



CHAPTER 7

RESULTS OF EXPERIMENT

TABLE 2 CHARACTERISTICS OF RAW WASTEWATER FOR
A PERIOD OF 24 HOURS.

18/12/17 - 19/12/17

Time *	12.00	15.00 P.M.	18.00	21.00	24.00	3.00 A.M.	6.00	9.00
BOD	135	106	112	157	190	170	126	147
COD	564	412	432	504	576	508	344	540
pH	7.15	7.25	7.22	6.95	7.00	6.95	7.15	6.90
Turbidity	120	125	125	122	120	120	122	122
Alkalinity	390	378	270	322	304	314	298	280
Acidity	30	27	20	35	24	34	26	36
Total solids	820	784	670	866	912	722	630	842
Suspended solids	356	476	309	425	397	348	260	344
Dissolved solids	464	308	361	441	515	374	370	498

* Time of taking samples.

TABLE 3 RAW CHARACTERISTICS OF WASTEWATER

Time of taking samples 8.00 - 10.00 A.M.

Date	BOD	COD	pH	Turbidity	Alkalinity	Acidity	Totals Solids	Suspended Solids	Dissolved Solids
13/11/17	154	430	7.2	122	350	32	857	412	445
15/11/17	185	492	7.00	120	311	29	884	332	552
18/11/17	163	411	7.10	120	320	34	742	364	378
21/11/17	113	358	7.00	125	275	21	966	404	562
23/11/17	170	440	7.15	120	317	31	900	252	648
26/11/17	125	380	6.72	120	380	62	820	380	440
29/11/17	134	385	7.05	120	226	46	782	406	376
2/12/17	128	360	6.70	122	290	26	854	310	544
4/12/17	138	358	7.20	120	292	25	1028	576	452
6/12/17	173	445	7.24	120	214	18	898	448	450
9/12/17	213	524	7.40	130	307	20	940	540	400
12/12/17	175	407	7.23	130	312	30	950	432	518
14/12/17	173	475	7.40	130	330	23	1042	572	470

TABLE 3 (CONTINUE)

Time of taking samples 8.00 - 10.00 A.M.

Date	BOD	COD	pH	Turbidity	Alkalinity	Acidity	Totals Solids	Suspended Solids	Dissolved Solids
16/12/17	134	369	7.12	130	302	48	884	436	448
18/12/17	135	400	7.15	120	390	30	820	356	464
19/12/17	147	422	6.90	122	280	37	842	344	498
20/12/17	150	402	7.40	130	490	65	838	368	470
21/12/17	125	360	7.72	120	570	40	885	372	513
22/12/17	183	522	7.35	120	557	44	930	380	550
24/12/17	210	492	7.60	120	542	64	1054	396	658
25/12/17	105	332	7.62	120	490	56	980	460	520

