Vol. II

REPORT OF THE EXPERT COMMITTEE ON FLOODS FOR DELTAIC AREAS OF KRISHNA GODAVARI AND GUNTUR DISTRICTS OF ANDHRA PRADESH

VOLUME II

APPENDICES

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APPENDICES

APPEN-

STATEMENT SHOWING THE RIVERS AND DRAINS FLOWING

Name of River, Stream or Drain	Catchment Area		Total	Maximum Peak flow		Total
	Upland	Deltaic.		Upland	Deltaic	
	Sq. miles.	Sq. miles.		Cusecs.	Cusecs.	Cusecs.
(1)	(2)	(3)	(4)	(5)	(6)	(7)
A. RIVERS :						
1. Budameru ..	516	213	729	38,900	3,381	42,281
2. Ramileru ..	103	16	119	12,089	584	12,673
3. Thammileru ..	463	60	523	26,920	1,410	28,330
4. Gunderu ..	208	36	244	15,800	1,004	16,804
Minor Streams ..	24	..	24	3,744	..	3,744
Total ..	1,314	325	1,639	97,453	6,379	1,03,832
B. DELTA DRAINS :						
1. Kaikalur Swamp Drain I ..	..	5	5	..	269	269
2. Kaikalur Swamp Drain II ..	..	10	10	..	427	427
3. Motur Channel Drain	..	18	18	..	632	632
4. Chandrayya Drain	..	44	44	..	1,146	1,146
5. Peddapadu Drain ..	..	8	8	..	378	378
6. Vatlur Drain ..	..	10	10	..	427	427
7. Mundicodu Drain ..	..	20	20	..	854	854
8. Pandicodu Drain ..	..	36	36	..	1,264	1,264
9. Siddapuram Drain ..	..	10	10	..	427	427
10. C.W. Drain ..	..	36	36	..	1,264	1,264
Total for Delta Drains		197	197	..	7,088	7,088
say	..	200	200			
Grand Total ..	1,314	525	1,839	97,453	13,467	1.10,920

DIX–A.

INTO KOLLERU AND THEIR HYDROLOGICAL PARTICULARS.

Mean annual rainfall in the catchment in inches for the period 1878 *to* 1940.	*Annual yield from the catchment.*		*Total.*	*Remarks.*
	Upland.	*Deltaic*		
	M.c.ft.	M.c.ft.		
(8)	(9)	(10)	(11)	(12)
35.96	14,241	2,939	17,180	The peak flow is computed from the Ryve's formula Q=CM 2/3 M where Q=discharge in cusecs. M= Catchment in sq. miles.
35.96	2,842	221	3,063	
39.8	16,112	1,008	17,120	The value of C is taken as 600 for upland catchment of Budameru, 550 for upland catchment of Ramileru and 450 for upland catchment of other rivers. For deltaic catchment and delta drains the C value is taken as 92.
39.8	7,370	420	7,790	
39.8	935	..	935	
	41,500	4,588	46,088	
35.96	..	69	69	The annual yield in million cubic feet is computed from Strange's table of Runoff; the upland catchment is treated as good and the delta catchment as bad catchment.
35.96	..	138	138	
35.96	..	248	248	
35.96	..	607	607	
39.8	..	134	134	
39.8	..	168	168	
39.8	..	336	336	
39.8	..	605	605	
39.8	..	168	168	
39.8	..	605	605	
		3,078	3,078	
	41,500	7,666	49,166	

APPENDIX-B.

STATEMENT OF GAUGE, DISCHARGE AND RAINFALL DATA AVAILABLE.

Sl.No.	*Name of river or drain*	*Kind of Data available.*	*Site of observation.*	*Period.*	*Remarks.*
(1)	(2)	(3)	(4)	(5)	(6)
1.	Budameru	Gauge & Discharge.	Diversion site	1959 to 1964	Available with the State. P.W.D.
2.	Thammileru	Do.	Nagireddigudem	1963 to 1964	Do.
		Gauge	East and West Thammileru Escapes.	1-9-1951 to 30-11-1964.	Do.
		Discharge	Do.	1-1-1936 to 30-11-1964.	Do.
3.	Yerrakalva River	Gauge & Discharge.	At the proposed dam site near Appalarajugudem.	1-8-1962 to 30-10-1964.	Do.
	Do.	Do.	At Nandamuru aqueduct.	1-10-1938 30-12-1964.	Do.
4.	Yenamadurru Drain	Do.	At Duvva Regulator	1-1-1955 to 31-12-1964.	Do.
5.	Upputeru River	Discharge	1,000 ft. below road bridge at M 6/6.	25 to 27 & 29 to 30-9-1964, 1, 8, 11, 13, 18, 22, 23 and 25 to 30-10-1964 and 5, to 9, 12 to 19 and 21 to 23-11-1964, 2, 6 and 10-12-964.	Do.
	Do.	Gauge	Do.	1-8-59 to 31-10-59 1-6-60 to 31-12-60 and 1961 to 1965.	Do.
6.	Kolleru Lake	Gauge readings on alternate days.	(i) Kolletikota	3-4-1921 to 23-5-1926.	Do.
			(ii) Kalichedu	1-1-1944 to 9-1-1954.	
			(iii) Perantala Kanuma Head.	1-3-1954 to 31-5-1954.	Do.
			(iv) Juvvikanuma head	1-6-1954 to 21-7-1954.	Do.
			(v) Juvvikanuma mouth.	7-10-1954 to 30-6-1962.	Do.
	Do.	Daily Gauge readings.	Perantala Kanuma mouth.	Do.	Do.
	Do.	Daily water levels.	Kolletikota	1964	Do.
	Do.	Do.	Do.	1965	Do.

APPENDIX-B—(*Contd.*)

STATEMENT SHOWING THE RAINFALL DATA AVAILABLE.

Sl.No.	*Name of the river or drain.*	*Kind of data available.*	*Site of observation.*	*Period.*	*Remarks.*
(1)	(2)	(3)	(4)	(5)	(6)
1.	Kolleru Lake Basin.	.. Rainfall data	1. Tiruvur	1925 to 1964	Available with the State P.W.D.
			2. Nuzvid		
			3. Vijayawada		
			4. Gudivada		
			5. Gannavaram		
			6. Kaikalur		
			7. Chintalapudi		
			8. Ellore		
			9. Nandigama.		
2.	Krishna Western Delta.	Do.	.. 1. Tenali	1945 to 1964 ..	Do.
			2. Repalle		
			3. Bapatla		
			4. Santaravur		
			5. Chinaganjam		
			6. Duggirala		
			7. Intur		
			8. Nizampatnam		
			9. Jagarlamudi		
			10. Nallamada lock		
			11. Pidaparru		
			12. Kolluru		
			13. Kollimerla.		
3.	Krishna Eastern Delta.	Do.	.. 1. Masulipatam	1945 to 1964 ..	Do.
			2. Tadinada		
			3. Lakshmipuram lock		
			4. Nidumolu		
			5. Veeranki lock		
			6. Pamarru		
			7. Komatigunta		
			8. Gannavaram		
			9. Kaikalur		
			10. Vijayawada.		

APPENDIX– B-(Contd.)

STATEMENT SHOWING THE RAINFALL DATA AVAILABLE—(*Contd.*)

Sl. No.	Name of the river or drain	Kind of data available	Site of observation	Period	Remarks.
(1)	(2)	(3)	(4)	(5)	(6)
4.	Godavari Western Delta	Rainfall Data...	1. Palakole lock	1945 to 1964 ..	Available with the State P.W.D.
			2. Mamadur		
			3. Undi		
			✓ 4. Mogalatur lock		
			5. Duvva		
			6. Lakshmipalem lock		
			7. Penkonda		
			8. Endagandi		
			✓ 9. Narasapur		
			10. Nidadavole		
			✓ 11. Bhimavaram		
			✓ 12. Tanuku		
			13. Tadepalligudem		
			✓ 14. Ellore.		
5.	Godavari Central Delta.	Do.	.. 1. Mummidivaram	.. 1945 to 1964 ..	Do.
			✓ 2. Kothapeta		
			✓ 3. Amalapuram		
			✓ 4. Razole		
			5. Ralli lock		
			6. Sakhinetipalli		
			7. Mukkamala.		
6.	Godavari Eastern Delta.	Do.	✓.. 1. Alamuru	1945 to 1964	Do.
			2. Vella		
			3. Coringa		
			✓ 4. Biccavolu		
			✓ 5. Kakinada		
			6. Dowlaiswaram		
			7. Kulla		
			✓ 8. Chintapalli.		

APPENDIX—C 1 (i)

DISCHARGES OF BUDAMERU RIVER AT DIVERSION SITE DURING 1959.

(In Cusecs)

Date	*July.*	*August.*	*September.*	*October.*	*November.*	*Remarks.*
1	Nil.	82	793	274	112	
2	,,	82	198	239	112	
3	,,	82	198	239	112	
4	1,064	82	364	171	112	
5	778	82	5,334	826	112	
6	368	82	1,808	826	112	
7	245	82	677	1,534	112	
8	327	450	452	2,360	112	
9	205	409	1,416	2,242	112	
10	163	205	1,416	1,770	112	
11	245	164	1,180	444	112	
12	82	655	546	265	75	
13	41	2,542	304	212	75	
14	41	900	273	186	37	
15	164	614	212	182	37	
16	696	680	182	182	37	
17	1,105	662	152	152	37	
18	737	212	152	152	37	
19	409	Nil.	152	119	37	
20	245	,,	91	119	37	
21	705	,,	91	90	35	
22	450	1,376	91	90	33	
23	2,251	1,124	91	90	33	
24	1,923	709	91	90	33	
25	859	333	61	298	33	
26	859	1,293	61	285	32	
27	655	5,940	152	149	26	Peak discharge 5,940 cusecs on 27-8-1959.
28	327	5,544	91	149	Nil.	
29	205	1,651	483	223	,,	
30	123	5,148	483	149	,,	
31	82	1,652	—	149	—	

APPEN-

DISCHARGES OF BUDAMERU RIVER AT

Date	June			July			August		
	Through Regulator	Through Diversion Channel	Total	Through Regulator	Through Diversion Channel	Total	Through Regulator	Through Diversion Channel	Total
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1	Nil.	Nil.	Nil.	Nil.	675	675	Nil.	759	759
2	,,	,,	,,	,,	1,511	1,511	,,	350	350
3	,,	,,	,,	,,	812	812	,,	525	525
4	,,	,,	,,	,,	721	721	,,	450	450
5	,,	,,	,,	,,	209	209	,,	434	434
6	,,	,,	,,	,,	216	216	,,	406	406
7	,,	,,	,,	,,	741	741	,,	375	375
8	,,	,,	,,	,,	709	709	,,	375	375
9	,,	,,	,,	,,	1,900	1,900	,,	375	375
10	,,	,,	,,	,,	775	775	,,	375	375
11	,,	,,	,,	,,	581	581	,,	350	350
12	,,	,,	,,	,,	147	147	,,	350	350
13	,,	,,	,,	,,	38	38	,,	288	288
14	,,	,,	,,	,,	25	25	,,	244	244
15	,,	,,	,,	,,	25	25	,,	119	119
16	,,	,,	,,	,,	25	25	,,	Nil.	Nil.
17	,,	,,	,,	,,	24	24	,,	,,	,,
18	,,	,,	,,	,,	20	20	,,	,,	,,
19	,,	,,	,,	,,	20	20	,,	,,	,,
20	,,	,,	,,	,,	20	20	,,	,,	,,
21	,,	,,	,,	,,	20	20	,,	,,	,,
22	,,	,,	,,	,,	20	20	,,	,,	,,
23	,,	,,	,,	,,	59	59	,,	,,	,,
24	,,	,,	,,	,,	66	66	,,	,,	,,
25	,,	,,	,,	,,	634	634	,,	,,	,,
26	123	,,	123	,,	419	419	,,	,,	,,
27	293	,,	293	,,	1,416	1,416	,,	,,	
28	123	,,	123	,,	1,206	1,206	,,	397	397
29	62	,,	62	,,	3,200	3,200	,,	253	253
30	229		229		2,519	2,519	,,	141	141
31					1,369	1,369	,,	200	200

DIX—Cr. (*ii*)

DIVERSION SITE DURING 1960 (In cusecs)

September			*October*			*Remarks*
Through Regulator	*Through Divn. Channel*	*Total*	*Through Regulator*	*Through Divn. Channel*	*Total*	
(11)	(12)	(13)	(14)	(15)	(16)	(17)
Nil.	512	512	Nil.	709	709	
,,	60	60	,,	2,244	2,244	
,,	39	39	,,	1,575	1,575	
,,	15	15	,,	1,213	1,213	
,,	Nil.	Nil.	,,	1,060	1,060	
,,	859	859	,,	797	797	
,,	472	472	,,	558	558	
,,	553	553	,,	880	880	
,,	419	419	,,	481	481	Peak discharge 3825 cusecs on 29-7-60 at 9-00 a.m.
,,	553	553	,,	422	422	
,,	144	144	,,	266	266	
,,	89	89	100	31	131	
,,	Nil.	Nil.	50	Nil.	50	
,,	,,	,,	Nil.	,,	Nil	
,,	,,	,,	,,	,,	,,	
,,	1,219	1,219	,,	,,	,,	
,,	859	859	,,	,,	,,	
,,	2,100	2,100	,,	,,	,,	
,,	1,056	1,056	,,	,,	,,	
,,	875	875	,,	,,	,,	
,,	944	944	,,	,,	,,	
,,	541	541	,,	,,	,,	
,,	1,569	1,569	,,	,,	,,	
,,	1,175	1,175	,,	,,	,,	
,,	834	834	,,	,,	,,	
,,	944	944		,,		
,,	881	881	,,	,,	,,	
,,	653	653	,,	,,	,,	
,,	1,075	1,075	,,	,,	,,	
,,	931	931	,,	,,	,,	

APPEN-

DISCHARGES OF BUDAMERU RIVER AT

Date	June			July			August		
	Through Regulator	Through Diversion Channel	Total	Through Regulator	Through Diversion Channel	Total	Through Regulator	Through Diversion Channel	Total
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1	Nil.	Nil.	Nil.	Nil.	Nil.	Nil.	Nil.	578	578
2	,,	,,	,,	,,	,,	,,	,,	619	619
3	,,	,,	,,	,,	,,	,,	,,	541	541
4	,,	,,	,,	,,	,,	,,	,,	322	322
5	,,	,,	,,	,,	,,	,,	,,	250	250
6	,,	,,	,,	,,	,,	,,	,,	150	150
7	,,	,,	,,	,,	,,	,,	,,	150	150
8	,,	,,	,,	,,	,,	,,	,,	Nil.	Nil.
9	,,	,,	,,	,,	,,	,,	,,	,,	,,
10	,,	,,	,,	,,	,,	,,	,,	,,	,,
11	,,	,,	,,	,,	,,	,,	,,	200	200
12	,,	,,	,,	,,	,,	,,	,,	181	181
13	,,	,,	,,	,,	,,	,,	,,	175	175
14	,,	,,	,,	,,	,,	,,	,,	150	150
15	,,	,,	,,	,,	,,	,,	,,	Nil.	Nil.
16	,,	,,	,,	,,	,,	,,	,,	,,	,,
17	,,	,,	,,	,,	,,	,,	,,	200	200
18	,,	,,	,,	,,	,,	,,	,,	318	318
19	,,	,,	,,	,,	,,	,,	,,	384	384
20	,,	,,	,,	,,	,,	,,	,,	447	447
21	,,	,,	,,	,,	,,	,,	,,	419	419
22	,,	,,	,,	141	,,	141	,,	375	375
23	,,	,,	,,	41	,,	41	,,	288	288
24	,,	,,	,,	Nil	393	393	,,	190	190
25	,,	,,	,,	,,	473	473	,,	200	200
26	,,	,,	,,	434	Nil.	434	,,	940	940
27	,,	,,	,,	Nil.	369	369	,,	622	622
28	,,	,,	,,	,,	253	253	,,	434	434
29	,,	,,	,,	,,	362	362	,,	406	406
30	,,	,,	,,	,,	291	291	,,	909	909
31				,,	166	166	,,	1,119	1,119

DIX C1 (*iii*)

DIVERSION SITE DURING 1961

(*In cusecs*)

September			*October*			
Through Regulator	*Through Division Channel*	*Total*	*Through Regulator*	*Through Division Channel*	*Total*	*Remarks*
(11)	(12)	(13)	(14)	(15)	(16)	(17)
Nil.	1,084	1,084	Nil.	444	444	
,,	906	906	,,	1,156	1,156	
,,	600	600	,,	819	819	
,,	1,940	1,940	,,	562	562	
,,	2,347	2,347	,,	465	465	
,,	2,134	2,134	,,	944	944	
801	3,100	3,901	,,	1,150	1,150	
1,404	1,404	2,808	,,	1,004	1,004	
Nil.	2,822	2,822	,,	2,258	2,253	
,,	1,218	1,218	,,	2,150	2,150	Peak discharge (1392+ 3625)=5017 cusecs on 8-9-1961 at 4 p.m.
,,	712	712	,,	2,194	2,194	
,,	619	619	,,	2,534	2,534	
,,	503	503	,,	1,481	1,481	
,,	444	444	,,	947	947	
,,	444	444	,,	1,165	1,165	
,,	425	425	,,	1,040	1,040	
,,	425	425	,,	890	890	
,,	456	456	,,	684	684	
,,	375	375	,,	681	681	
,,	406	406	,,	1,815	1,815	
,,	603	603	,,	1,328	1,328	
,,	788	788	,,	881	881	
,,	541	541	,,	625	625	
,,	438	438	,,	544	544	
,,	412	412	,,	475	475	
,,	1,978	1,978	,,	694	694	
,,	1,575	1,575	,,	958	958	
,,	941	941	,,	1,322	1,322	
,,	606	606	,,	1,481	1,481	
,,	484	484	,,	1,206	1,206	
				888	888	

APPEN-

DISCHARGES OF BUDAMERU RIVER AT

Date	June			July			August		
	Through Regulator	Through Diversion Channel	Total	Through Regulator	Through Diversion Channel	Total	Through Regulator	Through Diversion Channel	Total
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1	Nil	Nil	Nil	Nil	Nil	Nil	Nil	13	13
2	,,	,,	,,	,,	,,	,,	,,	Nil	Nil
3	485	,,	485	,,	,,	,,	,,	,,	,,
4	1,205	,,	1,205	,,	,,	,,	,,	,,	,,
5	573	,,	573	,,	,,	,,	,,	,,	,,
6	1,284	,,	1,284	39	,,	39	,,	,,	,,
7	560	,,	560	Nil	,,	Nil	9	,,	9
8	Nil	,,	Nil	,,	,,	,,	Nil	570	570
9	,,	,,	,,	,,	,,	,,	,,	1,053	1,053
10	,,	,,	,,	,,	108	108	,,	659	659
11	,,	,,	,,	,,	146	146	380	Nil	380
12	,,	,,	,,	,,	72	72	280	,,	280
13	,,	,,	,,	,,	434	434	271	,,	271
14	,,	,,	,,	,,	347	347	201	,,	201
15	,,	,,	,,	,,	134	134	Nil	217	217
16	,,	,,	,,	,,	Nil	Nil	,,	198	198
17	,,	,,	,,	,,	,,	,,	,,	154	154
18	,,	,,	,,	,,	,,	,,	,,	150	150
19	,,	,,	,,	,,	,,	,,	,,	201	201
20	,,	,,	,,	,,	,,	,,	,,	165	165
21	,,	,,	,,	53	257	310	,,	117	117
22	,,	,,	,,	184	93	277	,,	147	147
23	,,	,,	,,	120	112	232	,,	143	143
24	,,	,,	,,	47	172	219	,,	152	152
25	,,	,,	,,	Nil	319	319	,	111	111
26	,,	,,	,,	,,	134	134	,,	106	106
27	,,	,,	,,	,,	83	83	,,	442	442
28	,,	,,	,,	,,	164	164	,,	557	557
29	,,	,,	,,	,,	Nil	Nil	,,	533	533
30	,,	,,	,,	,,	,,	,,	,,	305	305
31	,,	,,	,,	,,	79	79	,,	475	475

DIX C 1 (*iv*)

DIVERSION SITE DURING 1962

(*In cusecs*)

September			*October*			
Through Regulator	*Through Diversion Channel*	*Total*	*Through Regulator*	*Through Diversion Channel*	*Total*	*Remarks*
(11)	(12)	(13)	(14)	(15)	(16)	(17)
Nil	473	473	Nil	1,016	1,016	
,,	264	264	,,	819	819	
,,	191	191	,,	675	675	
,,	321	321	,,	594	594	
,,	1,076	1,076	,,	528	528	
,,	918	918	,,	525	525	
,,	774	774	,,	590	590	Peak Discharge (2923+
,,	2,603	2,603	,,	613	613	5900)=8823 cusecs on
1,097	5,777	6,874	,,	525	525	9.9.1962 at 7 p.m.
521	5,914	6,435	,,	525	525	
84	4,920	5,004	,,	522	522	
110	3,450	3,560	,,	544	544	
84	1,953	2,037	,,	406	406	
Nil	1,619	1,619	,,	127	127	
,,	2,052	2,052	,,	388	388	
,,	2,131	2,131	,,	478	478	
,,	3,261	3,261	,,	1,097	1,097	
,,	3,050	3,050	,,	922	922	
,,	2,440	2,440	,,	678	678	
,,	1,622	1,622	,,	544	544	
,,	925	925	,,	522	522	
,,	975	975	,,	658	658	
,,	837	837	,,	597	597	
,,	746	746	,,	931	931	
,,	650	650	,,	737	737	
,,	697	697	,,	922	922	
,,	656	656	,,	1,340	1,340	
,,	650	650	,,	1,394	1,394	
,,	556	556	,,	1,009	1,009	
,,	594	594	,,	1,149	1,149	
,,	..	..	,,	1,997	1,997	

APPEN

DISCHARGES OF BUDAMERU RIVER AT

Date	June			July			August		
	Through Regulator	Through Diversion Channel	Total	Through Regulator	Through Diversion Channel	Total	Through Regulator	Through Diversion Channel	Total
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1	Nil	Nil	Nil	83	Nil	83	107	860	967
2	,,	,,	,,	261	,,	261	161	1,075	1,236
3	,,	,,	,,	61	,,	61	121	1,075	1,196
4	,,	,,	,,	61	,,	61	52	2,515	2,567
5	,,	,,	,,	61	,,	61	22	2,427	2,449
6	,,	,,	,,	33	,,	33	22	1,700	1,722
7	,,	,,	,,	Nil	,,	Nil	22	1,234	1,256
8	,,	,,	,,	,,	,,	,,	22	784	806
9	,,	,,	,,	,,	,,	,,	22	1,644	1,666
10	,,	,,	,,	,,	,,	,,	22	1,278	1,300
11	,,	,,	,,	,,	,,	,,	22	969	991
12	88	,,	88	,,	,,	,,	22	681	703
13	65.5	,,	65.5	,,	,,	,,	22	650	672
14	22	,,	22	,,	,,	,,	22	734	756
15	3	,,	3	,,	,,	,,	22	966	988
16	Nil	,,	Nil	37	,,	37	22	1,669	1,691
17	,,	,,	,,	8	,,	8	22	1,312	1,334
18	,,	,,	,,	Nil	,,	Nil	22	2,081	2,103
19	,,	,,	,,	42	246	288	22	1,678	1,700
20	,,	,,	,,	55	302	357	22	1,350	1,372
21	,,	,,	,,	61	62	123	40	2,956	2,996
22	,,	,,	,,	6	Nil	6	534	5,831	6,365
23	,,	,,	,,	Nil	,,	Nil	200	9,724	9,924
24	,,	,,	,,	172	261	433	80	2,376	2,456
25	,,	,,	,,	33	585	618	80	1,843	1,923
26	,,	,,	,,	22	450	472	70	1,449	1,519
27	,,	,,	,,	18	294	312	65	1,185	1,250
28	,,	,,	,,	81	61	142	55	1,003	1,058
29	,,	,,	,,	61	Nil	61	46	775	821
30	,,	,,	,,	27	,,	27	45	650	695
31	,,	,,	,,	43	,,	43	31	589	620

DIX C 1 (*v*)

DIVERSION SITE DURING 1963

(In cusecs)

September			October			Remarks
Through Regulator	*Through Diversion Channel*	*Total*	*Through Regulator*	*Through Diversion Channel*	*Total*	
(11)	(12)	(13)	(14)	(15)	(16)	(17)
30	543	573	35	412	447	
28	525	553	29	297	326	
26	506	532	21	94	115	
35	478	513	17	159	176	
33	441	474	20	241	261	
31	353	384	20	219	239	
30	350	380	22	319	341	
29	332	361	22	397	419	
24	203	277	117	1,794	1,911	
22	200	222	206	2,000	2,206	
22	313	335	333	507	1,840	
22	400	422	296	787	1,083	
22	367	389	160	591	751	
31	834	865	35	620	655	
36	610	646	30	534	564	
36	597	633	30	525	555	
63	1,320	1,383	30	456	486	
70	2,630	2,700	29	412	441	
70	1,431	1,501	21	344	365	
70	1,022	1,092	20	292	312	
70	663	733	23	481	504	
70	444	514	49	2,951	3,000	
70	312	382	3,409	6,755	10,164	Peak discharge (19750+ 7050)=26800 cusecs on 24-10-1963 at 10 a.m.
66	731	797	8,145	4,771	12,916	
36	594	630	2,131	2,873	5,004	
31	550	581	760	2,688	3,448	
43	822	865	20	2,278	2,298	
39	543	582	20	1,781	1,811	
35	452	487	16	1,556	1,572	
33	375	408	20	1,207	1,227	
..	..	..	20	881	901	

APPEN-

DISCHARGES OF BUDAMERU RIVER

Date	June			July		
	Discharge through Regulator	*Discharge through Diversion Channel*	*Total Discharge*	*Discharge through Regulator*	*Discharge through Diversion Channel*	*Total Discharge*
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1	Nil	Nil	Nil	Nil	Nil	,,
2	,,	,,	,,	,,	,,	,,
3	,,	,,	,,	,,	,,	,,
4	169	,,	169	,,	,,	,,
5	19	,,	19	,,	,,	,,
6	Nil	,,	Nil	,,	,,	,,
7	,,	,,	,,	,,	,,	,,
8	,,	,,	,,	,,	,,	,,
9	,,	,,	,,	,,	,,	,,
10	,,	,,	,,	,,	,,	,,
11	,,	,,	,,	56	,,	56
12	,,	,,	,,	19	,,	19
13	,,	,,	,,	Nil	,,	Nil
14	,,	,,	,,	,,	,,	,,
15	,,	,,	,,	11	,,	11
16	,,	,,	,,	22	,,	22
17	,,	,,	,,	Nil	,,	Nil
18	,,	,,	,,	,,	,,	,,
19	,,	,,	,,	14	,,	14
20	,,	,,	,,	22	,,	22
21	,,	,,	,,	71	,,	71
22	,,	,,	,,	32	,,	32
23	,,	,,	,,	22	,,	22
24	,,	,,	,,	17	,,	17
25	,,	,,	,,	112	291	403
26	,,	,,	,,	Nil	156	156
27	,,	,,	,,	,,	Nil	Nil
28	,,	,,	,,	,,	,,	,,
29	,,	,,	,,	,,	,,	,,
30	,,	,,	,,	,,	,,	,,
31	,,	,,	,,	,,	,,	,,

Note.—Peak discharge (28470+11125)=39595 cusecs on 29-9-1964 at 2-30 a.m.

