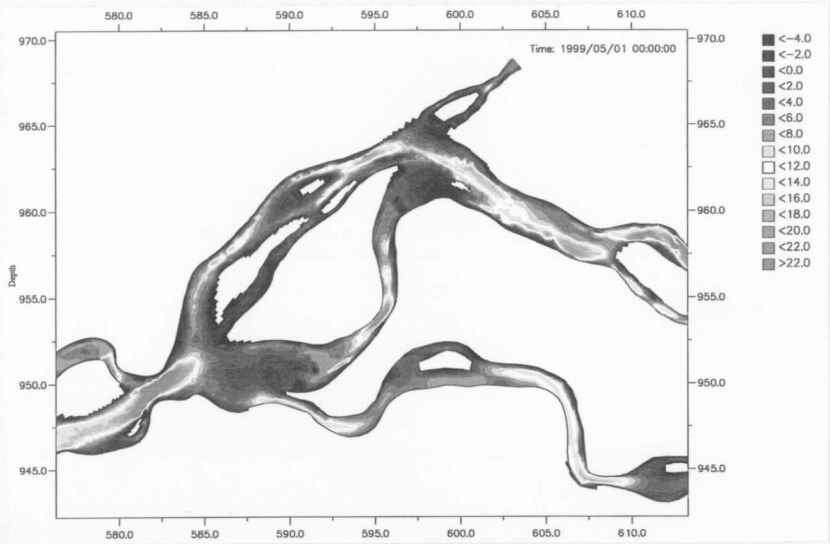
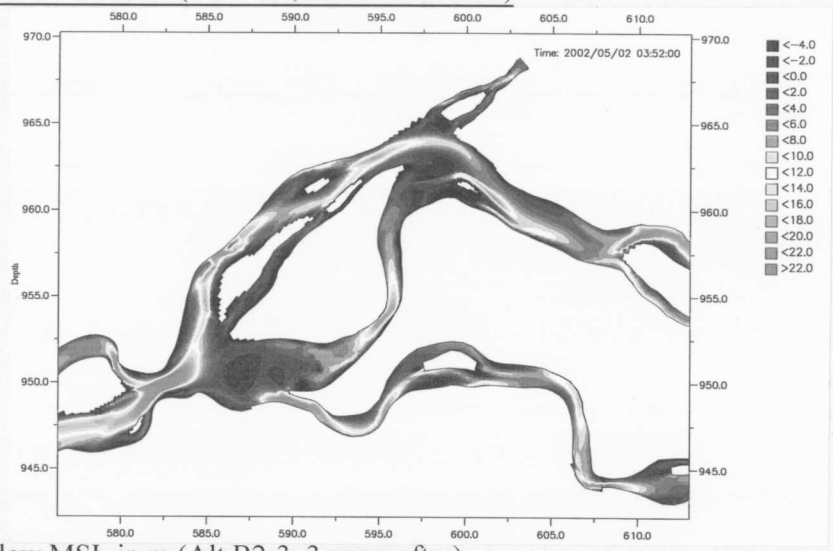
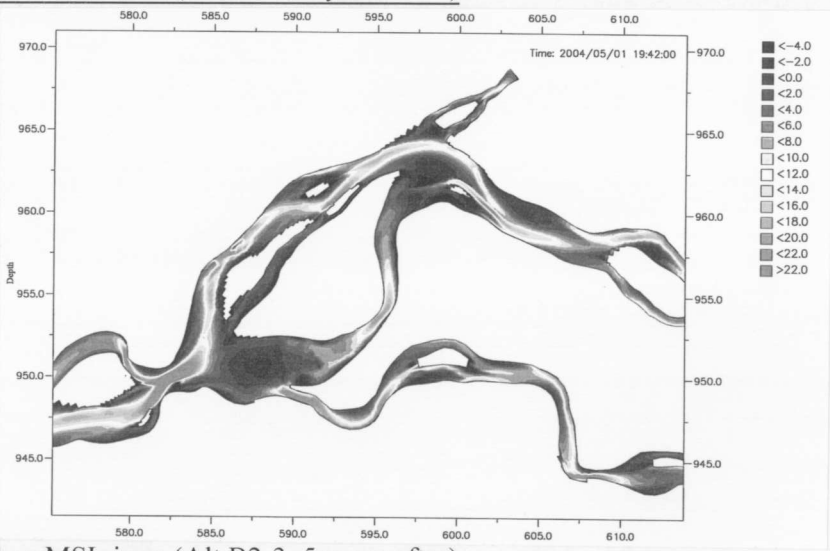


Depth below MSL in m (Alt.B2-3, Initial Condition)



Depth below MSL in m (Alt.B2-3, 3 years after)



Depth below MSL in m (Alt.B2-3, 5 years after)

Fig.7-3-6(7/7) **Results of 2 Dimensional Simulation Analysis**

- It is confirmed that the reference alternative [B2-8] is the most effective measure to increase the discharge in the channel but it is an expensive scheme among all alternatives. This measure would raise the water level of the upstream up to 2.5 m from the existing level. In addition, maximum velocity in the channel would exceed 2.4 m/s and hence the maximum non-dimensional shear force would be beyond 2.0. Under this flow condition, riverbank erosion would be very high and drastic morphological changes may occur. Apart from that, adverse impacts on the environment would be very severe as both Tortola channel and Piacoa channel are completely closed.

