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ARAB REPUBLIC
OF
EGYPT

WATER MASTER PLAN

PRESENT AND FUTURE OPERATING SCENARIOS FOR THE HIGH ASWAN DAM

VOLUME II: REPORT APPENDICES

Prepared By

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MINISTRY OF IRRIGATION

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MASTER PLAN FOR WATER RESOURCE DEVELOPMENT AND USE

PRESENT AND FUTURE OPERATING SCENARIOS FOR THE HIGH ASWAN DAM

VOLUME II

REPORT APPENDICES

NOVEMBER 1984

APPENDIX A

LIST OF HISTORICAL DISCHARGE DATA AND RELATIONSHIPS

FOREWORD

This report is one of the technical reports prepared to document work done for the second phase of the Water Master Plan Project EGY/31/031/A.

The second phase, like the first phase, was executed by the International Bank of Reconstruction and Development, financed by the United Nations Development Program, and the Ministry of Irrigation was the co-operating agency. In the second phase, the United States Agency for International Development also provided financial assistance. The second phase of the Water Master Plan Project began on January 1, 1983.

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STATION NAME IS : MALAKAL

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUN.	JUL.	AUG.	SEP.	OCT.	NOV.	DEC.	TOTAL
1912	[illegible]	1.4	1.32	[illegible]	1.19	1.58	2.31	[illegible]	3.16	3.32	3.41	2.71	26.20
1913	[illegible]	1.39	1.47	1.53	1.21	1.22	[illegible]	[illegible]	2.21	[illegible]	2.22	1.61	23.83
1914	[illegible]	1.73	1.31	1.56	1.31	1.61	2.17	2.71	3.24	[illegible]	3.38	[illegible]	26.64
1915	[illegible]	1.46	1.39	1.38	1.51	1.85	2.44	2.87	2.99	1.28	3.27	3.05	27.95
1916	[illegible]	1.40	[illegible]	1.10	1.46	1.84	2.50	[illegible]	3.19	3.99	4.07	4.78	30.76
1917	4.25	3.24	[illegible]	1.86	2.01	2.39	2.80	3.23	3.52	4.15	4.40	4.86	38.79
1918	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2.91	3.33	[illegible]	4.01	4.00	3.81	2.93	44.37
1919	2.19	1.81	1.00	1.58	1.76	2.26	2.81	3.16	3.23	3.49	3.45	2.88	30.43
1920	1.87	1.49	1.42	1.24	1.45	1.99	2.38	[illegible]	2.24	3.05	2.56	2.76	25.97
1921	[illegible]	1.24	1.23	1.13	1.43	1.72	2.21	[illegible]	2.38	2.07	2.71	[illegible]	23.97
1922	[illegible]	[illegible]	.95	.46	1.04	1.56	2.11	[illegible]	[illegible]	[illegible]	2.66	2.80	22.58
1923	1.71	1.04	1.06	1.33	1.41	2.01	2.46	2.94	3.17	3.35	[illegible]	2.96	26.46
1924	[illegible]	[illegible]	1.26	1.12	1.54	1.80	2.10	[illegible]	[illegible]	2.94	2.84	2.61	24.84
1925	[illegible]	1.36	1.29	1.21	1.47	[illegible]	2.36	2.66	[illegible]	2.99	2.88	2.59	25.16
1926	[illegible]	1.18	1.34	1.24	1.59	1.98	2.34	2.61	2.80	3.34	3.16	3.07	26.46
1927	[illegible]	1.40	1.37	1.31	1.34	1.70	2.25	2.58	2.65	2.86	2.71	1.81	24.46
1928	1.44	[illegible]	1.20	1.32	[illegible]	2.47	2.45	[illegible]	2.98	3.31	3.24	3.05	26.89
1929	[illegible]	1.41	1.41	1.36	1.96	2.34	2.68	[illegible]	2.78	3.31	3.15	3.08	28.45
1930	[illegible]	1.41	1.40	1.34	1.53	1.63	2.35	[illegible]	2.67	2.83	2.67	2.04	24.07
1931	1.55	1.19	1.25	1.20	1.27	1.59	2.31	2.64	2.87	3.17	3.16	2.82	25.11
1932	1.76	1.36	1.36	1.31	1.51	2.00	2.47	[illegible]	3.12	3.66	3.72	3.67	28.96
1933	3.47	1.82	1.67	1.66	1.67	1.96	2.43	[illegible]	3.44	3.73	3.66	3.42	31.96
1934	[illegible]	[illegible]	[illegible]	1.46	1.58	1.98	[illegible]	[illegible]	3.15	3.42	3.38	3.41	29.34
1935	[illegible]	[illegible]	[illegible]	1.51	1.72	[illegible]	2.74	[illegible]	2.97	3.17	3.17	3.07	[illegible]
1936	[illegible]	1.57	1.47	1.41	1.57	[illegible]	[illegible]	[illegible]	2.75	2.90	[illegible]	2.41	[illegible]
1937	1.64	1.32	1.34	1.24	1.54	1.98	[illegible]	[illegible]	2.97	3.37	3.07	2.79	26.31
1938	[illegible]	[illegible]	1.44	1.38	1.53	1.98	2.44	[illegible]	2.86	3.30	3.31	3.39	[illegible]
1939	[illegible]	[illegible]	1.60	1.49	1.75	2.16	2.54	2.71	2.79	3.02	2.99	2.53	28.54
1940	[illegible]	[illegible]	[illegible]	1.28	1.37	1.73	2.17	[illegible]	2.59	2.79	[illegible]	1.90	23.34
1941	1.46	[illegible]	1.24	1.16	1.34	1.95	2.36	[illegible]	2.71	2.80	2.84	2.91	24.66
1942	[illegible]	[illegible]	1.43	1.21	1.47	1.94	[illegible]	[illegible]	2.96	3.15	[illegible]	2.73	26.34
1943	[illegible]	[illegible]	1.14	1.31	1.51	1.71	2.21	[illegible]	2.74	2.95	2.90	2.54	24.71
1944	[illegible]	[illegible]	[illegible]	1.33	1.66	2.04	[illegible]	[illegible]	2.81	3.00	[illegible]	2.40	[illegible]
1945	[illegible]	1.27	[illegible]	1.07	1.23	1.81	[illegible]	[illegible]	2.81	3.24	3.15	3.14	25.48
1946	[illegible]	[illegible]	[illegible]	1.07	1.22	1.78	[illegible]	[illegible]	3.54	[illegible]	1.74	[illegible]	[illegible]
1947	[illegible]	2.34	1.46	1.42	1.56	1.93	2.41	[illegible]	2.92	[illegible]	3.21	3.35	30.37
1948	2.69	1.51	1.44	1.32	1.48	2.41	2.45	[illegible]	2.89	3.13	3.16	3.34	28.14
1949	2.94	1.81	1.53	1.45	1.45	1.92	2.37	[illegible]	3.81	3.44	3.29	3.34	29.25
1950	[illegible]	1.59	1.48	1.42	1.71	1.98	2.43	[illegible]	3.09	3.43	3.38	3.08	29.59
1951	2.21	1.35	1.35	1.17	1.19	1.63	2.11	[illegible]	2.47	2.67	2.65	[illegible]	23.77
1952	[illegible]	[illegible]	1.22	1.19	1.42	1.74	[illegible]	[illegible]	2.57	2.78	2.75	2.57	[illegible]
1953	[illegible]	1.26	1.26	1.25	1.43	1.75	[illegible]	[illegible]	2.77	3.04	2.97	[illegible]	24.67
1954	[illegible]	[illegible]	[illegible]	1.29	1.36	1.78	[illegible]	[illegible]	3.13	[illegible]	3.36	[illegible]	26.97
1955	2.81	[illegible]	1.40	1.40	1.58	1.93	[illegible]	[illegible]	2.79	3.89	3.04	3.69	27.37
1956	[illegible]	[illegible]	[illegible]	1.54	1.63	2.09	2.48	[illegible]	[illegible]	[illegible]	3.16	3.74	[illegible]
1957	3.14	[illegible]	[illegible]	1.79	1.50	[illegible]	[illegible]	[illegible]	2.77	[illegible]	[illegible]	2.34	27.99
1958	[illegible]	1.79	[illegible]	1.18	1.38	1.75	2.34	[illegible]	2.84	3.11	[illegible]	3.01	[illegible]
1959	[illegible]	1.36	1.38	1.24	1.56	[illegible]	[illegible]	[illegible]	2.68	2.92	[illegible]	2.94	[illegible]
1960	[illegible]	1.41	1.44	1.32	1.61	1.55	[illegible]	[illegible]	[illegible]	2.84	2.78	2.73	26.11
1961	1.92	1.37	1.38	1.38	1.33	1.73	[illegible]	[illegible]	[illegible]	3.73	3.41	3.40	[illegible]
1962	[illegible]	2.24	[illegible]	1.81	[illegible]	[illegible]	2.74	[illegible]	[illegible]	3.53	[illegible]	[illegible]	34.70
1963	[illegible]	[illegible]	[illegible]	1.88	[illegible]	2.61	[illegible]	[illegible]	3.89	4.63	4.67	4.75	40.25
1964	[illegible]	3.10	[illegible]	[illegible]	2.44	[illegible]	3.16	[illegible]	5.21	[illegible]	[illegible]	[illegible]	40.56
1965	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2.75	[illegible]	[illegible]	[illegible]	[illegible]	4.40	4.11	[illegible]
1966	[illegible]	[illegible]	[illegible]	1.99	[illegible]	2.79	[illegible]	[illegible]	3.94	[illegible]	[illegible]	[illegible]	[illegible]
1967	[illegible]	2.39	2.14	1.90	1.87	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1968	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1969	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	3.44	[illegible]	[illegible]	[illegible]	[illegible]
1970	[illegible]	[illegible]	[illegible]	1.93	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1971	[illegible]	2.41	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1972	[illegible]	[illegible]	[illegible]	1.04	[illegible]	[illegible]	[illegible]	[illegible]	3.21	[illegible]	[illegible]	[illegible]	[illegible]
1973	2.04	[illegible]	1.69	1.58	[illegible]	[illegible]	[illegible]	[illegible]	3.15	[illegible]	[illegible]	[illegible]	[illegible]
1974	2.44	1.73	1.74	1.61	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1975	2.64	[illegible]	1.05	1.72	[illegible]	[illegible]	[illegible]	[illegible]	3.15	3.91	[illegible]	4.00	[illegible]
NO. YRS.	64.00	64.00	64.00	64.00	64.00	64.00	64.00	64.00	64.00	64.00	64.00	64.00	64.00
MEAN	2.42	1.73	1.64	1.49	[illegible]	2.02	2.51	2.88	3.09	[illegible]	3.33	3.18	29.40
MED.	[illegible]	1.45	1.42	1.33	[illegible]	1.97	[illegible]	[illegible]	2.98	3.31	3.15	3.08	27.96
ST. DEV	.92	.71	[illegible]	.40	.74	[illegible]	.31	[illegible]	[illegible]	[illegible]	[illegible]	.78	[illegible]
CV	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
SKEW	1.46	2.34	3.01	1.93	[illegible]	.91	1.24	1.53	1.23	[illegible]	1.63	[illegible]	[illegible]
KURT	[illegible]	5.48	11.74	4.46	1.11	.48	1.07	[illegible]	[illegible]	[illegible]	[illegible]	3.26	[illegible]
S.CORR	.48	.59	.52	.66	[illegible]	[illegible]	.74	[illegible]	.57	[illegible]	[illegible]	[illegible]	.83
MIN.	1.40	1.01	.96	.86	[illegible]	1.56	2.11	2.14	2.47	[illegible]	2.22	1.63	22.58
MAX.	[illegible]	4.67	4.25	3.07	[illegible]	2.91	3.50	4.16	5.21	6.09	6.21	6.43	48.55

STATION NAME IS : ARIUT

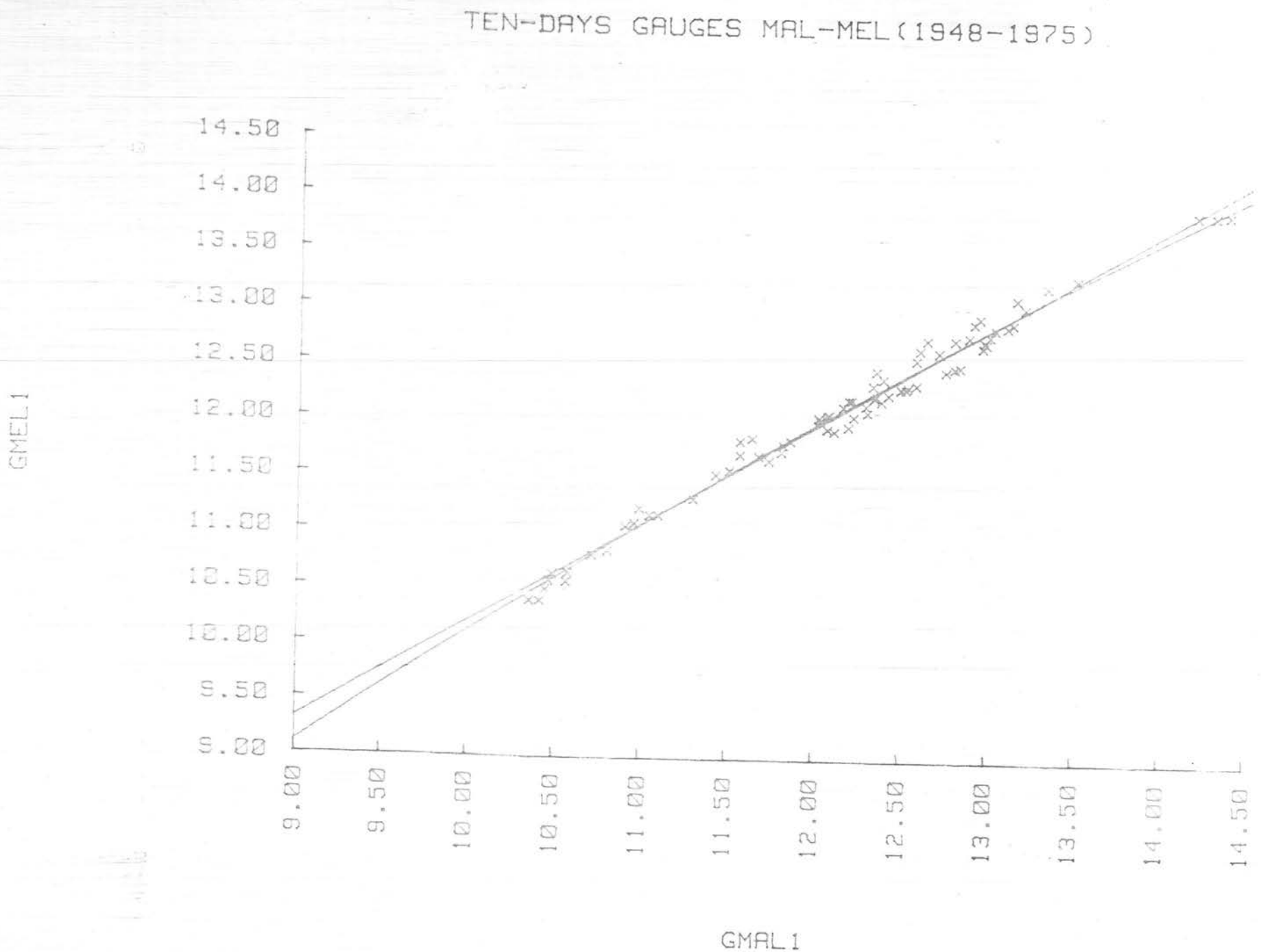
YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUN.	JUL.	AUG.	SEP.	OCT.	NOV.	DEC.	TOTAL
1948	2.96	1.58	1.49	1.34	1.49	1.93	2.45	2.72	2.98	3.20	3.12	3.36	28.44
1949	2.99	1.78	1.49	1.41	1.37	1.72	2.19	2.66	3.04	3.49	3.24	3.18	28.56
1950	3.05	1.84	1.47	1.43	1.77	1.88	2.31	2.78	3.13	3.40	3.41	3.38	29.60
1951	2.48	1.38	1.37	1.23	1.20	1.60	2.06	2.33	2.51	2.77	2.77	2.87	24.60
1952	2.07	1.24	1.19	1.17	1.41	1.70	2.13	2.46	2.62	2.84	2.82	2.71	24.36
1953	1.71	1.24	1.31	1.22	1.46	1.68	2.07	2.44	2.69	2.93	2.98	2.78	24.53
1954	1.89	1.38	1.31	1.23	1.34	1.71	2.19	2.70	3.18	3.50	3.39	3.26	26.91
1955	2.78	1.65	1.42	1.38	1.48	1.89	2.35	2.60	2.77	3.07	3.07	3.19	27.62
1956	2.88	2.01	1.61	1.51	1.80	2.04	2.45	2.73	2.94	3.26	3.21	3.32	29.88
1957	3.21	1.96	1.64	1.62	1.63	2.03	2.46	2.78	2.81	3.01	2.94	2.46	28.79
1958	1.65	1.38	1.51	1.19	1.41	1.69	2.29	2.65	2.84	3.15	3.02	3.02	25.52
1959	2.36	1.41	1.39	1.21	1.47	1.81	2.20	2.47	2.66	2.90	2.84	2.90	25.63
1960	2.36	1.40	1.39	1.27	1.52	1.82	2.28	2.49	2.50	2.80	2.78	2.77	25.39
1961	1.90	1.34	1.38	1.34	1.35	1.63	2.20	2.67	2.95	3.30	3.23	3.18	26.46
1962	3.13	2.67	2.52	1.82	1.93	2.30	2.74	3.08	3.22	3.54	3.55	3.76	34.23
1963	3.55	3.04	2.45	1.98	2.23	2.48	2.86	3.35	3.67	4.27	4.22	4.30	38.40
1964	4.53	3.63	3.31	2.55	2.38	2.57	3.10	3.74	4.36	5.09	5.20	5.53	45.99
1965	5.59	4.94	4.72	3.59	2.96	2.72	3.32	3.81	3.97	4.35	4.27	4.30	48.62
1966	3.82	2.68	2.33	2.02	2.37	2.65	3.14	3.44	3.67	4.10	4.19	4.39	38.76
1967	4.03	2.73	2.24	1.88	1.80	2.10	2.66	3.22	3.58	4.03	4.01	4.11	36.32
1968	3.98	2.97	2.42	1.83	1.80	2.20	2.72	3.07	3.24	3.53	3.54	3.50	34.79
1969	2.64	2.15	2.26	2.18	2.10	2.47	3.00	3.36	3.37	3.63	3.62	3.52	34.22
1970	2.73	2.08	2.15	1.94	1.68	2.25	2.79	3.11	3.34	3.74	3.81	4.05	33.88
1971	3.49	2.57	2.49	2.18	1.95	2.13	2.79	3.17	3.39	3.77	3.77	3.94	35.48
1972	3.37	2.31	2.17	1.88	2.05	2.15	2.72	3.00	3.28	3.33	3.03	2.54	31.91
1973	2.47	1.98	2.08	1.77	1.97	2.34	2.67	2.96	3.09	3.36	3.43	3.50	31.58
1974	2.67	1.75	1.79	1.62	1.86	2.32	2.88	3.18	3.45	4.00	3.92	3.93	33.43
1975	2.73	2.04	2.03	1.79	1.86	2.22	2.82	3.18	3.53	4.13	4.00	3.86	34.18
1976	3.73	2.53	2.18	1.97	1.95	2.14	2.83	3.21	3.35	3.67	3.71	3.61	35.02
1977	2.59	1.95	2.04	1.82	1.67	2.13	2.72	3.06	3.22	3.55	3.57	3.63	31.96
# OF YR.	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	
MEAN	2.98	2.11	1.96	1.71	1.78	2.08	2.56	2.90	3.17	3.53	3.49	3.49	31.83
MED.	2.85	1.92	1.89	1.78	1.80	2.12	2.67	3.01	3.16	3.49	3.42	3.44	31.70
ST.DV.	.85	.80	.72	.49	.38	.32	.34	.37	.42	.52	.55	.65	5.89
CV.	28.63	37.77	36.49	28.73	21.16	15.28	13.33	12.88	13.14	14.79	15.86	18.62	18.51
SKEW	.90	1.56	1.97	1.77	.98	.23	.22	.49	.67	.84	.95	.87	.98
KURT	1.13	3.09	5.09	4.64	1.23	-.95	-.94	-.49	.49	.74	1.06	1.15	.88
S.CORR	.60	.68	.66	.65	.71	.76	.84	.86	.80	.73	.73	.64	.84
MIN.	1.65	1.24	1.19	1.17	1.28	1.68	2.07	2.46	2.51	2.79	2.72	2.48	24.36
MAX.	5.59	4.94	4.72	3.59	2.96	2.72	3.32	3.81	4.36	5.09	5.20	5.53	48.62

NATURALIZED FLOW IN 10**6 CUBIC-METRES FOR ASWAN (1883-1982)

YEAR	JAN.	FEB.	MAR.	APR.	MAY.	JUN.	JUL.	AUG.	SEP.	OCT.	NOV.	DEC.	TOTAL
1883	4664.	3459	3174.	2070.	1573.	1647.	6686.	22632.	25484.	16008.	9145.	6725.	103.269
1884	5161.	4094	3634.	2512.	2079.	2134.	4416.	16192.	19964.	15548.	9844.	6385.	91.963
1885	4812.	3330.	2374.	1610.	1279.	1270.	7535.	23276.	21988.	14444.	7526.	5281.	94.725
1886	3772.	2328.	1978.	1592.	1573.	1822.	4692.	16676.	23928.	14444.	7792.	6357.	86.946
1887	4637.	3036.	2272.	1546.	1656.	2346.	7535.	27508.	29256.	16336.	9200.	6842.	111.970
1888	5124.	3183.	2374.	1757.	1555.	1628.	3928.	16008.	17480.	10764.	5437.	4066.	77.304
1889	2861.	1702.	1444.	1141.	1049.	1095.	4628.	20608.	25208.	16284.	7912.	5308.	89.240
1890	4094.	2410.	1748.	1224.	1040.	1380.	5410.	24268.	26864.	20056.	11224.	7222.	106.960
1891	5244.	3192.	2144.	1500.	1398.	2907.	5272.	20148.	24840.	18308.	11224.	6946.	103.123
1892	4839.	3174.	2125.	1380.	1113.	1132.	5198.	22264.	31372.	22632.	11316.	7673.	114.218
1893	6136.	4802.	4692.	4076.	2502.	1923.	4563.	20700.	22448.	18584.	9936.	6486.	106.848
1894	5005.	3284.	2282.	1638.	1647.	1978.	7029.	25024.	28612.	23276.	11316.	8004.	118.195
1895	6247.	4674.	4398.	3211.	2659.	2447.	7121.	28060.	26680.	16100.	9660.	7765.	115.022
1896	5925.	4480.	3542.	2512.	2208.	2171.	6541.	20424.	27416.	17388.	11960.	10120.	114.687
1897	6446.	4536.	3781.	2696.	2236.	2539.	5327.	17480.	22632.	15088.	7572.	5391.	95.718
1898	4342.	3100.	2254.	1601.	1371.	1306.	3730.	23184.	26598.	18768.	10396.	7480.	104.125
1899	5584.	4215.	4030.	2824.	2024.	1932.	4444.	13432.	15364.	9384.	4618.	3165.	71.112
1900	1941.	1237.	1021.	788.	814.	1159.	3570.	21068.	20332.	14536.	6633.	4683.	77.778
1901	3840.	2390.	1870.	1340.	1380.	1530.	5530.	20700.	24300.	13200.	7230.	4990.	88.300
1902	3380.	1960.	1580.	1280.	1200.	1330.	3480.	11000.	18300.	14100.	7200.	4810.	69.620
1903	3620.	2240.	1660.	1140.	989.	1740.	4980.	17700.	24800.	18600.	10200.	5920.	93.589
1904	4500.	3430.	2530.	1700.	1620.	2080.	5120.	18900.	19000.	13000.	6550.	4920.	82.350
1905	3850.	2500.	1960.	1400.	1170.	1110.	2640.	12400.	19600.	13200.	5660.	4640.	70.130
1906	3690.	2680.	2110.	1880.	1590.	1510.	3460.	17800.	24800.	17500.	8760.	5750.	91.530
1907	4290.	2890.	2170.	1690.	1660.	1540.	3160.	11700.	17600.	11200.	6660.	4580.	69.140
1908	3600.	2250.	1790.	1320.	1190.	1240.	3240.	21900.	29300.	20500.	9380.	5990.	101.700
1909	4530.	3430.	2580.	1700.	1990.	2700.	5730.	20700.	25800.	19400.	9560.	6400.	104.520
1910	5000.	3890.	3220.	1910.	1450.	1700.	3290.	16400.	24500.	18900.	10700.	5980.	96.940
1911	4340.	3200.	2350.	1470.	1280.	1660.	3160.	15000.	23300.	14500.	7400.	5360.	83.020
1912	2758.	2214.	1629.	1330.	1235.	1854.	6186.	17147.	16930.	9808.	5491.	3859.	70.441
1913	2685.	1911.	1486.	1320.	1445.	1463.	2792.	8770.	10966.	7133.	3606.	2216.	45.993
1914	1639.	1229.	1151.	1138.	1164.	1495.	5372.	18123.	19677.	14999.	10220.	5952.	82.158
1915	3981.	2741.	1859.	1344.	1343.	1978.	4179.	10946.	15315.	12916.	7880.	4980.	69.366
1916	3489.	2300.	1584.	1313.	1381.	2031.	8771.	24724.	27171.	19221.	11333.	6523.	109.841

YEAR	JAN.	FEB.	MAR.	APR.	MAY.	JUN.	JUL.	AUG.	SEP.	OCT.	NOV.	DEC.	TOTAL
1917	4739.	3786.	[illegible]	2142.	1891.	3095.	7551.	17807.	27161.	21376.	11236.	6376.	110,178
1918	4799.	3916.	[illegible]	4057.	4228.	4227.	6655.	14338.	15701.	10960.	6565.	4361.	83,494
1919	3281.	2423.	[illegible]	1736.	1653.	2316.	6932.	16484.	19339.	12551.	6220.	3958.	76,939
1920	2875.	1953.	[illegible]	1441.	1627.	2636.	6988.	16209.	17029.	12947.	7829.	4626.	77,815
1921	3280.	2163.	[illegible]	1340.	1344.	1996.	4740.	16091.	19139.	12631.	6779.	4081.	75,161
1922	2907.	1847.	[illegible]	1016.	1022.	1528.	5637.	17566.	21552.	14638.	7217.	4110.	80,337
1923	3138.	2008.	[illegible]	1273.	1551.	2430.	6359.	19007.	20930.	13498.	7168.	4705.	83,431
1924	3571.	2322.	[illegible]	1478.	1519.	2256.	7010.	17203.	20902.	13809.	7658.	4655.	84,008
1925	3249.	2145.	[illegible]	1305.	1480.	2382.	5141.	13943.	16093.	11380.	6597.	4103.	69,363
1926	2969.	1918.	[illegible]	1327.	1891.	2636.	7140.	17587.	20619.	14450.	7821.	4761.	84,575
1927	3597.	2498.	[illegible]	1338.	1336.	2193.	6192.	14756.	16183.	11540.	6293.	3745.	71,398
1928	2406.	1541.	[illegible]	1443.	2136.	3071.	7866.	18360.	19382.	12527.	6921.	4454.	81,403
1929	3280.	2180.	[illegible]	1427.	2147.	4266.	10477.	21570.	23763.	17515.	9435.	5206.	102,872
1930	3657.	2494.	[illegible]	1568.	1553.	2186.	7124.	16196.	17724.	11190.	5790.	3533.	74,878
1931	2462.	1666.	[illegible]	1142.	1139.	1839.	5132.	16403.	19958.	14597.	7822.	4358.	77,820
1932	3051.	1975.	[illegible]	1293.	1474.	2192.	6365.	18446.	22985.	15644.	7633.	4542.	87,078
1933	3845.	3135.	[illegible]	1628.	2039.	4566.	14265.	19992.	14965.	8499.	5302.	62,113
1934	3889.	2562.	[illegible]	1488.	1572.	2553.	8210.	19886.	21005.	14792.	8133.	4860.	90,745
1935	3767.	2620.	[illegible]	1595.	1850.	3105.	8940.	18967.	22869.	16611.	8409.	4709.	95,325
1936	3462.	2517.	[illegible]	1556.	1515.	2130.	7206.	17918.	22014.	14218.	6869.	4204.	85,529
1937	3115.	2150.	[illegible]	1560.	1672.	2218.	6952.	18919.	20572.	12351.	6368.	4350.	81,976
1938	2756.	2148.	[illegible]	[illegible]	[illegible]	2225.	6139.	21259.	24541.	17583.	9274.	5246.	98,859
1939	4016.	3279.	[illegible]	1816.	1905.	2603.	5984.	13963.	16224.	12225.	7340.	4531.	76,246
1940	3133.	1930.	[illegible]	1530.	1550.	1863.	4326.	16091.	16679.	9639.	4672.	3224.	66,436
1941	2239.	1530.	[illegible]	1329.	1556.	2679.	6135.	13877.	15295.	11746.	7355.	4442.	69,556
1942	3328.	2127.	[illegible]	1681.	1690.	2228.	7630.	16949.	20013.	12852.	6600.	4227.	81,078
1943	3154.	1886.	[illegible]	1542.	1624.	1788.	5002.	17214.	22181.	13593.	6411.	3975.	79,894
1944	2798.	1806.	[illegible]	1554.	1769.	2410.	7568.	17675.	18042.	10462.	5259.	3724.	74,638
1945	2651.	1681.	[illegible]	1374.	1696.	2344.	5886.	15853.	20048.	15130.	8551.	5074.	81,630
1946	3818.	2526.	[illegible]	1324.	1420.	2423.	9330.	27396.	25966.	14994.	8061.	5463.	104,376
1947	4332.	3666.	[illegible]	2184.	1698.	2166.	5130.	17481.	21412.	13779.	6836.	4275.	86,053
1948	3714.	2769.	[illegible]	1451.	1611.	3013.	7774.	16994.	19571.	15753.	8915.	4978.	88,462
1949	3661.	2886.	[illegible]	1578.	1741.	2590.	7022.	17186.	19998.	13417.	7091.	4724.	83,978
1950	3941.	3002.	[illegible]	1662.	2009.	2609.	6730.	18276.	21710.	13225.	6311.	4380.	85,911

YEAR	JAN.	FEB.	MAR.	APR.	MAY.	JUN.	JUL.	AUG.	SEP.	OCT.	NOV.	DEC.	TOTAL
1951	3626.	2276.	1503.	1401.	1498.	1847.	5047.	16243.	16981.	12114.	7218.	4382.	74.141
1952	3232.	1999.	1178.	1449.	1576.	1918.	5604.	16745.	18568.	12084.	6047.	3729.	74.259
1953	2760.	1730.	1257.	1423.	1655.	2008.	6834.	20156.	20134.	11998.	6130.	4272.	80.357
1954	3124.	1754.	1343.	1410.	1472.	2261.	8248.	22134.	25305.	16604.	8440.	5155.	97.250
1955	4110.	2099.	1793.	1391.	1647.	2310.	6776.	18210.	22653.	16124.	8017.	4553.	90.479
1956	3586.	2894.	2054.	1599.	1856.	3013.	7725.	18385.	19894.	18519.	11304.	5578.	96.407
1957	4024.	3440.	2564.	2385.	2097.	2615.	5727.	18111.	18689.	9963.	4750.	3504.	77.869
1958	2633.	1004.	1366.	1486.	1599.	2357.	7330.	21041.	22288.	15578.	8317.	4711.	90.510
1959	3581.	2360.	1703.	1422.	1632.	2061.	5673.	19467.	24078.	16290.	8551.	4947.	91.765
1960	3679.	2636.	1776.	1525.	1716.	2249.	6720.	17330.	20024.	12959.	6345.	3995.	80.854
1961	3062.	1641.	1488.	1706.	1783.	2130.	9758.	20605.	23953.	17666.	9374.	5650.	99.216
1962	4343.	3307.	2976.	2392.	1962.	2742.	6105.	17870.	21911.	15717.	7713.	4620.	91.720
1963	4030.	3225.	2909.	2415.	2642.	2938.	7005.	18853.	20969.	12457.	7186.	5968.	90.597
1964	5125.	3964.	3471.	2936.	2615.	3209.	8041.	20425.	23629.	17799.	10533.	7116.	108.865
1965	6129.	5669.	5420.	4424.	3567.	3195.	5895.	16142.	17438.	12978.	8764.	6201.	95.820
1966	4583.	3607.	2965.	2509.	2728.	3728.	6414.	15083.	18573.	11418.	6536.	5041.	83.184
1967	4609.	3762.	2967.	2255.	2111.	2687.	7424.	18251.	22116.	17982.	9880.	6088.	100.812
1968	4935.	4226.	2370.	2391.	2295.	3061.	8152.	16634.	14860.	11471.	7261.	4999.	83.267
1969	3906.	3127.	[illegible]	2310.	2610.	3211.	[illegible]	19697.	[illegible]	[illegible]	5951.	4745.	[illegible]
1970	4031.	3189.	2252.	2065.	2300.	2567.	6117.	19246.	21459.	13753.	7450.	5510.	89.941
1971	4641.	3619.	2771.	2331.	2471.	2865.	7215.	17488.	19676.	10238.	7229.	5125.	87.669
1972	4447.	3728.	2440.	2145.	2489.	2855.	6881.	14144.	13296.	6622.	5093.	3803.	69.943
1973	2888.	2445.	1875.	1592.	2129.	2582.	6171.	19092.	19067.	11852.	6657.	4525.	80.875
1974	3575.	[illegible]	2283.	2139.	2246.	3281.	8388.	18755.	20462.	13459.	7093.	4814.	89.066
1975	4182.	3173.	2492.	2008.	2049.	2755.	7791.	19690.	25079.	16429.	8613.	5626.	99.887
1976	4710.	3928.	3053.	1970.	2069.	2508.	7237.	17789.	17893.	10355.	6046.	4698.	82.680
1977	4119.	2936.	2088.	1880.	2613.	3163.	9668.	19488.	19307.	11984.	7654.	5513.	90.407
1978	5763.	3533.	2209.	1792.	1694.	2679.	7679.	17309.	17482.	13257.	7561.	4702.	85.660
1979	4707.	3549.	3257.	2622.	1622.	2631.	6569.	15023.	15248.	9697.	6092.	4404.	75.621
1980	3630.	2816.	2216.	2044.	1781.	2391.	8463.	19300.	16692.	9922.	5921.	3928.	79.104
1981	3737.	2775.	1543.	1766.	1151.	1806.	7809.	17142.	18052.	12191.	6400.	4207.	78.979
1982	3936.	2850.	1862.	902.	546.	1833.	7103.	16236.	15912.	11025.	6598.	4085.	72.888
NORMAL	3911.	2803.	2181.	1769.	1743.	2279.	6281.	18191.	20959.	14306.	7774.	5078.	87.275


TEN-DAYS GAUGES MAL-MEL(1948-1975)
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13.50
13.00
12.50
12.00
11.50
11.00
10.50
10.00
9.50
9.00
9.00
9.50
10.00
10.50
11.00
11.50
12.00
12.50
13.00
13.50
14.00
14.50
GMAL1

Fig.(A .1)

TEN-DAYS GAUGES MAL-MEL(1948-1975)

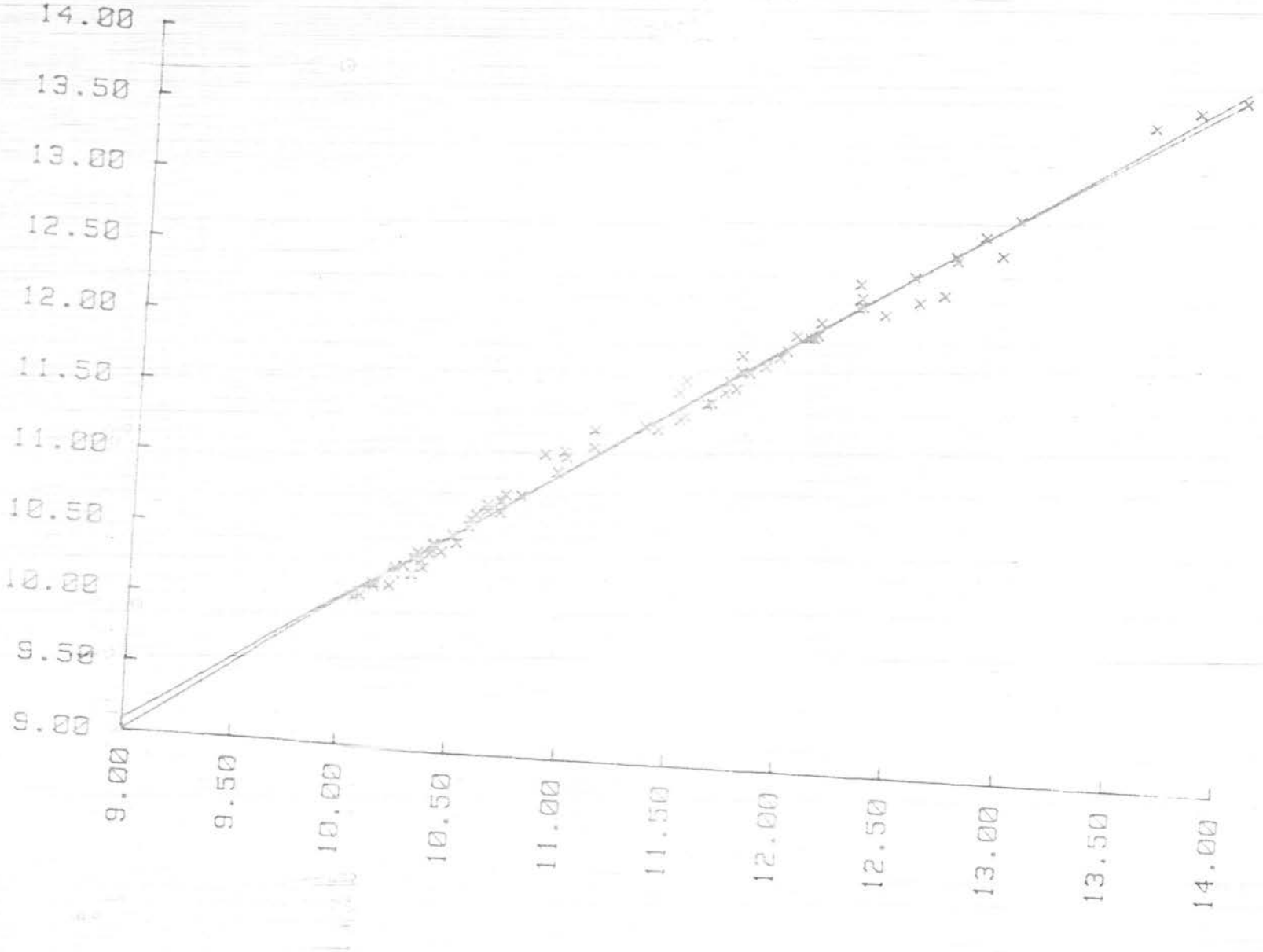


Fig.(A .2)

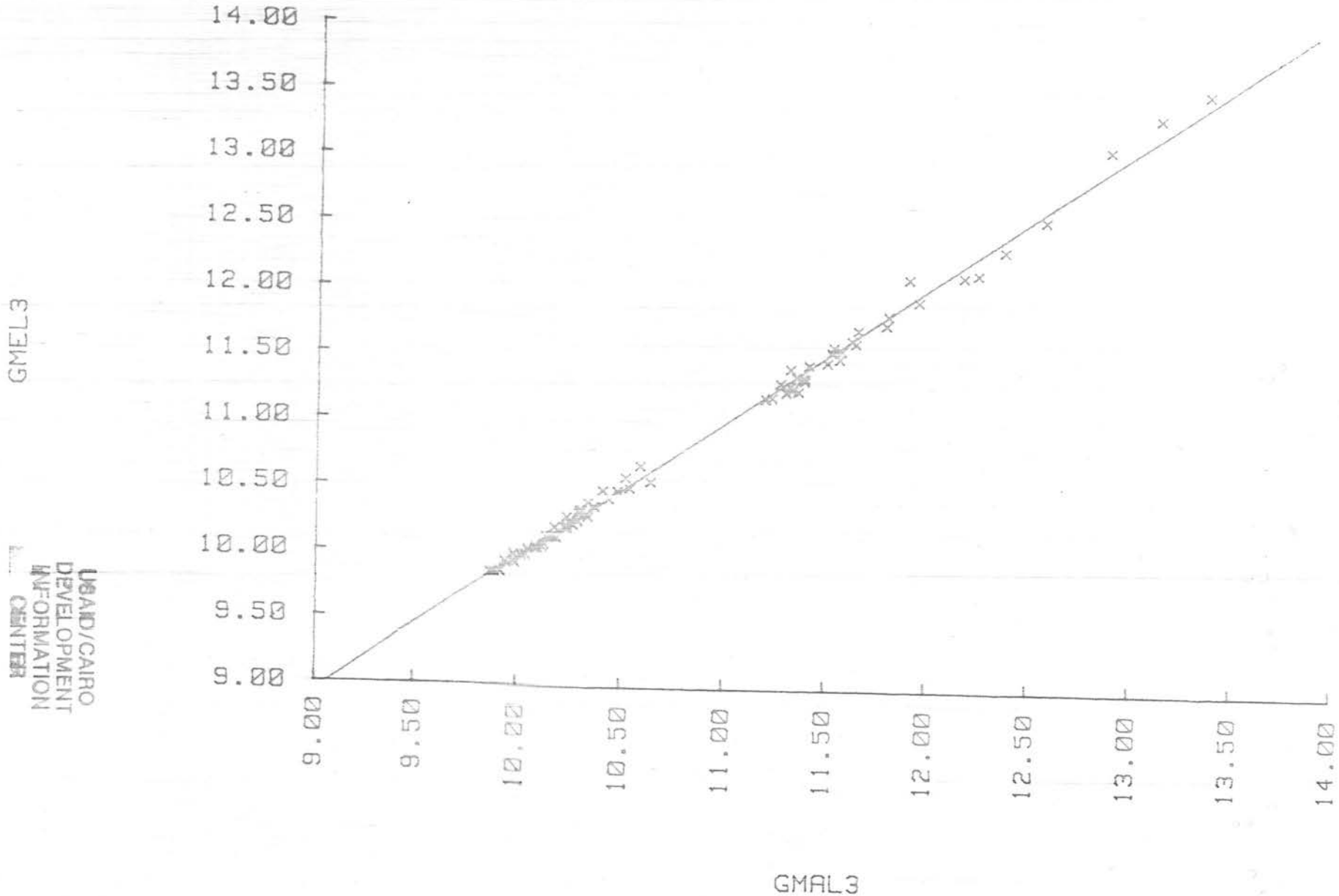
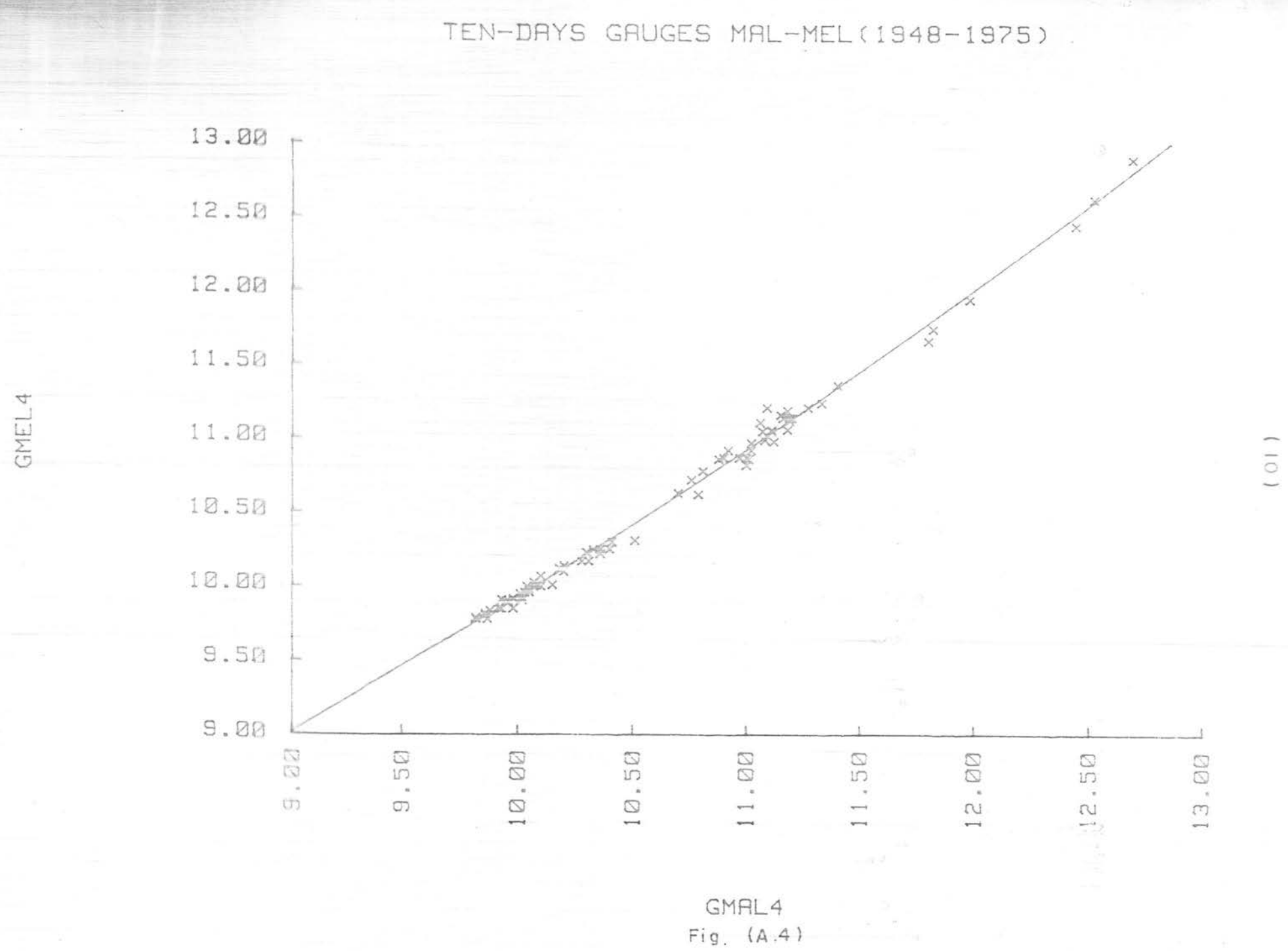


Fig (A . 3)


TEN-DAYS GAUGES MAL-MEL(1948-1975)
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9.50
9.00
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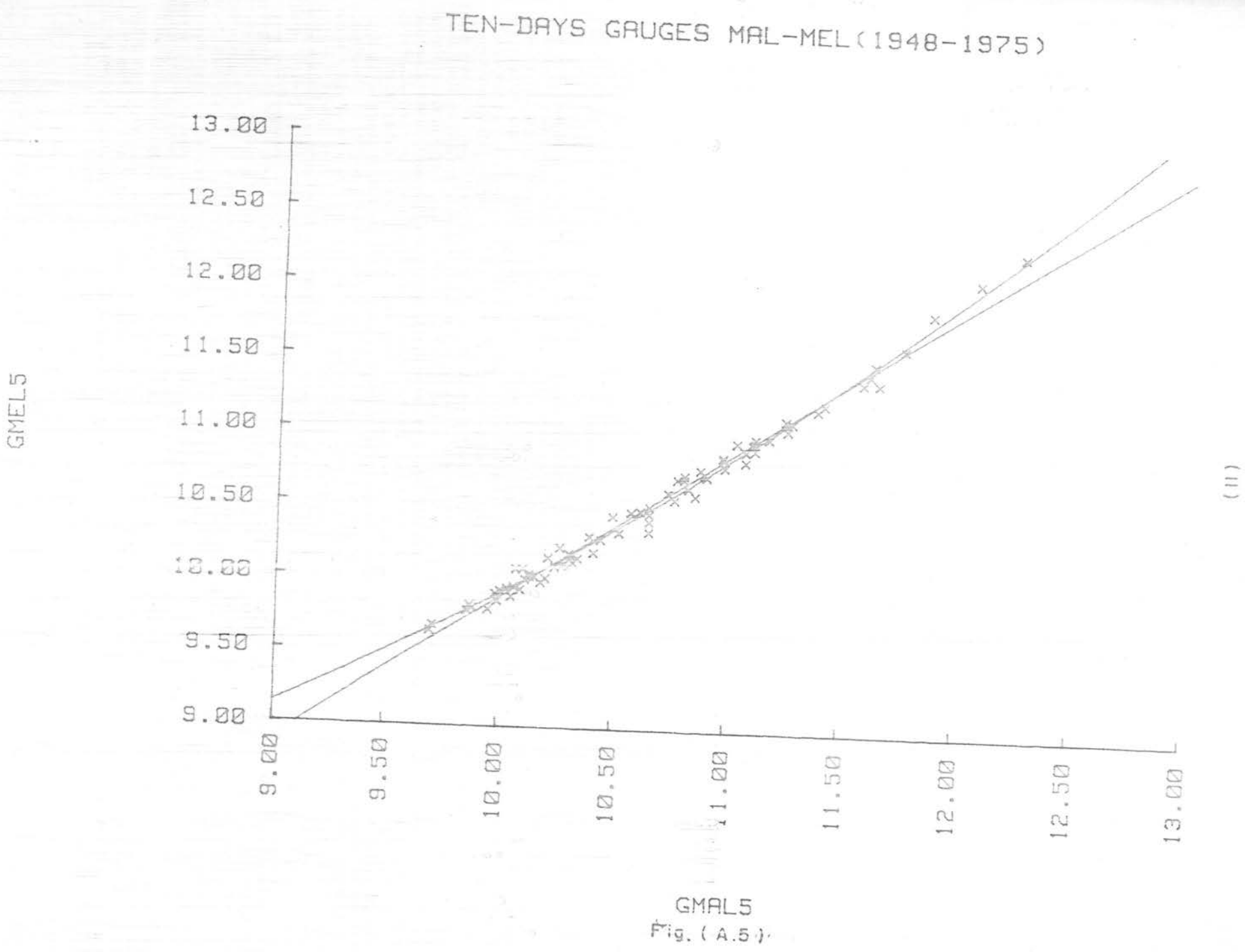
12.00
12.50
13.00
GMAL4

Fig. (A.4)


TEN-DAYS GAUGES MAL-MEL(1948-1975)
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9.00
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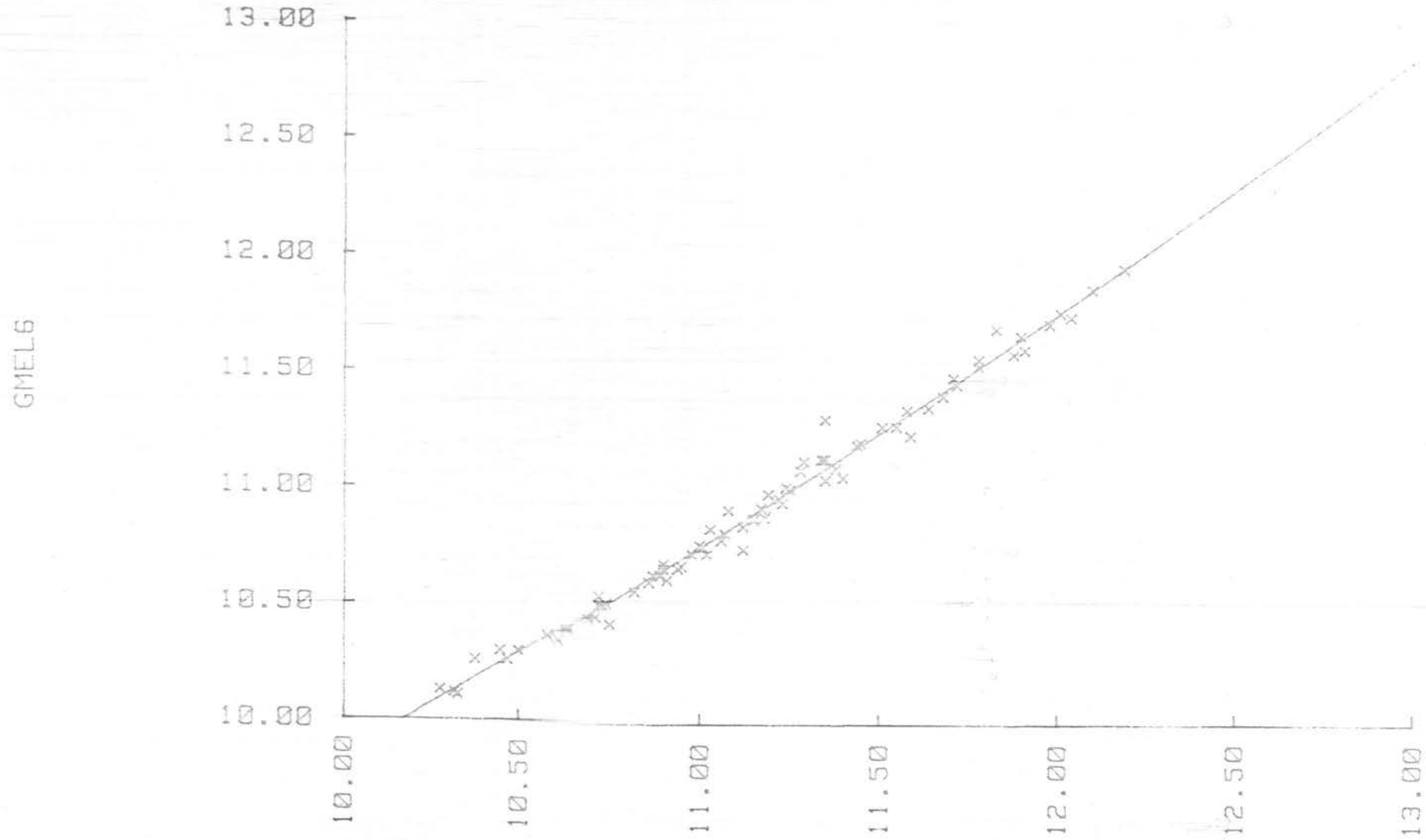
12.00
12.50
13.00
GMAL5

Fig. (A.5).


