APPENDIX B

Experimental Procedures For Sedimentological And Mineralogical Analyses

B.1 Textural analysis

The core samples were subjected to grain size analysis. In the sand layer, about 60-80g. sample was taken. This was subjected to sequential 10% HCl and 30% v/v hydrogen peroxide treatment to remove the carbonates and organics. The sample was then wet sieved through 62.5μ sieve (BSS No. 240). The finer than 62.5μ was used to determine the amount of silt and clay using standard pipette analysis method (Carver, 1971) employing the principle of Stoke's settling. The sand-silt-clay percentages were then computed. Results are given in Table B.1

B.2 Heavy mineral separation

Heavy minerals were separated from the sand fraction of the sample using bromoform (ρ=2.85). The samples were transferred to a separating funnel which had been filled with bromoform. After a few hours time, the heavy mineral fraction was collected in a beaker and washed. The remaining bromoform was kept aside for further use. The heavy minerals were mounted on glass slides and identified under a petrological microscope.

B.3 X- Ray diffraction

This was used for the identification of clay minerals to determine the provenance for Horizon-1 and Horizon-3. Calcium carbonate and organic matter were removed by dilute acetic acid and 6% v/v hydrogen peroxide respectively. Clay fraction (<2μ) was collected using Stoke's settling principle and concentrated by centrifugation. It was then pipetted onto glass slides and dried. The slides were scanned between 3° to 30° (2θ) at

1°/min/cm using a CuK_{α} source. The clay minerals were identified from the charts using the powder diffraction data file, published by International Centre for Diffraction Data, Pennsylvania.

Smectite has a broad peak in the region, 7.3° to 5.9° (2θ). However the peak for vermiculite also appears in this region (6.22°) The presence of smectite was confirmed using glycolation method. To the natural clay sample, 1N $MgCl_2$ was added and left overnight. The next day this mixture was washed with distilled water. A slide was subsequently prepared from this clay sample. This slide was then kept in a dessicator with ethyl glycol at 60°C for 6 hours. If the peak in the natural slide is of smectite and not vermiculite, the treated slide will show the widening of the peak.

Also both kaolinite and chlorite have the same peak at 12.4° (2θ). Differentiation of kaolinite and chlorite was carried out using the thermal treatment. To the natural slide was added a 1N solution of KCl and left overnight. The next day this mixture was washed with double distilled water and a slide prepared. This slide was then heated to 550°C. The peak remains if the mineral is chlorite.

For the purpose of semi-quantification, the area under the peak was graphically computed. Using the following formula (Biscaye, 1965), relative clay mineral percentages calculated,

$$\text{smectite}+4*(\text{illite})+2*(\text{kaolinite})+2*(\text{chlorite}) = 100\%$$

The results are given in Table B2.

Table B.1 Results of grain size analyses* on samples from Nal Sarovar core.

Lab no.	Depth (cm)	Sand (%)	Silt (5)	Clay (%)
N-4	10-20	3.84	31.19	64.97
N-34	86.5-90	3.38	14.20	82.42
N-75	195-207	7.33	31.78	60.89
N-83	280-290	14.41	45.47	40.42
N-99	390-393	85.98	10.9	3.12
N-100	393-417	64.62	27.53	7.85
N-105	477-522	91.34	6.95	1.71
N-107	540-552	82.79	10.31	6.90
N-113	600-610	64.43	24.44	11.13
N-118	685-702	70.04	13.72	16.24
N-124	775-790	44.76	37.62	17.62
N-126	887-907	65.90	26.60	7.50
N-127	907-920	71.59	19.32	9.09
N-132	987-1000	73.49	22.71	3.82
N-136	1065-1102	51.15	39.03	9.82
N-143	1217-1225	81.07	10.81	8.12
N-147	1285-1299	37.26	49.87	12.87
N-148	1299-1324	41.96	43.95	14.09
N-153	1405-1430	80.46	15.27	4.27
N-155	1455-1485	42.26	48.73	9.01
N-156	1485-1515	54.46	31.83	13.71
N-160	1565-1592	41.68	24.68	33.64
N-166	1675-1775	82.33	3.59	14.08
N-168	1835-1842	35.85	35.62	28.53
N-184	1925-1945	6.20	70.70	23.10
N-197	2098-2109	48.23	22.78	28.99
N-225	2364-2381	41.09	18.85	40.06
N-226	2381-2400	5.36	33.83	60.81
N-227	2400-2422	4.73	55.26	40.01
N-229	2444-2463	5.28	82.52	12.2
N-249	2768-2781	1.95	37.25	60.80

* For graphical presentation see Fig 2.17.

Table B.1 continued:

Lab No.	Depth (cm)	Sand (%)	Silt (%)	Clay (%)
N-268	3021-3045	11.75	28.43	59.82
N-288	3278-3290	3.35	39.98	56.67
N-350	4106-4120	12.73	23.31	63.96
N-378	4501-4511	11.61	32.27	56.12
N-397	4781-4790	30.21	30.33	39.46
N-411	4986-4995	17.96	29.1	52.94
N-412	4995-5000	18.46	35.75	45.79
N-424	5465-5485	53.91	6.89	39.20

Table B.2 Results of clay mineral analyses* on samples from Nal Sarovar core.

Lab No.	Depth (cm)	Smectite (%)	Kaolinite (%)	Chlorite (%)	Illite (%)
N-4	10-20	12.96	7.79	5.20	74.05
N-34	86.5-90	7.57	8.56	4.47	79.40
N-75	195-207	8.29	7.2	4.86	79.56
N-83	280-290	8.52	5.78	4.62	81.08
N-100	393-417	12.09	7.46	3.74	76.71
N-105	477-522	52.09	9.71	8.49	29.71
N-113	600-610	55.76	8.85	2.21	33.18
N-118	685-702	53.04	10.33	6.19	30.44
N-124	775-790	42.59	14.68	4.77	37.96
N-126	887-907	67.15	9.66	4.35	18.84
N-132	987-1000	68.40	5.10	1.70	24.80
N-136	1065-1102	70.30	5.91	1.97	21.82
N-147	1285-1299	74.78	5.22	2.61	17.39
N-148	1299-1324	62.14	6.19	3.10	28.57
N-155	1455-1485	64.92	4.16	2.61	28.51
N-156	1485-1515	51.43	7.27	7.01	34.29
N-227	2400-2422	52.89	5.82	5.36	35.93
N-229	2444-2463	97.53	1.19	0.44	0.84
N-249	2768-2781	97.96	0.57	0.45	1.02
N-268	3021-3045	76.47	7.86	3.89	11.76
N-288	3278-3290	98.23	1.18	0.59	-
N-350	4106-4120	98.69	0.66	0.65	-
N-378	4501-4511	94.87	3.44	1.69	-
N-412	4995-5000	97.45	1.82	0.73	-
SPM**	-	29.82	21.59	6.48	42.11

* For graphical presentation see Fig 2.18.

** Suspended sediment from flood water of Sabarmati river at Ahmedabad (Sept. 1994).