(1) பக்கங்களின் எண்ணிக்கை 96

(2) புதுக்கித் திருப்பிய நாள் 10/89

(3) ஆதாரங்குறிப்பவர் சுருக்கொப்பம்

தமிழ்நாடு ஆவணக் காப்பகம்.

31

தமிழ்நாடு அரசு

PWD துறை

அரசாணை எண். மு. கோப்புத் தாள் எண்.	1293	அச்சகம் பலவகை
நாள் :	14 5 1889	198 .

மடிக்கவோ கண்டபடி கையாளவோ கூடாது

~~4th Sheets~~

48

ஆவண. கா-1—18,000—15-6-87.

1293 Madras Water Works

Project 3A

1293

Dimensions of Pipes – (Mains)

[illegible]	[illegible]	[illegible]	[illegible]	Length	~~Total~~ Weight	Add 1/9 for Sockets	Total Weight	Tons	Cwt	Qrs	lbs
14	15"	1"	186·2	1320	245784·0	27309·3	273093·3	126	16	2	5
15	13	3/4	108·4	792	23052·8	2561·4	25614·2	11	8	2	2
16	12"	3/4	93·7	1276	119561·2	13284·5	132845·7	59	7	3	17
17	11"	5/8	71·0	1178	83638·0	9293·1	92931·1	41	9	2	27
19	9	1/2	46·5	1002	46552·0	5172·4	51724·4	23	1	3	8
78	8"	1/2	41·6	3730	155168·0	17240·9	172408·9	76	19	1	12
27	12	3/4	93·7	1900	178030·0	19781·1	197811·1	88	6	0	1
32	10"	1/2	51·4	1320	67848·0	7538·7	75386·7	33	13	0	10
90	6"	1/2	31·9	5050	161,095·0	17899·4	178994·4	79	18	[illegible]	[illegible]
78	8"	1/2	41·6	3650	151,840·0	16871·1	168711·1	75	6	1	
84	6"	1/2	31·9	4340	138,446·0	15382·9	153828·9	68	13	1	
	Total.			25568				684	11	1	5
					Add for breakage [illegible] 5%			34	8	2	23
					Total Tons			715	0	0	0

At 130 Rs per ton = Rupees 92950.

Total cost of pipes 92,950 + 26,650 = 1,19,600
Total cost of Hydrants ~~[illegible]~~ 7500
Total 1,27,100.

Pipes as per Estimate 1,39,100
Hydrants Do 13,500
1,52,600

~~[illegible]~~

Difference Saving 1,52,600 – 1,27,100 = 25,500

~~[illegible]~~

~~Difference~~

~~At~~ 13,250 10

[illegible] Works

Project 3 A

1293

Denominations of Pipes (Distributaries)

Sections	Hydrants	Pipe	Thickness of metal	Weight lb per foot	Length	Weight	Add 1/9 for Socket	Total Weight	Total Tons	Cwts	Qrs	lbs
19	15	3"	3/8"	12·4	10000	124,000·0	13777·8	137777·8	61	1	0	25
78	10	3"	3/8"	12·4	9000	111,600·0	12400·0	124000·0	55	7	0	16
32	8	3"	3/8"	12·4	4,800	59520·0	6613·2	66133·2	29	10	1	25
78	12	3"	3/8"	12·4	8000	99,200·0	11022·2	110222·2	49	4	0	14
84	6×	3"	3/8"	12·4								
tal	51		Length	31800					195	2	3	24
				Add for breakage &c about 5%					9	17	0	4
							Total Tons		205	0	0	0

At 130 Rs per Ton = Rs 26650

N.B.

× 5 off the eighty Hydrants will be as of the mains and ~~[illegible]~~ 1 for the distributaries in which is

2 2

F0 ~~At~~ 13,250 10

Madura Water Works.

Project No. 3 Appendix No. 34.

Dimensions and Weight of Pipes.

Pipe	Thickness of Metal.	Weight per foot.	Length	Weight	Add 1/9 for Sockets	Total Weight.	Total			
							Tons	Cwt.	Qrs.	lbs
15"	7/8"	136.1	1,320	179,652.0	199,61.3	199,613.3	89	2	1	1
13"	3/4"	108.4	792	85,852.8	95,39.2	95,392.0	42	11	2	24
12"	3/4"	93.7	1,276	119,561.2	132,84.6	132,845.8	59	6	0	13
11"	5/8"	71.0	1,178	83,638.0	92,93.1	92,931.1	41	9	2	27
9"	1/2"	46.0	1,012	46,552.0	51,72.4	51,724.4	23	1	3	8
8"	1/2"	41.6	4,356	181,209.6	201,34.4	201,344.0	89	17	2	24
7"	1/2"	36.8	6,248	229,926.4	255,47.4	255,473.8	112	1	0	1
6"	1/2"	31.9	17,380	554,422.0	616,02.4	616,024.4	275	0	0	24
5"	1/2"	26.9	7,756	208,636.4	231,81.8	231,818.2	103	9	3	6
4"	3/8	16.1	7,172	115,469.2	128,29.9	128,299.1	57	5	2	3
3"	3/8"	12.4	11,866	147,138.4	163,48.7	163,487.1	72	19	2	23
Total length			60,356			Total..	966	5	2	14
						Add for breakage, &c. at about 5 % - - - -	48	14	1	14
						Total Tons...	1015	0	0	0

At 130 Rupees per Ton = Rupees 131,950.

Cost of pipes (with Hydrants at about 450' apart) Rs 139,100.
— Do. — Do. — Do. 800' - Do. Rs 131,950

Difference Rs 7,150.

Cost of 90 Hydrants 450' apart at Rs 150 each = Rs 13,500.
- Do. 50 - Do. - 800' - Do. at Rs 150 Do. = Rs 7,500. 3

3

Difference Rs 6,000.

To ~~Rs~~ 13,250 10

Madura Water Works.

Project No. 3. Appendix No. 36.

Details of Values.

1293

Quantity	Particulars.	Rate delivered at Madras. Rs	as	p	Per.	Amount Rs	as	p	Total. Rs	as	p
	Stop Values.										
1	15" Stop Value	250	"	-	Each	250	"	-			
1	13" — do	176	"	-	do	176	"	-			
1	12" — do	148	"	-	do	148	"	-			
1	11" — do	130	"	-	do	130	"	-			
1	9" — do	95	"	-	do	95	"	-			
4	8" — do	86	"	-	do	344	"	-			
7	7" — do	70	"	-	do	490	-	-			
16	6" — do	60	"	"	do	960	"	-			
7	5" — do	52	"	-	do	364	"	-			
6	4" — do	48	"	-	do	288	"	-			
25	3" — do	33	"	-	do	825	-	-			
	Total cost								4,070	"	-
	Air Values.										
6	4" Air Values	83	"	-	Each	498	"	-			
12	3" — do	60	"	-	do	720	"	-			
12	2" — do	40	"	-	do	480	"	-			
	Total								1698	-	-
	Total								5768	-	-
	Contingencies and fixing at about 10%								572	"	-
	Total Rupees								6,340	0	0

Cost of Values with Hydrants at about 450' apart Rs 6470
— Do — Do — 800 Do Rs 6340
Difference Rs 130.

Rs 13,250

Comparative Statement showing differences in pipes &c. between the Estimate submitted for the No. 3 Project and the Revised estimate prepared in this Office.

1293

Item No.	Description	In Estimate as submitted			In Estimate as revised.			Differen		
		Rs	as	P.	Rs	as	P.	Rs	as.	P.
1	Pipes	139,100	..	..	131,950	..	..	7,150	..	..
2	Valves	6,470	..	..	6,340	..	..	130	..	..
3	Hydrants	13,500	..	..	7,500	..	..	6,000	..	..
					Total Rs			13,280	0	0

5

5

2nd March/89.

