf club have now been levelled to create a car park and the dune face seaward of this car park is now largely devoid of vegetation. (Whites Aviation photo – from Alexander Turnbull Library).

Figure 11: Photograph of southern car park area dating from January 1963.

There were some ongoing attempts at improved dune management at Piha in the 1980's and the early 1990's – including attempts at access management and planting. In the early 1990's, this work included significant and successful revegetation of the dunes fronting the southern car park – largely using pingao (at that time, spinifex could not be obtained from nurseries). While this useful planting work was endorsed by the Turner decision, it encountered various problems and opposition and did not persist.

By the early 2000's, the high use area in front of the surf club was still seriously damaged with exposed clay fill and very little native sand trapping vegetation (Figure 13).

The Piha Coastal Management Plan also reported that storms periodically uncovered rubble and waratahs and other sharp material, and there were issues with weeds (including cape ivy and boneseed). Serious problems with windblown sand continued to be experienced on both the surf club and southern car parks.

Figure 12: View of surf club car park and Moana Stream entrance area in 1985. Note the concrete stream training works in the Moana Stream and the placement of sand trapping fences (arrowed) to create dunes on the immediate northern side of the former embayment.

Figure 13: Area in front of surf club (undated but circa 2003) - before commencement of Coastcare dune restoration works. (Photo: Bobbie Carroll)

3.3 Dune Restoration Work to Date

Piha Coastcare was formed in 2002 to address the various dune management issues and for the general enhancement and protection of the natural environment at Piha. It was initially set up under the auspices of the Piha Ratepayers and Residents but is now a separate trust.

The serious dune damage and windblown sand problems has necessitated an initial focus on restoration of a good cover of native sand trapping vegetation over the frontal dune and management of human use to provide for beach access while preventing damage to this restored vegetation.

The work to date has primarily involved:

- Some dune reconstruction using machinery to rebuild dunes in badly wind damaged areas prior to planting and to remove or bury historic clay fill from the car park
- Review and realignment of several stormwater outfall pipes that discharged through the dune and caused blow outs (Jo Morris, Auckland Council, pers. comm.).
- Restoration of native sand trapping vegetation (particularly spinifex) over the frontal dune
- Installation of defined accessways and guiding fencing (bollards and ropes) to provide beach access while protecting the sensitive sand binding vegetation – together with signage.
- Weed control – eliminating the problem species noted in the Piha Coastal Management Plan and ongoing management to stop exotic perennial grasses invading the native sand binders.

More recently, a retaining wall has also been installed along the back of the dunes to:

- Provide a collection area for windblown sand that gets past the frontal dune and thereby reduce the volumes directly going onto the road and car park
- Provide for pedestrian accessway along the back of the dune but separated from the car park area for improved safety.

The minimum width of the accessway has been set to allow a machine to come in from time to time to remove sand as it builds up. In general, this removed sand is perfectly suitable for return to the beach provided it does not contain glass or other significant contaminants.

3.4 Review of Work to Date

The works conducted to date are generally of a high standard and despite setbacks have been very successful in addressing the serious dune damage and restoring a good cover of critical native sand trapping vegetation.

This is particularly evident in the area between the Moana Stream entrance and Piha Lagoon, including the area fronting the surf club car park. There is now an extensive cover of native sand- trapping vegetation in this area, contrasting markedly with the state prior to the formation of Coastcare. While there are still some localised areas of dune damage which need to be addressed, the improvements to date are impressive.

The most recent works fronting the southern car park were only completed in mid-2011 and so the plants are not yet well established. This area has also suffered from some ongoing vandalism since the plantings, including deliberate pulling of significant areas of the planting. However, the approach undertaken in this area is sound and with ongoing establishment and maintenance of the plantings will significantly reduce the serious windblown sand issues historically experienced. There is a minor issue with exotic perennial grasses recovering among the spinifex plantings. Problems of this nature can be minimised in future by spraying such grassed areas and allowing time for die-off before earthworks. These exotic grasses can be readily sprayed out on a calm day – though some spinifex may also be affected and require replanting. The spraying of the grassed areas should occur before any further plantings of spinifex are undertaken.

A difficulty is the limited width of natural dune in front of the car parking areas, reflecting the historic encroachment of development and infrastructure seaward over the former natural dunes. An ideal minimum width of sand trapping vegetation for Piha is probably in the order of 30m – but existing dunes are generally less than this, particularly along the front of the southern car park (typically <20 m width). The limited width means that ongoing problems with windblown sand will continue to be experienced for some time and these areas will require particular attention. However, over time, ongoing seaward advance will increase dune width in some places – particularly the area between Piha Lagoon and the eastern end of the southern car park. Available data suggests less certainty of dune advance in central and western areas fronting the southern car park.