(2) Submerged Closing Dike:

The submerged dike of height less than MSL+3 m is not effective to increase the discharge of the Rio Grande channel to meet navigation requirement. Accordingly alternatives [B2-4] and [B2-5] eliminated for any further considerations. Only the alternative [B2-3], the dike height is MSL+6 m, would provide the discharge increase of 3,000 m3/s compared to the existing condition in the Barrancas section (C-6) to meet the navigation requirement (Fig. 7-3-5).

(3) Groins

According to the results of Alternative [B2-6] and [B2-7], installation of groins is not an effective means to increase the discharge of the Rio Grande channel. The velocities at the cross sections where the groins are installed, are comparatively high due to the reduced effective flow areas.

(4) Effective Alternatives

According to flow analysis, the alternatives [B2-1], [B2-3] and no alternative case (without project) were selected for sediment transport and bed change simulations. The results are shown in Fig. 7-3-6. The lowest bed elevation profiles along the reach of Guarguapo-Barrancas-Ya Ya for both alternatives of [B2-1] and [B2-3] are illustrated in Fig. 7-3-8. It shows that lowering of bed level within at most 6 years would be sufficient to eliminate the maintenance dredging required at present. The required dredging volumes within first 6 years are summarized in Table 7.3.4.

Table 7.3.4 Dredging Volume and Cost for Alt.[B2-1] and Alt.[B2-3]

Stage	Year	Dredging Volume (m^3)		Dredging Cost (US$)	
		[B2-3]Submerged Dike(H=MSL+6m)	[B2-1]Non-submerged Dike	[B2-3]Submerged Dike(H=MSL+6m)	[B2-1]Non-submerged Dike
Under Construction of Dike	0	3,820,000	3,820,000	9,932,000	9,932,000
	1	3,820,000	3,820,000	9,932,000	9,932,000
	2	3,820,000	3,820,000	9,932,000	9,932,000
	3	3,820,000	3,820,000	9,932,000	9,932,000
After Completion	4	2,865,000	2,865,000	7,449,000	7,449,000
	5	1,910,000	1,910,000	4,966,000	4,966,000
	6	955,000	955,000	2,483,000	2,483,000
	7	0	0	0	0

Note: Dredging Cost =2.6 US$/m3

Due to the closure of Tortola channel, discharge at the downstream of Barrancas sections will decrease. The sediment on the Barrancas sections would move downstream and it produces shallow sections temporarily compared to the present condition. However it would not affect the navigation there.

