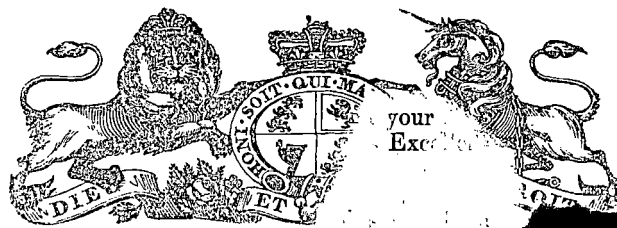


(No. 25.)



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TASMANIA

I R R I G A T I O N.

REPORT OF THE COMMISSIONERS.

Laid upon the Table by Mr. Henty, and ordered by the Council to be printed,  
September 17, 1861.



*To His Excellency Sir HENRY EDWARD FOX YOUNG, C.B., &c. &c.*

THE Commissioners, appointed by Your Excellency to "enquire into the question of Irrigation as regards this Colony," have given their most careful consideration to this important subject.

They request leave to express to Your Excellency their high sense and appreciation of your able and unwearied advocacy, encouragement, and promotion of the cause of Irrigation in Tasmania,—for which they feel sure that Your Excellency will eventually obtain the gratitude of the community.

In dealing with the various and intricate questions which are connected with Irrigation, and especially with that most difficult question of the legislative provisions necessary for bringing it into operation, with a due regard to individual and corporate rights, they have not only availed themselves of information which they have themselves acquired or have obtained from practical Irrigators in this Colony, but have had recourse to the best publications on the subject,—particularly to that of Captain R. Baird Smith on Italian Irrigation,—and to the various English and Colonial Acts affecting the drainage and supply of water. They have also had the advantage of perusing the three Draft Bills laid by Your Excellency before the Executive Council; namely,—“The Right of Passage for Water Bill,” “The Irrigation Districts Bill,” and “The Irrigation Loans’ Bill,”—in which they are gratified to find that principles are enunciated which correspond, for the most part, with those laid down by the Commissioners.

They have not regarded it, however, as within the special province assigned to them to frame such an Act as will be necessary to carry out their recommendations,—leaving that to be done by Your Excellency’s Government, under the care of the Attorney-General.

Various circumstances have conspired to interfere with the duty entrusted to the Commissioners, and to delay its execution. They have now, however, finally considered the question in all its bearings, and have agreed to the following Report.

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## REPORT.

THE general benefits resulting from a well-devised system of Irrigation are so well known and appreciated, that the Commissioners feel it to be quite unnecessary to enlarge upon them.

They deem it to be incumbent upon them, however, to direct especial attention to the extreme want of moisture during the Summer season in this Colony, and to the great loss of all kinds of vegetable and animal products resulting from the parched condition of the soil; and, at the same time, to point out the facilities afforded for Irrigation in many parts of the Island by the natural features of the country; and they consider that these facts entitle them to draw the conclusion, that a well-planned and properly-executed system of Irrigation could not fail to add very largely to the material prosperity of the community.

Need of Irrigation in Tasmania.

Usually about the middle or end of December the soil begins to dry up, and the pastures to wither, while crops of various kinds are more or less injuriously affected by the powerfully evaporative influence of the Summer sun. Sheep and cattle grow lean, and the supply of butter and cheese diminishes. At the same time, caterpillars, greatly increased in numbers by the drought, commence their ravages, and are driven, by the scantiness of the grasses, to attack the corn.

Under such circumstances, it must be evident that a copious supply of water would prove of inestimable value. Both garden and agricultural produce would, not only be preserved from injury by the Summer heat, but be immensely increased in quantity; our exports of fruit would be far greater, and of finer quality; while larger crops of grain and potatoes would enable the farmers to cope with the disadvantage of low prices; and the cost of good butter and cheese would be within the means of all. We should be in a position to compete successfully with

the Sister Colonies; and, if satisfied with moderate profits, might for ever shut the door on the importation of grain into Victoria and New South Wales from South America; and might become, practically, the granary of Australia.

But it may be said, that only a small portion of the Island can be brought under the influence of Irrigation, and only results comparatively small could be obtained.

Comparative  
results of  
Irrigation.

To that the Commissioners would reply, that the produce of every acre of properly irrigated land is so much greater than that of an acre of land unirrigated, that 100 acres of the former may be regarded as equivalent to at least 500 acres of the latter, in the amount of produce obtainable from it,—and to a larger area, if the greater certainty of good crops under Irrigation is considered.

It has been estimated by Major H. C. Cotton, that in this Colony, “green crops, potatoes, and all garden produce under Irrigation would yield up to £30 an acre,”—and that the increase of grain on any land properly irrigated would be “at least 20 bushels an acre.”

Mr. Martelli, in his Report to the Commissioners, calculates that “with regard to the application of Irrigation to horticulture, one acre will produce as much as ten under ordinary tillage; while, on pastoral lands, the ground which would only support 8 sheep to 10 acres, he finds, by his own observations, can be made to carry 8 sheep to each acre.” He also remarks that, with Irrigation, we shall not only be producing four crops of hay a year, and be feeding 8 sheep to each acre of land, but, “by rendering this Colony independent of the other Colonies, we should be enabled to put a stop to the exportation of money,” and to raise our produce “at seasons when the neighbouring Colonies could not possibly do so; and that, consequently, a considerable increase of price would be obtained.”

Actual re-  
sults of Irrigation in  
Tasmania.

But the Commissioners conceive that, apart from all mere speculations as to the benefits derivable from Irrigation in Tasmania, it ought to be a sufficient recommendation of its adoption, that very favourable results have actually been, and are still being obtained by its means,—often under very unfavorable circumstances. On the land bordering on the Derwent and its tributaries Irrigation is profitably carried on by Dr. Officer, Messrs. Shoobridge, R. C. Read, Fenton, Sherwin, E. Nicholas, A. Reid, and other proprietors. In the valley of the Macquarie River Messrs. Kermode, Parramore, Horton, and Smith have gone to considerable expense to secure the advantages of Irrigation. Several landholders on the northern side of the Island also derive very great benefit from the application of Irrigation to their estates. Mr. W. Archer, of Cheshunt, states that he has fattened, upon pastures of irrigated rye-grass and white clover, as many as 10 sheep to the acre, at a season when the greater part of the Island was parched with the heat, and cattle and sheep were barely subsisting upon the native grasses. The whole benefit was derived from the application of water to the land; for, while the meadows which had been irrigated were covered with luxuriant pasturage, the adjoining ones that had not, were brown and bare of herbage.

Amount of  
Capital sent  
out of the  
Colony for  
Meat.

Even without bestowing any consideration upon the valuable results to be fairly expected from the Irrigation of corn-fields and gardens,—the Commissioners think that it ought to be sufficient to attract our attention to the subject of Irrigation, and its beneficial influence upon pasture lands, to remember the large amount of wealth which is annually taken out of the Colony for our necessary supplies of provisions. In the year 1859, cattle were imported from the Sister Colonies to the value of £64,270,—sheep to the value of £23,815,—and salt provisions, chiefly from the Sister Colonies, to the value of £21,936. At the same time, butter and cheese, to the value of £6,669 were imported. We sent out of the Colony a total amount of £116,690 for provisions during 1859. The Statistics for 1860 not being in their possession, the Commissioners are not able to state the value of the provisions imported during that year.

Irrigation  
would render  
the Importa-  
tion of Meat  
unnecessary.

They are aware that we exported cattle, sheep, and provisions, to the value of £4,920, together with butter and cheese, to the value of £13,877 during 1859; but they cannot admit the necessity of importing any supplies of provisions at all; and, without guaranteeing the correctness of Major Cotton's and Mr. Martelli's calculations of increased produce resulting from Irrigation, they feel convinced that, under a proper system efficiently carried out, it would afford us the means of producing for ourselves more than the quantity of provisions required for the wants of this Colony; and would also yield us the incidental profit arising from an additional export of wool, hides, &c. For example, 16,650 acres of English grasses, properly irrigated, would enable us,—at the low rate of 1½ acre for a head of cattle, and 5 sheep to an acre,—to keep 7,300 head of cattle, and 28,500 sheep,—that is to say,—a sufficient number of each to furnish the full quantity of meat imported; and 7,710 acres in addition, would enable us to fatten them for the market.

An irrigated area, therefore, of about 24,000 or 25,000 acres of land laid down in English grasses, would obviate the necessity of importing meat into the Colony, and would secure the expenditure within our own territory of about £110,000 a year.

The questions then arise,—What available area of irrigable land is there in this Island? and what would be the means and cost of its irrigation?

In estimating the cost of Irrigation, the Commissioners have confined themselves to the question of supplying water for that purpose in the main channels, and have not taken into account the expense of necessary surveys, or the cost of actually distributing the water upon the land.

According to Mr. Martelli's surveys and calculations, there are 14,900 acres of land bordering on the River Derwent and its tributaries, which can be brought under an effective plan of Irrigation for about £22,000,—which would be at the rate of about £1 10s. an acre; and in the Midland and Northern Districts 83,000 acres, (comprising such land as "he considered, from its natural position and advantages, could be most easily and economically irrigated,") at a cost of about £221,000,—or at the rate of £2 13s. 9d. an acre.

Quantity of irrigable Land, and cost of Irrigation.

Major Cotton estimates that 20,000 acres of the plains bordering on the Macquarie, Elizabeth, and Lake Rivers could be supplied with a system of Irrigation at a cost of £40,000,—that is to say, at the rate of £2 an acre.

According to Captain R. Baird Smith, Irrigation in India, owing partly to the natural facilities afforded by the surface of the country, and partly to the extremely low price of labor, is carried out at a very small expense; the Grand Ganges Canal affording water at the original cost of about 5s. an acre; the Western Jumna Canal at a cost of about 3s. an acre, and the Eastern Jumna Canal—the most expensive British-Indian line—at a cost of about £1 2s. 6d. an acre.

Cost of Water-supply in India.

The same authority gives the cost of Canals for Irrigation in Piedmont, where labour is four or five times as dear as it is in India, as varying from about £1 10s. to £4 an acre, when the conditions under which it is adopted are favourable. The Canal di Caluso cost £34,908,—about £1,700 a mile,—for land, tunnels, aqueducts, dams, &c.,—which gives a rate, for 17,955 acres of land irrigated, of about £2 an acre. The Canal di Bra cost £20,000—£1,000 a mile—and irrigates 5,500 acres,—at the rate therefore of £3 12s. 9d. an acre.

Cost of Water-supply in Piedmont.

From these data it may fairly be inferred that 24,360 acres—that is to say, an area large enough for rearing and fattening an adequate number of cattle and sheep, to furnish a quantity of meat equal to that which we import—could be supplied with water for Irrigation in this Island at a cost of not more than £2 10s. an acre,—or for the sum of £60,900. A charge of 4s. 11d. an acre per annum on the above area would be sufficient to pay £6 10s. per cent. interest on the capital required, and to form a sinking fund which would afford the means of paying it off within a period of 22 years.

As to the means of Irrigation, Mr. Martelli, in speaking of the Great Lake, observes that "he is convinced, from inspection, that this magnificent body of water, comprising 28,000 acres of surface, is the grand reservoir of nature for supplying this part of the country (the land bordering on the Derwent and its tributaries) with water for the purpose of Irrigation." He proposes to provide water for the 83,000 acres of irrigable land in the Midland and Northern Districts, and to carry out a comprehensive system of Irrigation there, by the employment of four methods; viz., (to quote from his Report)—"1. By taking water direct from the rivers, and supplying the ground by cutting channels. For example, take the Lake River, and Mersey Valley, &c. 2. From the Reservoirs, as on the ground adjoining Elizabeth River near Campbell Town. 3. A combined supply from the Rivers and Reservoirs, as on the left hand side of the Macquarie. 4. A combined system from Springs, Reservoirs, and Rivers; as, for example—the country at Meander Valley."

The Means of Irrigation.—Mr. Martelli's Reports.

Major Cotton proposed to dam up Tooms's Lake and the Long Marsh, the former of which could be made to contain about 14,000,000 cubic yards of water, and the latter 50,000,000 to 60,000,000 cubic yards; and to distribute the water by means of main and branch channels.

Major Cotton's Estimates.

By reference to the remarks of Mr. Calder, the Surveyor-General, "on the principal natural reservoirs of Tasmania," contained in an Appendix to this Report, it will be seen that he believes that an ample supply of water may be obtained from our Lakes for the purposes of Irrigation,—both for the 83,000 acres described by Mr. Martelli in the Midland and Northern Districts, and for the 14,900 acres on the Southern side of the Island. To those remarks, therefore, the Commissioners direct attention, as affording full information on this part of the subject.

Mr. Calder's remarks.

Seeing, then, that there is a large area of land available for Irrigation, and that there appear to be sufficient means of providing a supply of water to irrigate it,—and that Irrigation could be carried out in this Colony in a manner profitable to the persons adopting it, and most beneficially to the community,—it is now the duty of the Commissioners to point out the measures that will be best adapted, in their opinion, for bringing Irrigation more extensively into operation, and for securing the benefits which it is undoubtedly calculated to produce.

Suggestions of the Commissioners.

They urgently recommend that all Crown Lands suitable for reservoirs, dams, and other

works of Irrigation, should be reserved from sale at once, under the powers conferred upon the Governor in Council by the *The Waste Lands Act*.

The best  
system of  
Irrigation.

In deciding upon the best system of Irrigation for this Colony, they have carefully weighed the opinions expressed by Mr. Martelli, and the Report of the Select Committee of the House of Assembly appointed last year,—as well as the observations contained, *passim*, in Captain Smith's Italian Irrigation,—and they have come to the conclusion, that the objections to a system of general Irrigation, by the direct action and superintendence of the Government, are insurmountable.

They do not consider it likely that "Private Companies," composed of individuals who would merely look for a profitable investment of their capital, would be at all calculated to succeed; because they would not have that local interest in Irrigation which the Commissioners consider essential to success,—at least in this Colony.

They, therefore, recommend that encouragement should be given to landholders throughout the Island to associate themselves together, for the purpose of establishing Districts, composed of lands capable of being irrigated,—to be called Irrigation Districts.

Legislation  
necessary.

In order to bring Irrigation successfully into operation within such Districts, the Commissioners are of opinion that the following legislative provisions will be required:—

1. That all Streams and Lakes should be declared Public Property, subject to existing rights,—in regard to which there should be an appeal to the Supreme Court from decisions under *The Lands Clauses Act*.

2. That a Right of Passage for Water should be afforded across all lands, on compensation being given,—both for a term of years (in the case of tenants), and in perpetuity,—for works both of Irrigation and Drainage.

3. That a Right of Purchase should be given of land for reservoirs, dams, watercourses, &c.

4. That the Governor in Council should be empowered to proclaim any portion of the Colony to be an Irrigation District, on the application of one or more landholders: such district to contain only the land of the parties capable of being benefited by Irrigation within it.