Rs 13,280 10

Madura Water works.

Project No. 2. Appendix No. 27.

Dimensions, Weight and Cost of Pipes.

Pipes	Thickness of Metal	Weight per foot	Length	Weight	Add 1/9 for Socket	Total Weight	Total			
							Tons	Cwts	Qrs	lbs
12"	3/4"	93.7	2,376	222,631.2	24,736.8	247,368.0	110	8	2	16
11"	5/8"	71.	3,080	218,680.	24,298.0	242,978.	108	9	1	22
8"	1/2"	41.6	3,080	128,128.0	14,236.4	142,364.4	63	11	0	12
7"	1/2"	36.8	6,808	250,534.4	27,837.1	278,371.5	124	5	1	23
6"	1/2"	31.9	8,074	257,560.6	28,617.8	286,178.4	127	15	0	18
5"	1/2"	26.9	12,100	325,460.0	36,162.2	361,622.2	161	8	3	2
4"	3/8"	16.1	4,114	75,798.8	8,422.1	84,220.9	37	11	3	24
4"	3/8"	16.1	3,619	58,265.9	6,473.8	64,739.7	28	18	"	3
3"	3/8"	12.4	15,335	190,154.0	21,128.2	211,282.2	94	6	1	22
Total length			58,586			Total ...	856	15	"	2
				Add for breakage &c. at about 5%			41	4	3	26
						Total Tons –	898	0	0	0

At 130 Rupees per Ton = Rs 116,740.

Cost of pipes (with Hydrants at about 450' apart)	Rs 128,180.
—— Do. —— Do. —— 800' - Do.	Rs 116,740.
Difference Rs ...	11,440.

Cost of 90 Hydrants 450' apart at Rs 150 each = Rs 13,500.

- Do. - 50 - Do. 800' - Do. at Rs 150 each = Rs 7,500.

Difference Rs 6,000.

Madura Water works.

Project No. 2 Appendix No. 28.

Details of Tees and Bends.

Tees				Bends				Total weight of Tees and Bends.			
Diameter in inches	No.	Weight of each pipe	Total weight in lbs	Diameter in inches	No.	Weight of each pipe	Total weight in lbs	Tons	Cwts	Qrs	lbs
12"	1	8433	843·3	¼" Bends 8"	1	168	168				
11"	1	639	63·9	do. 5"	1	70	70				
8"	1	374·4	374·4	do. 4"	1	56	56				
7"	4	331·2	1,324·8	do. 3"	5	42	210				
6"	2	287·1	574·2	⅛" do. 7"	2	168	336				
5"	2	178·1	356·4	do. 4"	3	56	168				
4"	10	144·9	1,449·0	do. 3"	2	42	84				
4"	12	144·9	1738·8								
3"	22	111·6	2,455·2								
Total lbs			9180·0				1,092				
or Total Tons			4-1-3-24				0-9-1-16				
							Total..	4	11	1	12
							Add for breakage, &c. ...	0	8	2	16
							Total --	5	0	0	0

At 200 Rupees per Ton = 1,000 Rupees.

Cost of Tees and Bends with Hydrants at about 450' apart Rs 1200
—— Do. —— Do. —— Do. – 800' Do. Rs 1000

Difference Rupees 200.

J 7

Madura Water works.

Project No. 2

Appendix No. 29.

Details of Values. | 293

Quantity	Particulars	Rate delivered at Madras Rs	as	p	Per	Amount Rs	a	p	Total Rs	as	p
	Stop Values.										
1	12" —— do ——	153	"	"	Each	153	"	"			
1	11" —— do ——	140	"	"	do	140	"	"			
1	8" —— do ——	86	"	"	do	86	"	"			
3	7" —— do ——	70	"	"	do	210	"	"			
3	6" —— do ——	60	"	"	do	180	"	"			
6	5" —— do ——	52	"	"	do	310	"	"			
13	4" —— do ——	48	"	"	do	624	"	"			
12	4" —— do ——	48	"	"	do	576	"	"			
22	3" —— do ——	33	"	"	do	726	"	"			
	Total cost of Stop Values - - - - -								3,005	"	"
	Air Values.										
6	4" —— do ——	83	"	"	Each	498	"	"			
12	3" —— do ——	60	"	"	do	720	"	"			
12	2" —— do ——	40	"	"	do	480	"	"			
	Total Rupees - - - -								1,698	"	"
	Total - - - -								4,703	"	"
	Contingencies and fixing at about 10% - - - -								467	"	"
	Total Rupees - - - -								5,170	"	"

cost of Values with Hydrants at about 450' apart Rs 5,610.
—— Do —— —— Do – 800' Do Rs 5,170.
Difference Rs - - 440.

8

8

points instead of 450, would be [illegible]

Rs 13,250

10

Comparative Statement showing differences in pipes &c between the Estimate submitted for the No 2 Project and the Revised estimate prepared in this office.

Item No	Description	In Estimate as submitted			In Estimate as revised			Difference		
		Rs	as	p.	Rs	as	p.	Rs	as	p.
1	Pipes	128180	-	-	116740	-	-	11440	-	-
2	Tees and Bends	1200	-	-	1000	-	-	200	-	-
3	Valves	5610	-	-	5170	-	-	440	-	-
4	Hydrants	13500	-	-	7500	-	-	6000	-	-
					Total Rs			18080	0	0

27th February/89.

…ones instead of 450, would be approximately

Fo

~~Rs~~ 13,280

Project No II

3619 feet of 4" pipe in place of 7238' of 3"
15335 " 3" " " " " 30670' of 2½"

12 4" tees in place of 25 3" tees
22 3" " " " " 44 2½ "

293

12 4" stop valves in place of 25 3" stop valves
22 3" " " " " " 44 2½ " "

90 Hydrants at 150 Rs each reduced to 50 at 150 Rs

The saving in Project No II by placing the Hydrants at an average distance of 500 feet from the houses, instead of 450 feet, would be approximately, as worked out in the accompanying tables Rs 18,080.

The number of hydrants being reduced from 90 to 50 the distributaries have been calculated to carry twice the quantity of water, by the formula
$Q \propto D^{\frac{5}{2}}$

The cost of laying is included in the rate of 130 Rs per ton allowed for the pipes –

Project No 3

11,866 feet of 3" pipe in place of 23,733' of 2½" pipe
25 stop valves 3" in place of 47 2½ valves.

Hydrants as in No II to be reduced from 13,500 Rs to 7500 Rs.

The saving in this case by placing the Hydrants at an average distance of 500 feet from the houses instead of 450, would be approximately Rs 13,280

To

10

Project No III A

Pipes (Mains)

P to 14	18" ✓	14 to 27	12" ✓
14 to 15	13"	27 to 32	10" ✓
15 to 16	12"	32 to 90	6"
16 to 17	11"	32 to 78	8" ✓
17 to 19	9"	66 to 84	6"
19 to 78	8"		

Pipes (Distributaries)

(14 to 19)	15 Hydrants	10000 feet of	3" pipe	
(19 to 78)	10 Hydrants	9000	Do	Do
(14 to 32)	8 Hydrants	4800	Do	Do
(32 to 78)	12 Hydrants	8000	Do	Do
(66 to 84)	6 Hydrants			
Total	51 Hydrants	31,800	Do	Do

Hydrants from 13,500 to 7,500 Rs.

The saving in this case would be approx^y 12000 Rs and by reducing the length of the distributaries some further saving would be possible.