TEN-DAYS GAUGES MAL-MEL(1948-1975)
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GMEL6
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10.50
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12.50
13.00
GMAL6

Fig. (A :6)

TEN-DAYS GAUGES MAL-MEL(1948-1975)

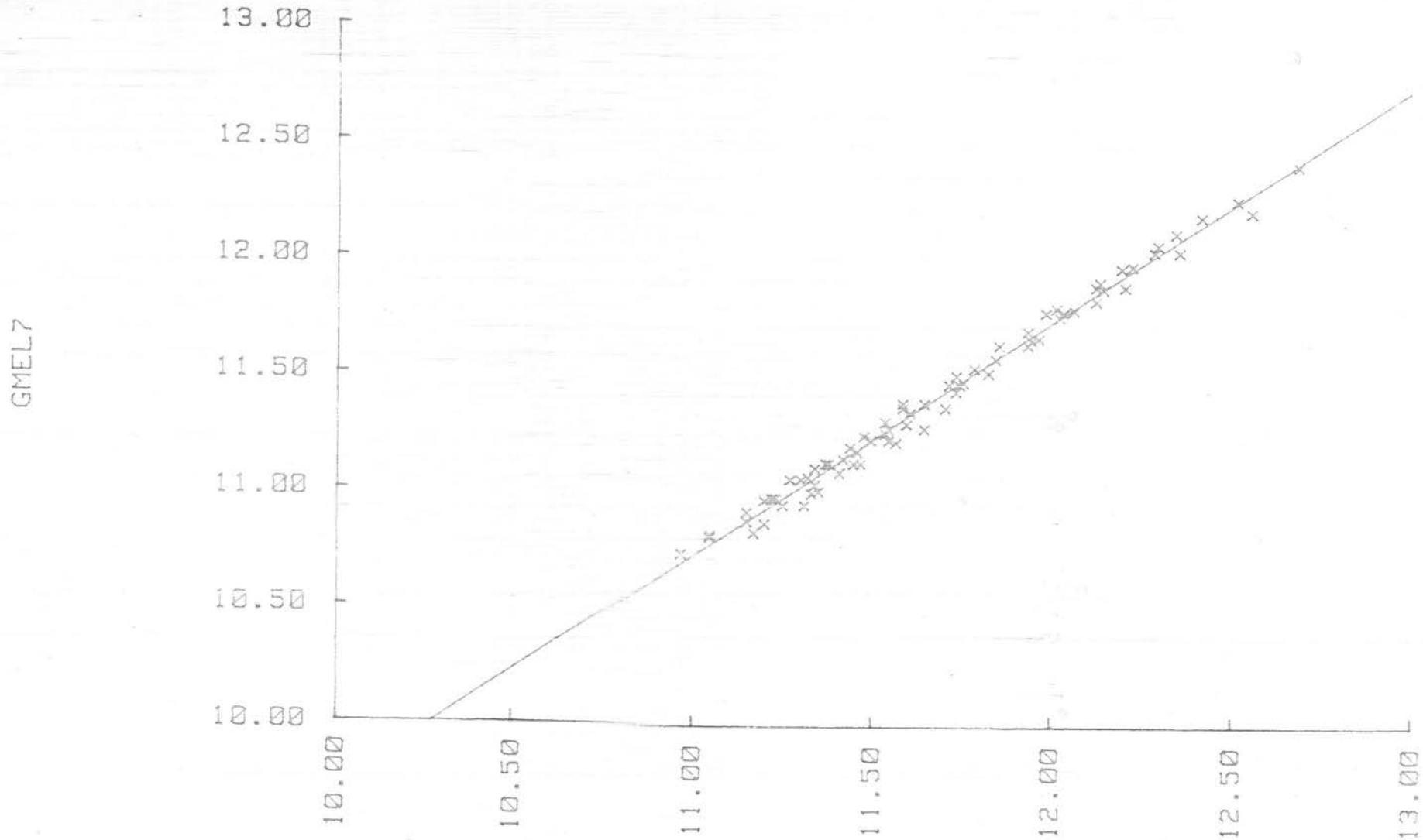


Fig. (A.7)

TEN-DAYS GAUGES MAL-MEL(1948-1975)

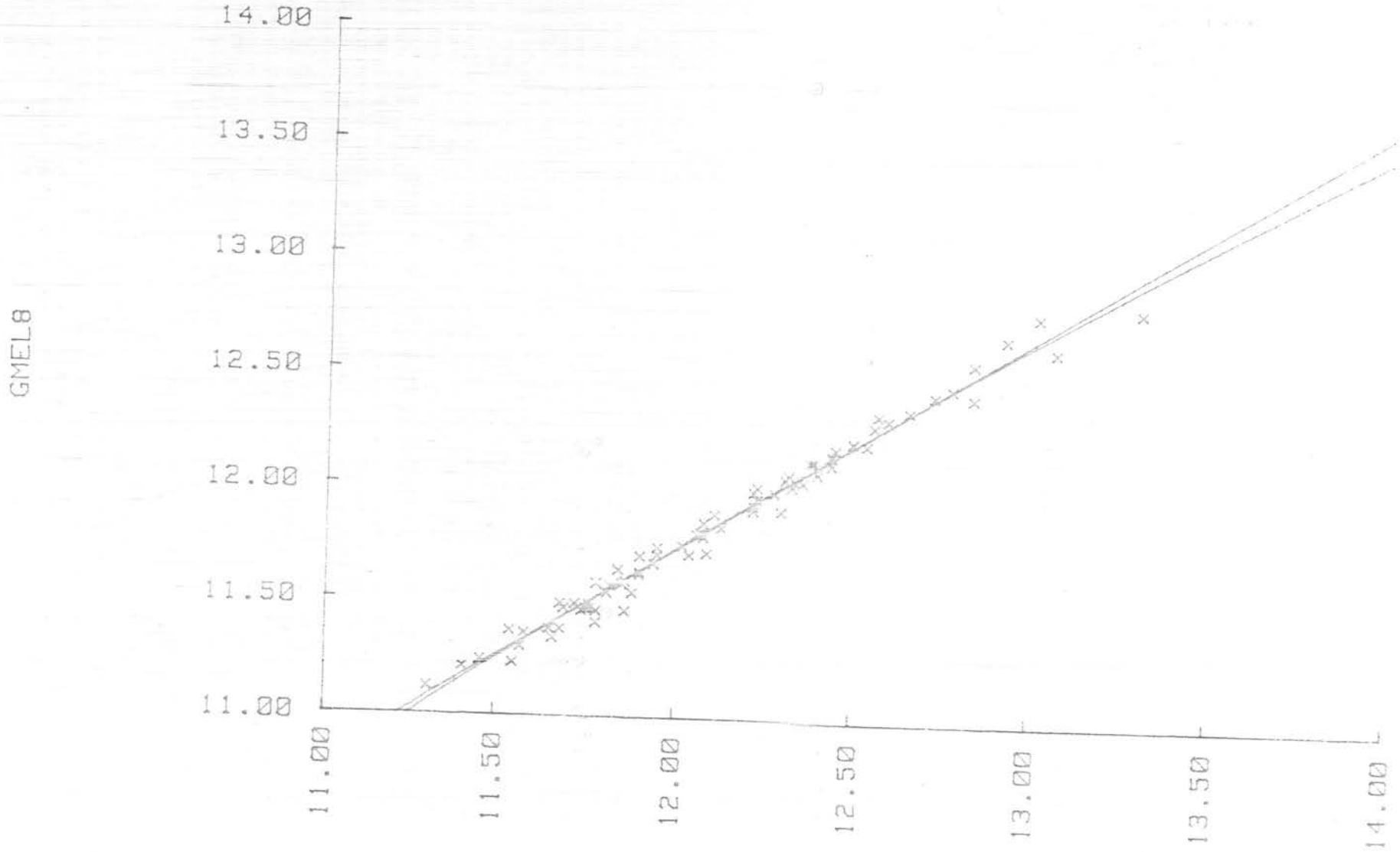


Fig. (A.8)

TEN-DAYS GAUGES MAL-MEL(1948-1975)

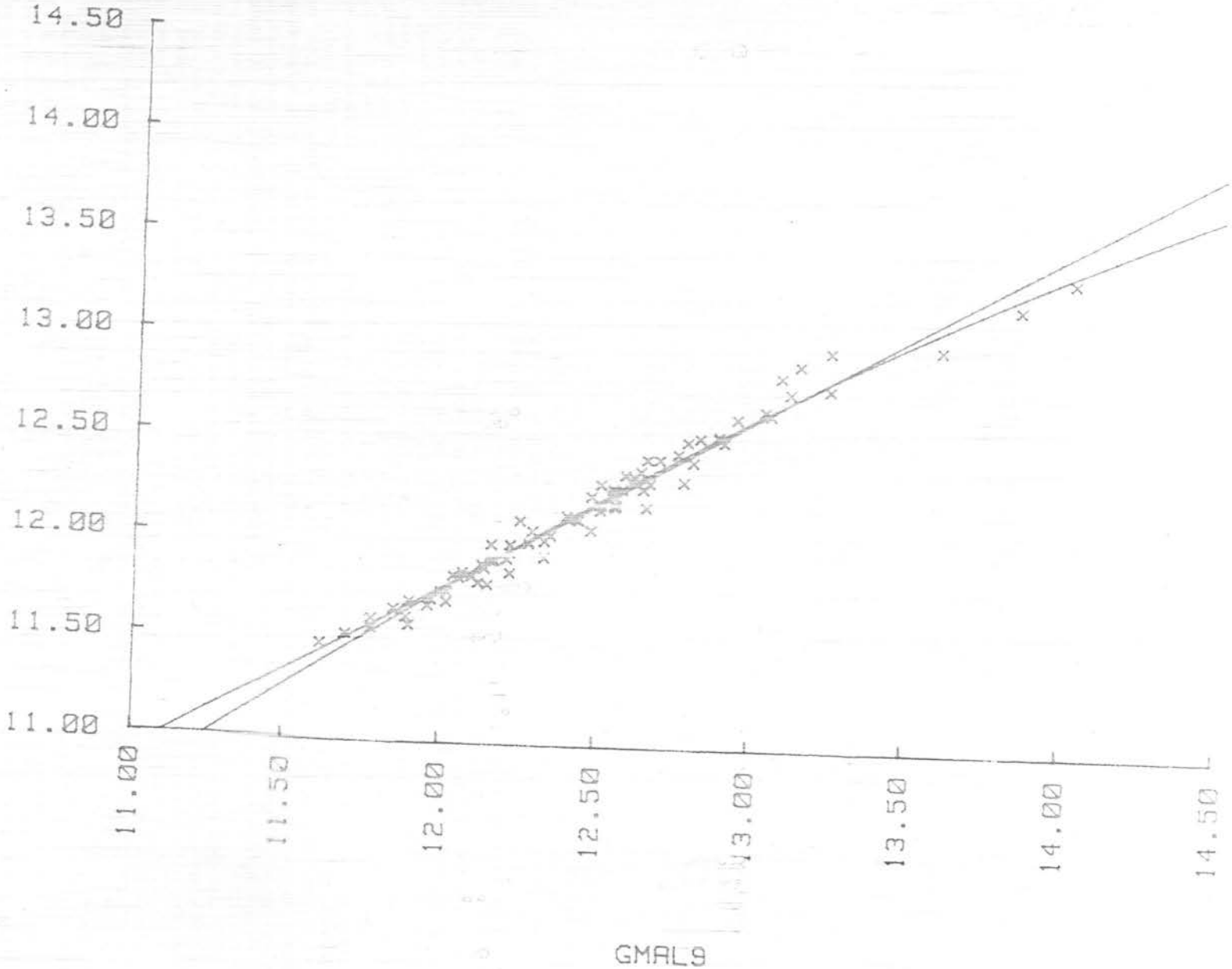
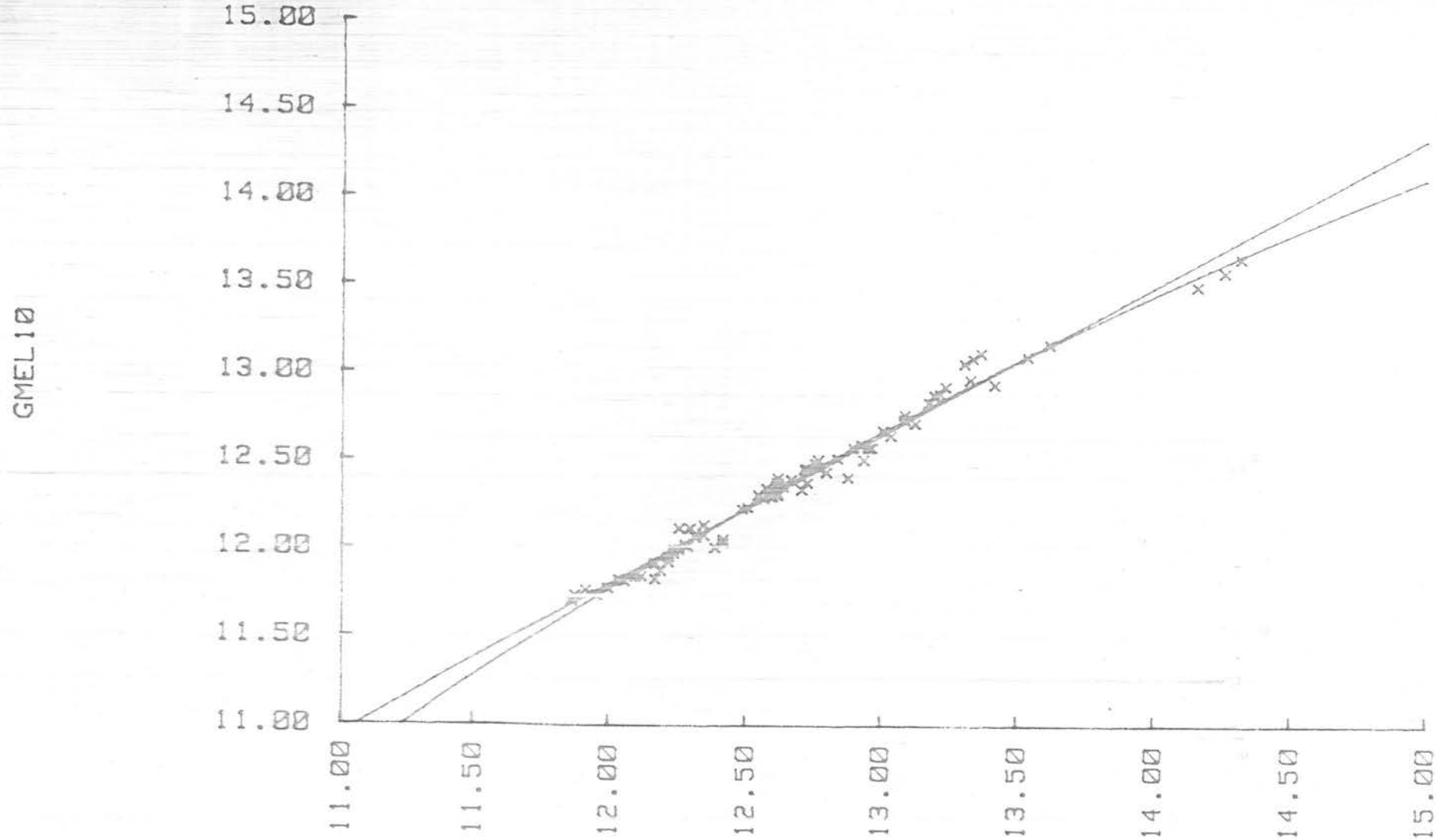


Fig.(A.9)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14.00
13.50
13.00
12.50
12.00
11.50
11.00
GMEL10
11.00
11.50
12.00
12.50
13.00
13.50
14.00
14.50
15.00
GMAL10

Fig (A.10)

TEN-DAYS GAUGES MAL-MEL(1948-1975)

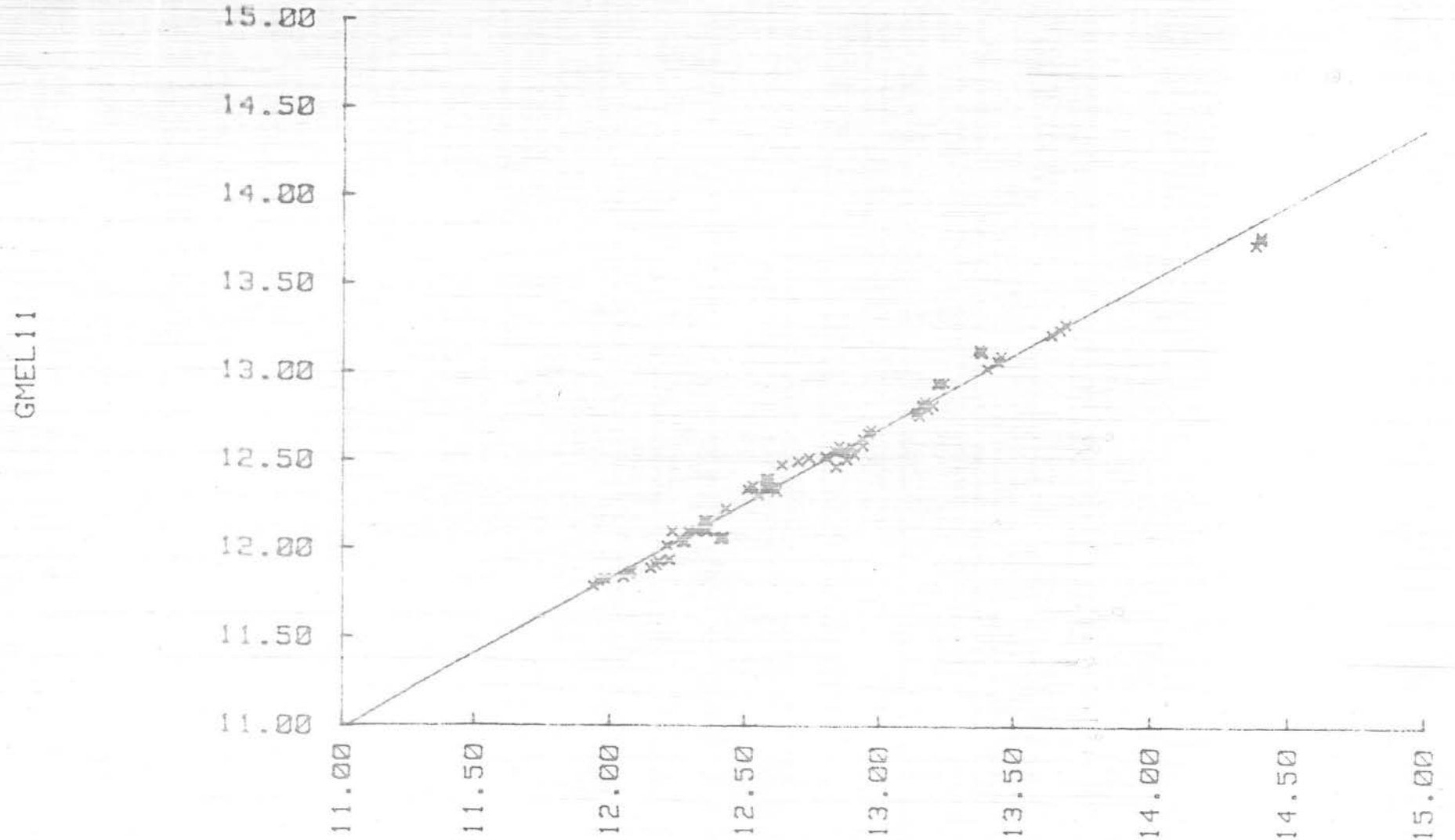
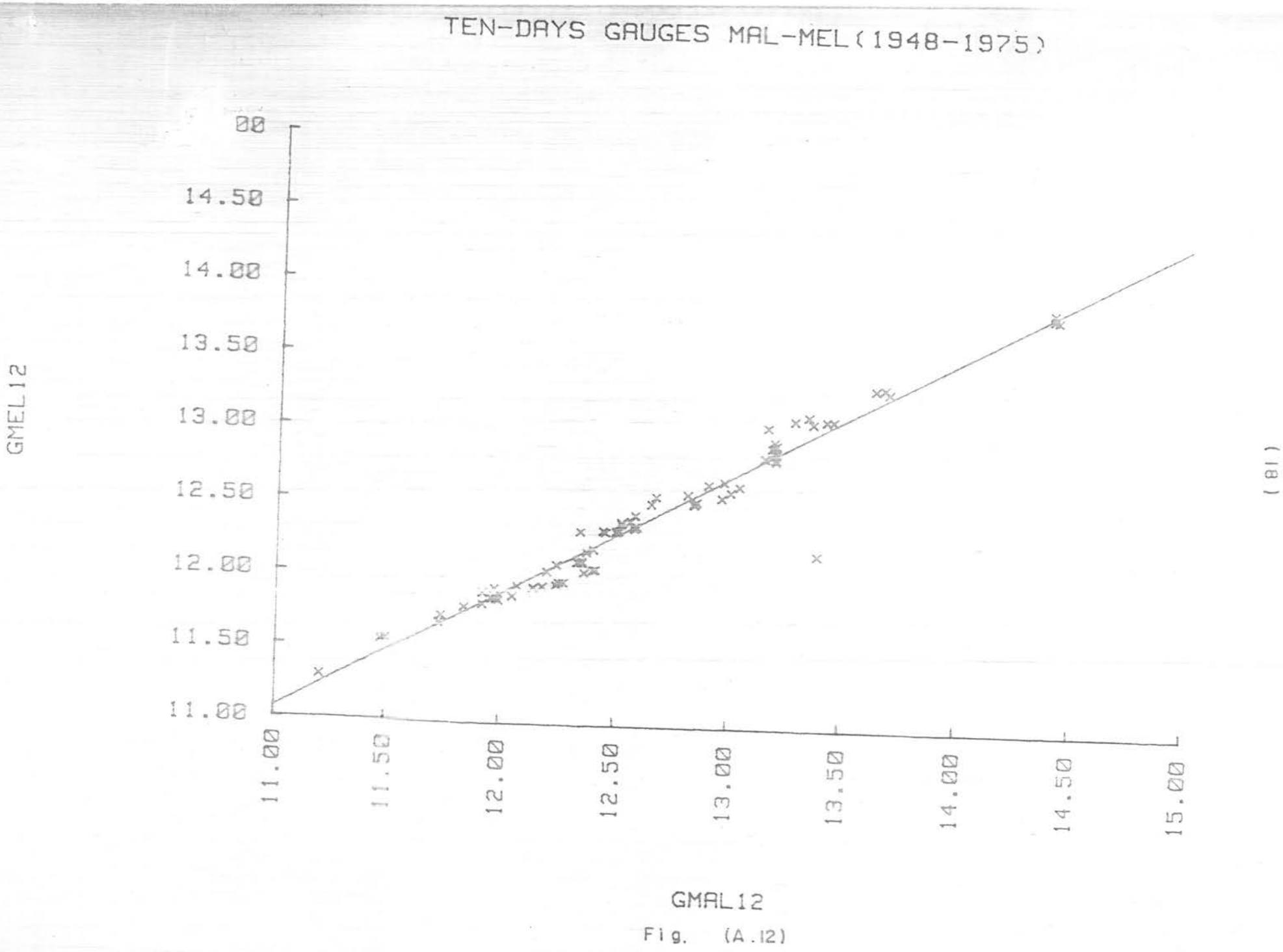


Fig (A .II)


TEN-DAYS GAUGES MAL-MEL(1948-1975)
GMEL12
00
14.50
14.00
13.50
13.00
12.50
12.00
11.50
11.00
11.00
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12.00
12.50
13.00
13.50
14.00
14.50
15.00
GMAL12

Fig. (A.12)

APPENDIX B

PRESENT OPERATING POLICY FOR THE HIGH ASWAN DAM USING DYNAMIC PROGRAM

B.1 SCENARIO I

a- EGYPTIAN DEMAND 55.5 MCM / ANNUM.

b- SUDANESE ABSTRACTION 14.8 MCM / ANNUM.

c- PRESENT INFLOW CONDITIONS.

d- OPTIMIZING ENERGY PRODUCTION WHILE SATISFYING IRRIGATION CONSTRAINTS.

OPERATING POLICY FOR HIGH DAM RESERVOIR

DERIVED FROM STEADY STATE DYNAMIC PROGRAM

FOR MONTH: JANUARY

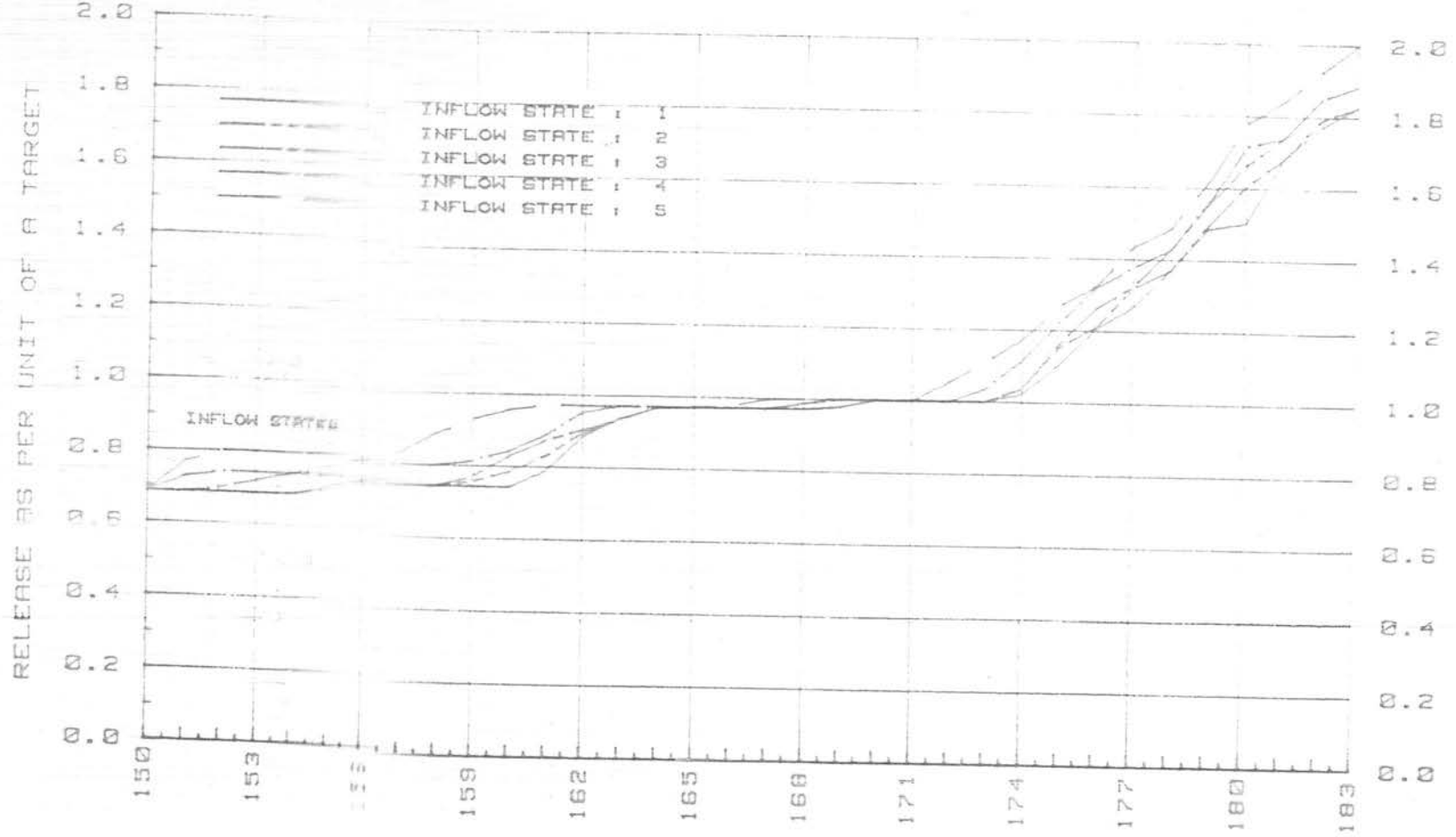
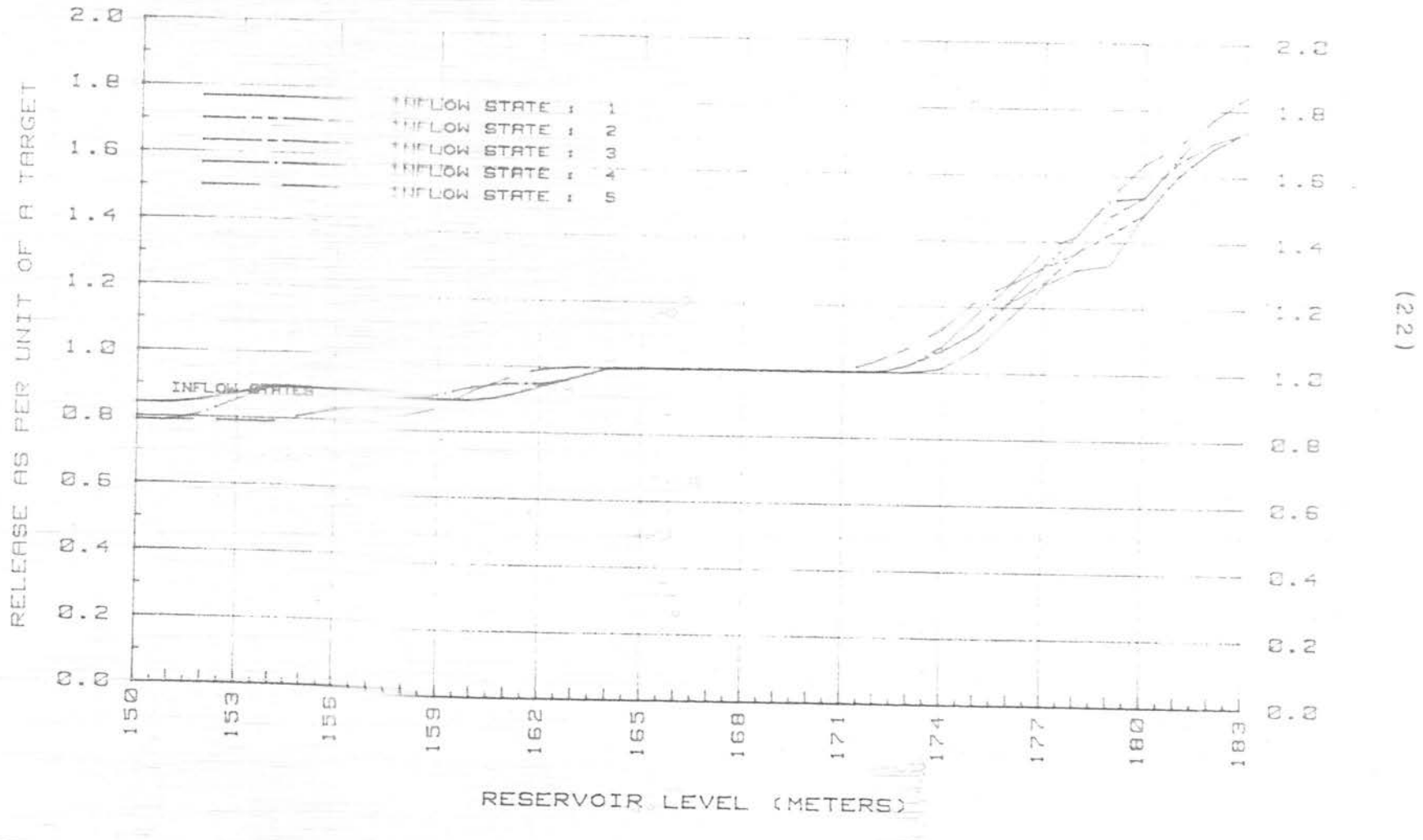


Fig.(B. 1)

OPERATING POLICY FOR HIGH DAM RESERVOIR
DERIVED FROM STEADY STATE DYNAMIC PROGRAM
FOR MONTH: FEBRUARY



(22)

Fig. (B. 2)

OPERATING POLICY FOR HIGH DAM RESERVOIR DERIVED FROM STEADY ST TE DYNAMIC PROGRAM FOR MONTH: MARCH

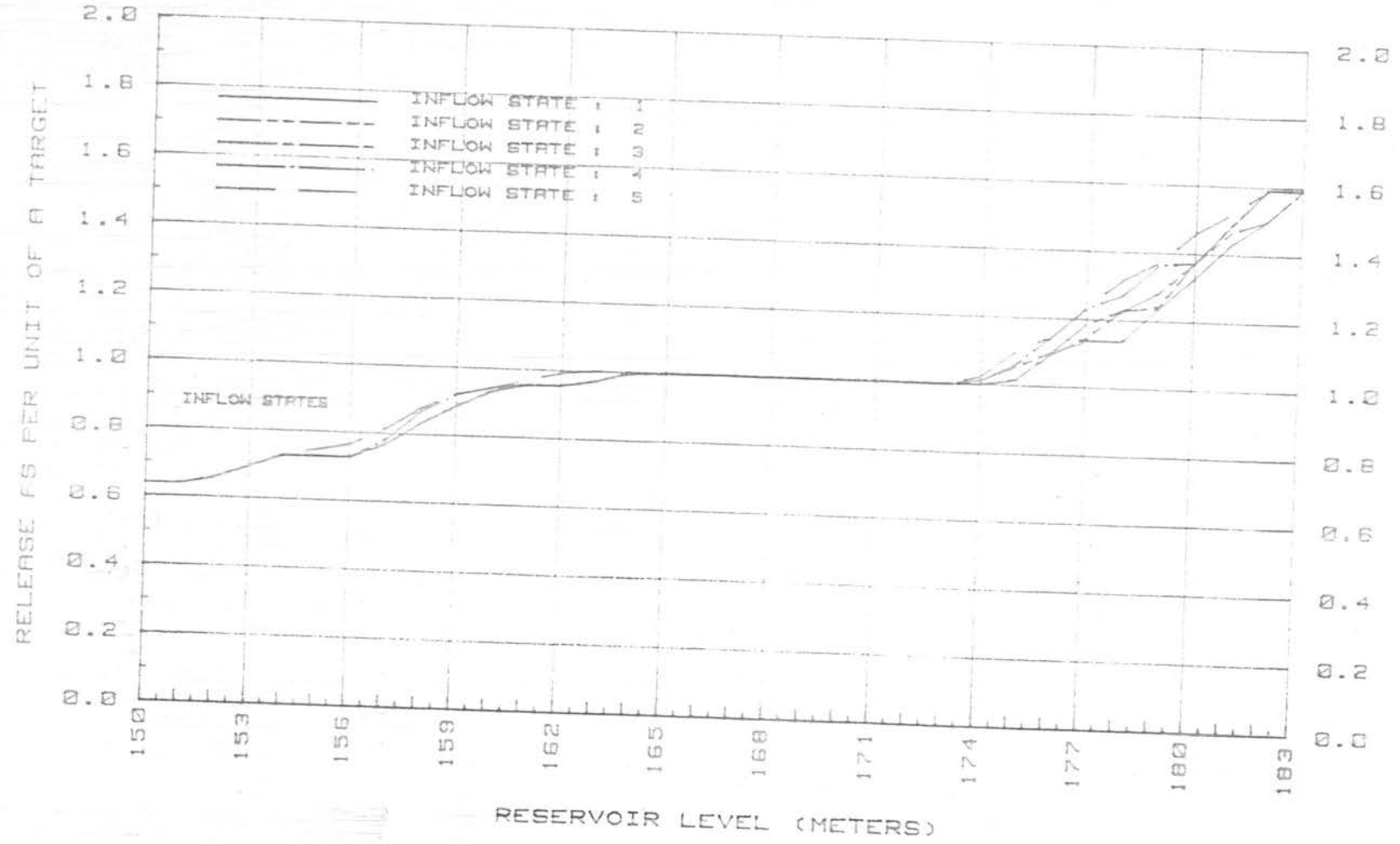


Fig. (8.3)

OPERATING POLICY FOR HIGH DAM RESERVOIR
DERIVED FROM STEADY STATE DYNAMIC PROGRAM
FOR MONTH: APRIL

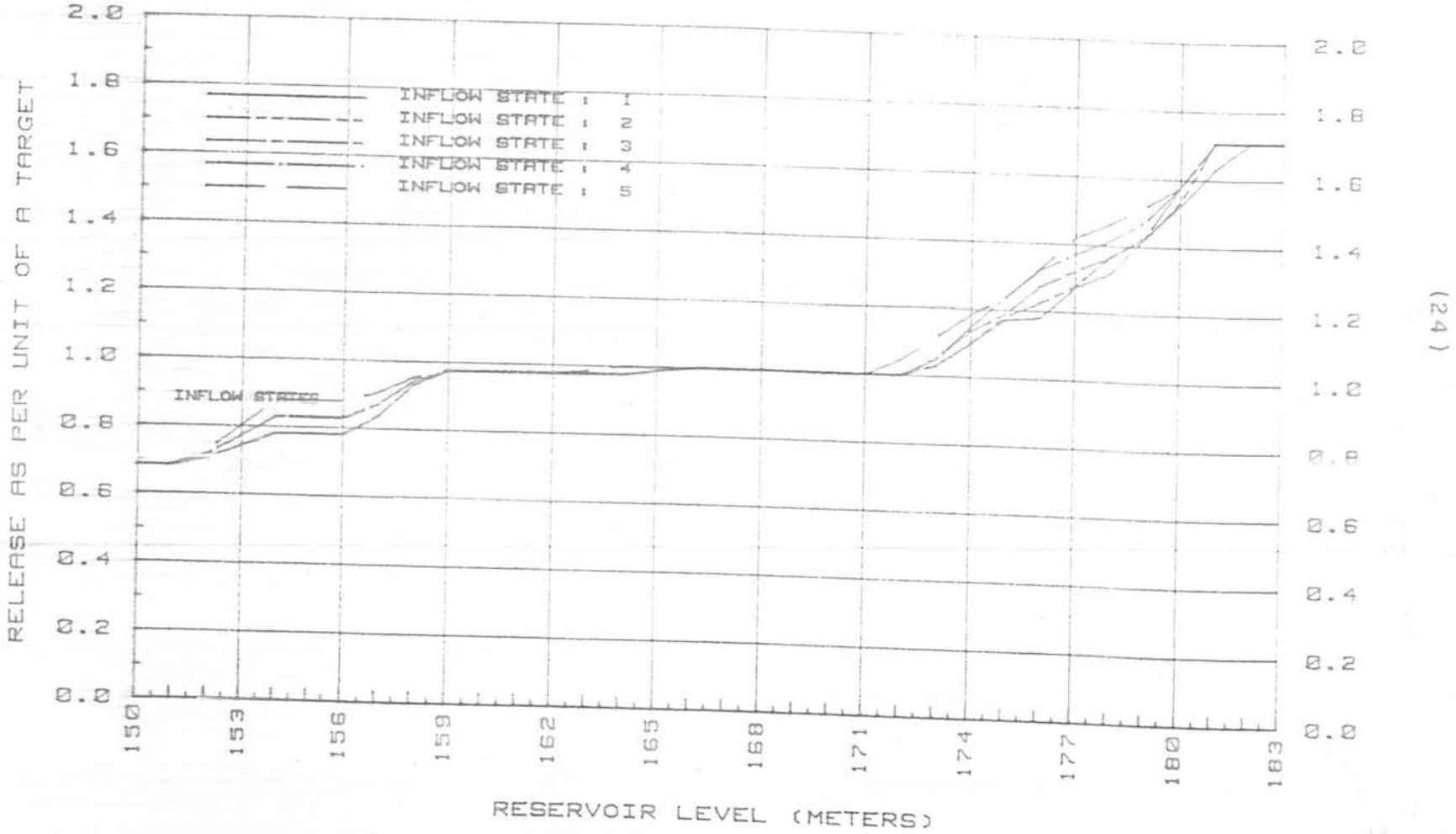


Fig. (B.4)

OPERATING POLICY FOR HIGH DAM RESERVOIR
DERIVED FROM STEADY STATE DYNAMIC PROGRAM
FOR MONTH: MAY

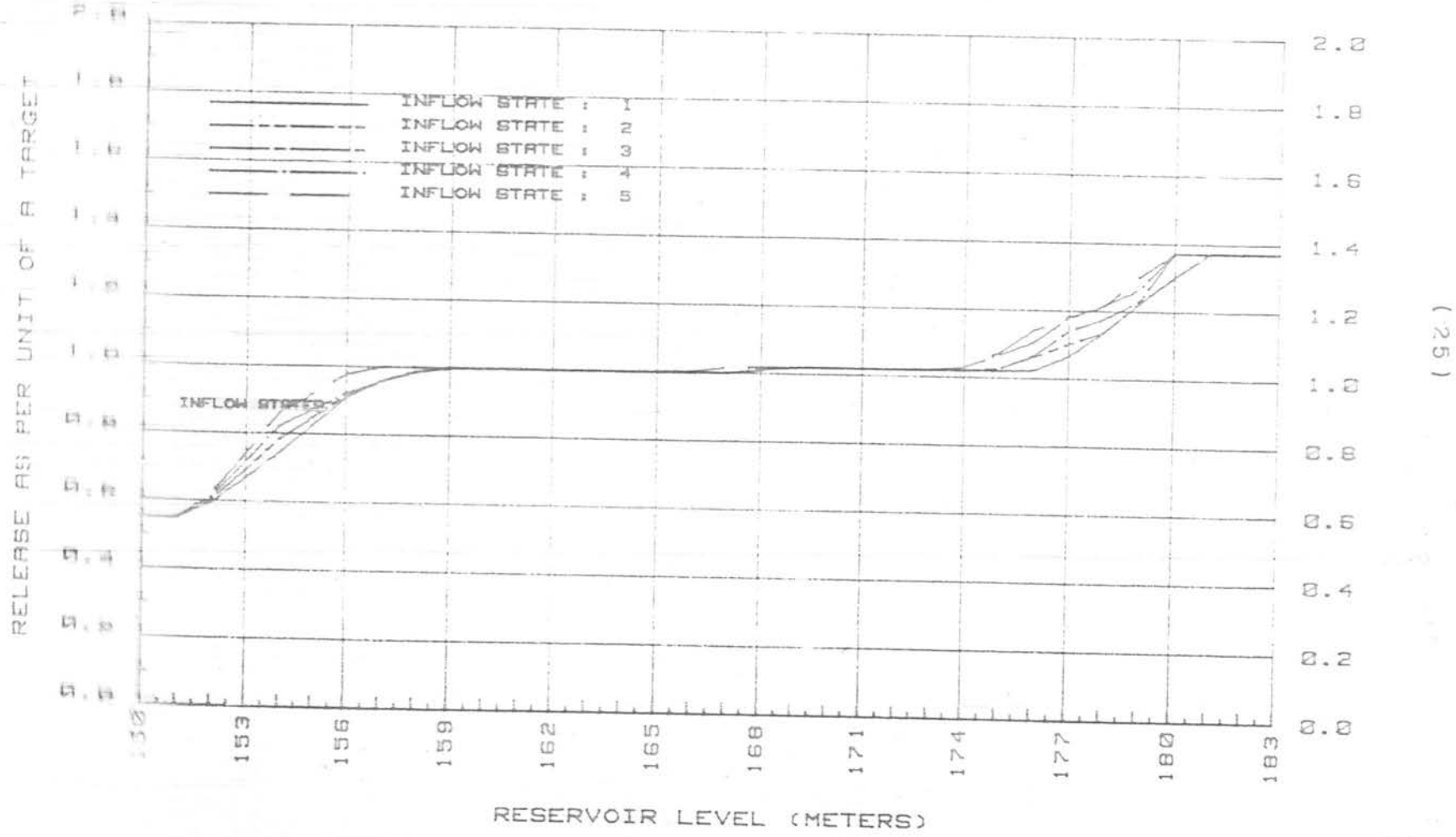


Fig. (B. 5)

OPERATING POLICY FOR HIGH DAM RESERVOIR

DERIVED FROM STEADY STATE DYNAMIC PROGRAM

FOR MONTH: JUNE

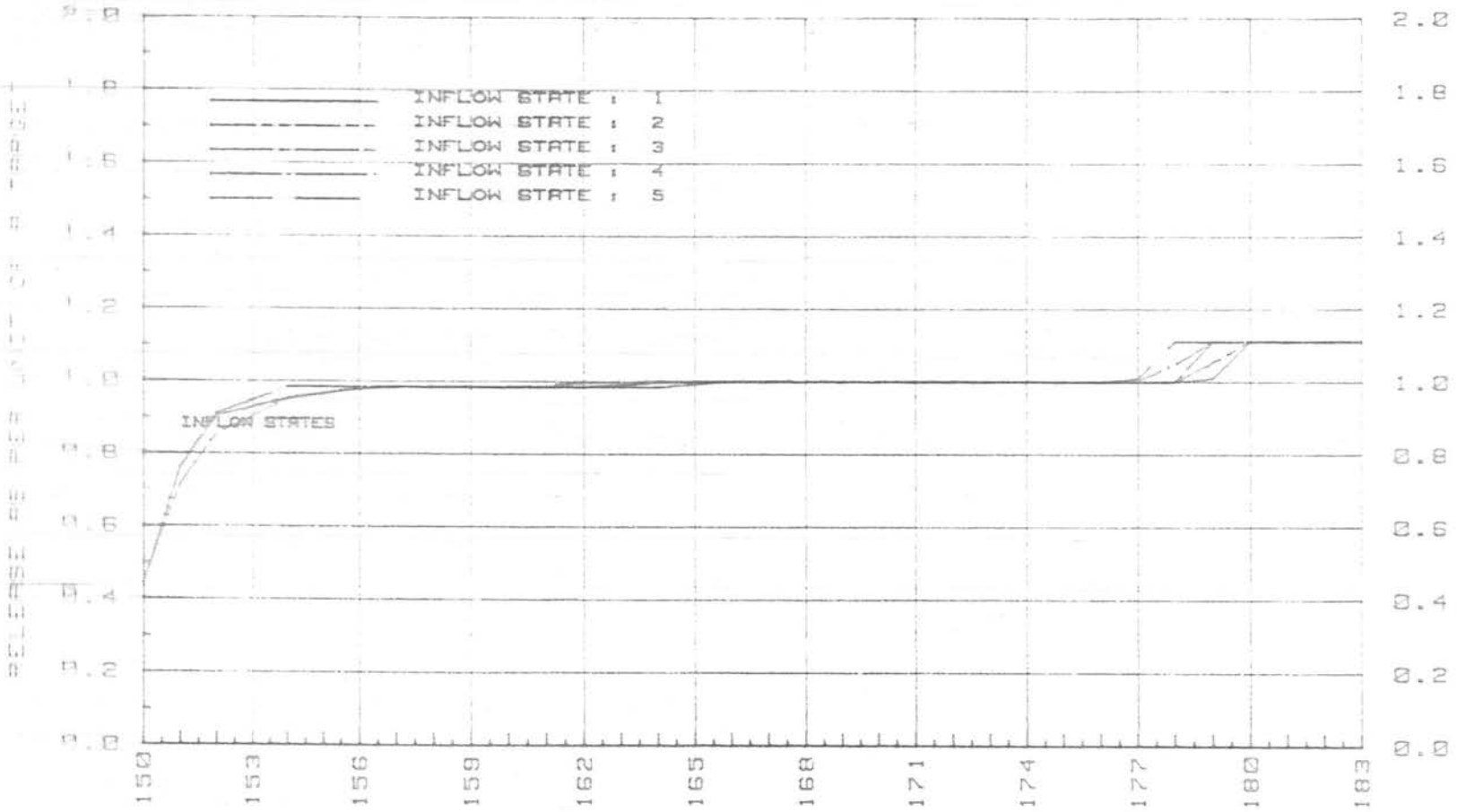


Fig. (B .6)

OPERATING POLICY FOR HIGH DAM RESERVOIR DERIVED FROM STEADY STATE DYNAMIC PROGRAM FOR MONTH: JULY

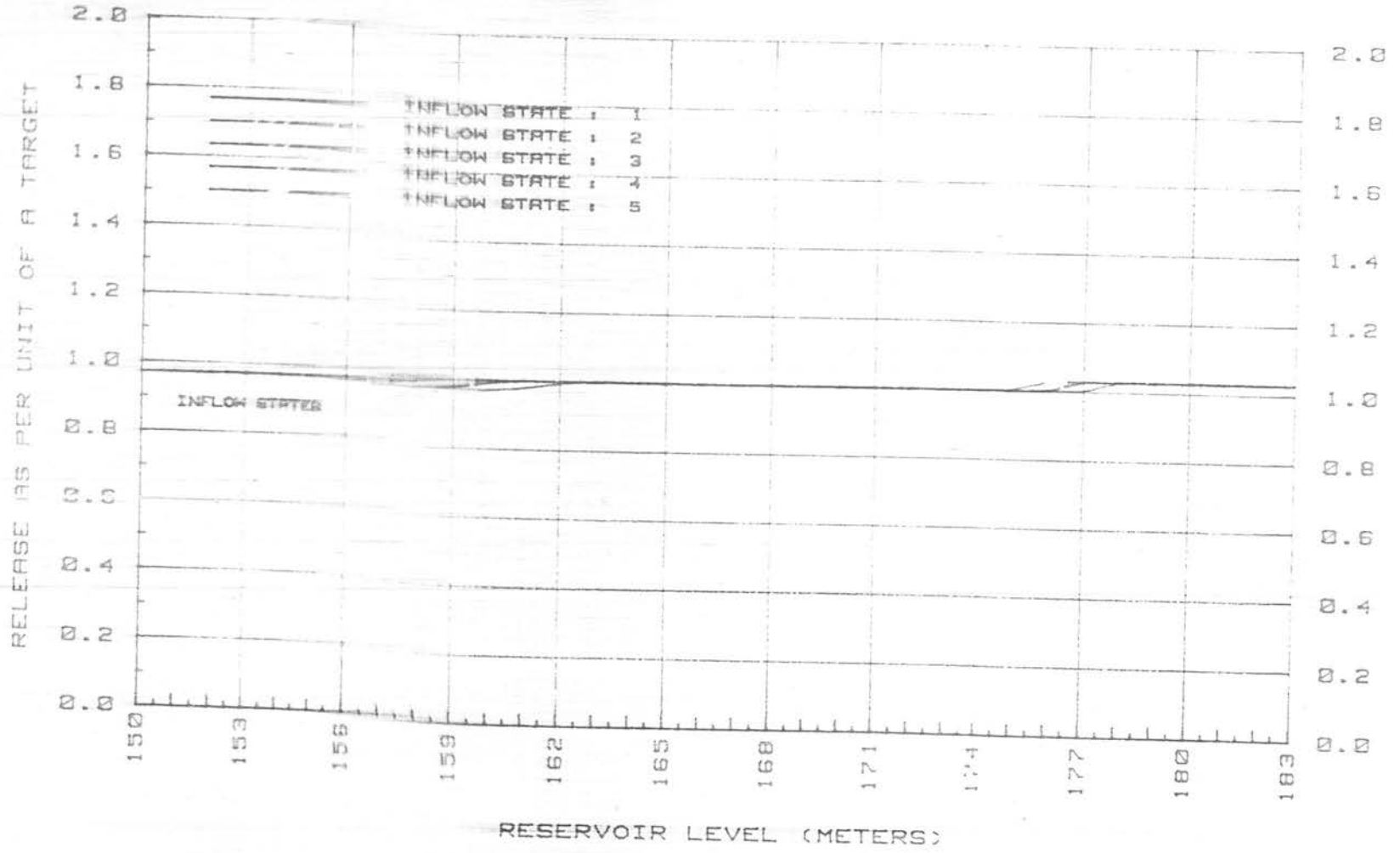


Fig. (B.7)

OPERATING POLICY FOR HIGH DAM RESERVOIR
DERIVED FROM STEADY STATE DYNAMIC PROGRAM
FOR MONTH : AUGUST

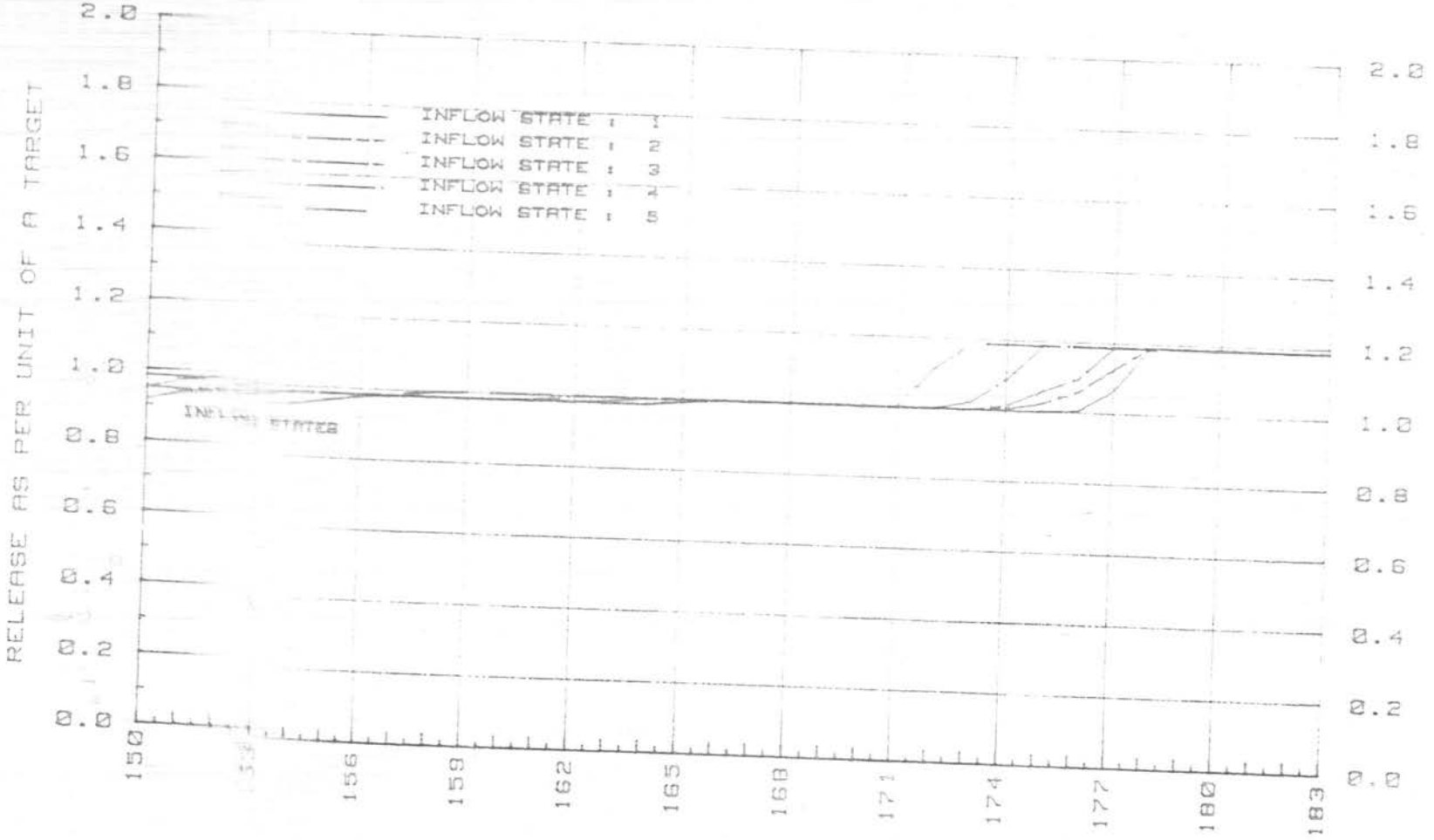


Fig. (B .8)

OPERATING POLICY FOR HIGH DAM RESERVOIR

DERIVED FROM STEADY STATE DYNAMIC PROGRAM

FOR MONTH: SEPTEMB

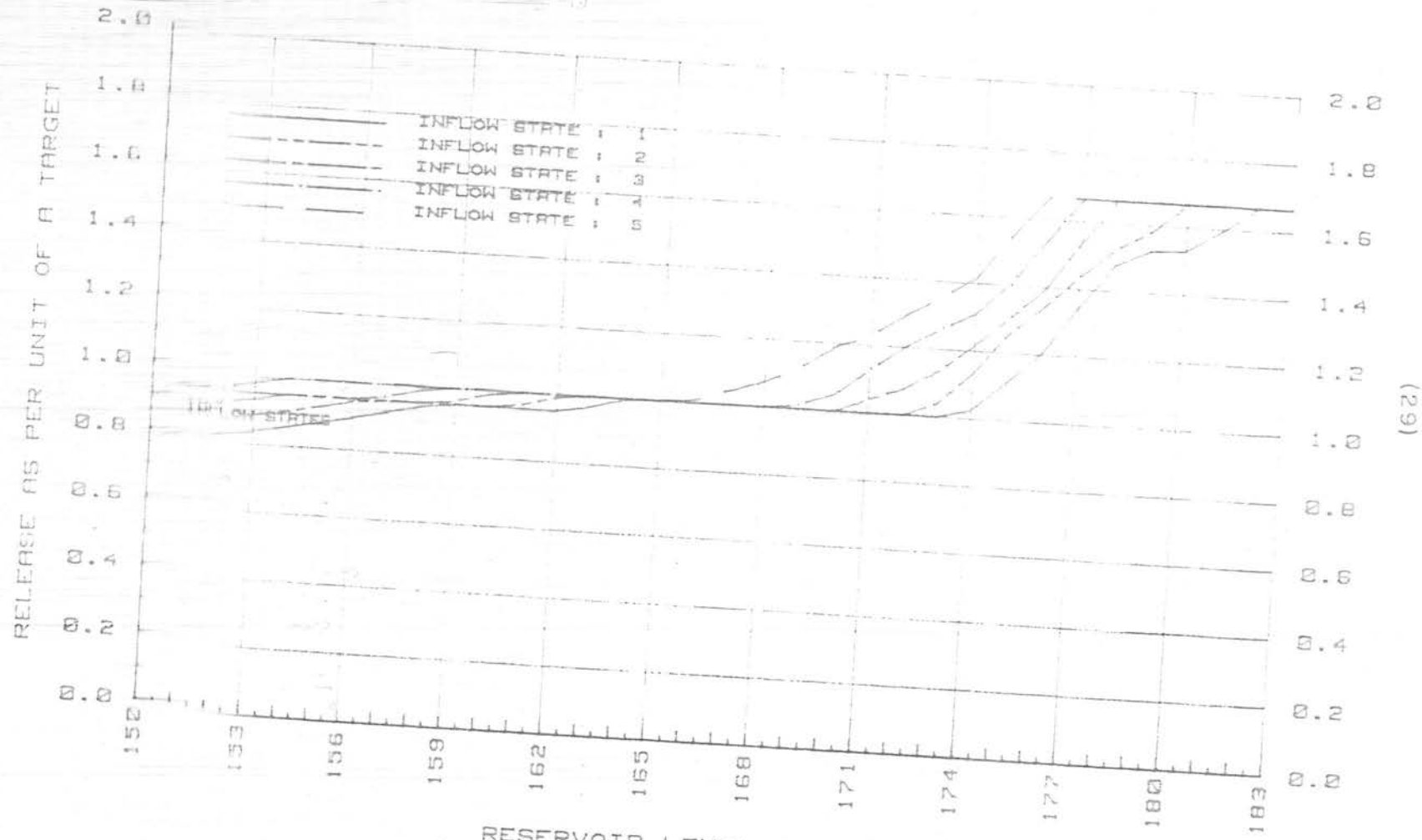


Fig. (B.9)

OPERATING POLICY FOR HIGH DAM RESERVOIR
DERIVED FROM STEADY STATE DYNAMIC PROGRAM
FOR MONTH: OCTOBER

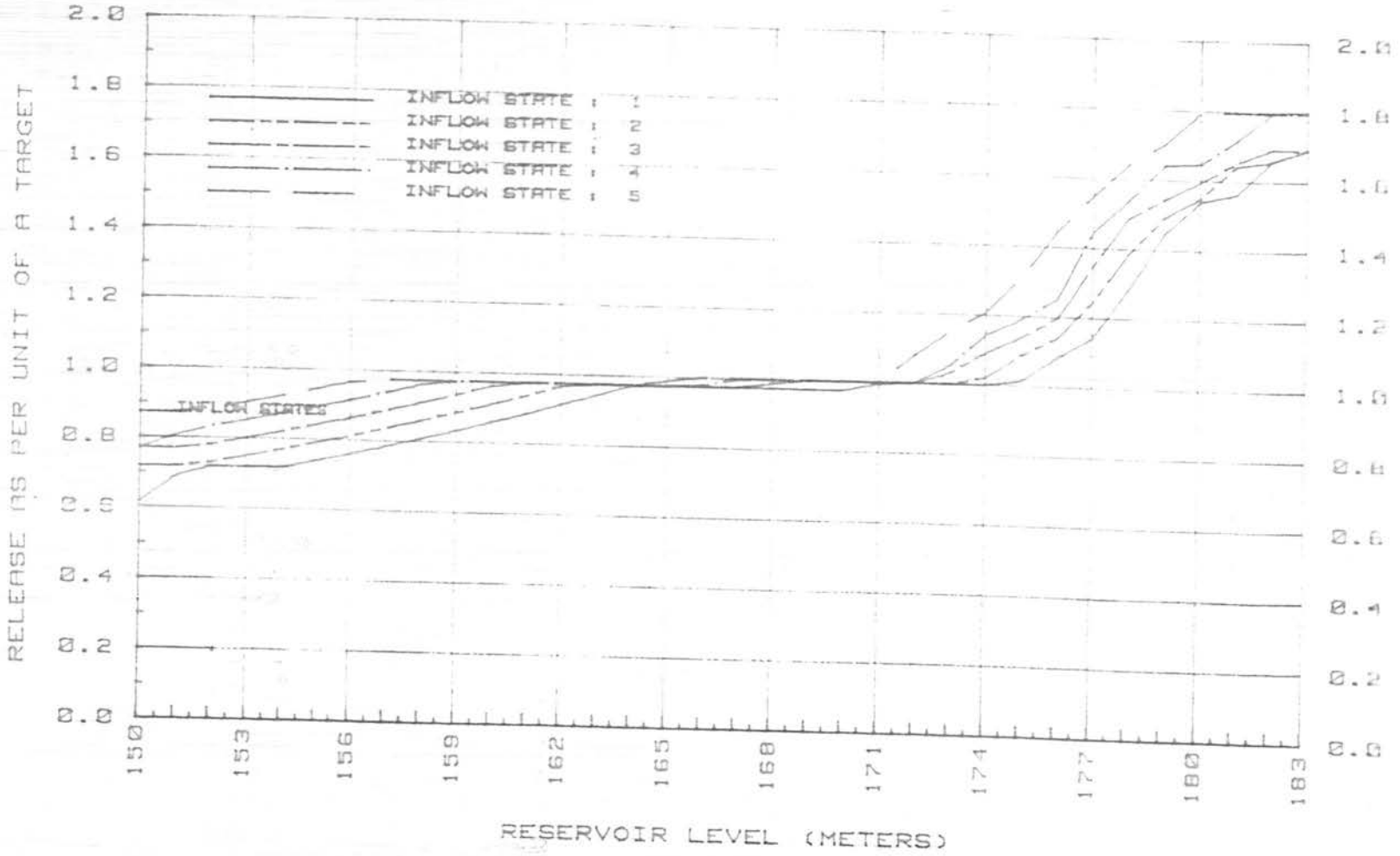


Fig (B.10)

OPERATING POLICY FOR HIGH DAM RESERVOIR

DERIVED FROM STEADY STATE DYNAMIC PROGRAM

FOR MONTH: NOVEMBER

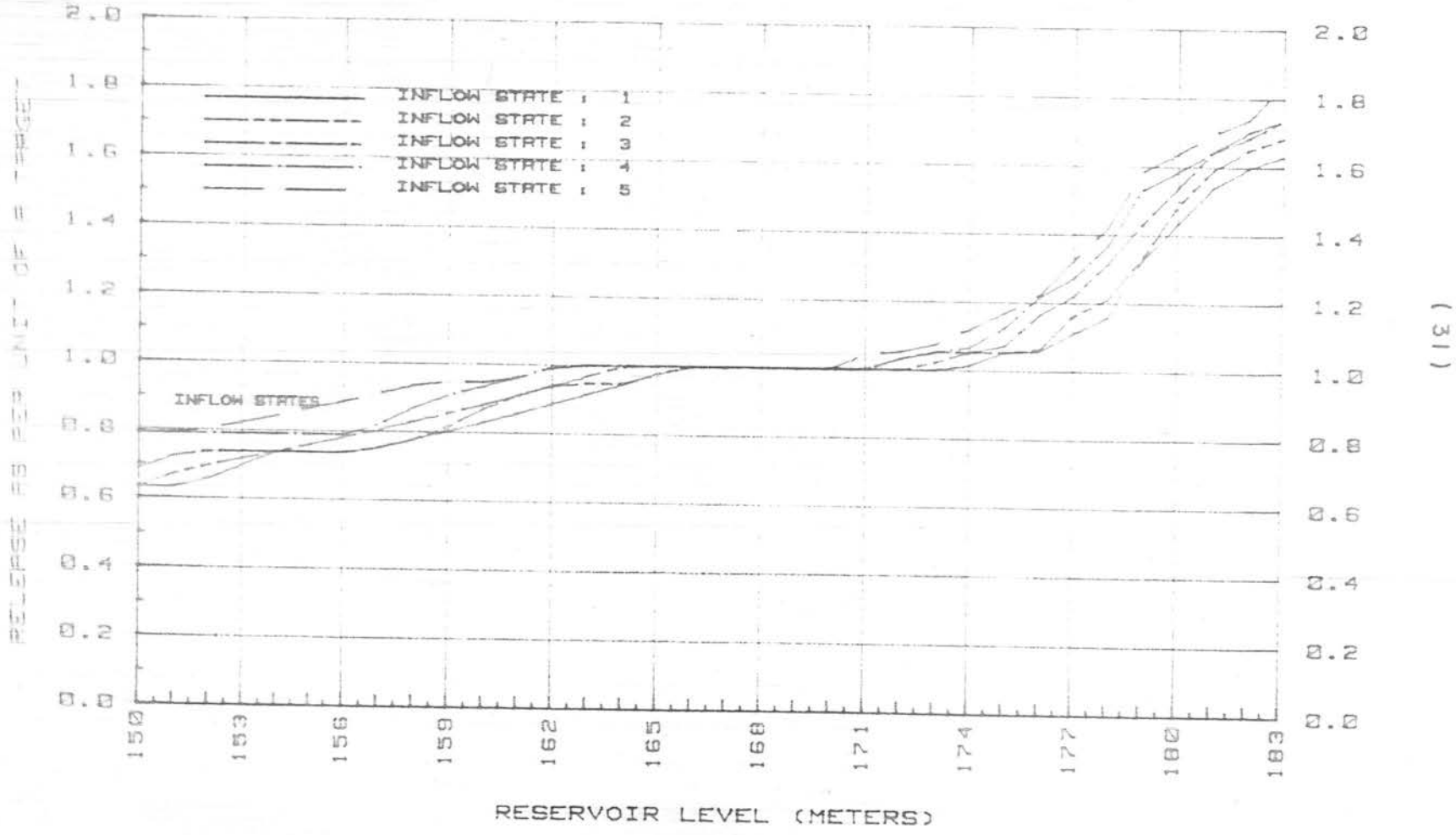


Fig. (B .11)

OPERATING POLICY FOR HIGH DAM RESERVOIR

DERIVED FROM STEADY STATE DYNAMIC PROGRAM

FOR MONTH: DECEMBER

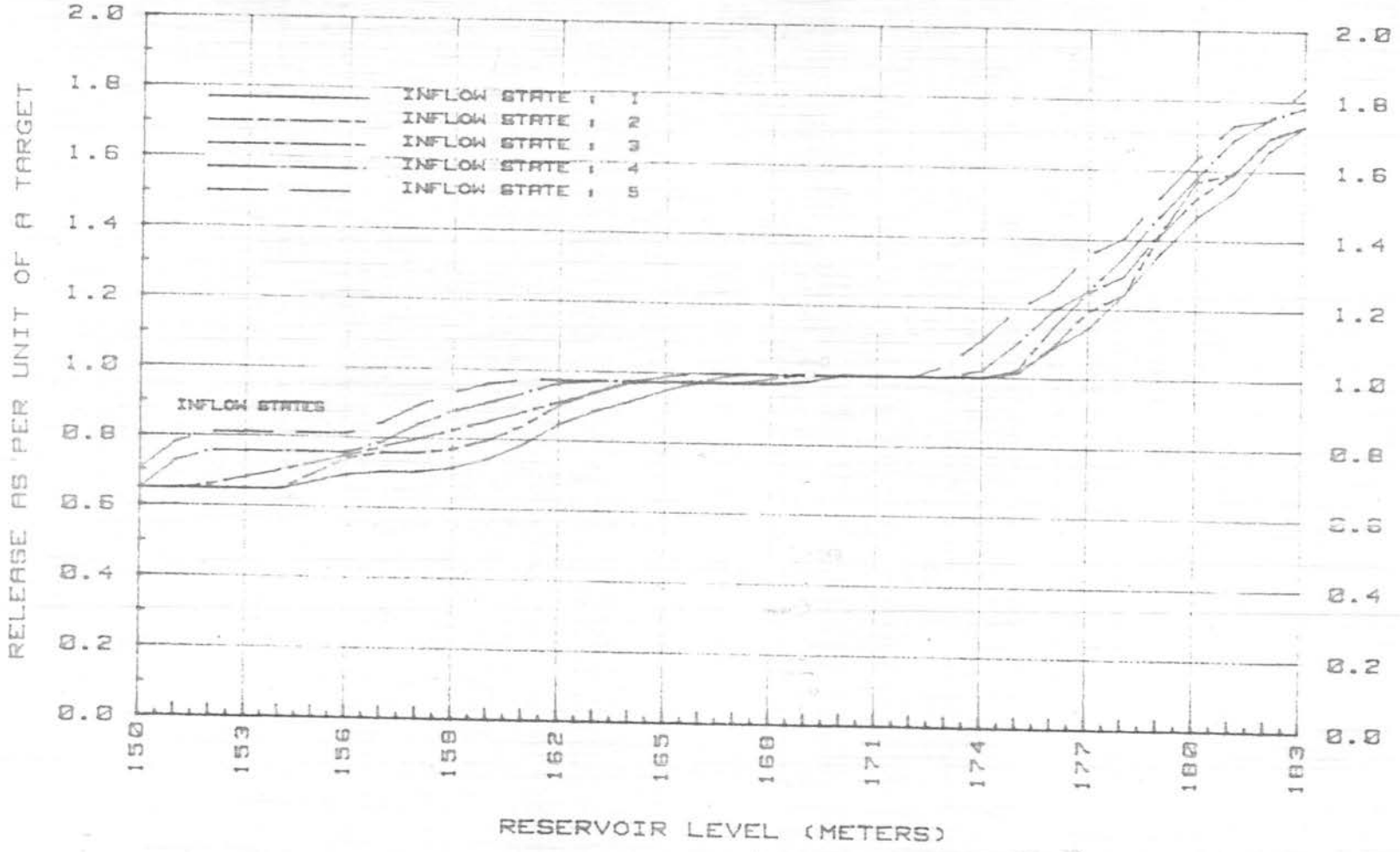


Fig. (B .12)

B.2 SCENARIO I

a- EGYPTIAN DEMAND 55.0 MCM / ANNUM.

b- SUDANESE ABSTRACTION 14.8 MCM / ANNUM.

c- PRESENT INFLOW CONDITION.

d- SATISFYING IRRIGATION CONSTRAINTS, WHILE ENERGY PRODUCTION IS A BYPRODUCT.