5. That the Governor in Council should be empowered to alter and redefine the boundaries of Irrigation Districts.

6. That, in the event of more than five ratepayers being included within an Irrigation District, three or five Trustees should be appointed, by election from among the ratepayers within such District. In the event of there being less than five ratepayers, that all should act as Trustees.

7. That the Trustees should be empowered to hold meetings to purchase and take lands, to take materials from adjoining lands on giving compensation, to construct and maintain dams, reservoirs, water-courses and drains, to fix the price and mode of distribution of water, to make and levy rates on those portions of lands within their District which the proprietors or occupiers thereof declare to the Trustees their desire to irrigate, and to have power of recovery of rates; and generally to do all things necessary to carry out a system and works of Irrigation within their District.

8. That the Trustees should be empowered to borrow money for carrying out works of Irrigation, on the security of the ordinary rates, or of a special rate, or of the land of the ratepayers.

9. That the Government should be empowered to advance moneys out of the Land Revenue on loan to the Trustees for works of Irrigation; the scheme and plans of which have been submitted to them for their approval, at £6 10s. per cent. per annum interest, in the proportion of Two Pounds for every one One Pound raised by the Trustees, and on the security of a special rate, or of the land of the ratepayers; such loans to be repayable within 22 years; the Government having power to cause the works of Irrigation within any Irrigation District to be inspected at such times as they shall think proper.

10. The Trustees may appoint a Treasurer and other Officers, who are to be accountable to them for the proper discharge of their duties.

11. The Trustees to publish Quarterly Accounts.

12. The Trustees to publish in the *Gazette*, during the month of July in each year, an Annual Report of the state of the works of Irrigation within their District, for the 12 months ending on the thirtieth day of June in every year.

13. The property in all works of Irrigation, and in the land purchased for the same, to be vested in the Trustees.

14. All moneys levied, received, or recovered under the Irrigation Act to be at the disposal of the Trustees.

15. The Trustees to make good all damage caused by the leakage, escape, or overflow of water from their reservoirs or water-courses.

16. The Trustees to be empowered to sue, and to be sued, in the name of the Trustees of the Irrigation District of (*naming the District.*)

17. Trustees refusing to act after their due election, or neglecting their duty, to be liable to a penalty.

18. Any person taking water without right, or opening or shutting or altering sluices, or hindering the use of water by ratepayers, or causing stoppages in water-courses, or damaging works of Irrigation, or obstructing the Trustees in the performance of their duties, to be guilty of a misdemeanor, and to be liable to a fine, or to imprisonment, or to both.

19. All offences under the Irrigation Act to be dealt with summarily under *The Magistrates Summary Procedure Act.*

20. All appeals from penalties under the Irrigation Act to be made under *The Appeals Regulation Act.*

21. And generally the provisions of the Irrigation Act to be, as far as possible, analagous to those of *The Cross and Bye Roads Act, 1860.*

W. ARCHER, *Chairman.*

August 14th, 1861.

## A P P E N D I X.

### SOME REMARKS ON THE PRINCIPAL NATURAL RESERVOIRS OF TASMANIA CONSIDERED IN CONNECTION WITH THE SUBJECT OF IRRIGATION.

THE principal Lakes of Tasmania are placed on the high central table lands of the Counties of Westmorland and Cumberland, the overflows of all of which, (except Wood's and Arthur's Lakes,) are directed southerly.

#### *Names and Areas of Lakes discharging Southerly.*

	ACRES.
The Great Lake covers .....	28,000
Lakes Sorell and Crescent cover .....	17,000
Lake St. Clair covers .....	10,000
Lake Echo covers .....	9,000
Nineteen Lagoons cover .....	1,500
TOTAL .....	65,500

#### *Names and Areas of Lakes discharging Northerly.*

	ACRES.
Lakes, Arthur cover .....	7,500
Wood's Lake covers .....	2,500
TOTAL .....	10,000

The above Lakes have a total surface of 75,500 acres, whereof the proportion discharging southerly is as 6.5 to 1 discharging northerly.

We may now estimate their capacity for Irrigation.

It is determined by Mr. Martelli that about 45,000 cubic feet of water is the quantity required to irrigate a single acre of land, though he intimates that his estimate is a liberal one. (See page 5, Report 2.) For simplicity's sake I will, however, in the subjoined calculations, take it that *one acre* of water, having a depth of *one foot*, will suffice to irrigate *one acre* of land; for, as the acre contains 43,560 feet, it will be evident that this measure will suit Mr. Martelli's statement so very nearly that the difference is not worth serious attention.

We may also very safely take it for granted that we can avail ourselves of one yard of the depth of each of the above-named reservoirs, to be taken either direct from the Lakes themselves or from convenient points of the rivers that carry off their superfluities. Now, this being the case, we may very soon discover that in these great reservoirs alone there is water enough to irrigate *twice* the land that he said, and considered suited for the purposes that we have in view; namely,—

	ACRES.
In the basins of the Derwent and its tributaries, about .....	15,000
And in the basins of the Macquarie, Meander, North and South Esks, and Lake Rivers, about .....	83,000
TOTAL.....	<u>98,000</u>

Which, according to Mr. Martelli, would require 4,410,000,000 cubic feet of water per year to irrigate them properly, and which could be provided for from the Great Lake alone, except 14,000 acres of it, or one-seventh of the whole.

*Supplies from the Great Lake.*

This Lake covers an area of 28,000 acres or 1,219,680,000 square feet; and taking one yard of its depth only for Irrigation, we have 3,659,040,000 cubic feet, and taking 43,560 cubic feet as enough for one acre, this Lake should water 84,000 acres.

*Supplies from Lakes Sorrell and Crescent.*

These Lakes contain 17,000 acres, 740,520,000 square feet, or, for a yard of their depth, 2,121,560,000 cubic feet, or enough to water 51,000 acres.

These Lakes, it should be remarked, cannot be dammed up so as to increase their depth one yard without damage to private property.

*Supplies from Lake St. Clair.*

This Lake may cover an area of 10,000 acres,\* or 435,600,000 square feet, or, taking one yard of its depth, 1,306,800,000 cubic feet, being enough to water 30,000 acres.

It has been said that this Lake will never be useful for Irrigation purposes; but there are vast extents of nearly level lands within a few miles of it to be eventually drained and irrigated. It is proved to be of vast depth; but as the surface water is all that we can avail ourselves of, this fact is interesting rather than useful.

*Supplies from Lake Echo.*

This Lake contains 9,000 acres; and, taking a yard of its depth, it should irrigate 27,000 acres.

*Supplies from the Nineteen Lagoons.*

Of these Lakes and Lagoons there may be about 1,500 acres available for Irrigation purposes; the same should therefore provide water enough for 4,500 acres.

The overflowings of all the above-named reservoirs have a southerly direction; and if, according to the above computation, each should water three times its own area, these alone would suffice for just double the area that Mr. Martelli said and thought suitable for Irrigation; namely,—

	ACRES.
The Great Lake, 28,000 acres.....	84,000
Sorrell and Crescent, 17,000 acres.....	51,000
Lake St. Clair, 10,000 acres.....	30,000
Lake Echo, 9000 acres.....	27,000
Nineteen Lagoons, 1500 acres.....	4,500
TOTAL.....	<u>196,000</u>

The only other Lakes of considerable area that lie on the great central table lands of Tasmania are Arthur's and Wood's Lakes, which cover collectively 10,000 acres. The overflowings of these Lakes take a *northerly* direction, and form the chief volume of water of the Lake River. They should provide a supply of water for 30,000 acres more.

It were easy to point out other supplies that lie on the great plateau referred to, which will eventually be brought into use; but it seems to me needless to swell this paper with their enumeration, when we see that

\* Mr. Sprent thought 20,000; but, in its present unsurveyed state, it is safer to be within bounds.

we have greatly more than enough for the lands that Mr. Martelli thinks can be profitably watered just at present, without taking them into consideration.

From the above, it would almost seem as if nature, to compensate the Southern Districts for their undulatoriness and consequent dryness of soil, has provided the means of fertilising larger masses of them than she has done for the more level lands of the North that lie within the principle vale of settlement that is bounded on the East by the Ben Lomond, and on the West by the Dry's Bluff Ranges.

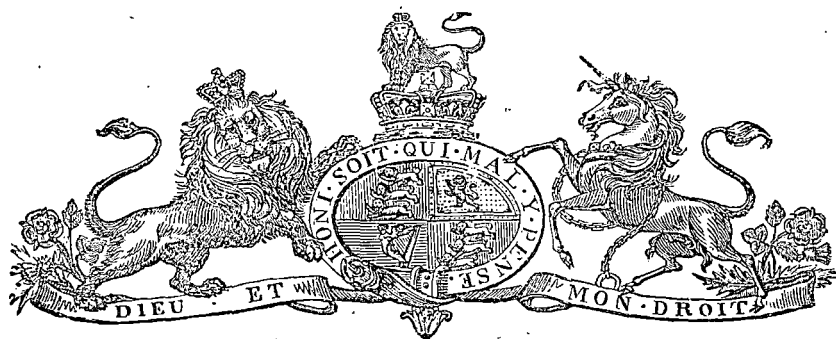
Mr. Martelli, in his recent Report on the Irrigation of Tasmania, says, he saw 15,000 acres in the basins of the Derwent and its tributaries, and 83,000 acres in the Macquarie, Lake Meander, and North and South Esk Rivers, suitable for watering. This, of course, is very vague, very vague indeed; and as far as regards the south, must refer to such land as is quite level, or very nearly so, that he happened to visit during his rapid journey to the lakes. Without pretending to much knowledge of Irrigation, I know it is not an indispensable condition to success that the surface should be, even pretty nearly, level; and I think, if Mr. Martelli had seen as much of the Southern Districts as I have, he might have safely used a good large multiplier to his present total to have produced a correct product with. However, for the sake of convenience, we will let this statement stand as it is, and it will appear that the Southern Districts have thirteen (13) times more water than they require for their own lands, (even in the very few supplies that I have enumerated) and thus can easily supply water to some of the great northern valleys from their own superfluities; but, of course, only until the same are required for the South; for I presume that it will be permissible to divert the southern waters from their own valleys, only for so long as they are not required for the lands of those valleys. If, however, it be legitimate, and that the great reservoirs whose excesses supply the Clyde and Shannon Rivers be raised *three feet*, I do not believe there would be any obstruction to turning their superabundance on to the northern lands, particularly that of Lakes Sorell and Crescent, which I think could be forced into the bed of the Blackman at a cost that need not alarm us. I am less sure about the Great Lake.

If, however, it be not legal to divert the supplies of the South into the valleys of the North, artificial reservoirs must be provided wherewith to irrigate them, for it is certain that there is not enough, nor nearly enough of water running through them for the purpose; but the consideration of which subject cannot be entered on until after a careful survey of the surface has been made.

Along the Northern Coasts are vast tracts of fertile lands that are, doubtless, destined to be irrigated hereafter, and for which a fair supply of water has been provided by nature; but their excessive fertility, and the peculiar character of their forests, seem likely to operate against the necessity of any general system of Irrigation being introduced there, for a quarter of a century at least. The discussion of the wants of the same would therefore be premature at present, and may be safely deferred till they are felt.

J. E. CALDER.





*To the Honorable the Members of the Commission on IRRIGATION.*

GENTLEMEN,

IN accordance with the instructions received from you, at the Meeting held on the 24th of December last, I proceeded to New Norfolk, where I had an opportunity on the property of Dr. Officer, of seeing Irrigation, on the principle of gravitation, scientifically and successfully applied, though on a small scale.

*New Norfolk.*  
(Dr. Officer, M.H.A.)

From New Norfolk, by the directions of Dr. Officer, I proceeded to Redlands, the estate of Mr. R. C. Read. On this property the water is taken from the Plenty Creek by means of a temporary dam across the bed of the stream; the channel does not take the water by a regulation sluice, but simply by gravitation; it is about six feet in width by two in depth, and discharges about six cubic feet per second, and the water is distributed through a good portion of ground; but I remarked that, from the inequalities and imperfections of the channel, only about one-half of the water received at the mouth was distributed over the land. At a comparatively small expense, and under the present proprietor's management, the same supply of water would be sufficient to irrigate five to six hundred acres, and to fertilize one of the most profitable estates in this part of the Island.

*Redlands.*  
(Robert C. Read, Esq.)

Leaving Redlands, I visited Fenton Forest, the property of the Honorable Captain Fenton, on whose fine estate Irrigation has been commenced on an extensive scale. The water is taken from Russell's Falls Rivulet by a channel of about three miles in length; but the dam across the stream is constructed from the trunks of trees, and allows much of the water to escape, thereby lessening the utility of the dam; it is still, however, sufficiently water-tight to send six cubic feet of water per second into the channel. The channel is partly cut through the rock, but being imperfect in some parts allows a great proportion of the water to filter through and become absorbed. This, however, is only a matter of detail. The original conception is magnificent, and worthy of the intelligent and spirited owner of this fine estate; under whose supervision the present works might be made to irrigate about twelve times the present quantity,—say about six hundred acres,—thereby producing a great amount of benefit.

*Fenton Forest.*  
(Hon. Capt. Fenton.)

From this delightful and hospitable spot I proceeded to Clarendon, the residence of Mr. John Walker, where Irrigation has been carried out on the principle of the well-known Mr. Mechi, of Tiptree Hall. The sluice-gate, escape channel, and hydraulic pump necessary for this system are the most perfect and efficient I have seen; but, it is to be regretted that it should have been attempted, as it is one by which only small results are obtained by a large outlay. When it is considered that, with the machinery in perfect order, the pump can only be worked up to thirty-two strokes to the minute, and only sufficient water supplied to fill a pipe of three inch diameter, it will be easily seen that the land irrigated would not pay for the expenditure when worked on an extensive scale.

*Clarendon.*  
(John Walker, Esq.)

After leaving Clarendon my next stage was Hamilton, and, directed by Dr. Sharland, I then went on to the Lawrenny estate, a magnificent property of thirteen thousand acres watered by the Derwent and Ouse, and including about four thousand acres of level land. I was here shown by Mr. Hood, manager of this estate, where Irrigation had been commenced twenty years since by Mr. Lord. Could that gentleman have carried out his original plan no doubt it would have been successful; he was, however, thwarted by not being allowed to place the dam in the right locality through the refusal of Mr. Marzetti, then owner of the estate, now occupied by Mr. H. Nicholas. In consequence of which Mr. Lord was compelled to construct the dam on a principle not approved of by hydraulic engineers, and it was destroyed by the winter floods.

*Lawrenny.*  
(Mr Hood, Agent.)

I then visited the works of Mr. H. Nicholas, and found that, through the dam not being placed on the right spot, the pump could not be worked to supply the land with water when most required, namely when the river is low.