It appears to me that the first point to be settled is the maximum distance from the houses that the Municipality are willing to accept; if it is agreed that 800 feet shall be the distance I would recommend that Project No

be revised accordingly. Probably a saving of 20,000 on the present estimate of Rs 3,31,600 might be effected – It is open to question however whether it is worthwhile to do away with the advantage of having the water supplied close to the houses, in order to effect any saving under 50,000 Rs and it does not appear likely that any redistribution would do this –

243

Project No II possesses an advantage over Nos III and III A in having 7 reservoirs, in place of one; thus reducing the risk of failure; but there is a decided advantage as regards supervision & control, in only having one reservoir close to the pumping station –

7.3.89

	Project No II	Project No III	Project No III A
As estimated by M^r O'S.	3,31,600	3,18,100	No estimate
Proposed reduction.	20,000	15 000	Nil
Revised Est.	3,11,600	3,03,100	~~[illegible]~~ ~~[illegible]~~ 2,88,100

The approximate savings as worked out were 18,080 and 13,280; these have been taken in round numbers at 20,000 and 15000.

The saving on Project No III by altering it to Project No II A worked out to ~~[illegible]~~ 25,500 Rs, this has been taken at ~~[illegible]~~ 30,000 Rs as the length of the distributaries could be reduced still more.

11 11

P. W. D

Note by the Chief Engineer

Madura Water Supply.

Mr. O'Shaughnessy has with considerable labour prepared a very complete report on the Madura Water Supply, giving the history of former projects proposed and showing what has been done to date. He also forwards 3 complete schemes for obtaining water from wells to be sunk in the Vaigai river, pumping it up and distributing it to the town. These have been carefully prepared and it is considered that much credit is due to Mr. O'Shaughnessy for the very complete way in which these schemes have been prepared.

It is not necessary for me to describe each scheme. This is done in Mr. O'Shaughnessy's report, and all I propose to do is to remark on the proposals and point out where I consider modification may be with advantage made.

Supply required.

This in the 3 schemes is taken as 800,000 gallons per 24 hours or nearly 90 cub. feet per minute. This gives a daily supply of 10 gallons per head for the existing population of 80,000.

This allowance is considered ample and liberal.

Quality of the water.

I myself have no doubt but that the water obtained from wells sunk in the Vaigai river is good wholesome water of better quality than that usually supplied to towns in India and even in Europe, but I consider that the Sanitary Commissioner

should

should record his opinion on it, and, as there have been several analyses of it made, I believe he can do this without any delay, and his official opinion should be given. What is wanted is a fair usable water that reaches a fair reasonable standard, and this it is ~~[illegible]~~ believed the Vaigai water is.

Quantity of water.

I regret that we have no positive information regarding this, and the experiments referred to in paragraphs 51 and 52 of the Report are not satisfactory, as in the 1st case the pumping was carried on for only 3 hours and in the 2nd for 48 hours. The supply pumped in the 1st case was only ·26 cub feet per 1" from 1 well, in the 2nd ·8 cub feet from 3 wells. What we want to know is the quantity of water, available in the sandy river bed, when there has been no supply in the river for a long period, (a reference to the water returns at the Railway bridge will show the number of months the river receives no supply in average years I — in 1878-79 no supply it is believed was received for 11 months) and this when for some months 90 cubic feet per minute has been taken from the river bed.

No doubt but that a dam built, as proposed will hold back, and collect the whole supply in the river bed, and render it available for the town supply, but what this supply after months of draught is, we have absolutely

absolutely no information whatever, and I can only repeat Mr. O'Shaughnessy's careful remarks, in paragraph 53 of his report, viz:- "It is probably safe to say that there will be water in abundance", and add that I agree with it but would substitute "sufficient" for "in abundance", and add that in famine years like 1878-79 the supply it is feared would fail.

The completion of the Periyar Project by keeping up a good supply in the river Vaigai, as far as the Parani anicut, will as pointed out increase the supply, but to what extent it is impossible to estimate; the Parani anicut is about 22 miles from Madura.

It is not likely however that there will be more water than

then can be used for Irrig=
=ation, but some little surplus
leakage &c may be calculated
on.

Head works.

I agree fully with the
proposal to move the site of
the Head works to near the
Railway, but before finally
fixing the site consider it
absolutely necessary for
borings to be taken above
and below the proposed
site so that we may know
the depth of the sand and
at what depth the Kunkur
is.

In paragraph 56 of the
Report, it is proposed to
sink 10 collecting wells
at distances 100 feet apart,
10 feet below the bed of the
river. This of course useless
sinking these wells any
depth into the Kunkur or

any

any strata that is practic=
=ally impervious to water,
as they are only required
to collect the water that is
in the sand or water-bearing
strata.

I believe that borings
will show that on the line
proposed for the wells the
sand is say 9 feet depth,
for a short distance only,
and that the Kunkur bed
rises at other places to
within a few feet of the river
bed, if not in places to the
surface. This is the case
~~of~~ at the site of the Causeway,
and at that of the new bridge,
and is probably the case at
the site for the wells now
proposed.

I fear therefore the proposal
made is not practicable.

Mr. Crole, in his note dated
24th August ~~1864~~ 1884 printed
in

Appendix 13. page 63, pointed out this objection, to the similiar proposal made by Mr. Jones.

There will be I consider no difficulty in arranging for a sunken Barrage or wall founded on the impervious strata below the sand being built, but before any attempt is made to design the works or settle the number or position of the wells, a careful series of borings must be taken both at the site, and for at least 1 mile, above. The latter is required in order that we may know whether there is a large area and depth of sand that will with the proposed Barrage form a reservoir for storage. It is possible but

but not very probable that there may be bands of rock or impervious strata across the bed of the river which may make it advisable to seek a new site for the Barrage, and wells, and perhaps it may be found advisable to place the wells above the new Vaigai bridge, making use of the retaining walls that are it is believed founded on the Kunkur as the Barrage.

The ~~ground~~ general design for the Barrage is approved of, but probably the culvert in it will not be required right across the river, and the depth of foundations may have to be increased in places. Careful borings will show what is required.

Man holes should be built at intervals of say 15 i feet, so that the culvert may be cleared of sand when required through them. It will not be practicable to build the wells as proposed in line; they will have to be built in groups where it is found the sand is deep enough.

The proposal of a built culvert from the wells to the collecting culvert, is not approved. An iron pipe would probably answer better, and by means of a plug, communication between any well and the culvert could be cut off.

It is a question whether the wells should not be made 12 or 15 feet in diameter, in ~~the plan~~ place of 10 proposed, and it is thought that the ring of ~~dury~~ dry rubble at the bottom of the wells had better be left out.

Reservoirs

Reservoirs & distribution.

These must be taken together. A reference to the plans shows that Mr Jones — see plate 1 — proposed that taps should be given, so that there should be one at a distance of less than 450 feet in a direct line from any of the houses in the populous parts of the City. This is in accordance with Act I of 1884 City of Madras Municipal Act section 138.

Project No I allows for 32 reservoirs with a storage of about 3/4 of the calculated daily supply of 800,000 gallons, and may be said generally to give a tap or supply within a distance of less than 800 feet from any of the houses.

Project No. 2 has 7 reservoirs with storage of ~~1~~ 5/8 of a days calculated supply and gives a tap or supply within a distance of less than 450 feet of any of the houses.

(Note: Should this project be carried out it is advisable that the height of reservoirs A and I be raised so that they may command respectively reservoirs B and D)

Project No. 3 has one Reservoir with the same storage as No. 2 – 5/8 of a day's supply – and as regards accessibility of taps is similiar to No 2.

I agree with Mr. O'Shaughnessy's remarks as regards the advisability and necessity for providing storage and for the present at all events storage for a little more than 1/2 the

the days calculated maximum supply should be sufficient.