OPERATING POLICY FOR HIGH DAM RESERVOIR
DERIVED FROM STEADY STATE DYNAMIC PROGRAM
FOR MONTH: JANUARY

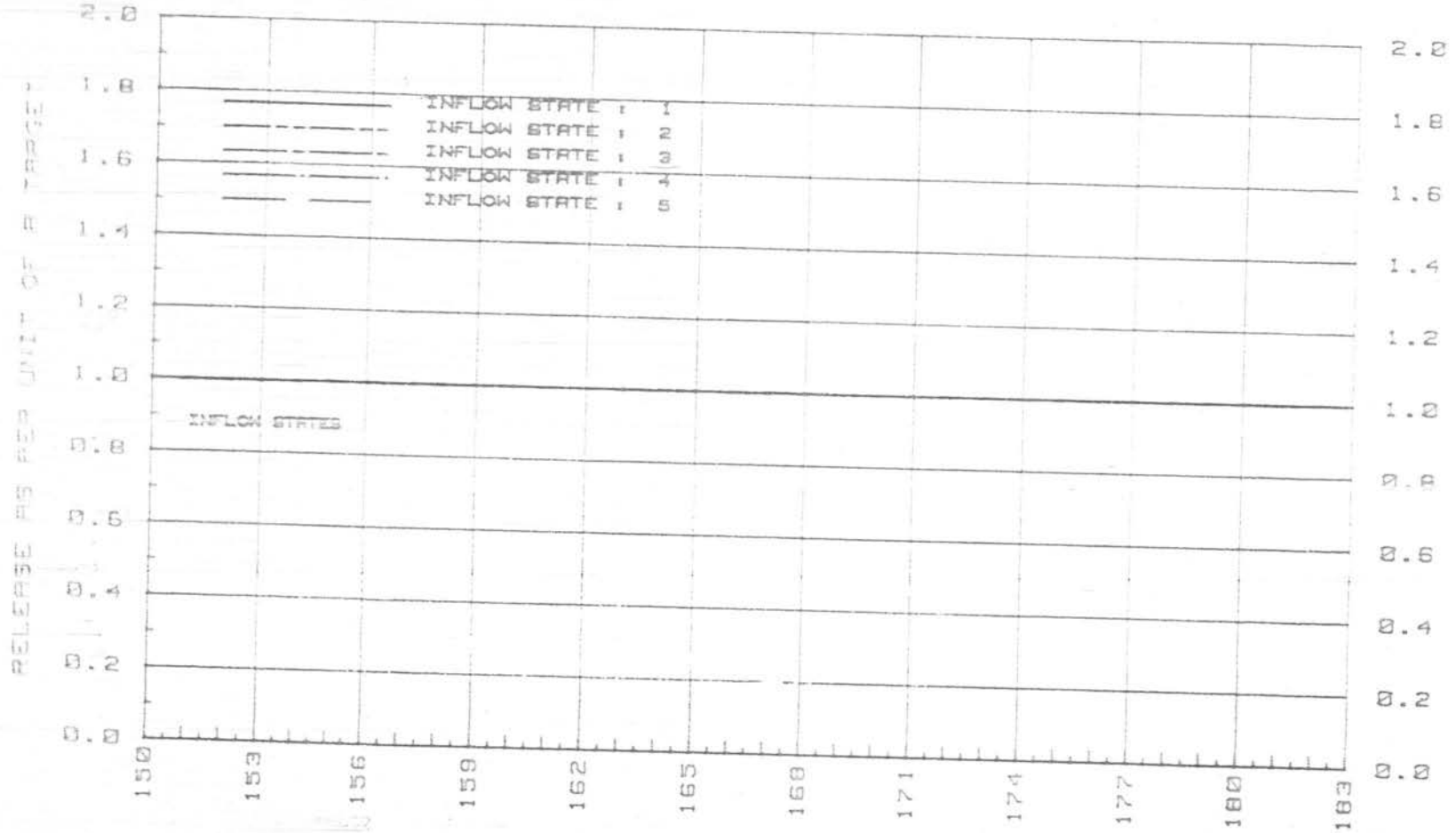


Fig. (B.13)

OPERATING POLICY FOR HIGH DAM RESERVOIR

DERIVED F M STEADY STATE DYNAMIC PROGRAM

FOR MONTH: FEBRUARY

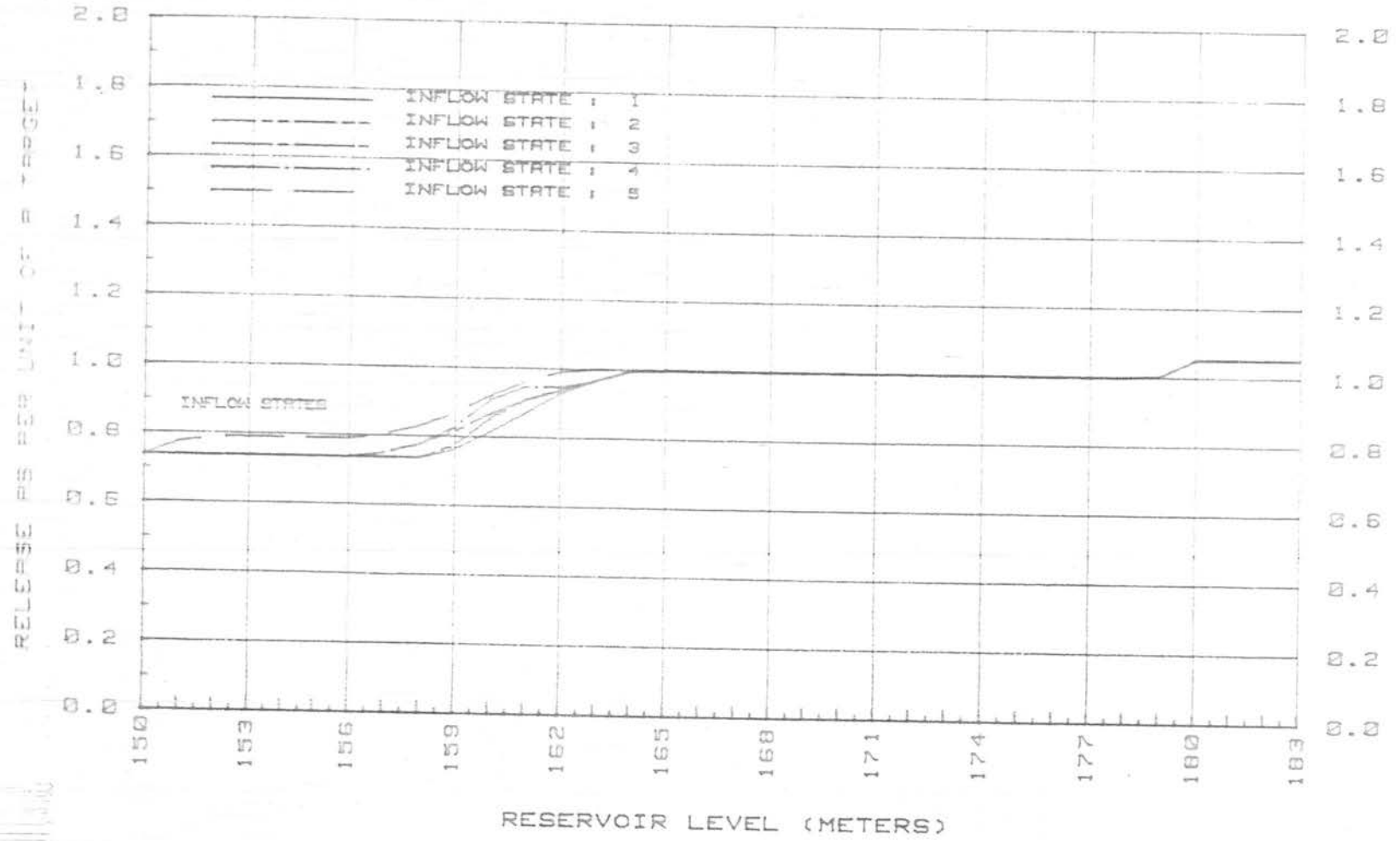


Fig. (B .14)

OPERATING POLICY FOR HIGH DPM RESERVOIR
DERIVED FROM STEADY STATE DYNAMIC PROGRAM
FOR MONTH: MARCH

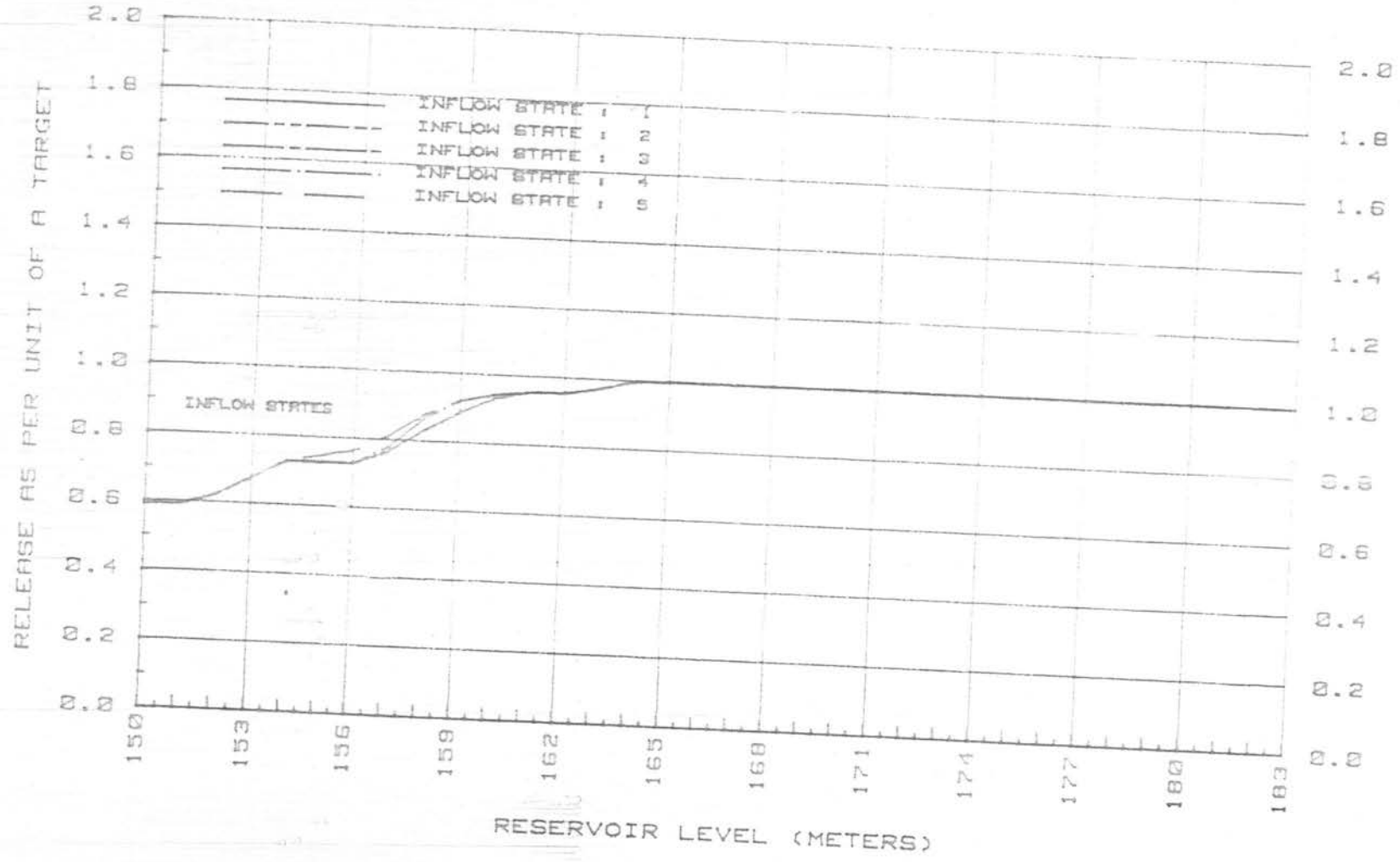


Fig. (B .15)

OPERATING POLICY FOR HIGH DAM RESERVOIR
DERIVED FROM STEADY STATE DYNAMIC PROGRAM
FOR MONTH: APRIL

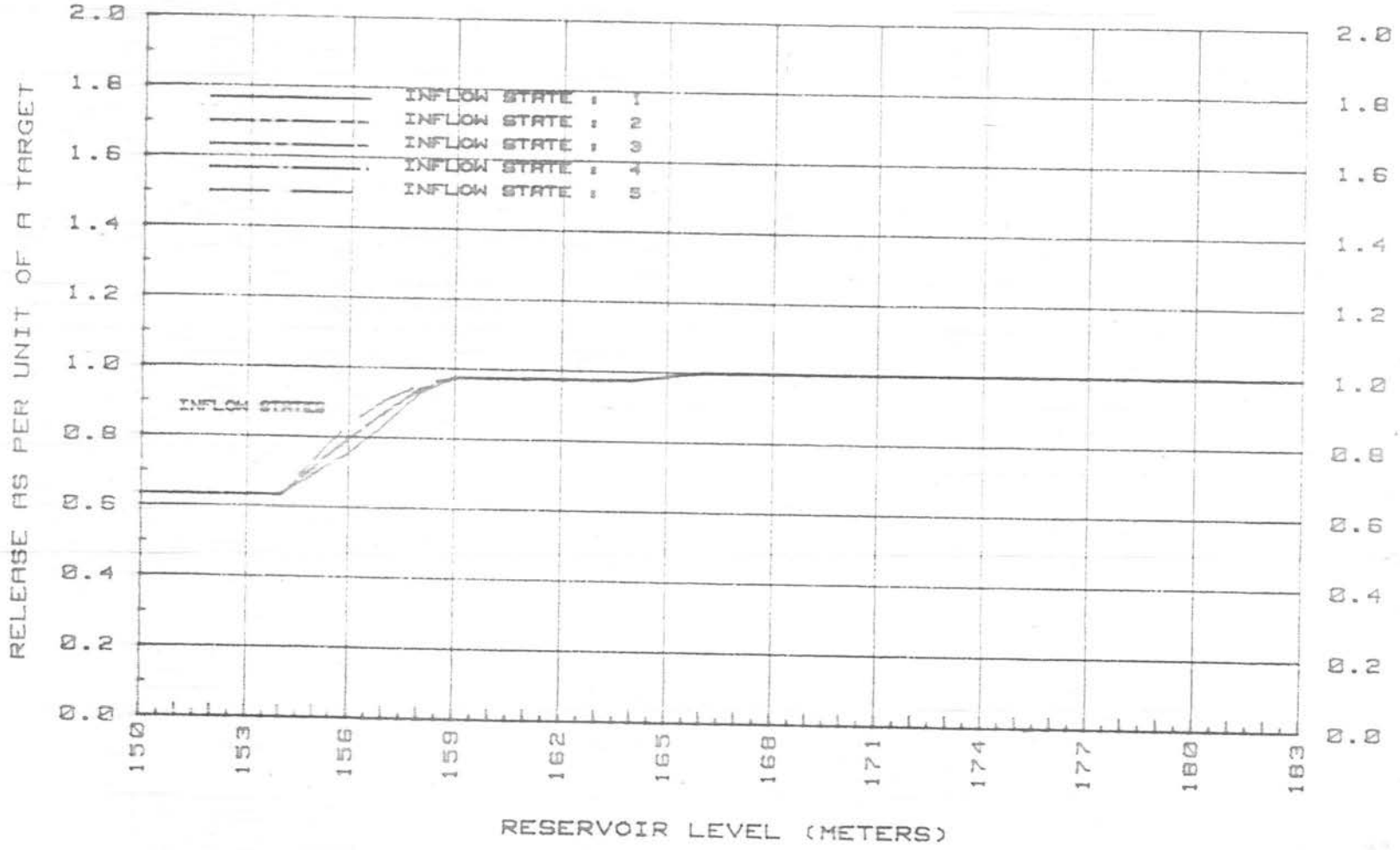


Fig. (B .16)

OPERATING POLICY FOR HIGH DAM RESERVOIR
DERIVED FROM STEADY STATE [illegible] AMIC PROGRAM
FOR MONTH: MAY

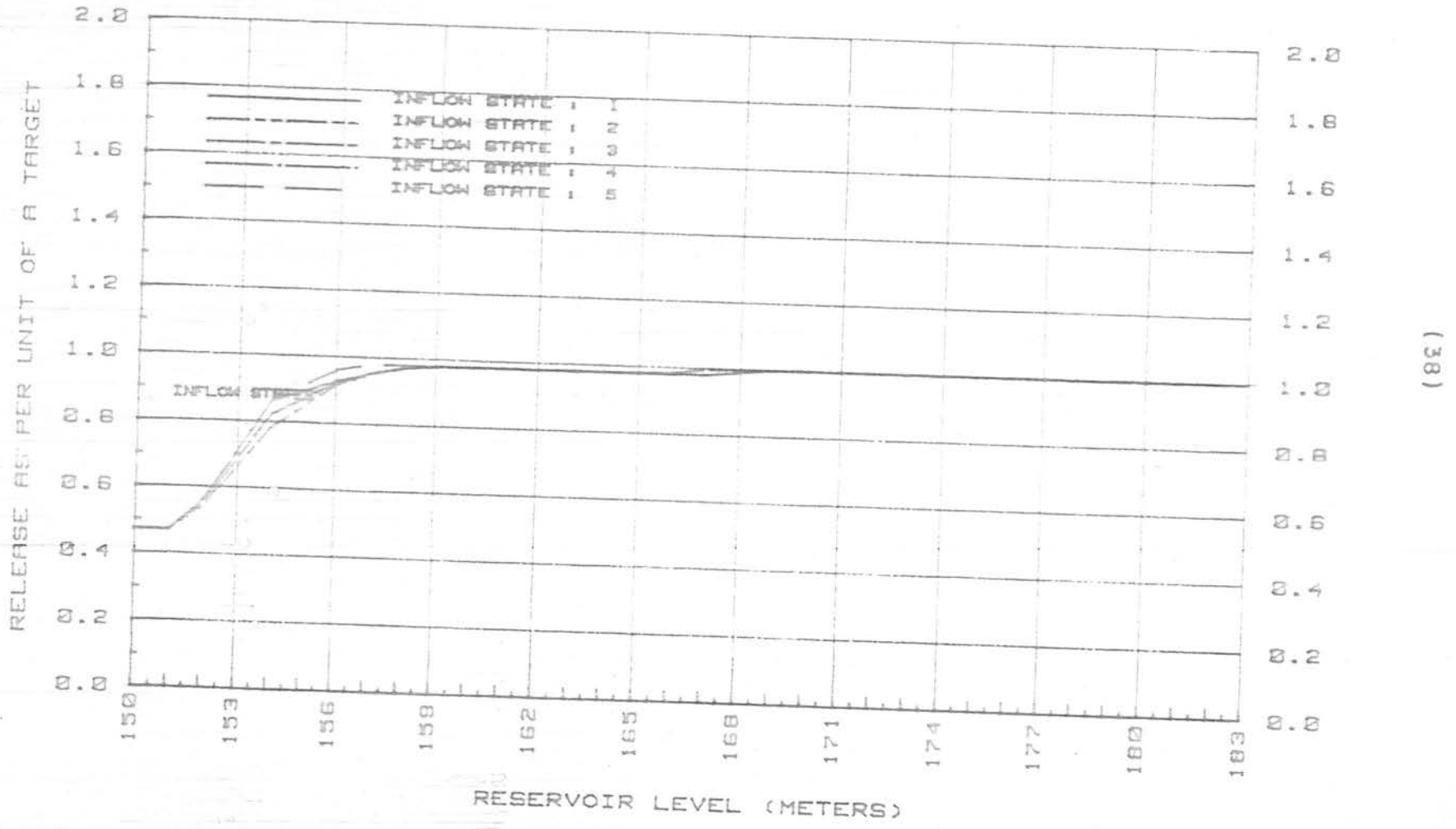


Fig (B .17)

OPERATING POLICY FOR HIGH DAM RESERVOIR

DERIVED FROM STEADY STATE DYNAMIC PROGRAM

FOR MONTH: JUNE

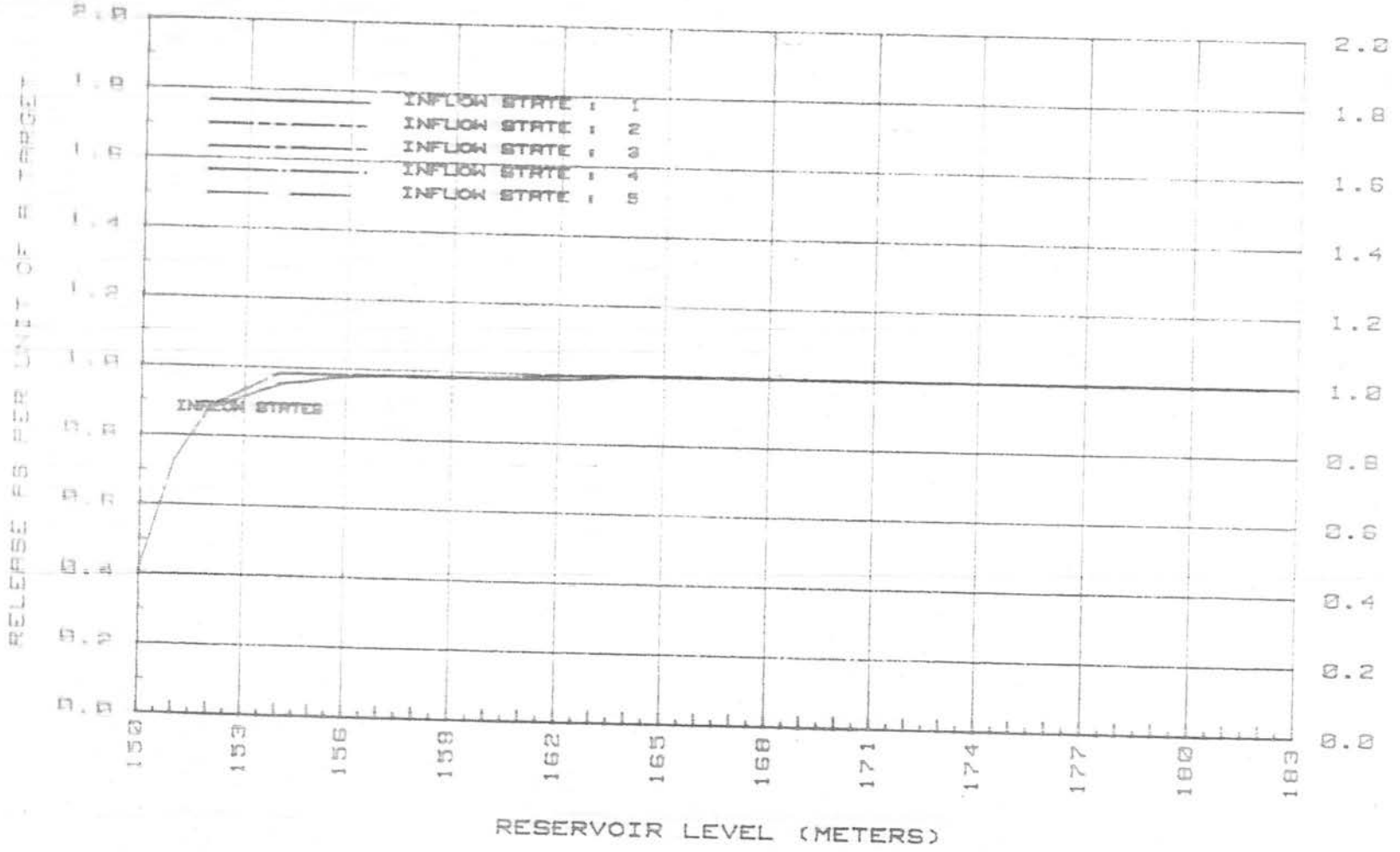


Fig. (B.18)

OPERATING POLICY FOR HIGH DAM RESERVOIR
DERIVED FROM STEADY STATE DYNAMIC PROGRAM
FOR MONTH: JULY

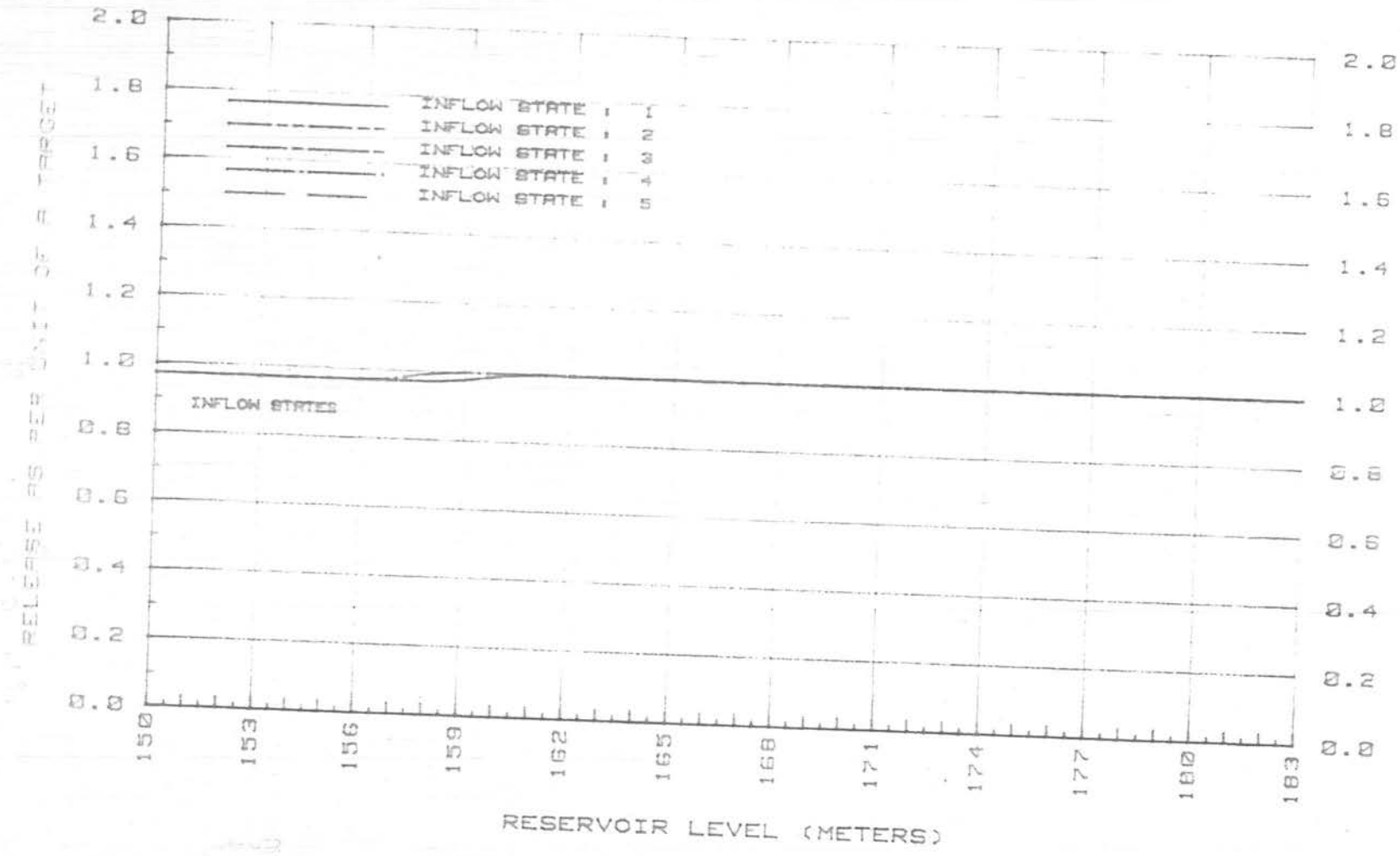


Fig. (B .19)

OPERATING POLICY FOR HIGH DAM RESERVOIR
DERIVED FROM STEADY STATE DYNAMIC PROGRAM
FOR MONTH: AUGUST

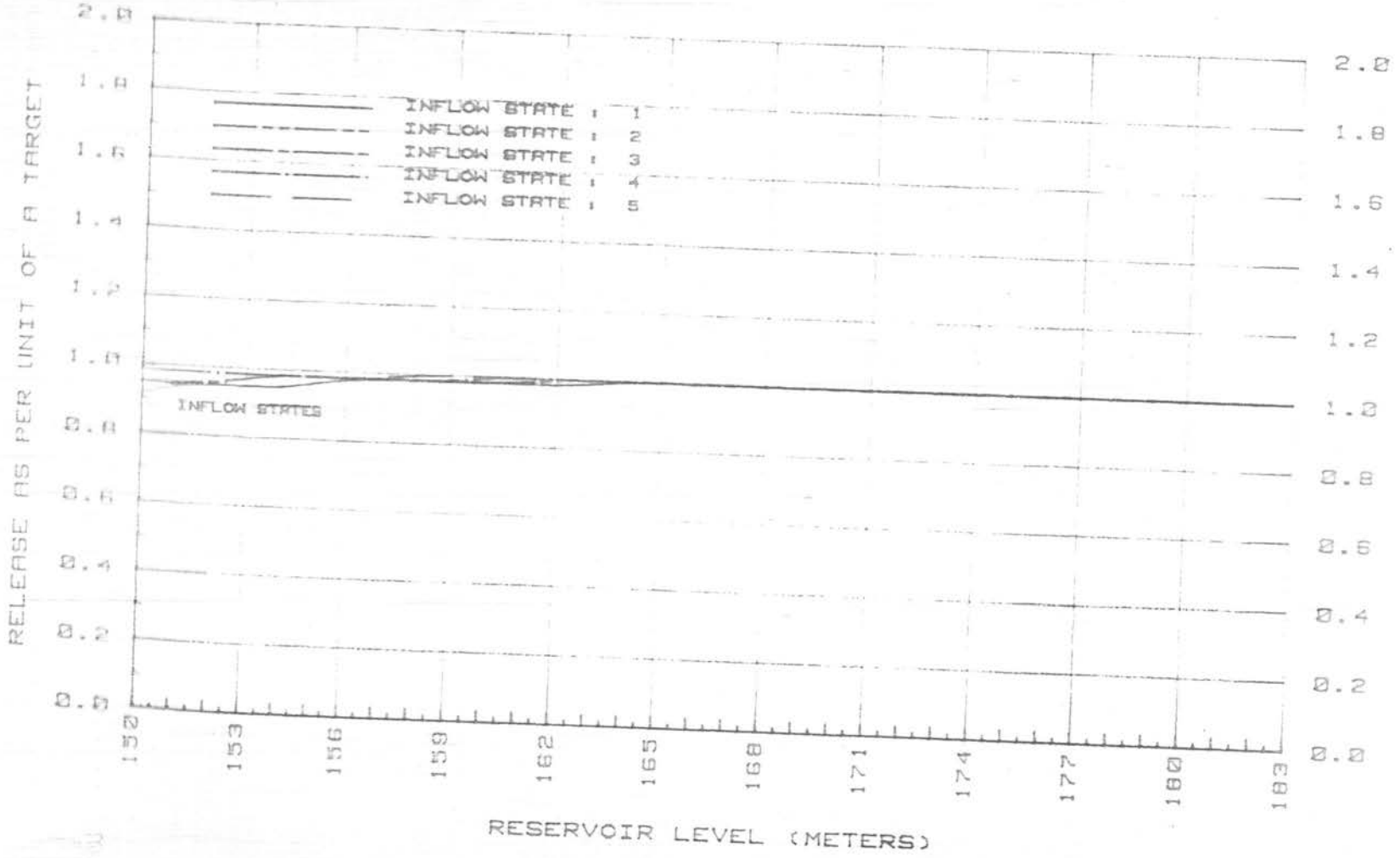


Fig. (B. 20)

OPERATING POLICY FOR HIGH DAM RESERVOIR
DERIVED FROM STEADY STATE DYNAMIC PROGRAM
FOR MONTH: SEPTEMBER

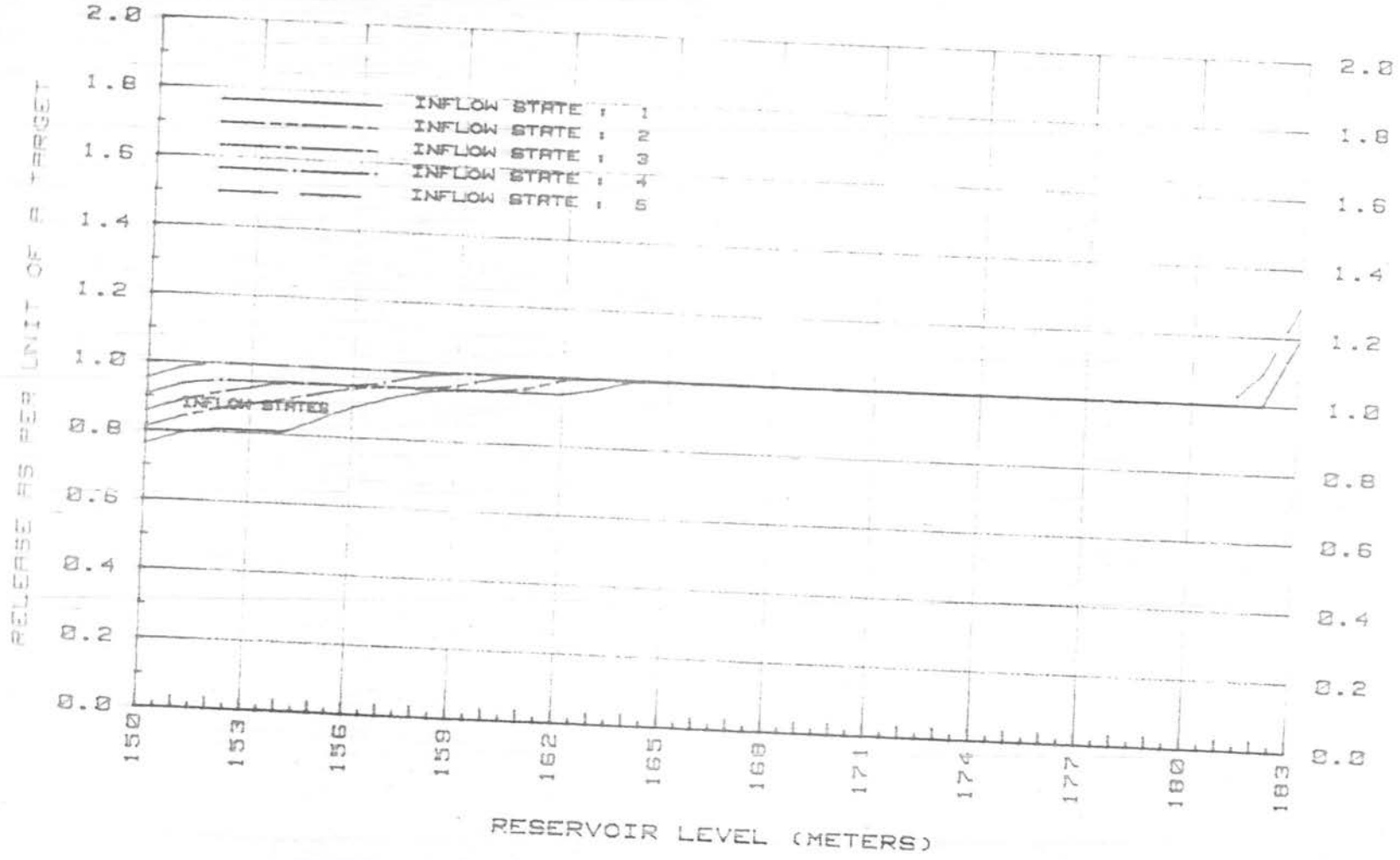


Fig. (B.21)

OPERATING POLICY FOR HIGH DAM RESERVOIR DERIVED FROM STEADY STATE DYNAMIC PROGRAM FOR MONTH: OCTOBER

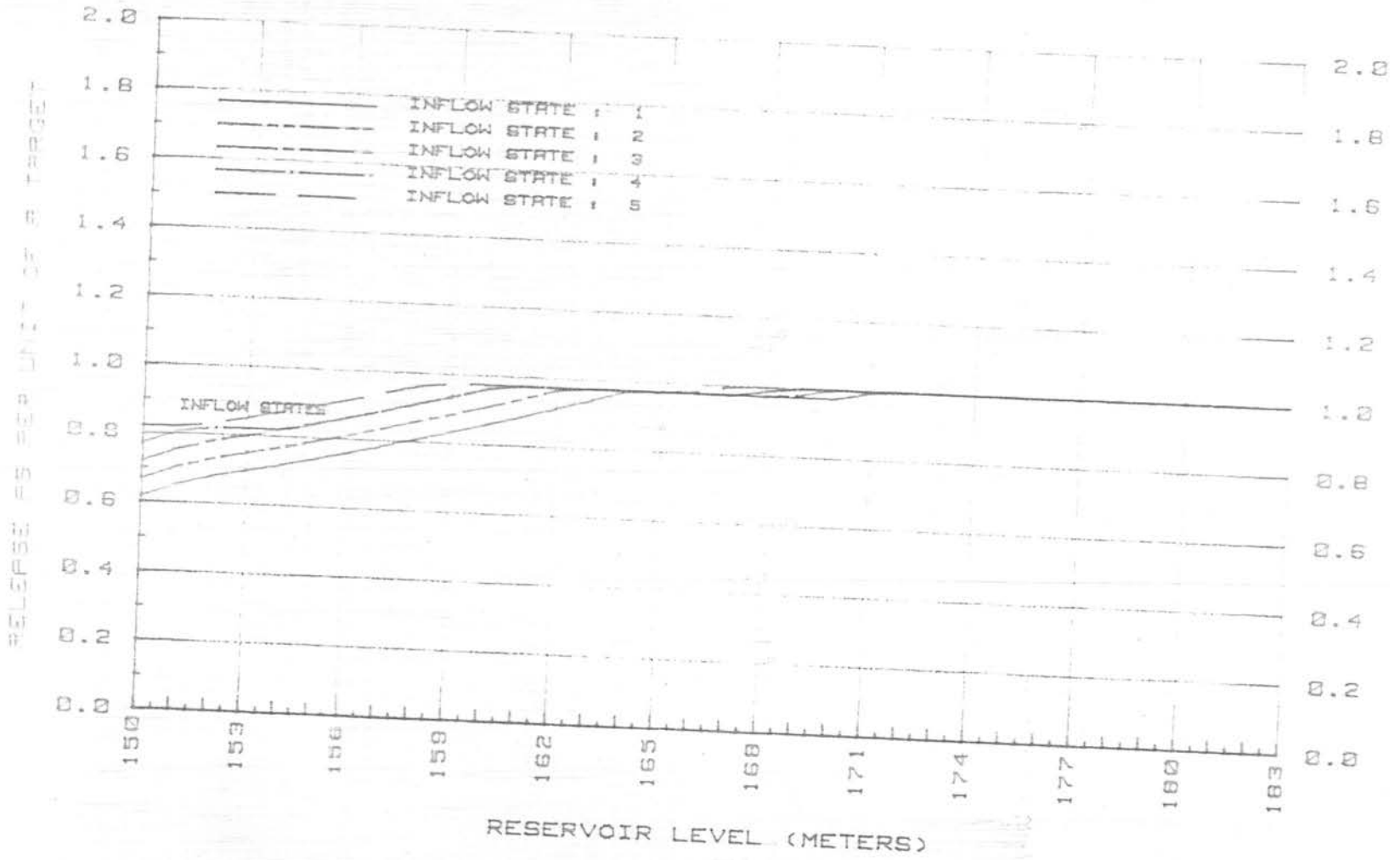


Fig. (B.22)

OPERATING POLICY FOR HIGH DAM RESERVOIR
DERIVED FROM STEADY STATE DYNAMIC PROGRF
FOR MONTH: NOVEMBER

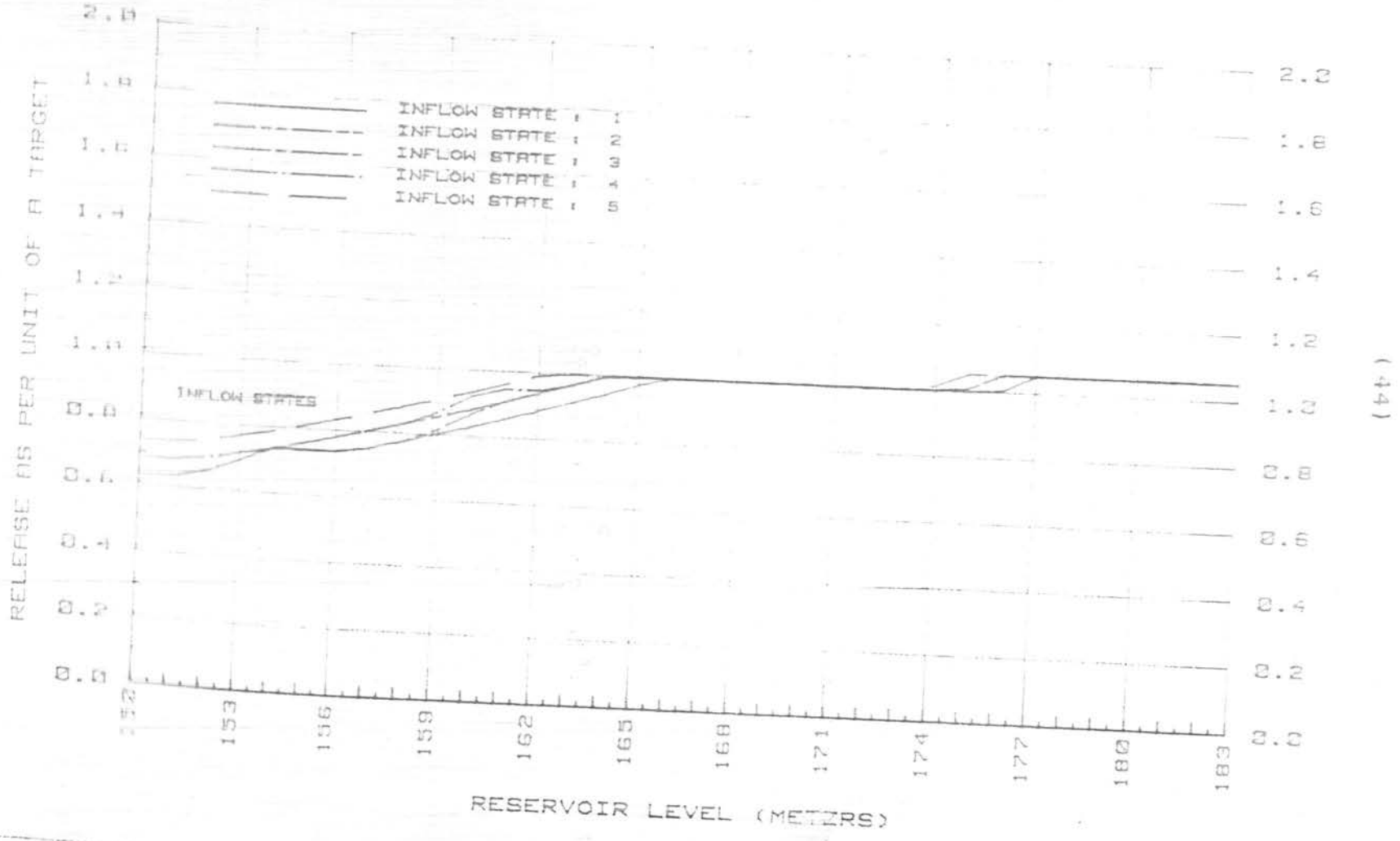


Fig. (B.23)

OPERATING POLICY FOR HIGH DAM RESERVOIR
DERIVED FROM STEADY STATE DYNAMIC PROGRAM
FOR MONTH: DECEMBER

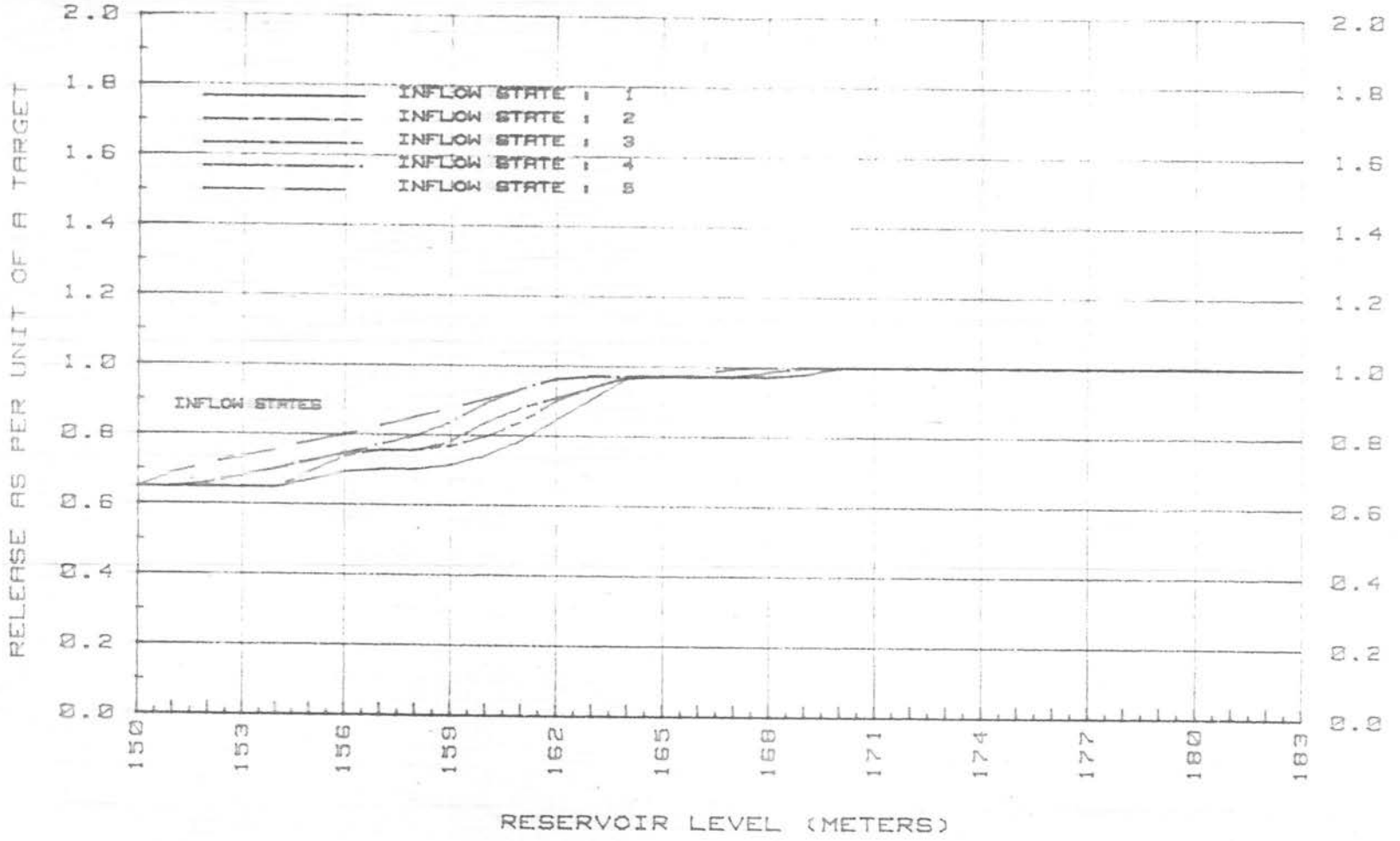


Fig. (B.24)

APPENDIX C

FUTURE OPERATING POLICY FOR THE HIGH ASWAN DAM AFTER JONGLEI PHASE I PROJECT USING DYNAMIC PROGRAM

C.1 SCENARIO II

a- EGYPTIAN DEMAND 57.8 MCM / ANNUM.

b - SUDANESE ABSTRACTION 21.8 MCM / ANNUM.

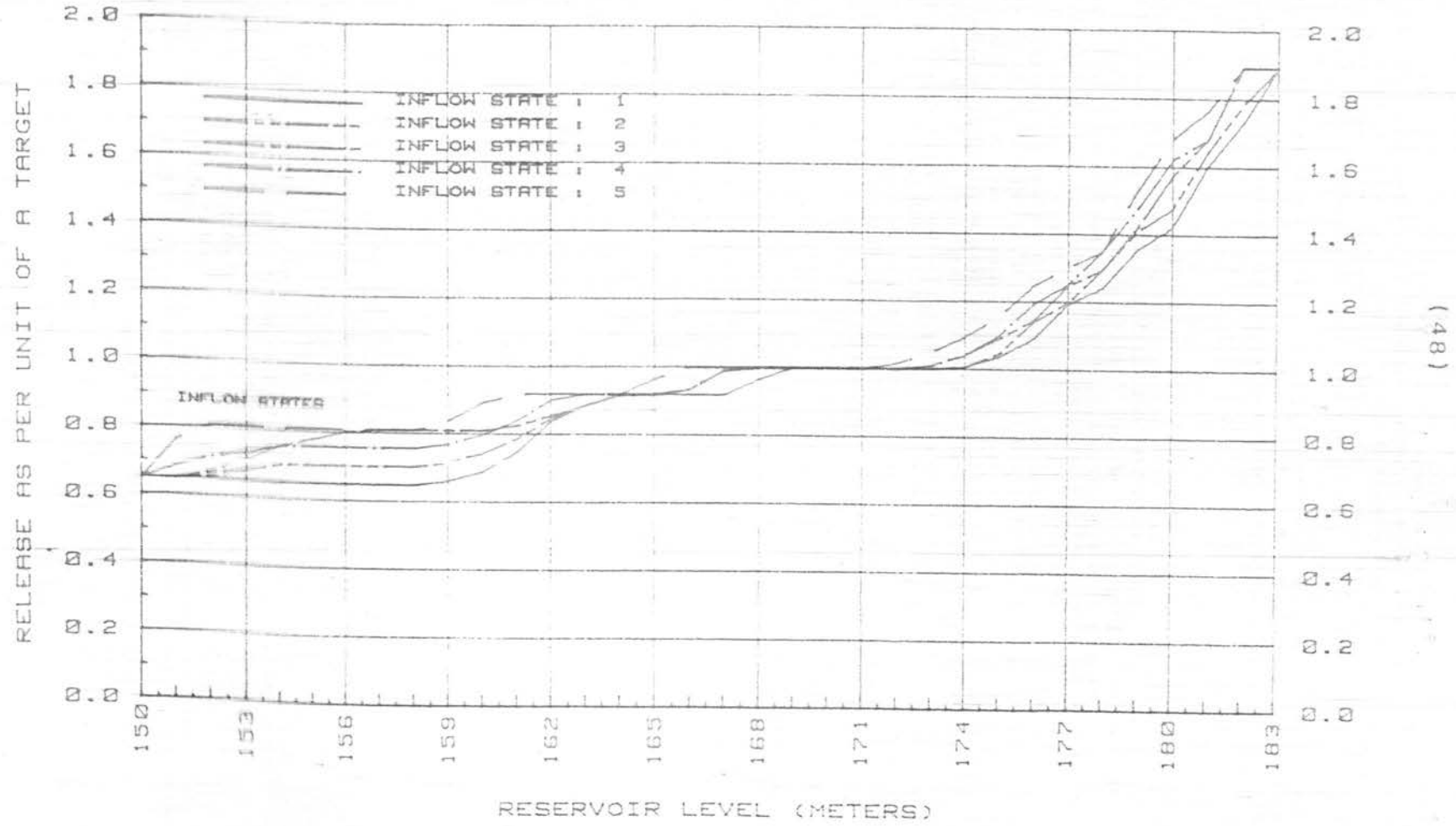
c - INFLOW CONDITIONS AFTER JONGLEI PHASE I PROJECT.

d - OPTIMIZING ENERGY PRODUCTION WHILE SATISFYING IRRIGATION CONSTRAINTS

OPERATING POLICY FOR HIGH DAM RESERVOIR

DERIVED FROM STEADY STATE DYNAMIC PROGRAM

FOR MONTH: JANUARY



(48)

Fig. (C .1)

OPERATING POLICY FOR HIGH DAM RESERVOIR

DERIVED FROM STEADY STATE DYNAMIC PROGRAM

FOR MONTH: FEBRUARY

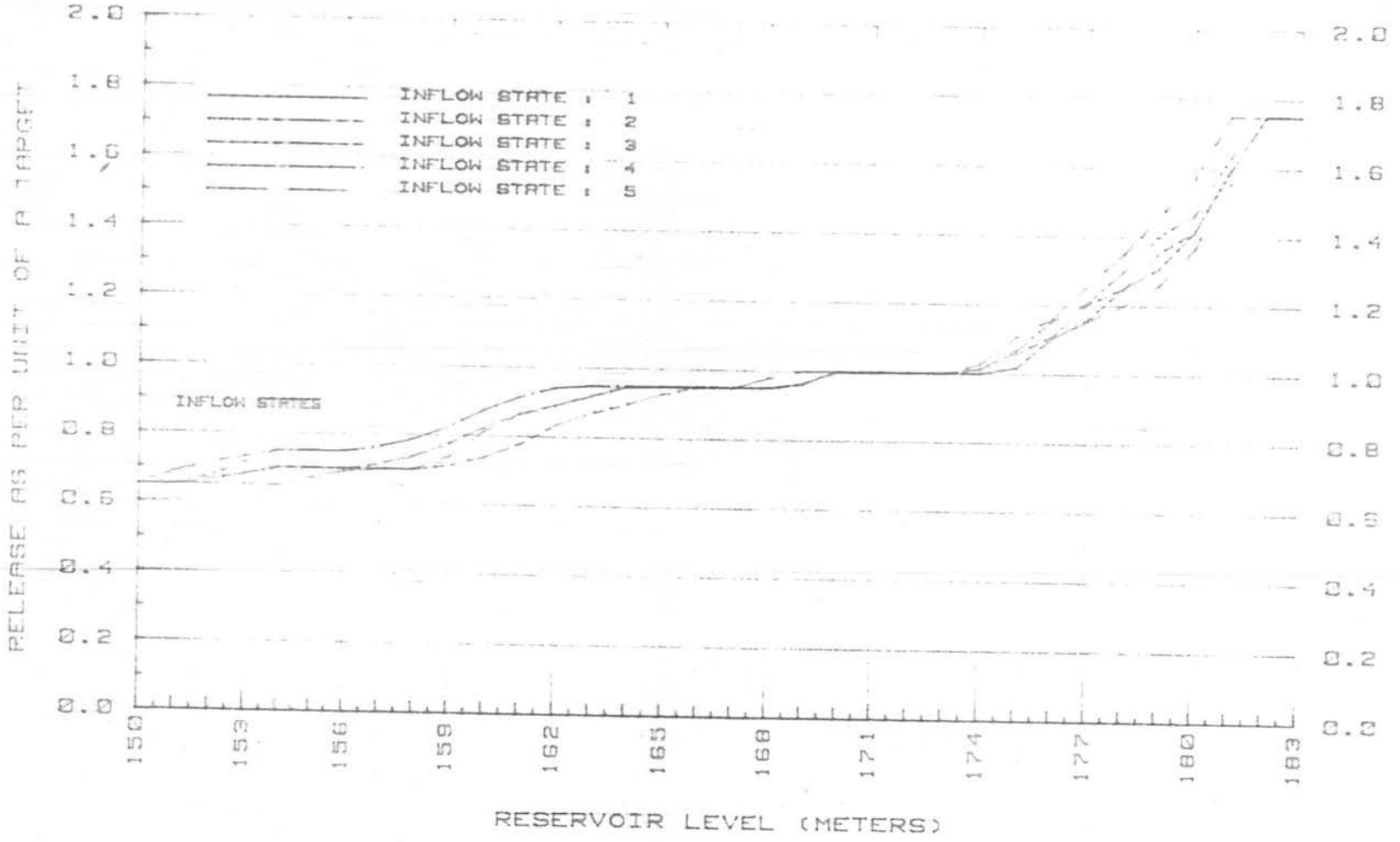


Fig. (C . 2)

