

REPORT TO DANIEL PEEBLES

ON DITCH 53

By G.W. Sublette

Filed 7/18/16

Attest A. Powell,

Co. Clerk,

by C. P. Piper
Sept 15.

Mr. Daniel Heebles

Dear Sir:-

Complying with your verbal instructions relative to the present condition of the conduits near the outlet of ditch

53 I submit the following:-

1st- as to the gradient of the metal conduit;

According to the design this conduit has a fall of 1.3 feet, but by my levels it actually has a fall of 2.4'. From this it appears that the slope of the conduit is about one foot more than called for by the design. As I have yet discovered no means of fixing the datum plane on which this work is based (the elevation of no bench marks being available) I am unable to say definitely whether this extra slope is the result of too deep a trench at the lower end, or too shallow a trench at the upper or a combination of these. From levels taken at intervals of ten feet along the full length of the conduit I find that it was laid with reasonable care as to grade and that the alignment was in no case very bad, the greatest departure from a true line was two feet in one hundred feet, which is in no sense a serious objection. From observations taken of the quantity of water passing through the conduit under the conditions present July 9th - July 11th, 1916, I find that the conduit is delivering approximately its normal quantity and no material obstruction can be responsible for its failure to pass the water efficiently coming to it from the drainage area. Hence the flood conditions existing above the conduit cannot be attributed in any material sense to a failure of the faithful carrying out of the design. From experiments conducted on my recent visit, the conduit was discharging between 11 and 12 cubic feet per second.

Referring to concrete bulkheads, they are well built,

but entirely needless with proper design of the system, as will appear later.

As to relief needed to meet the present emergency, it would appear that since nothing can be done with the conduit itself to increase its flow, relief can only come by diverting the water around the bulkheads in the unfilled ditch along the line of the conduits. This of course would have to be done guardedly to insure against destructive erosion.

Some relief it is believed might be obtained through ditch No. 32 in its connection with another outflow to Rice Creek. The culverts at stations 89 and 104 should be taken out and steel or concrete ^{bridges} substituted. Adopting the usual runoff coefficient, which applies to areas of this size and having like topographic features and Minnesota rainfall, I find that a discharge of from 55 to 60 cubic feet per second must be provided for to reduce in a reasonable time what is termed an average flood condition to the desired low water stage. Adopting the usual coefficient of friction for corrugated pipes I find that a pipe laid to the gradient of the present conduit would need to be 66 inches in diameter. A conduit of this size would provide the necessary capacity without working under a head, hence no bulkheads would be necessary.

From the foregoing it is readily seen that the difficulty in this system is one of design in using a 24 inch culvert to do the work for which a 66 inch culvert is required.

In other words, the discharging capacity of the pipe used is but 20 per cent of that I would recommend as called for by good design.

As to the tile culvert conduit from about station 144 to 148, I refrain from making a like full discussion as to

its inadequacy since its carrying capacity is but little more than the steel conduit and it has additional drainage area to care for. I am of the opinion that this piece of conduit has perhaps 25% of the necessary carrying capacity. If it is desired to maintain a water plane at the level evidently contemplated in the original design, there would seem to be no other way than to provide a waterway through these present obstructions at the level provided in the original design. If the conditions when the present water is reduced to a low stage are believed to be the same as were present when the pipe was originally laid there would seem to be no other way than to take up the present conduit and replace it with one of adequate carrying capacity.

As the cost of this larger conduit would be three or four times what the present culvert has already cost, it would seem undoubtedly raise the question whether or not an open ditch with the necessary side slope could not be provided and maintained at much less expense. Without further investigation of local conditions, including especially that of quick sand, I am not in a position to recommend definitely what plan would be most economical. Assuming that with the lowered water plane which will be present when work is resumed that the difficulty incident to quick sand will be considerably eliminated, and that a slope of three feet horizontal to one foot vertical would be a safe side slope, it would appear, with the present price of culverts, that an open ditch could be provided at between 50% and 60% of the cost of substituting a 66 inch culvert conduit for the present one and have besides the present culvert as salvage.

Respectfully submitted,

J. M. Sublette.
Consulting Engineer