DIX—C 1—v(i)

AT DIVERSION SITE DURING 1964.

(*in cusecs.*)

August			*September*			*October*		
Discharge through Regulator	*Discharge through Diversion Channel*	*Total discharge*	*Discharge through Regulator*	*Discharge through Diversion Channel*	*Total Discharge*	*Discharge through Regulator*	*Discharge through Diversion Channel*	*Total Discharge*
(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Nil	Nil	Nil	Nil	Nil	Nil	569	122	691
,,	,,	,,	,,	,,	,,	570	,,	570
,,	,,	,,	,,	,,	,,	401	,,	401
,,	,,	,,	,,	,,	,,	307	,,	307
,,	,,	,,	,,	,,	,,	251	,,	251
,,	275	275	,,	,,	,,	182	,,	182
,,	259	259	,,	,,	,,	362	,,	362
,,	125	125	,,	,,	,,	319	,,	319
,,	,,	,,	,,	,,	,,	173	,,	173
,,	,,	,,	,,	,,	,,	173	,,	173
95	585	680	84	,,	84	173	,,	173
46	492	538	70	,,	70	150	,,	150
Nil	,,	,,	36	,,	36	112	,,	112
,,	,,	,,	680	,,	680	112	,,	112
,,	,,	,,	649	,,	649	112	,,	112
,,	,,	,,	89	794	883	112	,,	112
,,	,,	,,	,,	941	941	112	,,	112
,,	,,	,,	,,	613	613	112	,,	112
,,	,,	,,	60	322	382	112	,,	112
,,	,,	,,	90	425	515	112	,,	112
,,	94	94	,,	600	600	112	,,	112
,,	391	391	,,	478	478	112	,,	112
,,	69	69	,,	525	525	112	,,	112
,,	,,	,,	,,	1,420	1,420	562	,,	562
,,	,,	,,	,,	1,263	1,263	167	,,	167
,,	,,	,,	,,	813	813	70	,,	70
,,	,,	,,	,,	725	725	,,	,,	,,
,,	,,	,,	11,577	5,293	16,870	,,	,,	,,
,,	,,	,,	14,883	5,345	20,228	,,	,,	,,
,,	,,	,,	852	600	1,452	,,	,,	,,
,,	,,	,,	,,	,,	,,	,,	,,	,,

APPENDIX C-2 (*i*)

DISCHARGES OF THAMMILERU RIVER AT NAGIREDDIGUDEM DURING 1963.

(*in cusecs*)

Date (1)	*June* (2)	*July* (3)	*Aug.* (4)	*Sept.* (5)	*Oct.* (6)	*Remarks.* (7)
1	Nil	14	190	113	29	
2	,,	11	361	61	23	
3	3	2	92	81	14	
4	3	2	1,670	208	14	
5	97	2	942	162	7	
6	3	117	260	249	25	
7	2	25	84	342	78	
8	Nil	14	32	256	113	
9	,,	1	210	188	765	
10	,,	Nil	134	145	296	
11	,,	,,	210	77	129	
12	,,	,,	167	215	35	
13	,,	,,	135	378	22	
14	,,	,,	157	294	14	
15	,,	,,	215	284	35	
16	,,	35	618	183	29	
17	,,	14	362	302	29	
18	,,	1	384	405	28	
19	,,	4	86	320	14	
20	,,	1	1,650	140	29	
21	,,	Nil	278	61	30	
22	,,	,,	1,670	43	134	
23	,,	31	1,600	101	2,430	
24	,,	13	1,765	530	7,050	Peak discharge 11,736 cs. on 24-10-63 at 11-0 a.m.
25	,,	1	1,600	497	6,520	
26	187	Nil	2,070	517	6,970	
27	104	,,	4,350	635	1,950	
28	150	,,	3,880	320	1,040	
29	2	2	815	115	730	
30	40	Nil	268	36	384	
31	..	28	156	..	384	

APPENDIX C 2—(*ii*)

DISCHARGES OF THAMMILERU RIVER AT NAGIREDDIGUDEM DURING 1964.

(*in cusecs.*)

Date (1)	*June* (2)	*July* (3)	*August* (4)	*September* (5)	*October* (6)	*Remarks* (7)
1	Nil	18	91	187	2,520	
2	,,	18	91	218	1,235	
3	,,	15	136	1,235	1,590	
4	,,	15	813	530	706	
5	,,	13	715	830	460	
6	,,	13	884	1,095	272	
7	,,	13	4,015	1,255	272	
8	,,	3	262	706	272	
9	,,	3	177	476	247	
10	,,	18	177	191	247	
11	,,	18	1,920	176	706	
12	,,	13	2,445	166	460	
13	,,	13	1,114	147	247	
14	,,	13	279	476	141	
15	,,	13	265	490	148	
16	,,	24	265	191	138	
17	,,	24	74	388	113	
18	,,	24	81	272	98	
19	,,	24	81	166	98	
20	,,	24	127	150	85	
21	,,	96	113	142	50	
22	4	96	109	106	33	
23	Nil	57	57	113	33	
24	,,	48	55	1,380	33	
25	,,	1,325	47	2,220	28	
26	7	152	47	1,475	19	
27	Nil	57	42	1,340	12	
28	,,	45	39	8,996	12	Peak discharge 17400 cusecs on 29-9-64 at 6 a.m.
29	,,	28	39	13,900	12	
30	6	27	39	4,600	12	
31	Nil	27	47	..	14	

APPEN-

DISCHARGES OF THAMMILERU

Date	JUNE			JULY			AUGUST		
	East Thammileru	*West Thammileru*	*Total*	*East Thammileru*	*West Thammileru*	*Total*	*East Thammileru*	*West Thammileru*	*Total*
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1	..	..	..	5	6	11	Closed	80	80
2	..	..	..	5	6	11	8	80	88
3	..	..	..	5	6	11	8	18	26
4	..	..	..	8	7	15	41	80	121
5	..	..	..	8	6	14	41	180	121
6	Closed	Closed	Closed	8	6	14	160	122	282
7	80	Closed	80	8	6	14	82	36	118
8	Closed	24	24	8	6	14	Closed	54	54
9	,,	12	12	4	6	10	,,	90	90
10	,,	24	24	Closed	12	12	80	36	116
11	,,	24	24	,,	12	12	80	234	314
12	,,	12	12	,,	12	12	40	54	94
13	,,	12	12	,,	12	12	Closed	Closed	Closed
14	12	24	36	4	6	10	,,	,,	,,
15	16	24	40	8	14	22	,,	18	18
16	16	24	40	8	18	26	320	320	640
17	10	24	34	9	18	27	760	320	1,080
18	6	24	30	Closed	18	18	480	180	660
19	12	24	36	4	18	22	120	180	300
20	12	24	36	8	8	16	360	324	684
21	12	24	36	8	8	16	360	1,280	1,640
22	Closed	12	12	8	8	16	1,660	640	2,300
23	5	12	17	8	8	16	1,240	1,640	2,880
24	4	12	16	8	18	26	1,040	720	1,760
25	6	12	18	8	28	36	1,438	1,280	2,718
26	6	6	12	8	18	26	719	480	1,199
27	7	6	13	8	54	62	1,440	960	2,400
28	4	6	10	8	18	26	1,622	720	2,342
29	4	6	10	Closed	24	24	720	480	1,200
30	5	6	11	,,	8	8	360	Closed	360
31	..	..	..	,,	8	8	Closed	,,	Closed

DIX C2—(*iii*).

AT EAST AND WEST THAMMILERU ESCAPES DURING 1963.

(*In cusecs.*)

SEPTEMBER			OCTOBER			
East Thammileru	*West Thammileru*	*Total*	*East Thammileru*	*West Thammileru*	*Total*	*Remarks*
(11)	(12)	(13)	(14)	(15)	(16)	(17)
Closed	Closed	Closed	Closed	Closed	Closed	
,,	,,	,,	,,	,,	,,	
,,	,,	,,	,,	,,	,,	
,,	,,	,,	,,	,,	,,	
,,	,,	,,	,,	,,	,,	
4	,,	4	,,	,,	,,	
4	2	6	6	,,	6	
6	,,	6	4	,,	4	
6	,,	6	8	,,	8	
4	,,	4	10	,,	10	
4	,,	4	80	96	176	
4	,,	4	Closed	Closed	Closed	
6	,,	6	,,	,,	,,	
80	,,	80	20	,,	20	
7	,,	7	Closed	,,	Closed	
6	,,	6	,,	,,	,,	
8	,,	8	,,	,,	,,	
150	240	390	,,	,,	,,	
740	560	1,300	,,	,,	,,	
240	160	400	,,	,,	,,	
Closed	16	16	,,	,,	,,	
40	80	120	,,	32	32	
40	16	56	7,240	4,500	11,740	
85	80	165	4,920	4,000	8,920	
320	240	560	6,996	8,100	15,096	
42	36	78	2,904	2,160	5,064	
85	48	133	2,136	1,304	3,440	Peak discharge (6996+8100) =15096 cusecs on 25-10-1963.
42	36	78	2,750	964	3,714	
42	36	78	1,000	836	1,836	
Closed	Closed	Closed	640	216	856	
..	..	..	390	92	482	

APPEN

DISCHARGES OF THAMMILERU AT EAST AND

Date	JUNE			JULY			AUGUST		
	East Thammileru Escape	*West Thammileru Escape*	*Total*	*East Thammileru Escape*	*West Thammileru Escape*	*Total*	*East Thammileru Escape*	*West Thammileru Escape*	*Total*
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1	..	..	..	Closed	12	12	9	16	25
2	..	..	..	4	12	16	9	16	25
3	..	..	..	4	12	16	5	12	17
4	..	..	..	4	12	16	6	16	22
5	..	..	..	4	12	16	100	64	164
6	Closed	Closed	Closed	4	12	16	397	80	477
7	,,	,,	,,	Closed	Closed	Closed	475	16	491
8	,,	,,	,,	5	,,	5	Closed	16	16
9	,,	,,	,,	Closed	,,	Closed	,,	Closed	Closed
10	,,	,,	,,	5	,,	5	,,	80	80
11	,,	,,	,,	5	,,	5	236	32	268
12	,,	,,	,,	5	16	21	368	480	848
13	,,	,,	,,	5	16	21	374	352	726
14	,,	,,	,,	5	16	21	105	160	265
15	,,	,,	,,	5	16	21	212	80	292
16	,,	,,	,,	5	16	21	Closed	Closed	Closed
17	,,	,,	,,	5	12	17	,,	,,	,,
18	,,	,,	,,	5	12	17	,,	,,	,,
19	,,	,,	,,	4	12	16	,,	,,	,,
20	,,	,,	,,	5	16	21	,,	,,	,,
21	,,	,,	,,	5	16	21	,,	,,	,,
22	,,	6	6	5	16	21	,,	,,	,,
23	,,	6	6	5	16	21	,,	,,	,,
24	,,	4	4	5	16	21	,,	,,	,,
25	,,	5	5	5	16	21	,,	,,	,,
26	4	5	9	5	16	21	,,	,,	,,
27	4	10	14	5	16	21	,,	,,	,,
28	Closed	10	10	4	16	20	,,	,,	,,
29	,,	10	10	7	16	23	,,	,,	,,
30	,,	12	12	6	16	22	,,	,,	,,
31	..	..	..	9	16	25	,,	,,	,,

DIX C2.—(*iv*)

WEST THAMMILERU ESCAPES DURING 1964.

(*in cusecs*)

SEPTEMBER			OCTOBER			
East Thammileru Escape	*West Thammileru Escape*	*Total*	*East Thammileru Escape*	*West Thammileru Escape*	*Total*	*Remarks*
(11)	(12)	(13)	(14)	(15)	(16)	(17)
Closed	Closed	Closed	2,392	2,300	4,692	
100	,,	100	1,394	800	2,194	
400	,,	400	2,145	1,792	3,937	
50	,,	50	1,394	300	1,694	
Closed	,,	Closed	1,123	250	1,373	
733	480	1,213	748	Closed	748	
311	192	503	649	,,	649	
206	192	398	649	,,	649	
105	48	153	874	120	994	
Closed	Closed	Closed	1,123	250	1,373	
,,	,,	,,	874	160	1,034	
,,	,,	,,	748	Closed	748	
,,	,,	,,	493	,,	493	
105	,,	105	493	,,	493	
Closed	,,	Closed	308	Nil	308	
,,	192	192	Nil	Nil	Nil	
212	Closed	212	174	Closed	174	
105	,,	105	174	,,	174	
88	,,	88	Closed	,,	Closed	
Closed	,,	Closed	,,	,,	,,	
,,	,,	,,	,,	,,	,,	
105	,,	105	,,	,,	,,	
105	,,	105	,,	,,	,,	
Closed	,,	Closed	,,	,,	,,	
4	360	364	,,	,,	,,	
413	192	605	,,	,,	,,	
413	192	605	,,	,,	,,	
413	2,500	2,913	,,	,,	,,	
9,000	11,940	20,940	12	,,	12	Peak discharge (12,395+ 10,840)=23,235 cusecs on 29-9-1964.
3,561	5,880	9,441	10	,,	10	
..	..	..	8	,,	8	

APPENDIX C 3 (*i*)

DISCHARGES OF YERRAKALVA AT APPALARAJUGUDEM DURING 1962.

(*In cusecs*)

Date (1)	*August* (2)	*September* (3)	*October* (4)	*Remarks* (5)
1	6	1,210	2	
2	8	1,078	3	Discharge data for the months of June and July are not available.
3	8	908	3	
4	8	2,697	3	
5	8	3,160	3	
6	18	1,874	2	
7	18	1,038	2	
8	38	878	2	
9	58	917	2	
10	75	1,177	2	
11	75	1,428	2	
12	120	2,028	2	
13	305	2,444	1	
14	410	2,325	1	
15	242	2,120	1	
16	515	1,908	7	
17	518	7,772	7	
18	534	11,060	7	
19	380	7,198	7	
20	255	3,692	6	Peak discharge 11,585 cs. on 18-9-1962 a 6 a.m.
21	200	2,084	6	
22	160	1,206	6	
23	140	840	3	
24	405	610	24	
25	440	544	49	
26	500	335	30	
27	358	427	109	
28	440	373	210	
29	358	289	99	
30	255	272	49	
31	412		13	

APPENDIX C-3 (*ii*)

DISCHARGES OF YERRAKALVA AT APPALARAJUGUDEM DURING 1963.

(*In cusecs*)

Date (1)	*June* (2)	*July* (3)	*August* (4)	*September* (5)	*October* (6)	*November* (7)	*Remarks* (8)
1	41	86	730	411	80	658	
2	41	92	1,316	907	50	672	
3	41	99	895	1,464	37	..	
4	45	99	586	501	37	..	
5	102	150	438	316	37	..	
6	118	555	270	287	37	..	
7	104	802	176	287	62	..	
8	74	620	145	166	80	..	
9	62	528	270	104	102	.	
10	62	382	321	101	156	..	
11	62	200	586	195	208	..	
12	108	200	544	485	269	..	
13	92	200	345	518	281	..	
14	118	180	311	406	159	..	
15	118	132	690	369	111	..	
16	118	93	2,612	310	102	..	
17	62	86	2,850	316	92	..	
18	62	86	1,801	381	159	..	
19	62	359	1,115	441	194	..	
20	62	221	865	501	194	..	
21	62	270	527	351	174	..	
22	62	200	2,663	313	620	..	
23	62	160	2,240	406	4,195	..	
24	55	200	2,488	586	15,670	..	
25	48	235	2,488	586	4,219	..	
26	536	397	2,488	484	3,188	..	Peak discharge 17,540 cs. on 24-10-1963 at 6 a.m.
27	895	455	3,460	299	2,322	..	
28	260	618	2630	269	1,836	..	
29	168	427	1,746	124	1,442	..	
30	102	359	1,120	108	1,442	..	
31	..	545	634	..	706	..	

APPENDIX–C 3 (*iii*)

DISCHARGES OF YERRAKALVA AT APPALARAJUGUDEM DURING 1964.

(*In cusecs*)

Date (1)	*June* (2)	*July* (3)	*September* (4)	*October* (5)	*Remarks.* (6)
1	40	55	3,348	4,405	
2	37	52	1,690	3,549	
3	37	35	1,510	1,718	
4	40	28	872	1,005	
5	40	34	589	937	
6	40	30	4,325	1,147	
7	40	29	4,045	789	
8	40	18	1,492	610	
9	40	16	766	488	
10	40	18	540	453	No discharge data supplied for 8/64.
11	40	5	533	376	
12	40	18	552	317	
13	38	13	327	252	
14	34	11	644	202	
15	35	15	1,445	162	
16	70	6	1,327	131	
17	80	18	1,085	111	
18	75	13	1,148	92	
19	56	13	751	84	
20	56	14	462	76	
21	56	5	344	76	
22	252	4	422	72	
23	105	3	530	60	
24	84	87	3,570	51	
25	84	380	4,397	35	
26	145	648	2,861	33	
27	118	533	1,304	36	
28	101	106	15,427	42	
29	86	65	10,151	53	Peak discharge 16,390 cs. on 28-9-1964 at 11 a.m.
30	98	55	6,469	50	
31	..	98	..	42	

APPENDIX—C 3(*iv*)

DISCHARGES OF YERRAKALVA RIVER AT NANDAMURU AQUEDUCT DURING 1963.

(*In cusecs*)

Date (1)	*June* (2)	*July* (3)	*August* (4)	*September* (5)	*October* (6)	*Remarks* (7)
1	Nil	Nil	Nil	Nil	Nil	
2	,,	,,	,,	,,	,,	
3	,,	,,	,,	,,	,,	
4	,,	,,	,,	,,	,,	
5	,,	,,	,,	,,	,,	
6	,,	,,	,,	,,	,,	
7	,,	,,	,,	,,	,,	
8	,,	,,	,,	,,	,,	
9	,,	,,	,,	,,	,,	
10	,,	,,	,,	,,	,,	
11	,,	,,	,,	,,	,,	
12	,,	,,	,,	,,	,,	
13	,,	,,	,,	,,	,,	
14	,,	,,	,,	,,	,,	
15	,,	,,	,,	,,	,,	
16	,,	,,	,,	,,	,,	
17	,,	,,	,,	,,	,,	
18	,,	,,	4,722	,,	,,	
19	,,	,,	4,722	,,	,,	
20	,,	,,	4,722	,,	,,	
21	,,	,,	Nil	,,	,,	
22	,,	,,	,,	,,	,,	
23	,,	,,	,,	,,	,,	
24	,,	,,	6,680	,,	4,722	
25	,,	,,	6,680	,,	6,680	
26	,,	,,	6,680	4,722	14,181	
27	,,	,,	4,722	4,722	14,944	Peak discharge 14,944 cs. on 27-10-63.
28	,,	,,	4,722	Nil	11,582	
29	,,	,,	6,680	,,	9,460	
30	,,	,,	4,722	,,	8,189	
31		,,	Nil		6,680	

APPENDIX—C 3 (*v*)

Discharges of Yerrakalva River at Nandamuru Aqueduct during 1964.

(*In cusecs*)

Date (1)	*June* (2)	*July* (3)	*August* (4)	*September* (5)	*October* (6)	*Remarks* (7)
1	Nil	Nil	Nil	Nil	15,762	Peak discharge 15,762, cusecs on 1-10-1964
2	,,	,,	,,	,,	12,508	
3	,,	,,	,,	,,	10,565	
4	,,	,,	,,	,,	8,189	
5	,,	,,	4,722	,,	6,680	
6	,,	,,	8,189	,,	4,722	
7	,,	,,	8,189	,,	..	
8	,,	,,	6,680	4,722	..	
9	,,	,,	6,680	4,722	..	
10	,,	,,	4,722	4,722	4,722	
11	,,	,,	..	..	6,680	
12	,,	,,	4,722	..	4,722	
13	,,	,,	6,680	4,722	Nil.	
14	,,	,,	4,722	4,722	,,	
15	,,	,,	Nil	Nil	,,	
16	,,	,,	,,	,,	,,	
17	,,	,,	,,	,,	,,	
18	,,	,,	,,	,,	,,	
19	,,	,,	,,	,,	,,	
20	,,	,,	,,	,,	,,	
21	,,	,,	,,	,,	,,	
22	,,	,,	,,	,,	,,	
23	,,	,,	,,	,,	,,	
24	,,	,,	,,	,,	,,	
25	,,	,,	,,	4,722	,,	
26	,,	,,	,,	6,680	,,	
27	,,	,,	,,	6,680	,,	
28	,,	,,	,,	6,680	,,	
29	,,	,,	,,	6,189	,,	
30	,,	,,	,,	Nil	,,	
31	..	,,	,,	..	,,	

APPENDIX—C 4 (*i*)

DISCHARGES OF YENAMADURRU DRAIN AT DUVVA REGULATOR DURING 1963.

(*In cusecs*)

Date (1)	*June* (2)	*July* (3)	*August* (4)	*September* (5)	*October* (6)	*Remarks* (7)
1	Closed	80	497	402	Closed	
2	,,	312	497	402	,,	
3	,,	312	497	166	,,	
4	,,	93	336	166	83	
5	,,	93	336	166	Closed	
6	,,	1,320	336	166	,,	
7	160	336	336	166	,,	
8	Closed	804	604	321	,,	
9	,,	604	402	616	,,	
10	,,	604	643	Closed	,,	
11	,,	Closed	604	321	,,	
12	,,	,,	1,142	166	302	
13	,,	,,	402	Closed	151	
14	,,	,,	166	166	Closed	
15	,,	842	402	321	,,	
16	,,	321	604	482	,,	
17	,,	Closed	842	562	,,	
18	,,	321	1,690	562	,,	
19	,,	160	1,690	Closed	,,	
20	,,	Closed	1,154	83	321	
21	,,	86	2,160	83	951	
22	,,	Closed	1,304	83	2,160	
23	,,	,,	2,404	Closed	2,160	
24	,,	,,	3,836	1,402	4,757	
25	,,	,,	3,836	2,016	4,885	
26		,,	3,676	2,016	8,469	
27	285	86	3,326	2,160	11,157	Peak discharge 11,157, cusecs on 27-10-1963.
28	1,180	Closed	3,326	2,160	10,901	
29	160	,,	3,326	Closed	8,981	
30	Closed	,,	2,275	,,	6,805	
31	..	84	1,404	..	4,629	

APPENDIX—C 4 (*ii*).

Discharges of Yenamadurru drain at Duvva regulator during 1964.

(*in cusecs*)

Date (1)	June (2)	July (3)	August (4)	September (5)	October (6)	Remarks (7)
1	Closed	Closed	328	156	12,693	
2	,,	,,	616	1,674	11,925	
3	,,	,,	616	2,140	9,877	
4	,,	,,	756	1,440	7,829	
5	,,	,,	4,629	1,324	6,037	
6	,,	,,	6,165	Closed	4,629	
7	,,	,,	6,869	1,232	1,900	
8	,,	,,	6,037	1,232	1,222	
9	,,	,,	4,373	2,140	2,016	
10	,,	,,	3,676	2,140	2,016	
11	,,	,,	3,326	1,674	2016	
12	,,	,,	3,326	1,674	1,584	
13	,,	,,	3,326	2,520	1,868	
14	,,	,,	3,326	2,520	Closed	
15	,,	,,	3,426	2,088	,,	
16	,,	,,	Closed.	1,400	460	
17	,,	,,	156	1,400	Closed.	
18	,,	,,	756	1,400	308	
19	,,	,,	1,152	1,674	1,536	
20	,,	,,	1,440	1,674	308	
21	,,	328	2,226	320	1,536	
22	,,	328	Closed.	1,138	150	
23	,,	175	616	1,138	150	
24	,,	1,275	320	1,138	Closed.	
25	,,	804	Closed.	4,629	,,	
26	,,	2,683	,,	4,629	,,	
27	,,	2,144	,,	4,885	,,	
28	,,	2,144	320	3,989	,,	
29	,,	2,144	Closed.	5,525	,,	
30	,,	175	,,	12,437	,,	
31	..	328	,,		,,	Peak discharge 12,693 cusecs on 30-9-1964.

APPENDIX - C 5 (*i*)

WATER LEVELS OF KOLLERU LAKE AT PERANTALA KANUMA MOUTH DURING 1959.

