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BA ROADS MINERAL SANDS VIBROCORING SURVEY

17-22 June 1983

by

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BA ROADS MINERAL SANDS VIBROCORING SURVEY — Cruise Report No. 78

17 - 22 June 1983 — of PE/FJ.4/FJ.18

INTRODUCTION AND BACKGROUND

The Ba River Delta has been recognised as a speculative gold placer prospect as well as a major magnetite placer prospect (Holmes, 1981). Commercial exploration has shown that an approximate reserve of 8.0 million tonnes of magnetite along with traces of gold exists in very localised channel like areas in the shallow inshore parts of the delta (Holmes, 1981; Manganex 1974). However, the deeper water areas of the delta have not been investigated apart from a bathymetric and surface sediment study by Kyaw (1981).

Between 16th and 27th May 1983 a shallow seismic reflection survey was undertaken by MRD - Fiji with the assistance of CCOP/SOPAC in the Ba Roads area, between the coastline of the Ba Delta and the offshore reefs of Cakau na Sasi, Yarawa, and Tavuca (Fig. 1). A bathymetric map (Fig. 2) was compiled from data gathered during the geophysical survey. Eden (1983) has summarised the preliminary results of this geophysical survey as follows:

> " Sparker records show a deeply channelled rockhead, the channel-infill having a number of non-sequences. Rockhead itself appears to comprise folded and faulted sediments, the Ba volcanics being doubtful beyond the vicinity of the coast. In places channel fill and rockhead stratification is sub-parallel and interpretation of their junction is not straightforward."

These records were used to select sites for vibrocoring with emphasis on sampling channel margins, condensed sequences, and rockhead. The programme of vibrocoring thus formulated was undertaken between 17th and 22nd June 1983 by staff from CCOP/SOPAC and MRD Fiji aboard HMFS LATUI, and is described in this report.

The work was carried out at the request of the Government of Fiji as part of the CCOP/SOPAC work programme elements CCSP/FJ.4 (Offshore geological mapping of the shallow shelves in Fiji) and CCSP/FJ.18 (nearshore surveys of coastal areas for metalliferous detrital minerals).

A brief log of survey operations is given in Appendix I.

OBJECTIVES

The objective of the survey was to assess the gold and magnetite potential of the sedimentary sequence underlying the sea bed of Ba Roads.

Unfortunately the geophysical records showed that a surface unit of flat-lying recent sediments blankets the older channel fill sequence to a depth of approximately 5 metres over much of the region (Unpublished MRD Data). Thus, since the LATUI is only equipped to enable the vibrocorer to be used easily with a 12ft. barrel (Gauss, 1982), many of the more promising targets were beyond the range of the sampling equipment.

PERSONNEL PARTICIPATING

The following personnel participated in the work:

R.V. Burne	UNDP Marine Geologist
T. Vuibau	MRD Marine Geologist
E. Saphore	UNDP Electronics Technician
S. Motuiwaca	UNDP Geological Assistant

Shipboard operations were assisted by the crew of HMFS LATUI (C.O. Lt. Lesi).

EQUIPMENT AND METHODS

The following major items of equipment were provided by the UNDP Project Office for the survey:

- Geomarex Vibrocorer, core barrels, spares and consumables
- Del Norte Trisponder Radio Positioning System
- Diving Equipment

Depths were determined using the echo-sounding systems aboard HMFS LATUI.

Position Fixing

The shore trisponder stations established for the May geophysical survey (Eden, 1983) were re-occupied during this survey (see Appendix 2). Position fixing was by the simultaneous measurement of two ranges from these stations.

Vibrocoring

The coring operations were planned so as to utilise the methods described by Gauss (1982). Calm conditions were experienced throughout the survey and a single anchor was sufficient for the LATUI to hold all stations. The draught of HMS LATUI did not permit operations in water depths of less than 10m. The survey was terminated prematurely on the sixth day when a bearing in the ship's main achor winch motor failed.

The Horvitz A-frame fitted to the LATUI provided insufficient lift to allow safe deployment of the vibrocorer using the 18ft. core barrel. At one station (Core 23) an 18ft. barrel was used without the base plate fitted to the corer. The marginal increase in recovery (3.18m) using the 18ft. barrel was not considered sufficient to merit the additional time and hazard involved over the use of the easily and safely managed 12ft. core barrels.

