

obliquely. A good deal of the rock is hard greywacke, traversed by but few planes of movement, but on the west side, a few yards above the bridge, and on the east side below the bridge, there is a zone made up of rock flaked by movement into innumerable flat fragments which are readily detached and broken, though the rock as a whole stands well in the cuttings and forms steep slopes. A few quartz veinlets were observed in the more intensely crushed part of the zone. In addition, several small flaws and planes of movement, some fairly flat and others dipping steeply in different directions, from $\frac{1}{2}$ in. to 3 in. wide, and filled with crushed rock, traverse the rock at this site.

Down-stream, some 15 chains south from the bridge, the stream cuts nearly directly across the strike of a band of hard greywacke several chains thick. Benches cleared on both sides at stream-level and the road-cutting on the east side, extending from 20 ft. to 40 ft. above the stream, expose the rock. Except for the joints and a few small irregular planes of movement, the greywacke is quite solid. On the west side a bench about 50 ft. above the stream shows for the greater part of its length rather weathered greywacke. About its centre a slip covered, when the site was visited, a few yards of the bench. Two or three small planes of movement were observed here. The actual bed of the stream has not been explored, but since the strata strike directly across the stream, and identical rock is exposed on both sides, no change or break is to be expected. This site is a few feet lower than that at the bridge, and will require a dam of somewhat greater mass; but the rock is much more solid, and is free from any except very small planes of movement. From the geological point of view it is a decidedly better site.

In the Wakatikei Valley the upper dam-site is topographically admirable—a comparatively broad flat-bottomed valley with steep sides which converge abruptly to a narrow gorge. Cuts through slope-deposit, up to 15 ft. thick, expose the rock on the east side of the site. There are six or seven cuts at stream-level and five about 15 ft. higher. Not more than 10 per cent. of the rock at these contours is exposed in these cuts. All show solid greywacke, except that farthest down-stream, where a narrow plane of movement traverses slightly crushed rock outcropping at stream-level. On the west side benches, each about 150 ft. long, have been cleared at and about 20 ft. above stream-level. The rock consists of greywacke with minor bands of argillite (5 per cent. or less). There are eight small planes of movement in the upper bench, and four, entirely distinct from these, in the lower. The topography suggests that the stream has cut its beds along an unexamined and larger plane of movement. The rocks in this locality strike about 35° east of north, and dip north-west at about 75° ; the stream flows nearly due south.

The other site in the Wakatikei Valley, about 30 chains downstream and 20 ft. lower, is at a very narrow gorge cut through a wide band of greywacke that strikes across the stream nearly at right angles. A dam at this point would contain decidedly less material than one of the same height at the upper site. Two benches on the west side, respectively 20 ft. and 50 ft. above the stream, expose the rock, which also outcrops at many points on both sides of the precipitous gorge. No planes of movement or bands of argillite were observed. The stream-channel is rather tortuous, and the gorge is probably due to erosion through solid greywacke, and not to cutting along a plane of weakness.

Provided that the strata in the actual streams are sound, the rock at the lower dam-sites in the Akatarawa and Wakatikei Valleys is more impervious and better able to carry the weight of dams, and to withstand the scour of falling water and of water under pressure, than that exposed at the upper sites.

The Hutt Valley, which is of structural and not of erosional origin, is, except for Port Nicholson, filled to grade-level with gravels, sands, and silts. These will occur in irregular layers and in different successions at different points, the finer material tending to be in greater amount at the lower end. Water, making its way to the sea under the influence of gravity, saturates these deposits to the ground water level. The Hutt River itself is the surplus of the run-off that, owing to the frictional resistance, cannot escape through the gravels and sands. In the Hutt Valley there is a large body of subartesian water from which domestic supplies could be drawn to a much greater extent than at present. This supply may become polluted, a possibility that will increase as the valley is more closely occupied and as more water is pumped.

In the Hutt Valley there is clear evidence that the land has been uplifted within, geologically speaking, comparatively recent times. The high terraces at Hayward's and near the junctions of the Wakatikei and Akatarawa Streams are the remnants of the higher flood-plain that formerly existed. The upper Wakatikei is entrenched about 300 ft. in the comparatively wide floor of its ancient valley, which here follows a strong fault. The valley was wide and mature, and the stream meandered at grade. After land-uplift the rejuvenated stream entrenched these meanders; where they chance to cross hard bars of rock gorges occur, but where they are in soft or crushed rock the valley is wide.

9. WAINUIOMATA AND ORONGORONGO VALLEYS.

(By J. HENDERSON.)

The Wainuiomata and Orongorongo have long narrow subparallel basins nearly equal in size, and the waterworks in each valley are at approximately the same distance from the sea. But the valleys at these points are unexpectedly different. For three miles or more up-stream from the confluence of Moore Creek the Wainuiomata meanders through a flat-floored valley-bottom from 6 to 8 chains wide, and formed of gravel flood-plain and low gravel terraces. Rock is exposed only where the stream approaches the valley-sides. Half a mile above Moore Creek junction a series of pits sunk across the valley showed that the gravel-filling there was up to 44 ft. deep; moreover, the two pits nearest the centre of the valley, where the filling is likely to be deepest, were not bottomed, and here