OPERATING POLICY FOR HIGH DAM RESERVOIR
DERIVED FROM STEADY STATE DYNAMIC PROGRAM
FOR MONTH: MARCH

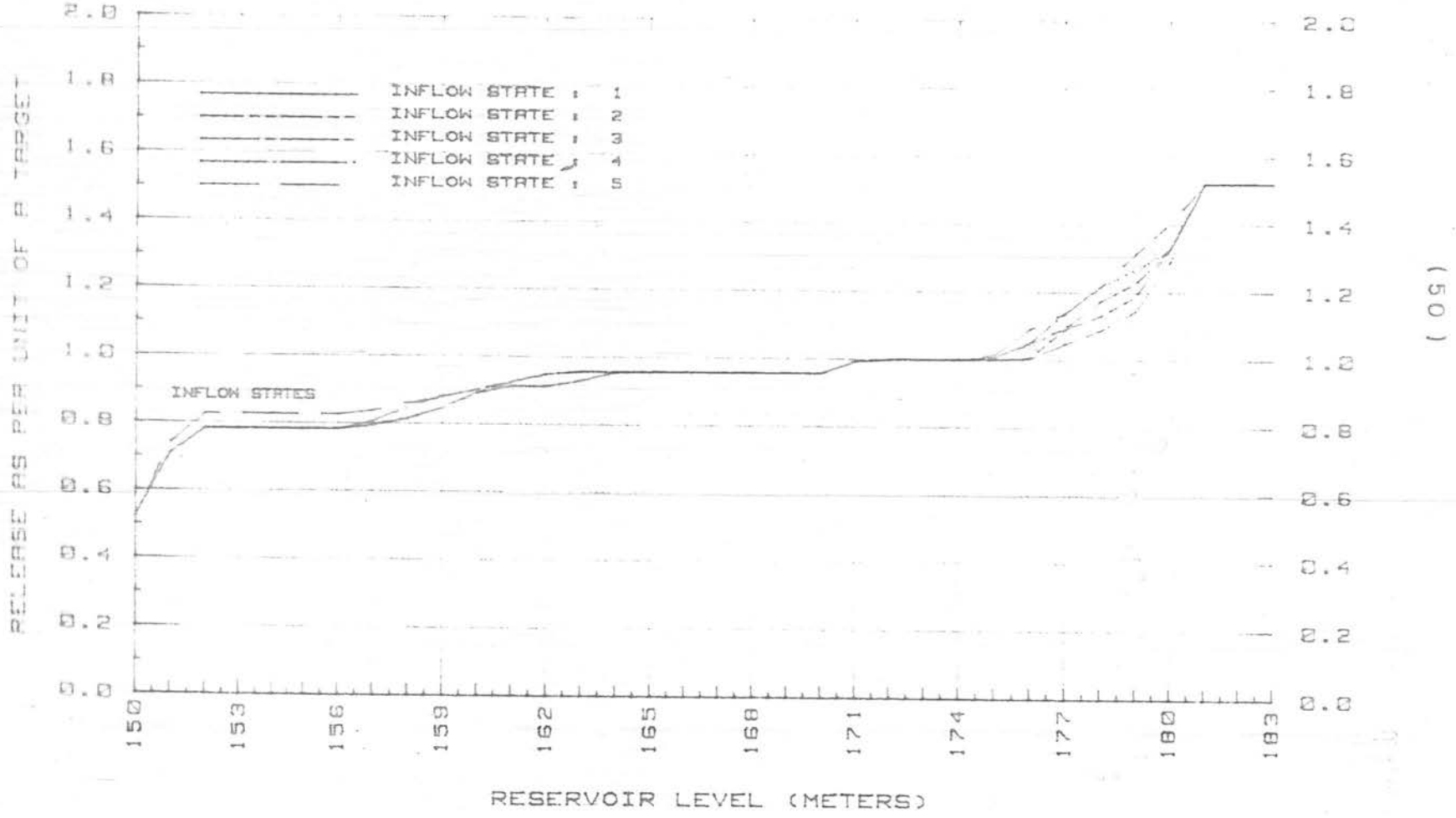


Fig. (C.3)

SCENARIO II

OPERATING POLICY FOR HIGH DAM RESERVOIR
DERIVED FROM STEADY STATE DYNAMIC PROGRAM
FOR MONTH: APRIL

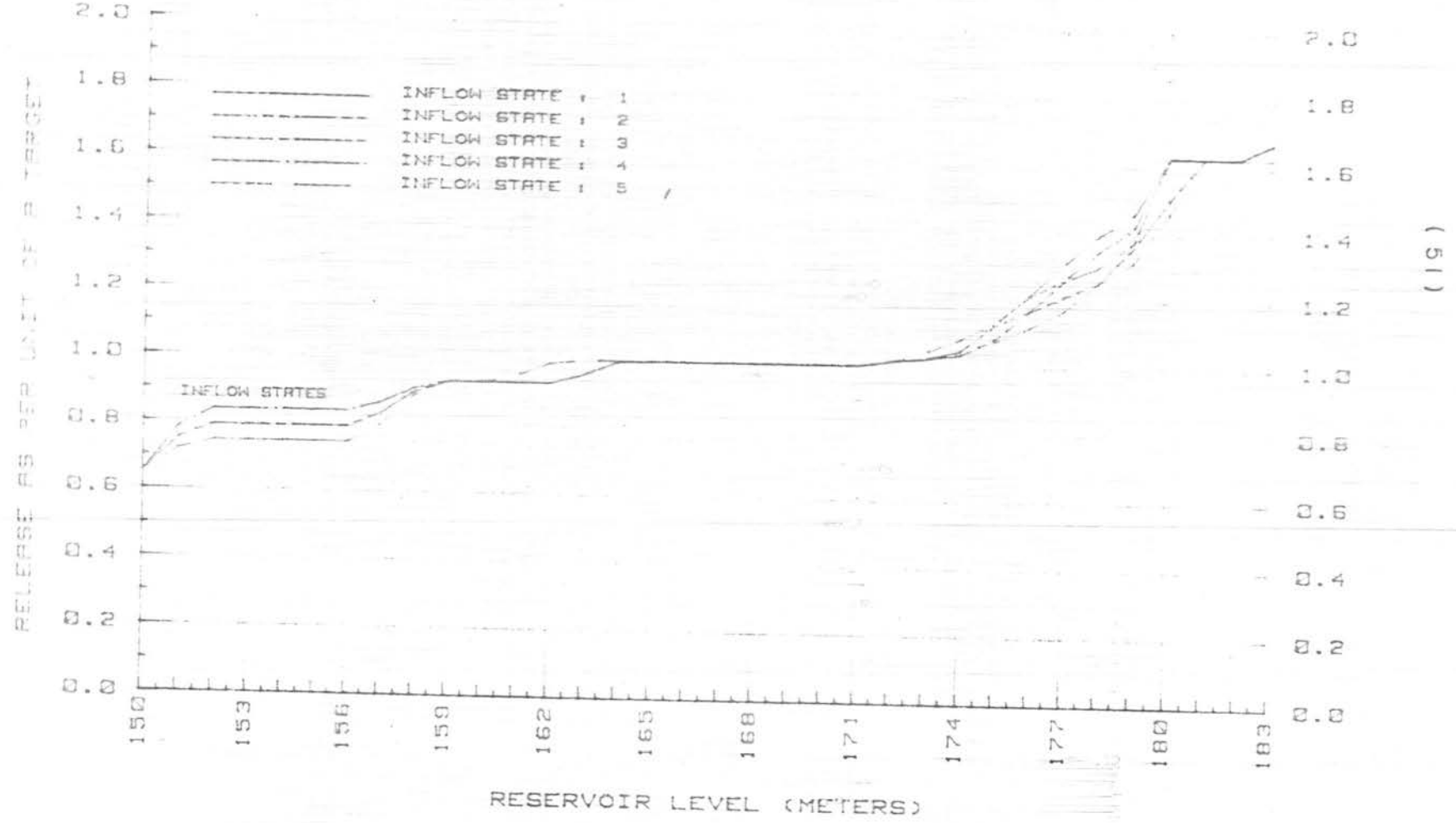


Fig. (C .4)

OPERATING POLICY FOR HIGH DAM RESERVOIR

DERIVED FROM STEADY STATE DYNAMIC PROGRAM

FOR MONTH: MAY

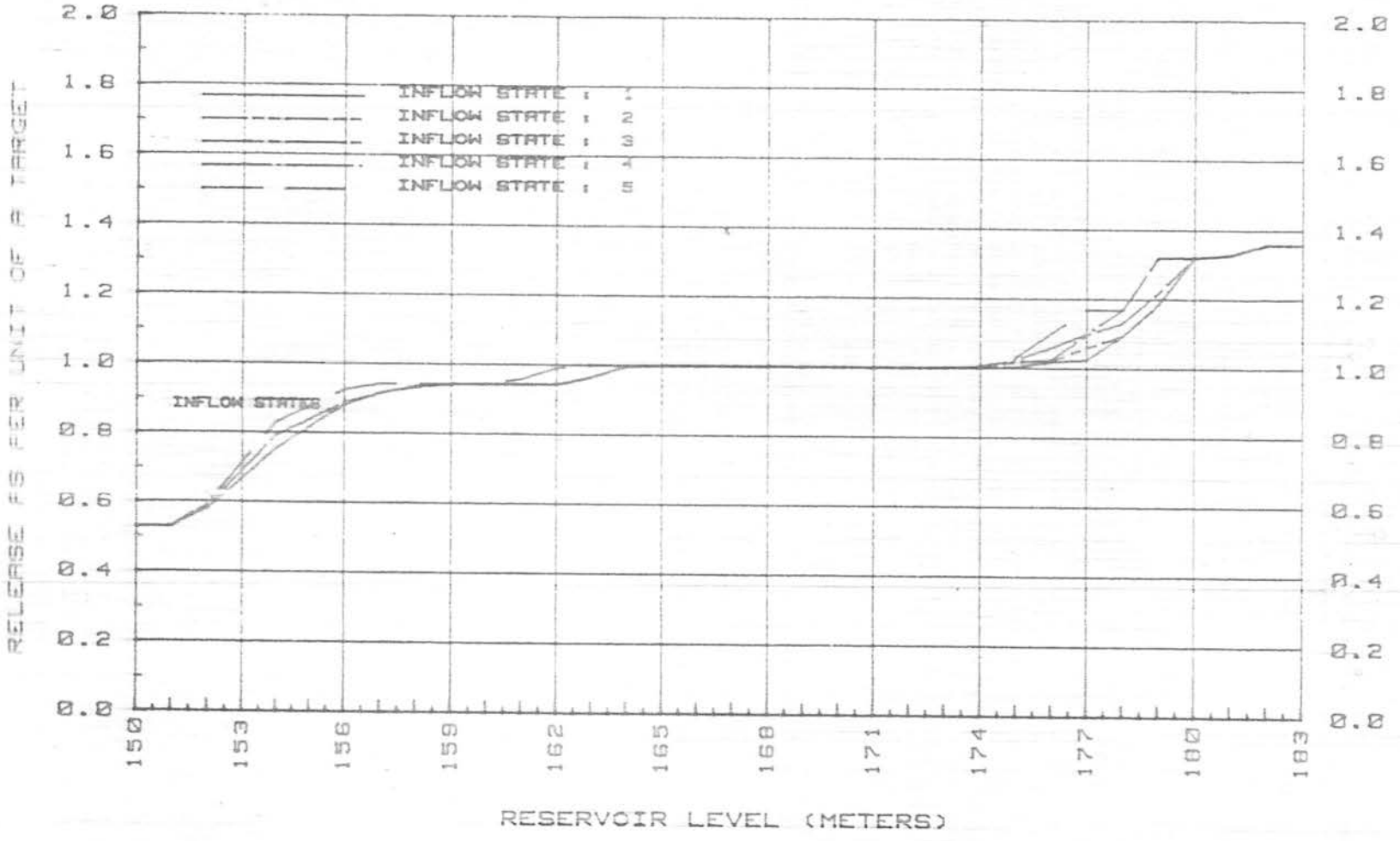


Fig. (C. 5)

OPERATING POLICY FOR HIGH DAM RESERVOIR DERIVED FROM STEADY STATE DYNAMIC PROGRAM FOR MONTH: JUNE

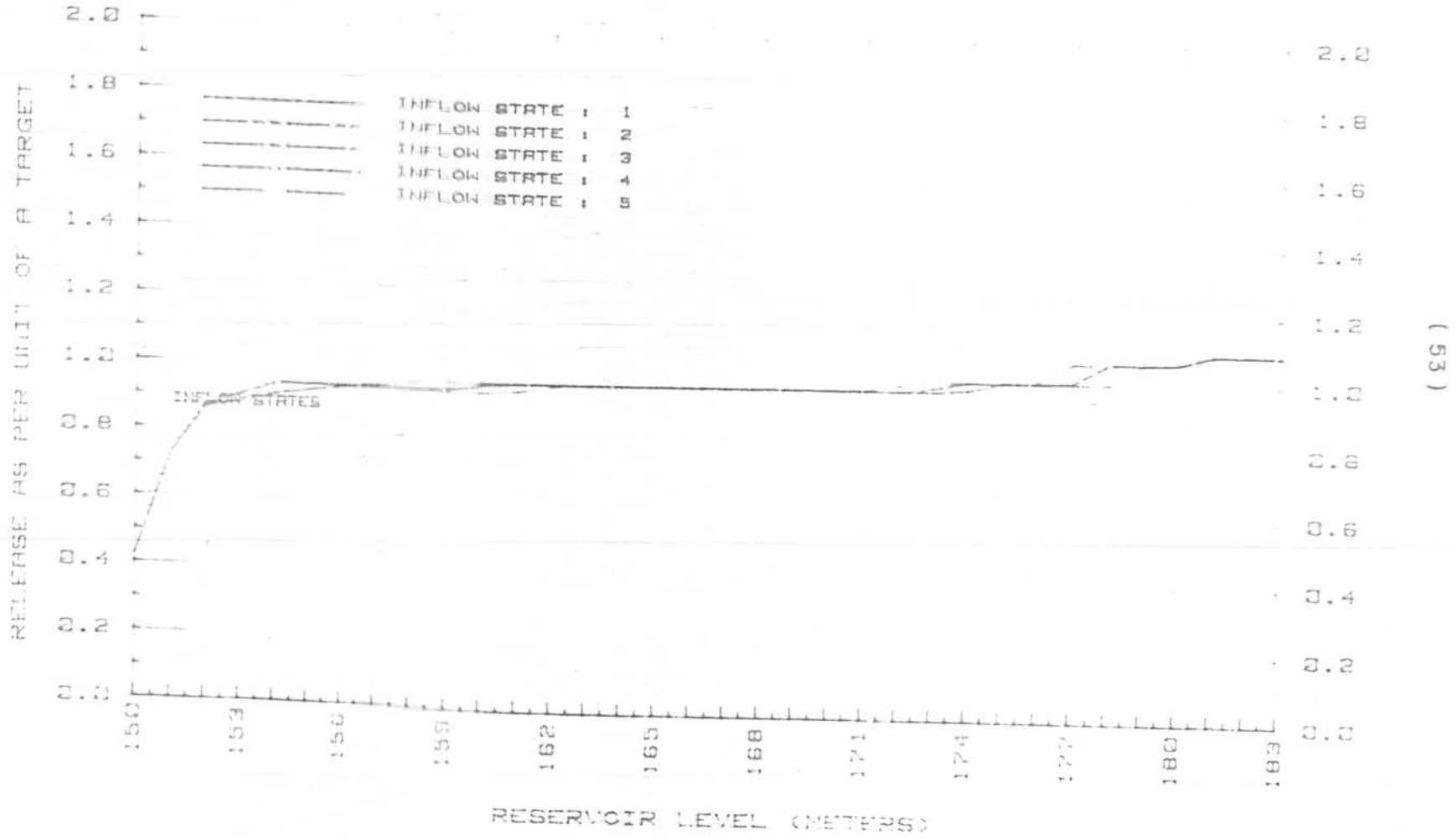


Fig. (C .6)

OPERATING POLICY FOR HIGH DAM RESERVOIR
DERIVED FROM STEADY STATE DYNAMIC PROGRAM
FOR MONTH: JULY

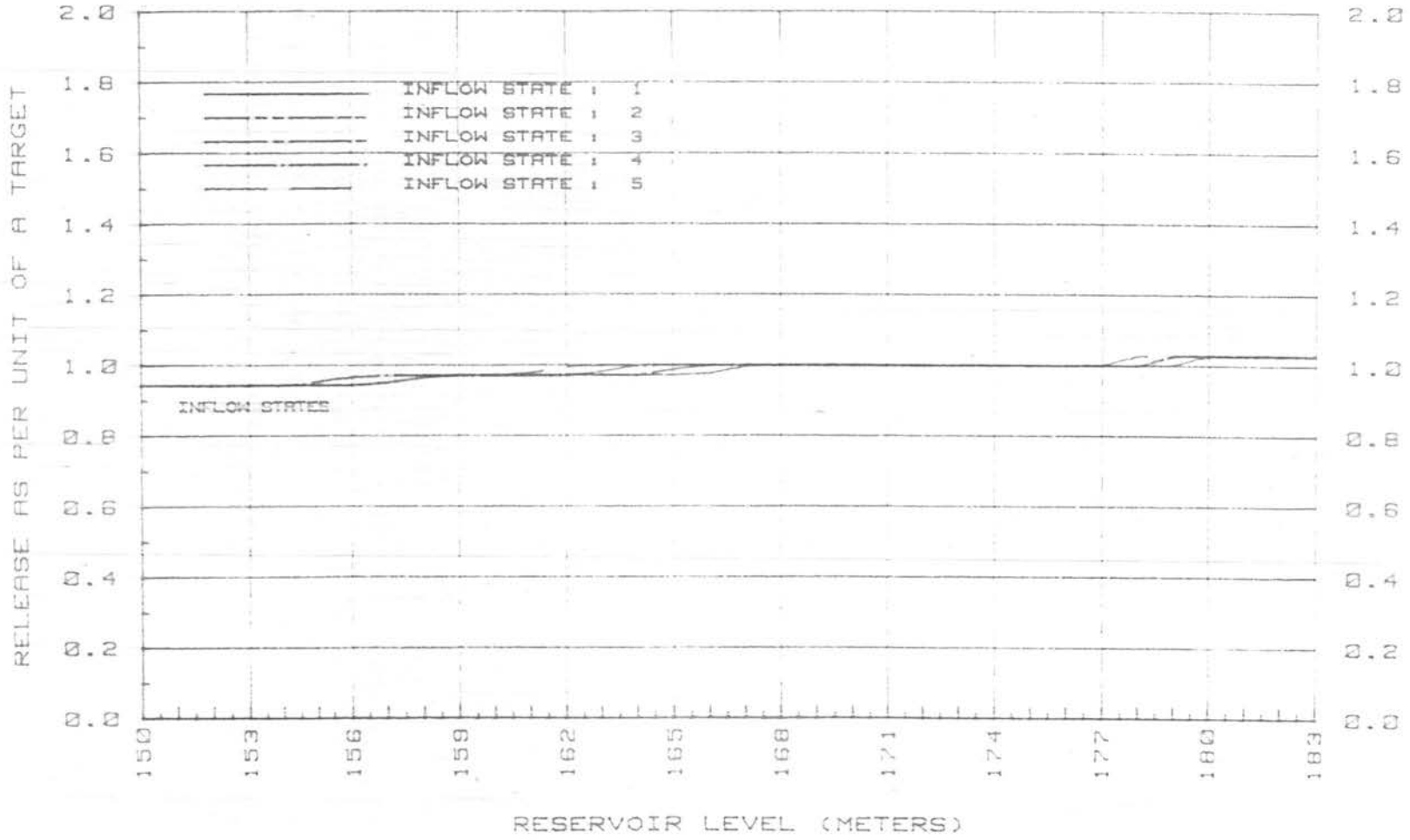


Fig. (C .7)

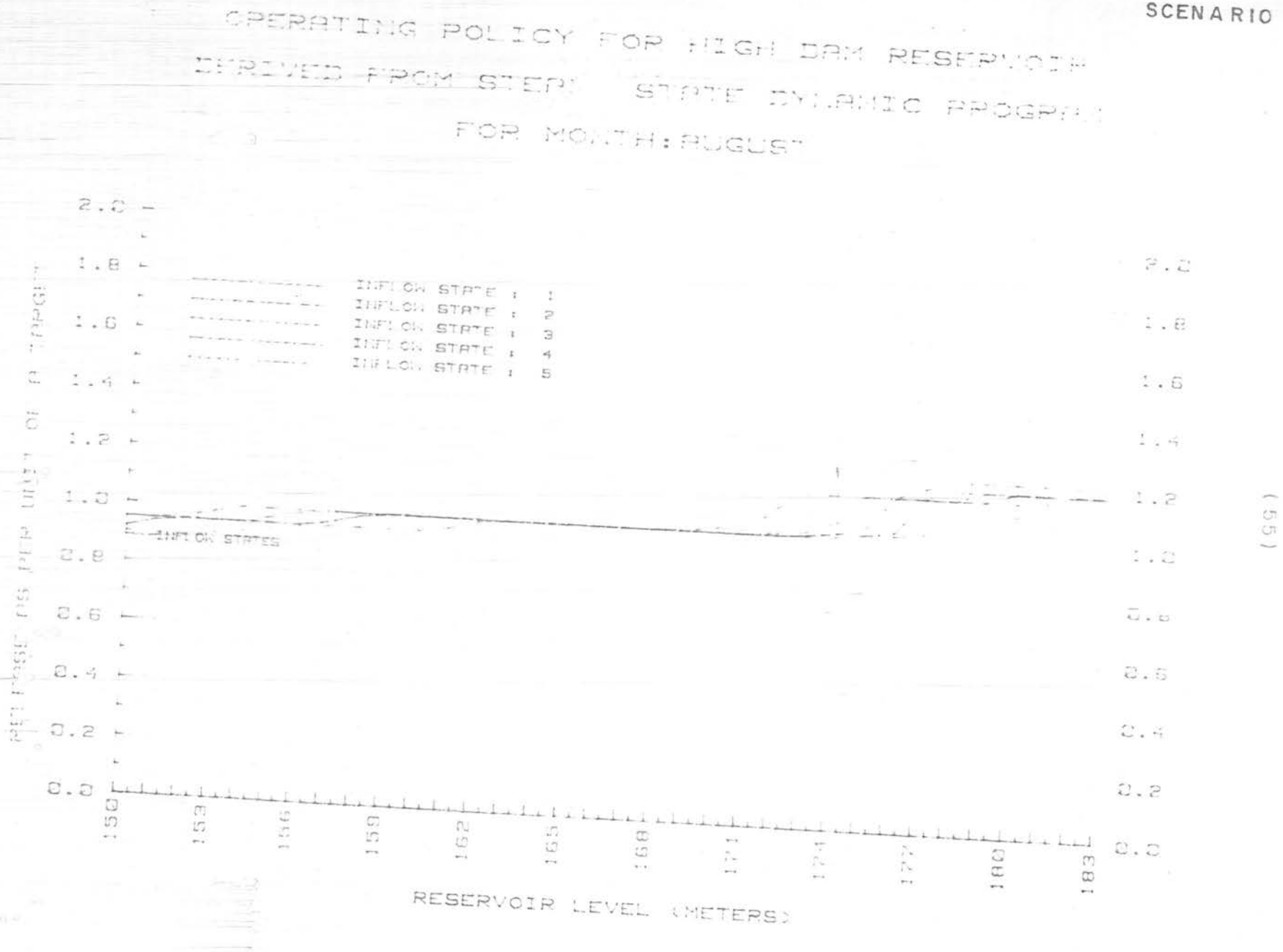

OPERATING POLICY FOR HIGH DAM RESERVOIR
DERIVED FROM STEP STATE DYNAMIC PROGRAM
FOR MONTH:AUGUST
INFLOW STATE : 1
INFLOW STATE : 2
INFLOW STATE : 3
INFLOW STATE : 4
INFLOW STATE : 5
INFLOW STATES
RESERVOIR LEVEL (METERS)

Fig. (C .8)

OPERATING POLICY FOR HIGH DAM RESERVOIR
DERIVED FROM STEADY STATE DYNAMIC PROGRAM
FOR MONTH: SEPTEMBER

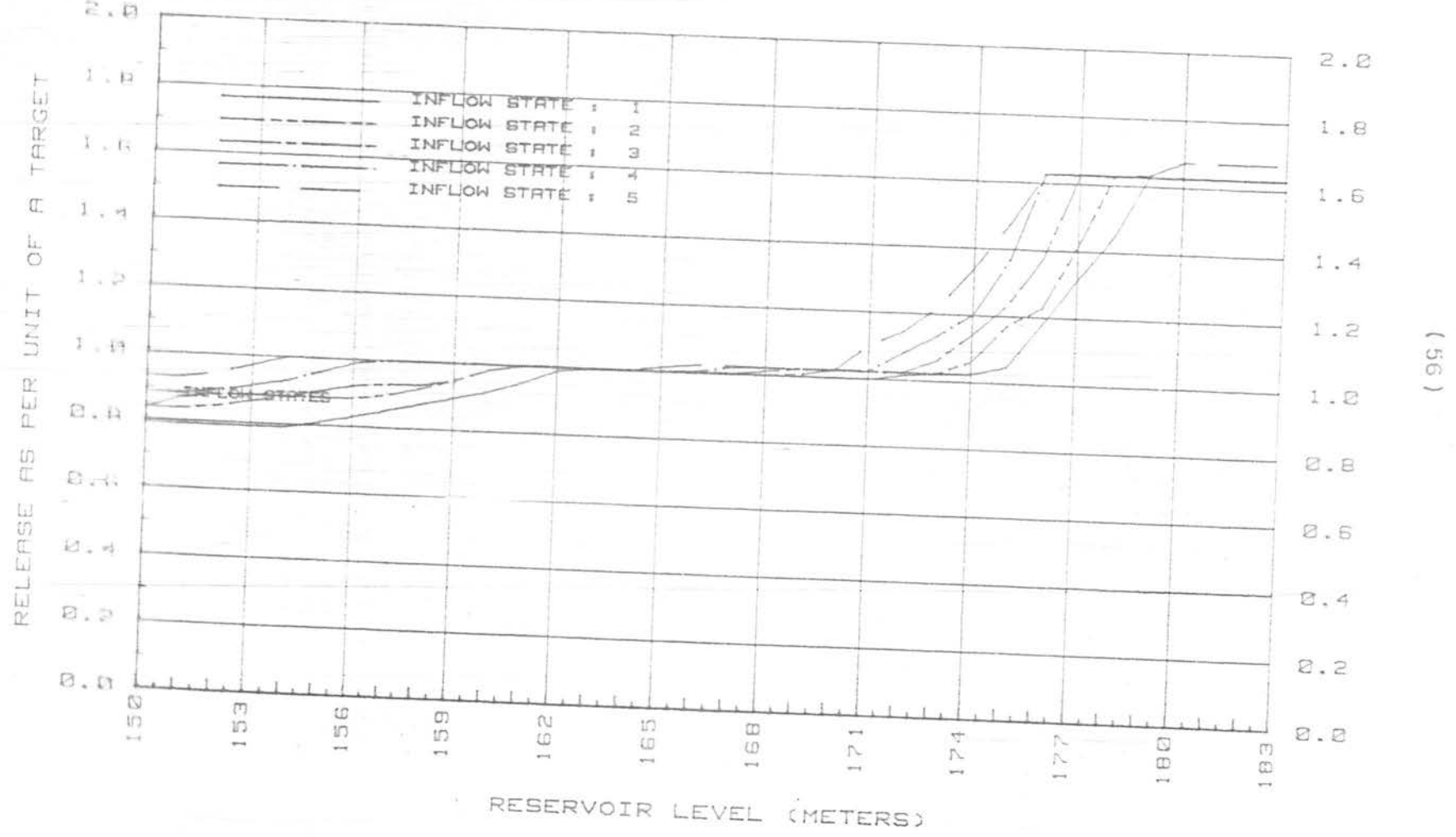


Fig. (C.9)

OPERATING POLICY FOR HIGH DAM RESERVOIR
DERIVED FROM STEADY STATE DYNAMIC PROGRAM
FOR MONTH: OCTOBER

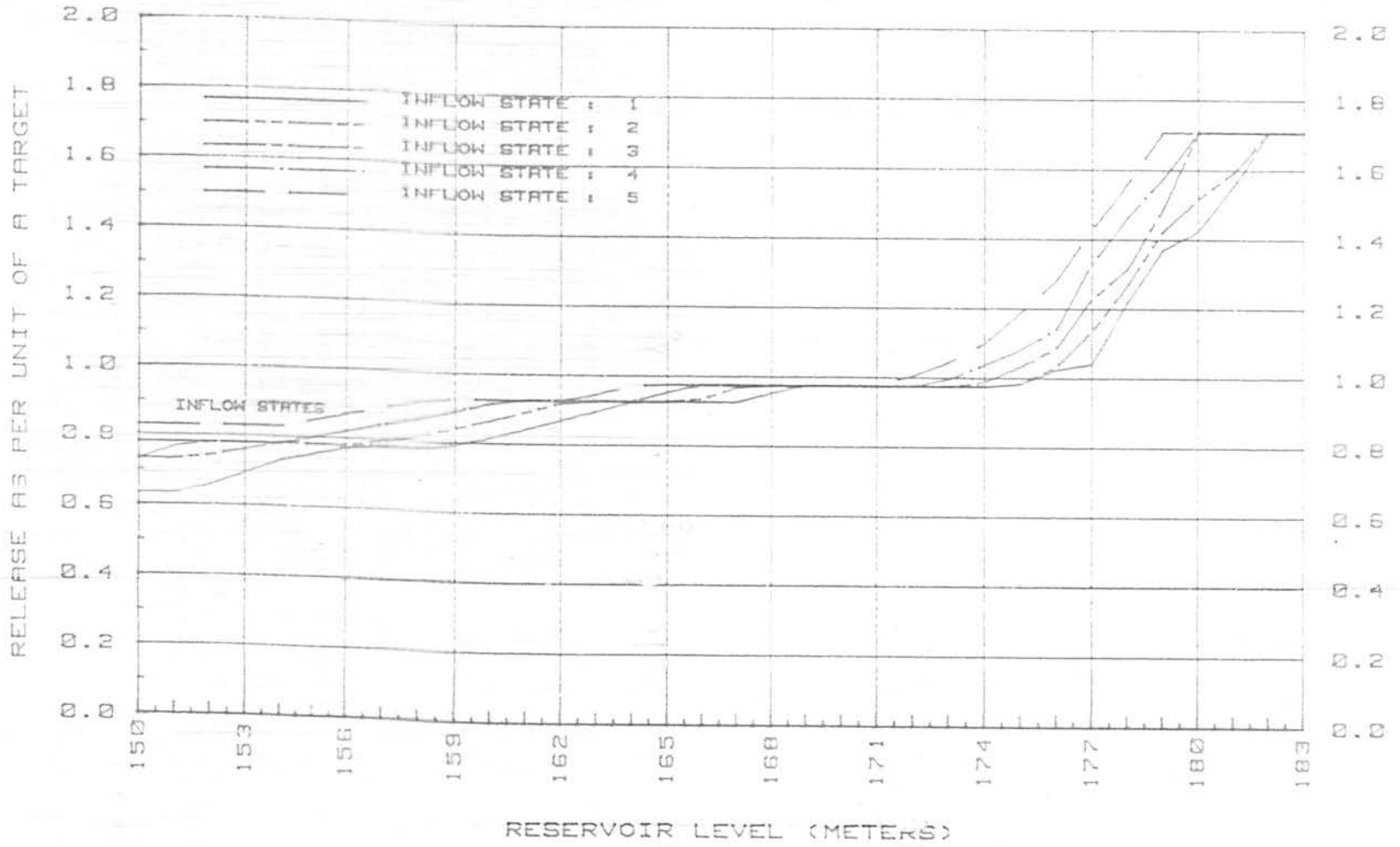


Fig. (C .10)

OPERATING POLICY FOR HIGH DAM RESERVOIR

DERIVED FROM STEADY STATE DYNAMI PROGRAM

FOR MONTH: NOVEMBER

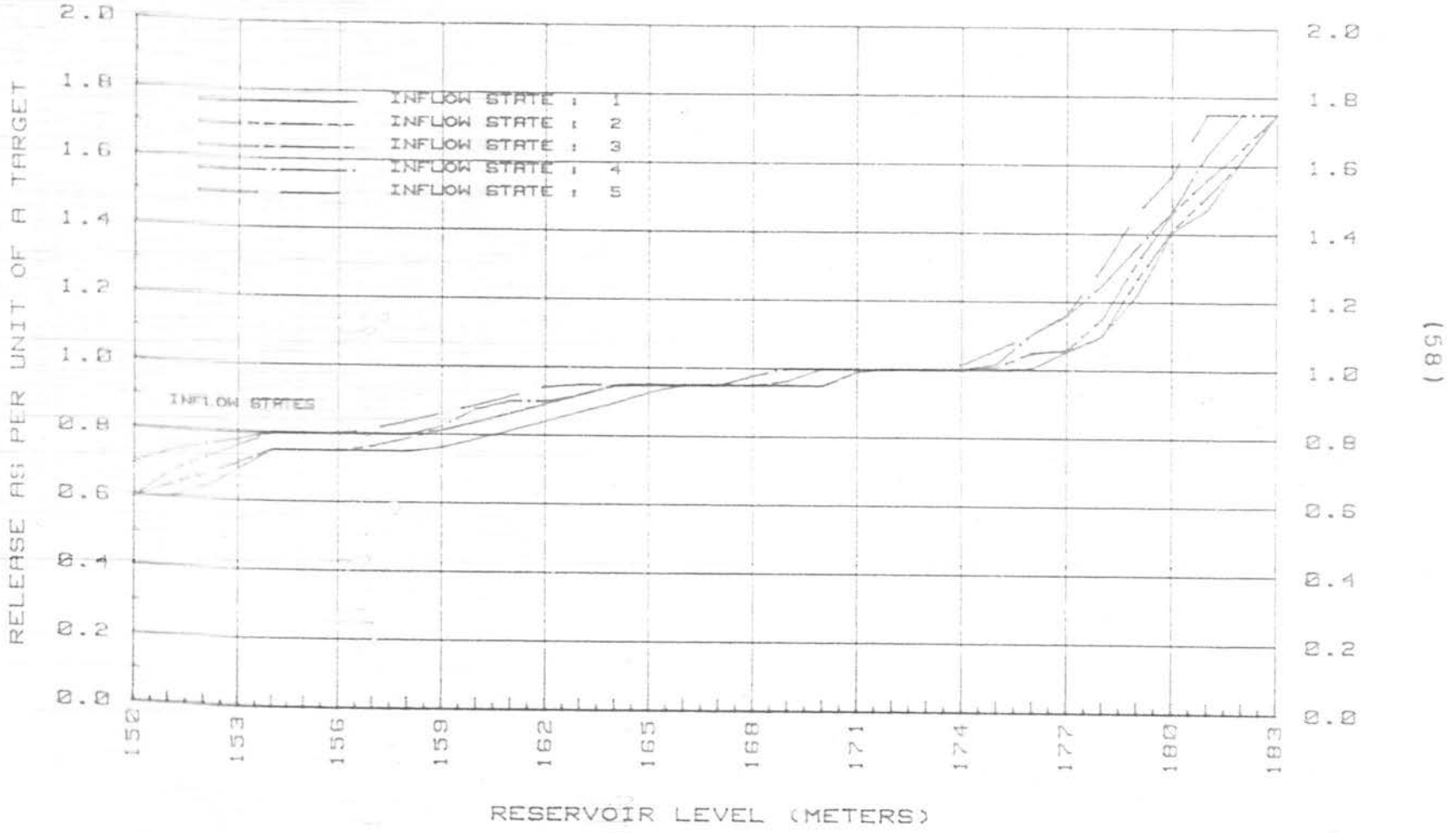


Fig. (C .11)

OPERATING POLICY FOR HIGH DAM RESERVOIR

DERIVED FROM STEADY STATE NAMIC PROGRAM

FOR MONTH: DECEMBER

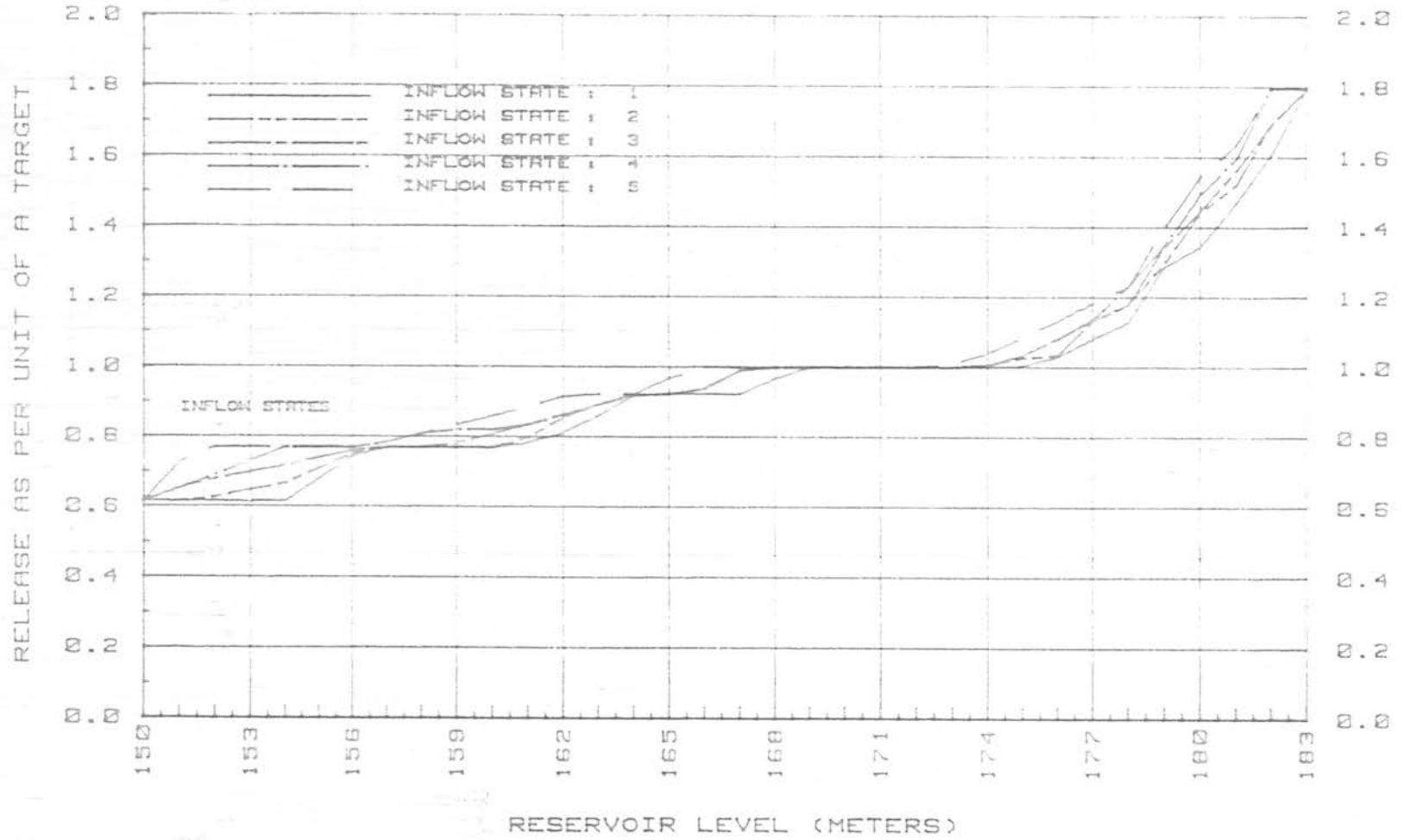


Fig. (C .12)

C . 2 SCENARIO (II

a - EGYPTION DEMAND 58.7 MCM / ANNUM.

b- SUDANESE ABSTRACTION 14.5 MCM /ANNUM.

c- INFLOW CONDITIONS AFTER JONGLEI PHASE I PROJECT.

d- OPTIMIZING ENERGY PRODUCTION WHILE SATISFYING IRRIGATION CONSTRAINTS.

OPERATING POLICY FOR HIGH DAM RESERVOIR
DERIVED FROM STEADY STATE DYNAMIC PROGRAM
FOR MONTH: JANUARY

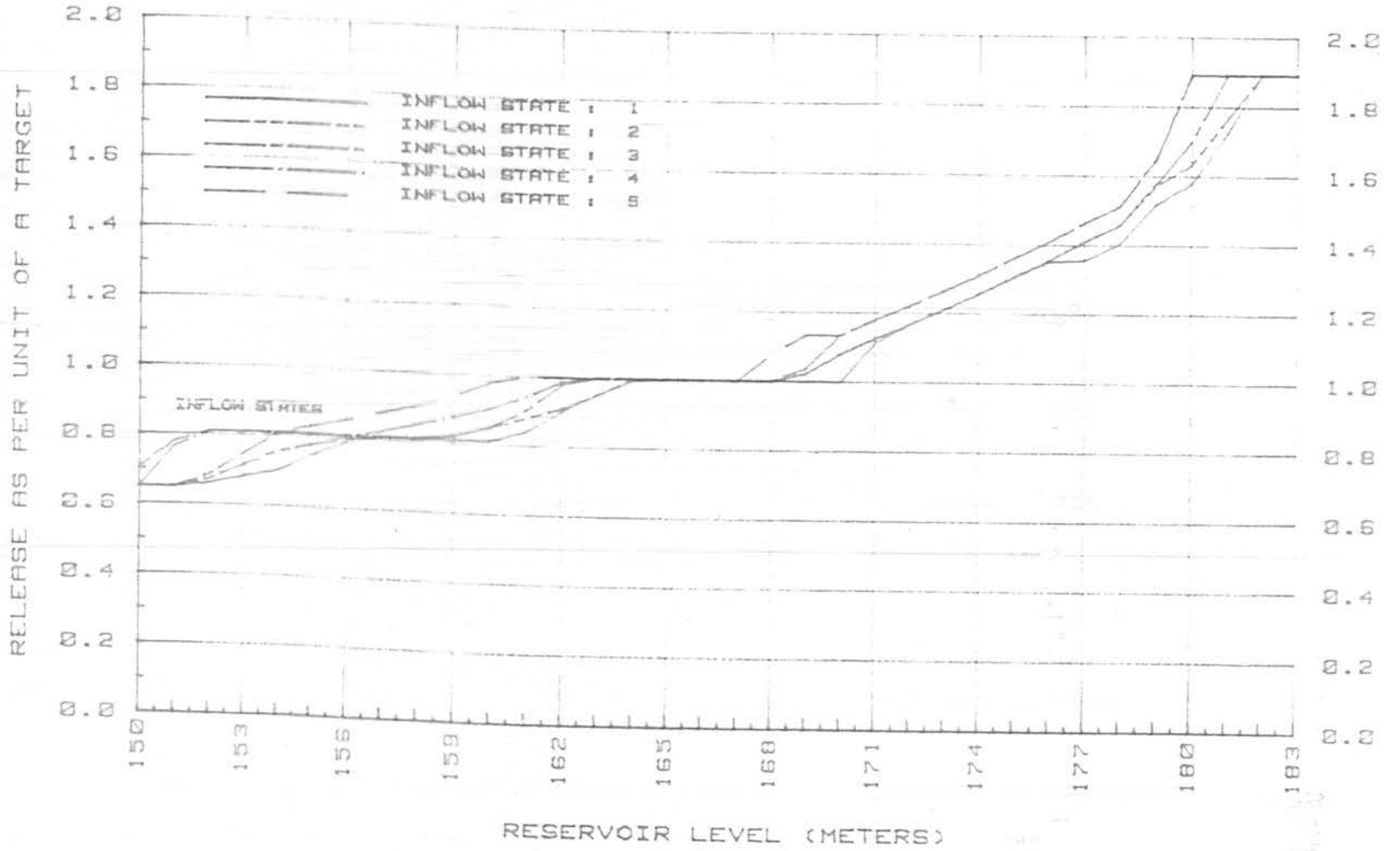


Fig. (C 13)

OPERATING POLICY FOR HIGH DAM RESERVOIR

DERIVED FROM STEADY STATE DYNAMIC PROGRAM

FOR MONTH: FEBRUARY

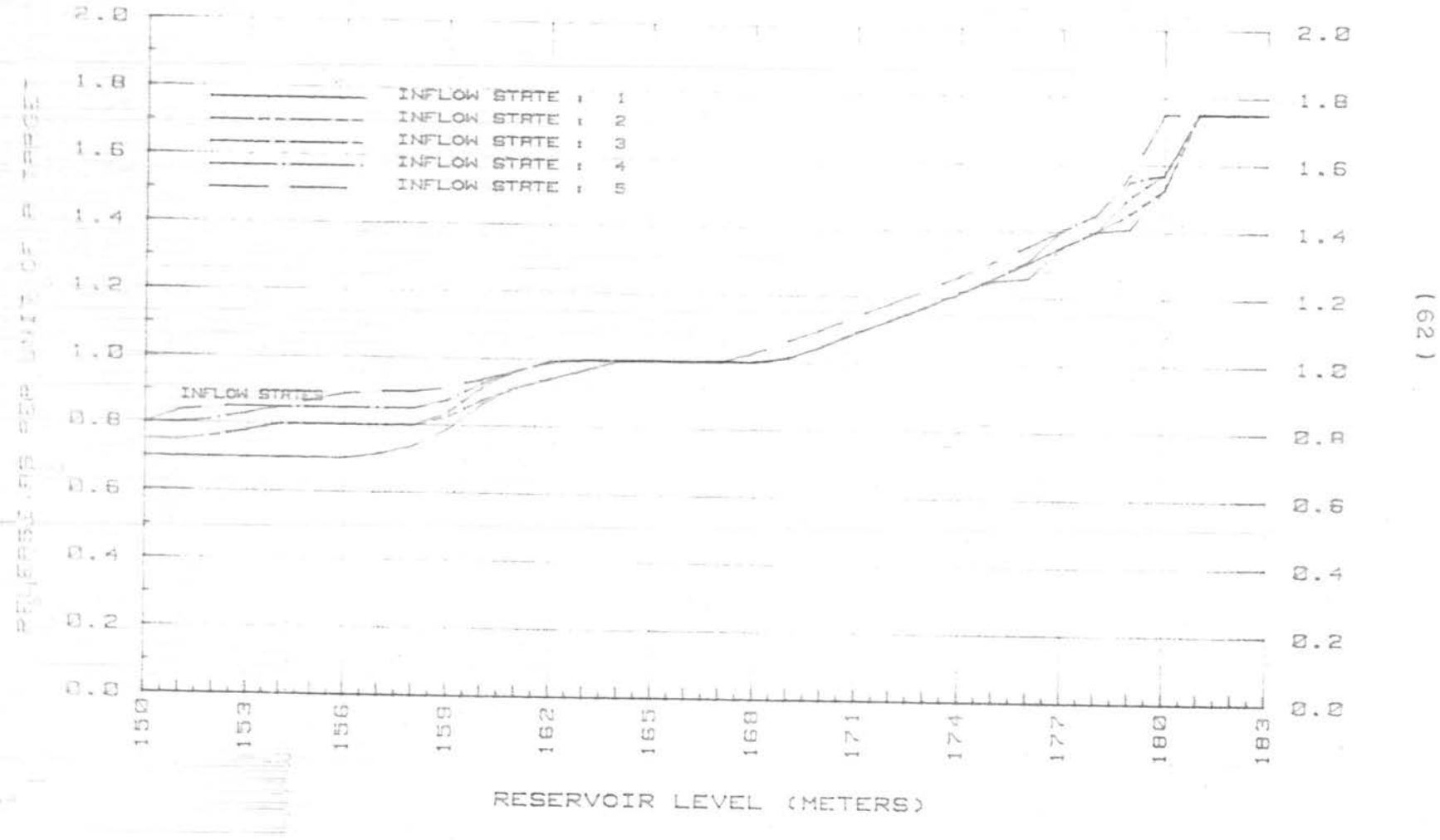


Fig. (C.14)

OPERATING POLICY FOR HIGH DAM RESERVOIR

DERIVED FROM STEADY STATE DYNAMIC PROGRAM-

FOR MONTH: MARCH

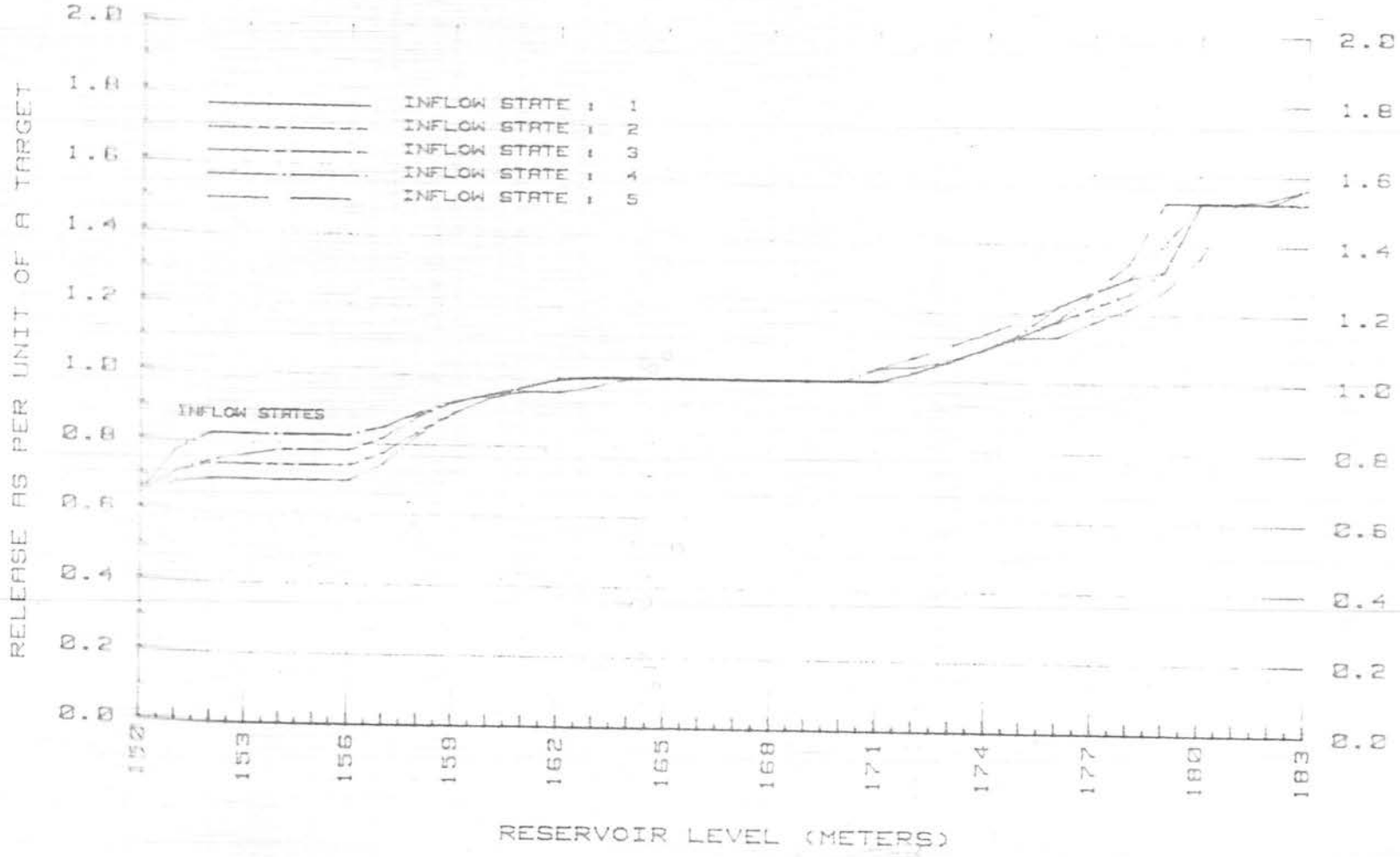


Fig. (C.15)

OPERATING POLICY FOR HT 4 DAM RESERVOIR
DERIVED FROM STEADY STA... DYNAMIC PROGRAM
FOR MONTH: APRIL

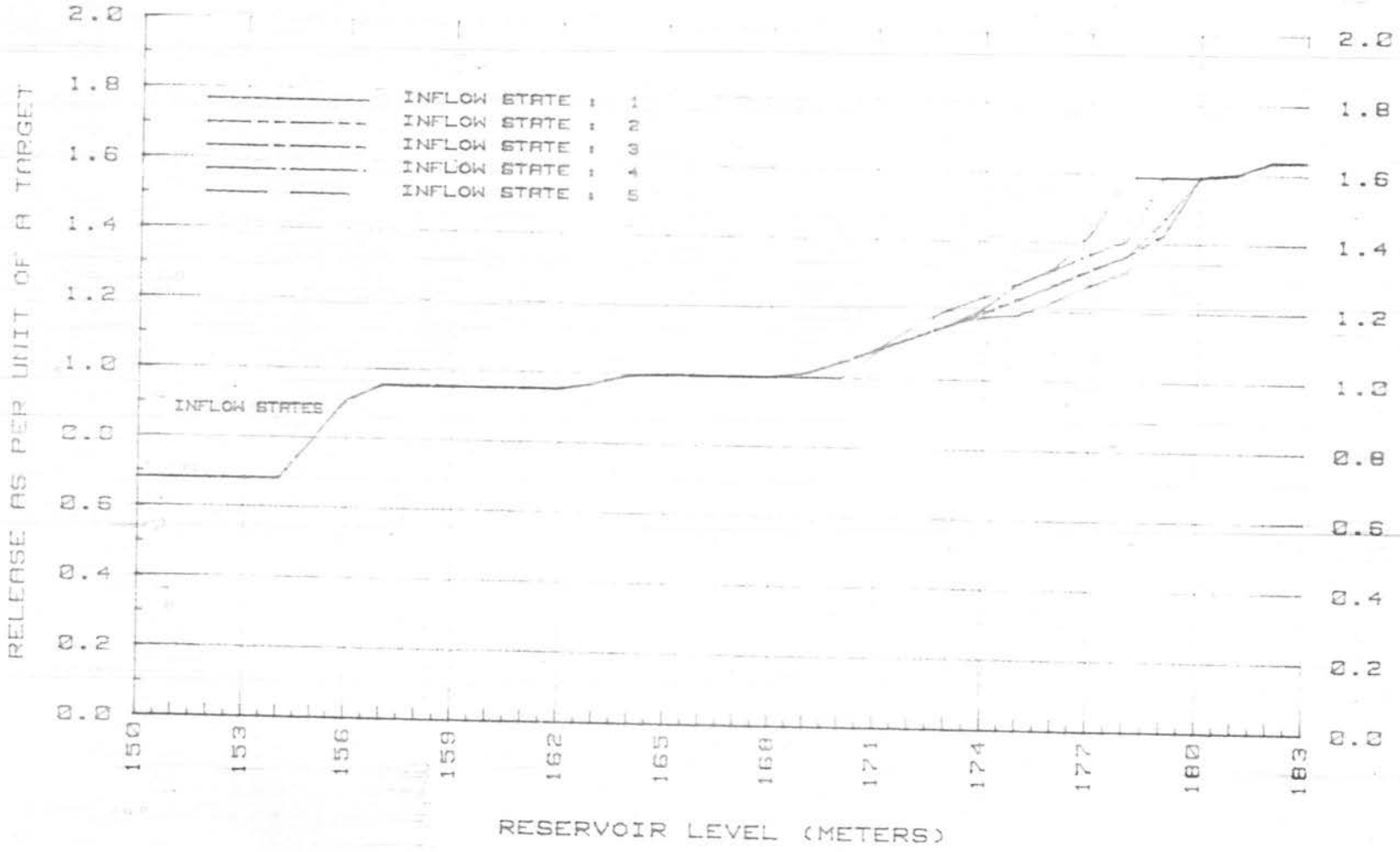


Fig (C.16)

OPERATING POLICY FOR HIGH DAM RESERVOIR
DERIVED FROM STEADY STATE DYNAMIC PROGRAM
FOR MONTH: MAY

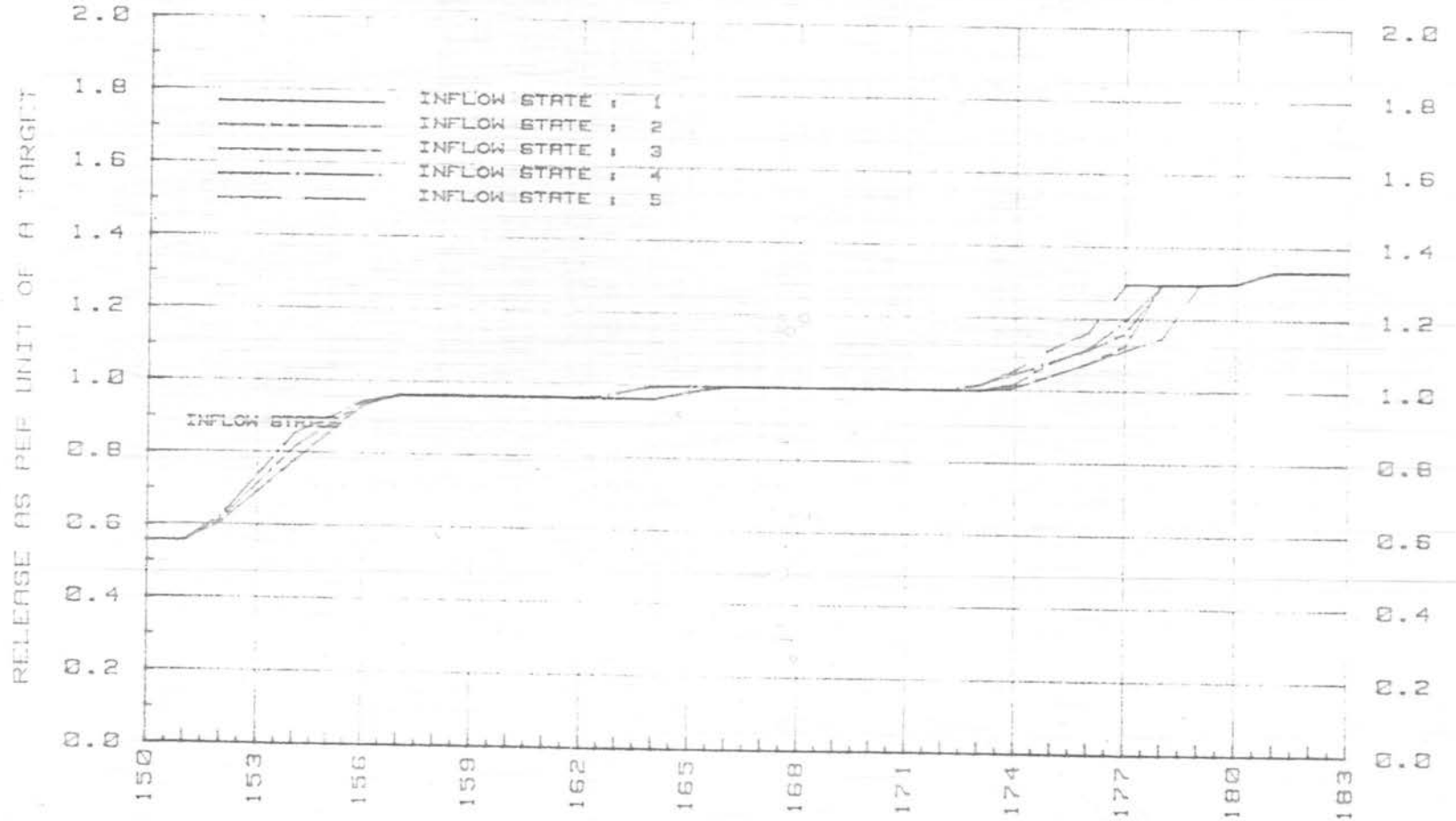


Fig. (C .17)

OPERATING POLICY FOR HIGH DAM RESERVOIR
DERIVED FROM STEADY STATE DYNAMIC PROGRAM
FOR MONTH: JUNE

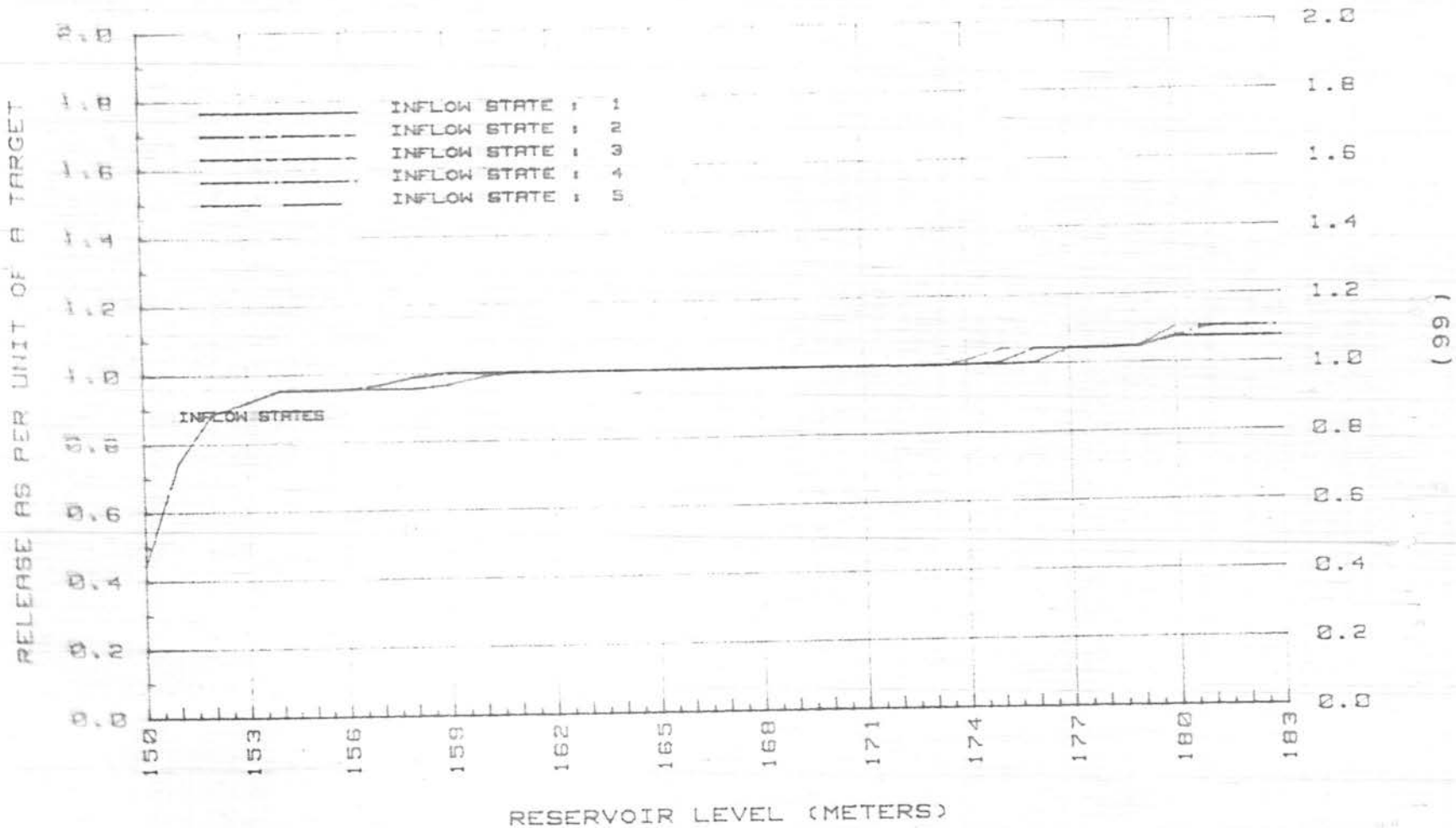


Fig. (C.18)