*Cawood.*  
(H. Nicholas, Esq.)

*Sherwood & Hatton  
Field.*  
(Isaac Sherwin, Esq.,  
M.H.A.)

In my excursion to the valley of the Upper Clyde I had the advantage of having for my companion, the accomplished owner of Montacute, in whose company I visited the estates of Sherwood and Hatton Field. I there found the water taken from the River Clyde, a well constructed and substantial dam being placed across the river. The water flows into a tunnelled channel 115 yards long, cut in the solid rock, and the flow is regulated by a sluice-gate. The water runs into the channel at the rate of six cubic feet per second: this channel is divided into two streams, each irrigating about fifty acres, an area utterly disproportionate to the quantity of water expended, a great part of which is absorbed in the earth.

*Ann Vale, Bielston.*  
(Mr. Sherwin.)

At Ann Vale Mr. Sherwin has seventy acres irrigated, and the same quantity at Bielston. The water is taken from the river by means of a temporary dam, and is distributed over the land by channels cut in the surface. Mr. Sherwin has about two hundred and forty acres of land under Irrigation.

*Meadsfield.*  
(E. Nicholas, Esq.)

Mr. E. Nicholas at Meadsfield, irrigates about one hundred and twenty acres, and takes about three cubic feet of water per second from the river.

*Ratho.*  
(A. Reid, Esq.)

Mr. A. Reid had about one hundred and twenty acres under Irrigation, but now confines his operations to the garden ground, in consequence of the dam not being so placed as to afford a supply of water during the dry season.

*Nant.*  
(G. Nicholas, Esq.)

Mr. G. Nicholas is commencing works to render available the waters of the Clyde.

*Dennistoun.*  
(W. B. Wood, Esq.)

On the estate of Mr. Wood, Irrigation might be carried out on a large scale; but in consequence of the water flowing at a wrong level, and in some parts lodging and forming stagnant pools, foot-rot has been caused amongst the sheep.

The Upper Valley of the Clyde is very available for the purpose of Irrigation, and under proper regulations more than three thousand acres of land might be irrigated. The chief difficulties are;—

1st. In placing dams in eligible localities.

2nd. In regulating the supply of water to the different proprietors, so that one may not take an undue quantity to the detriment of others.

*Lake Crescent, Lake  
Sorell, Lake Arthur,  
Great Lake.*

From the Valley of the Clyde I proceeded to the region of the Lakes. I visited the sources of the Clyde, Crescent Lake, and Lake Sorell, passed between Arthur's Lakes, and arrived at the Great Lake. I am convinced, from my inspection, that this magnificent body of water, comprising twenty-eight thousand acres in surface, is the grand reservoir of nature for supplying this part of the Colony with water for the purpose of Irrigation; it pours its supply of water into the Shannon, Ouse, and Derwent Rivers.

*Hunterston.*  
(John Maddock, Esq.)

In consequence of my impressions respecting the Great Lake, I followed down the course of the Shannon River, and at the junction of the Tea Tree Creek came on the estate of Hunterston, now the property of Mr. Maddock. Twenty years since Mr. Patterson irrigated on a large scale. Water was procured from the river by means of a temporary dam, and a channel without a sluice-gate, and was carried by a wooden aqueduct for about half a mile, and continued for nearly three miles through stone and earth; the work was originally well executed, but being out of repair much water is now absorbed. It might readily, however, be put into condition to irrigate upwards of one thousand acres.

On my road to Bothwell I visited several properties, amongst others that of Mr. Clark, now occupied by Mr. Brown, and found great capabilities for Irrigation upon them. I would remark that the water of the Great Lake is peculiarly adapted for the purposes of Irrigation from its high temperature, the thermometer, when standing at 78 degrees in the open air, showing 69 degrees when immersed in the water of the Shannon.

Remarks on the neces-  
sity of proper regu-  
lations for Water-  
courses.

During my journey I remarked that water is taken from the river without any control as to quantity. As the bed of the river is the property of the Crown, I consider the Crown has a right to regulate the distribution of the water flowing in such bed, according to equity and justice.

As the success of Agriculture is essential to the public good, so it demands the intervention of Government for the protection of all measures calculated to promote its success. In the event of a comprehensive system of Irrigation being determined on, it will be necessary that the attention of Parliament should be called to frame such an Act as will protect the interest of all parties, providing for the settlement of all questions respecting the occupation of land for construction of channels, distribution of water, &c., by arbitration.

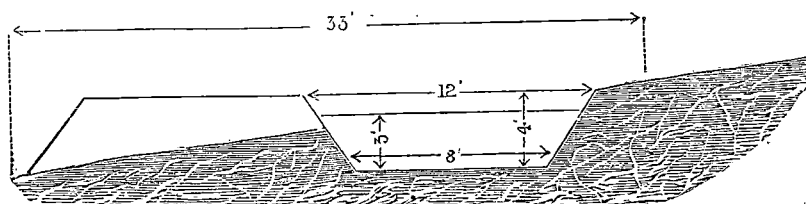
I think, Gentlemen, it is my duty to make some practical remarks on the places I have visited, and to submit to you such proposals as I deem most certain to carry out Irrigation on a large scale, and with the most profitable results. The astonishing increase of produce arising from Irrigation is too important to be passed over. With regard to its application to horticulture, the increase is about from one to ten,—that is to say, one acre under Irrigation will produce as much as ten under ordinary tillage,—while on pastoral lands, the ground which would only support eight sheep to ten acres, I find by my own observations can be made to carry on an average about eight sheep to each acre,—making an increase from one to seven. The addition to the industrial resources of this Colony, would be immense. I hope, therefore, for the benefit of the Colony that my proposals may meet with a favourable reception, and be adopted and carried out by some company of intelligent and enterprising men.

### PROPOSITIONS AND PLAN.

1. Weasel Plains Channel, length about 15 miles, commencing at the junction of the Tea Tree Scrub with the Shannon River;—to irrigate 4000 acres of ground and to supply Water to the Township of Bothwell.

#### SHANNON RIVER CHANNEL.

*Hunterston and Cluny.*



$10 \times 3 = 30 \times 66 = 1980$  cubic feet = 73 cubic yards.  $73 \times 80 \text{ ch.} = 5840 \times 15 = 87,600$  cubic yards; at 1s. = £4380. Land 1200 chains  $\times \frac{1}{2} = 60$  acres.

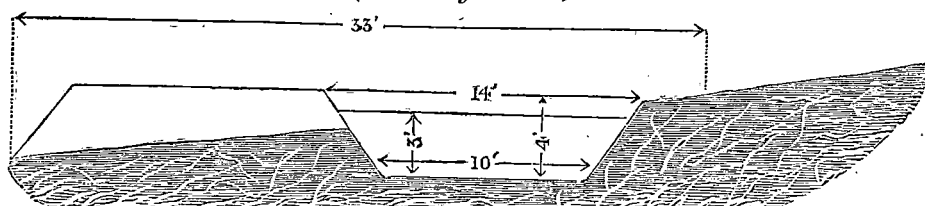
	£
Dam across River.....	150
Double-effect Regulator .....	120
Excavation of Channel.....	4380
Rubble Masonry .....	250
Bridges .....	210
Distribution Sluices .....	180
Timber for Aqueduct .....	310
Incidental Expenses.....	220
Land, 60 acres at 60s. ....	180
	<hr/>
	£6,000

When it is considered that a portion of this sum might be deducted for the supply of Water to the population and gardens of the Township of Bothwell,—that the land proposed to be irrigated is of the best description,—and that the return will be as seven to one,—there will be no difficulty in realizing a lucrative return for capital, either by disposing of the Water-right by sale in perpetuity or by annual rental.

2. High Plains Channel, length about 10 miles, commencing on the left bank of the River Ouse, three miles above Cawood and opposite Arthur's Seat;—to irrigate 6000 acres of ground running along the sides of the hills between the Valley of the Ouse and the Valley of the Clyde, in the direction of North West and South East: continuing the direction indicated, it would, in addition to the Irrigation of the land, supply Water to the Township of Hamilton.

#### OUSE RIVER CHANNEL.

*(Lawrenny Estate.)*



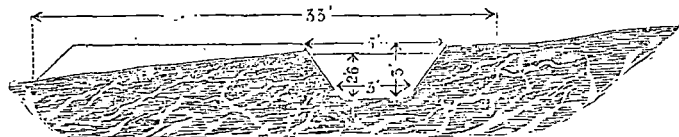
$12 \times 3 = 36 \times 66 = 2376$  cubic feet = 82 cubic yards.  $82 \times 80 \text{ chains} = 6560 \times 10 = 65,600$  cubic yards; at 1s. = £3280. Land 800 chains  $\times \frac{1}{2} = 40$  acres.

	£
Dam across River.....	200
Double-effect Regulator .....	220
Excavation of Channel.....	3280
Masonry Work.....	300
Bridges .....	120
Timber Aqueduct.....	670
Water Distribution Sluices .....	72
Land, 40 acres at £5.....	200
Incidental Expenses.....	340
Total.....	<u>£5,402</u>

A part would be defrayed by supplying the Township of Hamilton with water; leaving the remainder for the Irrigation of 6000 acres,—being only at the rate of about eighteen shillings an acre. The magnificent area of country proposed to be irrigated at this small cost, is now only able to support about 4800 sheep; under Irrigation it would support about 36,000. The advantages to be derived are too apparent to require further comment.

3. Derwent Channel length about 8 miles, to supply water to the Plains opposite the Township of New Norfolk. To commence on the left bank of the Derwent about a mile above the junction of the Plenty Creek, where the bed of the river is highly favourable to hydraulic engineering; to irrigate about 800 acres on the banks of the Derwent, close to the Township and abutting on navigable water. The discharge of the waters of this Channel into the Derwent will furnish a motive power for working flour, sawing and other mills, and for various industrial purposes.

DERWENT RIVER CHANNEL.  
(New Norfolk.)



$$4' \times 28' = 10 \times 66 = 660 \text{ cubic feet} = 25 \text{ cubic yards. } 25 \times 80 \text{ ch.} = 2000 \times 8 \\ = 16,000 \text{ cubic yards; at 2s.} = \text{£1600. Land } 640 \text{ chains} \times \frac{1}{2} = 32 \text{ acres.}$$

	£
Dam across River.....	150
Sluice Gate .....	100
Excavation of Earth and Rock .....	1600
Masonry .....	600
Bridges .....	200
Distributing Sluices .....	80
Land, 32 acres at £5 .....	160
Incidental expenses .....	310
	<u>£3,200</u>

Some part of the cost may fairly be deducted for the use of motive power. Taking into consideration the proximity to the Township, the facility afforded by water-carriage for the export of produce to all parts of the Colonies, I shall not be far out when I state my belief, that this will be the first of my proposals to be carried out.

In concluding this *preliminary* Report, it may be satisfactory to recapitulate the Properties and Number of Acres that can be brought under Irrigation by the present proposals:—

	ACRES.
R. C. Read, Esquire .....	500
The Honorable Captain Fenton .....	600
Upper Valley of Clyde.....	3000

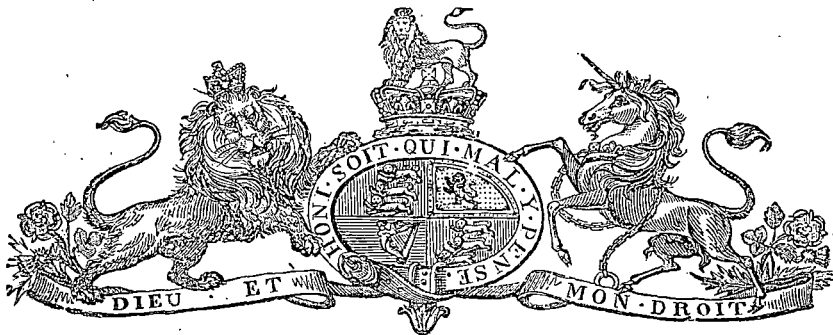
Shannon and Clyde .....	4000
Ouse and Clyde.....	6000
New Norfolk .....	800
Total.....	<u>14900</u>

making about Fifteen Thousand Acres, which under this system will produce a quantity equivalent to One Hundred Thousand Acres under the old system of tillage without Irrigation.

I have now only to express my acknowledgments to the owners and occupiers of the Estates I have visited for the hospitable reception I have invariably met with, and for the facilities which have been afforded me in pursuing my investigations.

A. MARTELLI, C.E.

*Hobart Town, 15th January, 1861.*



*To the Honorable Members of the Commission on IRRIGATION.*

GENTLEMEN,

IN accordance with your instructions received at the meeting on the 15th January last, and assuming that the valley of the Macquarie was the principal object of my excursion, I proceeded to Tunbridge, and from thence to Mona Vale, where, by the attention of Mr. Kermode, I received the necessary instructions to follow up the course of the Macquarie. I first proceeded up the South valley of this River to the Reservoir of water known as Tooms' Lake. This is an artificial lake, that is to say, a Reservoir which, in case of necessity, could be made to contain more water, and, by means of double regulating sluice-gates and some modifications in the construction of the dam, a supply of water could be obtained for an important surface of ground.

Valley of the Macquarie River.

Tooms' Lake.

From this place I directed my steps to the North valley of the Macquarie, where I saw with great pleasure the locality of Long Marsh, a place adapted by nature for extensive operations for the storage of water for the fertilization of the lower part of the valley. Some operations have been commenced, and the spot is well chosen for the dam; and it being my opinion that the time is not far distant when the attention of the public will be directed to this spot, I shall, in another part of this Report, give an estimate of the probable cost of works necessary for this purpose, and also of the quantity of land suitable for Irrigation.

Mounting the valley of the Macquarie, I next came on the vale of the Elizabeth River, and so on to Kearney's Bogs. At the foot of Snow Hill are two places remarkably adapted for Reservoirs, which will not only store a sufficient supply of water for the Irrigation of a very important surface of land, but, in regulating the bed of the River for the Irrigation of the valley, a double benefit will be obtained, as the channels which will be required will also act as drains, thereby rendering available Kearney's Bogs, a fine piece of ground of more than two thousand acres, now covered with water, and totally useless. Proceeding up the valley of the Elizabeth, traversing a fine tract of land, through Campbell Town, and crossing the River at its junction with the Macquarie, I arrived at Morning Side, on the left-hand bank of that River. At this place I was convinced of the necessity for the Reservoirs; the amount of water contained in the River being only about 15 or 16 cubic feet per second, a quantity almost useless for the immense tract of land required to be irrigated.

Valley of the Elizabeth River.

