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MADRAS RECORD OFFICE.**Government of Madras.***Public Works* **DEPARTMENT.**

G.O. No. 528-29	Press
429-32-33	Mis.
Dated 26-2-	1872.

Not to be folded or roughly handled

21

*Proceedings of the Madras Government, Public Works Department,
26th February 1872.*

Read the following papers :—

No. 429. Proceedings of the Madras Government in the Public Department, dated 3rd October 1871, No. 1,497.

Read the following letter from the Sanitary Commissioner for Madras, to the Chief Secretary to Government, Fort St. George, dated Bangalore, 18th September 1871, C, No. 54.

I HAVE the honour to acknowledge receipt of Proceedings of Government No. 2,178, of 24th August, Public Works Department, containing certain reports on the quality of the waters of the Ulsoor lake and Dhobies' wells at Bangalore.

2. As Government are aware I visited Bangalore in April last to make myself acquainted with the water-supply question, and, during my inspection of the station in July and August, I have had the subject constantly before me; I trust, therefore, that I shall be enabled, in the present communication, to afford all the information that is really essential to enable Government to take practical action in the completion of the water works project.

3. The investigations of Assistant Surgeon Nicholson have, I think, shown most conclusively that the water of the Ulsoor lake, when subjected to proper filtration, is not of that dubious character which former chemical analyses seemed to indicate. I have myself verified his analyses so far as the proportion of organic matter and the presence of nitrates are concerned, and, as these are the only really important considerations in a sanitary point of view, I have no hesitation in accepting his conclusions that the lake water at the present time exhibits no evidence of sewage contamination. The proportion of organic matter in the filtered water is not large, and not more than exists in many waters which are considered to be quite wholesome and fit for drinking, while analyses show that the water contains but the faintest traces of nitrates, not more it is estimated than one part of nitric acid in 10,000,000 parts of water.

4. A very great improvement has taken place in the quality of the filtered water. When I inspected the works in April last, the filtration was by no means good, and the water in the reservoirs was white and opaque. Now by the use of a better quality of sand, and passing the water through a pipe containing coarsely-divided animal charcoal, it comes out quite clear and bright, and so pure is it that it may be kept for months in bottles without any decomposition or growth of vegetable or animal life. These improvements are due mainly to the practical suggestions of Dr. Nicholson.

5. From a careful examination of the lake and its feeding grounds, I am satisfied that not more than an infinitesimal amount of sewage finds its way into the lake. The ordinary house drainage of the bazaar is conveyed away in a covered sewer which runs beneath a shallow corner of the lake, and is taken away to paddy fields below the Dumbloor tank. When heavy rain falls, some surface washings of the bazaar and streets of the valley above the lake do undoubtedly find their way into the lake; but, taking into account the fact that the conservancy of the streets and waste places about Bangalore is exceedingly good, this unavoidable pollution, in relation to the great bulk of water collected in the lake, is practically unimportant.

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6. The Ulsoor tank water is not an inviting fluid to look at. The drainage area feeding the lake consists of red soil, or decomposing felspathic rocks, and the water consequently retains a considerable amount of reddish or yellowish clay in suspension. Formerly, when aquatic plants were allowed to grow in the lake, the water was much clearer. Now the only vegetation is a green scum that floats on the surface, and where this scum collects on the tank margins and dries up, it is apt to give out very disagreeable smells.

7. This vegetable growth, which consists mainly of a microscopical *confervæ*, has, I make no doubt, tended to give the Ulsoor tank water a bad reputation. Some years ago, Dr. Orr collected a quantity of it and sent it to the Chemical Examiner for analysis. In transit to Madras some of the bottles burst, owing to the decomposition going on in the vegetable matter. The remaining bottles were received with the contents in a state of advanced decomposition, stinking abominably, so that the Chemical Examiner could only infer that they contained fecal matter.

8. The green scum, being a highly nitrogenized substance, would, in decomposing, necessarily resemble, in odour and appearance, decomposing fecal matter. Had the Chemical Examiner been made acquainted with the nature of the substance sent for investigation, the horrible odour of the decomposing compound might have been accounted for otherwise than on the supposition that fecal impurities abounded in the lake. I am not aware of any chemical or other test which would enable any one to distinguish such composition from fecal matter.

9. I believe that this is the true explanation of the supposed fecal contamination of the lake water, and my impression is that there are no grounds for supposing that such contamination is of common occurrence, and that there are very few large lakes in this country which receive so little impurity of that description as the Ulsoor lake does.

10. As a rule, the inhabitants of the Bangalore bazaar adopt the system of cess-pit privies in their private houses. The manure from these is carefully carted away when necessary, and used in agriculture. This, in fact, is the only station I have yet visited where manure of every description is eagerly sought for, and frequently bought at rather high prices by the cultivators. This being the case it necessarily follows that fecal contamination of the lake water cannot be so common as in other places where natives are in the habit of defiling waste places, and where they place no value on animal manure.

11. I think, therefore, that Government may be assured that the Ulsoor lake is not a receptacle of sewage, and that, although it does receive the rainfall of the valley in which a rather densely-populated town stands, yet that the resulting impurity of the lake water is practically unimportant, mainly on account of the careful conservancy of the town and the habits of the native population.

12. The suggestion of Dr. Nicholson for planting bulrushes or aquatic plants in the shallow parts of the tank, where the several feeding channels enter the lake, is a good one, and should be carried out with the view of arresting the silt of the flood waters, and to help their purification.