With the presently advancing shoreline, the issues with windblown sand in the car parks will decrease over time as long as effective dune restoration work is continued. However, in the longer term future, when serious erosion may occur the car park may eventually need to be relocated. Long term planning should address opportunities for future retreat of this and the surf club car park.

There appears to be widespread support for the work undertaken to date. Coastcare report a good turn-out to working bees and note considerable positive response to the gains achieved so far. Field inspections during this review also indicate that the vast majority of beach users use the defined accessways rather than cutting across the dunes. In addition, surf club personnel spoken to advise that they now train their volunteers from nipper stage in terms of accessing the beach using defined accessways rather than trampling the sensitive dune vegetation.

Some tensions were however identified in relation to matters such as:

- Consultation and communication
- Misunderstanding in relation to causes of beach advance and consequent impacts on surfing breaks and the “blue pool” (see Section 2.7)
- Concerns with the impact of dune management structures (e.g. fences, retaining walls) on natural character
- Dune height blocking views from properties and car parks to landward, with concerns having been raised in the past from property owners behind the surf club and southern car parks, as well as the extreme southern end of the beach. Community feedback indicates that views from certain areas of the surf club car park (i.e. adjacent to the surf club vehicle access) are particularly important for disabled people.
- Lack of elevated grassed areas for viewing and amenity.

Dune management is an incremental process and the focus to date has necessarily been on repair of the seriously damaged dune and reduction of issues with windblown sand. These wider matters can be increasingly addressed in the future as seriously damaged dune is restored and various recommendations in regard to these matters have been included in the proposed Management Plan.

A particular concern is the persistence of misunderstanding on the role of the dunes in the natural shoreline advance, despite this matter having been traversed in detail by the earlier NIWA report (NIWA, 1999). This misunderstanding has no basis in fact (see discussion in section 2.7) but has resulted in considerable antagonism towards dune management and appears to have played a significant role in the vandalism experienced to date. The issues arising from this misunderstanding (including abuse, vandalism of plantings, etc) are proving difficult and exhausting for Coastcare volunteers to deal with.

Coastcare volunteers emphasized the need for more support from Council with consultation and communication - as the work is very demanding and time-consuming on top of the practical works required. This was also supported by others spoken to in the community who believe that there is a

need for improved consultation on proposed dune works and is discussed later in the proposed management plan.

Overall, it is my opinion that the achievements to date are outstanding given the seriously degraded dune state at the start and the range of considerable difficulties faced. The planting, access management and earthworks have generally been undertaken very well and progress to date is notable despite the recent vandalism. It is important that these gains are maintained and built upon with future work and this has been given focus in the proposed Management Plan discussed in the next section.

4. Proposed Dune Management Plan

4.1 Objectives of Dune Management

A key element in dune restoration and management is knowing what work is necessary and what is not – so clear objectives are critical.

The primary purpose of dune restoration and management is to maintain and restore natural dune processes by preventing and repairing human damage. In addition, at popular beaches such as Piha, dune management must provide for human use and enjoyment as well as the protection of natural values. In contrast, controlling nature is almost never the purpose of dune restoration and management. Intervention with natural processes is generally only necessary when major assets (e.g. roads) are directly threatened. And even then, there may be better options (e.g. move the threatened asset).

Dune restoration and management is also an incremental rather than an overnight process. The damage and modification of the dune system over the past 70-80 years (see Section 3.2) will take some time to restore. It also takes time to develop a good understanding and community agreement on relevant matters at any beach – let alone this site, one of New Zealand's most iconic and intensively used beaches with a wide range of stakeholders and values.

The progress to date with restoration of natural dune vegetation and processes and the repair and control of human damage is generally excellent and a considerable achievement by all those involved, particularly considering the damaged state of the dunes when the work commenced (see discussion in Sections 3.2 and 3.3). A key aim of the Dune Management Plan is to also provide an agreed basis to maintain and build upon these achievements and to address remaining matters of concern.

The key objectives suggested for dune restoration and management in this area of Piha are:

- Continuing to raise community support, awareness and involvement
- Minimising problems with windblown sand (particularly on roads and car parks) and wind erosion
- Maintenance and enhancement of public access and amenity values
- Protection and restoration of natural character

These objectives overlap, as do the actions recommended to achieve them.

It is important that any dune management plan is not overly prescriptive as a degree of flexibility is required to accommodate coastal change and various management issues as they arise.

4.2 Raising Community Support, Awareness and Involvement

4.2.1 Discussion

The raising of community support and awareness is an important objective for any dune management work and is particularly important at Piha Beach as:

- Piha Beach is one of New Zealand's most iconic and popular beaches with a wide range of stakeholders, with various interests and values. The support of beach users and the local community is critical to the long term success and sustainability of dune management. This requires good communication and consultation and a balancing of interests – it is not an easy task.

- An informed and supportive beach user community provides the most effective protection for coastal dune values – while also minimising maintenance requirements and the need for control and structures. Natural dunes not subject to human pressure require little to no management. Most dune management is focused simply on repairing natural dunes that have been damaged by human action and/or action designed to protect critical dune vegetation from human disturbance.

