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G.O., No. 1672 m

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[Despatch Abstract.]

Water supply

Referring to ~~me~~ W.D, with remarks, papers relating to the drainage and —— schemes for the City of Madras.

BACK PAPERS.

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

PUBLISHED PAPERS.

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Government of Madras.

LOCAL AND MUNICIPAL DEPARTMENT.

MISCELLANEOUS.

Recd. } 1895. *Enclosures*

Regd. } *Spare copies*

G.O., No. 1672 M., 19th October 1895.

Water-supply

Referring to the Public Works Department, with remarks, papers relating to the drainage and — schemes for the city of Madras.

GOVERNMENT OF MADRAS.

LOCAL AND MUNICIPAL DEPARTMENT.

READ—the following papers :—

I

Letter—from Lieutenant-Colonel G. M. J. MOORE, C.I.E., President, Municipal Commission, Madras.
To—the Chief Secretary to Government.
Dated—the 14th September 1895.
No.—G.-337.

With reference to G.O., Mis. No. 366 M., dated 6th March 1895, I have the honor to forward Mr. Ellis' report on the Hydraulic survey of Madras city.

2. I have not submitted the plans and appendices as they are so voluminous that it would take at least a month to copy, and would suggest that if Government requires them, they might be sent over to Fort St. George on the return of Government from the hills, and after all they only concern the Municipality, which can base all extensions on them.

ENCLOSURE.

Letter—from R. E. ELLIS, Esq., Engineer, Municipal Commission, Madras.
To—the President, Municipal Commission, Madras.
Dated—the 5th September 1895.

With reference to the resolution of the Commissioners on G.O., Mis. No. 4 M., dated 8th January 1895, I have the honour to submit my report on the Hydraulic survey of Madras; attached to the report are the following plans and appendices :—

Plan No. 1, sheets 1, 2, 3, 4 and 5 shewing all the mains and branch pipes and the levels of the roads at different parts of the town, and sheets 1*a*, 2*a*, 3*a*, 4*a* and 5*a* showing all mains and branches above 7″, the area supplied by each main, and the additional pipes and alterations recommended for schemes Nos. 1 and 2.

Plan No. 2 showing the distribution of the population according to the last Census.

Plan No. 3 showing the area supplied by each main and the alterations and additions recommended for scheme No. 3.

Plan No. 4—Sections and hydraulic gradients of pipes of schemes Nos. 1, 2 and 3.

Plan No. 5—Longitudinal and cross sections of Red Hills channel.

Plan No. 6—Masonry shaft.

Plans Nos. 7 and 8—Existing safety weirs.

Appendix 1.—Tabular statement showing quantity of water delivered into Madras from 1879 to 1894.

Appendix 2.—Statement showing the position and description of fountains and rate of discharge between 6 and 8 A.M.

Appendix 3.—Statement showing the length of pipes of each size already laid, length of new pipes to be laid and length of pipes to be taken up and relaid for scheme Nos. 1 and 2.

Appendix 4.—List of hydrants on the mains showing the pressures between 6 and 8 A.M.

Appendices 5 *and* 6.—Tabular statements showing hydraulic gradients, and velocity of flow in pipes.

Appendix 7.—Statement showing the discharge over Red Hills weir.

Appendices 8, 9 *and* 10.—Estimates of works referred to in the report.

Appendix 11.—List of sites suitable for bathing places.

2. It has been known for a long time that the water-supply in many parts of the town is defective, that many of the fountains fail altogether at certain hours during the day, and that the supply in some districts is getting worse; to say that the defect is due to insufficient pressure does not explain matters very clearly to an unprofessional mind, when it is known that the pressure at Kilpauk is practically the same now as it always has been. The fact of the matter is, more water is being delivered into Madras than formerly, and is being drawn off before it has had time to proceed very far in the mains, and the result is, that all the available pressure is absorbed before the outlying districts are supplied. The quantity of water delivered in 1884 was 131,722,600 cubic feet as compared with 335,827,809 cubic feet in 1894—*vide* Appendix 1.

3. There are several ways in which the system of distribution could be improved :—

(1) By increasing the pressure in the main by pumping at Kilpauk.
(2) By increasing the size or number of mains.
(3) By using subsidiary pumps for such parts of the town where the pressure is defective.
(4) By limiting the supply to certain districts where pressure is good and preventing waste wherever it occurs.
(5) By scraping the inside of the pipes and removing deposit and dirt.
(6) By combination of the above.

4. Before any definite idea could be formed as to the best course to adopt, or to what extent alterations and additions would be necessary in case Mr. Cousins' water-supply scheme is carried out or otherwise, it has been necessary to prepare a correct plan of the pipes as they exist, and test the pressures in the mains and discharges at the fountains, and to ascertain as far as possible the population to be supplied by the different mains and branches and how far they are able to perform the work they have to do, and wherethey fail.

5. In his report on the water-supply Mr. Cousins proposes to increase the pressure at Kilpauk to 81·7 above datum * by pumping; he does not recommend any increase in the size of the principal mains, but considers that all public mains below 3″ in diameter should be taken up and replaced with pipes of larger size; what size these should be or what additional mains or extensions would be required in the 1st Division and other parts of the town not now supplied, is not stated.

* Datum is 20 feet below mean sea.

6. In making proposals for improving the system of distribution, I have had in view three alternative schemes, namely, scheme No. 1 to supply 20 gallons a head in 10 hours with increased pressure at Kilpauk, scheme No. 2 to supply 10 gallons a head in 10 hours without pumping and scheme No. 3 to supply 15 gallons a head in 10 hours without pumping.

7. Scheme No. 1—Mr. Cousins and the Committee appointed by Government in 1890 to enquire into the drainage and water-supply of Madras, have estimated that 25 gallons per head per diem would be required in Madras for all purposes. In calculating the pressure required, and determining the sizes of the branches, I have assumed in scheme No. 1 that four-fifths of that quantity will be drawn off in 10 hours allowing a minimum pressure of 10 feet in any part of the town.

8. For the purpose of water-supply, Madras may be divided into nine districts; the limits of each is shown in plans 1 and 3 by distinctive colours.

9. The result of the investigation goes to prove that with few exceptions, the sizes of the principal mains as originally laid, correspond very closely with the sizes that would be required to meet the conditions stated in paragraph 7, assuming that a pressure of 73 feet above datum is maintained at Kilpauk, so that, provided the existing mains are capable of standing that pressure, it would not be necessary to abandon them; the branch pipes however are not so well laid out and require to be considerably altered and extended.

10. The 1st Division was not included in the original scheme of 1869 for the water-supply of Madras. It has, however, been drawing a supply from mains intended to meet the demands of the 2nd and 3rd Divisions, but as some parts of the 3rd Division are considerably higher than the 1st Division, the supply in the former has suffered in consequence.

11. The north Auxiliary main proposed by the Acting Engineer in his letter No. 445 of the 13th July 1894 is intended to improve the supply in the 1st Division, but it is far too small to comply with the conditions referred to in paragraph 7, for assuming a pressure of 73 feet above datum is maintained at Kilpauk, the main would deliver only 10 gallons a head in 10 hours to the population in its district. If it is considered advisable that the 1st Division be supplied under the same conditions as the rest of the town, it would be necessary either to take up the main and lay a larger pipe in its place or to lay another main along-side of it or by another route or to further increase the pressure at Kilpauk.

12. I have provided for the 1st alternative in the estimates except for a short length where the pipe has been duplicated, in order to use up the stock that has been ordered. One pipe will give more satisfactory results than two in the same street, and the connections with the branches would be simpler; there is no other very suitable route for a second pipe. The 3rd alternative is out of question as the necessary pressure at Kilpauk would be excessive, namely 158 feet above datum.

13. The extension of existing mains and the size of each branch has been carefully considered with reference to the population to be supplied, the level of the highest point on the branch, the pressure on the main at the point of connection, and the velocity of flow in the pipes; and endeavours have been made to arrange the branches so that the water may circulate freely.

14. Reference is here made to plans Nos. 1 and 2 in order that the proposed alterations for scheme No. I may be understood. In plan No. I, sheets 1, 2, 3, 4 and 5 the north and south auxiliary mains have been omitted, but all the existing mains and branches have been, shown in red and the sizes of the pipes denoted. The fountains are shown by small red circles some of which are colored green denoting that they failed to give water at some time during May 1895. Levels have been written on the plan—this course has been adopted in preference to drawing contour lines as being more suitable for a flat town like Madras.

15. On sheets 1*a*, 2*a*, 3*a*, 4*a*, and 5*a*, the sanctioned auxiliary mains and branches are shown in red, and the existing trunk mains and branches above 7″ in dotted red lines, black dotted lines are drawn in streets where it is recommended to increase the size of the mains and full black lines are additional mains and branches. The length of pipe already laid in Madras is approximately 115 miles, of which 51 miles are 3″ pipe and under. The proposal for scheme No. I is to lay 35 miles and 1,960 feet of new pipe, to take up and clean and relay 9 miles and 1,848 feet of old pipes, and to take up and relay 6 miles and 3,645 feet of proposed auxiliary mains and branches—*vide* appendix 3.

16. With the increased pressure and these improvements carried out, the quantity of supply would be satisfactory. It would be necessary to introduce a thorough system of inspection to see that the fittings and connections for all house services are in good repair, as with the increased pressure any waste that now occurs will be greatly enhanced. The fittings for most of the public fountains will require renewing. It is estimated that there are 1,900 public taps and for this item alone Rs. 15,000 has been provided in the estimate.

17. Waste water meters have been fixed in three streets in Madras, Nagappa Aiyar street 7th Division, Rasappa Chetty street, 2nd Division, and Venaitheertha Mudali street, 5th Division and it is satisfactory to learn that the amount of water drawn off from 10 P.M. to 4 A.M. in each case is small showing there is very little waste in these streets during the night from leakage and taps being left open.

18. The following table gives the average draft per hour from the three mains referred to :—

Hours.	7″ Pipe, Nagappa Aiyar Street.	7″ Pipe, Rasappa Chetti Street.	4″ Pipe Venaitheertha Mudali Street.
	Gallons per hour.	Gallons per hour.	Gallons per hour.
1 A.M.	0	680	200
2 ,,	0	560	190
3 ,,	0	620	200
4 ,,	50	1,770	230
5 ,,	1,070	1,510	1,230
6 ,,	1,940	1,640	2,110
7 ,,	3,170	1,640	1,570
8 ,,	2,940	1,240	2,040
9 ,,	2,420	1,190	1,900
10 ,,	2,300	1,550	2,010
11 ,,	2,470	2,070	2,100
12 Noon	2,360	2,290	1,930
1 P.M.	2,240	2,380	1,820
2 ,,	2,010	2,310	1,910
3 ,,	2,110	2,180	1,790
4 ,,	2,140	2,530	1,940
5 ,,	2,030	2,730	1,970
6 ,,	2,190	2,950	1,900
7 ,,	1,980	2,990	1,600
8 ,,	1,620	3,050	1,380
9 ,,	1,170	3,550	1,190
10 ,,	730	2,370	510
11 ,,	140	1,560	300
12 Midnight	0	910	170
Total	37,080	46,270	32,190
Gallons from 6 A.M. to 6 P.M.	30,320	26,700	24,990
Proportion of 24 hours' supply drawn off in 13 hours.	·81	·58	·77

From the above figures it will be seen that the assumption that four-fifths will be drawn off in 10 hours leaves a fair margin.

19. It is difficult to say what the effect of increased pressure will be on the mains, but it is probable many leaks will show themselves and repairs will be necessary and for this purpose a sum of Rs. 5,000 has been provided in the estimate.

20. Many of the pipes are very dirty, a sample of the incrustation has been sent to the Chemical Examiner who reports as follows :—

"I have the honour to state that the composition of the matter sent with your letter is—

	PER CENT.
"Organic matter	11·46
Matter insoluble in hydrochloric acid (*i.e.*), sand, etc.	19·80
Oxide of iron and aluminium ($Fe_2 O_3$ and $Ab_2 O_3$)	64·64
Other metallic compounds not estimated, lime, etc.	4·10
	100·00

"The matter contained a slime in which were imbedded small leeches and other forms of life. I should say that water would deteriorate by passing through pipes containing matter having the composition of this stuff, containing so much loose organic matter."

21. Some idea of the amount of water stopped on account of incrustation in the pipes may be gathered from the experience of Torquay, England, where a pipe before being cleaned delivered 317 gallons a minute and after cleaning 595 gallons, the size of pipe under reference being 10," 9″ and 8″ and the pressure 465 feet. Whether any such improvement can be made in Madras with low pressure and velocity is very doubtful; the amount of good that could be done by cleaning the pipes and cost of the work can only be ascertained after a long series of experiments; Rs. 20,000 has been put in the estimate for this item.

22. The cost of the works enumerated amount to Rs. 6,53,382 details of which are shown in appendix 8. This is in addition to the cost of the works included in Mr. Cousins' estimate.

23. As the question of funds has always to be considered, and the cost of the entire works and maintenance appears prohibitive, the question naturally arises whether anything can be done to improve the water-supply of Madras without undertaking the complete scheme as recommended by Mr. Cousins. The chief difficulty being the cost of pumping, it becomes necessary to see whether it is possible to avoid this part of the scheme and what it will entail. To begin with, all idea of filtration would have to be given up, for without pumping, filtration is practically impossible, the available pressure in Madras being too low. The question then resolves itself into the advisability of adopting a scheme which will increase the supply, distribute it more equally, render it continuous, and improve the quality to some degree by creating a better circulation in the pipes; how far such a scheme is needed can be judged from the Sanitary Commissioner's inspection notes on the defects of an intermittent supply, and from Appendix 2 which gives the discharge in gallons per minute from the various fountains. From the statement it will be seen that 640 out of 1,025 fountains deliver less than 3 gallons a minute, and the supply at such fountains may be considered as defective.

24. Scheme No. 2 has been prepared with the object of meeting the case referred to above. By carrying out the alterations and extensions to the mains as recommended in scheme No. I and by making certain alterations to the head works at Kilpauk a continuous supply of 10 gallons a head in 10 hours could be effected, the cost of such works would amount to Rs. 6,74,382, details of which are given in appendix 9. As in scheme No. I, taking up and relaying north auxiliary main is provided for, for under existing pressure it will deliver only 5 gallons a head in 10 hours to the population in its district,—*vide* appendix 5, but this portion of the work might be delayed until found absolutely necessary.

25. The Red Hills channel has a fall of 5·83 feet in 6 miles and 1,081 yards. From the cross sections given in plan No. 5 it is evident that a considerable amount of silting up has taken place, though I can find no record of the original section. The level of the water at the masonry shaft at 6 A.M. is usually about 52·69 and at 6 P.M. about 51·69 indicating that the channel forms, as it were, a reservoir during the night. The maximum average discharge per diem was in May 1894 when it amounted to 7,002,988 gallons, and assuming that four-fifths of it was drawn off in 10 hours the channel should be capable of supplying 560,239 gallons an hour. If it is decided to retain the existing channel for the present, it would be advisable to resection its entire length, raise the banks in places, and construct an overflow weir about 50 feet long with its crest at 52·75 near the masonry shaft, discharging into the ottary nulla with a head of about 4″ so that a full supply may be allowed to come down without risk of damaging the banks. There are three safety overflows already in the channel, but owing to their position they do not render sufficient protection in case of accidents, the nearest weir being 1 mile and 1,694 yards from the masonry shaft. It takes about 14 hours for the water to come from Red Hills to Madras, and with a little experience it would be possible to regulate the supply so as to avoid wastage, and at the same time overcome the loss of 1-foot pressure now experienced. A lump sum Rs. 30,000 has been provided in the estimate for alteration to the channel and head works at Kilpauk.

26. One great defect in the present system is caused by shutting the sluice at Kilpauk whenever it is considered necessary to remove the dirt collected in the masonry shaft, thereby rendering the supply intermittent. This operation takes about one hour and is generally performed between 12 and 1 on Mondays. The amount of dirt arrested in the shaft must be small compared with the quantity that enters the pipes, and it would be far better to widen the

channel to some distance so that the velocity of flow may be reduced, and the silt allowed to settle before entering the shaft and subsequently removed, or to construct a bye-pass at Kilpauk so that the water may be led into the 42″ main without entering the shaft when the operation of cleaning is performed. Seeing the great objections raised to the intermittent supply, it is questionable whether it would not be advisable to clean the shaft less frequently, say, once in six months instead of once a week as is done now, pending the construction of these works.

27. *Scheme No.* 3.—Should a supply of 10 gallons in 10 hours be considered insufficient, it could be further increased by laying a still larger main to the north to supply the 1st and 4th divisions and parts of 2nd and 3rd divisions, and by extending the 14″ main from Woods Road along Royapettah High Road to help supply Mylapore. By this arrangement as shown in plan No. 3 it will be possible to deliver 15 gallons a head in 10 hours without resorting to pumping at Kilpauk. The estimated cost of this scheme is Rs. 9,26,414.

28. In case either scheme No. 2 or 3 is adopted the supply at the highest parts of the town, such as Cutcherry Road in the 8th division, and Angappa Naick Street, and Krishnaswami Pagoda Street, etc., in the 3rd division, is liable to be defective. This difficulty could be met by the adoption of cisterns in such districts, or by using steam pumps to give the necessary pressure. It may, however, be several years before such additional pressure is considered necessary and no provision has therefore been made in the estimate, such pumps would be far smaller than would be required at Kilpauk in Mr. Cousins' scheme.

29. The additions and extensions recommended do not provide pipes for all streets, but the sizes of the branches have been so arranged that sub-branches can be laid wherever required. It will be noticed that provision has not been made for taking up all branches under 3″ and substituting larger pipes as recommended by Mr. Cousins. This is merely matter of expense which can be postponed until found absolutely necessary.

30. In his inspection notes Dr. King has urged the necessity of providing places for dhobies of Madras. Two places for this appear to me to be suitable. One on the Spur tank, an ample supply of fresh water being obtained from a pipe branching off the 36″ main, the dirty water would be led into the Egmore drains in the event of the latter work being carried out and the other is near the Lunatic Asylum, the supply being obtained from the Red Hills channel, the dirty water could be conducted to the nearest sewer after the completion of the drainage works.

31. A list of the sites suitable for additional bathing places is given in appendix II.

32. It may be placed on record that the 30″ main supplying Mylapore and Triplicane, and the 18″ main supplying Royapettah are cases where the size of the pipes and the discharging capacity are not in accordance with the probable demand from the population within the districts, they have to supply, when compared with the sizes and requirements of the rest of the town. The advisability of extending these pipes and doing away entirely with the south auxiliary main has been carefully considered. In the event of pumping being resorted to, and more water being required at Mylapore, the pipe along Triplicane High Road and Barbers' Bridge Road, from Pycroft's Road to Mylapore might be taken up and a 16″ pipe laid in its place; the discharging capacity of this length of the existing pipe being too small compared with the rest of the main. In scheme No. 3, it is proposed to extend the 18″ main above referred to.

33. In conclusion I beg to recommend that scheme No. 2 be carried out or at least so much of it as funds will admit, postponing for the present, if necessary, such parts of it as relate to the alterations to the auxiliary mains. I also recommend that the masonry shaft be cleaned once in six months pending the completions to the alterations to the head works at Kilpauk. The great advantage of this proposal is, that it is one step towards completing Mr. Cousins' scheme should funds be available for the pumps and filters at Kilpauk, and for the masonry conduit from Red Hills in years to come. If it is considered advisable to further increase the supply, I would recommend that steam pumps be placed on the mains to give additional pressure during the hours when the demand is greatest, rather than carry out scheme No. 1 or 3. When this question of distribution is disposed of, I strongly recommend for consideration the removal of all villages within the catchment area of Red Hills lake estimated to cost Rs. 50,000 and the erection of an engine-house and drivers' quarter and pumps at Red Hills at a cost of Rs. 80,000 in place of the temporary engines and sheds now employed whenever the level of the lake falls below 35·50.

II

Letter—from Lieutenant-Colonel G. M. J. Moore, C.I.E., President, Municipal Commission, Madras.
To—the Chief Secretary to Government.
Dated—the 1st August 1895.
No.—G. 265.

With reference to G.O., No. 1651 M., dated 7th November 1894 (paragraph 9), I have the honour to submit as follows.

2. At a General Meeting held on the 28th January 1895 (copy of minutes herewith) the Commissioners appointed a Committee to report on the subject.

3. The report of the Committee (copy herewith) was considered by the Commissioners at an adjourned special meeting held on 31st May 1895 (copy of minutes attached) when it was resolved that the recommendations of the Committee in paragraphs 13 and 16 be adopted with the further recommendation that the Red Hills tank be restored to its original level.

4. The accompanying maps D and E show respectively the proposals of Mr. Ellis and Mr. Loane (appendices A and B to the report).

5. The Commissioners then proceeded to the consideration of the financial question which occupied their attention at the meetings held on 7th, 14th and 26th June (copy of minutes enclosed) and was finally disposed of at the meeting held on 8th July (copy of minutes herewith).

6. It will be seen from the resolution passed at this last meeting, and indeed from the proceedings of all the meetings, that the Commissioners are more than averse to enhance the house and water tax.

7. Their reasons are principally that they consider that those taxes are already oppressively heavy, that any increase will tell most unfavourably on the poorer class of house owners occupying their own houses, and will lead to the overcrowding of houses to a still greater extent than obtains at present.

8. With regard to the request for a grant of 10 lakhs, the views expressed by those who supported the resolution were briefly as follows:—Madras is the capital city of Southern India, the seat of Government and a Garrison Town. It contains a large number of Government offices and institutions, in consequence of which there is always a floating population from all parts of the country. On these grounds they consider that Madras is more entitled to assistance from Government than any other Municipality.

9. After having written the above, I learnt that Colonel Pennycuick would be in Madras in a few days and I thought it better to await his arrival in view to going into the subject with him personally.

10. Colonel Pennycuick very kindly met Mr. Ellis, Mr. Loane and myself and went briefly through the proposed schemes. At his suggestion more information has been obtained and is submitted in Mr. Ellis' letter of 20th July 1895 (annexed, marked F) and Mr. Loane's of 31st July (marked G).

11. Colonel Pennycuick also required a tracing of Mr. Ellis' map D, which is marked H and forwarded herewith, as also a copy of Mr. Cousins' proposed scheme which is marked I and also forwarded.

Enclosures.

Extract from the Proceedings of the Municipal Commissioners for the City of Madras, dated the 28th January 1895.

* * * * *

No. 4.

G.O., No. 4 M., Mis., dated 8th January 1895, deputing Mr. R. E. Ellis, on his relief by Mr. J. A. Jones, to prepare the estimates for Mr. Cousins' new water-supply scheme, and informing that his salary for the period of his deputation will form a legitimate charge on Municipal Revenues.

Proposed by the Hon'ble P. Rungiah Nayudu Garu and seconded by Mr. B. Lovery—

"That the proposals of Government be accepted."

Carried.

* * * * *

Report of the Committee appointed by the Commissioners at their meeting held on 28th January 1895 to consider Mr. Cousins' schemes for the improvement of the drainage and water-supply of Madras and for the purification of the river Cooum.

MEMBERS.

Lieutenant-Colonel G. M. J. Moore, C.I.E., *President.*
M.R.Ry. R. N. Pragasa Mudaliyar Avargal.
Surgeon-Major J. Maitland, M.D,
The Hon'ble P. Rungiah Nayudu Garu.
M.R.Ry. V. Varadappa Nayudu Garu.

The committee held two meetings.

In G.O., No. 1651 M., dated 7th November 1894, Government practically abandon Mr. Cousins' drainage scheme and request the Commissioners to adopt his water-supply scheme (modified) and to make early arrangements for financing it.

2. According to Colonel Pennycuick's estimate the annual cost of the modified water scheme would be Rs. 4,04,000, supposing a loan of Rs. 25,00,000 to be raised. These figures are slightly in excess. Colonel Pennycuick has allowed a little too much under Interest and Sinking Fund—the actual figures are Rs. 3,97,475 or in round number Rs. 4,00,000.

3. It is evident that, before any action can be taken in the matter, the Commissioners must be prepared to increase their revenue by Rs. 4,00,000.

4. It is calculated from official returns that a tax of 1 anna per gallon on all petroleum imported into Madras will yield a revenue of 2 lakhs per annum, *provided no refunds were allowed.* Doubling the tax the 4 lakhs are provided for at once. The committee will deal with this point further on.

I propose the omission of these 2 paragraphs.
P. RUNGIAH NAYUDU.

As remarked by me when the President's circular letter went round any attempt at increasing thr rate per cent. of house and water tax would create an uproar in the town. The maximum prescribed by the Act is being collected. I am for omitting paragraphs 5 and 6.
R. N. PRAGASA MUDALIYAR.

5. The water tax which is now at its maximum of 4 per cent. and yields about 2 lakhs a year might be increased to 6 per cent. or 8 per cent. and 1 or 2 lakhs could be obtained by the increase.

6. The tax on buildings, also at its maximum of 10 per cent. might be increased to 12 per cent. or more—if to 12 per cent. 1 lakh more and if to 14 per cent. 2 lakhs more would be obtained.

7. But in connection with the water-supply scheme the strong expression of opinion that has been evoked from all sanitary officers must not be ignored. The Health Officer has unhesitatingly condemned the subordination of drainage to water-supply. The Sanitary Commissioner apparently, because he thought it was a foregone conclusion in favour of water-supply, has suggested a compromise by laying down what is practically the backbone of Mr. Cousins' drainage scheme.

Besides these officers all the sanitary authorities who have ever reported on the subject have called attention to the paramount importance of draining Madras.

8. If the Commissioners are prepared to raise the income required for the modified water-supply scheme, viz., 4 lakhs, and consider the drainage should be shelved altogether, there is nothing more to be said.

9. The committee, however, are unanimous in their opinion that the drainage should not be subordinated to the water-supply, but the water-supply subordinated to the drainage.

In this connection the committee submit the following schemes for the consideration of the Commissioners which can be carried out for an annual outlay of 2 lakhs.

10. It will be seen from the accompanying note by Mr. Ellis (Appendix A) that Mr. Cousins' scheme can be worked by districts. (It must be understood that all idea of house connections is eliminated for the present.) If the first portion including Purasewakam, Elembore, Egmore, Chintadripet, Triplicane, with the main pumping station at Sydenham's road and main to outfall channel (or Kurakapet as might be finally settled) were undertaken, the backbone of the scheme would be completed and as time went on the other districts might be incorporated. One of the most important features of this scheme is that all the sewage would be diverted from the Cooum.

11. This, it is shown, is estimated to cost 20 lakhs. The maintenance is calculated at Rs. 85,000, but with the savings effected by closing all the other pumping stations and picottahs it might be put down at Rs. 60,000. The total cost would be—

	RS.
Interest and Sinking Fund on Rs. 20,00,000 at 4 per cent. ...	94,780
Maintenance	60,000
Total ...	1,54,780

12. Mr. Loane in his memorandum (Appendix B) suggests laying a main of about 6½ miles in length from Mylapore to waste lands at Manally. This main will receive all the sewage now delivered at the various sewage farms. In addition to the existing pumping stations, three more will be required, in Mylapore near Mundavelly—in Langs Garden Road and in Tondiarpet. The annual cost of these extra pumping stations will be about Rs. 25,000. The approximate cost of this scheme, disregarding the cinerators, is estimated at Rs. 27,25,000, say 28 lakhs.

	RS.
The total annual cost will be Interest and Sinking Fund on Rs. 28,00,000 at 4 per cent.	1,32,580
Maintenance	25,000
Total ...	1,57,580

13. A modification of this scheme would be to drain Mylapore separately on to the existing sewage farm at Kistnampet, commencing the main in Triplicane. The committee however would recommend the adoption of the scheme proposed by Mr. Loane—the main commencing at Mylapore.

14. It possesses the advantage over Mr. Ellis' scheme that it provides for the drainage of the whole of the city on the lines laid down by Mr. Cousins with the exception of the main being substituted for the brick sewer.

15. It will be seen that if either of the proposed schemes are adopted, the 2 lakhs which is taken throughout as the basis of expenditure will not be expended.

16. The committee would propose that 6 lakhs more be raised and devoted to the water-supply.

17. It is calculated that 6 lakhs will carry out the following improvements which will materially increase the supply, viz., raise the sides of the existing channel 2 feet thereby increasing the supply by about 50 per cent., remove all the villages on the borders of the Red Hills lake, alter all the existing branches in the city as may be required by the Hydraulic Survey.

18. These improvements will require no outlay on maintenance and will only cost the Interest and Sinking Fund on 6 lakhs = 28,434, which added to Rs. 1,57,580, required for drainage, will amount to Rs. 1,86,014 out of the 2 lakhs.

19. When the committee was appointed G.O., Mis. No. 661 M., dated 10th April 1895 (Appendix C), was not before the Commissioners and is really beyond the scope of the committee's proceedings; but as the carrying out of any drainage or water-supply scheme is dependent upon an increase of revenue and as the above quoted Government Order puts the question whether the Commissioners are prepared to levy a tax on kerosine-oil, the committee consider it advisable to place certain facts before the Commissioners in connection with the levy of the proposed tax.

20. In paragraph 4 it was stated that 2 lakhs might be obtained by imposing a tax of 1 anna per gallon on all kerosine-oil imported into the city.

21. This was dependent on no refund being allowed.

22. In March 1893 the Commissioners passed the following resolution: "That Government be moved to allow the Commissioners to impose a tax on all petroleum imported into the Town of Madras *for local consumption.*" From this it is evident that the Commissioners contemplate a refund, and it is almost certain that the Government of India would never sanction the imposition of the tax without such refund.

23. There is already an imperial tax of over 14 per cent. on petroleum and the proposed tax would double it.

24. It is very probable that any further local taxation would seriously affect the trade of Madras, driving the present consignments to some other coast port, such as Negapatam where they could be landed free and railed to their various destinations.

25. But there is another point in connection with the tax which the committee think right to lay before the Commissioners.

26. It is true that practically all petroleum is imported by sea and therefore the tax would be easy to collect, but the refund is a different matter. The experience derived from the tobacco tax should not be ignored. It is more than probable that an organized system of fraud would spring up. Old tins of kerosine-oil might be filled with water and exported and refunds claimed with the same results as in the tobacco tax—that the imposition of the tax would be a source of loss instead of profit.

27. Supposing that no frauds were perpetrated and refunds only paid on legitimate exports that had paid the tax on import, it is calculated that the tax would only yield a revenue of Rs. 45,000 per annum on a local consumption of 60,000 gallons per mensem or 7,20,000 gallons per annum.

J. Maitland, M.D.
Surgeon-Major.

V. Varadappa Nayudu.
G. M. J. Moore.

Appendix A.

Letter—from R. E. Ellis, Esq., Sanitary Engineer to Government.
To—the President, Municipal Commission.
Dated—the 15th March 1895.

I have read the Acting Sanitary Commissioner's letter to the Chief Secretary to Government, No. $\frac{2201A}{S.}$, dated 18th December 1894, in connection with G.O., No. 1651 M., dated 7th November 1894, and also the memoranda by the Health Officer and Acting Engineer to the Municipality.

2. It has always been my opinion that, if Madras is to be eventually properly drained, endeavours should be made to make a beginning on some complete scheme, and I do not see that the Commissioners could do better than adopt the scheme prepared by Mr. Cousins.

3. The first question that arises is whether it is possible to carry out Mr. Cousins' scheme by districts or sections, and if so how much can be done with the funds available.

4. Mr. Cousins in submitting his report says: "In devising the scheme for the drainage of the district I have had before me two necessary conditions, viz., efficiency combined with economy. I have therefore designed the sizes and gradients of the sewers with a view of carrying off the sewage only, together with a portion of the rain water which may fall in the backyards of dwelling houses, and a small amount of sub-soil water, which with every precaution to exclude will always find its way into sewers, but have excluded all storm water falling upon roads, streets, etc."

5. The attached map shows the area drained by Mr. Cousins' drainage scheme. There are to be three pumping stations—one at Sydenham's Road, one at Ráyapuram and one at Tondiarpet.

In the map I have divided the scheme into twelve sections, as each section is independent of the other except so far as relates to some of the main sewers which pass through one section to the other.

6. The twelve sections are briefly as under:—

(1) Ráyapuram and part of Tondiarpet.
(2) Part of Tondiarpet, Kurukupet and Washermanpet.
(3) North portion of Black Town.
(4) South portion of Black Town.
(5) Fort.
(6) Purasewakum.
(7) Vepery.
(8) Elembore.
(9) Egmore.
(10) Chintadripet.
(11) Triplicane.
(12) Mylapore.

7. Nos. (1) and (3) are to drain towards the existing pumping station at Ráyapuram. No. (2) is to drain towards the proposed pumping station at Kurukupet. Nos. (4), (5), (6), (7), (8), (9, (10) and (11) are to drain towards the proposed main pumping station at Sydenham's Road. No. (12) is to drain out to sea.

8. I will now refer to the Chief Engineer's memorandum, dated 14th August 1894, embodied in G.O., No. 1651 M. (page 47), in which he says—

(*a*) "I consider the general arrangements proposed by Mr. Cousins leave nothing to be desired."

(*b*) "I am of opinion that the gradients will be amply sufficient in practice."

(*c*) "In one point only connected with the general arrangement am I inclined to agree with Mr. Jones, viz., that it would have been better had a greater sub-division of area been made and more pumping stations adopted, but I do not hold this opinion so strongly, nor do I think the point of sufficient importance to justify a rejection of the scheme and its replacement by an entirely new one."

(*d*) "I am certain that the portion of the work which Mr. Cousins estimates at Rupees 23,38,176, and for which Mr. Jones' partially revised estimate amounts to Rs. 34,49,124, will not in practice be found to cost less than Rs. 40,00,000. To this has to be added the cost of house connections estimated at Rs. 21,00,000."

9. With a view of diverting the sewage from flowing into the river Cooum, Mr. Cousins recommends that the first work proceeded with should be erection of Sydenham's Road pumping station; the cast iron gravitating main from it to the present open sewer leading to the Black Town farm, where a temporary connection will be made with it; the constructions of the Sydenham's Road main sewer between the pumping station and the river, and the sewers abutting on both sides of the river, into which the whole of the sewage now discharged into the Cooum could be intercepted and diverted on to the Black Town sewage farm.

10. It is intended that a brick culvert 3′ 6″×3′ 6″, estimated by Mr. Jones to cost Rs. 42,638, should take the place of the existing open channel leading to the farm. This item has been included in the estimate.

11. The next question to be considered is what is to be done about house connections which are estimated to cost Rs. 21,00,000 and how should the sewage be conveyed to the mains pending the entire completion of this portion of the work, and it appears to me that the only way out of the difficulty is to have street connection, the sewage from several houses being collected in open drains of small dimensions which could be connected with the sewers at intervals. This being the case it will probably be possible to postpone laying some of the pipes of small size contemplated by Mr. Cousins, and I might here refer to the Sanitary Commissioner's inspection notes of Madras for 1894, paragraph 39, in which he says: "As I have shown, it is by no means an essential part of the pipe system that water closets should be used in all private houses. Their adoption will be gradual."

12. With a view of carrying out Mr. Cousins' scheme by districts, I have rearranged the order of the estimate by separating the isolated areas of Mylapore and Tondiarpet which Mr. Cousins proposes to deal with as separate schemes and also that portion of Royapuram which is to drain towards the existing pumping station, and I have placed last on the list Black Town which has been drained and the Fort which is outside Municipal limits.

