Date taken out.	For what purpose.			Initials of Referencer.	Date returned.	Initials of attender.
	Department.	C. No.	Year.			

Local & Munl. (1895) Department.

PRINTED.

G.O., No. 1486 Mn.

DATED 12th September 1895

[Despatch Abstract.]

Water-supply.

Referring to the Municipal Council, Cuddalore, for early remarks, the papers relating to the------scheme of the town, and stating that the Agent of the South Indian Railway Company will be requested in the Public Works Department to report whether the Company will be prepared to contribute either a lump sum or an annual grant towards the expenses of the scheme.

BACK PAPERS.

G.O.	No.	Department.	Date.	G.O.	No.	Department.	Date.

9

FURTHER PAPERS.

G.O.	No.	Department.	Date.	G.O.	No.	Department.	Date.

Cuddalore Water Supply Scheme.

List of enclosures to Report No. 12 of 8.1.96.

Enclosure 1— Report by the Sanitary Engineer to Gov

Enclosure 2— A file of plans from the Sanitary Engineer containing the following:—

(1) Plan showing Head works, Pumping Main & masonry conduit.

(2) Plan of Infiltration arrangements

(3) Plan of Engine & Boiler House.

(4) Section of Pumping Main and masonry Conduit from Engine House to Service Reservoir.

(5) Plan of Service Reservoir.

(6) General plan showing Service Reservoir, Pipe lines, fountains &c

(7) Section showing hydraulic gradient of pipes.

Enclosure 3— Sanitary Engineer's Estimate.

losure 4— One portfolio containing plans which accompanied Lieut. Col. Smart's Report.

…e File Book containing Lt. Col. Smart's Enclosure 5.
Reports & Estimates.

R E Ellis

Ag. Sany. Engr. to Govt.

LE

SANITARY ENGINEER TO THE GOVERNMENT OF MADRAS.
Register No. 2436
15-II-95

S.E./18 30-10-94—500.

Abstract of Detailed Estimate No. 14, dated 22nd December 1894 for the construction of Water Works for the town of Cuddalore

Quantity.	Description of Work.	Rate.			Per	Amount			Total.		
		RS.	A.	P.		RS	A	P.	RS.	A.	P.
	Infiltration Works					16,960	-	-			
	Engine & Boiler House					8,900	-	-			
	Wood & Stone shed					2,000	-	-			
	Engine Drivers quarters					5,000	-	-			
	Compensation for land					544	-	-			
	Forming road and constructing culverts					3,000	-	-			
	Engines, Pumps & Boilers including erection					21,600	-	-			
	Pumping main &c					36,780	-	-			
	Laying & jointing main					4,270	-	-			
	Masonry conduit					20,860	-	-			
	Service Reservoir					15,670	-	-			
	Pipes, sluice valves, fountains, hydrants &c					157,730	-	-			
	Laying & jointing pipes					25,770	-	-			
	Tools & plant					16,700	-	-			
	Establishment					16,700	-	-			
	Contingencies at 5%					17,596	-	-			

Compared.
C. Rajagopaul
8-1-95.

Grand Total of Estimate .. 370,000 - -

Office of Sanitary Engineer to Government,
Fort St. George, 22nd December 1894.

R E Ellis
Ag. Sanitary Engineer to Government.

S.E./18 30-10-94—500.

Abstract of Detailed Estimate No. 14, dated 22nd December 1894, for the construction of Water Works for the town of Cuddalore

Quantity.	Description of Work.	Rate. RS.	A.	P.	Per	Amount RS	A	P.	TOTAL. RS.	A.	P.
	Infiltration works										
	Infiltration pipes										
1,585	c.yds. Excavation	„	6	„	C.yd	594	„	„			
610	L.ft. 24" perforated stoneware pipes	10	„	„	L.ft.	6,100	„	„			
18,000	c.ft. Filling with gravel of sizes	6	„	„	c.ft. 100	1,080	„	„			
3	No. Manholes 4ft diameter & 12' deep	200	„	„	Each	600	„	„			
1	„ —— do —— 4ft diameter & 18' deep	300	„	„	„	300	„	„			
	Valve house										
78	Cyds. Excavation	„	4	„	C.yd	20	„	„			
17	L.ft. Sinking well 10' dia: to a depth of 17'	35	„	„	L.ft.	595	„	„			
	Wooden curb with suspending rod &c complete				Sum	300	„	„			
466	c.ft. Concrete in cement	45	„	„	c.ft. 100	210	„	„			
921	„ Brick in cement	45	„	„	„	414	„	„			
818	„ Brick in surki	16	8	„	„	134	„	„			
557	„ Brick in chunam	14	8	„	„	81	„	„			
	Carried over					10,428	„	„			

Grand Total of Estimate

Office of Sanitary Engineer to Government,
Fort St. George, 22nd December 1894.

Ag. Sanitary Engineer to Government.

S.E./18 30-10-94—500.

Abstract of Detailed Estimate No. 14, dated 22nd December 1894, for the construction of Water Works for the town of Cuddalore

Quantity.	Description of Work.	Rate.			Per	Amount			Total.		
		RS.	A.	P.		RS	A	P.	RS.	A.	P.
	Brought forward					10,428	-	-			
912	Sq. ft. Plastering with cement	8	2	-	Sqr.	74	-	-			
1114	——— do ——— with chunam 2 coats	2	8	-	„	28	-	-			
22¼	C. ft. Teak wood wrought & put up	4	-	-	C. ft.	89	-	-			
32	Sq. ft. Door leaf framed with hinges, bolts &c complete	1	4	-	Sq. ft.	40	-	-			
42½	R. ft. Cornice work	-	3	6	R. ft	9	-	-			
97	Sq. ft. Terracing	22	-	-	Sqr.	21	-	-			
64 „	Painting with two coats of oak paint	3	-	-	„	2	-	-			
1	24" Sluice valve including lifting gear &c	500	-	-	Each	500	-	-			
1	Iron ladder	30	-	-	„	30	-	-			
	Pipe from Valve House to Pump Well.										
1.18	Tons. 15" C. I. pipes	125	-	-	Ton	225	-	-			
13	L. yds. Laying & jointing pipes	2	3	-	L. yd	26	-	-	344		
247	C. yds. Excavation	-	6	-	C. yd	93	-	-			
	Baling & Pumping					5,000	-	-			
	Petty charges					415	-	-			
	Carried over								16,980	-	-
	Grand Total of Estimate										

Office of Sanitary Engineer to Government,
Fort St. George, 22nd December 1894

Ag: Sanitary Engineer to Government.

Abstract of Detailed Estimate No. 14 dated 22nd December 1894, for the construction of Water Works for the town of Cuddalor

Quantity.	Description of Work.	Rate.			Per	Amount.			Total.		
		RS.	A.	P.		RS.	A.	P.	RS.	A.	P.
	Brought forward								16,980	..	..
	Engine & Boiler House										
326	C. yds. Excavation —	-	4	-	C. yd	82	..	..			
512	" Filling earth —	"	4	-	"	128	-	-			
1575	L. ft. Sinking well 5 ft. dia: to a depth of 15.75	25	-	-	L. ft	394	-	-			
	Wooden curb with suspending rod &c complete				Sum	150	"	"			
1148	C. ft. Concrete in cement	45	.	.	100 C. ft	517	-	-			
1762	— do — chunam	14	-	-	"	247	-	-			
999	" Brick table moulded in surki	19	-	-	"	190	.	.			
7003	" — do — chunam	17	8	-	"	1226	.	.			
469	" archwork do	20	.	.	"	94	-	-			
18	" Cut stone set in chunam	1	3	"	C. ft	22	-	-			
1722	Sq. ft. Plastering with cement ½" thick	8	2	-	Sqr.	140	"	"			
4160	" — do — with chunam 2 coats	2	8	-	"	104	-	-			
619	" Flooring with concrete 9" thick plastered with cement ¾" thick	22	-	-	"	136	-	-			
	Carried over					3430	"	"	16,980	.	..

Grand Total of Estimate ..

Office of Sanitary Engineer to Government,
Fort St. George, 22nd December 1894

Ag. Sanitary Engineer to Government

$\frac{\text{S. E.}}{18}$ 13-11-93—500.

Abstract ~~of~~ Detailed Estimate No. 14, dated 22nd December, 1894 for the construction of Water Works for the town of Cuddalore.

Quantity.	Description of Work.	Rate.			Per	Amount.			Total.		
		RS.	A.	P.		RS.	A.	P	RS.	A.	P.
	Brought forward					3,430	..	..	16,980	..	..
2593	Sq. ft. Roofing with Mangalore tiles including teak reepers	30	..	..	Sqr.	778	..	..			
318	C. ft. Teak wood wrought & put up	4	..	..	C. ft.	1272	..	..			
750	Sq. ft. Teak framed venetianed doors & windows with hinges bolts &c complete	1	6	..	Sq. ft.	1031	..	..			
360	„ Glazed fan lights over doors and windows	1	..	..	„	360	..	..			
552	„ Flooring with teak planks 2" thick	..	10	..	„	346	..	..			
59	Cwt. Rolled iron joists	12	8	..	Cwt	738	..	..			
5713	Sq. ft. Painting with 2 coats of Carsonisate paint of approved color	3	..	..	Sqr.	171	..	..			
4	No. Iron finials	10	..	..	Each	40	..	..			
	Iron work in trusses				Sum	100	..	..			
	Carried over					8,265	..	..	16,980	..	..
	Grand Total of Estimate ..										

