

Kapiti Coast District Council

Beach Renourishment Trial at Marine Parade, Paraparaumu

Interim Report No 4

This 4th interim report is to briefly record the changes that have occurred to the end of June 1995 at the beach renourishment trial site at the south end of Marine Parade, Paraparaumu, and in the source area opposite Manly Street, since transport of the sand was completed during November 1994. The trial renourishment zone was 200 metres long and the sand was obtained by scraping from the inter-tidal zone on a section of the beach fronting Manly Street and transporting it along the beach to the trial site.

Fourteen profile sites were established for the purpose of monitoring the trial and these are shown on the two accompanying site plans. The site plans show three profile lines (141, 142 and 143) crossing the renourishment zone and four profile lines (152, 16, 18 and 181) across the area from where the sand was removed.

Each profile was surveyed across the dunes and to a point as far off-shore as could be reached by wading into the surf. To date the following surveys have been carried out:

- between 26 October and 1 November 1994 before the work commenced;
- between 25 - 28 November 1994 following completion of the work;
- between 9 - 11 January 1995;
- between 27 and 28 March 1995; and most recently
- between 23 - 29 June 1995.

Some of the profiles were also surveyed on 15 and 18 November 1994 to record the effects of storm action during the construction period.

The results of the previous surveys measuring the changes that occurred between Oct 94 and Nov 94 (before and after the renourishment work), between Oct 94 and Jan 95, and between Jan 95 and March 95, were summarised in Interim Reports Nos. 1, 2 and 3. In each case, plots of the cross-section profiles were produced by the Wellington Regional Council from the survey data and the volumetric changes, per metre of beach at each profile location, have been calculated.

Along the 200 metre trial renourishment site, approximately 30 m³ of sand was deposited for each metre of beach to give an original renourishment volume of 6000 m³. Losses from the sand placed on the beach during deposition amounted to approximately 6% of this volume and this was mainly attributed to minor lateral spreading of the deposited sand as the profiles adjusted.

The volumetric changes that have occurred between each survey at each profile have been summarised in the table attached to this report.

The results of the March 1995 survey showed some continuing loss of sand from profiles 142 and 143 although the surveys in both cases did not extend as far off-shore as on previous

occasions. This may have affected the reliability of the volumetric calculations. If the calculations were valid then these two profiles, located near the centre and at the northern end of the renourishment zone, respectively, appeared to have been losing sand at a rate of approximately 3 - 4 cubic metres (per metre along the beach) each month since the work was completed. Conversely, profile 141 at the southern end of the renourishment zone accreted 8.3 m³/m during the Jan - Mar 1995 period.

General growth of the beach at the profiles to the north and south of the trial renourishment site during the period Oct 1994 to Mar 1995 was apparent and these areas may have benefited from any movement of sand from the trial site as a new equilibrium sought to become established. Low groynes at each end of a renourishment zone may be required during any future exercise if such lateral movement of the deposited sand is considered undesirable.

Comment on the changes at individual profiles during the period March - June 1995, as indicated from the recent survey results, follow:

- Profile 131** 300m south of the trial site. No change in dune face during the period March to June 1995. General increase in beach levels up to 150 mm. Movement of sand below MLWS with significant bar formation 170 to 180 metres off-shore.
- Profile 132** 100 metres south of trial site. Minor adjustment to face of sand dune and general accretion on beach up to 220 mm deep. Significant movement of sand below Mean Sea Level (MSL) with bar formation 175 metres off-shore.
- Profile 14** Just south of the trial site. No change in face of dune during March - June 1995. General accretion on beach down to mid-way between Mean High Water Spring (MHWS) tide level and MSL, up to 200 mm. Significant sand movement below MSL with bar formation 180 metres off-shore.
- Profile 141** At the south end of the trial site. Toe of dune has moved seawards approximately 1 metre, possibly due to re-adjustment of the dune face. Up to 175 mm of sand accretion on beach down to near MSL, between March and June 1995. Mean High Water Spring (MHWS) tide mark has moved seawards approximately 7 metres as a result of the sand build-up during the period. General lowering of the profile below MSL indicating movement of sand shorewards. Evidence of bar formation 180 - 190 metres off-shore. Net loss of sand from the profile 10.7 m³/m between March and June 1995 although it is noted that the profile volume had grown 8.8 m³/m during the previous period Jan -March 1995.
- Profile 142** Centre of trial site. No change in dune face during March - June 1995. General accretion on beach, up to 200 mm, down to MSL. Significant movement of sand below MLWS with general growth in profile volume (9.219 m³/m) during the period although suspect volumetric calculations from the previous survey may have affected this result. Bar formation 170 - 190 metres off-shore noted.
- Profile 143** North end of trial site. No change in dune face during March - June 1995. Around 200 mm of beach growth down to MSL and MHWS tide mark has thus moved seaward approximately 7 metres as a result. Significant movement of sand below MSL with bar growth 180 - 190 metres off-shore. Again, apparent growth in measured beach volume during March - June period

(12.482 m³/m) possibly reflects misleading calculation from the previous survey.

- Profile 144** Just north of trial site opposite Tahiti Street. Sand levels on the beach between the toe of the dune and MLWS have risen up to 350 mm during the period March - June 1995. Measured profile volume increase (20.762 m³/m) is large and, again, may have been affected by the results of the previous survey. Movement of sand in the off-shore zone with bar growth 175 - 185 metres off-shore. Growth in beach at this location has effectively moved MHWS tide mark 10 metres off-shore.
- Profile 20** 270 metres north of trial site opposite Rua Road. No change in dune face during the period March - June 1995. Beach growth up to 400 mm from face of dune to just below MSL, and as a result, MHWS tide mark has been moved seaward 10 metres. Significant movement of sand in off-shore zone with bar growth evident 185 - 200 metres off-shore.
- Profile 151** 280 metres south of source area (35 Manly St). Growth in profile volume continues and since October 1994, volume of sand on the beach at this site has increased 106 m³/m including 18.34 m³/m during the period March - June 1995. Beach levels down to MSL have increased in height up to 250 mm. Significant movement of sand below MSL and a consistent bar remains 220 - 230 metres off-shore.
- Profile 152** South end of source area (71 Manly St). Survey shows a large increase in dune height of up to 1 metre at one location approximately 20 metres from the start of the profile survey. General growth in beach level of up to 150 mm down to MSL. Movement of sand below MSL with general smoothing of the profile off-shore. Little evidence of an off-shore bar at this site. Dune growth probably a major contributor to increase in beach volume (20.275 m³/m) during the March - June 1995 period.
- Profile 16** Through source area opposite Nathan Street. General increase in beach levels of 150 mm between dunes and MSL. Some movement of sand shoreward between MSL and MLWS. General profile accretion recorded since November 1994, continues with volumetric increase 9.737 m³/m during March - June 1995 period. Less movement of sand in off-shore zone than at other sites. No apparent bar growth.
- Profile 18** Through source area (103 Manly St). Accretion of upper part of beach above MHWS with little change between MHWS and MSL. Some movement of sand below MSL and general lowering of profile off-shore has led to a measured loss of volume of 12.503 m³/m during the March - June 1995 period. Note this follows a 40.366 m³/m gain in volume during the preceding Jan - March survey period.
- Profile 181** North end of source area (131 Manly St). No significant change in profile down to MSL. Considerable sand movement below MSL with significant growth (up to 500 mm) in sand levels reflected in an increase in measured sand volume of 20.074 m³/m during the period March - June 1995.

Profile 182 300 metres north of source area (163 Manly St). Only minor changes in beach profile above MLWS. Significant growth in sand levels (350 - 450 mm) off-shore. Overall growth in beach volume of 23.664 m³/m during the period March - June 1995.

In Renourishment Trial Report No 3 it was suggested that, if the volumetric calculations based on the results of the January - March 1995 survey were accurate, then around 35% of the sand deposited at the trial renourishment site may have moved elsewhere. It was suggested that if this was the case, the beaches, both to the south and to the north, may have been the main beneficiaries.