(*in feet above M.S.L.*)

Date (1)	July (2)	August (3)	September (4)	October (5)	November (6)	Remarks (7)
1	2.3	8.4	9.5	9.0	8.6	
2	2.5	8.4	9.5	8.9	8.5	
3	2.8	8.3	9.5	8.9	8.4	
4	2.8	8.2	9.6	8.9	8.3	
5	3.0	8.1	9.6	8.9	8.1	
6	3.0	8.1	9.6	9.1	7.9	
7	3.0	8.0	9.6	9.1	7.9	
8	3.2	8.1	9.6	9.2	7.8	
9	3.2	8.1	9.8	9.3	7.8	
10	3.2	8.1	9.9	9.3	7.6	
11	3.2	8.1	9.9	9.3	7.7	
12	3.3	8.2	9.9	9.3	7.6	The max. lake level
13	3.4	8.2	9.9	9.4	7.4	recorded at Kolletikota on
14	3.3	8.4	9.8	9.4	7.3	12-9-1959 is+10.0 Ft.
15	3.3	8.4	9.8	9.4	7.2	
16	3.3	8.4	9.8	9.4	7.1	
17	3.4	8.5	9.8	9.4	6.9	
18	3.5	8.5	9.8	9.3	6.8	
19	3.6	8.5	9.8	9.3	6.5	
20	3.6	8.5	9.8	9.2	6.5	
21	3.8	8.5	9.7	9.3	6.4	
22	4.2	8.6	9.6	9.1	6.3	
23	4.2	8.6	9.5	9.0	6.2	
24	3.6	8.7	9.4	9.0	6.0	
25	7.5	8.7	9.3	8.9	6.0	
26	7.5	8.9	9.2	8.8	5.8	
27	7.7	8.9	9.1	8.8	5.7	
28	8.0	9.1	9.0	8.8	5.5	
29	8.2	9.2	8.9	8.8	5.5	
30	8.2	9.3	9.0	8.8	5.4	
31	8.2	9.4	..	8.7	..	

APPENDIX-C5(*ii*)

KOLLERU LAKE LEVELS AT KOLLETIKOTA DURING 1964.

Time 8 a.m. (*In feet above M.S.L.*)

Date (1)	*July* (2)	*August* (3)	*September* (4)	*October* (5)	*November* (6)	*Remarks* (7)
1 ..	1.26	2.23	4.60	9.00	8.46	
2 ..	1.23	2.46	4.63	9.33	8.33	
3 ..	1.23	2.70	4.63	9.76	8.26	
4 ..	1.33	2.86	4.63	9.93	8.16	
5 ..	1.23	3.00	4.83	10.33	8.03	
6 ..	1.23	3.13	4.76	10.48	8.00	
7 ..	1.26	3.35	4.66	10.50	7.86	
8 ..	1.23	4.10	4.76	10.53	7.73	
9 ..	1.26	4.43	4.96	10.56	7.76	
10 ..	1.26	4.73	5.23	10.60	7.73	
11 ..	1.26	5.10	5.30	10.63	7.68	
12 ..	1.23	5.46	5.40	10.63	7.63	The max. lake level record-
13 ..	1.23	5.63	5.50	10.53	7.53	ed at Kolletikota on
14 ..	1.20	5.60	5.66	10.43	7.46	12-10-1964 is +10.7 Ft.
15 ..	1.20	5.63	5.80	10.33	7.33	
16 ..	1.20	5.53	6.00	10.26	7.30	
17 ..	1.23	5.33	6.00	10.13	7.26	
18 ..	1.23	5.40	6.10	10.33	7.20	
19 ..	1.26	5.40	6.13	9.93	7.13	
20 ..	1.26	5.60	6.23	9.80	7.07	
21 ..	1.26	5.10	6.33	9.70	6.97	
22 ..	1.26	5.03	6.50	9.58	6.90	
23 ..	1.50	5.06	6.60	9.47	6.80	
24 ..	1.70	5.00	6.63	9.33	6.73	
25 ..	1.90	4.93	6.73	9.23	6.67	
26 ..	1.93	4.86	6.82	9.10	6.60	
27 ..	2.10	4.73	6.96	8.83	6.53	
28 ..	2.17	4.67	7.32	8.73	6.47	
29 ..	2.20	4.67	7.86	8.73	6.40	
30 ..	2.23	4.63	8.40	8.63	6.27	
31 ..	2.26	4.66	..	8.56	..	

APPENDIX—C—6

DISCHARGES OF UPPUTERU RIVER AT 1000 FT. BELOW ROAD BRIDGE (M6/6) DURING 1964.

(*in cusecs*)

Date (1)	*September* (2)	*October* (3)	*November* (4)	*December* (5)	*Remarks* (6)
1 ..	N.A.	10,898	N.A.	N.A.	
2 ..	,,	N.A.	,,	5,124	
3 ..	,,	,,	,,	N.A.	Note :—N.A=Not Aavailable
4 ..	,,	,,	,,	,,	
5 ..	,,	,,	8,843	,,	
6 ..	,,	,,	7,925	5,108	
7 ..	,,	,,	7,248	N.A.	
8 ..	,,	13,545	7,482	,,	
9 ..	,,	N.A.	7,422	,,	
10 ..	,,	,,	N.A.	4,547	
11 ..	,,	12,077	,,	N.A.	
12 ..	,,	N.A.	7,972	,,	
13 ..	,,	10,993	7,532	,,	
14 ..	,,	N.A.	7,416	,,	
15 ..	,,	,,	7,071	,,	
16 ..	,,	,,	6,806	,,	
17 ..	,,	,,	6,647	,,	
18 ..	,,	12,406	6,149	,,	
19 ..	,,	N.A.	6,112	,,	
20 ..	,,	,,	N.A.	,,	
21 ..	,,	,,	6,029	,,	
22 ..	,,	10,281	5,782	,,	
23 ..	,,	10,004	5,892	,,	
24 ..	,,	N.A.	N.A.	,,	
25 ..	6,150	10,208	,,	,,	
26 ..	6,455	10,509	,,	,,	
27 ..	6,605	10,110	,,	,,	
28 ..	N.A.	9,354	,,	,,	
29 ..	7,103	9,528	,,	,,	
30 ..	8,706	10,806	,,	,,	
31 ..	..	N.A.	,,	,,	

APPENDIX D (*i*)

Statement showing Rainfall in Inches from 1925 *to* 1964 *in Kolleru Basin*

Name of Raingauge Stations: (1) Tiruvur, (2) Nuzvid, (3) Vijayawada, (4) Gudivada, (5) Gannavaram, (6) Kaikalur, (7) Chintalapudi, (8) Ellore, (9) Nandigama.

Year	*January to May*	*June*	*July*	*August*	*September*	*October*	*June to October*	*November and December*	*Remarks*
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1925 ..	4.89	5.73	10.14	11.40	2.82	6.64	36.73	1.34	
1926 ..	4.53	2.81	10.01	6.45	4.37	0.58	24.22	0.02	Maximum rainfall =48.39 inches (1959 June to Oct.)
1927 ..	2.92	4.93	10.19	6.80	5.52	2.82	30.26	5.25	
1928 ..	2.75	4.72	8.25	5.90	6.94	7.88	33.69	..	Minimum rainfall =22.40 inches (1952 June to October.)
1929 ..	3.40	7.33	4.32	8.21	4.82	3.65	28.33	0.32	
1930 ..	4.23	10.91	4.99	6.56	5.52	11.49	39.47	5.04	
1931 ..	2.37	4.73	7.40	7.32	7.24	8.89	35.58	4.64	
1932 ..	3.05	3.07	9.64	4.80	7.03	4.41	28.95	6.91	
1933 ..	4.21	5.75	11.62	7.34	5.65	7.78	38.14	1.86	
1934 ..	1.62	5.02	11.69	6.41	4.01	3.10	30.23	1.38	
1935 ..	2.60	3.27	6.31	4.13	10.05	6.58	30.34	0.01	
1936 ..	12.74	4.08	9.77	6.57	5.11	6.20	31.73	2.43	
1937 ..	5.39	1.89	7.94	7.91	3.05	6.17	26.96	..	
1938 ..	4.35	5.64	9.44	12.12	6.21	1.07	34.48	3.24	
1939 ..	2.36	3.08	7.64	7.17	5.48	13.19	36.56	2.26	
1940 ..	6.52	4.71	8.63	13.05	6.19	3.15	35.73	3.30	
1941 ..	1.47	5.27	4.70	3.89	8.73	6.98	29.57	3.57	
1942 ..	1.17	5.65	6.31	7.64	6.86	2.80	29.26	1.30	
1943 ..	1.21	6.48	5.31	2.74	10.11	7.04	31.68	0.52	
1944 ..	2.11	5.66	6.85	6.80	7.36	10.10	36.77	1.07	

APPENDIX—D (i)—(*Contd.*)

Year	*January to May*	*June*	*July*	*August*	*September*	*October*	*June to October*	*November and December*	*Remarks*
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1945 ..	2.93	1.27	8.93	9.03	6.87	3.94	30.04	0.36	
1946 ..	1.77	5.17	7.51	5.83	3.62	1.62	23.75	8.78	
1947 ..	0.78	3.80	12.00	11.27	8.09	5.63	40.79	3.95	
1948 ..	2.67	1.82	8.95	4.28	5.20	5.32	25.57	7.02	
1949 ..	4.41	3.59	11.35	8.31	6.42	8.39	38.06	0.53	
1950 ..	5.97	3.47	11.35	3.95	8.63	1.68	29.08	2.81	
1951 ..	4.43	7.60	11.86	6.77	3.71	3.18	33.12	0.52	
1952 ..	3.23	3.41	3.62	6.48	3.85	5.04	22.40	0.83	
1953 ..	2.58	4.27	7.90	6.04	7 09	6.56	31.86	0.04	
1954 ..	1.55	5.09	12.10	6.46	2.01	4.58	30.24	0.79	
1955 ..	1.15	4.49	5.80	10.71	4.94	7.52	33.46	3.24	
1956 ..	4.63	6.46	15.63	4.80	3.86	10.16	40.91	2.88	
1957 ..	2.25	9.98	5.02	11.98	4.94	3.74	35.66	...	
1958 ..	3.52	3.93	15.46	11.14	7.32	7.33	45.18	2.89	
1959 ..	1.90	5.94	16.43	12.70	5.76	7.56	48.39	0.20	
1960 ..	0.72	7.40	10.81	3.58	10.51	2.89	35.19	1.56	
1961 ..	2.11	5.77	9.69	9.11	8.42	8.22	41.21	0.83	
1962 ..	2.67	5.31	7.03	7.72	11.33	6.82	38.21	1.67	
1963 ..	1.65	5.65	7.59	11.65	3.57	12.07	40.53	0.04	
1964 ..	1.07	5.44	6.31	8.19	19.27	2.74	41.95	0.34	

APPENDIX-D (ii)

Statement showing rainfall in inches from 1945 *to* 1964 *in Krishna Western Delta.*

Name of Raingauge Stations: (1) Nizampatnam, (2) Jagarlamudi, (3) Kollimerla, (4) Santaravur, (5) Chinaganjam, (6) Nallamada, (7) Kolluru, (8) Intur, (9) Duggirala, (10) Tenali, (11) Repalle, (12) Bapatla and (13) Pidaparru.

Year.	*January to May*	*June*	*July*	*August*	*September*	*October*	*June to October*	*November and December*	*Remarks*
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1945 ..	3.08	2.46	6.02	5.87	7.04	7.00	28.39	1.35	
1946 ..	2.74	3.28	6.00	5.49	5.36	2.29	22.42	15.49	
1947 ..	0.69	1.81	6.00	7.94	7.24	3.96	26.95	6.02	
1948 ..	2.85	0.58	7.08	2.82	4.92	2.78	18.18	9.42	
1949 ..	2.59	3.66	11.90	7.50	9.61	9.63	42.30	1.90	
1950 ..	5.16	3.02	8.30	3.81	6.55	3.51	25.19	3.42	
1951 ..	1.83	5.32	7.39	4.71	1.99	1.23	20.64	0.46	
1952 ..	7.17	0.98	2.79	4.17	3.32	7.15	18.41	3.03	
1953 ..	0.41	2.78	4.22	7.61	6.93	8.97	30.51	0.00	
1954 ..	1.40	2.88	9.91	10.22	0.00	9.21	32.22	0.24	
1955 ..	3.19	3.28	3.89	8.85	3.41	8.72	28.15	0.02	
1956 ..	3.55	8.99	7.84	6.59	6.17	11.59	41.18	6.16	
1957 ..	1.37	4.55	4.49	10.17	4.19	3.17	26.57	0.11	
1958 ..	0.59	1.92	10.01	7.08	7.82	9.55	36.38	4.38	
1959 ..	0.07	4.73	6.72	5.92	3.75	7.10	28.22	0.63	
1960 ..	1.67	5.59	5.89	2.15	8.70	3.18	25.51	3.19	
1961 ..	0.70	4.61	4.59	9.33	7.41	8.56	34.50	3.03	
1962 ..	3.32	3.03	5.09	6.83	5.77	9.08	29.80	3.19	
1963 ..	2.97	3.75	6.15	6.25	2.08	14.43	32.66	0.02	
1964 ..	0.98	4.01	5.59	6.61	18.28	2.94	37.43	2.78	

APPENDIX-D (iii)

Statement showing rainfall in inches from 1945 *to* 1964 *in Krishna Eastern Delta.*

Name of Raingauge Stations : (1) Komatigunta, (2) Lakshmipuram, (3) Veeranki,(4) Nidumolu,(5) Pamarru (6) Masulipatnam and (7) Tadinada.

Year	*January to May*	*June*	*July*	*August*	*September*	*October*	*June to October*	*November and December*	*Remarks*
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1945	2.45	1.59	10.27	8.30	10.23	7.08	37.47	0.49	
1946	3.10	3.91	9.35	4.88	5.12	2.41	25.67	13.99	
1947	0.56	2.03	10.60	8.90	8.58	4.44	34.55	6.84	
1948	0.59	1.18	8.87	2.80	3.39	0.85	17.09	9.93	
1949	1.51	5.22	12.64	7.48	5.58	12.97	43.89	3.26	
1950	5.88	1.66	10.26	2.48	9.72	2.03	26.15	1.02	
1951	1.54	7.01	9.13	5.24	4.72	2.31	28.41	0.40	
1952	3.31	2.63	3.12	7.12	3.05	7.19	23.11	2.03	
1953	0.51	4.22	6.48	7.31	4.53	8.88	31·42	0.24	
1954	1.48	4.80	11.48	9.40	--	9.01	34.69	0.48	
1955	3.83	3.72	10.81	9.80	5.60	11.97	41.90	6.14	
1956	2.77	7.86	13.61	5.45	6.96	17.48	51.36	4.65	
1957	1.75	6.63	4.11	11.33	5.22	4.59	31.88	--	
1958	1.74	4.9	15.07	10.24	4.57	11.39	46.17	4.01	
1959	0.33	6.25	14.49	11.19	6.34	6.50	44.77	1.06	
1960	0.16	8.40	7.51	2.98	7.91	2.44	29.24	2.57	
1961	1.05	5.35	6.17	10.56	8.81	8.31	39.20	2.70	
1962	2.80	3.89	11.67	9.17	11.31	12.61	48.65	2.72	
1963	1.68	3.87	4.62	6.05	4.24	12.37	31.15	--	
1964	0.34	3.85	4.81	5.59	11.56	0.91	26.72	2.18	

APPENDIX-D (iv)

Statement showing rainfall in inches from 1945 to 1964 in Godavari Western Delta.

Name of Rain gauge Stations : (1) Lakshmipalem, (2) Penugonda, (3) Mogaltur, (4) Endagandi, (5) Duvva, (6) Mamadur, (7) Palakole and (8) Undi.

Year	*January to May*	*June*	*July*	*August*	*September*	*October*	*June to October*	*November and December*	*Remarks.*
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1945	2.29	2.31	10.49	8.71	8.14	6.30	35.95	0.37	
1946	2.98	3.52	8.39	5.29	4.85	3.74	25.79	10.84	
1947	0.63	1.93	10.40	6.22	6.94	3.33	28.82	11.25	
1948	0.63	3.63	10.32	3.95	8.91	4.53	31.34	6.50	
1949	2.36	4.08	13.88	9.56	7.07	12.33	46.92	0.43	
1950	4.19	5.42	11.64	6.98	14.04	3.62	41.70	2.49	
1951	2.05	8.17	15.27	7.61	10.90	4.87	46.82	1.50	
1952	1.89	3.91	5.03	6.17	3.27	8.63	27.01	2.51	
1953	1.14	6.09	7.83	6.81	4.30	10.99	36.02	0.68	
1954	0.32	10.09	9.09	6.85	..	9.83	35.86	0.79	
1955	4.54	2.41	5.63	9.88	9.68	13.43	41.03	3.33	
1956	4.40	7.58	16.63	8.24	5.17	18.81	56.43	3.70	
1957	1.29	10.23	6.66	11.53	4.30	3.28	36.00	..	
1958	0.20	3.43	11.01	7.80	4.84	15.45	42.53	8.16	
1959	4.60	5.63	16.19	10.50	5.75	8.91	46.98	0.11	
1960	0.58	7.86	10.50	1.79	14.00	3.88	38.03	1.22	
1961	1.50	5.73	7.01	5.40	10.18	13.50	41.82	1.60	
1962	2.98	3.73	12.01	7.21	11.04	12.94	46.93	2.24	
1963	1.39	4.29	6.68	7.50	5.65	11.66	35.78	..	
1964	0.80	4.84	6.98	11.71	12.16	4.59	40.28	3.51	

APPENDIX-D (v)

Statement showing rainfall in inches from 1945 to 1964 in Godavari Central Delta.

Names of the Rain gauge Stations :—(1) Amalapuram, (2) Mummidivaram, (3) Razole, (4) Mukkamala, (5) Kothapeta, (6) Ralli and (7) Sakhinetipalli.

Year	*January to May*	*June*	*July*	*August*	*September*	*October*	*June to October*	*November and December*	*Remarks*
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1945	2.45	1.63	11.51	13.44	6.45	7.90	40.93	2.02	
1946	3.05	3.95	7.67	7.52	2.31	4.95	26.40	10.45	
1947	0.35	1.30	12.15	9.49	8.66	7.65	39.25	6.83	
1948	0.54	4.11	8.64	5.91	8.28	5.77	32.71	7.27	
1949	3.46	4.64	13.81	8.54	6.62	8.01	41.62	..	
1950	0.94	2.93	8.76	5.72	15.81	8.84	42.06	2.74	
1951	1.05	2.80	9.26	6.45	10.05	4.36	32.92	3.59	
1952	3.27	3.58	3.09	3.62	3.17	12.32	25.78	2.37	
1953	1.14	4.80	5.39	2.43	2.61	7.66	22.89	0.83	
1954	0.49	8.14	14.72	5.04	..	8.51	36.41	1.11	
1955	5.89	1.64	4.17	5.05	7.69	18.21	36.76	2.09	
1956	6.47	6.25	9.81	5.30	8.79	12.51	42.66	3.75	
1957	1.04	6.39	5.36	7.11	2.08	4.47	25.41	..	
1958	2.83	4.64	13.00	6.62	9.30	21.25	54.81	9.49	
1959	1.76	4.76	11.85	13.70	6.62	6.67	43.60	0.33	
1960	1.98	7.92	9.85	3.22	12.20	2.72	35.91	0.69	
1961	1.36	3.38	5.80	3.30	9.00	15.25	36.73	3.28	
1962	2.43	1.74	11.10	7.35	8.70	15.35	44.24	1.78	
1963	0.47	5.41	9.49	8.22	5.20	13.05	41.37	..	
1964	0.03	4.86	8.78	9.76	15.70	5.91	45.01	5.81	

APPENDIX—D (vi).

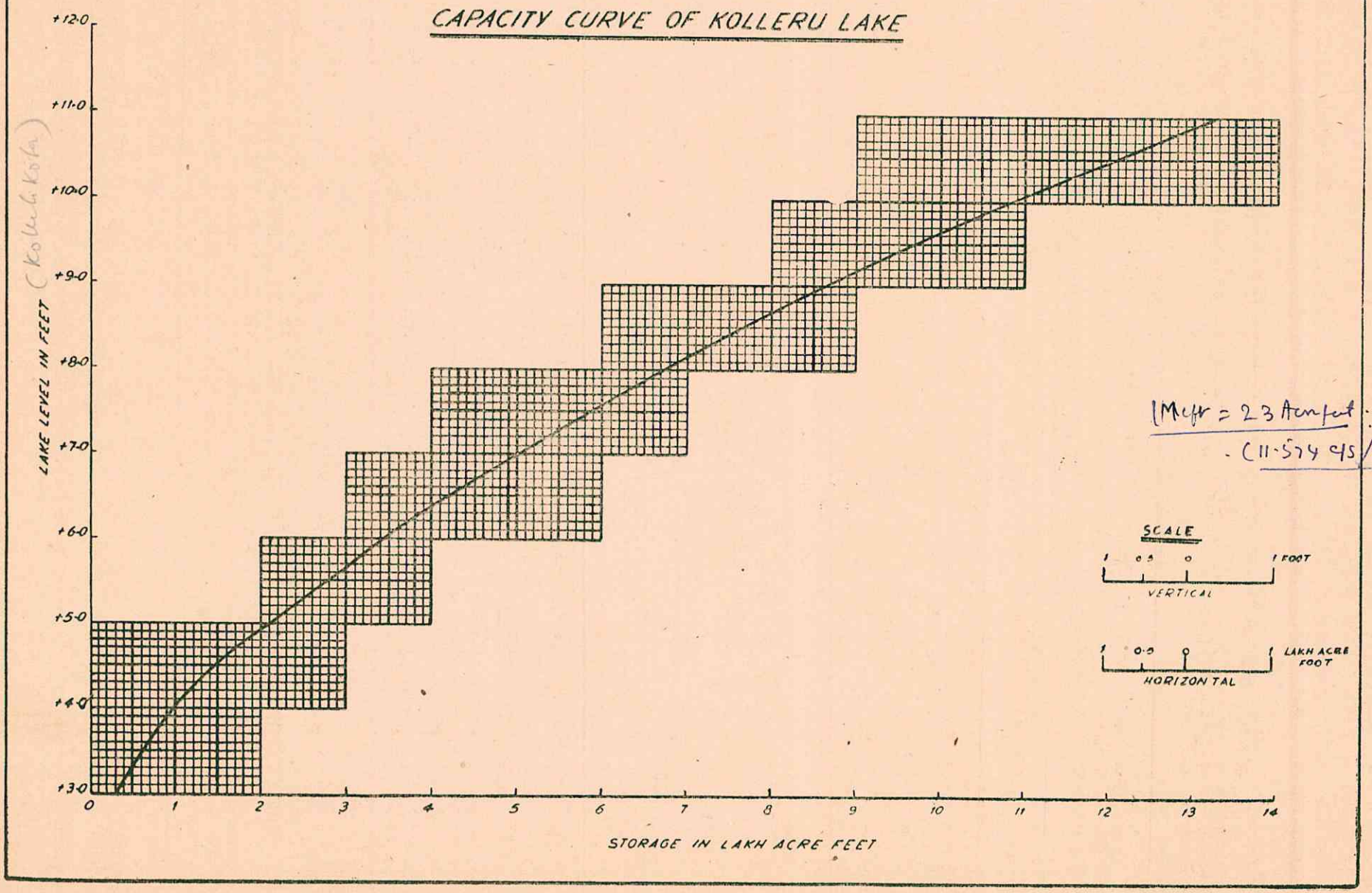
Statement showing rainfall in inches from 1945 *to* 1964 *in Godavari Eastern Delta.*

Names of rain gauge Stations:—(1) Chintapalli, (2) Biccavolu, (3) Kulla, (4) Dowlaiswaram, (5) Coringa, (6) Alamuru, (7) Kakinada and (8) Vella.