- The physical setting of Piha results in significant shoreline movements over long periods of time due to natural forces and changes that are beyond reasonable human control (as discussed in Section 2). A good understanding of these natural shoreline changes allows proactive planning and avoids the kinds of misunderstanding which have often complicated dune management at Piha to date and impacted on community support. Awareness of ongoing trends is also important. For instance, management issues at Piha will change radically when the beach system eventually moves from its present long term trend for advance to a long term trend for shoreline retreat. While the timeframe for this change is uncertain and may be several decades away, it is important to work through and plan for the implications of future retreat. For instance, at Piha, it may prove extremely unwise to allow any further subdivision and intensification of use on former sand dunes - as appropriate protection of these areas may not be possible in the event of serious retreat.

Sustainable protection of natural dunelands at Piha ultimately requires informed beach users who understand the critical role played by natural dune vegetation and who conduct their beach use activities in a manner which do not disturb this vegetation – particularly the native sand trapping vegetation (spinifex and pingao) on the most seaward dune exposed to strong onshore winds.

Piha Coastcare has already built a good level of community support and awareness – with good support for working bees (for instance, 60-100 people turning out in mid 2011 to assist with restoration of the dunes fronting the southern car park) and a large network and Email list of supporters. Coastcare also maintains a web site which endeavours to keep the community informed on current activities and plans

– as well as providing an opportunity for interested community members to sign up to the Coastcare Email list to be kept informed of activities. The web site and Email contact list are good initiatives and awareness of these should continue to be promoted to assist in expanding the level of community involvement.

Feedback during consultation suggested that Auckland Council consider producing and widely circulating a pamphlet outlining the reasons why shoreline advance is natural at Piha (i.e. not a consequence of dune restoration) and the importance of protecting and restoring natural dune vegetation.

However, there are also issues that need to be addressed going forward to continue to build community understanding, awareness and support.

Various parties spoken to raised the need for more openness and active community consultation prior to major works (e.g. significant reshaping of dunes, etc) so everybody can understand what is being planned and why, and there is opportunity for input. Some expressed the view that there had been less opportunity for community participation and dialogue in decision-making in recent times.

However, the wide range of demands in respect to community consultation and communication are very difficult for Coastcare volunteers to meet at a popular and iconic beach such as Piha. The key volunteers note that the workload is presently very high and too demanding, with more support from Council required. Council and Coastcare need to work together to provide appropriate consultation and communication.

Prior to Coastcare, many attempts at dune management failed at this site due to the extreme difficulties. Strong Council (and community) support is critical to ongoing success. Many councils involved in dune management employ or contract dedicated coordinators to support and assist Coastcare volunteers – though the most appropriate model for Auckland Council needs to be assessed. Subsequent to formation of Auckland Council, a key Council staff member has been appointed and this has improved the situation – though the staff member covers the whole western area. A Memorandum of Understanding (MOU) with Auckland Council/Local and Sports Parks West approved by the Waitakere Ranges Local Board has also been suggested as a useful way forward to ensure clear roles, expectations and boundaries.

4.2.2 Recommendations: Community Support and Information

It is recommended that:

a. A specific MOU be developed between Piha Coastcare and Auckland Council

b. Auckland Council give consideration to how best they can improve the level of support provided to Piha Coastcare, particularly to assist with improving consultation and communication in relation to dune management - including:

    i. building community awareness and support for dune management

ii. improving communication and relationships with those stakeholder groups who have ongoing reservations and concerns regarding dune management

iii. addressing existing misunderstandings of coastal processes at Piha (e.g. with information pamphlet)

iv. resolving stakeholder concerns as they arise

v. provision of an independent web site that is kept up to date with Coastcare activities and plans (upcoming working bees; meetings)

vi. providing opportunities for increased participation in dune management at Piha

4.3 Minimising Problems with Windblown Sand and Wind Erosion

4.3.1 Discussion

This is a critical element of dune management at high use public beaches such as Piha. Windblown sand is a natural part of dune formation. Historic management issues with windblown sand arise from human damage to natural sand stabilising vegetation and from seaward encroachment of human activities into dynamic dune areas (see discussion in Section 3). The main requirements to minimise windblown sand are:

- Restoration and maintenance of a good cover of native sand trapping vegetation (spinifex with a component of pingao) over the most seaward dune and particularly the seaward face to the crest
- Managing beach access and human use on the frontal dune to avoid trampling and disturbance of this critically important vegetation
- Building community and beach user understanding and acceptance that the beach and dune is a mobile system (see Section 4.2 above)

Earthworks are also occasionally necessary (subject to attaining necessary resource consents) to repair serious human damage to natural dunes (e.g. remove clay and rubble fill from historic car park/roading projects, reshape dune to natural topography following serious wind erosion damage, address areas of serious weed infestation).

