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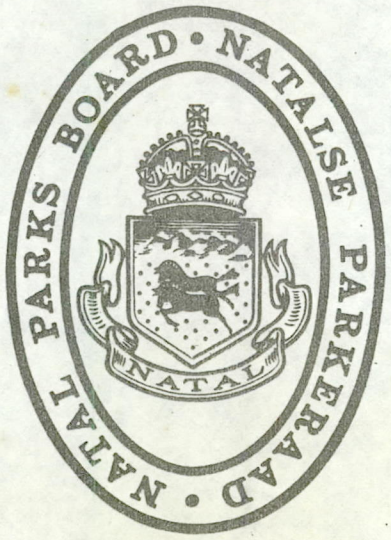

Author HUTCHISON I P G

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NATAL PROVINCIAL ADMINISTRATION

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ST. LUCIA LAKE RESEARCH REPORT

ADDENDUM TO VOLUME 2

LAKE AND ESTUARY - HYDROGRAPHIC DATA

by I.P.G. Hutchison

Hydrological Research Unit
University of the Witwatersrand
Johannesburg

Director: Professor D.C. Midgley

October 1974

1. INTRODUCTION

The long-term salinity and water level data for St. Lucia lake and estuary, reproduced in the main body of Volume 2, relate to the period ending September 1972. This addendum updates these data and embodies the results of a survey by the Hydrological Research Unit of cross-sections in the Fanies island area.

To facilitate cross-referencing, the chapter, section, table and figure numbering of the main report are preserved.

2. ESTUARY

2.4 Long-term salinities

The salinities measured in the estuary for the period October 1972 to September 1974 are listed in Table 3.4. The locations of the stations appear in Table 2.5.

Table 2.5 : Estuary stations at which regular salinity measurements are made

Station number	Name	Location
1	NPB* Jetty	Estuary cross-section number 3
2	Bridge	Water level recorder at section 6
3	Narrows	" " " " " 10
4	Esengeni	" " " " " 15
5	Potter's channel	" " " " " 19
6	Mitchell island	" " " " " 21

*Natal Parks Board

3. LAKE

3.1 Lake geometry

The lake narrows to roughly 400 m at Fanies island. This constriction has appreciable effect on wind set-up in the southern portion of the lake, i.e. south of Lane island. As the geometrical details given in Figure 3.2 of the main report are not

sufficiently accurate, it was decided to re-survey the area and drawings Nos. 1/4 to 3/4 illustrate the results.

The datum for these surveys (estuary chart datum ECD, or estuary mean sea level EMSL) could be determined only approximately from the water levels monitored by the recorders just north and south of Fanies island (see drawing 1/4) in conjunction with the corrections given in Table 3.8 of the main report. However the two Department of Water Affairs benchmarks near the Fanies island rest camp were levelled in (see drawing 2/4) and can be used to fix the datum accurately once their reduced levels have been checked.

3.2 Long-term water level and salinity data

Recorded water levels are listed in Table 3.2. Locations of the recorder stations are illustrated in Figure 4.1. The listed water levels for the period starting in July 1973 are the averages for the last week of the month.

Table 3.4 lists the salinity data for the period October 1972 to September 1974.

Tables 3.6 and 3.7 list the average month-end water levels, salinities and total salt loads for the ten lake cells shown in Figure 3.3 and for the five lake cells shown in Figure 3.4. The cell salinities for the period December 1973 to September 1974 were calculated on the basis of the factors given in Table 4.1 of the main report, as were the water levels after June 1973.

Plots of total lake salt load, average salinities in the five cells and water level in cell No. 1 have been added to Figure 3.4.

Table 3.2 : Lake water levels at the end of the month - cm relative to estuary chart datum (ECD)

date		station					
year	month	Makaka-tana	Charter's creek	Fanies island		Mkuze mouth	Lister's point
				south	north		
1972	Oct	999	-20	999	999	999	-17
	Nov	999	-30	999	.	.	-24
	Dec	999	-16	999	.	.	-35
1973	Jan	999	-27	.	.	.	999
	Feb	999	-22	.	.	.	-26
	Mar	999	-27	.	.	.	-35
	Apr	999	-14	.	.	.	-20
	May	999	-17	.	.	.	-18
	Jun	999	-12	999	999	999	-16
	Jul	-26	-20	-18	-19	-13	-18
	Aug	-10	1	-10	-4	-13	-8
	Sep	-13	-13	-14	-13	-16	-15
	Oct	33	30	29	26	21	27
	Nov	27	20	17	25	15	21
	Dec	25	24	24	23	25	27
1974	Jan	18	15	14	16	18	15
	Feb	18	18	17	18	18	18
	Mar	23	17	18	20	17	16
	Apr	10	6	6	6	12	10
	May	24	20	16	18	16	12
	Jun	16	8	5	6	10	9
	Jul	10	2	1	0	4	5
	Aug	-5	0	-10	-5	-20	-10
	Sep	0	-4	-18	-9	-26	-18