13. Notwithstanding the improved filtration of the lake water by artificial means, I must not omit to dwell upon the important fact that it still contains *rather*

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more than three times the quantity of organic matter that the Dhobies' well water yield. The Dhobies' well water obtains a very high standard as regards organic impurity. I by no means would wish it to be inferred that the Ulsoor filtered water is not a wholesome drinking water, because it compares unfavourably with the Dhobies' wells water as regards organic constituents. There are very many well and tank waters in Bangalore which contain much higher proportions of organic matter than the Ulsoor lake water does, which waters are habitually used by the population. No one can tell how much organic matter in water makes it wholesome or dangerous. Probably, in this matter, everything depends upon the nature and antecedents of the organic impurity. The filtered lake water has a distinct taste, to my palate, of vegetable matter, while the Dhobies' wells water is perfectly free of all organic taste. Both, I have no hesitation in saying, are, under ordinary circumstances, perfectly wholesome water, such as may be safely issued for the use of troops or the native population; but of the two, the Dhobies' wells water, owing to its freedom from all organic matter, must necessarily be the safest and the best.

14. The Dhobies' wells water is simply the water of the Ulsoor lake, subjected to a natural filtration through a stratum of lateritic gravel. It has this great advantage over water subjected to artificial filtration, that it is not liable to suffer from neglect or inefficiency of the filtering apparatus. The Ulsoor lake water, as now filtered, is a very fair specimen of a potable water; but if the filter beds were neglected, or the animal charcoal allowed to be clogged, a very different result might be expected. The natural filter bed, on the other hand, is independent of human supervision, and it has this very great recommendation, that it actually removes two-thirds of the organic matter which remains in the water artificially filtered. The Dhobies' wells water probably is as good a water for domestic use as could be procured anywhere. It approaches very nearly to the standard of distilled water in regard to the amount of organic impurity.

15. This very pure water being at hand and available, it only remains to consider whether it is obtainable in quantities sufficient for the use of the troops in the first instance, and of the bazaar population in the second. As regards the former, Captain Woods has shown, as the result of recent experiments on the yield of the Dhobies' wells, that if the area of the present number of wells be doubled, there will be an ample supply of the very purest water obtainable for the whole of the troops in garrison. There is ample space for the sinking of more wells, and I think it would be advisable that a few of these should be of larger capacity than those already sunk. The cost of these wells would be but trifling.

16. I advocate the sinking of extra wells, and the supply of the troops wholly from the Dhobies' wells, because I am assured that there is no difficulty whatever in arranging the present works with that object, and that the large engine on the rock and distribution apparatus can be made available for raising the water. All that is necessary is to connect the pumping engine with the nearest well, which would require about one thousand feet of piping, the greater portion of which is ready at hand. By using the Dhobies' wells water, the troops will be guaranteed a supply of the purest water obtainable, and the risks to health and life incidental to the use of doubtful or impure water will be reduced to a minimum.

17. I think it is a doubtful question whether the wells will yield, in addition to the supply for military purposes, enough for the use of the bazaar population.

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The natural filtration through the gravel bed is a slow process, and the filtering area is limited. Should the supply hereafter prove to be no more than sufficient for the troops, or should it at any time run short, there would not, in my opinion, be the slightest objection to the distribution of Ulsoor filtered water through the pipes used for the well water. The points of difference in the two waters as to the amount of organic matter are too slight to cause any apprehension of fouling the purest of the two.

The filtered lake water is much better than the majority of the bazaar people are in the habit of using; and, if the Municipality provided reservoirs for its reception and the necessary distribution works, the engine is quite capable of pumping up a supply for the use of a considerable portion of the town.

18. I may here point out that all the drinking water of the troops is at present drawn from one of the Dhobies' wells, and that the water in this particular well shows decided evidence of fouling. This is scarcely to be wondered at when it is considered how many dirty leathern-buckets are dipped into the water every day, with dirt from the puckallies' feet, and soakage from the spilled water around the well. The water from this well took .0004, and that from an unsued well .0002 grammes of oxygen, and the former showed very distinct traces of nitric acid while the latter gave only the faintest evidence of its presence. This fouling of the well is certainly due to the very crude method of raising the water, and it is liable to increase so long as the present practice is followed of bringing an army of dirty puckallies to the well day after day.

19. The case affords an excellent example of the way in which the very best of water in its natural state may become fouled by native usages. I could hardly have supposed that there would have been such perceptible evidence of fouling if I had not myself verified Mr. Nicholson's experiment on the point. The fact should teach the necessity of adopting such appliances for the raising and distribution of water as should effectively prevent the possibility of contamination.

20. Up to the present time no water-main has been led on to the Infantry barracks. New swimming baths have been built, but there is no water to fill them; the distributing reservoir has not yet been built. This portion of the project should be completed without delay, for the want of a good water-supply is much felt here.

21. The masonry reservoirs in the Artillery and Cavalry lines, which are intended to hold clean filtered water, are unprovided with roofing; as a consequence the water pumped into them is liable to constant fouling from dust and other impurities. The crows, for instance, bring putrid bones, which they constantly drop into the water, and mischievous persons throw into the reservoir broken bottles, and other rubbish, which they cannot otherwise dispose of. On cleaning the Cavalry reservoir lately, the bottom was found covered with old bones, broken bottles, mud, and other rubbish. Without proper coverings to the reservoirs, and protection of the water from dust, birds, etc., its original purity at its source will be but of doubtful value to consumers.

22. In a climate like that of Bangalore, where the rainfall is but moderate, it seems advisable to have more than one resource for water in the event of a series of adverse seasons occurring.

