

Kapiti Coast District Council

Coastal Management at Paraparaumu Post-renourishment Trial Monitoring

Report No 3

April 1998

1. Introduction

Following a period of erosion continuing over at least ten years prior to 1993, a beach renourishment trial was carried out in 1994 at a 200 metre long site adjacent to the southern end of Marine Parade, Paraparaumu. At the time of the trial it was considered that the sand dune barrier remaining was not sufficient to provide adequate protection to the roadway (Marine Parade) in the event of a major storm. The purpose of the trial, other than to augment the sand dune and provide improved protection along the most vulnerable part of the roadway, was to determine whether or not beach renourishment could provide a viable means of off-setting the impacts of any further erosion.

After obtaining the necessary resource consents, sand was obtained by scraping from the inter-tidal zone along an accreted section of the beach fronting Manly Street in November 1994. This sand was transported south along the beach and was used to replenish the dune face and upper part of the beach at the trial site. The amount of sand deposited during the trial was 6000 m³ at a more or less even distribution of 30 m³ per metre of beach. The trial site and the area from where the sand was extracted are shown in Figure 1, attached to this report.

Fourteen profile sites were established for the purpose of monitoring the trial. Three profile lines (141, 142 and 143) crossed the renourishment zone and four profile lines (152, 16, 18 and 181) crossed the area from where the sand was obtained. Other profile lines were established (131, 132, 14, 144, 20, 151 and 182) to provide additional information concerning sand movements both close to and remote from the trial zone and the source area.

During the renourishment trial each of the profile lines was surveyed across the dunes and to a point as far off-shore as was able to be reached by wading into the surf at low tide. Following each survey, the results were plotted, and the volumetric changes calculated by staff at Wellington Regional Council. The first survey began on 26 October 1994, just prior to deposition of the sand adjacent to Marine Parade and surveys were carried out on five further occasions through to mid-September 1995. The data so obtained provided a

valuable insight into the mechanics of sediment movement around the headland at Paraparaumu.

The results of the trial and the monitoring period were presented in the report, "*Beach Renourishment Trial at Marine Parade Paraparaumu*", (J L Lumsden, March 1996). The trial demonstrated that, from a technical point of view, beach renourishment is a viable proposition as a means of limiting the effects of further erosion at this location, and is consistent with the natural character of this part of the Kapiti coastline.

2. Post-Trial Monitoring

Among the recommendations included in the March 1996 report was the need for on-going monitoring. This recommendation also suggested that, for the time being, there was no need to continue surveying Profiles 132, 141, 143 and 152.

Two new profiles have since been established. Profile 21 is located approximately 300 metres south of Profile 151, off the end of Kapiti Road, and this is to provide an additional measure of the significant accretion that has been occurring around the tip of the Paraparaumu headland since 1995. Profile 17 was established approximately 300 metres north of Profile 182 for the purpose of monitoring the on-going erosion at the north end of Manly Street. The profile lines monitored during the most recent survey are also shown on Figure 1.

Since the renourishment trial period ended in mid-September 1995, further surveys have been carried out at the following times:

- 27-28 March 1996
- 24-29 April 1996
- 5-8 November 1996
- 9-10 December 1996
- 29-31 October 1997

The March 1996, November 1996 and October 1997 surveys were carried out as part of the regular monitoring programme, whereas both the April 1996 and December 1996 surveys were undertaken to record the effects of stormy north-westerly conditions. The volumetric changes that have occurred at each profile site are recorded in Table 1 attached to this report.

3. Results from the Latest Survey

Profiles from three of the survey sites, No. 142 at the centre of the trial renourishment site, No. 16 through the original sand supply area, and No 182 towards the northern end of Manly Street, are appended to this report, as representative profiles, to show graphically the changes that have occurred approximately annually at these locations since November 1994. Note, these cross-sections have been redrawn from the survey plots produced by Wellington Regional Council.

Descriptions of the changes that have occurred at each profile site follow.

Profile 131 ~ 300 metres south of the trial site

Since the previous survey in December 1996, there has been good growth across the beach between the dune face and low tide with most of this build up being derived from off-shore. There appears to be less activity in the bar area further off-shore. The survey records show that a loss in beach volume of 12.37 m³/m has occurred at this location during the period. This result is considered misleading, however, as it most probably represents a correction following an apparent anomaly during the previous survey, which recorded an unrealistically high accretion. Ignoring the previous change in volume and its impact on the present result, this profile has shown generally consistent growth over the two year period from September 1995, and it is worth noting that, during this period, Mean High Water (MHW) has moved seaward some 10 metres.