OPERATING POLICY FOR HIGH DAM RESERVOIR
DERIVED FROM STEADY STATE DYNAMIC PROGRAM
FOR MONTH: JULY

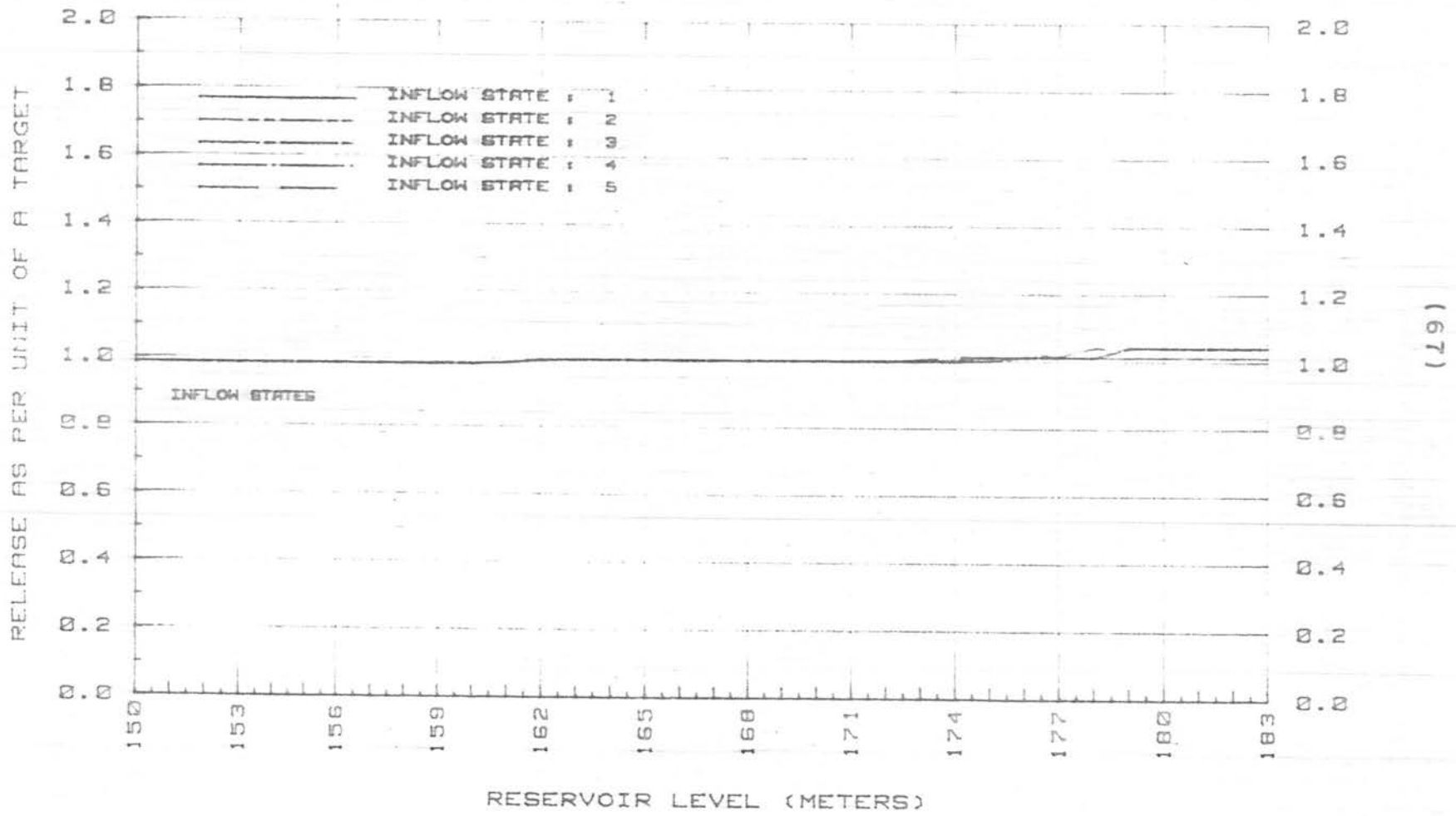


Fig. (C.19)

OPERATING POLICY FOR HIGH DAM RESERVOIR
DERIVED FROM STE Y STATE DYNAMIC PROGRAM
FOR MONTH: AUGUST

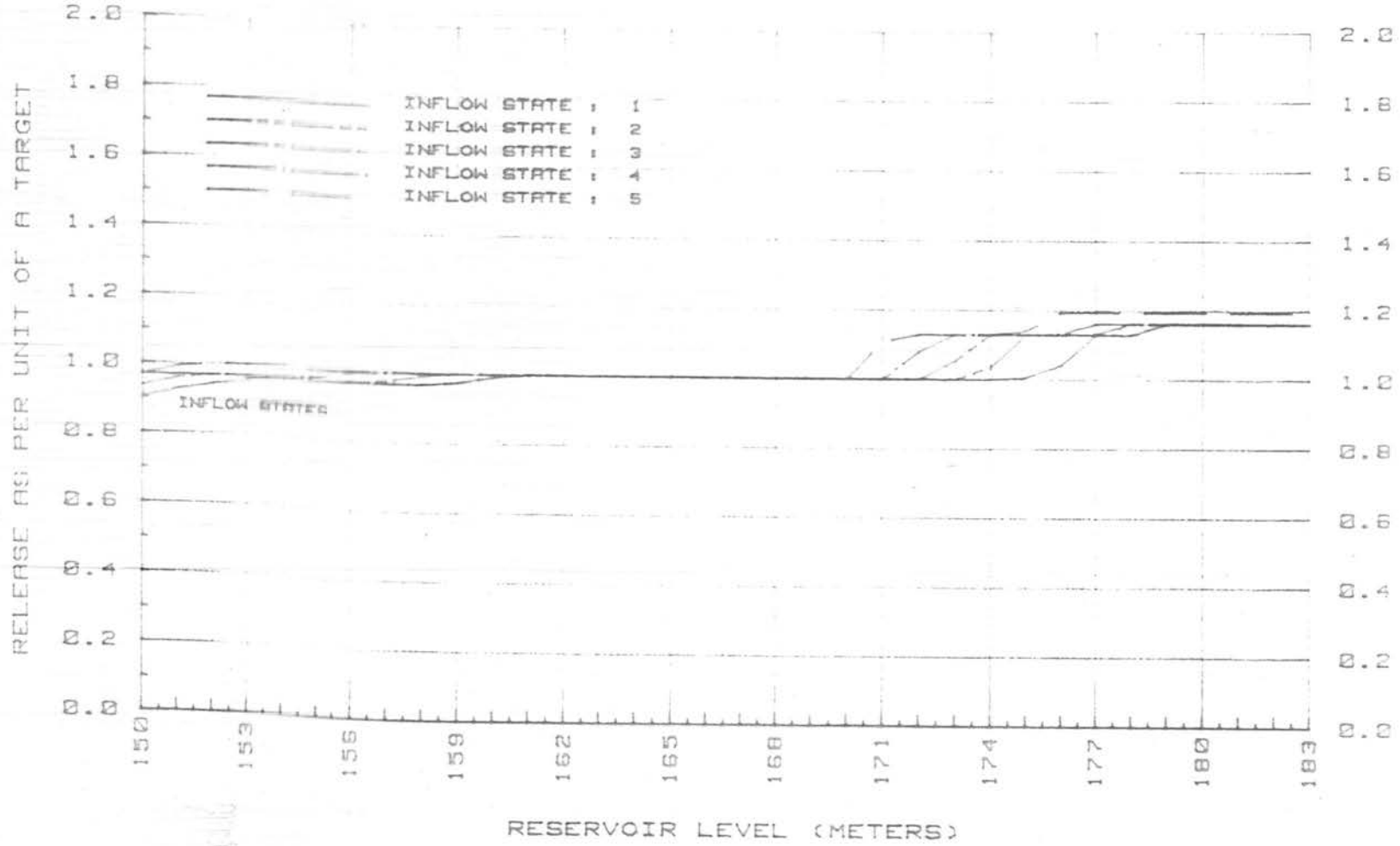


Fig. (C. 20)

OPERATING POLICY FOR HIGH DAM RESERVOIR
DERIVED FROM STEADY STATE DYNAMIC PROGRAM
FOR MONTH: SEPTEMBER

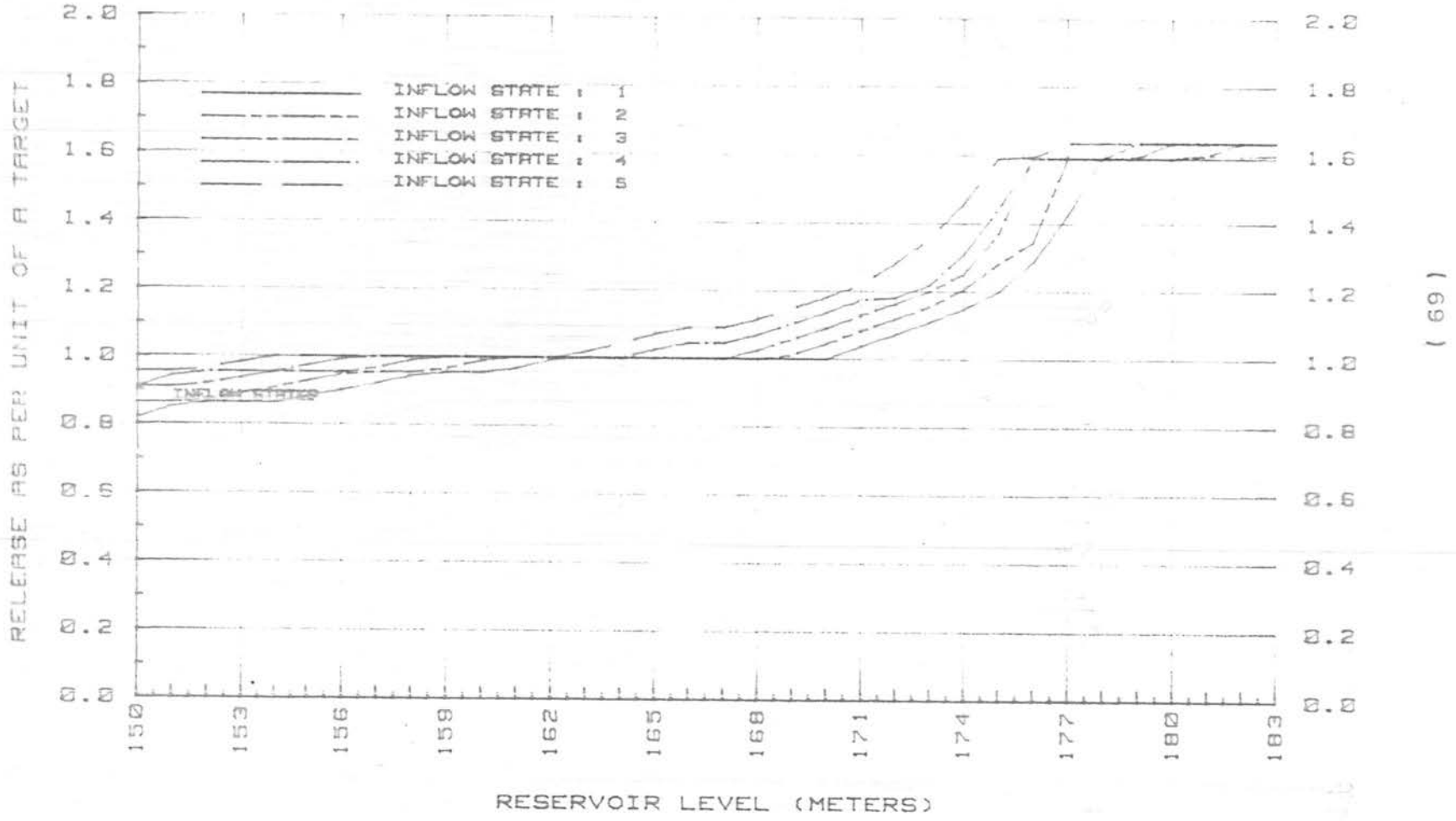
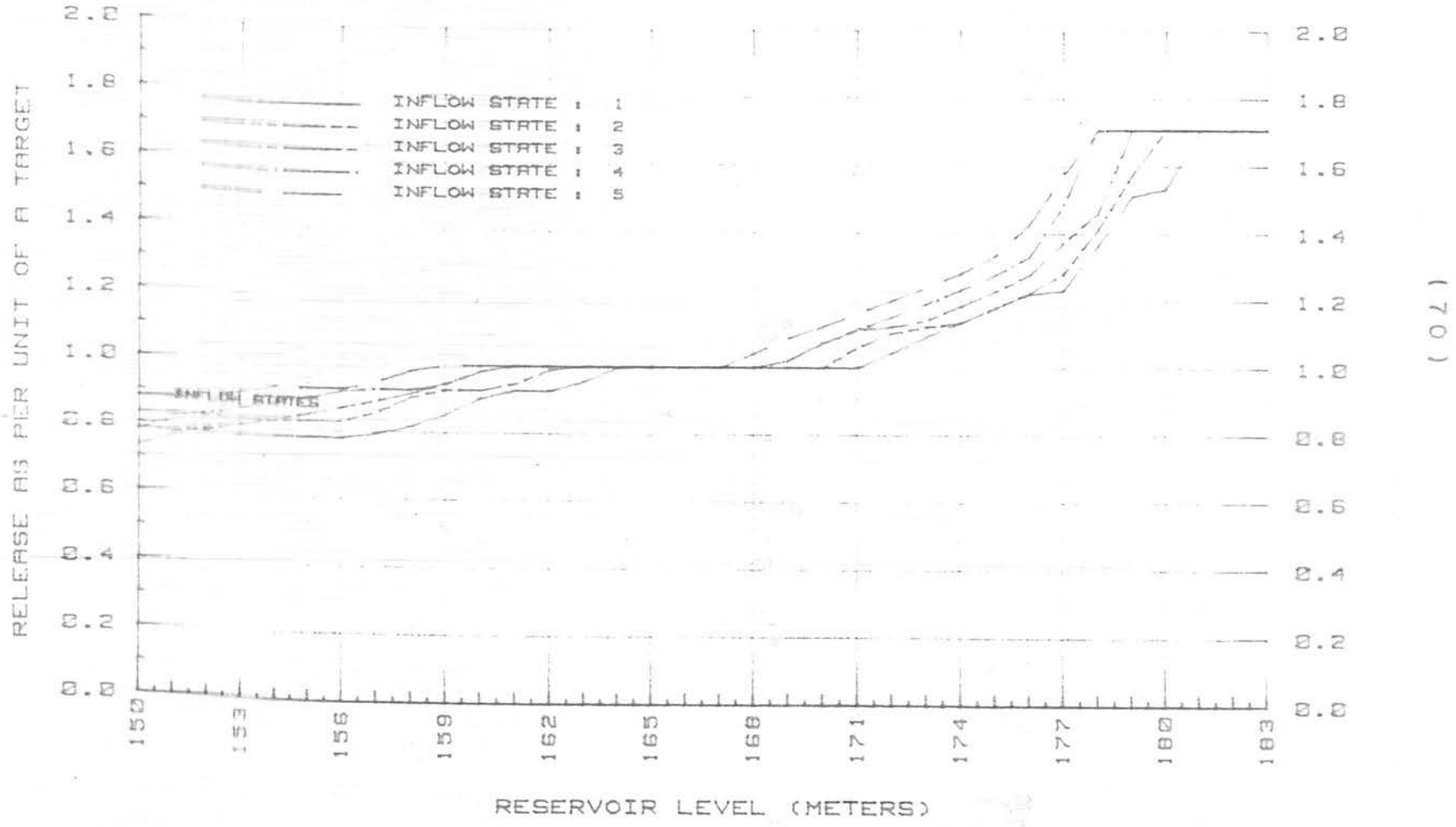


Fig. (C. 21)

OPERATING POLICY FOR HIGH DAM RESERVOIR
DERIVED FROM STEADY STATE DYNAMIC PROGRAM
FOR MONTH: OCTOBER



(70)

Fig. (C . 22)

OPERATING POLICY FOR HIGH DAM RESERVOIR

DERIVED FROM STEADY STATE DYNAMIC PROGRAM

FOR MONTH: NOVEMBER

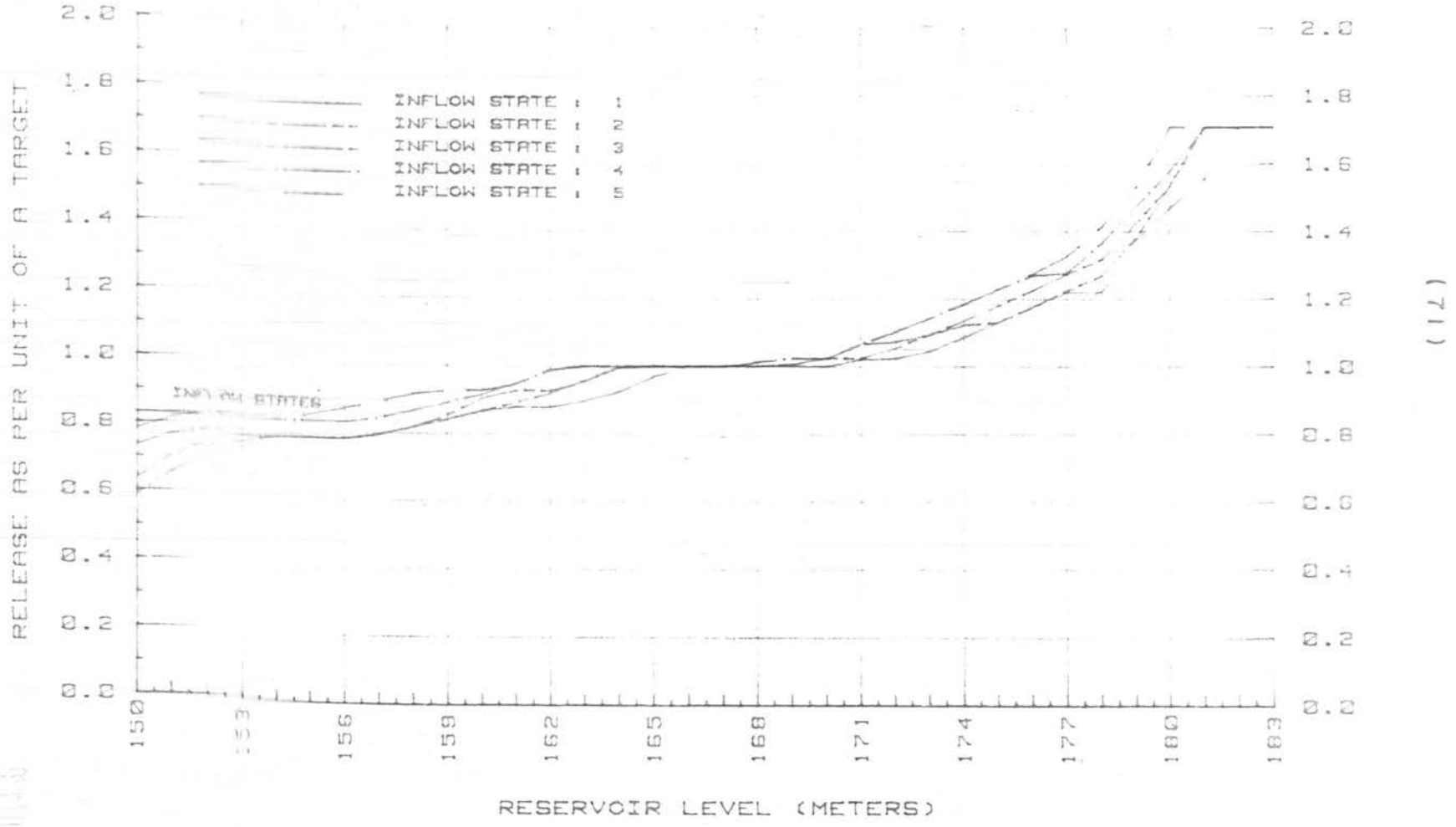


Fig. (C.23)

OPERATING POLICY FOR HIGH DAM RESERVOIR
DERIVED FROM STEADY STATE DYNAMIC PROGRAM
FOR MONTH: DECEMBER

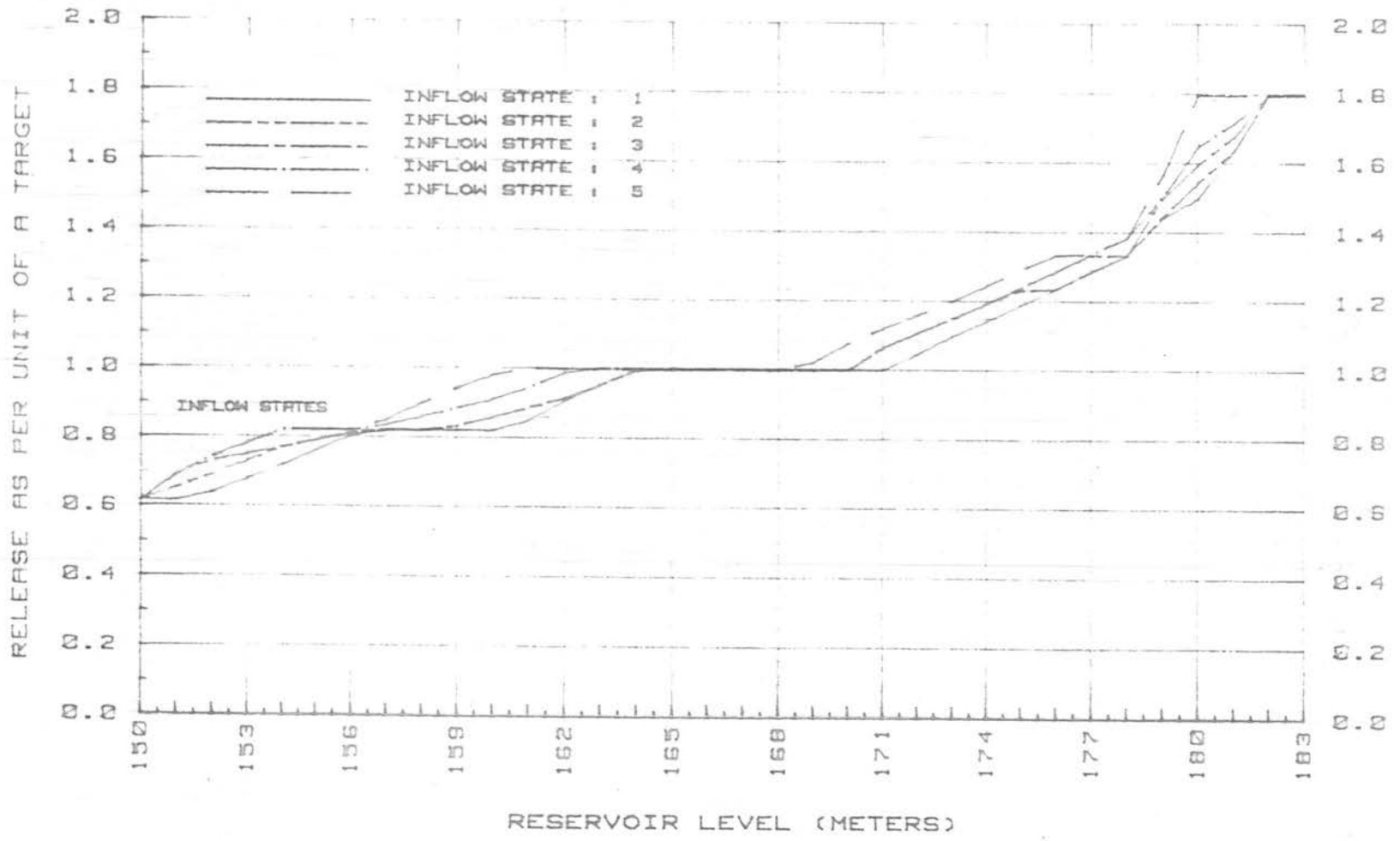


Fig. (C .24)

APPENDIX D

FUTURE OPERATING POLICY FOR THE HIGH ASWAN DAM AFTER ALL UPPER NILE PROJECTS COMPLETION USING DYNAMIC PROGRAM

D.1 SCENARIO IV

a.- EGYPTIAN DEMAND 64.5 MCM / ANNUM.

b.- SUDANESE ABSTRACTION 27.5 MCM / ANNUM.

c.- INFLOW CONDITIONS WITH ALL UPPER NILE PROJECTS.

d.- OPTIMIZING ENERGY PRODUCTION WHILE SATISFYING IRRIGATION CONSTRAINTS.

OPERATING POLICY FOR HIGH DAM RESERVOIR
DERIVED FROM STEADY STATE DYNAMIC PROGRAM
FOR MONTH: JANUARY

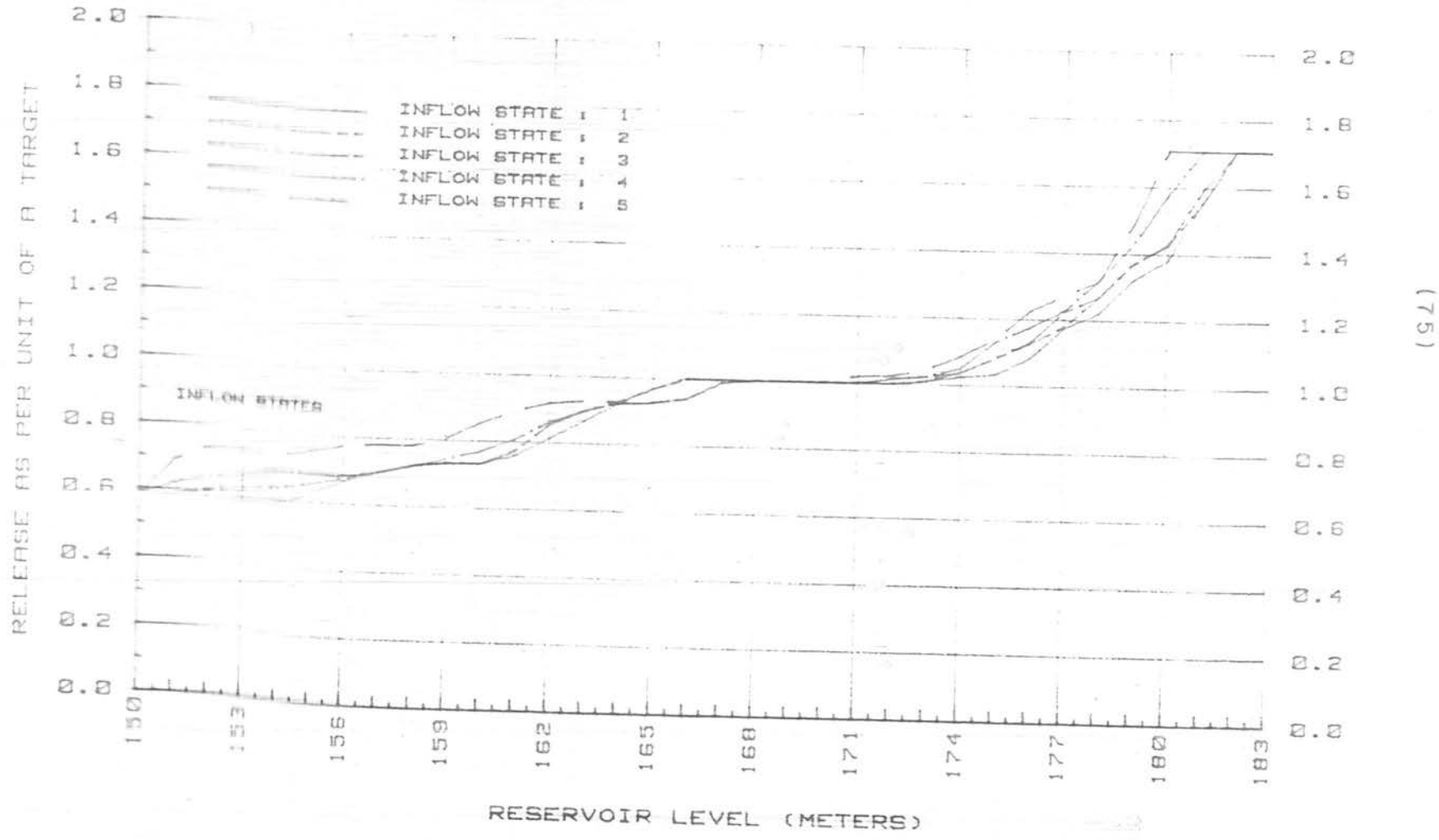


Fig. (D.1)

OPERATING POLICY FOR HIGH DAM RESERVOIR

DERIVED FROM STEADY STATE DYNAMIC PROGRAM

FOR MONTH:FEBRUARY

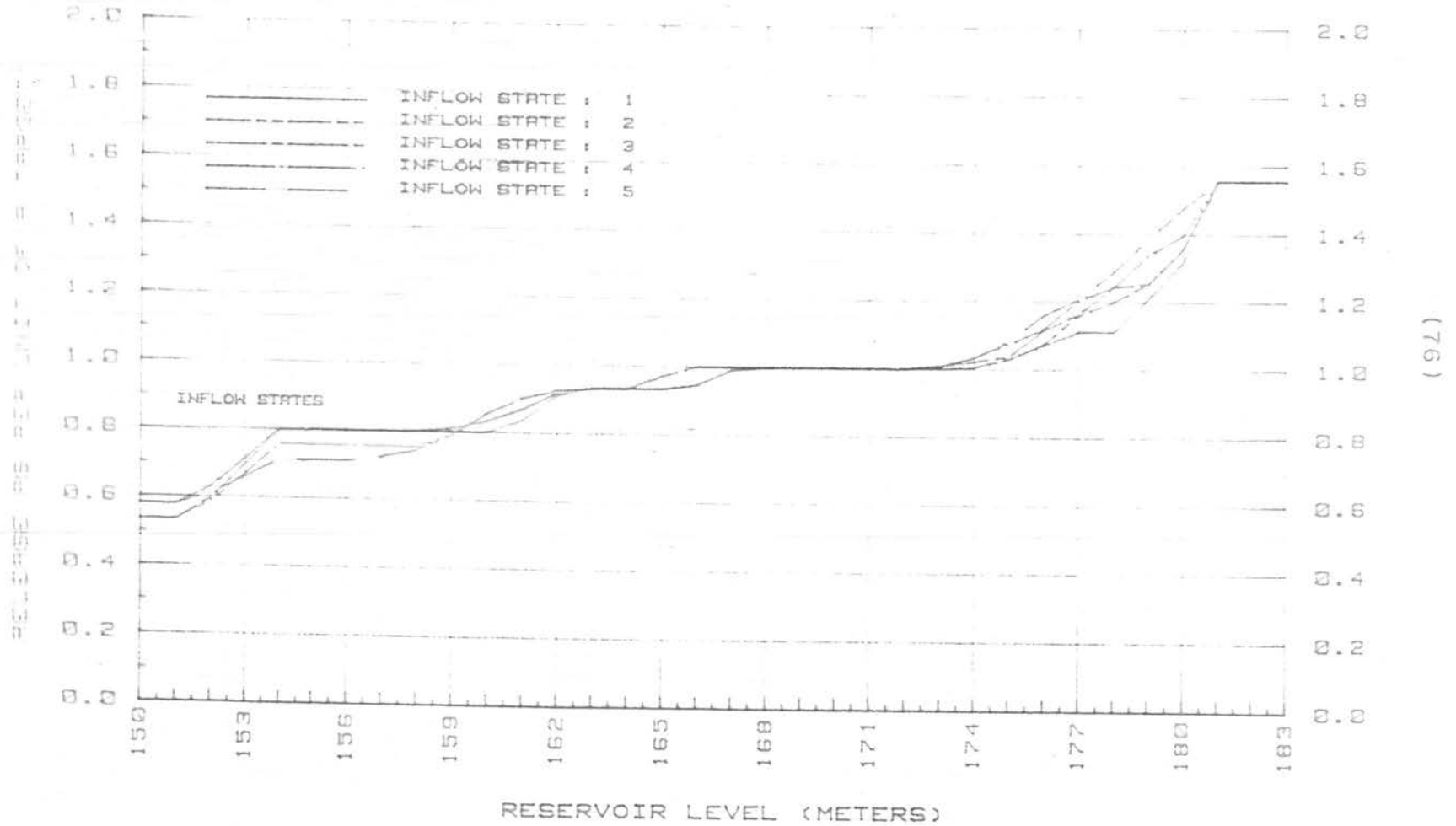


Fig. (D. 2)

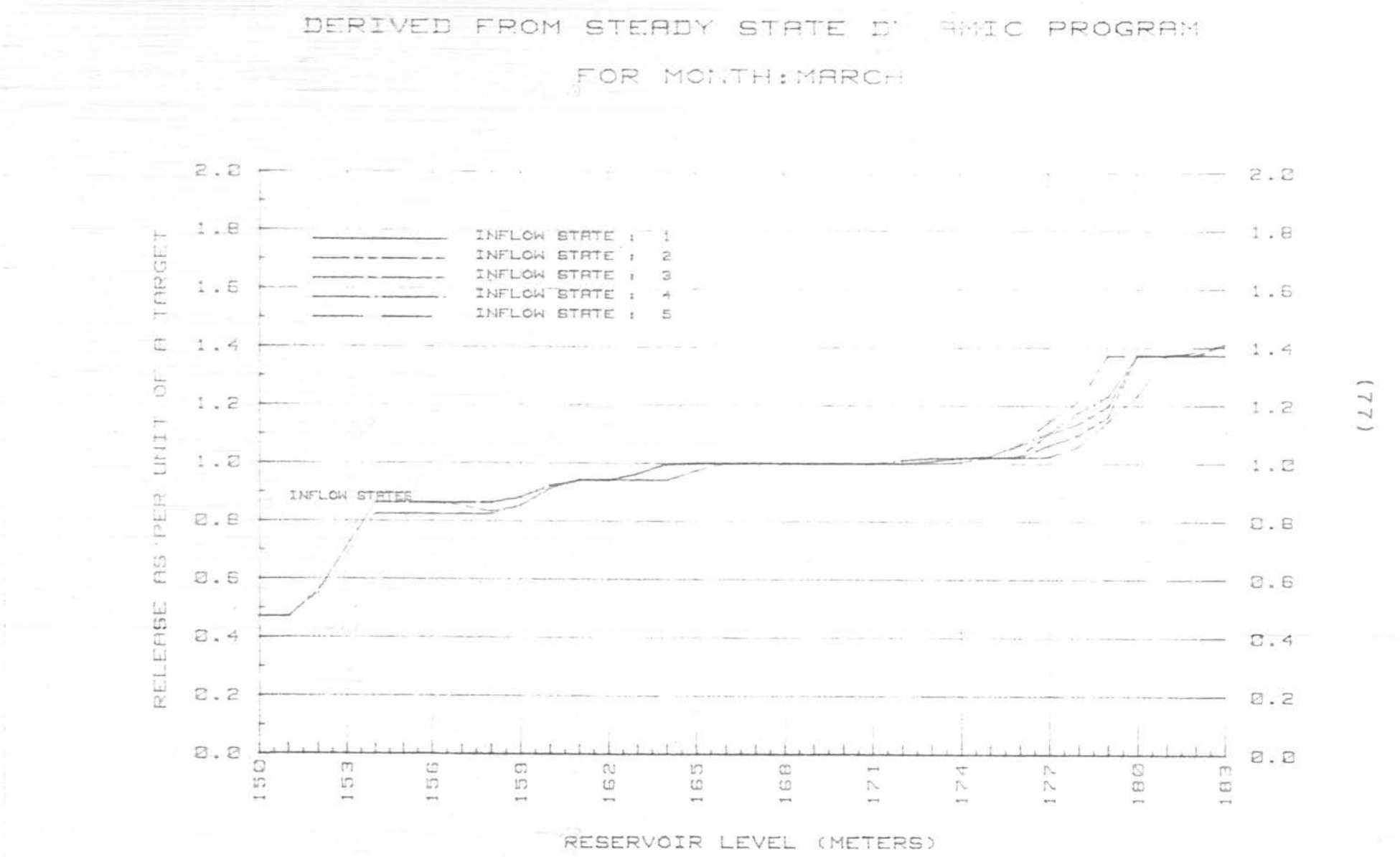
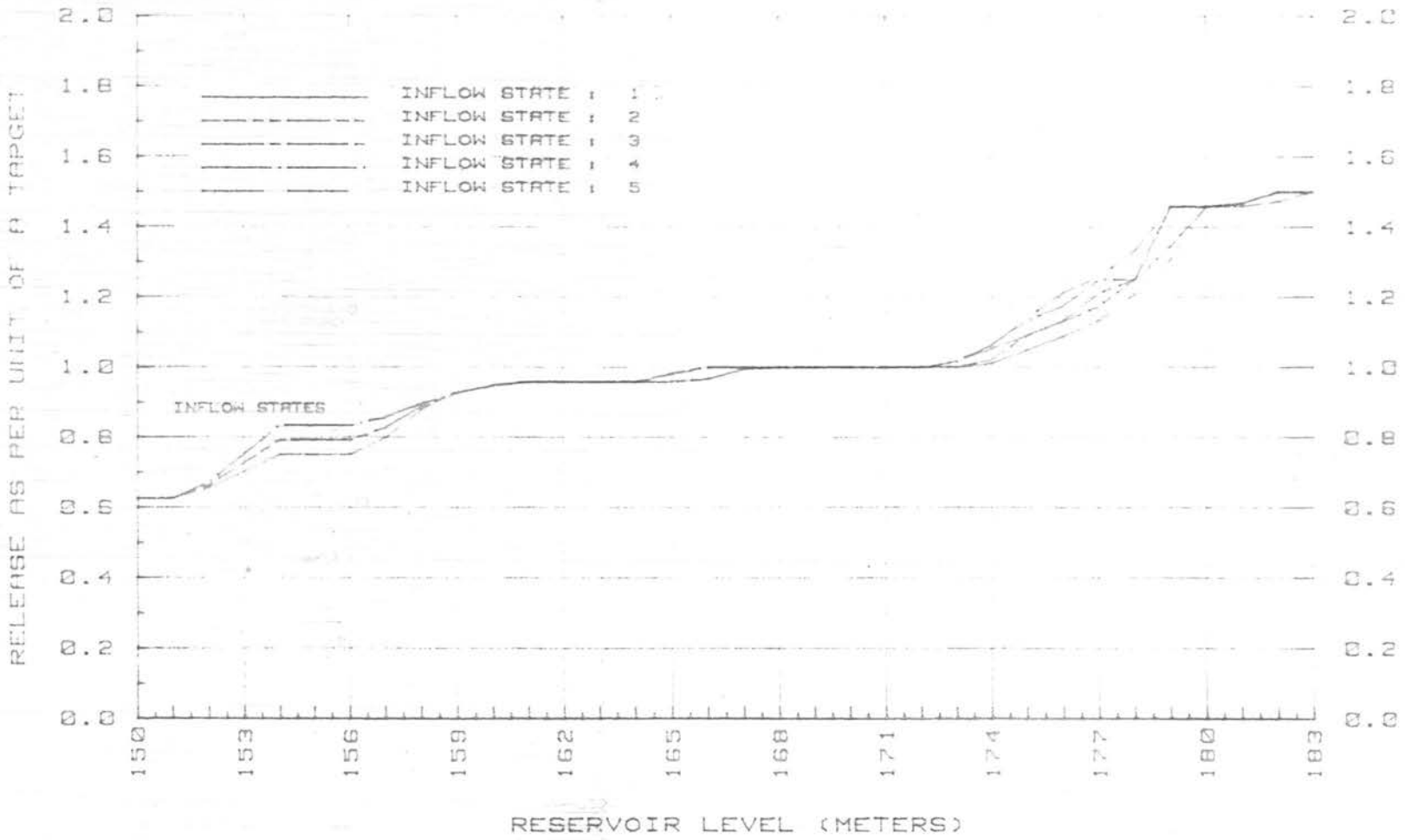

OPERATING POLICY FOR HIGH DAM RESERVOIR
DERIVED FROM STEADY STATE D' AMIC PROGRAM
FOR MONTH:MARCH
INFLOW STATE : 1
INFLOW STATE : 2
INFLOW STATE : 3
INFLOW STATE : 4
INFLOW STATE : 5
INFLOW STATES
RELEASE AS PER UNIT OF A TARGET
RESERVOIR LEVEL (METERS)
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
150
153
156
159
162
165
168
171
174
177
180
183

Fig. (D . 3)

OPERATING POLICY FOR HIGH DAM RESERVOIR

DERIVED FROM STEADY STATE DYNA[illegible] PROGRAM

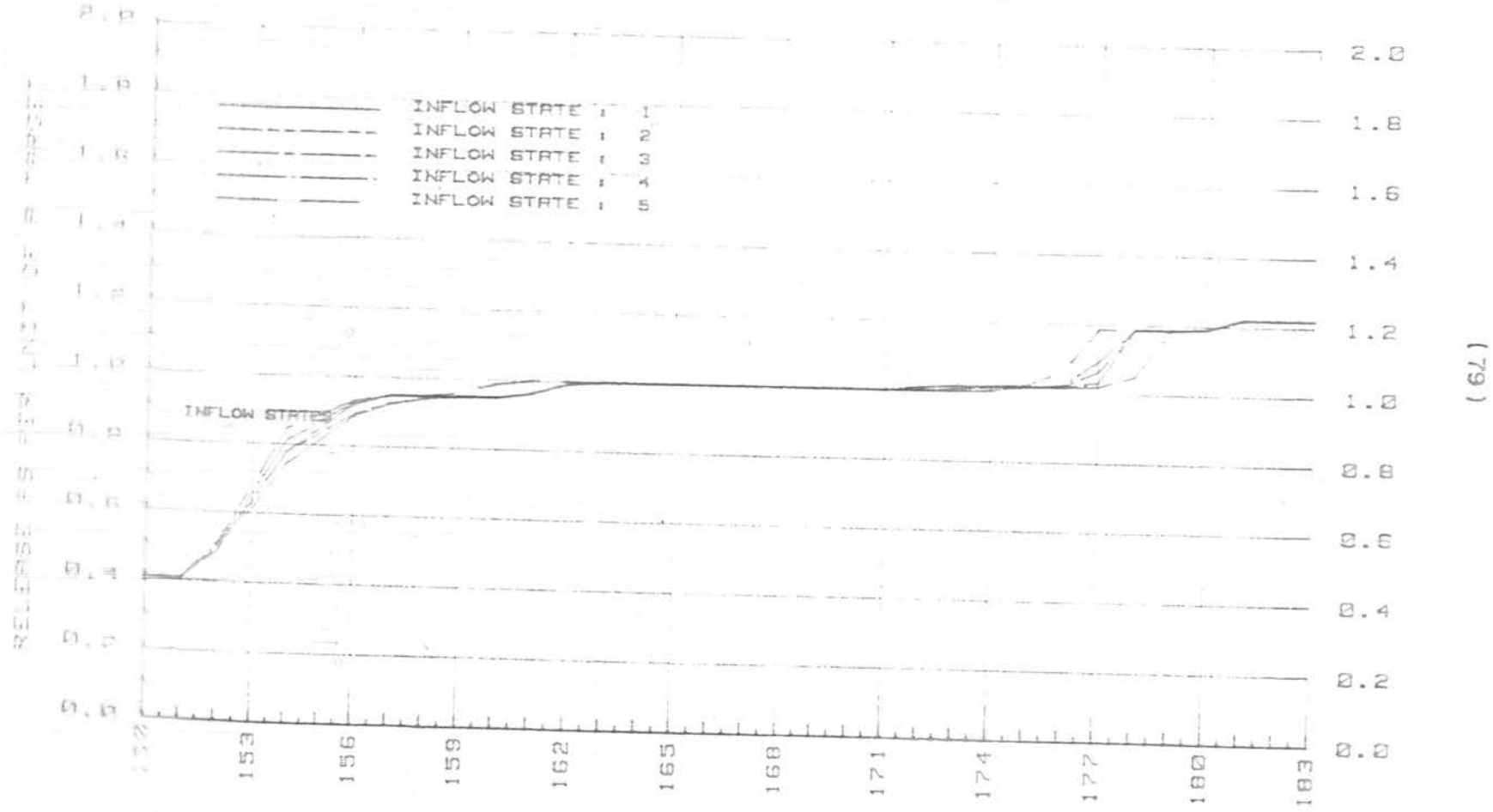
FOR MONTH: APRIL



SCENARIO IV

Fig. (D.4)

OPERATING POLICY FOR HIGH DAM RESERVOIR
DERIVED FROM STEADY STATE DYNAMIC PROGRAM
FOR MONTH: MAY



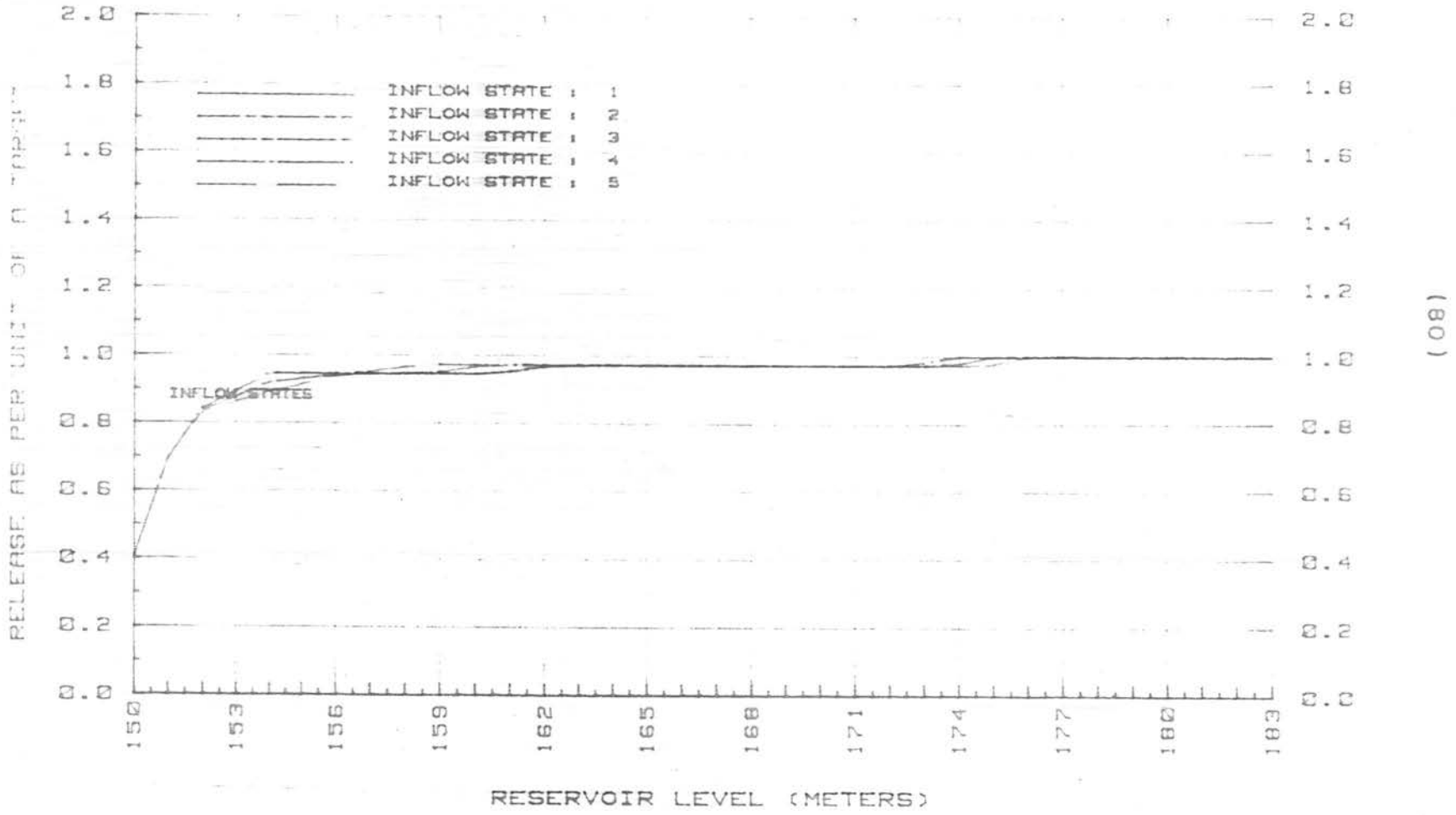
(67)

Fig. (D.5)

OPERATING POLICY FOR HIGH DAM RESERVOIR

DERIVED FROM STEADY STATE DYNAMIC PROGRAM

FOR MONTH: JUNE



(80)

Fig. (D .6)

OPERATING POLICY FOR HIGH DAM RESERVOIR
DERIVED FROM STEADY STATE DYNAMIC PROGRAM
FOR MONTH: JULY

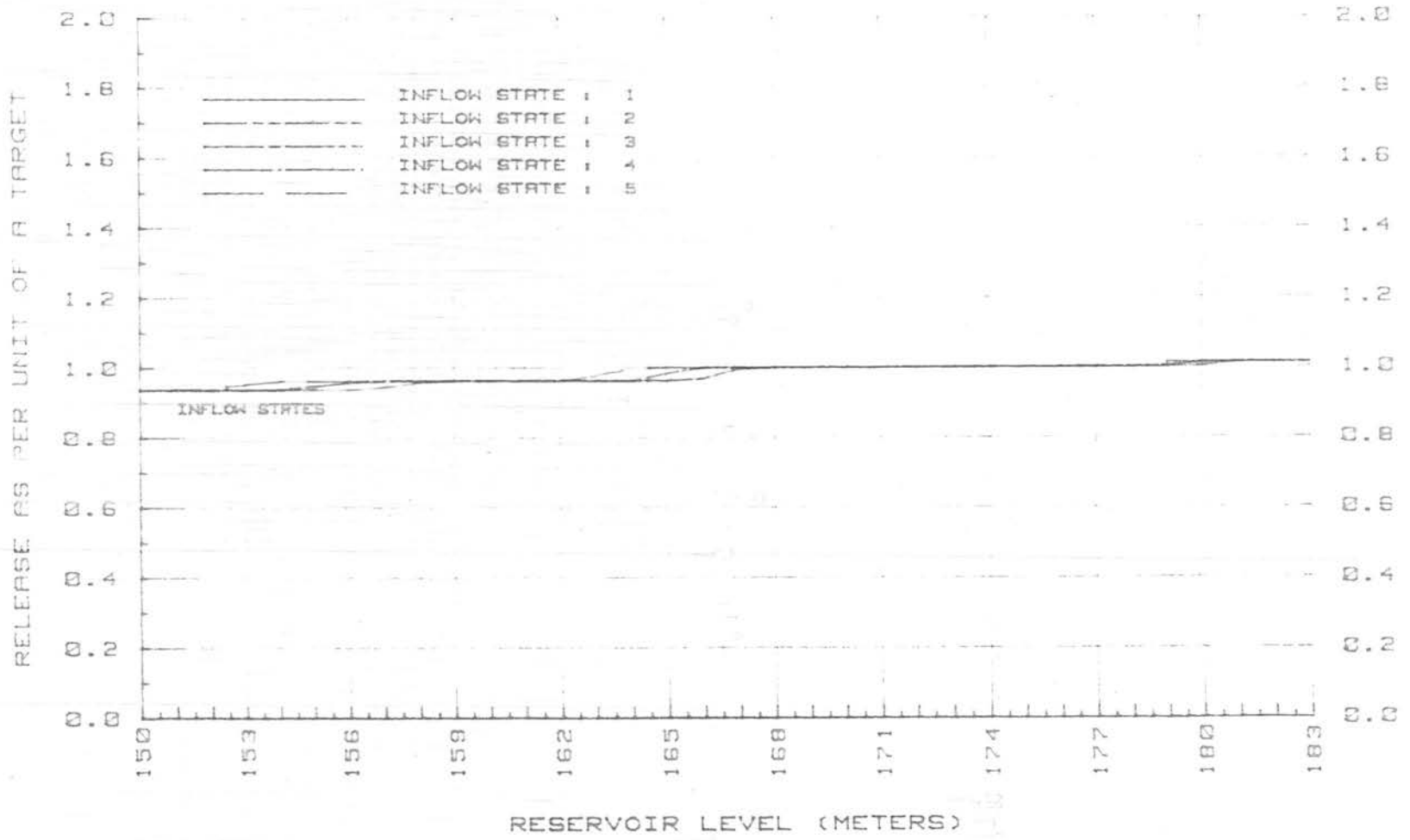


Fig. (D.7)

OPERATING POLICY FOR HIGH DAM RESERVOIR

DERIVED FROM STERDY STATE DYNAMIC PROGRAM

FOR MONTH: JULY

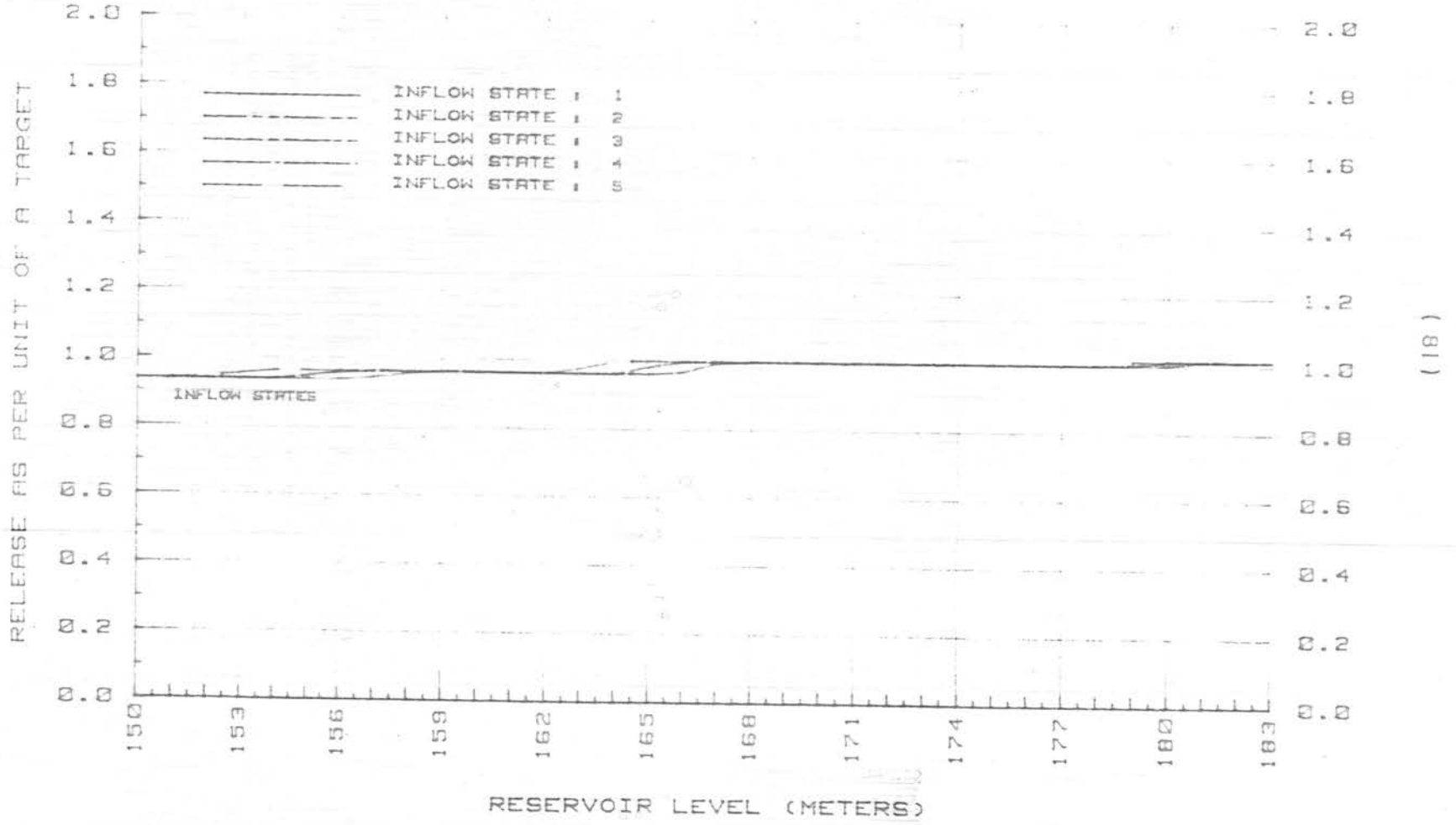


Fig. (D.7)

OPERATING POLICY FOR HIGH DAM RESERVOIR
DERIVED FROM STEADY STATE DYNAMIC PROGRAM
FOR MONTH: SEPTEMBER

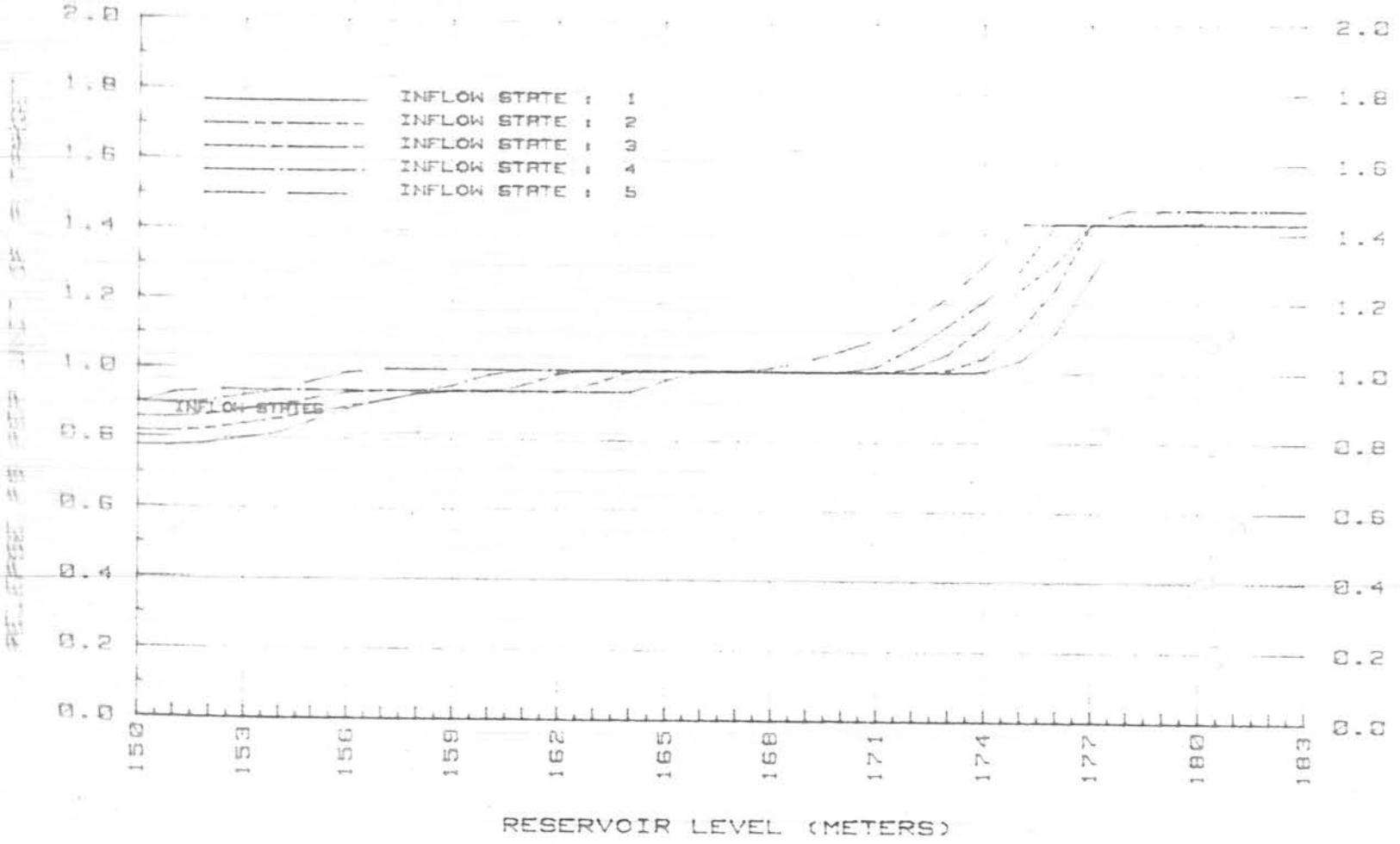


Fig. (D.9)

