

KIRWAN HILL AREA.

North of Waitahu River there is no division of the greywackes into two strips by a granite ridge, so that they are continuous from Caplestone eastwards to the slopes of the Victoria Range, beyond the Montgomerie River, except for a small block of unfaulked Tertiaries in the upper reaches of Boatman Stream. Faulting, massive rock types, and a deep cover of loose detritus prevent the establishment of good sections and obscure the structural relationships. There is an anticline in the Greenland rocks east of the syncline described in last year's report as having its axis near Potter Creek, a tributary of Larry Creek. Somewhat to the west of its crest in Larry Creek a group of granitic dykes occurs. Elsewhere less clear owing to faulting and other causes, this structure is best illustrated in the oblique section afforded by Larry Creek, Drysdale Creek, and the lower east branches of Montgomerie River. Farther south only the east flank is distinctly seen. It is notable that the greywackes and argillites are generally less metamorphosed than is usual in this area, the phyllitic types being largely absent, except adjacent to fault-zones. A possible inference from this is that we have here the upper beds of the Greenland Series, which, being less thickly covered, responded to tectonic stresses to a larger extent by faulting than by folding, as was the case in the western area.

In addition to the known occurrences, Tertiary beds were found between the eastern margin of the auriferous rocks and the granites of the Victoria Range. These outcrop as a narrow strip running along the eastern side of the Montgomerie Valley for about three miles above its junction with the Waitahu River. They may be continuous with the coal-measures between the Waitahu and Inangahua rivers in the neighbourhood of McConnochie Creek, but a cover of gravels obscures the position in the Waitahu Valley itself. This occurrence is evidently another example of entanglement of fragments of Tertiary cover within the zone of the important fault fronting the Victoria Range, a case analogous to that already described from the Alexander River. Coal-seams are contained in the rocks involved, but they are not of economic value owing to the extreme narrowness and faulted condition of the Tertiary strip. The large mass of intrusive dolerite discussed in the previous report was found to extend farther south than previously known.

KIRWAN'S REEFS.

The whole of the sinuous ridge known as Kirwan Hill and the surrounding country suffered a severe shaking from some geologically recent, although probably prehistoric, earthquake. Numerous earthquake escarpments and ridges are to be found, in general following the direction of the ridge, and large, overgrown ancient landslips exist in several places. Similar features are known to exist outside the subdivision in the Victoria Range and elsewhere in the region. One vast landslip in particular has descended from what is now a depression in the Kirwan Ridge, at the site of the rich Lord Brassey Claim, and now occupies an area represented roughly by a triangle with approximately half-mile-long sides, the base along the ridge, and the apex reaching well down into the Montgomerie Valley. The detritus was derived apparently from the collapse and projection down the eastern slopes during an earthquake, of the material of the ridge crest. Thus the loose auriferous rubble and "floaters" of rich stone mined on the Lord Brassey Claim were part of this great mass of slumped surface material. To restore all the slumped material to its original position would be to raise the height of the ridge by an amount of the order of 100 ft. The upper western slopes are cloaked with loose-slumped material, and that the entire ridge has been profoundly shaken even at places remote from the great slide is evident from the loose and broken condition of the country in which a tunnel is being driven by a leaseholder.

A strongly mineralized, steeply east-dipping shear-zone is showing in Drysdale Creek, is recognizable on the ridge above and, although it cannot be followed along its south-south-west strike across the intervening distance owing to the cover of slip detritus, may with some confidence be regarded as the same fault-zone as that which acted as an ore channel and contained a rich body of quartz where it crossed the south end of Kirwan Ridge. This ore-body may have cropped out at or near the crest of the ridge, as it was before the disturbances, on or about the site of the Lord Brassey Claim, its material being involved in the slip, from which the ore was mined, or rather, quarried. The other reefs outcropping farther north, more or less in the solid, and the other occurrences of quartz of similar appearance in the slumped area are nowhere as rich, but the most satisfactory explanation of these seems to be that they were separate shoots of quartz within the same lode channel but of lower gold content. Therefore to locate the downward continuation of the rich shoot that supplied the loose stone of the Lord Brassey Claim a prospecting-tunnel should be driven from the western side at about 250 ft. to 300 ft. vertically below the present ridge crest, and at such a point as will cause it to cut the probable line of reef some 200 ft. to the north of the open workings, in order to allow for a northerly pitch for the shoots. The adit now being driven is, it is believed, too far west and too high to strike the rich shoot.

The presence of the slip was recognized many years ago, but its significance in connection with the search for the roots of the ore-shoot does not seem to have been appreciated.

THE STRUCTURAL CONTROL HYPOTHESIS.

The work described in the two previous annual reports gave strong support to the theory that the sheared crests and troughs of anticlinal and especially synclinal folds were particularly favourable conducting channels for ore-depositing solutions. The data obtained this year, when applied to this problem are inconclusive. In the Alexander area the auriferous rocks are a fault-bounded fragment of which the relationships with the rest of the Greenland Series is not clear. The Kirwan reefs appear