Profile 14 ~ Immediately south of the trial site

The survey peg marking the in-shore end of this profile appears to have been destroyed by development (Pers. Comm. M Ede, Wellington Regional Council). Profile 141 has been surveyed instead.

Profile 141 ~ South end of renourishment trial site

This profile has not been surveyed since September 1995 but since then the profile has shown consistent growth across the beach with predictable movement off-shore in the bar area. Since the previous survey, beach volume at this location has increased by 16.23 m³/m. There appears to have been some recession of the dune face but no change at the toe, which would normally indicate the first sign of dune recession.

Profile 142 ~ Centre of renourishment trial site

There is evidence that sand has been moved shoreward from the off-shore area with a small build-up at the toe of the dunes and across the beach. Overall, there has been a small net decrease in beach volume of 1.69 m³/m during the Dec '96 - Oct '97 period. Despite previous losses, the dune face appears to have recovered to the point where it now seems little different to its position in November 1994 at the end of the sand deposition period during the renourishment trial. Although Mean Sea Level (MSL) has receded 3 metres during the period, MHW has moved seaward 2 metres.

Profile 144 ~ Just north of trial site opposite Tahiti Street

The October 1997 survey indicates that there has been very little change in the beach/dune profile above MSL during the Dec '96 - Oct '97 period. There has, however, been a net loss in beach volume of 6.84 m³/m and most of this can be attributed to bar movement in the off-shore region seaward of low tide. The position of MSL has remained unchanged but MHW has moved 2 metres seaward. The upper part of the beach in October 1997 was approximately 0.5 metre higher than in November 1994, at the end of the sand deposition period.

Profile 20 ~ 270 metres north of trial site opposite Rua Road

There has been significant accretion in the beach above MSL at this location during the period Dec '96 - Oct '97, as sand from the off-shore bar area has moved shorewards. This growth has resulted in MHW moving seawards 7 metres since the previous survey. Some growth has also occurred in the upper part of the dunes, presumably as a result of wind action. Movement of sand in the bar area below low tide has contributed to a small net loss in beach volume of 2.11 m³/m, despite the growth in-shore.

Profile 21 ~ Opposite the end of Kapiti Road

This profile was first surveyed in March 1996. Although located nearly 1 km north of Profile 20, this part of the Paraparaumu coastline has also exhibited similarly strong growth in the upper part of the beach. MHW here has prograded seawards by 9 metres and MSL has moved off-shore by 11 metres during the Dec '96 - Oct '97 period. Significant bar movement off-shore has resulted in a small net loss in overall beach volume of 0.80 m³/m.

Profile 151 ~ 300 metres south of sand supply area (opp. 35 Manly St)

The beach at this profile site continues to accrete, although not in such a spectacular fashion as on previous occasions. Net gain during the Dec '96 - Oct '97 period was 5.45 m³/m and this is mainly evident above MSL. MHW has moved a further 6 metres seaward and there is also evidence of growth within the dunes. The beach at this location is somewhat flatter than further south adjacent to Marine Parade, but at all stages of the tide, sea level by October 1997 had moved 30 metres or more seaward of its position in November 1994. As at other sites, bar movement has occurred below low tide.

Profile 16 ~ Through sand supply area opposite Nathan Street

There has been some lowering of the beach at this site, varying between 100-400 mm over the inter-tidal zone. Further in-shore, and well above MHW, the survey indicates that there has been a significant loss of sand over a width of approximately 50 metres. This apparent loss is largely the reason for the recorded change in beach volume showing a high net loss of 41.23 m³/m during the Dec '96 - Oct '97 period. The reason for such a loss, high on the beach well above MHW, is not apparent from the survey plot but the relatively modest changes elsewhere along the profile do not suggest wave action as the likely cause.

Profile 18 ~ Through sand supply area (103 Manly St)

Some loss of sand has occurred in the dune area but only small changes in the beach profile are apparent across the inter-tidal zone. As elsewhere there has been bar movement off-shore. The measured net loss in beach volume was 10.47 m³/m during the Dec '96 - Oct '97 period and, again, most of this seems to have occurred in the "dry" beach area above MHW. Although this point has moved a small distance, 2 metres, in-shore it remains some 18 metres seaward of its location in November 1994.