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The late Sir William Denison, when Governor of Madras, and His Excellency Sir Gaspard LeMarchant both approved of the collection of rain water from the roofs of the barrack buildings on the Race-course and its storage in underground reservoirs. One of these reservoirs was actually begun some years ago and is still in an unfinished state. The experience gained at Trimulgherry shows, I think, that such rain water reservoirs might become of great value if properly used. In Bangalore the subsoil water is only found at a great depth from the surface, and when it is obtained, it is not always of good quality. The storage of rain water on a large scale might certainly be attempted, both as regards the race-course barracks and those occupied by the Infantry. It would always be useful for bathing, washing, and cooking, even if it were thought better to employ other water for drinking purposes; and, although stored rain water is liable to suffer from organic developments, a very simple measure would, at all times, make it quite fit for drinking use. A reserve of locally-stored water would always be most valuable, and especially in the event of any accident to the distributing apparatus of the Ulsoor Water Project.

Indeed, in a place like Bangalore, I do not think that too much can be said in favour of any scheme for the collection and storage of pure water. The station occupies so high a plateau, and is growing so fast in extent and population on the higher grounds where the supply of water from the lake is impracticable, that it seems to me highly advisable that the collection of rain water from the roofs of houses, in underground cisterns, for domestic use, should be generally encouraged.

COMMUNICATED to the Public Works and Military Departments.

(True Extract.)

(Signed R. F. OAKES, Captain, R.E.,
Acting Joint Secretary, P. W. D.,
for Chief Secretary.

No. 430. Endorsement of the Secretary to Government, Public Department.
From Surgeon H. KING, A. B., M. B., Chemical Examiner, to the Chief Secretary to Government, Fort St. George, dated Madras, 6th October 1871, No. 224.

I HAVE the honour to inform you that, in obedience to G. O., No. 2,178, of 24th August 1871, Department Public Works, I proceeded to Bangalore for the purpose of examining the water of the Ulsoor tank before and after filtration.

2. Heavy rain had fallen immediately before my visit. I found the tank water yellow and turbid. The sample which I drew from it at the rock had no offensive odour, even after having been kept some days, though the shore of the tank was very foul in some places and the smell highly disagreeable. On examination I found 0.510 grm. per litre of solid matter, of which 0.130 grm. was volatile. Chlorides, estimated as sodium chloride, amounted to 0.037 grm. per litre. I detected neither nitrates nor ammonia. It is evident that the condition of this water is improved since it was examined on former occasions in this office; but no one, I presume, could recommend it for use without filtration.

3. After leaving the filter some of the water passes through nine feet of animal charcoal contained in a metal pipe. I examined some of the water collected

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from the free end of this pipe. It was perfectly clear, sweet, and fit for any use. The estimated oxygen necessary for removing the putrid, readily putrefying and slowly putrefying organic matter, respectively, did not exceed 0.00010, 0.00015, and 0.00030, and one determination yielded lower figures. The chlorine was the same in amount as in the unfiltered tank water. Ammonia and nitrates were absent. The solid residue was inconsiderable, and of this not more than a centigram per litre was volatile.

4. I took a sample of the water delivered at the barracks also. The fact that I had previously examined this water and pronounced it wholesome and fit for use appears to have been overlooked. On this occasion I found it sweet and pleasant to the taste, clearer than the produce of the Dhobies' wells, although inferior in this respect to the sample taken directly from the filter. The organic matter as estimated by the permanganate test, though absolutely small, was double that of the other sample. I believe the water in its present condition might be used for drinking and cooking without mischief.

5. The mixture of water filtered merely through sand and charcoal with that which has also passed through the animal charcoal; the exposure of the filtered water-basin and of the barrack reservoirs to pollution of various obvious kinds; and, probably, foulness of the pipes through which (if I have not been misinformed) unfiltered Ulsoor water was until recently driven, account for the inferiority of the water delivered at the barracks to that issuing thoroughly filtered at the water works.

6. I think it desirable to state, in order to remove misapprehensions which appear to exist, that filtered Ulsoor water has never been pronounced unwholesome or unfit for use either by me or my predecessors; that no analyses giving results contradictory to those recently obtained by Mr. Nicholson have been made here; and that there is no difference of opinions between that officer and myself either as to the quality of the water or as to the method of ascertaining its fitness for domestic use.

TRANSFERRED to the Public Works Department, with reference to the orders in that department, dated 24th August 1871, No. 2,178.

(Signed) W. HUDLESTON,
Secretary to Government.

No. 431. From the Acting Superintending Engineer, 5th Division, to the Secretary to Government, Public Works Department, dated Salem, 20th December 1871, No. 203.

I HAVE with reference to G. O., No. 1,933, of 22nd July 1871, the honour to

Twenty as per annexed list.

submit plans, estimates, etc., (particularised in the annexed list,) for completing the projects for the water-supply of the garrison of Bangalore, known as the Ulsoor and Dhobies' wells projects; accompanying these is a copy of a letter from the Executive Engineer, Bangalore.

2. As regards the present water-supply I may mention that the water of the Ulsoor tank is pumped into a filtering tank, from which it is passed into a sweet

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water basin, whence it is again pumped and passed through pipes for the supply of the troops. I am, however, informed that this water is only used for cooking and bathing purposes, and that all the drinking water is brought or supposed to be brought, by puckallies, from the Dhobies' wells.

3. I believe I am correct in saying that the Chemical Examiner is now agreed with Dr. Nicholson that the filtered water of the Ulsoor tank is of sufficient purity to warrant its use for all purposes, but I have no official information on the subject, and I merely notice it as Government may, on account of the somewhat less cost required to complete the Ulsoor project, be induced to give it their preference.

4. The main features of the Ulsoor scheme are to continue the main from the east gate of the Infantry barracks to a cistern in the Commissariat square, from which lines of distribution piping are to be laid for the supply of the above barracks; also to provide for the supply of the hospital on the Race-course.