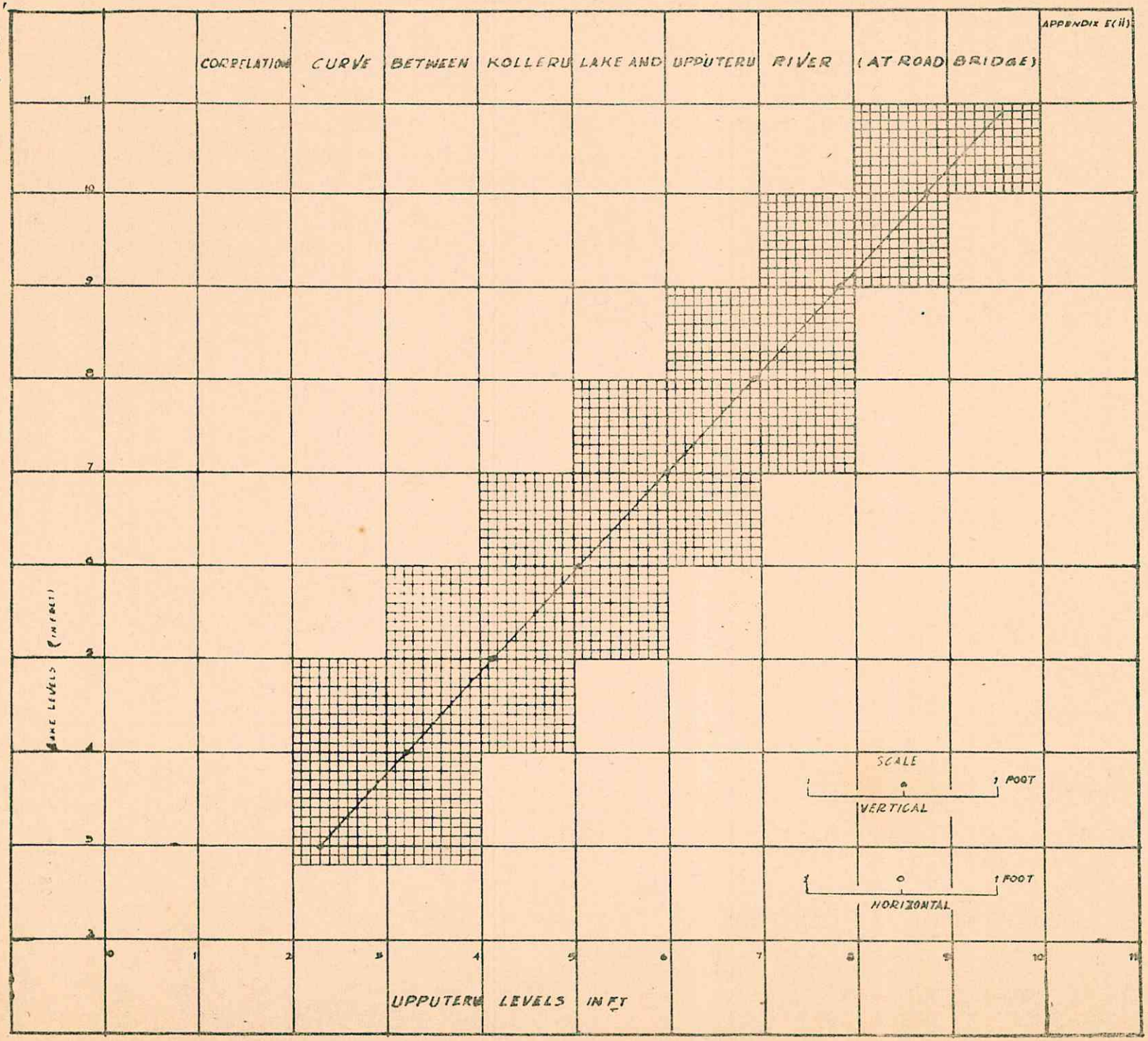
Year	*January to May*	*June*	*July*	*August*	*September*	*October*	*June to October*	*November and December*	*Remarks*
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1945	2.48	2.33	10.45	10.80	6.65	6.35	36.58	0.78	
1946	4.99	2.55	8.10	6.76	3.47	2.33	23.21	4.95	
1947	1.27	1.33	10.38	5.96	6.44	3.69	27.80	5.16	
1948	1.23	2.61	7.57	5.21	7.12	3.04	25.55	12.72	
1949	1.51	3.79	15.29	5.53	9.03	14.78	48.42	0.01	
1950	2.47	3.78	11.40	5.73	13.07	8.43	42.41	5.52	
1951	3.41	4.59	12.70	8.71	9.33	5.20	40.53	2.12	
1952	3.87	3.98	4.98	4.12	4.18	12.92	30.18	3.35	
1953	1.54	4.94	6.10	5.50	4.11	12.22	32.87	1.50	
1954	0.86	5.99	11.03	4.90	..	8.77	30.69	0.51	
1955	9.85	3.11	3.89	6.59	6.38	11.33	31.30	0.99	
1956	5.85	6.82	9.21	3.33	9.34	16.12	44.82	1.19	
1957	1.66	4.49	4.37	10.37	3.11	4.13	26.47	..	
1958	2.07	2.81	23.40	9.15	10.35	23.00	68.71	7.93	
1959	2.68	4.76	14.80	11.55	6.26	12.90	50.27	0.13	
1960	2.23	3.26	9.65	2.65	6.56	4.80	26.92	0.69	
1961	1.40	4.13	9.26	3.81	10.05	8.00	35.24	1.83	
1962	1.80	4.32	10.90	9.41	5.56	10.54	40.73	1.14	
1963	2.04	4.70	6.62	7.81	3.64	14.75	37.52	0.01	
1964	1.47	3.46	7.23	8.00	12.95	3.02	34.66	3.82	

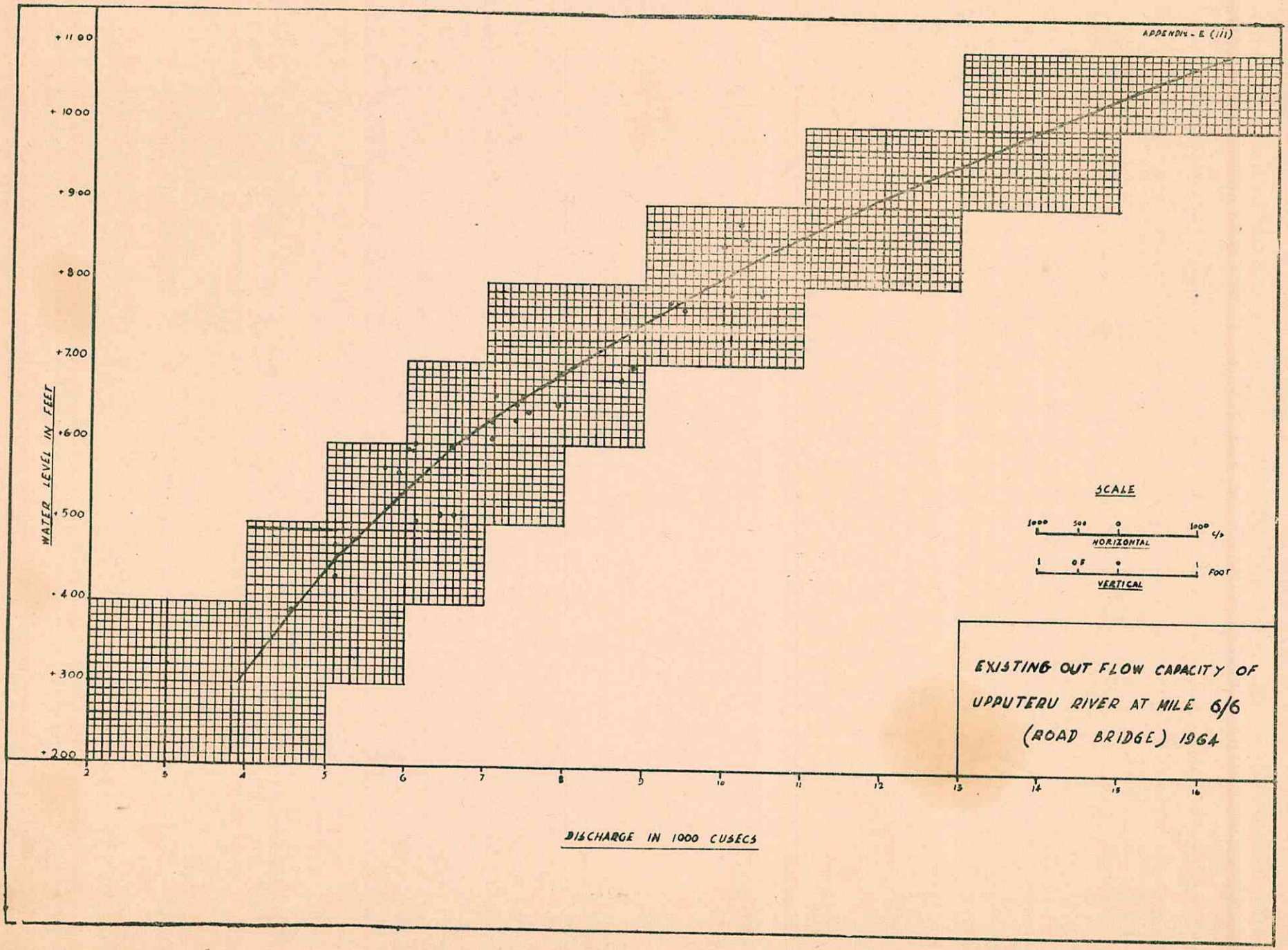
APPENDIX - E (1)

CAPACITY CURVE OF KOLLERU LAKE



1 Mcft = 2.3 Acre feet
(11.574 cs/24 hrs flow)


CORRELATION CURVE BETWEEN KOLLERU LAKE AND UPPUTERU RIVER (AT ROAD BRIDGE)
LAKE LEVELS (IN FEET)
SCALE
1 FOOT
VERTICAL
1 FOOT
HORIZONTAL
UPPUTERU LEVELS IN FT


+11.00
+10.00
+9.00
+8.00
+7.00
+6.00
+5.00
+4.00
+3.00
+2.00
WATER LEVEL IN FEET
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
DISCHARGE IN 1000 CUSECS
SCALE
1000
500
0
1000 c/s
HORIZONTAL
1
0.5
0
1
FOOT
VERTICAL
EXISTING OUT FLOW CAPACITY OF
UPPUTERU RIVER AT MILE 6/6
(ROAD BRIDGE) 1964

APPENDIX—F (i).

Statement showing the areas affected by floods and the extent of damage caused in Krishna Eastern and Godavari Western Deltas including Kolleru Basin for the years 1955 to 1964.

Sl. No.	Year	Area damaged by flood in acres			Estimated quantity of foodgrains (Paddy) lost in tonnes			Value of the foodgrains (Paddy) lost in Rs.			Remarks.
		Krishna Eastern Delta	*Godavari Western Delta*	*Total*	*Krishna Eastern Delta*	*Godavari Western Delta*	*Total*	*Krishna Eastern Delta*	*Godavari Western Delta*	*Total*	
1.	1955	56,272	21,524	77,796	42,204	16,140	58,344	1,60,37,500	61,33,000	2,21,70,500	
2.	1956	1,58,919	80,177	1,89,096	1,19,175	22,620	1,41,795	4,52,86,500	85,96,000	5,38,82,500	
3.	1957	12,000	6,518	18,518	9,000	4,888	13,888	34,20,000	18,58,000	52,78,000	
4.	1958	4,352	2,608	6,960	3,263	1,955	5,218	12,40,000	7,43,000	19,83,000	
5.	1959	46,780	89,528	1,36,308	35,085	67,170	1,02,255	1,33,32,000	2,55,25,000	3,88,57,000	
6.	1960	31,613	4,741	36,354	23,708	3,555	27,263	90,09,000	13,51,000	1,03,60,000	
7.	1961	18,802	1,149	19,951	14,100	862	14,962	53,58,000	3,28,000	56,86,000	
8.	1962	68,000	49,638	1,17,638	51,000	37,220	88,220	1,93,80,000	1,41,44,000	3,35,24,000	
9.	1963	50,000	46,871	96,871	37,500	35,150	72,650	1,42,50,000	1,33,57,000	2,76,07,000	
10.	1964	1,20,000	78,152	1,98,152	90,000	58,610	1,48,610	3,42,00,000	2,22,72,000	5,64,72,000	
Total for ten years.		5,66,738	3,30,906	8,97,644	4,25,035	2,48,170	6,73,205	16,15,13,000	9,43,07,000	25,58,20,000	
Average for ten years.		56,674	33,091	89,764	42,504	24,817	67,321	1,61,51,300	94,30,700	2,55,82,000	

APPENDIX-F (ii)

Statement showing areas affected by floods and the extent of damage caused in Krishna Western Delta (Guntur district) for the years 1955 to 1964.

Sl. No.	*Year*	*Area damaged by floods (in acres)*	*Estimated quantity of foodgrains (paddy) lost in tonnes.*	*Value of the foodgrains (paddy) lost in Rs.*	*Remarks*
1.	1955 ..	40,000	30,000	1,14,00,000	
2.	1956	40,000	30,000	1,14,00,000	
3.	1957	48,000	36,000	1,36,80,000	
4.	1958	56,000	42,000	1,59,60,000	
5.	1959	56,000	42,000	1,59,60,000	
6.	1960	56,000	42,000	1,59,60,000	
7.	1961	62,000	46,500	1,76,70,000	
8.	1962	66,432	49,824	1,89,33,000	
9.	1963	94,842	71,132	2,70,30,000	
10.	1964	1,20,000	90,000	3,42,00,000	
	Total for 10 years ..	6,39,274	4,79,456	18,21,93,000	
	Average for ten years ..	63,927	47,946	1.82 crores	

APPENDIX-F (iii)

Statement showing areas affected by floods and the extent of damage caused in Godavari Central Delta for the years 1955 to 1964.

Sl. No.	*Year*	*Area damaged by floods in acres*	*Estimated quantity of foodgrains (paddy) lost in tonnes*	*Value of the foodgrains (paddy) lost in Rs.*	*Remarks*
1.	1955	16,505	12,380	47,04,000	
2.	1956	22,794	17,100	64,98,000	
3.	1957	23,100	17,325	65,84,000	
4.	1958	28,403	21,303	80,95,000	
5.	1959	34,013	25,510	96,94,000	
6.	1960	15,950	11,970	45,49,000	
7.	1961	16,176	12,132	46,10,000	
8.	1962	22,675	17,007	64,63,000	
9.	1963	15,945	11,960	45,45,000	
10.	1964	15,600	11,700	44,64,000	
	Total for 10 years ..	2,11,161	1,58,387	6,01,88,000	
	Average for 10 years ..	21,116	15,839	60,18,800	

APPENDIX—F (iv)

Statement showing areas affected by floods and the extent of damage caused in Godavari Eastern Delta for the years 1955 to 1964.

Sl. No.	*Year*	*Area damaged by floods in acres*	*Estimated quantity of foodgrains (paddy) lost in tonnes*	*Value of the foodgrains (paddy) lost in Rs.*	*Remarks*
1.	1955	28,000	21,000	79,80,000	
2.	1956	32,120	24,090	91,54,000	
3.	1957	20,500	15,375	58,42,000	
4.	1958	20,610	15,456	58,73,000	
5.	1959	70,600	52,950	2,01,21,000	
6.	1960	38,000	28,500	1,08,30,000	
7.	1961	20,600	15,450	58,71,000	
8.	1962	45,500	34,125	1,27,86,000	
9.	1963	42,620	31,965	1,21,47,000	
10.	1964	68,000	51,000	1,93,80,000	
Total for 10 years ..		3,86,550	2,89,911	10,99,84,000	
Average for ten years ..		38,655	28,991	1.10 crores	

APPENDIX—G

A NOTE ON HEAVY RAINFALL IN ANDHRA PRADESH

The floods in Andhra Pradesh are generally due to the heavy to very heavy rains caused by storms and depressions which develop in the Bay of Bengal and move across the above area. Table-A gives the month-wise information regarding the number of disturbances (storms and depressions) which crossed the north and south coastal Andhra Pradesh during the period 1891-1960. It will be seen from the table that the above area is worst affected by disturbances in the months of September to October. The period December to April is practically free from disturbances, so far as the area in question is concerned. During the above 70 years 74 disturbances affected Andhra Pradesh in September and October alone. If the other months are also taken into account, the total number of disturbances are found to be about 120 during the period of 70 years. Thus, on an average, about two disturbances may be expected to affect the State every year and cause floods there.

In late September and early October of 1964, unusually heavy floods occurred in the districts of Krishna, Godavari and Guntur leading to considerable loss of life and property. These floods were the result of very heavy rains between September 27 and October 1, 1964 caused by a depression which formed in the Bay of Bengal and moved westwards across Andhra Pradesh. The available rainfall data for the above districts for the period 24-9-1964 to 30-9-1964 are given in Table 1-4. It will be seen that the heaviest rainfall occurred on the 28th and 29th September. On the 28th morning the depression was near the coast off Kakinada and on the 29th morning it was near Khammam. There after it weakened and moved away further westwards with rapid decrease in the rainfall.

The disturbances following a westerly or nearly westerly course as the September 1964 depression and thus affecting greater parts of the area usually cause more widespread floods. Table-B gives statistics of such disturbances and it will be seen that September is the worst month in this respect. Next comes October.

Table-C gives the chief amounts of rainfall that occurred at the I.M.D. observatories in Andhra Pradesh in association with disturbances from the Bay during the period 1950-1963. The-table also gives information regarding the points where the disturbances crossed the coast and the periods when heavy rainfall occurred.

N.B.—A disturbance, is treated as a storm when atleast one ship's observation is received from the disturbed area, reporting wind speed of 34 knots or more. Otherwise, a disturbance is considered as a depression.

TABLE-A

NUMBER OF STORMS AND DEPRESSIONS WHICH CROSSED ANDHRA COAST DURING THE PERIOD 1891–1960.

Month	*North Coastal Andhra Pradesh (Between Masulipatam and Gopalpur)*		*South Coastal Andhra Pradesh (Between Madras and Masulipatam)*	
	Depressions	*Cyclonic Storms*	*Depressions*	*Cyclonic Storms*
January	..	..	1	..
February	..	..	..	..
March	..	..	..	..
April	..	..	1	1
May	..	3	1	2
June	1	4	1	..
July	2	..	..	..
August	8	1	..	..
September	24	4	4	..
October	10	15	8	9
November	3	4	3	9
December	..	..	1	..

(Figures collected from charts 144 to 156 of latest volume of storm tracks)

During the period 1961 to 1963, one cyclonic storm and one depression crossed South Andhra Coast and one depression crossed North Andhra Coast.

TABLE-B

NUMBER OF STORMS AND DEPRESSIONS NEARLY SIMILAR TO SEPTEMBER 1964 CASE (WITH YEARS) DURING THE PERIOD 1891–1963.

Month	*Number of cases*		*Years*
	Depression	*Cyclonic storm*	
January	..	..	..
February	..	..	..
March	..	..	..
April	..	1	1956
May	..	..	..
June	..	..	..
July	..	..	..
August	..	..	..
September	14	2	1892, 1895, 1904, 1908, 1909, 1914, 1921, 1926, 1927, 1938, 1940, 1947, 1948, 1949, 1954, 1952.
October	3	7	1892 (2), 1901, 1916, 1921, 1927, 1939, 1943, 1944, 1958.
November	..	2	1915, 1946
December	..	..	..

TABLE-C.

HEAVY RAINFALL AMOUNTS ASSOCIATED WITH DEPRESSIONS AND CYCLONES WHICH HIT COASTAL ANDHRA PRADESH DURING THE PERIOD 1950 TO 1963.

S.No.	Depression or Cyclone.	Period.	Point of crossing.	Heavy.	Rainfall amounts in Andhra Pradesh.	
(1)	(2)	(3)	(4)		(5)	
1.	Depression	9th to 11th September 1950.	Kakinada	10th	Masulipatam	4.5"
					Rentachintala	3.3"
2.	Depression	21st and 22nd October 1953.	Nellore	21st-22nd	Ongole	3.0"
					Kakinada	7.6"
					Ongole	7.3"
					Masulipatam	7.2"
					Nellore	6.3"
					Vijayawada	2.6"
				23rd-	Kakinada	3.0"
3.	Depression	26th September to 1st October 1954.	Kakinada	26th-27th-	Cuddapah	3.0"
					Gannavaram	6.0"
					Masulipatam	5.0"
				28th	Rentachintala	6.0"
					Visakhapatnam	3.0"
4.	Cyclonic	5th to 7th May 1955.	Kakinada	7th	Visakhapatnam	5.7"
					Kakinada	3.8"
5.	Depression	6th to 13th October 1955.	Between Visakhapatnam and Calingapatam.	11th	Visakhapatnam	2.5"
6.	Cyclonic Storm.	27th April to 2nd May 1956.	Ongole	30th	Anantapur (No heavy rain in Coastal Andhra Pradesh).	3.0"
7.	Cyclonic	25th-26th June 1956.	Calingapatam	25th	Kakinada	4.0"
8.	Depression	26th-30th October 1956.	Ongole	30th	Nellore	6.0"
					Cuddapah	3.0"
9.	Depression	10th to 13th September 1957.	Calingapatam	11th & 12th	No heavy rain but rainfall between 3 & 6 cm. occurred.	
10.	Depression	23rd to 24th June 1959.	Ongole	23rd	Nellore	8 cm.
				24th	Cuddapah	9 cm.
11.	Depression	23rd to 28th October 1962.	Nellore	22nd	Nellore	8 cm.
					Kovur-(Nellore district)	11 cm.
				23rd	Do.	8 cm.
					Nellore	7 cm.
				24th	Calingapatam	17 cm.
					Nellore	15 cm.
					Kovur, Nellore district)	10 cm.
					Visakhapatnam	7 cm.
				25th	Visakhapatnam	13 cm.
					Calingapatam	26 cm.
				26th	Kakinada	13 cm.
					Bhimavaram	13 cm.
				27th	Kakinada	9 cm.
					Cuddapah	7 cm.
12.	Cyclonic Storm.	28th to 30th November 1962.	Nellore		No heavy rain.	

TABLE-1.

Rainfall (mm.) data of Revenue raingauge stations during the period 24th September 1964 to 30th September 1964.

DISTRICT : GUNTUR.

Name of the station.	24/9	25/9	26/9	27/9	28/9	29/9	30/9	*Total for the week ending 30/9*	*Total for 3 days 27/9 to 29/9*
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1. Guntur ..	5.0	..	..	..	75.2	63.8	2.7	146.7	139.0
2. Sattenapalli ..	9.7	..	..	..	83.3	84.3	1.2	178.5	167.6
3. Tenali	3.8	..	..	..	95.6	107.1	1.3	207.8	202.7
4. Repalle ..	..	..	..	75.9	53.3	2.5	..	131.7	131.7
5. Bapatla ..	..	2.5	60.0	48.8	..	..	..	111.3	48.8
6. Palnad (Gurazala)	5.3	..	..	..	48.8	..	..	54.1	48.8
7. Narasaraopet ..	3.6	..	..	..	99.9	38.1	..	141.6	138.0
8. Vinukonda ..	..	..	..	..	76.2	127.0	3.3	206.5	203.2
9. Ongole ..	..	..	..	32.3	62.4	..	..	94.7	94.7
10. Mangalagiri ..	..	..	..	..	170.8	104.1	..	274.9	274.9
11. Ponnur ..	1.8	..	..	..	85.4	78.7	2.5	168.4	164.1
12. Kanuparti ..	..	..	..	..	40.6	62.5	..	103.1	103.1

(Rentachintala 23 cm. on 29th).

TABLE-2.

Rainfall (mm.) data of Revenue raingauge stations during the period 24th September 1964 to 30th September 1964.

DISTRICT : KRISHNA.

Name of the station.	24/9	25/9	26/9	27/9	28/9	29/9	30/9	*Total for the week ending 30/9*	*Total for the 3 days 27/9 to 29/9*
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1. Avanigadda ..	4.0	..	..	..	71.1	50.8	2.5	128.4	121.9
2. Gudivada ..	22.4	..	..	5.6	85.4	123.4	1.0	237.8	214.4
3. Kaikalur ..	25.0	..	..	..	75.0	127.0	..	227.0	202.0
4. Vijayawada ..	31.0	..	..	..	190.5	114.3	..	335.8	304.8
5. Nandigama ..	29.0	..	..	..	162.0	181.0	1.2	373.2	343.0
6. Jaggayyapeta ..	..	..	..	81.0	171.2	1.0	1.0	254.2	253.2
7. Gannavaram ..	13.5	..	..	..	101.6	128.8	2.3	246.2	230.4
8. Nuzvid ..	29.0	..	..	..	85.0	170.0	2.0	286.0	255.0
9. Tiruvur ..	74.5	..	..	..	85.0	28.0	4.5	192.0	113.0
10. Manginapudi ..	14.2	..	..	15.2	80.0	58.9	..	168.3	154.1
11. Vijayawada* ..	..	..	..	..	139.7	121.9	2.5	..	261.6

* P.W.D. Station.

(Masulipatam 7 cm. on 28th).
(Gannavaram Observatory 12 cm. on 29th).

TABLE-3.

Rainfall (mm.) data of Revenue raingauge stations during the period 24th September 1964 to 30th September 1964.

DISTRICT: WEST GODAVARI.

Name of the station.	24/9	25/9	26/9	27/9	28/9	29/9	30/9	*Total for the week ending 30/9*	*Total for the 3 days 27/9 to 29/9*
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1. Eluru ..	24.1	..	..	..	101.6	170.2	2.0	297.9	271.8
2. Chintalapudi ..	46.2	..	..	78.2	106.2	23.6	3.1	257.3	208.0
3. Tadepalligudem ..	..	..	..	50.8	68.3	44.5	3.6	167.2	163.6
4. Kovvuru ..	91.4	10.4	..	..	43.2	19.1	2.5	166.6	62.3
5. Bhimavaram ..	20.3	..	..	..	96.5	88.9	1.3	207.0	185.4
6. Tanuku ..	30.7	..	..	..	57.9	48.5	3.1	140.2	106.4
7. Penugonda ..	25.4	..	..	..	12.7	25.4	..	63.5	38.1
8. Narsapur ..	29.0	2.0	..	3.6	102.6	90.7	1.8	229.7	196.9
9. Polavaram ..	15.2	..	..	0.5	22.9	21.6	3.1	62.3	44.0

TABLE-4.

Rainfall (mm.) data of Revenue raingauge stations during the period 24th September 1964 to 30th September 1964.

DISTRICT: EAST GODAVARI.

Name of the station.	24/9	25/9	26/9	27/9	28/9	29/9	30/9	*Total for the week ending 30/9*	*Total for 3 days 27/9 to 29/9*
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1. Mummidivaram ..	35.0	..	..	75.0	100.0	175.8	..	385.8	350.8
2. Tuni	6.3	0.2	..	8.3	44.2	38.6	..	97.6	91.1
3. Prathipadu ..	24.1	3.3	8.8	..	26.6	8.8	1.5	43.1	35.4
4. Peddapuram ..	78.2	..	..	..	57.1	12.7	3.8	151.8	69.8
5. Rajahmundry ..	61.2	..	..	..	41.8	21.6	2.8	127.4	63.4
6. Kakinada ..	82.8	0.2	..	0.8	92.8	19.2	1.0	96.8	112.8
7. Ramachandrapuram.	35.5	..	..	5.3	86.4	31.0	1.8	160.0	122.7
8. Alamuru ..	..	..	10.2	66.0	38.1	2.5	..	116.8	106.6
9. Kothapeta ..	25.0	..	..	25.0	100.0	50.0	..	200.0	175.0
10. Amalapuram ..	..	..	..	88.9	80.2	20.4	..	189.5	189.5
11. Razole ..	..	..	20.6	88.7	99.4	..	..	208.7	188.1
12. Yellavaram (Addatigala). ..	..	..	..	..	18.8	16.0	9.6	44.4	34.8
13. R. Chodavaram ..	..	..	..	..	23.0	14.0	..	37.0	37.0
14. Pithapuram ..	87.1	..	11.7	..	47.0	14.0	..	159.8	61.0

APPENDIX—H

MODEL EXPERIMENTS

1. INTRODUCTION :

1.1 The problem of reducing the flood levels in the Kolleru lake, by improving the discharging capacity of the Upputeru river, was referred to the Central Water and Power Research Station, Poona by the Superintending Engineer, Vijayawada Circle. It was desired that the flood levels in the lake should be reduced by 2 ft. for normal floods and it was estimated by the Superintending Engineer that this would require doubling the discharging capacity of the Upputeru river for a lake elevation of +7.4 MSL. The following proposals were, therefore, suggested for examination in the model.

(*i*) Widening the river between milages 6/6 and 12/0.

(*ii*) Providing cut-offs at meanders for the river at milages 17/0, 19/0 and 21/0 and

(*iii*) Providing a straight cut to the sea at milage 29/0.

1.2 Tests were also to be conducted for examining the stability of the mouth of the cut, by reproducing littoral drift in the sea portion of the model.

1.3 After examining the devastation caused in the area in 1964, due to inundation of valuable land bordering the Kolleru lake, the Flood Committee recommended that the primary aim of the model studies should be to ensure that the lake level would not exceed +7 ft. MSL for longer than 7 days, should the 1964 rainfall pattern recur.