With regard to the number of reservoirs I consider that the question is not between one Reservoir and Seven 7 (the cost of 7 being great and as far as I can see there is no advantage in having so many), but between 1 and say 3 or 4. One Reservoir is by far the cheapest arrangement, and if the Municipality are prepared to accept the risk, I see no reason why the proposals made in Project No. 3 for 1 reservoir should not be accepted. For my own part I should prefer 3 or 4 at an expenditure of say Rs 12,000 in excess of that, if 1 reservoir only is built.

With regard to distribution, an important saving may be made if the Municipality accept, as in Project No. 1, a greater distance from the taps to the houses than the 450 feet allowed in Nos. 2 & 3 Schemes, and this is a point that should have had received careful consideration and a definite decision on, before the projects were matured as they have been.

The short distance of 450 feet as in Madras is of course a great advantage, but it is Expensive; if a distance of say 800 feet was accepted many of the Branches would not be required and nearly all the distributaries

might

might be omitted. They could however be added at any future time if the town became rich enough to do so, at but a small Extra cost.

From the above it will be seen that the following is briefly my opinion regarding the proposals for the water supply of Madura.

1st That the Sanitary Commissioner should be called on to report on the quality of the water.

2nd. That as regards quantity, the fact that the supply in Famine Years would probably fail, must be accepted, but that in ordinary dry Years, although we have no proof, it is believed the supply would be sufficient.

3rd That the position &c of the Barrage, or wall, and the wells will require reconsideration and the best site &c cannot be determined until borings have been taken in the river beds. When the information required has been collected, there will be no difficulty in designing and executing the works. The cost probably will be less than estimated.

4th That the Municipality should decide whether they wish the storage of 500,000 gallons of water (a little more than 1/2 a days ultimate supply which is considered sufficient for

for the present) to be in one or more reservoirs. Having one reservoir is the cheapest, but a scheme of three or four reservoirs, ~~althou~~ although more expensive has great advantages.

5th. The Municipality should carefully consider the question of distribution. Should they consider that a distance of less than 800 feet in a direct line from any of the houses in the populous parts of the Town from the taps sufficient, an important saving in the cost of the project can be made.

6th. If a final decision is made on points 4 and 5 (number of reservoirs and distance apart of taps) then will with the plans and

Estimates that have been prepared, ~~there~~ ~~will~~ be no difficulty in completing a satisfactory but not perfect project (as it is feared the supply in dry years may be ~~short~~ short and that the supply will fail in famine years) for Madura.

WOB
22.12.06

[illegible] Col

Madura Water Supply
1893

Mr O'Shaughnessy has with considerable labour prepared a very complete report on the Madura water supply giving the history of former projects prepared and showing what has been done to date. He also submits 3 complete schemes for obtaining water from wells to be sunk in the Vigai river pumping it up and distributing it to the town. These have been carefully prepared and it is evident that much credit is due to Mr O'Shaughnessy for the very complete way in which these schemes have been prepared 22

~~The~~ It is not necessary for me to describe each scheme. This is done in Mr O'Shaughnessy's report and all I propose to do is to remark on the proposals and point out

23

in 1878/79 no supply
in behind was secured to
months.

when I consider unnecessary
may be with advantage
made.

Supply required

This in the 3 schemes is
taken as 800,000 Gallons
per 24 hours or nearly
90 cubic ft per ~~[illegible]~~ minute
this gives a daily supply
of 10 Gallons per head to
the ~~inhabitants~~ existing
population of 80,000
This allowance is considered
ample and liberal

Quality of the water

I myself have no doubt
but that the water
obtained from wells sunk
in the Vengai river is
good wholesome water
of far better quality
than that usually
supplied to Towns in
India and even in Europe
but I consider that
the Sanitary Commissioner
sh'd record his opinion
on it and as there have
been several analyses
of it made I believe he
can do this without an

delay considerable and then
his official opinion sh'd be
given. what is just wanted
is ~~[illegible]~~ a fair sample
water ~~may~~ [illegible]
mean [illegible]
~~water~~ then there [illegible]
~~than~~ this scheme [illegible]
be ~~condemned~~

that reaches us [illegible]
reasonable attention
and this it is believed
Vengai water ~~[illegible]~~

Quantity of water

I regret that no
positive information
this and the [illegible]
refined [illegible] 52
of the Ra[illegible]
[illegible]
[illegible]
[illegible]
The supply [illegible]
1st [illegible] only 2 [illegible]
~~[illegible]~~ [illegible]
in the [illegible] 3 [illegible]
What we want to know
is the quantity of water
available. [illegible]
after when there has been 23
no supply in the river the
~~[illegible]~~
long period ([illegible]
to the ~~Vengai~~ Water return
at the Railway bridge will 23
show the number of months
the river remains no supply
in average years×) and this

the [illegible] [illegible]
[illegible] the same
months [illegible] 90 [illegible]
[illegible] [illegible] [illegible] [illegible]
[illegible] Mitchell.
[illegible] that [illegible] a
built [illegible] [illegible]
[illegible] [illegible] [illegible]
the whole [illegible]
[illegible] [illegible]
[illegible] it [illegible] [illegible]
[illegible] [illegible] but which
[illegible] [illegible] after [illegible]
[illegible] is [illegible]
[illegible] [illegible]
[illegible] [illegible]
[illegible] [illegible] [illegible]
[illegible] [illegible] in 53
[illegible] [illegible]
[illegible] [illegible] to [illegible]
[illegible] [illegible]
[illegible] [illegible]
[illegible] [illegible] [illegible]
[illegible] in [illegible]
The [illegible] of the
Persian [illegible] [illegible]
[illegible] its [illegible] in the [illegible]
Virginia [illegible] as the Persian
[illegible] will [illegible] [illegible]
[illegible] the [illegible] but to
what extent it is [illegible]
[illegible] to estimate. The
[illegible] Persian [illegible] is about
22 miles [illegible] [illegible]
It is [illegible] likely [illegible] [illegible]
[illegible] will [illegible] water [illegible]
can be used for irrigation
but some little [illegible] to
[illegible] [illegible] [illegible] [illegible]

[illegible]

[illegible] the [illegible] [illegible]
[illegible] [illegible]
[illegible] [illegible] [illegible]
[illegible] [illegible]
[illegible]
[illegible] [illegible] [illegible]
[illegible] [illegible] [illegible]
[illegible] [illegible] [illegible]
[illegible] [illegible] [illegible]
[illegible] [illegible] [illegible]
[illegible] [illegible] [illegible]
[illegible] [illegible]
[illegible]
[illegible] [illegible] [illegible]
[illegible] [illegible] [illegible]
[illegible] [illegible] [illegible]
[illegible] the [illegible] [illegible]
[illegible] of the [illegible]
[illegible] [illegible] [illegible]
[illegible] [illegible] [illegible]
the [illegible] [illegible] [illegible]
[illegible] [illegible]
[illegible] [illegible] [illegible] [illegible]
[illegible] [illegible] [illegible]
the [illegible] [illegible] [illegible] the
[illegible] [illegible] [illegible]
[illegible] [illegible]
[illegible] [illegible] [illegible] [illegible]
[illegible] [illegible] [illegible] the [illegible]
the [illegible] the [illegible]
[illegible] of the [illegible]

[illegible]