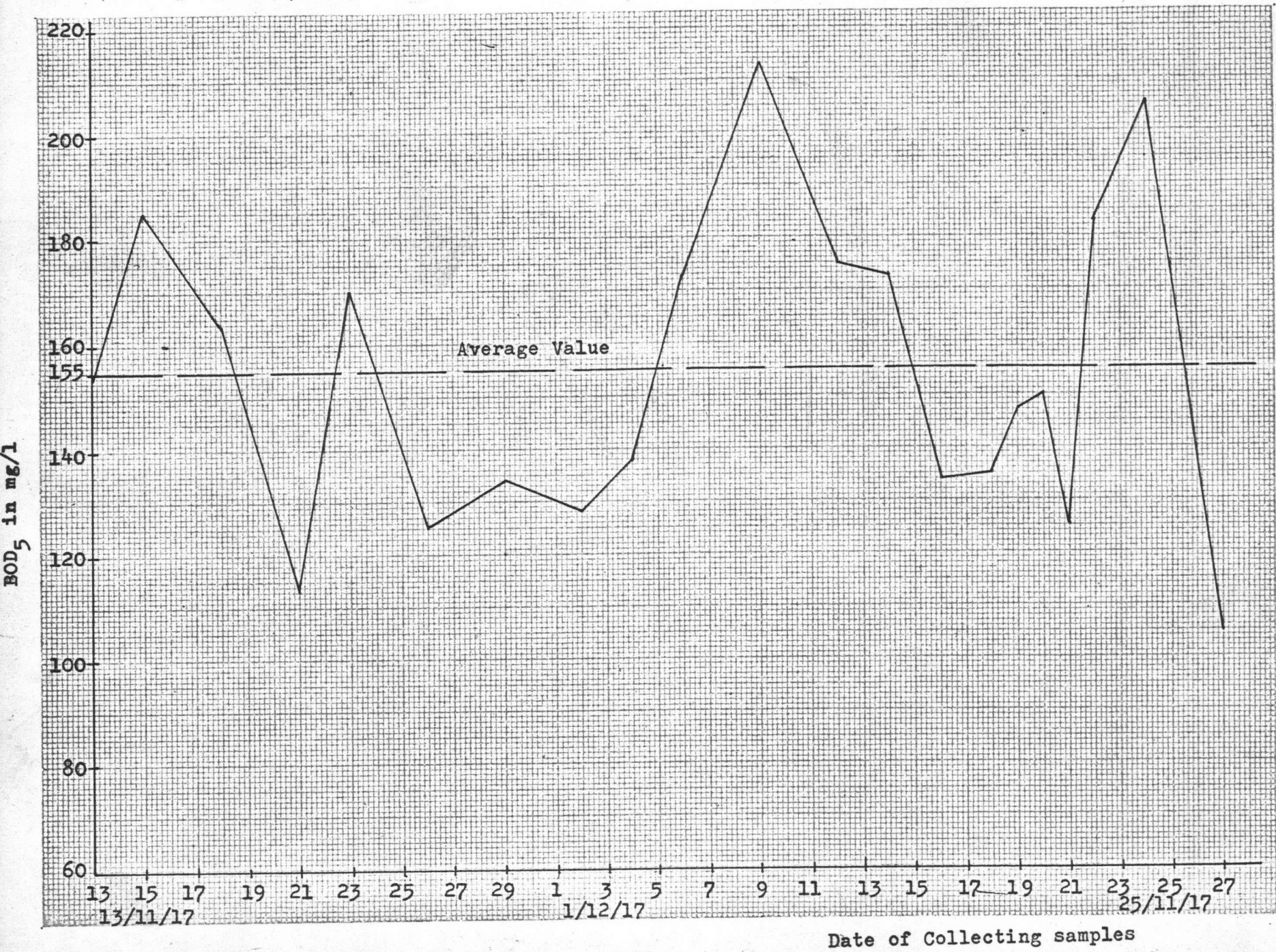


FIG 7 RELATION BETWEEN BOD₅ VERSUS DAYS

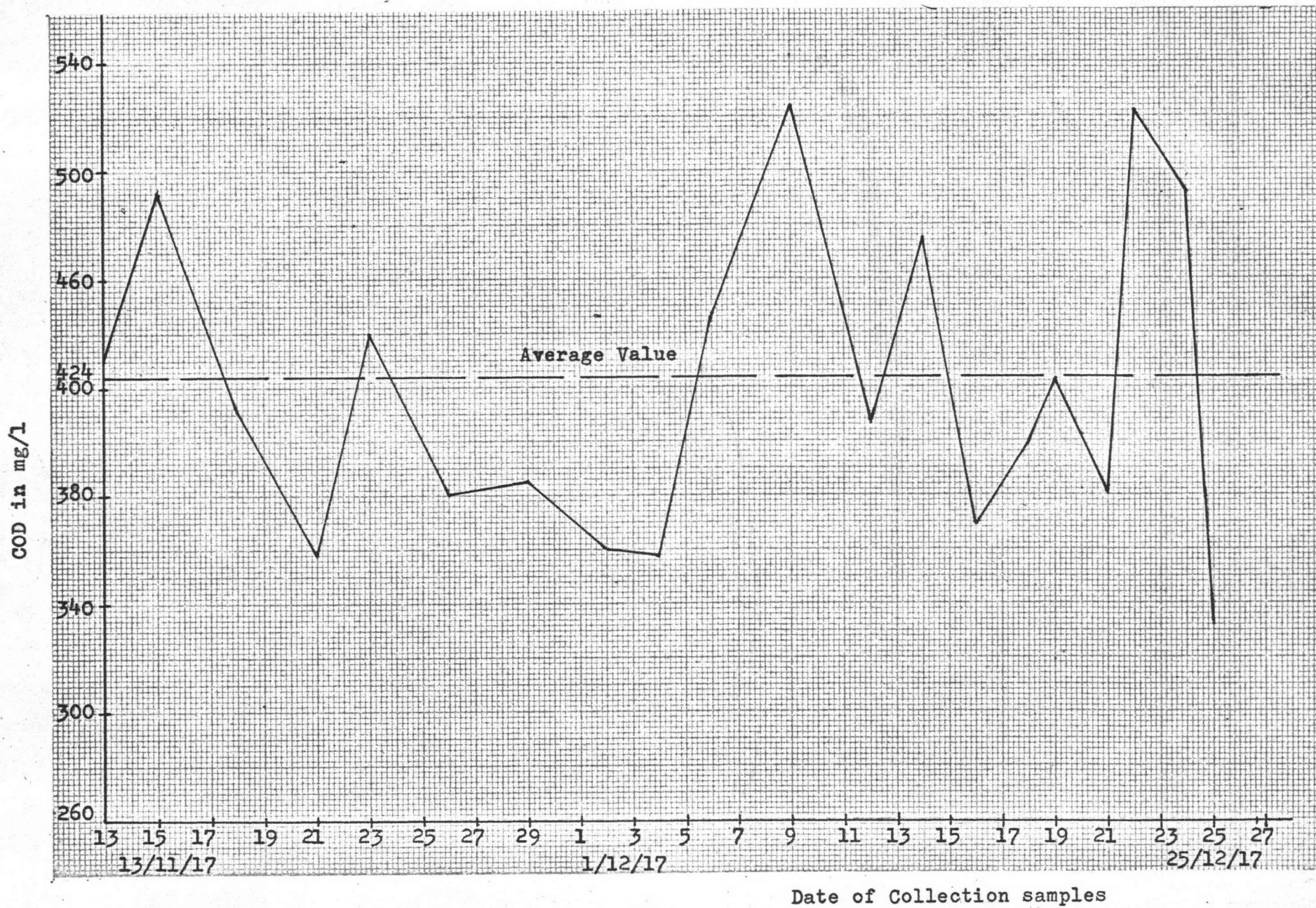


FIG 8 RELATION BETWEEN COD VERSUS DAYS

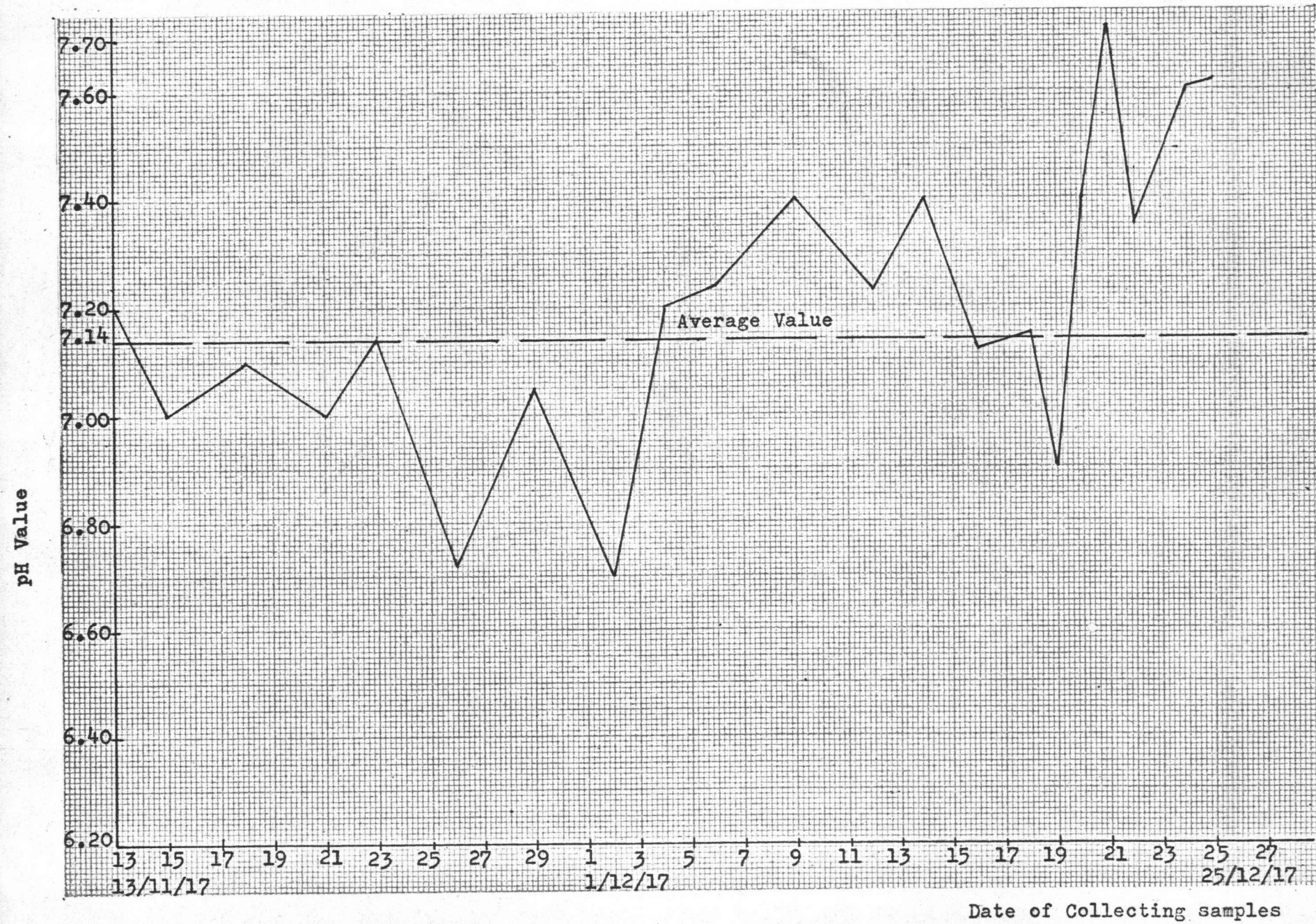


FIG 9 RELATION BETWEEN pH VALUE VERSUS DAYS

Turbidity in units FTU

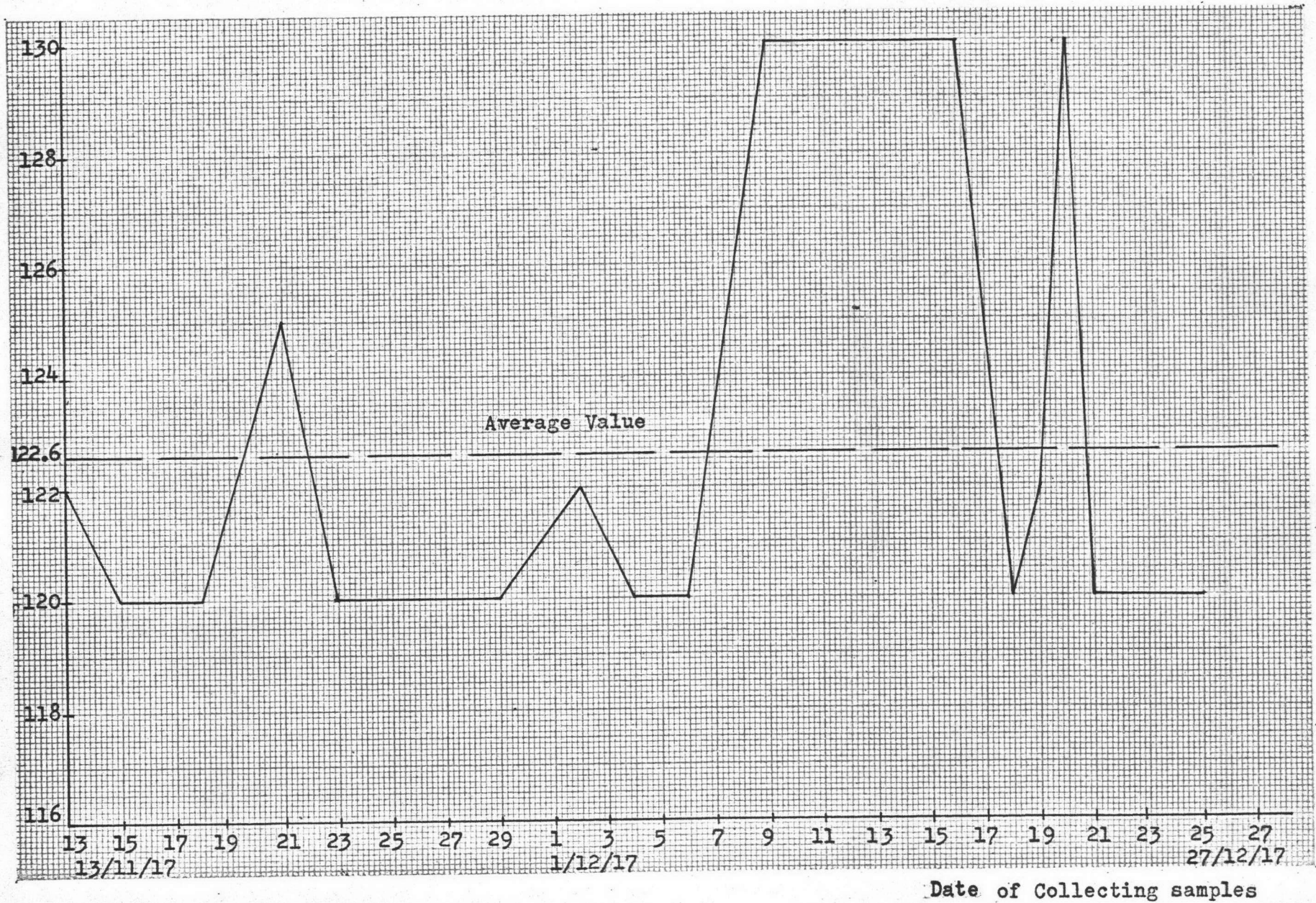