	RS.
The cost of the project complete is estimated at	2,77,600
Amount already spent is	2,22,902
Amount required for completion is	54,698

5. The Dhobies' wells project includes the works aforementioned as required for the Ulsoor scheme, and, in addition, the provision of eighteen more wells and the laying of a pipe from the engine-house to the sweet water basin of the Ulsoor tank.

	RS.
The cost of the complete project is	3,00,000
Expenditure up to date is	2,22,902
Balance required for completion is	77,098

6. From the foregoing it will appear that the Dhobies' wells' scheme is the more costly by Rupees 22,400.

7. The Executive Engineer provides in his estimate fifteen gallons per head for a population of 2,400, a consumption somewhat in excess of present requirements as deduced from observation; at the same time Captain Wood expresses his firm conviction that a supply of ten gallons per head and eight gallons per horse will be found sufficient. On these data the supply required would be—

	RS.
2,400 souls at 10 gallons each	24,000
850 horses at 8 do.	6,800
Total gallons required	30,800

or about 5,000 less than is provided for.

8. Captain Wood further recommends that the pumps at present worked by the Dhobies' wells engine, and capable of raising 100 gallons per minute, be replaced by others of three times the capacity; he shows that the engine has ample power to work these larger pumps, and his reasons for recommending the alteration are so good that I strongly second his proposal.

9. It will be seen that the increased cost of the Dhobies' well project is solely due to the provision of extra wells and a pipe to the fresh water basin of the Ulsoor tank; I am myself strongly of opinion that this work should be carried out

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to secure an alternative source of supply should that of the Ulsoor tank be insufficient, or should any circumstance occur to render it inadvisable to make use of its water.

10. I have myself examined all the works in company with Captain Wood, and am of opinion that the projects as now presented to Government are very complete, and that all requirements are provided for.

11. I would call the special attention of Government to the high praise accorded by Captain Wood to Mr. Smith, the Mechanical Engineer in charge of the Ulsoor water works. I can myself testify to the great interest manifested by Mr. Smith in his work, to his perfect acquaintance with all its details, and to the beautiful order in which his machinery and everything connected with the works is kept. Recognition by Government of acquaintance with this would of course be very gratifying, and would also I am sure be very encouraging to Mr. Smith.

12. In conclusion, I would strongly recommend that the half filter at the Ulsoor works at present useless from being out of repair, be at once put in thorough order; the reasons for this are so obvious that it seems quite unnecessary for me to repeat them. The cost of this has not been included in the project as it may be fitly provided for from the head of "Repairs Military."

No. 423.

ORDER THEREON, 26th February 1872, No. 528.

MILITARY WORKS, No. 15.

IN Proceedings dated 22nd July 1871, No. 1,933, the Government desired to be informed what would be the total expenditure required to complete separately the Ulsoor and Dhobies' wells projects at Bangalore. The Superintending Engineer complies with this requisition in his letter of the 20th December 1871, No. 203, ~~herein submitted.~~

2. The total cost of the Ulsoor project is estimated at Rupees 2,77,600, and Rupees 2,22,902 having been already expended, the amount required to complete is Rupees 54,698. The works proposed to be carried out are the continuation of the main from the east gate of the Infantry barracks to a cistern in the Commissariat square, from which lines of distribution pipes are to be laid for the supply of those barracks and the hospital on the Race-course.

3. The total cost of the Dhobies' wells project is estimated at Rupees 3,00,000 and deducting the expenditure of Rupees 2,22,902 up to date, the balance required for completion is Rupees 77,098. This project provides, in addition to the works proposed in connection with the Ulsoor scheme, eighteen extra wells and the laying of a pipe from the engine-house to the sweet water basin of the Ulsoor tank.

4. In the opinion of the Executive Engineer the actual consumption of water by the troops is not likely to exceed ten gallons per head and eight gallons for each horse daily. On these data the supply required will be 30,800 gallons for 2,400 people and 850 horses. The project as estimated provides for a daily consumption of 36,000 gallons, being at the rate of 15 gallons per head.

5. The Acting Superintending Engineer strongly recommends that the Dhobies' wells project should be carried out to completion to secure an alternative source of supply, and he also suggests the expediency of at once putting into

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thorough repair the half filter at the Ulsoor works which cannot be used in its present state. The cost of these repairs has not been provided for in the scheme.

6. The report of the Chemical Examiner which, in G. O., No. 2,178, dated 24th August 1871, it was resolved on awaiting is now before Government, as also report from the Sanitary Commissioner on the subject.

7. Dr. King considers that the filtered water has improved since its examination on former occasions, and, in pronouncing it fit for drinking and cooking purposes, he remarks that it was never declared by him or his predecessors unfit for use, and that there is no difference of opinion between Assistant Surgeon Nicholson and himself regarding its quality.

8. The opinion which the Sanitary Commissioner has formed is that although under ordinary circumstances the water of the Ulsoor tank is perfectly wholesome, and may be safely issued for the use of the troops or the native population, the Dhobies' well water, owing to its freedom from all organic matter, is the safest and the best. The sinking of extra wells, and the supply of the troops wholly from the Dhobies' wells is accordingly advocated, and if the supply hereafter prove to be insufficient for both the troops and the bazaar population, the Sanitary Commissioner considers there would be no objection to the distribution of the Ulsoor filtered water through the pipes used for the well water. The two schemes are so far advanced that the Government consider that both should be completed in order that they may assist each other, on the condition that the water from the two sources of supply is transmitted by the same pipes to the same reservoirs. The ruptured filter at the Ulsoor works should be put into thorough repair, as also the cistern which failed on the Bangalore side.