Office of Sanitary Engineer to Government,
Fort St. George, 22nd December 1894.

R. E. Ellis
Ag. Sanitary Engineer to Government.

-93-500.

t of Detailed Estimate No. 14, dated 22d December 1894 for the construction of Water Works for the town of Caddalore

Quantity.	Description of Work.	Rate. RS.	A.	P.	Per	Amount. RS.	A.	P.	TOTAL. RS.	A.	P.
	Brought forward					8,265	..	..	16,980	..	..
	Masonry under machinery				Sum	300	..	..			
	Covered wooden fittings to gullies				"	100	..	..			
	Petty charges					235	..	..	8,900	..	..
	Wood & Store shed								2,000	..	..
	Engine drivers' quarters								5,000	..	..
	Compensation for land										
2·72	acres. Land	200	..	..	Acre	544	..	..			
									544	..	..
	Forming road & constructing culvert								3,000	..	..
	Engines, pumps & Boilers including erection										
H.P. 16	Two Worthington Engines Pumps & Boilers each 8 Pump, H.P. including erection	1350	..	..	H.P.	21,600	..	..			
									21,600	..	..
	Pumping main & syphon &c										
278·3	Tons. C.I. pipes, 887 L. ft. of 12" pumping main 2718 L. ft. of 12" Syphon 4993 L. ft. of 9" pipe from cistern D to Service Reservoir	125	..	..	Ton	34,788	..	..			
	Carried over					34,788	..	..	58,024	..	..

Grand Total of Estimate ..

OFFICE OF SANITARY ENGINEER TO GOVERNMENT,
Fort St. George, 22d December 1894.

Ag R. E. Ellis
Sanitary Engineer to Government.

$\frac{\text{S. E.}}{18}$ 13-11-93—500.

Abstract of Detailed Estimate No. 14, dated 22d December 1894, for the construction of Water Works for the town of Cuddalore

Quantity.	Description of Work.	Rate. Rs.	A.	P.	Per	Amount. Rs.	A.	P.	Total. Rs.	A.	P.
	Brought forward					34,788	..	..	58,024	..	..
84·15	Cwt. Specials	10	..	..	cwt	841	..	..			
1	No. 12" Reflux valve	250	..	..	Each	250	..	..			
	Petty charges					901	..	..	36,780	..	..
	Laying & jointing Pumping main &c										
6065	C. yds. Excavation for pipes	..	4	..	C. yd.	1517	..	..			
1082	L. yds. Laying & jointing 12" C. I. turned & bored pipes cement joints	..	14	..	L. yd.	947	..	..			
1449	do 9" C. I. turned & bored pipes do	..	10	..	..	906	..	..			
120	do 12" C. I. pipes spigot & faucet pipes lead joints	1	12	..	..	210	..	..			
166	do 9" C. I. pipes spigot and faucet pipes lead joints	1	4	..	..	208	..	..			
	Extra for piling at tanks					330	..	..			
	Petty charges					152	..	..			
									4,270	..	..
					Carried over				99,074	..	..
	Grand Total of Estimate ..										

Office of Sanitary Engineer to Government,
Fort St. George, 22d December 1894.

R. E. Ellis
Ag Sanitary Engineer to Government.

S. E./18 13-11-93—500.

Abstract of Detailed Estimate No. 14, dated 22nd December 1894 for the construction of Water Works for the town of Cuddalore

Quantity.	Description of Work.	Rate.			Per	Amount.			Total.		
		RS.	A.	P.		RS.	A.	P.	RS.	A.	P.
	Brought forward								99,074	"	"
	Conduit										
15635	C. yd. Excavation & filling in	"	4	"	C. yd	3909	"	"			
42608	" Concrete in surki	16	"	"	C. ft 100	6,817	"	"			
20876	C. ft. Archwork brick in surki	20	"	"	"	4,175	"	"			
502.72	Sq. ft. Plastering with cement	8	2	"	Sqr.	4,085	"	"			
5412	C. ft. Brick in surki	18	"	"	C. ft 100	974	"	"			
327	" Cut stone work set in surki	1	3	"	C. ft	388	"	"			
	Petty charges					512	"	"	20,860	"	"
	Service Reservoir										
5,707	C. yds. Excavation & filling in, lead 40 yds lift 2 yards	"	3	"	C. yd	1,070	"	"			
24,342	C. ft. Concrete in surki	15	"	"	C. ft 100	3,651	"	"			
15,620	" Brick in surki	16	8	"	"	2,577	"	"			
14,477	" Archwork brick in surki	20	"	"	"	2,895	"	"			
175	" Cut stone work set in surki	1	3	"	C. ft.	208	"	"			
	Carried over					10,401	"	"	1,19,934	"	"
	Grand Total of Estimate ..										

Office of Sanitary Engineer to Government,
Fort St. George, 22nd December 1894.

a/ R. E. Ellis
Sanitary Engineer to Government.

S.E./18 30-10-94-500.

Abstract of Detailed Estimate No. 14, dated 22nd December 1894, for the construction of Water Works for the town of Cuddalore,

Quantity.	Description of Work.	Rate. RS.	A.	P.	Per	Amount RS	A	P.	TOTAL. RS.	A.	P.
	Brought forward					10,401	..	..	1,19,934	..	..
28,682	Sq. ft. Plastering with cement	8	2	..	Sqr.	2,330	..	..			
5·45	Tons. C. I. pipes	125	..	..	Ton	681	..	..			
44·47	Cwts. Specials	10	..	..	cwt.	445	..	..			
2	No. 15" Sluice valves	220	..	..	Each	440	..	..			
2	" 12" do	150	..	..	"	300	..	..			
2	" 6" do	55	..	..	"	110	..	..			
4	" Surface boxes to 12" & 15" Sluice valves	17	8	..	"	70	..	..			
2	" to 6" do	6	8	..	"	13	..	..			
	Fixing sluice valves				Sum	100	..	..			
	Laying & jointing pipes				"	100	..	..			
4	No. Ventilators	10	..	..	Each	40	..	..			
2	" Covers to manholes	50	..	..	"	100	..	..			
2	" Iron ladder	30	..	..	"	60	..	..			
	Petty charges					380	..	..	15,570	..	..
	Pipes, sluice valves, fountains, hydrants &c										
1,082	Tons. C. I. pipes 3 to 15 inches in diameter	125	..	..	Ton	1,35,250	..	..			
242	cwt. Bends	10	..	..	cwt.	2,420	..	..			
136	" Branches	10	..	..	"	1,360	..	..			
29	" Taper pipes	10	..	..	"	290	..	..			
46	" Collars	10	..	..	"	460	..	..			
	74 valves, 50 stopcocks 25 hydrants &c	...				5,640	..	..			
	Carried over					1,45,420	..	..	1,35,504	..	..
	Grand Total of Estimate										

R. E. Ellis
A. Sanitary Engineer to Government.

OFFICE OF SANITARY ENGINEER TO GOVERNMENT,
Fort St. George, 22nd December 1894.

S.E./18 30-10-94—500.

Abstract of Detailed Estimate No. 14, dated 22d December 1894, for the construction of Water Works for the town of Cuddalore

12

Quantity.	Description of Work.	Rate. RS.	A.	P.	Per	Amount RS	A	P.	Total. RS.	A.	P.
	Brought forward					1,45,420	"	"	1,36,504	"	"
12	No. Two tap pillar fountains	150	"	"	Each	1800	"	"			
26	" Single wall tap fountains	90	"	"	"	2,340	"	"			
12	" double do	190	"	"	"	2,280	"	"			
132	" Surface boxes					886	"	"			
	Extras					1,914	"	"			
	Jetty charges					3,090	"	"	1,57,730	"	"
	~~Laying & jointing~~										
34,703	C. yds. Excavation for Cast Iron pipes					7,541	"	"			
167	do for W. I. pipes					24	"	"			
21,926	L. yds. Laying & jointing turned & bored pipes with cement joints					10,855	"	"			
2,435	" do spigot & faucet pipes with lead joints					2,146	"	"			
668	" Laying & jointing W. I. pipes					167	"	"			
	Carried over					20,735	"	"	2,93,234	"	"

Grand Total of Estimate

Office of Sanitary Engineer to Government,
Fort St. George, 22d December 1894.

R. E. Ellis
Ag. Sanitary Engineer to Government.

S.E./18 30-10-94—500.

Abstract of Detailed Estimate No. 14, dated 22nd December 94 for the construction of Water Works for the town of Cuddalore

Quantity.	Description of Work.	Rate. RS.	A.	P.	Per	Amount. RS	A	P.	TOTAL. RS.	A.	P.
	Brought forward					20,735	.	.	293,234	-	-
46 No.	Fixing complete with masonry sluice valves on mains & branches					729	.	.			
25 .	—— do —— hydrants with valves, branches &c complete ——					625	.	.			
3 .	—— do —— 2½" air valves —— do ——					105	.	.			
5 .	—— do —— 1¼" air valves —— do ——					100	.	.			
26 .	Erecting single wall tap fountains with pipes, valves &c complete ——					1,300	.	.			
12 .	Double wall tap —— do ——					744	.	.			
12 .	Pillar —— do —— do ——					924	.	.			
	Petty charges ——					508	.	.	25,770	.	.
	Tools & plant								16,700	.	.
	Establishment								16,700	.	.
	Contingencies at 5%								17,596	.	.
	Grand Total of Estimate								370,000	.	.