FIG 10 RELATION BETWEEN TURBIDITY VERSUS DAYS

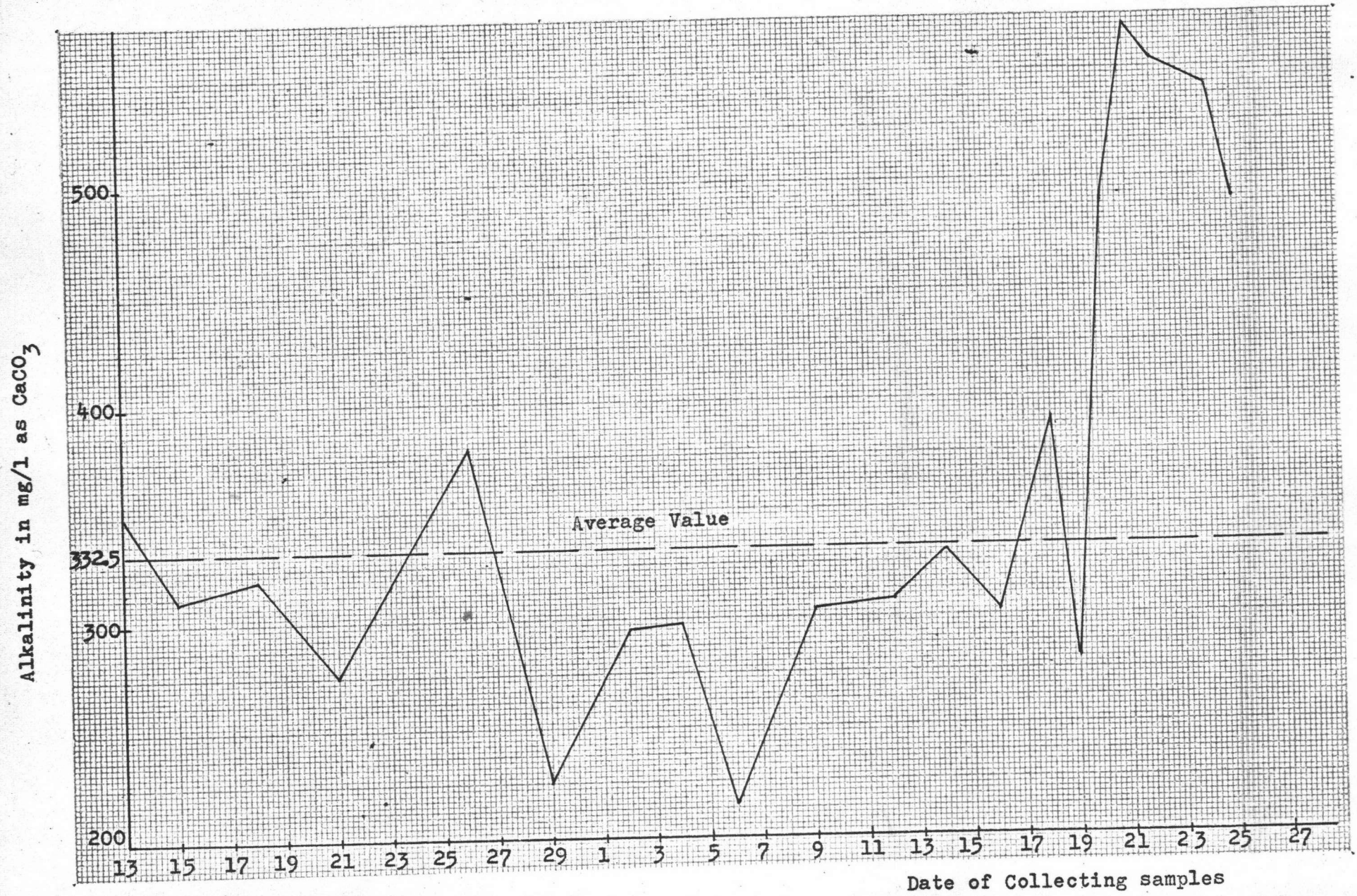


FIG 11 RELATION BETWEEN ALKALINITY VERSUS DAYS

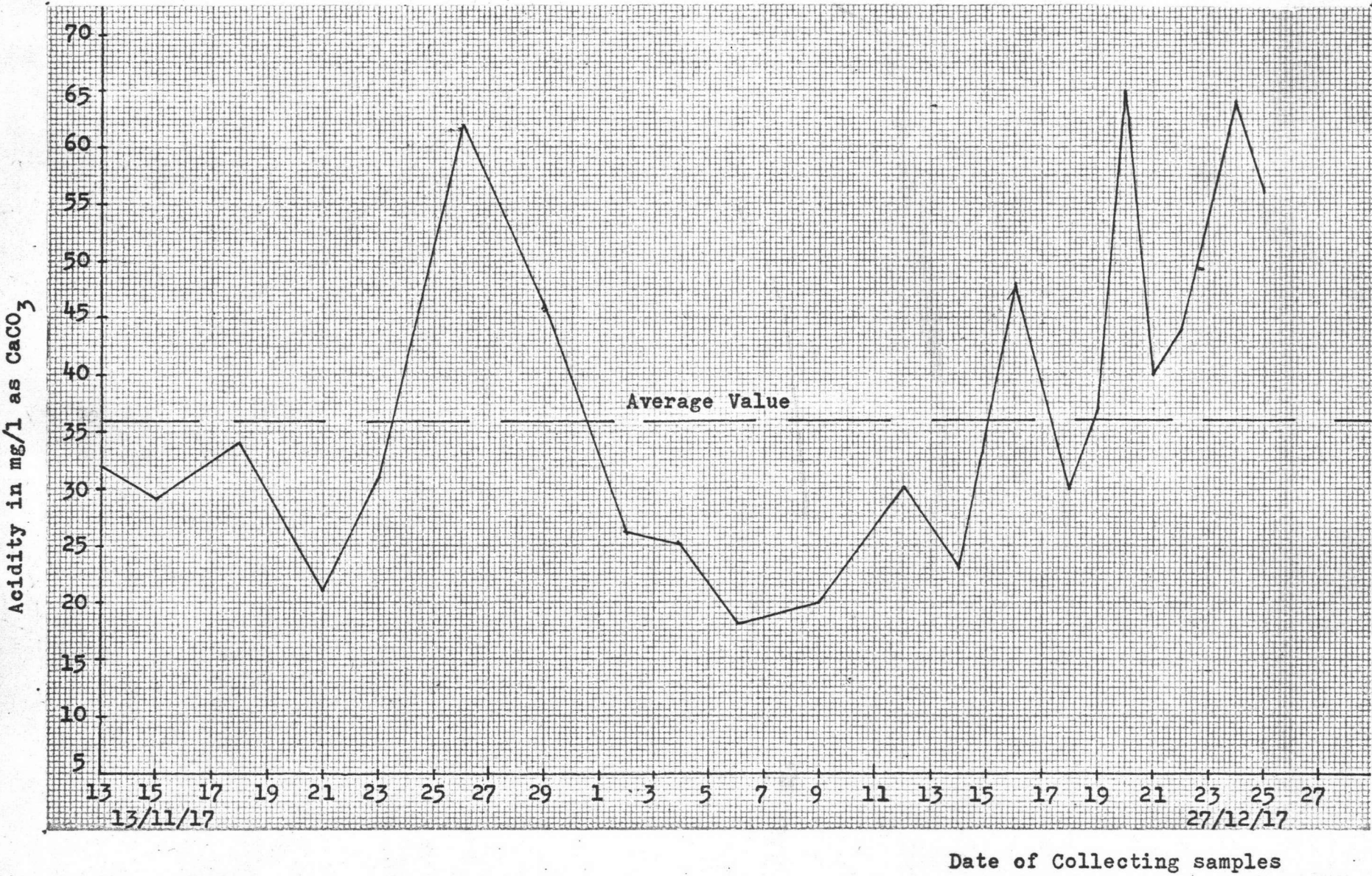


FIG-12 RELATION BETWEEN ACIDITY VERSUS DAYS

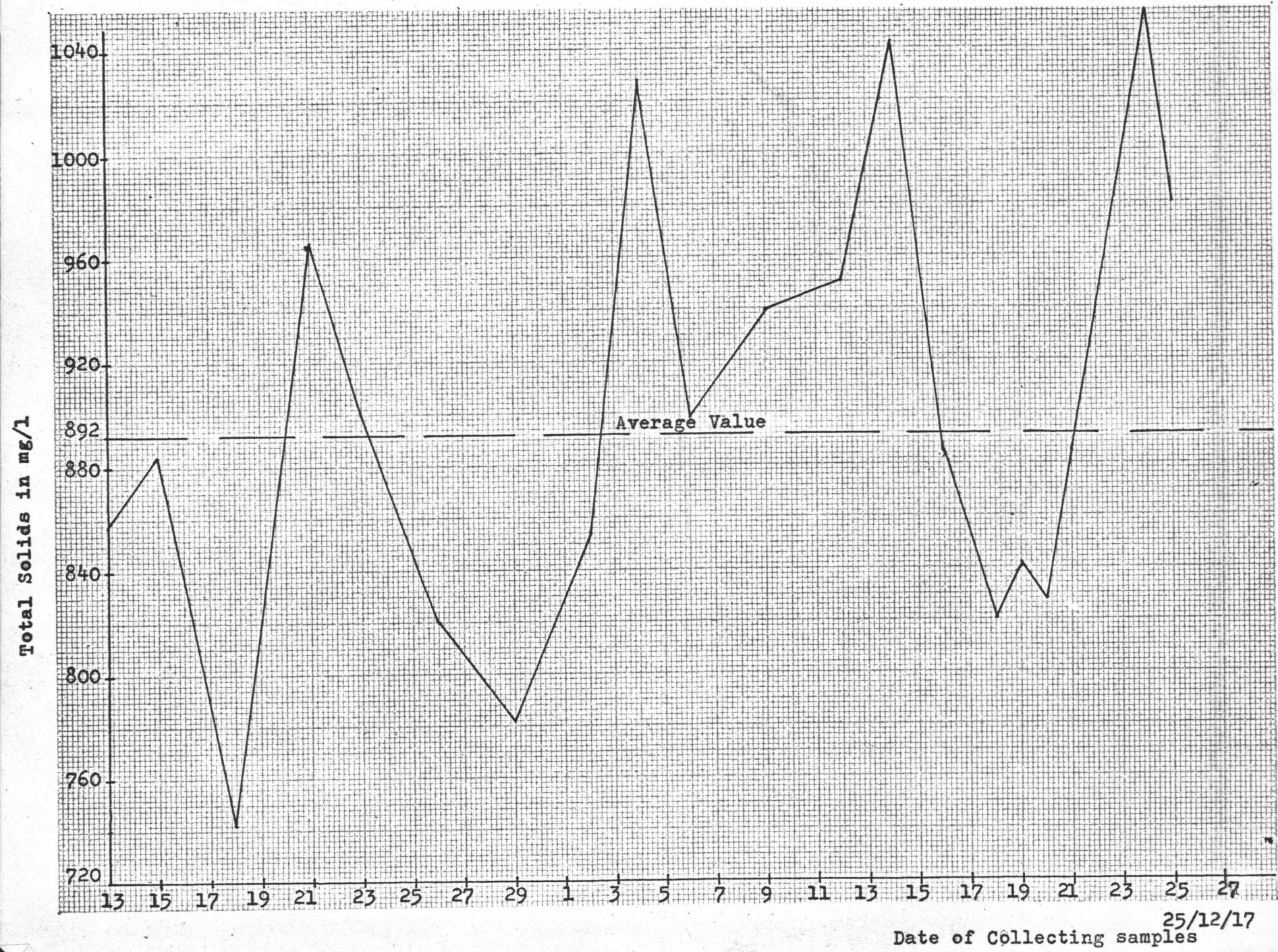


FIG 13 RELATION BETWEEN TOTAL SOLIDS VERSUS DAYS

Date of Collecting samples 25/12/17