Leaving Morning Side, with directions from the Honorable Mr. Gell, I continued my journey through the valley of the Macquarie, and found a very considerable quantity of land suitable for Irrigation. Proceeding to Lake River valley, I found the quantity of water in the River to be running about 25 or 30 cubic feet per second: this is a fair proportion, but it cannot always be depended upon, the dry summers greatly diminishing its bulk. But, as I stated in my first expedition to the Lakes, and especially to Arthur's Lake, the necessity of uniting the two Lakes by a deep drainage channel. While regulating the bed of the Upper Lake River, a more perfect communication can be formed with Wood's Lake; and, through the consequent drainage of the surrounding country, a very large quantity of land will be reclaimed, highly suitable for pastoral purposes. By deepening the bed of the Lake River from its mouth at Wood's Lake, and placing there a good regulating sluice-gate, enough water can always be commanded from these three Lakes for the Irrigation of the lower valley of the Lake River.

Valley of the Lake River.

Leaving the Lake River valley, I directed my steps towards Longford, and from there to the fertile and beautiful valley of the Meander. At Quamby I received fresh directions from the Honorable Sir Richard Dry, and proceeded to Deloraine, Elizabeth Town, and the valley of the Mersey; passing through the beautiful lands of this River, I arrived at the township of Latrobe. The land in this valley is adapted for every kind of cultivation, and the quantity of water contained in the bed of the River, with the good natural position, render this locality remarkably well adapted to the purposes of Irrigation. The facility enjoyed by this fine district of water-carriage, by way of Port Frederick, thus giving an easy means of exportation, combined with its other advantages, will, no doubt, cause it to become ultimately a place of great importance. I returned through Deloraine and Westbury to Launceston, and remarked the great capability of Irrigation, not only by means of the River, but also by Springs in different places on my route along the valley of the Meander.

The Valleys of the Meander and Mersey Rivers.

The Valleys of the North Esk, South Esk, and Nile Rivers.

From Launceston, following the course of the North Esk, passing the White Hills, I arrived at Evandale; leaving which place I passed through the spacious and magnificent plains extending along the banks of the South Esk and the Nile River. The quantity of water running in the bed of the River and the fine natural position of the land combine to render this splendid country highly adapted to the purposes of Irrigation. Crossing the Nile I kept the right-hand bank of the River to the village of Llewellyn. It was my original intention to have proceeded to Avoca, but seeing from the increased rapidity of the River that it ran from an elevated country where Irrigation would not be so much required, I retraced my steps when about half-way from Llewellyn to Avoca; the weather being most inclement and the rivers flooded, returned to Campbell Town. From thence I passed through Ross, where, at Beaufront and Somercotes, by the attention of Captain Horton, I was shown some works constructed for Irrigation, for which the land is well adapted. From there through Ross to Hobart Town, remarking on the road several small spots where Irrigation could be advantageously employed.

Quantity of Land where Irrigation can be easily applied.

During my journey I have seen many localities where large surfaces of ground could be irrigated with great facility, from the regularity of the ground and the possibility of procuring a supply of water either from the bed of the rivers or by constructing dams across the hills for the storage of water, and in some places from natural springs.

I shall now give a list of the different localities, premising, that the quantity of acres named is not to be taken as absolutely correct, but as a rough calculation of the distance passed over, taken by practical means.

	<i>Acres.</i>
No. 1. Country around Tunbridge .....	4,000
No. 2. Ross and Campbell Town, and adjacent country .....	6,000
No. 3. Banks on the left-hand side of the Macquarie .....	9,000
No. 4. Banks of the Macquarie, right-hand side .....	11,000
No. 5. Both banks of the Lake River, before joining the Macquarie .....	3,000
No. 6. Environs of Longford, to the junction of the South Esk River with the Meander, left-hand side .....	5,000
No. 7. Plains opposite Longford, right-hand side of the River .....	3,000
No. 8. Plains of Westbury, Deloraine, &c. &c., Meander Valley, right-hand side, and Quamby's Brook on both sides .....	12,000
No. 9. Valley of the Mersey, from the Native Plains on both sides of the River .....	4,000
No. 10. Plains from Evandale to Nile River on both sides and Ben Lomond Rivulet, that is to say, all the right-hand side banks of the South Esk .....	12,000
No. 11. Plains of Cleveland, that is to say, banks of the South Esk, left-hand side from Stony Creek .....	10,000
No. 12. Partial Plains, that is to say, North Esk near Launceston, Cornwallis, Oatlands, Quoin, Serpentine Rivulet, &c. &c. ....	4,000
Total .....	<u>83,000</u>

This quantity of 83,000 acres only comprises such land as I have considered, from its natural position and advantages, could be most easily and economically irrigated. I have seen besides a large proportion of good land which will, no doubt, be ultimately fertilized by the use of water; but I think it will be agreed that in a country where labour is high, in carrying out a work of public utility, such as a comprehensive scheme of Irrigation, every facility afforded by nature should be taken advantage of in preference to expending large means on more difficult positions, or undertaking to irrigate localities presenting difficult and expensive solutions of hydraulic problems.

Different Systems of Water Supply for Irrigation.

- In carrying out Irrigation in this country four different systems will be employed, viz:—
1. By taking water direct from the River and supplying the ground by cutting channels. For example, take the Lake River and Mersey Valley, &c. &c.
  2. From the Reservoirs, as on the ground adjoining Elizabeth River, near Campbell Town.
  3. A combined supply from the Rivers and Reservoirs, as on the left-hand side of the Macquarie.
  4. A combined system from Springs, Reservoirs, and Rivers; as, for example, the country at Meander Valley.

Quantity of Water required for Irrigation.

From Rivers.

The quantity of water required for Irrigation is greatly modified by different causes, viz:—The different modes of culture to which the land is to be subjected; the quality and position of the soil; and, also, the diversity of the seasons. During my journies of investigation through this Island I have never been able to gain the smallest information as to the quantity of water used in the Irrigation already effected. I have, therefore, endeavoured to solve that question by a comparison between this climate and that of my own country; also, to further assist me in

coming to a tolerably accurate conclusion, I have carefully studied the different characters of soli, position, &c. &c. I trust I have obtained as results, which experience will prove to be not far from the truth. One cubic foot of water per second will irrigate as follows:—

	<i>Acres.</i>
1. Artificial Meadows and Horticultural Land.....	60
2. Agricultural Land.....	80
3. Pastoral Land in primitive state, but sown with imported grass seeds	160
	<hr/>
	300
	<hr/>

I consider that Irrigation upon native grasses would not prove to be sufficiently remunerative.

Allowing, however, for land occupied by roads, paths, &c., it may safely be calculated that one cubic foot of water per second will irrigate 100 acres of land.

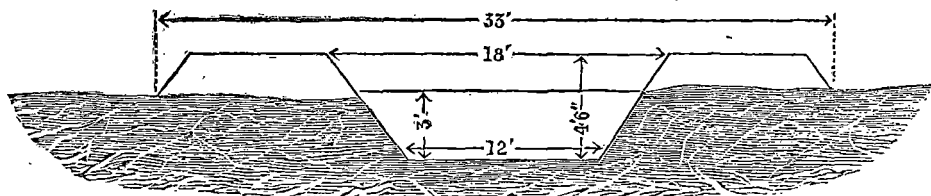
But in the employment of water stored in Reservoirs, a system altogether different must be observed from that taken direct from running streams. Water kept in Reservoirs is only distributed over the surface of the earth at the time when the exigencies of agriculture require it; at all other times the sluice-gate of the Reservoir must be kept shut. For the distribution of these waters a Time Bill must be kept, stating on what days and hours the water will be allowed to the several proprietors or lessees, according to their respective rights; so that the water may never be wastefully expended. Basing upon this system my calculations, and, also, taking the chance of a very dry summer, I have come to the conclusion that 30,000 cubic feet will be necessary storage for each acre of land. Taking also into consideration the quantity soaking through the bed of the Reservoir, and the evaporation ensuing from the exposure of a surface of water, I have further added 15,000 cubic feet of water per acre allowance for the unavoidable waste: the quantity, therefore, required to be kept in store will be about 45,000 cubic feet per acre. This may appear a very liberal and, perhaps, over-abundant supply. I will admit such may be the case in ordinary seasons; but if there is an error, it is on the right side, since it it will only leave a supply of water on hand to meet any exigencies that may occur.

From Reservoirs.

My next consideration must be the probable cost of water, a very important clause in all undertakings. Of course, the price will vary according to the nature of the soil, declivities of the land, and the sources from whence the supply is to be taken.

Cost of Water.

I will give as a specimen a calculation which, in my estimation, will be about a very fair average of what the cost of water would be under existing circumstances. I will take the left-hand side of the Macquarie after its junction with the Elizabeth River. In that locality there are about 9,000 acres available for Irrigation; but for the present subscribers could, perhaps, only be found for 5,000 acres. It will be necessary to cut a channel along the foot of the hills and put a dam across the river; sluice-gates, regulators, masonry, bridges, aqueducts, where required, will, by my calculations, amount to about £16,500, about £330 per cubic foot and £3. 6s. 0d. per acre.



15' x 3' = 45' x 66' = 2,970 cubic feet = 110 cubic yards; 110 x 80 = 8,800 x 30 = 261,000 cubic yards of excavation at 1s.; £13,200. Area of land—2,240 chains x ½ = 112 acres.

The works required for such irrigating channel, supposed to be 30 miles in length, will cost as follows:—

1. Dam across the River.....	£200
2. Double-effect Regulator.....	250
3. Excavation (as above).....	13,200
4. Masonry .....	500
5. Water-works .....	575
6. Bridges—18, at £30.....	540
7. Distribution Sluices—20, at £12.....	264
8. Land—about 112 Acres, at £5.....	560
9. Contingency .....	411
Total .....	<hr/> £16,500 <hr/>



River Water.

Reservoir Water.

But the body of water that could be taken from the stream of the Macquarie without interfering with other people would only be sufficient to irrigate 1,000 acres. A Reservoir will, therefore, be required for the storage of a supply of water sufficient for 4,000 acres, viz., 180 millions of cubic feet. At the foot of Snow Hill is a spot well adapted by its position for such a purpose, being at the foot of a mountain more than 3,000 feet in height. The works required for such a Reservoir will cost about

Average length at the Dam, 300ft.  $\times$  77' 6"  $\times$  30 = 697,500 cubic feet = 25,834 cubic yards, at 1s. 3d. in average prices, £1614. Yards cubic—1620.

Dam across Hills.....	1620
Rubble Stone for ditto.....	150
Clearing Bed of Reservoir.....	350
Flood Gates and Distributors .....	250
Brick Work, &c. ....	400
House for Water Bailiff .....	60
Regulation of Bed of River and Drainage of Bog .....	800
Contingencies .....	350

£3,980

Cost of River Work and Channel.....£16,500

Total .....£20,480

Being about £4 per acre, which, at six per cent., will be four shillings and ten-pence (4s. 10d.) per annum for rent of water. To this amount may be added a moderate annual charge for Water Bailiff and Assistant, giving altogether the annual average rent of water in this country at six shillings (6s.) per acre. This plan, should inducement be held out in the shape of additional subscribers, can easily be extended to the Irrigation of 9,000 acres with only the small additional expense of another Reservoir; thereby greatly reducing the annual rent to the subscribers. I have not given the locality of Long Marsh as an example, in consequence of its being so favourably situated for the storage of water that a calculation based on that locality would not give a fair average of the general cost of other less favoured places. To show how highly I estimate its capabilities I have made a rough sketch of the amount to be expended for the Irrigation of about Fifteen Thousand Acres.

Dam lined with Rubble Stone and properly puddled Flood Gate .....	1950
Regulator and Masonry .....	690
Clearing and regulating Bed of Reservoir, &c. and Water Bailiff's Residence .....	550
Works to Bed of River and Contingencies.....	1200

Total.....£4,390

Being less than seven shillings per acre for storage of water.

Water of Springs.

The Springs that I have seen issuing forth from the earth in the valleys of Deloraine and Westbury have given me the idea that they may be made available for the supplementary irrigation of land. This water *strata*, which shows itself on the surface of the earth, is certainly produced by filtration between the bed and the alluvial soil, and can be rendered very available for Irrigation on a small scale. But to ascertain the cost of works required and amount of water to be drawn from this source would demand a particular study. Yet, as in Piedmont and Lombardy, advantage is taken of these Springs (there termed *Fontanili*) for the irrigation of land, I feel convinced the same result could be obtained from them in this country.

Benefit to be derived from Irrigation.

It is not my intention to expatiate very fully on the question of the material benefits to be derived from Irrigation, having already spoken on the subject in my first Report. The beneficial effects of this measure will soon show themselves directly and indirectly in any country where it is carried out with vigour and judgment. I think it is not necessary to speak of the five or six crops of hay per annum that we can have on irrigated land, or of the seven or eight sheep per acre that can be fed upon it, because that benefit is easily seen and sufficiently known; but I wish the attention of the public to be drawn to the indirect benefits, that is to say, by rendering this Colony independent of the other Colonies, and thereby putting a stop to the exportation of money; by taking advantage of the natural resources of the country to the benefit of agriculture and production, especially in a country like this, where the resources are large and the labour dear.

When it is considered that there is a great extent of country between Launceston and Port Frederick where, sooner or later, the whistle of the Railway will be heard, facilitating the transit of produce, and that, by means of the use of water, all the productions of this locality can be put directly in communication with foreign markets;—when we also consider that we shall not only be producing four crops a-year, but, also, that those crops can be produced at

seasons when neighbouring Colonies cannot possibly produce them, and that, consequently, a considerable increase of price is obtained,—we shall see that in this competition the Colony of Tasmania will always be victorious ; and the result will be exportation of produce and importation of money.

Having spoken of the quantity of land that can be irrigated ; of the probable cost, and having also touched upon some of the benefits to be derived—it now remains to be shown by what means the system is to be carried out. Financial Measures  
for carrying out Irrigation.

There are three ways in which it may be done, namely :—

1. By the direct action of Government.
2. By Associations of individuals interested in the undertaking. (*Consortzii*).
3. By the general system of Private Companies.

With regard to the first method, namely,—by direct action of the Government,—I do not think that I could recommend it to be carried out, it being objectionable on two grounds, viz.,—the risk of its causing financial embarrassments, and the chance of creating jealousy by the different localities not being undertaken simultaneously. With one exception,—in a case where there is suitable land unsold by Government and a good supply of water obtainable from running streams,—in such a case the Government, if desirous of promoting the settlement of small farmers, could perform the necessary works for a supply of water—say at the rate of one cubic foot per second to every hundred acres, more or less, according to quality of soil—the land could then be sold in small allotments, with water-right to each proprietor. The direct result would be a quick return to the country, with interest, of capital expended ; and, indirectly, by increased production and consequent utilization of your natural resources.

2. The second system is by associations of individuals interested in the undertaking. As this system can only be carried out by the aid of coercive measures of the majority against the minority, I do not think it would be applicable to this country, where the freedom of the subject is so carefully respected by the law.