13. Column No. 1 in the appended statement is Mr. Cousins' estimate as revised by Mr. Jones, the figures in column No. 2 have been obtained by adding 16 per cent. to the figures in column No. 1, bringing the total estimate up to about Rs. 40,00,000 which is the figure given by the Chief Engineer as the probable cost, and column No. 3 is estimated cost of carrying out that portion of Mr. Cousins' scheme shown in red line in the accompanying map. The figures in column No. 3 have been obtained from the same data which was used in preparing column No. 2, and omitting many of the smaller branches as suggested in paragraph No. 11 above; a lump sum has been added to cover the cost of making silt traps and connecting present surface drains to the system of sewers and constructing new surface drains wherever necessary. Provision of Rs. 1,50,000 has been made for extending the sewage farm. The farm should not be less than 400 acres to enable it to take the sewage of 450,000 persons allowing 20 gallons per head per diem, 1 inch of sewage water being placed all over the farm every 24 hours. It is not known how much Government waste land is available or whether Government will hand any over to the Municipality free of cost; whether a more suitable site for a farm can be found near the Cochrane Canal is a question to be considered. In this case there would be a considerable saving in the pumping main.

14. The cost of pumping at Sydenham's Road station with certain modifications to the arrangements is estimated to come to Rs. 85,500 per annum. This item may be reduced until the entire scheme is undertaken.

15. In carrying out as it were the backbone of Mr. Cousins' scheme, it will be possible to close Triplicane, Kistnampet, DeMellows Road and Napier Park pumping stations and stop the picottahs at Ráyapettah, Dams Road, Egmore and Pudupet farms; it would still be possible to retain the DeMellows Road farm for the present and even extend it, all the effluent water being drained back into the sewers, and thus one of the great objections to the farm would be removed without entailing the loss of revenue from the farm. All swampy land between Brickkiln Road and DeMellows Road will be effectually drained and all sewage will be kept out of the Cooum, and further all future improvements can be executed on the lines laid down by the scheme.

16. As large tracts of land which are now swamps will be rendered valuable property as soon as the drainage scheme is introduced, endeavours should be made to acquire the same if private property, or if Government waste land the same might be obtained from Government free of cost.

17. As it is proposed to build a close culvert from the present termination of the 2 ft. outfall pipe, it would be expedient to stop laying the extension which is now in progress and use the pipe for one of the auxiliary water mains or for one of the 18-inch overflows to the sea provided by Mr. Cousins.

18. The question of draining Mylapore is a difficult to deal with. The sewage may be disposed of in one of the following ways: (1) pumped out to sea, (2) pumped on to a farm to the south of Mylapore, (3) pumped into the main at the north end of Barbers Bridge Road and allowed to gravitate to the main pumping station at Sydenham's Road, in which case the mains would have to be slightly enlarged, (4) pumped on the Kistnampet sewage farm as this will no longer be required for Triplicane sewage, the farm might be enlarged by taking in Barbers Bridge rubbish depot.

19. It must be borne in mind that Mr. Cousins does not allow for taking off storm water through the sewers, but intends that it shall pass off by the present open channel and culverts, for it is practically impossible to construct sewers so as to overcome all inconvenience in time of floods.

20. Should it be considered advisable to carry out Mr. Cousins' scheme, it would follow that junction pipes and manholes for all branches contemplated in scheme should be provided for, so that the additions can be made at any future date without disturbing that portion of the work already done.

Statement (*vide* para. 13 *supra*).

		1	2	3
	Cast iron delivery mains	4,22,934	4,90,603	4,90,603
	Sydenham's Road pumping station	3,90,471	4,52,946	4,52,946
6 & 7	Purasewakum drainage	4,01,273	4,65,476	1,63,247
				1,01,982
8	Elembore	44,058	51,107	45,704
9	Egmore	1,16,701	1,35,373	1,04,526
10	Chintadripet	1,82,805	2,12,653	1,17,634
11	Triplicane	4,78,806	5,55,414	2,95,149
	Extension of sewage farms			1,50,000
	Surface drains & silt traps			48,309
		20,37,018	23,62,972	20,00,000
12	Mylapore	3,05,168	3,53,994	
	Tondiarpet pumping station	1,19,887	1,39,068	
	Tondiarpet	9,687	11,236	
2	Tondiarpet	1,00,017	1,16,019	
1	Royapuram	1,45,336	1,68,589	
3 & 4	Black Town	6,93,287	8,04,212	
5	Fort	38,693	44,883	
	Total ..	34,49,123	40,00,973	

Appendix B.

Memorandum.

Mr. Loane's Memorandum on the drainage, water-supply and purification of the Cooum in the town of Madras.

The Government by their order No. 1651 M., of the 7th of November last, have set aside the scheme proposed by Mr. Cousins for the drainage of the town, on the score of its great cost, not only in the outlay, but also in that for its maintenance. The Commissioners have been called upon to consider the question of improving the water-supply at a cost of 25 lakhs, and the Chief Engineer has been directed to take steps for the purification of the Cooum, by cutting a canal from the harbour to the basin, whereby sea-water may be let into the Cooum twice a day at high tides, and be discharged into the sea by another outlet at low tides thereby converting it into a tidal river.

It does appear a very great pity that Government should have put aside the drainage question, which in importance to the town stands at the head of the three works, and it is to be hoped the Commissioners will not lose sight of this, when considering that for the water-supply.

As to the purification of the Cooum, this will be done by Government, it is hoped, as an Imperial or Provincial work; should, however, the Commissioners be called upon to do this work at their cost, they should then obtain full control over the river and canal, within Municipal limits, so that they may recover the outlay by the fees charged on all vessels sailing on its waters, and for the trade conducted on its banks.

There is no doubt, but that the purification of the Cooum—which is for eight months in the year, a stagnant sewer—will be of immense blessing to the people of Madras. The sooner therefore this work is undertaken the better for Madras.

Water-supply.—Now as to the question of water-supply. Mr. Cousins proposes to bring down a larger quantity of water from the Red Hills through a masonry conduit, so that the water may not be contaminated on its way from the lake to the town, to filter this water at Kilpauk, where the present system of iron pipes begins, and to pump it under pressure into the pipes, so that the present defective pressure may be overcome, and all places that have pipes already laid to them, may have a better supply. Mr. Cousins estimates this work at 21 lakhs; but this estimate is found to be incorrect, by about 4 lakhs, so that the work must be put down as likely to cost 25 lakhs; we will get for an outlay of 25 lakhs, (1) more water, (2) the water filtered, (3) higher pressure.

2. Unfortunately, however, it will be seen that no provision has been made for further extension of the water-supply within the town, nor for cleaning out the present system of pipes (the larger sizes of which have been under ground for nearly a quarter century); these are largely coated inside with foreign matter. To further extend the system within the town will require about 5 lakhs; the total outlay will therefore come to 30 lakhs; and the maintenance, sinking fund and interest will rise to 4¼ lakhs annually, instead of 4 lakhs as shown in the report on the scheme.

3. It is now suggested that with an outlay of about 11 lakhs only, and with no more than about 33 per cent. increase over the present maintenance, which is about 50,000 annually, as much may be done on other lines.

4. To avoid the annual expenditure of about Rs. 20,000 to which the Municipality has been subjected since the breaching of the Red Hills lake bund in 1884, when the level of the lake was reduced by 3′, it is now recommended that one lakh of rupees be allotted, for raising and strengthening these bunds, so that the old level may be restored, and thereby a larger body of water secured. The Municipality have spent about 2 lakhs on pumping, etc., during the past ten years, which in future may be avoided if the lake level is thus restored.

5. There are about seven villages which drain into the lake at present; these ought to be removed at once, since the sewage brought into the lake every year from them cannot but contaminate it, and more so, since its bulk has been reduced. Half a lakh of rupees would more than compensate for this purpose.

6. The present water-supply channel from the Red Hills should be widened, the banks strengthened, proper fences put up along the whole line, and the channel next the bridges covered in for about 30 yards on either side, so as to prevent people passing over, fouling the water. This work can be done for half a lakh. (The channel costs almost a lakh to construct.) With an expenditure therefore of about 2 lakhs, we will secure a larger body of water, and thereby save annual pumping, the lake will be made somewhat purer by the removal of the villages which drain into it (these works do not find a place in Mr. Cousins' scheme) and a larger body of water brought down to Madras.

7. To extend the water-supply within the town, an outlay of about 5 lakhs will be required of which 3½ is to be spent in auxiliary mains.

We have about 1,000 fountains in Madras at present; if the extensions suggested are carried out, this number will be increased to about 1,200, a half of this number may be converted into filtered water cisterns, somewhat similar to the one put up by Diwan Bahadur Ragunatha Rao at Mylapore, to the memory of his late brother Sir T. Madhava Rao at a cost of about Rs. 600. These fountains will be rapid filters, the filtering medium being, asbestos cloth, and manganese, or spongy iron, so that the water will be acted on both mechanically and chemically. The cost for 600 such fountains will be about 3½ lakhs.

8. Approximate Estimate—

	Rs.
Removal of villages at Red Hills	50,000
Raising level of Red Hills lake	1,00,000
Widening and strengthening Channel	50,000
Extension of water supply within the Town	5,00,000
Erection of 600 filter water cisterns	3,50,000
Total ...	10,50,000
Unforeseen expenditure ...	50,000
Total ...	11,00,000

9. For an expenditure of 11 lakhs we get (1) more water, (2) better quality, (3) filtered water in 600 places, (4) extended system, (5) only 33 per cent. increase over present expenses in maintenance, instead of about six times as much as will be the case if pumping is resorted to, (6) annual pumping at Red Hills done away with, (7) ⅔ less interest and sinking fund to be provided for.

10. Drainage.—The water-supply having been thus improved and increased, the undersigned suggests that 30 lakhs be borrowed, for the drainage of such places in Madras, as at present have a very bad system, or none at all, the work being done somewhat on the lines laid down by Mr. Cousins in his scheme, and also for the erection of three cinerators, for the destruction of rubbish, and for improvement in removal of night-soil.

11. According to Mr. Cousins' scheme (as modified by Mr. Jones as to rates), the drainage of Mylapore and St. Thomé will cost 3 lakhs, but instead of discharging the sewage as therein proposed, it is here suggested, to throw it on a sewage farm which may be made by the filling up of the swamp between the butts and Quibble island bridge, with sand from the sea shore, near by; this swamp is an unbearable nuisance for several months in the year. The swamp west of the bridge and up to Brodies' Road may also be taken up in the same manner, if more

land is required. The land here is quite open, far from dwellings, and close to the sea, and will be vastly improved by its conversion from a swamp into a raised sewage farm; it will also form another source of income to the Municipality, which now derives about Rs. 200 per annum, on each cawnie of ground planted with Hurriali grass; and as there are fully 60 cawnies here, which may be thus brought under cultivation, a large revenue may be expected.

12. If, however, a sewage farm at Quibble island is considered objectionable, the same objection will apply to all other sewage farms within the city, and with greater force, inasmuch as they are in the midst of dwellings.

13. To remedy this evil—if it be one—it will be well to lay an iron main of about 6½ miles in length, from Mylapore to the waste lands at Munally, commencing with 12″ and terminating with 36″ diameter. Into this main all sewage now delivered at the various farms on the way, may be discharged, by the pumping machinery now at work, and others of a similar character which will be required.

14. The best line for such main will be as follows:—beginning in Brodies' Road near the Mundavelly, to pass along Brodies, Royapettah High Road, West Cott's Road, Patters and Dams Road, then crossing the Cooum obliquely at Chintadripeta, strike west of St. Andrew's Bridge, then on by the east side of the Women and Children Hospital, through the Friend-in-Need Society's premises, along naval Hospital Road, through Cunnia Chetti's waste land, west of Dobbin's Hall, through waste land in Kurriancootai, along Sydenham's Road, and the open ground east of the Powder Mills, then across the Madras Railway, and the Magazine to Munally.

15. The line as detailed above will be found most suitable, as it will have the least bends. All the drains may be made to flow towards this main, suitable pumping machinery being fixed near by to pump into it.

16. To drain Triplicane, Royapeta, and Chintadripeta, 4¾ lakhs will be required; all sewage will be carried on, as at present, to the Kistnampet Farm, which may be further extended, or into the iron main referred to above, if it be decided to close the farms within the city.

17. To drain Egmore, Comaleeswarampeta, Vepery, Chulai, New Town, Purasewakum and Kosapet, a sum of ten lakhs will be required. The sewage farm in D'Mellows Road will be closed, so also those in the People's Park and Egmore; all sewage from these places will be carried, to the waste lands, a mile to the north of the Powder Mills, and Veyasurpadi, far from dwellings. This site is proposed whether the sewage from the 7th and 8th Division is sent here or not.

18. The present system of drainage in Black Town will be left alone for the present, and will have added to it, the drainage of the Fort and Royapuram, at a cost of two lakhs. The pumping machinery at Royapuram will be equal to this addition of sewage. Another lakh will cover the cost of constructing two large-storm water-drains, for carrying off more rapidly the rainfall from Popham's and Wall Tax Roads, where at present much inconvenience is felt owing to the flooding of those places during heavy rains.

19. Tondiarpet is to be drained at a cost of two lakhs, the sewage passing on to the Rubbish Depôt in Ennore Road, which will then be converted into a farm. It will be well if the sewage from the Royapuram Pumping Station is also sent to this place, and the Outfall Channel, by which the sewage is now passed, and which is of much inconvenience to the inhabitants of Washermanpet, may then be done away with.

Approximate Estimate.

	Rs.
For draining Mylapore and St. Thomé	3,00,000
For draining Triplicane, Chintadripeta and Royapuram ...	4,75,000
Egmore, Purasewakum, etc.	10,00,000
Black Town	3,00,000
Tondiarpet	2,00,000
Total ...	22,75,000
If the iron main be adopted, and the Sewage Farms in the City closed	4,50,000
	27,25,000
Three Rubbish cinerators at ½ lakh each	1,50,000
One in Black Town,	
One in Kosapet,	
One in Kistnampet, and	
Increase of carts and buckets for removal of night-soil	1,25,000
Grand Total ...	30,00,000

20. The sewage farms will after the first year pay for their maintenance as well as for their pumping arrangements. The only annual increase over the present expenditure will then be, the maintenance of water supply as already noted, and the payment for interest and sinking fund on 41 lakhs which will not come to more than 3 lakhs in the first year, the two latter will of course annually decrease. The 3 lakhs for interest and sinking fund includes in addition to that required for increased maintenance under water supply, the pumping works for Tondiarpet, the other divisions being provided for under this head by the machinery now at work.

21. Considering the very great necessity there is in Madras for a proper drainage system and other sanitary improvements, it does appear a waste of money to spend 30 lakhs on the improvement of its water supply only, and that coupled with a heavy annual charge for maintenance, when an equally good supply with less expenditure in outlay and maintenance can be found as already detailed.

22. By Mr. Cousins' scheme, all the water drawn from the taps will be filtered, but since more than half of this quantity is used for the flushing of drains, watering of roads, and irrigation, the filtering of so large a body is unnecessary; hence is the suggestion to have filtered water cisterns within the Town, from which people can draw off for domestic purposes. Those who do not care to go to the public filtered water cisterns may at a very small cost have the Indian chatty-filter, which costs no more than one rupee; these can be put up in dwellings where the improved European filters cannot be afforded or adopted. The Chatty filters (as is known) contain vegetable charcoal, in addition to fine sand, and are therefore as efficient as those proposed in Mr. Cousins' scheme.

Appendix C.

Proceedings of the Madras Government.

Order—Mis. No. 661 *M., dated* 10*th April* 1895.

In G.O., No. 1651 M., dated 7th November 1894, the execution of Mr. Cousins' scheme for improving the water supply of Madras, and a scheme for purifying the Cooum were sanctioned; the Municipal Commissioners have subsequently requested sanction to a proposal to erect cinerators to consume the rubbish collected in the City; it is probable that some improvements in the method of disposing of the town sewage will also be eventually necessary; and a loan of 4 lakhs has recently been raised by the Commissioners for expenditure upon water supply mains. All these schemes will require a larger sum of money to carry them out than can be set aside from the ordinary annual revenue of the Municipality, and the imposition of additional taxation appears to be unavoidable, the more so that the tobacco duties have not fulfilled the expectations that were formed of them.

2. The President will accordingly be requested to report whether the Commissioners are still of the opinion recorded in their resolution of the 15th March 1893, embodied in G.O., No. 607 M, dated 5th May 1893, that a duty upon kerosine oil imported into Madras for local consumption would be a satisfactory method of raising a part of the funds that are required, and if so, at what rate they would propose to levy the duty.

(True Extract.)

J. F. Price,
Chief Secretary.

To the President, Municipal Commission, Madras.

Extract from the Proceedings of the Municipal Commissioners for the City of Madras, dated the 31*st May* 1895.

Read Report of the Committee appointed by the Commissioners at their Meeting held on 28th January 1895, on Mr. Cousins' Scheme for the improvement of the Drainage and the Water supply of Madras.

Proposed by M.R.Ry. P. Theagaroya Chetti Garu and seconded by M.R.Ry. M. O. Parthasarathy Aiyangar Avargal—

"That the Committee's recommendations in paragraphs 13 and 16 of their report be adopted, and that the following measures be adopted to meet the necessary expenditure:—

	Rs.
Tax on vehicles, animals, carts, etc., to be raised 50 per cent. yielding an additional ..	36,000
Profession tax to be raised 100 per cent. yielding an additional	65,000
Tax on liquor shops to be doubled yielding an additional	13,600
Petroleum tax at 1 anna per gallon for all petroleum consumed in the city yielding ..	40,000
That Government be requested to forego the contribution of Rs. 50,000 per annum yielding	50,000
Total ..	2,04,600"

The resolution was divided into two parts.

M.R.Ry. R. N. Pragasa Mudaliyar Avargal proposed an amendment seconded by M.R.Ry. R. Balakristnama Chetti Garu—

"That the following words be added to the first part of the resolution 'with the additional recommendation that the Red Hills tank be restored to its original level at the cost of the Municipality.'"

The amendment on being put to the meeting was carried.

M.R.Ry. M. Venkataramiah Chetti Garu proposed an amendment seconded by M.R Ry. C. Yetherajulu Nayudu Garu—

"That, that portion of the second part of the resolution referring to the tax on vehicles, animals, carts, etc., and the profession tax be omitted and 3 annas be substituted for 1 anna in the tax on petroleum."

M.R.Ry. Salla Guruswami Chetti Garu proposed an amendment seconded by Muhammad Sheriff—

"That 2 annas be substituted for 1 anna in the tax on petroleum and the following be added: 'the tax on tolls be doubbled' and that portion of the second part of the resolution referring to the tax on vehicles, animals, carts, etc., and the profession tax be omitted."

M.R.Ry. W. S. Venkataramanjulu Nayudu Garu proposed as a further amendment seconded by M.R.Ry. G. Subbarayalu Chetti Garu—

"That 50 per cent. be substituted for 100 per cent. in the profession tax and that the following be added:—

'Tax on tolls to be raised 50 per cent.

'Tax on timber to be raised one-fifth of the present rate.'"

Proposed by M.R.Ry. P. M. Sivagnana Mudaliyar Avargal and seconded by M.R.Ry. P. Theagaroya Chetti Garu—

"That the meeting adjourn till Friday the 7th June 1895."

Carried.

Extract from the Proceedings of the Municipal Commissioners for the City of Madras, dated the 7th June 1895.

Read Report of the Committee appointed by the Commissioners at their Meeting held on 28th January 1895 on Mr. Cousins' Schemes for the improvement of the Drainage and the Water supply of Madras.

Proposed by the Hon'ble P. Rungiah Nayudu Garu and seconded by Mr. N. Subrahmanyam—

"That the meeting resolve itself into Committee."

The proposition, on being put to the meeting, was lost.

Extract from the Proceedings of the Municipal Commissioners for the City of Madras, dated the 26th June 1895.

Read Report of the Committee appointed by the Commissioners at their Meeting held on 28th January 1895 on Mr. Cousins' Schemes for the improvement of the Drainage and the Water supply of Madras.

Proposed by Diwan Bahadur R. Ragunatha Rao Garu and seconded by M.R.Ry. R. Balajee Rao Avargal—

"That the meeting resolve itself into Committee."

Carried.

Extract from the Proceedings of the Municipal Commissioners for the City of Madras, dated the 8th July 1895.

Read Report of the Committee appointed by the Commissioners at their Meeting held on 28th January 1895 on Mr. Cousins' Schemes for the improvement of the Drainage and the Water supply of Madras.

Proposed by Diwan Bahadur R. Ragunatha Rao Garu and seconded by M R.Ry. P. Rungiah Nayudu Garu—

"That the meeting resolve itself into Committee."

Carried.

Letter—from R. E. ELLIS, Esq., Engineer.

To—the President, Municipal Commission, Madras.

Dated—the 20th July 1895.

In continuation of my letter of 15th March 1895, I have the honour to send herewith a tracing showing the position of the drains in Mr. Cousins' scheme. Upon this tracing I have marked the approximate levels of the inverts of the main sewers. In nearly all cases the branch sewers are connected with the main sewers in such a way that all the available head is made use of.

I send also estimates in detail of that portion of the work I propose should be done first; this shows at a glance how much is proposed to be done, and when compared line by line with Mr. Cousins' estimates, it shows what is proposed to be left out. It is probable that even more may be left out and a consequent saving may be effected, but until a plan of existing drains has been prepared, it is impossible to say to what extent.

The 30 per cent. at the foot of the estimates includes about 14 per cent. for supervision and contingencies and 16 per cent. for extra cost estimated by the Chief Engineer in paragraph 13 of his report.

There appears to be some misconception in paragraph 14 of the Committee's report. My proposals are briefly to carry out Mr. Cousins' scheme as far as money will permit, leaving out certain districts and some of the small drains and all house connections; whereas I understand Mr. Loane proposes to alter the alignment of the sewers, the levels and consequently the size, for, it follows that if the sewers are laid at a less depth than shown by Mr. Cousins and are to discharge the same quantity, the sewers must be larger and velocity reduced; the latter scheme will therefore differ in many important details from that prepared by Mr. Cousins which may not appear evident at first sight.

In order that the levels of the sewers as arranged by Mr. Cousins may be compared with the level of existing sewers, I may mention that the level of the invert of his sewer at Sydenham's Road is 10·50 above datum, whereas the level of No. 1 sewer at Royapuram is 12·97; in other words the lowest new sewer will be only 2′—6″ deeper than the lowest existing sewer. Mr. Cousins appears to have used the Municipal bench marks, the reduced levels of the streets as given by him agree very closely with those taken by me, however, for some reason he has selected a datum line 19 feet below corrected mean sea level, instead of 20 feet below D'Haviland's sea level as used by the Municipality; the result is that reduced levels of all streets and bench marks are practically unchanged; this of course is important when comparing the levels of proposed sewers with those already existing.

ESTIMATE of works referred to in my letters, dated 15th March and 20th July 1895.

Pursewakum.

	Average depth.	Rate. RS. A. P.	Amount. RS.
Lin. yards—			
1,533 of 9 inch pipe sewers	8 feet	6 0 0	9,198
1,583 of 9 ,, ,, ...	9 ,,	6 6 0	10,091
843 of 12 ,, ,, ...	7 ,,	7 14 0	6,638
826 of 12 ,, ,, ...	8 ,,	8 4 0	6,814
200 of 12 ,, ,, ...	11 ,,	9 6 5	1,880
783 of 15 ,, ,, ...	7 ,,	10 2 0	7,927
1,296 of 15 ,, ,, ...	10 ,,	11 4 0	14,580
1,464 of 1′ 8″ × 2′ 6″ brick sewers ...	16 ,,	34 15 7	51,201
No.—			
20 man-holes on 9″ sewers	8 ,,	151 1 0	3,021
13 ,, on 12″ ,, ...	8 ,,	151 1 0	1,964
26 ,, on 15″ ,, ...	8 ,,	151 1 0	3,927
11 ,, 1′ 8″ × 2′ 6″ brick sewers.	16 ,,	200 12 0	2,208
8 ,, 1′ 8″ × 2′ 6″ brick sewers.	16 ,,	200 12 0	1,606
20 lamp-holes on 9″ sewers	8 ,,	50 12 0	1,015
3 ,, on 12″ ,, ...	12 ,,	50 12 0	152
5 ,, on 15″ ,, ...	8 ,,	50 12 0	254
3 ,, 1′ 8″ × 2′ 6″ brick sewers	16 ,,	57 12 0	173
7 automatic flushing chamber on 9″ pipe sewers	8 ,,	418 2 0	2,926
			1,25,575
Contingencies at 30 per cent ...			37,672
Total ...			1,63,247

Vepery included in Estimate for Pursewakum by Mr. Cousins.

	Average depth.	Rate.	Amount.
		RS. A. P.	RS.
Lin. yards—			
393 of 12″ pipe sewers	11 feet.	9 6 5	3,688
1,400 of 9″ ,, ...	8 ,,	6 0 0	8,400
1,293 of 3′ 2″ × 4′ 9″ brick sewers ...	16 ,,	46 5 11	59,956
No.—			
20 man-holes on 9″ sewers	8 ,,	151 1 0	3,021
2 ,, on 12″ ,, ...	8 ,,	151 1 0	302
8 ,, on 3′ 2″ × 4′ 9″ brick sewers	16 ,,	200 12 0	1,606
20 lamp-holes on 9″ sewers ...	8 ,,	50 12 0	1,015
1 Lamp-hole on 12″ ,, ...	8 ,,	50 12 0	51
2 lamp-holes on 3′ 2″ × 4′ 9″ brick sewers	16 ,,	57 12 0	115
1 automatic flushing chamber on 6″ pipe sewers	4 ,,	294 2 0	294
Contingencies at 30 per cent. ...			{ 78,448 23,534
Total ...			1,01,982

Elembore.

Lin. yards—			
833 of 18″ pipe sewers	11 feet.	15 15 0	13,287
1,100 of 15″ ,, ...	8 ,,	10 8 0	11,550
130 of 12″ ,, ...	8 ,,	8 4 0	1,072
560 of 9″ ,, ...	6 ,,	5 0 5	2,814
170 of 9″ ,, ...	7 ,,	5 10 0	3,150
No.—			
6 man-holes on 9″ sewers	7 ,,	146 12 0	880
1 man-hole on 12″ ,, ...	8 ,,	151 1 0	151
4 man-holes on 15″ ,, ...	8 ,,	151 1 0	604
7 ,, 18″ ,, ...	11 ,,	164 0 0	1,149
5 lamp-holes on 9″ sewers	6 ,,	50 0 0	250
1 lamp-hole on 12″ ,, ...	8 ,,	50 12 0	50
3 lamp-holes on 15″ ,, ...	8 ,,	50 12 0	152
1 lamp-hole on 18″ ,, ...	11 ,,	52 1 0	52
1 automatic flushing chamber on 9″ pipe sewer	4 ,,	418 12 0	418
Contingencies at 30 per cent. (say) ...			{ 35,578 10,126
Total ...			45,704

Egmore.

Lin. yards—			
466 of 12″ pipe sewers	7 feet.	7 14 0	3,669
580 of 12″ ,, ...	9 ,,	8 10 0	5,002
635 of 12″ ,, ...	10 ,,	9 0 0	5,715
306 of 12″ ,, ...	11 ,,	9 6 5	2,876
468 of 9″ ,, ...	8 ,,	6 0 0	2,808
300 of 9″ ,, ...	7 ,,	5 10 0	1,687
116 of brick sewer 3′ × 4′ 6″ ...	17 ,,	46 11 6	5,420
1,695 of ,, 1′ 8″ × 2′ 6″ ...	11 ,,	27 4 8	46,259
No.—			
5 man-holes on 9″ sewer	9 ,,	146 12 0	734
15 ,, on 12″ ,, ...	9 ,,	155 6 0	2,330
5 lamp-holes on 9″	7 ,,	50 5 0	251
9 ,, on 12″	9 ,,	51 8 0	460
6 man-holes on brick sewers 1′ 8″ × 2′ — 6″	17 ,,	58 7 0	1,230
5 lamp-holes	17 ,,	205 1 0	292
4 automatic flushing chambers ...		418 0 0	1,672
Contingencies at 30 per cent. ...			{ 80,405 24,121
Total ...			1,04,526

Chintadripet.

	Average depth.	Rate.	Amount.
		RS. A. P.	RS.
Lin. yards—			
1,406 of 12″ pipe sewers	8 feet.	8 4 0	11,599
270 of 12″ ,, ...	6 ,,	7 4 5	1,964
350 of 9″ ,, ...	10 ,,	6 12 0	2,362
306 of 30″ cast iron pipes laid through bed of river Cooum		59 0 0	18,054
1,726 of brick sewer 3′ × 4′ 6″	14 ,,	40 7 8	69,827
No.—			
6 man holes on 9″ sewers	10 ,,	159 11 0	958
10 ,, on 12″ ,, ...	7 ,,	146 12 0	1,467
10 ,, on 3′ 0″ × 4′ 6″ brick sewer	14 ,,	192 2 0	1,921
2 special man holes on 3′ 0″ × 4′ 6″ brick sewer	14 ,,	200 0 0	400
6 lamp holes on 9″ sewers	6 ,,	49 14 0	299
5 ,, on 12″ ,, ...	7 ,,	50 5 0	251
6 ,, on 3′ 0″ × 4′ 6″ brick sewers	14 ,,	56 6 0	338
5 automatic flushing chambers laid on 6″ pipe sewers	4 ,,	294 2 0	1,470
1 automatic flushing chamber laid on 12″ pipe sewer	5 ,,	520 0 0	520
Contingencies at 30 per cent. (say) ...			{ 1,11,430 36,104
Total ...			1,47,534

Triplicane.

Lin. yards—			
578 of 18″ pipe sewers	12 feet.	16 6 2	9,470
573 of 18″ ,, ...	10 ,,	15 9 0	8,917
500 of 18″ ,, ...	6 ,,	13 13 5	6,919
653 of 15″ ,, ...	9 ,,	10 14 0	7,101
642 of 15″ ,, ...	6 ,,	9 8 5	6,115
510 of 15″ ,, ...	5 ,,	9 1 7	4,640
955 of 12″ ,, ...	12 ,,	9 13 2	9,380
566 of 12″ ,, ...	10 ,,	9 0 0	5,094
176 of 12″ ,, ...	9 ,,	8 10 0	1,518
1,406 of 12″ ,, ...	8 ,,	8 4 0	11,599
270 of 12″ ,, ...	6 ,,	7 4 5	1,964
225 of 9″ ,, ...	11 ,,	7 2 5	1,608
1,601 of 9″ ,, ...	10 ,,	6 12 0	10,806
783 of 9″ ,, ...	9 ,,	6 6 0	4,991
6,500 of 9″ ,, ...	8 ,,	6 0 0	39,000
750 of brick sewers 2′ 2″ × 3′ 3″ ...	12 ,,	32 11 0	24,515
956 of ,, 2′ 4″ × 3′ 6″ ...	14 ,,	35 12 0	34,177
250 of ,, 3′ 0″ × 4′ 6″ ...	14 ,,	40 7 8	10,119
No.—			
50 man holes on 9″ sewers	8 ,,	151 1 0	7,553
17 ,, on 12″ ,, ...	10 ,,	159 11 0	2,714
14 ,, on 15″ ,, ...	8 ,,	151 1 0	2,114
22 ,, on 18″ ,, ...	10 ,,	159 11 0	3,513
8 ,, on 2′ 2″ × 3′ 3″ brick sewers	12 ,,	183 0 0	1,468
14 man holes on 2′ 4″ × 3′ 6″ brick sewers	14 ,,	192 2 0	2,689
3 man holes on 3′ 0″ × 4′ 6″ brick sewers	14 ,,	192 2 0	576
34 lamp holes on 9″ pipe sewer ...	8 ,,	50 12 0	1,725
20 ,, on 9″ ,, ...	6 ,,	49 14 0	997
10 ,, on 10″ ,, ...	10 ,,	51 10 0	516
4 ,, on 15″ ,, ...	8 ,,	50 12 0	203
5 ,, on 18″ ,, ...	10 ,,	51 10 0	258
2 ,, on 2′ 4″ × 3′ 6″ brick sewers	14 ,,	56 6 0	112
13 automatic flushing chambers on 6″ and 9″ pipe sewers	4 ,,	...	4,567
Contingencies at 30 per cent. (say) ...			{ 2,26,938 68,211
Total ...			2,95,149

Letter—from S. Loane, Esq., Acting Engineer, Madras Municipality.
To—the President, Madras Municipal Commission.
Dated—Madras, the 31st July 1895.

In continuation of my memorandum of the 25th January last, I beg to submit the following details on the drainage of Mylapore and St. Thomé, which also applies to the other districts to be drained.

The details given below are for a complete scheme to drain Mylapore and St. Thomé and for pumping the sewage by suitable machinery into an iron main to be laid from Mylapore to a site about 6½ miles north of this station.

Provision is here made for draining the sewage from 5,000 houses, having a population of 35,000 with an allowance of 20 gallons a head per diem (these numbers are far in excess of what now exist within the area to be drained as shown on plan).

The sewers will be either of glazed stone ware or portland cement pipes; these are of sufficient sizes for the work required of them. The minimum fall given is 5 feet to the mile, and as the sill of the pump-well will be at mean sea level, none of the excavation for the sewers will go below that level.

For draining all houses directly into these sewers 3″ branch pipes will be fixed in the line of sewers opposite each house drain, and from these, 3″ pipes will be laid up to the house drain where a stoneware syphon-trap with iron grating and ventilating pipe will be fixed. The sewage from the house drains will be discharged on to these gratings which will be fixed in the mouths of the syphon-traps, the latter will be so fixed that the street drainage will not enter them, but will at the same time be easily accessible for cleaning.

Man-holes will be built all along the line of sewers at 300′ intervals, also at the commencement of each line of sewer, and at all junctions.

There will be an overflow into the sea or into the canal where the sea happens to be too far from the station for discharging any excess of diluted sewage which may enter the sewers during heavy rains.

Automatic flushing pipes are provided at twelve suitable sites for flushing the sewers at intervals throughout the day and night.

Ventilating pipes for each syphon-trap should be fixed. These will not need to go more than an average height of 25′ above the roadway and may be fixed up for about As. 3 a running feet or within Rs. 5 each.

Estimate.

	Rs.
3,675 feet of 21″ pipes laid at an average depth of 10′ at Rs. 7 per foot	25,725
3,525 feet of 18″ pipes laid at an average depth of 10′ at Rs. 5-8-0 per foot	19,387
3,600 feet of 16″ pipes laid at an average depth of 8′ at Rs. 3-12-0 per foot	13,500
6,500 feet of 12″ pipes laid at an average depth of 7′ at Rs. 2-12-0 per foot	17,875
16,500 feet of 9″ pipes laid at an average depth of 6′ at Rs. 2-4-0 per foot	37,125
10,000 feet of 7″ pipes laid at an average depth of 5′ at Rs. 1-12-0 per foot	17,500
1,500 feet of 6″ pipes laid at an average depth of 4′ at Re. 1 per foot	1,500
50,000 feet of 3″ pipes laid at an average depth of 5′ at As. 10 per foot	31,250
5,000 syphon-traps with fixing and iron gratings at Rs. 12 per foot	60,000
3,000 feet of 15″ cast iron piping at Rs. 7 per foot	21,000
120 man-holes at Rs. 50 each	6,000
Pumping station with duplicate set of machinery	30,000
	2,80,862
Sundries and supervision	14,138
Total ...	2,95,000

Order— No. 1672 M., dated 19th October 1895.