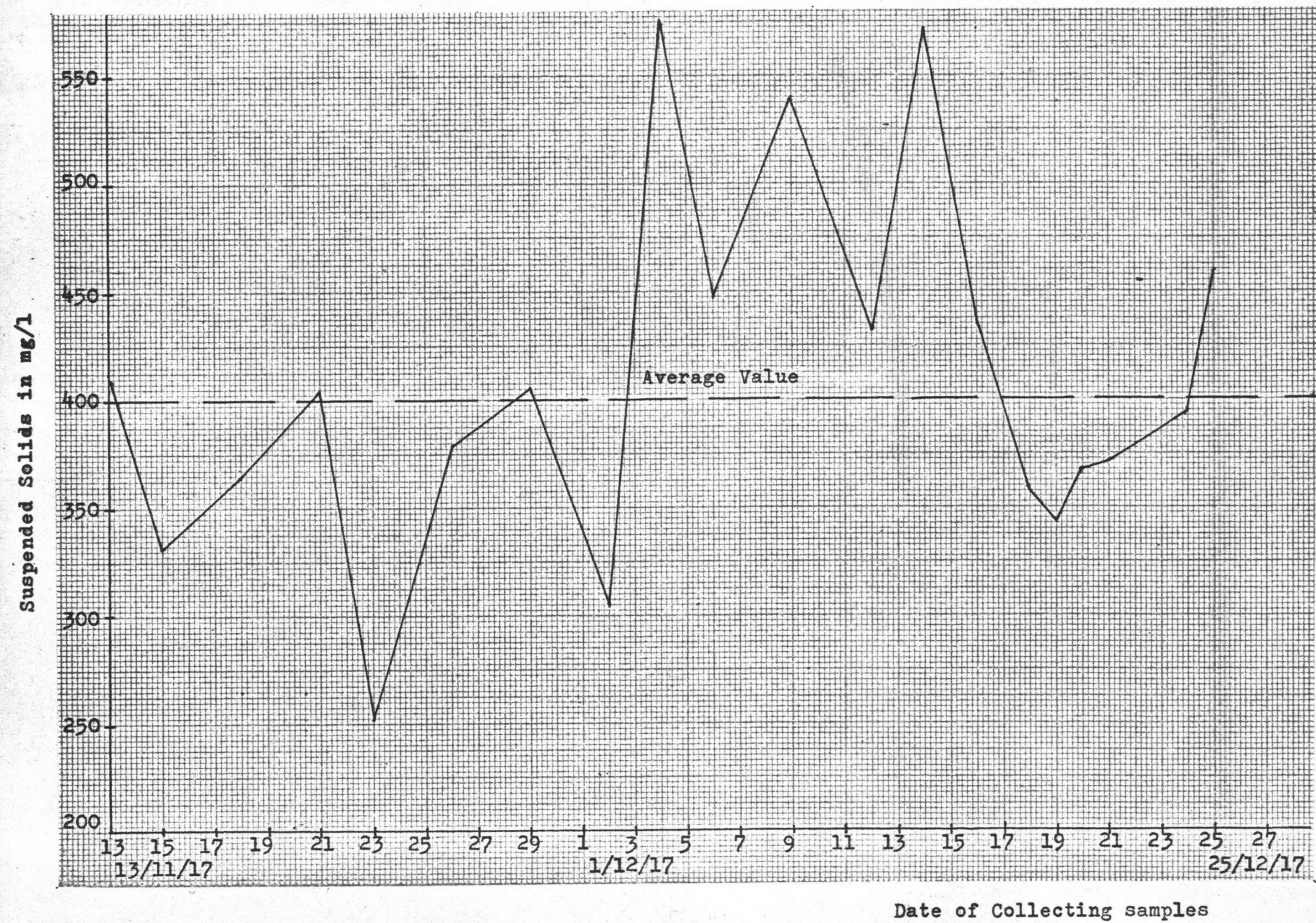


FIG 14 RELATION BETWEEN SUSPENDED SOLIDS VERSUS DAYS

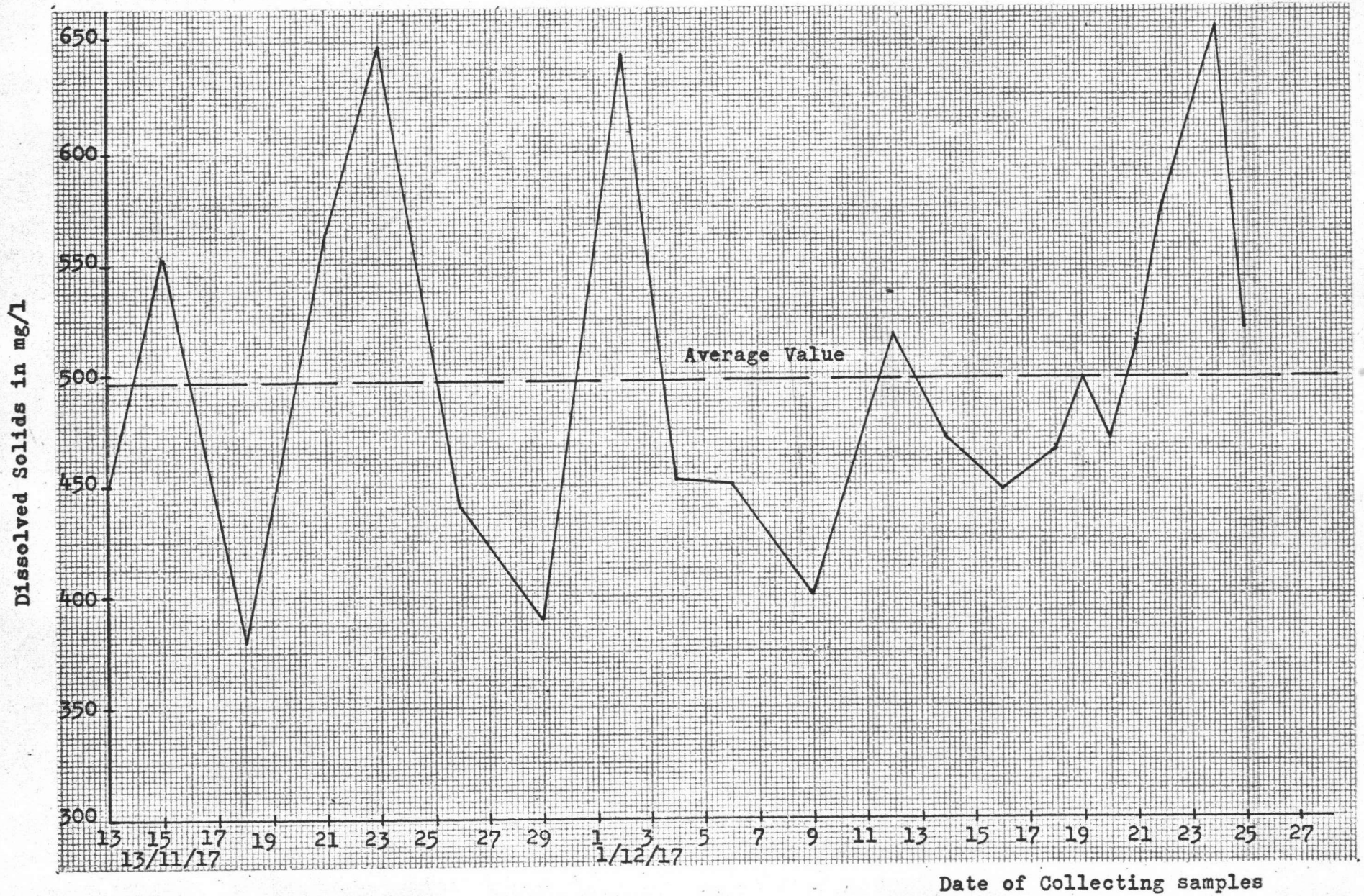


FIG 15 RELATION BETWEEN DISSOLVED SOLIDS VERSUS DAYS

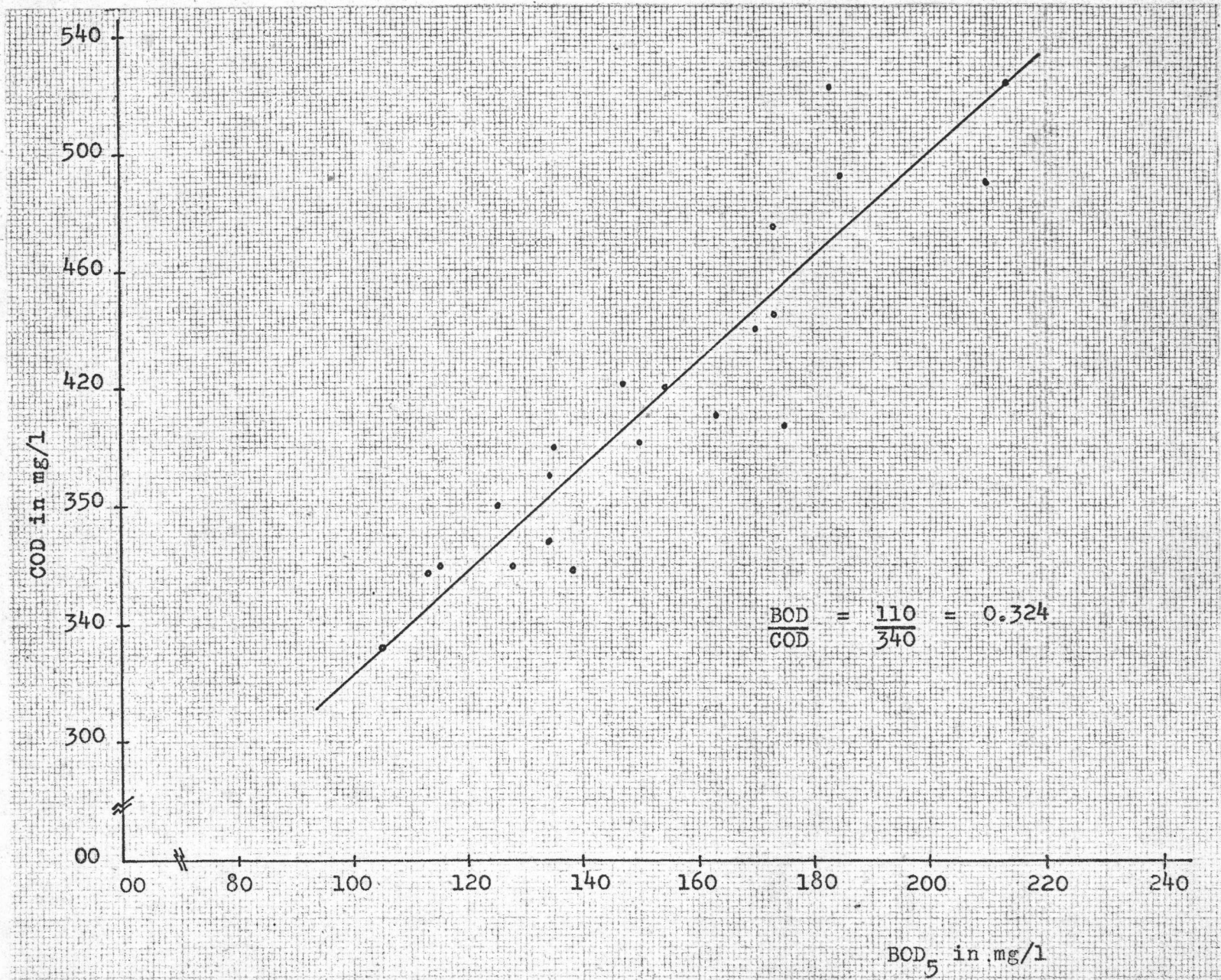


FIG. 16 RELATIONSHIP BETWEEN COD AND BOD₅ OF RAW WASTEWATER