Initially the vibrocorer was used with the base plate, flexible wire guides, piston, and float assembly (Gauss, 1982). Problems were experienced with distortion in the wide diameter core liners causing them to become jammed in the core barrel. This was solved by disposing with the piston assembly and using smaller diameter undistorted liners. No significant difference in core recovery was observed when coring without the piston.

A fracture developed in a weld in the mounting block for the vibrator motors which terminated the first day's operations. The motors were remounted on a spare block in time for the second day of coring.

Premature operation of the winch while arriving at a coring station on the second day resulted in the base plate being lost overboard in 25m of water. Attempts to locate the apparatus by SCUBA diving were unsuccessful due to the limited visibility in the muddy bottom waters.

The corer was then successfully deployed without base plate or guides for the rest of the cruise. The success of this mode of operation was probably due to the soft nature of the sediments combined with calm sea conditions and absence of bottom currents.

RESULTS OF CORING

Twenty-six cores were recovered in depths varying from 10m to 28m at representative locations in Ba Roads (Fig. 3). Sediment recovery varied from 0.1m (core 18) to 3.18m (core 23) (Appendix 3). With the exception of core 18, which recovered carbonate shell gravel

from the slope of Yarawa Reef, all cores recovered silty mud. This material comprises the flat-lying surface blanket unit observed on the seismic sections recorded during MRD cruise LATUI 83/4. Local concentrations of shell material occur in some cores, and a gravel consisting of angular pebbles (up to 1cm) of volcanics associated with wood fragments was observed at the base of core 23.

The muds represent the Recent pro-delta deposits of the Ba River. Observation of bottom conditions by SCUBA diving at station 11 showed that at 25m the sea floor was covered by a benthic boundary layer of fluid mud, and firm bottom conditions were not encountered up to 2 metres beneath the top of this layer.

LABORATORY ANALYSIS

All 26 sediment cores were cut longitudinally and examined in the Suva laboratory of MRD. They are of uniform character (with the exception of core 18 described above) generally with an upper layer, about 5-25cm thick, consisting of brown grey mud which overlies green grey mud. No sedimentary structures were observed.

There are no visible traces of magnetite or other mineral concentrations in the cores. Very small traces of magnetite were found by running a magnet over dried crushed mud samples.

Representative samples have been submitted for analysis to determine their Gold content.

Descriptions of the cores are given in Appendix 3.

CONCLUSIONS

The UNDP vibrocoring system was unable to penetrate beyond the surface mud blanket of the present day pro-delta deposits of the Ba River. This unit shows no trace of heavy mineral concentration. It also seems unlikely that it contains significant quanitites of gold, although results of analyses have yet to be obtained. Proper evaluation of the underlying buried channel-fill sequences identified on the geophysical records requires coring techniques offering much greater penetration than is currently possible using the UNDP Geomarex vibrocorer. Reconnaissance of areas less than 10m deep, which would require a shallower draught vessel, is needed to demarcate the seaward margin of the known magnetite deposits.

REFERENCES

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Kyaw, Shwe, 1981, A preliminary report on reconnaissance bathymetry and geological sampling surveys. Mba Delta - (MRD Cruise 5/81). MRD Fiji Note BP 22/10