The papers will be referred to the Public Works Department with the request that the opinion of the Chief Engineer upon the schemes for the improvement of the drainage and water-supply of the city suggested by Mr. Ellis and Mr. Loane may be obtained and forwarded to Government at a very early date.

2. The consideration of the financial aspect of the matter will meanwhile be deferred.

(True Extract.)

J. F. Price,
Chief Secretary.

To the Public Works Department.
„ President, Madras Municipal Commission.

No. 1672 M., 19TH OCTOBER 1895.

GOVERNMENT OF MADRAS.

LOCAL AND MUNICIPAL DEPARTMENT.

READ—the following paper :—

I

Letter—from Lieutenant-Colonel G. M. J. MOORE, C.I.E., President, Municipal Commission, Madras.
To—the Chief Secretary to Government.
Dated—the 14th September 1895.
No.—G.-337.

With reference to G.O., Mis. No. 366 M., dated 6th March 1895, I have the honor to forward Mr. Ellis' report on the Hydraulic survey of Madras city.

2. I have not submitted the plans and appendices as they are so voluminous that it would take at least a month to copy, and would suggest that if Government requires them, they might be sent over to Fort St. George on the return of Government from the hills, and after all they only concern the municipality, which can base all extensions on them.

ENCLOSURE.

Letter—from R. E. ELLIS, Esq., Engineer, Municipal Commission, Madras.
To—the President, Municipal Commission, Madras.
Dated—the 5th September 1895.

With reference to the resolution of the Commissioners on G.O., Mis. No. 4 M., dated 8th January 1895, I have the honour to submit my report on the Hydraulic survey of Madras; attached to the report are the following plans and appendices :—

Plan No. 1, sheets 1, 2, 3, 4 and 5 shewing all the mains and branch pipes and the levels of the roads at different parts of the town, and sheets 1*a*, 2*a*, 3*a*, 4*a* and 5*a* showing all mains and branches above 7″, the area supplied by each main, and the additional pipes and alterations recommended for schemes Nos. 1 and 2.

Plan No. 2 showing the distribution of the population according to the last Census.

Plan No. 3 showing the area supplied by each main and the alterations and additions recommended for scheme No. 3.

Plan No. 4—Sections and hydraulic gradients of pipes of schemes Nos. 1, 2 and 3.

Plan No. 5—Longitudinal and cross sections of Red Hills channel.

Plan No. 6—Masonry shaft.

Plans Nos. 7 and 8—Existing safety weirs.

Appendix 1.—Tabular statement showing quantity of water delivered into Madras from 1879 to 1894.

Appendix 2.—Statement showing the position and description of fountains and rate of discharge between 6 and 8 A.M.

Appendix 3.—Statement showing the length of pipes of each size already laid, length of new pipes to be laid and length of pipes to be taken up and relaid for scheme Nos. 1 and 2.

Appendix 4.—List of hydrants on the mains showing the pressures between 6 and 8 A.M.

Appendices 5 *and* 6.—Tabular statements showing hydraulic gradients, and velocity of flow in pipes.

Appendix 7.—Statement showing the discharge over Red Hills weir.

Appendices 8, 9 *and* 10.—Estimates of works referred to in the report.

Appendix 11.—List of sites suitable for bathing places.

2. It has been known for a long time that the water-supply in many parts of the town is defective, that many of the fountains fail altogether at certain hours during the day, and that the supply in some districts is getting worse; to say that the defect is due to insufficient pressure does not explain matters very clearly to an unprofessional mind, when it is known that the pressure at Kilpauk is practically the same now as it always has been. The fact of the matter is, more water is being delivered into Madras than formerly, and is being drawn off before it has had time to proceed very far in the mains, and the result is, that all the available pressure is absorbed before the outlying districts are supplied. The quantity of water delivered in 1884 was 131,722,600 cubic feet as compared with 335,827,809 cubic feet in 1894—*vide* Appendix 1.

3. There are several ways in which the system of distribution could be improved:—

(1) By increasing the pressure in the main by pumping at Kilpauk.
(2) By increasing the size or number of mains.
(3) By using subsidiary pumps for such parts of the town where the pressure is defective.
(4) By limiting the supply to certain districts where pressure is good and preventing waste wherever it occurs.
(5) By scraping the inside of the pipes and removing deposit and dirt.
(6) By combination of the above.

4. Before any definite idea could be formed as to the best course to adopt, or to what extent alterations and additions would be necessary in case Mr. Cousins' water-supply scheme is carried out or otherwise, it has been necessary to prepare a correct plan of the pipes as they exist, and test the pressures in the mains and discharges at the fountains, and to ascertain as far as possible the population to be supplied by the different mains and branches and how far they are able to perform the work they have to do, and where they fail.

5. In his report on the water-supply Mr. Cousins proposes to increase the pressure at Kilpauk to 81·7 above datum * by pumping; he does not recommend any increase in the size of the principal mains, but considers that all public mains below 3″ in diameter should be taken up and replaced with pipes of larger size; what size these should be or what additional mains or extensions would be required in the 1st Division and other parts of the town not now supplied, is not stated.

* Datum is 20 feet below mean sea.

6. In making proposals for improving the system of distribution, I have had in view three alternative schemes, namely, scheme No. 1 to supply 20 gallons a head in 10 hours with increased pressure at Kilpauk, scheme No. 2 to supply 10 gallons a head in 10 hours without pumping, scheme No. 3 to supply 15 gallons a head in 10 hours without pumping.

7. Scheme No. 1—Mr. Cousins and the Committee appointed by Government in 1890 to enquire into the drainage and water-supply of Madras, have estimated that 25 gallons per head per diem would be required in Madras for all purposes. In calculating the pressure required, and determining the sizes of the branches, I have assumed in scheme No. 1 that four-fifths of that quantity will be drawn off in 10 hours allowing a minimum pressure of 10 feet in any part of the town.

8. For the purpose of water-supply, Madras may be divided into nine districts; the limits of each is shown in plans 1 and 3 by distinctive colours.

9. The result of the investigation goes to prove that with few exceptions, the sizes of the principal mains as originally laid, correspond very closely with the sizes that would be required to meet the conditions stated in paragraph 7, assuming that a pressure of 73 feet above datum is maintained at Kilpauk, so that, provided the existing mains are capable of standing that pressure, it would not be necessary to abandon them, the branch pipes however are not so well laid out and require to be considerably altered and extended.

10. The 1st Division was not included in the original scheme of 1869 for the water-supply of Madras. It has, however, been drawing a supply from mains intended to meet the demands of the 2nd and 3rd Divisions, but as some parts of the 3rd Division are considerably higher than the 1st Division, the supply in the former has suffered in consequence.

11. The north Auxiliary main proposed by the Acting Engineer in his letter No. 445 of the 13th July 1894 is intended to improve the supply in the 1st Division, but it is far too small to comply with the conditions referred to in paragraph 7, for assuming a pressure of 73 feet above datum is maintained at Kilpauk, the main would deliver only 10 gallons a head in 10 hours to the population in its district. If it is considered advisable that the 1st Division be supplied under the same conditions as the rest of the town, it would be necessary either to take up the main and lay a larger pipe in its place or to lay another main alongside of it or by another route or to further increase the pressure at Kilpauk.

12. I have provided for the 1st alternative in the estimates except for a short length where the pipe has been duplicated, in order to use up the stock that has been ordered. One pipe will give more satisfactory results than two in the same street, and the connections with the branches would be simpler; there is no other very suitable route for a second pipe. The 3rd alternative is out of question as the necessary pressure at Kilpauk would be excessive, namely 158 feet above datum.

13. The extension of existing mains and the size of each branch has been carefully considered with reference to the population to be supplied, the level of the highest point on the branch, the pressure on the main at the point of connection, and the velocity of flow in the pipes; and endeavours have been made to arrange the branches so that the water may circulate freely.

14. Reference is here made to plans Nos. 1 and 2 in order that the proposed alterations for scheme No. I may be understood. In plan No. I sheets 1, 2, 3, 4 and 5 the north and south auxiliary mains have been omitted, but all the existing mains and branches have been, shown in red and the sizes of the pipes denoted. The fountains are shown by small red circles some of which are colored green denoting that they failed to give water at some time during May 1895. Levels have been written on the plan, this course has been adopted in preference to drawing contour lines as being more suitable for a flat town like Madras.

15. On sheets 1*a*, 2*a*, 3*a*, 4*a*, and 5*b*, the sanctioned auxiliary mains and branches are shown in red, and the existing trunk mains and branches above 7″ in dotted red lines, black dotted lines are drawn in streets where it is recommended to increase the size of the mains and full black lines are additional mains and branches. The length of pipe already laid in Madras is approximately 115 miles, of which 51 miles are 3″ pipe and under. The proposal for scheme No. I is to lay 35 miles and 1,960 feet of new pipe, to take up and clean and relay 9 miles and 1,848 feet of old pipes, and to take up and relay 6 miles and 3,645 feet of proposed auxiliary mains and branches—*vide* appendix 3.

16. With the increased pressure and these improvements carried out, the quantity of supply would be satisfactory. It would be necessary to introduce a thorough system of inspection to see that the fittings and connections for all house services are in good repair, as with the increased pressure any waste that now occurs will be greatly enhanced. The fittings for most of the public fountains will require renewing. It is estimated that there are 1,900 public taps and for this item alone Rs. 15,000 has been provided in the estimate.

17. Waste water meters have been fixed in three streets in Madras, Nagappa Iyer street, 7th Division, Rasappa Chetty street, 2nd Division, and Venaitheertha Mudali street, 5th Division, and it is satisfactory to learn that the amount of water drawn off from 10 P.M. to 4 A.M. in each case is small showing there is very little waste in these streets during the night from leakage and taps being left open.

18. The following table gives the average draft per hour from the three mains referred to :—

Hours.	7″ Pipe, Nagappa Iyer Street.	7″ Pipe, Rasappa Chetti Street.	4″ Pipe Venitheertha Mudaly Street.
	Gallons per hour.	Gallons per hour.	Gallons per hour.
1 A.M.	0	680	200
2 ,, ...	0	560	190
3 ,, ...	0	620	200
4 ,, ...	50	1,770	230
5 ,, ...	1,070	1,510	1,230
6 ,, ...	1,940	1,640	2,110
7 ,, ...	3,170	1,640	1,570
8 ,, ...	2,940	1,240	2,040
9 ,, ...	2,420	1,190	1,900
10 ,, ...	2,300	1,550	2,010
11 ,, ...	2,470	2,070	2,100
12 Noon	2,360	2,290	1,930
1 P.M.	2,240	2,380	1,820
2 ,, ...	2,010	2,310	1,910
3 ,, ...	2,110	2,180	1,790
4 ,, ...	2,140	2,530	1,940
5 ,, ...	2,030	2,730	1,970
6 ,, ...	2,190	2,950	1,900
7 ,, ...	1,980	2,990	1,600
8 ,, ...	1,620	3,050	1,380
9 ,, ...	1,170	3,550	1,190
10 ,, ...	730	2,370	510
11 ,, ...	340	1,560	300
12 Midnight	0	910	170
Total ..	37,080	46,270	32,190
Gallons from 6 to 6	30,320	26,700	24,990
Proportion of 24 supply drawn off in 13 hours..	·81	·58	·77

From the above figures it will be seen that the assumption that four-fifths be drawn off in 10 hours leaves a fair margin.

19. It is difficult to say what the effect of increased pressure will be on the mains, but it is probable many leaks will show themselves and repairs will be necessary and for this purpose a sum of Rs. 5,000 has been provided in the estimate.

20. Many of the pipes are very dirty, a sample of the incrustation has been sent to the Chemical Examiner who reports as follows:—

"I have the honour to state that the composition of the matter sent with your letter is—

	PER CENT.
"Organic matter	11·46
Matter insoluble in hydrochloric acid (*i.e.*), sand, etc.	19·80
Oxide of iron and aluminium (Fe_2O_3 and Ab_2O_3)	64·64
Other metallic compounds not estimated, lime, etc.	4·10
	100·00

"The matter contained a slime in which were imbedded small leeches and other forms of life. I should say that water would deteriorate by passing through pipes containing matter having the composition of this stuff, containing so much loose organic matter."

21. Some idea of the amount of water may be delivered 317 gallons a minute and can be made in Madras with low pressure of good that could be done by cleaning the pipes and after a long series of experiments; Rs. 20,000 has been put in the estimate for this item.

22. The cost of the works enumerated amount to Rs. 6,53,382 details of which are shown in appendix 8. This is in addition to the cost of the works included in Mr. Cousins' estimate.

23. As the question of funds has always to be considered, and the cost of the entire works and maintenacne appears prohibitive, the question naturally arises whether anything can be done to improve the water-supply of Madras without undertaking the complete scheme as recommended by Mr. Cousins. The chief difficulty being the cost of pumping, it becomes necessary to see whether it is possible to avoid this part of the scheme and what it will entail. To begin with, all idea of filtration would have to be given up, for without pumping, filtration is practically impossible, the available pressure in Madras being . The question then resolves itself into the advisability of adopting a scheme which will increase the supply it more equally, render it continuous, and to some degree by creating a better the pipes; how far such a scheme is needed from the Sanitary Commissioner's inspection defects of an intermittent supply, and from which gives the discharge in gallons per minute various fountains. From the statement it will be 640 out of 1,025 fountains deliver less than 3 gallons a minute, and the supply at such fountains may be as defective.

24. Scheme No. 2 has been prepared with the object of meeting the case referred to above. By carrying out the alterations and extensions to the mains as recommended in scheme No. I and by making certain alterations to the head works at Kilpauk a continuous supply of 10 gallons a head in 10 hours could be effected, the cost of such works would amount to Rs. 6,74,382, details of which are given in appendix 9. As in scheme No. I, taking up and relaying north auxiliary main is provided for, for under existing pressure it will deliver only 5 gallons a head in 10 hours to the population in its district,—*vide* appendix 5, but this portion of the work might be delayed until found absolutely necessary.

25. The Red Hills channel has a fall of 5·83 feet in 6 miles and 1,081 yards. From the cross sections given in plan No. 5 it is evident that a considerable amount of silting up has taken place, though I can find no record of the original section. The level of the water at the masonry shaft at 6 A.M. is usually about 52·69 and at 6 P.M. about 51·69 indicating that the channel forms, as it were, a reservoir during the night. The maximum average discharge per diem was in May 1894 when it amounted to 7,002,988 gallons, and assuming that four-fifths of it was drawn off in 10 hours the channel should be capable of supplying 560,239 gallons an hour. If it is decided to retain the existing channel for the present, it would be advisable to resection its entire length, raise the banks in places, and construct an overflow weir about 50 feet long with its crest at 52·75 near the masonry shaft, discharging into the ottary nulla with a head of about 4" so that a full supply may be allowed to come down without risk of damaging the banks. There are three safety overflows already in the channel, to their position they do not render sufficient in case of accident, the nearest weir being 1 mile and 1,694 yards from the masonry shaft. It takes about 14 hours for the water to come from Red Hills to Madras, and with a little experience it would be possible to regulate the supply so as to avoid wastage, and at the same time overcome the loss of 1-foot pressure now experienced. A lump sum Rs. 30,000 has been provided in the estimate for alteration to the channel and head works at Kilpauk.

26. One great defect in the present system is caused by shutting the sluice at Kilpauk whenever it is considered necessary to remove the dirt collected in the masonry shaft, thereby rendering the supply intermittent. This operation takes about one hour and is generally

performed between 12 and 1 on Mondays. The amount of dirt arrested in the shaft must be small compared with the quantity that enters the pipes, and it would be far better to widen the channel to some distance so that the velocity of flow may be reduced, and the silt allowed to settle before entering the shaft and subsequently removed, or to construct a bye-pass at Kilpauk so that the water may be led into the 42″ main without entering the shaft when the operation of cleaning is performed. Seeing the great objections raised to the intermittent supply, it is questionable whether it would not be advisable to clean the shaft less frequently, say, once in six months instead of once a week as is done now, pending the construction of these works.

27. *Scheme No.* 3.—Should a supply of 10 gallons in 10 hours be considered insufficient, it could be further increased by laying a still larger main to the north to supply the 1st and 4th divisions and parts of 2nd and 3rd divisions, and by extending the 14″ main from Woods Road to Royapettah High Road to help supply Mylapore. By the arrangement as shown in plan No. 3 it will be possible to deliver 15 gallons a head in 10 hours without resorting to pumping at Kilpauk. The estimated cost of this scheme is Rs. 9,26,414.

28. In case either scheme No. 2 or 3 is adopted the supply at the highest parts of the town, such as Cutcherry Road in the 8th division, and Ungappa Naick Street, and Krishnasamy Pagoda Street, etc., in the 3rd division, is liable to be defective. This difficulty could be met by the adoption of cisterns in such districts, or by using steam pumps to give the necessary pressure. It may, however, be several years before such additional pressure is considered necessary and no provision has therefore been made in the estimate, such pumps would be far smaller than would be required at Kilpauk in Mr. Cousins' scheme.

29. The additions and extensions recommended do not provide pipes for all streets, but the sizes of the branches have been so arranged that sub-branches can be laid wherever required. It will be noticed that provision has not been made for taking up all branches under 3″ and substituting larger pipes as recommended by Mr. Cousins. This is merely matter of expense which can be postponed until found absolutely necessary.

30. In his inspection notes Dr. King has urged the necessity of providing places for dhobies of Madras. Two places for this appear to me to be suitable. One on the Spur tank, an ample supply of fresh water being obtained from a pipe branching off the 36″ main, the dirty water would be led into the Egmore drains in the event of the latter work being carried out and the other is near the Lunatic Asylum, the supply being obtained from the Red Hills channel, the dirty water could be conducted to the nearest sewer after the completion of the drainage works.

31. A list of the sites suitable for additional bathing places is given in appendix II.

32. It may be placed on record that the 30″ main supplying Mylapore and Triplicane, and the 18″ main supplying Royapettah are cases where the size of the pipes and their discharging capacity are not in accordance with the probable demand from the population within the districts, they have to supply, when compared with the sizes and requirements of the rest of the town. The advisability of extending these pipes and doing away entirely with the south auxiliary main has been carefully considered. In the event of pumping being resorted to, and more water being required at Mylapore, the pipe along Triplicane High Road and Barbers' Bridge Road, from Pycrofts Road to Mylapore might be taken up and a 16″ pipe laid in its place; the discharging capacity of this length of the existing pipe being too small compared with the rest of the main. In scheme No. 3, it is proposed to extend the 18″ main above referred to.

33. In conclusion I beg to recommend that scheme No. 2 be carried out or at least so much of it as funds will admit, postponing for the present, if necessary, such parts of it as relate to the alterations to the auxiliary mains. I also recommend that the masonry shaft be cleaned once in six months pending the completions to the alterations to the head works at Kilpauk. The great advantage of this proposal is, that it is one step towards completing Mr. Cousins' scheme should funds be available for the pumps and filters at Kilpauk, and for the masonry conduit from Red Hills in years to come. If it is considered advisable to further increase the supply, I would recommend that steam pumps be placed on the mains to give additional pressure during the hours when the demand is greatest, rather than carry out scheme 1 or 3. When this question of distribution is disposed of, I strongly recommend for consideration the removal of all villages within the catchment area of Red Hills lake estimated to cost Rs. 50,000 and the erection of an engine-house and drivers' quarter and pumps at Red Hills at a cost of Rs. 80,000 in place of the temporary engines and sheds now employed whenever the level of the lake falls below 35·50.

II

Letter—from Lieutenant-Colonel G. M. J. MOORE, C.I.E., President, Municipal Commission, Madras.

To—the Chief Secretary to Government.

Dated—1st August 1895.

No.—G. 265.

With reference to G.O., No. 1651 M., dated 7th November 1894 (paragraph 9), I have the honour to submit as follows.

2. At a General Meeting held on the 28th January 1895 (copy of minutes herewith) the Commissioners appointed a Committee to report on the subject.

3. The report of the Committee (copy herewith) was considered by the Commissioners at an adjourned special meeting held on 31st May 1895 (copy of minutes attached) when it was resolved that the recommendations of the Committee in paragraphs 13 and 16 be adopted with the further recommendation that the Red Hills tank be restored to its original level.

4. The accompanying maps D and E show respectively the proposals of Mr. Ellis and Mr. Loane (appendices A and B to the report).

5. The Commissioners then proceeded to the consideration of the financial question which occupied their attention at the meetings held on 7th, 14th and 26th June (copy of minutes enclosed) and was finally disposed of at the meeting held on 8th July (copy of minutes herewith).

6. It will be seen from the resolution passed at this last meeting, and indeed from the proceedings of all the meetings, that the Commissioners are more than averse to enhance the house and water tax.

7. Their reasons are principally that they consider that those taxes are already oppressively heavy, that any increase will tell most unfavourably on the poorer class of house owners occupying their own houses, and will lead to the overcrowding of houses to a still greater extent than obtains at present.

8. With regard to the request for a grant of 10 lakhs, the views expressed by those who supported the resolution were briefly as follows :—Madras is the capital city of Southern India, the seat of Government and a Garrison Town. It contains a large number of Government offices and institutions, in consequence of which there is always a floating population from all parts of the country. On these grounds they consider that Madras is more entitled to assistance from Government than any other Municipality.

9. After having written the above, I learnt that Colonel Pennycuick would be in Madras in a few days and I thought it better to await his arrival in view to going into the subject with him personally.

10. Colonel Pennycuick very kindly met Mr. Ellis, Mr. Loane and myself and went briefly through the proposed schemes. At his suggestion more information has been obtained and is submitted in Mr. Ellis' letter of 20th July 1895 (annexed, marked F) and Mr. Loane's of 31st July (marked G).

11. Colonel Pennycuick also required a tracing of Mr. Ellis' map D, which is marked H and forwarded herewith, as also a copy of Mr. Cousins' proposed scheme which is marked I and also forwarded.

ENCLOSURES.

Extract from the Proceedings of the Municipal Commissioners for the City of Madras, dated the 28th January 1895.

* * * * *

No. 4.

G.O., No. 4 M., Mis., dated 8th January 1895, deputing Mr. R. E. Ellis, on his relief by Mr. J. A. Jones, to prepare the estimates for Mr. Cousins' new water-supply scheme, and informing that his salary for the period of his deputation will form a legitimate charge on Municipal Revenues.

Proposed by the Hon'ble P. Rungiah Nayudu Garu and seconded by Mr. B. Lovery—

"That the proposals of Government be accepted."

Carried.

* * * * *

Report of the Committee appointed by the Commissioners at their meeting held on 28th January 1895 to consider Mr. Cousins' schemes for the improvement of the drainage and water-supply of Madras and for the purification of the River Cooum.

MEMBERS.

Lieutenant-Colonel G. M. J. Moore, C.I.E., *President.*
M.R.Ry. R. N. Pragasa Mudaliar Avargal.
Surgeon-Major J. Maitland, M.D.
The Hon'ble P. Rungiah Nayudu Garu.
M.R.Ry. V. Varadappa Nayudu Garu.

The committee held two meetings.

In G.O., No. 1651 M., dated 7th November 1894, Government practically abandon Mr. Cousins' drainage scheme and request the Commissioners to adopt his water-supply scheme (modified) and to make early arrangements for financing it.

2. According to Colonel Pennycuick's estimate the annual cost of the modified water scheme would be Rs. 4,04,000, supposing a loan of Rs. 25,00,000 to be raised. These figures are slightly in excess. Colonel Pennycuick has allowed a little too much under Interest and Sinking Fund—the actual figures are Rs. 3,97,475 or in round number Rs. 4,00,000.

3. It is evident that, before any action can be taken in the matter, the Commissioners must be prepared to increase their revenue by Rs. 4,00,000.

4. It is calculated from official returns that a tax of 1 anna per gallon on all petroleum imported into Madras will yield a revenue of 2 lakhs per annum, *provided no refunds were allowed*. Doubling the tax the 4 lakhs are provided for at once. The committee will deal with this point further on.

I propose the omission of these 2 paragraphs.
P. RUNGIAH NAIDU.

As remarked by me when the President's circular letter went round any attempt at increasing the rate per cent. of house and water tax would create an uproar in the town. The maximum prescribed by the Act is being collected. I am [illegible] omitting paragraphs 5 and 6.
R. N. PRAGASA MUDALIAR.

5. The water tax which is now at its maximum of 4 per cent. and yields about 2 lakhs a year might be increased to 6 per cent. or 8 per cent. and 1 or 2 lakhs could be obtained by the increase.

6. The tax on buildings, also at its maximum of 10 per cent. might be increased to 12 per cent. or more—if to 12 per cent. 1 lakh more and if to 14 per cent. 2 lakhs more would be obtained.

7. But in connection with the water-supply scheme the strong expression of opinion that has been evoked from all sanitary officers must not be ignored. The Health Officer has unhesitatingly condemned the subordination of drainage to water-supply. The Sanitary Commissioner apparently, because he thought it was a foregone conclusion in favour of water-supply, has suggested a compromise by laying down what is practically the backbone of Mr. Cousins' drainage scheme.

Besides these officers all the sanitary authorities who have ever reported on the subject have called attention to the paramount importance of draining Madras.

8. If the Commissioners are prepared to raise the income required for the modified water supply scheme, viz., 4 lakhs, and consider the drainage should be shelved altogether, there is nothing more to be said.

9. The committee, however, are unanimous in their opinion that the drainage should not be subordinated to the water-supply, but the water-supply subordinated to the drainage.

In this connection the committee submit the following schemes for the consideration of the Commissioners which can be carried out for an annual outlay of 2 lakhs.

10. It will be seen from the accompanying note by Mr. Ellis (Appendix A) that Mr. Cousins' scheme can be worked by districts. (It must be understood that all idea of house connections is eliminated for the present.) If the first portion including Purasewakam, Elembore, Egmore, Chintadripet, Triplicane, with the main pumping station at Sydenham's road and main to outfall channel (or Kurakapet as might be finally settled) were undertaken, the backbone of the scheme would be completed and as time went on the other districts might be incorporated. One of the most important features of this scheme is that all the sewage would be diverted from the Cooum.

11. This, it is shown, is estimated to cost 20 lakhs. The maintenance is calculated at Rs. 85,000, but with the savings effected by closing all the other pumping stations and picottahs it might be put down at Rs. 60,000. The total cost would be—

	Rs.
Interest and Tinking Fund on Rs. 20,00,000 at 4 per cent. ...	94,780
Maintenance	60,000
Total ...	1,54,780

12. Mr. Loane in his memorandum (Appendix B) suggests laying a main of about 6½ miles in length from Mylapore to waste lands at Manally. This main will receive all the sewage now delivered at the various sewage farms. In addition to the existing pumping stations, three more will be required, in Mylapore near Mundavelly—in Langs Garden Road and in Tondiarpet. The annual cost of these extra pumping stations will be about Rs. 25,000. The approximate cost of this scheme, disregarding the cinerators, is estimated at Rs. 27,25,000, say 28 lakhs.

	RS.
The total annual cost will be Interest and Sinking Fund on Rs. 28,00,000 at 4 per cent.	1,32,580
Maintenance	25,000
Total ...	1,57,580

13. A modification of this scheme would be to drain Mylapore separately on to the existing sewage farm at Kistnampett, commencing the main in Triplicane. The committee however would recommend the adoption of the scheme proposed by Mr. Loane—the main commencing at Mylapore.

14. It possesses the advantage over Mr. Ellis' scheme that it provides for the drainage of the whole of the city on the lines laid down by Mr. Cousins with the exception of the main being substituted for the brick sewer.

15. It will be seen that if either of the proposed schemes are adopted, the 2 lakhs which is taken throughout as the basis of expenditure will not be expended.

16. The committee would propose that 6 lakhs more be raised and devoted to the water-supply.

17. It is calculated that 6 lakhs will carry out the following improvements which will materially increase the supply, viz., raise the sides of the existing channel 2 feet thereby increasing the supply by about 50 per cent., remove all the villages on the borders of the Red Hills lake, alter all the existing branches in the city as may be required by the Hydraulic Survey.

18. These improvements will require no outlay on maintenance and will only cost the Interest and Sinking Fund on 6 lakhs = 28,434, which added to Rs. 1,57,580, required for drainage, will amount to Rs. 1,86,014 out of the 2 lakhs.

19. When the committee was appointed G.O., Mis. No. 661 M., dated 10th April 1895 (Appendix C), was not before the Commissioners and is really beyond the scope of the committee's proceedings; but as the carrying out of any drainage or water-supply scheme is dependent upon an increase of revenue and as the above quoted Government Order puts the question whether the Commissioners are prepared to levy a tax on kerosine-oil, the committee consider it advisable to place certain facts before the Commissioners in connection with the levy of the proposed tax.

20. In paragraph 4 it was stated that 2 lakhs might be obtained by imposing a tax of 1 anna per gallon on all kerosine-oil imported into the city.

21. This was dependent on no refund being allowed.

22. In March 1893 the Commissioners passed the following resolution: "That Government be moved to allow the Commissioners to impose a tax on all petroleum imported into the Town of Madras *for local consumption.*" From this it is evident that the Commissioners contemplate a refund, and it is almost certain that the Government of India would never sanction the imposition of the tax without such refund.

23. There is already an imperial tax of over 14 per cent. on petroleum and the proposed tax would double it.

24. It is very probable that any further local taxation would seriously affect the trade of Madras, driving the present consignments to some other coast port, such as Negapatam where they could be landed free and railed to their various destinations.

25. But there is another point in connection with the tax which the committee think right to lay before the Commissioners.

26. It is true that practically all petroleum is imported by sea and therefore the tax would be easy to collect, but the refund is a different matter. The experience derived from the tobacco tax should not be ignored. It is more than probable that an organized system of fraud would spring up. Old tins of kerosine-oil might be filled with water and exported and refunds claimed with the same results as in the tobacco tax—that the imposition of the tax would be a source of loss instead of profit.

27. Supposing that no frauds were perpetrated and refunds only paid on legitimate exports that had paid the tax on import, it is calculated that the tax would only yield a revenue of Rs. 45,000 per annum on a local consumption of 60,000 gallons per mensem or 7,20,000 gallons per annum.

J. MAITLAND, M.D.
Surgeon-Major.

V. VARADAPPA NAYUDU.

G. M. J. MOORE.

Appendix A.

Letter—from R. E. Ellis, Esq., Sanitary Engineer to Government.
To—the President, Municipal Commission.
Dated—the 15th March 1895.

I have read the Acting Sanitary Commissioner's letter to the Chief Secretary to Government, No. $\frac{2201A}{S.}$, dated 18th December 1894, in connection with G.O., No. 1651 M., dated 7th November 1894, and also the memoranda by the Health Officer and Acting Engineer to the Municipality.

2. It has always been my opinion that, if Madras is to be eventually properly drained, endeavours should be made to make a beginning on some complete scheme, and I do not see that the Commissioners could do better than adopt the scheme prepared by Mr. Cousins.

3. The first question that arises is whether it is possible to carry out Mr. Cousins' scheme by districts or sections, and if so how much can be done with the funds available.

4. Mr. Cousins in submitting his report says: "In devising the scheme for the drainage of the district I have had before me two necessary conditions, viz., efficiency combined with economy. I have therefore designed the sizes and gradients of the sewers with a view of carrying off the sewage only, together with a portion of the rain water which may fall in the backyards of dwelling houses, and a small amount of sub-soil water, which with every precaution to exclude will always find its way into sewers, but have excluded all storm water falling upon roads, streets, etc."

5. The attached map shows the area drained by Mr. Cousins' drainage scheme. There are to be three pumping stations—one at Sydenhams Road, one at Ráyapuram and one at Tondiarpet.

In the map I have divided the scheme into twelve sections, as each section is independent of the other except so far as relates to some of the main sewers which pass through one section to the other.

6. The twelve sections are briefly as under:—

(1) Ráyapuram and part of Tondiarpet.
(2) Part of Tondiarpet, Coroekoopet and Washermanpet.
(3) North portion of Black Town.
(4) South portion of Black Town.
(5) Fort.
(6) Purasewakum.
(7) Vepery.
(8) Elembore.
(9) Egmore.
(10) Chintadripet.
(11) Triplicane.
(12) Mylapore.

7. Nos. (1) and (3) are to drain towards the existing pumping station at Ráyapuram. No. (2) is to drain towards the proposed pumping station at Coroekoopet. Nos. (4), (5), (6), (7), (8), (9, (10) and (11), are to drain towards the proposed main pumping station at Sydenhams Road. No. (12) is to drain out to sea.

8. I will now refer to the Chief Engineer's memorandum, dated 14th August 1894, embodied in G.O., No. 1651 M. (page 47), in which he says—

(*a*) "I consider the general arrangements proposed by Mr. Cousins leave nothing to be desired."

(*b*) "I am of opinion that the gradients will be amply sufficient in practice."

(*c*) "In one point only connected with the general arrangement am I inclined to agree with Mr. Jones, viz., that it would have been better had a greater sub-division of area been made and more pumping stations adopted, but I do not hold this opinion so strongly, nor do I think the point of sufficient importance to justify a rejection of the scheme and its replacement by an entirely new one."

(*d*) "I am certain that the portion of the work which Mr. Cousins estimates at Rupees 23,38,176, and for which Mr. Jones' partially revised estimate amounts to Rs. 34,49,124, will not in practice be found to cost less than Rs. 40,00,000. To this has to be added the cost of house connections estimated at Rs. 21,00,000."

9. With a view of diverting the sewage from flowing into the river Cooum, Mr. Cousins recommends that the first work proceeded with should be erection of Sydenhams Road pumping station; the cast iron gravitating main from it to the present open sewer leading to the Black Town farm, where a temporary connection will be made with it; the constructions of the Sydenhams Road main sewer between the pumping station and the river, and the sewers abutting on both sides of the river, into which the whole of the sewage now discharged into the Cooum could be intercepted and diverted on to the Black Town sewage farm.

10. It is intended that a brick culvert 3′ 6″×3′ 6″. estimated by Mr. Jones to cost Rs. 42,638, should take the place of the existing open channel leading into the farm. This item has been included in the estimate.

11. The next question to be considered is, what is to be done about house connections which are estimated to cost Rs. 2,100,000 and how should the sewage be conveyed to the mains pending the entire completion of this portion of the work, and it appears to me that the only way out of the difficulty is to have street connection, the sewage from several houses being collected in open drains of small dimensions which could be connected with the sewers at intervals. This being the case it will probably be possible to postpone laying some of the pipes of small size contemplated by Mr. Cousins, and I might here refer to the Sanitary Commissioner's inspection notes of Madras for 1894, paragraph 39, in which he says: "As I have shown, it is by no means an essential part of the pipe system that water closets should be used in all private houses. Their adoption will be gradual."

12. With a view of carrying out Mr. Cousins' scheme by districts, I have rearranged the order of the estimate by separating the isolated areas of Mylapore and Tondiarpet which Mr. Cousins proposes to deal with as separate schemes and also that portion of Rayapuram which is to drain towards the existing pumping station, and I have placed last on the list Black Town which has been drained and the Fort which is outside municipal limits.

13. Column No. 1 in the appended statement is Mr. Cousins' estimate as revised by Mr. Jones, the figures in column No. 2, have been obtained by adding 16 per cent. to the figures in column No. 1, bringing the total estimate up to about Rs. 40,00,000 which is the figure given by the Chief Engineer as the probable cost, and column No. 3 is estimated cost of carrying out that portion of Mr. Cousins' scheme shown in red line in the accompanying map. The figures in column No. 3 have been obtained from the same data which was used in preparing column No. 2, and omitting many of the smaller branches as suggested in paragraph No. 11 above, a lump sum has been added to cover the cost of making silt traps and connecting present surface drains to the system of sewers and constructing new surface drains wherever necessary. Provision of Rs. 1,50,000 has been made for extending the sewage farm. The farm should not be less than 400 acres to enable it to take the sewage of 450,000 persons allowing 20 gallons per head per diem, 1 inch of sewage water being placed all over the farm every 24 hours. It is not known how much Government waste land is available or whether Government will hand any over to the Municipality free of cost; whether a more suitable site for a farm can be found near the Cochrane Canal is a question to be considered. In this case there would be a considerable saving in the pumping main.