Profile 181 ~ North end of sand supply area (131 Manly St)

The survey results from this site indicate that a significant volume of sand has moved shoreward during the Dec '96 - Oct '97 period. The beach volume has increased 113.21 m³/m and this is atypical when compared to previous surveys at this location. While growth across the beach has been strong, a significant part of the recent increase can be attributed to the changes shown in the dune profile. In this respect it is relevant to note that the previous survey in December 1996 showed an unusually large loss of sand from the dune face, which raised the possibility of either a survey error or perhaps a dune blowout. The October 1997 profile is more consistent with earlier surveys prior to December 1996. Notwithstanding this anomaly, the growth across the beach and the apparent shoreward bar movement at this location is encouraging in light of earlier losses.

Profile 182 ~ 300 metres north of sand supply area (163 Manly St)

After consistent losses of sand since the renourishment trial began in October 1994, the beach at this at this profile site has recorded a gain in beach volume of 17.51 m³/m during the Dec '96 - Oct '97 period. This gain has occurred in the area below MSL where a significant bar system has developed with height variations of up to 1 metre. This may be an encouraging sign for the future providing sand continues to move shoreward but, in the meantime, the beach above MHW has continued to erode with a recession of 1-2 metres evident in the dune face providing small comfort for those living nearby.

Profile 17 ~ Opposite 202 Manly Street

This profile was first surveyed in April 1996. The dune face appears to have receded approximately 3 metres during the Dec '96 - Oct '97 period and there has been a net loss in beach volume of 24.12 m³/m, which is evidenced by a general lowering of the beach across the whole profile. Unlike the other profiles surveyed in October 1997, there is much less evidence of sand movement in the bar area below low tide level. The beach here remains somewhat steeper than further south. Although the position of MHW has not changed, MSL has moved shoreward 10 metres confirming the continuing deficit in the sediment budget.

4. Discussion

Although most profile sites lost small volumes of sand during the Dec '96 - Oct '97 period, strong growth was recorded in the area above Mean Sea Level at many sites as sand moved shoreward from the bar area below low tide level. More significant losses that were contrary to previous trends were recorded at Profile Nos 131 and 16. Possible survey inconsistency may account for the result at Profile 131 but at Profile 16 most of the loss is attributed to the apparent removal of sand from within the dune system, possibly caused by wind.

The northern end of Manly Street has been an area of concern since the renourishment trial began and consistent losses in beach volume have been recorded. On this occasion the results are more encouraging in so far as Profiles 181 and 182 have both shown increases

in beach volume. Profile 17, further north has continued to erode however and remains a matter of concern.

It is understood that, at the time of writing this report, the mouth of the Waikanae River has migrated south back to its former position, prior to realignment in 1995 by Wellington Regional Council. While this will no doubt have some impact on the natural by-passing of sand from the northern coast, it is too early to tell whether or not this has been responsible for the signs of beach recovery at the northern end of Manly Street (Profiles 181 and 182). This issue will need to be reviewed following subsequent surveys. It must be noted that, as yet, there has been no sign of possible recovery at Profile 17, further north.

The most recent survey was carried out in October 1997, three years after the deposition of sand adjacent to Marine Parade. After losses, an average of about 27 m³/m was added to the beach system during this exercise and since that time the trial area has undergone a further increase in beach volume of approximately 15 m³/m, largely by natural means assisted by some deposition following stormwater outfall clearance along Manly Street. Further north from the trial area, the beach has undergone greater accretion. There are thus no losses to be made up at this time by importing sand from inland quarries.

A further survey, prior to the 1998 winter, is recommended.