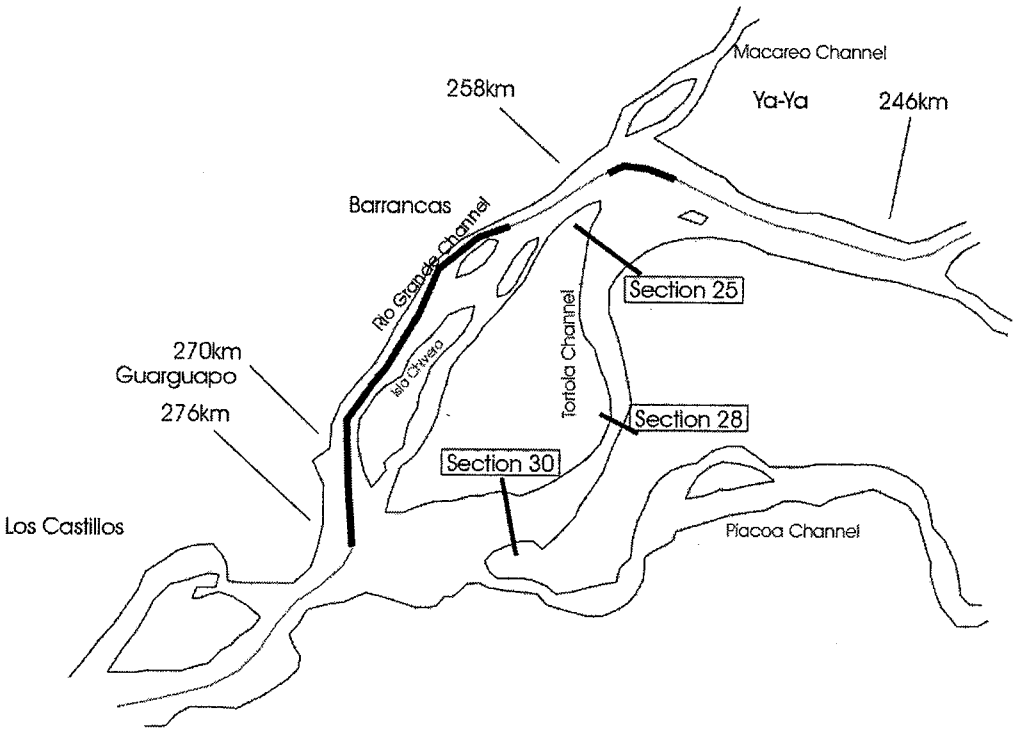


Fig. 7-3-7 Possible Locations of Dike Construction

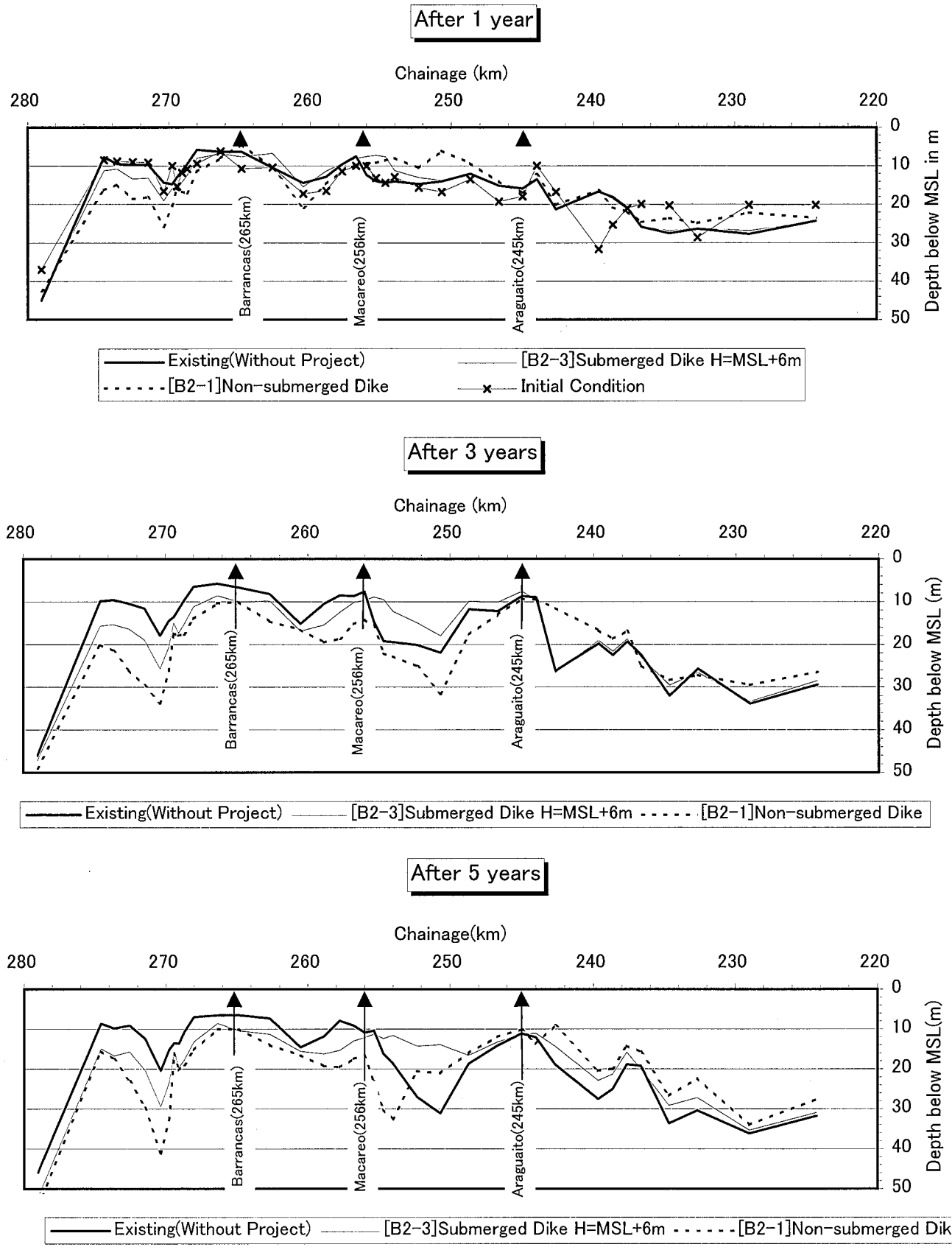


Fig. 7-3-8 Longitudinal Profiles of Bed Elevation Change for [B2-1] and [B2-3]