14. The cost of pumping at Sydenhams Road station with certain modifications to the arrangements is estimated to come to Rs. 85,500 per annum. This item may be reduced until the entire scheme is undertaken.

15. In carrying out as it were the backbone of Mr. Cousins' scheme, it will be possible to close Triplicane, Kistnampet, DeMellows Road and Napier Park pumping stations and stop the picottahs at Rayapettah, Dams Road, Egmore and Pudupet farms; it would still be possible to retain the DeMellows Road farm for the present and even extend it, all the effluent water being drained back into the sewers, and thus one of the great objections to the farm would be removed without entailing the loss of revenue from the farm. All swampy land between Brickkiln Road and DeMellows Road will be effectually drained and all sewage will be kept out of the Cooum, and further all future improvements can be executed on the lines laid down by the scheme.

16. As large tracts of land which are now swamps will be rendered valuable property as soon as the drainage scheme is introduced, endeavours should be made to acquire the same if private property, or if Government waste land the same might be obtained from Government free of cost.

17. As it is proposed to build a close culvert from the present termination of the 2 ft. outfall pipe, it would be expedient to stop laying the extension which is now in progress and use the pipe for one of the auxiliary water mains or for one of the 18-inch overflows to the sea provided by Mr. Cousins.

18. The question of draining Mylapore is more difficult to deal with. The sewage may be disposed of in one of the following ways: (1) sent to sea, (2) pumped on to a farm to the south of Mylapore, (3) pumped into the main at the north end of Barbers Bridge Road and allowed to gravitate to the main pumping station at Sydenhams Road, in which case the mains would have to be slightly enlarged, (4) pumped on the Kistnampet sewage farm as this will no longer be required for Triplicane sewage, the farm might be enlarged by taking in Barbers Bridge rubbish depot.

19. It must be borne in mind that Mr. Cousins does not allow for taking off storm water through the sewers, but intends that it shall pass off by the present open channel and culverts, for it is practically impossible to construct sewers so as to overcome all inconvenience in time of floods.

20. Should it be considered advisable to carry out Mr. Cousins' scheme, it could follow that junction pipes and manholes for all branches contemplated in scheme should be provided for, so that the additions can be made at any future date without disturbing that portion of the work already done.

Statement (*vide* para. 13 *supra*).

		1	2	3
	Cast iron delivery mains	4,22,934	4,90,603	4,90,603
	Sydenhams Road pumping station	3,90,471	4,52,946	4,52,946
6 & 7	Purasawakum drainage	4,01,273	4,65,476	1,63,247
				1,01,982
8	Elembore	44,058	51,107	45,704
9	Egmore	1,16,701	1,35,373	1,04,526
10	Chintadripet	1,82,805	2,12,053	1,17,534
11	Triplicane	4,78,806	5,55,414	2,95,149
	Extension of sewage farms	"	"	1,50,000
	Surface drains & silt traps	"	"	48,309
		20,37,048	23,62,972	20,00,000
12	Mylapore	3,05,168	3,53,994	
	Tondiarpet pumping station	1,19,887	1,39,068	
	Tondiarpet	9,687	11,236	
2	Tondiarpet	1,00,017	1,16,019	
1	Royapuram	1,45,336	1,68,589	
3 & 4	Black Town	6,93,287	8,04,212	
5	Fort	38,693	44,883	
	Total ..	34,49,123	40,00,973	

15th March 1905.

R. E. Ellis.

Appendix B.

Memorandum.

Memorandum on the drainage, water-supply and purification of the Cooum in the town of Madras.

The Government by their order No. 1651 M., of the 7th of November last, have set aside the scheme proposed by Mr. Cousins for the drainage of the town, on the score of its great cost, not only in the outlay, but also in that for its maintenance. The Commissioners have been called upon to consider the question of improving the water-supply at a cost of 25 lakhs, and the Chief Engineer has been directed to take steps for the purification of the Cooum, by cutting a canal from the harbour to the basin, whereby sea-water may be let into the Cooum twice a day at high tides, and be discharged into the sea by another outlet at low tides thereby converting it into a tidal river.

It does appear a very great pity that Government should have put aside the drainage question, which in importance to the town stands at the head of the three works, and it is to be hoped the Commissioners will not lose sight of this, when considering that for the water-supply.

As to the purification of the Cooum, this will be done by Government, it is hoped, as an Imperial or Provincial work; should, however, the Commissioners be called upon to do this work at their cost, they should then obtain full control over the river and canal, within Municipal limits, so that they may recover the outlay by the fees charged on all vessels sailing on its waters, and for the trade conducted on its banks.

There is no doubt, but that the purification of the Cooum—which is for eight months in the year, a stagnant sewer—will be of immense blessing to the people of Madras. The sooner therefore this work is undertaken the better for Madras.

Water-supply.—now as to the question of water-supply. Mr. Cousins proposes to bring down a larger quantity of water from the Red Hills through a masonry conduit, so that the water may not be contaminated on its way from the lake to the town. To filter this water at Kilpauk, where the present system of iron pipes begins, and to pump it under pressure into the pipes, so that the present defective pressure may be overcome, and all places that have pipes already laid to them, may have a better supply. Mr. Cousins estimates this work at 21 lakhs; but this estimate is found to be incorrect, by about 4 lakhs, so that the work must be put down as likely to cost 25 lakhs; we will get for an outlay of 25 lakhs, (1) more water, (2) the water filtered, (3) higher pressure.

2. Unfortunately, however, it will be seen that no provision has been made for further extension of the water-supply within the town, nor for cleaning out the present system of pipes, (the larger sizes of which have been under ground for nearly a quarter century); these are largely coated inside with foreign matter. To further extend the system within the town will require about 5 lakhs; the total outlay will therefore come to 30 lakhs; and the maintenance, sinking fund and interest will rise to $4\frac{1}{4}$ lacs annually, instead of 4 lakhs as shown in the report on the scheme.

3. It is now suggested that with an outlay of about 11 lakhs only, and with no more than about 33 per cent. increase over the present maintenance, which is about 50,000 annually, as much may be done on other lines.

4. To avoid the annual expenditure of about Rs. 20,000 to which the Municipality has been subjected since the breaching of the Red Hills lake bund in 1884, when the level of the lake was reduced by 3', it is now recommended that one lac of rupees be allotted, for raising and strengthening these bunds, so that the old level may be restored, and thereby a larger body of water secured. The Municipality have spent about 2 lac on pumping, etc., during the past ten years, which in future may be avoided if the lake level is thus restored.

5. There are about seven villages which drain into the lake at present; these ought to be removed at once, since the sewage brought into the lake every year from them cannot but contaminate it, and more so, since its bulk has been reduced. Half a lac of rupees would more than compensate for this purpose.

6. The present water-supply channel from the Red Hills should be widened, the banks strengthened, proper fences put up along the whole line, and the channel next the bridges covered in for about 30 yards on either side, so as to prevent people passing over, fouling the water. This work can be done for half a lac. (The channel costs almost a lac to construct.) With an expenditure therefore of about 2 lacs, we will secure a larger body of water, and thereby save annual pumping, the lake will be made somewhat purer by the removal of the villages which drain into it (these works do not find a place in Mr. Cousins' scheme) and a larger body of water brought down to Madras.

7. To extend the water-supply within the town, an outlay of about 5 lacs will be required of which 3½ is to be spent in auxiliary mains.

We have about 1,000 fountains in Madras at present; if the extensions suggested are carried out, this number will be increased to about 1,200, a half of this number may be converted into filtered water cisterns, somewhat similar to the one put up by Diwan Bahadur Ragunatha Row at Mylapore, to the memory of his late brother Sir T. Madava Row at a cost of about Rs. 600. These fountains will be rapid filters, the filtering medium being, asbestos cloth, and manganese, or spongy iron, so that the water will be acted on both mechanically and chemically. The cost for 600 such fountains will be about 3½ lacs.

8. Approximate Estimate—

	Rs.
Removal of villages at Red Hills	50,000
Raising level of Red Hills lake	1,00,000
Widening and strengthening Channel	50,000
Extension of water supply within the Town	5,00,000
Erection of 600 filter water cisterns	3,50,000
Total ...	10,50,000
Unforeseen expenditure ...	50,000
Total ...	11,00,000

9. For an expenditure of 11 lacs we get (1) more water, (2) better quality (3) filtered water in 600 places, (4) extended system, (5) only 33 per cent. increase over present expenses in maintenance, instead of about six times as much as will be the case if pumping is resorted to, (6) annual pumping at Red Hills done away with, (7) ⅔ less interest and sinking fund to be provided for.

10. DRAINAGE.—The water-supply having been thus improved and increased, the undersigned suggests that 30 lacs be borrowed, for the drainage of such places in Madras, as at present have a very bad system, or none at all, the work being done somewhat on the lines laid down by Mr. Cousins in his scheme, and also for the erection of three cinerators, for the destruction of rubbish, and for improvement in removal of night-soil.

11. According to Mr. Cousins' scheme (as modified by Mr. Jones as to rates), the drainage of Mylapore and St. Thomé will cost 3 lacs, but instead of discharging the sewage as therein proposed, it is here suggested, to throw it on a sewage farm which may be made by the filling up of the swamp between the butts and Quibble island bridge, with sand from the sea shore, near by; this swamp is an unbearable nuisance for several months in the year. The swamp west of the bridge and up to Brodies' Road may also be taken up in the same manner, if more land is required. The land here is quite open, far from dwellings, and close to the sea, and will be vastly improved by its conversion from a swamp into a raised sewage farm; it will also form another source of income to the Municipality, which now derives about Rs. 200 per annum, on each cawnie of ground planted with Hurriali grass; and as there are fully 60 cawnies here, which may be thus brought under cultivation, a large revenue may be expected.

12. If, however, a sewage farm at Quibble island is considered objectionable, the same objection will apply to all other sewage farms within the city, and with greater force, inasmuch as they are in the midst of dwellings.

13. To remedy this evil—if it be one—it will be well to lay an iron main of about 6½ miles in length, from Mylapore to the waste lands at Munally, commencing with 12″ and terminating with 36″ diameter. Into this main all sewage now delivered at the various farms on the way, may be discharged, by the pumping machinery now at work, and others of a similar character which will be required.

14. The best line for such main will be as follows:—beginning in Brodies' Road near the Mundavelly, to pass along Brodies, Royapettah High Road, West Cott's Road, Patters and Dams Road, then crossing the Cooum obliquely at Chintadripetta, strike west of St. Andrew's Bridge, then on by the east side of the Women and Children Hospital, through the Friend-in-Need Society's premises, along naval Hospital Road, through Cunnia Chetty's waste land, west of Dobbin's Hall, through waste land in Kurriancootai, along Sydenham's Road, and the open ground east of the Powder Mills, then across the Madras Railway, and the Magazine to Munally.

15. The line as detailed above will be found most suitable, as it will have the least bends. All the drains may be made to flow towards this main, suitable pumping machinery being fixed near by to pump into it.

16. To drain Triplicane, Royapetta, and Chintadripetta, 4¾ lacs will be required; all sewage will be carried on, as at present, to the Kistnampet Farm, which may be further extended, or into the iron main referred to above, if it be decided to close the farms within the city.

17. To drain Egmore, Comaleeswarampetta, Vepery, Chulay, New Town, Purasavaukam and Kosapet, a sum of ten lacs will be required. The sewage farm in D'Mellows Road will be closed, so also those in the People's Park and Egmore; all sewage from these places will be carried, to the waste lands, a mile to the north of the Powder Mills, and Veyasurpady, far from dwellings. This site is proposed whether the sewage from the 7th and 8th Division is sent here or not.

18. The present system of drainage in Black Town will be left alone for the present, and will have added to it, the drainage of the Fort and Royapuram, at a cost of two lacs. The pumping machinery at Royapuram will be equal to this addition of sewage. Another lac will cover the cost of constructing two large-storm-water-drains, for carrying off more rapidly the rainfall from Popham's and Wall Tax Roads, where at present much inconvenience is felt owing to the flooding of those places during heavy rains.

19. Tondiarpet is to be drained at a cost of two lacs, the sewage passing on to the Rubbish Depôt in Ennore Road, which will then be converted into a farm. It will be well if the sewage from the Royapuram Pumping Station is also sent to this place, and the Outfall Channel, by which the sewage is now passed, and which is of much inconvenience to the inhabitants of Washermanpet, may then be done away with.

Approximate Estimate.

	Rs.
For draining Mylapore and St. Thomé	3,00,000
For draining Triplicane, Chintadripetta and Royapuram ...	4,75,000
Egmore, Purasavaukam, etc.	10,00,000
Black Town	3,00,000
Tondiarpet	2,00,000
Total ...	22,75,000
If the iron main be adopted, and the Sewage Farms in the City closed	4,50,000
	27,25,000
Three Rubbish cinerators at ½ lac each	1,50,000
One in Black Town.	
One in Kosapet.	
One in Kistnampet and increase of carts, buckets and for removal of night-soil	1,25,000
Grand Total ...	30,00,000

20. The sewage farms will after the first year pay for their maintenance as well as for their pumping arrangements. The only annual increase over the present expenditure will then be, the maintenance of water supply as already noted, and the payment for interest and sinking fund on 41 lacs which will not come to more than three lacs in the first year, the two latter will of course annually decrease. The three lacs for interest and sinking fund includes in addition to that required for increased maintenance under water supply, the pumping works for Tondiarpet, the other Divisions being provided for under this head by the machinery now at work.

21. Considering the very great necessity there is in Madras for a proper drainage system and other sanitary improvements, it does appear a waste of money to spend 30 lacs on the improvement of its water supply only, and that coupled with a heavy annual charge for maintenance, when an equally good supply with less expenditure in outlay and maintenance can be found as already detailed.

22. By Mr. Cousins' scheme, all the water drawn from the taps will be filtered, but since more than half of this quantity is used for the flushing of drains, watering of roads, and irrigation, the filtering of so large a body is unnecessary; hence is the suggestion to have filtered water cisterns within the Town, from which people can draw off for domestic purposes. Those who do not care to go to the public filtered water cisterns may at a very small cost have the Indian chatty-filter, which costs no more than one rupee; these can be put up in dwellings where the improved European filters cannot be afforded or adopted. The Chatty filters (as is known) contain vegetable charcoal, in addition to fine sand, and are therefore as efficient as those proposed in Mr. Cousins' scheme.

APPENDIX C.

Proceedings of the Madras Government.

Order—Mis. No. 661 *M., dated* 10*th April* 1895.

In G.O., No. 1651 M., dated 7th November 1894, the execution of Mr. Cousins' scheme for improving the water supply of Madras, and a scheme for purifying the Cooum were sanctioned; the Municipal Commissioners have subsequently requested sanction to a proposal to erect cinerators to consume the rubbish collected in the City; it is probable that some improvements in the method of disposing of the town sewage will also be eventually necessary; and a loan of 4 lacs has recently been raised by the Commissioners for expenditure upon water supply mains. All these schemes will require a larger sum of money to carry them out than can be set aside from the ordinary annual revenue of the Municipality, and the imposition of additional taxation appears to be unavoidable, the more so that the tobacco duties have not fulfilled the expectations that were formed of them.

2. The President will accordingly be requested to report whether the Commissioners are still of the opinion recorded in their resolution of the 15th March 1893, embodied in G.O., No. 607 M., dated 5th May 1893, that a duty upon kerosine oil imported into Madras for local consumption would be a satisfactory method of raising a part of the funds that are required, and if so, at what rate they would propose to levy the duty.

(True Extract.)

W. FRANCIS,
Ag. Assistant Secretary,
for *Chief Secretary.*

To the President, Municipal Commission, Madras.

Extract from the Proceedings of the Municipal Commissioners for the City of Madras, dated the 31*st May* 1895.

Report of the Committee appointed by the Commissioners at their Meeting held on 28th January 1895, on Mr. Cousins' Scheme for the improvement of the Drainage and the Water-supply of Madras.

Proposed by M.R.Ry. P. Theagaroya Chetty Garu and seconded by M.R.Ry. M. O. Parthasarathy Iyangar Avergal—

"That the Committee's recommendations in paragraphs 13 and 16 of their report be adopted, and that the following measures be adopted to meet the necessary expenditure:—

	Rs.
Tax on vehicles, animals, carts, etc., to be raised 50 per cent. yielding an additional	36,000
Profession tax to be raised 100 per cent. yielding an aditdional	65,000
Tax on liquor shops to be doubled yielding an additional	13,600
Petroleum tax at 1 anna per gallon for all petroleum consumed in the city yielding ..	40,000
That Government be requested to forego the contribution of Rs. 50,000 per annum yielding	50,000
Total ..	2,04,600"

The resolution was divided into two parts.

M.R.Ry. R. N. Pragasa Mudaliar Avargal proposed an amendment seconded by M.R.Ry. R. Balakristnama Chetty Garu—

"That the following words be added to the first part of the resolution 'with the additional recommendation that the Red Hills tank be restored to its original level at the cost of the Municipality.'"

The amendment on being put to the meeting was carried:

M.R.Ry. M. Venkataramiah Chetty Garu proposed an amendment seconded by M.R.Ry. C. Yetherajulu Nayudu Garu—

"That, that portion of the second part of the resolution referring to the tax on vehicles, animals, carts, etc., and the profession tax be omitted and 3 annas be substituted for 1 anna in the tax on petroleum."

M.R.Ry. Salla Gurusawmy Chetty Garu proposed an amendment seconded by Mr. Mahomed Sheriff—

"That 2 annas be substituted for 1 anna in the tax on petroleum and the following be added: 'the tax on tolls be doubled' and that portion of the second part of the resolution referring to the tax on vehicles, animals, carts, etc., and the profession tax be omitted."

M.R.Ry. W. S. Venkataramanjulu Nayudu Garu proposed as a further amendment seconded by M.R.Ry. G. Subbarayalu Chetty Garu—

"That 50 per cent. be substituted for 100 per cent. in the profession tax and that the following be added:—

'Tax on tolls to be raised 50 per cent.

'Tax on timber to be raised one-fifth of the present rate.'"

Proposed by M.R.Ry. P. M. Sivagnana Mudaliar Avargal and seconded by M.R.Ry. P. Theagaroya Chetty Garu—

"That the meeting adjourn till Friday the 7th June 1895."

Carried.

Extract from the Proceedings of the Municipal Commissioners for the City of Madras, dated the 7th June 1895.

Report of the Committee appointed by the Commissioners at their Meeting held on 28th January 1895 on Mr. Cousins' Schemes for the improvement of the Drainage and the Water supply of Madras.

Proposed by the Hon'ble P. Rungiah Nayudu Garu and seconded by Mr. N. Subrahmanyam—

"That the meeting resolve itself into Committee."

The proposition, on being put to the meeting, was lost.

Extract from the Proceedings of the Municipal Commissioners for the City of Madras, dated the 26*th June* 1895.

Report of the Committee appointed by the Commissioners at their Meeting held on 28th January 1895 on Mr. Cousins' Schemes for the improvement of the Drainage and the Water-supply of Madras.

Proposed by Dewan Bahadur R. Ragoonath Rau Garu and seconded by M.R.Ry. R. Balajee Rau Avargal—

"That the meeting resolve itself into Committee."

Carried.

Extract from the Proceedings of the Municipal Commissioners for the City of Madras, dated the 8*th July* 1895.

Report of the Committee appointed by the Commissioners at their Meeting held on 28th January 1895 on Mr. Cousins' Schemes, for the improvement of the Drainage and the Water-supply of Madras.

Proposed by Dewan Bahadur R. Ragoonath Rau Garu and seconded by M.R.Ry. P. Rungiah Nayudu Garu—

"That the meeting resolve itself into Committee."

Carried.

No. 1672 M., 8th October 1895.

Letter—from R. E. Ellis, Esq., Engineer.
To—the President, Municipal Commission, Madras.
Dated—the 20th July 1895.

In continuation of my letter of 15th March 1895, I have the honour to send herewith a tracing showing the position of the drains in Mr. Cousins' scheme. Upon this tracing I have marked the approximate levels of the inverts of the main sewers. In nearly all cases the branch sewers are connected with the main sewers in such a way that all the available head is made use of.

I send also estimates in detail of that portion of the work I propose should be done first; this shows at a glance how much is proposed to be done and when compared line by line with Mr. Cousins' estimates, it shows what is proposed to be left out. It is probable that even more may be left out and a consequent saving may be effected, but until a plan of existing drains has been prepared, it is impossible to say to what extent.

The 30 per cent. at the foot of the estimates includes about 14 per cent. for supervision and contingencies and 16 per cent. for extra cost estimated by the Chief Engineer in paragraph 13 of his report.

There appears to be some misconception in paragraph 14 of the Committee's report. My proposals are briefly to carry out Mr. Cousins' scheme as far as money will permit, leaving out certain districts and some of the small drains and all house connections; whereas I understand Mr. Loane proposes to alter the alignment of the sewers, the levels and consequently the size, for, it follows that if the sewers are laid at a less depth than shown by Mr. Cousins and are to discharge the same quantity, the sewers must be larger and velocity reduced; the latter scheme will therefore differ in many important details from that prepared by Mr. Cousins which may not appear evident at first sight.

In order that the levels of the sewers as arranged by Mr. Cousins may be compared with the level of existing sewers, I may mention that the level of the invert of his sewer at Sydenhams Roard is 10·50 above datum, whereas thelevel of No. 1 sewer at Rayapuram is 12·97; in other words the lowest new sewer will be only 2′—6″ deeper than the lowest existing sewer. Mr. Cousins appears to have used the Municipal bench marks, the reduced levels of the streets as given by him agree very closely with those taken by me, however, for some reason he has selected a datum line 19 feet below corrected mean sea level, instead of 20 feet below D'Haviland's sea level as used by the Municipality; the result is that reduced levels of all streets and bench marks are practically unchanged; this of course is important when comparing the levels of proposed sewers with those already existing.

Estimate of works referred to in my letters, dated 15th March and 20th July 1895.

Pursewalkum.

	Average depth.	Rate. Rs. A. P.	Amount. Rs.
Lin. yards—			
1,533 of 9 inch pipe sewers	8 feet	6 0 0	9,198
1,583 of 9 „ „	9 „	6 6 0	10,091
843 of 12 „ „	7 „	7 14 0	6,638
826 of 12 „ „	8 „	8 4 0	6,814
200 of 12 „ „	11 „	9 6 5	1,880
783 of 15 „ „	7 „	10 2 0	7,927
1,296 of 15 „ „	10 „	11 4 0	14,580
1,464 of 1′—8″ × 2′—6″ brick sewers.	16 „	34 15 7	51,201
Number—			
20 Man-holes on 9″ sewers	8 „	151 1 0	3,021
13 „ on 12″ „	8 „	151 1 0	1,964
26 „ on 15″ „	8 „	151 1 0	3,927
11 „ 1′—8″ × 2′—6″ brick sewers	16 „	200 12 0	2,208
8 „ 1′—8″ × 2′—6″ brick sewers	16 „	200 12 0	1,606
20 Lamp holes on 9″ sewers	8 „	50 12 0	1,015
3 „ on 12″ „	12 „	50 12 0	152
5 „ on 15″ „	8 „	50 12 0	254
3 „ 1′—8″ × 2′—6″ brick sewers	16 „	57 12 0	173
7 Automatic flushing chamber on 9″ pipe sewers	8 „	418 2 0	2,926
			1,25,575
Contingencies at 30 per cent ...			37,672
Total ...			1,63,247

No. 1672, M. 19TH OCTOBER 1895.

Vepery included in Estimate for Purasewakum by Mr. Cousins.

	Average depth.	Rate. Rs. A. P.	Amount. Rs.
Lin. yards—			
393 of 12″ pipe sewers	11 feet.	9 6 5	3,688
1,400 of 9″ „	8 „	6 0 0	8,400
1,293 of 3′ — 2″ × 4′ — 9″ brick sewers	16 „	46 5 11	59,956
No.—			
20 man holes on 9″ sewers	8 „	151 1 0	3,021
2 „ on 12″ „	8 „	151 1 0	302
8 „ on 3′ — 2″ × 4′ —9″ brick sewers	16 „	200 12 0	1,606
20 lamp holes on 9″ sewers ...	8 „	50 12 0	1,015
1 Lamphole on 12″ „ ...	8 „	50 12 0	51
2 lamp holes on 3′ — 2″ × 4′ — 9″ brick sewers	16 „	57 12 0	115
1 automatic flushing chamber on 6″ pipe sewers	4 „	294 2 0	294
Contingencies at 30 per cent. ...			78,448 / 23,534
		Total ...	1,01,982

Elembore.

	Average depth.	Rate. Rs. A. P.	Amount. Rs.
Lin. yards—			
833 of 18″ pipe sewers	11 feet.	15 15 0	13,287
1,100 of 15″ „	8 „	10 8 0	11,550
130 of 12″ „	8 „	8 4 0	1,072
560 of 9″ „	6 „	5 0 5	2,814
170 of 9″ „	7 „	5 10 0	3,150
No.—			
6 man holes on 9″ sewers	7 „	146 12 0	880
1 man hole on 12″ „	8 „	151 1 0	151
4 man holes on 15″ „	8 „	151 1 0	604
7 „ 18″ „	11 „	164 0 0	1,149
5 lamp holes on 9″ sewers	6 „	50 0 0	250
1 lamp hole on 12″ „	8 „	50 12 0	50
3 lamp holes on 15″ „	8 „	50 12 0	152
1 lamg hole on 18″ „	11 „	52 1 0	52
1 automatic flushing chamber on 9″ pipe sewer	4 „	418 12 0	418
Contingencies at 30 per cent. (say) ...			35,578 / 10,126
		Total ...	45,704

Egmore.

	Average depth.	Rate. Rs. A. P.	Amount. Rs.
Lin. yards--			
466 of 12″ pipe sewers	7 feet.	7 14 0	3,669
580 of 12″ „	9 „	8 10 0	5,002
635 of 12″ „	10 „	9 0 0	5,715
306 of 12″ „	11 „	9 6 5	2,876
468 of 9″ „	8 „	6 0 0	2,808
300 of 9″ „	7 „	5 10 0	1,687
116 of brick sewer 3′ × 4′ — 6″ ...	17 „	46 11 6	5,420
1,695 of „ 1′ — 8″ × 2′ — 6″.	11 „	27 4 8	46,259
No.—			
5 man holes on 9″ sewer	9 „	146 12 0	734
15 „ on 12″ „	9 „	155 6 0	2,330
5 lamp holes on 9″	7 „	50 5 0	251
9 „ on 12″	9 „	51 3 0	460
6 man holes on brick sewers 1′ — 8″ × 2′ — 6″	17 „	58 7 0	1,230
5 lamp holes 1′ — 8″ × 2′ — 6″ ...	17 „	205 1 0	292
4 automatic flushing chambers ...		418 0 0	1,672
Contingencies at 30 per cent. ...			80,405 / 24,121
		Total ...	1,04,526

No. 1672, M. 19th October 1895.

Chintadripet.

	Average depth.	Rate. RS. A. P.	Amount. RS.
Lin. yards—			
1,406 of 12″ pipe sewers	8 feet.	8 4 0	11,599
270 of 12″ „	6 „	7 4 5	1,964
350 of 9″ „	10 „	6 12 0	2,362
306 of 30″ cast iron pipes laid through bed of river Cooum		59 0 0	18,054
1,725 of brick sewer 3′ × 4′ — 6″ ...	14 „	40 7 8	69,827
No.—			
6 man holes on 9″ sewers	10 „	159 11 0	958
10 „ on 12″ „	7 „	146 12 0	1,467
10 „ on 3′ — 0″ × 4′ — 6″ brick sewer	14 „	192 2 0	1,921
2 special man holes on 3′ — 10″ × 4′ — 6″ brick sewer	14 „	200 0 0	400
6 lamp holes on 9″ sewers	6 „	49 14 0	299
5 „ on 12″ „	7 „	50 5 0	251
6 „ on 3′ — 0″ × 4′ — 6″ brick sewers	14 „	56 6 0	338
5 automatic flushing chambers laid on 6″ pipe sewers	4 „	294 2 0	1,470
1 automatic flushing chamber laid on 12″ pipe sewer	5 „	520 0 0	520
			1,11,430
Contingencies at 30 per cent. (say) ...			36,104
Total ...			1,47,534

Triplicane.

	Average depth.	Rate. RS. A. P.	Amount. RS.
Lin. yards—			
578 of 18″ pipe sewers	12 feet.	16 6 2	9,470
573 of 18″ „	10 „	15 9 0	8,917
500 of 18″ „	6 „	13 13 5	6,919
653 of 15″ „	9 „	10 14 0	7,101
642 of 15″ „	6 „	9 8 5	6,115
510 of 15″ „	5 „	9 1 7	4,640
955 of 12″ „	12 „	9 13 2	9,380
566 of 12″ „	10 „	9 0 0	5,094
176 of 12″ „	9 „	8 10 0	1,518
1,406 of 12″ „	8 „	8 4 0	11,599
270 of 12″ „	6 „	7 4 5	1,964
225 of 9″ „	11 „	7 2 0	1,608
1,601 of 9″ „	10 „	6 12 0	10,806
783 of 9″ „	9 „	6 6 0	4,991
6,500 of 9″ „	8 „	6 0 0	39,000
750 of brick sewers 2′ — 2″ × 3′ — 3″.	12 „	32 11 0	24,515
956 of „ 2′ — 4″ × 3′ — 6″.	14 „	35 12 0	34,177
250 of „ 3′ — 0″ × 4′ — 6″.	14 „	40 7 8	10,119
No.—			
50 man holes on 9″ sewers	8 „	151 1 0	7,553
17 „ on 12″ „	10 „	159 11 0	2,714
14 „ on 15″ „	8 „	151 1 0	2,114
22 „ on 18″ „	10 „	159 11 0	3,513
8 „ on 2′ — 2″ × 3′ — 3″ brick sewers	12 „	183 0 0	1,468
14 manholes on 2′ — 4″ × 3′ — 6″ brick sewers	14 „	192 2 0	2,689
3 manholes on 3′ — 0″ × 4′ — 6″ brick sewers	14 „	192 2 0	576
34 lamp holes on 9″ pipe sewer ...	8 „	50 12 0	1,725
20 „ on 9″ „ ...	6 „	49 14 0	997
10 „ on 10″ „ ...	10 „	51 10 0	516
4 „ on 15″ „ ...	8 „	50 12 0	203
5 „ on 18″ „ ...	10 „	51 10 0	258
2 „ on 2′ — 4″ × 3′ — 6″ brick sewers	14 „	56 6 0	112
13 automatic flushing chambers on 6″ and 9″ pipe sewers	4 „	...	4,567
			2,26,938
Contingencies at 30 per cent. (say) ...			68,211
Total ...			2,95,149

[Despatch Abstract.]

Water-supply.

Referring to the Public Works Department, with rekarks, papers relating to the drainage and------schemes for the city of Madras.

Letter—from S. Loane, Esq., Acting Engineer, Public Works Department.
To—the President, Madras Municipal Commission.
Dated—Madras, the 31st July 1895.
No.—

In continuation of my memorandum of the 25th January last, I beg to submit the following details on the drainage of Mylapore and St. Thomé, which also applies to the other districts to be drained.

The details given below are for a complete scheme to drain Mylapore and St. Thomé and for pumping the sewage by suitable machinery into an iron main to be laid from Mylapore to a site about 6½ miles north of this station.

Provision is here made for draining the sewage from 5,000 houses, having a population of 35,000 with an allowance of 20 gallons a head per diem (these numbers are far in excess of what now exist within the area to be drained as shown on plan).

The sewers will be either of glazed stone ware or portland cement pipes; these are of sufficient sizes for the work required of them. The minimum fall given is 5 feet to the mile, and as the sill of the pump-well will be at mean sea level, none of the excavation for the sewers will go below that level.

For draining all houses directly into these sewers 3″ branch pipes will be fixed in the line of sewers opposite each house drain, and from these, 3″ pipes will be laid up to the house drain where a stoneware syphon-trap with iron grating and ventilating pipe will be fixed. The sewage from the house drains will be discharged on to these gratings which will be fixed in the mouths of the syphon-traps, the latter will be so fixed that the street drainage will not enter them, but will at the same time be easily accessible for cleaning.

Man-holes will be built all along the line of sewers at 300′ intervals, also at the commencement of each line of sewer, and at all junctions.

There will be an overflow into the sea or into the canal where the sea happens to be too far from the station for discharging any excess of diluted sewage which may enter the sewers during heavy rains.

Automatic flushing pipes are provided at twelve suitable sites for flushing the sewers at intervals throughout the day and night.

Ventilating pipes for each syphon-trap should be fixed. These will not need to go more than an average height of 25′ above the roadway and may be fixed up for about As. 3 a running feet or within Rs. 5 each.

Estimate.

	Rs.
3,675 feet of 21″ pipes laid at an average depth of 10′ at Rs. 7 per foot	25,725
3,525 feet of 18″ pipes laid at an average depth of 10′ at Rs. 5-8-0 per foot	19,387
3,600 feet of 16″ pipes laid at an average depth of 8′ at Rs. 3-12-0 per foot	13,500
6,500 feet of 12″ pipes laid at an average depth of 7′ at Rs. 2-12-0 per foot	17,875
16,500 feet of 9″ pipes laid at an average depth of 6′ at Rs. 2-4-0 per foot	37,125
10,000 feet of 7″ pipes laid at an average depth of 5′ at Rs. 1-12-0 per foot	17,500
1,500 feet of 6″ pipes laid at an average depth of 4′ at Rs. 1 per foot	1,500
50,000 feet of 3″ pipes laid at an average depth of 5′ at As. 10 per foot	31,250
5,000 ~~feet~~ syphon-traps with fixing and iron gratings at Rs. 12 per foot	60,000
3,000 feet of 15″ cast iron piping at Rs. 7	21,000
120 man-holes at Rs. 50 each	6,000
Pumping station with duplicate set of machinery	30,000
	2,80,862
Sundries and supervision	14,138
Total ...	2,95,000

Order— No. 1672 M., dated 19th October 1895.

The papers will be referred to the Public Works Department with the request that the opinion of the Chief Engineer upon the schemes for the improvement of the drainage and water-supply of the city suggested by Mr. Ellis and Mr. Loane may be obtained and forwarded to Government at a very early date.

2. The consideration of the financial aspect of the matter will meanwhile be deferred.

(True Extract.)

J. F. Price,
Chief Secretary.

To the Public Works Department.
„ President, Madras Municipal Commission.

MISCELLANEOUS.

G.O., No. 1672 M., 19th October 1895.

Water-supply

Referring to the Public Works Department, with remarks, papers relating to the drainage and — schemes for the city of Madras.

1672 M

CURRENT No. 873 M

Madras Municipality.

From

The President,

Municipal Commission,

MADRAS.

To

The Chief Secretary
to Government
Fort St. George

G. No. 337

Dated 14th
Despd. 16th September 1895.
Recd. 17 SEP 95

Enc. One

SUBJECT.

Forwarding Mr. Ellis's Report on the Hydraulic Survey of Madras City and informing that the plans and appendices will be forwarded after the return of Government to Fort St. George, if required.