1.4 A rigid bed hydraulic model of the Upputeru river was constructed having a Horizontal scale 1 : 500 and a Vertical Scale 1 : 100. The Kolleru lake was reproduced in its entirety and the sea bed at the mouth of the Upputeru was reproduced for a distance of 10 miles to the west and 4 miles to the east of the present mouth of the Upputeru river upto 60 ft. contour. Arrangements were made for reproducing the tides in the sea portion, and also to reproduce waves from SSW. Inflow arrangemnts were made for each of the drains entering into Kolleru lake as well as for all the drains joining the Upputeru in its course to the sea.

1.5 The model was proved for dry weather for a tide having a range of 4.1ft. at the mouth of the Upputeru (mile 36/4½), and for a monsoon tide having a range of 3.4 ft. at the mouth. The tidal ranges at various stations as observed in the prototype are given in Table-1.

Table-1.

Tidal ranges at various milages along the Upputeru.

Date of observation	*Milages*							
	2/0	6/6	12/0	20/4	25/7½	28/0	30/2	36/4½
5-10-1960 (Monsoon)	Nil	Nil	0.1′	0.1′	Not available.	0.6′	1.8′	3.4′
15- 2-1961 (Dry weather)	Nil	1.6′	2.1′	2.7′	2.5′	2.2′	2.4′	4.1′

1.6 A comparison of the tidal curves obtained at the various gauging stations, for model and prototype, is shown in Fig. 1. It may be seen that the model reproduces various gauges in the prototype satisfactorily for both the dry season and for the monsoon. The prototype data for the actual discharge obtained in the new Yenamadurru drain on 5-10-1960 (the date for which the model was proved) are not available. In order to obtain accurate reproduction of the tidal curves, it was found necessary to pass a discharge of 6,500 cfs. through the new Yenamadurru drain. From the rainfall records of the three days preceeding the date of proving, and assuming a run-off co-efficient of 0.5, this discharge passing through the new Yenamadurru drain appeared to be reasonable.

1.7 Velocities over the entire tidal cycle at milages 33/0 and 8/6 were also checked and found to conform to observed prototype values. Therefore, proving of the model was considered quite satisfactory.

1.8 The lake elevation on 5-10-1960 was +7.4 MSL, for which the above proving of the model was undertaken. It was also necessary to prove the model for other lake elevations. The tidal range reproduced in the model was maintained at 3.4 ft. It was found that for lake elevations ranging between +5 and +10 the model discharge came within 5 per cent of the given prototype values, using the appropriate Froude scale conversion.

2. Experiments to improve the Upputeru :

2.1 In order to quickly examine the effect of various improvements on the Upputeru, a constant inflow of 8,000 cfs. was maintained into the Kolleru lake. It was found that, of the three measures suggested by the Superintending Engineer, Vijayawada Circle (para 1.1 supra) the straight cut from mile 29/0 to the sea and widening the river between milages 6/6 and 12/0 were found effective, whereas cut-offs at the meanders at milages 17/0, 19/0 and 21/0 made virtually no difference to the discharging capacity of the Upputeru. In addition, widening and deepening of the river above the railway bridge (in the Perantala Kanuma) was also tested and found to be effective.

2.2 *Effect of isolating New Yenamadurru Drain :*

The Upputeru river is able to carry only about 7,500 cfs. at the road bridge for a lake elevation of +7 MSL. Thus when the New Yenamadurru drain carries a discharge of 6,500 cfs., it was surmised that the choking effect on the Upputeru would be considerable. In view of this, the Flood Committee had suggested that a straight cut to the sea be made at mile 29/0, through which the discharge of the Upputeru river could pass directly to the sea, while the N.Y. drain discharge would continue to flow through the old course of the Upputeru river below mile 29/0. A bund was proposed across the Upputeru river at this point, isolating the N.Y. drain from the straight cut. The effect of such a proposal is shown in Fig. 2. It is seen that, with a cut 90 ft. wide, the discharging capacity of the Upputeru drops, indicating that the width of the straight cut is inadequate. The original discharging capacity of the Upputeru can only be restored when the cut is made 400 ft. wide.

While this illustrates the effect of monsoon conditions, one ought not to lose sight of the fact that placing a bund across Upputeru at mile 29/2 would disturb the tidal regime during dry weather which was apparently maintained the present Upputeru with little or no silting. In addition, navigation facilities across the bund would have to be provided for the fishing craft that use the river.

2.3 *Effect of a straight cut at mile* 29/0 :

Improvement in the discharging capacity of the Upputeru, for various widths of the straight cut at mile 29/0 are shown in Fig. 3. For these experiments no bund was placed across the Upputeru, nor was any improvement in the cross sectional area of the Upputeru made. It is seen that for a cut 400 ft. wide, there is a 12 per cent improvement in the discharging capacity of the Upputeru at lake elevation +7 ft. M.S.L.

2.4 *Effect of the New Yenamadurru Drain :*

The maximum discharge that can be brought down through the N.Y. Drain has been estimated to be approximately 23,000 cfs. The choking effect of such a discharge in comparison to a N.Y. discharge of 6,500 cfs. is shown in Figs. 4 and 5. Fig. 4 shows the choking effect under existing conditions and with a cut 400 ft. wide at mile 29/0. The reduction in capacity under existing conditions is 37 per cent and with the 400 ft. straight cut 14 per cent, for lake elevation of +7. Fig. 5 shows the choking effect with a straight cut to the sea at mile 30/6, the width of the cut being 400 ft. The reduction in discharging capacity of the Upputeru is 5 per cent for a 400 ft. cut. It is also seen that the 600 ft. cut does not offer any distinct advantage over the 400 ft. cut. This factor needs further examination in conjunction with improvements further upstream in the Upputeru river.

2.5 *Improvement to the cross-sectional area of the Upputeru River :*

The cross-sectional area of the existing Upputeru has been plotted as a function of longitudinal distance from the lake below the sloping datum varying from +10 at the lake to zero at the sea (Fig. 6). Since the cross-sectional area in various stretches of the river was found to be inadequate, improvements were made in the river (*i*) from mile 2/0 to the rail bridge (mile 6/3), (*ii*) between the bridges including widening of the river course between the abutments, (*iii*) from mile 6/6 to 11/0 and (*iv*) from 13/0 to 25/0. In addition, a cut-off

was made across a meander from mile 11/2 to 13/0, and at the meander at mile 21/0. The improved cross sections together with the original cross-sections of the Upputeru are shown in Figs. 7, 8 and 9. Various combinations of the above improvements were tested in the model and are described below.

With the Upputeru river improved between miles 2/0 to 6/3 and 6/6 to 11/0, together with a straight cut to the sea, 90 ft. wide at mile 29/0, the rating curve obtained in the model is shown as curve 1 in Fig. 10. The improvement in the capacity of the Upputeru for lake elevation +7 is 55 per cent. With the same improvements but a cut 400 ft. wide, the improvement was 69 per cent at lake elevation +7 (curve 2). With the Upputeru improved further between miles 13/0 and 25/0 together with the cut-offs at miles 11/2 to 13/0 and at mile 21/0, the discharging capacity of the Upputeru is shown in curve 3. The improvement for a lake elevation of +7 is 110 per cent. It could be seen from Fig. 2 that the discharging capacity of the Upputeru with a bund at mile 29/2 remains approximately the same if a cut 400 ft. wide was made without any improvements upstream. It was also desired to examine the effect of a bund across Upputeru when both the upstream river had been improved and a straight cut to the sea 400 ft. wide had been provided. This is shown in curve 4. It is seen that by isolating the N.Y. drain, there is some improvement, the total improvement over existing conditions being 118 per cent.

2.6 *Widening of the Road and Railway Bridges :*

Longitudinal water surface profiles taken both in the model and in the prototype had shown that there was a considerable afflux due to the restriction caused by the abutments of the road and railway bridges. This is shown in Fig. 11. Consequently the distance between abutments was increased to 600 ft. for each of the bridges, the river cross-section being widened to 500 ft. as shown in Fig. 12, in conjunction with the various improvements of the river down to mile 25/0, and a straight cut 400 ft. wide at mile 29/0 (without any bund). The effect of widening the bridge openings is shown as curve 5 on Fig. 10. The longitudinal water surface profile obtained for this condition is also plotted on Fig. 11. It is seen that with the widening of the bridges, the total improvement goes up by 132 per cent.

The quantities of dredging involved in each of these improvements is tabulated below :

Table No. 1—Quantities of Excavation.

S. No.	*Item*	*Quantity (m. cft.)*
1.	Improvement to Upputeru from mile 2/0 to 6/3	60.0
2.	Widening of road and railway bridges and improving the river between bridges..	8.2
3.	Improvement to Upputeru from mile 6/6 to 11/0	41.0
4.	Cut-off at meander from 11/0 to 13/0	33.6
5.	Improvement to Upputeru from 13/0 to 25/0 excluding cut-off at 21/0 ..	27.6
6.	Cut-off at 21/0 (from 21/2 to 21/6)	8.0
7.	Straight cut at 29/0 ; 90 ft. width	44.0
8.	Straight cut at 29/0 ; 400 ft. width..	200.0
9.	Streamlining N.Y. outfall	14.6

Since the total quantity of dredging amounts to about 393 m.cft., an approximate plan for phasing would be desirable. The combination of the various improvements would result in a large number of experiments to determine the proper phasing and hence, this aspect cannot be fully commented on, at the moment. However, some preliminary studies in this regard have been conducted as shown in Fig. 13. Curve 1 in this figure represents the existing condition of the Upputeru while curve 4 represents the improvement obtained by the total excavation of 393 m. cft. Since the widening of the road and railway bridges would require concurrence of the railway authorities, this would have to be postponed to the last phase of development. The afflux caused by these bridges, however, may tend to nullify the beneficial effects of widening the river between miles 2/0 and 6/3. As a consequence, this may also be postponed to the last phase of development. For

the first phase one might consider improving the river between mile 6/6 and 11/0 and a straight cut to the sea at mile 29/0, 90 ft. wide. For the second phase of development one may consider improving the river between miles 13/0 and 25/0 and widening the straight cut to 200 ft. (curve 2). For the third phase, the cut-offs between 11/2 and 13/0 and that at mile 21/0 may be considered along with widening of cut to 400′ 0″ (curve 3). The final phase would include widening the bridges and improving the upstream reaches of the river (Perantala Kanuma) (curve 4).

3.0 *Flood routing through the improved Upputeru river :*

Flood routing studies were conducted for the phase of development as suggested above using 1964 hydrograph for the inflow. The derived inflow hydrograph of 1964 gave a peak of 3 days. Since this inflow hydrograph includes the effect of the Budameru diversion to the Krishna (capacity 7,500 cfs.) and further diversion being uneconomical, this hydrograph has been used for computing the maximum lake level, should conditions identical to 1964 recur. The lake levels as a function of time for various phases of development are shown in Fig. 14. The quantities of excavation involved in each phase of development together with the maximum water level likely to be attained and the duration of submergence is given below in Table II.

Table No. II

S. No.	*Conditions.*	*Total quantity of excavation (m. cft.)*	*Base level*	*Max. lake level*	*Submergence in days above*			
					+7	+8	+9	+10
1.	Existing (1964)	..	7.3	10.7	54	37	25	14
2.	*Phase* 1—(*i*) Upputeru improved between 6/6 to 11/0 and (*ii*) a straight cut to sea 90 ft. wide at mile 29/0 ..	85.00			Experiments in progress.			
3.	*Phase* 2—(*i*) Upputeru improved between 6/6 to 25/0 and (*ii*) widening of straight cut to 200 ft.	168.6	5.10	8.92	22	15	Nil	Nil
4.	*Phase* 3—(*i*) Upputeru improved from 6/6 to 25/0, (*ii*) Providing cut-offs at 11/2 to 13/0 and 21/2 to 21/6 and (*iii*) Widening of straight cut to 400 ft.	310.2	4.85	8.67	19	12	Nil	Nil
5.	*Phase* 4—(*i*) Widening Road and Railway bridges including improvement of Upputeru as per Fig. 12, (*ii*) Upputeru improved from 2/0 to 25/0 including cut-offs at 11/2 to 13/0 and at 21/2 to 21/6, (*iii*) Streamlining N. Y. outfall and (*iv*) Straight cut to sea 400 ft. wide	393.0	4.06	8.17	15	6	Nil	Nil

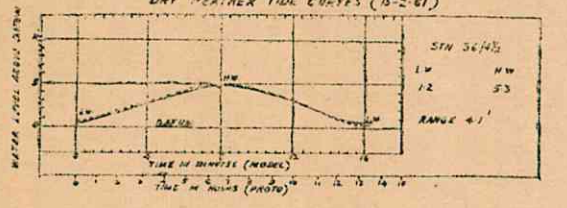
4.0 *Concluding Remarks :*

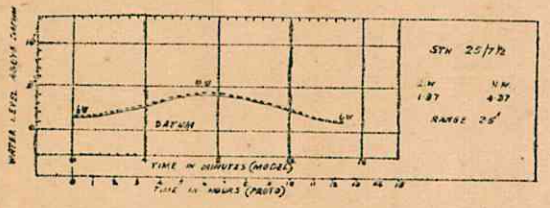
1. A dredging programme of 393 m. cft. or about 20 m. tons improves the discharging capacity of the Upputeru by 132 percent at lake elevation +7 M.S.L. However, this is still not adequate to achieve the goal set down by the Flood Committee viz., that the lake level should not exceed +7 for longer than 7 days. Further experiments with greater improvements in the Upputeru are therefore necessary.

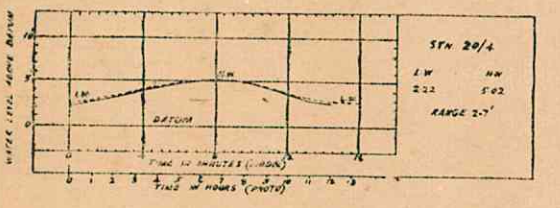
2. Since the quantity of dredging required is very large, a carefully phased programme has to be developed by further model studies, in order to obtain the maximum impact from a given quantity of dredging.

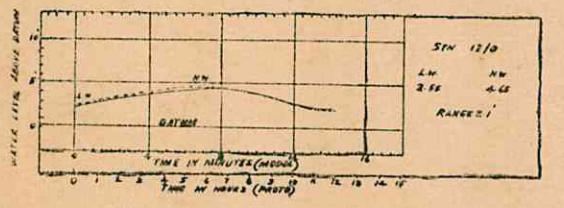
3. The location of the cut and its optimum width need to be further investigated.

DRY WEATHER TIDE CURVES (15-2-61)



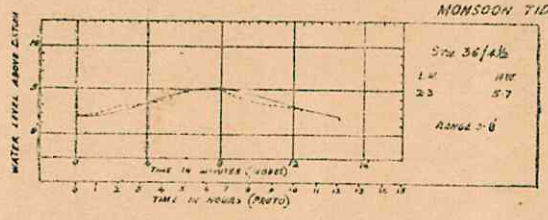


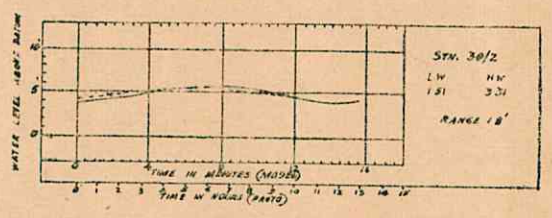


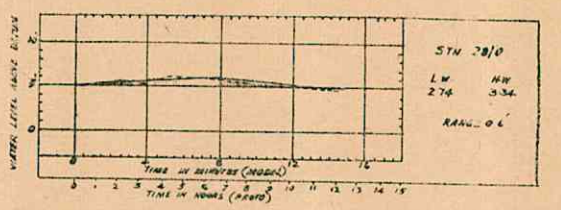


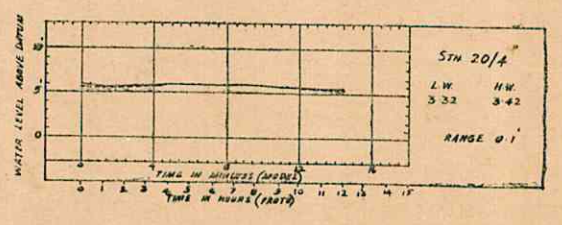
MONSOON TIDE CURVES (5-10-60)

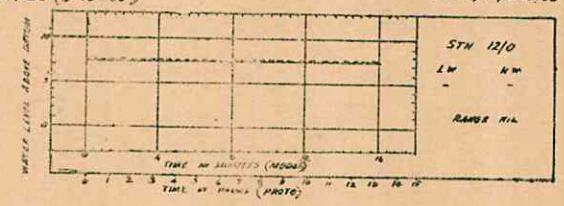
C.W.P.R.S. (POONA) HO/314/60

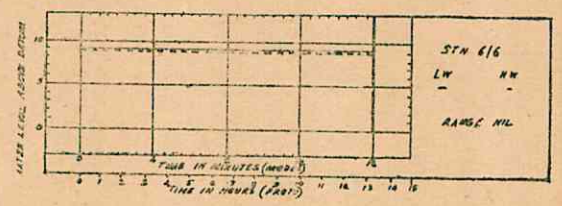


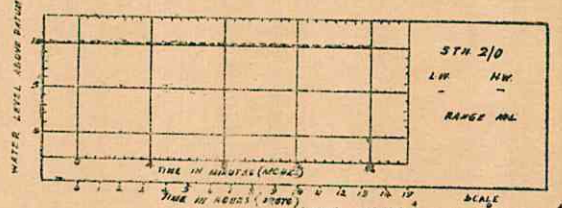












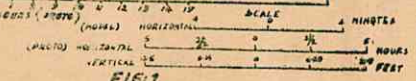


FIG 1

1/500 : 1/100 UPPUTERU RIVER MODEL STUDIES

PLAN SHOWING TIDAL CURVES OBTAINED IN THE MODEL IN COMPARISION TO PROTOTYPE DATA

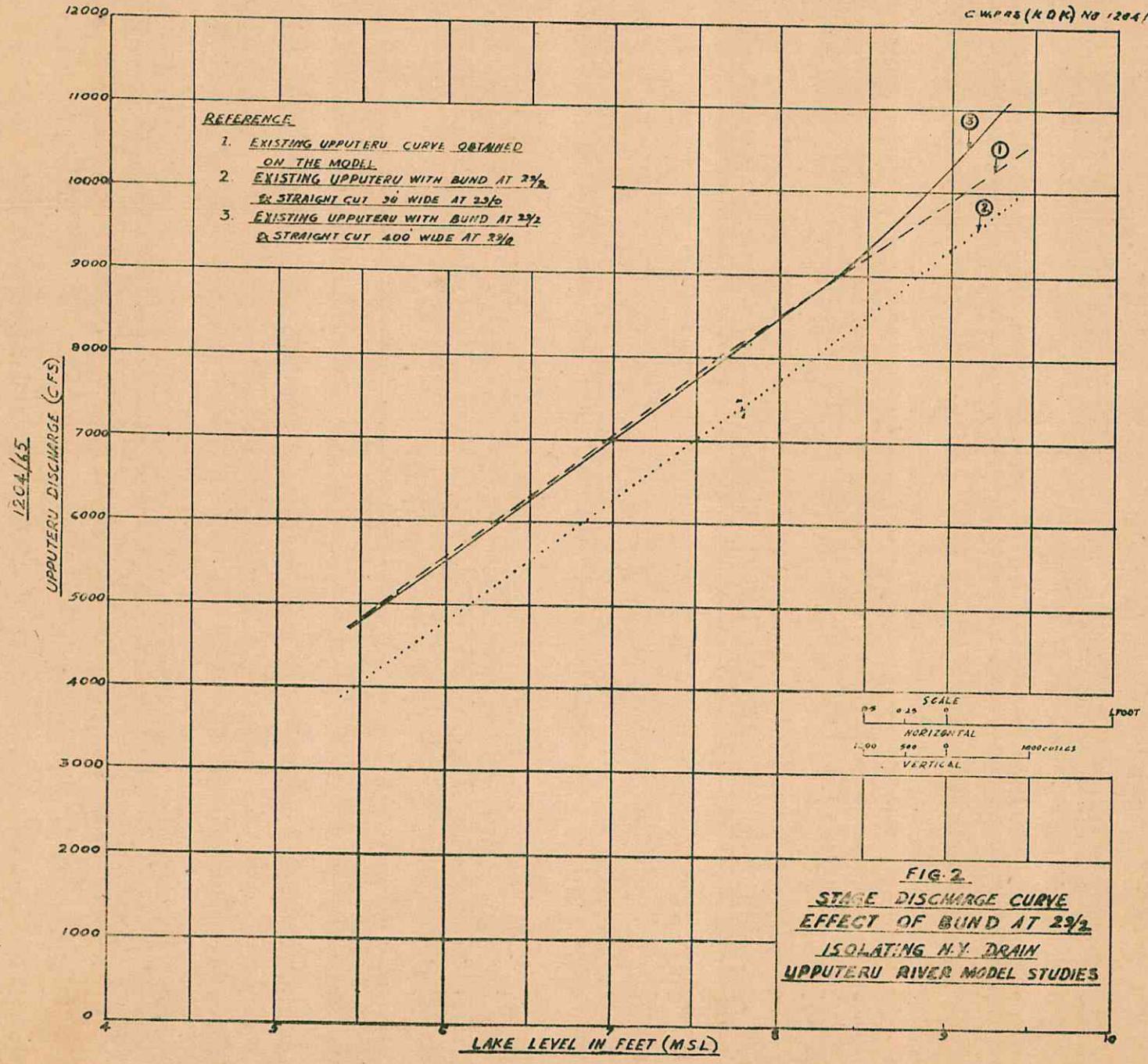
REFERENCE

------- MODEL CURVE

——— PROTO CURVE

NOTE :- DATUM REFERS TO L.W. OST WHICH IS 2·5 FT BELOW M.S.L.

