

[P.W. 385.]

PART No. 1.

P.W. 15  
19/3

FILE OPENED:

SERIES: IRRIGATION & WATER SUPPLY

SUBJECT:

GALLOWAY IRRIGATION SCHEME, LOWER MANORBURN DAM.

Previous  
Papers:

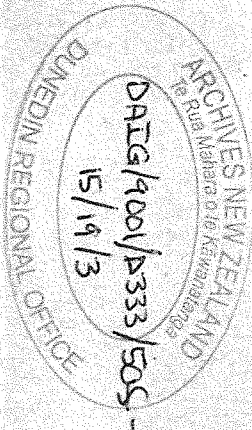
Subsequent  
Papers:

# MINISTRY OF WORKS

Sub-Files or Related Files:

*20/8/53*

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15/19/3

TMB/DW

Dunedin

12th April 1932.

Galloway Irrigation - Lower Manorburn Dam.

The permanent Head,  
P.W. WELLINGTON.

In reply to your telegram of 21st ultimo re the above, I herewith forward two blue prints and a copy of the report of the Resident Engineer, Alexandra, in amplification thereof.

You will notice that although at first recommending the upper site - see my memorandum of 15th January - he now finds that the cost of the work at both sites is practically identical, but that the lower site requires less maintenance. The area commanded also proved to be the same in both cases, namely 380 acres or considerably more than at first reported, so that the proposal although more costly, is rather more favourable per acre, namely £18.8.0.

The Resident Engineer proposes to simplify the design as much as possible by eliminating reinforcing and making no special provision for a spillway, and thus keep the cost down, and in these recommendations I am in agreement, as the 3 inches allowed on the centre portion will take all the discharge likely to take place except during cloudbursts which occur for a few hours only at very long intervals, probably less than once a year, and this occasional surplus on the side which met below the dam cannot possibly do any damage. If the reinforcing is omitted the materials used will be all New Zealand products and will tend to alleviate unemployment,

District Engineer.



Seen.  
T. M. B.

Enc. DN. 5225 sheets 1 & 2  
R.E. Alexandra - report.

Address reply to—

In replying

Resident Engineer,  
Public Works Department,  
Alexandra,



FWL/RS.

P.W. 18/3.

please quote these numbers.

PUBLIC WORKS DEPARTMENT,

Alexandra, N.Z., 4th April, 1932.



Galloway Irrigation - Lower Manorburn Dam.

Memorandum for

District Engineer,  
Public Works Department,  
DUNEDIN

*DN5225 shs 1/2 Z.*

I enclose herewith two tracings and one lithograph shewing the proposed work to divert the Manorburn Stream onto Galloway Flat.

The tracings shew the dam, in plan and developed section, and the litho <sup>section</sup> shews the location of the dam and reservoir, the race line and the ~~area~~ served coloured green. You will note that I have, as forecasted in my report of the 11th instant, reverted to the original proposal, for a dam at the lower site.

Comparative estimates have shewn that the cost of the alternatives is practically the same in each case, as the cost of the upper dam, and access road thereto, plus the race and pipeline to the site of the lower dam is within a few pounds of the cost of the lower dam. The location of the race below the lower dam is the same in either case.

The lower site has so great advantages in the ease of operation, and lower maintenance, that there is no question as to which should be adopted.

The race fed by the lower dam will supply irrigation water right from its commencement and there will be no dead going, or unproductive travelling or maintenance for the raceman, as would be necessary with the upper site.

The upper site would have been warranted only if there was a marked saving in capital cost, and as there is not, it has been abandoned in favour of the lower site.

The present proposal is for an arch dam with gravity abutments. The arch has been designed with a thirty ton per square foot concrete load, and no provision for reinforcement is made. The concrete stress is therefore 470 per square inch and there should be no difficulty whatever in getting a factor of safety of six.

I have omitted reinforcing, although Head Office may consider it desirable, because in my opinion, it adds very little to the security unless a large percentage is put in, more for instance than was put in the Idaburn Dam.

The rock at the dam site is particularly dense and solid schist, and it will not be necessary to cut in more than sufficient to get a good bond at the foundations.

*Enclosure copy  
of this memo and  
letter attached also  
2 B.P. [initials]*

Memorandum to D.E. Dunedin re "Galloway Irrigation - Lower Manorburn Dam"  
Dated 4/4/32.

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The depth in the creek bed to rock has not been tested as the bed is heavy boulders, but there are indications that the depth is less than that shewn tentatively on the plan, while the distance across the creek between the ~~cliff~~ rock walls (20 feet) is so small that a little extra depth would have little effect on the cost. The section proposed for the gravity abutments is shewn, and provision is made to use portion of the gravity abutments as additional spillway. Although the water will go over this portion, no ogee section has been shewn, the section being designed for a depth of 2.25 feet over the crest, without the support of the curved toe being taken into account, and with no reduction in resisting moment on account of water adhesion.

As Head Office may desire to modify this section, no attempt to finalise the dimensions has been made, but if splitter blocks are placed on the crest, flood flows should jump clear, and the section proposed should be suitable, except possibly at the deepest portion of the abutments near the junction with the arch.