P.W. Enc 2 8177/95

W/10.
22/5. Paris from Dep.

G. No. 337

MUNICIPALITY OF MADRAS,
General Department.
Madras, 14 September 1895.

From

LIEUT.-COL. G. M. J. MOORE, C.I.E.,
President, Municipal Commission.

To

The Chief Secretary to Government
Fort St. George.

SIR,

5563 W 8.11.3.95.

With reference to G.O. dated 6th March 1895 No 366 M.Mis. I have the honor to forward Mr Ellis' report on the Hydraulic Survey of Madras City.

Enclosure.
1

2. I ha[illegible] submitted the plans and appendices as they are so voi[illegible]ous that it would take at least a month to copy, and would suggest that if Governmen[illegible] -quires them, they might be sent over to Fort St. George on the return of Government from the Hills, and after all they only concern the Municipality, which can base all extensions on them.

I have the honor to be,
Sir,
Your most obedient servant
Gm. M. Moore
Lt.Co
President, M.M.

Municipal Office,

5th September I895.

Enclosure

2 S.P.

TO

The President

Municipal Commission.

Sir,

With reference to the resolution of the Commissioners on G.O. No 4 M.Mis dated 8t. January I895, I have the honor to submit my report on the Hydraulic Sur-vey of Madras;attached to the report are the following plans and appendices.

Plan No I sheets I,2,3,4 and 5 shewing all the mains and b anch pipes and the levels of the roads at different parts of the Town, and sheets Ia,2a,3a,4a, and 5a shewing all mains and branches above 7", the area sup-plied by each main, and the additional pipes and al-tions recommended for schemes Nos I & 2.

Plan No 2 shewing the distribution of the population according to the last Census.

Plan No 3 shewing the area supplied by each main and the alterations and additions recommended for - scheme No 3.

Plan No 4 sections and hydraulic gradients of pipes of schemes Nos I,2 & 3.

Plan No 5 Longitudinal and cross sections of Red Hills Channel.

Plan No 6 Masonry shaft.

Plan Nos 7 & 8 Existing Safety Weirs.

Appendix

before the outlying districts are supplied. The quantit[y] of water delivered in I884 was I3I,722,600 c.ft. as com-[pub-]-pared with 335,827,809 c.ft in I894 Vide appendix I.

3. There are several ways in which the system [and re-]of distribution could be improved. [should]

I By increasing the pressure in the main by pump-[equired]-ing at Kilpauk.

2 By increasing the size or number of mains.

3 By using subsidiary pumps for such parts of the town where the pressure is defective.

4 By limiting the supply to certain districts where pressure is good and preventing waste wherever it occurs.

5 By scraping the inside of the pipes and removing deposit and dirt.

6 By combination of the above.

4. Before any definite idea could be formed as to the best course to adopt, or to what extent alterations and additions would be necessary in case Mr Cousins water supply scheme is carried out or otherwise, it has been necessary to prepare a correct plan of the pipes as they exist, and test the pressures in the mains and discharges at the fountains, and to ascertain as far as possible the population to be supplied by the different mains & branches and how far they are able to perform the work they have to do, and where they fail.

5. In his report on the water supply Mr Cousins proposes to increase the pressure at Kilpauk to 8I.7 above *datum by pumping, he does not recommend any increase in the

*datum is 20 ft. below mean sea.

size of the principal mains, but considers that all pub-
-lic mains below 3" in diameter should be taken up and re-
-placed with pipes of larger size; what size these should
be or what additional mains or extensions would be required
in the Ist Division and other parts of the town not now -
supplied, is not stated.

6. In making proposals for improving the sys-
-tem of distribution, I have had in view 3 alternative -
schemes, namely, scheme No I to supply 20 gallons a head
in I0 hours with increased pressure at Kilpauk, scheme No 2
to supply I0 gallons a head in I0 hours without pumping,
scheme No 3 to supply I5 gallons a head in I0 hours without
pumping.

7. Scheme No I. Mr Cousins and the Committee
appointed by Government in I890 to enquire into the drain-
-age and water supply of Madras, have estimated that 25
gallons per head per diem would be required in Madras for
all purposes. In calculating the pressure required, and
determining the sizes of the branches, I have assumed in
scheme No I that 4/5ths of that quantity will be drawn off in
I0 hours allowing a minimum pressure of I0 ft. in any part
of the town.

8. For the purpose of water supply, Madras may
be divided into 9 districts; the limits of each is shewn
in plans I & 3 by distinctive colors.

The result of the investigation goes to
prove that with few exceptions, the sizes of the principal
mains as originally laid, correspond very closely with the
sizes that would be required to meet the conditions stated
in para 7, assuming that a pressure of 73 ft. above datum
is maintained at Kilpauk, so that provided the existing -
mains are capable of standing that pressure, it would not

be necessary to abandon them, the branch pipes however are not so well laid out and require to be considerably alter--ed and extended.

I0. The Ist Division was not included in the original scheme of I869 for the water supply of Madras. It has however been drawing a supply from mains intended to meet the demands of the 2nd and 3rd Divisions, but as some parts of the 3rd Division are considerably higher than the Ist Division, the supply in the former has suffered in con--sequence.

II. The north Auxiliary main proposed by the Ag. Engineer in his letter No 445 of the I3th July I894 is intended to improve the supply in the Ist Division, but it is far too small to comply with the conditions referred to in para 7, for assuming a pressure of 73 ft. above datum is maintained at Kilpauk, the main would deliver only I0 gal--lons a head in I0 hours to the population in its district. If it is considered advisable that the Ist Division be sup--plied under the same conditions as the rest of the town, it would be necessary either to take up the main and lay a larger pipe in its place or to lay another main along side of it or by another route or to further increase the pres--sure at Kilpauk.

I2. I have provided for the Ist alternative in the estimates except for a short length where the pipe has been duplicated, in order to use up the stock that has be ordered. One pipe will give more satisfactory results than two in the same street, and the connections with the bran--es would be simpler; there is no other very suitable rou for a second pipe. The 3rd alternative is out of question as the necessary pressure at Kilpauk would be excessive, namely I58 ft. above datum.

The extension of existing mains and the size of each branch has been carefully considered with reference to the population to be supplied, the level of the highest point on the branch, the pressure on the main at the point of connection, and the velocity of flow in the pipes; and endeavours have been made to arrange the branches so that the water may circulate freely.

I4. Reference is here made to plans Nos I & 2 in order that the proposed alterations for scheme No I may be understood. In plan No I sheets I,2,3,4 & 5 the north and south Auxiliary mains have been omitted, but all the existing mains and branches have been shewn in red and the sizes of the pipes denoted. The fountains are shewn by - small red circles, some of which are colored green denoting that they failed to give water at some time during May I895. Levels have been written on the plan, this course has be adopted in preference to drawing contour lines as being mo. suitable for a flat town like Madras.

I5. On sheets Ia,2a,3a,4a & 5a, the sanctioned Auxiliary mains and branches are shewn in red, and the - existing Trunk mains and branches above 7" in dotted red lines, black dotted lines are drawn in streets where it is recommended to increase the size of the mains and full - black lines are additional mains and branches. The length of pipe already laid in Madras is approximately II5 miles, of which 5I miles are 3" pipe and under. The proposal for scheme No I is to lay 35 miles & I,960 ft. of new pipe, to take up and clean and relay 9 miles & I,848 ft. of ld - pipes, and to take up and relay 6 miles & 3,645 ft. of pro- -posed Auxiliary mains and branches Vide appendix 3.

I6. With the increased pressure and these im-

satisfactory. It would be necessary to introduce a thorough system of inspection to see that the fittings and connections for all house services are in good repair, as with the increased pressure any waste that now occurs will be greatly enhanced. The fittings for most of the public fountains will require renewing. It is estimated that there are I,900 public taps and for this item alone Rs I5,000 has been provided in the estimate.

I7. Waste water meters have been fixed in 3 streets in Madras, Nagappa Iyer street 7th Division, Rasappa chetty street 2nd Division, and Venaitheertha Moodaly street 5th Division, and it is satisfactory to learn that the amount of water drawn off from I0 P.M. to 4 A.M. in each case small, shewing there is very little waste in these streets during the night from leakage and taps being left open.

The folowing table gives the average draft from the 6 mains referred to.

Hour.	7" pipe Ragappa Iyer. Gallons per hour	7" pipe Rasappa Chetty & Co. Gallons per hour	4" pipe Venkatesha Iyer Gallons per hour
I A.M.	0	680	200
2	0	560	I90
3	0	620	200
4	50	I,770	230
5	I,070	I,5I0	I,230
6	I,940	I,640	2,II0
7	3,I70	I,640	I,570
8	2,940	I,240	2,040
9	2,420	I,I90	I,900
I0	2,300	I,550	2,0I0
II	2,470	2,070	2,I00
I2 noon	2,360	2,290	I,930
I P.M.	2,240	2,380	I,820
2	2,0I0	2,3I0	I,9I0
3	2,II0	2,I80	I,790
4	2,I40	2,530	I,940
5	2,030	2,730	I,970
6	2,I90	2,950	I,900
7	I,980	2,990	I,600
8	I,620	3,050	I,380
9	I,I70	3,550	I,I90
I0	730	2,370	5I0
II	I40	I,560	300
I2 midnight	0	9I0	I70
Total	37,080	46,270	32,I90
allons from 6 to 6	30,320	26,700	24,990
proportion of 24			
pply drawn off in 13. HOURS.	.8I	.58	.77

From the above figures it will be seen t
the assumption that $\frac{4}{5}$ be drawn off in I0 hours leaves a
fair margin.

I9. It is difficult to say what the effect of increased pressure will have on the mains, but it is pro-
-bable many leaks will shew themselves and repairs will be necessary and for this purpose a sum of Rs 5,000 has been provided in the estimate.

20. Many of the pipes are very dirty, a sar
of the incrustation has been sent to the Chemical Exar
who reports as follows:-

"I have the honor to state that the compo-
-sition of the matter sent with your letter is,

Organic matter	II.46 p.c.
Matter insoluble in Hydrochloric acid (sand &c.	I9.80 ..
Oxide of iron & aluminium (Fe_2O_3 & Al_2O_3)	64.64 ..
Other metallic compounds not estimated Lime &c	4.I0 ..
	I00.00

The matter contained a slime in which were imbedded small leeches and other forms of life. I should say that water would deteriote by passing through pipes containing matter having the composition of this stuff, containing so much loose organic matter."

2I. Some idea of the amount of water st
account of incrustation in the pipes may be ga
the experience of Torquay England, where a
cleaned delivered 3I7 gallons a minute and
595 gallons, the size of pipe under refer
9" & 8" and the pressure 465 ft. Whether
-ment can be made in Madras with low pressu

is very doubtful; the amount of good that could be done by cleaning the pipes and cost of the work can only be ascer--ained after a long service of experiments; Rs 20,000 has -en put in the estimate for this item.

23. The cost of the works enumerated amount to Rs 653,382 details of which are shewn in appendix 8. This is in addition to the cost of the works included in Mr Cousins estimate.

23. As the question of funds has always to be considered, and the cost of the entire works and mainte--nance appears prohibitive, the question naturally arises whether anything can be done to improve the water supply of Madras without undertaking the complete scheme as recommen--ded by Mr Cousins. The chief difficulty being the cost of pumping, it becomes necessary to see whether it is possible to avoid this part of the scheme and what it will entail. To begin with, all idea of filteration would have to given up, for without pumping, filteration is practi- impossible, the availbale pressure in Madras being The question then resolves itself into the advisabi- adopting a scheme which will increase the supply it more equally render it continuous, and impr -lity to some degree by creating a better circ the pipes; how far such a scheme is needed c from the Sanitary Commissioners inspection r defective of an intermittent supply, and from which gives the discharge in gallons per minute i various fountains. From the statement it will be 640 out of I025 fountains deliver less than 3 ga minute, and the supply at such fountains may be c as defective.

24. Scheme No 2 has been prepared with

object of meeting the case referred to above. By carrying out the alterations and extensions to the mains as recommended in scheme No I and by making certain alterations to the head works at Kilpauk a continuous supply of I0 gallons a head in I0 hours could be effected, the cost of such works would amount to Rs 674,382 details of which are given in appendix 9. As in scheme No I, taking up and relaying north auxiliary main is provided for, for under existing pressure it will deliver only 5 gallons a head in I0 hours to the population in its district, vide appendix 5, but this portion of the work might be delayed until found absolutely necessary.

25. The Red Hills channel has a fall of 5.83 ft in 6 miles and I08I yds. From the cross sections given in plan No 5 it is evident that a considerable amount of silting up has taken place, though I can find no record of the original section. The level of the water at the masonry shaft at 6 a.m. is usually about 52.69 and at 6 p.m. about 5I.69 indicating that the channel forms, as it were, a reservoir during the night. The maximum average discharge per diem was in May I894 when it amounted to 7,002,988 gallons, and assuming that 4/5 of it was drawn off in I0 hours the channel should be capable of supplying 560,239 gallons an hour. If it is decided to retain the existing channel for the present, it would be advisable to resection its entire length, raise the banks in places, and construct an overflow weir about 50 ft. long with its crest at 52.75 near the Masonry shaft, discharging into the ottary nullah with a head of about 4" so that a full supply may be allowed to come down without risk of damaging the banks. There are 3 safety overflows already in the channel, but owing to their position they do not render sufficient

in case of accident, the nearest weir being I mile and I694 yards from the Masonry Shaft. It takes about I4 hours for the water to come from Red Hills to Madras, and with a little experience it would be possible to regulate the supply so as to avoid wastage, and at the same time overcome the loss of Ift pressure now experienced. A lump sum Rs 30,000 has been provided in the estimate for alteration to the channel and head works at Kilpauk.

26. One great defect in the present system is caused by shutting the sluice at Kilpauk whenever it is considered necessary to remove the dirt collected in the Masonry shaft, thereby rendering the supply intermittent. This operation takes about I hour and is generally performed between I2 and I on Mondays. The amount of dirt arrested in the shaft must be small compared with the quantity that enters the pipes, and it would be far better to widen the ~~distance~~ channel to some distance so that the velocity of flow may be reduced, and the silt allowed to settle before entering the shaft and subsequently removed, or to construct a bye-pass at Kilpauk so that the water may be led into the 42" main without entering the shaft when the operation of cleaning is performed. Seeing the great objections raised to the intermittent supply, it is questionable whether it would not be advisable to clean the shaft less frequently say once in 6 months instead of once a week as is done now, pending the construction of these works.

27. Scheme No 3. Should a supply of I0 gallons in I0 hours be considered insufficient, it could be further increased by laying a still larger main to the north to supply the Ist & 4th Divisions and parts of 2nd & 3rd Divisions, and by extending the I4" main from Woods Ro... to Royapettah High Road to help supply Mylapore. ...ic

sewer

No. 1028, REVENUE, 23

2. The Governor in Council is further pleased to ap
to be the Forest Settlement-officer, who shall enqui
extent of any right claimed by, or alleged to exist i
comprised within such limits, or to any forest produce
in chapter II of the said Act, and the District Fores
attend on behalf of Government at the enquiry prescrib

3. The Governor in Council is further pleased, u
of the said Act, to appoint the Collector of South Cana
who shall hear appeals from the orders of the Fores
and 13 of the said Act.

arrangement as shewn in plan No 3 it will be possible to deliver I5 gallons a head in I0 hours without resorting to pumping at Kilpauk. The estimated cost of this scheme is Rs 926,4I4.

28. In case either scheme No 2 or 3 is adopted the supply at the highest parts of the town, such as Cut-cherry road in the 8th Division, and Ungappa naick street, and Kistnasawmy pagoda street &c in the 3rd Division, is liable to be defective. This difficulty could be met by the adoption of Cisterns in such districts, or by using steam pumps to give the necessary pressure. It may however be several years before such additional pressure is considered necessary and no provision has therefore been made in the estimate, such pumps would be far smaller than would be required at Kilpauk in Mr Cousins scheme.

29. The additions and extensions recommended do not provide pipes for all streets, but the sizes of the branches have been so arranged that sub-branches can be laid wherever required. It will be noticed that provision has not been made for taking up all branches under 3 " and substituting larger pipes as recommended by Mr Cousins.This is merely matter of expense which can be postponed until found absolutely necessary.

30 In his inspection notes Dr King has urgerd the necessity of providing places for Dhobies of Madras. Two places for this appear to me to be suitable. One on the Spur tank, an ample supply of fresh water being obtained from a pipe branching off the 36" main, the dirty water would be led into the Egmore drains in the event of the latter work being carried out; the other is near the Lunatic Asylum, the supply being obtained from the Red Hills chan-nel, the dirty water could be conducted to the nearest -

sewer

sewer after the completion of the Drainage works.

31. A list of the sites suitable for additional bathing places is given in appendix II.

32. It may be placed on record that the 30" main supplying Mylapore and Triplicane, and the I8" main supplying Royapettah are cases where the sizes of the pipes and their discharging capacity are not in accordance with the probable demand from the population within the districts they have to supply, when compared with the sizes and re-quirements of the rest of the town. The advisability of extending these pipes and doing away entirely with the south auxiliary main has been carefully considered. In the event of pumping being resorted to, and more water being required at Mylapore, the pipe along Triplicane High Road and Barbers Bridge Road, from Picrofts Road to Mylapore might be taken up and a I6" pipe laid in its place; the discharging capacity of this length of the existing pipe being too small compared with the rest of the main. In scheme No 3 it is proposed to extend the I8" main above referred to.

33. In conclusion I beg to recommend that scheme No 2 be carried out or at least so much of it as funds will admit, postponing for the present if necessary such parts of it as relate to the alterations to the auxiliary mains. I also recommend that the Masonry shaft be cleaned once in 6 months pending the completions to the alterations to the head works at Kilpauk. The great advantage of this proposal is, that it is one step towards completing Mr Cousins scheme should funds be available in years to come. If it is con-sidered advisable to further increase the supply I would recommend that steam pumps be placed on the mains to give additional pressure during the hours when the demand is

greatest

greatest, rather than carry out schemes I & 3. When this question of distribution is disposed of I strongly recommend for consideration the removal of all villages within the catchment area of Red Hills lake estimated to cost Rs 50,000 and the erection of an Engine house and Drivers - quarter and pumps at Red Hills at a cost of Rs 80,000 in place of the temporary Engines and sheds now employed whenever the level of the lake falls below 35.50.

I have the honor to be,

Sir,

Your most obedient servant,

(Signed) R.E. Ellis

Engineer, M.C.

/True Copy/

Lt. Col.

President Muni. Comm.

Real

Municipal Office,

5th September 1895.

TO

The President,

Municipal Commission.

Sir,

With reference to the resolution of the Commissioners on G.O.No.4 M.Mis dated 8th January 1895, I have the honour to submit my report on the Hydraulic Survey of Madras attached to the report and the following plans and appendices.

Plan No.I sheets 1,2,3,4 and 5 showing all the mains and branch pipes and the levels of the roads at different parts of the Town, and sheets 1a,2a,3a,4a,and 5a showing all mains and branches above 7", the area supplied by each main, and the additional pipes and alterations recommended for schemes Nos. 1 & 2.

Plan No.2 showing the distribution of the population according to the last Census.

Plan No.3 showing the area supplied by each main and the alterations and additions recommended for scheme No.3.

Plan No.4 sections and hydraulic gradients of pipes of schemes Nos. 1,2 & 3.

Plan No.5 Longitudinal and cross sections of Red Hills channel.

Plan No.6 Masonry shaft.

Plan Nos 7 & 8 Existing Safety Weirs.

Appendix 1. Tabular statement showing quantity of water delivered into Madras from 1879 to 1894.

Appendix 2. Statement showing the position and description of fountains and rate of discharge between 6 & 8 A.M.

Appendix 3. Statement showing the length of pipes of each size

already

already laid, length of new pipes to be laid and length of pipes to be taken up and relaid for scheme Nos 1 & 2.

Appendix 4. List of Hydrants on the mains showing the pressures between 6 & 8 A.M.

Appendices 5 & 6. Tabular statement showing Hydraulic Gradients, and velocity of flow in pipes.

Appendix 7. Statement showing the discharge over Red Hills Weir.

Appendices 8, 9 & 10. Estimates of works referred to in the report.

Appendix 11. List of sites suitable for bathing places.

2. It has been known for a long time that the water supply in many parts of the town is defective, that many of the fountains fail altogether at certain hours during the day, and that the supply in some districts is getting worse; to say that the defect is due to insufficient pressure does not explain matters very clearly to an unprofessional mind, when it is known that the pressure at Kilpauk is practically the same now as it always has been. The fact of the matter is, more water is being delivered into Madras than formerly, and is being drawn off before it has had time to proceed very far in the mains, and the result is, that all the available pressure is absorbed before the outlying districts are supplied. The quantity of water delivered in 1884 was 131, 722, 600 c.ft. as compared with 335, 827, 809 c.ft. in 1894 Vide Appendix 1.

3. There are several ways in which the system of distribution could be improved.

1. By increasing the pressure in the main by pumping at Kilpauk.
2. By increasing the size or number of main.
3. By using subsidiary pumps for such parts of the town where the pressure is defective.
4. By limiting the supply to certain districts where pressure is good and preventing waste wherever it occurs.
5. By scraping the inside of the pipes and removing deposit and dirt.
6. By combination of the above.

4. Before any definite idea could be formed as to the best course to adopt, or to what extent alterations and additions would be necessary in case Mr. Cousins water supply scheme is carried out or otherwise, it has been necessary to prepare a correct plan of the pipes as they exist, and test the pressures in the mains and discharges at the fountains, and to ascertain as far as possible the population to be supplied by the different mains and branches and how far they are able to perform the work they have to do, and where they fail.

5. In his report on the water supply Mr. Cousins proposes to increase the pressure at Kilpauk to 81.7 above datum@ by pumping, he does not recommend any increase in the size of the principal mains but considers that all public mains below 3" in diameter should be taken up and replaced with pipes of longer size; what size these should be or what additional mains or extensions would be required in the 1st Division and other parts of the town not now supplied, is not stated.

@ datum is 20 feet below mean sea.

6. In making proposals for improving the system of distribution, I have had in view 3 alternative schemes, namely, scheme No. to supply 20 gallons a head in 10 hours with increased pressure at Kilpauk, scheme No.2 to supply 10 gallons a head in 10 hours without pumping, scheme No.3 to supply 15 gallons a head in 10 hours without pumping.

7. Scheme No.1 Mr. Cousins and the Committee appointed by Government in 1890 to enquire into the drainage and water supply of Madras, have estimated that 25 gallons per head per diem would be required in Madras for all purposes. In calculating the pressure required, and determining the sizes of the branches, I have assumed in scheme No.1 that $\frac{4}{5}$th of that quantity will be drawn off in 10 hours allowing a minimum pressure of 10 ft, in any part of the town.

8. For the purpose of water supply, Madras may be divided into 9 districts; the limits of each is shown in plans 1 & 3 by distinctive

[illegible] increased pressure [illegible] waste [illegible]

distinctive colours.

9. The result of the investigation goes to prove that with few exceptions, the sizes of the principal mains as originally laid, correspond very closely with the sizes that would be required to meet the conditions stated in para 7, assuming that a pressure of 73 ft. above datum is maintained at Kilpauk, so that provided the existing mains are capable of standing that pressure, it would not be necessary to abandon them, the branch pipes however are not so well laid out and required to be considerably altered and extended.

10. The 1st Division was not included in the original scheme of 1869 for the water supply of Madras. It has however been drawing a supply from mains intended to meet the demands of the 2nd and 3rd Divisions, but as some parts of the 3rd Division are considerably higher than the 1st Division, the supply in the former has sufferred in consequence.

11. The north auxiliary main proposed by the Ag.Engineer in his letter No.445 of the 13th July 1894 is intended to improve the supply in the 1st Division, but it is far too small to comply with the conditions referred to in para 7, for assuming a pressure of 73 ft. above datum is maintained at Kilpauk, the main would deliver only 10 gallons a head in 10 hours to the population in its district. If it is considered advisable that the 1st Division be supplied under the same conditions as the rest of the town, it would be necessary either to take up the main and lay a larger pipe in its place or to lay another main along side of it or by another route or to further increase the pressure at Kilpauk.

12. I have provided for the 1st alternative in the estimates except for a short length where the pipe has been duplicated, in order to use up the stock that has been ordered. One pipe will give more satisfactory result than two in the same street, and the connections with the branches would be simpler; there is no other very suitable route for a second pipe. The 3rd alternative is out of question as the necessary pressure at Kilpauk would be excessive, namely 158 ft. above datum.

The

18. The following table gives the average draft per hour from the 3 mains referred to.

13. The extension of existing mains and the size of each branch has been carefully considered with reference to the population to be supplied, the level of the highest point on the branch, the pressure on the main at the point of connection, and the velocity of flow in the pipes; and endeavours have been made to arrange the branches so that the water may circulate freely.

14. Reference is here made to plans Nos 1 & 2 in order that the proposed alterations for scheme No.1 may be understood. In plan No 1 sheets 1,2,3,4 & 5 the north and south Auxiliary mains have been omitted, but all the existing mains and branches have been shown in red and the sizes of the pipes denoted. The fountains are shown by small red circles, some of which are coloured green denoting that they failed to give water at some time during May 1895. Levels have been written on the plan, this course has been adopted in preference to drawing contour lines as being more suitable for a flat town like Madras.

15. On sheets 1a,2a,3a,4a & 5a, the sanctioned Auxiliary mains and branches are shown in red, and the existing trunk mains and branches above 7" is dotted red lines, black dotted lines are drawn in streets where it is recommended to increase the size of the mains and full black lines are additional mains and branches. The length of pipe already laid in Madras is approximately 115 miles, of which 51 miles are 3" pipe and under. The proposal for scheme No.1 is to lay 35 miles & 1,960 ft. of new pipe, to take up and clean and relay 9 miles & 1,848 ft. of old pipes, and to take up and relay 6 miles & 3,645 ft. of proposed Auxiliary mains and branches Vide appendix 7

16. With the increased pressure and these improvements carried out, the quantity of supply would be satisfactory. It would be necessary to introduce a thorough system of inspection to see that the fittings and connections for all house services are in good repair, ... the increased pressu... any waste that now occurs will ...

distinctive colours.

and for this item alone ₹15,000 has been provided in the estimate.

17. Waste water meters have been fixed in 3 streets in Madras, Nagappa Iyer street 7th Division, Rasappa Chetty street 2nd Division, and Venaitheertha Moodaly street 5th Division, and it is satisfactory to learn that the amount of water drawn off from 10 P.M. to 4 A.M. in each case small showing there is very little waste in these xxx streets during the night from leakage and taps being left open.

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18. The following table gives the average draft per hour from the 3 mains referred to.

Hour.	7" pipe Nagappa Iyer Street. gallons per hour	7" pipe Rasappa Chetty Street. gallons per hour.	4" pipe. Vinaitheertha Mudaly Street. gallons per hour
1 A. M.	0	680	200
2 A. M.	0	560	190
3	0	620	200
4	50	1,770	230
5	1,070	1,510	1,230
6	1,940	1,640	2,110
7	3,170	1,640	1,570
8	2,940	1,240	2,040
9	2,420	1,190	1,900
10	2,300	1,550	2,010
11	2,470	2,070	2,100
12 noon	2,360	2,290	1,930
1 P. M.	2,240	2,380	1,820
2	2,010	2,310	1,910
3	2,110	2,180	1,790
4	2,140	2,530	1,940
5	2,030	2,730	1,970
6	2,190	2,950	1,900
7	1,980	2,990	1,600
8	1,620	3,050	1,380
9	1,170	3,550	1,190
10	730	2,370	510
11	140	1,560	300
12 midnight	0	910	170
Total	37,080	46,270	32,190
Total gallons from 6 to 6	30,320	26,700	24,990
proportion of 24 hours supply drawn off in 13 hours	.81	.58	.77

From the above figures it will be seen that the assumption that 4/5th be drawn off in 10 hours leaves a fair margin.

19. It is difficult to say what the effect of increased pressure will have on the mains, but it is probable many leaks will show themselves and repairs will be necessary and for this purpose a sum of ₹5,000 has been provided in the estimate.

20. Many of the pipes are very dirty, a sample of the incrustation has been sent to the Chemical Examiner who reports as follows:-

"I have the honour to state that the composition of the matter sent with your letter is,

Organic matter	11.46 p.c.
Matter insoluble in Hydrochloric acid(i.e.)sand &c.	19.80 ..
Oxide of iron & of aluminium	64.64 ..
Other metallic compounds not estimated(i.e) Lime &c.	4.10 ..
	100.00

The matter contained a slime in which were imbedded small leeches and other forms of life. "I should say that water ~~xiii~~ would deteriorate by passing through pipes containing matter having the composition of this stuff, containing so much loose organic matter."

21. Some idea of the amount of water stopped on account of incrustation in the pipes may be gathered from the experience of Torquay, England, where a pipe before being cleaned delivered 317 gallons a minute and after cleaning 595 gallons, the size of pipe under reference being 10", 9" & 8" and the pressure 465 feet. Whether any such improvement can be made in Madras with low pressure and velocity is very doubtful; the amount of good that could be done by cleaning the pipes and cost of the work can only be ascertained after a long service of experiments; ₹20,000 has been put in the estimate for this item.

22. The cost of the works enumerated amount to ₹6,53,382 details of which are shown in appendix 8. This is in addition to the cost of the works included in Mr. Cousins estimate.

23. As the question of funds has always to be considered, and the cost of the entire works and maintenance appears to be prohibitive, the question naturally arises whether anything can be done to improve the water supply of Madras, without undertaking the complete scheme as recommended by Mr.Cousins. The chief difficulty being the cost of pumping, it becomes necessary to see whether it is possible to avoid this part of the scheme and what it will entail. To begin with, all idea of filteration would have to given up, for without pumping, filteration is practically impossible, the available pressure in Madras being too low. The question then resolves itself into the advisability of adopting a scheme which will increase the supply distribute it more equally render it continuous, and improve the quality to some degree by creating a better circulation in the pipes; how far such a scheme is needed can be judged from the Sanitary Commissioners inspection notes on the defects of an intermittent supply, and from appendix 2 which gives the discharge in gallons per minute from the various fountains. From the statement it will be seen that 640 out of 1025 fountains deliver less than 3 gallons a minute, and the supply at such fountains may be considered as defective.

24. Scheme No.2 has been prepared with the object of meeting the case referred to above. By carrying out the alterations and extensions to the mains as recommended in scheme No.1 and by making certain alterations to the head works at Kilpauk a continuous supply of 10 gallons ~~xxx~~ a head in 10 hours could be effected, the cost of such works would amount to ₹674,382 details of which are given in appendix 9. As in scheme No.1, taking up and relaying north auxiliary main is provided for, for under existing pressure it will deliver only 5 gallons a head in 10 hours to the population in its district, vide appendix 5, but this portion of the work might be delayed until found absolutely necessary.

25. The Red Hills channel has a fall of 5.83 ft in 6 miles and 1081 yds. From the cross sections given in plan No 5 it is evident that a considerable amount of silting up has taken place, the ent

I can find no record of the original section. The level of the water at the masonry shaft at 6 A.M. is usually about 52.69 and at 6 p.m. about 51.69 indicating that the channel forms, as it were, a reservoir during the night. The maximum average discharge per diem was in May 1894 when it amounted to 7,002,988 gallons, and assuming that $\frac{4}{5}$th of it was drawn off in 10 hours the channel should be capable of supplying 560,239 gallons an hour. If it is decided to retain the existing channel for the present, it would be advisable to resection its entire length, raise the banks in places, and construct an overflow weir about 50 ft. long with its crest at 52.75 near the masonry shaft, discharging into the ottary nullah with a head of about 4" so that a full supply may be allowed to come down without risk of damaging the banks. There are 3 safety overflows already in the channel, but owing to their position they do not render sufficient protection in case of accident, the nearest weir being one mile and 1694 yards from the Masonry Shaft. It takes about 14 hours for the water to come from Red Hills to Madras, and with a little experience it would be possible to regulate the supply so as to avoid wastage, and at the same time overcome the loss of 1 ft pressure now experienced. A lump sum ₹30,000 has been provided in the estimate for alteration to the channel and head works at Kilpauk.

26. One great defect in the present system is caused by shutting the sluice at Kilpauk whenever it is considered necessary to remove the dirt collected in the Masonry shaft, thereby rendering the supply intermittent. This operation takes ~~xxxxx~~ about 1 hour and is generally performed between 12 and 1 on Mondays. The amount of dirt arrested in the shaft must be small compared with the quantity that enters the pipes, and it would be far better to widen the channel to some distance so that the velocity of flow may be reduced, and the silt allowed to settle before entering the shaft and subsequently removed, or to construct a bye-pass at Kilpauk so that the water may be led into the 42" main without entering the shaft when the operation of cleaning is performed. Seeing the great objections raised to the intermittent supply, it is questionable whether it would not be advisable to clean the shaft less frequently say once in 6 months instead of once a week as is done now, pending the

construction of these works.

27. Scheme No 3. Should a supply of 10 gallons in 10 hours be considered insufficient, it could be further increased by laying a still larger main to the north to supply the 1st & 4th Divisions and parts of 2nd & 3rd Divisions, and by extending the 14" main from Woods Road along Royapettah High Road to help supply Mylapore. By this arrangement as shown in plan No 3 it will be possible to deliver 15 gallons a head in 10 hours without resorting to pumping at Kilpauk. The estimated cost of this scheme is ₹9,26,414.

28. In case either scheme No 2 or 3 is adopted the supply at the highest parts of the town, such as Cutcherry Road in the 8th Division, and Ungappa Naick Street, and Kistnasawmy Pagoda Street &c in the 3rd Division, is liable to be defective. This difficulty could be met by the adoption of Cisterns in such districts, or by using steam pumps to give the necessary pressure. It may however be several years before such additional pressure is considered necessary and no provision has therefore been made in the estimate, such pumps would be far smaller than would be required at Kilpauk in Mr.Cousins scheme.

29. The additions and extensions recommended do not provide pipes for all streets, but the sizes of the branches have been so arranged that sub-branches can be laid wherever required. It will be noticed that provision has not been made for taking up all branches under 3" and substituting larger pipes as recommended by Mr. Cousins. This is merely matter of expense which can be postponed until found absolutely necessary.

30. In his inspection notes Dr King has urged the necessity of providing places for Dhobies of Madras. Two places for this appear to me to be suitable. One on the Spur tank, an ample supply of fresh water being obtained from a pipe branching off the 36" main, the dirty water would be led into the Egmore drains in the event

completion of the Drainage works.

31. A list of the sites suitable for additional bathing places is given in appendix 11.

32. It may be placed on record that the 30" main supplying Mylapore and Triplicane, and the 18" main supplying Royapettah are cases where the size of the pipes and the discharging capacity are not in accordance with the probable demand from the population within the districts, they have to supply, when compared with the sizes and requirements of the rest of the town. The advisability of extending these pipes and doing away entirely with the south auxiliary main has been carefully considered. In the event of pumping being resorted to, and more water being required at Mylapore, the pipe along Triplicane High Road and Barbers Bridge Road, from Picrofts Road to Mylapore might be taken up and a 16" pipe laid in its place; the discharging capacity of this length of the existing pipe being too small compared with the rest of the main. In scheme No 3 it is proposed to extend the 18" main above referred to.