CWPRS (KDK) No 1264/65



1264/65

FIG. 2

STAGE DISCHARGE CURVE EFFECT OF BUND AT 23/2 ISOLATING N.Y. DRAIN

UPPUTERU RIVER MODEL STUDIES

CWARS (K) NO: 1205/6

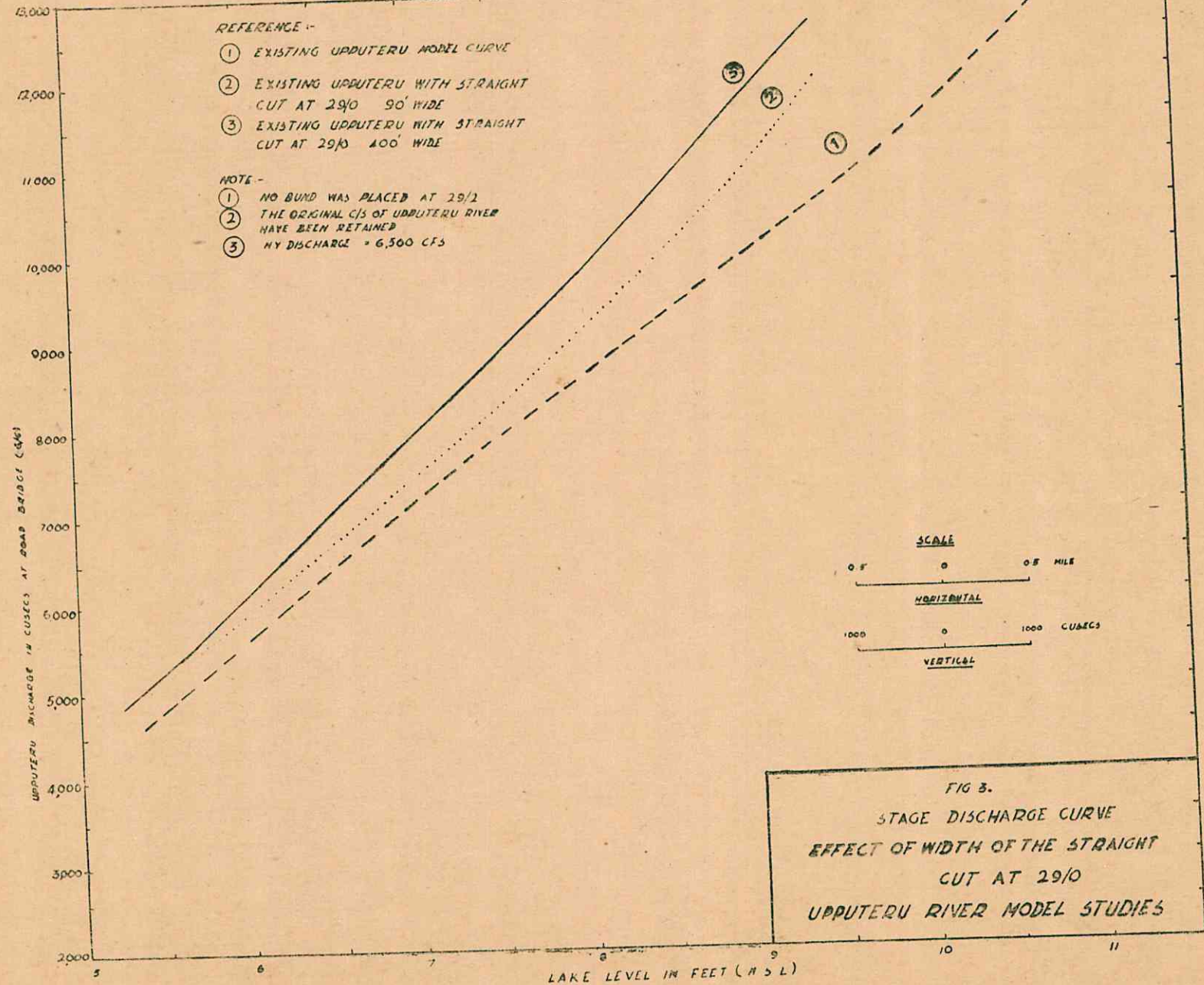


FIG 3.
STAGE DISCHARGE CURVE
EFFECT OF WIDTH OF THE STRAIGHT CUT AT 29/0
UPPUTERU RIVER MODEL STUDIES

1205/65

65

CWPRS (KDK) 1206/65

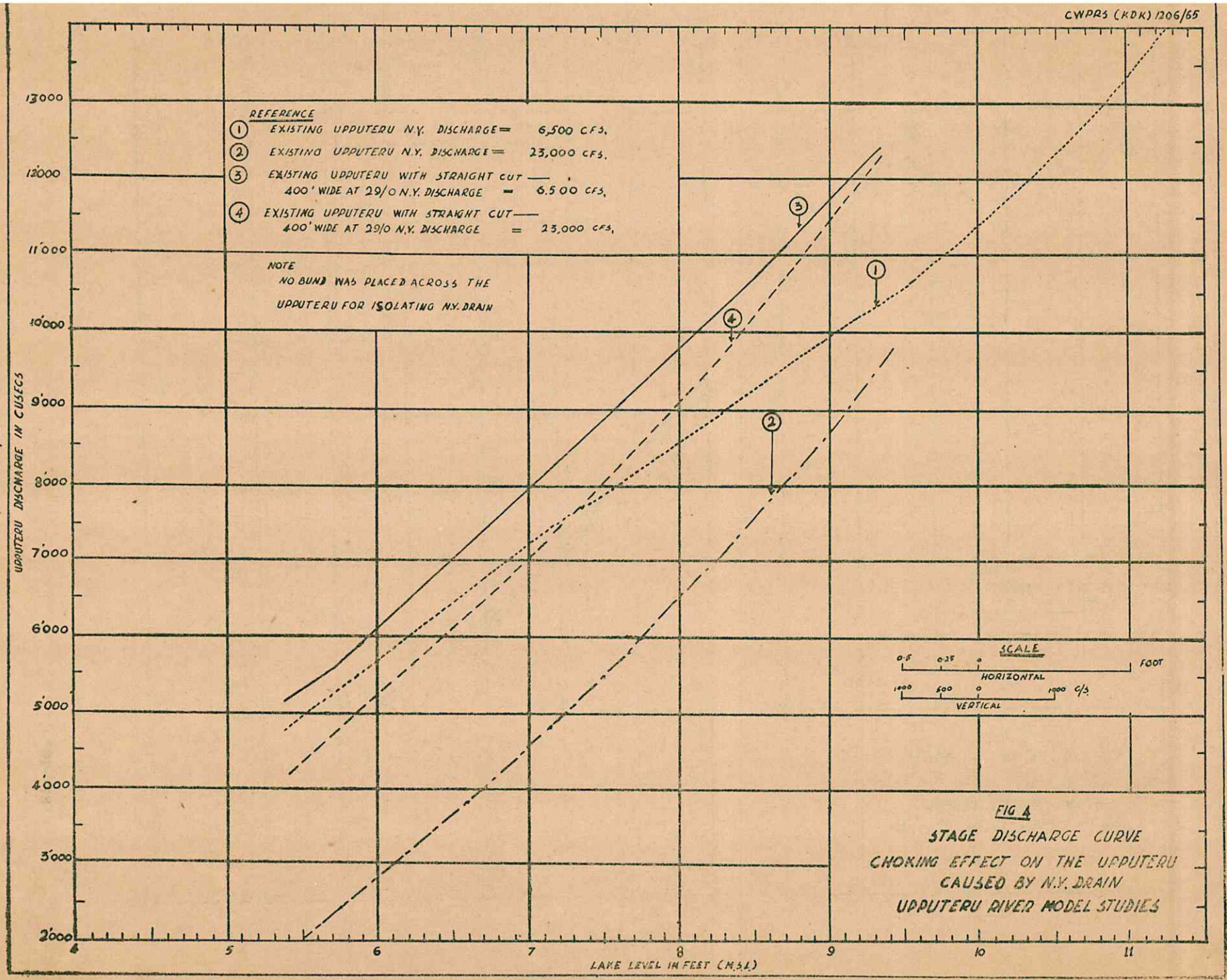


FIG 4

STAGE DISCHARGE CURVE

CHOKING EFFECT ON THE UPPUTERU CAUSED BY N.Y. DRAIN

UPPUTERU RIVER MODEL STUDIES

1206/65

67

CWPRS (KDK) MR 1807/63

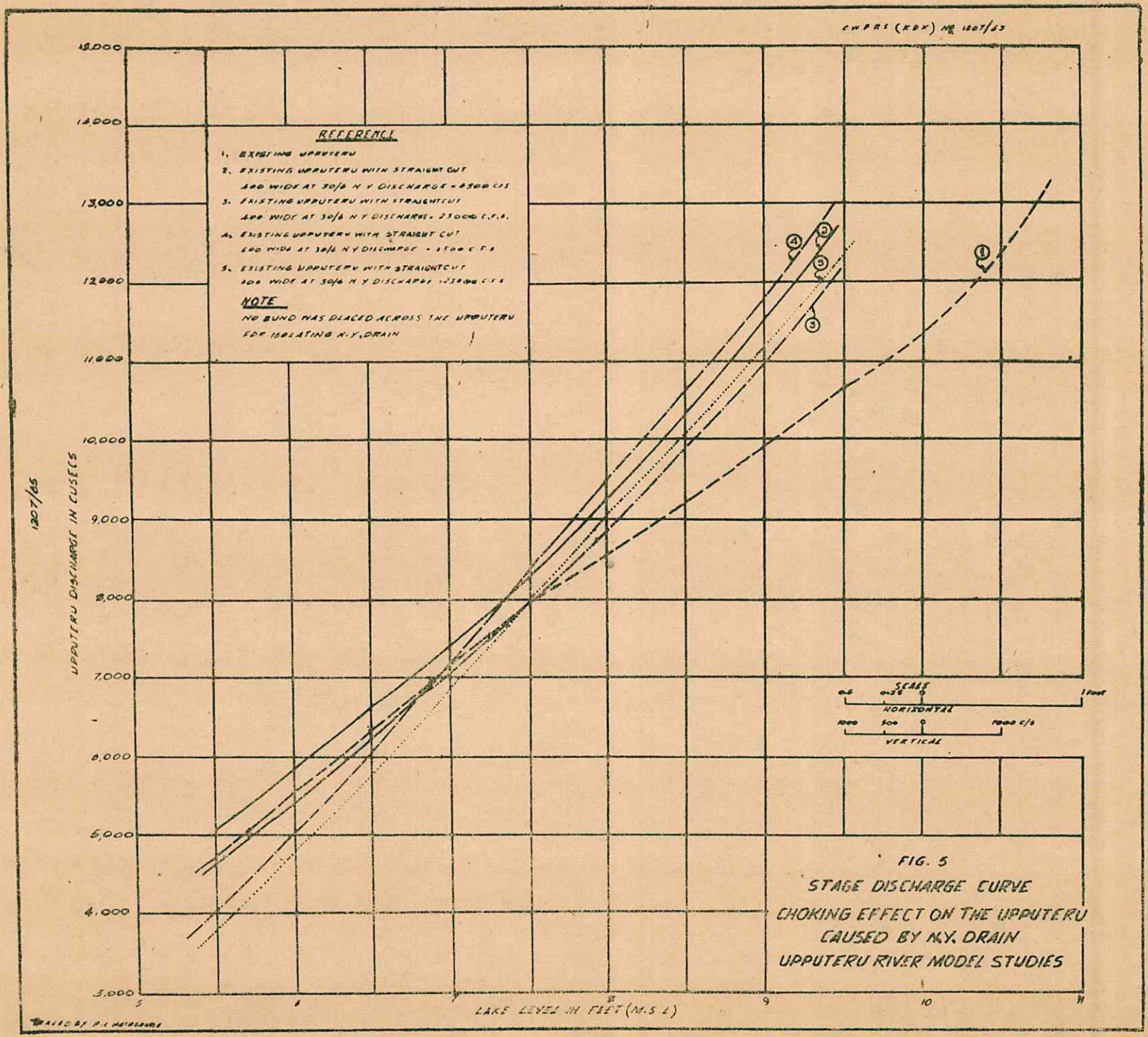


FIG. 5
STAGE DISCHARGE CURVE
CHOKING EFFECT ON THE UPPUTERU
CAUSED BY N.Y. DRAIN
UPPUTERU RIVER MODEL STUDIES

1207/65

PLOTTED BY P.S. HATALKAR

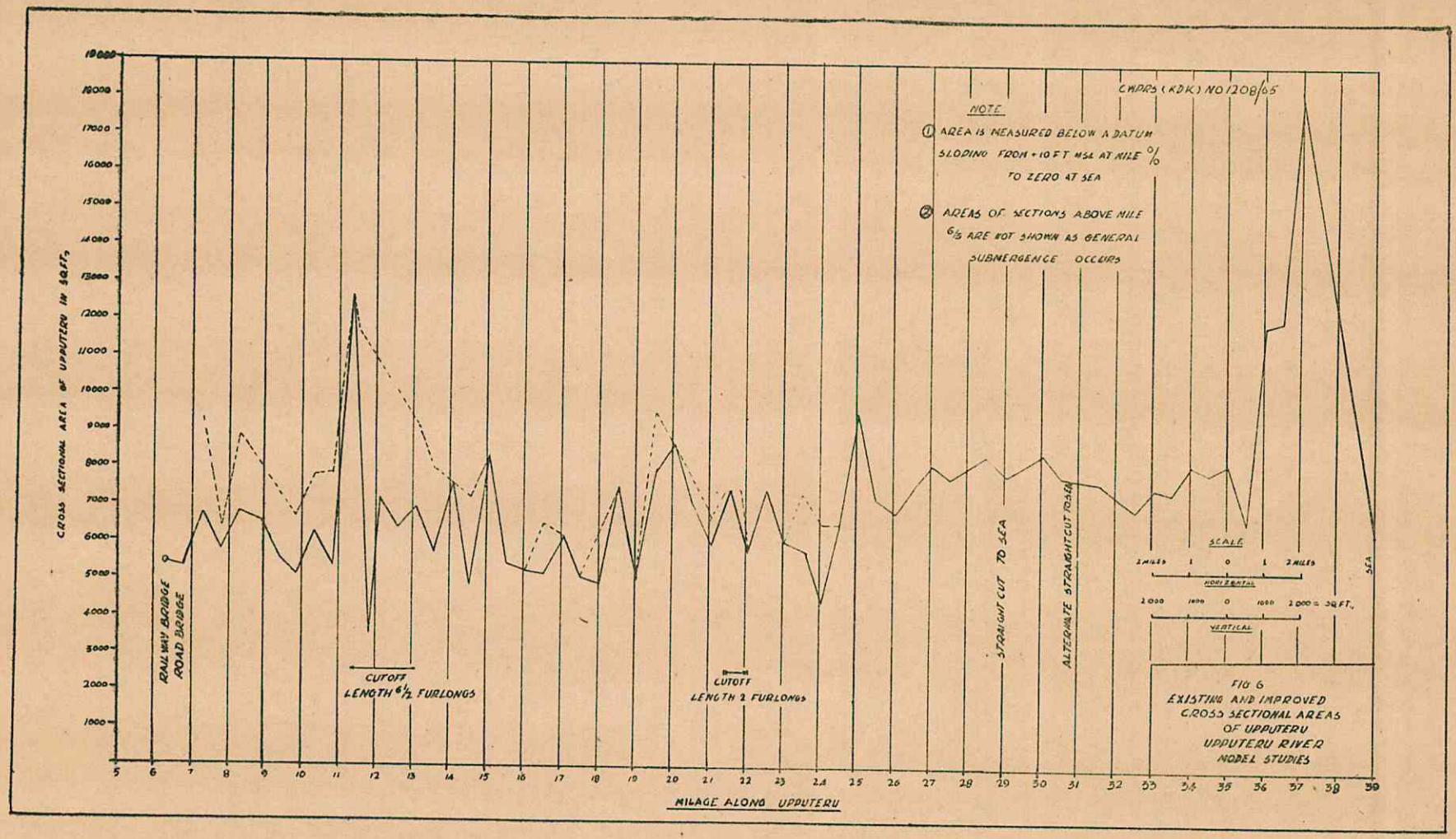
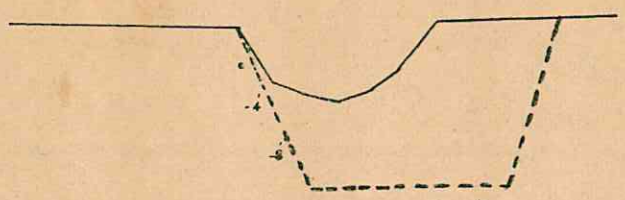
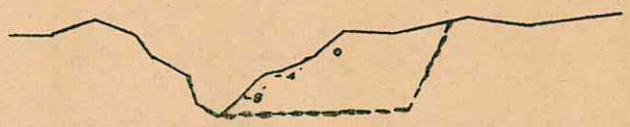


FIG 6
EXISTING AND IMPROVED CROSS SECTIONAL AREAS OF UPPUTERU
UPPUTERU RIVER
MODEL STUDIES

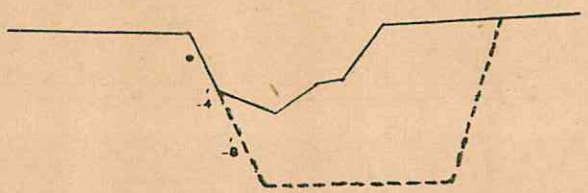
CWPRS (R D K) NO 1200/65



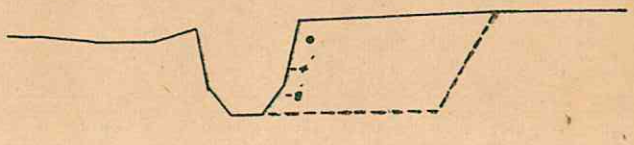
CROSS - SECTION AT 2/0



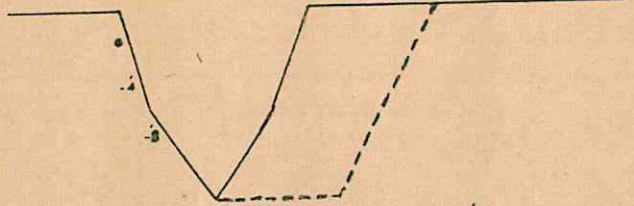
CROSS - SECTION AT 4/6



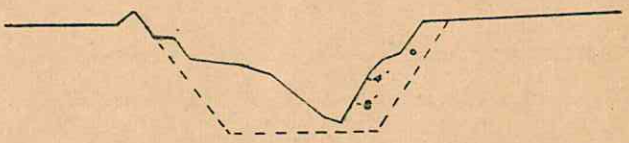
CROSS - SECTION AT 3/0



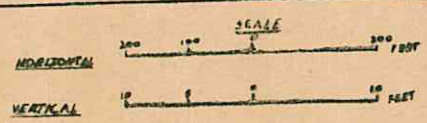
CROSS - SECTION AT 5/2

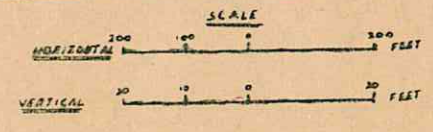


CROSS - SECTION AT 4/0



CROSS - SECTION AT 5/6





REFERENCE :-

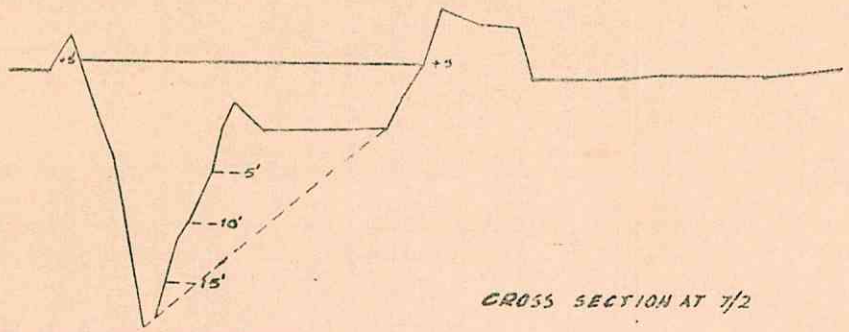
——— EXISTING CROSS-SECTION

- - - - - IMPROVED CROSS-SECTION

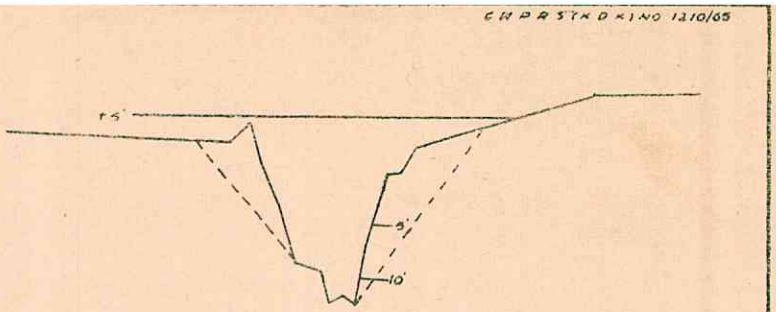
FIG-7

CROSS SECTIONS OF UPPUTERU RIVER FROM MILE 2/0 TO 5/6

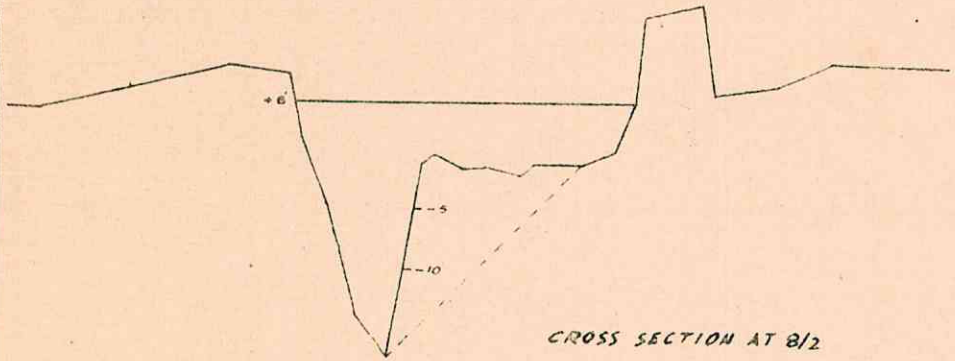
UPPUTERU RIVER MODEL STUDIES



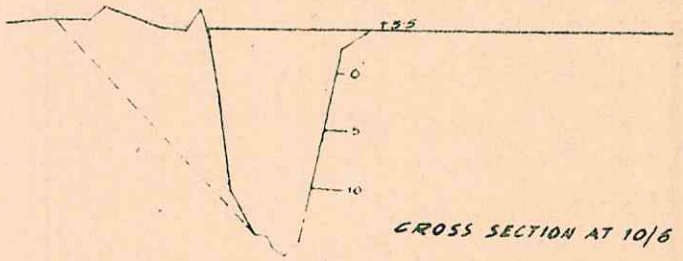
CROSS SECTION AT 7/2



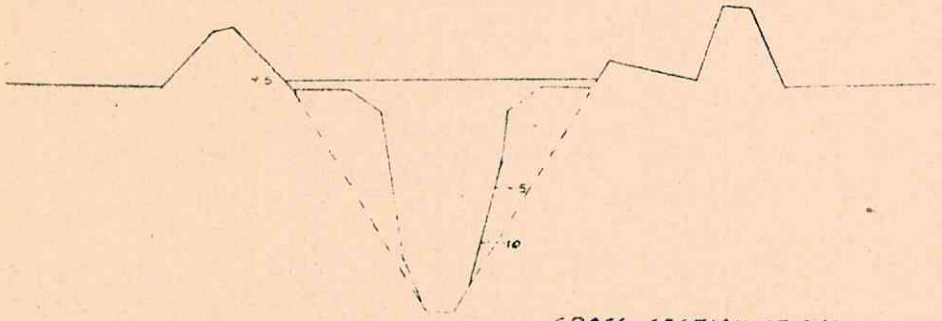
CROSS SECTION AT 10/2



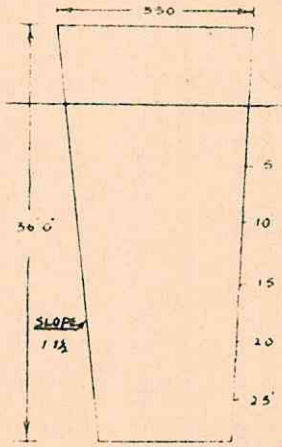
CROSS SECTION AT 8/2



CROSS SECTION AT 10/6



CROSS SECTION AT 9/2



CROSS SECTION AT THE CENTRE OF CUT-OFF FROM M.11/2 TO 13/0

REFERENCE :-

——— EXISTING CROSS SECTION.

– – – IMPROVED CROSS SECTION.

SCALE

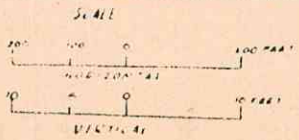
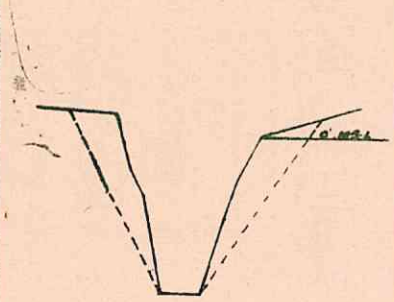
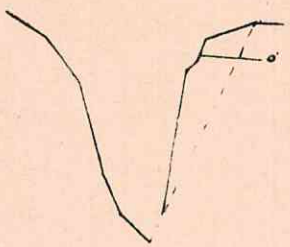


FIG. 8

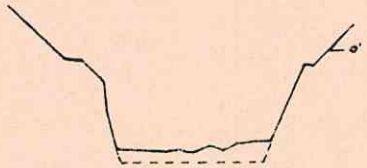
CROSS SECTIONS OF UPPUTERU RIVER FROM MILE 7/2 TO 10/6.



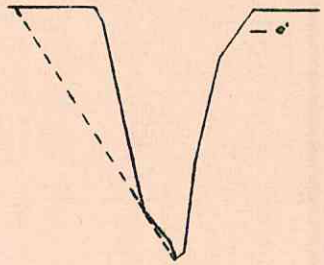
CROSS SECTION AT MILE 13/4



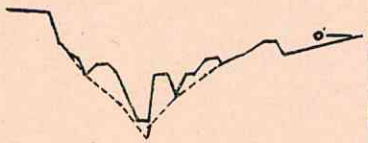
CROSS SECTION AT MILE 10/4



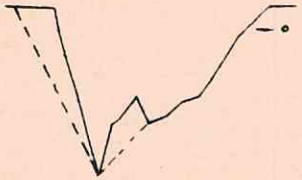
CROSS SECTION AT MILE 20/4



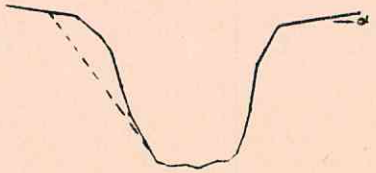
CROSS SECTION AT MILE 24/0



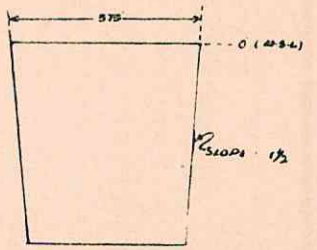
CROSS SECTION AT MILE 14/0



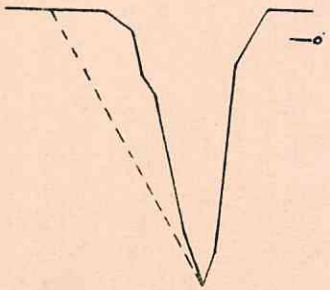
CROSS SECTION AT MILE 18/0



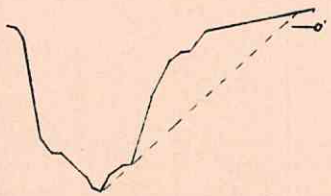
CROSS SECTION AT MILE 21/0



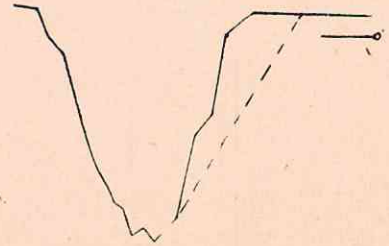
CROSS SECTION OF CUT-OFF FROM 21/2 TO 21/6