It is proposed to build the abutments largely of stone obtained close by, laid in cement mortar, and within boxing, with two feet of concrete on both upstream and downstream faces.

As the maximum height of the gravity abutments is approximately twenty feet, and as the dam will always be full, any special expansion joint system does not appear necessary and it is proposed to build the dam without expansion joints, but to put a drain behind the cut-off wall in the gravity section to prevent uplift.

The storage provided for is one foot only, the crest of the dam being one foot higher than the water level of the race. This will give a storage of thirty dayheads which should be sufficient as the flow in the creek has been sufficient during this summer, without drawing on any storage, although the late summer has been very dry and creeks low. Additional storage could be obtained by raising the dam another 18 inches, but this does not appear necessary.

Spillway area is provided for a flood of 3000 cusecs, and the area over which water will travel on the downstream side, when the full width is in operation, is all sound rock.

It is proposed to make the race capacity 6 cusecs, on account of the area commanded being 380 acres. This will enable a good supply to be given to the land, which comprises most of the light gravelly land on Galloway.


The estimate for the work is as follows, based on 8/- per day:--

<u>Dam</u>	950 cyds. gravity dam @ £3	2850: --: -
	510 " arch " @ £4	2040: --: -
	Plant & accommodation	200: --: -
	Foundation excavation, 300 cyds @ 7/6	112:10: -
	Byepassing stream	100: --: -
	Outlet gate	20: --: -
<u>Race</u>	140 chs race @ £2	280: --: -
	Railway, road & farm crossings	300: --: -
	Additional boxes	50: --: -
	4 chs. flume @ £25	100: --: -
	Supervision	450: --: -
	Contingencies	497:10: -
		<u>£7000: --: -</u>

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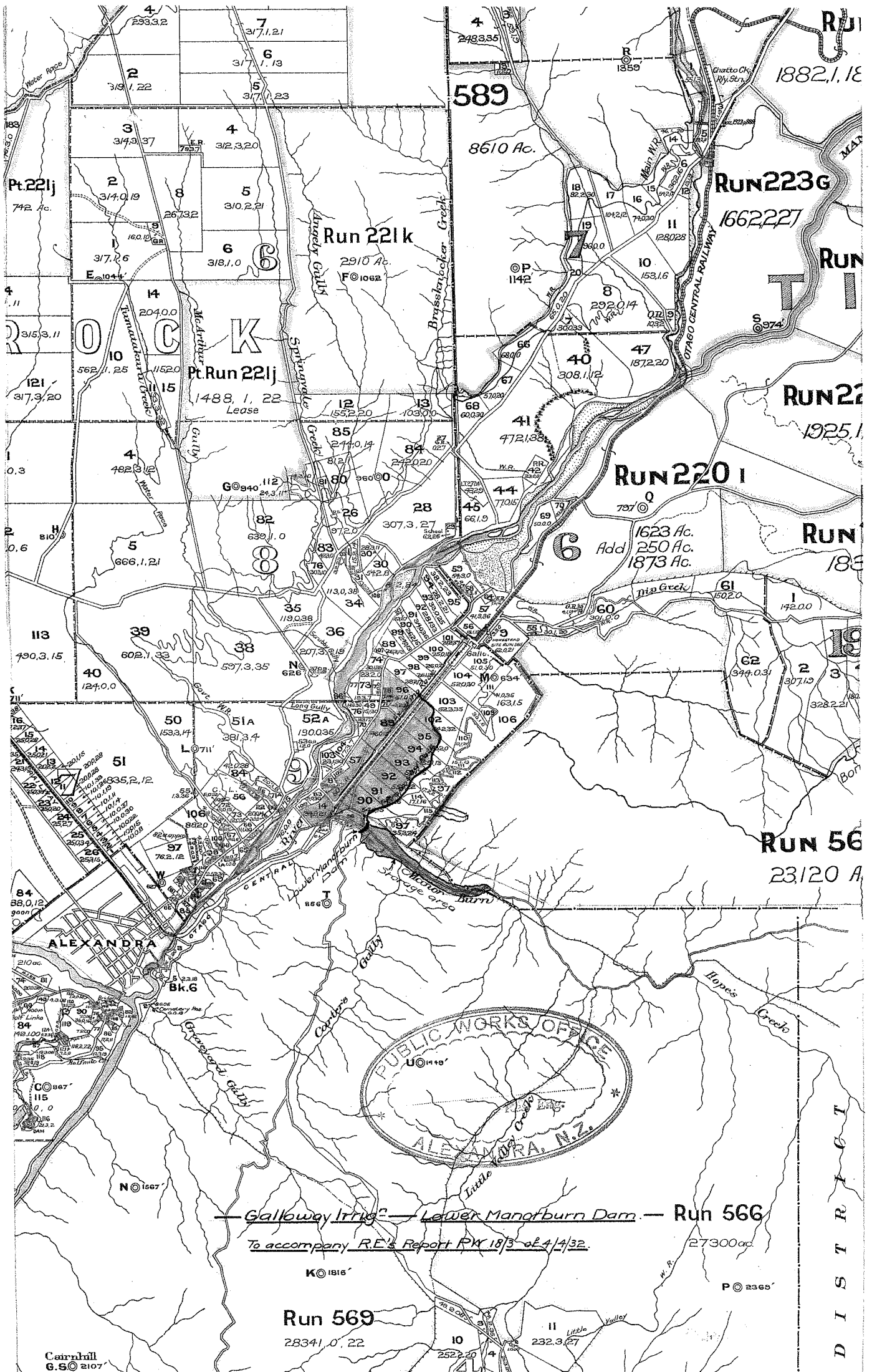
Memo to D.E. Dunedin re "Galloway Irrigation - Lower Manorburn Dam"  
Dated 4/4/32.  
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The work can be put in hand as soon as these proposals  
are approved.