Office of Sanitary Engineer to Government,
Fort St. George, 22nd December 1894

Ag. Sanitary Engineer to Government.

S.E./18 30-10-94—500.

Abstract of Detailed Estimate No. 14, dated 22d December 94, for the construction of Water Works for the town of Cuddalore

Quantity.		Description of Work.	Rate. RS.	A.	P.	Per	Amount RS	A	P.	TOTAL. RS.	A.	P.
		Details of Cast iron pipes & Valves										
Tons	Cwt.	Distribution										
91	13	15" Cast iron pipes 1956 Lft.										
207	14	12" —— do —— 6021 "										
208	15	10" —— do —— 8172 "										
106	13	9" —— do —— 4617 "										
55	19	8" —— do —— 3042 "										
68	9	7" —— do —— 4320 "										
9	9	6" —— do —— 756 "										
27	19	5" —— do —— 2691 "										
26	18	4" —— do —— 3519 "										
191	16	3" —— do —— 37989 "										
3	15	2½" —— do —— 750 "										
999	"											
33	"	Add for deviation in weight										
50	"	do 5% for breakage										
1082	"	Total ——	125	"	"	Ton	135250	"	"			
No:	1	15" Sluice valve double faced	220	"	"	each	220	"	"			
"	2	12" —— do —— do ——	150	"	"	do	300	"	"			
"	3	10" —— do —— do ——	110	"	"	do	330	"	"			
"	2	9" —— do —— do ——	90	"	"	do	180	"	"			
"	2	8" —— do —— do ——	80	"	"	do	160	"	"			
"	1	7" —— do —— do ——	65	"	"	do	65	"	"			
"	1	6" —— do —— do ——	55	"	"	do	55	"	"			
"	2	5" —— do —— do ——	45	"	"	do	90	"	"			
		Carried over ——					1400	"	"			

~~Grand Total of Estimate~~

OFFICE OF SANITARY ENGINEER TO GOVERNMENT,
Fort St. George, 22d December 1894

R. E. Ellis
ag: Sanitary Engineer to Government.

S.E./18 30-10-94—500.

Abstract of Detailed Estimate No. 14, dated 22nd December 1894, for the construction of Water Works for the town of Cuddalore

Quantity.	Description of Work.	Rate. RS.	A.	P.	Per	Amount. RS	A	P.	TOTAL. RS.	A.	P.
	Brought forward					1400					
No: 2	4" Sluice valve double faced	35	„	„	each	70	„	„			
„ 30	3" —— do —— do ——	27	8	„	do	825	„	„			
„ 28	2½" —— do —— do ——	22	8	„	do	630	„	„			
„ 50	Gun metal Stop cocks	35	„	„	do	1750	„	„			
„ 5	Stops ferrules with covers	12	„	„	do	60	„	„			
„ 5	Air valves 1¼" ——	5	„	„	do	25	„	„			
„ 3	—— do —— 2½" ——	10	„	„	do	30	„	„			
„ 25	Hydrants with surface boxes attached	25	„	„	do	625	„	„			
„ 3	Copper stand pipes with 10 ft: of hose & one brass Coupling complete	75	„	„	do	225	„	„			
	Total ——					5640	„	„	5640	„	„

~~Grand Total of Estimate~~

Office of Sanitary Engineer to Government,
Fort St. George, 22nd December 1894

Ag Sanitary Engineer to Government.

Enclosure to ~~letter~~ Report No. 12 of 1895

GOVERNMENT OF MADRAS.

SANITARY ENGINEER'S DEPARTMENT.

~~Specification and Detailed~~ Abstract Estimate No. 14

of 1894-95 of the cost of constructing

Water Works

for the Town

of Cuddalore

Amount of Estimate No. 14

Rs. 370,000

Covering ~~letter~~ Report No. 12 dated 8·1·95,

SANITARY ENGINEER
Register No 2436
15 .. 95
TO THE GOVERNMENT OF MADRAS

1486 M.L.
12-9-95

17

12th September 1895, No. 1486 M., Local and Municipal.

GOVERNMENT OF MADRAS.

LOCAL AND MUNICIPAL DEPARTMENT.

Read—the following papers:—

From R. E. ELLIS, Esq., ASSOC. M. INST. C.E., Acting Sanitary Engineer to Government, to the President, Sanitary Board, dated Fort St. George, 8th January 1895, No. 13.

With reference to G.O., No. 2380 L., dated 16th November 1894, Local and Municipal, I have the honour to forward herewith a draft resolution on Cuddalore water-supply scheme.

Enclosure.

Proceedings of the Madras Sanitary Board, Sanitary Engineering Department.

Report on the Cuddalore Water-supply Scheme, dated 8th January 1895, *No.* 12.

In April 1892, Lieutenant-Colonel Smart forwarded to the Sanitary Engineer complete report, plans and estimates for a scheme for the water-supply of Cuddalore.

2. Briefly, the scheme is as follows. To construct infiltration works in the right bank of the Gadilam river just above the Tiruvahindrapuram anicut, to pump the water so obtained into a small cistern on the western summit of the Capper Hill, to conduct the water from thence to a service reservoir placed on the eastern summit of the Capper Hill, and, finally, to distribute the water from the reservoir by pipes and fountains in the usual manner. The scheme provides for a population of 50,000 at 10 gallons per head, and is estimated to cost Rs. 2,55,000.

3. Lieutenant-Colonel Smart's scheme requires modifications in many respects. In the following description of the revised scheme the various modifications will be enumerated and the reasons for such modifications will be given.

4. Lieutenant-Colonel Smart provides for a population of 50,000 at 10 gallons per head per diem. But in conformity with the standard usually adopted by this department with the approval of Government (*vide* G.O., No. 773 M., dated 16th May 1890, Local and Municipal), provision has been made in the revised scheme for the same population at 15 gallons per head.

5. *Drawing No.* 1.—The source of supply will be the underflow in the bed of the Gadilam river above the Tiruvahindrapuram anicut. The site of the infiltration pipe in Lieutenant-Colonel Smart's scheme is 500 feet above the anicut. The Sanitary Commissioner considers that it is open to objection from a sanitary point of view. Above this site lies on the bank of the Gadilam the town of Tiruvahindrapuram and also a bathing ghât. The site now selected is above the town and the bathing ghât.

6. While Lieutenant-Colonel Smart places his infiltration works in the bank of the river, it is considered that they would be under more favourable conditions as regards the supply of water if placed across the river. If the works are placed across the river the underflow in the Gadilam will find its way more freely to the

regards

infiltration pipe than it would be were the works placed in the bank. In the latter case the soil of the bank being clayey will act as a barrier to the flow of the under current in the Gadilam towards the pipe and the works will have to depend chiefly on the flow from the land side, and there is no data to prove that the supply of water from the land side is copious.

are/

7. *Drawing No.* 2.—The water will be drawn by a line of 24-inch* perforated stoneware pipes laid across the river 3,300 feet above the anicut. The bottom of the perforated pipe will be at the level of 7·50 or 10 feet below lowest water level. The pipe will be bedded on 12 inches of gravel and the pipe trench will also be filled up with gravel to a height of 5 feet and above that with the original sand.

8. Lieutenant-Colonel Smart proposes a length of 200 feet. This length appears to be inadequate even for a 10 gallon scheme from experience of infiltration works already constructed in this Presidency. If the soil were gravelly and charged with abundance of water 200 feet would have sufficed. The length of perforated pipes in the revised scheme will be 610 feet. The actual length that will be required can only be determined during construction as there is not sufficient data yet available to calculate the length required with any degree of accuracy.

are?/

9. The perforated pipe will end in a valve house on the right bank of the river from whence the water will be conducted by a 15-inch iron pipe to the pump well 40 feet distant from the valve house.

10. *Drawing No.* 3.—Sheet No. 3 illustrates the pump, well and engine-house. The floor level of the boiler room will be 1 foot above the maximum flood level and the engine room floor 2 feet higher than that of the boiler room. There will be two engines of the vertical Worthington type, each eight horse-power and each capable of lifting half the daily supply in 24 hours. Space is provided for a third engine, but this will not be required for some years as it will take some time before the demand reaches the maximum of 15 gallons per head per day.

11. Lieutenant-Colonel Smart proposed to work the pumps by water power as long as it was available at the anicut. He proposed to gear the pelton wheel directly with the engines, but as the engine house now proposed is 3,300 feet above the anicut this arrangement is impracticable.

12. *Vide Drawing No.* 4.—It is proposed to pump the water from the engine-house to a cistern on top of the adjoining hill through a rising iron main 12 inches in diameter and 887 feet long. The main is shorter than in Lieutenant-Colonel Smart's scheme by 1,213 feet. It will discharge the whole daily supply in 24 hours with a head of 1·4 in 1,000; one reflux valve will be placed on the pipe.