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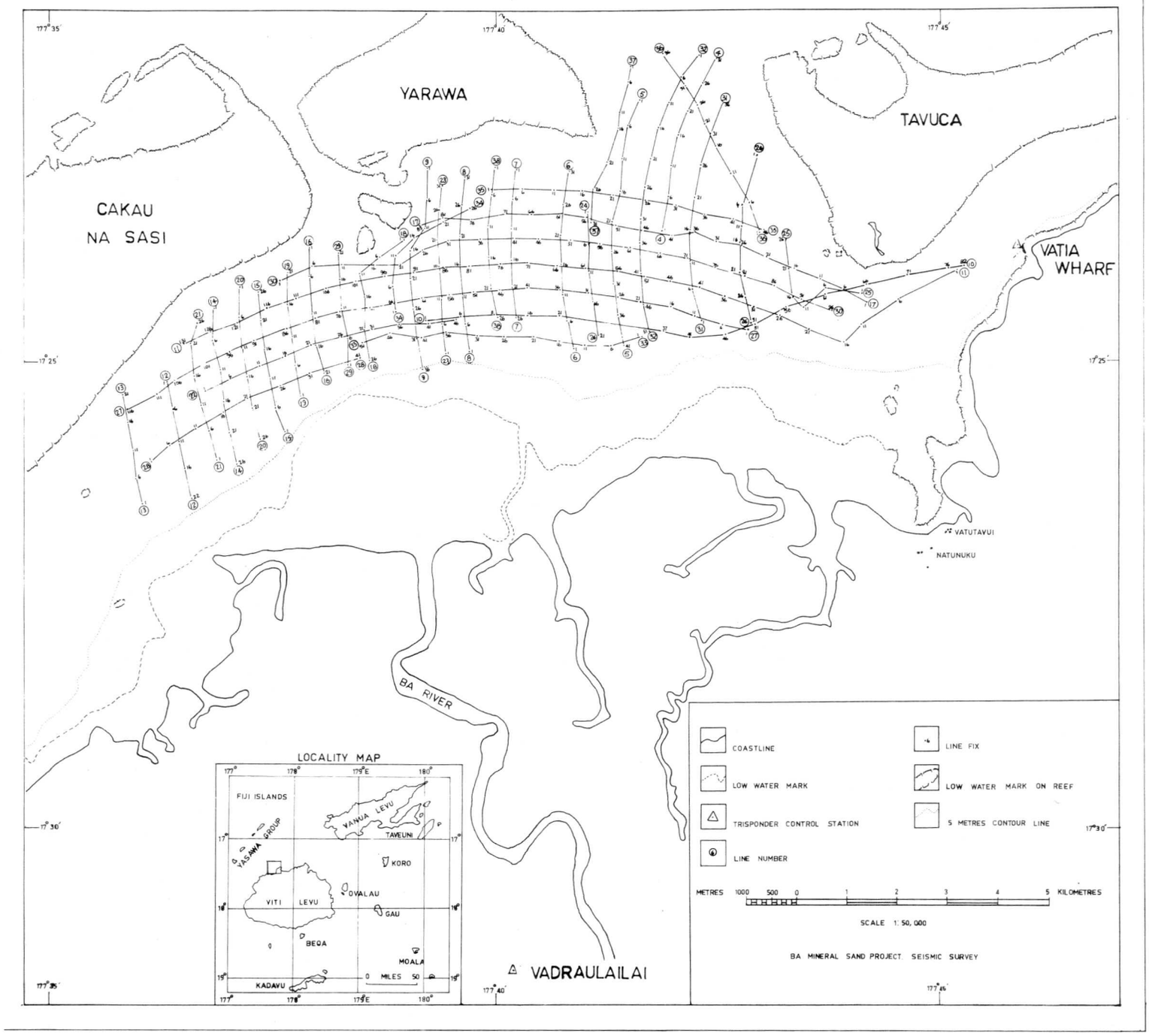

FIGURE 1: Location map of Ba Roads area showing tracks of MRD seismic reflection survey cruise LATUI 83/4