3. Now, I have nothing further to recommend but the adoption of the system of Private Companies. I must explain my ideas on this subject.—Private Companies can be composed of landholders, merchants, &c. If you leave the shareholders to their own resources, you subtract the capital from their stock, from the improvement of agriculture and from commercial enterprise. To obtain a benefit on the one part, you have to contend with a difficulty on the other. How is this to be remedied ?—By the application of foreign capital to the enterprise.

Supposing a Company formed for the purpose of irrigating a large surface of land under very favourable auspices, with proposed channel passing through fertile land, where proprietors have already subscribed for a large supply of water, the annual amount of rent for which would give interest for a great part of the capital required. If, to enable such a Company to make their shares marketable, they apply to Government for a guarantee for a moderate rate of interest,—would it be right for the Government in such a case to refuse their moral assistance ?

Moral Assistance  
necessary from the  
Government.

Not only, in my opinion, ought the Government, after ascertaining the utility of the scheme and possibility of execution, to give every material assistance, in the shape of ground required for dams, channels, flood gates, reservoirs, &c. &c., without compensation ; but, also, to take water from the adjacent supplies without prejudice to public claims and at a small amount of rent ; but, also, guarantee an amount of interest that shall put the Company in a position of procuring foreign capital to stimulate the development of the resources of this Colony.

In conclusion,—

1. By regulating the subtraction of water from rivers, creeks, lakes, &c., so as to stimulate private enterprise, and, at the same time, protect the public interests ;
2. By declaring all Irrigation works to be works of public utility, and placing them on the same footing as Railway works ;
3. By giving to such works assistance, whether pecuniary or otherwise, as may be required,—I am convinced that a fresh source of prosperity will be opened for this Colony by the rapid development of the resources nature has so bountifully bestowed on it.

A. MARTELLI, C.E.

Hobart Town, 15th February, 1861.



1860.

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T A S M A N I A.

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## IRRIGATION.

MAJOR COTTON'S REPORTS, WITH ESTIMATES.

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Laid upon the Table by Mr. Henty, and ordered by the Council to be printed,  
July 27, 1860.



*REPORTS, with Estimates, on IRRIGATION.*

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*Longford, 13th July, 1844.*

SIR,

IN compliance with the instructions conveyed to me in your letter of the 19th ultimo, I have the honour to forward the Plans, as far as they are yet completed, of the Irrigation project in which I am employed.

In explanation of the Plans, and of the progress of the survey, it may be desirable that I should here refer to my original instructions, and the measures I have taken to carry them out.

The extensive plains of the Macquarie, Elizabeth, and Lake Rivers, and the facilities supposed to exist for forming reservoirs of water in the upper parts of those rivers, offering a fine field for laying out a great combined project, I suggested that the three rivers should be explored and surveyed, and the lands examined, with the view of forming one great project for the Irrigation of the whole country commanded by the three rivers, on the principle that the more comprehensive the plan, the greater would be the effect produced from the same outlay of capital, or the same amount of labour employed,—the more sure the supply of water for the whole,—and the more uniform and general the benefit obtained. These suggestions were offered in my letter of the 31st July, 1843, supported by a copy of a Lecture on the subject of Irrigation generally, which I had given at the Mechanics' Institution a short time previous; and I then received orders to propose a plan for commencing Irrigation. The plan I proposed was approved by His Excellency; and instructions were given, under date 20th November, 1843, for the formation of a small establishment for the examination of the rivers and country referred to.

I commenced this examination in December; and on the 29th of that month I reported on the heads of the Elizabeth and Macquarie Rivers, giving a detailed account of the work undertaken by private enterprise and funds, with Government labour, for reserving water in the Long Marsh, and the dam formed by private hands under the authority of Government at 'Tooms' Lake.

In January I received more full instructions for the conduct of the survey, and from that time to the close of the season I have been employed in carrying it on; and the Plans now submitted exhibit the extent to which the operations have proceeded.

As far as I have yet gone in the planning of the reservoirs and channels, with all the masonry works, as dams, aqueducts, sluices, &c. for this portion, I have kept in view the formation of a great combined project for all the plain country commanded by the Macquarie, Elizabeth, and Lake Rivers, including Norfolk Plains,—a vast tract of the finest arable land in the Colony.

A first or partial undertaking might be carried on to the extent already surveyed and estimated, as explained in the Appendix to this report; but the capacity and the number of the reservoirs can be increased, and the main channels widened, according to the extent of land found available as the survey proceeds.

A. The "General Plan" is a map of the country between the Elizabeth and the Macquarie Rivers, and between the Macquarie and Blackman, in the County of Somerset, exhibiting the two reservoirs at the heads of the Macquarie; viz.—the Long Marsh and 'Tooms' Lake, and the proposed channels of distribution.

Tooms' Lake is an extensive shallow reservoir formed by a low embankment, retaining, when full, about fourteen million cubic yards of water. It is complete, having been formed with the assistance of Government by the efforts of a body of settlers possessing property on the banks of the river below. The Long Marsh is also an extensive flat, receiving the drainage of a far greater tract of country than Tooms' Lake; and may, by means of a short but high embankment, be made to retain fifty or sixty million cubic yards of water. This work was undertaken, and carried on to a certain extent, by Government labour, conjointly with private subscription, but has been discontinued.

The first work to be done is the completion of this embankment; and I give it in my plan a base sufficient for its being raised to the height of eighty feet, when I calculate that it will retain all the water flowing into the marsh in one season: but the present Estimate allows only for the retention of thirty feet of water.

The water retained in these two reservoirs will be delivered into the natural bed of the river by means of sluices through their embankments; and, following its course while confined within precipitous banks, it will be arrested by a low dam six miles below the junction of the two heads. This dam forms the head of the two main channels north and south of the river, commencing in the Parishes of Peel on the north and Durham on the south side. These two main channels, coloured pink in the "General Plan," and their branches are allowed a fall of one and a half feet in a mile, and will, with the capacity given to them, carry water to twelve different properties, irrigating about 18,000 acres, besides the Townships of Tunbridge, Ross, and Campbell Town, in which about 2000 acres of crown land will be watered.

B & C. The plans of the Peel and Durham channels are drawn on a large scale to show more distinctly their course, and the lands to be watered by them, and the proposed sites for mills. The survey of the Peel channels is incomplete, having been interrupted by the winter weather: that of the Durham channels is complete as far as the Blackman River.

D. Plans of the masonry and other works in detail:—

No. 1. The dam at the Long Marsh in elevation and section, the sluices (showing the arrangement for opening them), and the gauge-chambers by means of which the quantity of water delivered will be regulated. The elevation of the dam shows its height when completed, as well as the height I have allowed for in the accompanying Estimate.

No. 2. Is the Peel and Durham dam across the river at the heads of the two main channels. Its object is not to retain any body of water, but to raise its level, and give an elevation of fifteen feet to the surface, in order that the channel heads may be raised above the river floods. The river, in its floods, will pass freely over the escape in this dam, and pursue its natural course; there being at the head of each main channel a regulating sluice, to limit the body of water admitted into each, or exclude it entirely when necessary.

Nos. 3, 4, & 5, are the details of cuttings and masonry works for the channels. The whole water will by means of these be under perfect control, to be dispensed or retained as required.

E. Is a scale showing the quantity of water required to flow in each main and branch channel, the capacity of channel due to the required supply, and data for estimating all the different works.

F. The Estimate, amounting to £40,000. It includes the completion of the Long Marsh Reservoir, the Peel and Durham Dam, the Durham Channels, and all the works connected with them, with a *rough* calculation of the expense of the Peel Channels; they being not yet fully planned.

All my computations are for free labour; but it is palpable that in the present state of the Colony free labour cannot be obtained to the amount required to complete the work in one or two years; indeed, as my last instructions are to carry on the survey for the full project, my present Estimate has in it no object but to elucidate my plans, and give a view of what I expect to be the cost and effect of such projects in the Colony; and I append for the same purpose my estimation of the value of water, and a scheme for paying for it. (*Vide Appendix.*)

An extended project will be much less expensive in proportion to the benefit derived; and therefore the present computation of £2 per acre is above what will prove an average outlay for the whole country to be irrigated by the three rivers: particularly as the extensive plain which the Lake River commands will, from its extent and other advantages which it possesses, be done with far less labour.

At the rate of £2 per acre for the first outlay for the Government works, the water is brought within the reach of each proprietor for all his land fit for Irrigation.

I estimate the lowest *annual* value of water on the acre at £5; and I set the payment at a tithe of this, or 10s. per acre, after the fifth year, giving it three years gratis, the fourth year at 2s. 6d., and the fifth year at 5s.: under which scale I should expect the proprietor will obtain from the water itself ample means for preparing his land at first, and paying for the water after the fifth year at a price which will just remunerate the Government.

The sale of Crown Land in the townships will be a further return to the Government, and make up for the delay in receiving payment from the land proprietors. In the three townships of Ross, Campbell Town, and Tunbridge, 2000 acres of crown land will be watered; and would undoubtedly sell at an average price of at least £15 per acre, or £30,000 which amounts to three-fourths of the total amount.

I mention these particulars (and they are more fully detailed in the Appendix) to show that the project as at present planned would be a profitable outlay of money if paid for at the cost of free labour, though the return would be at a distant period; and therefore that the Government would be warranted in undertaking it for the benefit of the country, if it could bear the present outlay, and the delay of repayment.

The extended project would yield a greater proportionate direct return; and the advantages to the community, spreading over a wider space, would be more equable, and conduce more to general prosperity.

I may in conclusion therefore repeat, that the present partial project might be undertaken independently, and rest on its own recommendations, or it may be considered as a commencement of the full project, and be extended at a future period.

I would beg leave to add, that the North and South Esk Rivers offer great facilities for extending the Irrigation of the country to Launceston, and would afford water-power and canal communication to the town and its vicinity, as well as induce the sale of some highly valuable crown land.

In the south, although no very extensive fields for Irrigation exist, and the system to be pursued would be of a different character, yet I have no doubt that most important works might be carried on in that part of the country, combining all the advantages of water communication, water power, and Irrigation.

I have the honour to be,

Sir,

Your most obedient Servant,

H. C. COTTON.

J. E. BICHENO, *Esq.*, *Colonial Secretary*,  
*&c.* *&c.* *&c.*



## A P P E N D I X.

### VALUE OF WATER AND SCHEME OF PAYMENT.

THE quantity of water to be allowed per acre is 2500 cubic yards per annum, to be drawn uniformly in the course of 5 months, or at any other rate to suit the crops, mills, &c. This quantity is sufficient for grass land, and is the maximum for any crop,—1000 cubic yards drawn in the course of 2 months is sufficient for grain; but cut green as a previous crop for hay, the grain would require water for a longer period, and pasture may be obtained after the crop is off by continuing the water, so that the full quantity of 2500 cubic yards would generally be used. Potatoes watered twice a month during the dry months will make a very great return, especially in this part of the country where frosts prevail; the expenditure of water being comparatively very small. Lucern irrigated is a highly productive crop: it requires the full supply of water. The grain crop is the least valuable. The increase of produce on any land will be at least 20 bushels per acre, which, at the low rate of 5s per bushel, gives £5 as the value of the water per acre, when 1000 cubic yards only of water is used: and I set this as the lowest return for the use of water upon an acre of land. Green crops, potatoes, and all garden produce will yield up to £30 per acre; and Irrigation makes all crops sure as well as productive.

The total estimate of the first part of the Government project,—viz. the Peel and Durham Channels, with their supplying reservoirs,—amounts to £40,000, calculated at the cost of free labour. About 20,000 acres will be irrigated; so that the first expense is £2 per acre.

Tooms Lake, one of the supplying reservoirs, has been completed by a body of subscribers, who have laid out on that, and the commencement of the Long Marsh, about £1200. I have therefore supposed that 600 acres belonging to the subscribers might be watered gratis for ever in consideration of their outlay; and, to mark the exertions of the founders of the Macquarie Irrigation, Crown Lands in the Townships of Tunbridge, Ross, and Campbell Town, to the amount of 2000 acres, may be sold at from £8 to £30 or £40, yielding at an average of £15, £30,000, or three-fourths of the amount of the first outlay.

Setting the value of the water at its lowest rate of £5 per acre, and fixing the water-rate at a tithe of this, or 10s. per acre per annum, the computation gives 25 per cent. on the total outlay when all the land is cultivated; and deducting 2½ per cent. for repairs and superintendence, the receipts will amount to 22½ per cent.—(£9000).

In addition to this annual return, and the receipts for Crown Land sold, water-power will be a further source of Revenue. There will be several mill-sites on the irrigating channels where water will be paid for, as it were, twice, where the water will not be withdrawn from the land by its being applied to drive mills; and there is also water to spare for some other mills, all of which will pay: but the number of them will depend on the population and wants of the neighbourhood—every principal proprietor will have water-power for threshing, winnowing, grinding, cutting turnips, &c. &c.

The whole of the works are so planned as that they may be enlarged for the purpose of extending the operations below; and the project, besides being complete in itself, is the foundation of a second project for the plains lower down the Macquarie, and will tend to diminish the expense of all the irrigation downwards to the sea.

With reference to what is stated above, I will suppose, 1st. That 600 acres belonging to the founders is watered gratis. 2nd. That the following rates shall be fixed for all other land; viz. :—

1st, 2nd, & 3rd year to allow for preparation of the land—Gratis.	s.	d.
4th year, at per acre .....	2	6
5th year, ditto .....	5	0
6th and sequent years .....	10	0

Or at per 1000 cubic yards—

1st, 2nd, and 3rd year .....	Gratis.
4th year .....	1s.
5th year .....	2s.
6th year .....	4s.

3rd. That Mills shall pay for water at the full rate of 4s. per 1000 cubic yards.