As noted in the review (Section 3.4), Coastcare has significantly improved management of this aspect. There is now generally a good cover of native sand trapping species and beach users generally use the defined accessways rather than disturb vegetated areas. These gains need to be maintained and built upon.

The dunes fronting high use car parking areas will require particular ongoing attention as, because of historic encroachment, they remain too narrow to completely avoid windblown sand issues. Any problems in this area with disturbance of vegetation cover and poor management of human use will be reflected in aggravation of windblown sand issues. At this stage, it appears that ongoing beach advance

will eventually increase dune widths to adequate dimensions and therefore the immediate focus should be on restoration and maintenance of appropriate native sand trapping vegetation. However, if shoreline advance does not continue, reconfiguration of the car parks may be required to create extra dune width. In the event of future shoreline retreat, the car parks may ultimately have to be retreated to alternative locations.

The following recommendations are suggested to reinforce existing sound practice and ensure ongoing improvement in the management of windblown sand:

4.3.2 Recommendations: Planting and Weed Control:

a. Planting and weed control are primarily required to restore natural sand trapping vegetation damaged and modified by historic and ongoing human activities.

b. Restore and maintain a good cover of appropriate native sand trapping vegetation over the frontal dune, with particular emphasis on narrow dune areas seaward of the car parks. This will maximise the sand trapping potential of the dunes and minimise erosion.

c. Plantings on the seaward face and crest should continue to emphasize spinifex with a subcomponent of pingao. These are the most appropriate species for the control of windblown sand at Piha and are also part of the original natural character of Piha dunes.

d. Plantings in more landward areas of the frontal dune and/or on the interface with grassed reserves should emphasize knobby club rush interplanted with species such as *Muehlenbeckia complexa,* sand coprosma and the native spinach.

e. Use of regionally critical threatened dune species (e.g. sand coprosma) should be incorporated in planting where appropriate to aid regional restoration. This work should however be conducted carefully with appropriate planning (e.g. specific “Threatened Pant Translocation Plan” for the species and site – using the template developed by the Auckland Council Biodiversity Team) and monitoring.

f. Wave erosion is a natural process and it is not necessary or desirable to plant eroded dune scarps formed by such erosion if there is already a good cover of native sand trapping vegetation to landward. The spinifex and pingao in the more landward areas will grow seaward down the dune face and naturally repair the erosion as natural processes permit. Any planting would be at risk of loss in the event of further storm erosion and dune repair is best left to natural processes. It is important that wave erosion is a natural and expected process and does not require any intervention unless significant assets (e.g. roads) are likely to be threatened.

g. It is not necessary to plant along the seaward edge of a well-vegetated dune system to encourage seaward expansion – provided a good coherent cover of spinifex and pingao is maintained on the seaward face of the dune. This vegetation will naturally extend seaward. In general, any seaward expansion of dunes should be left to natural processes unless there are compelling reasons for intervention.

h. Plants should be appropriately eco-sourced, ideally from the nearest population or within the Waitakere Ecological District. It is acceptable however if the nearest population is in an adjacent ecological district. If the only available seed source is further afield, thought should be given to most genetically appropriate source. With some species (e.g. spinifex) alongshore dispersal

i. Eradicate exotic perennial grasses within spinifex areas (even if some area of spinifex are damaged and need to be replanted) and ensure exotic perennial grasses do not invade from grassed areas to landward. Spraying is best undertaken during active growth periods in autumn and/or spring using a grass-specific herbicide with an appropriate wetting agent. Spraying among spinifex should only be undertaken on very calm days using a nozzle that gives strong control over direction – to minimise damage to adjacent spinifex.

j. Where dunes are reworked by machinery to prepare for planting, ensure that any exotic perennial grasses are appropriately sprayed and die-off prior to the earthworks to minimise reinvasion. Otherwise, stolons broken up by the earthworks may lead to serious re-invasion of the exotic grasses.

k. Remove any incursion by common garden plants (e.g. gazanias, arctotis and agapanthus) as these species can spread rapidly and impact native vegetation.

l. The knobby club rush community recommended along the landward margin of the spinifex zone will assist in managing invasion by the exotic grasses (allowing grass specific herbicides to be used without damaging spinifex), while also enhancing natural character of the dunes. It will also assist with access management and protection of natural character (see Section 4.5).

m. When dunes have to be reworked (subject to attaining any required resource consent) to bare sand prior to planting, ensure planting is undertaken as soon as practical and dense planting (e.g. spacing 0.3-0.5 m) is desirable to assist in rapid restoration of a good vegetation cover.

n. The Coastcare annual plan should incorporate an inspection of the spinifex areas (particularly seaward of the car parks) in autumn – so that any significant bare areas that have developed (e.g. as a consequence of human damage over summer) can be planted that growing season.