CROSS SECTION AT MILE 14/4



CROSS SECTION AT MILE 19/4



CROSS SECTION AT MILE 23/4

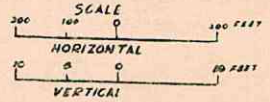
REFERENCE

—— EXISTING CROSS SECTION

- - - IMPROVED CROSS SECTION

FIG 9

EXISTING AND IMPROVED CROSS SECTIONS OF UPPUTERU RIVER FROM MILE 13/4 TO 24/0 UPPUTERU RIVER MODEL STUDIES



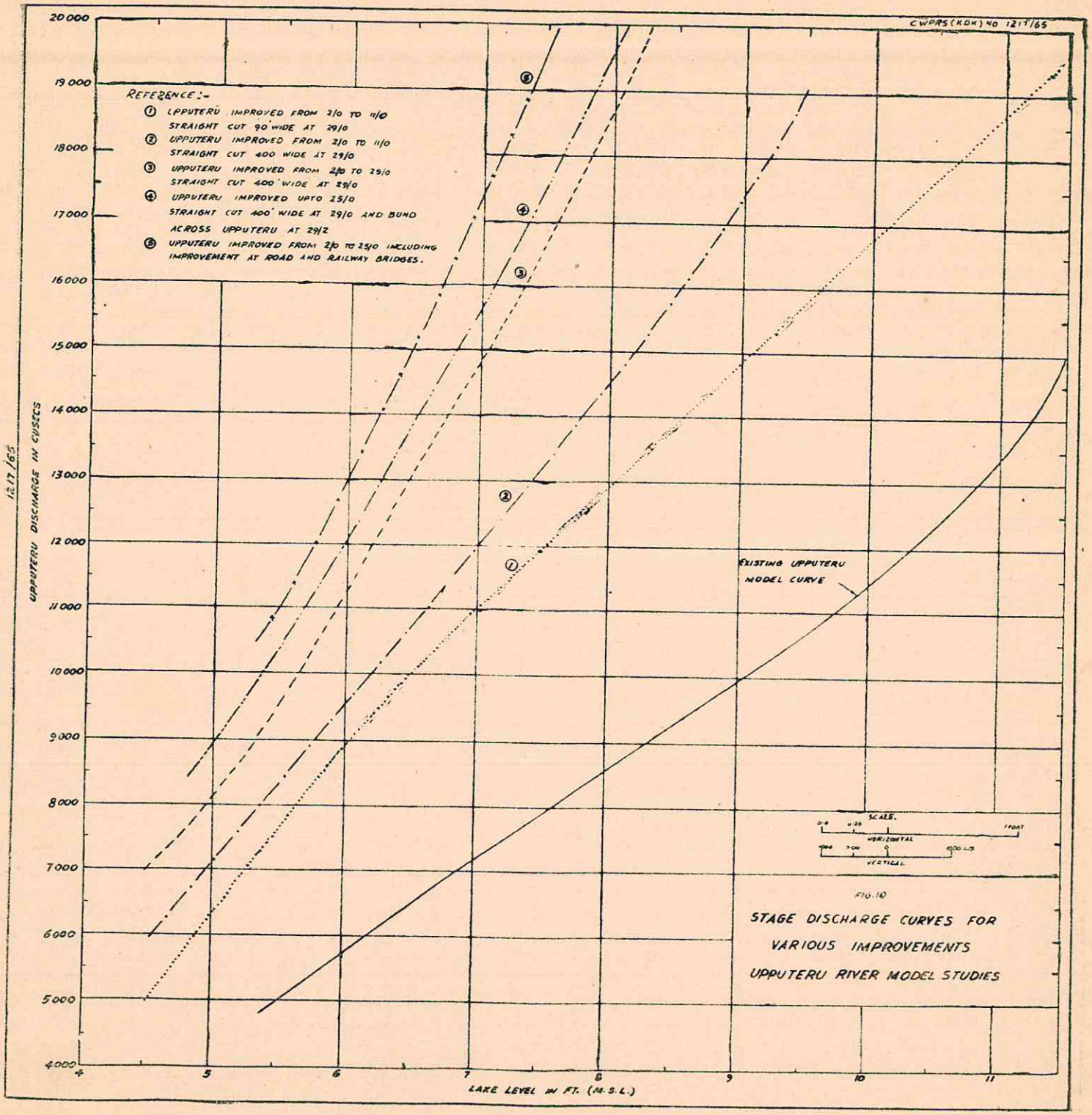


FIG. 10

STAGE DISCHARGE CURVES FOR VARIOUS IMPROVEMENTS UPPUTERU RIVER MODEL STUDIES

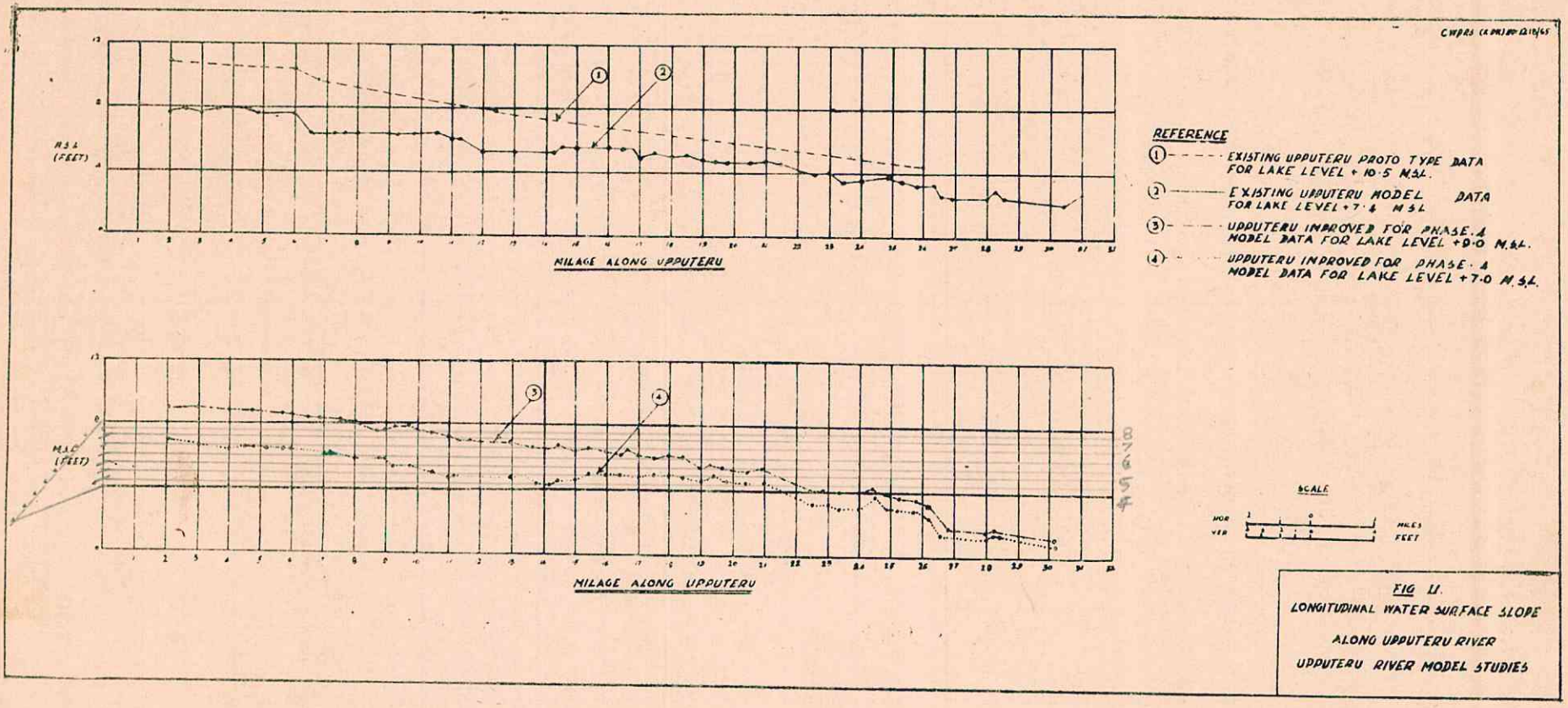
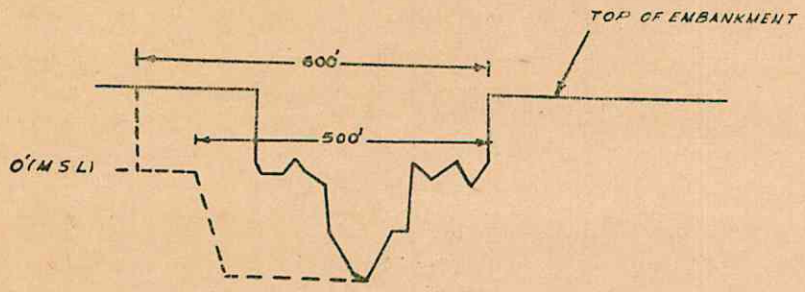


FIG 11.

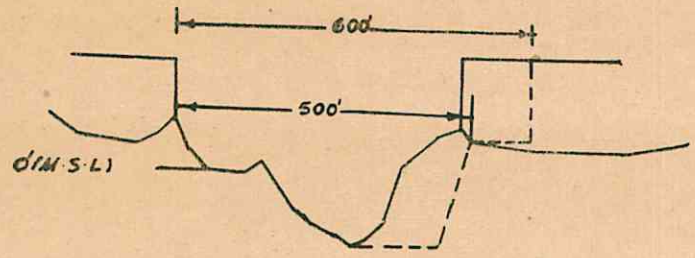
LONGITUDINAL WATER SURFACE SLOPE

ALONG UPPUTERU RIVER

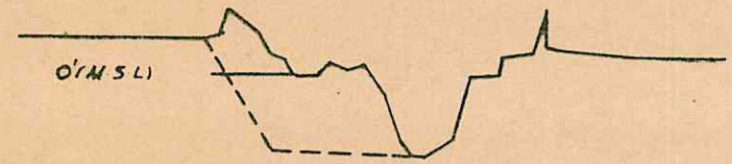
UPPUTERU RIVER MODEL STUDIES



CROSS-SECTION AT RAILWAY BRIDGE (6/3)



CROSS-SECTION AT ROAD BRIDGE (6/6)



CROSS-SECTION AT (6/2)

REFERENCE:-

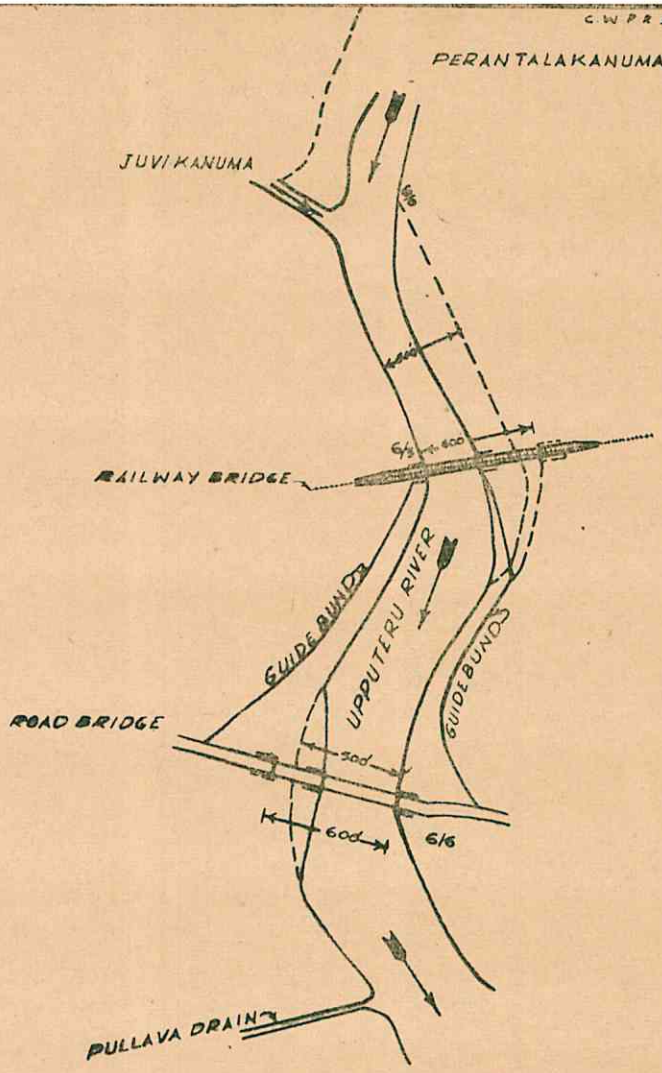
——— EXISTING CROSS SECTION

– – – – – IMPROVED CROSS-SECTION.

SCALE

200 100 0 200 FT HORIZONTAL

20 10 0 20 FT VERTICAL



INDEX PLAN

SCALE

0.5 0 0.5 1 FURLONG

FIG 12

IMPROVEMENTS NEAR ROAD & RAILWAY BRIDGES
UPPUTERU RIVER MODEL STUDIES

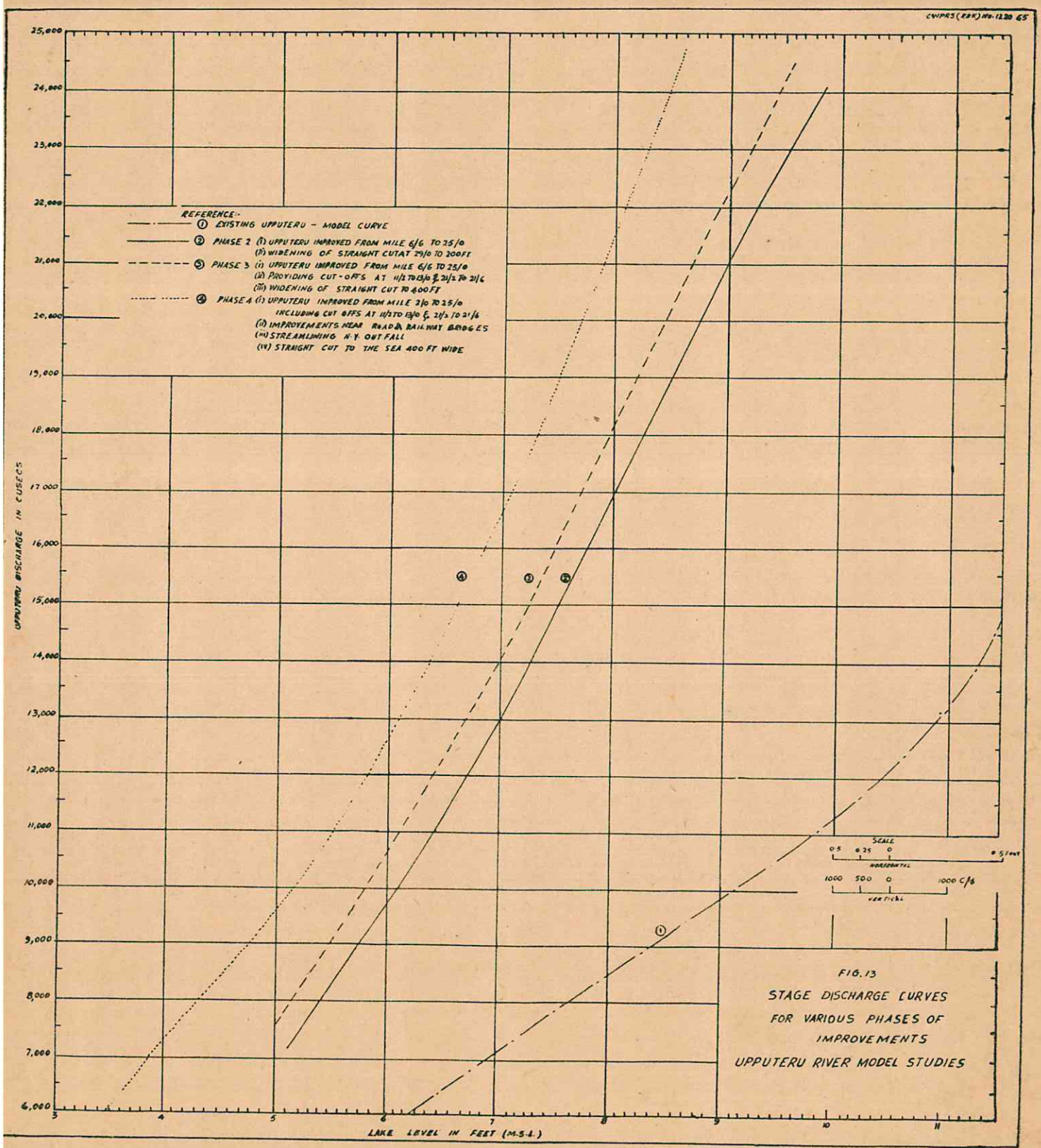
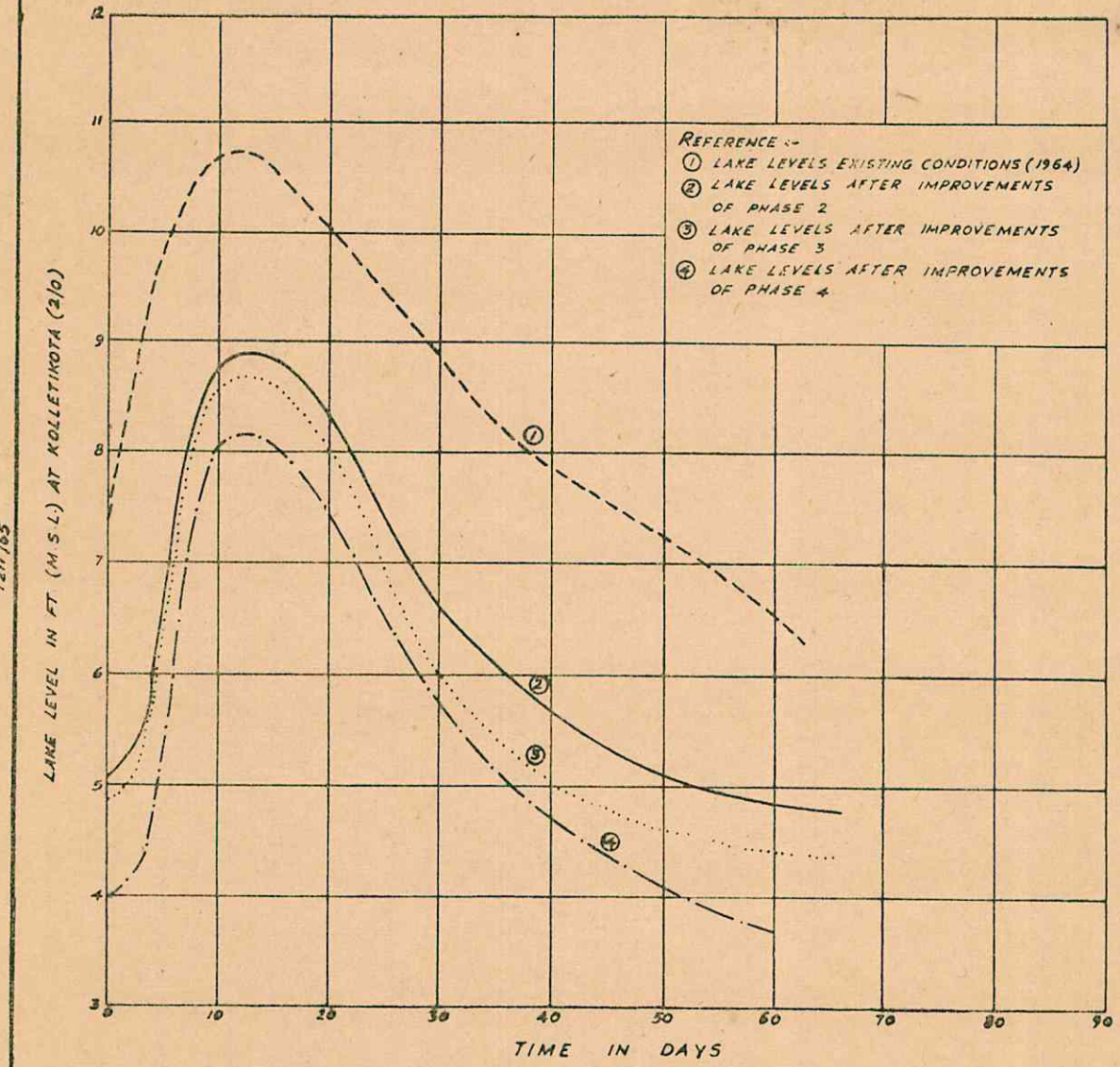


FIG. 13

STAGE DISCHARGE CURVES FOR VARIOUS PHASES OF IMPROVEMENTS UPPUTERU RIVER MODEL STUDIES



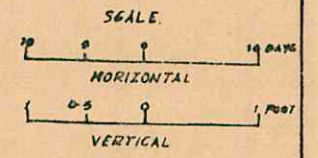


FIG. 14

KOLLERU LAKE LEVELS AFTER FLOOD ROUTING

UPPUTERU RIVER MODEL STUDIES

1211/65

APPENDIX—J.

Estimate for widening and straightening of Upputeru river upto Mile 28/0 and excavating a straight cut from there to Sea.

Item.	*Description.*	*Amount in lakhs Rs. for* 15,000 *cs.*	20,000 *cs.*	*Remarks.*
(1)	(2)	(3)	(4)	(5)
A.	*Preliminaries :*			
	Surveying and levelling operations, etc.	0.50	0.50	..
B.	*Land Acquisition :*			
	(i) Wet land	69.63	69.63	
	(ii) Marshy or waste land	7.53	7.53	..
C.	Works:	..	..	..
D.	Regulators :	30.00	30 00	
E.	Falls and Weirs :	..	..	..
F.	*Cross-drainage works :*			
	Construction of outfall sluices at various drains falling direct into Upputeru. ..	3.00	3.00	..
G.	*Bridges :*			
	(i) Improvements to Railway bridge at M. 6/3 ..	2.00	2.00	..
	(ii) Improvements to road bridge at M. 6/6 ..	2.00	2.00	
	(iii) Construction of a 'L' class bridge in reach between mile 29/0 to 32/0	2.00	2.00	..
	(iv) Providing ramps to cattle and cart crossings wherever necessary	0.50	0.50	..
K.	*Buildings :*			
	Construction of temporary and permanent buildings for executive staff and store sheds, etc.	10.00	10.00	
L.	Earthwork excavation and forming service roads on banks.	629.00	866.00	
M.	Planting avenue on either side	0.50	0.50	..
O.	Miscellaneous	3.50	3.50	..

(1)	(2)	(3)	(4)	(5)
P.	*Maintenance :*			
	Maintaining service roads, buildings, Jeeps, launches, etc.	4.84	4.84	
Q.	Special tools and plant :	20.00	24.00	
	For works ..	785.00	1,026.00	
II.	Direct and indirect charges : (this includes establishment charges, leave and pensionary charges, ordinary tools and plant, audit charges and abatement of land revenue).	67.43	83.30	
	Cost including direct and indirect charges	852.43	1,109.30	
	Say Rs.	8.5	11.10 Crores.	

APPENDIX—J1.

STATEMENT SHOWING THE MAXIMUM LAKE LEVELS REACHED, MAXIMUM DISCHARGE CAPACITY OF UPPUTERU,

AND DURATION OF SUBMERGENCE OF KOLLERU LAKE FOR 1959 AND 1964 FLOODS AND IMPROVEMENT THAT IS EXPECTED AS A RESULT OF INCREASING THE DISCHARGING CAPACITY OF UPPUTERU.

Year.	*Present condition.*					*After improving the capacity of Upputeru to*							
						15,000 *cusecs at lake level* +7.00 ft.				20,000 *cusecs at lake level* +7.00 ft.			
	Maximum lake level reached in ft.	*Discharge in cs. at road bridge at Max. lake level.*	*Discharge at lake level* +7.00 *ft. in cusecs at road-bridge.*	*Duration of submergence in days at or above.*		*Max. lake level in ft.*	*Dis. in cus. at Max. lake level at road bridge.*	*Duration of submergence in days at or above.*		*Max. lake level. in ft.*	*Disch. in cus. at Max. lake level at road bridge.*	*Duration of submergence in days at or above.*	*Remarks.*
				+7.00 ft.	+8.00 *ft.*			+7.00 *ft.*	+8.00 *ft.*			+7.00 *ft.*	+8.00 *ft.*	
1959	+10.0	11,250 (at Road Bridge)	6,650	115	100	+7.75	18,400	15	..	+7.48	23,000	9	..	
1964	+10.7	12,700 (at Road Bridge)	6,650	55	38	+9.00	25,300	22	13	+8.40	29,300	15	7	
1964	..	Do.	..	*		+8.51	22,400	17 (Pumping 60 days)	9	..	..	..		*For pumping 10,000 cs. into improved Upputeru for out fall capacity of 15,000 cs.
1964	..	Do.	..	†		+7.66	18,400	13 (Pumping 56 days)	..	..	..	..		†For pumping 15,000 cusecs into improved Upputeru for out-fall capacity of 15,000 cu secs

APPENDIX—K.

STATEMENT SHOWING THE EXISTING AND PROPOSED STORAGE CAPACITY OF BRAHMAYYALINGAM TANK AND SAGGURU AMANI TANK

S. No.	Name of the tank	F.T.L.		M.W.L.		Capacity		Remarks
		Existing	Proposed	Existing	Proposed	Existing at F.T.L.	Proposed at M.W.L.	
1.	Brahmayyalingam Tank ..	+156.00	+160.00	+159.00	+163.00	189.30 M.cft.	621.00 M.cft.	Additional storage capacity available for flood absorption over and above the irrigation requirement
2.	Sagguru Amani Tank ..	+159.85	+160.00	+161.60	+163.00	162.03 M.cft.	270.00 M.cft.	891—351 =540 M.cft.
					Total ..	351.33 M.cft.	891.00 M.cft.	

APPEN

STATEMENT SHOWING THE SALIENT FEATURES AND

Sl. No.	Particulars	NAMES OF		
		Budameru		
		1	2	3
1	2	3	4	5
1.	Location	.. Nandigama	Chandragudem	Tolukodu
2.	Catchment Area at the reservoir site.	204 sq. miles.	69.89 sq. miles.	76 sq. miles.
3.	(*a*) Maximum Flood Discharge (observed.)	39600 (1964) cusecs	Not available	Not available
	(*b*) Maximum design discharge	34650 cusecs.	16820 cusecs.	17950 cusecs.
4.	Type of Dam (Masonry or Earth)	Earth Dam with masonry surplus weir.	Earth dam with masonry spillway.	Earth dam with masonry spillway.
5.	Length of dam	.. 19,063 ft.	13,200 ft.	10,230 ft.
6.	Height of the dam from the deepest bed level.	35 ft.	60 ft.	43 ft.
7.	Top level of the dam	+165.00	+235.00	+240.00
8.	Dead storage level	+138.00	+185.00	+195.00
9.	Full reservoir level (F. R. L.) ..	+152.00	+220.00	+225.00
10.	Maximum water level	+155.00	+223.00	+228.00
11.	Storage capacity at Dead storage level ..	54 mcft	6 mcft.	1.4 mcft.
12.	Flood storage capacity at F.R.L. ..	1430 mcft.	1080 mcft.	1123 mcft.
13.	Flood storage capacity at M.W.L. ..	1907 mcft.	1337 mcft.	1423 mcft.
14.	Area and No. of villages submerged upto—			
	(*i*) Dead storage level	414 acres	..	..
	(*ii*) M.W.L.	3922 acres In the limits of (1) Ganapavaram. (2) Kandrika villages.	1787 acres In the limits of (1) Chandra Gudem. (2) Jangalapalli villages.	1070 acres In the limits of (1) Tolukodu. (2) Nagaleru. (3) Tadi Gudem. (4) Obulapalem villages.
	(*iii*) F.R.L.	3378 acres in the limits of (1) Ganapavaram. (2) Kandrika villages.	Do.	Do.
15.	Cost of compensation for land		Rs. 19.361 lakhs.	..
16.	Estimated cost of the project	.. Rs. 216 lakhs.	Rs. 66.00 lakhs.	Rs. 45.62 lakhs.
17.	Benefits expected ..	.. Flood moderation.	Flood moderation.	Flood moderation.

DIX—L.

COSTS OF PROPOSED RESERVOIRS.