Note: 999 indicates missing data

Table 3.4 : St. Lucia Lake - Salinity data Oct 1972 - Sept 1974

DAY	MONTH	YEAR	SALINITY IN PARTS PER THOUSAND																								
			STATION NUMBERS →																								
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
15	10	72	34	33	29	28	27	27	26	26	25	25	25	25	26	25	26	25	24	25	25	24	11	25	-1	-1	-1
31	10	72	36	36	36	35	35	31	31	30	31	28	27	28	35	34	35	28	30	29	28	30	-1	28	-1		
15	11	72	36	35	35	36	35	34	33	32	31	30	28	29	30	30	29	28	29	30	30	30	-1	-1	-1		
30	11	72	35	34	34	33	32	32	33	32	30	30	32	29	20	27	28	30	30	30	29	30	32	30	-1		
15	12	72	36	32	32	33	34	34	34	34	32	33	32	30	26	28	30	31	31	31	31	31	31	-1			
31	12	72	35	36	36	37	37	35	35	38	35	37	35	34	31	33	35	34	35	35	35	37	37	-1			
15	1	73	35	36	34	34	32	35	36	36	38	38	36	35	34	35	36	36	35	36	-1	38	36	35			
1	2	73	34	35	34	34	34	35	35	38	36	38	38	38	-1	42	39	28	38	38	38	41	42	38			
15	2	73	32	20	25	25	36	37	40	36	38	39	39	39	39	33	39	41	41	43	40	40	-1	-1			
1	3	73	32	18	24	33	33	33	32	33	35	38	37	39	39	39	40	38	38	39	40	38	-1	41	all	-1	
16	3	73	35	34	33	33	35	35	35	35	36	37	39	41	-1	44	44	42	41	42	39	20	0	39			
1	4	73	34	33	33	32	33	35	34	35	35	35	39	44	-1	45	46	42	43	45	43	44	5	44			
1	5	73	34	34	34	33	34	32	34	34	39	39	38	42	47	46	45	40	40	37	39	37	-1	45			
15	5	73	35	34	34	35	36	34	34	35	38	39	41	44	48	47	47	41	41	40	37	37	-1	-1			
1	6	73	34	36	37	34	34	38	35	35	35	36	40	43	45	45	44	41	40	40	42	18	3	48			
15	6	73	34	34	38	36	35	35	35	35	37	37	39	42	47	46	47	44	42	42	42	42	9	-1			
1	7	73	34	34	34	37	36	36	36	37	37	37	40	46	49	47	47	44	43	43	43	42	40	49			
16	7	73	36	35	34	35	35	37	37	38	39	39	41	48	50	48	50	45	49	46	45	44	-1	49			
31	7	73	34	36	35	34	37	38	39	40	42	43	43	47	49	51	50	46	46	46	45	56	-1	50			
15	8	73	19	16	17	19	24	29	29	29	34	36	39	44	44	32	41	42	42	39	42	41	26	-1			
31	8	73	36	36	36	30	23	30	28	30	29	33	36	42	41	47	47	40	39	39	44	45	38	46			
16	9	73	35	34	34	34	34	32	-1	33	33	34	39	47	50	50	49	42	45	-1	44	45	47	-1			
3	10	73	17	14	14	17	24	28	23	30	29	34	35	19	0	0	19	33	37	-1	35	8	0	9			
17	10	73	29	29	28	29	29	31	32	30	31	33	31	24	12	17	17	30	35	-1	23	5	0	-1			
31	10	73	31	33	33	32	31	32	32	32	32	34	32	26	15	17	20	30	30	-1	23	6	0	21	-1	-1	-1
2	12	73	30	29	28	28	29	29	29	28	30	26	28	16	5	8	18	25	23	-1	19	5	0	18	27	23	24
17	12	73	28	30	29	30	28	28	28	28	26	24	23	19	13	10	18	20	23	-1	18	4	0	18	26	24	21
31	12	73	27	27	27	27	26	25	26	25	23	22	21	20	15	10	19	17	17	-1	17	0	0	18	24	22	21
15	1	74	28	26	26	26	27	24	26	24	21	21	20	18	14	16	19	16	15	15	9	0	0	18	24	18	19
31	1	74	14	20	24	23	22	23	22	23	21	18	19	18	15	8	18	17	14	-1	11	0	0	20	16	18	16
14	2	74	18	18	17	18	21	18	21	20	20	18	16	13	14	16	18	16	15	-1	9	0	0	18	20	15	15
28	2	74	14	12	15	16	20	20	19	19	17	16	17	14	17	17	17	13	13	-1	13	0	0	17	18	16	15
15	3	74	19	18	18	18	18	18	19	17	17	15	16	15	16	15	20	14	12	-1	12	0	0	17	17	14	16
2	4	74	34	34	27	27	18	16	15	15	15	15	15	15	10	15	17	13	12	-1	10	7	0	18	15	14	13
15	4	74	19	17	17	17	17	16	17	15	15	15	17	16	17	17	17	13	15	-1	16	3	0	17	15	15	14
30	4	74	29	29	30	28	27	19	19	16	17	15	15	15	15	17	17	13	13	-1	12	0	0	16	16	14	14
15	5	74	20	18	20	19	18	19	17	16	15	14	17	14	18	18	15	13	13	-1	12	0	0	15	15	14	14
4	6	74	36	32	27	22	17	16	17	16	14	14	14	14	15	11	14	12	13	-1	13	3	0	14	14	15	14
17	6	74	34	31	30	30	18	15	14	15	15	15	13	13	15	15	16	13	13	-1	12	3	0	15	14	15	15
29	6	74	24	16	17	17	17	16	17	15	16	14	14	15	15	16	17	13	13	-1	12	0	0	17	16	14	15
15	7	74	17	16	17	16	16	15	15	15	14	14	16	16	15	16	16	13	14	-1	15	6	0	16	16	15	-1
30	7	74	21	17	17	16	16	15	16	15	14	13	13	15	15	15	16	13	14	-1	13	8	3	17	15	16	15
14	8	74	34	26	29	26	16	17	16	15	15	15	16	16	16	16	16	14	15	-1	14	12	2	16	15	15	14
30	8	74	35	28	24	19	18	17	17	16	17	17	16	17	19	19	20	16	17	-1	16	10	8	19	16	16	17
15	9	74	35	36	33	34	30	22	23	23	17	20	18	17	20	19	20	17	17	-1	19	17	4	21	19	19	20
30	9	74	35	33	29	25	17	24	24	23	20	21	20	20	22	21	22	21	20	21	18	19	7	19	24	18	19

Note: -1 indicates missing data

Table 3.6 : Water level and salinity data for the ten elementary lake cells illustrated in Figure 3.3