9. The Government are not prepared to sanction at present the proposals of the Sanitary Commissioner for roofing the masonry reservoirs in the Artillery and Cavalry lines, and for collecting the rain water from the roofs of the barrack buildings on the Race-course and storing it in underground reservoirs.

10. The Government are gratified to notice the high praise accorded by Captain Wood to Mr. Smith, the Mechanical Engineer in charge of the Ulsoor works.

(Here enter No. 529, dated 26th February 1872.)

(True Extract.)

Colonel, R.E.,

Secretary to Government.

To the Acting Superintending Engineer, 5th Division.

.. Military Department.

.. Public ..

.. Controller of Public Works Accounts.

.. Sanitary Commissioner.

Exd. S. T. Augustin.

PUBLIC WORKS DEPARTMENT,
FORT ST. GEORGE, 26th February 1872.

No. 433.

No. 529.

To

THE SECRETARY TO THE GOVERNMENT OF INDIA,

PUBLIC WORKS DEPARTMENT.

MILITARY WORKS, No. 16.

SIR,—Referring to paragraph 9 of my letter of the 29th ultimo, No. 270, I am directed herewith to forward a letter from the Acting Superintending Engineer of the 5th Division, giving cover to plans and estimates for completing the Ulsoor and Dhobies' wells projects

G. O., 18th May 1870, No. 1,278.	
„ 8th Sept. „ „ 2,152.	
„ 28th March 1871 „ „ 919.	
„ 15th May „ „ 1,333.	
„ 22nd July „ „ 1,933.	
„ 24th August „ „ 2,178.	
„ 8th Sept. „ „ 2,292.	

separately, together with the Proceedings of this Government thereon, and the correspondence, as per margin, which has taken place since the subject came under the consideration of the Government of India in their letter of the 17th November 1869, No. 1,169 B. M.

2. It will be observed from the reports of the Chemical Examiner and Assistant Surgeon Nicholson, Analyst of Potable waters, that the filtered water of the Ulsoor tank has so much improved since its examination on former occasions as to be considered fit for drinking purposes.

3. The water of the Ulsoor tank is pumped into a filter bed through which it passes into a sweet water cistern, and thence it is passed over a stand pipe of sufficient elevation through lines of main and branch piping into cisterns supplying the Royal Horse Artillery barracks, and the Race-course barracks occupied by the Cavalry and two Field Batteries. The cistern at the Royal Horse Artillery barracks contains about 192,000 gallons, while that at the Race-course barracks about 288,000 gallons, and at the rate of 15 gallons per head per diem, and 10 gallons per diem for each horse, the cisterns respectively contain about 27 and 12 days' supply. The works estimated for completing the project are to continue the main to a cistern in the Commissariat square and to lay lines of distribution pipes from it to the Infantry barracks, and for the supply of the hospitals at the Race-course barracks. The cistern at the Infantry barracks is designed to contain a week's supply.

4. The Dhobies' wells, which were found to yield water of the most pure and wholesome description, were purchased in 1868. They are sixteen in number, and a preliminary expenditure has been incurred in the erection of engine and boiler-houses with chimney stalk, etc. Experiments undertaken to ascertain to what extent the wells would afford a supply of water for the troops, showed the necessity for increasing the number of wells, and provision has accordingly been

with of water No. 224
From Surgeon W. King A. B. M. B.
Chemical Examiner.

To,
The Chief Secretary to Government
Fort Saint George
Sir

I have the honor to inform you
that in obedience to G. O. No. 2178 of 24th
August 1891 D.P.W. I proceeded to Banga-
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delivered at the Barrack cistern. The fact that I had previously examined this water and pronounced it wholesome and fit for use appears to have been overlooked. On this occasion I found it sweet and pleasant to the taste, clearer than the produce of the Whobies' Wells, although inferior in this respect to the sample taken directly from the filter. The organic matter, as estimated by the permanganate test, though absolutely small, was double that of the other sample. I believe the water in its present condition might be used for drinking and cooking without mischief. The mixture of water filtered merely through sand and charcoal, with that which has also passed through the animal charcoal, the exposure of the filtered water basin and of the barrack reservoirs to pollution of various obvious kinds, and probably of foulness of the pipes, through which (if I have not been misinformed)

2178.

Ch 430

Ad. C. 20 July 1872 A. 22
C. 12 July 1872 A. 16

Dated 6th } October 1871
Received 9 }
Recd. 27 }
Enclosures - None.

No 2141 N^o 224
gives results of
analyses of water of the
Ulsoor Tank made
on the spot agreeable
to G. C. N^o 2178 of 24th
August 1841. D. P. W.
N^o 52 Vis 29: Feb 1841

From,
Captain J. Tertue R. E.,
Superintending Engr, 5th Dist.

Colonel J. Harpendale R. C.
Secretary to Government, M. D.

Enclosures
20 as per annexed
List

I have, with reference to G.O. No. 1933 of 29th July 1871, the honor to submit Plans & Estimates, for par-
ticularised in the annexed List, for com-
pleting the Projects for the water
supply of the garrison of Bangalore
known as the Ulsoor and Shikier
Wells Projects; accompanying these is
a copy of a letter from the Executive
Engineer, Bangalore.

As regards the present water supply I may mention that the water of the Ulsoor Tank is pumped into a filtering Tank from which it is

passed into a Sweet water Basin, whence it is again pumped and passed through pipes for the supply of the troops. I am, however, informed that this water is only used for Cooking and Bathing purposes and that all the Drinking water is brought or supposed to be brought, by Puckalis from the Dho-ber Wells.

