

somewhat westward in preference to eastward, as affording a preferable site, all things considered, for the bridge, and where the stream would be in a direct line with the piers, having a clear uninterrupted run at right angles with the longitudinal line of the bridge. The 5 chains westward sought for can be obtained by increasing the curvature to a 1000 chain radius, instead of 800 chains, still keeping the tangent line as at present, which line continued northward into the Province of Canterbury would avoid the Moraine gully described and shown on the sketched map herewith.

I have, &c.,
J. MILLAR, F.S.A.,
Consulting Engineer.

To the Hon. the Minister for Works.

No. 25.

Mr. MILLAR to Mr. BLACKETT.

SIR,—

Dunedin, 17th July, 1871.

I have the honor to enclose the result of the borings taken in the bed of the river Waitaki.

I may add for your information that the report of Mr. Forrester (the Clerk of Records of Boring Work, whom I engaged under authority from you) is quite trustworthy, he being a very painstaking and reliable man.

I have, &c.,
J. MILLAR, F.S.A.

John Blackett, Esq., Engineer-in-Chief.

N.B.—The work has cost the Contractors quite double their contract, even with allowance for the extra bores. Certificates next mail.

Enclosure 1 to No. 25.

Mr. FORRESTER to Mr. MILLAR.

SIR,—

Oamaru, 26th June, 1871.

I have the honor to report the completion of borings, &c., at Waitaki River, as test for foundations of railway bridge.

I herewith send you Schedules of Borings, as check upon Contractor's record, together with memorandum of lock-spitting completed to date.

As you will further gather from my notes no correct sample of strata could be got on account of great influx of water. I have, nevertheless, kept such samples as could be procured for your use or reference, and which I will leave at your office in Oamaru, together with Provincial Government boring rods, as per list.

I have, &c.,
THOS. FORRESTER,
Clerk of Record of Borings.

J. Millar, Esq., F.S.A.

Enclosure 2 to No. 25.

NOTES OF OBSERVATIONS ON BORINGS.

No. 1. Is situated on first island on Otago side, and during winter can be approached by land. Is near peg marked 9400, and was originally intended to be finished at the depth of 21 feet, being subsequently carried to the depth, as stated in schedule annexed (by your instructions).

The material in its boring is very uniform and compact in alternate beds of shingle and gravel and sand, to the depth scheduled. The rock found appears to be of a gritty nature, as it wore the side of chisel bit rapidly, without blunting edge. I enclose sample of rock, which I found sticking in valve of sludge pump during my endeavors to find portions of rock; these samples are quite unlike any of the stones composing shingle bed of river.

No. 2. Is situated on second island from South or Otago side of river, at peg 10 on line of curve (South), top of boring being at winter level of river. This boring was carried to the depth of 18 feet 5 inches, with 3-16 tubing, which at this depth got burred up at bottom upon what seemed large shingle. As the tube could not be driven in further, the boring was completed with "gad" to the depth stated in schedule.

No. 3. Is situated at peg 30, North, on 800 chains curve, and is at top about 6 feet above level of river in winter (lower level), was sunk to the depth of 21 feet, and subsequently by your instructions sunk to the depth of 30 feet 3 inches, tubing $\frac{1}{4}$ inch in thickness was used for the lower lengths, which got burred at the depth of 24 feet, and could be driven no further. To ascertain whether rock could be found at full depth required, an inch round iron "gad" of required length was procured and driven to the depth stated in schedule, the gad being left in boring.

The material in this boring exhibited a marked difference in condition from other borings, the upper layers of shingle being loosely bedded in sand mixed with vegetable soil, the whole material of boring being more easily penetrated than on Otago side.

In this boring, occasional pieces of thin pare or crust of cemented shingle were broken by the chisel, but as they were very thin and presented no material resistance to the boring tools I have not scheduled them separately.

No. 4. Is situated on low middle spit of river, and in ordinary circumstances (say summer level) will be under water. Consists of the largest class of shingle in this part of the river, closely packed together, as stated in schedule. An unsuccessful attempt was made to sink with 3-16 inch plain tubes, which was followed by a trial with steel-pointed tubes with same result. At length, by repeated trials a tube was got to the depth of nearly nine feet, and the boring was continued to a depth of 17 feet 6 inches with "gad" only, at which point the "gad" got so stiff to work that it had to be suspended, and at this depth it remains.

No. 5. Is situated on large island next to Canterbury shore, top of boring being about summer level of river, was also the scene of failure with thin tubes (3-16 inch), both plain and pointed with steel.