THE RIVERS			
Ramileru	*Thammileru*	*Gunderu*	*Yerrakalva*
6	7	8	9
Mirzapuram	Errampalli	Badarala	Anumuni Lanka
99.54 sq. miles.	.. 223 sq. miles	.. 102 sq miles	.. 743 sq. miles.
16120 cusecs	.. 17400 (1964) ..	.. Not available	.. Not available.
18000 cusecs	.. 46800 cusecs	.. 26200 cusecs	.. 61530 cusecs.
Earth Dam with surplus weir	Earth Dam with masonry spillway.	Earth Dam and spillway	.. Earth Dam with masonry spillway
18480 ft.	.. 20,460 ft. ..	.. 2900 ft.	.. 8290 ft.
43 ft.	.. 76 ft. ..	.. 65 ft.	.. 60 ft.
+141.00	.. +361.00 ..	.. +227.00	.. +214.00
+106.00	.. +322.00 ..	.. +186.00	.. +150.00
+133.00 ..	.. +355.00 ..	.. +221.00	.. +178.00
+138.00 ..	.. +355.00	.. +221.00	.. +200.00
0.1 mcft. ..	.. 300 mcft. ..	.. 20 mcft.	..
475 mcft. ..	.. 3000 mcft. ..	.. 971 mcft. .. (From +206.0 to +221.0)	.. 4680 mcft.
610 mcft. ..	.. 3000 mcft. ..	.. 971 mcft. ..	.. 13470 mcft.
..	..	..	..
..	2820 acres In the limits of (1) Chintalapudi (2) Talarlapadu .. (3) Mankollu .. (4) Kotapadu (5) Pothanapalli (6) Polavaram .. villages.	2142.37 acres In the limits of .. (1) Badarala .. (2) Kallacheruvu .. (3) Polasi Gudem .. (4) Asannagudem .. (5) Jadikala Pudi .. (6) Tallagokavaram villages.	12350 acres In the limits of .. (1) Pothureddipalam .. (2) Sushadrapalem. .. (3) Rajahvaram .. (4) Pangidigudem .. (5) Kanakadripuram. .. (6) Yeduvadalapalam. (7) Errapeta. (8) Lakhavaram. (9) Ammapalem. (10) Nimmalagudem. (11) Raghavapuram. (12) Jagannadhapuram villages.
1400 acres in the limits of: (1) Vagu-Poramboku (2) Billanapalli village	Do.	Do.	.. 7700 Acres in the limits of villages mentioned in item No 14 (*ii*). .. .. ..
Rs. 65.23 lakhs Flood moderation.	Rs. 200.00 lakhs Flood moderation.	Rs. 108.13 lakhs Flood moderation +206.00 to +221.00 and Irrigation between +186.00 to +206.00 for 5650 Acres.	Rs. 260.00 lakhs Flood moderation

APPENDIX—M (i)

ABSTRACT ESTIMATE FOR PUMPING 10,000 CUSECS OF KOLLERU LAKE WATER INTO UPPUTERU RIVER.

I. Capital Cost :

Sl. No.		Amount in Rs.
1.	Excavation of foundations including dewatering and shoring arrangements etc. ..	3,50,000
2.	Construction of Pump house, suction wells, intake towers, conduits, stilling basin ..	1,02,00,000
3.	Pumps, gear boxes, Motors etc., including electrical installations, erection charges import duties	2,32,50,000
4.	Regulator-cum-navigation lock across Upputeru to discharge 20,000 cusecs ..	28,00,000
5.	High tension supply line 66 KVA (single pole) at Rs. 32,200 per mile for 15 miles ..	4,83,000
6.	Add extra for unforeseen items of work	1,67,000
		3,72,50,000
	Say Rs.	3.73 Crores.

II. *Working cost of pumping* 10,000 *C/s.*

It is assumed that 13 pumps of 1,000 c/s. capacity (including 3 stand bys) will be required to pump 10,000 C/s. The pumps will have to work for a total period of 60 days during a year like that of 1964.

Discharge to be pumped = 10,000 C/s.

Head = 5 ft.

H.P. required at 70% efficiency $= \frac{100}{70} \times 10{,}000 \times 62.5 \times \frac{5}{550}$

$= 8117.$

Equivalent KVA with power factor 0.8 $= \frac{8117}{1.34 \times 0.8} = 7580$ KVA

Total consumption of Electrical Energy per month $= \frac{8117 \times 24 \times 30}{1.34.}$

= 43,65,000 K.W.H.

Adopting the Power Tariffs of Andhra Pradesh State Electricity Board (Published in A.P. State Gazette dated 1-3-66)—the demand charges and energy charges are worked below :

(a) *Maximum Demand charges :*

	KVA	*Rate in Rs. per KVA.*	*Amount in Rs.*
First	500	12.80	6,400
Next	1,500	11.20	16,800
Next	3,000	9.60	28,800
Next	2,580	8.00	20,640
Total maximum demand charges			72,640

(*b*) *Energy charges :*

	KWH	*Rate in N.P. per* KWH.	*Amount in* Rs.
First	50,000	9.60	4,800
Next	1,50,000	8.00	12,000
ext	3,00,000	6.80	20,400
Next	5,00,000	5.60	28,000
Next	10,00,000	5.20	52,000
Balance in Excess of 20,00,000	23,65,000	4.80	1,13,520
		Total Energy charges	2,30,720

Total amount towards maximum demand and Energy charges per month — Rs. 72,640 + 2,30,720 = Rs. 3,03,360

As per the flood routing studies carried out for the Kolleru lake, the pumps have to work only for 60 days i.e., for 2 months in a year. They will be idle during the remaining 10 months. It is therefore adequate to have seasonal supply of Electrical energy for 2 months during monsoon period.

Total yearly charges for Electricity (for the two months of working). .. Rs. 2 × 3,03,360 = 6,06,720.

The Andhra Pradesh Electricity Board stipulates that, in case of seasonal demands, the total amount payable by the Department is either the Energy and demand charges as worked out above, or 12 times the maximum demand charges whichever is higher.

In this case, 12 times the maximum demand charges comes to Rs. 12 × 72640 = Rs. 8,71,680. Hence this amount is payable.

Working Cost per year.	*Amount in Rs.*
(*a*) Maximum demand and Energy charges	8,71,680
(*b*) Meter charges for year at Rs. 50 per month	600
(*c*) Establishment charges at Rs. 15,000 per month	1,80,000
(*d*) Maintenance charges for machinery etc., at $2\frac{1}{2}\%$ on cost. $\frac{1,95,00,000 \times 2.5}{100}$ =	4,87,500
(*e*) Depreciation on the cost of machinery at 7% $\frac{1,95,00,000 \times 7}{100}$ =	13,65,000
(*f*) Interest charges at 6% on capital cost. $\frac{3,35,00,000 \times 6}{100}$ =	20,10,000
Total working cost Rs.	49,14,780
or say Rs. 49 lakhs	

APPENDIX—M (*ii*)

ABSTRACT ESTIMATE FOR PUMPING 15,000 CUSECS OF KOLLERU LAKE WATER INTO UPPUTERU RIVER.

I. *Capital Cost*

Sl. No.		*Amount in Rs.*
1.	Excavation of foundations including dewatering and shoring arrangements etc., $3,50,000 \times \frac{15,000}{10,000}$	5,25,000
2.	Construction of pump house, suction wells, intake towers, conduits, stilling basin ..	1,35,00,000
3.	Pumps, gear boxes, Motors etc., including electrical installations, erection charges, import duties	3,47,25,000
4.	Regulator-cum-navigation lock across Upputeru to discharge 20,000 c/s.	28,00,000
5.	High tension supply line 66 KVA (single pole) at Rs. 32,200 per mile for 15 miles ..	4,83,000
6.	Add extra for unforeseen items of work	5,92,000
	Total	5,26,25,000
	or Say Rs. 5.26 Crores.	

II. *Working cost of pumping* 15,000 *C/s.*

It is assumed that 18 pumps of 1,000 c/s capacity (including 3 stand bys) will be required to pump 15,000 c/s. The pumps will have to work for a total period of 56 days during a normal year like that of 1964.

Diseharge to be pumped $= 15,000$ c/s.

Head $= 5$ ft.

H.P. required at 70% efficiency. $= \frac{100}{70} \times \frac{15,000 \times 62.5 \times 5}{550}$

$= 12,175.$

Equivalent KVA with power factor $0.8 = \frac{12175}{1.34 \times 0.8} = 11360$ KVA

Total consumption of Electrical energy per month $= \frac{12,175 \times 30 \times 24}{1.34} = 65,43,000$ KWH

From the Power Tariffs of Andhra Pradesh State Electricity Board, the demand charges and Energy charges, will be as follows

(*a*) *Maximum Demand charges :*

	K.V.A.	*Rate in Rs. per K.V.A.*	*Amount in Rs.*
First	500	12.80	6,400
Next	1,500	11.20	16,800
Next	3,000	9.60	28,800
Balance in excess of 5,000.	6,360	8.00	50,880
	Total maximum demand charges Rs. ..		1,02 880

(*b*) *Energy charges* :(—)

	K.W.H.	*Rate in* N.P. *per K.W.H*	*Amount in Rs.*
First	50,000	9.60	4,800
Next	1,50,000	8.00	12,000
Next	3,00,000	6.80	20,400
Next	5,00,000	5.60	28,000
Next	10,00,000	5.20	52,000
Balance in excess of 20,00,000.	45,43,000	4.80	2,18,064
	Total Energy charges	..	3,35,264

Total amount payable to the Electricity Department towards demand and Energy charges per month= 1,02,880 + 3,35,264 = Rs. 4,38,144.
As per the flood routing studies carried out for the Kolleru lake, the pumps have to work for 56 days in a year. They will be idle for the remaining days. It is therefore, adequate to have seasonal supply of Energy for 56 days during the monsoon season.

Total yearly charges for Electricity (for 56 days) $= 4,38,144 \times \frac{56}{30} =$ Rs. 8,17,900

The Andhra Pradesh Electricity Board stipulates that, in case of seasonal demands, the total amount payable by the department is either the energy and Demand charges as worked above or 12 times the maximum Demand charges whichever is higher.

In this case, 12 times the maximum demand charges comes to Rs. 12 × 1,02,880 = Rs. 12,34,560. Hence this amount is payable.

Working Cost per year	*Amount in Rs.*
(*a*) Maximum demand and Energy charges	12,34,560
(*b*) Meter charges per year at Rs. 50 month	600
(*c*) Establishment charges at Rs. 20,000 p.m.	2,40,000
(*d*) Maintenance charges for machinery at $2\frac{1}{2}$% on cost=2,91,00,000 ×2.5/100	7,02,750
(*e*) Depreciation on the cost of machinery at 7%=2,91,00,000 ×7/100	20,37,000
(*f*) Interest charges at 6% on capital cost 4,70,00,000 ×6/100	28,20,000
Total Working cost Rs. ..	70,34,910
or say Rs. 70 Lakhs. ..	

APPENDIX—M (*iii*)

ABSTRACT ESTIMATE FOR PUMPING 6,000 CUSECS OF KOLLERU LAKE WATER INTO UPPUTERU.

I. *Capital Cost* :

	Amount in Rs.
(*i*) Excavation for foundations including dewatering and shoring arrangements etc. ..	2,10,000
(*ii*) Construction of pump house, suction wells, intake towers, conduits, stilling basin ..	62,77,000
(*iii*) Pumps, gear boxes, Motors etc., including electrical installations, erection charges, import duties etc., ...	1,40,00,000
(*iv*) Regulator-cum-navigation lock across Upputeru to discharge 20,000 c/s.	28,00,000
(*v*) High tension supply line 66 K.V.A. (single pole) at Rs. 32,200 per mile for 15 miles. ..	4,83,000
(*vi*) Add extra for unforeseen items of work	1,50,000
Total Rs.	2,39,20,000

or Rs. 2.40 Crores.

II. *Working Cost of Pumping* 6,000 *C/s.*

It is assumed that 9 pumps of 1,000 c/s. capacity (including 3 stand bys) will be required to pump 6,000 c/s. The pumps will have to work for a total period of 77 days during a normal year like that of 1944.

Discharge to be pumped = 6,000 c/s.

Head = 5 ft.

H.P. required at 70% efficiency $= 100/70 \times \frac{6000 \times 62.5 \times 5}{550} = 4,870.$

Equivalent—K.V.A. with power factor 0.8 $= \frac{4870}{1.34 \times 0.8} = 4542$ K.V.A.

Total consumption of Electrical Energy per month $= \frac{4542 \times 24 \times 30}{1.34}$

$= 24,41,000$ K.W.H.

Adopting the Power Tariffs of the Andhra Pradesh State Electricity Board (Published in A.P. State Gazette dated 1-3-66), the Demand charges and Energy charges are worked below :

(*a*) *Max. Demand charges :*

	K.V.A.	*Rate in Rs. per K.V.A.*	*Amount in Rs.*
First	500	12.80	6,400
Next	1,500	11.20	16,800
Next	2,542	9.60	24,403
Total max. Demand charges ..			47,603

(*b*) *Energy charges*

	K.W.H.	*Rate in np. per K.W.H.*	*Amount in Rs.*
First	50,000	9.60	4,800
Next	1,50,000	8.00	12,000
Next	3,00,000	6.80	20,400
Next	5,00,000	5.60	28,000
Next	10,00,000	5.20	52,000
Balance in excess of 20,00,000.	4,41,000	4.80	21,168
		Total Energy charges ..	1,38,368

Total amount towards max. demand and Energy charges per month = 47,603 + 1,38,368 = Rs. 1,85,971
As per the flood routing studies carried out for the Kolleru lake, the pumps have to work for a period of 77 days in a year. They will be idle during the remaining period. It is therefore adequate to have seasonal supply of electrical energy for 77 days during the monsoon season.

Total yearly charges for Electricity for the period of 77 days = Rs. 1,85,971 × 77/30 = Rs. 4,77,400.

The Andhra Pradesh State Electricity Board stipulates that, in the case of seasonal demands, the total amount payable by the consumer is either the energy charges and demand charges as worked out above, or 12 times the maximum demand charges whichever is higher.

In this case, 12 times the max. demand charges comes to Rs. 12 × 47,603 = Rs, 5,71,236. Hence this amount is payable.

Working cost per year.	*Amount in Rs.*
(*a*) Max. demand & Energy charges	5,71,236
(*b*) Meter charges pea year at Rs. 50 per month	600
(*c*) Establishment charges at Rs. 9,000 P.M.	1,08,000
(*d*) Maintenance charges for machinery etc., at $2\frac{1}{2}\%$ on cost .. .. .. $= \frac{2.5}{100} \times 1,17,50,000$	2,93,750
(*e*) Depreciation charges at 7% = 7/100 × 1,17,50,000	8,22,500
(*f*) Interest charges at 6% on capital cost = $\frac{6}{100} \times 2,17,00,000$	13,02,000
Total Working Cost	Rs. 30,98,086
or Rs. 31 Lakhs.	

APPENDIX M (*iv*)

ABSTRACT ESTIMATE FOR PUMPING 8,000 CUSECS OF KOLLERU LAKE WATER INTO UPPUTERU RIVER:

I. *Capital Cost.*

		Amount in Rs
1.	Excavation for Foundations including dewatering and shoring arrangements etc., $3,50,000 \times \frac{8,000}{10,000}$ ..	2,80,000
2.	Construction of pump house, suction wells, intake towers, c nduits, stilling basin ..	82,33,000
3.	Pumps, gear boxes, Motors etc., including electrical installations, erection charges, import duties	1,86,00,000
4.	Regulator-cum-navigation lock across Upputeru to discharge 20,000 c/s, ..	28,00,000
5.	High tension supply line 66 KVA (single pole,) at Rs. 32,200 per mile for 15 miles ..	4,83,000
6.	Add extra for unforeseen items of work	1,60,000
	Total Rs. ..	3,05,56,000
	or Say Rs. 3.06 Crores.	

II. *Working cost of pumping* 8000 *c/s.*

It is assumed that 11 pumps of 1,000 c/s. capacity (including 3 stand by) will be required to pump 8,000 c/s. The pumps will have to work for a total period of 74 days during a normal year like that of 1944.

Discharge to be pumped = 8,000 c/s.

Head = 5 ft.

H.P. required at 70% efficiency $= \frac{100}{70} \times \frac{8,000 \times 62.5 \times 5}{550} = 6497.$

Equivalent K.V. A. with power factor $0.8 = \frac{6494}{1.34 \times 0.8}$ = 6057 K.V.A.

The total consumption of Electrical Energy per month $= \frac{6494 \times 24 \times 30}{1.34}$ = 34,89,000 K.W.H.

Adopting the Power Tariffs of the Andhra Pradesh State Electricity Board (Published in A.P. State Gazette dated 1-3-66), the demand charges and Energy charges are worked below:

(*a*) *Maximum Demand charges*

	K.V.A.	*Rate in Rs. per K.V.A.*	*Amount in Rs.*
First	500	12.80	6,400
Next	1,500	11.20	16,800
Next	3,000	9.60	28,800
Next	1,494	8.00	11,952
	Total Max. demand charges Rs.		63,952

(*b*) *Energy Charges* :

	K.W.H.	*Rate in N.P. per K.W.H.*	*Amount in Rs.*
First	50,000	9.60	4,800
Next	1,50,000	8.00	12,000
Next	3,00,000	6.80	20,400
Next	5,00,000	5.60	28,000
Next	10,00,000	5.20	52,000
Balance in Excess of 20,00,000	14,89,000	4.80	71,472
		Total Energy charges Rs.	1,88,672

Total amount towards maximum demand and Energy charges per month = Rs. 63,952+1,88,672=Rs. 2,52,624. As per the flood routing studies carried out for the Kolleru lake, the pumps have to work only for a period of 74 days in a year. They will be idle during remaining period. It is therefore adequate to have seasonal supply of Electrical Energy for 74 days (—) during monsoon period.

Total yearly charges for Electricity (for the period of 74 days). Rs. 2,52,624 × 74/30=Rs. 6,23,000.

The Andhra Pradesh State Electricity Board stipulates that, in case of seasonal demands, the total amount payable by the consumer is, either the Energy and demand charges as worked out above or 12 times the maximum demand charges whichever is higher.

In this case, 12 times the maximum demand charges comes to 12 × 63,952 = Rs. 7,67,424. Hence this amount is payable.

Working cost per year.	*Amount in Rs.*
(*a*) Maximum demand and Energy charges	7,67,424
(*b*) Meter charges per year at Rs. 50 p.m.	600
(*c*) Establishment charges at Rs. 12,000 per month	1,44,000
(*d*) Maintenance charges for machinery etc., at 2½% on cost. .. .. .. $\frac{2.5}{100} \times 1,56,00,000$	3,90,000
(*e*) Depreciation on the cost of machinery at 7% =7/100 × 1,56,00,000	10,92,000
(*f*) Interest charges at 6% on capital cost 6/100 × 2,76,00,000	16,56,000
Total working cost Rs. or say Rs. 41 Lakhs.	40,50,024

APPENDIX—N.

STATEMENT SHOWING M.F.L. READINGS AT MASONRY WORKS OF TUNGABHADRA DRAIN.

Sl. No.	Place.	Milage. M/F.	Span.	M.F.L. observed.		Flood level—1964.		Flood level. 1963	M.F.L. computed from hydraulic particulars.
				Year.	R.L.	Date.	R.L.	R.L.	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1.	Guntur Nalla under-tunnel.	0/0	Old 2 vents 8′-0″ Span. New 3 vents.	10/1964	38.33 33.90	1-10-1964	38.33 33.90	34.00	28.50
2.	Yedlapalli bridge	3/4	6 spans of 15. ft.	9/1962	33.80	1-10-1964	30.64	30.24	25.00
3.	Valiveru bridge	5/0	2 spans of 31 ft.	9/1962	33.10	1-10-1964	29.58	29.58	23.50
4.	Tsunduru bridge	9/1	4 spans of 30 ft.	1939	26.15	2-10-1964	24.45	24.45	19.57
5.	Modukuru bridge	11/1	5 spans of 24 ft.	1939	25.75	2-10-1964	22.04	21.94	17.90
6.	Aramanda bridge	12/4	9 spans of 10 ft.	1939	24.98	2-10-1964	21.50	21.60	16.80
7.	Ponnur bridge	16/5	2 spans of 20 ft.	1939	20.11	3-10-1964	18.93	18.75	14.14
8.	Railway bridge	20/4	7 spans of 40 ft.	..	..	3-10-1964	15.41	15.91	11.06
9.	Buddam road bridge	25/2	4 spans of 54 ft.	9/1963	12.30	10-10-1964	11.50	12.20	8.67

APPENDIX– O.

STATEMENT SHOWING THE MAXIMUM LAKE LEVELS REACHED, AND DURATION OF SUBMERGENCE OF KOLLERU LAKE FOR 1944 FLOOD AND THE IMPROVEMENT THAT IS EXPECTED AS A RESULT OF PUMPING KOLLERU LAKE WATERS INTO UPPUTERU RIVER AFTER INCREASING ITS DISCHARGING CAPACITY TO 15,000 CUSECS AT ROAD BRIDGE (M. 6/6).

			Present condition					*After improving the capacity of Upputeru to 15,000 cusecs and pumping.*										
			Duration of submergence in days a or above the lake level.					6,000 *cusecs.*				8,000 *cusecs.*				10,000 *cusecs.*			
Year	*Max. lake level reached in ft.*	*Dis. in c/s at Max. lake level at road bridge.*	+4.00	+5.00	+6.00	+7.00	+8.00	*Max. lake level in ft.*	*Duration of submergence in days at or above the lake level.*			*Max. lake level in ft.*	*Duration of submergence in days at or above the lake level.*			*Max. lake level in ft.*	*Duration of submergence in days at or above the lake*		
									+4.00	+5.00	+6.00		+4.00	+5.00	+6.00		+4.00	+5.00	+6.00
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
1944	+8.40	8,600	141	103	52	39	21	+6.92	97	36	23	+6.20	42	29	12	+6.10	36	28	5
									Period of pumping 77 days.				Period of pumping 74 days.				Period of pumping 73 days.		

Note : Pumping is started when lake level attains a level of 3.4 ft. upto which level the water was steady for a number of days. The pumping is stopped when the carrying capacity of the Upputeru by gravity equals the capacity of the pumps.

ERRATA.

Sl. No.	Page No. in the printed Volume II.	Location	For	Read as
1.	30	Against 21st date in August month.	2.226	2,262
2.	36	Appendix D (*ii*) against year 1955, under column 9.	0.02	1.02
3.	37	Appendix D (*iii*) against year 1949 under column 9.	3.26	1.26
4.	37	Against year 1950 under column 9.	1.02	3.02
5.	49	Appendix F (*iii*), against year 1964, and under the column 'Value of food grains lost'.	44,64,000	44,46,000
6.	50	Appendix F (*iv*)	..	The following figures may be read respectively under columns Sl. No., year and area damaged by floods in acres, 10, 1964, 68,000.
7. (*a*)	91	Appendix J-1		
		Line No. 2 under "year" ..	964	1,964.
(*b*)	do	LineNo. 3 under "Year" ..	964	1,964.
8.	97	Under (*b*) Energy charges, Line 3 from top.	ext.	Next.
9.	98	Under item II "Working cost of Pumping 15,000 c/s."—Line (2).	during a normal year	During a year.
10.	101	Under "Working cost per year" —Line 2 i.e., (*b*).	pea	per
11.	102	Under "Capital cost", line 2.	C nduits	Conduits.
12.	105	Appendix 'O' under column "Present condition".	Duration of submergence in days a or above the lake level.	Duration of submergence in days at or above the lake level.

by APSEB vide B.P.M.S.no. 66 dt. 22.
(effective from 22.2.76

These tariffs are applicable for supply of electricity to H.T. Consume
loads with a contracted demand not less than 70 KVA or having
load exceeding 75 H.P.

H.T. Category I :- This tariff is meant for H.T. Consumers
Consumption for lights & fans is not more than 10% of the total consum
Excluding the consumption in colony or town which will be b
separately.

Demand charges per KVA of Billing Demand

First 1000 KVA - - - Rs 21.00 per KVA month
Above 1000 KVA Rs 19.00 per K.V.A month.

Plus

Energy charges:

First 100,000 Units/month - - - Rs 0.21 paise per Unit
Next 100,000 " - - Rs 0.19 "
Next 18,00,000 " - - Rs: 0.18 "
Above 20,00,000 " - - Rs: 0.15 "

Important :- The energy charges will be billed on the basis of
actual consumption or 50 Units per KVA of Billing demand
is higher.

Note :- The consumer may use the electricity to run under
tariff for lights & fans upto 10% of the total consumption in Factory P

2. The H.T. Consumers availing supply for Sugar factories, Ice M
decorating, ginning & tobacco Redrying factories and such other Sea
industries as may be specified by the board from time to time, shall
billed demand & energy charges & electricity actually used during the
off season period (which will be notified by them by the board)
Provided however that the total electricity energy paid and billed
12 months shall not be less than 12 times the highest of bi
during the year multiplied by demand charges, & there
pay the difference.

3. The H.T. Consumers availing supply of electricity
for Irrigation & Agricultural purposes, shall be billed
and energy charges as per the foregoing tariffs; bu
a rebate rate of 23.5 paise per Unit on the actual co
or 50 Units per KVA of billing demand whichever
higher, but in no case the Consumer pay less than
minimum demand charges.

(3)	(4)	(5)	(6)	(7)	(8)
of 2 M in case of h[illegible]d load only in loamy and clayey soils like black cotton soil red earth and ordinary gravel.					
420 um. Earth work excavation and deposition on banks with an initial lead of 10 M and initial lift of 2 M in case of head load only in mixture of gravel and disintegrated rock likes shales, ordinary gravel, stoney earth and earth mixed with fair sized boulders.	301, 308 and special conditions.			10 Cum. Ten Cubic Metres.	
700 Cum. Earth work excavation and deposition on banks with an initial lead of 10 M and initial lift of 2 M in case of head load only in soft disintegrated rock (removable by pick axes and crew bars).	301, 308 and special conditions.			10 Cum. Ten Cubic Metres.	
00 m. Earth work excavation and deposition on banks with an initial lead of 10 M and initial lift of 2 M in case of head load only in hard disintegrated rock or soft rock or conglomorate rock and hard like kankar requiring partial blasting.	301, 308 and special conditions.			10 Cum. Ten Cubic Metres.	
65 m. Earth work excavation and deposition on banks with an initial lead of 10 M and initial lift of 2 M in case of head load only in fissured and fractured rock and boulders upto 3 cum. in size requiring blasting excluding stacking.	301, 308 and special conditions.			1 Cum. One Cubic Metres.	
0 m. Extra for every additional lift of one metre or part there of over the intial lift for the first 3 extra lifts for hard disintegrated rocks.	301			10 Cum. Ten Cubic Metres.	

C T O R.

SUPERINTENDING ENGINEER,
IRRIGATION CIRCLE, ELURU.