13. The level of the cistern into which the main will discharge will be 97·00. The total lift against which the pumps will have to work will be including friction in main 91·24 feet.

14. From the cistern a gravitating conduit and pipes will convey the water to the service reservoir placed near the jail. The conduit will be circular in shape, having a diameter of 1 foot 9 inches and a fall of $1\frac{1}{2}$ feet per mile. The conduit running full will discharge 938 gallons per minute, whereas the discharge required is 521 gallons. The conduit will therefore discharge the required quantity running a little more than half full. The valley will be crossed by a 12-inch iron pipe. There is no necessity for using so large a pipe as 20 inches as proposed by Lieutenant-Colonel Smart. A 12-inch pipe however necessitates the lowering of the conduit on the other side by 2·75 feet. It is cheaper to do so than to use a 20-inch main. The soil is gravelly or loose laterite, the additional excavation will cost Rs. 750 while the difference in cost between the 20-inch and 12-inch main is Rs. 14,500. The alteration will thus effect a saving of Rs. 13,750. The conduit will terminate in a cistern opposite the jail. From this point to the service reservoir there is a fall of 25·79 feet, and as with this head a 9-inch iron pipe would suffice, it is considered advisable to use it in preference to the masonry conduit as this part of the hill is much more frequented by people than the higher portion.

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* NOTE.—It is a matter for consideration whether three or four rows of 12" pipes would not be more effective than a single row of 24" pipes.

15. *Vide Drawing No.* 5.—The service reservoir is some 4,200 feet nearer the town than in Lieutenant-Colonel Smart's scheme. But the pressure in the town will be much less than in his scheme. If however the reservoir is placed at the site proposed by him it will entail an extra cost equal to the difference in value of 4,200 feet of 15-inch pipe and 4,200 feet of 9-inch pipe which is about Rs. 12,700. A high pressure service is certainly desirable if a town can afford it. But the finances of Cuddalore are so low that if a saving can be effected by reducing the pressure of supply it is very desirable that it should be done. An inspection of sheet No. 7 shows that if the minimum pressure is limited to 10 feet, a reservoir with its floor level at 55·00 will suffice. He intended to cut this reservoir in the solid laterite and provide no lining. But laterite *in situ* is too soft to be trusted to make an impermeable reservoir. There may be faults, lines of cleavage or seams of soft mud as usually found in laterite beds which it would be impossible to make it water-tight without masonry lining. The reservoir in the revised scheme will hold $\frac{2}{3}$ day's supply. The storage capacity could be increased by a second reservoir when funds permit.

16. *Drawings Nos.* 6 *and* 7.—The mains and pipes are calculated to deliver the full daily supply in twelve hours according to the population in the district or areas they serve. The following is a statement of pipes and appendages provided in the distributing part of the scheme :—

1,956 feet 15 inches cast iron pipes.
6,021 „ 12 „ „
8,171 „ 10 „ „
4,617 „ 9 „ „
3,042 „ 8 „ „
4,320 „ 7 „ „
756 „ 6 „ „
2,691 „ 5 „ „
3,519 „ 4 „ „
37,789 „ 3 „ „
74 sluice valves from $2\frac{1}{2}$ inches to 15 inches.
8 air valves.
25 hydrants for fire service.
12 two-tap pillar fountains.
38 wall tap fountains, single and double.

17. Exchange has declined considerably since Lieutenant-Colonel Smart prepared his estimate, and in the revised estimate one of the heaviest item of excess is due to this cause.

18. The total cost of the scheme is estimated as below :—

	RS.
Infiltration works	16,980
Engine and boiler house	8,900
Wood and store shed	2,000
Engine-driver's quarters	5,000
Forming road and constructing culverts	3,000
Compensation for land	544
Engines, pumps and boilers including erection	21,600
Pumping main, &c.	36,780
Laying and jointing main	4,270
Masonry conduit	20,860
Service reservoir	15,570
Pipes, sluice valves, fountains, hydrants, &c.	1,57,730
Laying and jointing pipes	25,770
Tools and plant	16,700
Establishment	16,700
Contingencies	17,596
Total ..	3,70,000

19. The working and maintenance charges would be as follows on the assumption that Government will pay a moiety of the cost of the scheme :—

20

	RS.
Interest and sinking fund on moiety of the cost Rs. $\frac{3,70,000}{2} \times 5{\cdot}96$ per cent. = ...	11,026
Pumping for 50,000 people at 10 gallons[*] a head at 10 annas per million gallons raised 1 foot high	10,494
Maintenance charges	3,000
Total ..	24,520

(Signed) R. E. ELLIS,
Ag. Sanitary Engineer to Government.

[*] The consumption for many years after the opening of the works will not exceed 10 gallons.

Resolved,—that the above report with plans and estimates be submitted to Government for approval and sanction.

(Signed) R. E. ELLIS,
Joint Secretary.

To the Chief Secretary to Government,
Local and Municipal Department.

No. 322-D.

Note by the Chief Engineer, Public Works Department.

I approve generally of the proposals contained in the Sanitary Engineer's report, but, with regard to paragraph 7, I consider that three rows of 12-inch pipes will be considerably more efficient and cost little, if anything, more than a single row of 24-inch pipes and should therefore be adopted.

2. With regard to paragraph 11, apart from the charge of rise there could have been no possible economy obtained from the use of the water power of the river at the anicut for pumping. This power would only have been available for a short time, and could only be depended on for a still smaller time in each year; it would be necessary for at least nine months in each year, and probably for more, to be prepared to use steam at a few hours' notice, so that little or no saving in establishment would be possible, while the small saving in fuel would be more than swallowed up by the interest on first cost and cost of maintenance of the extra plant required for utilising the water power.

OOTACAMUND,
7th June 1895.

(Signed) J. PENNYCUICK, Colonel, R.E.,
Chief Engineer, P.W.D.

No. 323-D.

Transferred to the Local and Municipal Department.

8th June 1895.

(Signed) J. PENNYCUICK, Colonel, R.E.,
Secy. to Govt., P.W.D.

To the Local and Municipal Department,
with papers, &c., in original and plans.

No. 949.

The Sanitary Engineer is requested to revise the estimate with reference to the remarks of the Chief Engineer.

(By order.)

FORT ST. GEORGE,
13th July 1895.

(Signed) C. G. TODHUNTER,
Ag. Asst. Secretary.

21

From J. A. JONES, Esq., MEM. INST. C.E., F.R.S.E., Sanitary Engineer to Government, to the Chief Secretary to Government, dated Fort St. George, 3rd August 1895, No. 2160.

With reference to your endorsement, No. 949, dated 13th July 1895 (herewith returned), I have the honour to enclose a comparative statement showing the excess of cost due to the revision of the estimate with reference to the remarks of the Chief Engineer. The total estimate now stands at Rs. 3,71,200.

ENCLOSURE.

COMPARATIVE statement showing the difference between the cost of the *Infiltration Works* as originally estimated and the cost as revised with reference to the Chief Engineer's note, No. 322-D., dated 8th June 1895.

Particulars.		Original estimate single row of 24" stoneware pipes.			Revised estimate three rows of 12" stoneware pipes.			Increase.	Decrease.
		Quantity.	Rate.	Amount.	Quantity.	Rate.	Amount.		
			RS. A. P.	RS.		RS. A. P.	RS.	RS.	RS.
Excavation including labour for timbering trenches ..	c. yd.	1,585	0 6 0	594	2,739	0 6 0	1,027	433	..
24" stoneware pipes including laying	c. ft.	610	10 0 0	6,100	..	..	..	..	6,100
12" stoneware pipes including laying	,,	..	..	..	1,830	3 0 0	5,490	5,490	..
Manholes, 12' deep 4' diameter.	each.	3	200 0 0	600	..	..	..	..	600
Manholes, 18' deep 4' diameter.	,,	1	300 0 0	300	..	..	..	..	300
Manholes 12' deep 7' 6" × 4' diameter	,,	..	..	..	3	330 0 0	990	990	..
Manholes 18' deep 7' 6" × 4' diameter	,,	..	..	..	1	430 0 0	430	430	..
24" sluice valve with lifting gear, &c., complete ..	,,	1	500 0 0	500	..	..	..	..	500
12" sluice valve with lifting gear, &c., complete	,,	..	..	..	3	250 0 0	750	750	..
Filling with gravel of sizes ..	c. ft. 100	18,000	6 0 0	1,080	27,000	6 0 0	1,620	540	..
Valve house	..	Lump sum.		2,047	..	..	2,047	..	..
Pipes from engine to valve house	..	..	..	344	..	..	344	..	..
Baling and pumping	..	..	..	5,000	..	..	5,000	..	..
Petty charges	..	..	..	415	..	..	482	67	..
				16,980			18,180	8,700	7,500
							16,980	7,500	..
						Net excess.	+ 1,200	+ 1,200	..

ORDER—dated 12th September 1895, No. 1486 M., Local and Municipal.

The papers will be referred to the Municipal Council, Cuddalore, for early remark. The scheme appears at first sight to be beyond the means of the council. The Government is not prepared to contribute more than the usual amount of one-half of the estimated cost, but it may be that there are public-spirited inhabitants of the town who would be able and willing to assist the council with the funds necessary to the execution of the scheme.