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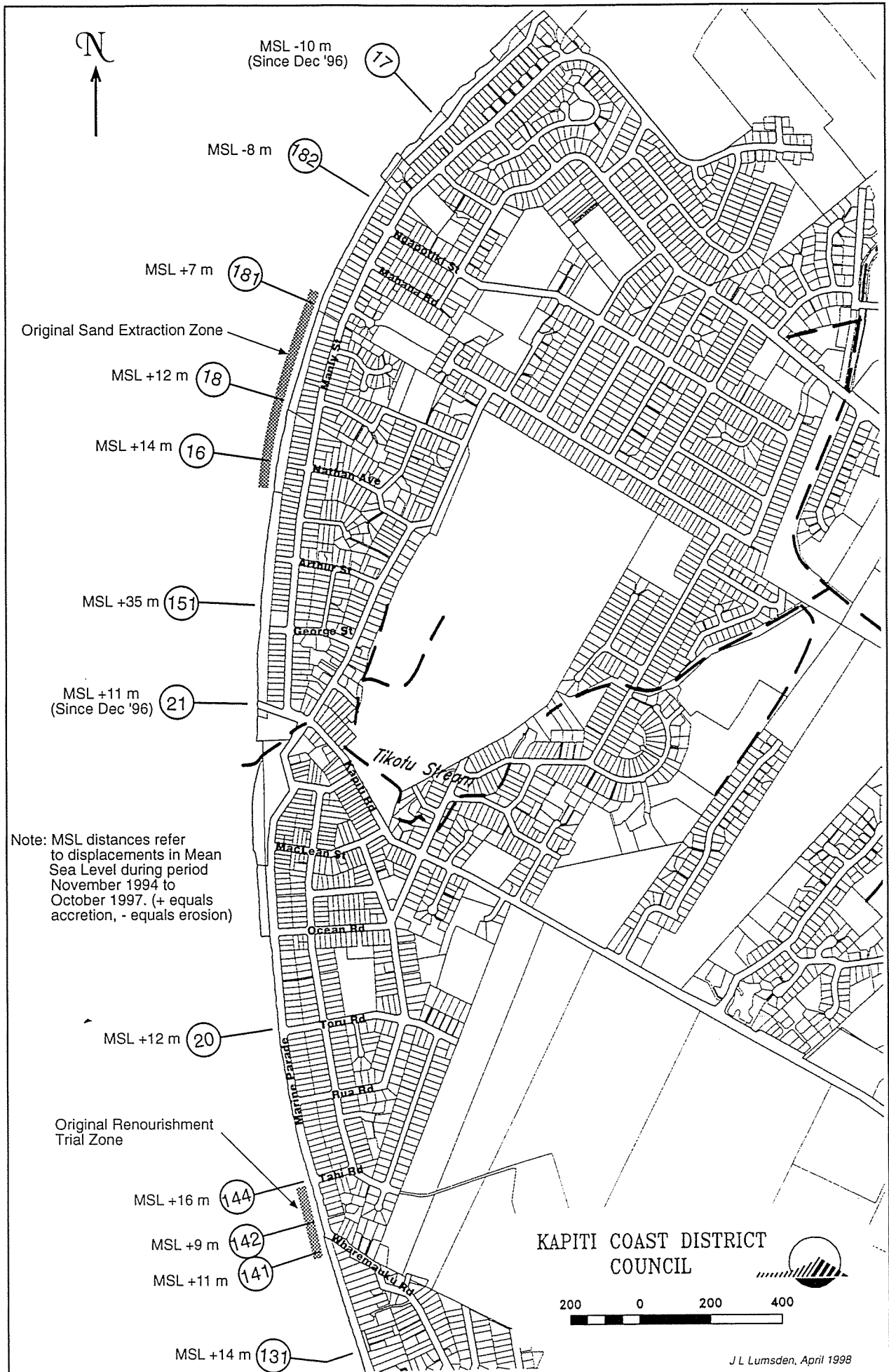


Figure 1: Paraparaumu Shoreline Showing Profile Locations Surveyed October 1997

Table 1: Changes in Beach Volume at Selected Profiles Following Renourishment Trial at Marine Parade, Paraparaumu