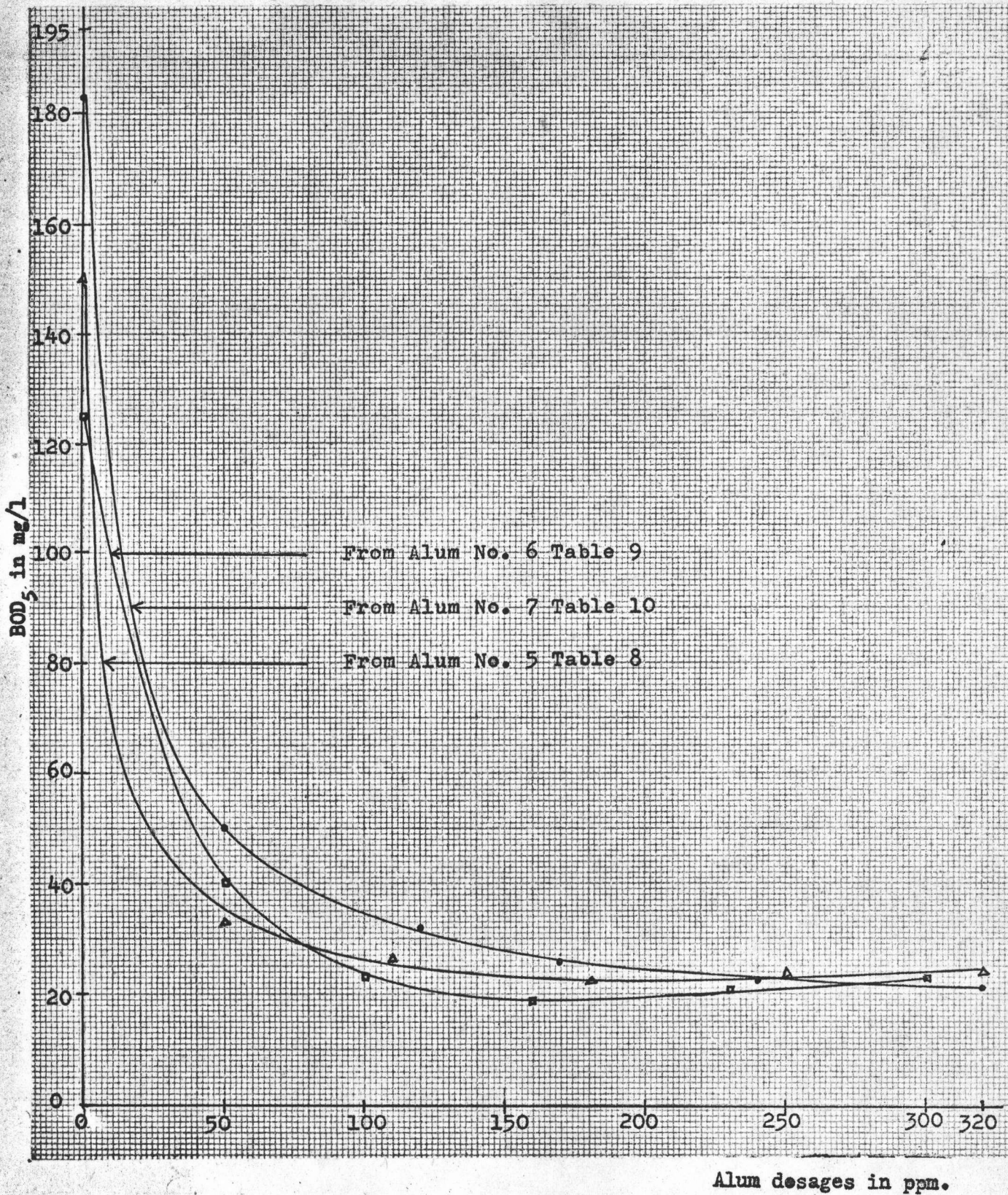


FIG. 17 EFFECTS OF ALUM DOSAGES ON BOD₅ VALUE

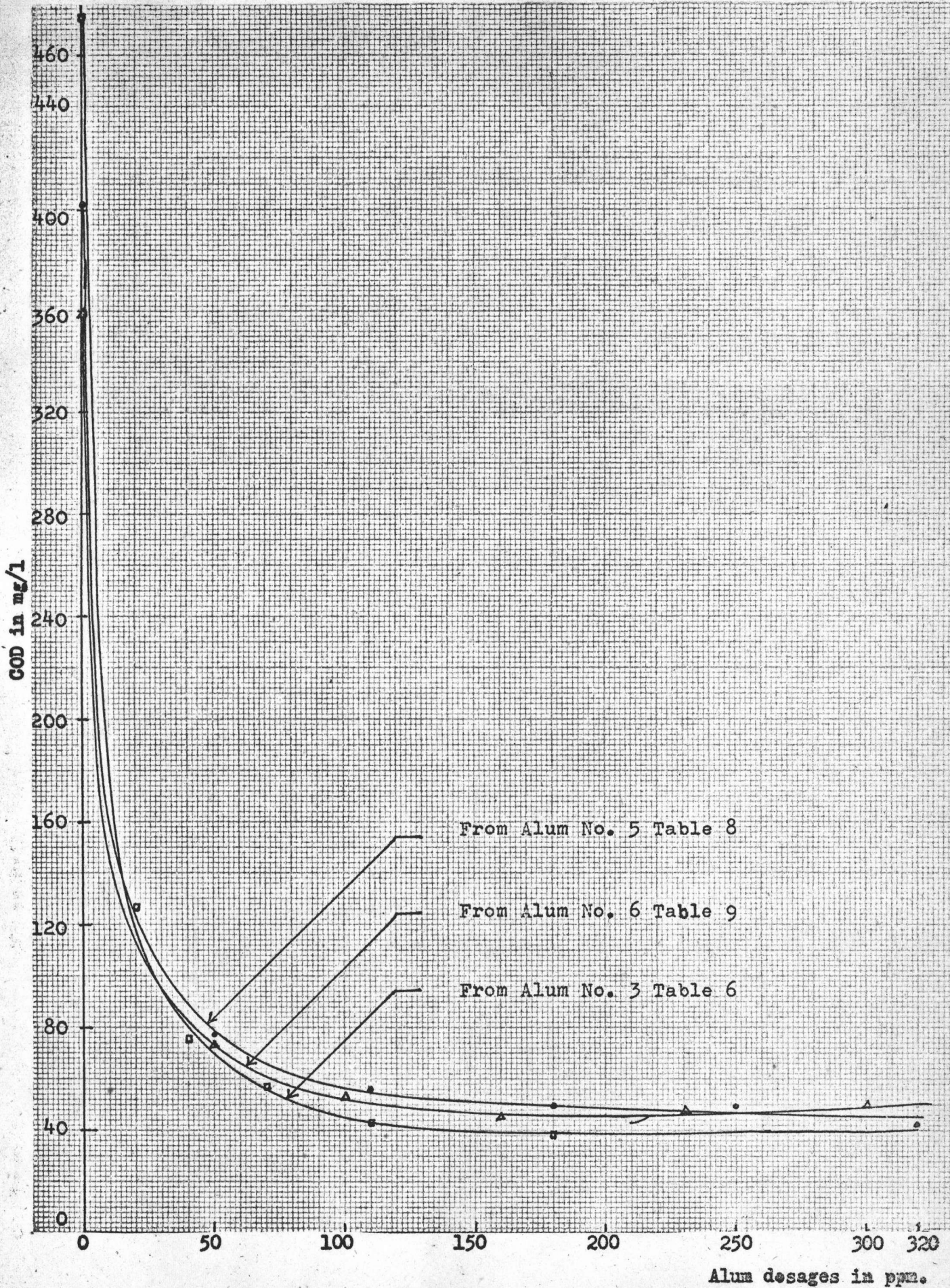


FIG. 18 EFFECTS OF ALUM DOSAGES ON COD VALUE

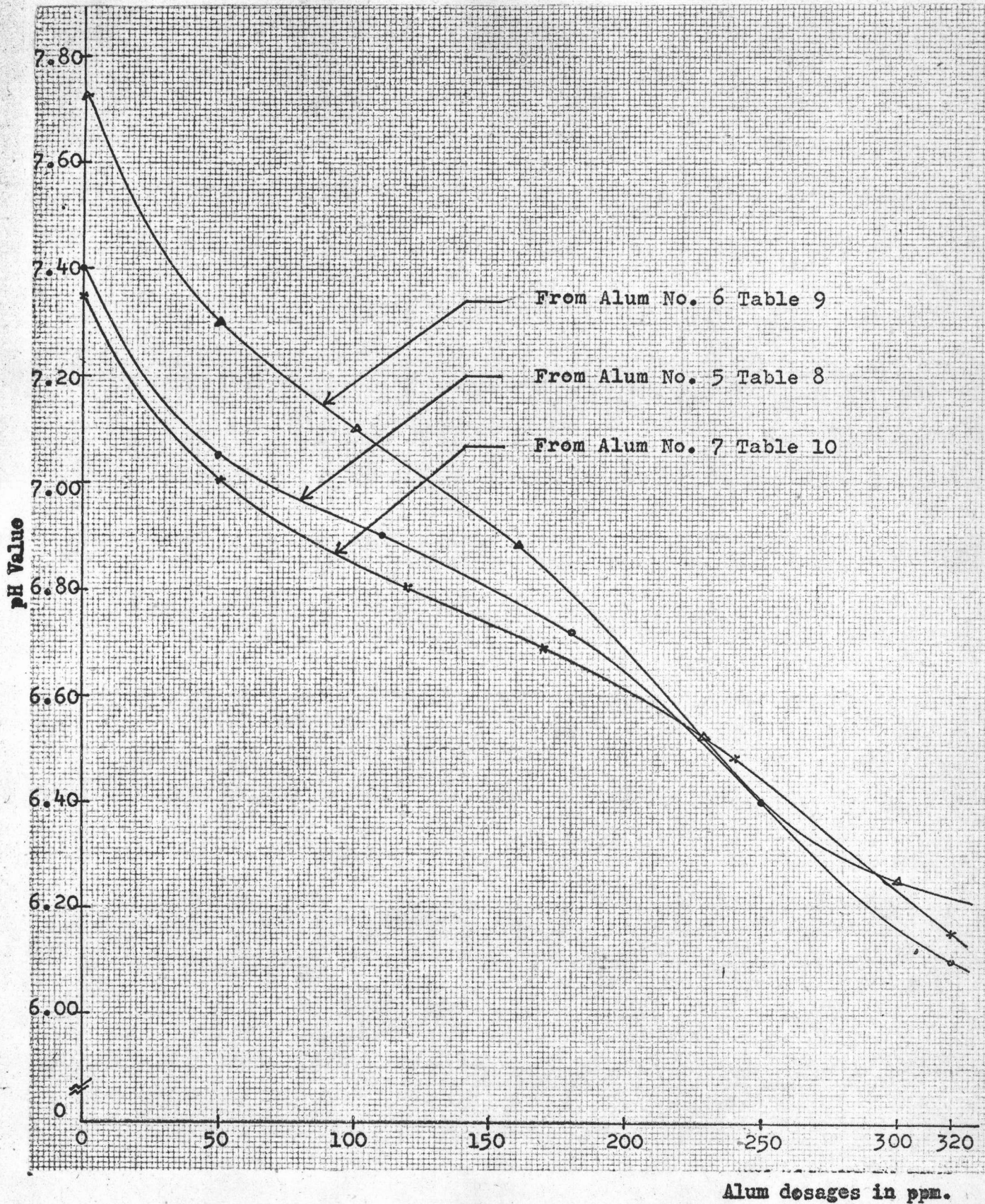


FIG. 19 EFFECTS OF ALUM DOSAGES ON pH VALUE

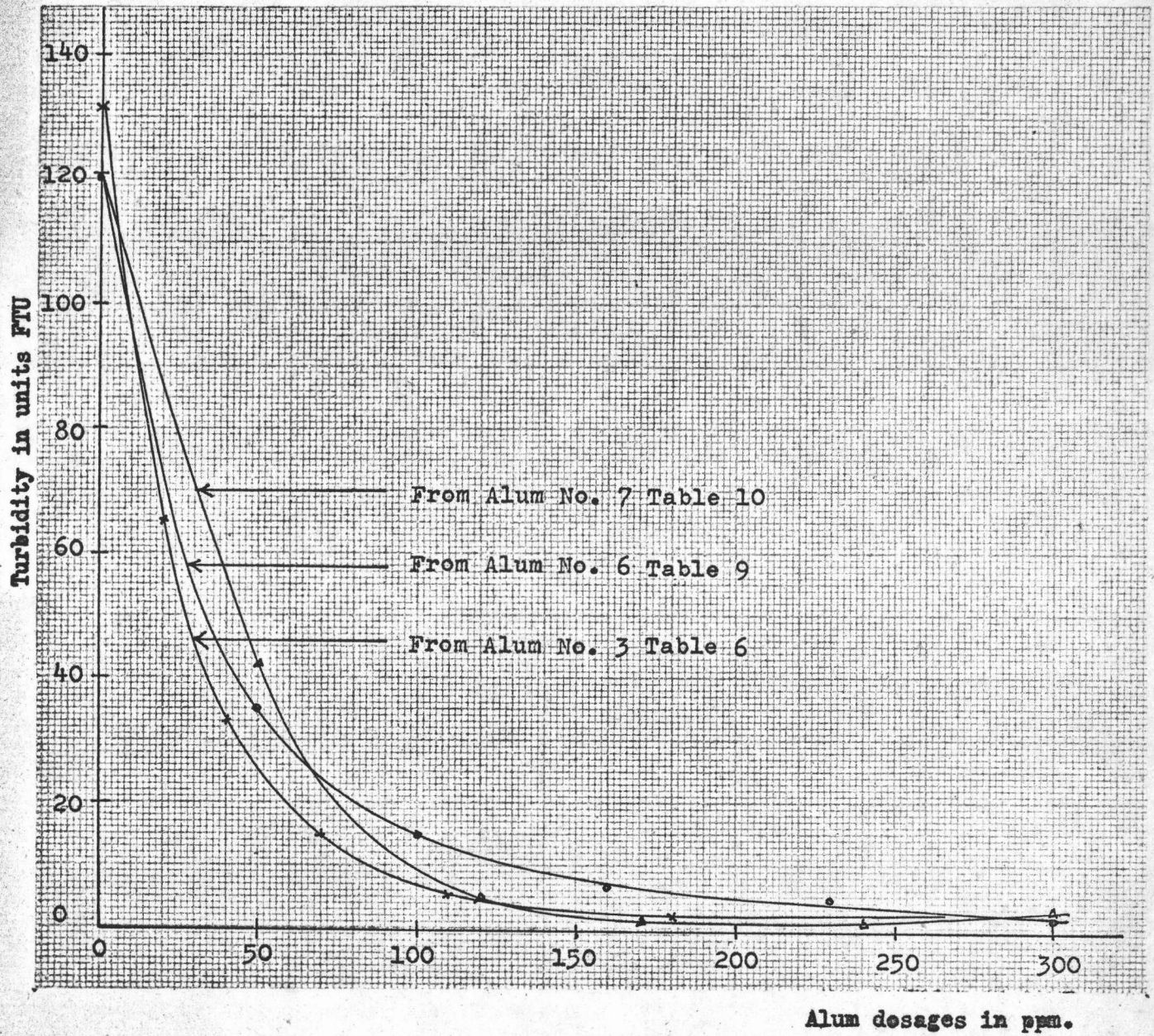


FIG. 20 EFFECTS OF ALUM DOSAGES ON TURBIDITY VALUE