levels : cm
salinity : parts per thousand (°/oo)
salt load : million metric tons

MONTH	YEAR	Level, salinity and salt load at the end of the month for cell numbers:-										Average lake salinity & total salt load
		1	2	3	4	5	6	7	8	9	10	
10	72	-20 31 1.0	-20 30 .6	-17 28 .3	-17 28 .8	-17 28 1.6	-17 29 1.3	-17 30 .3	-17 34 .5	-17 32 .9	-17 35 .6	30 8.0
11	72	-30 32 .9	-30 31 .6	-24 30 .3	-24 30 .8	-24 29 1.6	-24 30 1.2	-24 30 .2	-24 26 .3	-24 28 .8	-24 28 .5	30 7.2
12	72	-16 36 1.2	-16 36 .8	-35 35 .3	-35 35 .9	-35 34 1.7	-35 35 1.2	-35 37 .2	-35 33 .4	-35 35 .9	-35 35 .5	35 8.0
1	73	-27 36 1.1	-27 38 .7	-27 38 .4	-27 38 1.0	-27 38 2.0	-27 38 1.5	-27 39 .3	-27 34 .4	-27 37 1.0	-27 38 .6	37 9.0
2	73	-22 33 1.0	-22 35 .7	-26 37 .4	-26 37 1.0	-26 39 2.1	-26 39 1.5	-26 37 .3	-26 39 .5	-26 40 1.1	-26 41 .7	38 9.2
3	73	-27 35 1.0	-27 35 .7	-35 38 .4	-35 39 1.0	-35 43 2.1	-35 43 1.5	-35 43 .3	-35 45 .5	-35 45 1.1	-35 46 .6	41 9.1
4	73	-14 33 1.1	-14 37 .8	-20 39 .5	-20 39 1.1	-20 41 2.3	-20 39 1.7	-20 37 .3	-20 45 .6	-20 44 1.2	-20 45 .8	40 10.5
5	73	-17 36 1.2	-17 35 .8	-18 39 .5	-18 39 1.1	-18 41 2.4	-18 41 1.8	-18 21 .2	-18 45 .6	-18 43 1.2	-18 44 .8	40 10.6
6	73	-12 36 1.2	-12 37 .8	-16 40 .5	-16 41 1.2	-16 44 2.6	-16 43 1.9	-16 42 .4	-16 46 .7	-16 46 1.3	-16 46 .9	42 11.6
7	73	-23 38 1.2	-19 41 .9	-19 43 .5	-17 44 1.3	-16 46 2.7	-14 46 2.1	-13 55 .6	-18 50 .7	-18 49 1.4	-18 50 .9	46 12.3
8	73	-4 30 1.1	-6 30 .7	-4 35 .5	-7 36 1.1	-9 41 2.5	-11 41 2.0	-13 45 .5	-8 45 .7	-8 44 1.4	-8 47 1.0	39 11.5
9	73	-13 28 .9	-14 19 .4	-13 36 .5	-14 24 .7	-15 29 1.7	-15 41 1.9	-16 33 .4	-15 34 .5	-15 38 1.1	-15 19 .4	31 8.5
10	73	31 29 1.4	29 18 .6	26 32 .7	24 20 .8	23 21 1.6	22 27 1.8	21 8 .2	27 17 .4	27 22 .9	27 10 .3	21 8.7
11	73	23 29 1.3	18 28 .9	25 26 .5	22 25 1.0	19 22 1.7	17 22 1.4	15 6 .1	21 8 .2	21 17 .7	21 18 .5	21 8.2
12	73	24 25 1.2	24 23 .7	23 21 .4	24 21 .8	24 19 1.5	25 17 1.1	25 2 .0	27 11 .2	27 19 .8	27 18 .6	18 7.4
1	74	16 22 1.0	14 18 .5	16 18 .3	17 18 .7	17 16 1.2	18 13 .8	18 1 .0	15 9 .2	15 18 .7	15 19 .5	16 5.9
2	74	18 19 .8	17 17 .5	18 16 .3	18 16 .6	18 14 1.1	18 13 .9	18 1 .0	18 17 .3	18 16 .6	18 17 .5	15 5.6
3	74	20 15 .7	18 15 .5	20 15 .3	19 14 .5	18 13 1.0	18 12 .8	17 7 .2	16 14 .3	16 16 .6	16 18 .5	14 5.3
4	74	8 18 .7	6 16 .4	6 15 .2	8 14 .5	9 14 1.0	11 13 .8	12 1 .0	10 17 .3	10 16 .6	10 16 .4	14 5.0
5	74	22 16 .7	18 14 .4	18 15 .3	17 14 .5	17 13 1.0	16 13 .8	16 3 .1	12 13 .2	12 14 .5	12 14 .4	13 5.0
6	74	12 16 .7	6 16 .4	6 14 .2	7 14 .5	8 14 1.0	9 13 .8	10 2 .0	9 16 .3	9 16 .6	9 17 .4	14 4.9
7	74	6 15 .6	1 14 .4	0 14 .2	1 15 .5	2 14 1.0	3 13 .8	4 9 .2	5 15 .3	5 16 .5	5 16 .4	14 4.8
8	74	-2 17 .6	-6 17 .4	-5 16 .2	-9 17 .5	-13 17 1.0	-17 16 .7	-20 11 .1	-10 19 .3	-10 19 .6	-10 20 .4	17 4.9
9	74	-2 24 .9	-12 22 .5	-9 20 .3	-14 19 .6	-18 20 1.1	-23 19 .8	-26 19 .1	-18 21 .3	-18 21 .6	-18 20 .4	21 5.6

Table 3.7 : Water level and salinity data for the five lake cells illustrated in Figure 3.4

levels : cm
salinity : parts per thousand ($^{o}/_{oo}$)
salt load : million metric tons

MONTH	YEAR	Level, salinity and salt load at the end of the month for cell numbers:-														
		1			2			3			4			5		
10	72	-20	31	1.6	-17	28	1.1	-17	28	1.6	-17	29	1.6	-17	33	2.1
11	72	-30	31	1.5	-24	30	1.2	-24	29	1.6	-24	30	1.4	-24	28	1.6
12	72	-16	36	2.0	-35	35	1.2	-35	34	1.7	-35	35	1.4	-35	34	1.7
1	73	-27	37	1.8	-27	38	1.4	-27	38	2.0	-27	38	1.8	-27	37	2.0
2	73	-22	34	1.7	-26	37	1.4	-26	39	2.1	-26	39	1.8	-26	40	2.2
3	73	-27	35	1.7	-35	39	1.3	-35	43	2.1	-35	43	1.7	-35	45	2.3
4	73	-14	35	1.9	-20	39	1.6	-20	41	2.3	-20	39	2.0	-20	44	2.6
5	73	-17	36	1.9	-18	39	1.6	-18	41	2.4	-18	37	2.0	-18	44	2.7
6	73	-12	36	2.1	-16	40	1.7	-16	44	2.6	-16	43	2.4	-16	46	2.9
7	73	-21	40	2.0	-18	44	1.8	-16	46	2.7	-14	47	2.7	-18	49	3.0
8	73	-5	30	1.8	-6	35	1.6	-9	41	2.5	-12	42	2.5	-8	45	3.1
9	73	-13	24	1.4	-14	28	1.2	-15	29	1.7	-16	40	2.2	-15	31	2.0
10	73	31	24	2.0	25	24	1.5	23	21	1.6	22	22	2.0	27	17	1.6
11	73	21	28	2.2	23	25	1.5	19	22	1.7	16	18	1.5	21	15	1.3
12	73	24	24	1.9	23	21	1.2	24	19	1.5	25	12	1.2	27	17	1.6
1	74	16	21	1.5	16	18	1.0	17	16	1.2	18	10	.9	15	16	1.4
2	74	18	18	1.4	18	16	.9	18	14	1.1	18	10	.9	18	17	1.4
3	74	19	15	1.1	19	14	.8	18	13	1.0	17	10	.9	16	16	1.4
4	74	7	17	1.2	7	14	.7	9	14	1.0	11	10	.8	10	16	1.3
5	74	20	15	1.2	18	14	.8	17	13	1.0	16	10	.9	12	14	1.1
6	74	10	16	1.1	7	14	.7	8	14	1.0	9	10	.8	9	16	1.3
7	74	4	15	1.0	1	15	.7	2	14	1.0	3	12	.9	5	16	1.2
8	74	-4	17	1.0	-8	16	.7	-13	17	1.0	-18	16	.8	-10	19	1.3
9	74	-6	23	1.4	-12	19	.8	-18	20	1.1	-23	19	.9	-18	21	1.3