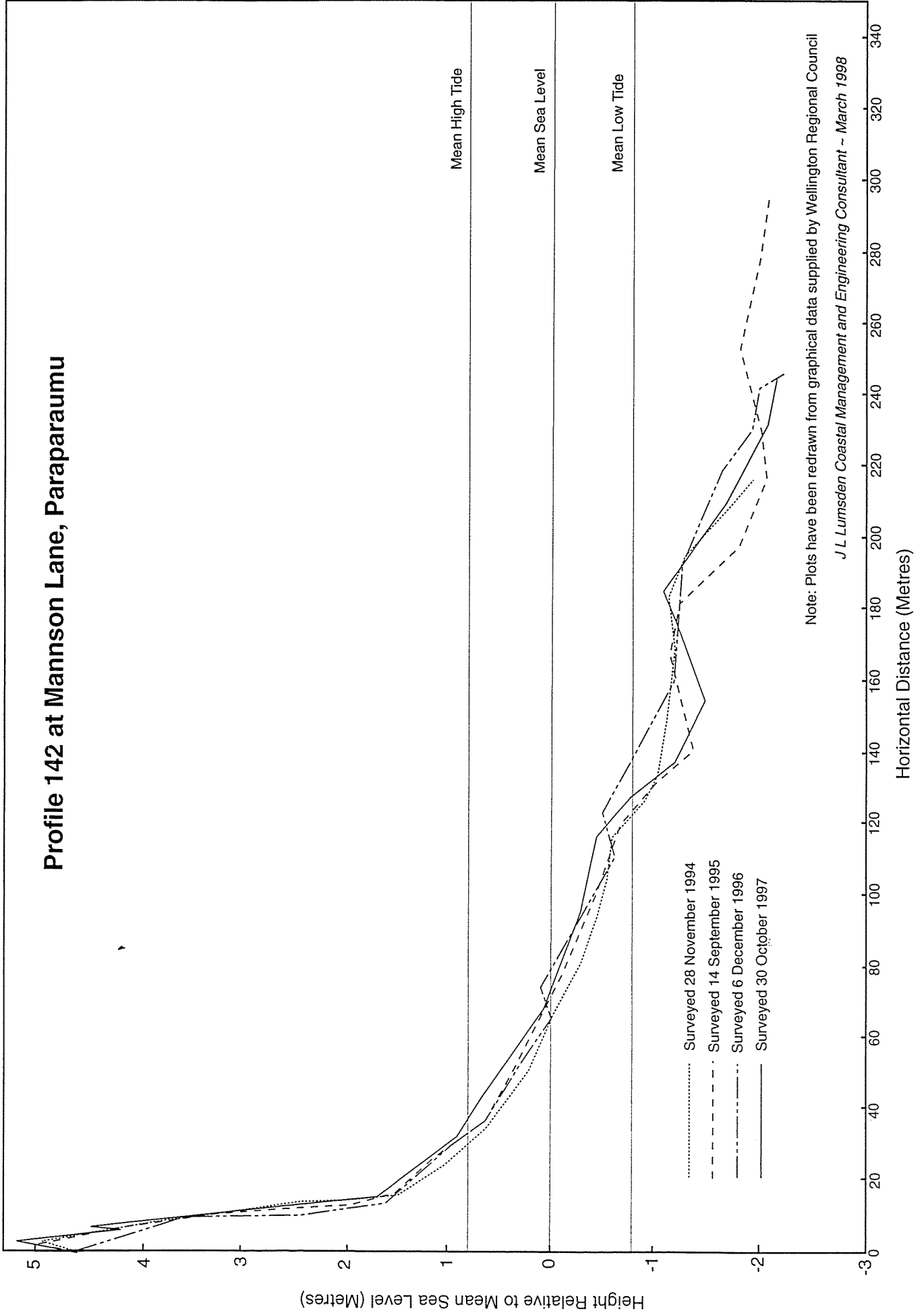
Profile Number	Results of Post-trial Monitoring														Gross Changes	
	Contract Period		1 yr Trial Monitoring												Sep-95 to Oct-97	Nov-94 to Oct-97
	Oct-94 to Nov-94	Nov-94 to Sep-95	Sep-95 to Mar-96	Mar-96 to Apr-96	Apr-96 to Nov-96	Nov-96 to Dec-96	Nov-96 to Dec-96	Sep-95 to Dec-96	Dec-96 to Oct-97	Dec-96 to Oct-97	Sep-95 to Oct-97	Nov-94 to Oct-97				
131	2.950	-3.567	12.892	-6.315	10.435	29.423	46.435	-12.370					34.065	30.498		
132	3.038	6.975														
14	7.275	10.270	-3.155	9.523	15.939	1.187	23.494	No Result								
141	25.488	-1.260											16.226	14.966		
142	27.016	-4.115	-5.984	8.425	13.462	5.921	21.824	-1.690					20.134	16.019		
143	30.940	3.441														
144	15.785	9.334	-7.634	1.116	2.162	23.147	18.791	-6.839					11.952	21.286		
20	2.684	23.558	11.145	3.234	3.928	0.105	18.412	-2.111					16.301	39.859		
21				-10.678	42.271	-4.817		-0.800					25.976	25.976		
151	30.067	91.867	21.118	8.258	19.922	-9.878	39.420	5.454					44.874	136.741		
152	46.709	2.924														
16	-12.229	38.889	53.488	28.287	-29.245	9.803	62.333	-41.225					21.108	59.997		
18	-43.858	67.231	29.910	-21.579	15.799	-4.540	19.590	-10.466					9.124	76.355		
181	-58.141	9.502	-6.559	-39.390	66.119	-81.128	-60.958	113.209					52.251	61.753		
182	-69.581	-2.042	-4.644	0.123	-0.953	-32.846	-38.320	17.505					-20.815	-22.857		
17				5.948		-16.267		-24.116								