3. I believe I am correct in say-
ing that the Chemical Examiner is now
agreed with Doctor Nicholson that the
Filtered water of the Ulsoor Tank is
of sufficient purity to warrant its use for
all purposes but I have no official in-
formation on the subject and I merely
notice it as Government may, on account
of the some what less cost required to
complete the Ulsoor Project, be induced
to give it their preference.

4. The main features of the Ulsoor

Scheme are to continue the main from the
East Gate of the Infantry Barracks
to a Western in the Commissariat square,
from which lines of distribution piping
are to be laid for the supply of the above
Barracks also to provide for the supply
of the Hospital on the Race Course.

The cost of the Project complete is Esti-
mated at Rupees ————— 277,600

Amount already spent is Rupees — 222,902

Amount required for completion is — 54,698

5. The Dhober Wells Project in-
cludes the works afore-mentioned as required
for the Ulsoor scheme and, in addition, the
provision of 18 more Wells and the laying of
a Pipe from the Engine House to the Sweet
water Basin of the Ulsoor Tank.

The cost of the complete Project is Ru — 3000,000

Expenditure up to date is — 222,902

Balance required for completion is — 770,998

6. From the foregoing it will appear

that the Dhobies Wells Scheme is the
more costly by Rs 22400.

The Executive Engineer provides
in his Estimate 15 Gallons per head for a
population of 2400, a Consumption some-
what in excess of present requirements
as deduced from observation. at the same
time Captain Wood expresses his firm
conviction, that a supply of 10 Gallons
per head and 8 Gallons per horse will
be found sufficient. On these data the
supply required would be

2400 Souls at 10 Gallons each	24000
850 Horses at 8 Do.	6800

Total Gallons required 30800

is about 5000 less than is provided for.

Captain Wood further recom-
mends that the Pumps at present worked
by the Dhobies Wells Engine and ca-
pable of raising 100 gallons per minute,
be replaced by others of 3 times the

capacity; he shows that the Engine has
ample power to work these larger pumps
and his reasons for recommending the
alteration are so good that I strongly
second his proposal.

It will be seen that the increas-
ed cost of the Dhobies Well Project is
solely due to the provision of extra Wells
and a Pipe to the Fresh-water Basin
of the Ulsoor Tank; I am myself strongly
of opinion that this work should be carried
out to secure an alternative source of supply
should that of the Ulsoor Tank be in-
sufficient or should any circumstance oc-
cur to render it inadvisable to make use
of its water.

I have myself examined all the
Works in Company with Captain Wood,
and am of opinion, that the Projects as
now presented to Government are very
complete, and that all requirements are

provided for.

11. I would call the special attention of Government to the high praise accorded by Captain Wood to Mr. Smith the Mechanical Engineer in charge of the Walsoor Water Works. I can myself testify to the great interest manifested by Mr. Smith in his work to his perfect acquaintance with all its details, and to the beautiful order in which his Machinery and every thing connected with the Works is kept. Recognition by Government of acquaintance with this would of course be very gratifying and would also I am sure be very encouraging to Mr. Smith.

12. In conclusion I would strongly recommend that the Self Filter at the Walsoor Works at present useless from being out of repair, be at once put in thorough order, the reasons

for this are so obvious that it seems quite unnecessary for me to repeat them. The cost of this has not been included in the Project as it may be fitly provided for from the Head of "Repairs Military".

I have the honor to be
Sir,

Your Most Obedt. Servant
James Little Capt. R.E.
Acting Supt. Engr. 5th Div.

R. L.

List of Papers ~~has~~ connected with the Ulsoor Water and
Dhoby's Wells Projects at Bangalore.

<u>Ulsoor Water Project</u>	
1	General Plan
1	Plan of a Cistern to be built in old Infantry Barracks
1	do of 2 Cisterns for Female Hospital
1	do of 3 do Male do
1	do of Stand Cock
1	Detailed Estimate
1	Abstract do of Rupees 277,600
1	Specification
1	Report
<u>Dhoby's Wells Project</u>	
1	General Plan
1	Plan of Wells
1	do of a Cistern to be built in old Infantry Barracks
1	do of 2 Cisterns for Female Hospital
1	do of 3 do Male do
1	do of Stand Cock
1	Detailed Estimate
1	Abstract do of Rupees 30,000.00
1	Specification
1	Report
19	Copy of letter from the Executive Engineer Bangalore.
20	Total

James Fortu ^{Supt. R.E.}
Acting Suptg Engr, 5th D.
Suptg Engr Office
Salem, 20th December
1871

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22-11-1871 - 378-380

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11-12-1025-1026
11-12-1026-1027
11-12-1027-1028
11-12-1028-102

Public Works Department
Proceedings of the Madras Government
Read the following
No. 528.

Pres of the Madras Government } (H. Ct. 179) 9th October 1871
 Public Deptt
 From the Chemical Engineer } (H. Ct. 224) 16th October 1871
 Madras through the Chief }
 Secretary
 From the Chief Engineer } (H. Ct. 223) 20th December 71
 Madras

In Proceedings

3. The Scheme and its
for and around the
I think with should
be completed and
which each this is
on the creation of the
with water and the
Transportation of the
some other
some other
in the Bangalore
side. The
The water supply
at the present time
is not sufficient for
the purpose of the
under which are
certain which are
on the Bangalore side

In Proceedings
dated 22 July 1911 No. 1933,
the Govt. desired to be
informed what would
be the total expenditure
required to complete se-
parately the Holsoor
and Dhoobies Wells pro-
jects at Bangalore. The
Super Engineer complies
with this requisition
in his letter of the 20th
Decr 11 No. 203. herewith
submitted.