4.3.3 Recommendations: Accessways:

a. Defined accessways are required and critical to prevent human damage to natural sand trapping vegetation. It is also important in terms of natural character and visual amenity to keep the number of these accessways to the minimum required.

b. The present number of accessways is largely adequate but an additional defined pedestrian accessway should be established at the southern end of the surf club car park (as arrowed below in Figure 14) where an informal accessway presently exists.

c. The existing practice of aligning accessways so the seaward end is not aligned into prevailing southwest winds is sound and should be retained.

d. Over time, where reasonably practicable, accessway alignments can be adjusted as required to include curvature - located so that any sand blowing into the seaward end lands on spinifex, rather than travelling through to the landward end of the accessway. Straight accessways are less desirable as they tend to act as a “conveyor belt” for sand movement into landward areas.

e. The state of the accessways should be monitored to ensure they stay well maintained, including allowance for sand removal when required (e.g. the alongshore accessways landward of the dunes and seaward of the car parks). Observing where particularly significant windblown sand accumulations occur in these areas will also provide useful clues on the issues that need to be addressed in the dune areas to seaward.

f. Recognise the need to maintain the natural character of Piha Beach and to minimise and avoid structures to the extent reasonably practical (see Section 4.5 below).

Figure 14: Location of informal accessway (arrowed) at the southern end of the surf club car park. It is recommended that this accessway be formalised and defined.

g. The double-entry on the landward side of the accessways fronting the southern car park is a useful design innovation. However, with the present narrow dunes in this area, the double-entries tend to provide more opportunity for windblown sand to penetrate to landward areas. The dune “islands” formed between the landward entrances are also difficult to manage. This is not a pressing issue but, over time, these accessways could be reduced to a single landward entry if required to minimise issues with windblown sand. The dune “islands” presently formed between these double entrances can be merged with the adjacent vegetated dune areas as this work is undertaken.

h. The present practice of generally avoiding surfacing on accessways (e.g. board and chain structures; boardwalks) is supported. These structures tend to get buried with sand on west coast beaches such as Piha and are difficult to maintain. In most places at Piha, a sand surface is adequate and preferable.

i. The surf club concrete accessway is an important feature for access to and from the beach and as practical should be cleared as requested by the Surf Club or several times a year (e.g. each time machinery is taken to Piha to clear sand from the roads or pedestrian access track). This particularly

important over summer. The sand removed from this area is perfectly suitable for placement on the beach unless obviously contaminated by broken glass.

j. If the present boat ramp ultimately has to be replaced because of excessive maintenance accompanying beach advance, it should be removed at the time of replacement rather than allowed to be buried. The new ramp should maintain the existing northwest orientation to minimise problems with windblown sand.

k. The retaining wall to minimise sand blow onto the road and the associated pedestrian access and sand trap along the back of the dune is a useful innovation. It is likely to remain necessary for some time because of the narrow width of the natural dunes to seaward. The present design to allow seating on top was commented on favourably by various parties and is well used according to surf club members spoken to. Concerns were however raised by some parties in relation to impact of fences on natural character and so reliance on these structures should be reduced over time as practical (see recommendations in the discussion of natural character further below).

Note: The accessway on the northern side of Piha Lagoon and creeks (outside the study area) should be widened to improve it for use by the surf life saving club – who occasionally have to use this accessway in an emergency. The SLSC find this accessway difficult to use on those rare occasions.

4.3.4 Recommendations: Dune Reshaping and Earthworks

a. Appropriately designed earthworks are occasionally necessary to restore seriously damaged dunes.

b. Where clay fill or rubble occurs on dunes, any earthworks should remove this to the extent reasonably practicable.

c. Earthworks addressing serious grass or weed infestation should be preceded by appropriate spraying of the relevant weed species, allowing time for die-off before the works. Deep (>0.75 m) burial of the surficial sand that contained the weed materials can also be helpful when the earthworks are implemented. These actions help minimise weed re-establishment.

d. The earthworks should be conducted as close to the planting date as practicable to reduce the risk of windblown sand before planting. Earthworks should not be conducted outside of the best spinifex planting period and ideally within the period from April to October inclusive.

4.4 Maintenance and Enhancement of Public Access and Amenity Values

On a popular public beach like Piha, dune management needs to give attention to ensuring human use and enjoyment is provided for. This was a common theme in the feedback received during discussions with representatives of various stakeholders.

Two particular areas that were drawn attention to were:

- The general issue of views – including the maintenance of views from car-parks and properties landward of the dunes.

- The need to provide grassed areas (ideally with shade) in elevated locations where people could sit and view the sea. These areas would also be valuable during the frequent surfing, surf lifesaving and other competitions held at Piha.