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

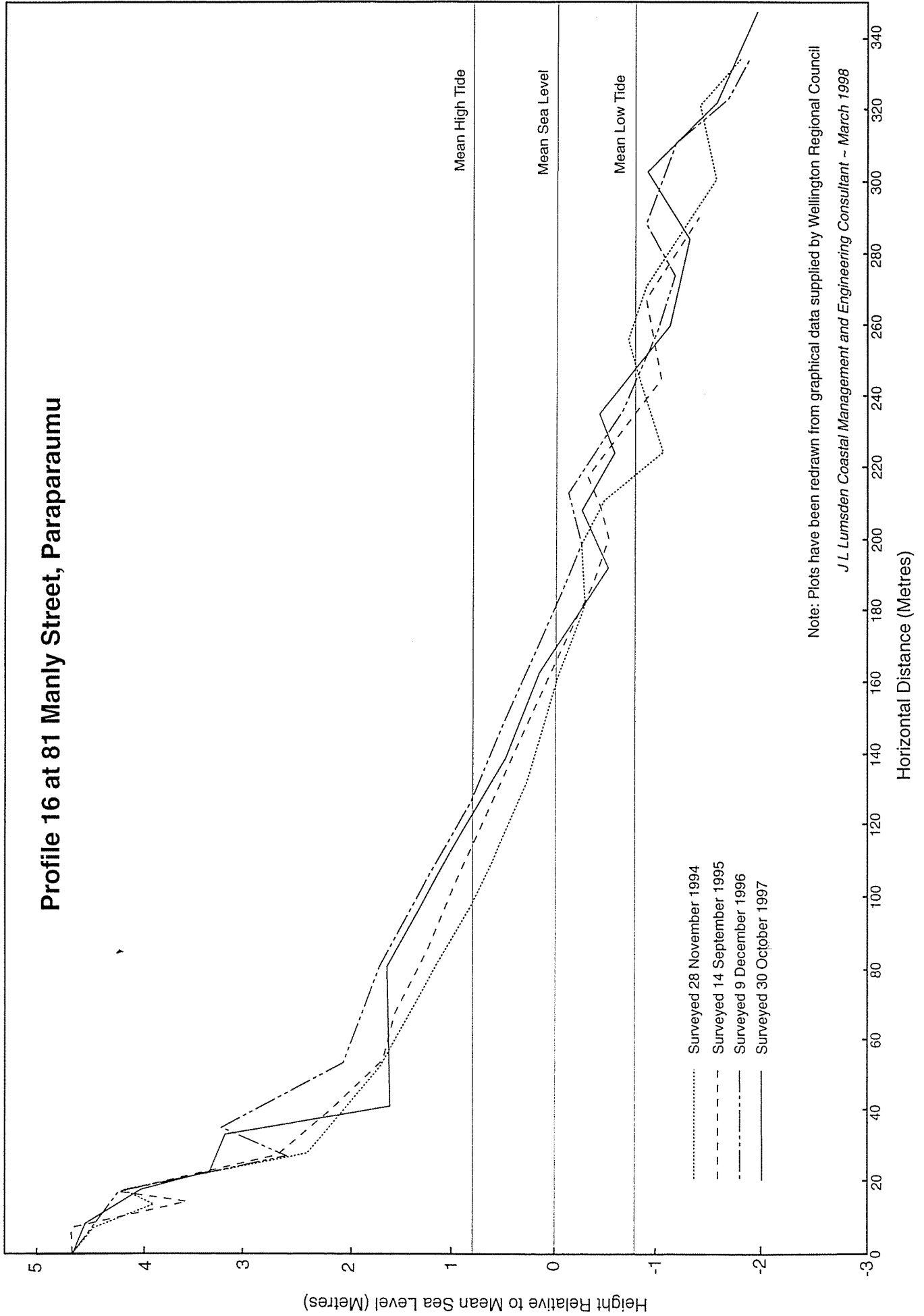
2. The shaded zones represent the cut (lower) and fill (upper) zones.