The total cost of
the Holsoor project is
estimated

Trinity Office New
connected with the Western
Water and Shanty Mills
Depot at Sandstone

estimated at Rs 2,77,600,
and Rs 2,22,902 having
been already expended
the amount required
to complete is Rs 5, 198.

The works proposed to
be carried out are the
continuation of the main
from the east gate of
the Infantry Barracks
to a cistern in the Com-
missariat square from
which lines of distribution
pipes are to be laid for
the supply of those Bar-
racks and the Hospital
on the Race Course.

The total cost of the
Dhobies Wells Project
is estimated at Rs
3, 00, 000 and deducting
the expenditure of
Rupees

I would not sanction
the roofing of the cisterns
on the Bangalore side.
I understand any
scheme for storing
rain water for the
barrack roofs.

Visitors in the above
suggestions. I would not
enter upon any scheme
for storing water from the
roofs of the Barrack buildings.
I think the proposed
cistern should be con-
structed with a complete
system of cisterns at foot
of the original place.
There may be good reasons
for not storing water from
the roofs of cisterns, but
it should be done carefully
as I think necessary.
The broken filter bed should
be repaired it is a work of
emergency and should be
done in use would cause a
collapse in the filter bed.

Rupees 2, 22, 902 up to date,
the balance required for
completion is Rs 77, 098.
This project provides
in addition to the works
proposed in connection
with the Holoor scheme,
18 extra wells and the
laying of a pipe from
the Engine house to the
sweet water basin of
the Holoor Tank.

The pumps at pre-
sent worked by the
Engine at the Dhobies
Wells are only capable
of raising 100 gallons
a minute it is re-
commended that they
should be replaced
by others of three times
the capacity the
Engine

Engine having ample power to work the larger pumps.

In the opinion of the Executive Engineer the actual consumption of water by the troops is not likely to exceed 10 gallons per head and 8 gallons for each horse daily. On these data, the supply required will be 30,800 gallons for 2500 people and 850 horses. The project as estimated provides for a daily consumption of 36,000 gallons being at the rate of 15 gallons per head.

The Acting Engineer strongly recommends that

that the Shobrie Wells project should be carried out to completion to secure an alternative source of supply, and he also suggests the expediency of at once putting into thorough repair the half filter at the Holcor Works which cannot be used in its present state. The cost of these repairs has not been provided for in the scheme.

The reports of the Chemical Examiner and of Assistant Surgeon Nicholson on the water of the Holcor tank, which in G. O. No. 2178 dated 24th Aug 1911 it was resolved on awaiting are also

now before Govt. as also
~~also circulated with~~
report from the Sanitary
Commissioner on the
subject.

Dr. King considers
that the filtered water
has improved since
its examination on
former occasions and
in pronouncing it fit
for drinking and cooking
purposes he remarks
that it was never
declared by him or
his predecessors unfit
for use and that there
is no difference of
opinion between Spt
Surgeon Nicholson and
himself regarding its
quality.

Spt

Spiritant Surgeon
Nicholson reports that
when subjected to do-
-mestic filtration the
Shaker's Well water
comes up to the highest
standard and the
Habsor tank water
only fails in one point
the larger amount of
oxygen consuming
organic matters, a de-
fect common to all
tanks. Spiritant Surgeon
Nicholson draws atten-
tion to the expense of
the present arrangements
for supplying the Bar-
-racks with water
and he submits for
consideration three
schemes for trial for
a

a few months viz:-

1. To use the present water supply from the Holoor works for all purposes, the water used for drinking and cooking being freed from any suspended matters by efficient domestic filtration. Black moulded earthen filters are proposed in supersession of the present Chatty filters and Mr. Surgeon Nichol. now states that he would undertake to manufacture filters for all the European Troops in Bangalore at a cost not exceeding

Rs 500 for 5000 gallons of water daily.

2. To increase the quantity of filtered water by connecting the Holoor pumps with the Dhulice Wells. About 700 ft. of the 1150 feet of pipes required are in the spot and could be laid in two months.

3. In the preceding scheme the Dhulice Wells are utilized as a reserve to the filters but the laying of pipes to these wells would assist of the water being pumped up to the harracka through the same pipes as are now

now used; but on dif-
-ferent days and the
water would be stored
in the duplicate cisterns.

The opinion which
the Sanitary Commis-
-sioner has formed
is, that although under
ordinary circumstances,
the water of the Hilsior
tank is perfectly whole-
-some and may be
safely issued for the use
of the troops or the native
population, the Shobies
well water, owing to
its freedom from all
organic matter, is the
safest and the best.
The sinking of extra
wells, and the supply
of the troops wholly
from

...
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...
The two schemes are so far
advanced, that the Commis-
-sioner should be completed in
order that they may assist each
other, on the condition that the water
from the two sources of supply
is transmitted by the same
pipes to the same reservoirs.
The ruptured filter at the Hilsior
works should be put into
thorough repair as also the
Cistern which failed on the
Bangalore side -

from the Shobies Wells
is accordingly advocated
and if the supply here-
-after prove to be in-
sufficient for both
the troops and the
native population,
the Sanitary Commis-
-sioner considers there
would be no objection
to the distribution of the
Hilsior filtered water
through the pipes used
for the well water.
The further suggestions
made by the Sanitary
Commissioner are -
1. ~~cleaning up the water~~
2. ~~in the infant~~
Barracks.
3. ~~Proofing the masonry~~
reservoirs in the

Artillery and Cavalry Lines.

The collection of rain water from the roofs of the barracks building on the Race Course and ~~the~~ in underground reservoirs.