4.4.1 Views and Dune Height

The issue of views from behind the dune is a difficult one to exercise much control over - as dune height is governed by natural processes. Fortunately, any changes in dune height over time are relatively slow. Nonetheless, it is important to maintain an empathetic approach to the issue as views from landward properties and areas are important to those affected. Most properties in the study area were developed when the dunes to seaward were degraded by wind erosion due to poor management of human use (see discussion in Section 3.2 of this report). At this time, dunes were probably lower due to wind erosion and deflation. The natural seaward advance of the shoreline has also likely impacted views by increasing dune width to seaward.

Auckland Council conducts regular beach profile surveys (usually 1-2 times per year) and this provides a means by which dune height can be monitored.

The options for intervention with natural dune characteristics and processes are limited. For instance, periodic earthworks to lower the dunes would require ongoing intervention as well as disruption of native dune vegetation and natural character and this is not likely to be an appropriate approach. In addition, obtaining resource consent is likely to be very difficult given the recognised importance of dune environments in the New Zealand Coastal Policy Statement and the Auckland Council Regional Plan: Coastal.

There are however measures that can be taken to minimise the potential for issues. For instance:

- Encouraging an extensive cover of natural sand trapping vegetation on the seaward dune face down to the seaward toe can greatly assist in limiting dune height. An extensive cover of sand trapping vegetation in this area helps reduce the volumes of sand reaching the crest where it can lead to increases in height. As noted earlier, it is not necessary to plant the dune toe area if a good cover of spinifex already exists on the seaward face – as this vegetation will natural extend seaward.

- Managing access to prevent damage to dune vegetation. Human damage of dune vegetation at the toe and on the seaward dune face can result in more windblown sand reaching the crest and (typically localised) increases in dune height. Therefore, providing defined accessways as at present and encouraging use of these helps.

The present general trend for the shoreline to advance in many areas will also help minimise increases in dune height (e.g. Figure 4) – advancing dunes tend to build less height than static dunes in the same environment.

4.4.2 Elevated Grassed Viewing Areas

In regard to the provision of elevated grassed and viewing areas, community and beach user feedback suggest there is widespread support for this. For instance, the submission from Piha Ratepayers and Residents suggested inclusion of a specific objective to maximise the opportunity to view the surf from the dunes.

The provision of these areas will also require appropriate design and consultation and detailed recommendations on this matter are beyond the terms of reference and scope of the present report. However, a discussion of potential options is included below to help guide any future action.

With the present narrow dunes, there is no useful opportunity to introduce (or extend existing) grassed areas seaward of the car parks – as maintaining the full dune width in spinifex and pingao is required to minimise windblown sand to landward. Ideally, a width of at least 30-40 m of sand trapping vegetation should be maintained to minimise windblown sand at this site due to the strong onshore winds. In the longer term, continuation of existing seaward beach advance may eventually create sufficient dune width in these areas for new grassed areas to also be established (Figure 4). However it must be noted that it is possible that this dune buffer could be eroded again at some stage in the future.

Shade trees are also unlikely to be practical in any grassed area eventually able to be established seaward of the surf club - as views from the surf club must be maintained for beach safety. Surf club personnel advise that the existing small pohutukawa currently presents no issues but may need to be managed as it grows – or possibly relocated.

In terms of more immediate action, the existing grassed area at the western end of the southern car park (arrowed in Figure 15) is already extensively used and could be enhanced for use in the near future. For instance, ground levels are presently irregular and could be leveled to improve the area for recreational use. There are also existing small pohutukawa here that will in time provide useful shade – though they may need to be managed (e.g. periodically opened up with careful pruning) to maintain views from landward. This is an important issue to address as otherwise landowners in other nearshore areas will tend to oppose shade trees because of fears of impacts on views. It is important to build trust on this issue as this beach (like many) presently lacks shade trees for beach visitors.

There are also other local areas, one of which could be appropriate to develop as a raised grassed viewing area given the high human use in this area of Piha. For instance, there are elevated backdune areas to the immediate north of the surf club car park part of which could be used to establish an elevated grassed areas, while still maintaining a wide spinifex zone (at least 30-35 m) to seaward (Figure 16). An advantage of this area is that it is not only immediately adjacent to the surf club car park but also borders the beach access from the Domain

Figure 15: Grassed area behind spinifex zone at western end of the southern car park. This area provides an important grassed elevated viewing area and could readily be levelled to improve suitability for use.

Figure 16: dashed line outlines backdune area to the immediate north of the surf club car park within which a grassed viewing area could potentially be established – subject to appropriate design and consultation.

Another potential option relates to the dunes on the northern side of the Moana Stream, which have been a bone of contention among some parties since they were established. As noted earlier, these dunes are to some extent artificial as their existence depends totally on the existing Moana Stream training works. The Turner decision suggested some restoration of natural character be undertaken in this area. Detailed comment on this is beyond the terms of reference and scope of this report, but in my opinion there are likely to be practical options in this regard – with appropriate design and consultation (see discussion under natural character below). If such work proceeds, the design could probably also incorporate elevated or improved beach viewing areas.