The recent survey indicates that beach levels in the trial zone have now recovered to the point where the 85% of the original amount deposited remains. Before reading too much into this it must be realised that there has been a general increase in beach levels at most profile sites and, while the 35% loss indicated from the previous results may have been overly pessimistic, there has no doubt been some redistribution of the renourishment material. It does appear though that the deposited sand has at least remained in the area rather than being lost off-shore and has probably contributed to the fortuitous (for this time of the year) growth in beach levels.

The improvement in beach levels has been accompanied in many cases by off-shore bar growth as well, which is uncommon in that it is usually material removed from the beach during storm action that contributes to off-shore bar development. While the reasons for the changes that have occurred may be unclear at this stage, beach growth and off-shore bar development will both provide improved resistance to storm action.

Because of the quality of the data that has been obtained during the monitoring period it will be instructive to attempt to relate the changes in the beach profiles that have occurred since the renourishment trial began, to weather details recorded at Paraparaumu airport, at end of the 12 month trial period.

It is also noted that apart from Profile 18, which has previously recorded significant growth, the remainder of the source area also has undergone considerable growth in beach volume during the March - June 1995 period.

J L Lumsden
Coastal Engineering Consultant
P O Box 8515
Christchurch

7 August 1995

Paraparaumu Beach Renourishment Trial
Beach Profile Changes

Profile	Oct-94	Oct-94	Oct-94	Oct-94	Nov-94	Nov-94	Nov-94	Jan-95	Nov-94	Jan-95	Mar-95	Mar-95
	to Nov-94	to Jan-95	to Mar-95	to Jun-95	to Jan-95	to Jan-95	to Mar-95	to Jun-95	to Jun-95	to Mar-95	to Jun-95	to Jun-95
131	2.950	1.541	8.856	12.873	-1.409	5.906	9.923	7.315	4.017			
132	3.038	3.665	10.802	20.133	0.627	7.764	17.095	7.137	9.331			
14	7.275	12.795	13.269	18.582	5.520	5.994	11.307	0.474	5.313			
141	25.488	25.953	34.276	23.545	0.465	8.788	-1.943	8.323	-10.731			
142	27.016	20.886	13.083	22.302	-6.130	-13.933	-4.714	-7.803	9.219			
143	30.940	24.695	17.738	30.220	-6.245	-13.202	-0.720	-6.957	12.482			
144	15.785	8.350	12.473	33.235	-7.435	-3.312	17.450	4.123	20.762			
20	2.684	5.671	15.745	28.934	2.987	13.061	26.250	10.074	13.189			
151	30.067	51.136	87.785	106.126	21.069	57.718	76.059	36.649	18.341			
152	46.709	44.297	54.492	74.767	-2.412	7.783	28.058	10.195	20.275			
16	-12.229	7.762	14.544	24.281	19.991	26.773	36.510	6.782	9.737			
18	-43.858	-25.247	15.119	2.616	18.611	58.977	46.474	40.366	-12.503			
181	-58.141	-72.631	-73.493	-53.419	-14.490	-15.352	4.722	-0.862	20.074			
182	-69.581	-56.827	-70.122	-46.458	12.754	-0.541	23.123	-13.295	23.664			

Note: 1. Figures show volumetric changes in beach profile in cubic metres per metre along the beach.