33. In conclusion I beg to recommend that scheme No 2 be carried out or at least so much of it as funds will admit, postponing for the present if necessary such parts of it as relate to the alterations to the auxiliary mains. I also recommend that the Masonry shaft be cleaned once in 6 months pending the completions to the alterations to the head works at Kilpauk. The great advantage of this proposal is, that it is one step towards completing Mr. Cousins scheme should funds be available in years to come. If it is considered advisable to further increase the supply I would recommend that steam pumps be placed on the mains to give additional pressure during the hours when the demand is greatest, rather than carry out schemes 1 or 3. When this question of distribution is disposed of I strongly recommend for consideration the removal of all villages within the catchment area of Red Hills lake estimated to cost ₹ 50000 and the erection of an Engine house and Drivers quarter and pumps at Red Hills at a cost of ₹ 20[illegible] in place of the [illegible]tly say once in 6 months instead of once a week as is done now, pending the

and sheds now employed whenever the level of the lake falls below 35.50.

I have the honour to be,
Sir,
Your most obedient servant,

(Signed) R.E. Ellis,
Engineer, M.C.

(True copy)

Sd/ G.M.G. Moore, Lt. Col.,
President, Munl. Commission.

(True copy)

J. Brijnarain Gandhi

Manager, Corporation of Madras.

190
Local & Municipal Dept.
Secl. No. 1
G. No.

...of the Drainage works.

Genel. Deptt.
12

1895.

Madras Municipality.

Local & Municipal Dept.
From
CURRENT No. 2473 M

The President,

Municipal Commission,

MADRAS.

To

The Chief Secretary
to Government
Fort St: George.

G. No. 265

Dated 15th august 1895
Despd. 2nd " 1895
Recd. - 3 AUG. 95

Encs. 13

SUBJECT.

Forwarding with remarks along with other papers report of the Committee on Mr: Cousins' Scheme with recommendations of Commissioners.

818 M 10-5-95
661 M 10-6-95
+18 ML 8-1-95
+16 ML 8-1-95
+4 ML 8-1-95
+1860 LL 3-12-94
+1769 M 19-11-94
+1651 M 7-11-94
607 ML 5-73

P.W. Enl 8177/95

Read
For

17 P

G. No. 265

MUNICIPALITY OF MADRAS.
General Department.
Madras, 1st August 1895.

From

LIEUT.-COL. G. M. J. MOORE, C. I. E.,

President, Municipal Commission.

To

Local & Municipal Dept.
CURRENT No. 2473 M

The Chief Secretary to Government

Fort St. George.

3164 8 10-12-94

Enclosures.
13.

With reference to G.O No 1651 M dated 7th Novem-ber 1894 (para 9) I have the honor to submit as follows:--

2. At a General Meeting held on the 28th January 1895 (copy of minutes herewith) the Commissioners appointed a Committee to report on the subject.

3. The report of the Committee (copy herewith) was considered by the Commissioners at an Adjourned Special - Meeting held on 31st May 1895 (copy of minutes attached) - when it was resolved that the recommendations of the Com--mittee in paras 13 & 16 be adopted with the further recom--mendation that the Red Hills Tank be restored to its ori--ginal level.

4. The accompanying Maps D and E show respectively the proposals of Mr Ellis and Mr Loane (appendices A and B to the report).

5. The Commissioners then proceeded to the considera--tion of the financial question which occupied their atten--tion at the meetings held on 7th, 14th, and 26th June - (copy of minutes enclosed) and was finally disposed of at the meeting held on 8th July (copy of minutes herewith).

6. It will be seen from the resolution passed at

...ion of the Drainage works.

Read

7. Their reasons are principally that they consider that those taxes are already oppressively heavy, that any increase will tell most unfavourably on the poorer class of house owners occupying their own houses, and will lead to the overcrowding of houses to a still greater extent than obtains at present.

8. With regard to the request for a grant of 10 lakhs the views expressed by those who supported the resolution were briefly as follows- Madras is the capital city of Southern India, the Seat of Government and a Garrison Town. It contains a large number of Government Offices & Institutions, in consequence of which there is always a floating population from all parts of the country. On these grounds they consider that Madras is more entitled to assistance from Government than any other Municipality.

9. After having written the above, I learnt that Col. Pennycuick would be in Madras in a few days and I thought it better to await his arrival in view to going into the subject with him personally.

10. Colonel Pennycuick very kindly met Mr Ellis, Mr Loane and myself and went briefly through the proposed schemes. At his suggestion more information has been obtained and is submitted in Mr Ellis' letter of 20th July 1895 (annexed marked F) and Mr Loane's of 31st July (marked G).

11. Colonel Pennycuick also required a tracing of Mr Ellis' Map D which is marked H and forwarded herewith as also a copy of Mr Cousins' proposed scheme which is marked I and also forwarded.

I have the honor to be,

Sir,

Your most obedient servant,

Lt. Col.

Pre

Read

Extract from

18 S.P.

MINUTES of the PROCEEDINGS of a GENERAL MEETING of the MUNICIPAL COMMISSIONERS for the CITY of MADRAS, held at their Office Premises, No. 22, Errah Bauloo Chetty Street, Black Town, on Monday the 28th January 1895, at 5 P.M., under the provisions of the City of Madras Municipal Acts I and VII of 1884 and II of 1892.

dated

PRESENT:

Lieutenant-Colonel G. M. J. Moore, C.I.E., *President.*
M.R.Ry. P. Theagaroya Chetty Garu.
,, R. Balakistnama Chetty Garu.
,, R. N. Pragasa Mudaliar Avargal.
,, Salla Gurusawmy Chetty Garu.
,, M. Venkataramiah Chetty Garu.
,, C. Yetherajulu Nayudu Garu.
,, P. M. Sivangnana Mudaliar Avargal.
Cowasjee Eduljee, Esq.
Haji Mahamad Abdul Hadi Badsha Sahib.
M.R.Ry. M. Varadarajulu Chetty Garu.
,, G. Subbarayalu Chetty Garu.
V. Mahomed Sheriff, Khan Bahadur.
J. DeCaster, Esq.
M.R.Ry. V. Varadappa Nayudu Garu.
The Honorable P. Rungiah Nayudu Garu.
M.R.Ry. W. S. Venkataramanjulu Nayudu Garu.
B. Lovery, Esq.
M.R.Ry. Rai Bahadur A. Dhanakoti Mudaliar Avargal.
,, M. O. Parthasarathy Iyangar Avargal.
,, G. Subramania Iyer Avargal.
Surgeon-Lieutenant-Colonel H. D. Cook.
Surgeon-Major J. Maitland.
Dewan Bahadur R. Ragoonath Rao Garu.
M.R.Ry. R. Balajee Row Avargal.

No. 1.

G.O., No. 1651, *M., dated 7th November* 1894, *passing orders on Mr. Cousins' schemes for the improvement of the drainage and water-supply of Madras and for the purification of the river Coovum.*

Proposed by M.R.Ry. G. Subramania Iyer Avargal and seconded by Mr. DeCaster—

"That a Committee, composed as follows, be appointed to consider the subject-matter of the order of Government—

M.R.Ry. R. N. Pragasa Mudaliar Avargal,
Surgeon-Major J. Maitland,
The Honorable P. Rungiah Nayudu Garu,
M.R.Ry. V. Varadappa Nayudu Garu, and
The President."

Carried.

No. 2.

G.O., No. 1679, *M., dated 19th November* 1894, *referring to the Sanitary Board for report the proposal of the Municipal Commission re disposal of rubbish in the Madras Municipality, and requesting the Accountant-General to forward his opinion on the proposals of the Committee to finance the scheme.*

Recorded.

No. 3.

G.O., No. 1943, *M., dated 14th December* 1894, *ordering, with remark, the publication in the* Fort St. George Gazette *of a notification proposing to make a certain alteration in the Order, dated 6th April* 1892, *authorising the construction of Tramways in Madras, and stating that any objection which any person may desire to make with respect to the above alteration will be considered if submitted on or before the 31st January* 1895.

Recorded.

No. 4.

G.O., No. 4, *M., Mis., dated 8th January* 1895, *deputing Mr. R. E. Ellis, on his relief by Mr. J. A. Jones, to prepare the estimates for Mr. Cousins' new Water-supply scheme, and informing that his salary for the period of his deputation will form a legitimate charge on Municipal Revenues.*

Proposed by the Honorable P. Rungiah Nayudu Garu and seconded by Mr. B. Lovery—

"...roposals of Government be accepted."

No. 5.

G.O., No. 16, *M., Mis., dated 8th January* 1895, *sanctioning the proposal of the Commissioners to raise a loan of four lakhs of rupees.*

Recorded.

No. 6.

Proceedings of the Standing Committee, dated 21st December 1894 *and 11th January* 1895.

Recorded.

No. 7.

M.R.Ry. R. N. Pragasa Mudaliar Avargal moved the following resolution, of which he had given notice :—

"The Commissioners are of opinion that the proceedings of the Standing Committee, Nos. 13 and 14 of the 19th October, and No. 10 of the 2nd November 1894, are *ultra vires*, inasmuch as the subjects disposed of therein do not come within the scope of the powers and duties conferred on it by the Act; and, further, that there is no provision empowering the Commissioners to impose on the Standing Committee duties other than those contemplated by the Act or to interfere with the proceedings of that Committee generally by way of rejection or confirmation, except in accordance with the provisions of the Act."

M.R.Ry. M. Varadarajulu Chetty Garu seconded.

Proposed by M.R.Ry. G. Subramania Iyer Avargal and seconded by M.R.Ry. W. S. Venkataramanjulu Nayudu Garu—

"That the consideration of this subject be deferred till the next General Meeting."

Carried.

The Meeting terminated.

G. M. J. MOORE, Lieut.-Col.,
President, Municipal Commission.

Municipal Office, Madras,
January 1895.

works.

Read

Read

A

19.5.95

Report of the Committee appointed by the Commissioners at their meeting held on 28th January 1895, to consider Mr. Cousins' schemes for the improvement of the Drainage and Water supply of Madras and for the purification of the river Cooum.

MEMBERS.

Lieutenant-Colonel G. M. J. Moore, C.I.E., *President.*
M.R.Ry. R. N. Pragasa Mudaliar Avargal.
Surgeon Major J. Maitland, M. D.
The Honorable P. Rungiah Nayudu Garu.
M.R.Ry. V. Varadappa Nayudu Garu.

The Committee held two meetings.

In G. O. dated 7th November 1894, No. 1654, M. Local and Municipal, Government practically abandon Mr. Cousins' drainage scheme and request the Commissioners to adopt his water supply scheme (modified) and to make early arrangements for financing it.

2. According to Col. Pennycuick's estimate the annual cost of the modified water scheme would be Rs. 4,04,000, supposing a loan of Rs. 25,00,000 to be raised. These figures are slightly in excess. Col. Pennycuick has allowed a little too much under Interest and Sinking Fund—the actual figures are Rs. 3,97,475 or in round number Rs. 4,00,000.

3. It is evident that before any action can be taken in the matter, the Commissioners must be prepared to increase their revenue by Rs. 4,00,000.

4. It is calculated from official returns that a tax of 1 anna per gallon on all Petroleum imported into Madras will yield a revenue of 2 lakhs per annum, *provided no refunds were allowed.* Doubling the tax the 4 lakhs are provided for at once. The Committee will deal with this point further on.

I propose the omission of these 2 paras.
(Initialled) P. R.
As remarked by me when the President's Circular letter went round any attempt at increasing the rate per cent of house and water tax would create an uproar in the town. The maximum prescribed by the Act is being collected. I am for omitting paras 5 and 6.
(Initialled) R. N. P.

5. The water tax which is now at its maximum of 4 % and yields about 2 lakhs a year might be increased to 6 % or 8 % and 1 or 2 lakhs could be obtained by the increase.

6. The tax on buildings, also at its maximum of 10 % might be increased to 12 % or more—if to 12 % 1 lakh more and if to 14 % 2 lakhs more would be obtained.

7. But in connection with the water supply scheme the strong expression of opinion that has been evoked from all Sanitary officers must not be ignored. The Health Officer has unhesitatingly condemned the subordination of drainage to water supply. The Sanitary Commissioner apparently because he thought it was a foregone conclusion in favour of water supply, has suggested a compromise by laying down what is practically the backbone of Mr. Cousins' drainage scheme.

Besides these officers all the Sanitary authorities who have ever reported on the subject have called attention to the paramount importance of draining Madras.

8. If the Commissioners are prepared to raise the income required for the modified water supply scheme, *viz*:— 4 lakhs, and consider the drainage should be shelved altogether there is nothing more to be said.

9. The Committee however are unanimous in their opinion that the drainage should not be subordinated to the water supply, but the water supply subordinated to the drainage.

In this connection the Committee submit the following schemes for the consideration of the Commissioners which can be carried out for an annual outlay of 2 lakhs.

10. It will be seen from the accompanying note by Mr. Ellis (Appendix A) that Mr. Cousins' scheme can be worked by Districts. (It must be understood that all idea of House Connections is eliminated for the present). If the first portion including Purasewakam, Elembore, Egmore, Chintadripet, Triplicane, with the main pumping station at Sydenham's Road and main to Outfall Channel (or Kurakapet as might be finally settled) were undertaken the backbone of the scheme would be completed and as time went on the other Districts might be incorporated. One of the most important features of this scheme is that all the sewage would be diverted from the Cooum.

11. This, it is shown, is estimated to cost 20 lakhs. The maintenance is calculated at Rs. 85,000 but with the savings effected by closing all the other pumping stations and picottahs it might be put down at Rs. 60,000. The total cost would be—

Interest and Sinking Fund on Rs. 20,000 at 4%	Rs. 94,780
Maintenance	60,000
Total Rs ...	1,54,780

12. Mr. Loane in his memorandum (Appendix B) suggests laying a main of about 6½ miles in length from Mylapore to waste lands at Manally. This main

will receive all the sewage now delivered at the various sewage Farms. In addition to the existing pumping stations, three more will be required, in Mylapore near Mundaveiy—in Langs Garden Road and in Tondiarpet. The annual cost of these extra pumping stations will be about Rs. 25,000. The approximate cost of this scheme, disregarding the cinerators, is estimated at Rs 2,72,500 say 28 lakhs.

The total annual cost will be Interest and Sinking Fund on Rs. 28,00,000 at 4 o/o Rs. 1,32,580

Maintenance 25,000

Total... 1,57,580

13. A modification of this scheme would be to drain Mylapore separately on to the existing Sewage Farm at Kistnampett, commencing the main in Triplicane. The Committee however would recommend the adoption of the scheme proposed by Mr. Loane—the main commencing at Mylapore.

14. It possesses the advantage over Mr. Ellis' scheme that it provides for the drainage of the whole of the city on the lines laid down by Mr. Cousins with the exception of the main being substituted for the brick sewer.

15. It will be seen that if either of the proposed schemes are adopted the 2 lakhs which is taken throughout as the basis of expenditure will not be expended.

16. The Committee would propose that 6 lakhs more be raised and devoted to the water supply.

17. It is calculated that 6 lakhs will carry out the following improvements which will materially increase the supply—*viz*. raise the sides of the existing channel 2 feet thereby increasing the supply by about 50 %, remove all the villages on the borders of the Red Hills lake, alter all the existing branches in the city as may be required by the Hydraulic Survey.

18. These improvements will require no outlay on maintenance and will only cost the Interest and Sinking Fund on 6 lakhs =28,434 which added to Rs. 157,580, required for drainage, will amount to Rs. 186,014 out of the 2 lakhs.

19. When the Committee was appointed G. O. No. 661 M. Mis. dated 10th April 1895 (Appendix C.) was not before the Commissioners and is really beyond the scope of the Committee's proceedings; but as the carrying out of any drainage or water supply scheme is dependent upon an increase of revenue and as the above quoted G. O. puts the question whether the Commissioners are prepared to levy a tax on kerosine oil, the Committee consider it advisable to place certain facts before the Commissioners in connection with the levy of the proposed tax.

20. In para. 4 it was stated that 2 lakhs might be obtained by imposing a tax of 1 anna per gallon on all kerosine oil imported into.

21. This was dependent on no refund being allowed.

22. In March 1893 the Commissioners passed the following resolution. "That Government be moved to allow the Commissioners to impose a tax on all petroleum imported into the Town of Madras *for local consumption*. From this it is evident that the Commissioners contemplate a refund, and it is almost certain that the Government of India would never sanction the imposition of the tax without such refund.

23. There is already an imperial tax of over 14 % on Petroleum and the proposed tax would double it.

24. It is very probable that any further local taxation would seriously affect the trade of Madras, driving the present consignments to some other coast port, such as Negapatam where they could be landed free and railed to their various destinations.

25. But there is another point in connection with the tax which the Committee think right to lay before the Commissioners.

26. It is true that practically all Petroleum is imported by sea and therefore the tax would be easy to collect, but the refund is a different matter. The experience derived from the tobacco tax should not be ignored. It is more than probable that an organized system of fraud would spring up. Old tins of kerosine oil might be filled with water and exported and refunds claimed with the same results as in the tobacco tax—that the imposition of the tax would be a source of loss instead of profit.

27. Supposing that no frauds were perpetrated and refunds only paid on legitimate exports that had paid the tax on import, it is calculated that the tax would only yield a revenue of Rs. 45,000 per annum on a local consumption of 60,000 gallons per mensem or 7,20,000 gallons per annum.

J. MAITLAND, M. D.
Surgeon Major.
V. VURADAPPAH NAIDU.
G. M. J. MOORE.

APPENDIX A.

TO

THE PRESIDENT,

MUNICIPAL COMMISSION.

SIR,

(1). I have read the Acting Sanitary Commissioner's letter to the Chief Secretary to Government No. $\frac{2201A}{S}$, dated 18th December 1894, in connection with G. O. No. 1651 M. dated 7th November 1894, and also the Memoranda by the Health Officer and Acting Engineer to the Municipality.

(2). It has always been my opinion that, if Madras is to be eventually properly drained, endeavours should be made to make a beginning on some complete scheme and I do not see that the Commissioners could do better than adopt the scheme prepared by Mr. Cousins.

(3.) The first question that arises is whether it is possible to carry out Mr. Cousins' scheme by districts or sections and if so how much can be done with the funds available.

(4.) Mr. Cousins in submitting his report says "In divising the scheme for the drainage of the district I have had before me two necessary conditions, *viz.*, efficiency combined with economy. I have therefore designed the sizes and gradients of the sewers with a view of carrying off the sewage only, together with a portion of the rain water which may fall in the back yards of dwelling houses, and a small amount of subsoil water, which with every precaution to exclude will always find its way into sewers, but have excluded all storm water falling upon roads, streets, &c."

(5.) The attached map shews the area drained by Mr. Cousins' drainage scheme. There are to be 3 pumping stations, 1 at Sydenhams Road, 1 at Royapuram and 1 at Tondiarpet.

In the map I have divided the scheme into 12 sections as each section is independent of the other except so far as relates to some of the main sewers which pass through one section to the other.

(6). The 12 sections are briefly as under:—

1. Royapuram and part of Tondiarpet.
2. Part of Tondiarpet, Corookoopet and Washermanpet.
3. North portion of Black Town.
4. South portion of Black Town.
5. Fort.
6. Purasewakum.
7. Vepery.

8. Elembore.
9. Egmore.
10. Chintadripet.
11. Triplicane.
12. Mylaupore.

(7). Nos. 1 and 3 are to drain towards the existing pumping station at Royapuram. No. 2 is to drain towards the proposed pumping station at Corookoopet. Nos. 4, 5, 6, 7, 8, 9, 10, & 11, are to drain towards the proposed main pumping station at Sydenhams Road. No. 12 is to drain out to sea.

(8). I will now refer to the Chief Engineers memo. dated 14th August 1894, embodied in G. O. No. 1651 M. Local and Municipal (Page 47) in which he says,

(*a*) "I consider the general arrangements proposed by Mr. Cousins leave nothing to be desired."

(*b*) "I am of opinion that the gradients will be amply sufficient in practice."

(*c*) "In one point only connected with the general arrangement am I inclined to agree with Mr. Jones *Viz*. That it would have been better had a greater subdivision of area been made and more pumping stations adopted, but I do not hold this opinion so strongly, nor do I think the point of sufficient importance to justify a rejection of the scheme and its replacement by an entirely new one."

(*d*) "I am certain that the portion of the work which Mr. Cousins estimates at Rs. 23,38,176 and for which Mr, Jones' partially revised estimate amounts to Rs. 34,49,124, will not in practice be found to cost less than 40,00,000. To this has to be added the cost of house connections estimated at 21,00,000."

(9). With a view of diverting the sewage from flowing into the river Cooum Mr. cousins recommends that the first work proceeded with should be erection of Sydenhams Road pumping station ; the cast iron gravitating main from it to the present open sewer leading to the Black Town farm, where a temporary connection will be made with it ; the constructions of the Sydenhams Road main sewer between the pumping station and the river, and the sewers abutting on both sides of the river, into which the whole of the sewage now discharged into the Cooum could be intercepted and diverted on to the Black Town sewage farm.

(10). It is intended that a brick culvert 3′—6″×3′—6″ estimated by Mr. Jones to cost Rs. 42,638, should take the place of the existing open channel leading to the farm. This item has been included in the estimate.

(11). The next question to be considered is, what is to be done about house connections which are estimated to cost Rs. 2,100,000 and how should the sewage be conveyed to the mains pending the entire completion of this portion of the work, and it appears to me that the only way out of the difficulty is to have street connection, the sewage from several houses being collected in open drains of

small dimensions which could be connected with the sewers at intervals. This being the case it will probably be possible to postpone laying some of the pipes of small size contemplated by Mr. Cousins and I might here refer to the Sanitary Commissioner's inspection notes of Madras for 1894 para 39. in which he says "As I have shewn, it is by no means an essential part of the pipe system that water closets should be used in all private houses. Their adoption will be gradual."

(12). With a view of carrying out of Mr. Cousins' scheme by districts I have re-arranged the order of the estimate by separating the isolated areas of Mylaupore and Tondiarpet which Mr. Cousins proposes to deal with as separate schemes and also that portion of Royapuram which is to drain towards the existing pumping station and I have placed last on the list Black Town which has been drained and the Fort which is outside Municipal limits.

(13.) Col. No. 1 in the appended statement is Mr. Cousins' estimate as revised by Mr. Jones, the figures in Col. No. 2 have been obtained by adding 16 per cent. to the figures in Col. No. 1, bringing the total estimate up to about Rs. 40,00,000, which is the figure given by the Chief Engineer as the probable cost, and Col. No. 3 is estimated cost of carrying out that portion of Mr. Cousins' scheme shown in red line in the accompanying map. The figures in Col. No. 3 have been obtained from the same data which was used in preparing Col. No. 2 and omitting many of the smaller branches as suggested in para. No. 11 above, a lump sum has been added to cover the cost of making silt traps and connecting present surface drains to the system of sewers and constructing new surface drains wherever necessary. Provision of Rs. 1,50,000 has been made for extending the Sewage Farm. The farm should not be less than 400 acres to enable it to take the sewage of 4,50,000 persons allowing 20 gallons per head per diem, 1 inch of sewage water being placed all over the farm every 24 hours. It is not known how much Government waste land is available or whether Government will hand any over to the Municipality free of cost ; whether a more suitable sight for a farm can be found near the Cockrane Canal is a question to be considered. In this case there would be a considerable saving in the pumping main.

(14). The cost of pumping at Sydenhams Road station with certain modifications to the arrangements is estimated to come to Rs. 85,500 per annum. This item may be reduced until the entire scheme is undertaken.

(15). In carrying out as it were the backbone of Mr. Cousins' scheme it will be possible to close Triplicane, Kistnampett, DeMellows Road and Napier park pumping stations, and stop the picottahs at Royapettah, Dams Road, Egmore and Pudupet Farms ; it would still be possible to retain the DeMellows Road Farm for the present and even extend it, all the effluent water being drained back into the sewers and thus one of the great objections to the Farm would be removed without entailing the loss of revenue from the Farm. All swampy land between Brick kiln Road and DeMellows Road will be effectually drained and all sewage will be kept out of the Cooum, and further all future improvements can be executed on the lines laid down by the scheme.

(16.) As large tracts of land which are now swamps will be rendered valuable property as soon as the drainage scheme is introduced, endeavours should be made to acquire the same if private property, or if Government waste land the same might be obtained from Government free of cost.

(17.) As it is proposed to build a close culvert from the present termination of the 2 ft. outfall pipe it would be expedient to stop laying the extension which is now in progress and use the pipe for one of the auxiliary water mains or for one of the 18 inch over flows to the sea provided by Mr. Cousins.

(18.) The question of draining Mylaupore is more difficult to deal with. The sewage may be disposed of in one of the following ways :—(1) sent to sea, (2) pumped on to a farm to the south of Mylaupore (3) pumped into the main at the north end of Barbers Bridge Road and allowed to gravitate to the main pumping station at Sydenhams Road, in which case the mains would have to be slightly enlarged, (4) pumped on the Kistnampet sewage farm as this will no longer be required for Triplicane sewage, the farm might be enlarged by taking in Barbers Bridge Rubbish Depôt.

(19). It must be borne in mind that Mr. Cousins does not allow for taking off storm water through the sewers but intends that it shall pass off by the present open channel and culverts, for it is practically impossible to construct sewers so as to overcome all inconvenience in time of floods.

(20). Should it be considered advisable to carry out Mr. Cousins' scheme it could follow that junction pipes and manholes for all branches contemplated in scheme should be provided for, so that the additions can be made at any future date without disturbing that portion of the work already done.

R. E. ELLIS.

15—3—95.

STATEMENT.

		Col. 1	Col. 2	Col. 3
	Cast iron delivery mains.	422934	490603	490603
	Sydenhams Road pumping station	390471	452946	452946
6&7	Purasewakum drainage	401273	465476	163247
8	Elembore			101982
9	Egmore	44058	51107	45704
10	Chintadripet	116701	135373	104526
11	Triplicane	182805	212053	147534
	Extension of Sewage Farms	478806	555414	295149
	Surface drains & Silt traps			150000
				48309
		2037048	2362972	2,000,000
12	Mylaupore	305168	353994	
	Tondiarpet pumping station	119887	139068	
	Tondiarpet	9687	11236	
2	Tondiarpet	100017	116019	
1	Royapuram	145336	168589	
3&4	Black Town	693287	804212	
5	Fort	38693	44883	
	Total...	3449123	4000973	

R. E. ELLIS,
15-3-95.

APPENDIX B.

MEMO.

On the Drainage, Water Supply and purification of the Cooum in the Town of Madras.

The Government by their order No. 1651 M. of the 7th of November last, have set aside the scheme proposed by Mr. Cousins for the Drainage of the Town, on the score of its great cost, not only in the outlay, but also in that for its maintenance. The Commissioners have been called upon to consider the question of improving the Water Supply at a cost of 25 lacs, and the Chief Engineer has been directed to take steps for the purification of the Cooum, by cutting a Canal from the Harbour to the Basin, whereby sea-water, may be let into the Cooum twice a day at high tides, and be discharged into the sea by another outlet at low tides thereby converting it into a tidal river.

It does appear a very great pity that, Government should have put aside the Drainage question, which in importance to the Town stands at the head of the three works, and it is to be hoped the Commissioners will not lose sight of this, when considering that for the water supply.

As to the purification of the Cooum, this will be done by Government, it is hoped, as an Imperial, or Provincial work; should, however, the Commissioners be called upon to do this work at their cost, they should then obtain full control over the river and Canal, within Municipal limits, so that they may recover the outlay by the fees charged on all vessels sailing on its waters, and for the trade conducted on its banks.

There is no doubt, but that the purification of the Cooum—which is for 8 months in the year, a stagnant sewer—will be of immense blessing to the people of Madras. The sooner therefore this work is undertaken the better for Madras.

(Water Supply) Now as to the question of Water Supply.

Mr. Cousins proposes to bring down a larger quantity of water from the Red Hills through a masonry conduit, so that the water may not be contaminated on its way from the lake to the Town. To filter this water at Kilpauk, where the present system of iron pipes begins, and to pump it under pressure into the pipes, so that the present defective pressure may be overcome, and all places that have pipes already laid to them, may have a better supply. Mr. Cousins estimates this work at 21 lacs; but this estimate is found to be incorrect, by about 4 lacs, so that the work must be put down as likely to cost 25 lacs; we will get for an outlay of 25 lacs, (1) more water (2) the water filtered, (3) higher pressure.

2. Unfotunately, however, it will be seen that no provision has been made for further extension of the water supply within the Town, nor for cleaning out the present system of pipes, (the larger sizes of which have been under ground for nearly a quarter century); these are largely coated inside with foreign matter. To further extend the system within the Town will require about 5 lacs ; the total outlay will therefore come to 30 lacs ; and the maintenance, sinking fund, and interest will rise to $4\frac{1}{4}$ lacs annually, instead of a 4 lacs as shown in the report on the scheme.

3. It is now suggested that with an outlay of about 11 lacs only, and with no more than about 33 per-cent increase over the present maintenance, which is about 50,000 annually, as much may be done on other lines.

4. To avoid the annual expenditure of about Rs 20,000 to which the Municipality has been subjected since the breaching of the Red Hills lake bund in 1884, when the level of the lake was reduced by 3′, it is now recommended that one lac of Rupees be allotted, for raising and strengthening these bunds, so that the old level may be restored, and thereby a larger body of water secured. The Municipality have spent about 2 lacs on pumping &c., during the past 10 years, which in future may be avoided if the lake level is thus restored.

5. There are about seven villages which drain into the lake at present ; these ought to be removed at once, since the sewage brought into the lake every year from them, cannot but contaminate it, and more so, since its bulk has been reduced. Half a lac of rupees would more than compensate for this purpose.

6. The present water supply Channel from the Red Hills should be widened, the banks strengthened, proper fences put up along the whole line, and the Channel next the bridges covered in for about 30 yards on either side, so as to prevent people passing over, fouling the water. This work can be done for half a lac. (The Channel costs almost a lac to construct). With an expenditure therefore of about 2 lacs, we will secure a larger body of water, and thereby save annual pumping, the lake will be made somewhat purer, by the removal of the villages which drain into it (these works do not find a place in Mr. Cousins scheme) and a larger body of water brought down to Madras.

7. To extend the Water supply within the Town, an outlay of about 5 lacs will be required of which $3\frac{1}{2}$ is to be spent in auxiliary mains.

We have about 1000 fountains in Madras at present; if the extensions suggested are carried out, this number will be increased to about 1200, a half of this number may be converted into filtered water cisterns, somewhat similar to the one put up by Dewan Bahadur Ragunatha Row at Mylapore, to the memory of his late brother, Sir T. Madava Row at a cost of about Rs. 600. These foutains will be rapid filters, the filtering medium being, asbestos cloth, and manganese, or spongy of iron, so that the water will be acted on both mechanically, and chemically. The cost for 600 such fountains will be about 3 $\frac{1}{2}$ lacs.

8. Approximate Estimate.

Removal of villages at Red Hills	50,000
Raising level of Red Hills lake	1,00,000
Widening and strengthening Channel ...	50,000
Extension of water supply within the Town	5,00,000
Erection of 600 filter water cisterns	3,50,000
	10,50,000
Un-foreseen expediture	50,000
Total Rupees	11,00,000

9. For an expenditure of 11 lacs we get (1) more water (2) better quality (3) filtered water in 600 places (4) extended system (5) only 33 per-cent increase over present expenses in maintenance, instead of about 6 times as much as will be the case if pumping is resorted to, (6) annual pumping at Red Hills done away with, (7) $\frac{2}{3}$rd less interest and sinking fund to be provided for.

10. Drainage.—The water supply having been thus improved and increased, the undersigned suggests that 30 lacs be borrowed, for the drainage of such places in Madras, as at present have a very bad system, or none at all, the work being done somewhat on the lines laid down by Mr. Cousins in his scheme, and also for the erection of 3 cinerators, for the destruction of rubbish, and for improvement in removal of night soil.

11. According to Mr. Cousins' scheme, (as modified by Mr. Jones as to rates) the drainage of Mylapore and St. Thomè will cost 3 lacs, but instead of discharging the sewage as therein proposed, it is here suggested, to throw it on a sewage farm which may be made by the filling up of the swamp between the butts and Quibble island bridge, with sand from the sea shore, near by; this swamp is an unbearable nuisance for several months in the year. The swamp west of the bridge and up to Brodies' Road, my also be taken up in the same manner, if more land is required. The land here is quite open, far from dwellings, and close to the sea, and will be vastly improved by its conversion from a swamp into a raised sewage farm; it will also form another source of income to the Municipality, which now derives about 200. Rs per annum, on each Cawnie of ground planted with Hurriali grass; and as there are fully 60 cawnies here, which may be thus brought under cultivation, a large revenue may be expected.

12. If, however, a sewage farm at Quibble island is considered objectionable, the same objection will apply to all other sewage farms within the city, and with greater force, inasmuch as they are in the midst of dwellings.

13. To remedy this evil - if it be one- it will be well to lay an iron main of about $6\frac{1}{2}$ miles in length, from Mylapore to the waste lands at Munally, commencing with 12" and terminating with 36" diameter. Into this main all sewage now delivered at the various farms on the way, may be discharged, by the pumping machinery now at work, and others of a similar character which will be required.

14. The best line for such main will be as follows:— beginning in Brodies' Road near the Mundavelly, to pass along Brodies, Royapettah High Road, West Cott's Road, Patters and Dams Road, then crossing the Cooum obliquely at Chintadripetta, strike West of St. Andrews Bridge, then on by the east side of the Women and Children Hospital, through the Friend-in-Need Society's premises, along naval Hospital Road, through Cunnia Chetty's waste land, west of Dobbin's Hall, through waste land in Kurriancootai, along Sydenham's Road, and the open ground east of the Powder-Mills, then across the Madras Railway, and the Magazine to Munally.

15. The line as detailed above will be found most suitable, as it will have the least bends. All the drains may be made to flow towards this main, suitable pumping machinery being fixed near by to pump into it.

16. To drain Triplicane, Royapetta, and Chintadripetta, $4\frac{3}{4}$ lacs will be required; all sewage will be carried on, as at present, to the Kistnampet Farm, which may be further extended, or into the iron main referred to above, if it be decided to close the farms within the city.

17. To drain Egmore, Comaleeswarampetta, Vepery, Chulay, New Town, Purasavaulkam and Kosepet, a sum of ten lacs will be required. The sewage farm in D'Mellows Road will be closed, so also those in the People's Park and Egmore; all sewage from these places will be carried, to the waste lands, a mile to the north of the Powder Mills, and Veyasurpady, far from dwellings. This site is proposed whether the sewage from the 7th and 8th Division is sent here or not.

18. The present system of drainage in Black Town will be left alone for the present, and will have added to it, the drainage of the Fort and Rayapuram, at a cost of 2 lacs. The pumping machinery at Royapuram will be equal to this addition of sewage. Another lac will cover the cost of constructing two large storm-water-drains, for carrying off more rapidly the rainfall from Popham's and Wall Tax Roads, where at present much inconvenience is felt, owing to the flooding of those places during heavy rains.

19. Tondiarpet is to be drained at a cost of 2 lacs, the sewage passing on to the Rubbish Depôt in Ennore Road, which will then be converted into a farm. It will be well if the sewage from the Royapuram Pumping Station is also sent to this place, and the Outfall Channel, by which the sewage is now passed, and which is of much inconvenience to the inhabitants of Washermanpet, may then be done away with.

Approximate Estimate.