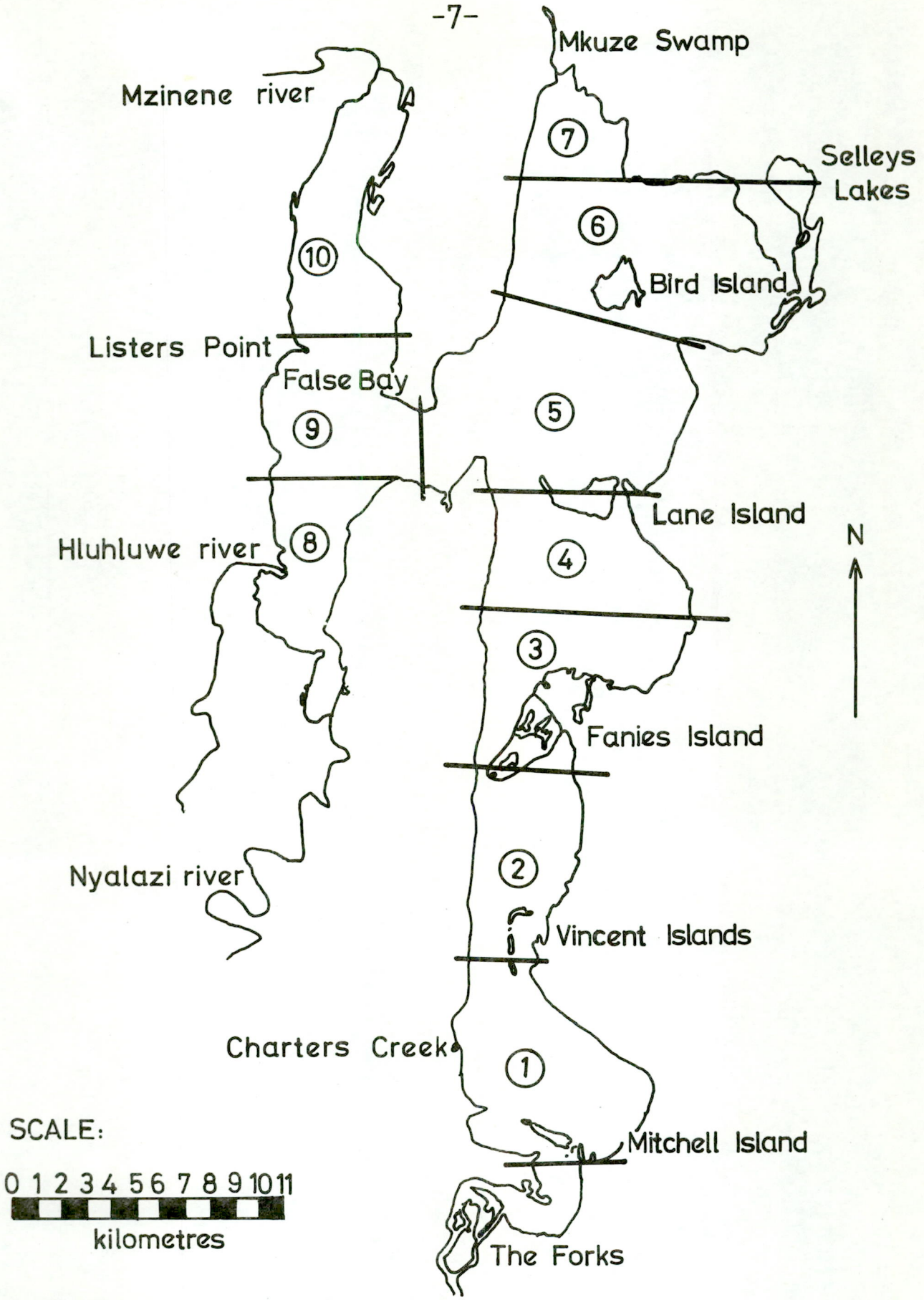
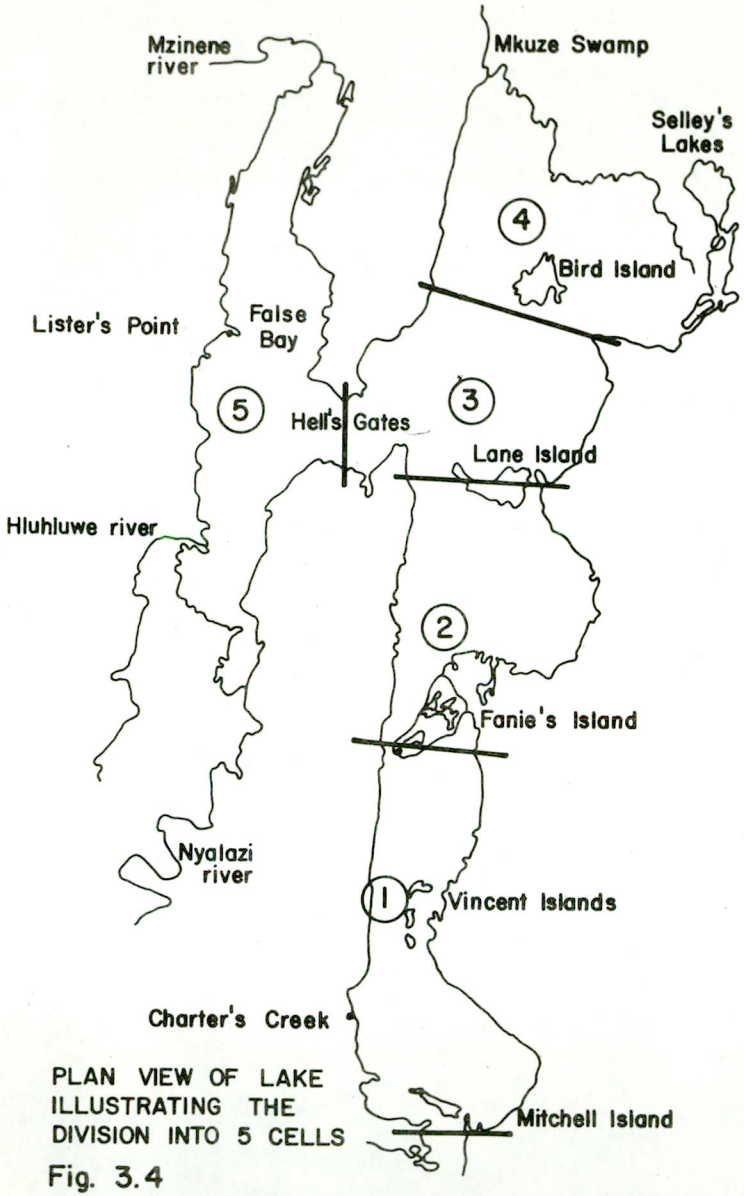