*STATEMENT of expected Returns from Lands for 20 Years.*

Year.	<i>Acres under pre- paration. Gratis.</i>	<i>Acres paid for at 2s. 6d.</i>	<i>Acres paid for at 5s.</i>	<i>Acres paid for at 10s.</i>	<i>Founders' Acres Gratis.</i>	<i>Annual Receipts.</i>			<i>Amount to be expended on the Works.</i>		
						£	s.	d.	£	s.	d.
1	500	—	—	—	600		—		15,000	0	0
2	1000	—	—	—	600		—		7,000	0	0
3	1500	—	—	—	600		—				
4	1500	500	—	—	600	62	10	0	6,000	0	0
5	1500	1000	500	—	600	250	0	0			
6	1500	1500	1000	500	600	687	10	0			
7	1500	1500	1500	1,000	600	1,062	10	0			
8	1500	1500	1500	1,500	600	1,312	10	0	6,000	0	0
9	1500	1500	1500	3,000	600	2,062	10	0			
10	1500	1500	1500	4,500	600	2,812	10	0			
11	1500	1500	1500	6,000	600	3,562	10	0			
12	1500	1500	1500	7,500	600	4,312	10	0	6,000	0	0
13	2000	1500	1500	9,000	600	5,062	10	0			
14	2000	1500	1500	10,500	600	5,812	10	0			
15	1000	1500	1500	12,000	600	6,562	10	0			
16	—	2000	1500	13,500	600	7,375	0	0			
17	—	2000	2000	15,000	600	8,000	0	0			
18	—	1000	2000	17,000	600	8,500	0	0			
19	—	—	1000	19,000	600	9,125	0	0			
20	—	—	—	20,000	600	10,000	0	0			

*Total of Estimate at the cost of Free Labour..... £40,000 0 0*

Amount of receipts when all the land is cultivated .....	£10,000
Deduct for repairs and superintendence, at $2\frac{1}{2}$ per cent. on £40,000.....	1000
Remaining clear receipts, $22\frac{1}{2}$ per cent. on £40,000.....	<u>£9000</u>

The interest on the Capital sunk is not taken into the account. If taken at 5 per cent. it will exceed the clear receipts for the first seven years, after which the receipts will increase from 5 to  $22\frac{1}{2}$  per cent. : this is on the irrigation of land only. The sale of Crown Lands, and the return derived from water for mills, will at once commence paying off the Capital.

H. C. COTTON.



# ESTIMATES.

## No. 1.

### ESTIMATE FOR DAM, &c. AT LONG MARSH.

#### FREE LABOUR.

36,566 cubic yards of earth to be got, and shot, calculated at 5 yards per day.  
 7870 cubic yards of puddle to be got, tempered, and placed, calculated at 2 yards per day.  
 67,200 cubic feet of rough facing stone to be got, rough dressed, and built, calculated at 40 feet per day.  
 10,450 cubic feet of rubble masonry in culverts, calculated at 15 feet per day.

	£	s.	d.
11,248 days for labour, at 2s.....	1124	16	0
2093 ditto mechanic, at 4s.....	418	12	0
418 bushels of lime, at 1s. 6d.....	31	7	0
Centering, tools, repairs of ditto .....	50	0	0
2 framed stages, complete .....	42	0	0
2 guages, iron work and valves.....	15	0	0
2 sluices, including cut masonry, in which they are to be set.....	40	0	0
2 crab winches, chains and fixing.....	36	0	0
Cottage for Dam-keeper.....	50	0	0

	£	s.	d.
<i>Supervision.</i>			
1 Superintendent, 1 year .....	150		
1 Overseer, ditto.....	60		
1 Messenger, ditto .....	35		
		245	0 0
<b>TOTAL .....</b>	<b>£2052</b>	<b>15</b>	<b>0</b>

## No. 2.

### ESTIMATE FOR THE DAM ON THE MACQUARIE RIVER.

#### FREE LABOUR.

2710 cubic yards of earth to be got, and shot, calculated at 4 yards per day.  
 995 cubic yards of puddle to be got, tempered, and placed, calculated at  $1\frac{1}{2}$  yards per day.  
 7320 cubic feet of paving to top and slopes of escape, to be got, rough dressed, and laid, calculated at 20 feet per day.  
 12,744 cubic feet of rough facing to top and slopes of dam, calculated at 30 feet per day.  
 6899 cubic feet of rubble masonry in walls and culverts, to be got, dressed, and built, calculated at 12 feet per day.

	£	s.	d.
<i>Labour.</i>			
1340 days at 2s.....	134	0	0
1365 ditto, mechanic, at 4s.....	273	0	0
250 bushels of lime, at 10d.....	10	8	4
Centering, tools, implements, repairs to ditto, wear and tear.....	10	0	0
6 freestone caps for pins, at 25s.....	7	10	0
195 feet freestone coping, saddle back, tooled and throated, at 2s. 6d.....	24	7	6
2 double sluices, fixed.....	25	0	0
1 single ditto, ditto.....	15	0	0
Cottage for Dam-keeper.....	50	0	0

**TOTAL.....£549 5 10**

#### *Supervision.*

See No. 7, Estimate of Sundries.

# 9

## No. 3.

### ESTIMATE FOR EMBANKMENT AND AQUEDUCT ACROSS KITTY'S RIVULET, DURHAM CHANNEL.

#### FREE LABOUR.

2790 cubic yards of earth to be got, and shot, calculated at 3 yards per day.  
4327 cubic feet of masonry, calculated at 12 feet per day.

#### Labour.

	£	s.	d.
930 days, at 2s. ....	93	0	0
360 ditto, mechanic, at 4s. ....	72	0	0
20 ditto, digging foundations, at 2s. ....	2	0	0
180 bushels of lime, at 1s. ....	9	0	0
Scaffolding, centering, tools, repairs, &c. ....	10	0	0
132 feet run of freestone coping, saddle-back, tooled and throated, fixed with cramps, at 2s. 6d. ....	16	10	0
4 freestone caps, fixed, at 25s. ....	5	0	0
TOTAL.....	£207	10	0

#### Supervision.

See No. 7, Estimate of Sundries.

## No. 4.

### ESTIMATE OF EMBANKMENT AND CULVERT ON THE DURHAM MAIN CHANNEL, BETWEEN BRANCHES Nos. 5 & 6.

#### FREE LABOUR.

25,206 cubic yards of earth to be got, and shot, calculated at 3½ yards per day.  
875 cubic feet masonry in culvert, calculated at 15 feet per day.

#### Labour.

	£	s.	d.
7201 days, at 2s. ....	720	2	0
58 ditto, mechanic, at 4s. ....	11	12	0
35 bushels of lime, at 1s. ....	1	15	0
Water for ditto ....	0	17	6
Centering, tools, implements, and repairs of ditto ....	30	0	0
Tamping.....	20	0	0
TOTAL.....	£784	6	6

#### Supervision.

See No. 7, Estimate of Sundries.

## No. 5.

### ESTIMATE FOR EMBANKMENT AND BRIDGE AQUEDUCT ON THE MAIN CHANNEL ACROSS YORK RIVULET.

#### FREE LABOUR.

705 cubic yards of earth to be got, and shot, calculated at 3½ yards per day.  
2050 cubic feet of masonry in aqueduct, calculated at 12 feet per day.

#### Labour.

	£	s.	d.
171 days, mechanic, at 4s. ....	34	4	0
201 ditto, labour, at 2s. ....	20	2	0

	£	s.	d.
10 days, foundations, at 2s. ....	1	0	0
122 bushels of lime, at 1s. ....	6	2	0
Centering, scaffolding, tools, repairs.....	10	0	0
132 feet of coping, saddle-back of freestone, tooled and throated, and fixed with bead and cramps, at 2s. 6d. ....	16	10	0
4 freestone caps for pins, at 25s. ....	5	0	0
TOTAL.....	£92	18	0

Supervision.

See No. 7, Estimate of Sundries.

No. 6.

ESTIMATE FOR THE CHANNELS, BACK DRAINS, AND CUTTINGS CAUSED  
BY INEQUALITIES OF GROUND, &c.

FREE LABOUR.

For Quantities see Tabular Abstract.

	£	s.	d.
54,994 days' labour, at 2s. ....	5499	8	0
Tools, and repairs of ditto, for the above, estimating 300 days to the year, at 30s. per man ....	276	0	0
14,536 days, mechanic, at 4s. ....	2907	4	0
Tools, and repairs of ditto ....	72	0	0
Centering, moulds, running planks ....	50	0	0
1500 bushels of lime, at 1s. ....	75	0	0
Water for ditto.....	50	0	0
40 occupation bridges, at £5.....	200	0	0
12 sluices (6 head sluices to the branches, and 6 dispensing ditto), at £8 Fencing the various channels on both sides, when necessary, 36 miles, at £40 ....	96	0	0
1440	0	0	
TOTAL.....	£10,665	12	0

Supervision.

See No. 7, Estimate of Sundries.

No. 7.

ESTIMATE OF SUNDRIES.

	£	s.	d.
Purchase of 148 acres of land for channels, at £3 per acre ....	444	0	0
Ditto of 2 acres of land for cottage for dam and sluice keepers.....	10	0	0
Compensation for damage done to lands by works ....	100	0	0
Building 3 stations for the accommodation of men, at £150.....	450	0	0
Wood and Water, 18 months, for stations :—			
Water 40 hhds. per week, 40 × 78, at 1s. ....	156	0	0
Wood 20 tons ditto, 20 × 78, at 2s. ....	156	0	0
Stores and implements for 3 stations, cooking utensils, &c. at £25 ....	75	0	0
Surveyor, men, and allowances.....	500	0	0
Superintendent ....	200	0	0
Six Overseers, at £50 ....	300	0	0
Three Messengers, at £30.....	90	0	0
	£1090	0	0
Ditto ditto for 18 months .....	£1635	0	0
TOTAL.....	£3026	0	0

## ABSTRACT ESTIMATES.

	£	s.	d.
No. 1. Dam at Long Marsh .....	2,052	15	0
2. Dam on Macquarie River .....	549	5	10
3. Embankment and aqueduct across Kitty's Rivulet .....	207	10	0
4. Embankment and culvert between Nos. 5 & 6.....	784	6	6
5. Embankment and aqueduct across York Rivulet.....	92	18	0
6. Channels, &c. ....	10,665	12	0
7. Estimate of Sundries .....	3,026	0	0
	17,378	7	4
Contingencies 10 per cent. ....	1,737	16	9
TOTAL .....	£19,116	4	1

Durham Channel.

NOTE.—The Estimate supposes that the labourers and mechanics will be hutted, and provided with wood and water, at the expense of the Government; and that the Government will supply them at contract prices with provisions,

	£	s.	d.
Total of Reservoirs and Durham Channels .....	19,116	4	1
Estimated expense of Peel Channels .....	20,883	15	11
TOTAL .....	£40,000	0	0

*Longford, 2nd April, 1845.*

SIR,

I HAVE the honor to forward plans and estimates of the two irrigation projects which I have recommended as the first to be undertaken by the Government.

In the month of July last I furnished plans of a considerable project on the Macquarie River, with an explanatory report, and estimates in detail for the works required. The survey was at the time incomplete, and the estimate comprised the main reservoirs on the Macquarie and a set of channels in the Parish of Durham, with all the requisite works planned and calculated: with a rough calculation of proposed works for the Parish of Peel, on the opposite side of the river, to depend on the same supplying reservoirs. With these plans and estimates I offered suggestions for the ultimate repayment of the outlay by rates charged on the water, founded upon calculations of the absolute value of water used in irrigation—the first expense of the undertaking, and the annual expenses of superintendence and repairs.

In this report, after explaining the two projects, one of which is the same as that before proposed in the Parish of Durham, I propose to recapitulate those calculations, and set them in comparison with the estimated cost of the two projects as performed by free labour.

The plan A is a map of a portion of the County of Somerset, showing the course of the Macquarie and Elizabeth Rivers from their sources to their junction. This map exhibits the sites of the proposed reservoirs and main and branch channels for the two projects; and I must here explain that the lands lying between Campbell Town and Ross, and up the east bank of the Macquarie to the proposed Peel and Durham Dam (the works for which were roughly estimated in my former report), were proposed to be irrigated by the Macquarie: but my survey of the Elizabeth River enables me to propose a better scheme for this tract, and it will be seen that I now propose supplying it by a channel from the latter river.

The first project, then, is for the irrigation of about 8000 acres, lying entirely between the Macquarie and Blackman, including the Township of Tunbridge. Tooms Lake and the Long Marsh will, as being proposed, be the supplying reservoirs; and the dam of the latter is so planned as to retain a body of water sufficient, in conjunction with Tooms Lake, to irrigate the tract and supply several mills with water-power.

In planning the works I have also arranged for the extension of the project, giving the Long Marsh Dam a form which will admit of its being raised to increase the capacity of the reservoir, and giving space for widening the main channel to carry an increased supply of water through to the land on the west banks of the Blackman and Macquarie.

The second project proposes to irrigate the lands between Ross and Campbell Town and down to the junction of the two rivers; those north of the Elizabeth as far as Wanstead, and both the Townships of Campbell Town and Ross. The supply of water will be retained in a reservoir formed for the purpose in Kearney's Bogs, near the head of the Elizabeth. The water discharged from the reservoir will flow in the bed of the river as far as the proposed Campbell Town Dam, from whence it will be conducted by the two main channels, north and south of the river, and several branches from each, to all the lands. The extent of land north of the river, included in this scheme, amounts to about 7000 acres, and south of the river 13,000 acres, and water-power will be provided for twenty mills.

These mills, as well as those provided for in the first project, are chiefly intended for farm purposes. Every principal proprietor will have a mill-site, where a fall of water can be allowed, affording sufficient power for threshing, cleaning, and grinding all the corn he can grow, and other farm work, and in most cases supplying fresh water to his dwelling-house and irrigating his garden. Three mill-sites are fixed upon for the use of the town at Campbell Town, one at Ross, and two at Tunbridge: these will be of greater power, and may be made to suit the wants of the towns as their population increases. They are situated on Crown land, which can be reserved, given on lease for a term of years, or sold with its prospective advantages, as the Government may think fit.

The plan B shows on an enlarged scale the course of the Durham Channels, the lands to be watered by them, the boundary lines of the various properties, and the Township of Tunbridge (the whole of which township, with the exception of 30 acres, belongs to the Crown). The proposed mill-sites are marked—eleven in number, including two on the Township of Tunbridge.

The total quantity of land proposed to be watered is 8000 acres, which will require 20,000,000 cubic yards of water; all the private mills will be driven by water merely passing to irrigated lands, and worked only during the irrigating season; and it is only the two mills at Tunbridge which will expend water passing to too low a level for irrigation within the

range of this project. There is but one house at present on the township, and there are 1100 acres of Crown land below the channels, which will shortly find purchasers, so that I have no doubt the population will increase quickly, and one mill would probably be established immediately. Each of these mills, worked through the year, would expend water from the reservoir to the amount of  $1\frac{1}{2}$  million cubic yards; so that, when the project is in full operation, 23 millions of cubic yards of water will be required annually to be stored in the two reservoirs. They are planned to contain about 34 millions, giving a surplus for cases of accidental waste or unusual drought.

The plan C is an enlarged plan of the Elizabeth Channels, the lands to be irrigated by them, the Townships of Ross and Campbell Town, the boundaries of those properties through which the Channels pass, and the sites of the proposed mills—sixteen on located lands, three on Crown land in Campbell Town, and one on Crown land in Ross. The private mills, as in the first project, expend no water but what is used immediately below for irrigation, and will be worked only during five months while the irrigation proceeds. The sites of the four town mills may be reserved, given on lease, or sold, at the pleasure of the Government, as before suggested with respect to those at Tunbridge. The extent of land to be irrigated south of the river is about 13,000 acres, and north of the river 70,000 acres—total 83,000, for which about 50 million cubic yards of water must be reserved, and for the town mills about 5 million cubic yards extra, making 55 millions to be retained in the reservoir at Kearney's Bogs when all the land is irrigated. I have planned the reservoir at present to contain this quantity, and the dam will admit of being raised whenever it shall become necessary.