2. The Agent of the South Indian Railway Company will also be requested in the Public Works Department (Railway Branch) to state whether the Company would be prepared to contribute either a lump sum or an annual grant towards the expenses of the scheme in consideration of the benefits which it will probably confer upon the railway property in the town.

(True Extract.)

Chief Secretary.

To the Sanitary Engineer.
,, Chairman, Municipal Council, Cuddalore.
,, Public Works Department (Railway Branch).

Exd. S. J. Pereira.

82

Govt. of {1895} Madras.

LOCAL AND MUNICIPAL.

Issued

Recd. Encl.

G.O., 12th Sept. 1895, No. 1486 M.

SEPTEMBER.

Water-supply.

Referring to the Municipal Council, Cuddalore, for early remarks the papers relating to the — scheme of the town, and stating that the Agent of the South Indian Railway Company will be requested in the Public Works Department to report whether the Company will be prepared to contribute either a lump sum or an annual grant towards the expenses of the scheme.

Procs of the Sany Board - Sany Engr Dept [illegible] 95

No. 12 23 18

In 1486 M 12/9/95

Report on the Cuddalore Water supply Scheme

In April 1892 Lt. Col. Smart forwarded to the Sanitary Engineer complete report, plans & estimates for a scheme for the water supply of Cuddalore.

2. Briefly the scheme is as follows. To construct infiltration works in the right bank of the Gadilam river just above the Tiruvendipuram Anicut, to pump the water so obtained into a small cistern on the western summit of the Capper Hill, to conduct the water from thence to a service reservoir placed on the eastern summit of the Capper Hill, and finally to distribute the water from the reservoir by pipes and fountains in the usual manner. The scheme provides for a population of 50,000 at 10 gallons per head, and is estimated to cost Rs 2,65,000.

3. Lt. Col. Smart's scheme

requires

equires modifications in many respects.
n the following description of the
evised scheme the various modifications will be enumerated and the
reasons for such modifications will be
given.

4. Lt. Col. Smart provides for a population of 50,000 at 10 gallons per head per diem. But in conformity with the standard usually adopted by this department with the approval of Government (Vide G.O. No. 773 M dated 16th May 1890, Local & Municipal) provision has been made in the revised scheme for the same population at 15 gallons per head.

5. The source of supply will be the underflow in the bed of the Gadilam river above the Tirumendipuram anicut. The site of the infiltration pipe in Lt. Col. Smart's scheme is 500 feet above the anicut. The Sanitary Commissioner considers that it is open to objection from a sanitary point of view. Above this site lies on the bank of the Gadilam — Drawing No. 1

the

the town of Tirumendipuram and also a
bathing ghaut. The site now selected
is above the town & the the bathing ghaut

6. While Lt. Col. Smart places his infiltration works in the bank of the river, it is considered that they would be under more favorable conditions as regards the supply of water if placed across the river. If th
works are placed across the river the underflow in the Gadilam will find its way more freely to the infiltration pipe than it would be were the works placed in the bank. In the latter case the soil of the bank being clayey will act as a barrier to the flow of the under current in the Gadilam towards the pipe, and the works will have to depend chiefly on the flow from the land side, and there is no data t
prove that the supply of water from the landside is copious.

Drawing No. 2. 7. The water will be drawn

by

by a line of 24"* perforated stoneware pipes laid across the river 3300 feet above the anicut. The bottom of the perforated pipe will be at the level of 7.50 or 10 feet below lowest water level. The pipe will be bedded on 12 inches of gravel and the pipe trench will also be filled up with gravel to a height of 5 feet and above that with the original sand.

8. Lt Col. Smart proposes a length of 200 feet. This length appeared to be inadequate even for a 10 gallon scheme from experience of infiltration works already constructed in this Presidency. If the soil were gravelly and charged with abundance of water 200 feet would have sufficed. The length of perforated pipes in the revised scheme will be 610 feet. The actual length that will be required can only be determined during construction as there is not sufficient data yet available to calculate the length required with any degree of accuracy.

9. The perforated pipe will end in a valve house, on the right bank of the river, from whence the water will be conducted by a 15" iron pipe to the pump well 40 feet distant from the valve house.

Drawing No 3. 10. Sheet No 3 illustrates the pump well and engine house. The floor level of the boiler room will be one foot above the maximum flood level and the engine room floor two feet higher than that of the boiler room. There will be two engines of the vertical Worthington type each 8 P.H.P., and each capable of lifting half the daily supply in 24 hours. Space is provided for a third engine, but this will not be required for some years as it will take some time before the demand reaches the maximum of 15 gallons per head per day.

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* Note :- It is a matter for consideration whether 3 or 4 rows of 12" pipes would not be more effective than a single row of 24" pipes.

11. Lt. Col. Smart proposed to work the pumps by water power as long as it was available at the anicut. He proposed to gear the pelton wheel directly with the engines, but as the engine house now proposed is 3300 feet above the anicut this arrangement is impracticable.

12. It is proposed to pump the water from the engine house to a cistern on top of the adjoining hill through a rising iron main 12" in diameter and 487 feet long. The main is shorter than in Lt. Col. Smart's scheme by 1213 feet. It will discharge the whole daily supply in 24 hours with a head of 1.4 in 1000; One reflux value will be placed on the pipe.

Vide drawing No. 4

13. The level of the cistern into which the main will discharge will be 97.00. The total lift against which the pumps will have to work will be including friction in main 91.24 feet.

14. From the cistern a gravitating conduit & pipes will convey the water

to

to the service reservoir placed near the jail. The conduit will be circular in shape having a diameter of 1'-9" and a fall of 1½ feet per mile. The conduit running full will discharge 938 gallons per minute whereas the discharge required is 521 gallons. The conduit will therefore discharge the required quantity running a little more than half full. The valley will be crossed by a 12" iron pipe. There is no necessity for using so large a pipe as 20" as proposed by Lt. Col. Smart. A 12" pipe however necessitates the lowering of the conduit on the other side by 2.75 feet. It is cheaper to do so than to use a 20" main. The soil is gravelly or loose laterite, the additional excavation will cost Rs 750 while the difference in cost between the 20" & 12" main is Rs 14,500. The alteration will thus effect a saving of Rs 13,750. The conduit will terminate in a cistern opposite the jail. From this point to the service reservoir there is a fall of 2579 feet, and as with this head a 9" iron pipe would suffice it is considered advisable to use it in preference to the masonry conduit, as this part of the hill is much more frequented by people than the higher portion.

15. The service reservoir is some 4200 feet nearer the town than in Lt. Col. Smart's scheme. But the pressure in the town will be much less than in his scheme. If however the reservoir is placed at the site proposed by him it will entail an extra cost equal to the difference in value of 4200 feet of 15" pipe & 4200 feet of 9" pipe which is about Rs 12,700. A high pressure service is certainly desirable if a town can afford it. But the finances of Cuddalore are so low that if a saving can be effected by reducing the pressure of supply it is very desirable that it should be done. An inspection of Sheet No 7 shews that if the minimum pressure is limited to 10 feet, a reservoir with its floor level at 55.00 will suffice. He intended to cut this reservoir in the solid laterite and provided no lining. But laterite *in situ* is too soft to be trusted to make an impermeable reservoir. There may be faults, lines of cleavage or seams of soft mud as usually found in laterite beds which it would be impossible to make water tight without masonry lining. The reservoir in the revised scheme will hold 2/3 day's supply. The storage capacity could be increased by a second reservoir when funds permit.

Vide drawing No. 5.

its

Drawings No 6 & 7. 16. The mains & pipes are calculated to deliver the full daily supply in 12 hours according to the population in the division district or areas they serve. The following is a statement of pipes & appendages provided in the distributing part of the scheme.

1956 feet 15" Cast Iron pipes.
6021 " 12" "
8171 " 10" "

4617 feet 9" cast iron pipes.
3042 " 8" "
4320 " 7" "
756 " 6" "
2691 " 5" "
3519 " 4" "
37,789 " 3" "
74 sluice valves from 2½ inches to 15 inches.
8 Air valves.
25 Hydrants for fire service.
12 Two tap pillar fountains.
38 Wall tap fountains single and double.

17. Exchange has declined considerably since Lt Col Smart prepared his estimate, and in the revised estimate one of the heaviest item of excess is due to this cause.

18. The total cost of the scheme is estimated as below:-

Infiltration Works	16,980
Engine & Boiler House	8,900
Wood & Store shed	2,000
Engine Drivers' Quarters	5,000
Forming road & constructing culverts	3,000
Compensation for land	54
Engines, Pumps & Boilers including erection	21,600
Pumping main &c	36,780
Laying & jointing main	4,27
Masonry conduit	20,86
Service Reservoir	15,67
Pipes, sluice valves, fountains hydrants &c	1,57,73
Laying & jointing pipes	2,57
Tools & plant	16,70
Establishment	16,70
Contingencies	17,59
Total Rs	3,70,00

19. The working & maintenance charges would be as follows on the assumption that Government will pay a moiety of the cost of the scheme.