FIGURE 3.3 ST LUCIA LAKE - PLAN OF LAKE SHOWING LOCATIONS OF THE CELLS FOR WHICH DEPTH-AREA CURVES ARE GIVEN

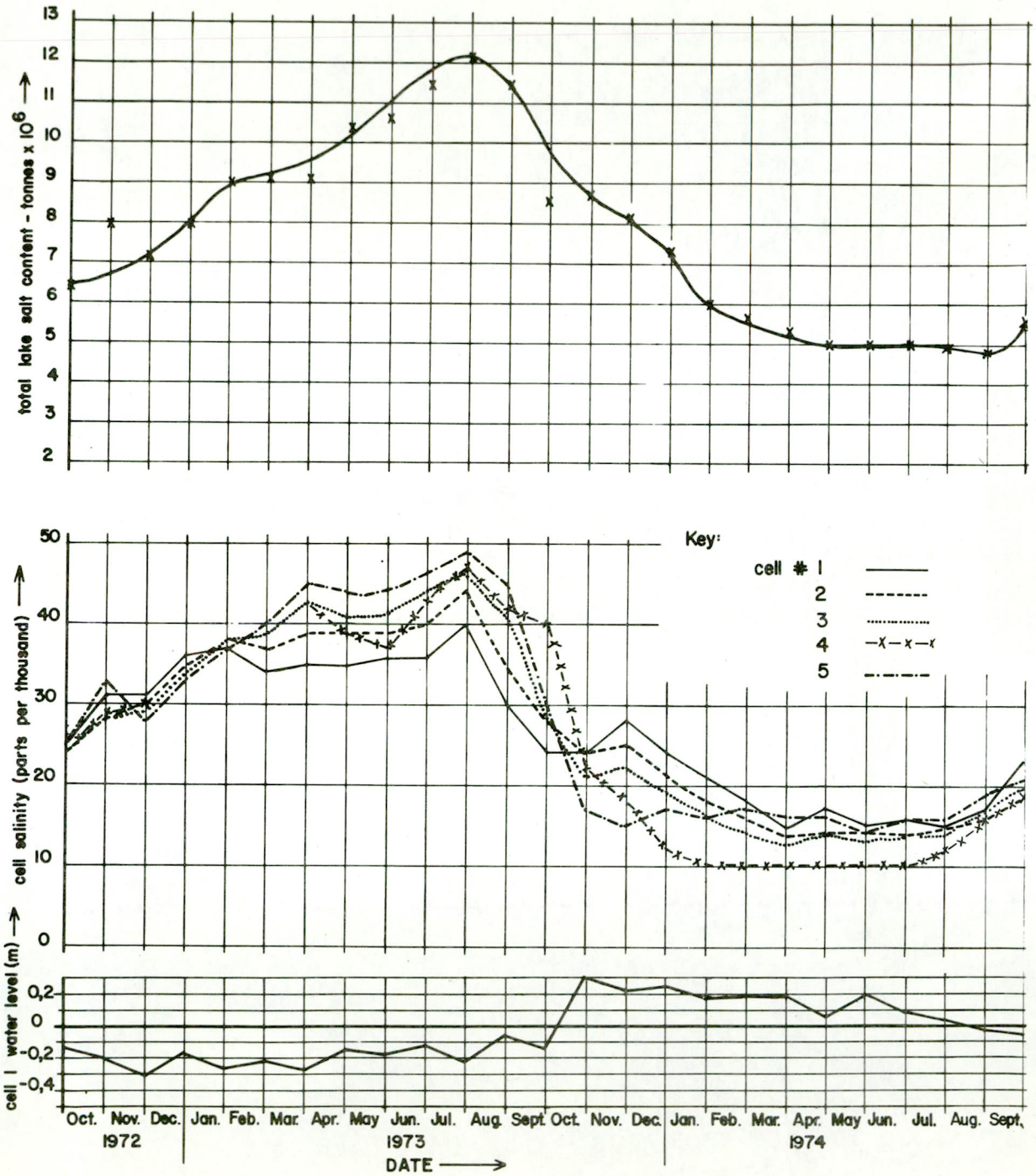


PLAN VIEW OF LAKE ILLUSTRATING THE DIVISION INTO 5 CELLS

Fig. 3.4

ST. LUCIA LAKE : WATER LEVEL, SALINITY AND SALT CONTENT.

Hydrological Research Unit
University of the Witwatersrand.