[illegible] the earth,
tells not the [illegible]
~~above~~ it [illegible] not [illegible]
1 mile [illegible]
is requiring to extend the
~~depth~~ [illegible] may [illegible]
while then there is [illegible]
area and depth [illegible]
same that with [illegible]
the [illegible] Burns
in [illegible]
It is possible but
very probable that
many the [illegible] of [illegible]
in [illegible] strata
because the [illegible] of the
which may [illegible]
[illegible] the [illegible]
[illegible] that the [illegible]
[illegible] walls
The design [illegible] Burns
[illegible]
[illegible]
[illegible] practicable
[illegible] it is [illegible]
[illegible]
they will [illegible] in the [illegible]
[illegible] where it is
found the sand is dark
enough
75
[illegible] of a [illegible]
[illegible] then the wells
collecting [illegible]

[illegible]
[illegible] unbroken strata
[illegible]
But before long [illegible]
[illegible] much in [illegible]
larger the water [illegible]
[illegible] the [illegible]
[illegible] of the wells
be carried [illegible] of

[illegible] [illegible] [illegible]
carry [illegible] can [illegible]
[illegible] [illegible] probably
and [illegible] better [illegible]
[illegible] action [illegible] be
[illegible] [illegible] [illegible]
[illegible] if necessary
communication between
the [illegible] [illegible] the collecting
[illegible] [illegible] be cut off
by means of [illegible]
communication between [illegible]
[illegible] [illegible] [illegible]
[illegible] could be cut off.
It is a question whether
[illegible] [illegible] [illegible]
a 15 ft [illegible] [illegible]
[illegible] of [illegible] [illegible]
[illegible] that the [illegible]
[illegible] the bottom
[illegible] better [illegible]
[illegible]
[illegible]
together [illegible]
the plans [illegible]
[illegible] 2 [illegible]
show [illegible] Projects 2 3
allow for [illegible] [illegible]
at distances of [illegible]
show that Mr [illegible]
[illegible] 1 [illegible]
[illegible]

to so that the [illegible]
are at a distance of
than 450 ft in a [illegible]
line direct line [illegible]
any of the houses in the
[illegible] parts of the [illegible]
This is in accordance [illegible]
the Act I of 1884
City of [illegible] [illegible]
Act Section 138
Project No 1 allows [illegible]
32 Reservoirs with a
storage of about 3/4 of
the calculated daily supply
of 8,00,000 gallons and
[illegible] the said quantity
gives with a tap a supply
within a distance of less
than 800 ft [illegible]
any of the houses
Project No 2 has 7 Reservoirs
with storage of ~~about~~ 5/8
[illegible] a days calculated supply
and gives a tap a supply
within a distance of less
than 450 ft of any of
the houses ×
Project No 3 has 1 Reservoir
with the same storage as
No 2 5/8 of a days supply
and as regards accessibility
of taps is similar to
No 2 25 28
I agree with Mr [illegible]
remarks as regards the

safety and necessity
viding, ~~storage~~
~~[illegible]~~ storage and
the present at all
ts storage to a
the same than 1/2 the
days calculated maximum supply
d be sufficient
With regard to the
umber of Reservoirs
I consider that so
nd the question is
t between 1 Reservoir
d 7 the (the cost
f 7 being great and as
n as I can see ~~has~~
~~[illegible]~~ there is
o advantage in "being
so many"), but between
and say *3 or 4
~~With 4~~
The extra cost of 4 is
of course great
1 Reservoir is by far
the simplest arrangement
and if the Municipality
are prepared to accept
the risk of ~~[illegible]~~ I
see no reason why
the proposals made in
project No 3 for 1 Reser
es shd be 9

1293

* (Note shd this project be
carried out it is advisable
that the height of
reservoirs A & F be
raised ~~say~~ so that they
may command respective
Reservoirs B & D)

21 ~~25~~
~~26~~

28

~~23~~

× in 1878/79 we actually
it is behind our record by
11 months.

× and add that in famine years like 1878/79 the supply it is feared would be ~~insufficient~~ ~~short~~ fail

× and ~~[illegible]~~ perhaps it may be found advisable to place the walls where the new Vaigai Bridge crossing was of the Retaining walls that are it is believed founded on the Kunkur as the Barrage

× and the depth of foundation may have to be increased in places careful borings will show ~~[illegible]~~ what is required. Man holes should be built at intervals of say 150 ft so that ~~water found~~ the culvert may be cleared of sand when drifted through them.

129

214

5.2.93

5203

30 27

sh^d not be accepted
be any one part I
sh^d prefer 3 or 4 at
an increased calculation
of say R 15,000 in
excess of ~~the Reservoir~~
that if the Reservoir only
is built 1793

With regard to distribute
~~[illegible]~~
as ~~considerable~~ substantial saving
being the result of the
[illegible] accept
as in project No 1
a ~~short~~ greater distance than
to be from the tops
of the several basins
than the 450 ft allowed
in No 2 & 3 scheme
~~as is clear in the~~
and this is a point
that sh^d have been
several careful consideration
and a definite [illegible]
decision come to before the
projects were matured
as they have been
The short distance
of 450 ft as in 2
schemes is of no
a great advan

but it is in continuation
of a distance of say
800 ft was adopted
accepted a saving of
the Branches would
not be required and
merely with the distribution
might be omitted
They would require to
added at any future
time if the storage became being
rich enough to do
so at once take
a small extra
cost

From the above it will
be seen that the following
is briefly my opinion
regarding the ~~water supply~~
~~of the~~ proposals for
the water supply of Madras
1st That the Sanitary
Commission sh'd be
called on to report on
the quality of the water
2nd That as regards
quantity the fact that
[illegible] say [illegible] used in France
[illegible] ~~the~~ x ~~which~~ would
[illegible] the proved that
[illegible] for an although
[illegible]

x probably [illegible]

1293

78 31

in times as proof it
is believed the supply
would be sufficient

3rd That the Municipality
sh'd decide whether they
wish the storage of
5,00,000 gallons of water
~~water~~ (a little more than
1/2 a days ultimate supply
which is considered sufficient
for the present) to be
in 1 or more Reservoirs
the having one Reservoir is
the cheapest but 3 or 4
Reserv. although more
expensive has great
advantages

187

~~3~~ 4 That the position of
of the Barrage or wells
and the wells will require
reconsideration and the
best site cannot be cannot
be decided until borings
have been taken in the
river bed, ~~which~~ when
~~too~~ the information req'd
has been collected there will
be no difficulty in designing
them & executing the works
the cost probably will be
less than estimated 28

5 The Municipality shou'd
carefully consider the
question of distribution

sh^d they consider that
a distance of less than
800 ft .. a direct line
from any of the houses
in the [illegible] parts
of the town from the
Tubes sufficient an ~~[illegible]~~
important saving in the
cost of the project can
be made.

6 If a final decision
is made on points 4 & 5
(number of [illegible] &
distance about of Tubes)
within the plans & estimates
that have been prepared
there will be no difficulty
in ~~[illegible]~~ completing them
in satisfactory ~~[illegible]~~
~~[illegible] [illegible] for [illegible]~~
but not perfect ~~[illegible]~~ manner (it is
hoped the subsidy in dry
years may be short
and that the subsidy will
[illegible] in [illegible] years)
for [illegible]

20/12/[illegible]

The note by W is to be
fair copied & sent to D U

20.12.58

---

24 ~~8,000,000~~

80.000
10

12 / 800,000

24

2 / 66666

[illegible] 60 / 33333

1' 6.25 / 555.00 (9
5625

1793

555 galls per 1'

90 c ft per 1'

1½ — per 1"

Which 86   6.25 / 30000 (4

300 galls per 1'

5 galls per 1"   less than 1 ft per 1"

.16   6.25 / 5

.8 c ft

60 / 100 galls per 1'

1.66 per 1"

.16

996

166

.2656

~~30~~ 33

1293

P	Station Ground 436.8		
A	— 437.3	453.3	462
B	442.6	458.6	
C	439.5	455.5	
D	435.6	451.6	
E	425.5	441.5	
F	437.3	452.3	455
G	431.6	447.6	

Octg pipes [293

10" 9 ft length 5 .. 0 .. 20

4

20

28

580 lbs

deduct 10 p.c. 58

9 | 522 lbs

per ft run 58 lbs

1/2 in 51.5 5/8 65.2 lbs

9" - 9 ft length 4 .. 1 .. 14

4

17

28

135

34
14

489

44

9 | 440

39 lbs

3/8" thick = 34.5 1/2 46.6

6" 9 ft long 2 .. 1 .. 18

4

9

28

252

18

9 | 234

26 lbs per ft

3/8 - 23.5 1/2 31.9

5" " 1 .. 3 .. 18

4

7
28

196

18

9 | [illegible]

214

21

9 | 193

21.4

3/8 19.7 per ft

Act I of 84

1293 Water - Tax. City of Madras Municipal Act
Applies only to Madras Town

Section - 138.