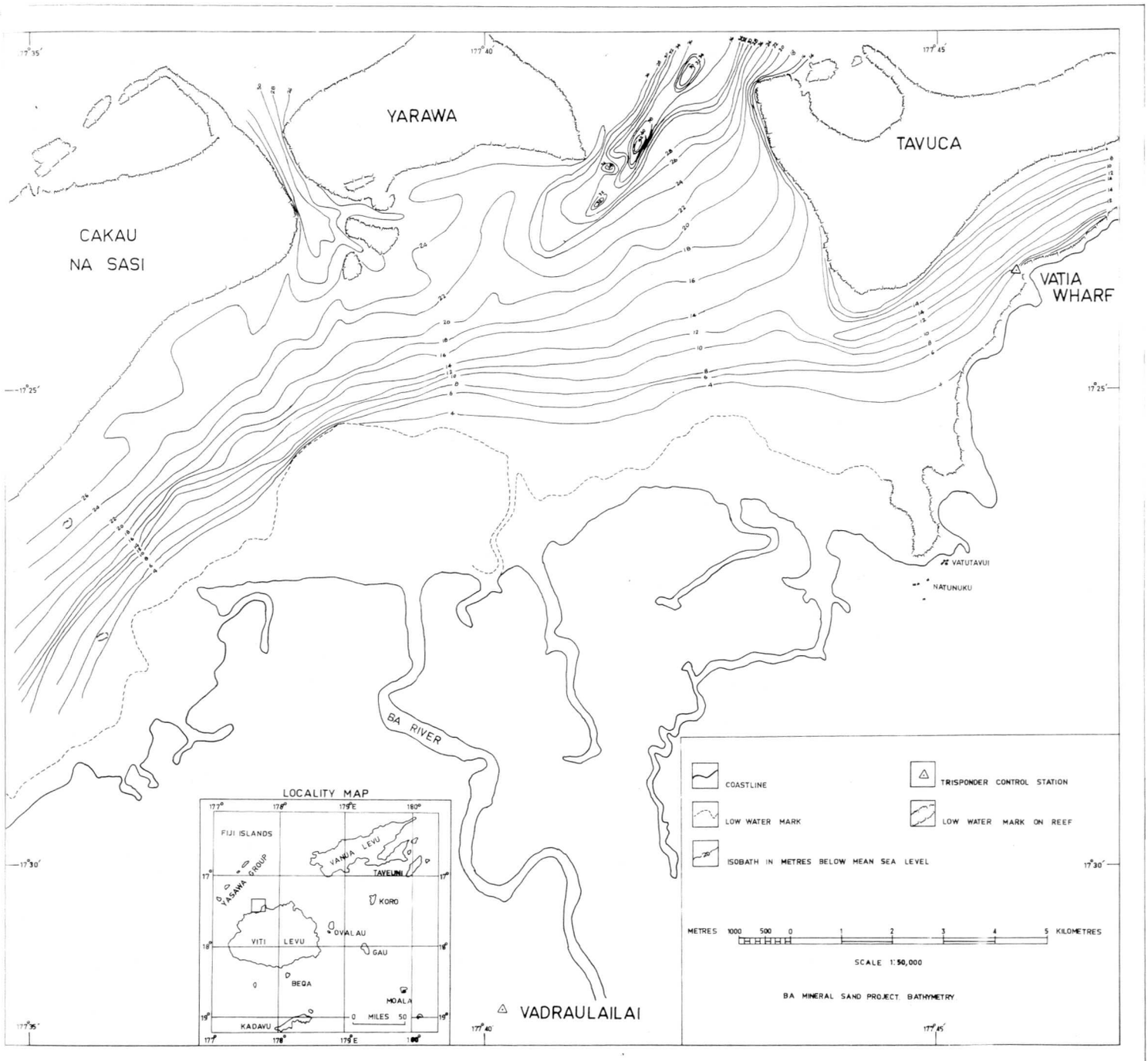

FIGURE 2: Bathymetric map of Ba Roads

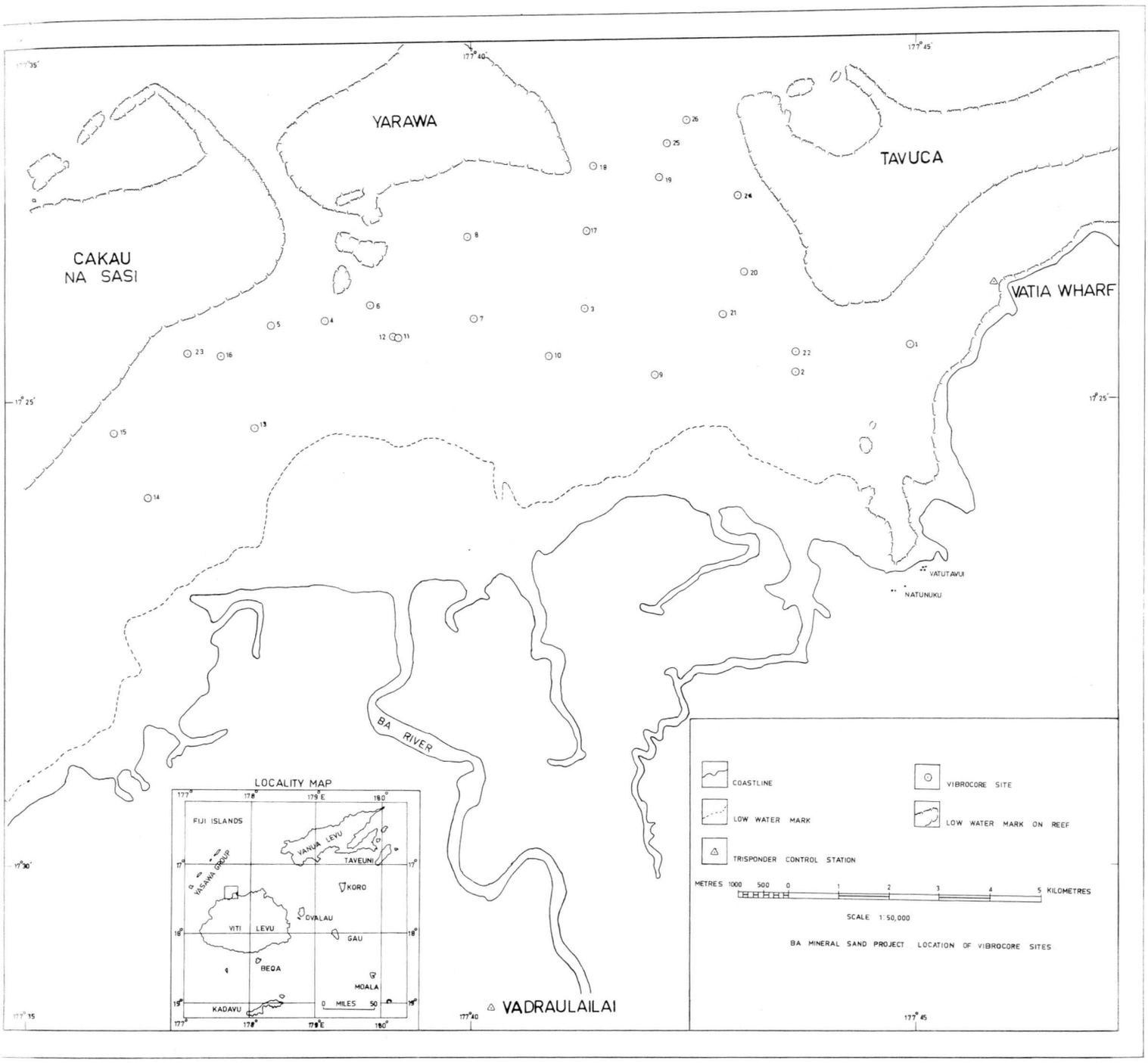

FIGURE 3: Location of vibrocore stations

APPENDIX I

Survey Log

Date 1983	Activity
17 June	R. Burne and S. Motuiwaca travelled Suva to Vatia Wharf. Commenced survey preparations aboard LATUI.
18 June	E. Saphore travelled Suva to Vatia Wharf. Trisponders calibrated. Vibrocorer rigged.
19 June	Recovered 8 vibrocores. Replaced vibrator mounting block due to fractured weld.
20 June	Sailing delayed due to Trisponder malfunction. Two vibrocores recovered. Vibrocore base frame lost overboard in 25m of water. SCUBA diving to locate frame unsuccessful due to poor visibility. One vibrocore recovered without using guides. Supply of undeformed core liners transported from Suva to Vatia Wharf by P. Fuata.
21 June	S. Motuiwaca and P. Fuata travelled Vatia Wharf to Suva. 10 vibrocores recovered.
22 June	4 vibrocores recovered. Coring operations abandoned due to failure of anchor winch engine. Equipment disassembled.
23 June	R. Burne and E. Saphore travelled Vatia Wharf to Suva.

APPENDIX II

Trisponder Locations

The shore stations established for MRD Cruise LATUI 83/4 were reoccuppied for this cruise. The following location details are extracted from Eden (1983).

1. VATIA WHARF

The Channel 1 Remote was mounted at the seaward end of Vatia Wharf, half way between the first and second of the six vertical stanchions (numbered from the SW) which lie between the end corner piers, and 1.5m from the edge of the wharf. At this point a plank has the following inscription in white paint "25 FEB. MOBIL S. HABONEE". The location was immediately seaward of the word "HABONEE".

The position of this trisponder was fixed on 18 May by reference to the following Trig. stations:

Ndrautana (Drautana) Survey Control Station 72.

UTM coordinates N. 8073923.568
E. 583110.832

Distance from Vatia Wharf station to a position approximately 50m N60°E of the quadripod 3186m.

Vandraulailai (Survey Control Station 527

UTM coordinates N. 8062127.486
E. 571154.791

Distance from Vatia Wharf location 17551m.

2. VANDRAULAILAI (N.8062127.486 E.571154.791)

The Channel 2 Remote was mounted at the quadripod at this trig. station.