In discussion of the draft plan, the large dune at the extreme south end of the beach (adjacent to boat launching area) was also noted as another alternative where a new raised grassed viewing area might be able to be established. An adjacent landowner also expressed concerned about the impact of this feature on views. It may be practical to address this aspect through creation of a raised viewing area, though given the earthworks likely to be required (and any necessary resource consents), a feasibility investigations including appropriate consultation would be required. The sustainability of a lowered dune would also need to be assessed. The dune in this area is controversial with some groups as the initial dune was apparently formed by human intervention and so it is often referred to as an "artificial dune". However, a dune would have formed naturally in this area given the beach advance that has occurred in recent decades (see discussion in Section 3).

The potential for future development of an elevated grassed viewing area in one of these alternative locations would require investigation and consultation to confirm which (if any) was the most appropriate area - prior to detailed design and any required consenting.

Ideally, any provision of grassed viewing areas should also incorporate shade trees where practical as they are otherwise less likely to be used, particularly in summer. Shade trees can create concerns with views from residents to landward but with active intervention and pruning to open the trees up these concerns are usually able to be managed. This is particularly so with pohutukawa where appropriate pruning can maintain shade without significant impacts on views. Nonetheless, the reflex action of beachfront owners is to oppose tree plantings and so any such works will need to be undertaken and designed with appropriate consultation. Where tree planting is able to be undertaken, any agreements reached in regard to ongoing safeguarding of views through appropriate pruning must be honoured – as high levels of trust are required to get agreement on shade trees.

4.4.3 Recommendations: Dune Height and Views from Landward:

a. Trends in dune height can be regularly reviewed (say every 1-3 years) following resurvey of the Auckland Council beach profile sites. If there is evidence of a that significant (say >0.5-1 m) change in average height over time, options to manage this could be reviewed though these are likely to be limited.

b. Any disturbance or significant gaps in sand trapping vegetation should be repaired to avoid isolated raising the dune crest.

c. Allowing spinifex runners to extend as far down the dune toe as practical to maximise sand trapping seaward of the dune crest (though planting this area is not required if there is already a good spinifex cover to landward)

4.4.4 Recommendations Increased provision of raised grassed viewing areas:

a. Given the community/beach user desire for increased provision of grassed viewing areas, review and consult on opportunities to provide an additional grassed viewing area, including the:

    i. backdunes immediate north of the surf club car park,

    ii. dune and grassed reserve area north of the Moana Stream entrance

    iii. large dune at the extreme south end of the beach.

b. The existing grassed area seaward of the southern car park (see arrowed area in Figure 15) should also be improved to enhance use, including leveling. Soil should also be built up to natural ground level where the roots of pohutukawa tree have been exposed by wind erosion. Over time, modification of accessways (discussed in 4.2 above) can also ensure access paths are moved away from the pohutukawa to the extent practical – to enable these potential shade trees to be used to enhance reserve amenity. As the pohutukawa increase in size, Council will probably need to maintain a reasonable pruning regime (designed and undertaken by trained arborists) to minimise impacts on landowner views while maintaining shade and amenity. This aspect was reinforced in discussions with and submissions from adjacent landowners. Building landowner trust in areas of existing trees such as these is the key to any expansion of shade trees on future grassed viewing areas.

c. In the much longer term, a raised grassed area may also be practical seaward of the Surf Club car park as this shoreline advances, or if the carpark was reduced in width – though only when the dune is of sufficient width to retain a minimum 30 m width of native sand trapping vegetation seaward of any grassed area. It will need to be accepted that if such an area was to be developed, it may be necessary to revegetate with sand binding dune species to provide additional sand trapping if windblown sand becomes a management issue, and that the area may also be lost in the future if the dune buffer is eroded in the event of future shoreline retreat.

d. Opportunities to provide shade trees in grassed viewing areas could also be investigated in future work - with appropriate consultation. Any shade trees will need to be carefully managed to avoid significantly impacting views. This work could include negotiations with adjacent beachfront owners and the development of agreements in regard to views that provide reasonable certainty for owners. While the beach and reserves are public space and there is no right of veto on the basis of views, a balanced approach that respects all interests is preferred. The pohutukawa around the perimeter of the camp ground have been pruned to maintain views and provide an indication of what can be achieved.

4.5 Natural Character and Biodiversity

4.5.1 Discussion

Piha Beach is an iconic New Zealand beach with significant natural character and landscape values, notwithstanding the extensive human development and modification of the area. These values need to be protected and, where practical, restored – as outlined in the Piha Design Guidelines (ARC, 2010.