  
Resident Engineer.







589

8610 Ac.

Run 223 G

1662227

Run 221 k

2910 Ac.

Run 220 I

Add  
1623 Ac.  
250 Ac.  
1873 Ac.

Run 56

23120 A

ALEXANDRA

PUBLIC WORKS OFFICE  
ALEXANDRA, N.Z.

Galloway Irrig - Lower Manorburn Dam - Run 566

To accompany R.E.'s Report RK 18/3 of 4/4/32.

Run 569

28341.0.22

27300 ac

Cairnhill  
G.S. 2107

D I S T R I C T

15/19/3

TMB/DM

Dunedin

15th January 1932.

Proposed Dam in Manorburn Stream-  
Galloway.

The Permanent Head,  
P.W. WELLINGTON.

With reference to my memo. P.W. 64/12 of 17th December last, I have now made more detailed investigations of two dam sites in the lower reaches of the Manorburn near Galloway, and have to report as follows:-

Upper Dam Site.

This site is located about  $1\frac{1}{2}$  miles above the railway bridge and has good rock abutments suitable for a concrete arch of approximately 75 feet radius. The race line from the Dam to the lower end of the present irrigation scheme will require to follow the rocky gorge of the Manorburn and a considerable length will require to be piped or flumed. For this purpose I would recommend Hume reinforced concrete pipes on account of their low maintenance cost and because it may be advisable to bury the pipe lines in places.

Suitable gravel for concrete making is obtainable within a short distance of the dam site.

Spillway provision for 3000 cusecs is necessary, as recent flood levels in the Manorburn (the highest known for many years) give an estimated flood flow of 2500 cusecs. The proposed race capacity is 5 cusecs.

The estimated cost of the proposal is as follows:-

Dam and out off wall.

Concrete in position	- 400 c. yds. @ £5	2000	
Excavating foundations and diverting stream			250
Plant, buildings and workers' accommodation			250
			£2500

Race line out of Gorge.

Hume pipe lines (18" dia.)	45 chs. @ £45	2025	
Flumes and concrete lined race			
	12 chs. @ £30	360	
Racework in earth	80 chs. @ 30/-	120	£2505
Race along Galloway flat	150 chs. @ £1		150
Road and Railway crossings			50
Surveys, supervision etc.			595
			£25800

This proposal will command an area of 300 acres. Storage amounting to approximately 100 acre feet will be available in the dam.

Mem. to P. H. Wellington, re "Proposed Dam in Manorburn Stream - Galloway".  
15/1/32.

This should be sufficient to provide a minimum flow in dry times of 3 cusecs. The capital cost per acre is £19.7.-.

Lower Dam Site.

This site lies within about  $\frac{1}{2}$  mile above the railway line and adjacent to the lower end of the irrigation scheme. Solid rock is obtainable but a much higher dam is required to divert water out at the required level.

The estimated cost of a concrete arch dam with gravity section tangential walls of a sufficient height to command 250 acres is £6200. No storage would be available.

This works out at £24.16.- per acre. A dam 5' higher and commanding 300 acres, as in the first proposal, would cost £9000, and would provide no storage, as the crest height is the limiting one obtainable at the site. The average cost is £30 per acre.

Recommendation.

It will be seen, therefore, that from the point of first cost, the first proposal is the best.

The maintenance costs, on account of the extra length of race line, would be higher than in the other proposals, but this extra cost should not exceed £30 per annum. In addition the maintenance of the new race along Galloway Flat, which is required on all proposals, may amount to £20 per annum.

No records have been kept of the summer flows in the Manorburn at these dam sites, but the minimum flow in an average dry year is estimated at 2 cusecs. In an ordinary summer, however, the flow would not fall for long below  $3\frac{1}{2}$  or 4 cusecs.

Under the Irrigation Committee's rates, the land commanded by the proposed race is entitled to a seasonal supply of approximate 400 day heads or 800 acre feet, and the draw off from Manorburn Dam would be relieved to that extent.

The estimates are based on a wage rate of 12/6 per day. The work would absorb up from 30 to 40 men, the greater number of whom could travel daily to the work from their homes.

Detailed drawings will be forwarded later if the proposals are approved.

District Engineer.