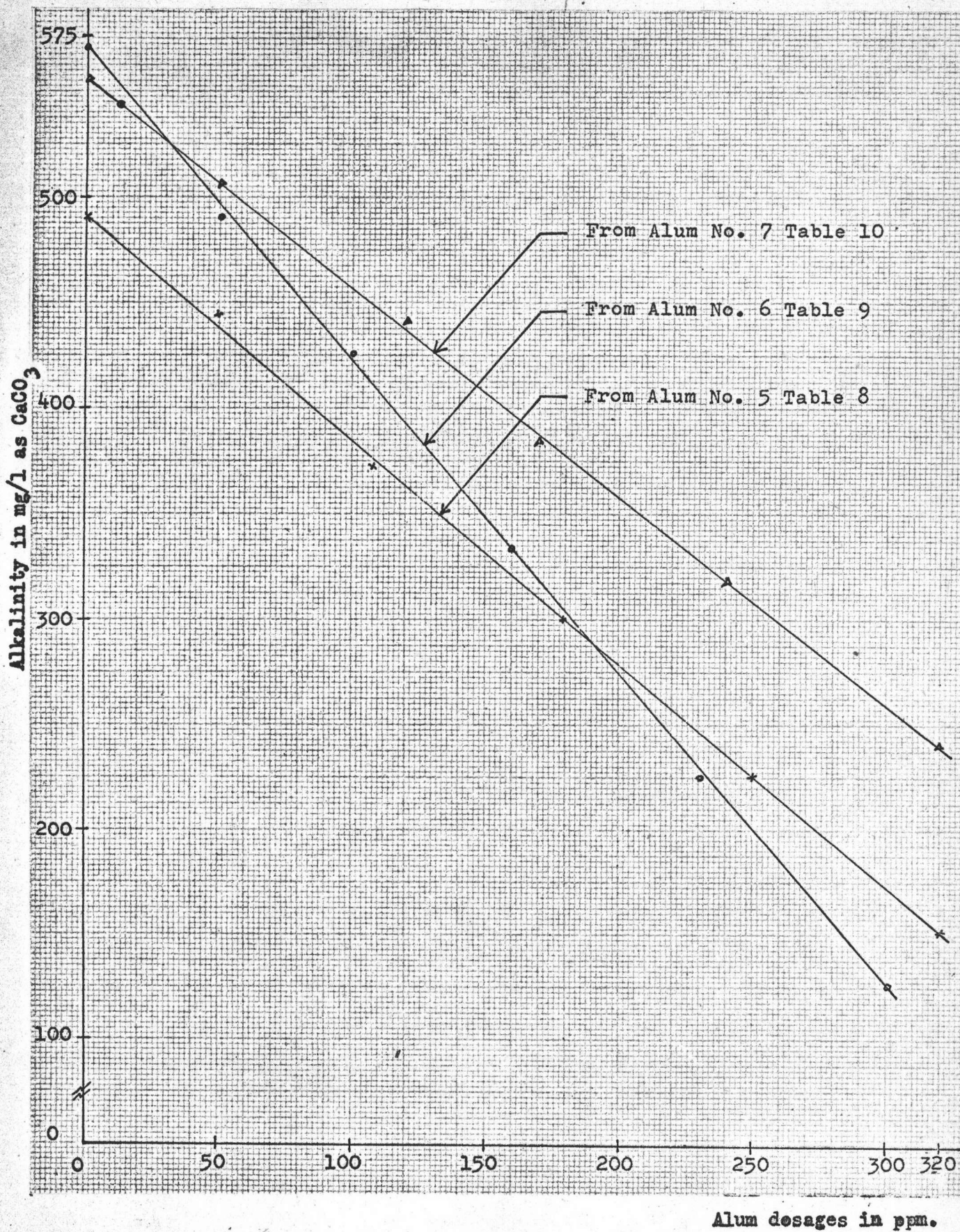


FIG. 21 EFFECTS OF ALUM DOSAGES ON ALKALINITY VALUE

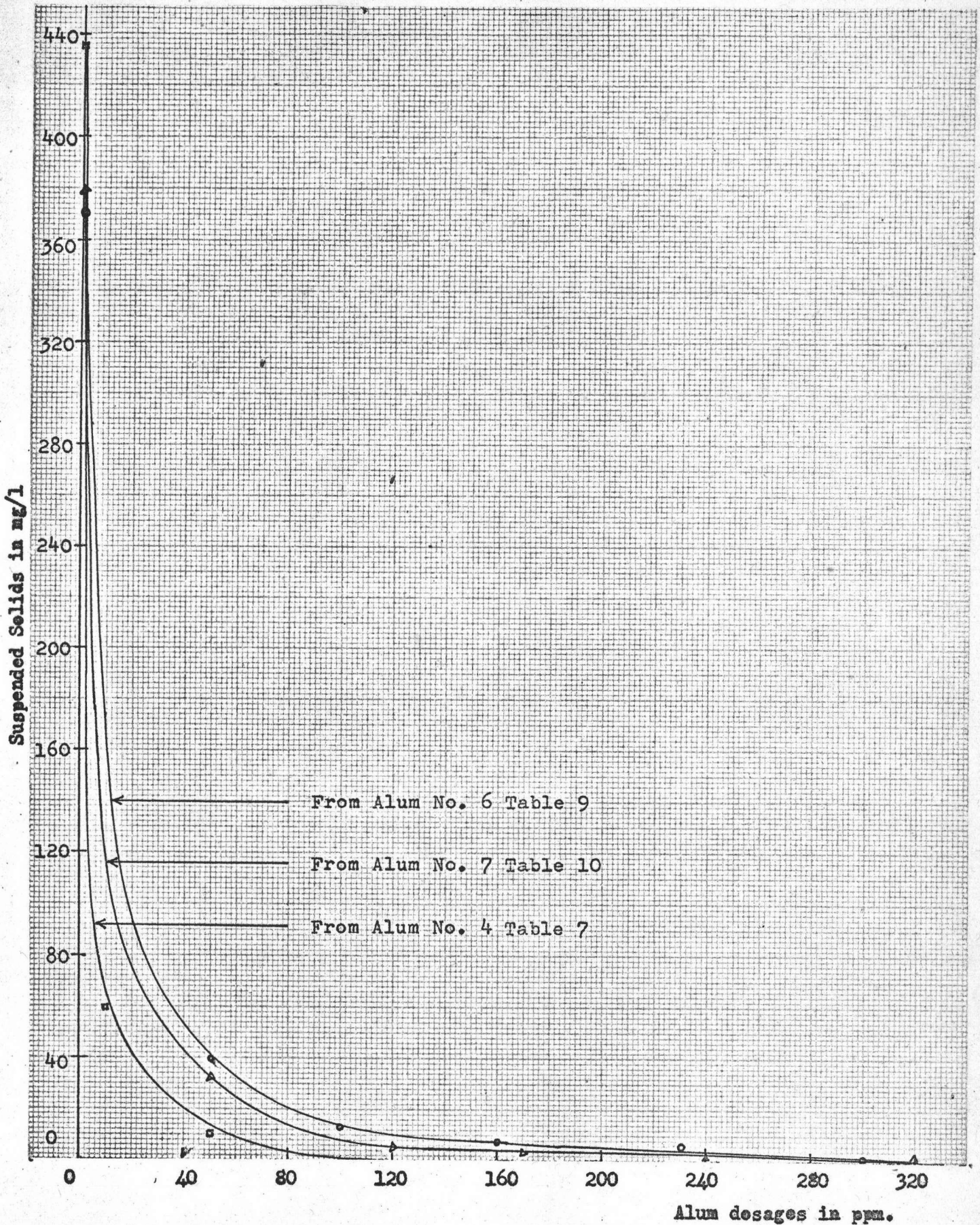


FIG. 22 EFFECTS OF ALUM DOSAGES ON SUSPENDED SOLIDS VALUE

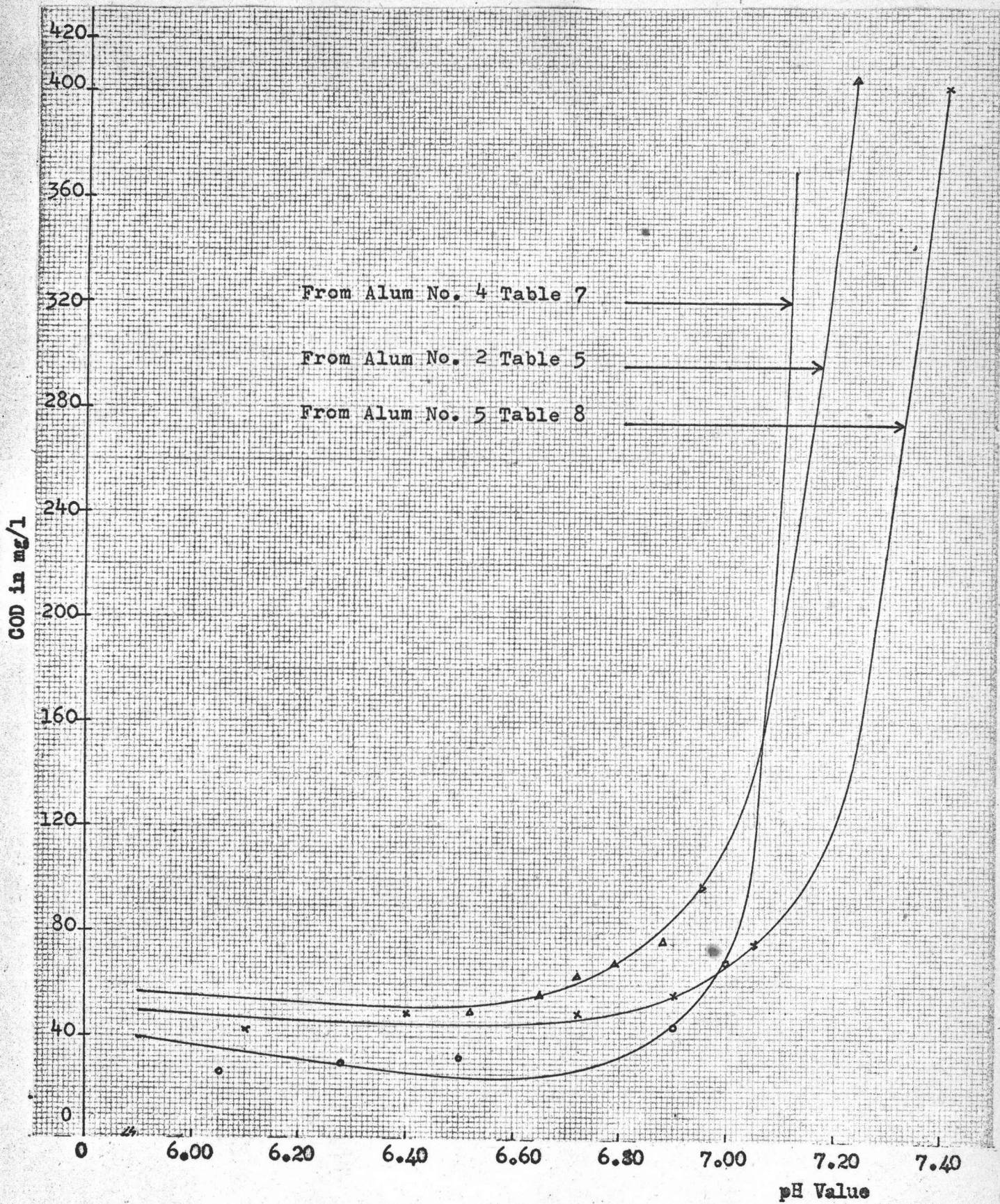
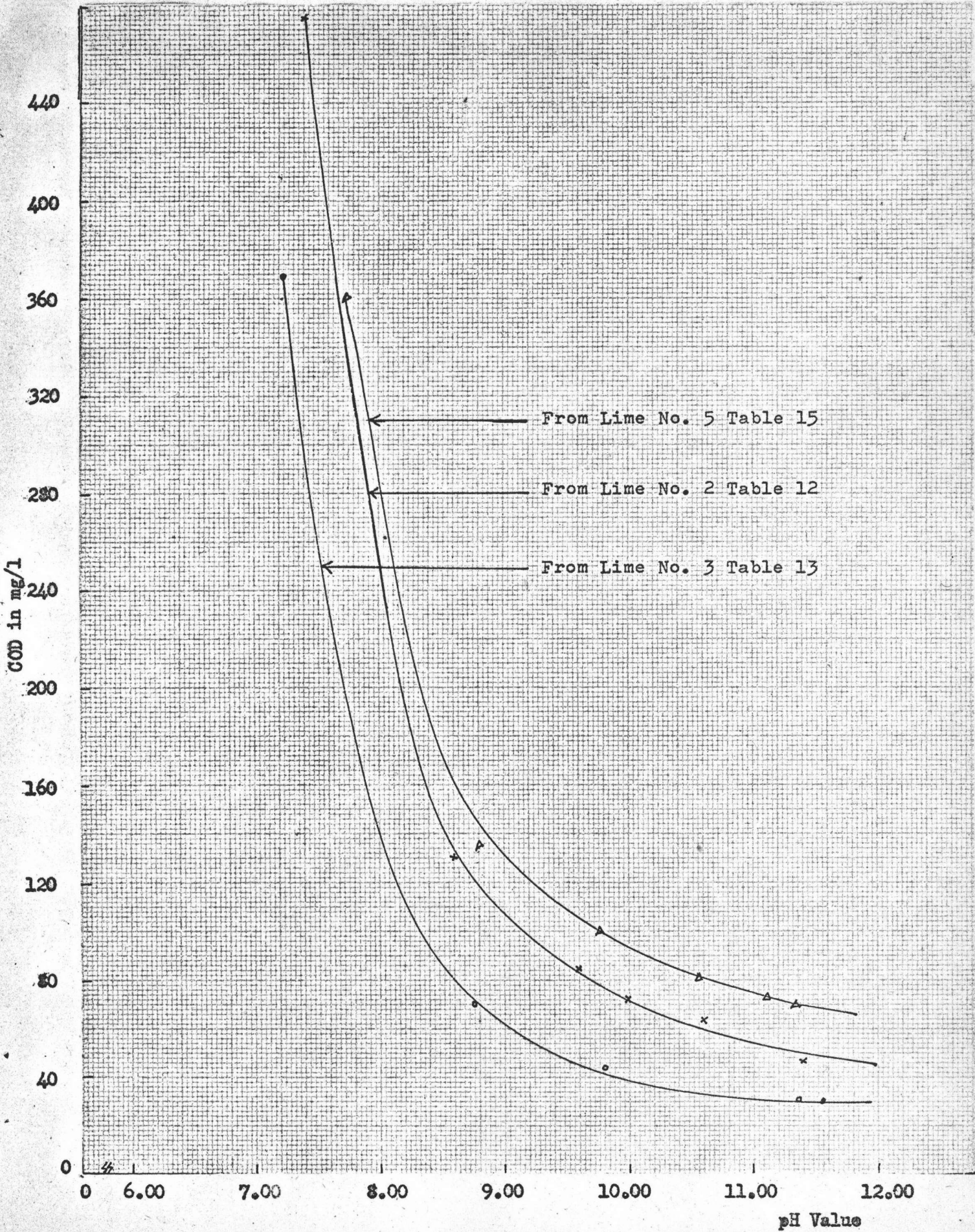
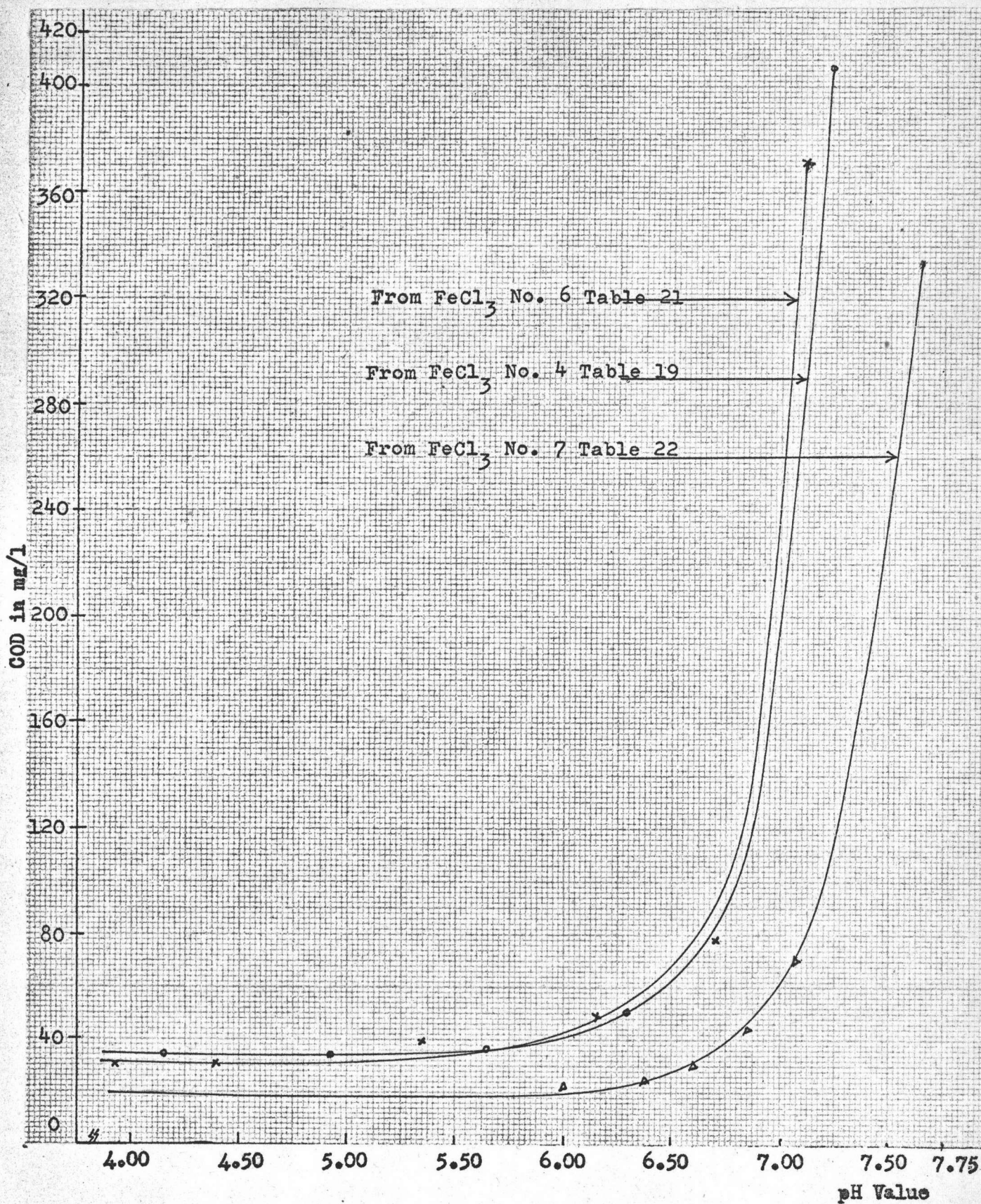