OPERATING POLICY FOR HIGH DAM RESERVOIR

DERIVED FROM STEAI STATE DYNAMIC PROGRAM

FOR MONTH:OCTOBER

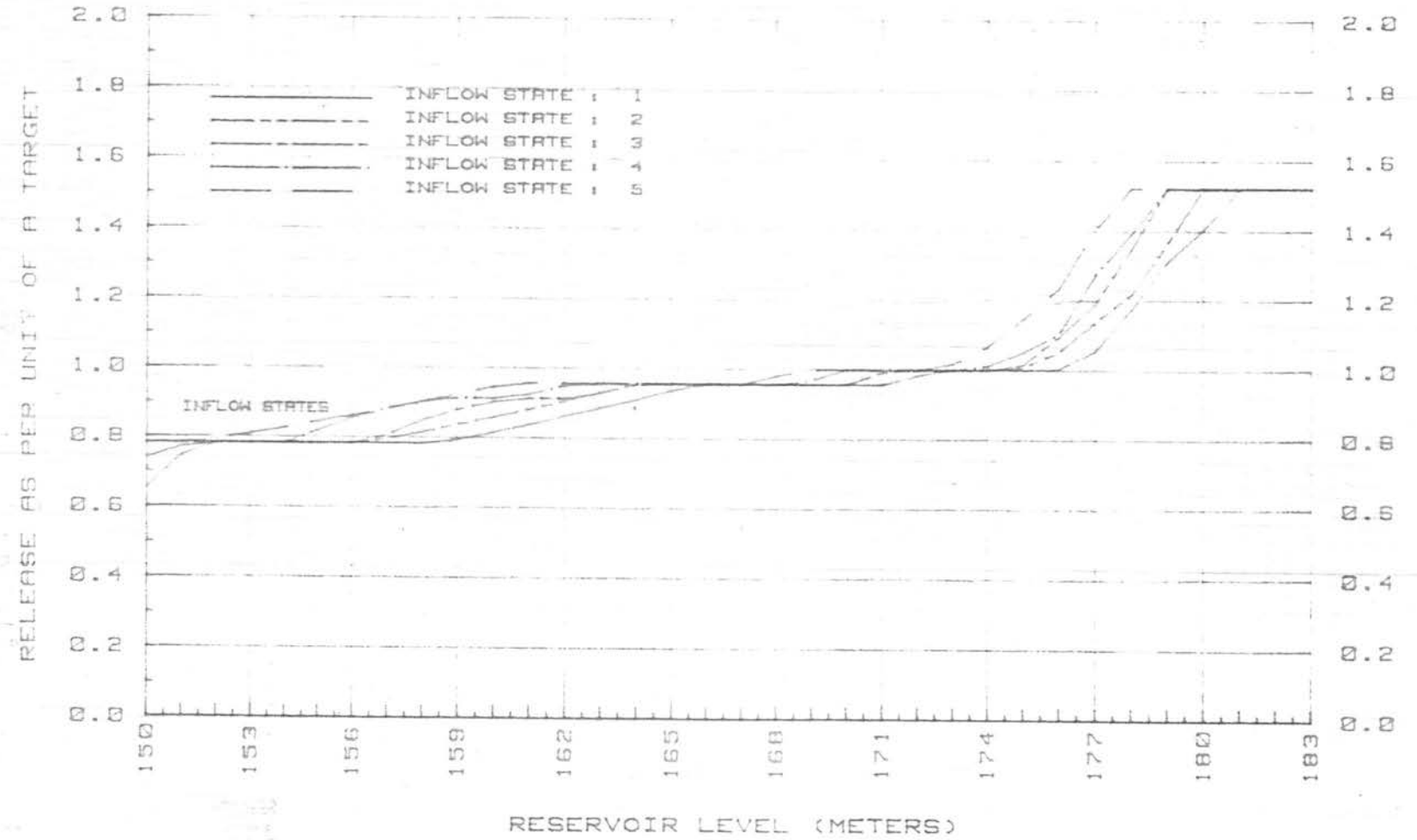


Fig. (D .10)

OPERATING POLICY FOR HIGH DAM RESERVOIR

DERIVED FROM STEADY STATE DYNAMIC PRO RAM

FOR MONTH: NOVEMBER

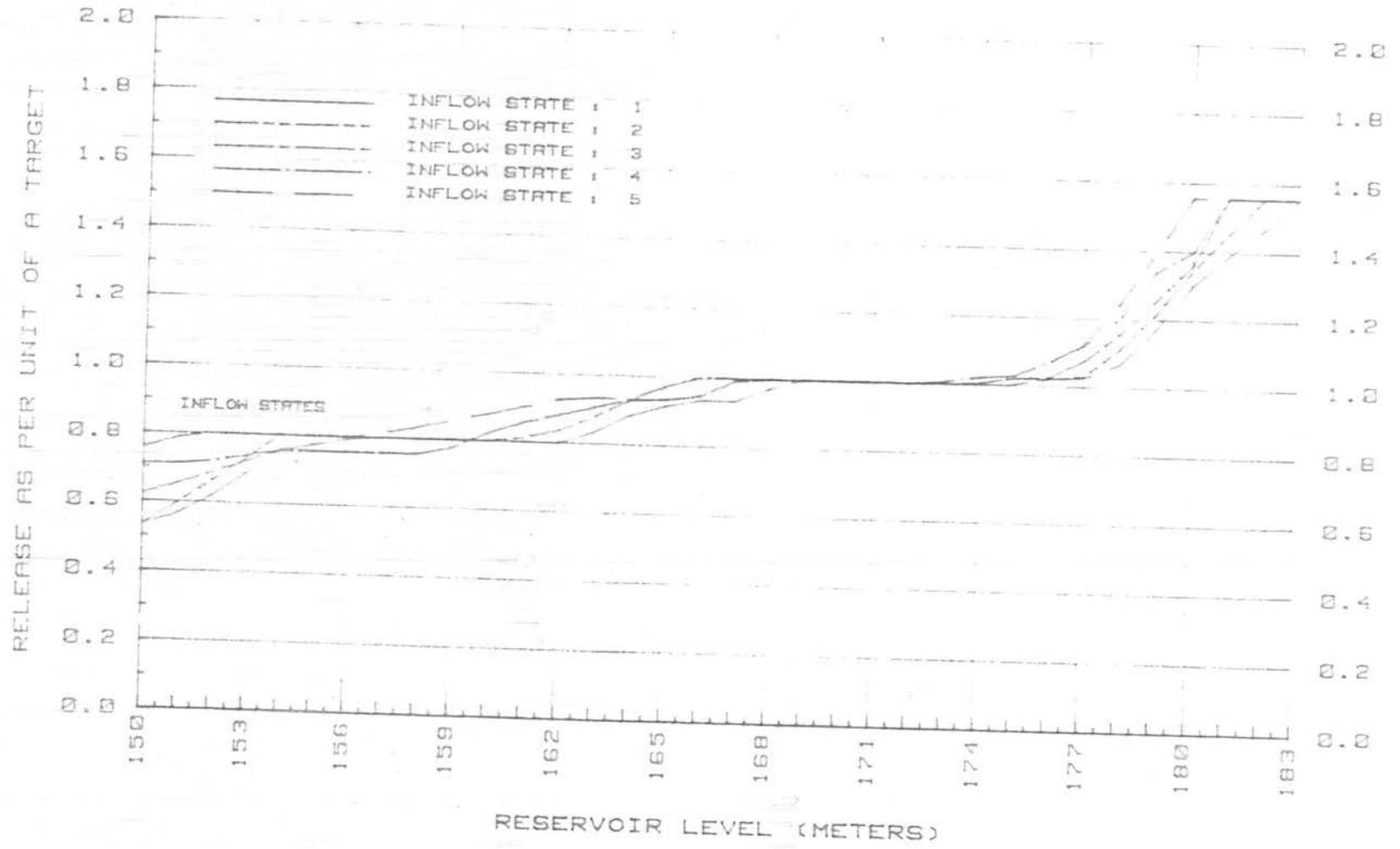


Fig. (D.II)

OPERATING POLICY FOR HIGH DAM RESERVOIR
DERIVED FROM STEADY STATE DYNAMIC PROGRAM
FOR MONTH: DECEMBER

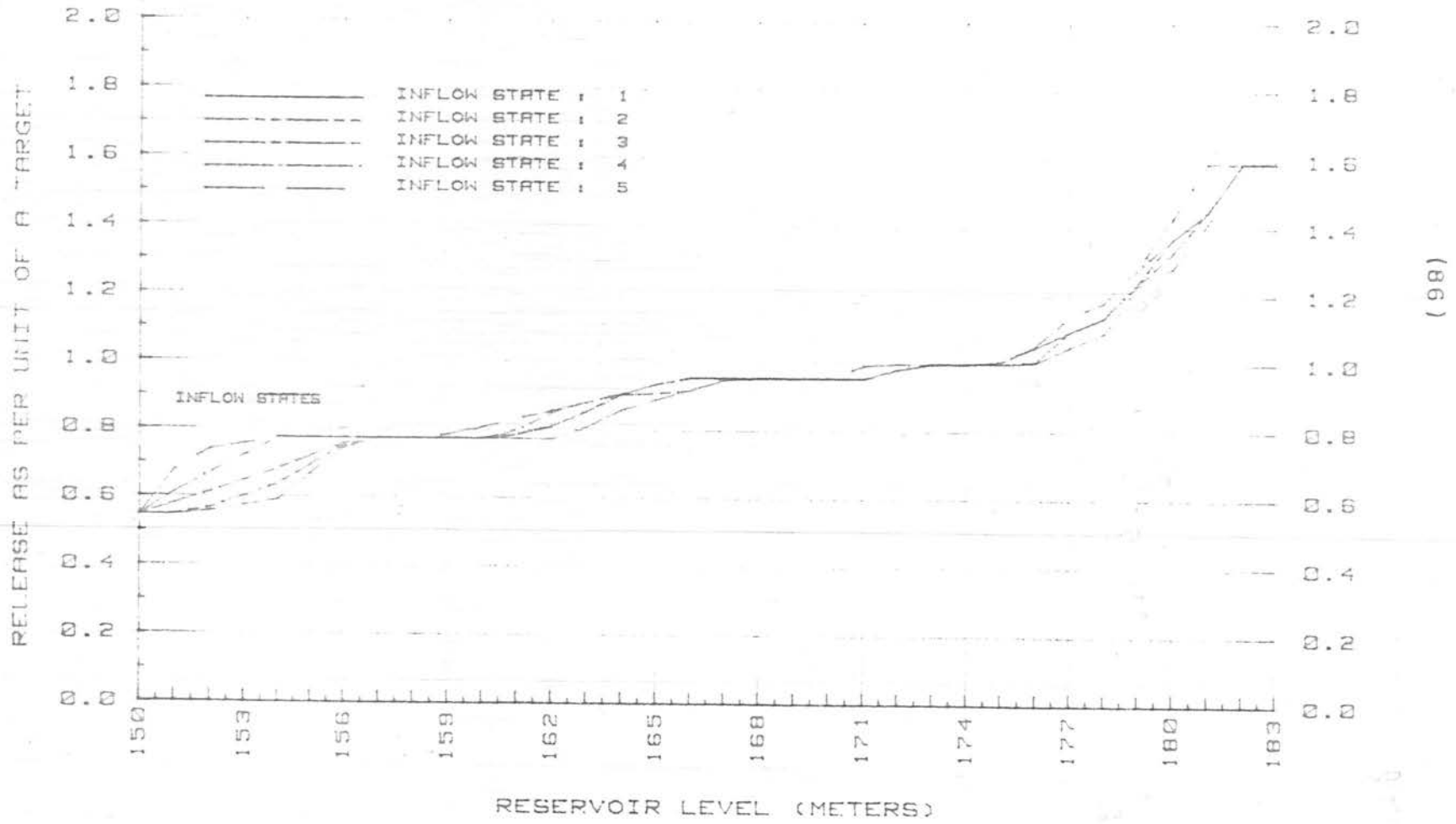


Fig. (D.12)

D. 2 . SCENARIO V

a _ EGYPTION DEMAND 63.9 MGM / ANNUM.

b_ SUDANESE ABSTRACTION 18.5 MCM / ANNUM.

c _ INFLOWCONDITIONS WITH ALL UPPER NILE PROJECTS

d_ OPTIMIZING ENERGY PRODUCTION WHILE SATISFYING IRRIGATION CONSTRAINTS.

OPERATING POLICY FOR HIGH DAM RESERVOIR DERIVED FROM STEADY STATE DYNAMIC PROGRAM FOR MONTH: JANUARY

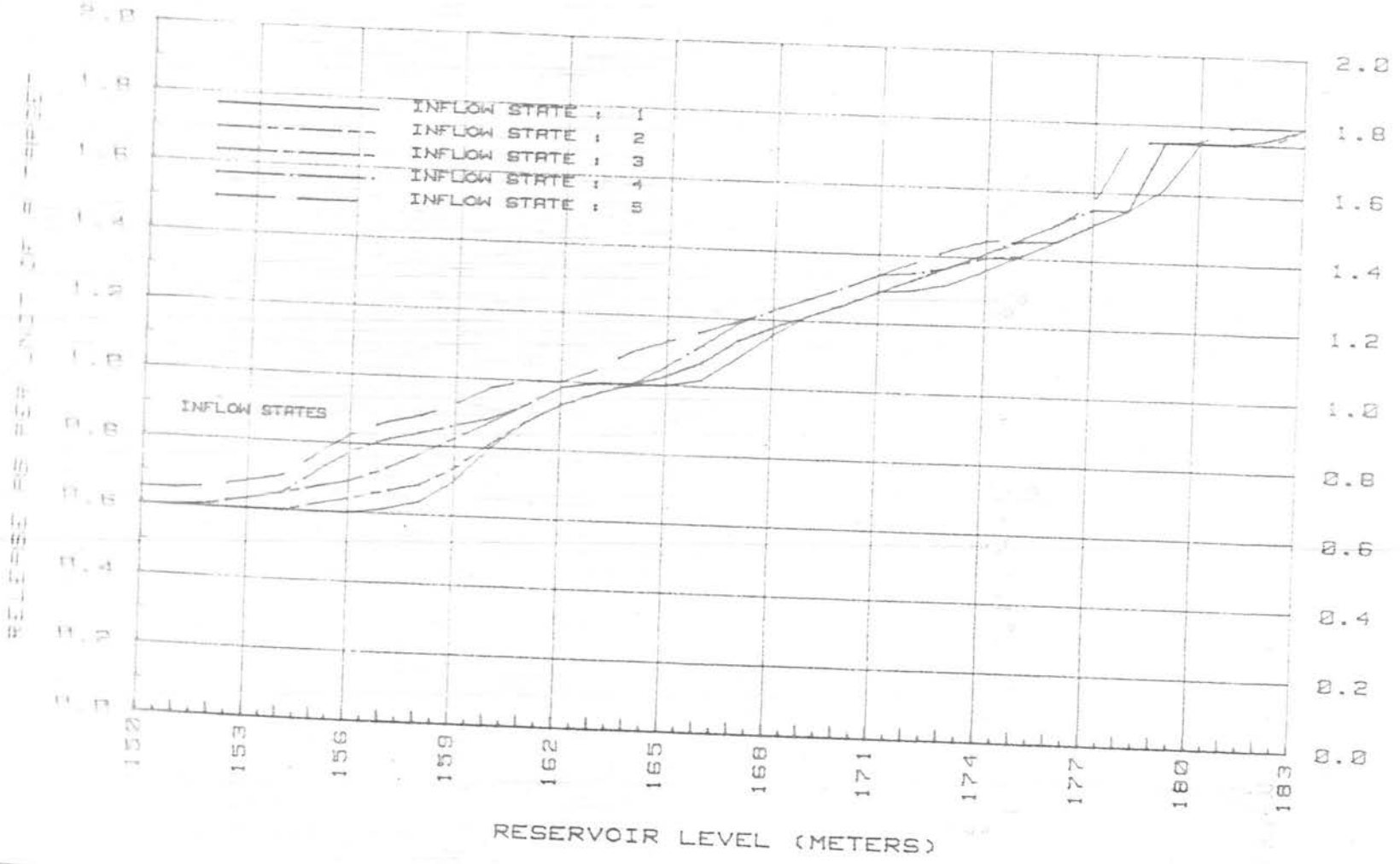


Fig. (D.13)

OPERATING POLICY FOR HIGH DAM RESERVOIR DERIVED FROM STEADY STATE DYNAMIC PROGRAM FOR MONTH: FEBRUARY

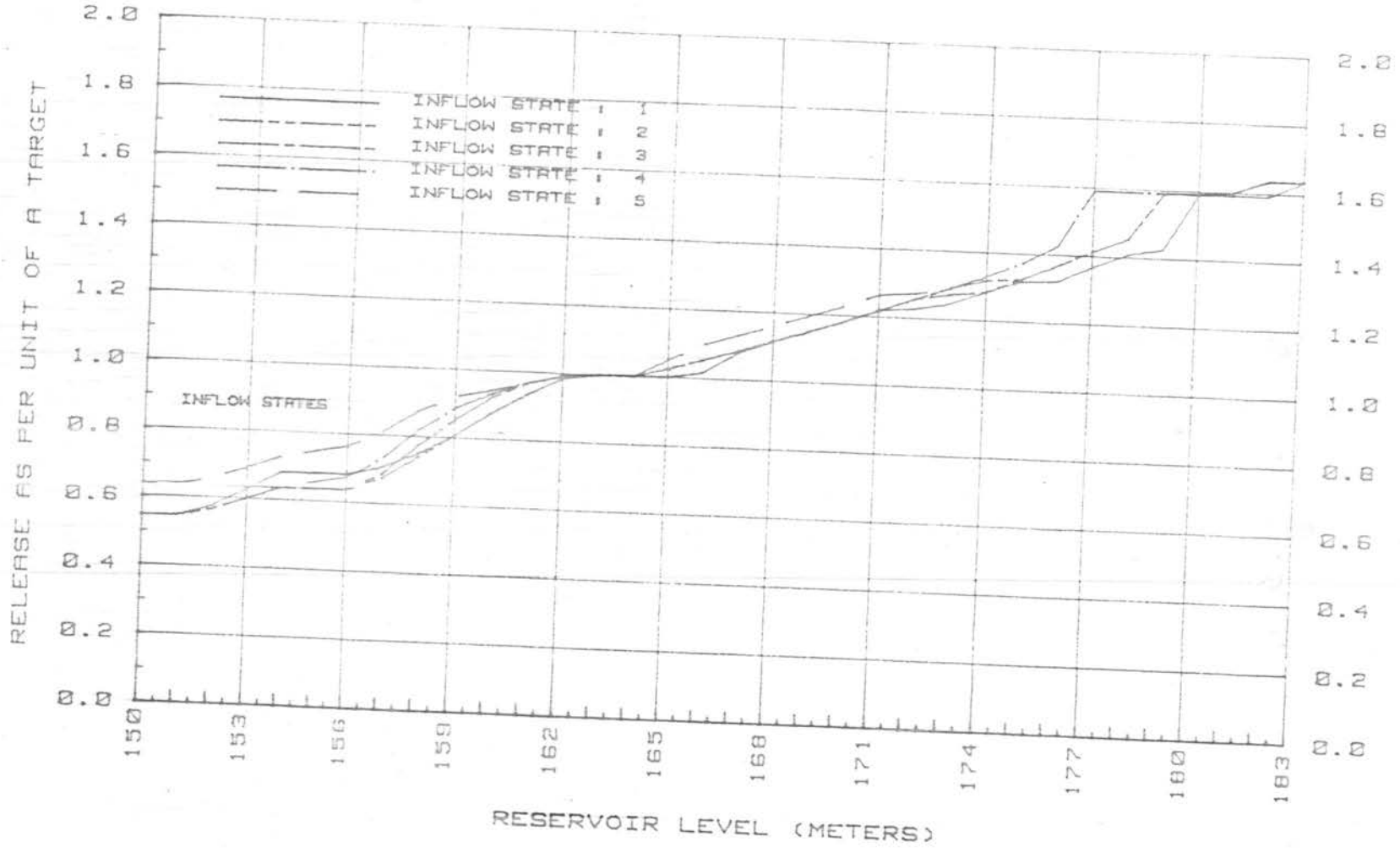


Fig. (D.14)

OPERATING POLICY FOR HIGH DAM RESERVOIR

DERIVED FROM STEADY STATE DYNAMIC PROGRAM

FOR MONTH: MARCH

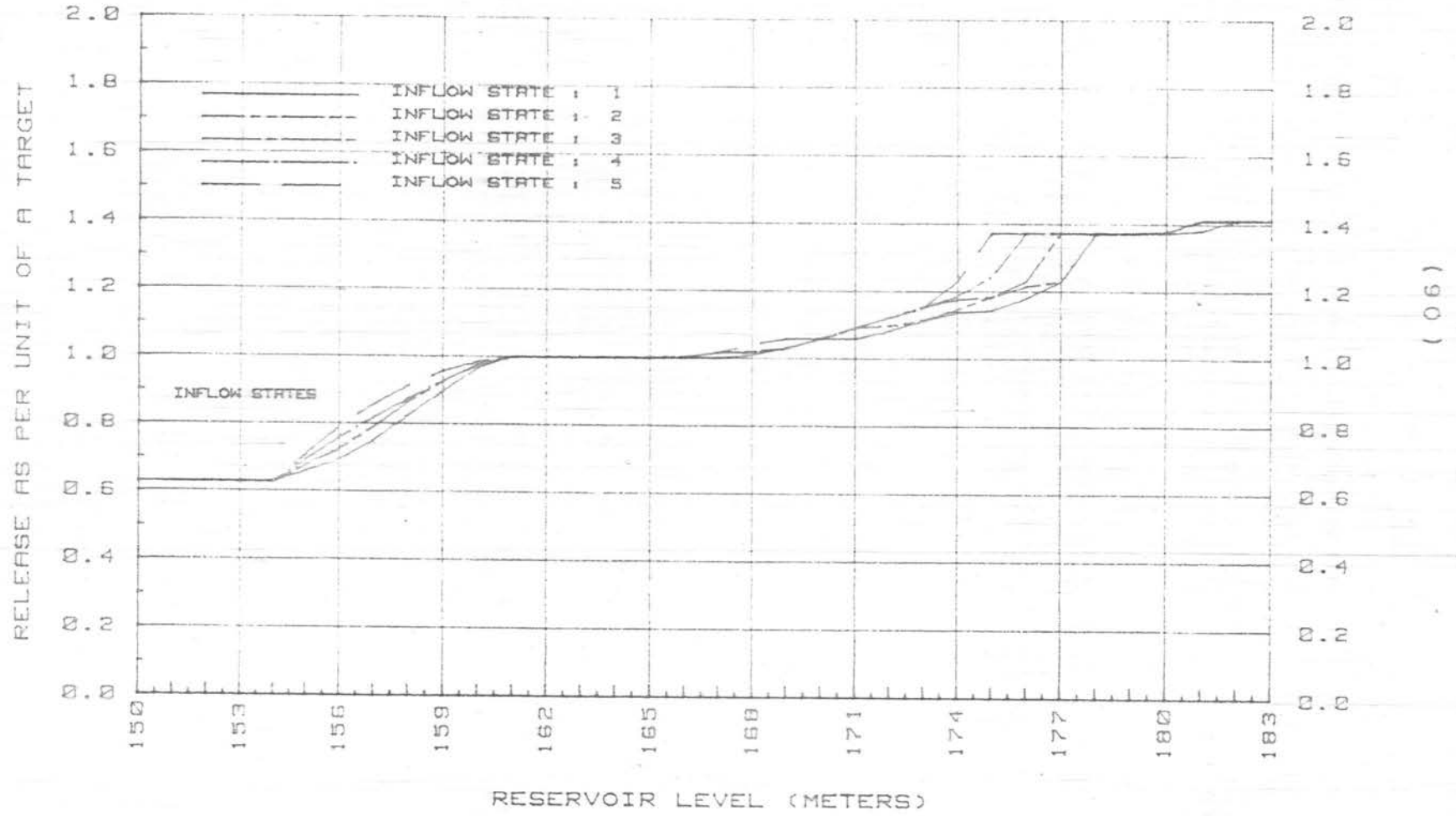


Fig. (D.15)

OPERATING POLICY FOR HIGH DAM RESERVOIR DERIVED FROM STEADY STATE DYNAMIC PROGRAM FOR MONTH: APRIL

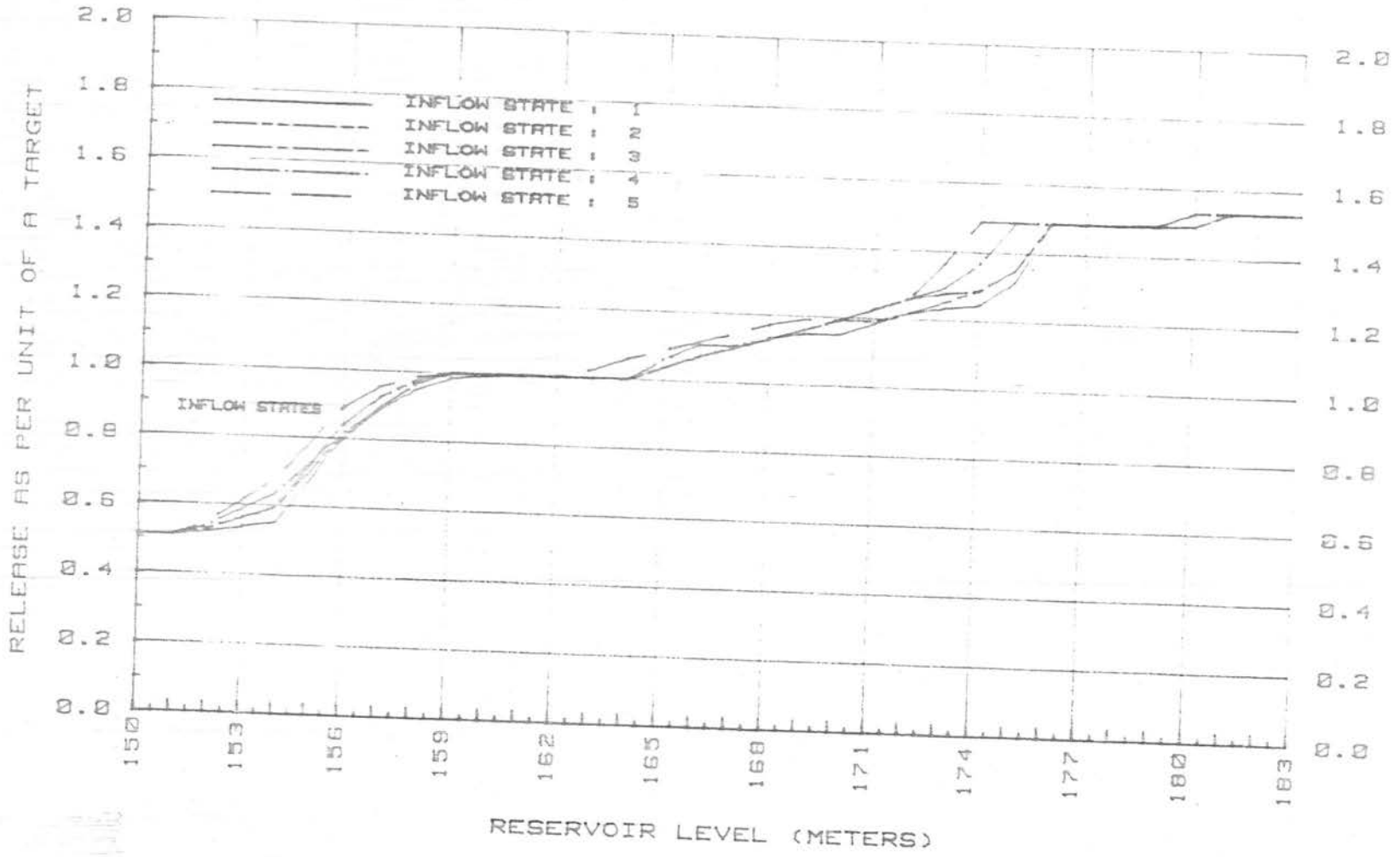


Fig. (D.6)

OPERATING POLICY FOR HIGH DAM RESERVOIR
DERIVED FROM STEADY STATE DYNAMIC PROGRAM
FOR MONTH: MAY

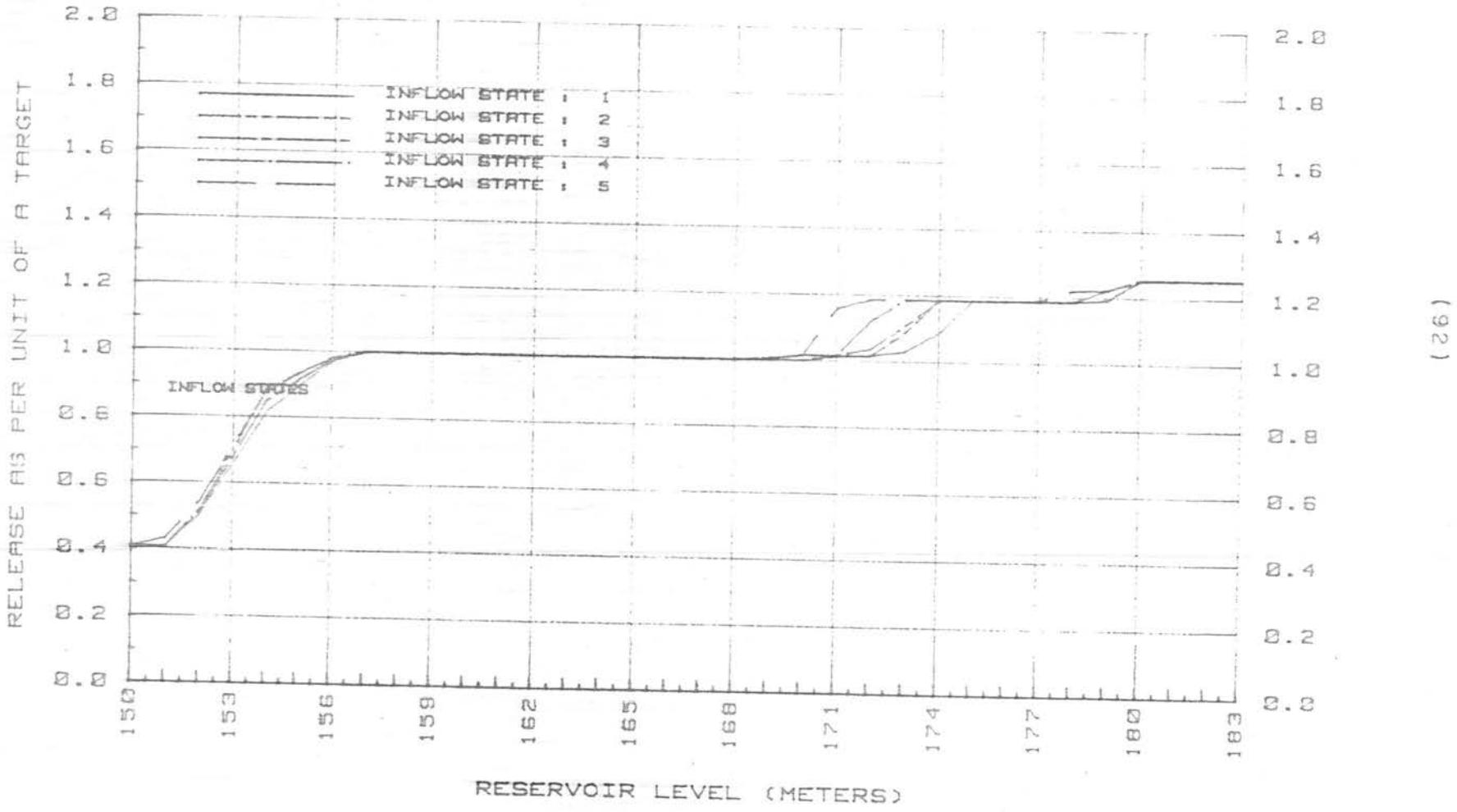


Fig. (D .17)

OPERATING POLICY FOR HIGH DAM RESERVOIR
DERIVED FROM STEADY STATE DYNAMIC PROGR
FOR MONTH: JUNE

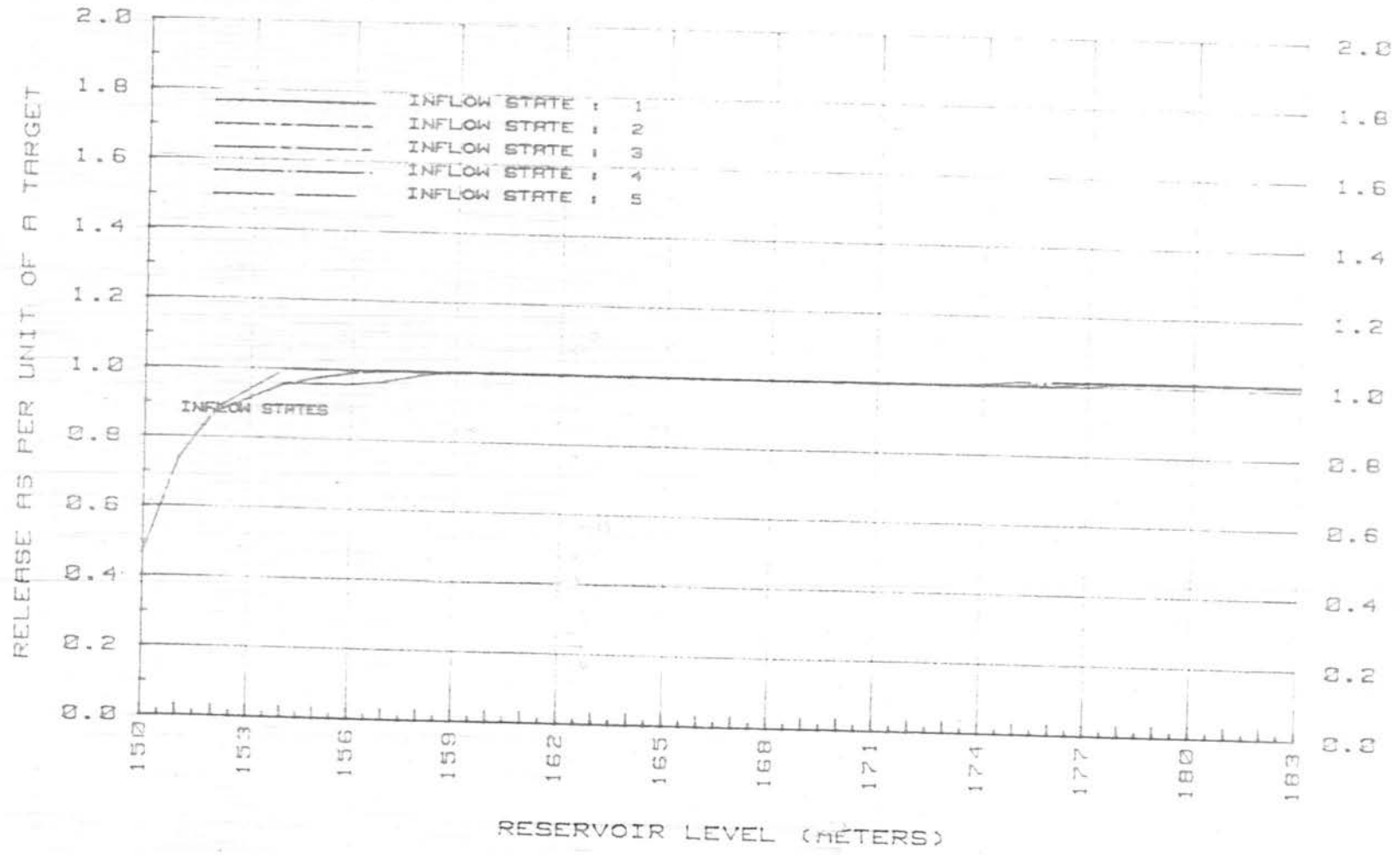


Fig. (D. 18)

OPERATING POLICY FOR HIGH DAM RESERVOIR
DERIVED FROM STEADY STATE DYNAMIC PROGRAM
FOR MONTH: JULY

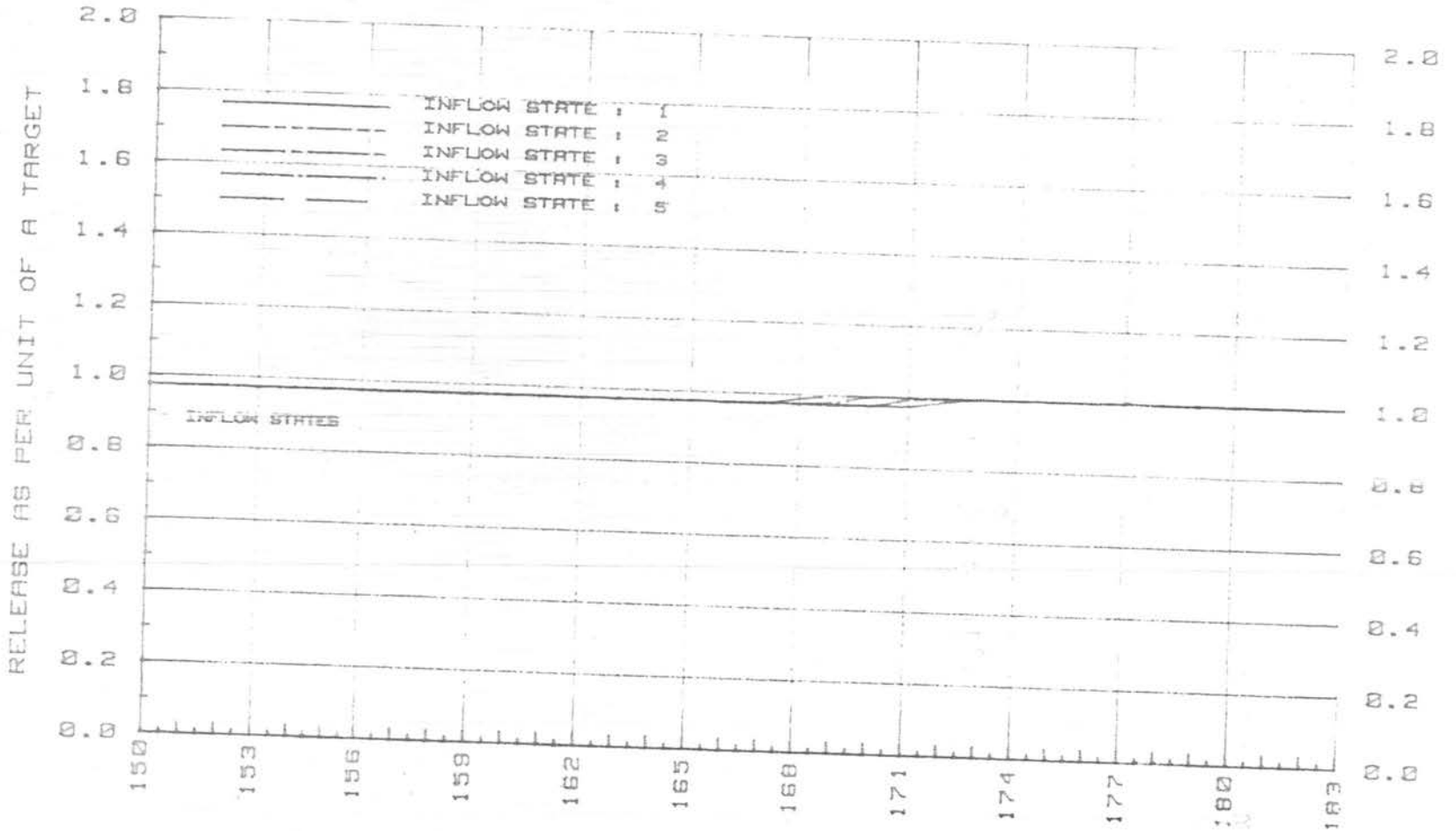


Fig. (D.19)

OPERATING POLICY FOR HIGH DAM RESERVOIR
DERIVED FROM STEADY STATE DYNAMIC PROGRAM
FOR MONTH: AUGUST

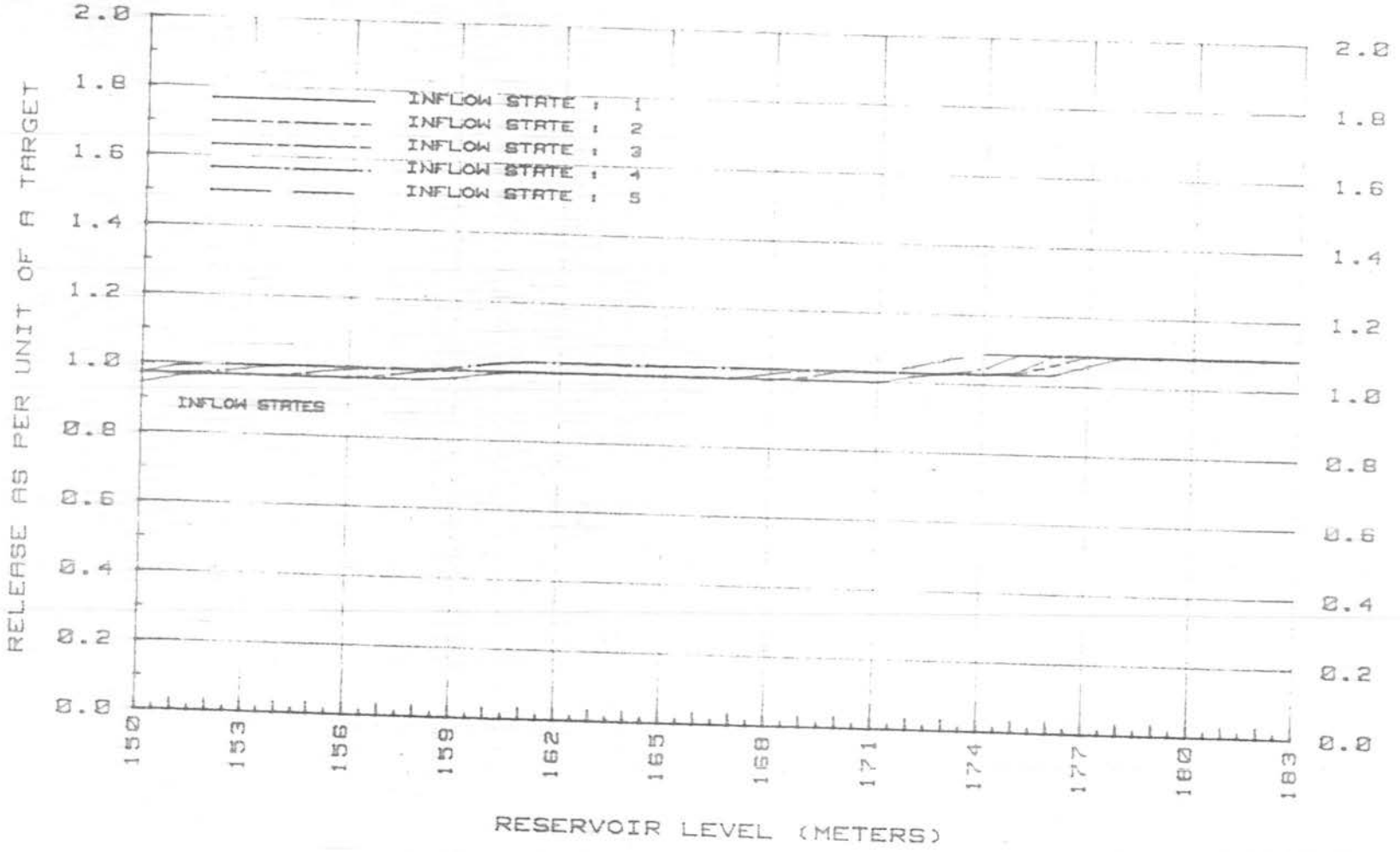


Fig. (D. 20)

OPERATING POLICY FOR HIGH DAM RESERVOIR
DERIVED FPOM STEADY STATE DYNAMIC PROGRAM
FOR MONTH: SEPTEMBER

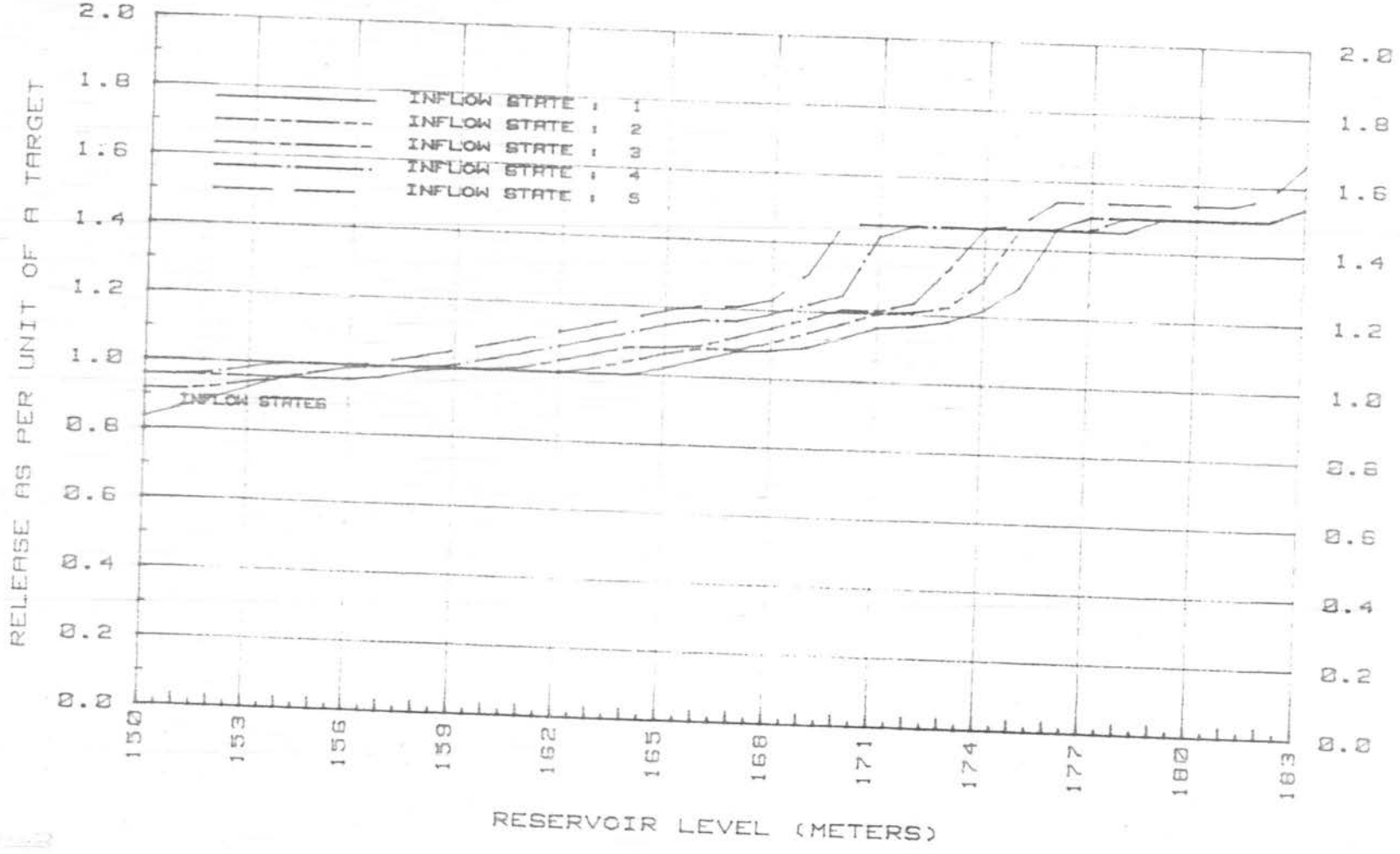


Fig. (D .21)

OPERATING POLICY FOR HIGH DAM RESERVOIR DERIVED FROM STEADY STATE DYNAMIC PROGRAM FOR MONTH: OCTOBER

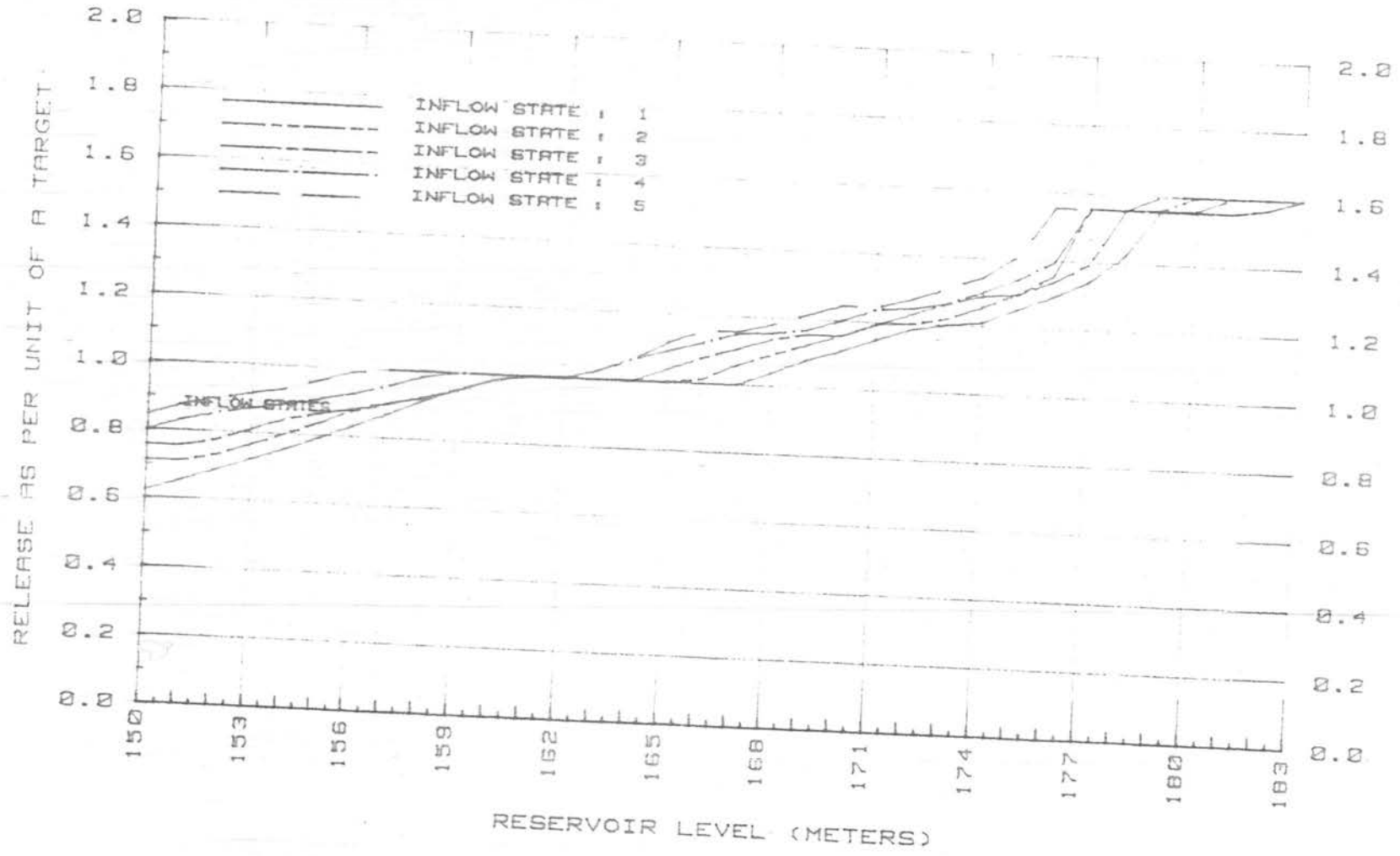


Fig. (D.22)

OPERATING POLICY FOR HIGH DAM RESERVOIR
DERIVED FROM STEADY STATE DYNAMIC PROGRAM
FOR MONTH: NOVEMBER

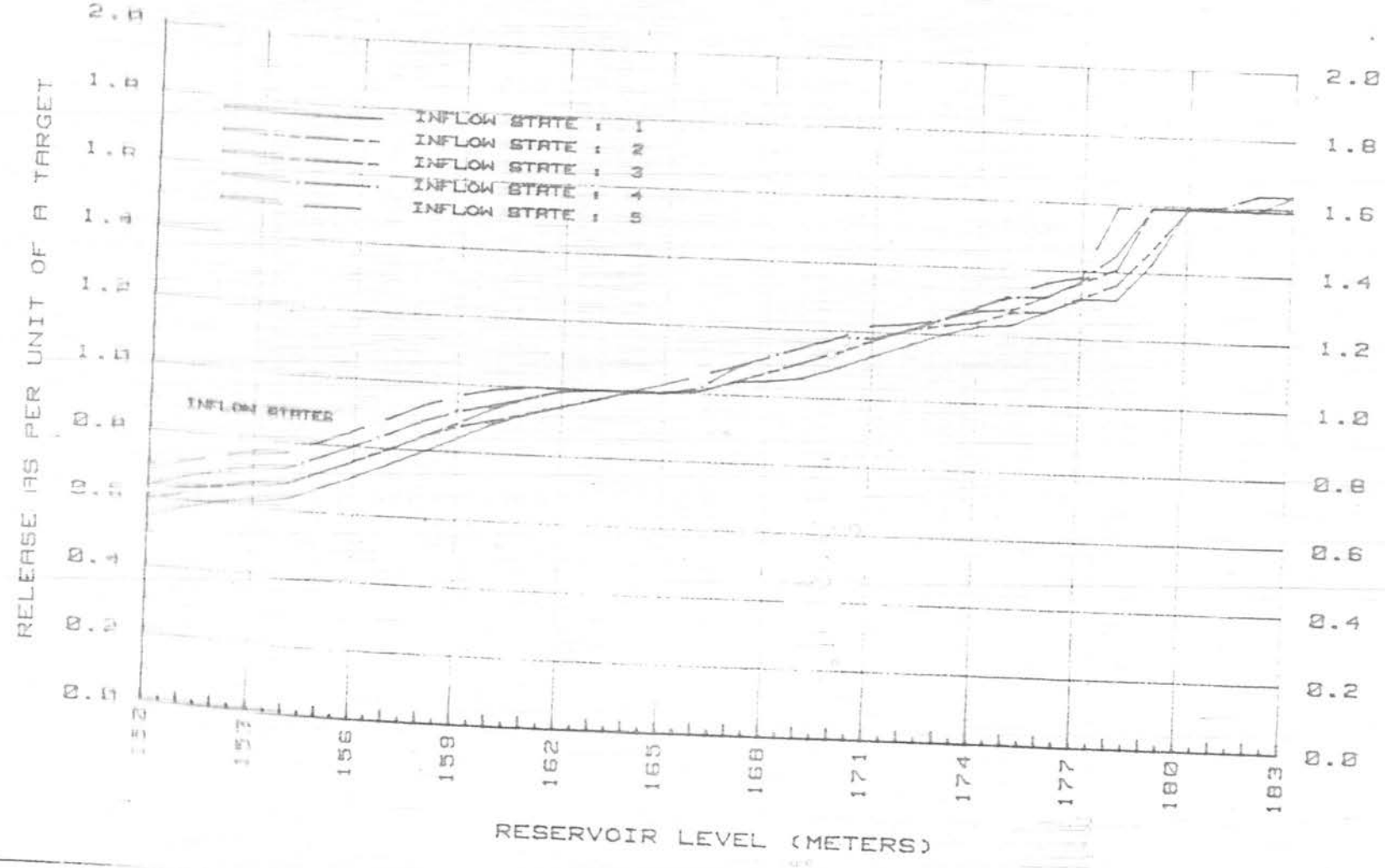
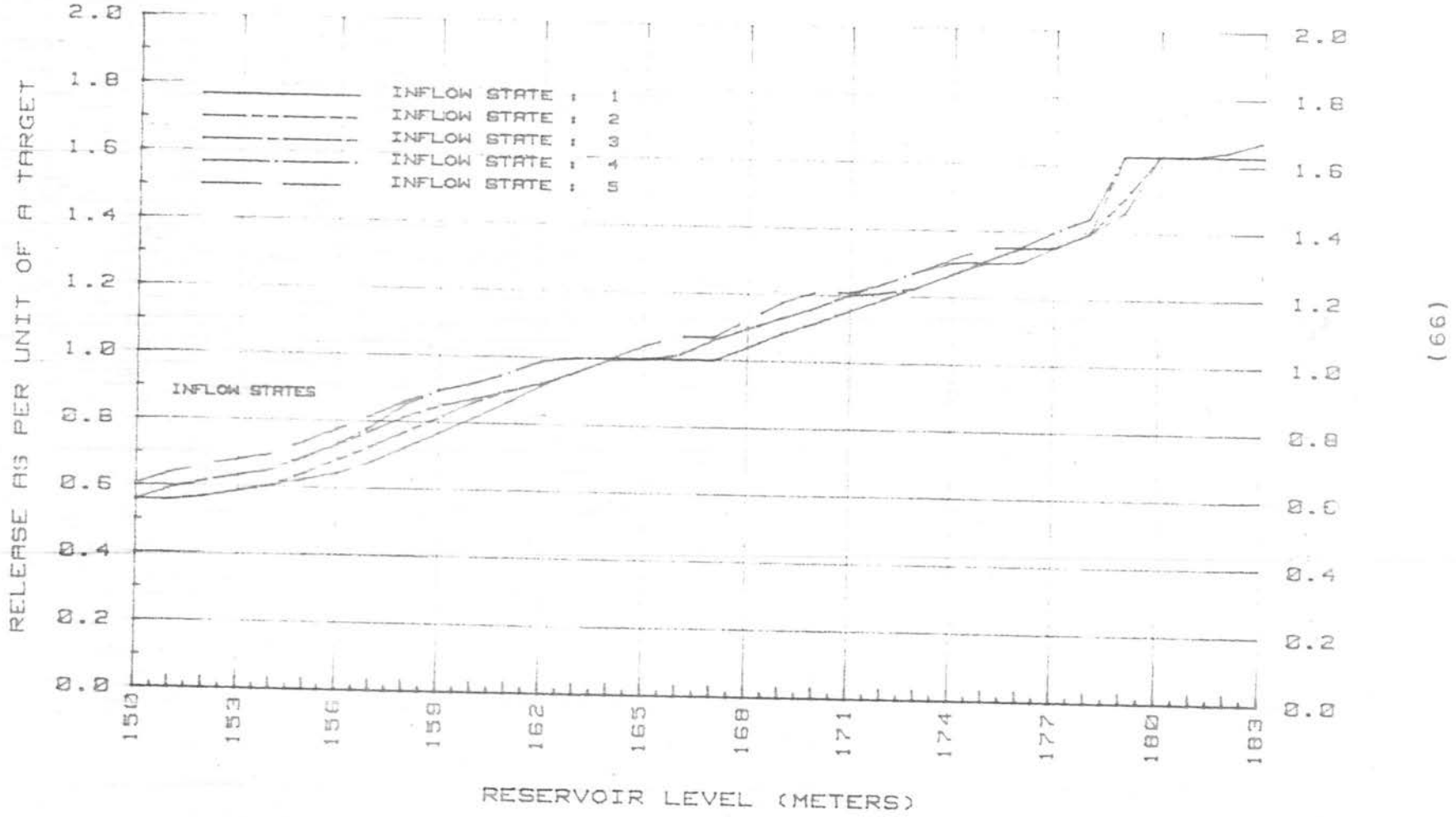


Fig. (D.23)

OPERATING POLICY FOR HIGH DAM RESERVOIR
DERIVED FROM STEADY STATE DYNAMIC PROGRAM
FOR MONTH: DECEMBER



(66)

Fig. (D. 24)