	R
Interest & sinking fund on moiety of the cost	$\frac{3,70,000}{2} \times 5.96\% =$ 11,02
Carried over	11,02

	Rs
Brought forward	11026
Pumping for 50,000 people at * 10 gallons a head at 10 annas per million gallons raised 1 foot high	10,494
Maintenance charges	3,000
	13494
Total	24,520

R E Ellis

Office of Sanitary Engineer }
Fort St. George, 8th January 1895 } Ag. Sany. Engineer to Govt.

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* The consumption for many years after the opening of the works will not exceed 10 gallons.

SANITARY ENGINEER
Number No 2436
15 [illegible] 95
TO THE GOVERNMENT OF MADRAS.

1880 [illegible] of 95

Draft Resolution

25

Government of Madras.

SANITARY BOARD OFFICE.

SANITARY ENGINEERING DEPARTMENT.

Mr. ~~J. A. Jones.~~ R. E. Ellis

Proceedings of the Board, No.   , dated

Read report dated 8th January 1895, No 12 from the ag: Sanitary Engineer on Cuddalore water supply together with plans and estimate amounting to Rs 370,000.

Resolved that the above report with plans and estimates be submitted to Government for approval and sanction.

(True Extract)

R E Ellis
Joint Secretary

To

The Chief Secretary to Government
Local and Municipal Deptt.

SANITARY ENGINEER
No. 2636
15 JAN 95
TO THE GOVERNMENT OF MADRAS.

S.E. 6 23-7-94—1,000.

No. 13

GOVERNMENT OF MADRAS.
OFFICE OF SANITARY ENGINEER,
Fort St. George, 8th January 1895.

From

R. E. ELLIS, ESQ., ASSOC. M. INST. C.E.,
ACTING SANITARY ENGINEER TO GOVERNMENT,

To

The Hon: Col: J. Pennycuick, R.E.,
President, Sanitary Board,
Madras.

SIR,

With reference to G.O. No. 2380, L dated 16th November 1894, Local & Municipa I have the honor to forward herewith a draft resolution on Cuddalore water supply scheme.

I have the honor to be,
Sir,
Your most obt. servt.
R. E. Ellis
Ag: Sanitary Engineer

itary Current Number 25S.

3

1895
SANITARY ENGINEER TO THE GOVERNMENT OF MADRAS
Register No. 2436
15-11-95
Regd. 7-6-95

From

The Ag: Sanitary Engineer
to Government

To

The President, Sanitary Board,
Madras

No. 13

Dated 8th }
Desp.d 9th } January 1895
Rec.d }

Enc. 1

Cuddalore Water Supply Scheme

—

Forwarding a draft
resolution on the ——.

Public Works Department.

58

98

Letter from the Acting Sanitary Engineer to Govt.
No. 13 dated 8th January 1895.

Note by the Chief Engineer
Public Works Department:—
No. 322 D dated 8th June 1895

I approve generally of the proposals contained in the Sanitary Engineer's report, but with regard to para 7, I consider that three rows of twelve inch pipes will be considerably more efficient and cost little if anything more than a single row of twenty four inch pipes, and should therefore be adopted.

2. With regard to para 11, apart from the change of the rise there could have been no possible economy obtained from the use of the water power

of the power at the anicut for pumping. This power would only have been available for a short time, and could only be depended on for a still smaller time in each year; it would be necessary for at least nine months in each year, and probably for more, to be prepared to use steam at a few hours notice, so that little or no saving in establishment would be possible, while the small saving in fuel would be more than swallowed up by the interest on first cost, and cost of maintenance, of the extra plant required for utilising the water

power

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power

(Sd.) John Pennycuick.
Colonel R.E.,
Chief Engineer P. W. Dept.

Ootacamund
7th June 1895

Local & Municipal Dept.
CURRENT No. 1850 M

No. 3230 dated 8th June 1895

Transferred to the Local and Municipal Department.

J. Pennycuick
Colonel R.E.,
Secretary to Govt. P. W. Dept.

To,
The Local and Munl. dept.
with papers & in original
and plans.

tary Current Number 25 C

CHIEF SECRETARY
8 JUN. 1895
GOVERNMENT OF MADRAS

[9]

LOCAL AND MUNICIPAL DEPARTMENT

Local & Municipal Dept
CURRENT No. 1850 M

Enclosure No 1 to letter No. 2160 of 1895

SANITARY ENGINEER
Register No 2436
15-VIII-95

From

The Public Works Department

No. 322 D

Dated 8-6-95

Received 11-6-95

Enclosures 5

SUBJECT.

Transferring note by the Chief Engineer P. W. Deptt approving with remarks Sanitary Engineer's proposals regarding the Cuddalore Water supply scheme

No. 949

The Sanitary Engineer is requested to revise the estimate with reference to the remarks of the Chief Engineer.

/By order

C Todhunter
Ag assistant Secretary

11-VIII-95

P.M
5/7/95

Fort St George }
13th July 1895 }

There is only one revision necessary which can be done in a few minutes. The Asst S E will please see this done & the plans ready when I return.

7.7.95
Kodai

To
The Sanitary Engineer
with plans.

S. E./6 19-3-95—1,000.

No. 2160

GOVERNMENT OF MADRAS.

OFFICE OF SANITARY ENGINEER,
Fort St. George, 3rd August 1895.

From

J. A. JONES, ESQ., MEM. INST. C.E., F.R.S.E.,
SANITARY ENGINEER TO GOVERNMENT,

To

The Chief Secretary to Government
Local and Municipal Department

SIR,

With reference to your endorsement No 949+, dated 13th July 1895, I have the honor to enclose a comparative statement showing the excess of cost due to the revision of the estimate with reference to the remarks of the Chief Engineer. The total estimate now stands at Rs 3,71,200.

+ herewith returned

I have the honor to be
Sir
Your most obedient Servant

for Sanitary Engineer to Govt

Acc: 2 { 1 - Comparative Stat.
{ 1 - Local ~~[illegible]~~ current No. 1850 M.

2380-81 L 16-11-94

Local & [illegible]al Dept.
CURR[illegible] 2479 M

43

1895

From

The Sanitary Engineer
to Government

To

The Chief Secretary
to Government
Local & Mun^l Dept.

No. 2160.

Dated 3rd
Despd. 3rd } August 1895
Recd. - 3 AUG. 95

Encs. 2 L & C. No 1838 M noted

Subject

Cuddalore Water Works

Forwarding a comparative statement shewing the difference tween the cost of the Infiltration Works originally estimated and the cost vised with reference to C. Engineer's note.

a/3/5

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44 138

Cuddalore Water Works.

Comparative statement shewing the difference between the cost of the Infiltration Works as originally estimated and the cost as revised with reference to the Chief Engineer's Note No. 322 D, dated 8th June 1895.

Particulars		Original Estimate single row of 24" Stoneware pipes					Revised estimate 3 rows of 12" Stoneware pipes					Increase	Decrease	Remarks
		Quantity	Rate			Amount	Quantity	Rate			Amount			
			Rs	As		Rs		Rs	As		Rs	Rs	Rs	
Excavation including labor for timbering trenches	C. yd.	1585	"	6	"	594	2739	"	6	"	1027	433	"	
24" Stoneware pipes including laying	L. Ft.	610	10	"	"	6,100	"	"	"	"	"	"	6,100	
12" do do	"	"	"	"	"	"	1830	3	"	"	5490	5490	"	
Manholes 12 feet deep 4 feet diameter	Each	3	200	"	"	600	"	"	"	"	"	"	600	
do 18 do	"	1	300	"	"	300	"	"	"	"	"	"	300	
do 12 7'-6"×4'	"	"	"	"	"	"	3	330	"	"	990	990	"	
do 18 do	"	"	"	"	"	"	1	430	"	"	430	430	"	
24" Sluice valve with lifting gear &c complete	"	1	500	"	"	500	"	"	"	"	"	"	500	
12" do do	"	"	"	"	"	"	3	250	"	"	750	750	"	
Filling with gravel of sizes	C. ft 100	18000	6	"	"	1080	27,000	6	"	"	1620	540	"	
Valve House		Lump sum				2047	"			"	2047	"	"	
Pipes from Engine to Valve House		"	"	"	"	344	"	"	"	"	344	"	"	
Baling and pumping		"	"	"	"	5000	"	"	"	"	5000	"	"	
Petty charges						415					482	67	"	
						16,980					18,180	8,700	7,500	
											16,980	7,500		
										Net Excess	+1,200	+1,200		

Office of Sany. Engr. to Govt.
Fort St. George, 3rd August 1895

for Sanitary Engineer to Govt.

Enclosure No. 2 to letter No. 2160 of 1895

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1895

From

The Sanitary Engineer
to Government

To

The Chief Secretary
to Government
Local & Mun^l. Dep^t.

Dated 3^d. August 1895

Cuddalore Water Works

Comparative statement shewing the difference between the cost of the Infiltration works as originally estimated and the cost revised with reference to the Chief Engineer's note No. 322, S dated 1st June 1895

2479 M of 95

LOCAL AND MUNICIPAL DEPARTMENT.

46

Again G.O., dated 189 , No.
Curren. No. 1850 M of 1895, dated 8th June 1895. from the Public works Dept.
Current No. 2479 M of 1895, dated 3rd August 1895 from the Sanitary Engineer.