Water tax on buildings and lands.

To enable the Commissioners to provide for the maintenance, repairs, extension, improvement and other incidental expenses of water works heretofore provided or hereafter to be provided, together with interest on any loan heretofore contracted for the construction of such works or which may be hereafter specially contracted for the purposes aforesaid, the Commissioners may impose an annual tax upon all buildings and lands except those exempted under Section one hundred and nineteen and as hereinafter provided; at such rate not exceeding four per centum upon the annual value thereof within the populous parts of the City and upon all other buildings and lands and sheds &c and not exceeding two per centum on the annual value thereof elsewhere as appears to the Commissioners sufficient for the purpose.

Power to exempt any division or part thereof from whole or part of water tax.

Provided that the Governor in Council may, from time to time, by notification in the Fort St. George Gazette, exempt any division or part of a division from the payment of the water tax or any part of it and may also from time to time remove such exemption.

General Conservancy —

Water-Supply

Section

212. The Commissioners shall provide a supply of drinking water within the City, and shall for that purpose cause such pipes to be laid, and such tanks, reservoirs or other works to be made or set apart as are necessary for the supply of wholesome water in the Public Streets of the City; and shall cause to be erected in such streets convenient stand pipes, fountains, open reservoirs or pumps for the gratuitous use of the inhabitants of the City for domestic purposes.

The Commissioners provide water supply

Such Stand pipes, fountains, reservoirs or pumps shall be so placed within the populous parts of the City that there shall be one at a distance not exceeding one hundred and fifty yards measured in a direct line from any house in any Public Street.

Distance of stand pipes &c

It shall be the duty of the Commissioners as far as possible to make adequate provision that such supply of water shall be continuous throughout the year, and that the water supplied may be at all times pure and fit for human consumption.

Supply to be Continuous

[29]

Issue today
Cu
26/12

~~33~~ 37

V/

5258C d/26-12-88 P.W.D.

Memo 1293

Note by the Chief Engr P.W. Dept — d 22-12-88

Forwarded to the Local & Municipal Dept, with reference to endt from that depm ~~[illegible]~~ No 963 of 8th Novr 1888, herewith returned with enclosures

22.12.88

22/12/88

38 34

To the L & M. Dept
with papers returned

C

25-12-88

D
20/12

5258C d/26-12-88

1293 1686

This [illegible] the [illegible] the
[illegible] ~~+~~ about ½ the
mains will not be required
but the mains left ~~—~~ will
have to be enlarged
The number of hydrants will
be reduced

I for necessary action.

C.a.w. ~~35~~ Ces 39
20-2-89

The abstract est. and
the [illegible] are not in the
file with your [illegible] let me
have them — [illegible] 21/2/89

12931686

I 1543 Never written
for the volume,
& you can keep
the file until
it comes

Ch
21-2-07

~~38~~ 40

R 92950
26650
1,19,600 [293

[illegible] 1,39.100 ~~R 1.19.600~~

Ce dill 19,500

Hyderabad 90 & 51 6.500
R 13500 & 7.500

26.000

Le No II [illegible] R 20.000

Le No III —— R ~~28.000~~
36.000

~~37~~ 41

N.B.—The reply to this communication should be addressed to the Chief Secretary.

CHIEF SECRETARIAT, MADRAS.

1293

1293

Memorandum.

Dated the 19th February 1889.

No. 194

With reference to his note on the Madura water supply Scheme, transferred to this Department with Public Works Department Memo: No. 5258C d/ 26th December /88 the Chief Engineer Public Works Department is requested to be good enough to state whether he can roughly estimate the saving in the cost of the distributaries which would be effected by substituting 300 feet for 450 feet as the limit of distance from the taps to the houses. The papers are herewith forwarded for reference & return with the reply.

(By Order)

42

~~35~~ 38

Asst. Secretary.

To

The Chief Engineer P. W. D. thro' the Secretary to Govt. Public Works Department.

OTTC N: 1080

Rg 20.2.89

E.14

129/3 Fair Draft

Memo. re sending the papers

With reference to Memo No 194 of 19th Feb 89 from the L & M Dept, the Chief Engineer has the honor to state that the saving in the cost of the distributaries by substituting 500 feet for 450 feet as the limit of distance from the taps to the houses, would be approximately in Project II Rs 20,000, and in Project III Rs 30,000.

WCB
7.3.89

The papers containing the calculations are to be retained in this office – those sent by the L & M Dept for reference to be returned.

4B

To the L & M Dept
the orig. papers returned

80/1

No. 1153 C

P. W. Deptt
7 March 89

Memo
-

1293

With reference to Memo No. 194 of 19 Feby 1889 from the Local & Munl. Deptt., the Chief Engineer has the honor to state that the saving in the cost of the distributaries by substituting 800 feet for 450 feet as the limit of distance from the taps to the houses, would be approximately in Project II Rs. 20,000 and in Project III Rs. 30,000.

7.3.89

7/3/89

44

To the L & M Deptt 8/3
with original papers returned -

5258 C 16·12·11

No 1153 C 27·3·89

J.

86/11

1293

GOVERNMENT OF MADRAS.

LOCAL AND MUNICIPAL DEPARTMENT.

Read,—the following papers:—

From M.R.Ry. M. TILLAINAYAKAM PILLAI, Avargal, Rao Bahadur, Chairman, Municipal Council, Madura, to the Chief Secretary to Government (through the Deputy Collector on General Duties, Madura, and the Collector of Madura), dated 18th October 1888, No. 50.

I have the honor to submit, for the consideration of Government, a printed copy of the long expected report of Mr. O'Shaughnessy with detailed estimates on the water-supply of Madura, together with a copy of the resolution passed by the Municipal Council on the subject at their meeting held on the 17th instant. The state of the finances of the Municipality is so well known to Government and so much has been said regarding the water-supply of Madura in previous correspondence, that I need hardly say anything further on the subject.

2. I beg, however, to enclose an abstract statement of receipts and charges for the past year for ready reference.

3. The estimated cost of maintenance of the proposed water-works after their completion, and the annual interest and sinking fund on the debt, which Mr. O'Shaughnessy thinks the Council will have to contract, amount to Rs. 23,450.

4. The Council have already raised a loan of Rs. 32,000 on account of the experimental water-works, and the interest and sinking fund on this debt amount to Rs. 2,510 a year. The total cost of maintenance and interest, &c., will thus be Rs. 25,960. The water-tax at the maximum rate will amount to Rs. 15,000 in round numbers, which, of course, will be insufficient for defraying the charges connected with the maintenance of the water-works. The Council have therefore to look to savings in other items for the purpose. There are, however, no savings at present.