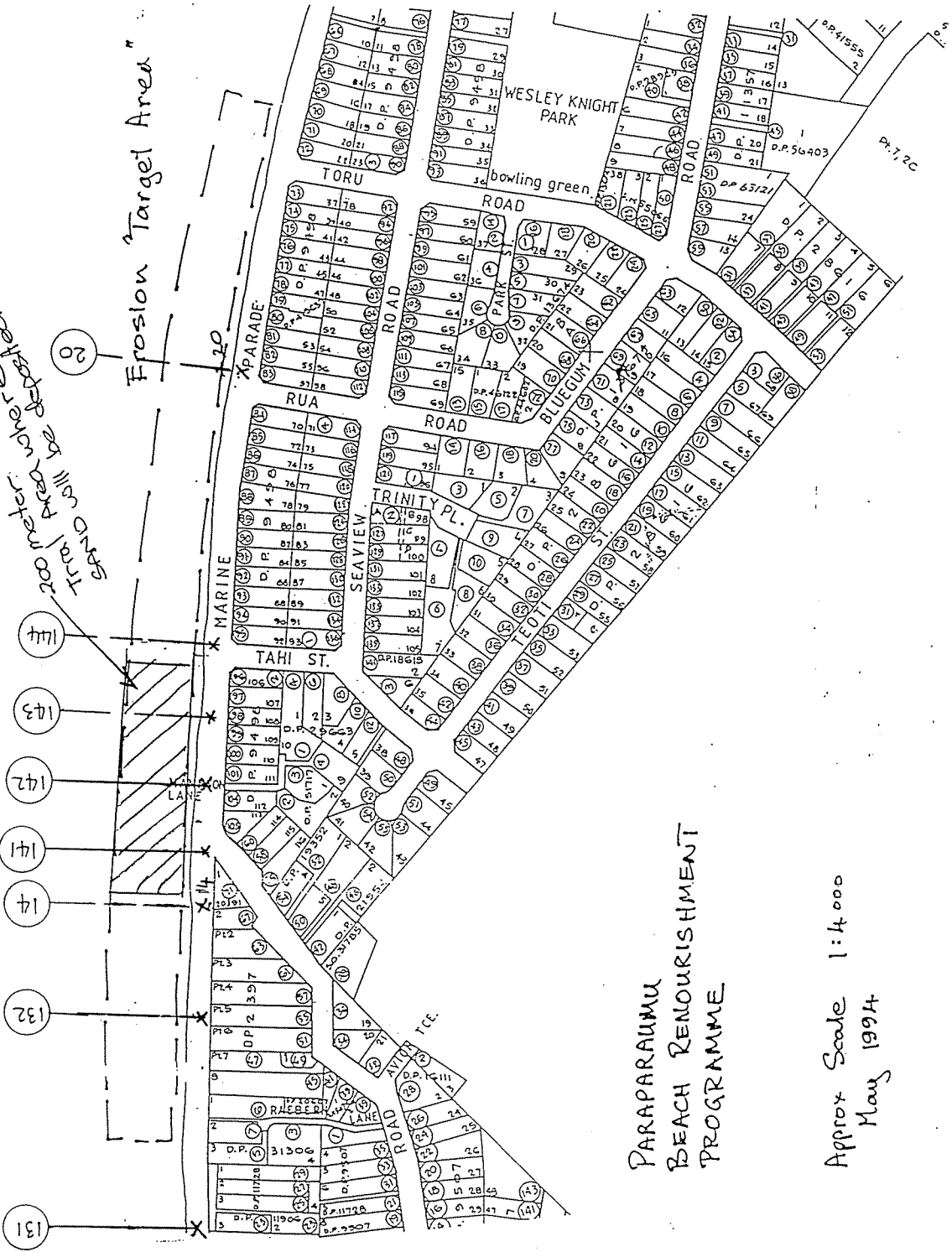
2. The shaded zones represent the cut (lower) and fill (upper) zones.

3. Negative values represent loss of sand. Positive values represent accretion.

PROPOSED X SECTIONS FOR
MONITORING RENOURISHMENT TRIAL

200m from beach
Trinity Centre
200m from beach
200m from beach

Frosion "Target Area"



PARARAMU
BEACH RENOURISHMENT
PROGRAMME

Approx Scale 1:4000
May 1994

Proposed x sections for Monitoring
Renourishment Trial.

Inter-Tidal area

Approximate
Initial Source area
(in mid-tide zone)

GENERAL LOCATION OF
SOURCE AREA

Extended source
area for future

PARAPARAMU
BEACH RENOURISHMENT
PROGRAMME

Approx Scale 1: 4,000

May 1994