FIG. 23 ALUM : RELATIONSHIP BETWEEN COD AND pH VALUE



FIG. 25 FeCl₃ : RELATIONSHIP BETWEEN COD AND pH VALUE

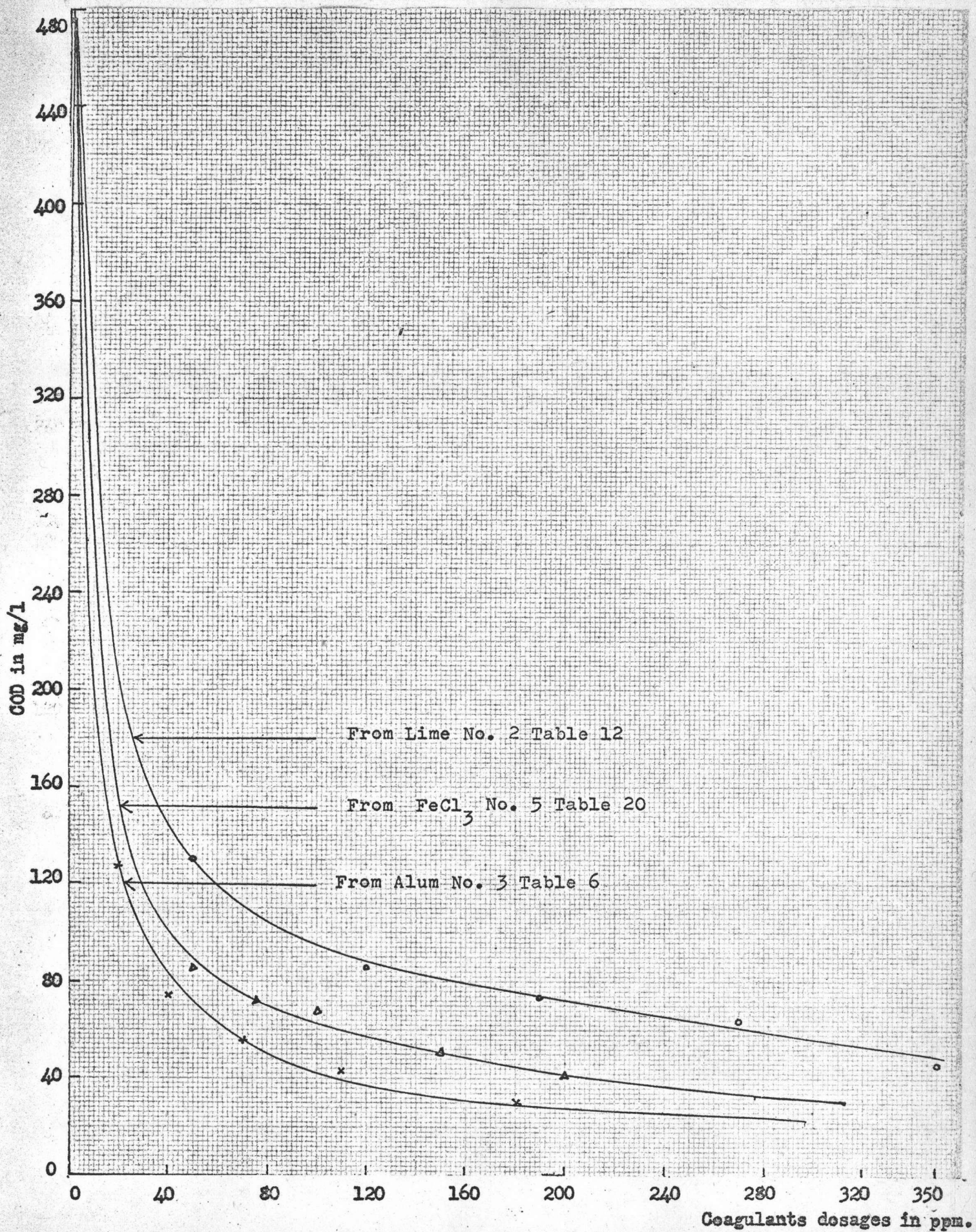


FIG. 26 INFLUENCE OF COAGULANTS DOSAGES ON COD VALUE

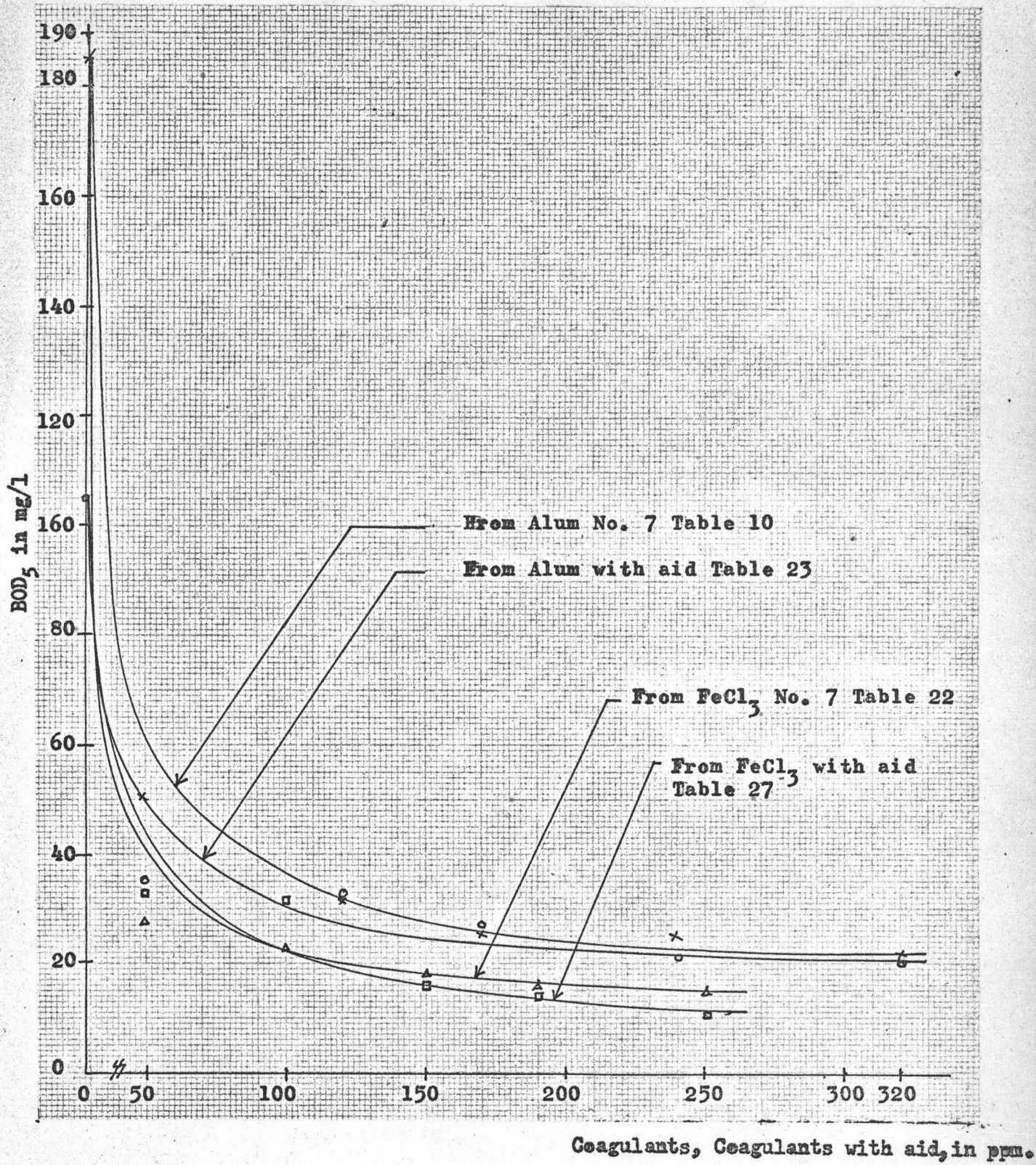


FIG. 27 INFLUENCE OF COAGULANTS, COAGULANTS WITH AID, ON BOD₅ VALUE

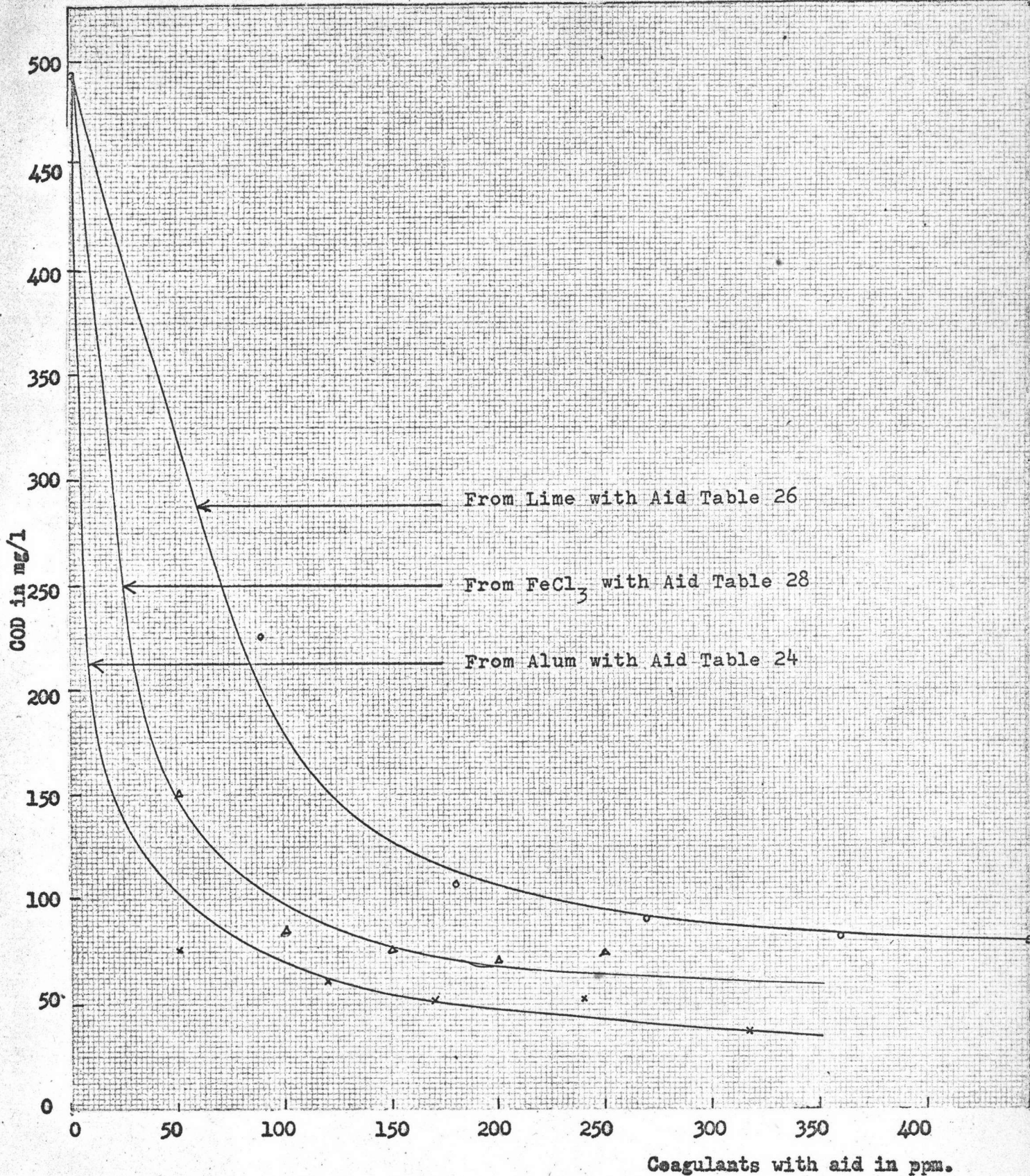


FIG. 28 INFLUENCE OF COAGULANTS WITH AID ON COD VALUE

TABLE 4. JAR TEST FOR TRIAL OPTIMUM VALUE OF ALUM DOSAGE

Rapid mixing 1 minute speed 95 rpm
 Slow mixing 29 minutes " 40 "
 Sedimentation 15 "

The Results are shown in table below

Alum NO.1

9/12/17

	R	T ₁	T ₂	T ₃	T ₄
COD	524	138	123	108	99
SS	540	112	71	50	38
Turbidity	130	95	57	44	25
pH	7.40	7.11	6.82	6.63	6.5
Alkalinity	307	270	225	190	156
Acidity	20	24	30	35	40
Alum dosage	-	25	50	75	100
Sedimentation	-	fair	good	good	very good
Color	light beige	light turbid	light turbid	clear	clear

TABLE 5. Alum No.2

12/12/17

	R	T ₁	T ₂	T ₃	T ₄	T ₅	T ₆
BOD	175	63	50	45	42	36	32
COD	407	97	77	69	65	57	49
SS	432	100	60	32	20	14	11
Turbidity	130	72	59	34	23	15	12
pH	7.23	6.95	6.88	6.79	6.72	6.65	6.52
Alkalinity	312	300	272	260	244	225	180
Acidity	30	33	35	40	44	50	60
Alum dosage	-	10	20	35	50	70	100
Sedimentation	-	poor	fair	fair	good	good	very good
Color	light beige	turbid	turbid	light turbid	clear	clear	clear

R = Raw wastewater

T = Treated water

TABLE 6. JAR TEST FOR TRIAL OPTIMUM VALUE OF ALUM DOSAGE

Rapid mixing 1 minute speed 95 rpm
 Slow mixing 29 minutes " 40 "
 Sedimentation 30 "

The Results are shown in table below

Alum NO.3

14/12/17

	R	T ₁	T ₂	T ₃	T ₄	T ₅
BOD	173	60	37	32	29	27
COD	475	127	75	56	43	35
SS	572	65	40	16	4	2
Turbidity	130	65	33	15	5	4
pH	7.40	7.10	6.90	6.78	6.35	6.10
Alkalinity	330	305	275	236	185	101
Acidity	23	30	40	51	67	96
Alum dosage	-	20	40	70	110	180
Sedimentation	-	poor	fair	good	good	good
Color	light beige	light turbid	light turbid	clear	clear	clear

TABLE 7. Alum NO.4

16/12/17

	R	T ₁	T ₂	T ₃	T ₄	T ₅
BOD	134	41	33	27	23	21
COD	369	70	44	33	31	27
SS	436	60	10	0	0	0
Turbidity	130	34	11	5	3	3
pH	7.12	7.00	6.90	6.50	6.28	6.05
Alkalinity	302	270	235	162	98	42
Acidity	48	52	60	73	82	94
Alum dosage	-	20	50	100	150	200
Sedimentation	-	fair	good	good	very good	good
Color	light beige	light turbid	clear	clear	clear	clear

R = Raw wastewater

T = treated water

TABLE 8. JAR TEST FOR TRIAL OPTIMUM VALUE OF ALUM DOSAGE

Rapid mixing 1 minute speed 95 rpm
 Slow mixing 29 minutes " 40 "
 Sedimentation 30 "

The Results are shown in table below

Alum NO.5

20/12/17

	R	T ₁	T ₂	T ₃	T ₄	T ₅
BOD	150	33	29	23	24	23
COD	402	77	56	50	50	42
SS	368	24	5	0	0	0
Turbidity	130	34	8	2	1	2
pH	7.40	7.05	6.90	6.72	6.40	6.10
Alkalinity	490	445	372	300	224	152
Acidity	65	80	96	128	142	160
Alum dosage	-	50	110	180	250	320
Sedimentation	-	fair	very good	very good	good	good
Color	light beige	light turbid	clear	clear	clear	clear

TABLE 9. Alum NO.6

21/12/17

	R	T ₁	T ₂	T ₃	T ₄	T ₅
BOD	125	40	23	19	21	23
COD	360	75	53	45	48	50
SS	372	40	14	7	5	0
Turbidity	120	35	15	4	2	1
pH	7.72	7.30	7.10	6.88	6.52	6.25
Alkalinity	570	490	426	332	225	125
Acidity	40	54	62	76	94	109
Alum dosage	-	50	100	160	230	300
Sedimentation	-	fair	good	very good	good	good
Color	light beige	turbid	clear	clear	clear	clear

R = Raw wastewater

T = Treated water

TABLE 10. JAR TEST FOR TRIAL OPTIMUM VALUE OF ALUM DOSAGE & LIME - DOSAGE

Rapid mixing 1 minutes speed 95 rpm
 Slow mixing 29 " " 40 "
 Sedimentation 30 " "

The Results are shown in table below

Alum NO.7

22/12/17

	R	T ₁	T ₂	T ₃	T ₄	T ₅
BOD	183	50	32	26	25	21
COD	522	133	60	54	54	51
SS	380	32	5	4	1	0
Turbidity	120	42	5	1	1	2
pH	7.35	7.00	6.80	6.69	6.48	6.15
Alkalinity	557	507	440	385	320	242
Acidity	44	66	93	118	146	180
Alum dosage	-	50	120	170	240	320
Sedimentation	-	fair	very good	very good	good	good
Color	light beige	light turbid	clear	clear	clear	clear

TABLE 11. Lime NO.1

12/12/17

	R	T ₁	T ₂	T ₃	T ₄	T ₅
BOD	175	62	59	55	40	29
COD	407	125	110	100	96	88
SS	432	80	52	40	36	30
Turbidity	130	68	49	44	34	25
pH	7.23	8.55	8.90	9.88	10.60	11.05
Alkalinity	312	332	358	400	420	465
Acidity	30	-	-	-	-	-
Lime dosage	-	50	100	175	225	300
Sedimentation	-	fair	fair	fair	good	good
Color	light beige	light turbid	light turbid	light turbid	light turbid	clear

R = Raw wastewater

T = Treated water

TABLE 12. JAR TEST FOR TRIAL OPTIMUM VALUE OF LIME DOSAGE

Rapid mixing 1 minute speed 95 rpm
 Slow mixing 29 minutes " 40 "
 Sedimentation 30 "

The Results are shown in table below

Lime NO.2

14/12/17

	R	T ₁	T ₂	T ₃	T ₄	T ₅
BOD	173	47	43	38	33	21
COD	475	130	86	75	64	46
SS	572	69	42	24	12	7
Turbidity	130	90	85	39	17	10
pH	7.40	8.60	9.58	10.00	10.3	11.38
Alkalinity	330	348	372	390	428	453
Acidity	23	-	-	-	-	-
Lime dosage	-	50	120	190	270	350
Sedimentation	-	poor	poor	good	good	good
Color	light beige	turbid	light turbid	clear	clear	clear

TABLE 13. Lime NO.3

16/12/17

	R	T ₁	T ₂	T ₃	T ₄	T ₅
BOD	134	32	23	13	11	15
COD	369	70	43	32	30	30
SS	436	30	19	5	0	0
Turbidity	130	43	32	17	12	18
pH	7.12	8.68	9.8	11.05	11.35	11.55
Alkalinity	302	360	414	475	560	625
Acidity	48	-	-	-	-	-
Lime dosage	-	75	150	250	350	450
Sedimentation	-	fair	fair	very good	very good	good
Color	light beige	light turbid	light turbid	clear	clear	clear

R = Raw wastewater

T = treated water

TABLE 14. JAR LEST FOR TRIAL OPTIMUM VALUE OF LIME DOSAGE

Rapid mixing 1 minute speed 95 rpm
 Slow mixing 29 minutes " 40 "
 Sedimentation 30 "

The Results are shown in table below

Lime NO.4

20/12/17

	R	T ₁	T ₂	T ₃	T ₄	T ₅
BOD	150	36	30	20	18	16
COD	402	95	69	56	46	42
SS	368	24	12	4	3	0
Turbidity	130	50	25	6	4	2
pH	7.40	8.85	10.40	11.10	11.30	11.45
Alkalinity	490	550	605	675	700	750
Acidity	65	-	-	-	-	-
Lime dosage	-	100	200	300	360	420
Sedimentation	-	fair	fair	very good	very good	good
Color	beige	light turbid	light turbid	clear	clear	clear

TABLE 15. Lime NO.5

21/12/17

	R	T ₁	T ₂	T ₃	T ₄	T ₅
BOD	125	58	46	47	32	28
COD	360	135	100	81	73	70
SS	372	34	18	9	2	0
Turbidity	120	78	60	35	9	4
pH	7.72	8.80	9.75	10.50	11.10	11.30
Alklinity	570	620	680	725	778	825
Acidity	40	-	-	-	-	-
Lime dosage	-	90	180	270	360	450
Sedimentation	-	fair	fair	good	very good	good
Color	beige	turbid	turbid	light turbid	clear	clear

R = Raw wastewater

T = Treated water

TABLE 16. JAR TEST FOR TRIAL OPTIMUM VALUE OF FERRIC CHLORIDE

Rapid mixing 1 minute speed 95 rpm
 Slow mixing 29 minutes " 40 "
 Sedimentation 30 "

The Results are shown in table below

FeCl_3 NO.1

4/12/17

	R	T ₁	T ₂	T ₃	T ₄
BOD	138	74	68	45	47
COD	358	135	91	59	52
SS	576	124	60	34	28
Turbidity	120	93	56	21	5
pH	7.2	6.7	6.32	5.92	5.45
Alkalinity	292	235	197	140	75
Acidity	25	39	53	66	82
FeCl_3 dosage	-	50	100	150	200
Sedimentation	-	poor	fair	very good	good
Color	light beige	light yellowish	light yellowish	clear	clear

TABLE 17. FeCl_3 NO.2

6/12/17

	R	T ₁	T ₂	T ₃	T ₄
BOD	173	65	41	35	34
COD	445	109	95	89	87
SS	448	19	3	2	1
Turbidity	120	33	6	2	2
pH	7.24	6.50	6.10	5.65	4.80
Alkalinity	214	155	125	77	50
Acidity	18	49	74	94	118
FeCl_3 dosage	-	75	125	175	225
Sedimentation	-	fair	very good	good	good
Color	light beige	clear	clear	clear	clear

R = Raw wastewater

T = Treated water

TABLE 18. JAR TEST FOR TRIAL OPTIMUM VALUE OF FERRIC CHLORIDE

Rapid mixing 1 minute speed 95 rpm
 Slow mixing 29 minutes " 40 "
 Sedimentation 15 "

The Results are shown in table below

FeCl_3 NO.3

9/12/17

	R	T ₁	T ₂	T ₃	T ₄
BOD	213	41	35	33	31
COD	524	101	86	76	72
SS	540	28	18	14	18
Turbidity	130	65	37	26	22
pH	7.40	6.39	6.05	5.22	4.30
Alkalinity	307	200	135	70	16
Acidity	20	48	65	78	95
FeCl_3 dosage	-	90	140	190	240
Sedimentation	-	fair	very good	good	fair
Color	light beige	yellowish of FeCl_3	clear	clear	clear

Sedimentation 30 minutes

TABLE 19. FeCl_3 NO.4

12/12/17

	R	T ₁	T ₂	T ₃	T ₄
BOD	175	29	21	19	18
COD	407	50	33	32	32
SS	432	6	0	0	0
Turbidity	130	10	2	2	2
pH	7.23	6.30	5.64	4.93	4.15
Alkalinity	312	220	125	60	14
Acidity	30	51	70	86	101
FeCl_3 dosage	-	75	150	200	250
Sedimentation	-	good	very good	good	good
Color	light beige	clear	clear	clear	clear