The work to date by Coastcare has significantly restored natural dune character, including natural dune vegetation and function. There is opportunity to build on these gains over time by:

- Minimising the use of human built structures as much as practical
- Addressing historic modification around the Moana Stream entrance, and carparks built in dune system
- Integrating backdune biodiversity into planting and amenity provision

In regard to human-built structures, fences and other access management structures are presently essential to protect restored dunes from a repeat of the serious human damage which historically characterised these dunes. The need for these measures was acknowledged in the Turner decision and is also evidenced in the degraded dune condition that resulted over the preceding 60-70 years (since mid-late 30's) when access management was generally poor (see Section 3.2). The wooden retaining walls separating pedestrian use along the back of the dune from car parking area are also important for safe use and access, and to act as a sand trap to minimise windblown sand issues on the car parking areas.

Nonetheless, as the level of beach user awareness and support for dune management improves, it may be possible to reduce the structures required and place greater emphasis on the use of natural dune vegetation for access management.

In the immediate future it would be possible to soften fencing in some areas by appropriate plantings. For instance, planting of dense knobby club rush and associated species (e.g. *Muehlenbeckia complexa,* sand coprosma and native spinach) could be undertaken along the landward margin of the naturally vegetated dunes and the landward margins of accessways.

Initially, any such planting should be additional to the existing fences. However, as this vegetation establishes and as support for dune management increases, it may be practical to eventually remove the fences in such areas and rely on the natural vegetation for access management. This would be best approached by small trial fence removal once a dense knobby club rush vegetation community is well established.

The use of vegetation for access management where this is practical has obvious natural character advantages over human-built fences. Other advantages include the fact that natural vegetation is not buried over time as can happen with fences.

Plantings of this nature would also enhance native dune biodiversity and simplify the control of exotic grasses invading the spinifex zone from landward.

Knobby club rush and associated backdune species will not be able to be used to guide access in more seaward dune areas where these species are not appropriate and are also unlikely to survive. However, in such areas pingao may be able to be used to provide subtle visual cues as to the location of accessways and trial of this approach would be worthwhile. Use of vegetation for this purpose should ensure plantings maintain the natural character of Piha Beach and avoid artificial appearance. For instance, planting strips of pingao along the seaward margins of accessways is likely to appear unnatural - but more subtle planting schemes that provide a visual cue may be practical.

The training of the Moana Stream in the mid 1980's has significantly modified the natural character in that area and is an ongoing concern to many (particularly longer term) members of the Piha community. The Turner decision concluded that these works were unnecessary and proposed that a degree of restoration of natural character would be desirable – in particular flaring of the stream entrance. During this review, concerns were expressed that to date there has been little attempt to undertake such work – though accumulations of concrete and rubble have now been removed from the seaward end of the trained stream channel.

Design of such work is outside the scope and terms of reference of this report but I concur with the Turner decision on the desirability of such work. The consultation also indicated community and beach users support for work in this area – though concerns were also raised that changes to stream flows may present issues, emphasizing the need for careful design. Further work and appropriate consultation would be required to scope and design the best option; but in my opinion there would be practical options to significantly restore the natural character of this area. This reflects the fact that the natural seaward advance of Piha Beach in recent decades has increased the potential to restore natural character through flaring of the stream entrance and realignment of the (man-made) dunes to the immediate northern side of the stream. With appropriate design, this work could also enhance the existing grassed reserve by the stream (a useful picnic area according to feedback received) and achieve a variety of amenity gains in this area (e.g. in regard to reserve use, beach access and beach views). There is also potential for this restoration to reduce (but not eliminate) stream erosion at the eastern end of the narrow dune fronting the southern car park.

Native backdune communities are very rare on the remaining areas of natural dunelands in the study area and, while backdune amenity would be given preference in this high use area, there would be opportunities to integrate natural vegetation with access management and enhancement of amenity.

4.5.2 Recommendations

a. Incorporation of native backdune planting is desirable where practical to enhance natural values. The key opportunities are the areas to the north of the surf club car park and on the rear of the large dune at the extreme southern end of the beach.

b. It is recommended use of native dune vegetation be adopted to assist in access management as part of a longer term effort to reduce reliance on human-built structures, including:

    i. Planting of knobby club rush planted densely (spacing of 0.4-0.5 m) along the landward margin of the naturally vegetated dunes – ideally over a width of at least 2-3 m. *Muehlenbeckia complexa,* sand coprosma and/or native spinach should be inter-planted among the knobby club rush or introduced later.

    ii. Experimentation with use of pingao as a visual cue for accessway location on the seaward dune face – while ensuring plantings maintain a natural pattern and appearance (i.e. simply defining the margins of the accessways with pingao may not be appropriate)

c. This work should be additional to existing fencing. However, once dense vegetation is established, removal of existing fences could be trialled in limited areas with close monitoring.

d. Restoration of natural character and enhancement of amenity values in the vicinity of the Moana Stream can probably be achieved with appropriate design and consultation and further investigation and design is recommended.

e. The design of amenity areas (including grassed areas) should usefully incorporate native backdune species where appropriate, in preference to exotic vegetation.

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