The plan E is a survey of the marsh known by the name of Meredith's Marsh, one of the bogs; it is the best site on the river for a reservoir, being an extensive flat terminating in a narrow gorge. The only objection to this site is, that the marsh is for the most part private property, but the land is of little value; and I conceive that the proprietors would be glad to give it up for the purpose, in consideration of receiving from the Crown a double quantity of land elsewhere. Water might be reserved in the marshes higher up; but they would require extensive embankments, and would not receive so large a drainage. Looking forward to an extension of irrigation down the Macquarie River below the present scheme, the possession of this reservoir will be of the greatest importance as it receives the drainage of a great extent of country, and would at a small additional expense be made to retain the whole.

The eight sheets marked D contain detailed drawings of masonry and other works for both projects.

No. 1. The dam at the Long Marsh in elevation and section, the sluices and gauge chambers, by means of which the quantity of water delivered will be regulated. The elevation of the dam shows its height when completed, as well as the height I have allowed for in the accompanying estimate.

No. 2. Similar plan of the dam at Kearney's Bogs.

No. 3. Is the Peel and Durham Dam across the Macquarie at the head of the channel. Its object is, not to retain any body of water, but to raise its level and give an elevation of 15 feet to the surface, in order that the channel heads may be raised above the river floods. The river in its floods will pass freely over the escape in this dam, and pursue its natural course; there being at the head of the main channel a regulating sluice to limit the body of water admitted into it, or to exclude it entirely when necessary.

No. 4. Similar plan of the dam across the Elizabeth River at the head of the two main channels.

Nos. 5, 6, 7, and 8, are the details of cuttings and masonry works for the channels of the two projects. The whole water will, by means of these, be under perfect control, to be dispensed or retained as required.

The sheet F is a scale showing the quantity of water required to flow in the main and branch channels; the capacity of channel due to the required supply, and data for estimating all the different works.

The sheet G is a similar scale for the Elizabeth scheme.

H is the estimate of the Macquarie scheme, calculated for free labour, amounting to £20,517 2s. 10d. As free labour is not procurable, I submit this estimate to show the value of the works in comparison with my estimation of the value of the water preserved and distributed.

I is the estimate of the Elizabeth scheme, calculated for free labour, amounting to £35,007 7s. 6d.

I have not data upon which to estimate correctly what cash outlay would be required, with the aid of Convict labour, for these works, but have made a rough computation, supposing every man actually at work to receive 6d. a day, and each man's work half that of a free man.

The Macquarie project would cost—

	£
In Convict labour .....	8000
In land in exchange for that occupied by works .....	500
And in cash .....	2000
TOTAL.....	<u>£10,500</u>

The Elizabeth project would cost—

	£
In Convict labour .....	11,000
In land in exchange for that occupied by the works .....	4000
And in cash .....	3500
TOTAL.....	<u>£18,500</u>

Total of the two projects with the aid of Convict labour* .....	<u>£29,000</u>
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The following table shows the cost per acre of the two projects as performed by free and convict labour severally ; the former amounting on the whole to £1 18s., and the latter to £1 per acre.

	Acres.	Free Labour Estimate.	Per Acr e.	Convict Labour Estimate.	Per Acre.
		£	£ s.	£	£ s.
Macquarie project.....	8,000	20,500	2 11	10,500	1 6
Elizabeth ditto.....	21,000	35,000	1 13	18,500	0 17
TOTAL .....	29,000	55,500	1 18	29,000	1 0

The value of water was computed in my former report at £5 per annum per acre on corn land, the least profitable of all watered crops. Setting this as the value of the water used on one acre, or for 2500 cubic yards, and fixing a tithe of this value, or 10s. per acre, water rate, the two projects will yield on 29,000 acres £14,500 per annum; or, deducting 600 acres watered gratis, 28,400 acres, £14,200; and, deducting for repairs and superintendence 2½ per cent. on £55,500 (£1387), gives an actual annual return of £12,813 when the whole tract is irrigated.

As explained in my former Report, a certain remuneration is due to the founders of the Macquarie Irrigation, by whose exertions and funds the Tooms' Lake Reservoir, now to be connected with these works, was formed; and I would suggest that 600 acres belonging to the subscribers should be watered gratis, both to mark the exertions and to repay the expense of the founders,—and deducting on this account £300 from the annual receipts, the net return becomes £12,800 per annum.

The sale of Crown land in the townships will amount within a few years to £30,000—viz., 2000 acres in the Townships of Tunbridge, Campbell Town, and Ross at an average price of £15 per acre.

* Convict labour .....	£19,000
Land.....	4,500
Cash .....	5,500
TOTAL.....	<u>£29,000</u>

With respect to the return to be expected from mills, I think it would be desirable to fix a light rate upon each mill supplied with water power,—not as a source of revenue, but as a mark of right retained by Government over the distribution of the water. Those which will be erected on Crown land in the three towns will be mills of great power, if a sufficient quantity of water is reserved for them; and when the irrigation is extended to tracts lower down the river the water passing through them will not be lost. It follows, therefore, that the mill power set apart for the towns may be made to keep pace with the increase of population and the wants of the towns: they may be made to yield funds for public improvements, or, as I have mentioned above, they may be given on a lease for a term of years; or the sites, with all their prospective advantages, sold at once, or placed in the hands of trustees for the benefit of the towns. I will, therefore, make no estimate of the return on mill power in the following table of prospective returns for the two projects, but confine myself to the amount of assessment on water used for irrigation, and the amount received from the sale of land in the towns:—

*STATEMENT of expected Returns from Lands for 20 Years.*

Year.	Acres under Preparation Gratis.	Acres paid for at 2s. 6d.	Acres paid for at 5s.	Acres paid for at 10s.	Founders' Acres Gratis.	Irrigation Receipts.	Crown lands sold.			Total Receipts.	Deduct Expenses and Repairs.	Net Annual Receipts.
							Acres.	At per Acre.	Annual Amount.			
1	500	—	—	—	600	£ s.	50	15	750	£ s.	—	£ s.
2	1000	—	—	—	600	—	100	—	1500	1,500 0	—	1,500 0
3	1500	—	—	—	600	—	200	—	3000	3,000 0	1400	1,600 0
4	1500	500	—	—	600	62 10	300	—	4500	4,562 10	1400	3,162 10
5	1500	1000	500	—	600	250 0	450	—	6750	6,800 0	1400	5,400 0
6	1500	1500	1000	500	600	687 10	450	—	6750	7,437 10	1400	6,037 10
7	1500	1500	1500	1,000	600	1,062 10	450	—	6750	7,812 10	1400	6,412 10
8	1500	1500	1500	1,500	600	1,312 10	—	—	—	1,312 10	1400	
9	1500	1500	1500	3,000	600	2,062 10	—	—	—	2,062 10	1400	662 10
10	1500	1500	1500	4,500	600	2,812 10	—	—	—	2,812 10	1400	1,412 10
11	2000	1500	1500	6,000	600	3,562 10	—	—	—	3,562 10	1400	2,762 10
12	3000	2000	1500	7,500	600	4,375 0	—	—	—	4,375 0	1400	2,975 0
13	3000	3000	2000	9,000	600	5,375 0	—	—	—	5,375 0	1400	3,975 0
14	3000	3000	3000	11,000	600	6,625 0	—	—	—	6,625 0	1400	5,225 0
15	3000	3000	3000	14,000	600	8,125 0	—	—	—	8,125 0	1400	6,725 0
16	3000	3000	3000	17,000	600	9,625 0	—	—	—	9,625 0	1400	8,225 0
17	2400	3000	3000	20,000	600	11,125 0	—	—	—	11,125 0	1400	9,725 0
18	—	2400	3000	23,000	600	12,625 0	—	—	—	12,625 0	1400	11,225 0
19	—	—	2400	26,000	600	13,750 0	—	—	—	13,750 0	1400	12,350 0
20	—	—	—	28,400	600	14,200 0	—	—	—	14,200 0	1400	12,800 0

NOTE.—If the works performed by Convict labour cost in all 29,000*l.*, the sale of 2000 acres at 15*l.* per acre, 30,000*l.*, will pay the whole amount of the first outlay in the course of 8 years.

I suppose, in the above calculation, that the whole of the land will be laid down for irrigation in the course of twenty years, at the end of which period the annual receipts from so low a rate as 10*s.* per acre would yield a clear revenue of £12,800 per annum. In the first eight years the outlay, if the work be performed by Convict labour, will be paid for by the sale of Crown lands; and in the next eight years the Land Fund would be reimbursed, and the rate may be taken off, except a fraction for repairs and superintendence, unless, as in other countries, the water be made a source of revenue for Government purposes.



I have not the smallest doubt that the use of Irrigation will extend as quickly as the above table assumes. An agricultural population will rapidly pour in upon these irrigated plains, finding a maintenance and paying rent to the great proprietors of these at present unproductive, or indeed all but barren, tracts.

Tunbridge is an exceedingly fine site for a central town; Campbell Town, already a considerable town, would immediately extend itself; and Ross, supplying its beautiful freestone, would aid in the establishment of the other two, and increase its own importance.

There is a portion of the land included in the general project laid before the Council last year which is not provided for in these plans. It lies north of the Macquarie, on the borders of Johnson's Rivulet, and can be watered by means of that stream, which I am now surveying for the purpose.

I am also carrying on a line of levels from the extremity of the Macquarie main at Tunbridge, with a view of extending it across the Blackman, and down the west banks of that river and the Macquarie.

I then propose to examine the lakes at the head of the Lake River, and the sources of the South Esk, for the formation of reservoirs, and to carry on the survey for the irrigation of the extensive plains which depend on those rivers.

I have the honor to be,  
Sir,

Your most obedient servant,

H. C. COTTON.

The COLONIAL SECRETARY.

## 1. ESTIMATE ON THE MACQUARIE RIVER SCHEME.

### No. 1.

#### D A M A T L O N G M A R S H.

##### FREE LABOUR.

	DAYS.	
	Mechanic.	Labour.
33,780 cubic yards of earth to be got, and shot, 5 yards per day.....	—	6756
3,164 cubic yards of puddle to be got, tempered, and placed, 2 yards per day .....	—	1582
42,636 cubic feet of stone facing, to be got, rough dressed, and built, 20 feet per day.....	2131	—
2,820 cubic feet of stone facing in counterfort, 12 feet per day.....	235	—
9,792 cubic feet of masonry in culverts and gauge chambers, 12 feet per day.....	816	—
<i>Total Days</i> .....	<u>3182</u>	<u>8338</u>

	£	s.	d.
3,182 days, mechanic, at 4s.....	636	8	0
8,338 days, labour, at 2s. ....	938	16	0
500 bushels of lime, at 1s. 6d.....	37	10	0
Centering and tools, and repairing ditto.....	50	0	0
2 gauges, iron work and valves.....	7	10	0
2 sluices, valves, racks, levers, &c., complete .....	25	0	0
Cottage for Dam-keeper .....	50	0	0

##### Supervision.

	£	s.	d.
1 Superintendent, 1 year .....	£150		
1 Overseer, ditto .....	60		
1 Messenger, ditto.....	35		
	<u>245</u>	0	0
<b>TOTAL</b> .....	<u>£2090</u>	<u>4</u>	<u>0</u>

## No. 2.

## DAM ON THE MACQUARIE.

## FREE LABOUR.

	DAYS.	
	Mechanic.	Labour.
2,094 cubic yards of earth to be got and shot, at 4 yards per day....	—	523
555 cubic yards of puddle to be got, tempered, and placed, 2 yards per day .....	—	277
15,015 cubic feet rough masonry, for face of dam, to be got, rough dressed, and built, 20 feet per day.....	750	—
10,010 cubic feet of rough paving, for top and inner slope, 30 feet per day .....	333	—
7,825 cubic feet of masonry in escape, 12 feet per day.....	652	—
2,799 cubic feet in retaining walls, chambers, &c., 12 feet per day....	233	—
<i>Total Days</i> .....	1968	800

	£	s.	d.
1,968 days, mechanic, at 4s.....	393	12	0
800 days, labour, at 2s .....	80	0	0
600 bushels of lime, at 1s.....	30	0	0
Centering tools, implements, &c.....	10	0	0
2 freestone caps for pins, at 25s .....	2	10	0
4 ditto for chamber, at 15s .....	3	0	0
105 feet of coping, fixed, at 2s. 6d .....	13	2	6
2 double sluices, fixed .....	20	0	0
1 single ditto .....	7	0	0
Cottage for Dam-keeper.....	50	0	0
<b>TOTAL</b> .....	<b>£609</b>	<b>4</b>	<b>6</b>

## No. 3.

## EMBANKMENT AND BRIDGE AQUEDUCT ACROSS THE KITTY'S RIVULET.

## FREE LABOUR.

	DAYS.	
	Mechanic.	Labour.
2790 cubic yards of earth to be got and shot, 3 yards per day .....	—	930
Digging foundations.....	—	20
4327 cubic feet of masonry, at 12 feet per day.....	360	—
<i>Total Days</i> .....	360	950

	£	s.	d.
360 days, mechanic, at 4s .....	72	0	0
950 days, labour, at 2s.....	95	0	0
180 bushels of lime, at 1s.....	9	0	0
Scaffolding, centering tools, &c. ....	10	0	0
132 feet run of coping, at 2s. 6d.....	16	10	0
4 caps, fixed, at 25s .....	5	0	0
<b>TOTAL</b> .....	<b>£207</b>	<b>10</b>	<b>0</b>

No. 4.

EMBANKMENT ON MAIN CHANNEL BETWEEN NOS. 5 AND 6 BRANCHES.

FREE LABOUR.		DAYS.	
		Mechanic.	Labour.
25,206 cubic yards of earth to be got and shot on the entire line of embankment, 1454 feet, and the channel formed therein, $3\frac{1}{2}$ cubic yards per day .....	—	—	7201
875 cubic feet of masonry in culvert, 15 feet per day .....	58	—	—
<i>Total Days</i> .....	58	—	7201
		£	s. d.
7201 days, labour, at 2s. ....	720	2	0
58 days, mechanic, at 4s .....	11	12	0
35 bushels of lime, at 1s .....	1	15	0
Water for ditto .....	0	17	6
Centering tools, and turning planks, and repairing ditto .....	30	0	0
Tamping .....	20	0	0
<i>TOTAL</i> .....	£784	6	6

No. 5.

EMBANKMENT AND BRIDGE AQUEDUCT ACROSS THE YORK RIVULET.