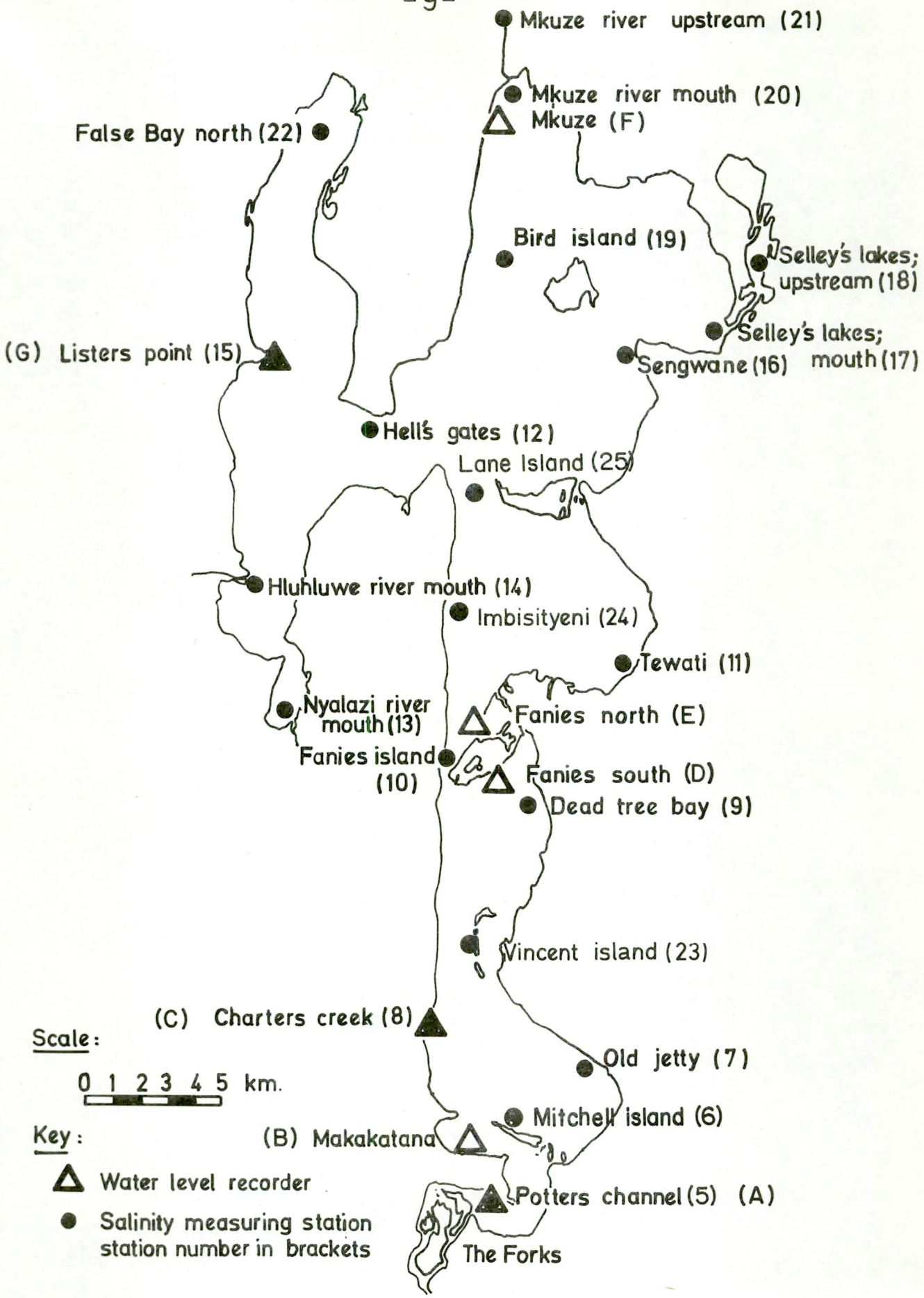
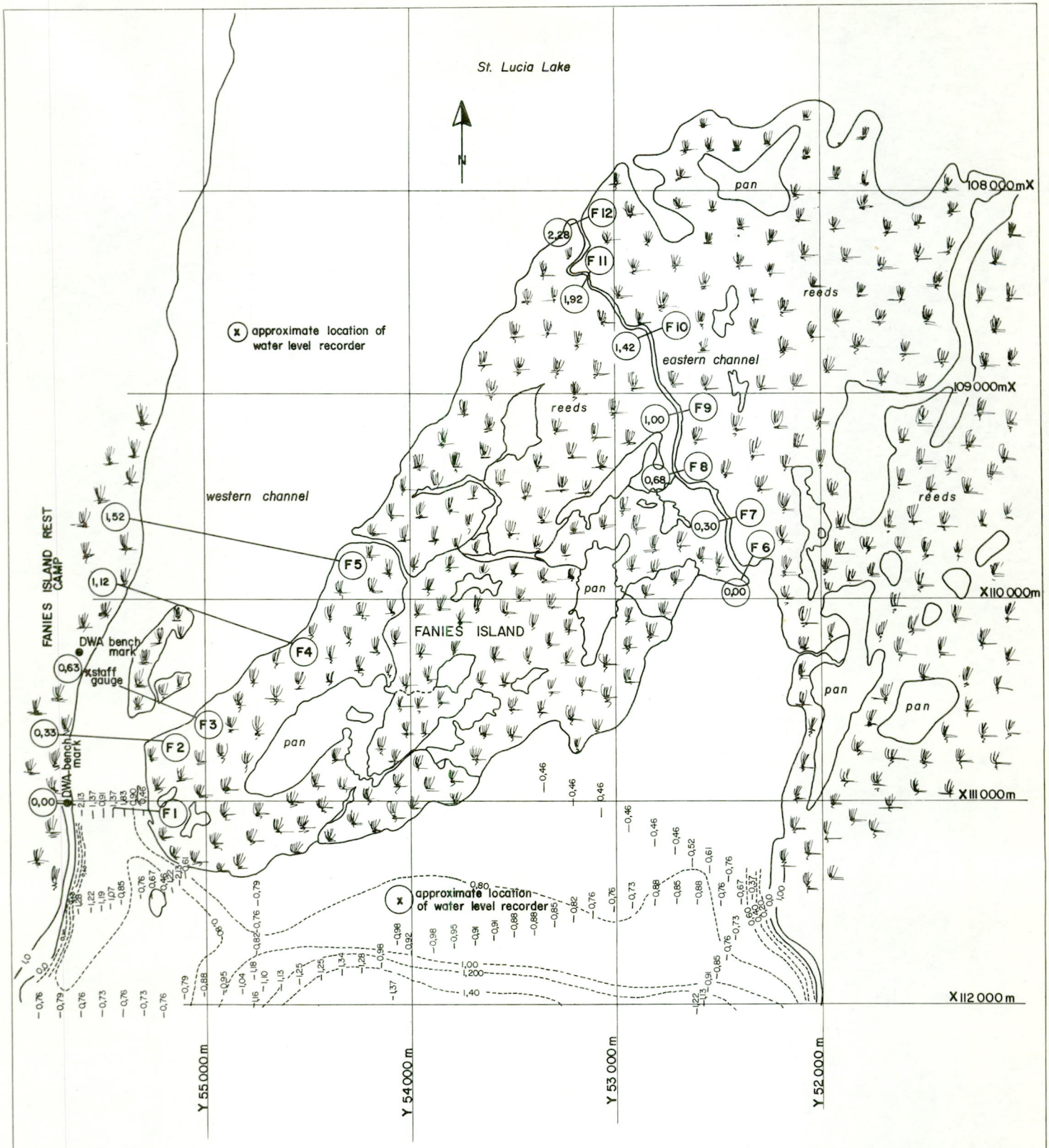


FIGURE 4.1 ST LUCIA LAKE -
PLAN OF LAKE SHOWING THE APPROXIMATE LOCATIONS OF THE WATER LEVEL & SALINITY RECORDING STATIONS



SCALE: 1:10 000

200 0 200 400 600 800 1000m

KEY: 0,33 — F2 surveyed cross-section - chainage in km & section Nº.

X water level recorder

x staff gauge — read daily

● bench mark

Notes: contours and depths shown south of Fanies island were abstracted from N.P.A. drawing Nº HYDROG A/LS/2 of May 1970

INFORMATION USED TO DRAW THE ABOVE PLAN INCLUDES:

(1) Natal Provincial Administration drawing Nº HYDROG A/LS/2

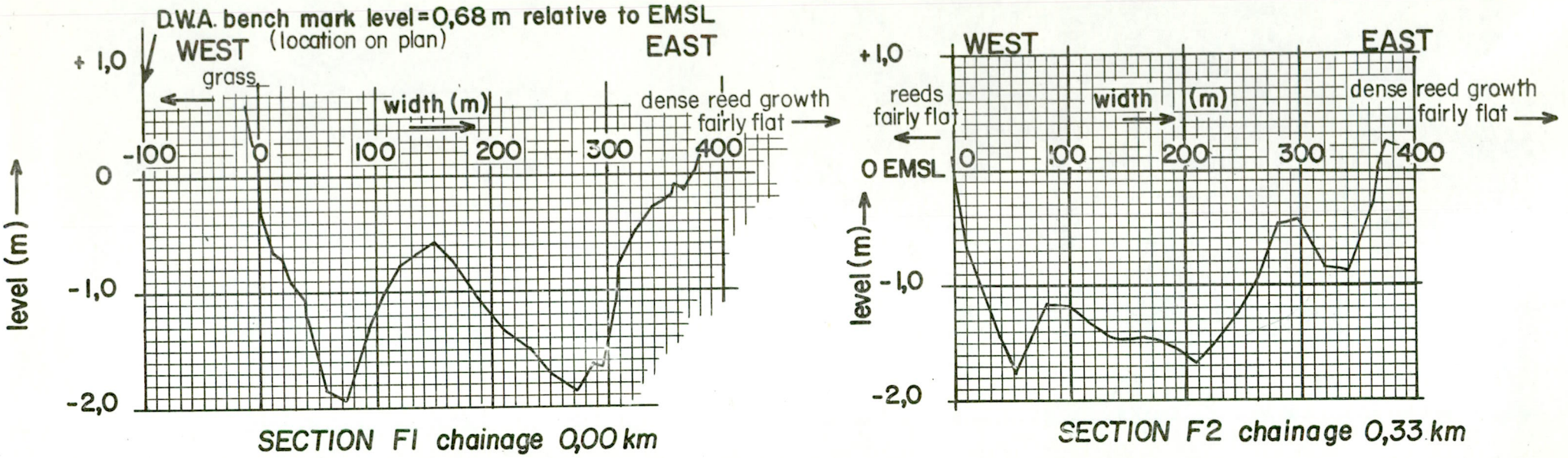
(2) Aerial photograph dated 1965 (Job Nº 449/4, Strip Nº 3; Photo Nº 7845)