FOR ORDERS.

The papers read above re-
late to the watersupply scheme pre-
pared by the Sanitary Engineer for the
town of Cuddalore. The Chief Engine
through whom the plans and esti-
mates for the work were submitte
approves generally of the proposal
of the Sanitary Engineer. The cost
of the scheme was originally esti-
mated by Mr Ellis at Rs 3,70,000;
but, as the Chief Engineer suggeste
that it would be better to place t
rows of twelve-inch pipes instead
of a single row of twentyfour-in
pipes in the infiltration galler
the Sanitary Engineer was aske
to revise the estimate in accor
with this suggestion. With the
second of the currents read abov
Mr Jones submits a comparati
statement showing the result
the revision and the scheme
no

now modified is estimated to cost Rs 3.71.200.

2. Assuming that Government would allow the municipal council a grant of half the cost and a loan of the balance at 4¼ per cent. interest, the annual payment required to liquidate the loan in 30 years will be Rs. 11,060, which, together with the working charges amounting to Rs 13.490, as shown in para. 19 of the Sanitary Engineer's report, represents an annual expenditure of Rs 24.550 from municipal funds.

3. The chief available source of income to meet this charge is the water tax, which, if levied at the maximum rate would yield about Rs. 7.910. The tax on buildings and lands, which is now levied at 7 per cent. of the annual rental may also be raised to the maximum rate of 7½ per cent and this may be expected to bring in about Rs. 990 more. The incidence of the tax on arts in 1893-94, having been only Rs 3-a-4, or about three fourths of the general average for municipalities in that year,

a

for 1894-95

The net amount demand (of) the taxes on buildings & lands at 7% of their annual value is — Rs 13,850 —

∴ water tax at 4% would fetch $\frac{13850 \times 4}{7}$

$= \frac{55400}{7} = 7910$ nearly

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means of the council.

V.A. 7/9/95

Apparently there is nothing to do but to say so.

It seems a great pity that so much trouble should have been expended in working out the details of a scheme which was all along financially out of the question.

Perhaps before the San. Engr. is asked to prepare other schemes this office had better first find out within a little what the Council concerned is likely to be able to afford, & then the San. Engr. can see at once whether any given scheme will come anywhere within this, & so wd. be worth working out in detail.

12.8.96

The scheme seems a good one but financially beyond the means of the Council unless Govt. can see its way to making the grant larger or the Engineers can cut down the estimate in any way, which appears to be hardly possible. If Govt. did give a larger grant it would have to face a cry from other Municipalities not similarly favoured but could get out of this difficulty by saying that grants were apportioned with reference to the financial circumstances of individual Municipalities. The suggestion of the Asst. Secy.

I agree - but the papers had better be sent to the C. for consideration in the usual way - Perhaps some public-spirited inhabitants may be able & willing to help. The Railway might also be asked if they will make a lump contribution or an annual payment. They have two stations in the area affected, one of which is an Engine station at which an ample supply of good water must be most important -

I don't think we ought to give more than half the cost.

4/9/95

a strict and careful assessment of the tax may result in an increa of Rs. 139[illegible] but this is too uncertain an item of receipt to be calculated upon in financing the watersupply scheme. Even if this extra income is taken into account, the total amount available from all sources will be Rs 10,290 or only a little more than 40 percent. of the amount required. The municipal revenues do not appear to be capable of any further expansion, all the other taxes being already levied at the maximum rates and the increase of the rate of tolls to meet the charges of a watersupply scheme is objectionable – vide G.O. dated 2nd August 1889, No. 948 M. & 26th January 1892, No. 153. Even if the proposal to raise the rate of the tax on houses and lands & the watertax from 7½ to 10 & from 4 to 6½ percent. of the annual rental is passed into law, the additiona income which may be expecte would be Rs 20,180,× which is still considerably short of the required amount. The schem is thus quite beyond the

means

×

	Rs
Water tax	12,850
House & land taxes	5,940
Arts-tax	1,390
Total	20,180.

appears to be a good one. It would not be a difficult matter in the case of all Municipalities which it is contemplated to provide with water supply in the near future to work out approximately the amount which each could possibly raise to meet the cost of a scheme. This could be communicated to the Sanitary Engr. and he would then know with fair accuracy the figure which would have to be his limit in estimating for it and he might in many cases be able to say definitely without going into many of the details which must necessarily appear in an estimate whether it would be financially practicable to provide a fairly satisfactory water scheme for any particular Municipality or not.

J.P.
2/5/96.

infiltration pipe than it would be were the works placed in the bank. In the latter case the soil of the bank being clayey will act as a barrier to the flow of the under current in the Gadilam towards the pipe and the works will have to depend chiefly on the flow from the land side, and there are no data to prove that the supply of water from the land side is copious.

7. *Drawing No.* 2.—The water will be drawn by a line of 24-inch * perforated stoneware pipes laid across the river 3,300 feet above the anicut. The bottom of the perforated pipe will be at the level of 7·50 or 10 feet below lowest water level. The pipe will be bedded on 12 inches of gravel and the pipe trench will also be filled up with gravel to a height of 5 feet and above that with the original sand.

8. Lieutenant-Colonel Smart proposes a length of 200 feet. This length appears to be inadequate even for a 10 gallon scheme from experience of infiltration works already constructed in this Presidency. If the soil were gravelly and charged with abundance of water 200 feet would have sufficed. The length of perforated pipes in the revised scheme will be 610 feet. The actual length that will be required can only be determined during construction as there are not sufficient data yet available to calculate the length required with any degree of accuracy.

9. The perforated pipe will end in a valve house on the right bank of the river from whence the water will be conducted by a 15-inch iron pipe to the pump well 40 feet distant from the valve house.

10. *Drawing No.* 3.—Sheet No. 3 illustrates the pump, well and engine-house. The floor level of the boiler room will be 1 foot above the maximum flood level and the engine room floor 2 feet higher than that of the boiler room. There will be two engines of the vertical Worthington type, each eight horse-power and each capable of lifting half the daily supply in 24 hours. Space is provided for a third engine, but this will not be required for some years as it will take some time before the demand reaches the maximum of 15 gallons per head per day.

11. Lieutenant-Colonel Smart proposed to work the pumps by water power as long as it was available at the anicut. He proposed to gear the pelton wheel directly with the engines, but as the engine house now proposed is 3,300 feet above the anicut this arrangement is impracticable.

12. *Vide Drawing No.* 4.—It is proposed to pump the water from the engine-house to a cistern on top of the adjoining hill through a rising iron main 12 inches in diameter and 887 feet long. The main is shorter than in Lieutenant-Colonel Smart's scheme by 1,213 feet. It will discharge the whole daily supply in 24 hours with a head of 1·4 in 1,000; one reflux valve will be placed on the pipe.

13. The level of the cistern into which the main will discharge will be 97·00. The total lift against which the pumps will have to work will be including friction in main 91·24 feet.

14. From the cistern a gravitating conduit and pipes will convey the water to the service reservoir placed near the jail. The conduit will be circular in shape, having a diameter of 1 foot 9 inches and a fall of 1½ feet per mile. The conduit running full will discharge 938 gallons per minute, whereas the discharge required is 521 gallons. The conduit will therefore discharge the required quantity running a little more than half full. The valley will be crossed by a 12-inch iron pipe. There is no necessity for using so large a pipe as 20 inches as proposed by Lieutenant-Colonel Smart. A 12-inch pipe however necessitates the lowering of the conduit on the other side by 2·75 feet. It is cheaper to do so than to use a 20-inch main. The soil is gravelly or loose laterite, the additional excavation will cost Rs. 750 while the difference in cost between the 20-inch and 12-inch main is Rs. 14,500. The alteration will thus effect a saving of Rs. 13,750. The conduit will terminate in a cistern opposite the jail. From this point to the service reservoir there is a fall of 25·79 feet, and as with this head a 9-inch iron pipe would suffice, it is considered advisable to use it in preference to the masonry conduit as this part of the hill is much more frequented by people than the higher portion.

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* Note.—It is a matter for consideration whether three or four rows of 12" pipes would not be more effective than a single row of 24" pipes.

15. *Vide Drawing No.* 5.—The service reservoir is some 4,200 feet nearer the town than in Lieutenant-Colonel Smart's scheme. But the pressure in the town will be much less than in his scheme. If however the reservoir is placed at the site proposed by him it will entail an extra cost equal to the difference in value of 4,200 feet of 15-inch pipe and 4,200 feet of 9-inch pipe which is about Rs. 12,700. A high pressure service is certainly desirable if a town can afford it. But the finances of Cuddalore are so low that if a saving can be effected by reducing the pressure of supply it is very desirable that it should be done. An inspection of sheet No. 7 shows that if the minimum pressure is limited to 10 feet, a reservoir with its floor level at 55·00 will suffice. He intended to cut this reservoir in the solid laterite and provide no lining. But laterite *in situ* is too soft to be trusted to make an impermeable reservoir. There may be faults, lines of cleavage or seams of soft mud as usually found in laterite beds which it would be impossible to make it water-tight without masonry lining. The reservoir in the revised scheme will hold ⅔ day's supply. The storage capacity could be increased by a second reservoir when funds permit.