5. Revision of the house, land and profession tax registers may, however, increase the revenue under these heads. An additional revenue is also expected under licenses for offensive trades, and I request early orders on my letters, Nos. 43 and 45, dated 11th and 18th September 1888, respectively.

6. There is also the probability of a great demand arising for the Municipal rubbish after the completion of the Periyar Project. These are all the prospects of increase of revenue the Council have; but the increase, I am afraid, will barely cover the cost of the maintenance of the water-works and payment of the interest and sinking fund on the loan proposed to be raised. The Council have got the drainage scheme to attend to, and they do not calculate on any assistance from the Zemindars or pagoda authorities. It is therefore clear that the Council will not be in a position to carry out the water-works scheme without the aid from Government applied for by them.

Enclosure.

Proceedings of the Municipal Council of Madura, passed at their meeting held on the 17th October 1888.

* * * *

328. Read Mr. O'Shaughnessy's report on the water-supply of Madura town.

Resolution.—The Council feel convinced of the necessity for a complete system of water-supply to the Madura town, and resolve to submit Mr. O'Shaughnessy's report to the Government for consideration with a request that they will make a selection of a suitable scheme, having regard to the question as to how far the Periyar Project may be utilized in carrying the scheme out.

The Council, however, regret that the state of their finances will not admit of their undertaking such a large scheme without substantial aid from the Government. They therefore beg that the Government will be pleased to sanction the grant of a moiety of the amount required for the scheme and lend the other moiety at a low rate of interest.

No. 464.

Submitted.

2. I think the resolution of the Council is a wise one. They have no means of criticising the professional report, and, in my opinion, they are right in leaving the selection of a scheme to Government, which has plenty of professional advice to appeal to. As regards funds, I think they have a certain claim upon the liberality of Government. Madura has undoubtedly been the first in the field, and has proved by costly experiment that a town, situated as Madura is, can supply water to a large population by pumping arrangements from the bed of a river. The Municipality has spent over Rs. 70,000 on this experiment, and its finances have been greatly crippled thereby. Surely, such a display of energy and forethought deserves more than mere recognition. Other Municipalities are following on the same lines, and are profiting by the money spent and experience gained in the Madura experiment.

Madura,
20*th October* 1888.

(Signed) E. TURNER,
Collector.

No. 963.

Referred to the Public Works Department, for remarks on Mr. O'Shaughnessy's report.

(By order.)

Fort St. George,
8*th November* 1888.

(Signed) W. S. MEYER,
Ag. Assistant Secretary.

Note by the Chief Engineer.

Madura Water-Supply.

Mr. O'Shaughnessy has, with considerable labor, prepared a very complete report on the Madura water-supply, giving the history of former projects proposed and showing what has been done to date. He also forwards three complete schemes for obtaining water from wells to be sunk in the Vaigai river, pumping it up, and distributing it to the town. These have been carefully prepared, and it is considered that much credit is due to Mr. O'Shaughnessy for the very complete way in which these schemes have been prepared.

It is not necessary for me to describe each scheme. This is done in Mr. O'Shaughnessy's report, and all I propose to do is to remark on the proposals and point out where I consider modifications may be with advantage made.

Supply required.—This in the three schemes is taken as 800,000 gallons per 24 hours, or nearly 90 cubic feet per minute. This gives a daily supply of 10 gallons per head for the existing population of 80,000. This allowance is considered ample and liberal.

Quality of the Water.—I myself have no doubt but that the water obtained from wells sunk in the Vaigai river is good, wholesome water of better quality than that usually supplied to towns in India and even in Europe, but I consider that the Sanitary Commissioner should record his opinion on it, and, as there have been several analyses of it made, I believe he can do this without any delay, and his official opinion should be given. What is wanted is a fair, usable water that reaches a fair, reasonable standard, and this, it is believed, the Vaigai water is.

Quantity of Water.—I regret that we have no positive information regarding this, and the experiments referred to in paragraphs 51 and 52 of the report are not satisfactory, as in the first case the pumping was carried on only for 3 hours and in the second for 48 hours. The supply pumped in the first case was only ·26 cubic feet per 1 inch from 1 well, in the second ·8 cubic feet from 3 wells. What we want to know is the quantity of water available in the sandy river bed, when there has been no supply in the river for a long period (a reference to the water returns at the Railway bridge will show the number of months the river receives no supply in average years—1878-79, no supply, it is believed, was received for eleven months) and this when for some months 90 cubic feet per minute has been taken from the river bed.

No doubt but that a dam built as proposed will hold back and collect the whole supply in the river bed and render it available for the town supply, but what this supply after months of drought is we have absolutely no information whatever, and I can only report Mr. O'Shaughnessy's careful remark in paragraph 53 of his report, viz., "It is probably safe to say that there will be water in abundance," and add that I agree with it, but would substitute "sufficient" for "in abundance," and add that in famine years like 1878-79, the supply, it is feared, would fail.

The completion of the Periyar Project by keeping up a good supply in the river Vaigai as far as the Parani Anicut, will, as pointed out, increase the supply, but to what extent it is impossible to estimate; the Parani Anicut is about 22 miles from Madura.

It is not likely, however, that there will be more water than can be used for irrigation, but some little surplus leakage, &c., may be calculated on.

Head Works.—I agree fully with the proposal to move the site of the head works to near the Railway, but, before finally fixing the site, consider it absolutely necessary for borings to be taken above and below the proposed site, so that we may know the depth of the sand and at what depth the kunker is.

In paragraph 56 of the report, it is proposed to sink 10 collecting wells at distances 100 feet apart, 10 feet below the bed of the river. It is, of course, useless sinking these wells any depth into the kunker or any strata that is practically impervious to water, as they are only required to collect the water that is in the sand or water-bearing strata.

I believe that borings will show that on the line proposed for the wells, the sand is, say, 9 feet depth for a short distance only; and that the kunker bed rises at other places to within a few feet of the river bed, if not in places to the surface. This is the case at the site of the causeway and at that of the new bridge, and is probably the case at the site for the wells now proposed.

I fear, therefore, the proposal made is not practicable. Mr. Crole, in his note, dated 24th August 1884, printed in Appendix 13, page 63, pointed out this objection to the similar proposal made by Mr. Jones.

There will be, I consider, no difficulty in arranging for a sunken barrage or wall founded on the impervious strata below the sand being built; but, before any attempt is made to design the works or settle the number or position of the wells, a careful series of borings must be taken both at the site and for at least 1 mile above. The latter is required in order that we may know whether there is a large area and depth of sand that will, with the proposed barrage, form a reservoir for storage. It is possible, but not very probable, that there may be bands of rock or impervious strata across the bed of the river which may make it advisable to seek a new site for the barrage and walls, and perhaps it may be found advisable to place the wells above the new Vaigai bridge, making use of the retaining walls that are, it is believed, founded on the kunker as the barrage.

The general design for the barrage is approved of, but probably the culvert in it will not be required right across the river, and the depth of foundations may have to be increased in places. Careful borings will show what is required. Man-holes should be built at intervals of, say, 150 feet, so that the culvert may be cleared of sand when required through them. It will not be practicable to build the wells as proposed in lines; they will have to be built in groups, where it is found the sand is deep enough. The proposal of a built culvert from the wells to the collecting culvert is not approved. An iron pipe would probably answer better, and by means of a plug, communication between any well and the culvert could be cut off.

It is a question whether the wells should not be made 12 or 15 feet in diameter in place of 10 proposed, and it is thought that the ring of dry stone rubble at the bottom of the wells had better be left out.

Reservoirs and Distribution.—These must be taken together. A reference to the plans shows that Mr. Jones (see plate 1) proposed that taps should be given so that there should be one at a distance of less than 450 feet in a direct line from any of the houses in the populous parts of the city. This is in accordance with Act I of 1884 (City of Madras Municipal Act), section 138.