For draining Mylapore and St. Thomè	3,00,000	
Do. Triplicane, Chintadripetta and Royapuram	4,75,000	
Egmore, Purasavaulkam &c	10,00000	
Black Town	3,00,000	
Tondiarpet	2,00,000	
	22,75,000	
If the iron main be adopted, and the Sewage Farms in the City closed	4,50,000	
	27,25,000	
3 Rubbish cinerators at ½ lac each	1,50,000	
1 in Black Town.		
1 in Kosapet.		
1 in Kistnampet and		
increase of carts buckets and for removal of night-soil	1,25,000	
... ... Grand Total...	30,00,000	

20. The sewage farms will after the first year pay for their maintenance as well as for their pumping arrangements. The only annual increase over the present expenditure will then be, the maintenance of water supply as already noted, and the payment for interest and sinking fund on 41 lacs which will not come to more than 3 lacs in the first year, the two latter will of course annually decrease. The three lacs for interest and sinking fund includes in addition to that required for increased maintenance under water supply, the pumping works for Tondiarpett, the other Divisions being provided for under this head by the machinery now at work.

21. Considering the very great necessity there is in Madras for a proper drainage system and other sanitary improvements, it does appear a waste of money to spend 30 lacs on the improvement of its water-supply only, and that coupled with a heavy annual charge for maintenance, when an equally good supply with less expenditure in outlay and maintenance can be found as already detailed.

22. By Mr. Cousins' scheme, all the water drawn from the taps will be filtered, but since more than half of this quantity is used for the flushing of drains, watering of roads, and irrigation, the filtering of so large a body is unnecessary; hence is the suggestion to have filtered water cisterns within the Town, from which people can draw off for domestic purposes. Those who do not care to go to he public filtered water cisterns may at a very small cost have the Indian Chatty-filter, which costs no more than one Rupee ; these can be put up in dwellings where the improved European filters cannot be afforded or adopted. The Chatty filters (as is known) contain vegetable charcoal, in addition to fine sand, and tare therefore as efficent as those proposed in Mr. Cousins' scheme.

25—1—95. S. LOANE,

APPENDIX C.

Local and Municipal Department.

Proceedings of the Madras Government.

Order 10th April 1895, No. 661, M. Mis.

In G. O. dated 7th November 1894, No. 1651 M., the execution of Mr. Cousins' scheme for improving the water supply of Madras, and a scheme for purifying the Cooum were sanctioned ; the Municipal Commissioners have subsequently requested sanction to a proposal to erect cinerators to consume the rubbish collected in the City ; it is probable that some improvements in the method of disposing of the town sewage will also beeventually necessary ; and a loan of four lakhs has recently been raised by the Commissioners for expenditure upon water supply mains. All these schemes will require a larger sum of money to carry them out than can be set aside from the ordinary annual revenue of the Municipality, and the imposition of additional taxation appears to be unavoidable, the more so that the Tobacco Duties have not fulfilled the expectations that were formed of them.

2. The President will accordingly be requested to report whether the Commissioners are still of the opinion recorded in their resolution of the 15th March 1893, embodied in G. O. dated 5th May 1893, No. 607 M. that a duty upon Kerosine Oil imported into Madras for local consumption would be a satisfactory method of raising a part of the funds that are required, and if so, at what rate they would propose to levy the duty.

(True Extract.)

W. FRANCIS,

Ag. Asst. Secretary,

for Chief Secretary.

To

The President, Municipal Commission, Madras.

MINUTES of the PROCEEDINGS of an Adjourned SPECIAL MEETING of the MUNICIPAL COMMISSIONERS for the CITY OF MADRAS, held at their Office Premises, No. 22, Errah Bauloo Chetty Street, Black Town, on Friday the 31st May 1895, at 5 P.M., under the provisions of the City of Madras Municipal Acts I and VII of 1884 and II of 1892.

PRESENT :

Lieutenant-Colonel G. M. J. Moore, C.I.E., *President*.
M.R.Ry. P. Theagaroya Chetty Garu.
M.R.Ry. R. Balakristnama Chetty Garu.
M.R.Ry. R. N. Pragasa Mudaliar Avargal.
M.R.Ry. Salla Gurusawmy Chetty Garu.
M.R.Ry. M. Venkataramiah Chetty Garu.
M.R.Ry. C. Yetherajulu Nayudu Garu.
M.R.Ry. P. M. Sivangnana Mudaliar Avargal.
Cowasjee Eduljee, Esq.
M.R.Ry. M. Varadarajulu Chetty Garu.
M.R.Ry. G. Subbarayalu Chetty Garu.
V. Mahomed Sheriff, Khan Bahadur.
J. DeCaster, Esq.
M.R.Ry. V. Varadappa Nayudu Garu.
The Hon'ble P. Rungiah Nayudu Garu.
M.R.Ry. W. S. Venkataramanjulu Nayudu Garu.
B. Lovery, Esq.
M.R.Ry. M. O. Parthasarathy Iyangar Avargal.
Surgeon-Major G. L. Walker.
Surgeon-Major J. Maitland.

Report of the Committee appointed by the Commissioners at their Meeting held on 28th January 1895, on Mr. Cousins' Schemes for the improvement of the Drainage and the Water-supply of Madras.

Proposed by M.R.Ry. P. Theagaroya Chetty Garu and seconded by M.R.Ry. M. O. Parthasarathy Iyangar Avargal—

"That the Committee's recommendations in paragraphs 13 and 16 of their report be adopted, and that the following measures be adopted to meet the necessary expenditure :—

	Rs.
Tax on vehicles, animals, carts, &c., to be raised 50 per cent. yielding an additional ..	36,000
Profession tax to be raised 100 per cent. yielding an additional	65,000
Tax on liquor shops to be doubled yielding an additional	13,600
Petroleum tax at 1 anna per gallon for all petroleum consumed in the city yielding ..	40,000
That Government be requested to forego the contribution of Rs. 50,000 per annum yielding	50,000
	2,04,600"

The resolution was divided into two parts.

M.R.Ry. R. N. Pragasa Mudaliar Avargal proposed an amendment seconded by M.R.Ry. R. Balakristnama Chetty Garu—

"That the following words be added to the first part of the resolution 'with the additional recommendation that the Red Hills tank be restored to its original level at the cost of the Municipality.'"

The amendment on being put to the meeting was carried.

M.R.Ry. M. Venkataramiah Chetty Garu proposed an amendment seconded by M.R.Ry. C. Yetherajulu Nayudu Garu—

"That, that portion of the second part of the resolution referring to the tax on vehicles, animals, carts, &c., and the profession tax be omitted and 3 annas be substituted for 1 anna in the tax on petroleum."

M.R.Ry. Salla Gurusawmy Chetty Garu proposed an amendment seconded by Mr. Mahomed Sheriff—

"That 2 annas be substituted for 1 anna in the tax on petroleum and the following be added : 'the tax on tolls be doubled' and that portion of the second part of the resolution referring to the tax on vehicles, animals, carts, &c., and the profession tax be omitted."

M.R.Ry. W. S. Venkataramanjulu Nayudu Garu proposed as a further amendment seconded by M.R.Ry. G. Subbarayalu Chetty Garu—

"That 50 per cent. be substituted for 100 per cent. in the profession tax and that the following be added :—
'Tax on tolls to be raised 50 per cent.
'Tax on timber to be raised one-fifth of the present rate.'"

Proposed by M.R.Ry. P. M. Sivangnana Mudaliar Avargal and seconded by M.R.Ry. P. Theagaroya Chetty Garu—

"That the meeting adjourn till Friday the 7th June 1895."

Carried.

G. M. J. MOORE, Lieut.-Col.,
President, Municipal Commission.

Municipal Office, Madras,
June 1895.

MADRAS : PRINTED BY THE SUPERINTENDENT, GOVERNMENT PRESS.

285.P.

Extract from the

MINUTES of the PROCEEDINGS of an ADJOURNED SPECIAL MEETING of the MUNICIPAL COMMISSIONERS for the CITY of MADRAS, held at their Office Premises, No. 22, Errah Baloo Chetty Street, Black Town, on Friday the 7th June 1895, at 5 P.M., under the provisions of the City of Madras Municipal Acts I and VII of 1884 and II of 1892.

PRESENT:

Lieutenant-Colonel G. M. J. Moore, C.I.E., *President.*
M.R.Ry. P. Theagaroya Chetty Garu.
M.R.Ry. R. Balakistnama Chetty Garu.
M.R.Ry. R. N. Pragasa Mudaliar Avargal.
M.R.Ry. Salla Gurusawmy Chetty Garu.
M.R.Ry. M. Venkataramiah Chetty Garu.
M.R.Ry. P. M. Sivangnana Mudaliar Avargal.
M.R.Ry. P. V. Kistnasawmy Chetty Garu.
M.R.Ry. M. Varadarajulu Chetty Garu.
M.R.Ry. G. Subbarayalu Chetty Garu.
V. Mahomed Sheriff, Khan Bahadur.
M.R.Ry. M. Ramakistnaiya Pantulu Garu.
J. De aster, Esq.
M.R.Ry. V. Varadappa Nayudu Garu.
The Hon'ble P. Rungiah Nayudu Garu.
B. Lovery, Esq.
N. Subrahmanyam, Esq.
M.R.Ry. Rai Bahadur A. Dhanakoti Mudaliar Avargal.
M.R.Ry. M. O Parthasarathy Iyangar Avargal.
M.R.Ry. G. Subramania Iyer Avargal.
Surgeon-Major G. L. Walker.
Surgeon-Major J. Maitland.

Report of the Committee appointed by the Commissioners at their Meeting held on 28th January 1895 on Mr. Cousins' Schemes for the improvement of the Drainage and the Water-supply of Madras.

Proposed by the Hon'ble P. Rungiah Nayudu Garu and seconded by Mr. N. Subrahmanyam—

"That the Meeting resolve itself into Committee."

The proposition, on being put to the Meeting, was lost.

Surgeon-Major G. L. Walker proposed an amendment seconded by Surgeon-Major J. Maitland—

"That the following be omitted:—
Tax on Vehicles, Animals, Carts, &c.,
Profession tax,
Tax on Liquor Shops,
Petroleum tax,
Request to Government for remission of Rs. 50,000 contribution,
and the following be added:—
'that a new tax on Patent Medicines and Proprietary Articles sold within the limits of the Municipality be imposed,
that the House tax be increased,
that the Tolls be increased.'"

Mr. N. Subrahmanyam proposed an amendment seconded by the Hon'ble P. Rungiah Nayudu Garu—

"That 100 per cent. be substituted for 50 per cent. in the Tax on Vehicles, Animals, Carts, &c.,
That the following be added to the Profession tax:—
'that schedule A be amended so as to affect all persons whose income is Rs. 20 per mensem and upwards,'
That the tax on Petroleum be omitted."

Proposed by M.R.Ry. R. N. Pragasa Mudaliar Avargal and seconded by M.R.Ry. V. Varadappa Nayudu Garu—

"That the Meeting adjourn till Friday the 14th June 1895 at 4-30 P.M."

Carried.

G. M. J. MOORE, Lieut.-Col.,
President, Municipal Commission.

Municipal Office, Madras,
June 1895.

MADRAS: PRINTED BY THE SUPERINTENDENT, GOVERNMENT PRESS.

MINUTES of the PROCEEDINGS of an ADJOURNED SPECIAL MEETING of the MUNICIPAL COMMISSIONERS for the CITY of MADRAS, held at their Office Premises, No. 22, Errah Bauloo Chetty Street, Black Town, on Friday the 14th June 1895, at 4-30 P.M., under the provisions of the City of Madras Municipal Acts I and VII of 1884 and II of 1892.

PRESENT:

Lieutenant-Colonel G. M. J. Moore, C.I.E., *President.*
M.R.Ry. Salla Gurusawmy Chetty Garu.
M.R.Ry. P. M. Sivangnana Mudaliar Avargal.
Cowasjee Eduljee, Esq.
M.R.Ry. M. Varacarajulu Chetty Garu.
M.R.Ry. G. Subbarayalu Chetty Garu.
V. Mahomed Sheriff, Khan Bahadur.
J. DeCaster, Esq.
M.R.Ry. V. Varadappa Navudu Garu.
The Hon'ble P. Rungiah Nayudu Garu.
M.R.Ry. Rai Bahadur A. Dhanakoti Mudaliar Avargal.
Surgeon-Major G. L. Walker.

Report of the Committee appointed by the Commissioners at their Meeting held on 28th January 1895 on Mr. Cousins' schemes for the improvement of the Drainage and the Water-supply of Madras.

Proposed by the Hon'ble P. Rungiah Nayudu Garu and seconded by Surgeon-Major G. L. Walker—

"That in view of the small number of Commissioners present and the importance of the subject under discussion the Meeting be adjourned till Wednesday the 26th June 1895, at 5 P.M."

Carried.

Municipal Office, Madras,
June 1895.

G. M. J. MOORE, Lieut.-Col.,
President, Municipal Commission.

MADRAS: PRINTED BY THE SUPERINTENDENT, GOVERNMENT PRESS.

MINUTES of the PROCEEDINGS of an ADJOURNED SPECIAL MEETING of the MUNICIPAL COMMISSIONERS for the CITY of MADRAS, held at their Office Premises, No. 22, Errah Bauloo Chetty Street, Black Town, on Wednesday the 26th June 1895, at 5 P.M., under the provisions of the City of Madras Municipal Acts I and VII of 1884 and II of 1892.

PRESENT :

Lieutenant-Colonel G. M. J. Moore, C.I.E., *President.*
M.R.Ry. P. Theagaroya Chetty Garu.
M.R.Ry. R. Balakistnama Chetty Garu.
M.R.Ry. R. N. Pragasa Mudaliar Avargal.
M.R.Ry. Salla Gurusawmy Chetty Garu.
M.R.Ry. M. Venkataramiah Chetty Garu.
Cowasjee Eduljee, Esq.
V. Mahomed Sheriff, Khan Bahadur.
J. DeCaster, Esq.
J. P. Nicholas, Esq.
M.R.Ry. V. Varadappa Nayudu Garu.
M.R.Ry. W. S. Venkataramanjulu Nayudu Garu.
M.R.Ry. Rao Bahadur V. Krishnama Charriar Avargal.
M.R.Ry. M. O. Parthasarathy Iyangar Avargal.
M.R.Ry. G. Subramania Iyer Avargal.
Surgeon-Major G. L. Walker.
Dewan Bahadur R. Ragoonath Rao Garu.
M.R.Ry. R. Balajee Rau Avargal.

Report of the Committee appointed by the Commissioners at their Meeting held on 28th January 1895 on Mr. Cousins' Schemes for the improvement of the Drainage and the Water-supply of Madras.

Proposed by Dewan Bahadur R. Ragoonath Rao Garu and seconded by M.R.Ry. R. Balajee Rau Avargal—

"That the Meeting resolve itself into Committee."

Carried.

The Meeting resumes.

Proposed by M.R.Ry. W. S. Venkataramanjulu Nayudu Garu and seconded by M.R.Ry. Salla Gurusawmy Chetty Garu—

"That the Meeting adjourn till Monday the 8th July 1895.

Carried.

G. M. J. MOORE, Lieut.-Col.,
President, Municipal Commission.

Municipal Office, Madras,
June 1895.

MADRAS: PRINTED BY THE SUPERINTENDENT, GOVERNMENT PRESS.

MINUTES of the PROCEEDINGS of an ADJOURNED SPECIAL MEETING of the MUNICIPAL COMMISSIONERS for the CITY of MADRAS, held at their Office Premises, No. 22, Errah Bauloo Chetty Street, Black Town, on Monday the 8th July 1895, at 5 P.M., under the provisions of the City of Madras Municipal Acts I and VII of 1884 and II of 1892.

PRESENT:

Lieutenant-Colonel G. M. J. Moore, C.I.E., *President.*
M.R.Ry. P. Theagaroya Chetty Garu.
M.R.Ry. R. Balakistnama Chetty Garu.
M.R.Ry. R. N. Pragasa Mudaliar Avargal.
M.R Ry. Salla Gurusawmy Chetty Garu.
M.R.Ry. M. Venkataramiah Chetty Garu.
M.R.Ry. P. M. Sivangnana Mudaliar Avargal.
Haji Muhammad Abdul Hadi Badsha Sahib.
M.R.Ry. P. V. Kistnasawmy Chetty Garu.
M.R.Ry. M. Varadarajulu Chetty Garu.
M.R.Ry. G. Subbarayalu Chetty Garu.
M.R.Ry. M. Ramakistnaiya Pantulu Garu.
J. DeCaster, Esq.
M.R.Ry V. Varadappa Nayudu Garu.
M.R.Ry. P. Rungiah Nayudu Garu.
M.R.Ry. W. S. Venkataramanjulu Nayudu Garu.
B. Lovery, Esq.
N. Subrahmanyam, Esq.
M.R.Ry. Rao Bahadur V. Krishnama Charriar Avargal.
M R.Ry. M. O. Parthasarathy Iyangar Avargal.
M.R.Ry. G. Subramania Iyer Avargal.
Surgeon-Major G. L. Walker.
Surgeon-Major J. Maitland.
Dewan Bahadur R. Ragoonath Rao Garu.
M.R.Ry. R. Balajee Row Avargal.

Report of the Committee appointed by the Commissioners at their Meeting held on 28th January 1895 on Mr. Cousins' Schemes for the improvement of the Drainage and the Water-supply of Madras.

Proposed by Dewan Bahadur R. Ragoonath Rao Garu and seconded by M.R.Ry. P. Rungiah Nayudu Garu—

"That the Meeting resolve itself into Committee."

Carried.

The Meeting resumes.

Dewan Bahadur R. Ragoonath Rao Garu proposed an amendment seconded by Surgeon-Major G. L. Walker—

	Rs.
"That the Tax on Tolls (section 170) be raised 50 per cent., yielding	20,000
"That the Tax on Vehicles and Animals (section 154) be raised 50 per cent., yielding	37,000
"That Schedule A be recast on the annexed scale, the minimum being Rs. 50.	70,000
"That the Compensation paid by Government under section 179 be doubled, yielding ..	13,500
Total ..	1,40,500"

Carried.

Proposed by M R.Ry. Salla Gurusawmy Chetty Garu and seconded by M.R.Ry. M. Venkataramiah Chetty Garu—

"That the above proposed increase in taxation being, in the opinion of the Commissioners, the utmost limit to which taxation can be raised, Government be respectfully requested to make a grant of 10 lakhs of rupees to meet the total expenditure necessary for carrying out the proposed Drainage and Water-supply schemes, the improvements to which are matters in which the Imperial interests are also concerned."

M.R.Ry. G. Subramania Iyer Avargal proposed an amendment seconded by Surgeon-Major J. Maitland—

"That the following words, 'the improvements to which are matters in which the Imperial interests are also concerned,' be omitted."

The amendment, on being put to the meeting, was lost.

The original resolution was then put and carried.

The Meeting then terminated.

G. M. J. MOORE, Lieut.-Col.,
President, Municipal Commission.

Municipal Office, Madras,
July 1895.

SCHEDULE of Proposed Rat[illegible]nd Classification of Profession Tax.

		Per mensem.		Per annum.		Rate per annum.
		From	To	From	To	
		RS.	RS.	RS.	RS.	RS.
21	.. .. ..	50	100	600	1,200	5
20	.. .. ..	101	150	1,201	1,800	7-8
19	.. .. ..	151	200	1,801	2,400	10
18	.. .. ..	201	300	2,401	3,600	15
17	.. .. ..	301	400	3,601	4,800	20
16	.. .. ..	401	500	4,801	6,000	30
15	.. .. ..	501	600	6,000	7,200	40
14	.. .. ..	601	700	7,200	8,400	50
13	.. .. ..	701	800	8,400	9,600	60
12	.. .. ..	801	900	9,600	10,800	70
11	.. .. ..	901	1,000	10,800	12,000	80
10	.. .. ..	1,001	1,250	12,000	15,000	100
9	.. .. ..	1,251	1,500	15,000	18,000	150
8	.. .. ..	1,501	1,750	18,000	21,000	200
7	.. .. ..	1,751	2,000	21,000	24,000	250
6	.. .. ..	2,001	2,500	24,000	30,000	300
5	.. .. ..	2,501	3,000	30,000	36,000	400
4	.. .. ..	3,001	4,000	36,000	48,000	500
3	.. .. ..	4,001	5,000	48,000	60,000	600
2	.. .. ..	5,001 upwards		..	..	1,000
1	.. .. ..	(A) Joint Stock Company.		Capital exceeding 20 lakhs	..	1,000
		(B)	Do.	do. 10 do.	..	700
		(C)	Do.	do. 5 do.	..	400
		(D)	Do.	do. 3 do.	..	300
		(E)	Do.	do. 2 do.	..	200
		(F)	Do.	do. 1 lakh	..	100
		(G)	Do.	less than 1 do.	..	50

The provisos to Clause D, Schedule A, to be amended as follows :—

Provided that any Company described in Division (A), (B), (C) or (D) of this class, the head office or a branch or principal office of which shall not be in Madras, and which shall show that its gross income received in or from Madras shall not in the year immediately preceding the year of taxation have exceeded the sum of—

						RS.
Rs. 25,000,	shall pay only	..	..	..	..	500
,, 20,000,	do.	..	..	..	..	400
,, 15,000,	do.	..	..	..	..	300
,, 10,000,	do.	..	..	..	..	200
,, 5,000,	do.	..	..	..	..	100
,, 2,500,	do.	..	..	..	..	50

and that if any such Company shall show that such gross income has not exceeded Rs. 2,000, such Company shall be exempt from taxation.

Provided also that whenever a Joint Stock Company has an office, agent, or firm to represent it for the purpose of carrying on business in the City, such office, agent, or firm shall be liable for the taxes payable under this Schedule.

G. M. J. MOORE, Lieut.-Col.,
President, Municipal Commission.

MADRAS: PRINTED BY THE SUPERINTENDENT, GOVERNMENT PRESS.

F

Madras, 20th July 1895.

TO

The President

Municipal Commission.

Sir,

In continuation of my letter of 15th March 1895, I have the honor to send herewith a tracing shewing the po-sition of the drains in Mr Cousins' scheme. Upon this tra-cing I have marked the approximate levels of the inverts of the Main Sewers. In nearly all cases the branch sewers are connected with the main sewers in such a way that all the available head is made use of.

I send also estimates in detail, of that portion of the work I propose should be done first, this shews at a glance how much is proposed to be done and when compared line by line with Mr Cousins' estimates, it shows what is proposed to be left out. It is probable that even more may be left out and a consequent saving may be effected, but until a plan of existing drains has been prepared, it is impossible to say to what extent.

The 30 % at the foot of the estimates includes about 14 % for Supervision & Contingencies & 16 % for extra cost estimated by the Chief Engineer in para 13 of his re-port.

There appears to be some misconception in para 14 of the Committees report. My proposals are briefly to carry out Mr Cousins' scheme as far as money will permit leaving out certain districts and some of the small drains and all house connections, whereas I understand Mr Loane proposes to alter the alignment of the sewers, the levels and co. se-quently the size, for, it follows that if the sewers are laid at a less depth than shewn by Mr Cousins and are to

velocity reduced; the latter scheme will therefore differ in many important details from that prepared by Mr Cousins which may not appear evident at first sight.

In order that the levels of the sewers as arranged by Mr Cousins may be compared with the level of existing sewers, I may mention that the level of the invert of his sewer at Sydenhams Road is I0.50 above datum, whereas the level of No I sewer at Royapuram is I2.97; in other words the lowest new sewer will be only 2'-6" deeper than the lowest existing sewer. Mr Cousins appears to have used the Municipal bench marks, the reduced levels of the streets as given by him agree very closely with those taken by me, however for some reason he has selected a datum line I9 feet below corrected mean sea level, instead of 20 feet below D'Havilands sea level as used by the Municipality; the result is that reduced levels of all streets and bench marks are practically unchanged; this of course is important when comparing the levels of proposed sewers with those already existing.

I have the honor to be,

Sir,

Your most obedient servant,

R R Rees

Engineer.

For

Estimate of works referred to in my letters dated I5th March and 20th July I895:- R R Rees

Puraseiwakam.

	average depth.	Mr Cousins' Rate as revised by Mr Jones (see page 21 of No 7 of 94)	Amount
Lin.Yds.			
I,533 of 9 inch pipe sewers	.8 ft.	6--0-0	9,I98
I,583 of 9"	9 ft.	6--6-0	I0,09I
843 of I2"	7 ft.	7-I4-0	6,638
826 of I2"	8 ft.	8--4-0	6,8I4
200 of I2"	II ft.	9--6-5	I,880
783 of I5"	7 ft.	I0--2-0	7,927
I,296 of I5"	I0 ft.	II--4-0	I4,580
I,464 of I'-8"x2'-6" brick sewers	I6 ft.	34-I5-7	5I,20I
No.			
20 Man holes on 9" sewers	8 ft	I5I--I-o	3,02I
I3 .. I2"	8 ft	I5I--I-o	I,964
26 .. I5"	8 ft	I5I--I-o	3,927
II .. I'-8"x 2'-6" brick sewers	I6 ft	200-I2-o	2,208
8 .. I'-8"x 2'-6" ..	I6 ft.	200-I2-o	I,606
20 Lamp holes on 9" sewers	8 ft	50-I2-o	I,0I5
3 .. I2"	I2 ft	50-I2-o	I52
5 .. I5"	8 ft	50-I2-o	254
3 .. I'-8"x 2'-6" brick sewers	I6 ft	57-I2-o	I73
7 Automatic flushing chamber on 9" pipe sewers	8 ft	4I8--2-o	2,926
			I,25,575
Contingencies at 30 %			37,672
Total			I,63,247

		Rate	Amount
	Vepery included in Estimate for Purasewaukum		
	by Mr Cousins. averge depth		
Lin.Yds.			
393	of I2" pipe sewers . . . . . .II ft.	9--6-5	3,688
I,400	of 9"—— .. —— 8 ft.	6--o-o	8,400
I,793	of 3'-2"× 4'-9" brick sewers—— I6 ft.	46--5-II	59,956
No.			
20	Man holes on 9" sewers —— 8 ft	I5I--I-o	3,02I
2	—— .. —— I2" —— 8 ft	I5I--I-o	302
8	—— .. —on 3'-2"× 4'-9" brick sewers—I6 ft	200-I2-o	I,606
20	Lamp holes on 9"sewers —— 8 ft	50-I2-o	I,0I5
I	—— .. —— I2" —— 8 ft	50-I2-o	5I
2	—— .. —on 3'-2"× 4'-9" brick sewers —I6 ft	57-I2-o	II5
I	Automatic flushing chamber on 6" pipe sewers —— 4 ft	294--2-o	294
			78,448
	Contingencies at 30 % ——		23,534
	Total ——		I,0I,982

			Rate	Amount
Lin.Yds.		average depth		
833	of I8" pipe sewers	II ft.	I5-I5-o	I3,287
I,I00	of I5"	8 ft.	I0--8-o	II,550
I30	of I2"	8 ft.	8--4-o	I,072
560	of 9"	.6 ft.	5--o-5	2,8I4
I70	of 9"	7 ft.	5-I0-o	3,I50
No.				
6	Manholes on 9" sewers	7 ft.	I46-I2-o	880
I	I2"	8 ft.	I5I--I-o	I5I
4	I5"	8 ft.	I5I--I-o	604
7	I8"	II ft.	I64--o-o	I,I48
5	Lamp holes. 9"	6 ft.	50--o-o	250
I	I2"	8 ft.	50-I2-o	50
3	I5"	8 ft.	50-I2-o	I52
I	I8"	II ft.	52--I-o	52
I	Automatic flushing chamber on 9" pipe sewer	4 ft.	4I8-I2-o	4I8
				35,578
	Contingencies at 30 % say			I0,I26
	Total			45,704

Lin.Yds.	Egmore.	average depth	Rate	Amount
466	of I2" pipe sewers	7 ft.	7-I4-o	5,669
580	of I2" —— .. ——	9 ft.	8-I0-o	5,002
635	of I2" —— .. ——	I0 ft.	9--o-o	5,7I5
306	of I2" —— .. ——	II ft.	9--6-5	2,876
468	of 9" —— .. ——	8 ft.	6--o-e	2,808
300	of 9" —— .. ——	7 ft.	5-I0-o	I,687
II6	of brick sewer 3'× 4'-6" ——	I7 ft.	46-II-6	5,420
I,695	of —— .. — I'-8"× 2'-6" ——	II ft.	27--4-8	46,259
No 5	Man holes on 9" sewer ——	7 ft.	I46-I2-o	734
I5	—— .. —— I2" ——	9 ft.	I55--6-o	2,330
5	Lamp holes— 9" ——	7 ft.	50--5-o	25I
9	—— .. —— I2" ——	9 ft.	5I--3-o	460
6	Man holes on brick sewers I'-8"× 2'-6"—	I7 ft.	205--I-o	I,230
5	Lamp holes—— .. —— .. ——	I7 ft	58--7-o	292
4	Automatic flushing chambers ——		4I8--o-o	I,672
				80,405
		Contingencies at 30% —		24,I2I
		Total —		I,04,526

Chintadripett.

		Rate	Amount
Lin.Yds.	average depth		
I,406 of I2" pipe sewers	8 ft.	8--4-o	II,599
270 of I2" "	6 ft.	7--4-5	I,964
350 of 9" "	I0 ft.	6-I2-o	2,362
306 of 30" cast iron pipes laid through bed of river cooum		59--o-o	I8,054
I,726 of brick sewer 3'×4'-6"	I4 ft.	40--7-8	69,827
No.6 Man holes on 9" sewers	I0 ft	I59-II-o	958
I0 " " I2"	7 ft.	I46-I2-o	I,467
I0 " " on 3'-o"×4'-6" brick sewer	I4 ft.	I92--2-o	I,92I
2 Special " " on 3'-o"×4'-6" "	I4 ft.	200--o-o	400
6 Lamp holes on 9" sewers	6 ft.	49-I4-o	299
5 " " I2"	7 ft.	50--5-o	25I
6 " " on 3'-o"×4'-6" brick sewers	I4'	56--6-o	338
5 Automatic flushing chambers laid on 6" pipe sewers			
I " " " I2"	5 ft.	294--2-o	I,470
		520--o-o	520
		Contingencies at 30 % say	I,II,430 36,I04
		Total	I,47,534

For

Lin.Yds.	Triplicane.	average depth	Rate	Amou
578	of I8" pipe sewers	I2 ft.	I6--6-2	9,470
573	of I8" —— .. ——	I0 ft.	I5--9-o	8,9I7
500	of I8" —— .. ——	6 ft.	I3-I3-5	6,9I9
653	of I5" —— .. ——	9 ft.	I0-I4-o	7,I0I
642	of I5" —— .. ——	6 ft.	9--8-5	6,II5
5I0	of I5" —— .. ——	5 ft.	9--I-7	4,640
955	of I2" —— .. ——	I2 ft.	9-I3-2	9,380
566	of I2" —— .. ——	I0 ft.	9--o-o	5,094
I76	of I2" —— .. ——	9 ft.	8-I0-o	I,5I8
I,406	of I2" —— .. ——	8 ft.	8--4-o	II,599
270	of I2" —— .. ——	6 ft.	7--4-5	I,964
225	of 9" —— .. ——	II ft.	7--2-5	I,608
I,60I	of 9" —— .. ——	I0 ft.	6-I2-o	I0,806
783	of 9" —— .. ——	9 ft.	6--6-o	4,99I
6,500	of 9" —— .. ——	8 ft.	6--o-o	39,000
750	of brick sewers 2'-2" × 3'-3" ——	I2 ft.	32-II-o	24,6I5
956	of —— .. —— 2'-4" × 3'-6" ——	I4 ft.	35-I2-o	34,I77
250	of —— .. —— 3'-o" × 4'-6" ——	I4 ft.	40--7-8	I0,II9
No.				
50	Man holes on 9" sewers ——	8 ft.	I5I--I-o	7,553
I7	—— .. —— I2" ——	I0 ft.	I59-II-o	2,7I4
I4	—— .. —— I5" ——	8 ft.	I5I--I-o	2,II4
22	—— .. —— I8" ——	I0 ft.	I59-II-o	3,5I3
8	—— .. —— on 2'-2" × 3'-3" brick sewers ——	I2 ft.	I83--6-o	I,468
I4	—— .. —— on 2'-4" × 3'-6" —— .. ——	I4 ft.	I92--2-o	2,689
3	—— .. —— on 3'-o" × 4'-6" —— .. ——	I4 ft.	I92--2-o	576
34	Lamp holes on 9" pipe sewer ——	8 ft.	50-I2-o	I,725
0	—— .. —— 9" —— .. ——	6 ft.	49-I4-o	997
0	—— .. —— I0" —— .. ——	I0 ft.	5I-I0-o	5I6
4	—— .. —— I5" —— .. ——	8 ft.	50-I2-o	203
5	—— .. —— I8" —— .. ——	I0 ft.	5I-I0-o	258
2	—— .. —— on 2'-4" × 3'-6" brick sewers —	I4 ft.	56--6-o	II2
I3	Automatic flushing chambers on 6" & 9" pipe sewers ——	4 ft.		4,567
			contingencies at 30 % say —	2,26,938 68,2II
			Total —	2,95,I49

8
2473 Just 95

G

To

The President

M . M . C .

Sir,

In continuation of my Memorandum of the 25th Ja-
-nuary last, I beg to submit the following details on the Drai-
-nage of Mylapore and St. Thome, which also applies to the other Districts to be drained.

The details given below are for a complete scheme to drain Mylapore and St.Thome and for pumping the sewage by sui-
-table machinery into an iron main to be laid from Mylapore to -
a site about 6½ Miles north of this station.

Provision is here made for draining the sewage from 5,000 houses, having a population of 35,000 with an allow-
-ance of 20 gallons a head per diem (these numbers are far in -
excess of what now exist within the area to be drained as shown on plan).

The Sewers will be either of Glazed Stone Ware or Portland cement pipes; these are of sufficient sizes for the work required of them. The minimum fall given is 5 ft. to the mile, and as the sill of the pump-well will be at mean sea level, none of the excavation for the sewers will go below that level.

For draining all houses directly into these sewers 3" branch pipes will be fixed in the line of sewers opposite each house drain, and from these, 3" pipes will be laid up to the -- house drain where a stone-ware Syphon-trap with iron grating and ventilating pipe will be fixed. The sewage from the house drains will be discharged on to these gratings which will be fixed in - the mouths of the Syphon traps, the latter will be so fixed, that the street drainage will not enter them, but will at the same - time be easily accessable for cleaning.

Man-holes will be built all along the line of

For approval.

Read 31/1/95

...wer, and at the commencement

...wer, and at all junctions.

There will be an overflow into the sea or into the Canal where the sea happens to be too far from the station, for discharging any excess of diluted sewage which may enter the sewers during heavy rains.

Automatic flushing pipes are provided at twelve suitable sites for flushing the sewers at intervals throughout the day and night.

Ventilating pipes for each Syphon-trap should be fixed. These will not need to go more than an average height of 25' above the roadway and may be fixed up for about 3 annas a running ft. or within Rs 5 each.

ESTIMATE

				Rs
3,675 ft.	of 2I" pipes laid at an average depth of	I0'	at Rs 7--o--o per ft.	25,725
3,525 . . .	I8"	do . . .	. .	I9,387
3,600 . . .	I6"	8 . . .	.3-I2--o	I3,500
6,500 . . .	I2"	7 . . .	2-I2--o	I7,875
I6,500	9"	6	.2--4--o	37,I25
I0,000	7"	5 . . .	I-I2--o	.I7,500
I,500	6"	.4	.I--o--o	I,500
50,000	3"	5 . . .	o-I0--o	.3I,250
5,000 ..	Syphon-traps with fixing and iron gratings at		I2--o--o	60,000
7,000	...of I5" cast iron piping at		7--o--o	2I,000
I20	Man-holes at		50--o--o each . .	6,000
Pumping station with duplicate set of machinery				30,000
				2,80,862
Sundries and Supervision				.I4,I38
			Total Rs	2,95,000

Public Works Dept.
Municipal Office,
Madras, 3Ist July 95.