16. *Drawings Nos.* 6 *and* 7.—The mains and pipes are calculated to deliver the full daily supply in twelve hours according to the population in the district or areas they serve. The following is a statement of pipes and appendages provided in the distributing part of the scheme :—

1,956	feet	15	inches	cast iron pipes.
6,021	,,	12	,,	,,
8,171	,,	10	,,	,,
4,617	,,	9	,,	,,
3,042	,,	8	,,	,,
4,320	,,	7	,,	,,
756	,,	6	,,	,,
2,691	,,	5	,,	,,
3,519	,,	4	,,	,,
37,789	,,	3	,,	,,

74 sluice valves from 2½ inches to 15 inches.
8 air valves.
25 hydrants for fire service.
12 two-tap pillar fountains.
38 wall tap fountains, single and double.

17. Exchange has declined considerably since Lieutenant-Colonel Smart prepared his estimate, and in the revised estimate one of the heaviest item of excess is due to this cause.

18. The total cost of the scheme is estimated as below :—

	RS.
Infiltration works	16,980
Engine and boiler house	8,900
Wood and store shed	2,000
Engine-driver's quarters	5,000
Forming road and constructing culverts	3,000
Compensation for land	544
Engines, pumps and boilers including erection	21,600
Pumping main, &c.	36,780
Laying and jointing main	4,270
Masonry conduit	20,860
Service reservoir	15,570
Pipes, sluice valves, fountains, hydrants, &c.	1,57,730
Laying and jointing pipes	25,770
Tools and plant	16,700
Establishment	16,700
Contingencies	17,596
Total	3,70,000

19. The working and maintenance charges would be as follows on the assumption that Government will pay a moiety of the cost of the scheme :—

	RS.
Interest and sinking fund on moiety of the cost Rs. $\frac{3,70,000}{2} \times 5{\cdot}96$ per cent. = ...	11,026
Pumping for 50,000 people at 10 gallons* a head at 10 annas per million gallons raised 1 foot high	10,494
Maintenance charges	3,000
Total ..	21,520

(Signed) R. E. ELLIS,
Ag. Sanitary Engineer to Government.

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* The consumption for many years after the opening of the works will not exceed 10 gallons.

Resolved,—that the above report with plans and estimates be submitted to Government for approval and sanction.

(Signed) R. E. ELLIS,
Joint Secretary.

To the Chief Secretary to Government,
Local and Municipal Department.

No. 322-D.

Note by the Chief Engineer, Public Works Department.

I approve generally of the proposals contained in the Sanitary Engineer's report, but, with regard to paragraph 7, I consider that three rows of 12-inch pipes will be considerably more efficient and cost little, if anything, more than a single row of 24-inch pipes and should therefore be adopted.

2. With regard to paragraph 11, apart from the charge of rise there could have been no possible economy obtained from the use of the water power of the river at the anicut for pumping. This power would only have been available for a short time, and could only be depended on for a still smaller time in each year; it would be necessary for at least nine months in each year, and probably for more, to be prepared to use steam at a few hours' notice, so that little or no saving in establishment would be possible, while the small saving in fuel would be more than swallowed up by the interest on first cost and cost of maintenance of the extra plant required for utilising the water power.

OOTACAMUND,
7th June 1895.

(Signed) J. PENNYCUICK, Colonel, R.E.,
Chief Engineer, P.W.D.

No. 323-D.

Transferred to the Local and Municipal Department.

(Signed) J. PENNYCUICK, Colonel, R.E.,
Secy. to Govt., P.W.D.

8th June 1895.

To the Local and Municipal Department,
with papers, &c., in original and plans.

No. 949.

The Sanitary Engineer is requested to revise the estimate with reference to the remarks of the Chief Engineer.

(By order.)

FORT ST. GEORGE,
13th July 1895.

(Signed) C. G. TODHUNTER,
Ag. Asst. Secretary.

From J. A. JONES, Esq., MEM. INST. C.E., F.R.S.E., Sanitary Engineer to Government, to the Chief Secretary to Government, dated Fort St. George, 3rd August 1895, No. 2160.

With reference to your endorsement, No. 949, dated 13th July 1895 (herewith returned), I have the honour to enclose a comparative statement showing the excess of cost due to the revision of the estimate with reference to the remarks of the Chief Engineer. The total estimate now stands at Rs. 3,71,200.

ENCLOSURE.

COMPARATIVE statement showing the difference between the cost of the *Infiltration Works* as originally estimated and the cost as revised with reference to the Chief Engineer's note, No. 322-D., dated 8th June 1895.

Particulars.		Original estimate single row of 24″ stoneware pipes.			Revised estimate three rows of 12″ stoneware pipes.			Increase.	Decrease.
		Quantity.	Rate.	Amount.	Quantity.	Rate.	Amount.		
			RS. A. P.	RS.		RS. A. P.	RS.	RS.	RS.
Excavation including labour for timbering trenches ..	c. yd.	1,585	0 6 0	594	2,739	0 6 0	1,027	433	..
24″ stoneware pipes including laying	c. ft.	610	10 0 0	6,100	..	..	..	..	6,100
12″ stoneware pipes including laying	,,	..	..	..	1,830	3 0 0	5,490	5,490	..
Manholes, 12′ deep 4′ diameter.	each.	3	200 0 0	600	..	..	..	..	600
Manholes, 18′ deep 4′ diameter.	,,	1	300 0 0	300	..	..	..	..	300
Manholes 12′ deep 7′ 6″ × 4′ diameter	,,	..	..	..	3	330 0 0	990	990	..
Manholes 18′ deep 7′ 6″ × 4′ diameter	,,	..	..	..	1	430 0 0	430	430	..
24″ sluice valve with lifting gear, &c., complete	,,	1	500 0 0	500	..	..	..	..	500
12″ sluice valve with lifting gear, &c., complete	,,	..	..	..	3	250 0 0	750	750	..
Filling with gravel of sizes ..	c. ft. 100	18,000	6 0 0	1,080	27,000	6 0 0	1,620	540	..
Valve house	..	..	Lump sum.	2,047	..	..	2,047	..	..
Pipes from engine to valve house	..	..	..	344	..	..	344	..	..
Baling and pumping	..	..	..	5,000	..	..	5,000	..	..
Petty charges			..	415	..	..	482	67	..
				16,980			18,180	8,700	7,500
							16,980	7,500	..
						Net excess.	+ 1,200	+ 1,200	..

ORDER—dated 12th September 1895, No. 1486 M., Local and Municipal.

The papers will be referred to the Municipal Council, Cuddalore, for early remark. The scheme appears at first sight to be beyond the means of the council. The Government is not prepared to contribute more than the usual amount of one-half of the estimated cost, but it may be that there are public-spirited inhabitants of the town who would be able and willing to assist the council with the funds necessary to the execution of the scheme.

2. The Agent of the South Indian Railway Company will also be requested in the Public Works Department (Railway Branch) to state whether the Company would be prepared to contribute either a lump sum or an annual grant towards the expenses of the scheme in consideration of the benefits which it will probably confer upon the railway property in the town.

(True Extract.)

J. F. PRICE,
Chief Secretary.

To the Sanitary Engineer.
,, Chairman, Municipal Council, Cuddalore.
,, Public Works Department (Railway Branch).

Exd. S. J. Pereira.

Govt. of {1895} Madras.

LOCAL AND MUNICIPAL.

Issued

Recd. *Encl.*

G.O., 12th Sept. 1895, No. 1486 M.

SEPTEMBER.

Water-supply.

Referring to the Municipal Council, Cuddalore, for early remarks the papers relating to the — scheme of the town, and stating that the Agent of the South Indian Railway Company will be requested in the Public Works Department to report whether the Company will be prepared to contribute either a lump sum or an annual grant towards the expenses of the scheme.

READ AGAIN ORDER OF GOVERNMENT, DATED 18 , No.

15

BACKER, No. of 18

FURR PAPER No. of 18

ENCLOSURES.

CURRENT NO.S · 1859 M/95 enclosures 3 & 4 · & one 2479 M/95 & enclosure to the same } A

STATEMENT WITH DITTO.

ORDER, &C., OF GOVERNMENT—A.

PAPERS KEPT OUT OF FILE FOR DESPATCH IN ORIGINAL (not paged).

NUMBER OF COPIES REQUIRED.
- Order complete. 100
- Letter only.
- Order complete with Letter.

[illegible] 13/9/95

N.B.—

A = Print in full.
B = Not to be printed.
P = Print abstract only.
Q = Print heading only.
R = Print, but not for monthly volume.

[1]

INDEXED.

PRESS.

LOCAL AND MUNICIPAL DEPARTMENT.
G.O., DATED 12-9-95
No. 1486 M.

First copy sent to Press. 13/9/95
Returned for signature. 7/10/95
Despatched in print. 11/10/95

[Despatch Abstract.]

Water supply

Referring to the Munl
Commr at, Cuddalore, for ear
remarks, the papers relatin
to the —— scheme of the to
& stating that the Agent of
S. I. R. Co. will be requested
& the P. W. D. to report
whether the Co. will b
prepared to contribute
either a lump sum or an
annual grant towards
expenses of the scheme