APPENDIX E

ANALYSIS OF CARRYING CHARACTERISTICS OF SOME SELECTED CROSS _. SECTIONS FROM MALAKAL TO MELUT

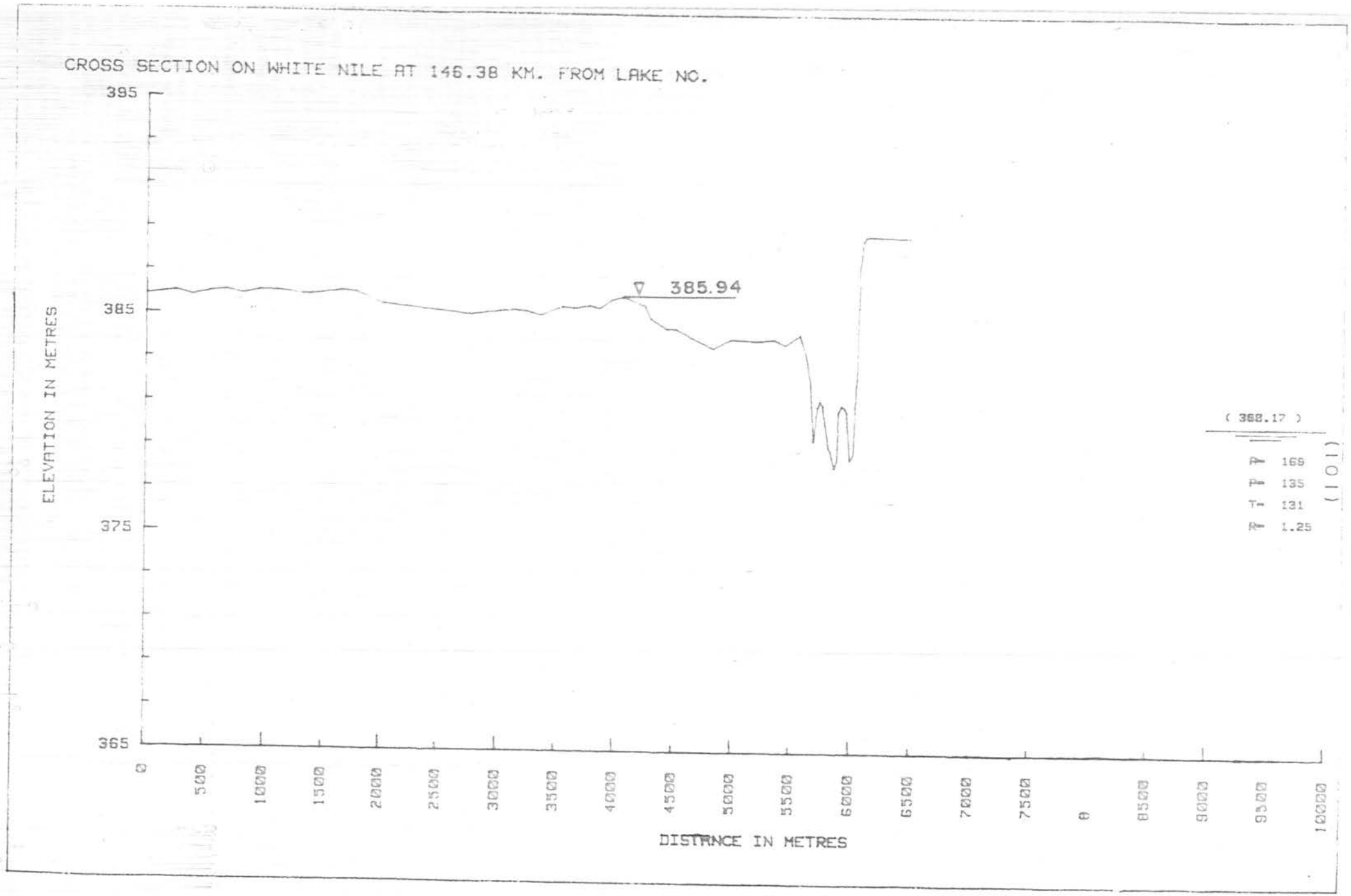

CROSS SECTION ON WHITE NILE AT 146.38 KM. FROM LAKE NO.
395
385
375
365
ELEVATION IN METRES
385.94
(368.17)
(101)
169
135
131
1.25
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000
6500
7000
7500
8
8500
9000
9500
10000
DISTANCE IN METRES

Fig. (E.1)

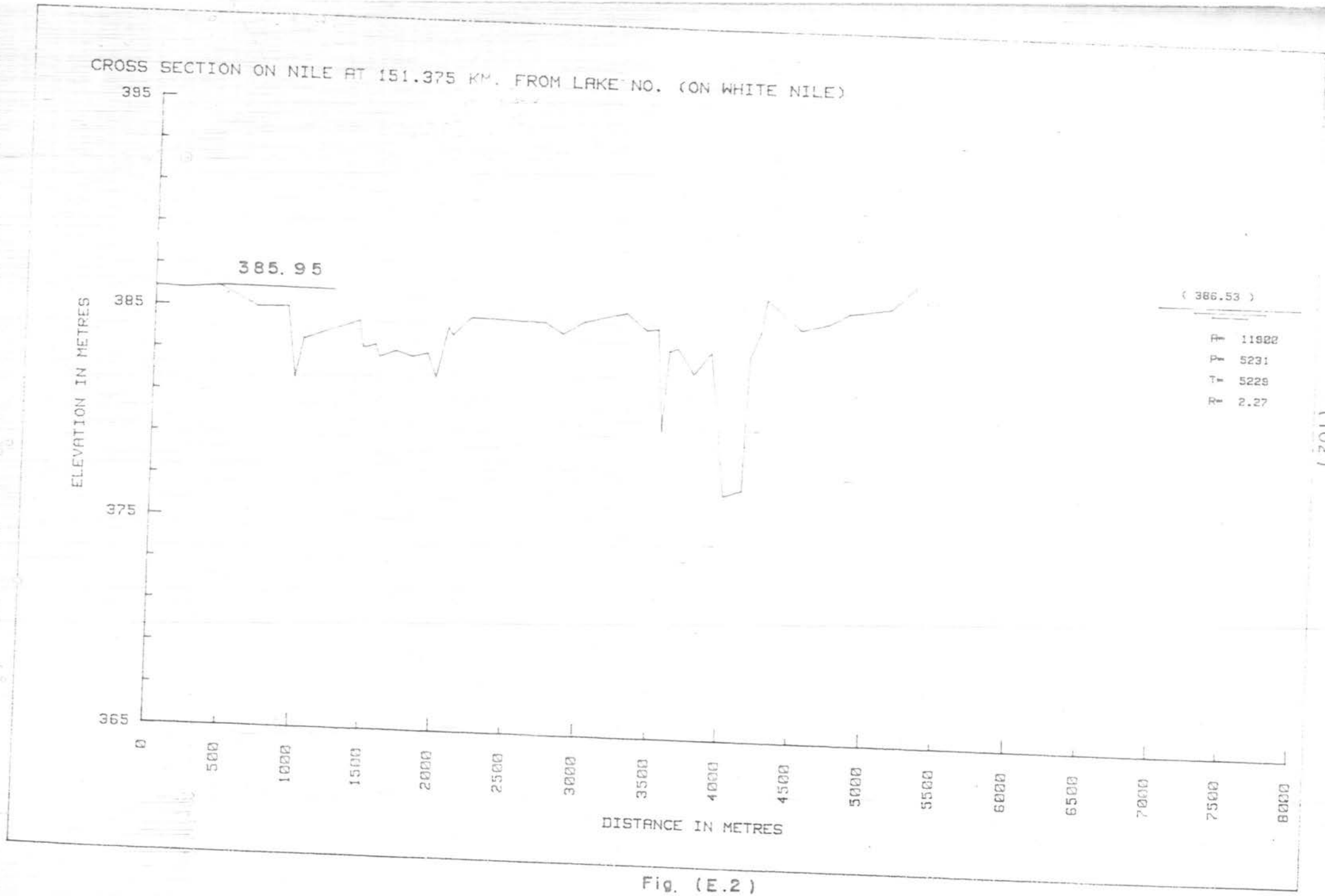

CROSS SECTION ON NILE AT 151.375 KM. FROM LAKE NO. (ON WHITE NILE)
395
385
375
365
385.95
(386.53)
A= 11902
P= 5231
T= 5229
R= 2.27
ELEVATION IN METRES
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000
6500
7000
7500
8000
DISTANCE IN METRES

Fig. (E.2)

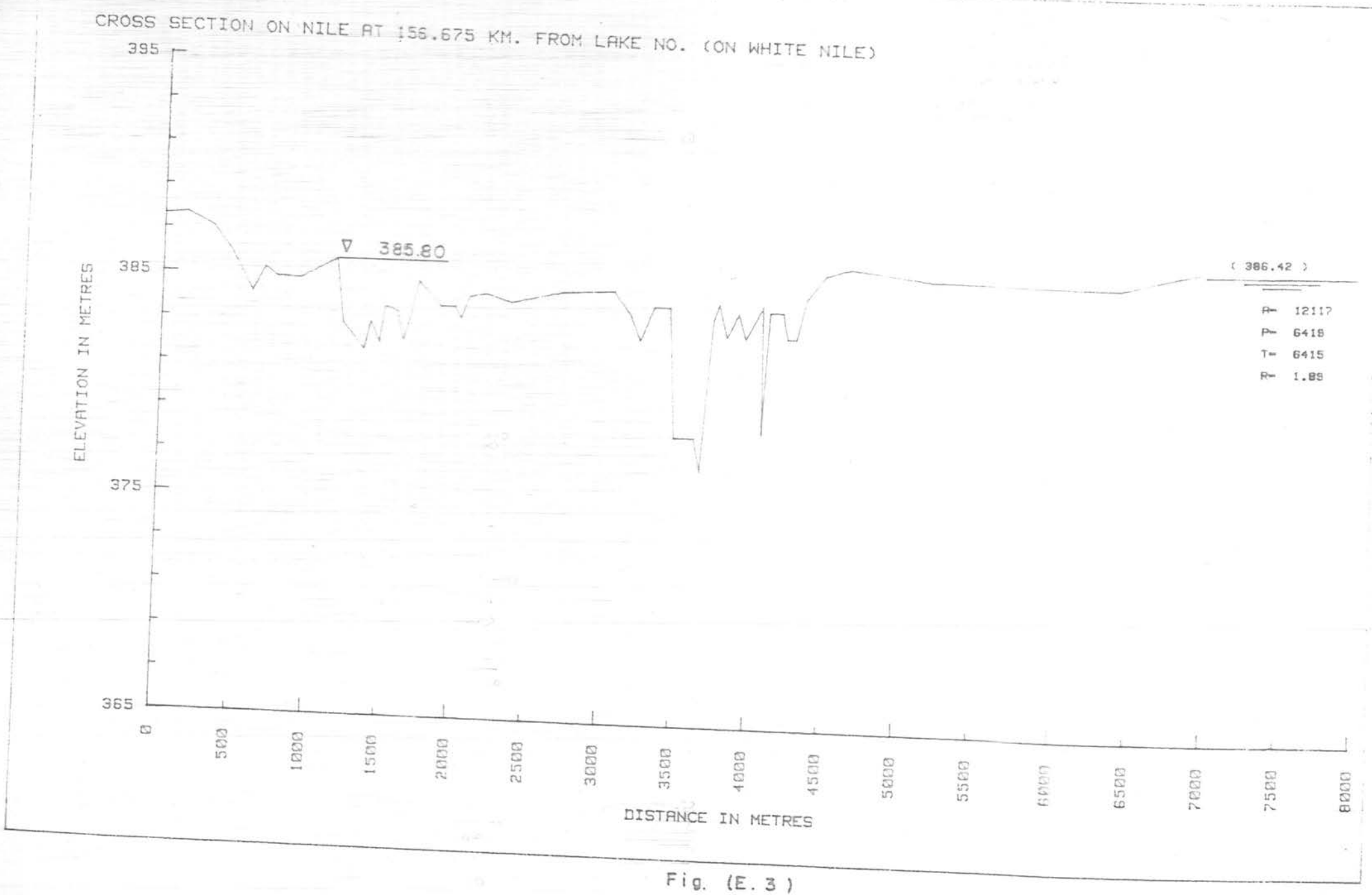

CROSS SECTION ON NILE AT 156.675 KM. FROM LAKE NO. (ON WHITE NILE)
395
385
375
365
ELEVATION IN METRES
385.80
(386.42)
A= 12117
P= 6418
T= 6415
R= 1.88
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000
6500
7000
7500
8000
DISTANCE IN METRES

Fig. (E. 3)

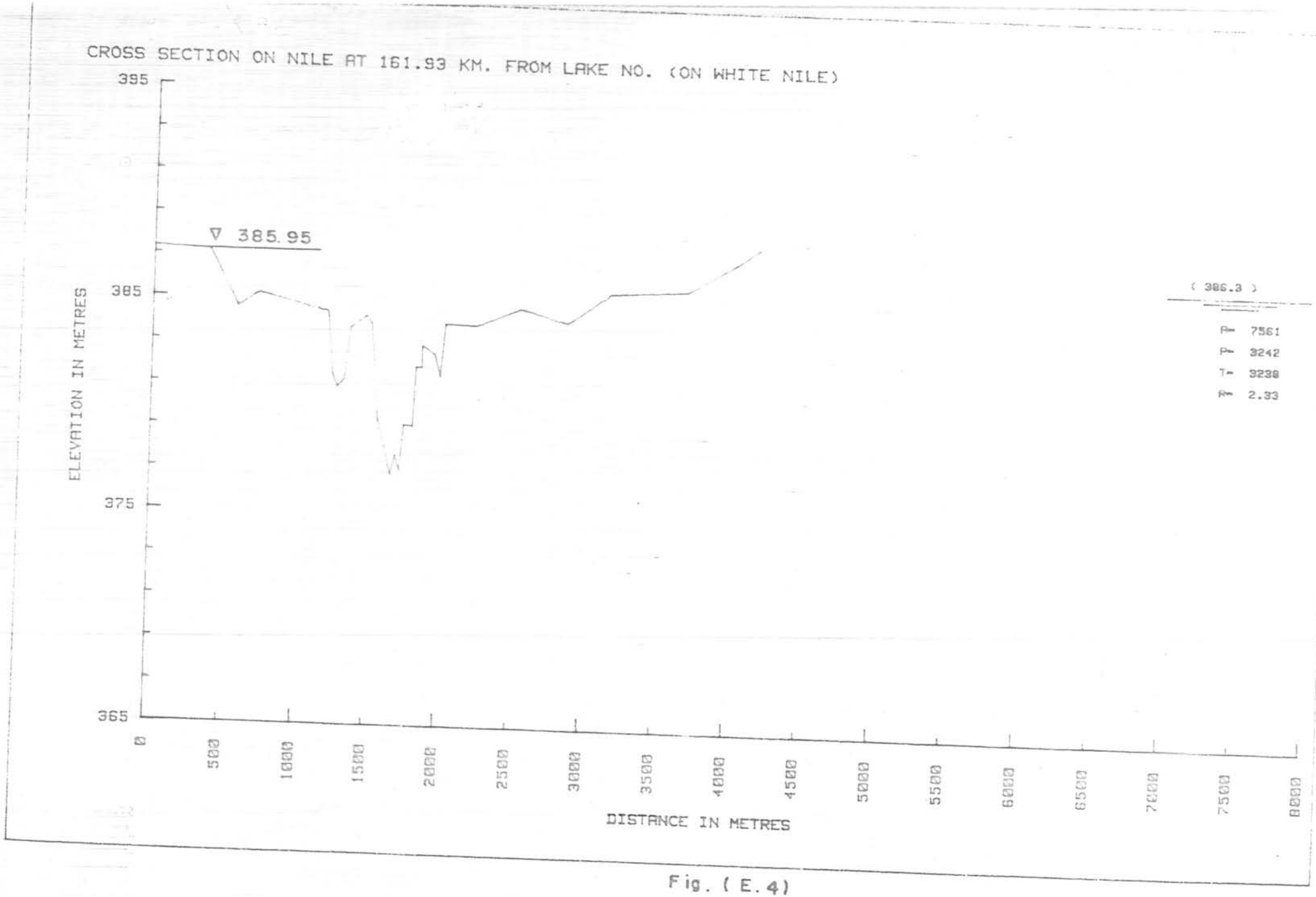

CROSS SECTION ON NILE AT 161.93 KM. FROM LAKE NO. (ON WHITE NILE)
395
385
375
365
ELEVATION IN METRES
385.95
(386.3)
R= 7561
P= 3242
T= 3238
K= 2.33
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000
6500
7000
7500
8000
DISTANCE IN METRES

Fig. (E.4)

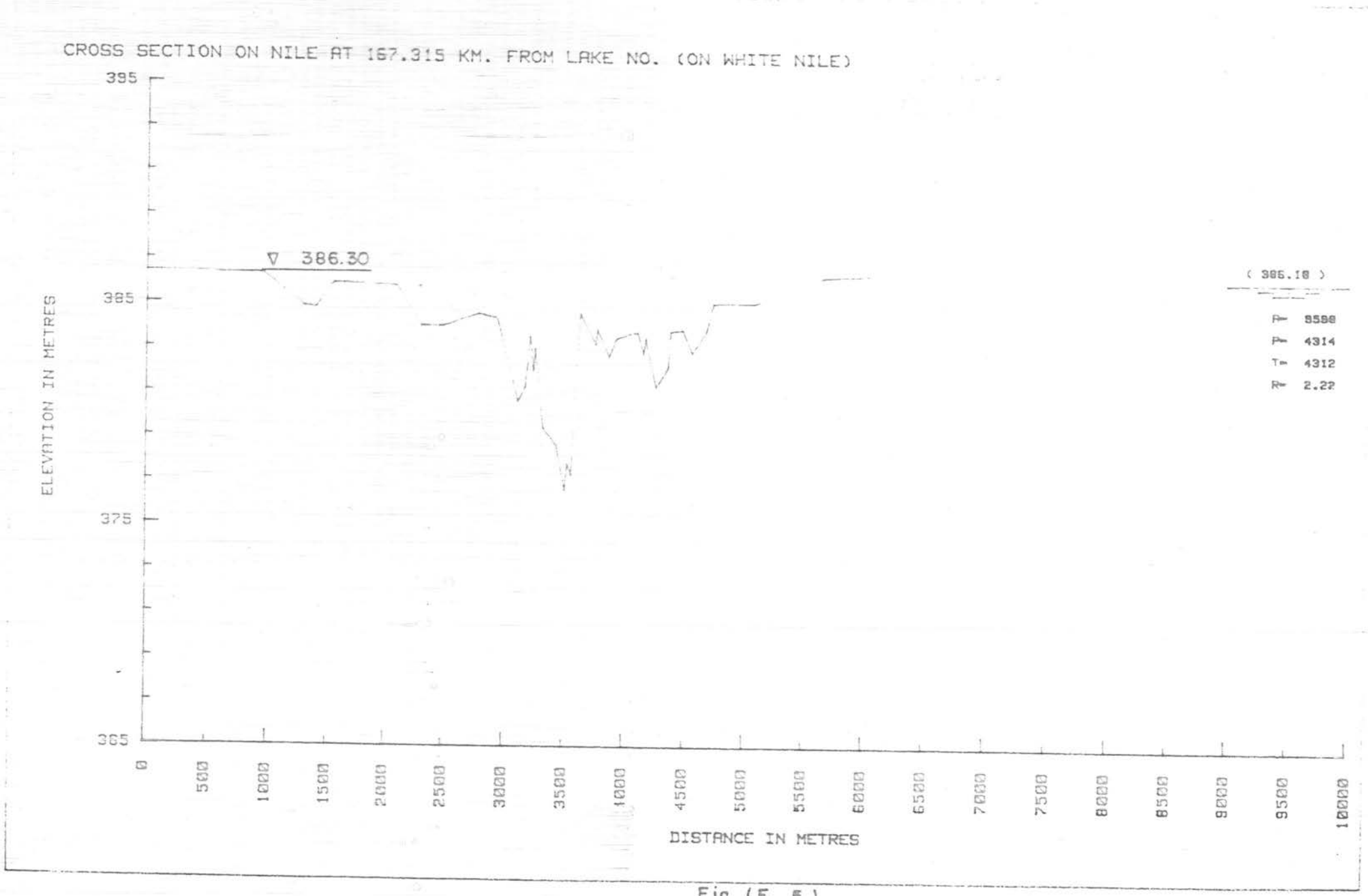

CROSS SECTION ON NILE AT 167.315 KM. FROM LAKE NO. (ON WHITE NILE)
395
385
375
365
ELEVATION IN METRES
▽ 386.30
(385.18)
= 8598
= 4314
= 4312
= 2.22
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000
6500
7000
7500
8000
8500
9000
9500
10000
DISTANCE IN METRES

Fig. (E .5)

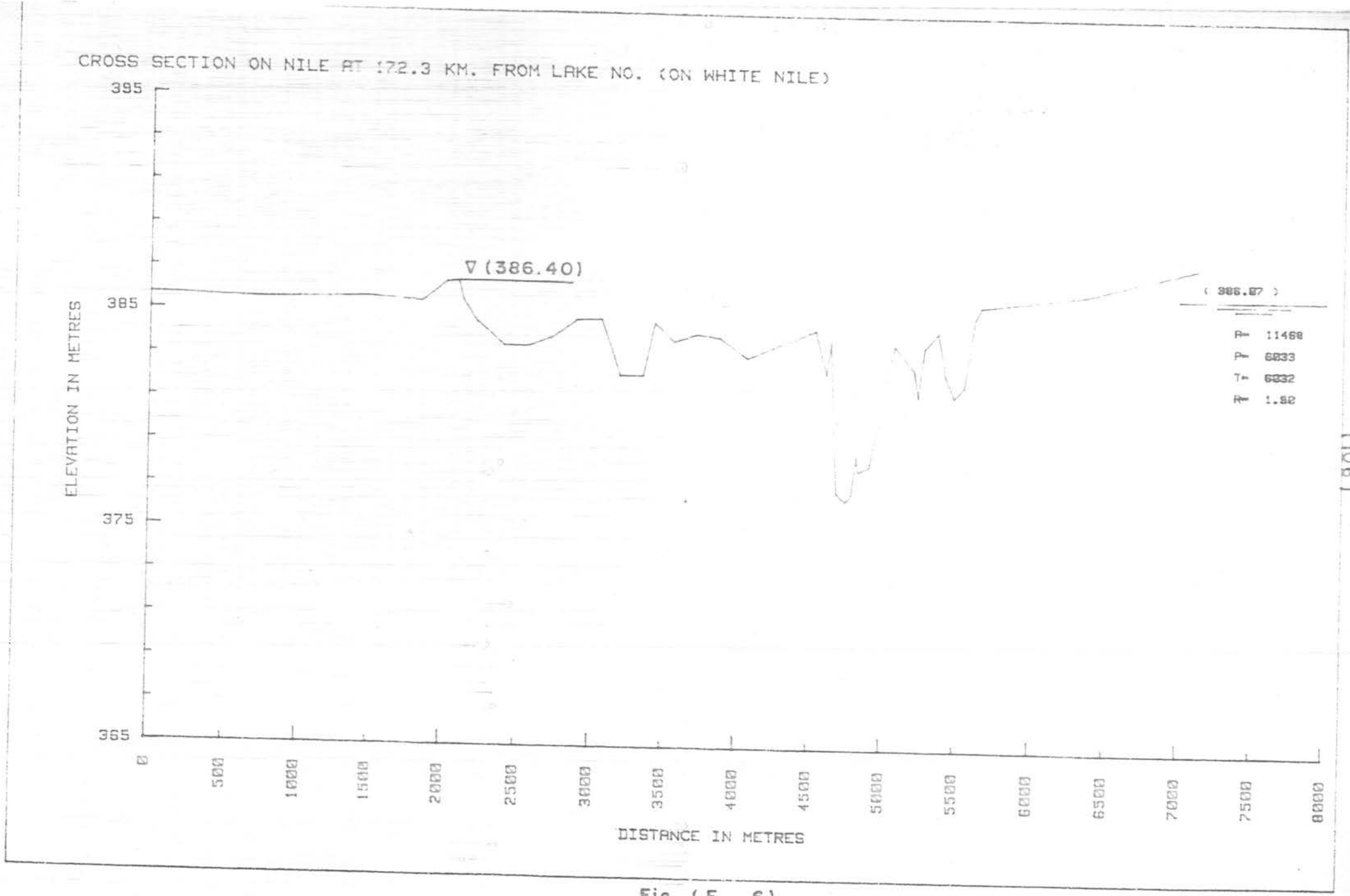

CROSS SECTION ON NILE AT 172.3 KM. FROM LAKE NO. (ON WHITE NILE)
395
385
375
365
ELEVATION IN METRES
∇ (386.40)
(386.87)
P= 11468
P= 6833
T= 6832
R= 1.82
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000
6500
7000
7500
8000
DISTANCE IN METRES

Fig. (E . 6)

CROSS SECTION ON NILE AT 177.4 KM. FROM LAKE NO. (ON WHITE NILE)

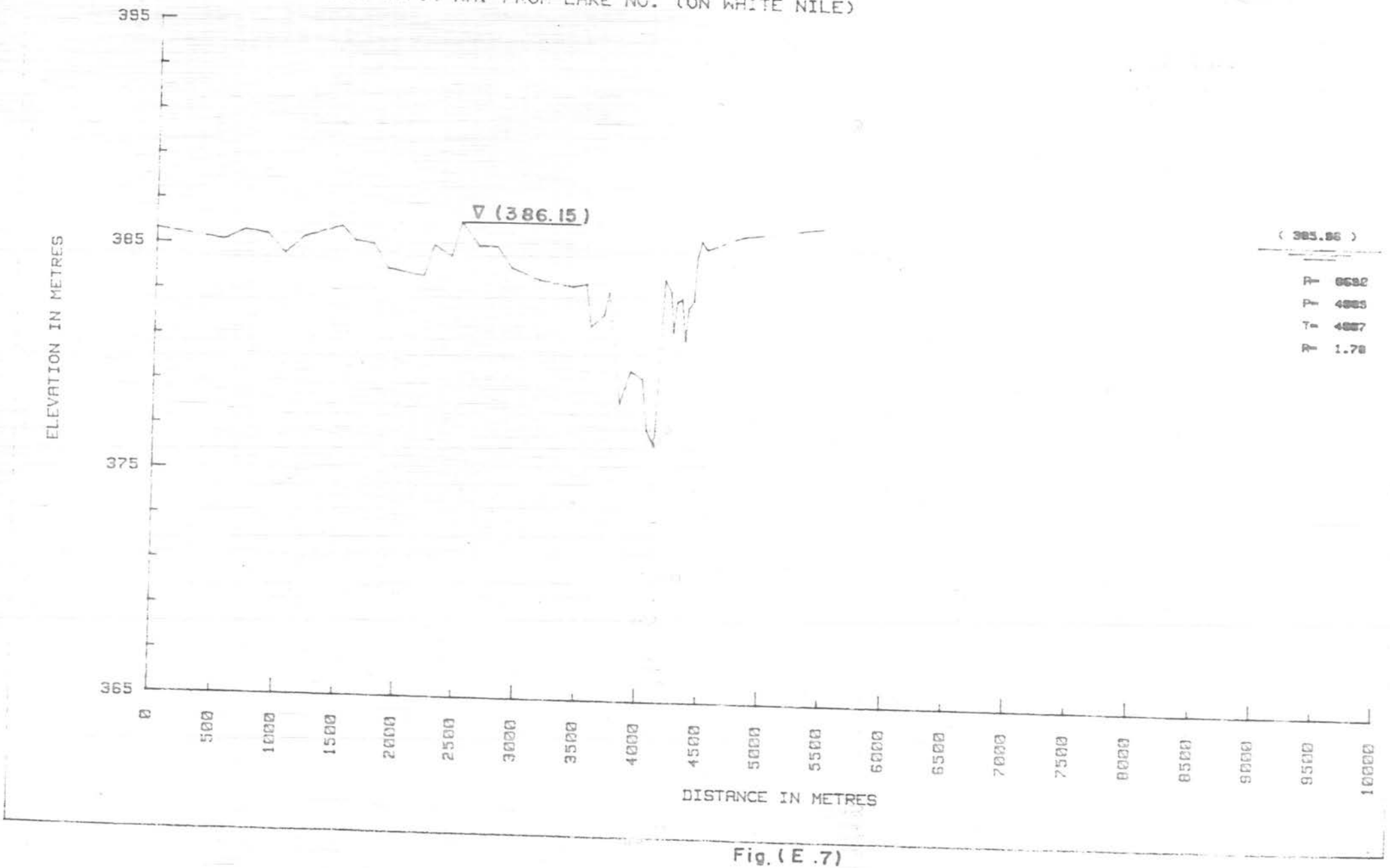


Fig. (E .7)

CROSS SECTION ON NILE AT 182.315 KM. FROM LAKE NO. (ON WHITE NILE)

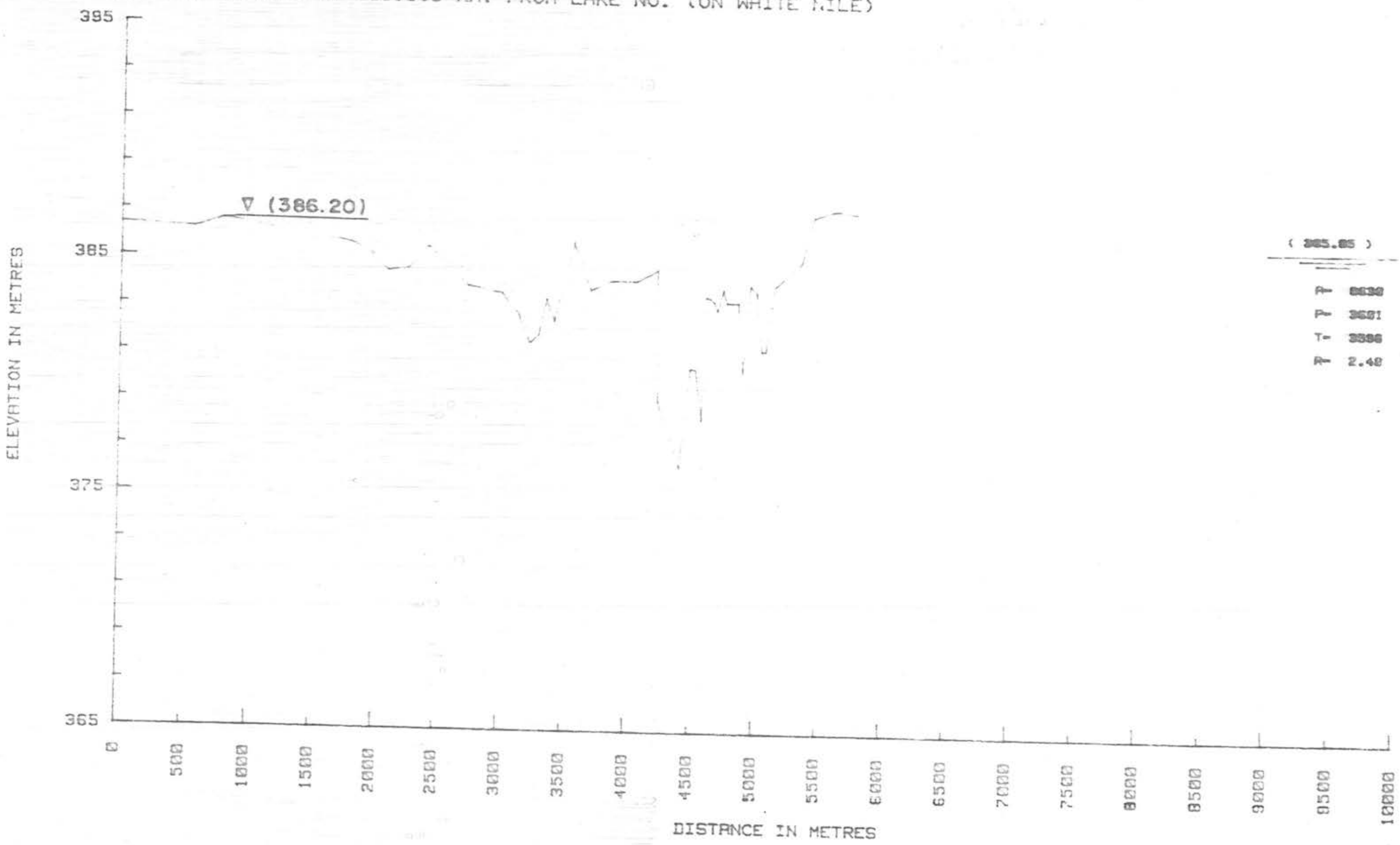


Fig. (E.8)

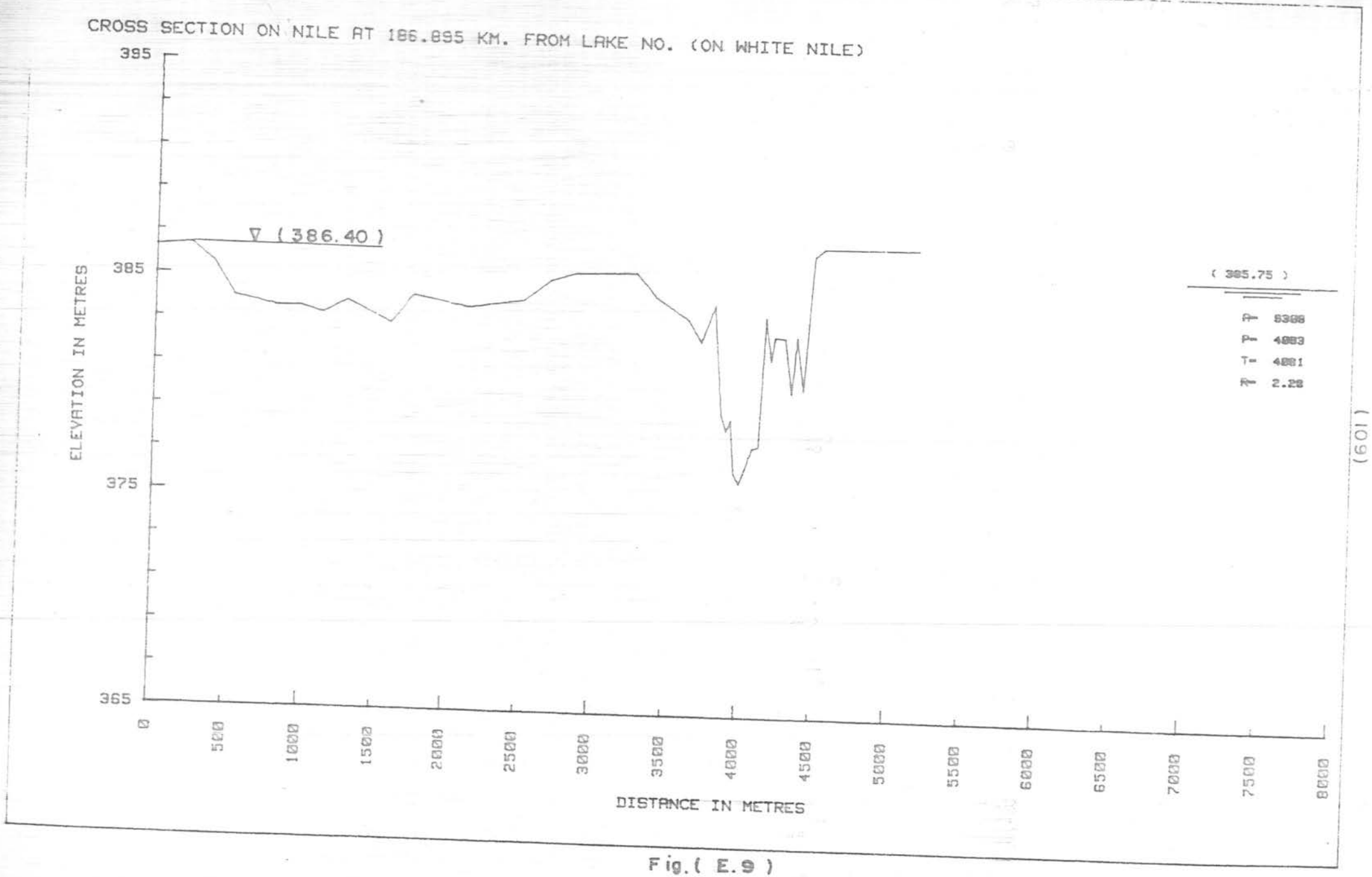

CROSS SECTION ON NILE AT 186.895 KM. FROM LAKE NO. (ON WHITE NILE)
395
385
375
365
ELEVATION IN METRES
▽ (386.40)
(385.75)
A= 8388
P= 4083
T= 4081
R= 2.28
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000
6500
7000
7500
8000
DISTANCE IN METRES

Fig.(E.9)

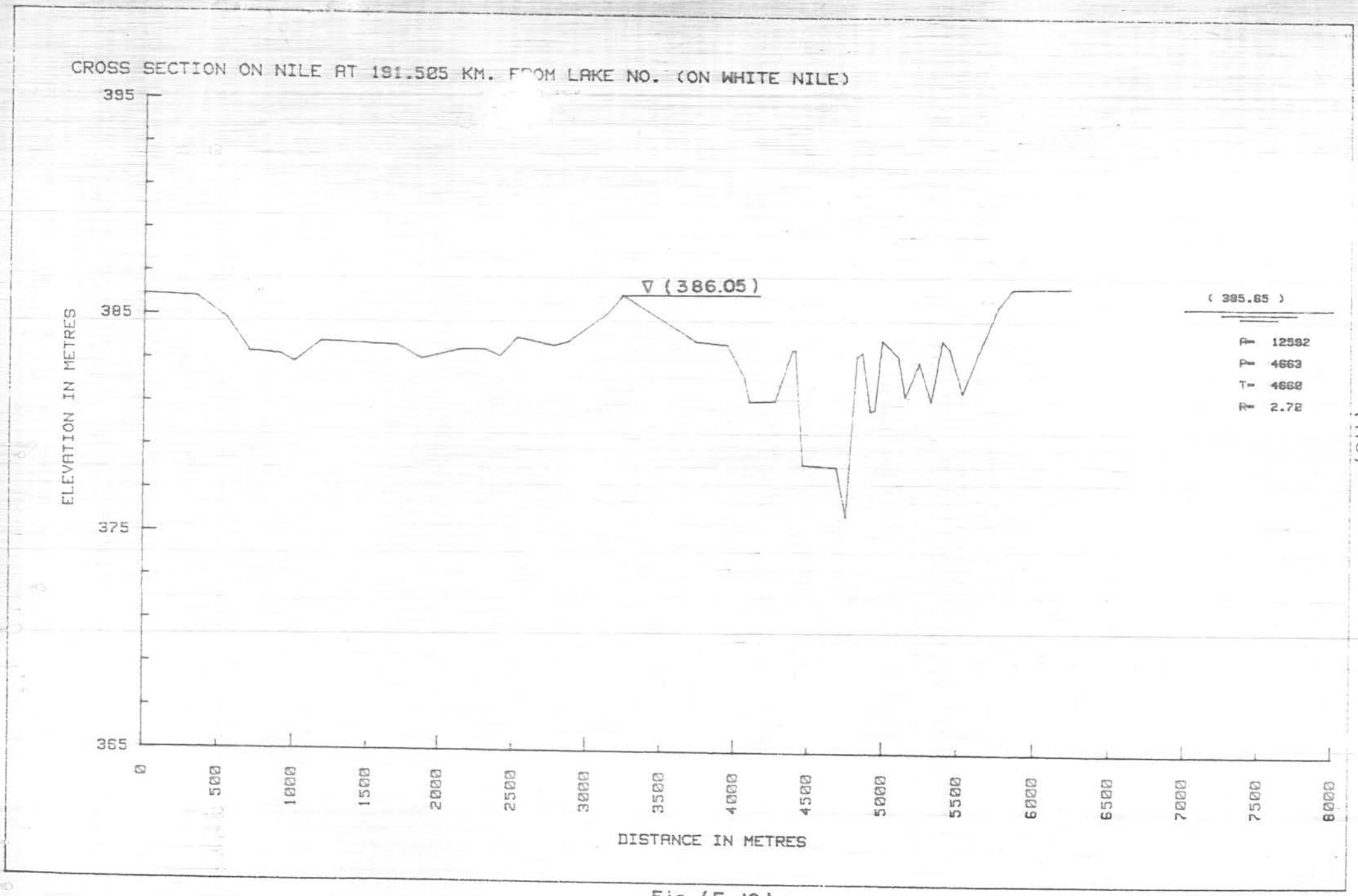

CROSS SECTION ON NILE AT 191.505 KM. FROM LAKE NO. (ON WHITE NILE)
395
385
375
365
ELEVATION IN METRES
▽ (386.05)
(385.65)
R= 12582
P= 4663
T= 4668
R= 2.72
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000
6500
7000
7500
8000
DISTANCE IN METRES
(110)

Fig. (E.10)

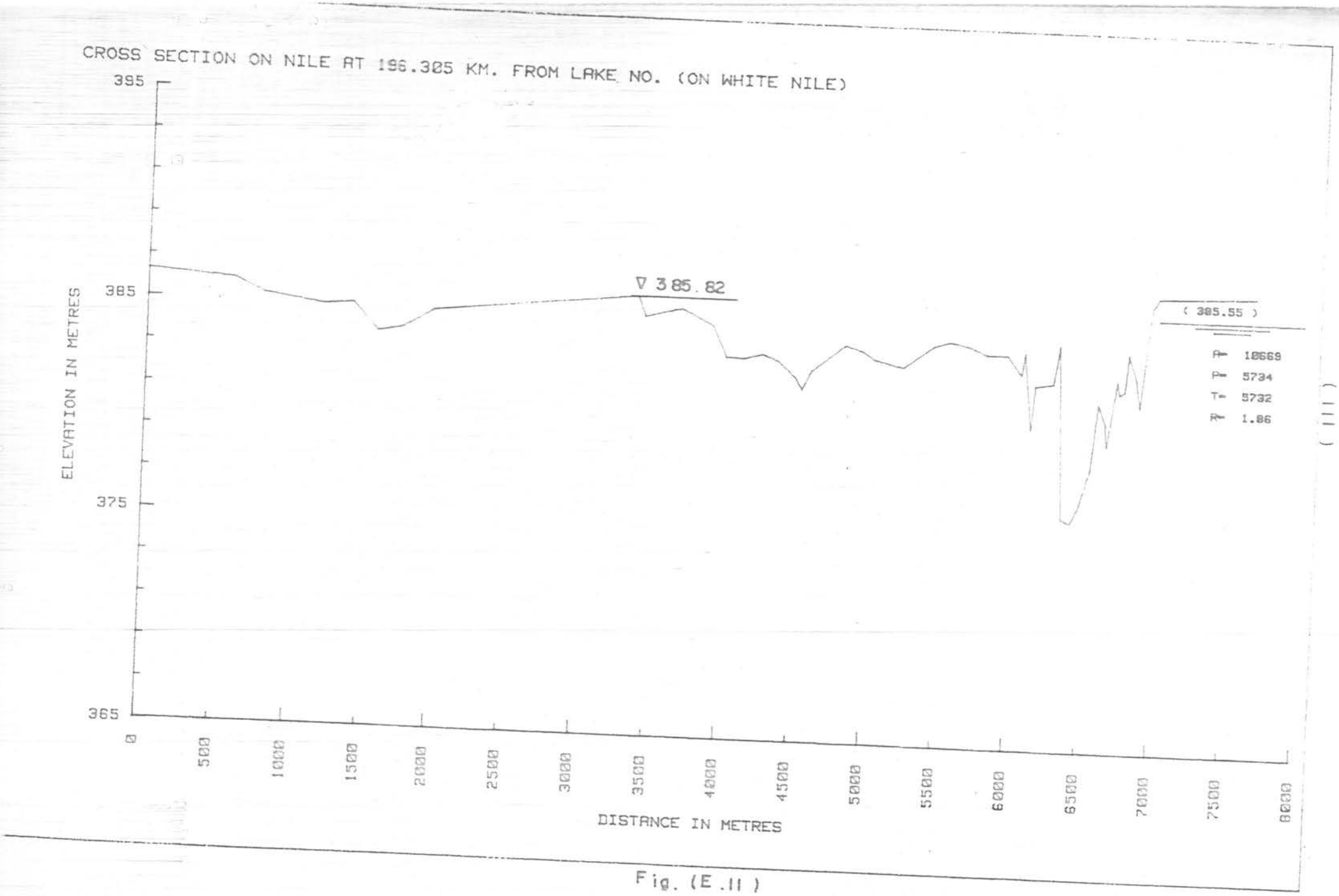

CROSS SECTION ON NILE AT 196.305 KM. FROM LAKE NO. (ON WHITE NILE)
395
385
375
365
ELEVATION IN METRES
385.82
(385.55)
10669
5734
5732
1.86
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000
6500
7000
7500
8000
DISTANCE IN METRES

Fig. (E.11)

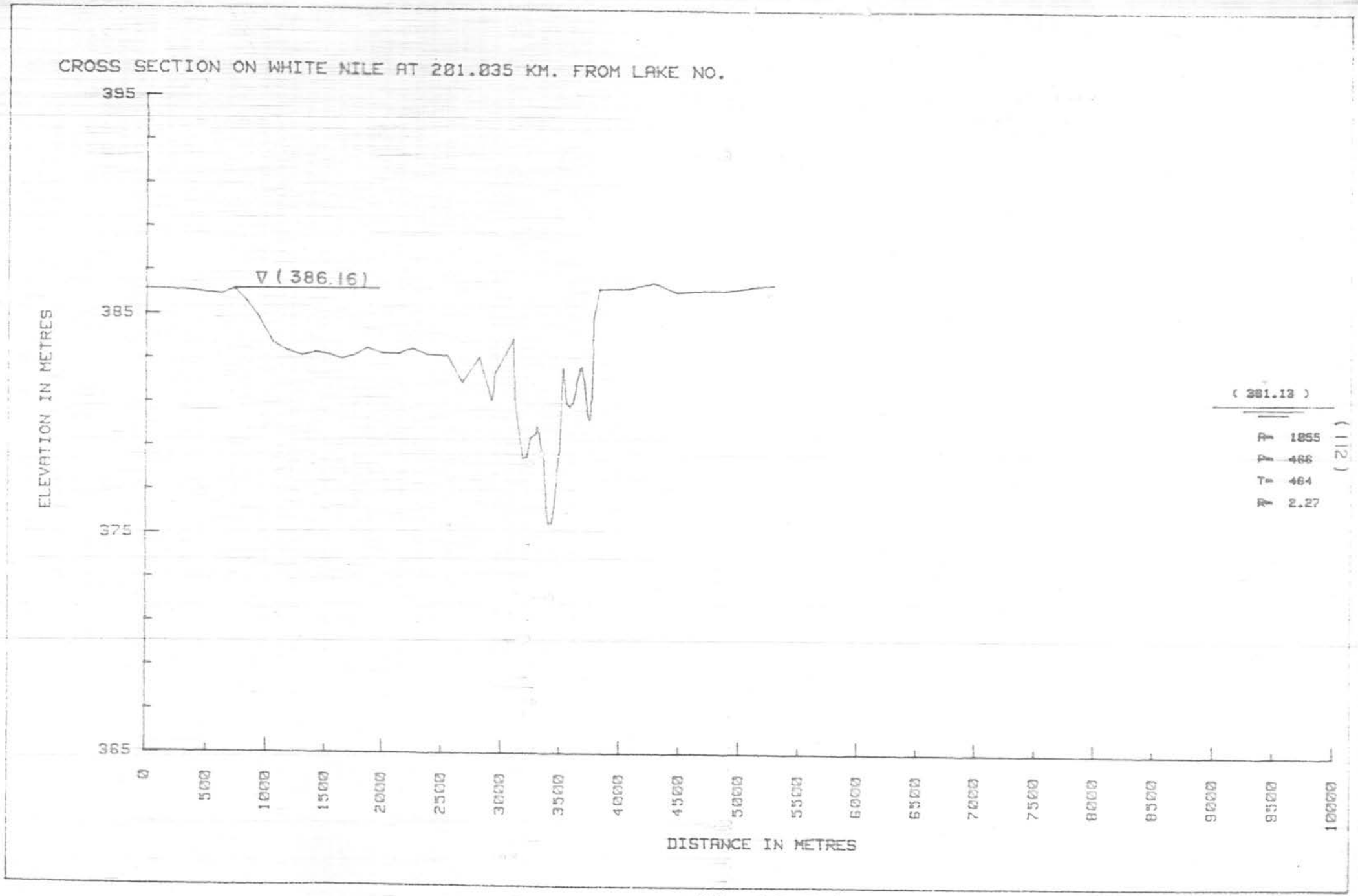

CROSS SECTION ON WHITE NILE AT 201.035 KM. FROM LAKE NO.
395
385
375
365
ELEVATION IN METRES
▽ (386.16)
(381.13)
A= 1855
P= 466
T= 464
R= 2.27
(12)
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000
6500
7000
7500
8000
8500
9000
9500
10000
DISTANCE IN METRES

Fig. (E. 12)

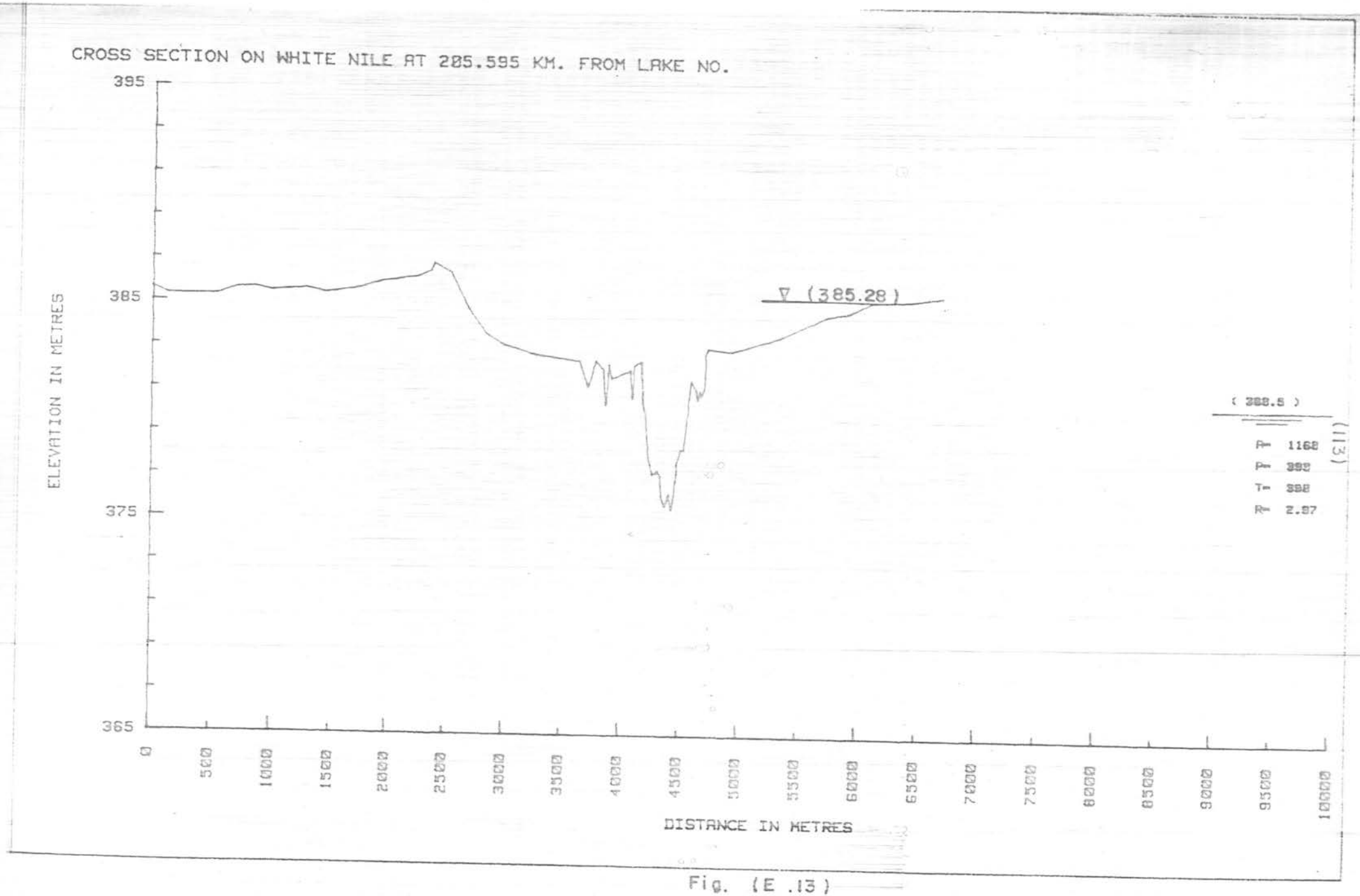

CROSS SECTION ON WHITE NILE AT 205.595 KM. FROM LAKE NO.
395
385
375
365
ELEVATION IN METRES
▽ (385.28)
(388.5)
(113)
R= 1168
P= 392
T= 398
R= 2.87
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000
6500
7000
7500
8000
8500
9000
9500
10000
DISTANCE IN METRES

Fig. (E .13)

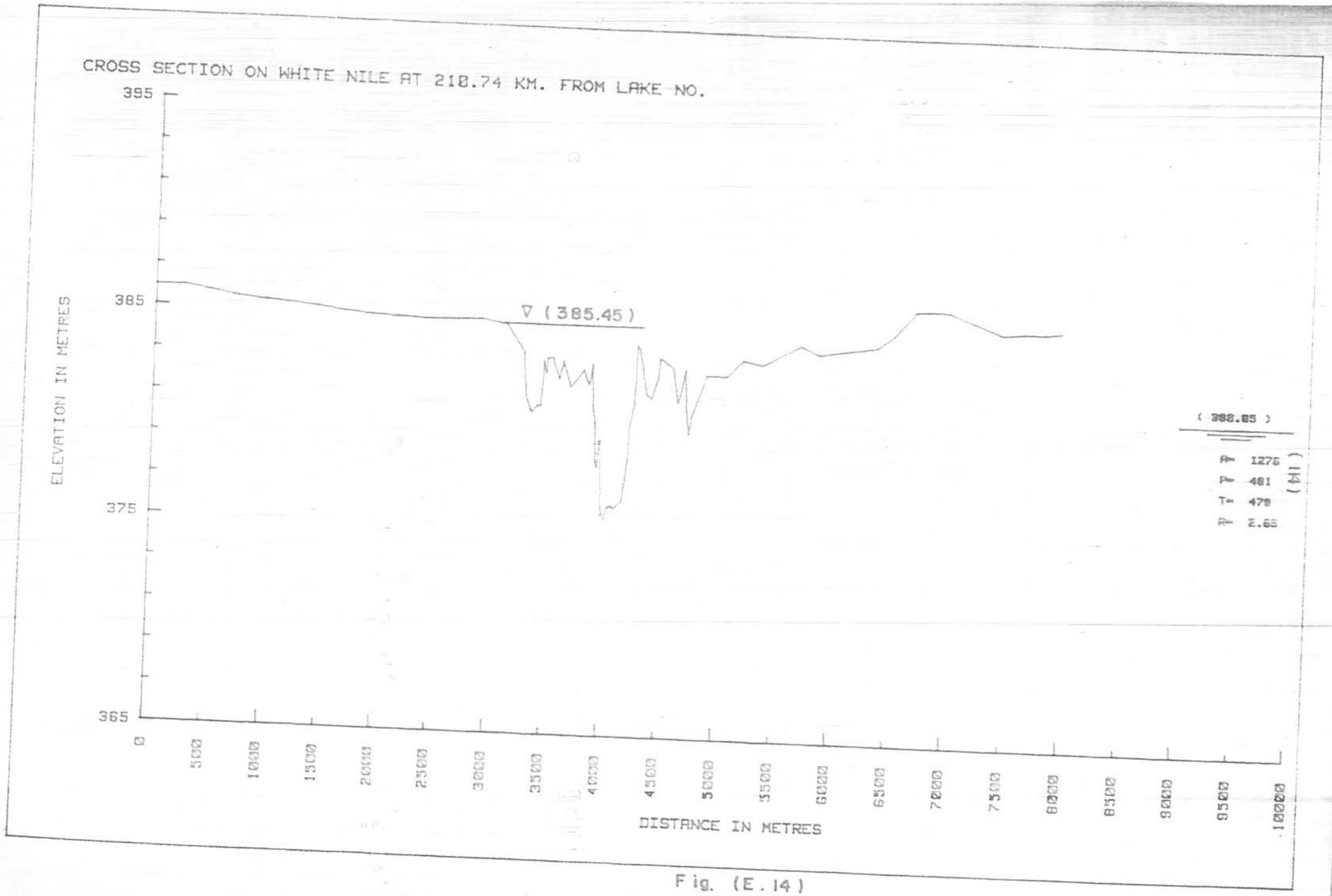

CROSS SECTION ON WHITE NILE AT 218.74 KM. FROM LAKE NO.
395
385
375
365
ELEVATION IN METRES
▽ (385.45)
(388.85)
R= 1276
P= 481
T= 478
R= 2.65
(M)
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000
6500
7000
7500
8000
8500
9000
9500
10000
DISTANCE IN METRES

Fig. (E.14)

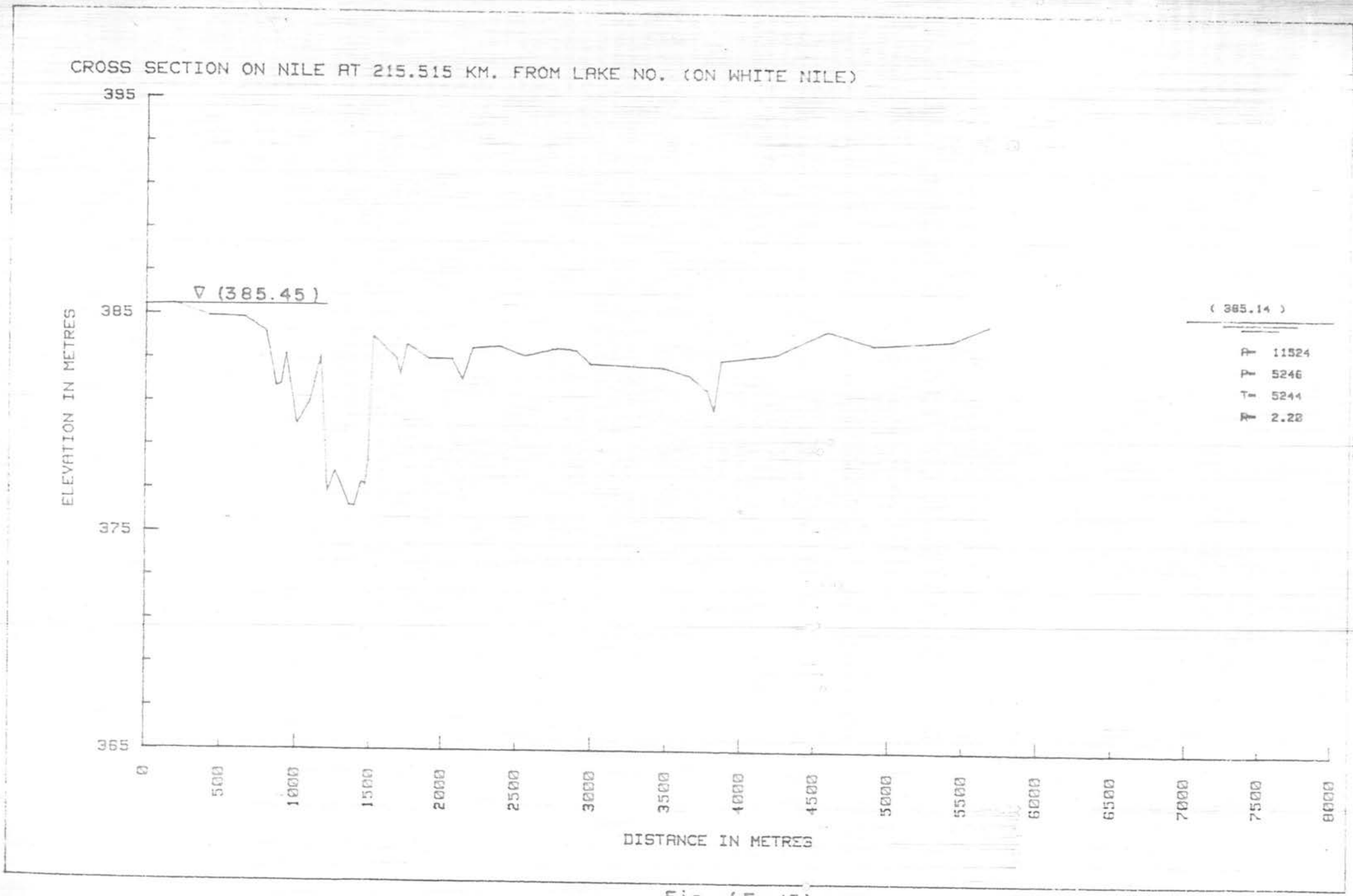

CROSS SECTION ON NILE AT 215.515 KM. FROM LAKE NO. (ON WHITE NILE)
395
385
375
365
ELEVATION IN METRES
▽ (385.45)
(385.14)
11524
5246
5244
2.28
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000
6500
7000
7500
8000
DISTANCE IN METRES

Fig. (E .15)