R = Raw wastewater

T = Treated water

TABLE 20. JAR TEST FOR TRIAL OPTIMUM VALUE OF FERRIC CHLORIDE

Rapid mixing	1	minute	speed	95	rpm
Slow mixing	29	minutes	"	40	"
Sedimentation	30	"	"	"	"

The Results are shown in table below

FeCl₃ NO.5

14/12/17

	R	T ₁	T ₂	T ₃	T ₄	T ₅
BOD	173	41	33	28	22	20
COD	475	88	72	69	52	41
SS	572	26	11	1	0	0
Turbidity	130	71	47	18	6	3
pH	7.40	6.75	6.57	6.42	5.99	5.49
Alkalinity	330	260	220	185	110	46
Acidity	23	43	55	63	84	104
FeCl ₃ dosage	-	50	75	100	150	200
Sedimentation	-	poor	fair	good	very good	good
Color	light beige	yellowish of FeCl ₃	yellowish of FeCl ₃	clear	clear	clear

TABLE 21. FeCl₃ NO.6

16/12/17

	R	T ₁	T ₂	T ₃	T ₄	T ₅
BOD	134	31	24	21	19	19
COD	369	79	49	40	35	35
SS	436	22	1	0	0	0
Turbidity	130	28	3	2	2	3
pH	7.12	6.72	6.15	5.35	4.40	3.90
Alkalinity	302	233	153	75	14	0
Acidity	48	72	105	133	156	270
FeCl ₃ dosage	-	50	120	180	230	300
Sedimentation	-	fair	good	very good	good	good
Color	light beige	yellowish of FeCl ₃	clear	clear	clear	clear

R = Raw wastewater

T = Treated water

TABLE 22. JAR TEST FOR TRIAL OPTIMUM VALUE OF FERRIC CHLORIDE

Rapid mixing	1	minute	speed	95	rpm
Slow mixing	29	minutes	"	40	"
Sedimentation	30	"			

The Results are shown in table below

FeCl₃ NO.7

25/12/17

	R	T ₁	T ₂	T ₃	T ₄	T ₅
BOD	105	28	23	18	16	15
COD	332	70	44	30	25	23
SS	460	17	2	0	0	0
Turbidity	120	25	7	2	1	1
pH	7.62	7.08	6.85	6.60	6.38	6.00
Alkalinity	490	413	330	260	180	108
Acidity	56	69	82	96	114	125
FeCl ₃ dosage	-	50	100	150	200	250
Sedimentation	-	fair	good	very good	very good	very good
Color	light beige	yellowish of FeCl ₃	yellowish	clear	clear	clear

R = Raw wastewater

T = Treated water

TABLE 23. JAR TEST FOR TRIAL OPTIMUM VALUE OF ALUM DOSAGE

Rapid mixing	1	minute	speed	95	rpm
Slow mixing	29	minutes	"	40	"
Sedimentation	30	"			

The results are shown in table below

Alum with aid 5 ppm

22/12/17

	R	T ₁	T ₂	T ₃	T ₄	T ₅
BOD	183	35	33	26	21	20
COD	522	71	56	54	51	47
SS	380	8	5	3	2	0
Turbidity	120	35	11	3	2	4
pH	7.35	7.13	6.85	6.64	6.42	6.05
Alkalinity	557	505	450	400	340	268
Acidity	44	65	90	108	135	172
Alum dosage	-	50	120	170	240	320
Sedimentation	-	good	good	very good	good	good
Color	light beige	light turbid	clear	clear	clear	clear

TABLE 24. Alum with aid 2 ppm

24/12/17

	R	T ₁	T ₂	T ₃	T ₄	T ₅
BOD	210	41	38	37	41	35
COD	492	75	60	52	52	42
SS	396	13	8	7	0	0
Turbidity	120	44	25	15	10	5
pH	7.60	7.25	7.03	6.80	6.70	6.50
Alkalinity	542	510	462	440	390	342
Acidity	64	81	106	120	144	176
Alum dosage	-	50	120	170	240	320
Sedimentation	-	fair	good	very good	good	good
Color	light beige	light turbid	clear	clear	clear	clear

R = Raw wastewater

T = Treated water

TABLE 25. JAR TEST FOR TRIAL OPTIMUM VALUE OF LIME DOSAGE

Rapid mixing	1	minute	speed	95	rpm
Slow mixing	29	minutes	"	40	"
Sedimentation	30	"	"		

The Results are shown in table below

Lime with aid 5 ppm

21/12/17

	R	T ₁	T ₂	T ₃	T ₄	T ₅
BOD	125	35	29	26	22	21
COD	360	98	92	72	63	55
SS	372	25	19	13	8	3
Turbidity	120	78	72	26	9	8
pH	7.72	9.50	10.00	10.70	11.25	11.40
Alkalinity	570	630	695	730	780	830
Acidity	40	-	-	-	-	-
Lime dosage	-	90	180	270	360	450
Sedimentation	-	fair	fair	very good	good	good
Color	beige	turbid	turbid	clear	clear	clear

TABLE 26. Lime with aid 2 ppm

24/12/17

	R	T ₁	T ₂	T ₃	T ₄	T ₅
BOD	210	88	48	43	42	32
COD	492	226	105	91	83	79
SS	396	84	40	25	19	10
Turbidity	120	55	80	81	74	16
pH	7.60	8.55	9.15	9.82	10.30	10.90
Alkalinity	542	580	630	663	700	735
Acidity	64	-	-	-	-	-
Lime dosage	-	90	180	270	360	450
Sedimentation	-	fair	fair	good	good	very good
Color	beige	white turbid	white turbid	white turbid	white turbid	clear

R = Raw wastewater

T = Treated water

TABLE 27. JAR TEST FOR TRIAL OPTIMUM VALUE OF FERRIC CHLORIDE

Rapid mixing	1	minute	speed	95	rpm
Slow mixing	29	minutes	"	40	"
Sedimentation	30	"			

The Results are shown in table below

FeCl_3 with aid 5 ppm

25/12/17

	R	T ₁	T ₂	T ₃	T ₄	T ₅
BOD	105	33	32	16	15	11
COD	332	48	44	30	28	21
SS	460	8	5	0	0	0
Turbidity	120	56	44	27	20	12
pH	7.62	7.08	6.82	6.55	6.32	5.70
Alkalinity	490	410	340	265	193	122
Acidity	56	70	80	94	105	120
FeCl_3 dosage	-	50	100	150	200	250
Sedimentation	-	fair	fair	very good	very good	very good
Color	light beige	yellowish	yellowish	clear	clear	clear

TABLE 28. FeCl_3 with aid 2 ppm

24/12/17

	R	T ₁	T ₂	T ₃	T ₄	T ₅
BOD	210	40	38	37	32	35
COD	492	150	85	76	73	76
SS	396	11	7	2	4	8
Turbidity	120	54	48	39	36	30
pH	7.60	7.10	6.92	6.77	6.60	6.40
Alkalinity	542	510	470	430	400	362
Acidity	64	75	82	93	100	110
FeCl_3 dosage	-	50	100	150	200	250
Sedimentation	-	fair	very good	very good	good	fair
Color	light beige	yellowish	clear	clear	clear	clear

R = Raw wastewater

T = Treated water



TABLE 29. COMPARISON BETWEEN HOURLY AND DAILY AVERAGE VALUE
OF RAW WASTEWATER

	* Hourly	** Daily
BOD in mg/l	142	155
COD in mg/l	452	424
pH	7.075	7.14
Turbidity in FTU	122	122.6
Alkalinity as CaCO ₃	315	332.5
Acidity as CaCO ₃	28.2	36
Total Solids mg/l	768	892
Suspended Solids mg/l	364	400
Dissolved Solids mg/l	407.5	496.25

* From table 2

** From Fig. 7 - 15

TABLE 30. COMPARISON PERCENTAGE OF REMOVAL BETWEEN ALUM, LIME AND FERRIC CHLORIDE COAGULANTS

14/12/17

	R	A = 20 - 180 mg/l		L = 50 - 350 mg/l		F = 50 - 200 mg/l	
		T	% removal	T	% removal	T	% removal
BOD in mg/l	173	60 - 27	65 - 84	47 - 21	73 - 88	41 - 20	77 - 89
COD in mg/l	475	127 - 35	73 - 92	130 - 46	73 - 91	88 - 41	82 - 92
SS in mg/l	572	65 - 2	88 - 99	69 - 7	88 - 99	26 - 0	96 - 100
Turbidity units FTU	130	65 - 4	50 - 98	90 - 10	31 - 93	71 - 3	46 - 98
pH	7.40	7.10-6.10	-	8.60-11.38	-	6.75-5.49	-
Alkalinity mg/l as CaCO ₃	330	305 - 101	8 - 70	348 - 453	-	260 - 46	2 - 87
Acidity mg/l as CaCO ₃	23	30 - 96	-	-	100	43 - 104	-

R = Raw wastewater

T = Treated water

A = Alum dosages

L = Lime dosages

F = Ferric chloride dosages

TABLE 31. COMPARISON PERCENTAGE OF REMOVAL BETWEEN ALUM, LIME AND FERRIC CHLORIDE COAGULANTS

16/12/17

	R	A = 20 - 200 mg/l		L = 75 - 450 mg/l		F = 50 - 300 mg/l	
		T	% removal	T	% removal	T	% removal
BOD in mg/l	134	41 - 21	70 - 85	32 - 15	77 - 89	31 - 19	77 - 86
COD in mg/l	369	70 - 27	82 - 93	70 - 30	82 - 92	79 - 35	79 - 91
SS in mg/l	436	60 - 0	87 - 100	30 - 0	94 - 100	22 - 0	95 - 100
Turbidity units FTU	130	34 - 3	74 - 98	43 - 18	67 - 87	28 - 3	79 - 98
pH	7.12	7.00-6.05	-	8.68-11.55	-	6.72-3.90	-
alkalinity mg/l as CaCO ₃	302	270-42	11 - 87	360-625	-	233 - 0	23 - 100
Acidity mg/l as CaCO ₃	48	52 - 94	-	-	100	72 - 270	-

R = Raw wastewater

T = Treated water

A = Alum dosages

L = Lime dosages

F = Ferric chloride dosages

TABLE 32. COMPARISON PERCENTAGE OF REMOVAL BETWEEN ALUM AND ALUM WITH AID

22/12/17

	R	A =50-320 mg/l		A =50-320 mg/l + a	
		T	% removal	T	% removal
BOD in mg/l	183	50 - 32	73 - 83	35 - 20	81 - 90
COD in mg/l	522	133 - 60	75 - 89	71 - 47	87 - 91
SS in mg/l	380	32 - 0	92 - 100	8 - 0	98 - 100
Turbidity units FTU	120	42 - 2	65 - 99	35 - 4	71 - 97
pH	7.35	7.00-6.15	-	7.13-6.05	-
Alkalinity as CaCO ₃	557	507-242	9 - 57	505-268	10 - 52
Acidity as CaCO ₃	44	66 - 180	-	65 - 90	-

R = Raw wastewater

T = Treated water

A = Alum dosages,

a = aid 5 ppm

TABLE 33. COMPARISION PERCENTAGE OF REMOVAL BETWEEN LIME AND LIME WITH AID

21/12/17

	R	L =90-450 mg/l		L =90-450 mg/l + a	
		T	% removal	T	% removal
BOD in mg/l	125	58 - 28	54 - 78	35 - 21	72 - 84
COD in mg/l	360	135 - 70	63 - 81	98 - 55	73 - 85
SS in mg/l	372	34 - 0	91 - 100	25 - 3	94 - 99
Turbidity in FTU	120	78 - 4	35 - 97	78 - 8	35 - 94
pH	7.72	8.80-11.30	-	9.50-11.40	-
Alkalinity mg/l as CaCO ₃	570	620 - 825	-	630 - 830	-
Acidity mg/l as CaCO ₃	40	-	100	-	100

R = Raw wastewater

T = Treated water

L = Alum dosages

a = aid 5 ppm

TABLE 34. COMPARISON PERCENTAGE OF REMOVAL BETWEEN FeCl_3 AND FeCl_3 WITH AID

25/12/17

	R	F = 50 - 250 mg/l		F = 50 - 250 mg/l + a	
		T	% removal	T	% removal
BOD in mg/l	105	28 - 15	74 - 86	33 - 11	69 - 90
COD in mg/l	332	70 - 23	79 - 94	48 - 21	86 - 94
SS in mg/l	460	17 - 0	97 - 100	8 - 0	99 - 100
Turbidity in FTU	120	25 - 1	80 - 100	56 - 12	54 - 90
pH	7.62	7.08-6.00	-	7.08-5.70	-
Alkalinity mg/l as CaCO_3	490	413 - 108	6 - 78	410 - 122	17 - 76
Acidity mg/l as CaCO_3	56	69 - 125	-	70 - 120	-

R = Raw wastewater

T = Treated water

F = FeCl_3 dosages

a = aid 5 ppm.

TABLE 35. COMPARISON PERCENTAGE OF REMOVAL BETWEEN ALUM + AID, LIME + AID, AND FeCl_3 + AID

24/12/17

	R	A = 50 - 320 mg/l + a		L = 90 - 450 mg/l + a		F = 50 - 250 mg/l + a	
		T	% removal	T	% removal	T	% removal
BOD in mg/l	210	41 - 35	81 - 84	88 - 32	59 - 85	40 - 35	81 - 84
COD in mg/l	492	75 - 42	85 - 92	226 - 79	55 - 84	150 - 76	70 - 85
SS in mg/l	396	13 - 0	97 - 100	84 - 10	79 - 98	11 - 8	97 - 98
Turbidity units FTU	120	44 - 5	64 - 96	55 - 16	55 - 87	54 - 30	55 - 75
pH	7.60	7.25-6.50	-	8.55-10.90	-	7.10-6.40	-
Alkalinity mg/l as CaCO_3	542	510-342	6 - 37	580-735	-	510-362	6 - 34
Acidity mg/l as CaCO_3	64	81 - 176	-	-	100	75 - 100	-

R = Raw wastewater

T = Treated water

a = aid 2 ppm

A = Alum dosages

L = Lime dosages

F = Ferric Chloride dosages