Project No. 1 allows for 32 reservoirs with a storage of about three-fourths of the calculated daily supply of 800,000 gallons, and may be said generally to give a tap or supply within a distance of less than 800 feet from any of the houses.

Project No. 2 has 7 reservoirs with storage of five-eighths of a day's calculated supply, and gives a tap or supply within a distance of less than 450 feet of any of the houses.

Note.—Should this project be carried out, it is advisable that the height of the reservoirs A and F be raised, so that they may command, respectively, reservoirs B and D.

Project No. 3 has one reservoir with the same storage as No. 2—five-eighths of a day's supply—and as regards accessibility of taps is similar to No. 2.

I agree with Mr. O'Shaughnessy's remarks as regards the advisability and necessity for providing storage, and for the present, at all events, storage for a little more than half the day's calculated maximum supply should be sufficient.

With regard to the number of reservoirs, I consider that the question is not between 1 reservoir and 7 (the cost of 7 being great, and, as far as I can see, there is no advantage in having so many), but between 1 and, say, 3 or 4.

One reservoir is by far the cheapest arrangement, and if the Municipality are prepared to accept the risk, I see no reason why the proposals made in Project No. 3 for 1 reservoir should not be accepted. For my own part, I should prefer 3 or 4 at an expenditure of, say, Rs. 12,000 in excess of that, if 1 reservoir only is built.

With regard to distribution, an important saving may be made if the Municipality accept, as in Project No. 1, a greater distance from the taps to the houses than the 450 feet allowed in Nos. 2 and 3 schemes, and this is a point that should have received careful consideration and a definite decision on before the projects were matured as they have been.

The short distance of 450 feet as in Madras is, of course, a great advantage, but it is expensive, if a distance of, say, 800 feet was accepted, many of the branches would not be required and nearly all the distributaries might be omitted. They could, however, be added at any future time, if the town became rich enough to do so, at but a small extra cost.

From the above it will be seen that the following is briefly my opinion regarding the proposals for the water-supply of Madura:—

1st.—That the Sanitary Commissioner should be called on to report on the quality of the water.

2nd.—That as regards quantity, the fact that the supply in famine years would probably fail must be accepted, but that in ordinary dry years, although we have no proof, it is believed the supply would be sufficient.

3rd.—That the position, &c., of the barrage or wall and the wells will require reconsideration, and the best site, &c., cannot be determined until borings have been taken in the river bed. When the information required has been collected, there will be no difficulty in designing and executing the works. The cost probably will be less than estimated.

4th.—That the Municipality should decide whether they wish the storage of 5 lakhs gallons of water (a little more than half a day's ultimate supply, which is considered sufficient for the present,) to be in one or more reservoirs. Having one

reservoir is the cheapest, but a scheme of 3 or 4 reservoirs, although more expensive, has great advantages.

5th.—The Municipality should carefully consider the question of distribution. Should they consider that a distance of less than 800 feet in a direct line from any of the houses in the populous parts of the town from the taps sufficient, an important saving in the cost of the project can be made.

6th.—If a final decision is made on points 4 and 5 (number of reservoirs and distance apart of taps), there will, with the plans and estimates that have been prepared, be no difficulty in completing a satisfactory but not perfect project (as it is feared the supply in dry years may be short and that the supply will fail in famine years) for Madura.

(Signed) H. R. MEAD., Col., R.E.,
Chief Engineer, P.W.D.

No. 5258-C.

Memorandum.

Forwarded to the Local and Municipal Department, with reference to endorsement from that department, No. 963, dated 8th November 1888, herewith returned with enclosures.

Chepak, (Signed) H. R. MEAD, Col., R.E.,
26*th December* 1888. *Ag. Secy. to Govt., P.W.D.*

To the Local and Municipal Department, with papers returned.

No. 194.

Official Memorandum.

With reference to his note on the Madura water-supply scheme transferred to this department with Public Works Department memorandum, No. 5258-C., dated 26th December 1888, the Chief Engineer, Public Works Department, is requested to be good enough to state whether he can roughly estimate the saving in the cost of the distributaries which would be effected by substituting 800 feet for 450 feet as the limit of distance from the taps to the houses. The papers are herewith forwarded for reference and return with the reply.

Fort St. George, (Signed) J. F. PRICE,
19*th February* 1889. *Chief Secretary.*

To the Chief Engineer, Public Works Department,
through the Secretary to Government.

No. 1153-C.

Memorandum.

With reference to memorandum, No. 194, of 19th February 1889, from the Local and Municipal Department, the Chief Engineer has the honor to state that the saving in the cost of the distributaries by substituting 800 feet for 450 feet as the limit of distance from the taps to the houses, would be, approximately, in Project II, Rs. 20,000, and in Project III, Rs. 30,000.

Chepak, (Signed) H. R. MEAD, Col., R.E.,
7*th March* 1889. *Chief Engineer, P. W. D.*

To the Local and Municipal Department,
with original papers returned.

Order—dated 25th April 1889, No. 460 M., Local and Municipal.

The Chief Engineer's remarks will be communicated to the Municipal Council, Madura, for early report as to which of the three alternative schemes proposed by Mr. O'Shaughnessy they are now prepared to adopt, subject to the modifications suggested by the Chief Engineer.

2. It appears to Government that Project No. 3 is the best, and the estimate for it can be reduced to about Rs. 2,90,000 by substituting 800 feet for 450 feet as the limit of distance from taps to houses, as proposed by the Chief Engineer. His suggestion that the retaining walls of the new bridge should be used as a barrage does not, however, commend itself to Government, as it involves removing the collecting wells to that locality and incurring risk of the water being contaminated in the river bed adjoining the town—a danger which should not be run for the sake of the Rs. 27,800 which is the estimated cost of the dam.

3. The Government will be prepared, in the event of a satisfactory project being adopted, to make a grant of one-fourth of the amount of the estimated cost, and to lend the balance from Provincial funds at 4½ per cent., repayable in thirty years. Taking the figure of Rs. 2,90,000, referred to in paragraph 2 above, the Council would have, on these terms, to find about Rs. 13,353 annually for payment of principal and interest, besides Rs. 13,700 for working expenses. As the water-tax at the maximum rate will not yield more than Rs. 15,000 on the present rating, the Council should consider how the balance can be met.

4. In paragraph 5 of G.O., dated 18th April 1888, No. 369 M., the Council were requested to have the water of the trial wells analysed. The Chairman will report what action has been taken on this direction. If no analysis of the water has yet been made, no further time should be lost in having the omission supplied.

5. The completeness and ability with which the project has been worked out and put before the Council and Government, are very creditable to Mr. O'Shaughnessy.

(True Extract.)

Chief Secretary.

To the Chairman, Municipal Council, Madura,
through the Collector.
„ Public Works Department.
„ Financial Department.
„ Sanitary Commissioner for Madras.

Exd. A. Raitt.

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No. 453 C a/7.3.89
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P.W.C. No. 4179

Gobt. of {1889} Madras.

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Supg. Engr. VI
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G.O., 25th April 1889, No. 460 M.

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APRIL.

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2 copies sent

Water-supply.

Communicating to the Chairman, Municipal Council, Madura, with certain observations, the Chief Engineer's remarks in connection with the Madura — scheme, and requesting him to report as to which of the three alternative schemes proposed by Mr. O'Shaughnessy the Council are prepared to adopt, subject to the modifications suggested by the Chief Engineer.

S.E. VI Circle
S.E. VI Circle

Despd
11/5/89

Ask. 52/5. In 11/5.
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