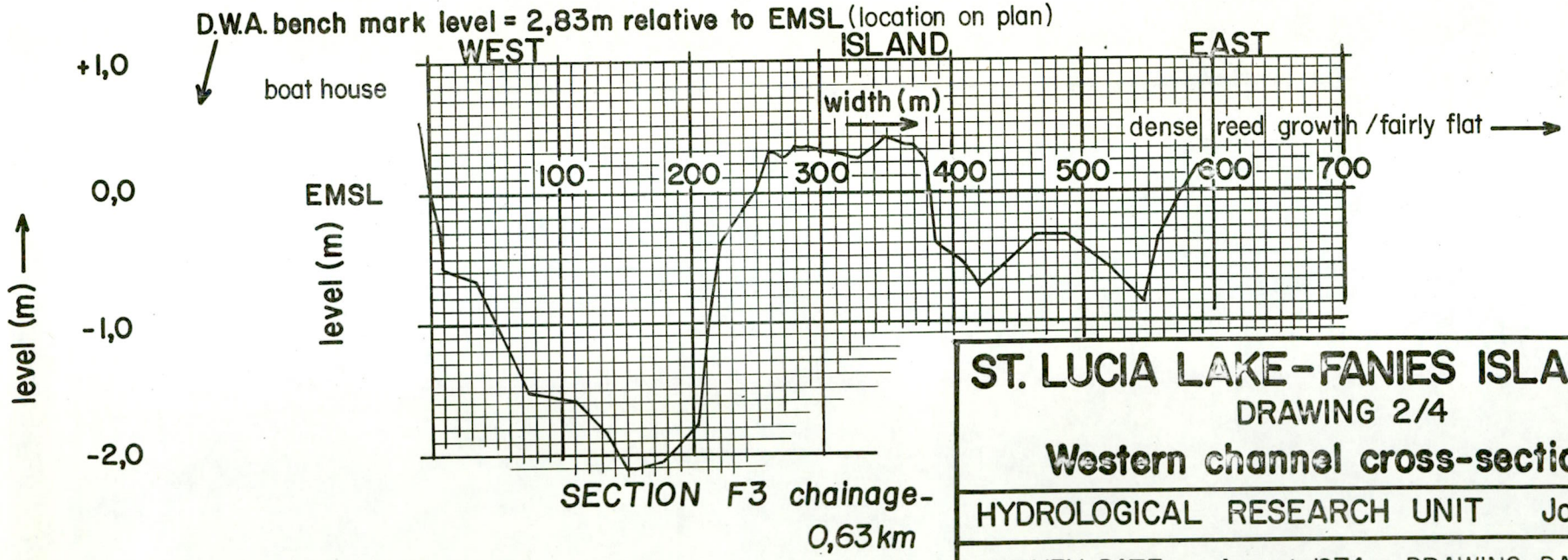
ST. LUCIA LAKE
FANIES ISLAND SURVEY
DRAWING Nº 1/4

PLAN VIEW OF FANIES ISLAND SHOWING LOCATION OF SURVEYED CROSS-SECTIONS

HYDROLOGICAL RESEARCH UNIT
JOHANNESBURG.