APPENDIX III

Details of Vibrocores

TABLE 1: LOCATION DATA

Core No.	Uncorrected Water Depth (M)	Date & Time Recovered DD/HHMM	Range	
			Vatia Wharf	Vandrauleilei
1	12	19/1056	2054	15634
2	10	19/1140	4334	14002
3	18	19/1220	8233	14034
4	20	19/1320	13353	13999
5	22	19/1355	14421	14242
6	22	19/1430	12425	14180
7	21	19/1500	10403	13676
8	20	19/1530	10544	15349
9	10	20/1120	7005	13014
10	13	20/1150	9017	13043
11	18	20/1540	11940	13497
12	20	21/0930	12022	13520
13	20	21/1005	15003	12458
14	19	21/1059	17333	12209
15	26	21/1120	17735	13613
16	24	21/1150	15410	14034
17	25	21/1315	8227	15510
18	28	21/1406	8365	16858
19	25	21/1444	7019	16792
20	17	21/1510	5012	15441
21	13	21/1529	5480	14487
22	10	21/1600	3694	14366
23	23	22/1100	16072	14039
24	20	22/1250	5415	16867
25	26	22/1335	7086	17482
26	28	22/1435	6962	18083

TABLE 2: DESCRIPTIVE LOGS

(logged by T. Vuibau)

Core No.	Length (cm) on Recovery	Length (cm) in Lab		Description
1	24	189	0-30cm 30-189cm	Brown-grey mud. Green-grey cohesive mud. Occasional bivalve shell fragments throughout the core.
2	Liner stuck in core barrel, core not logged			
3	292	249	0-244cm	Green-grey cohesive mud with shell fragments
4	227	188	0-188cm	Green-grey cohesive mud with shell fragments. Shells concentrated in bottom 4cm.
5	?	280	0-15cm 15-280cm	Brown-grey mud. Green-grey cohesive mud. Occasional shell fragments.
6	273	250	0-5cm 5-250cm	Brown-grey mud. Green-grey cohesive mud. Shell fragments throughout the core.
7	210	189	0-30 cm 30-189cm	Brown-grey mud. Green-grey cohesive mud. Shell fragments (bivalves) throughout the core.
8	255	240	0-10cm 10-192cm 192-240cm	Brown-grey mud. Green-grey cohesive mud. Concentration of shell fragments in Green-grey mud
9	262	250	0-250 cm	Green-grey Mud.
10	228	200	0-15cm 15-200cm	Brown-grey mud. Green-grey mud.
11	285	246	0-246cm	Green-grey cohesive mud.
12	205	180	0-30 cm 30-180cm	Brown-grey mud. Green-grey cohesive mud
13	103(?)	140	0-14cm 14-140cm	Green brown mud. Grey mud.
14	161	145	0-15cm 15-145cm	Brown-grey mud. Green-grey cohesive mud.

Core No.	Length (cm) on Recovery	Length (cm) in Lab		Description
15	262	262	0-140cm	Brown-grey cohesive mud with bivalve fragments.
			140-262cm	Green-grey cohesive mud with occasional shell fragments.
16	311	300	0-300cm	Green-grey cohesive mud with small shell fragments.
17	200	177	0-30cm	Brown-grey cohesive mud. Green-grey cohesive mud.
18	10	-	0-10cm	Coral gravel.
19	255	225	0-225cm	Green-grey cohesive mud with occasional shell fragments.
20	305	236	0-236cm	Green-grey cohesive mud with scattered shell fragments
21	107	96	0-5cm	Grey-brown Mud.
			5-96cm	Dark grey mud. Shell concentrations at 3-4cm, 51-60cm, 81-83cm.
22	176	151	0-22cm	Brown-grey mud with shell fragments.
			22-29cm	Shell concentration.
			29-151cm	Cohesive mud.
23	318	289	0-64cm	Cohesive mud.
			64-145cm	Shelly, sandy mud.
			145-185cm	Cohesive mud.
			186-284cm	Sandy with occasional shell fragments. Wood fragments and gravel towards the base.
24	175	116	0-5cm	Brown grey mud.
			5-58cm	Grey cohesive mud.
			58-116cm	Cohesive grey mud with coral and shell fragments.
25	230	230	0-230cm	Green-grey cohesive mud with shell fragments.
26	88	78	0-8cm	Brown-grey cohesive mud.
			8-14cm	Green-grey mud.
			14-18cm	Sand.
			18-72cm	Cohesive mud with shell fragments.
			72-78cm	Mud with abundant shell fragments.