FREE LABOUR.		DAYS.	
		Mechanic.	Labour.
705 cubic yards of earth to be got and shot, and channel formed therein, $3\frac{1}{2}$ yards per day .....	—	—	201
Digging for foundations .....	—	—	10
2050 cubic feet of masonry, 12 feet per day .....	171	—	—
<i>Total Days</i> .....	171	—	211
		£	s. d.
171 days, mechanic, at 4s .....	34	4	0
211 ditto, labour, at 2s. ....	21	2	0
122 bushels of lime, at 1s. ....	6	2	0
Centering, scaffolding, tools, &c .....	10	0	0
132 feet run of freestone coping, saddle back, at 2s 6d .....	16	10	0
4 caps, at 25s .....	5	0	0
<i>TOTAL</i> .....	£92	18	0

No. 6.

CHANNELS.

FREE LABOUR.		DAYS.	
		Mechanic.	Labour.
16,368 cubic yards of rock to be excavated and shot, 20 cubic feet per day .....	—	—	22,096
68,485 cubic yards of loam to be got and shot, at 4 yards per day ...	—	—	17,121
41,146 cubic yards of loam and stones to be got and shot, 3 yards per.. day .....	—	—	13,715
11,514 cubic yards of sandy loam to be got and shot, 5 yards per day .....	—	—	2,303
193,875 cubic feet of masonry in culverts, at 12 feet per day .....	16,156	—	—
19,387 cubic feet of masonry in occupation bridges, special culverts, &c., 12 feet per day .....	1,615	—	—
<i>Total Days</i> .....	17,771	—	55,235

	£	s.	d.
17,771 days, mechanic, at 4s. ....	3554	4	0
55,235 ditto, labour, at 2s. ....	5523	10	0
Tools and repairs for the above .....	72	0	0
Centering, moulds, running planks, &c. ....	50	0	0
8,522 bushels of lime at 1s. ....	426	2	0
Water for ditto .....	50	0	0
25,000 perches of fencing, being about three-fifths of double the length of the channels, taken at 1s. 6d. at an average. ....	1870	0	0
40 occupation bridges, at £5. ....	200	0	0
12 sluices, at £8. ....	96	0	0
<b>TOTAL</b> .....	<b>£11,841</b>	<b>16</b>	<b>0</b>

## No. 7.

## GENERAL ESTIMATE.

## FREE LABOUR.

	£
Purchase of 148 acres of land occupied by channels, at £3 .....	444
Ditto of 1 acre for dam cottages .....	10
Compensation for damage to lands .....	100
Building three stations for the accommodation of men, at £150 .....	450
Wood and water for stations for 18 months .....	312
Stores and implements for three stations .....	75

## Supervision.

Surveyor, men, and expenses .....	£500
Superintendent .....	200
Six overseers, at £50. ....	300
Three messengers, at £30 .....	90

£1090

For 18 months ..... 1635

**TOTAL** ..... **£3026**

## A B S T R A C T.

## FREE LABOUR.

	£	s.	d.
No. 1. Dam at Long Marsh .....	2,090	4	0
2. Dam on Macquarie River .....	609	4	6
3. Embankment and Bridge across Kitty's Rivulet .....	207	10	0
4. Embankment on main line, between Nos. 5 & 6 branches .....	784	6	6
5. Embankment and bridge aqueduct on main channel York Rivulet ..	92	18	0
6. Channels .....	11,841	16	0
7. General .....	3,026	0	0
	<b>£18,651</b>	<b>19</b>	<b>0</b>
Contingencies 10 per cent. ....	1,865	3	10
	<b>£20,517</b>	<b>2</b>	<b>10</b>

## II. ESTIMATE OF THE ELIZABETH RIVER SCHEME.

## No. 1.

## DAM AT KEARNEY'S BOGS.

## FREE LABOUR.

	DAYS.	
	Mechanic.	Labour.
30,983 cubic yards of earth to be got and shot, 4 yards per day .....	—	7745
6,208 cubic yards of puddle to be got, tempered, and placed, 2 yards per day .....	—	3104
134,100 cubic feet of rough facing stone to be got, rough dressed, and built, 20 feet per day .....	6705	—
2,376 cubic feet of rough masonry for counterfort, 12 feet per day .....	198	—
3,920 cubic feet of masonry in culverts, sluice gauge chamber, 12 feet per day .....	326	—
<i>Total Days</i> .....	<u>7229</u>	<u>10,849</u>

	£	s.	d.
7,229 days, mechanic, at 4s. ....	1445	16	0
10,849 days, labour, at 2s. ....	1084	18	0
250 bushels of lime, at 1s. 6d. ....	18	15	0
Centering and tools, and repairing ditto .....	50	0	0
2 guages, iron work, and valves .....	7	10	0
2 sluices, valves, racks, levers, chains, &c., including cut masonry .....	25	0	0
Cottage for Dam-keeper .....	50	0	0

*Supervision.*

1 Superintendent, at per annum .....	£120		
1 Overseer, ditto .....	60		
1 Messenger, ditto .....	30		
		210	0 0

**TOTAL** ..... £2891 19 0

## No. 2.

## DAM ON THE ELIZABETH.

## FREE LABOUR.

	DAYS.	
	Mechanic.	Labour.
2,720 cubic yards of earth to be got and shot, at 4 yards per day .....	—	680
809 cubic yards of puddle to be got, tempered, and placed, 2 yards per day .....	—	404
12,238 cubic feet of rough masonry for facing of dam, to be got, rough dressed, and built, 20 feet per day .....	611	—
5,167 cubic feet of paving for top and inner slope of dam, 30 feet per day .....	172	—
3,280 cubic feet of masonry in escape, 12 feet per day .....	273	—
5,391 cubic feet of masonry in retaining walls, chamber, &c., 12 feet per day .....	449	—
<i>Total Days</i> .....	<u>1505</u>	<u>1084</u>

	£	s.	d.
1,505 days, mechanic, at 4s. ....	301	0	0
1,084 days, labour, at 2s. ....	108	8	0
300 bushels of lime, at 1s. ....	15	0	0
Centering tools, implements, &c. ....	10	0	0
4 freestone caps for pins, £1 5s. each .....	5	0	0
90 feet run of freestone coping at 2s. 6d. ....	11	5	0
4 double sluices, fixed .....	40	0	0
2 single ditto .....	15	0	0
Cottage for Dam-keeper .....	50	0	0

**TOTAL** ..... £555 13 0

No. 3.

C H A N N E L S.

FREE LABOUR.

	DAYS.	
	<i>Mechanic.</i>	<i>Labour.</i>
30,295 cubic yards of rock to be excavated and shot, 20. feet per day	—	40,898
191,614 cubic yards of loam to be got and shot, 4 yards per day.....	—	47,903
18,428 cubic yards of loam and stones to be got and shot, 3 yards per day.....	—	6142
17,376 cubic yards of sandy loam to be got and shot, 5 yards per day	—	3475
325,751 cubic feet of masonry in culverts, at 12 feet per day .....	27,146	—
32,575 cubic feet in occupation bridges, special culverts, &c., 12 feet per day .....	2714	—
<i>Total Days</i> .....	<u>29,860</u>	<u>98,418</u>

	£	s.	d.
29,860 days, mechanic, at 4s. ....	5972	0	0
98,418 days, labour, at 2s. ....	9841	16	0
Tools and repairs for ditto, 30s. per man per annum, 300 days per annum .....	641	5	0
Centering moulds, running planks, &c. ....	100	0	0
14,000 bushels of lime, at 1s .....	700	0	0
Water for ditto .....	70	0	0
149 occupation bridges at £5 .....	745	0	0
25 sluices, at £8 .....	200	0	0
30,000 perches of fencing, being about three-fifths of twice the length of channels, taken at 1s. 6d. as an average .....	2250	0	0
<i>TOTAL</i> .....	<u>£20,520</u>	<u>1</u>	<u>0</u>

No. 4.

G E N E R A L E S T I M A T E.

FREE LABOUR.

	£	s.	d.
Purchase of 294a. 1r. 26p. of land for channels at £3 per acre .....	883	4	9
Ditto for Dam Cottage, 1 acre .....	10	0	0
Compensation for damage to lands.....	250	0	0
Purchase of 1535 acres at Kearney's Bogs for reservoir, at £2 per acre ....	3070	0	0
Building three stations for men at £150 .....	450	0	0
Wood and water for 5 stations for 2 years .....	494	0	0

*Supervision*

	£	s.	d.
Surveyor, men, and expenses .....	500		
Two Superintendents at £200 .....	400		
Nine Overseers at £50 .....	450		
	<u>1350</u>		
For two years.....	2700	0	0
	<u>£7857</u>	<u>4</u>	<u>9</u>

## No. 5.

## A B S T R A C T:

## FREE LABOUR.

	£	s.	d.
No. 1. Dam at Kearney's Bogs.....	2,891	19	0
2. Dam on Elizabeth .....	555	13	0
3. Channels .....	20,520	1	0
4. General .....	7,857	4	9
	<hr/>		
	£31,824	17	9
Contingencies 10 per cent .....	3,183	9	9
	<hr/>		
	£35,007	7	6
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H. C. COTTON,

[ *Draft.* ]

T A S M A N I A.



1 8 6 1.

No. 1.

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### The Right of Passage for Water Bill.

**W**HEREAS the use of the natural Waters of the Lakes, Rivers, and Springs of *Tasmania*, is a public right and interest: And whereas the Irrigation of Land, and other uses of Water, are calculated to promote the Public Prosperity :—

**1** Be it enacted that there may and shall be a Right of Passage for such Waters aforesaid to flow wherever nature or art shall enable them to flow.

**2** In case the Right to a Passage for Water shall be across the land of a Proprietor unwilling to concede it, the same may and shall be obtainable, and be obtained, on payment of a fair valuation price, according to the law and custom in similar cases of proprietary rights.

**3** The exercise of the Right of Passage for Water across private property shall be exercised only in the way which, according to professional judgment, to be selected by mutual agreement in Irrigation Districts, or, failing such agreement, by the Governor in Council, is reported to be least injurious to the Proprietor, and ascertained in practice to be beneficial to the public interests.

**4** That the short Title of this Act shall be *The Right of Passage for Water Act.*



No. 1.

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*The Right of Passage for  
Water Bill.*

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[*Draft Bill: laid before the Executive  
Council by the Governor, on the 4th July,  
1861.*]

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[ *Draft.* ]

T A S M A N I A.



1861.

No. 2.

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### The Irrigation Districts Bill.

**W**HEREAS it is to the advantage of the Public that facilities should be given for the Proprietors or Occupiers of Land to improve, by means of Irrigation, the productiveness of Pastoral and Agricultural Land, and to obtain Water Power for various works in connection therewith, and for other general uses :—

**1** Be it enacted that, on the application of Ten owners or occupiers of land situated so that the Waters of any lake, river, stream, spring, tank, or reservoir can or may be conducted to it by natural or artificial means, it shall be lawful for them, or any Two Justices resident in the District, to call, by public advertisement, a Meeting of all persons owning or occupying land, and of the millers or other persons having a beneficial interest in the use of the Waters, for the purpose of determining, and in general terms describing, the boundaries of the tract proposed to be irrigated, and the means of supplying it with Water for any purpose whatever.

**2** The tract so described, with its lakes, reservoirs, streams, or springs, to have a distinctive name, as, for example, in the order as follows, or according to priority of application :—

1. The *New Norfolk* and *Derwent* River Districts.
2. The *Great Lake* and *Shannon* and *Clyde* Rivers Districts.
3. The *Macquarie* and *Elizabeth* Rivers Districts.
4. The *Tooms' Lake* and *Kearney's Bogs* Districts.
5. The *Norfolk* Plains and *Lake* River Districts.
6. The *Meander* and *Mersey* Districts.

**3** On the application of the Chairman or other representative of the Meeting, the Governor in Council shall, after such enquiry as he shall direct to be made, and shall prove satisfactory to the Governor in Council, proclaim the District, and the name of the Surveyor, Engineer, Superintendent, or other Officer who shall have been appointed by and on the responsibility and at the cost of the District, to plan and construct the requisite Irrigation Works of the District so proclaimed.

**4** It shall and may be lawful for a proclaimed Irrigation District, through its duly appointed representatives, to apply to the Governor in Council, under any Irrigation Loans Act then in force, for an advance of money by way of loan to be expended on the improvement of the land by Irrigation and the works necessary to the same: Provided that, at the same time, the report, plans, specifications, and estimates of their own District Surveyor or Engineer, for the execution of the work in a substantial and durable manner, and an estimate also of the annual value and permanence of the improvement, with particulars of the land to be irrigated, the proposed manner of effecting it, and the nature and amount of the supply of Water, and the manner in which it is to be obtained, shall be submitted to the Governor in Council for decision.

**5** Fair compensation, in the customary mode of arbitration and appraisement according to the existing law and usage, shall be awarded or be claimable for proprietary rights affected or alleged to be injured in respect of lands required for Irrigation purposes, and not voluntarily conceded for such works of improvement.

**6** The District Surveyor or Engineer shall have power to regulate and control the supply and distribution of the Water, not only throughout the whole length of the stream upwards to its source, but over the lakes or other reservoirs, if any, from which the stream or its tributaries take their rise;—to construct such works as may be necessary to raise the Water in the said reservoir, or to retain that which accumulates or would accumulate in any valley, gully, or water-course;—to construct dams, aqueducts, sluices, or other necessary works to lead and take Water to and through the District to be irrigated;—to regulate the supply to be drawn at any period from the reservoir through sluices or other works constructed for the purpose; sluices to be opened and shut under his authority only, under penalty of Fifty Pounds for opening and Five Pounds penalty for shutting, with customary powers to

recover the same summarily ;—to regulate the distribution of Water and measuring its issue, by works constructed on plan and drawings by him authorised ; with power to appoint River Constables, or Water Wardens, to act in obedience to his orders.

**7** The District Surveyor or Engineer shall have power to assess and fix a Rate on land benefitted or lying within the influence of the Water, not exceeding  $\frac{1}{2}$  per Acre, for every One thousand Cubic Yards of Water used, or so much as may suffice gradually year by year to repay the capital expended for Irrigation, at the rate of  $6\frac{1}{2}$  per cent. *per annum* for Twenty-two Years.

**8** Irrigation Districts duly constituted under the provisions of this Act shall and may be proclaimed, from time to time, to be Irrigation Districts.

**9** There shall be an Engineer-in-Chief or Director-General of Irrigation, appointed by and responsible to the Governor in Council, to report on all plans, specifications, estimates, and proposals from the District Engineers ;—to inspect and advise with them before the commencement and during the progress of the works ;—and who shall also be the consulting Engineer with whom the Governor in Council will confer before announcing his decision, adverse or favourable, as the case may be, on all Irrigation District applications which may be presented.

No 2.

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*The Irrigation Districts Bill.*

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[*Draft Bill: laid before the Executive  
Council by the Governor, on the 4th July,  
1861.*]

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