Attention is directed to the remarks which the Ordnance Engineer made regarding the convenience of the Holborn Bank, in his letter recorded in G.O. No. 2478 dated 28/1/72.

The following long drains special attention to the high price recorded by Captain Wood to Sir Smith the

The Govt are not prepared to sanction at present the proposal of the Sanitary Commissioner for roofing the masonry reservoirs in the Artillery and Cavalry Lines and for collecting the

The Govt are gratified to notice the high price recorded by Captain Wood to Mr. Smith the mechanical engineer in charge of the Holborn Bank in his letter recorded in G.O. No. 2478 dated 28/1/72.

the Mechanical Engineer in charge of the Holborn Works.

H. 12/2/72

70

To the Supd Engineer
15 " City Dept.
11 " Public
" Controller
" Sanitary Comm.

Recd 28/2/72

Public Works Department
Proceedings of the Madras Government
Read the following

~~Proc of the Madras Government~~ H.C. No. 147 of 3rd October 1871)
~~Public Department~~
~~From the Chemical Examiner~~ H.C. No. 224 of 1st October 1871)
~~Madras through the Chief~~
~~Secretary Department~~
~~From the chg. supg. Engrs~~ H.C. No. 213 of 20th December 1871)

L. No. 329
The Secretary to the Govt.
of India, P. W. D.
Sir

Referring to Para 9
of my letter of the 29th Volume
No. 270, I am directed
herewith to forward a
letter from the Acting
Supr Engineer of the 5th
Division giving cover
to plans and estimates
for completing the Ulesoor
and Dhoobie Wells projects
separately, together with
the Proceedings of this
Govt.

Recd. 20th July 1872 A. 22nd
17 Aug 72 A. 16th

Government thereon and
 the correspondence as per
 margin which has taken
 place since the subject
 came under the con-
 sideration of the Govt of
 India in their letter of the
 17th November 1869 No. 1169 B. M.

L.O.	18 th May	1870	1278
"	8 th Sept.	"	2152
"	28 th March	1871	919
"	15 th May	"	1333
"	22 nd July	"	1933
"	24 th Sept.	"	2178
"	8 th Sept.	"	2292

It will be observed
 from the reports of the
 Chemical Examiner and
 Assistant Surgeon Nicholson,
 Analyst of Potable waters,
 that the filtered water of
 the Heloor Tank has so
 much improved since
 its examination on
 former occasions as to be
 considered fit for drinking
 purposes.

The water of the Heloor
 Tank is pumped into a

filter bed, through which
 it passes into a sweet
 water cistern, and thence
 it is passed over a
 stand pipe of sufficient
 elevation through lines
 of main and branch
 piping into cisterns sup-
 plying the Royal Horse
 Artillery Barracks, and
 the Race Course Barracks
 occupied by the Cavalry
 and two Field Batteries.
 The cistern at the Royal
 Horse Artillery Barracks
 contains about 192,000
 gallons, while that at
 the Race Course Barracks
 about 288,000 gallons, and
 at the rate of 15 gallons
 per head per diem and
 10 gallons per diem for
 each horse, the cisterns

respectively contain about
27 and 12 days supply.
The works estimated for
completing the project
are to continue the main
to a cistern in the Com-
missariat square and
to lay lines of distribution
pipes from it to the
Infantry Barracks and
for the supply of the
Hospitals at the Race
Course Barracks. The
cistern at the Infantry
Barracks is designed
to contain a week's supply.

The Dholes wells,
which were found to yield
water of the most pure
and wholesome description,
were purchased in 1868.
They are 16 in number
and

and a preliminary ex-
penditure has been
incurred in the erection
of engine and boiler
houses with chimney
stack &c. Experiments
undertaken to ascertain
to what extent the wells
would afford a supply
of water for the Troops,
showed the necessity for
increasing the number
of wells, and provision
has accordingly been made
in the project now
submitted for 18 addi-
tional wells, and it
is expected that with
this extra number, a
supply of 36,000 gallons
daily will be secured.

Dr.

In the opinion of the Executive Engineer the actual consumption is not likely to exceed 10 gallons a head and 8 gallons for each horse, and on these data the supply required will be 30,800 gallons for 2,400 people and 850 horses. The projects, as estimated, provide for a daily consumption of 36,000 gallons being at the rate of 15 gallons per head, or 5000 gallons more than it is expected will be actually needed.

The total estimates for the Heloor and Dhoobis wells projects amount respectively to Rs 2,77,600 and

and Rs 3,00,000, and deducting past expenditure, the amount required to complete each scheme will be Rs 54,968 and Rs 77,098. Seeing that both schemes have so far advanced, and that the sufficiency of a supply from each source for all purposes is still a matter of doubt, the Govt are of opinion that both the projects should be completed and assist each other and I am accordingly to request the sanction of the Govt of India to this arrangement, and to the estimates

estimated which accompany.

W 8/12

Recd 29/2/72 with

31 Copies of Gov 528 of 1872, seven
Copies of Gov. noted in the margin
of the letter, seven plans and
nine enclosures.

W. D. Jones

Op. 5715, 5716 & 5719

Govt. of 1872 Madras.

PUBLIC WORKS.

To the Superintending Engrs
5th Division
and

To the Secretary to the Govt.
of India

Dated

Recd.

Encl.

G. O. 26th July 1872, N^o 528-529

Nos. 429 @ 4324433

Uleer & Salnes Wells Project
at Bangalore. Paperwork
in papers relating to the
Uleer & Salnes Wells
Project at Bangalore

Formary, with remarks
plans & estimates for con-
pleting the Uleer & Sal-
nes Wells Project at Bangalore