

82E/2W
near to 82ESW151

duplicate filed in Room 422
Title Rock Creek Bridge
Author M.S. Hedley **001619**
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to 23

GEOLOGY OF ROCK CREEK BRIDGE SITE

The Mines Department was asked to consult on the footings for this bridge. First J.S. Stevenson paid a visit in the spring of 1950 and advised scaling of loose rock from the west pier site. M.S. Hedley went up in October 1950 and advised further scaling and removal of a mass of contorted and finely shattered rock. Later trips were made when the scaling was in progress. The site was judged safe.

The centre line of the bridge has an approximate bearing of north 48 degrees east, but the two sides of the creek are referred to as west and east. Piers Nos. 1 and 4 are on the flat at the edge of the canyon and presented no problem. Pier No. 3, the eastern of the two main piers, is on a site not excessively weathered and reasonably well exposed. No. 2, the west main pier site, was overlain and surrounded by large masses of weathered and unstable rock that not only obscured the solid underlying rock but presented a hazard from landfalls.

Bedrock is overlain by boulder clay that is planed by stream action in a broad flat which has been incised by Rock Creek canyon. Pockets of stratified gravels occur in or at the base of the boulder clay.

Title Rock Cre Bridge

Author msh

Date and Typist November 30_51 ceb 2

The rock at and in the vicinity of the footings is sedimentary. It is for the most part finely bedded, although the bedding is only locally distinct. The rock is siliceous, cherty to quartzitic, and is an argillaceous and probably tuffaceous to sandy sediment that has been deformed and silicified. On the west side the rock is dark grey to black or greenish and is locally a ribbon chert. On the east side the rock is lighter in colour and is nearly all strongly siliceous. Some may be quartzite but some is silicified breccia and the amount of silicification could not be judged.

The structure is not known beyond the fact that the dips on the west side are predominantly steep towards the creek and upstream, and the dips on the east side are at low angles into the hillside. There has been local contortion and some brecciation, the latter being silicified and healed.

The rock is highly fractured and tends to weather to a ravelled surface. Bedding cleavage is not prominent and much of the rock is massive or nearly so; there is no secondary cleavage.

There are some throughgoing fractures and a few fissures which represent joints and faults, the latter of probably small displacement. The fracturing is not systematically developed. There is little

Title Rock Creek Bridge

Author msh

Date and Typist November 30/51 ceb 3

evidence of shearing and none that intersects the two main piers or pier footings.

On the brow of the bluff west of pier 2 a flat serpentinous dyke shows beneath boulder clay. The dyke has an exposed thickness of 2 to 4 feet beneath the boulder clay and is terminated by a fault to the north. A small mass of serpentinous rock, a few feet across, is exposed just north of the north face of No. 2 pier, north of a steep fault and apparently surrounded by argillaceous chert. A mass of serpentine is exposed on the access road about 50 feet north of pier 2 and is terminated by a fault. This mass is at least 15 feet thick and continuity is not known except that it is possibly continuous with a prominent body of serpentine at least 30 feet wide exposed several hundred feet north of pier 2 on the access road. If continuous, this body of serpentine probably passes between piers 2 and 3 in the bed of the creek.

Piers 1 and 4 at the approaches to the bridge are set on bedrock which is now obscured. Excavation was made through about 5 to 20 feet of boulder clay and, in pier 4, some gravels. Both footings are drained to prevent pondage of water. The rock surfaces on which the piers were set were finely shattered but were free of fissures or shear zones.

Title Rock Cre Bridge

Author msh

Date and Typist November 30/51 ceb 4

Pier No. 3 is set on freshly excavated rock, shattered but not fissured, and is poured solidly against the freshly excavated rock face for a height of about 45 feet. The pier stands on a semi bench above a bluff which extends down to the creek. The bluff is strongly weathered and fractures in it are exaggerated by the weathering. One prominent fracture dipping out of the hill is terminated by a steep fracture and does not pass under the pier. The only systematically developed fractures are joints dipping steeply into the hillside. Other fractures are non systematic, and there appears no reason for a mass movement of rock to occur, although there will naturally be spalling of rock with the passage of time. The rock on the whole is siliceous and bedding is obscure.

Pier No. 2 is on a deeply excavated footing with a berm of about 30 feet. The pier rests on shattered cherty argillite free of either large or systematic fractures. Excavation was carried down to the present level to permit complete removal of a crumple in the argillites that plunged at a steep angle out of the bluff face. The crumple was in relatively soft, strongly shattered argillites possessing some bedded cleavage, and it was not thought wise to

Title Rock Creek Bridge

Author msh

Date and Typist November 30/51 ceb 5

build the pier on or against such a structure.

Initial plans called for erection of the pier clear of the almost vertical rock face, but it was later decided to fill solidly the space between with concrete to 2,805 feet elevation, particularly in view of the shattered nature of the rock that would eventually lead to ravelling and filling of the space with rock fragments.

The rock wall against which pier 2 is built is shattered, but contains no systematic fracturing. Bedding is obscure and for the most part does not impart a cleavage to the rock. One small brow immediately north of the northwest corner of the concrete is undercut on poorly bedded siliceous argillite for a height of about 12 feet--this is the only undercutting of beds on the dip and is a remnant of the crumple already referred to, but the rock is relatively massive and only a few tons is involved. Only one fault crosses the excavated ground. This dips at 40 degrees into the hill and the trace follows diagonally up the rock face above the pier and intersects the concrete-filled gap at the southwest corner. The fault is a fracture, unaccompanied by gouge, and weakens to the south--it cannot be seen south of the pier with certainty and is in any event terminated by

Title Rock Creek Bridge

Author hn

Date and Typist November 30/51 ceb 6

a steep shear fault south of the pier. Two other faults north of the pier are steeply dipping and trend up the bank.

A small mass of serpentine a few feet in maximum dimension and without apparent continuity lies just north of the footing. It is believed to represent a "squirt" from some unknown source, possibly the dyke-like mass already referred to that may pass between piers 2 and 3. The small flat serpentine dyke at the brow of the bluff beneath boulder clay is thought to have no significance as far as footings are concerned.

Accompanying this report is a geological map, scale 20 feet to 1 inch, two Public Works maps, and two photographs. The profile of the site shows the original ground surface, but the design of the main piers, Nos. 2 and 3, was later modified.

M.S. Hedley
December 1, 1951.