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

Profile 142 at Mannson Lane, Paraparaumu

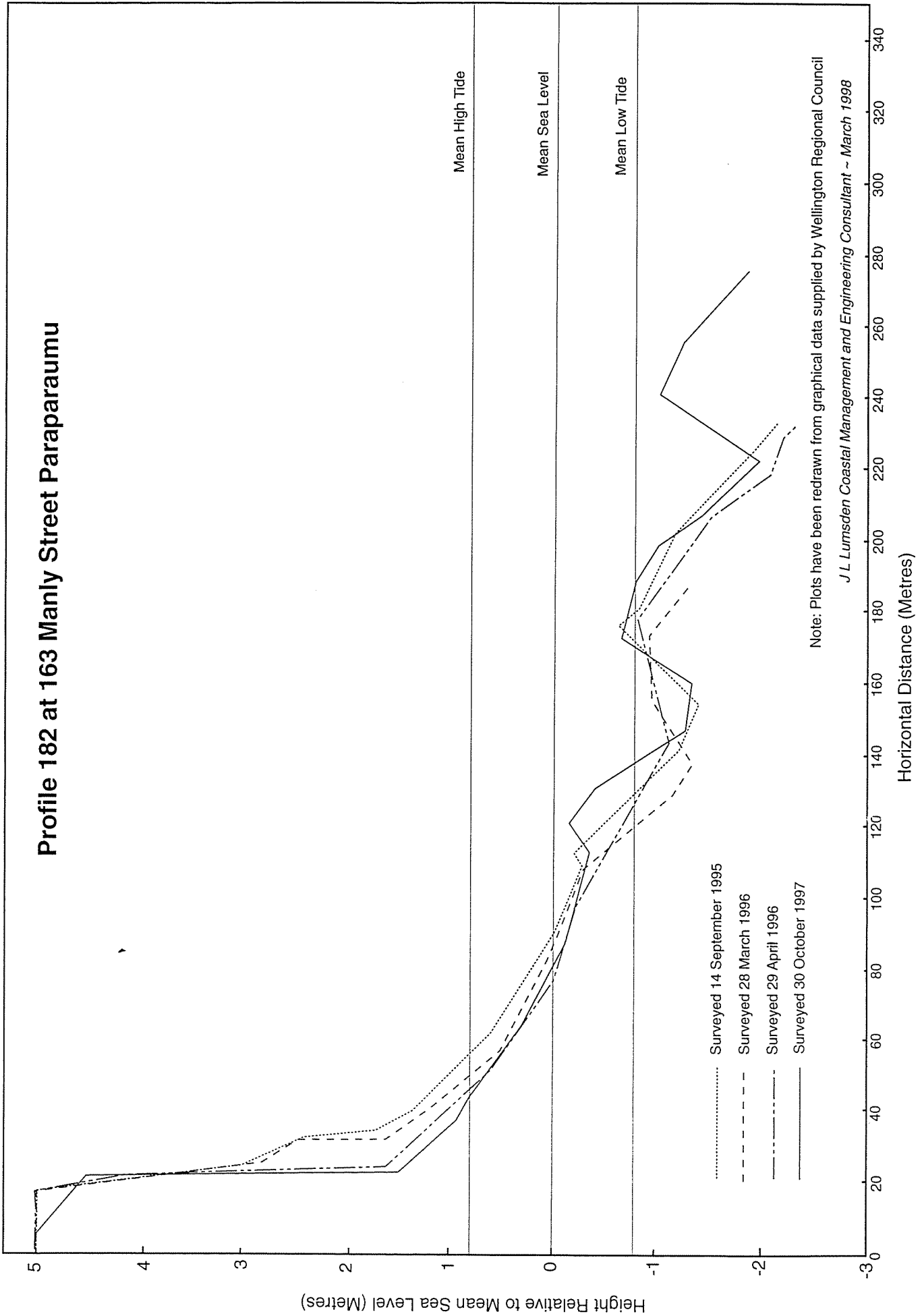


Profile 16 at 81 Manly Street, Paraparaumu



Note: Plots have been redrawn from graphical data supplied by Wellington Regional Council
J L Lumsden Coastal Management and Engineering Consultant ~ March 1998

Profile 182 at 163 Manly Street Paraparaumu



Note: Plots have been redrawn from graphical data supplied by Wellington Regional Council
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