I beg to remain,
Sir,
Your most obedient servant,

Ag. Engineer.

For approval.

Slight Has revised

31/1/96

LOCAL AND MUNICIPAL DEPARTMENT.

NOTES CONNECTED WITH G.O., No. 1672 M., DATED 19TH OCTOBER 1895.

[SUBJECT.—*Improvement of the water-supply for the town of Madras.*]

From the President, Madras Municipal Commissioner, No. 337 dated 14-9-95

The current deals with two matters :—

(1) The reply of the Commissioners to G.O., No. 1651 M., dated 7th November 1894, asking them to propose measures for financing Mr. Cousins' water-supply scheme.

(2) Their reply to G.O., No. 661 M., dated 10th April 1895, asking them if they were still prepared to tax petroleum consumed in Madras to raise funds to pay for the sanitary improvements now under consideration.

2. As to (1): A committee of the Commissioners, which comprised the President and Surgeon-Major Maitland, sat to consider G.O., No. 1651 M., dated 7th November 1894. In that Government Order Mr. Cousins' drainage scheme was not recommended for adoption as (1) it was too expensive, and (2) it was thought that its idea of house connections was unworkable. Mr. Cousins' water-supply scheme, costing 25 lakhs, and requiring 4 lakhs annually for maintenance, was recommended for adoption with the modifications suggested by Colonel Pennycuick and Mr. Jones—that the settling tank at Red Hills should be constructed, and that the inlet of the conduit to Kilpauk should be 6·83 feet higher than proposed by Mr. Cousins, the conduit having also a less fall than he suggested.

3. The committee—*vide* paragraph 9 of its report,—differs from the conclusions in G.O., No. 1651 M., and considers that, as funds are not available for both the drainage and water-supply schemes, the drainage scheme should have the preference. This was also Dr. King's opinion—*vide* his letter in G.O., No. 1226 M., dated 31st July 1895.

4. The committee therefore proposes to spend only 6 lakhs on water-supply (paragraph 17 of its report). It proposes that this money should be spent (paragraph 17 again) on (1) raising the sides of the supply channel by two feet (which it says will increase the supply 50 per cent), (2) removing all villages in the waterspread of the Red Hills lake, and (3) altering the mains in the city as the hydraulic survey may show to be necessary.

Recommendations (2) and (3) are no doubt sound, and will probably have in any case to be adopted sooner or later.

Recommendation (1) is the only step that the committee would take to remedy the existing deficiency in the supply. How it would increase the supply 50 per cent. is not understood, and it will not obviate the difficulties now felt from the pollution of the channel and the lowness of the pressure in the pipes in Madras. The closed conduit, the pumping works at Kilpauk and the filtering of the water there, which were proposed by the committee of 1890 and by Mr. Cousins are to be abandoned.

5. The Commissioners have accepted the committee's proposals (*vide* resolution, dated 31st May 1895), but have also added a recommendation that a suggestion in paragraph 4 of Mr. Loane's memorandum (Appendix B), that one lakh be also spent in raising the bund of the Red Hills lake to the level existing before the breach in 1884, should be adopted. Mr. Loane's memorandum says that by the breach in 1884 the lake level was reduced by three feet, and that only since then has the pumping at the lake, which has cost 2 lakhs in ten years, been necessary, and that the adoption of his proposal would enable a much larger volume of water to be retained in the lake.

6. Neither this last suggestion, nor the proposal to raise the banks of the delivery channel, have apparently been made before by any of the experts that have considered the matter, and it is submitted that the Chief Engineer, Public Works Department, may be asked whether they are worth carrying * out.

* My recollection is that the lowing took place in view to securing safety of the bund.

7. Having proposed to spend seven lakhs on these improvements to the water-supply, the committee and the Commissioners propose to lay out 23 lakhs on drainage.

8. They had before them, when considering the matter, two alternative schemes, one proposed by Mr. Ellis (appendix A) and the other by Mr. Loane (appendix B). Both schemes aim at getting over the objections made in G.O., No. 1651 M., to Mr. Cousins' scheme (that it was too expensive, and that the house connections would be unworkable), by doing away with house-connections for the present, and by only laying down the main drains of a system, leaving smaller drains to be done at a later period. Mr. Ellis suggests that the larger drains of Mr. Cousins' scheme be laid down exactly as he planned them in Pursewalkam, Vepery, Elembur, Egmore, Chintadripet and Triplicane, which are the parts of the town that call for immediate action, and that Mylapore, Tondiarpet, the Fort and Black town, which are in a far less evil condition, be treated later. He points out that the Chief Engineer thinks very highly of the engineering side of Mr. Cousins' scheme, and he therefore follows it exactly. He proposes to put up the pumping station at Sydenham's Road suggested by Mr. Cousins, and to send all the sewage collected there to the existing Black Town farm. His sewers would be big enough to carry all the sewage that would ever be likely to be collected in the neighbourhoods through which they pass, and therefore any future additions to his scheme would merely require to be connected with it, his original pipes remaining unaltered. The scheme would enable the farms and pumps at Triplicane, Kistnampet, Dr. Mellows' Road and Napier Park, and the picottahs and farms at Royapettah, Dams Road, Egmore and Pudupet to be closed, so there would not remain a single sewage farm among habitations. His scheme, including a lakh and a half for the extension of the existing Black Town farm, is estimated to cost 20 lakhs, and this estimate appears to have been carefully worked out, Mr. Jones' revision of the figures in Mr. Consins' estimate being adopted, and 16 per cent. being added to these in accordance with the Chief Engineer's remark in paragraph 13 of his note on page 48 of G.O., No. 1651 that even Mr. Jones had under estimated the probable expenditure on contingencies and supervision.

9. It is submitted that this scheme invites confidence, for it follows Mr. Cousins', and the estimates for it have been the joint work of Mr. Jones and Colonel Pennycuick.

10. Mr. Loane's scheme, on the other hand, is a new and original one of his own. He proposes a sewer from Mylapore all the way to Manally, 6½ miles off, along at a new alignment, and pipes and gradients different from those of Mr. Consins. He would do away with the Black town farm altogether, and start another farther inland, and he talks of pumping stations in unspecified numbers and localities, and lakhs of rupees without estimates in a manner which seems casual.

11. The committee, however, has preferred his scheme. It says, paragraph 14 of its report, that it "provides for the drainage of the whole of the city on the lines laid down by Mr. Cousins", which remark appears to be based on a misapprehension of the principles of the scheme.

12. Government has now to consider whether it will consent to the Commissioners, undertaking a partial drainage scheme at a reasonable cost. The President and all the Commissioners, the Sanitary Commissioner and the Municipal Engineers are all in favour of it, and as the objections formerly made against Mr. Cousins' scheme will be removed by the proposals now made, it is submitted that the matter is open to reconsideration. The masses of sewage that are now dealt with by the existing make shift farms, and the unsatisfactory way in which these deal with them would be appreciated by an inspection on the spot, and it is respectfully submitted that Honourable Members would be convinced of the necessity of some radical improvement after seeing the lakes of sewage which are now left to stagnate and soak into the ground in the midst of

some of the thickly populated parts of the town. G.O., No. 818 M., dated 10th May 1895, states that steps to improve matters are necessary, and defers consideration of what these steps should be.

13. If then Government decides to permit a drainage scheme to be undertaken, it is submitted that the rival schemes be forwarded to the Chief Engineer for report as to which should be adopted. It is not proposed to send them to the Sanitary Board as, setting aside the fact that the question is one of technical Engineering, Mr. Jones prefers open drains and Dr. King has pronounced in favour of Latham's system on lines of his own, and a report from the Board that was not unanimous would only increase difficulties.

14. The next matter for considerateon is the Commissioner's reply about the petroleum tax and their suggestions for raising the money for the drainage and water-supply schemes. These are detailed in the resolution of 8th July 1895, and are as follows :—

	Rs.
To increase the tolls 50 per cent., bringing in	20,000
Do. tax on vehicles and animals, bringing in	37,000
To recast schedule A of profession tax as shown	70,000
To double the compensation paid by Government under section 179.	13,500
Total ...	140,500

The petroleum tax did not find supporters. The Committee's remarks on it are in paragraphs 19—27 of its report. The Commissioner's suggestions * would cost Rs. 1,86,014 per annum, including maintenance, interest, and sinking fund. The increased taxation proposed will not meet this, so the Commissioners ask Government to grant 10 lakhs from Provincial.

* Excluding the one lakh for raising the bund of the Red Hills Lake (paragraph 18 of Committee's report).

15. It is submitted that the whole question of the means to meet the proposals may lie over until the proposals are more definitely decided upon, and complete estimates for them are ready. The money which will be required for the cinerators and rubbish tramway (G.O., No. 1177 M., dated 24th July 1895), has not been included in the Commissioners' proposals, and if the scheme suggested in the Presidents' letter in G.O., No. 1769 M. dated 19th November 1894, be referred to India and approved by it some more ready money will be available from it.

W. Francis—24-8-95.

J. F. Price—12-9-95.

~~It is quite useless to send me a file of this kind which will take days, I presume, to study, until I have disposed of the medical questions now pending.~~

~~H. W. B[liss].—13-9-95.~~

I must say that I am disposed to agree most thoroughly with the Commissioners that the chief outlay should be devoted to the improvement of drainage in preference to that of the water-supply. It must be noticed, however, that they do not propose to leave the water-supply out of consideration, but propose to spend several lakhs on it. Mr. Loane's proposals for the improvement of the water-supply should be referred to the Chief Engineer for his remarks—especially with regard to the raising of the bund of the Red Hills tank.

2. Then Mr. Ellis and Mr. Loane's rival drainage should also be submitted to him for remarks, both of these references being *urgent*. I think there is no doubt that we shall have to put down a large sum for the assistance of the Commissioners, but I do not well see that we can go into the financial question till the Chief Engineer has gone into the merits of the various schemes and advises us as to which should be adopted, and what the expense is likely to be.

As soon as the Chief Engineer has sent in his report I will go over the plans (and localities if necessary) with him in Madras.

WENLOCK.—3-10-95.

In G.O., No. 366 M., dated 6th March 1895, Mr. Ellis was appointed to undertake the hydraulic survey of Madras, which Mr. Jones and Colonel Pennycuick both considered an indispensable preliminary to the execution of Cousins' water-supply scheme (paragraph 9 of G.O., No. 1551, dated 7th November 1894).

2. In reporting, in the current, the completion of the work Mr. Ellis makes certain proposals with reference to the water-supply of the town, which have been suggested by the survey.

3. He finds that though the bigger water mains are suitable for supplying the 25 gallons a head for which Cousins' scheme estimates, the smaller pipes require many alterations before they could form part of the scheme. He finds, also, that many of the pipes want clearing. (Such cleaning would not only render the supply carried by them purer, but would increase their carrying capacity by reducing the existing friction.) In paragraph 15 are given the amount of alterations that would be necessary, and in paragraph 22 the cost of carrying these out is given as $6\frac{1}{2}$ lakhs.

4. This is, of course, in addition to the estimate of 25 lakhs for Cousins' conduit from Red Hills, and filter-beds and pumps at Kilpauk. Cousins' scheme appears, therefore, to be going to cost $31\frac{1}{2}$ lakhs.

[5. Two economies would reduce the working expenses of the scheme: (1) Mr. Ellis' survey shows that a head of 73 feet at Kilpauk would supply all but the highest parts of the town referred to in his paragraph 28 with water under a pressure of 10 feet, while separate small pumps might be used in these localities to give the necessary pressure. Cousins proposed to lift the whole supply 81·7 feet at Kilpauk that is, to lift a great deal of it 8·7 feet higher than is necessary. (2) Mr. Jones' suggestion in page 36 of G.O., No. 1651 M., dated 7th November 1894, to pump direct into the mains instead of into a cistern would also save a considerable amount of fuel.]

6. Mr. Ellis considers with the Commissioners (please see their views in current No. 2473 M.) that the need of a drainage scheme is so urgent that it would be preferable to spend some of the limited funds at the Commissioners' disposal on carrying out part of such a scheme rather than to exhaust all their resources in *perfecting* the water-supply.

7. Cousins' scheme, coupled with Mr. Ellis' alterations in the pipes, would be very complete, as the conduit would reduce pollution *en route* to a minimum, the filters would clear the water, and the pumps would distribute it under a sufficient pressure to all parts of the town. *But* it would cost $31\frac{1}{2}$ lakhs.

8. Mr. Ellis therefore goes on to make suggestions for the partial improvement of the distribution, purification, and quantity of the supply which would obviate the immediate necessity for Cousins' expensive pumps, filters, and conduit. This is "Scheme No. 2".

9. The scheme is estimated to cost Rs. 6,74,000, and is calculated to give ten gallons of water per head of the population *in ten hours*. (paragraph 24 of current). The scheme consists in carrying out the alterations and clearing of the existing pipes and the laying of the new pipes already referred to: resectioning the existing Red Hills channel and repairing it: rendering it safer by constructing a new overflow weir, so that a full supply may be brought down it without danger: and making silt-traps at Kilpauk to prevent so much silt entering the pipes as at present, and to obviate the necessity of interrupting the supply, as at present, whenever the well at Kilpauk gets choked with silt and requires cleaning.

10. Mr. Ellis claims for this scheme that it will render the water purer,—as the pipes will be cleaned, and the silt caught,—that the supply will be more continuous,—as the necessity of cleaning the well at Kilpauk will be done away with,—and that the distribution will be fairer,—as pipes of sizes accurately adapted to the wants of each neighbourhood will be laid down, and these will be regulated in such a way as to prevent the people living at the Kilpauk end of the town, where the pressure is greatest, from drawing off so much water that residents near the tails of the mains find their pressure reduced to almost nothing.

11. Mr. Ellis also claims for the scheme, and this appears to be its great advantage, that it is in reality a part of the scheme proposed both by Cousins and the Committee of 1890. For once the pipes and mains are scientifically laid, it will be possible at any time when funds are available to add any one of Mr. Cousins' further improvements, such as the filter beds, the pumps, or the conduit from Red Hills. It is submitted that this point about the scheme invites the greatest confidence in it. The expert Committee of 1890 and Mr. Cousins were agreed as to the best scheme for supplying the town, and it would appear to be far better to carry out their recommendations than to support the Commissioners' proposal to adopt a bran-new scheme of Mr. Loane's which comprises the raising of the bund of Red Hills lake and of the banks of the supply channel which no one ever suggested before.

12. The weak point about Mr. Ellis' scheme will probably appear to be the smallness of the daily supply per head—ten gallons. But special attention is invited to the fact that the scheme provides for giving this supply *in ten hours*. In the whole 24 hours a much larger supply could be given, and if cisterns were erected about the town into which the water could run during the night this additional supply would be available. Mr. Ellis' table in paragraph 18 shows that for four hours of the 24 the mains are idle, as no water is drawn from them, while for three others they are called upon to do very little. If they were made to fill cisterns for three seven hours, a large quantity of water could be collected ready for use in the busier hours of the 24.

13. The notes in the margin of the current have been made from information supplied by Mr. Ellis, whom I requested to explain some points that were not very clear.

14. It is submitted that this paper may go with the other suggestions for the improvement of the water-supply and for the drainage of the town to the Chief Engineer for opinion, and that the reference may state that Government would prefer to adopt such schemes both for drainage and water-supply as follow most closely the lines laid down by Mr. Cousins and the Committee of 1890.

W. Francis—11—10—95.

J. F. Price—11–10–95.

I submit herewith the papers in regard to the Madras water-supply scheme for perusal of the note of His Excellency the Governor. The matter was talked of incidentally at the last Council, but no orders, were as far as I remember given with regard to it. If there had been any I should as usual have made a note of it. As far as I remember it was settled that Honourable Members would look at the papers, but that full consideration of them would be deferred until the Chief Engineer's opinion had been obtained. His Excellency's note had not then returned to the office; so it was not known what he had written.

H. W. B[liss].

J. G[rose].

2. I submit also in linked file a report of Mr. Ellis on the result of the Hydraulic survey of Madras with certain suggestions as regards improvement of water-supply: this, I presume, should as suggested in the Under Secretary's note, go to the Chief Engineer.

H.W.
J.G.

3. His Excellency the Governor has not yet seen it.

It would be desirable, however that the two sets of papers should be considered together after the Chief Engineer has expressed an opinion on them.

H.W.B—12–10–05.
J.G—14–10–05.

J. F. Price—11–10–05.

[G.O., No. 1672 M., dated 19th October 1895.]

Read 8/1/96.

[G/25]
600—23-7-95.

Note connected with G.O. No 1672 M / 19-10-95 L & M. DEPARTMENT.

1 P

C. No. 2873 M.

Subject
Improvement of the Water supply for the Town of Madras

FOR ORDERS.

In G.O. 366 M / 6.3.95 Mr. Ellis was appointed to undertake the Hydraulic survey of Madras, which Mr. Jones & Col. Penny cir. all both considered an indispensable preliminary to the execution of Cousins' water-supply scheme (para 9 of G.O. 165 / 7.11.94).

2. In reporting, in the current, the completion of the work Mr. Ellis makes certain proposals suggestions with reference to the water-supply of the town, which have been suggested by the survey.

3. He finds that though the bigger water mains are suitable for supplying the 25 gallons a head for which Cousins' scheme sets mates, the smaller pipes require many alterations before they could form part of the scheme. He finds, also, that many of the pipes want cleaning. (Such cleaning will not only render the supply carried by them purer, but will increase their

carrying capacity by reducing the existing friction.). In para 15 are given the amount of alterations that would be necessary, & in para 22 the cost of carrying these out is given as 6½ lakhs.

FOR ORDERS.

4. This is, of course, in addition to the estimate of 25 lakhs for Cousins' conduit from Red Hills, & filter-beds & pumps at Kilpauk. Cousins' scheme appears, therefore, to be going to cost 31½ lakhs.

[5. Two economies wd. reduce the working expenses of the scheme. (1) Mr. Ellis' survey shows that a head of 73 feet at Kilpauk wd. supply all but the highest parts of the town referred to in his para 28 with water under a pressure of 10 feet, while separate small pumps might be used in these localities to give the necessary pressure. Cousins proposed to lift the whole supply 81.7 feet at Kilpauk, that is to lift a great deal of it 8.7 feet higher than is necessary. (2) Mr. Jones' suggestion in page 36 of GO. 1651. M. 7.11.94 to pump direct into the mains instead of into a cistern wd. also save a considerable amount of fuel.].

6. Mr. Ellis considers with the Commissioners (please see their views in ~~Gio~~ Current 2473.9.) that the need of a drainage scheme is so urgent that it wd. be preferable to spend some of the limited funds at the Comrs' disposal on carrying out part of such a scheme, rather than to exhaust all their resources in perfecting the water-supply.

7. Cousins' scheme, coupled with Mr. Ellis' alterations in the pipes, wd. be very complete, as the conduit wd. reduce pollution to a minimum, the filters wd. clear the water, & the pumps wd. distribute it under a sufficient pressure to all parts of the town. But it would cost 31½ lakhs.

8. Mr. Ellis therefore goes on to make suggestions for the partial improvement of the distribution, purification, & quantity of the supply which would obviate the immediate necessity for Cousins' expensive pumps, filters, & conduit. This is "scheme No. 2".

9. The scheme is estimated to cost Rs. 6.74.000, & is calculated

to give 10 gallons of water per
head of the population in 10 hours.
(para 24. of current). The scheme
consists in carrying out the alter-
ations & cleaning of the existing
pipes & the laying of the new
pipes already referred to: resectioning
the existing Red Hills Channel &
repairing it: rendering it safer
by constructing a new overflow
weir, so that a full supply may
be brought down it without danger:
and making silt-traps at Kilpatrick
to prevent so much silt entering
the pipes as at present & to obviate
the necessity of interrupting the
supply, as at present, whenever the
well at Kilpatrick gets choked with
silt & requires cleaning.

10. Mr. Ellis claims for this
scheme that it will render the water
purer, - as the pipes will be cleaned,
and the silt caught, - that the
supply will be more continuous, - as
the necessity of cleaning the well at
Kilpatrick will be done away with -,
that the distribution will be
fairer, - as pipes of sizes accurately adapted
to the wants of each neighbour-
hood will be laid down, these will be
regulated in such a way as to

prevent the people living at the
Kilpatrick end of the town, from
where the pressure is greatest, from
drawing off so much water that
residents near the tails of the
mains find their pressure reduced
to almost nothing.

11. Mr. Ellis also claims
for the scheme, & this appears
to be its great advantage, that
it is in reality a part of the
scheme proposed both by Cousins'
& the Committee of 1890. For
once the pipes & mains are
scientifically laid, ~~that from~~
it will be possible at any time
when funds are available to add
any one of Mr. Cousins further
improvements, such as the filter
beds, the pumps, or the conduit
from Red Hills. His submitted
that this point about the scheme
invites the greatest confidence in it.
The expert committee of 1890 & Mr.
Cousins were agreed as to the
best scheme for supplying the town,
& it wd. appear to be far better to
carry out their recommendations
than to support the Commissioners

proposal to adopt a brand new scheme of Mr. Loanes which comprises the raising of the sand of Red Hills Lake & of the banks of the supply channel which no one ever suggested before.

12. The weak point about Mr. Ellis' scheme will probably appear to be the smallness of the daily supply per head — 10 gallons. But special attention is invited to the fact that the scheme provides for giving this supply in ten hours. In the whole 24 hours a much larger supply could be given, & if cisterns were erected about the town into which the water could run during the night this additional supply would be available. Mr. Ellis' table in para 18 shows that for 4 hours of the 24 the mains are idle, as no water is drawn from them, while for three others they are called upon to do very little. If they were made to fill cisterns for three seven hours a large quantity of water could be collected ready for use in the busiest hours of the 24.

13. The notes in the margin of the current have been made from information supplied by Mr. Ellis, whom I requested to explain some points that were not very clear.

14. It is submitted that this paper may go with the other suggestions for the improvement of the water supply & for the drainage of the town, to the Chief Engineer for opinion, & that the reference may state that Govt. would prefer to adopt such schemes both for drainage & water-supply as follow most closely the lines laid down by Mr. Cousins & the Committee of 1890.—

Mr 11.10.95

Mr J. F. Price.
11/10/95

Mr. Ellis' suggestions for improving the water supply of Madras.

For orders.

H.M. + circ.

C. 12/10 enclosed file

[G. 25.] 3-7-95.

L. & M. DEPARTMENT.

again G.O. 1226 M. 31.7.95

C. No. 2473 M. from Pres. Madras Mun. Comrs.

FOR ORDERS.

I must say that I am disposed to agree most thoroughly with the Commissioners that the chief outlay should be devoted to the improvement of drainage in preference to that of the water supply. It must be noticed however that they do not propose to leave the water supply out of consideration - but propose to spend several lakhs on it: Mr. Loane's proposals for the improvt. of the water supply shd. be referred to the Chief Engineer for his remarks - especially with regard to the raising of the bund of the Red Hills tank.

Then Mr. Ellis' and Mr. Loane's trivial drainage should also be submitted to him for remarks - both of these references being urgent.

I think there is no doubt that the current deals with two matters:-

(1) The refusal of the Comrs. to G.O. No. 1651 M. 7.11.94 assisting them to finance proposed measures for ~~carrying out~~ Mr. Cousins' water-supply scheme.

(2) Their reply to G.O. 661 M. 10.4.95 asking them if they were still prepared to tax Petroleum consumed in Madras to raise funds to pay for the sanitary improvements now under consideration.

As to (1).

A Committee of the Comrs., which comprised the President and Surg. Major Maitland, set to consider the G.O. 1651 M. 7.11.94. In that G.O. Mr. Cousins drainage-scheme was not recommended for adoption as (1) it was too expensive, and (2)

It was thought that the idea of house-connections was unworkable.

Mr. Cousins' water supply scheme, costing 25 lakhs, & requiring 4 lakhs annually for maintenance, was recommended for adoption with the modifications suggested by Col. Pennycuick & Mr. Jones — that the settling-tank at Red Hills should be constructed, & that the inlet of the conduit to Kilpauk should be 6·83 feet higher than proposed by Mr. Cousins, the conduit having also a less fall than he suggested vide para. 9.

3. The Committee, in those recommendations of its report, differs from the conclusions in G.O. 1651. M. & considers that, as funds are not available for both the drainage & water supply schemes, the drainage scheme should have the preference. This was also Dr. King's opinion, vide his letter in G.O. 1226. M. 31. 7. 95

4. The Committee therefore proposes to spend only 6 lakhs on water-supply (para 17 of its report). It proposes that this money should be spent (para 17. again)

shall have to put down a large sum for the assistance of the Loan Commissioners but I do not tell the that we can go into the financial question, till the C.E. has gone into the merits of the

FOR ORDERS.

various schemes, and advises us as to wh. shd be adopted, and what the expense is likely to be.

To

3 Oct

As soon as the C.E. has put in his report — I will go over the plans — (and localities if necessary) with him in Madras.

on (1) raising the sides of the supply Channel by 2 feet (which it says will increase the suppply 50 per cent) ~~& thought how this can be in not at all understood~~, (2) removing all villages in the watershed of the Red Hills Lake, and (3) altering the mains in the City as the Hydraulic survey may show to be necessary.

Recommendations (2) and (3) are no doubt sound, & will probably have in any case to be adopted sooner or later.

Recommendation (1) is the only step that they would take to remedy the existing deficiency in the suppply. How it wd increase the suppply 50 per cent is not understood, and it will not obviate the difficulties now felt from the pollution of the channel and the lowness of the pressure in the pipes in Madras. The closed conduit, the pumping works at Kilpauk & the filtering of the water there, which have

been proposed by the Committee of 1890 & by Mr. Cousins are to be abandoned.

5. ~~In addition~~ The Commrs have accepted the Committee's proposals, (vide resolution dated 31st May 1895), but have also added a recommendation that a suggestion in para 4. of Mr. Loane's memo. (Appendix B), that one lakh be also spent in raising the bund of the Red Hills Lake to the level existing before the breach in 1884, should be adopted. Mr. Loane's memo. says that by the breach in 1884 the lake level was reduced by three feet, & that only since then has the pumping, which has cost 2 lakhs in 10 years, at the lake has been necessary, & that the adoption of his proposal would enable a much larger volume of water to be retained in the lake.

6. Neither this last suggestion, nor the proposal to raise the bunds of the delivery channel, have apparently been made before by any of the experts that have considered the matter, and it is submitted that the Chief Engineer D.P.W. may be asked whether they are worth carrying out.

× My recollection is that the lowering took place in view to securing safety of the bund.

7. Having proposed to spend 7 lakhs on these improvements to the water-supply, the Committee & the Commrs propose to lay out 28 lakhs on drainage.

8. They had before them when considering the matter two alternative schemes, one proposed by Mr. Ellis (Appendix A), & the other by Mr. Loane (Appendix B.)

Both schemes ~~propose~~ aim at getting over the objections made in G.O. 1651 M. to Mr. Cousins' scheme, (that it was too expensive, & that the house connections would be unworkable), by doing away with house-connections for the present, and by only ~~draining~~ laying down the main drains of a system, leaving smaller drains to be done at

a later period. Mr. Ellis suggests that the larger drains of Mr. Cousins' scheme be laid down exactly as he planned them in Pursewalkam, Vepery, Elembur, Egmore, Chintadripet & Triplicane, which are the parts of the town that call for immediate action, & that Nyflapore, Tandiarpet, the Fort, & Black Town, which are in a far less evil condition, be treated later. He points out that the Chief Engineer thinks very highly of the engineering side of Mr. Cousins' scheme, & he therefore follows it exactly. He proposes to put up the pumping station at Sydenhams Road suggested by Mr. Cousins, and to send all the sewage collected there to the existing Black Town Farm. His sewers would be big enough to carry all the sewage that would ever be likely to be collected in the neighbourhoods through which they pass, and therefore any future additions to his scheme would merely require to be connected with it, his original pipes remaining unaltered. The scheme would enable the farms & pumps at Triplicane, Kistnampet, De Mellows' Road & Napier Park, & the Pycrofts & farms at Royapettah, Dams Road, Egmore, & Pudupet to be closed, so there would not remain a single sewage farm among habitations. His scheme, including a lakh & a half for the extension of the existing Black Town farm, is estimated to cost 20 lakhs, & this estimate appears to have been carefully worked out, Mr. Jones' revision of the figures in Mr. Cousins' estimate being adopted, & 16 per cent. being added to these in accordance with the Chief Engineer's remark in para 13. of his note on page 48. of G.O. 1657 that even Mr. Jones had underestimated the probable expenditure on contingencies & supervision.

9. It is submitted that this scheme invites confidence, for it follows Mr. Cousins, & the estimates for it have been the joint work of Mr. Jones & Col. Pennycuick.

10. Mr. Loanes scheme on the other hand is a new & original one of his own. He proposes a sewer from Reclafore all the way to Manalley, 6½ miles off, along a new alignment, & pipes & gradients different from those of Mr. Cousins. He would do away with the two Black Town & form altogether, & start another further inland, & the talks of pumping stations in unspecified numbers & localities, and Lakhs of rupees without estimates in a manner which seems casual.

11. The Committee, however, have preferred his scheme. It says, para 14 of its report, that it "provides for the drainage of the whole of the city on the lines laid down by Mr. Cousins", which remark appears to be based on a misapprehension of the principles of the scheme.

12. Govt. has now to consider whether it will consent to the Commrs. undertaking a partial drainage scheme at a reasonable cost. The President & all the Commissioners, the San. Commrs. & the Municipal Engineers are all in favour of it, & as the objections formerly made against Mr. Cousins' scheme will be removed by the proposals now made, it is submitted that if in the matter is open to reconsideration. The masses of sewage that are now dealt with by the existing make shift farms, & the unsatisfactory way in which these deal with them would be fully appreciated by an inspection on the spot, & it is respectfully submitted that Hon. Members might would be convinced of the necessity of

9. It is submitted that this some radical improvement after seeing the lakes of sewage which are now left to stagnate & soak into the ground in the midst of [some of the thickly populated parts of the town.

10. 818.M 10.5.96. states that steps to improve matters are necessary, & defers consideration of what these steps should be.

13. If then Govt. decides to permit a drainage scheme to be undertaken it is submitted that the rival schemes be forwarded to the Chief Engineer for report as to which should be adopted. It is not proposed to send them to the Sanitary Board as, setting aside the fact that the question is one of technical engineering, Mr. Jones prefers open drains, & Dr. King has pronounced in favour of Latham's system on lines of his own, a report from the Board that was not unanimous would only increase difficulties.

* Excluding the one lakh for raising the bund of the Red Hills Lake, (para 18. of Committee's report).

14. The next matter for consideration is the Comm^rs' reply about the Petroleum tax and their suggestions for raising the money for the drainage & water-supply schemes. These are detailed in the resolution of 8th Feb 1895, & are as follows:-

	Rs.
To increase the tolls 50 per cent, bringing in	20.000
Ditto tax on vehicles & animals, bringing in	37.000
To recast schedule A of professions tax as shown	70.000
To double the compensation paid by Govt. under sec. 179	13.500
Total	1.40.500

The ~~tobacco~~ petroleum-tax did not find supporters. The Committee's remarks on it are in paras 19-27 of its report. The Comm^rs' suggestions would cost Rs 1.86.014 per annum, including maintenance, interest, and sinking fund. The proposed increased taxation will not meet this, & the Comm^rs ask Govt. to grant 10 lakhs from Provincial.

15. It is submitted that the

It is submitted that the whole question of the means to meet the proposals may lie over until the proposals are more definitely decided upon, & complete estimates for them are ready. The money which will be required for the cinerators & rubbish tramway (G.O. 1177.M. 24.7.95) has not been included in the Comm^rs proposals, & if the scheme suggested in the President's letter in G.O. 1709 M 19.11.94 be reported to & approved by H.E. some ready money will be available from it.

W. 28.8.95

H.E. 29/8/95

Drainage & Watersupply schemes for Madras City.

H.M. & circ

(for orders)

His suite useful. Send me a file of letters which will take days, I presume, to study, until I have disposed of the most pressing questions now pending.

H.W. 13/9/95

C.P.C. 23/10

[G 2.] 600—23-7-95.

DEPARTMENT.

118

C. No.

FOR ORDERS.

I submit herewith the papers in regard to the Madras Water Supply scheme noted in Journal of the 20th of the Govt. The matter was talked of incidentally at the last Council but no orders were as far as I remember given with regard to it. If there had been any I should as would have made a note of them. As far as I remember it was settled that H.E. would look at the papers but that consideration of them would be deferred until the C.E.'s opinion had been given. H.E. not had not then returned to the Office, so it was not known what he had written.

I submit herewith also an Enclosed file a report of Mr Ellis on the results of the Hydraulic Survey of Madras with certain suggestions in regard to improvement of water supply: this I presume should be suggested in the G.O.'s note for

H.E. [illegible]

J.S. 14.W.13.

Drainage and water supply schemes for Madras city

FOR ORDERS.

H.W.B
12/10/95

J.S. 14/10/95

Hon: the Chief C.E
Hon: Mr Grose

To the C. E.

1st The Govt can however not act—
seem it.

It would be desirable however that
the two sets of papers should be
considered together after the C.E
has expressed an opinion on them

Advice
11/10/95.

From the President Municipal Commission, Madras as to the present condition of the Chief Engineer's office has been torn in many portions and is not fully available for reference.

Replies

16. 1. 96.
Sept.

As the copy of this is also in mss and forbad with the Govt. I fear will not be able to say Copy. I will however make a trial

Copy
3/11

[illegible] DEPARTMENT.

418

Papers to be read in proceedings:—

Again G.O., dated 189 , No.

Again G.O., dated 189 , No.

Current No. 2473.M of 1895, dated , from

" " 2873 " 1895, " , "

" " 189 , " , "

ORDER. No 1672 Mun. 19-10-95

The papers will be referred to the D.P.W. with the request that the opinion of the Chief Engineer upon the schemes for the improvement of the drainage & water supply of the city suggested by Mr. Mills and Mr. Loane may be obtained & forwarded to Govt. at a very early date.

2. Meanwhile ~~further~~ The consideration of the financial aspect of the matter will be deferred.

15.10.95

16/10/95

To D.P.W. Copy from order
Con. Cor. 2473 & 2873 in reference to
From Madras Mun. Commr.

Desp 23/10/95.

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Drainage & Sewerage Schemes for Madras.

Cdg.

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(from orders).

1672m

...ENCLOSURES TO C. No. 2873m

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500—11-11-04.

LOCAL AND MUNICIPAL DEPARTMENT

C. No.

TELEPHONE MESSAGE.

From The Supdt

To LOCAL AND MUNICIPAL SECRETARIAT,

The Manager, Corporation of Madras

Dated 3rd Jan 1906.

Please send as early as possible a copy of Mr Ellis' report on the Hydraulic Survey of the Madras city which formed the enclosure to Gf. No 337 dated 14-9-95

29-6-05 ✓

23-12-05

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Ot Mun'l Commn's letter No 265 A — II

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SURES TO G. No. 2873M — A —

Ot Mun'l Commn's letter No 265 —

" 1-8-05 — A

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Send proofs

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25.11.86

2/12/86 RH

21.12.90 RH

8/12/90 RH/86