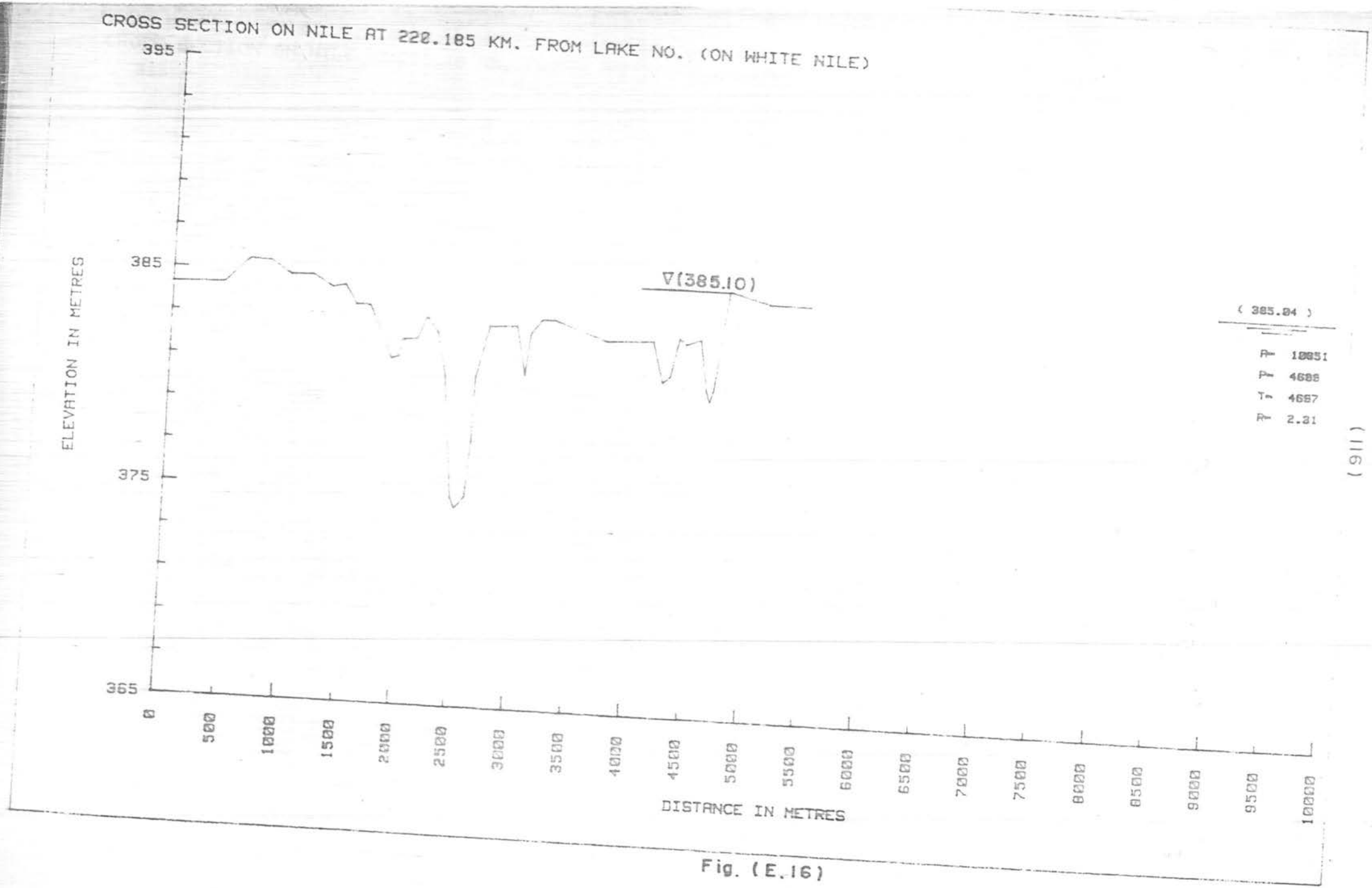

CROSS SECTION ON NILE AT 220.185 KM. FROM LAKE NO. (ON WHITE NILE)
395
385
375
365
ELEVATION IN METRES
▽(385.10)
(385.04)
P= 10851
P= 4688
T= 4687
P= 2.21
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000
6500
7000
7500
8000
8500
9000
9500
10000
DISTANCE IN METRES

Fig. (E.16)

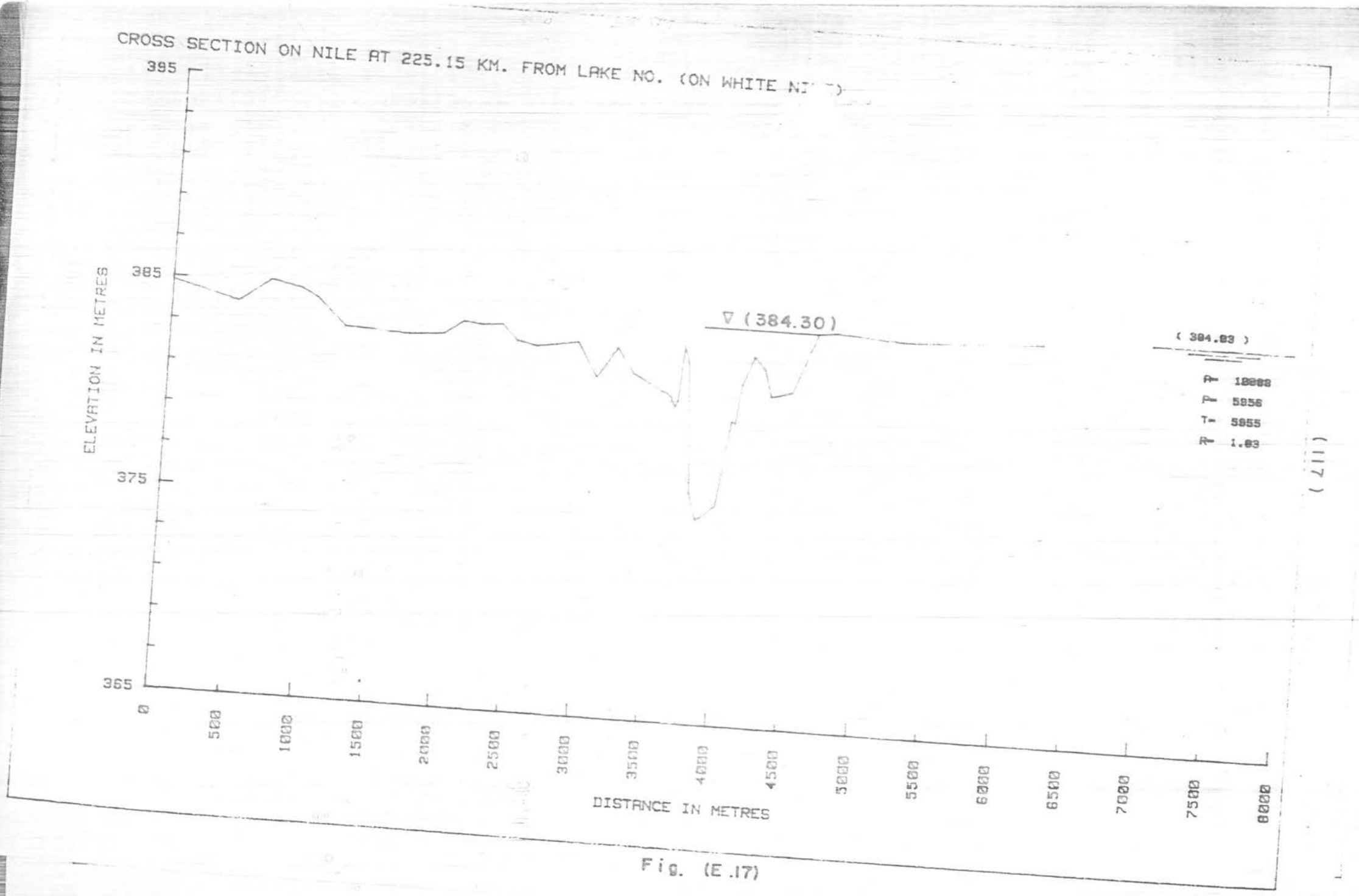

CROSS SECTION ON NILE AT 225.15 KM. FROM LAKE NO. (ON WHITE NI
395
385
375
365
ELEVATION IN METRES
▽ (384.30)
(384.83)
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000
6500
7000
7500
8000
DISTANCE IN METRES

Fig. (E.17)

CROSS SECTION ON NILE AT 232.28 KM. FROM LAKE NO. (ON WHITE NILE)

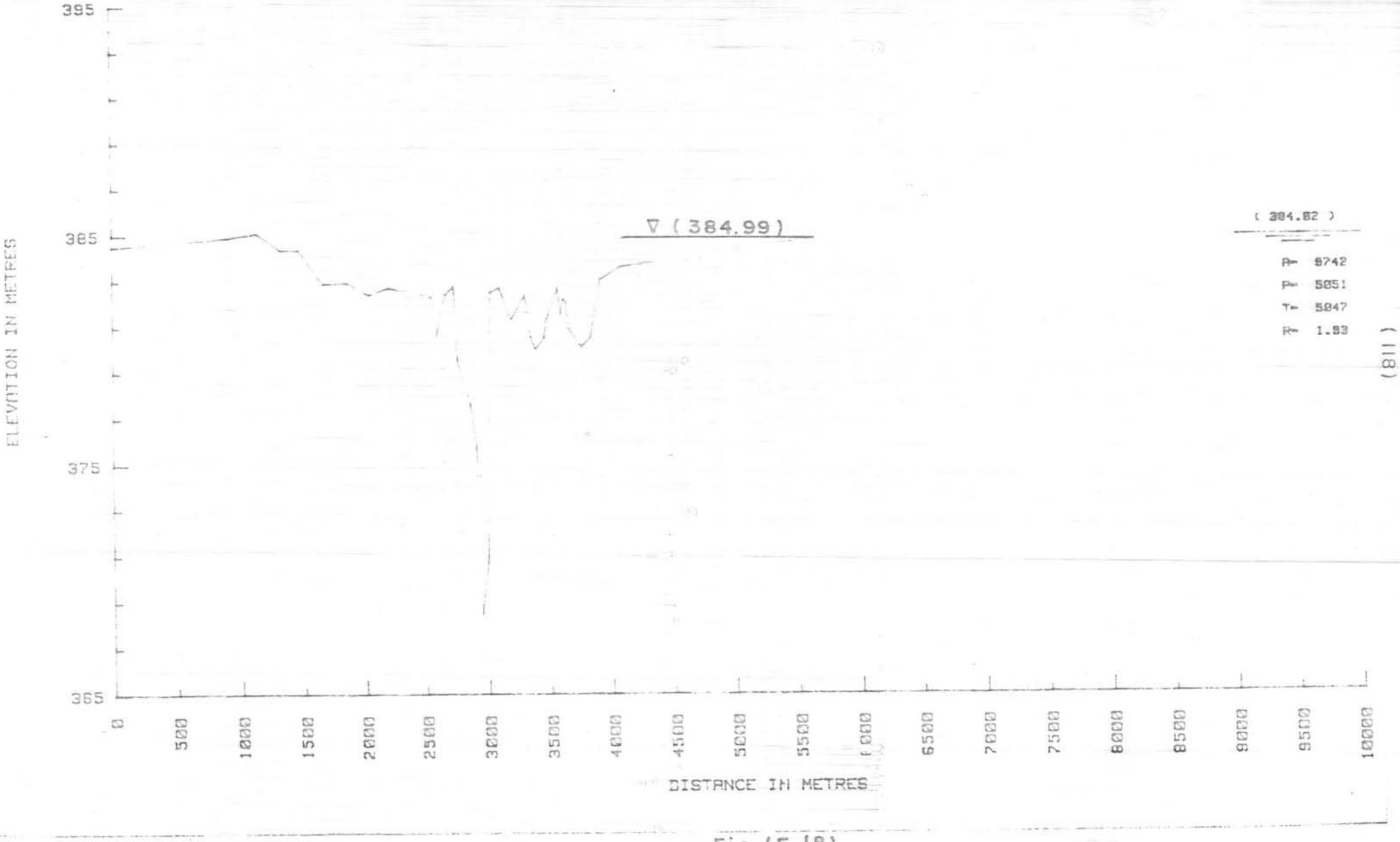


Fig. (E.18)

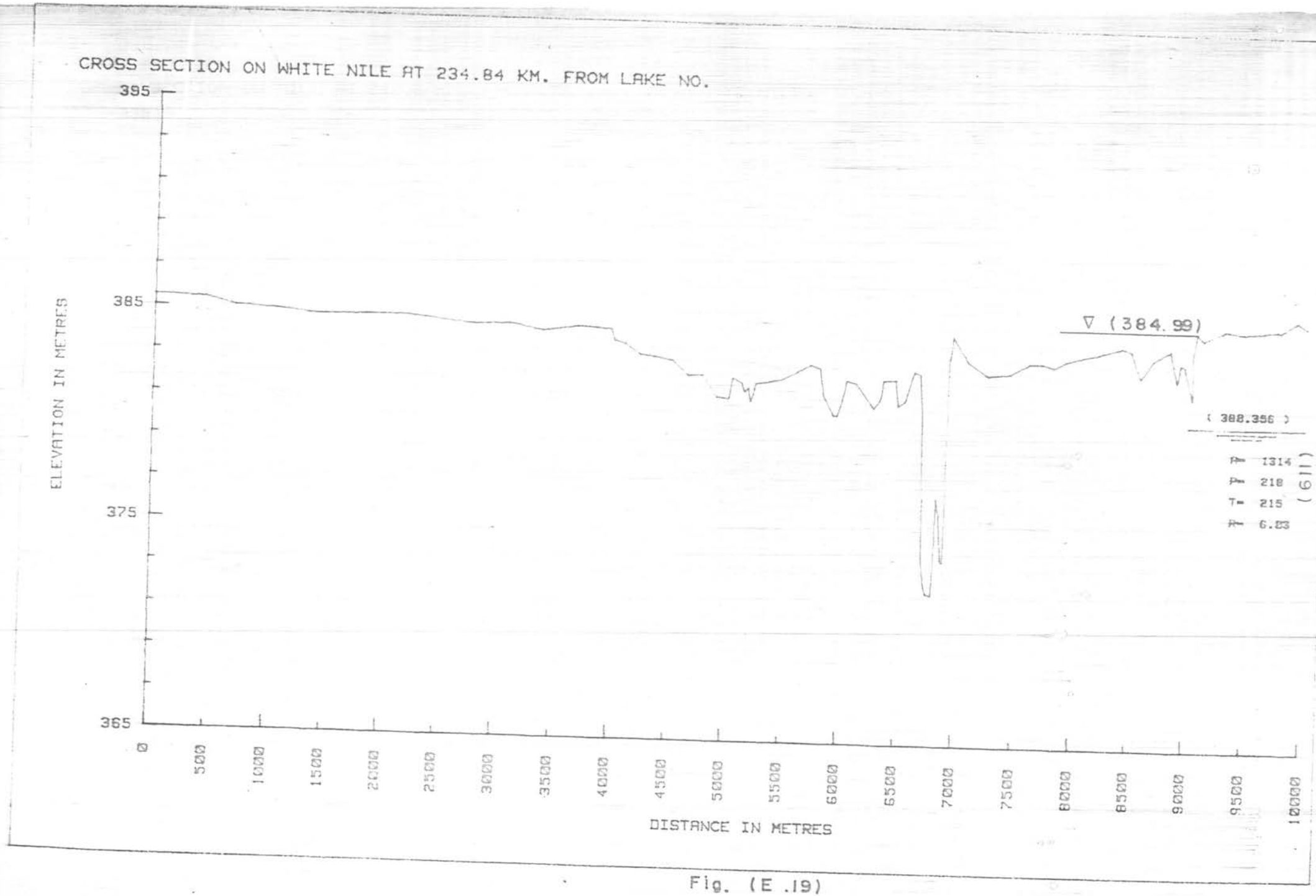

CROSS SECTION ON WHITE NILE AT 234.84 KM. FROM LAKE NO.
ELEVATION IN METRES
395
385
375
365
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000
6500
7000
7500
8000
8500
9000
9500
10000
DISTANCE IN METRES
∇ (384.99)
(388.356)
P= 1314
P= 218
T= 215
F= 6.03
(119)

Fig. (E .19)

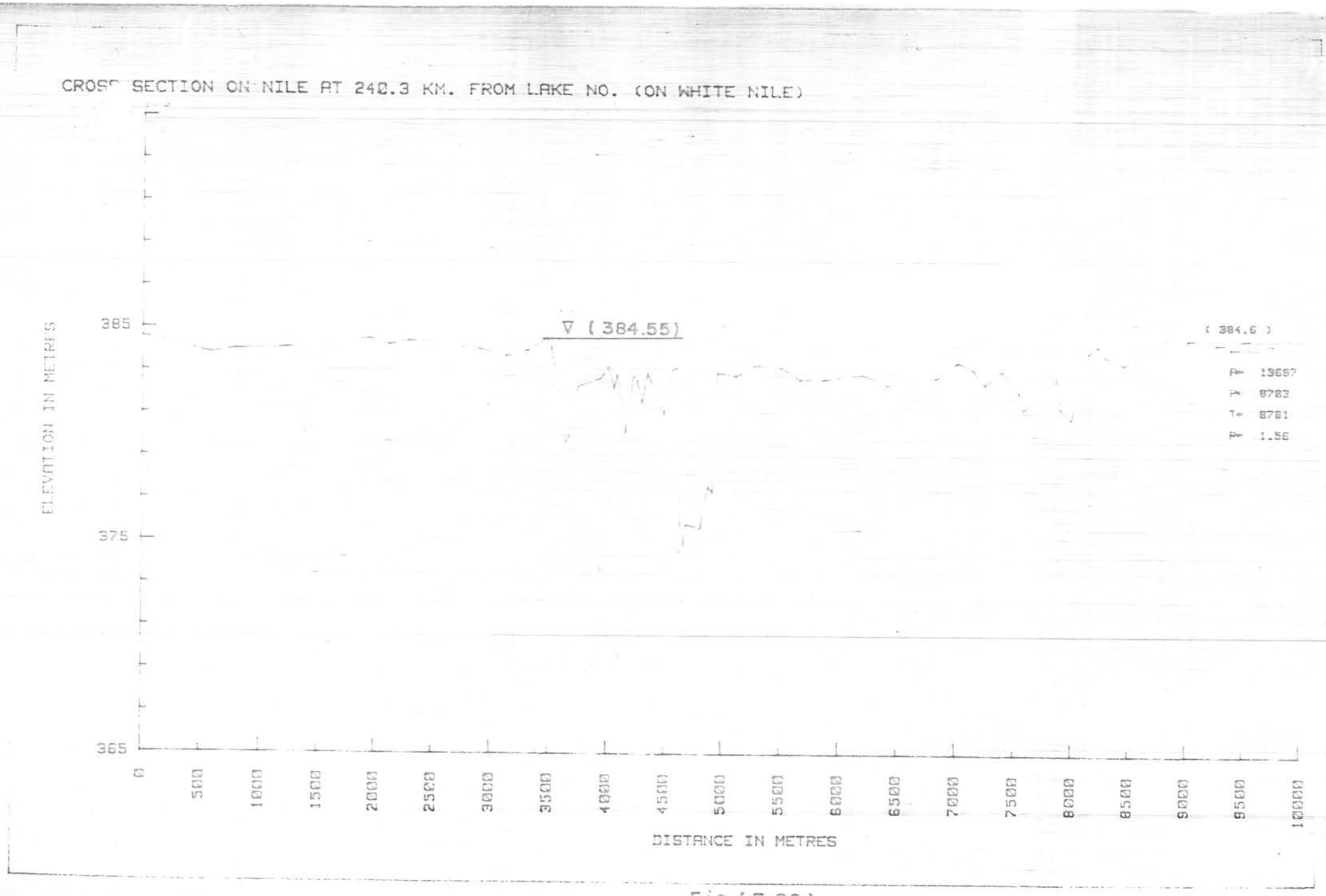

CROSS SECTION ON NILE AT 240.3 KM. FROM LAKE NO. (ON WHITE NILE)
ELEVATION IN METRES
385
375
365
▽ (384.55)
(384.6)
P= 13697
A= 8783
T= 8781
R= 1.56
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000
6500
7000
7500
8000
8500
9000
9500
10000
DISTANCE IN METRES

Fig. (E.20)

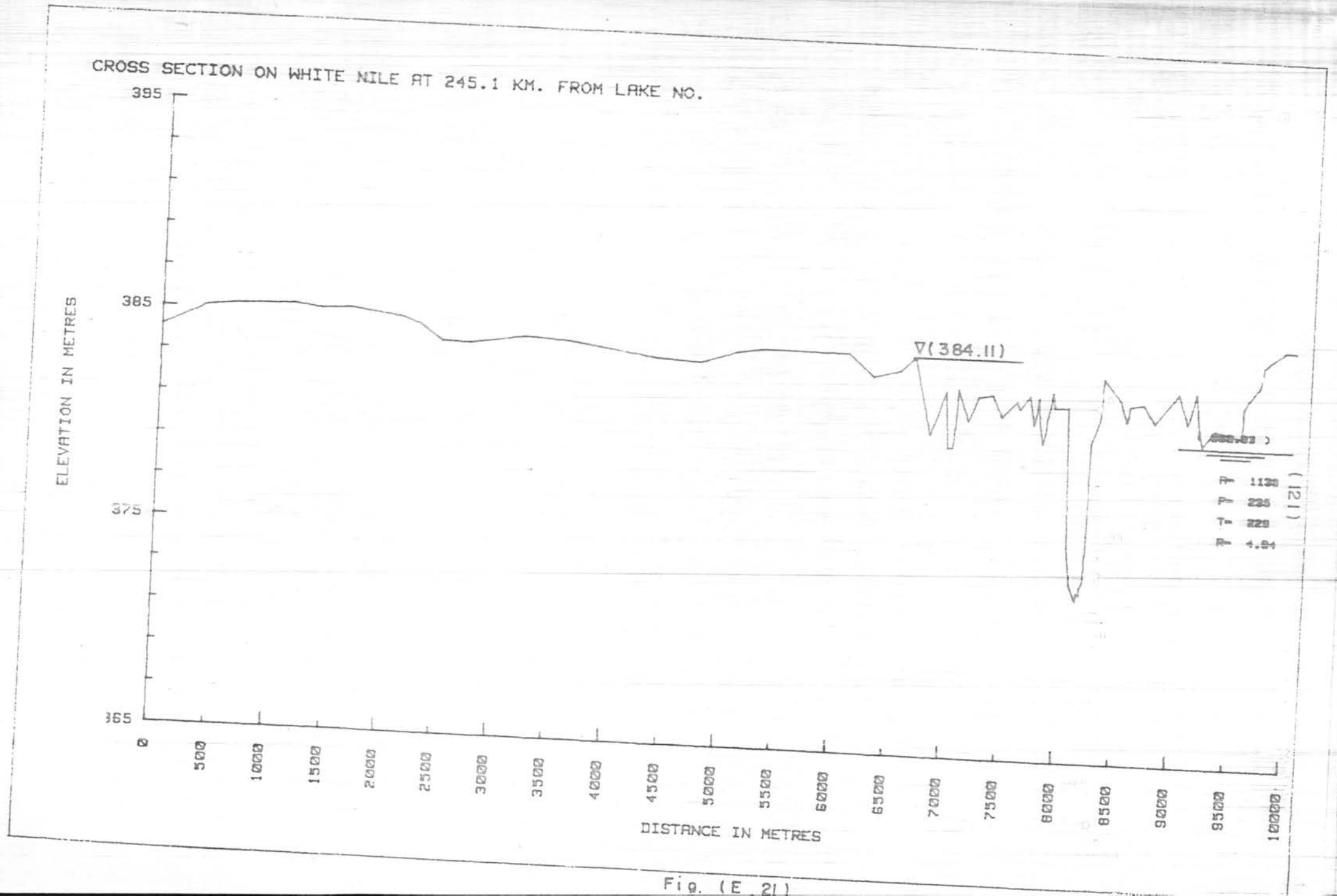

CROSS SECTION ON WHITE NILE AT 245.1 KM. FROM LAKE NO.
395
385
375
365
ELEVATION IN METRES
∇(384.11)
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000
6500
7000
7500
8000
8500
9000
9500
10000
DISTANCE IN METRES

Fig. (E 21)

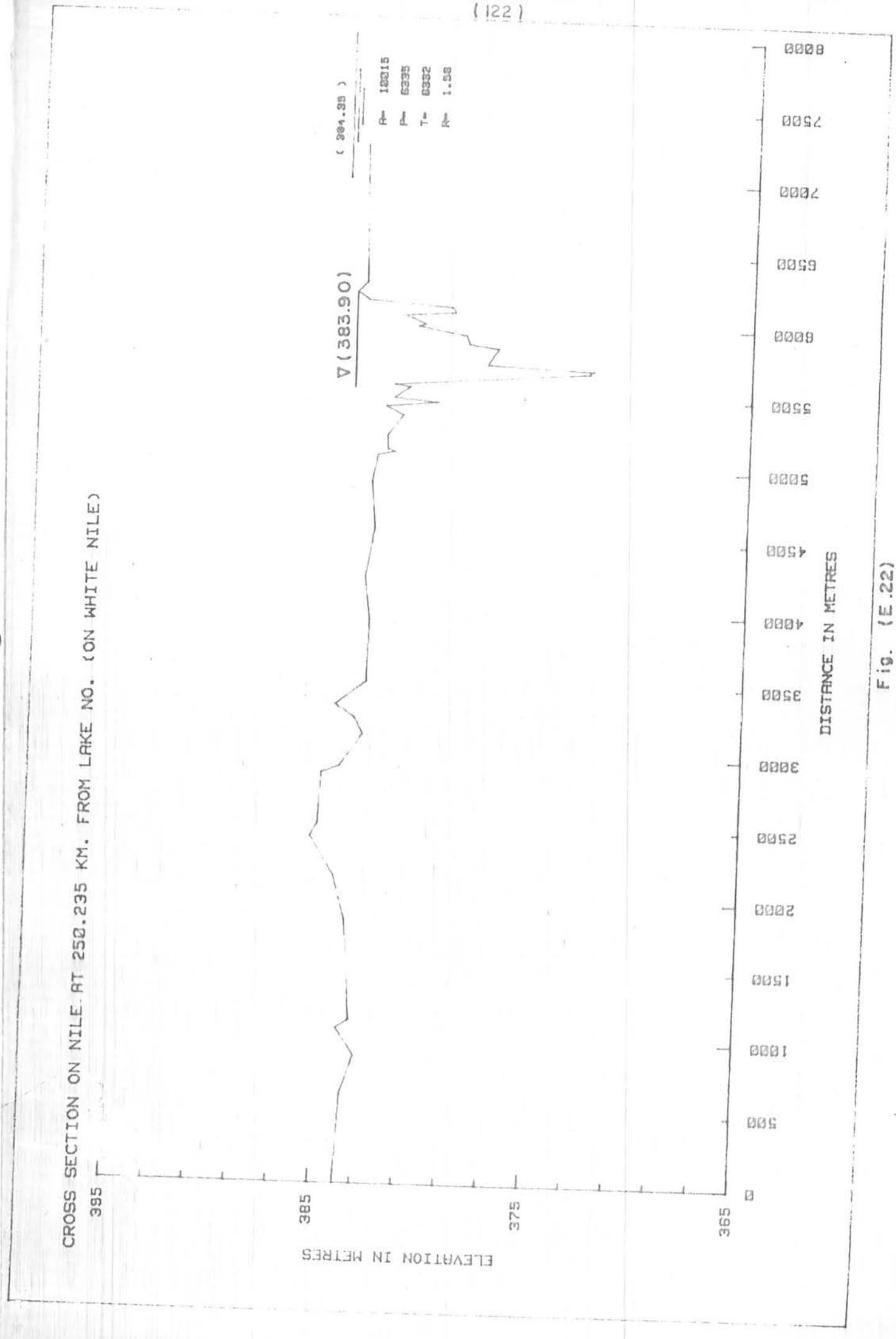

CROSS SECTION ON NILE AT 250.235 KM. FROM LAKE NO. (ON WHITE NILE)
ELEVATION IN METRES
395
385
375
365
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000
6500
7000
7500
8000
DISTANCE IN METRES
▽(383.90)
(384.38)
A= 12015
P= 6335
T= 6382
R= 1.58

Fig. (E.22)

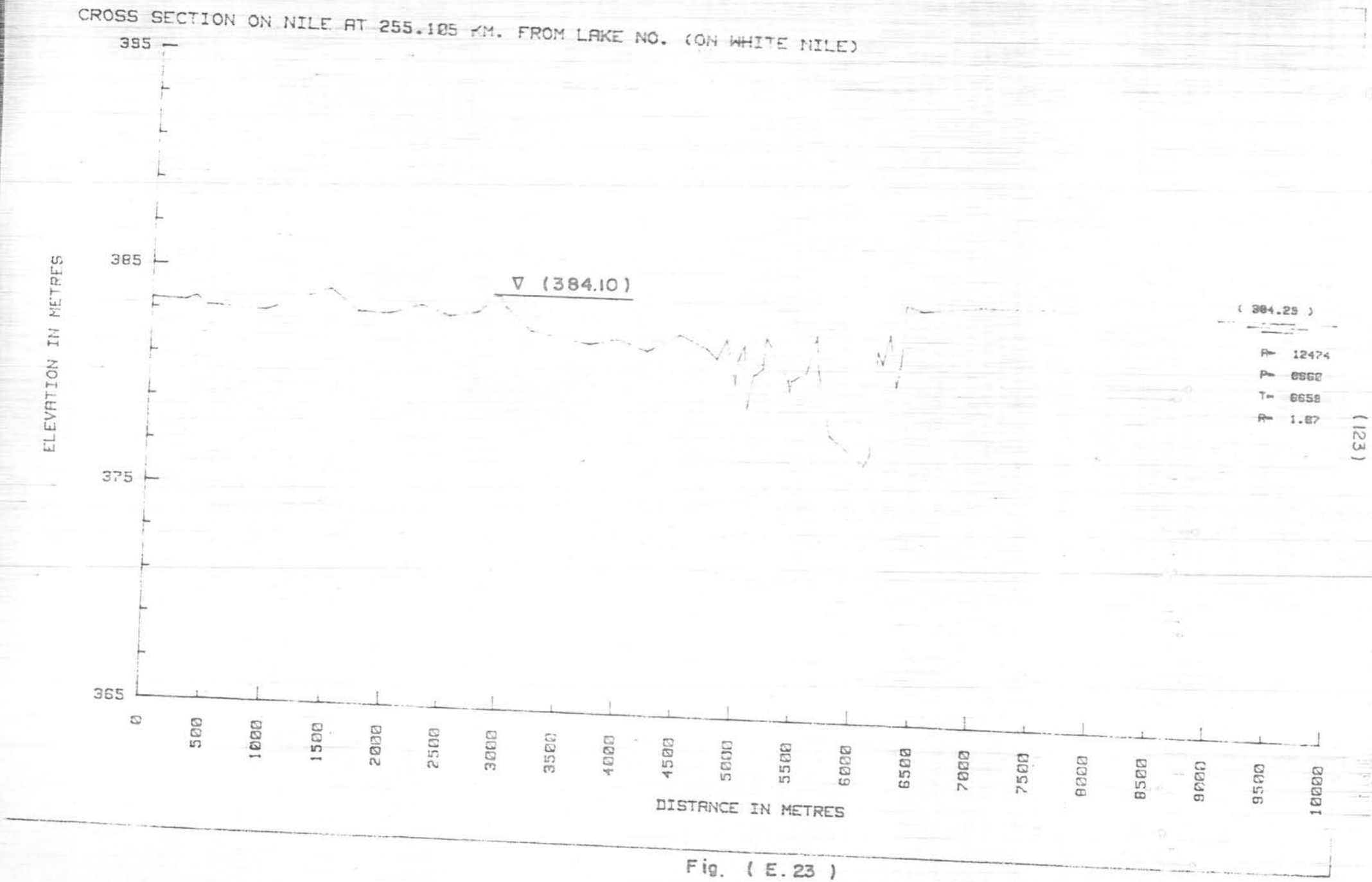

CROSS SECTION ON NILE AT 255.185 KM. FROM LAKE NO. (ON WHITE NILE)
ELEVATION IN METRES
395
385
375
365
▽ (384.10)
(384.25)
P= 12474
P= 6862
T= 6658
R= 1.87
(123)
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000
6500
7000
7500
8000
8500
9000
9500
10000
DISTANCE IN METRES

Fig. (E. 23)

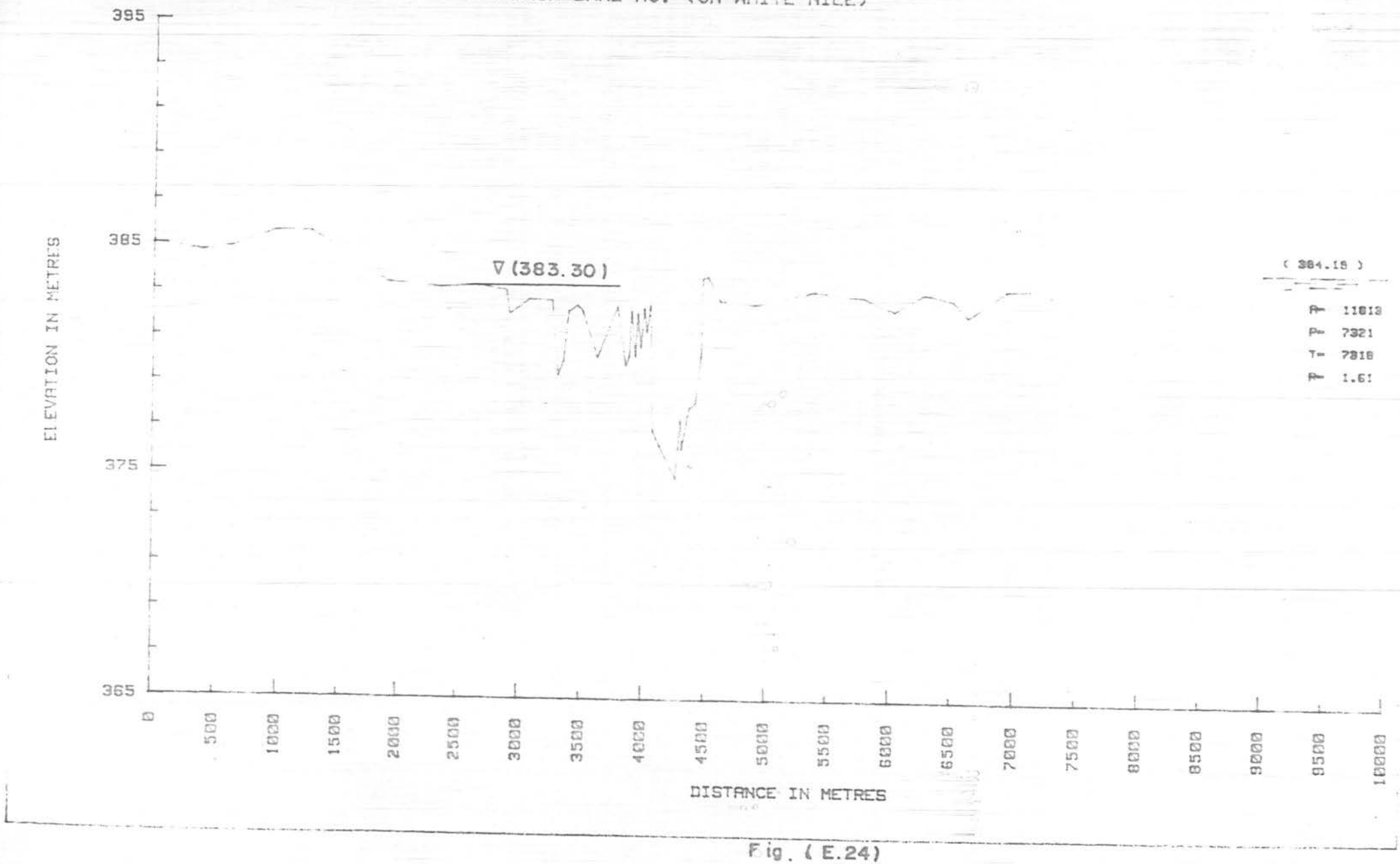

CROSS SECTION ON NILE AT 259.71 KM. FROM LAKE NO. (ON WHITE NILE)
395
385
375
365
ELEVATION IN METRES
▽(383.30)
(384.18)
P= 11813
P= 7321
T= 7818
F= 1.61
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000
6500
7000
7500
8000
8500
9000
9500
10000
DISTANCE IN METRES

Fig. (E.24)

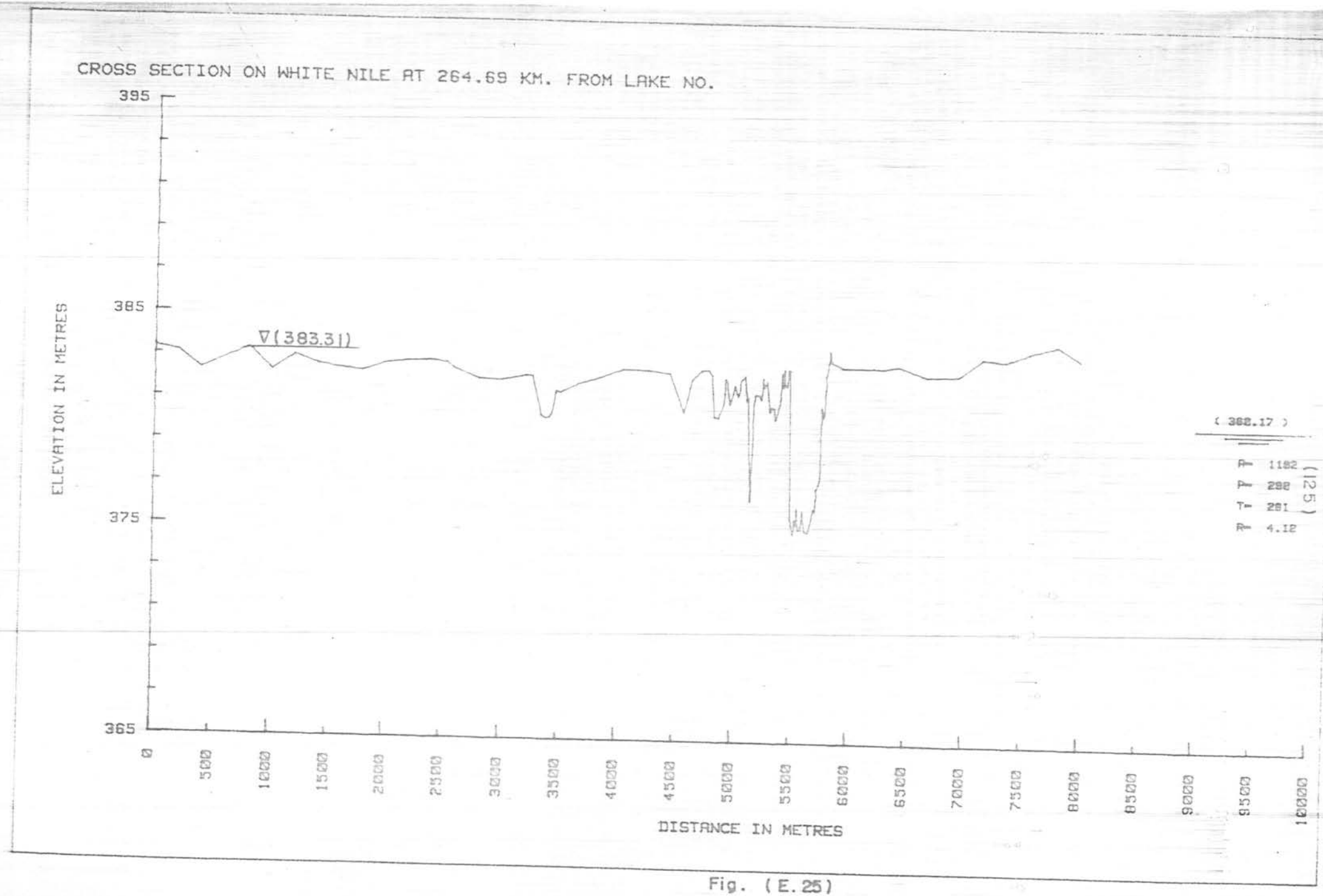

CROSS SECTION ON WHITE NILE AT 264.69 KM. FROM LAKE NO.
395
385
375
365
ELEVATION IN METRES
▽(383.31)
(382.17)
A= 1182
P= 288
T= 281
R= 4.12
(125)
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000
6500
7000
7500
8000
8500
9000
9500
10000
DISTANCE IN METRES

Fig. (E.25)

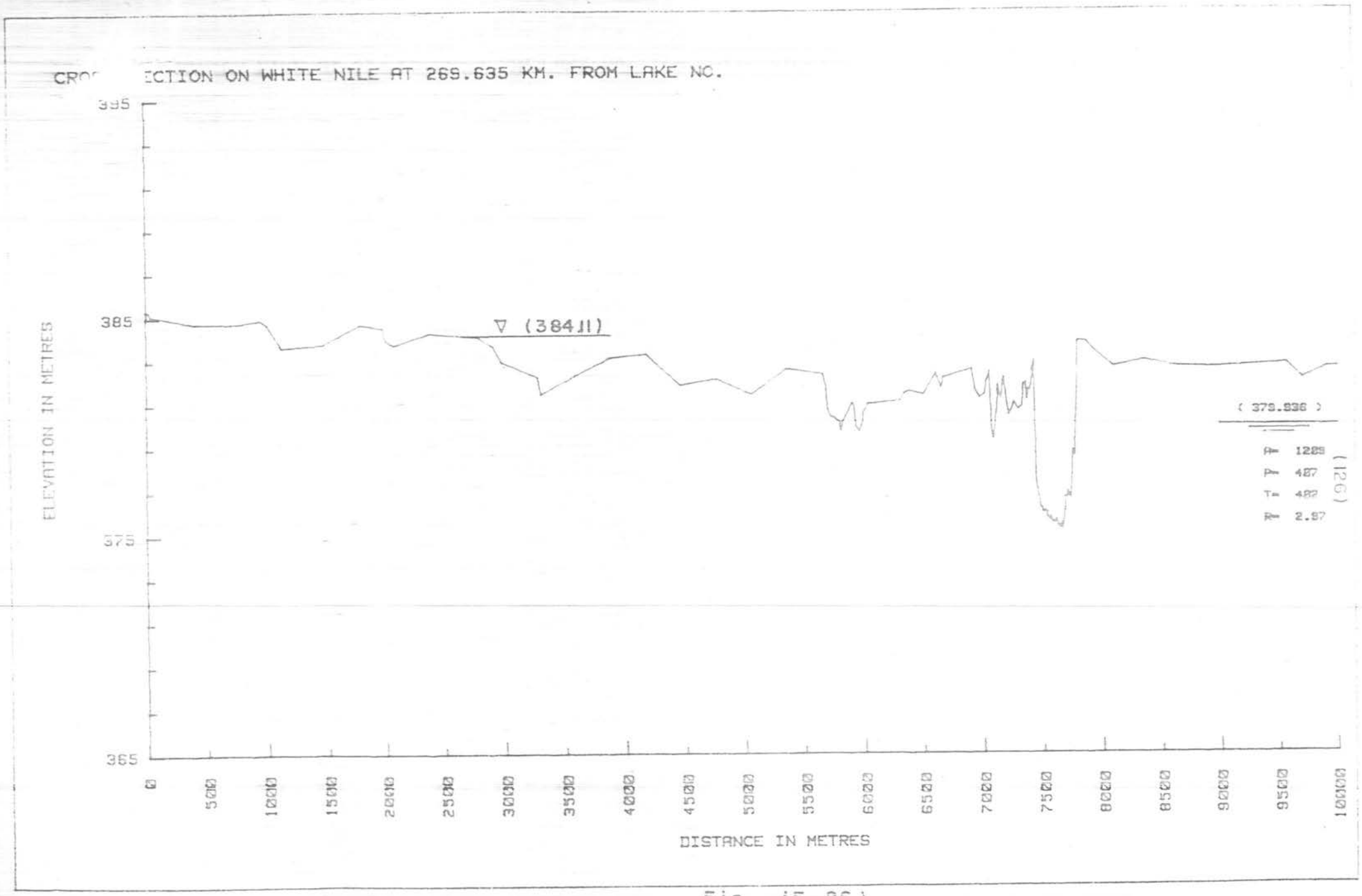

CROSS SECTION ON WHITE NILE AT 269.635 KM. FROM LAKE NO.
395
385
375
365
ELEVATION IN METRES
▽ (384.11)
(379.836)
A= 1289
P= 487
T= 489
R= 2.97
(126)
0
5000
10000
15000
20000
25000
30000
35000
40000
45000
50000
55000
60000
65000
70000
75000
80000
85000
90000
95000
100000
DISTANCE IN METRES

Fig. (E.26)

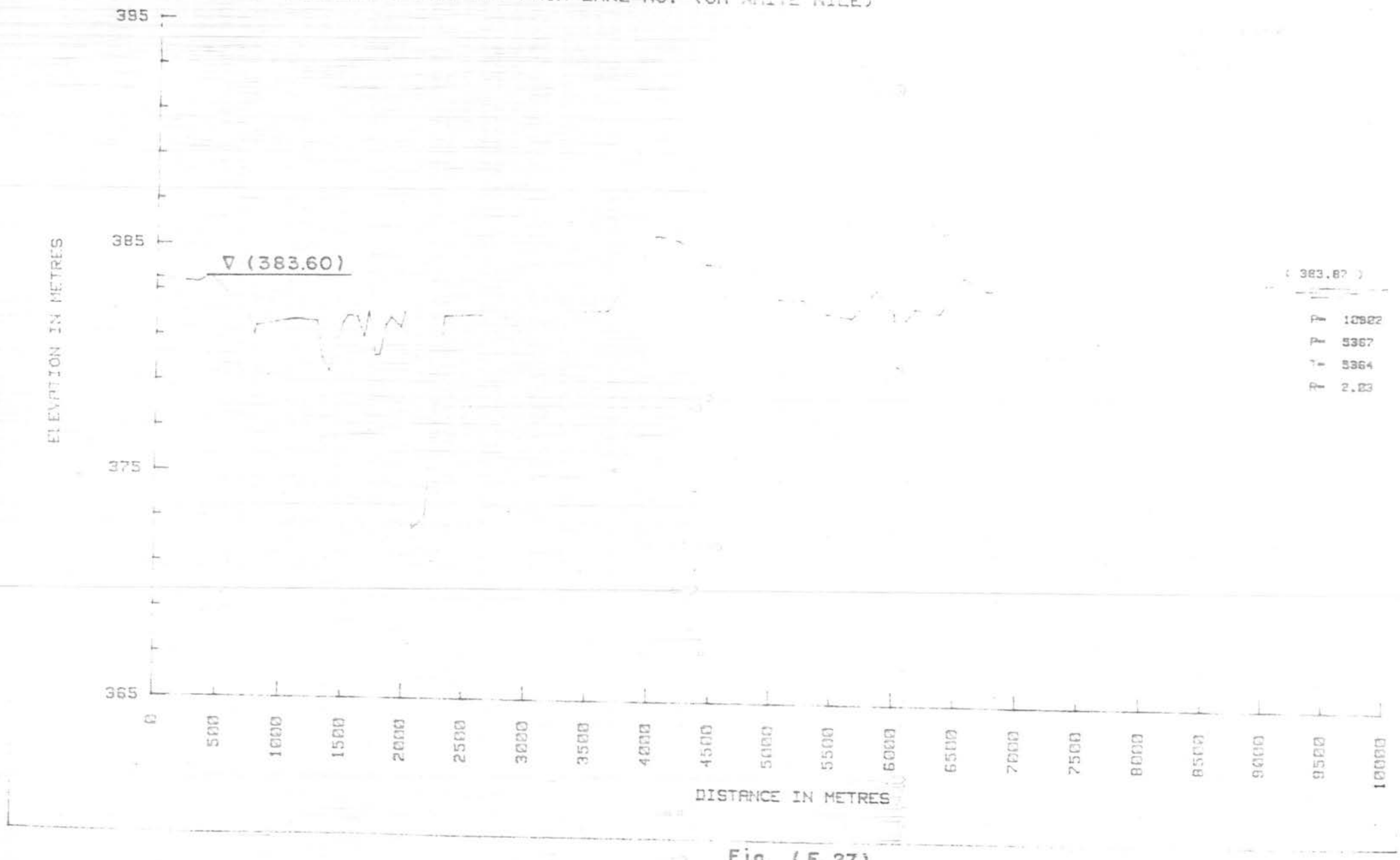

CROSS SECTION ON NILE AT 274.55 KM. FROM LAKE NO. (ON WHITE NILE)
395
385
375
365
ELEVATION IN METRES
▽ (383.60)
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000
6500
7000
7500
8000
8500
9000
9500
10000
DISTANCE IN METRES

Fig. (E.27)

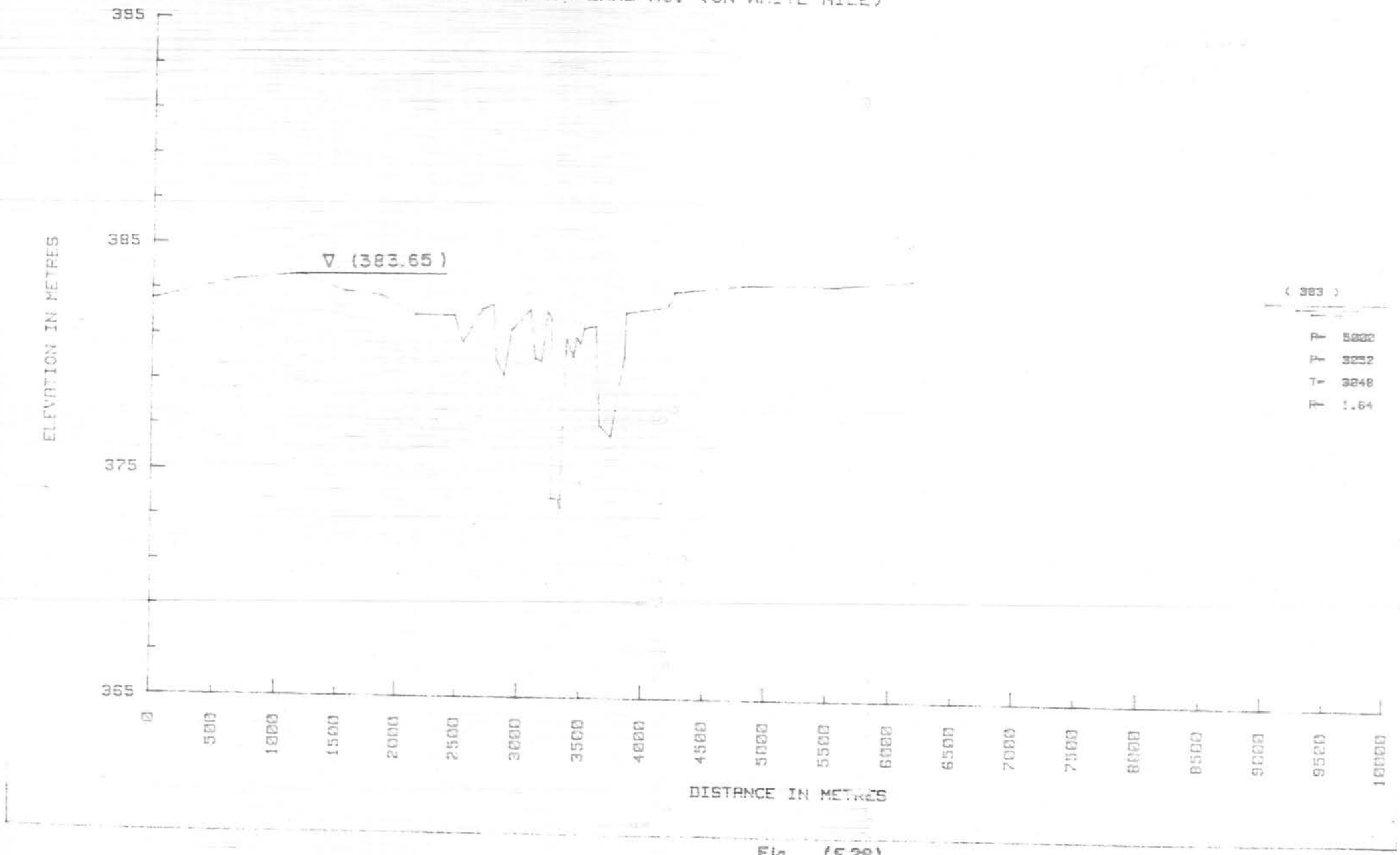

CROSS SECTION ON NILE AT 279.715 KM. FROM LAKE NO. (ON WHITE NILE)
395
385
375
365
ELEVATION IN METRES
▽ (383.65)
(383)
R= 5000
P= 3252
T= 3248
F= 1.64
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000
6500
7000
7500
8000
8500
9000
9500
10000
DISTANCE IN METRES

Fig. (E28)

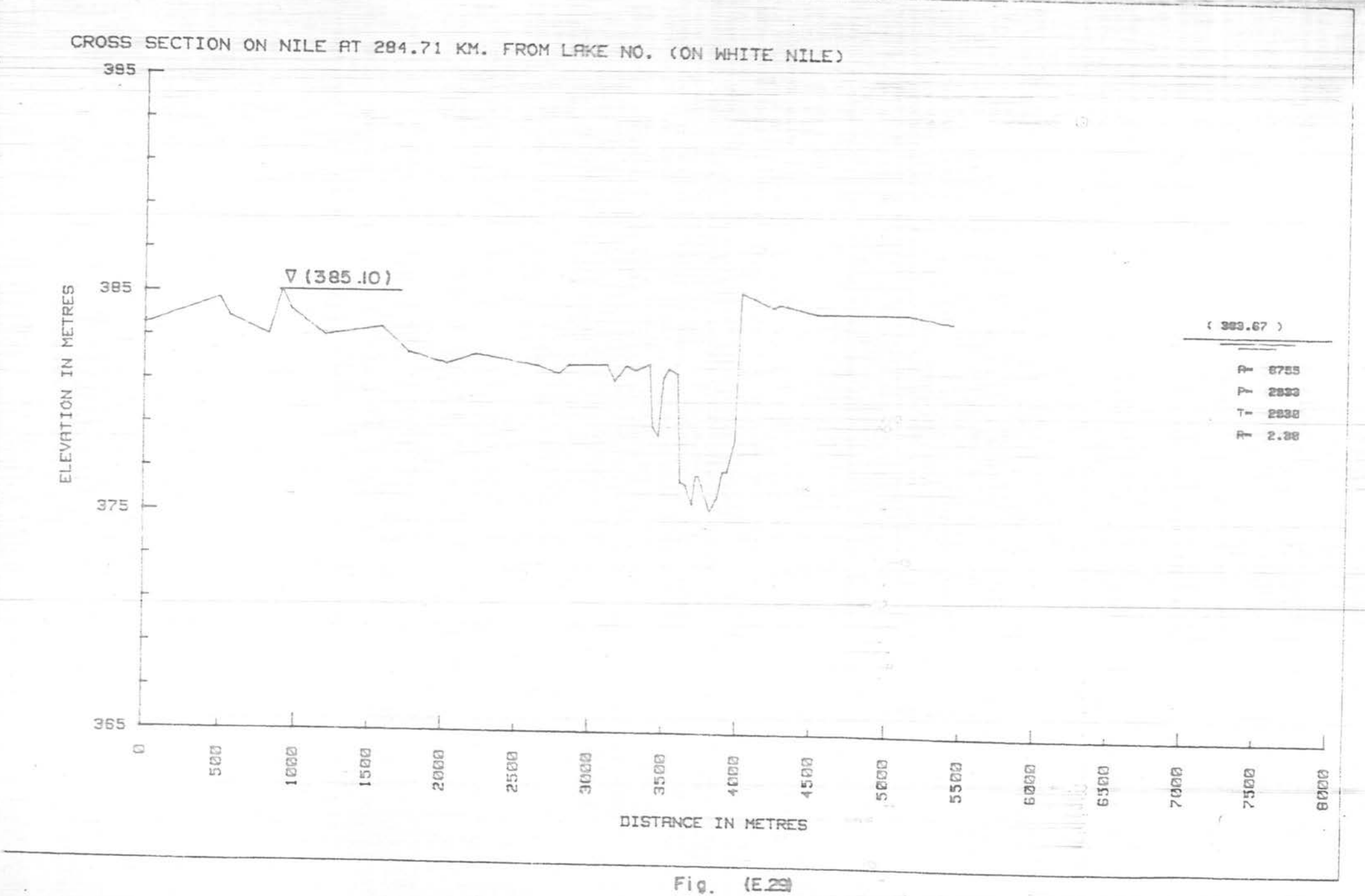

CROSS SECTION ON NILE AT 284.71 KM. FROM LAKE NO. (ON WHITE NILE)
395
385
375
365
ELEVATION IN METRES
▽ (385.10)
(383.67)
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000
6500
7000
7500
8000
DISTANCE IN METRES

Fig. (E.29)

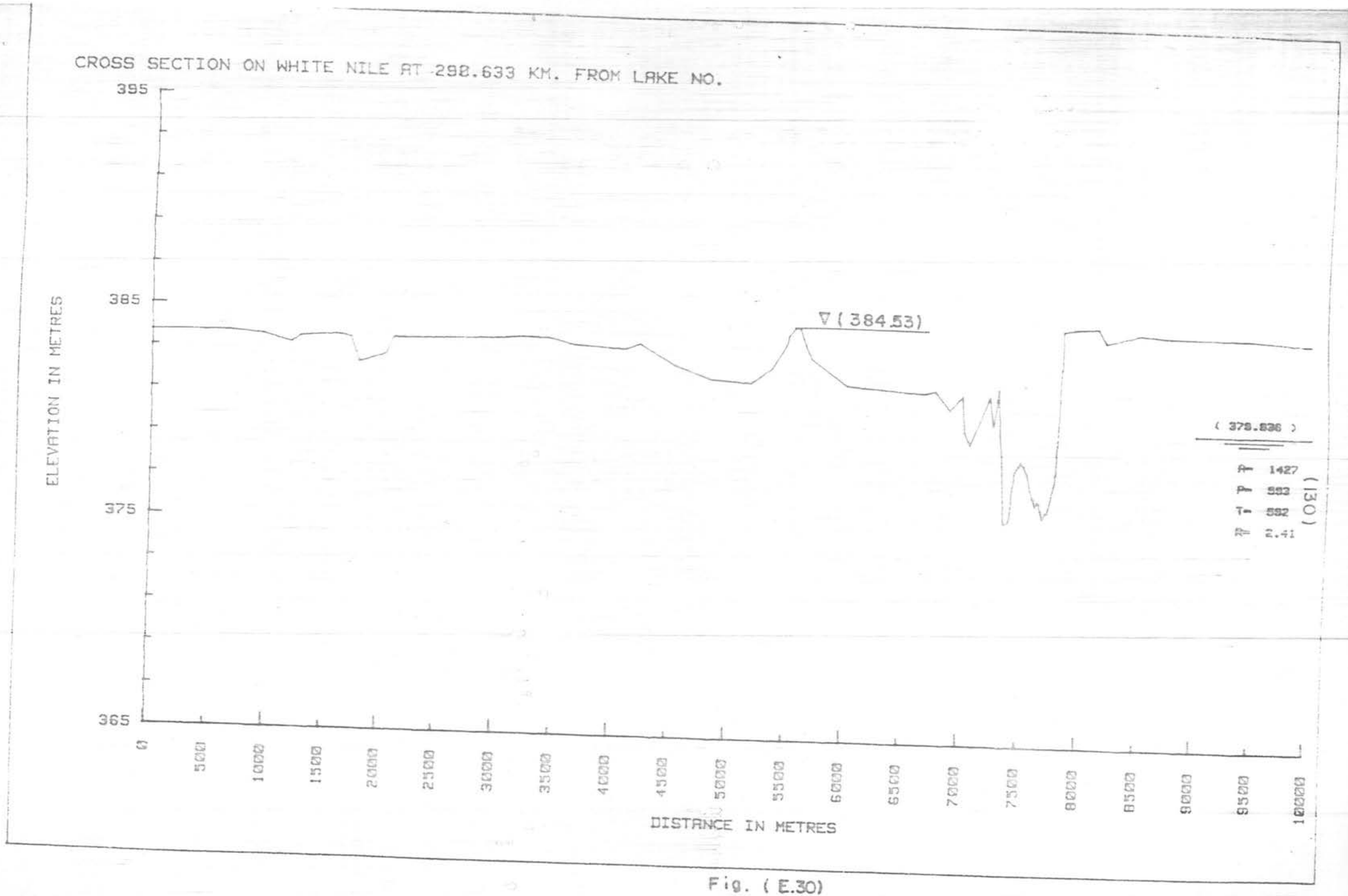

CROSS SECTION ON WHITE NILE AT 298.633 KM. FROM LAKE NO.
395
385
375
365
ELEVATION IN METRES
▽ (384.53)
(378.836)
A= 1427
P= 552
T= 592
R= 2.41
(130)
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000
6500
7000
7500
8000
8500
9000
9500
10000
DISTANCE IN METRES

Fig. (E.30)