SURVEY DATE: AUGUST 1974
DRAWING DATE: SEPTEMBER 1974
ACCURACY: Horizontal ± 20 m





ST. LUCIA LAKE-FANIES ISLAND SURVEY

DRAWING 2/4

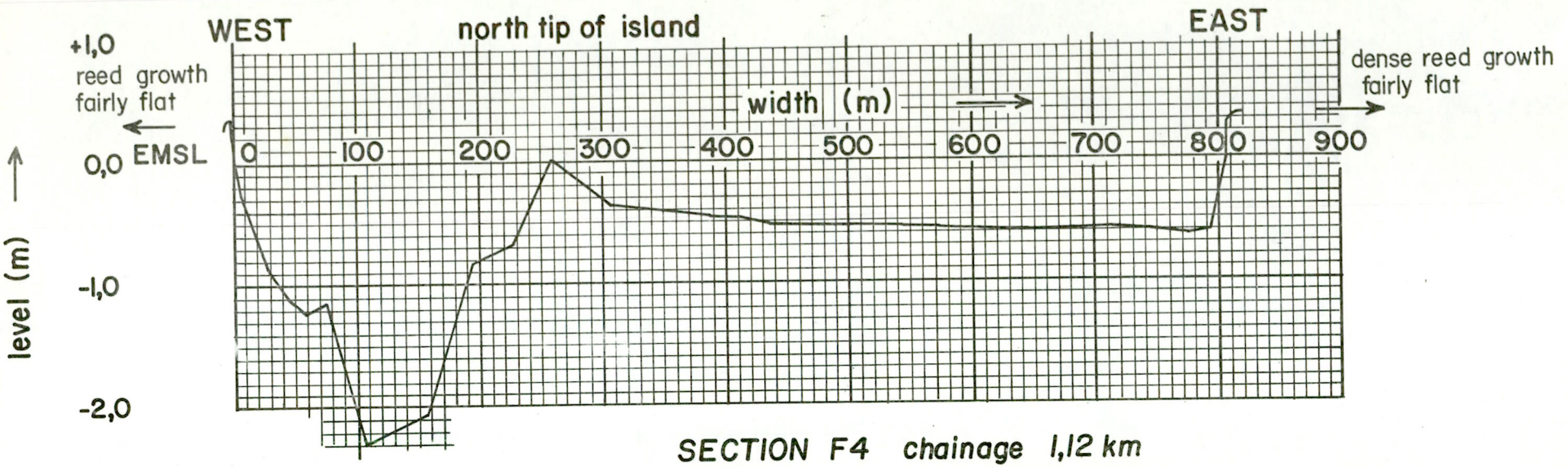
Western channel cross-sections

HYDROLOGICAL RESEARCH UNIT Johannesburg

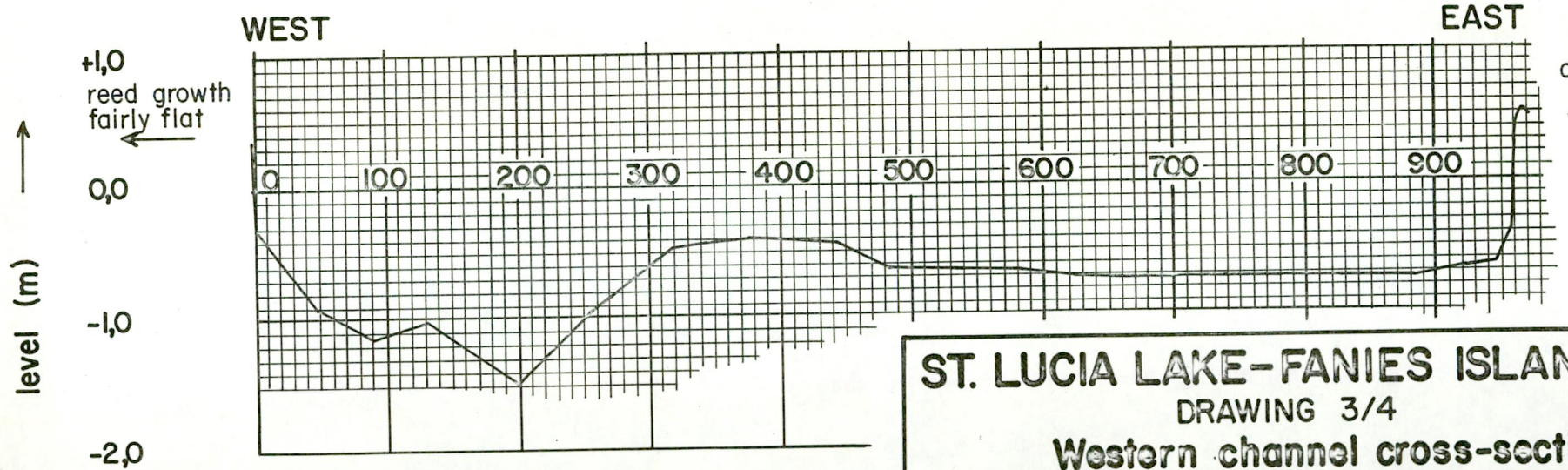
SURVEY DATE : August 1974. DRAWING DATE : September 1974

DATUM : approximate estuary mean sea level (EMSL)

ACCURACY : Vertical ± 0,02 m, Horizontal ± 10 m.



SECTION F4 chainage 1,12 km



SECTION F5 chainage 1,52 km

ST. LUCIA LAKE-FANIES ISLAND SURVEY

DRAWING 3/4

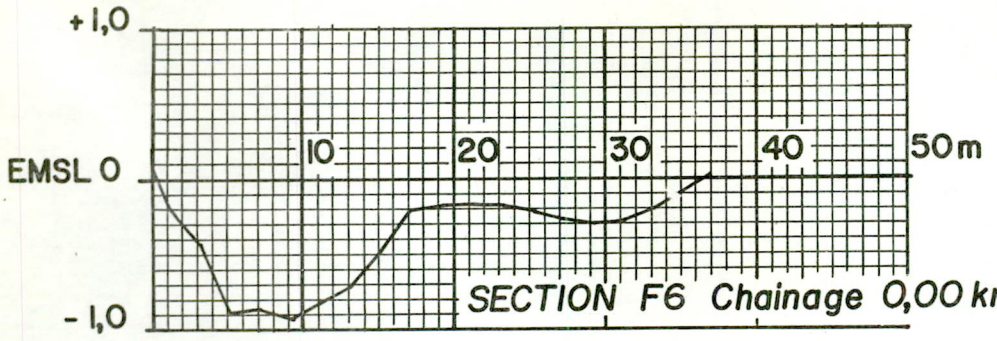
Western channel cross-sections

HYDROLOGICAL RESEARCH UNIT JOHANNESBURG

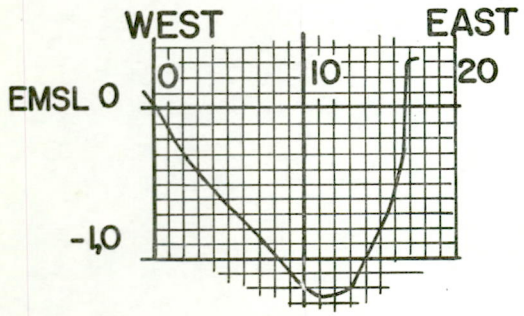
SURVEY DATE: August 1974. DRAWING DATE: September 1974

DATUM: approximate estuary mean sea level (EMSL)

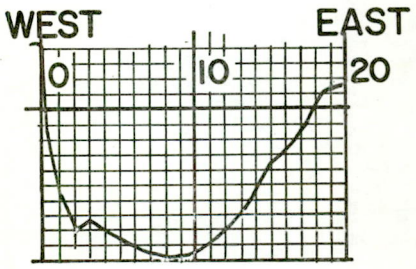
ACCURACY: Vertical ± 0,02m, Horizontal ± 10m.



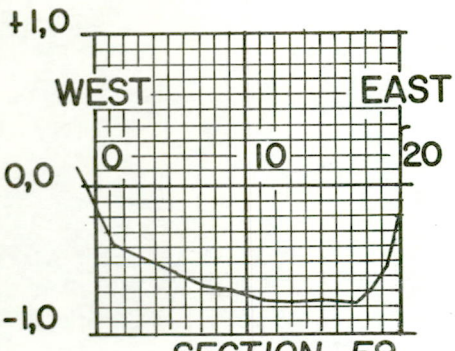
SECTION F6 Chainage 0,00 km



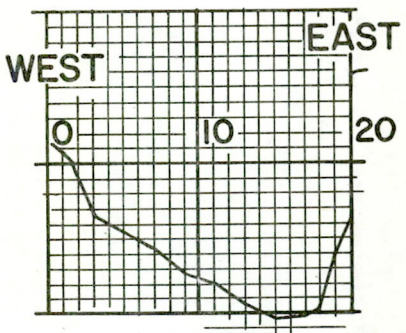
SECTION F7
chainage 0,30km



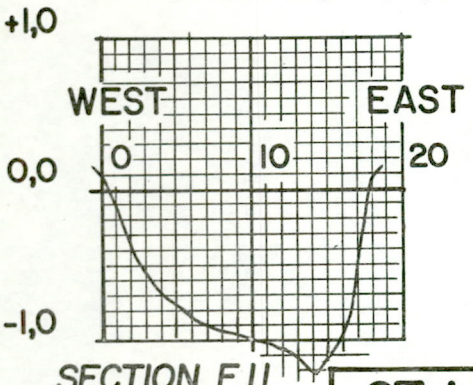
SECTION F8
chainage 0,68 km



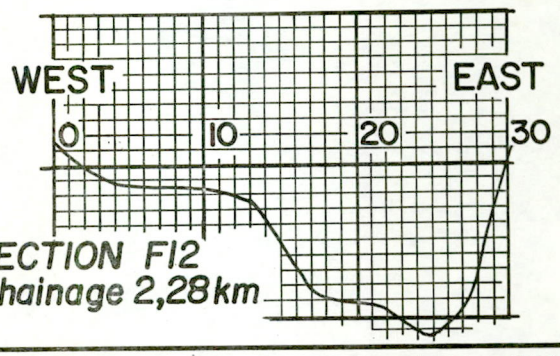
SECTION F9
chainage 1,00 km



SECTION F10
chainage 1,42km



SECTION F11
chainage 1,92km



SECTION F12
chainage 2,28km

ST. LUCIA LAKE - FANIES ISLAND SURVEY

DRAWING 4/4

Eastern channel cross-sections

HYDROLOGICAL RESEARCH UNIT Johannesburg

SURVEY DATE : August 1974 DRAWING DATE : September 1974

DATUM : approximate estuary mean sea level (EMSL)

ACCURACY : Vertical ±0,02m, Chainage ± 10m, Cross-section width ± 1m