

North of the typical locality the beds are developed mainly round Kitahi Bay and in Kikowhakarere, where the breccias extend inland for a distance of a quarter of a mile. On the south shore of the bay the coarse breccias overlie a flow of grey trachytic lava rock, which appears to be the lowest member of the series, for here, and also in the two branches of the Kikowhakarere Creek, it rests directly on the auriferous series, and is conformably overlain by the coarse breccias. The latter appear in Long Bay, and form the islands off the mainland (Pita, Surflen, Goat, Rabbit Islands, &c.).

From the lava-flow in Kikowhakarere, which possibly marks the eastern portion of the main volcanic centre of this period, a main fissure was evolved running in a south-easterly direction, at first giving rise to deposits of fine-grained tuffs, but with increasing distance from the point of eruption filling the fissure only with volcanic matter. The fine-grained tuffs are met with along the line of this fissure forming the country rock of the Kathleen Crown, Kathleen, and Blagrove's Freehold Mines, and rising to a height of about 350 ft. on Trig Hill. They evidently thin out to the west, for when passed through in the Kathleen shaft they had a thickness of 168 ft. only. These tuffs are light in colour, with occasionally large boulders or fragments of solid lava, presumably ejecta from the vent. Reefs in this rock, though well defined and well mineralised, are valueless, so far as has been shown by the workings in the above-mentioned mines.

From the Kathleen Crown Mine the course of the fissure is obscured for more than two miles by the recent alluvial deposits, but is again found on the Tiki spur at an elevation of 600 ft. In the bed of the Tiki Creek it appears as a dyke at the junction of the Pukewhau and Tiki Creeks, and by a spur, which, however, does not appreciably stand out above the enclosing slaty shales, crosses the Opitonui Track at an altitude of 770 ft., and has there a width of 2 chains. Crossing the Matawai Creek it reappears on the main range at a height of 1,250 ft. above sea-level. Here the lavas have remained viscid much longer than at other points, and are consequently jointed, containing large hornblende phenocrysts. The dyke forms the spur of the main range for a distance, and finally culminates, as regards height, in Motutere or Castle Rock, 1,724 ft. above sea-level. This is a peak of remarkable outline. Its height is not, of course, remarkable; but, as it rises sheer on three sides for the last 400 ft. of ascent, it becomes a sufficiently striking feature in the landscape. The hade or dip of the dyke is to the south-west at a high angle. The width of the dyke is from 6 to 10 chains. The foot-wall is well defined, but on the south-western or hanging-wall side the junction with the overlying andesites is obscured by talus and dense bush. The rock shows fine jointing at right angles to the walls, and also a coarser jointing parallel with the dip. From the top of Castle Rock the southern prolongation of the dyke may be traced for at least three miles by a succession of bare outcrops. The total length, therefore, of the Castle Rock dyke is certainly not less than nine miles, and is probably about fourteen. The dense bush in the centre of the peninsula prevented further work in this direction of tracing the dyke to its southern extremity.

The general facies of the solid lavas of this period is a light-grey rock, with porphyritic feldspars and hornblendes. Neither macroscopically nor microscopically can any distinction be made between the breccia inclusions of Beeson's Island and the dyke matter of Castle Rock. Under the microscope they present features so nearly akin that, to avoid undue repetition, I have grouped their characteristics in one description. Hornblende trachyte: Sections from Kitahi Bay, Long Bay, Little Passage, Beeson's Island, Tiki Creek dyke, and Castle Rock. Base in freshest sections glassy; in others devitrified, abundant. Phenocrysts corroded slightly, otherwise showing well-contoured crystallographic outlines. Feldspars: Orthoclase not abundant, except in the section from the Little Passage, where Carlsbad twins are common. A few twinned on the Baveno type (parallel to the clinodome $2P\infty$). The greater proportion of the orthoclase belongs to the sanidine variety. Plagioclase abundant, twinned polysynthetically; average extinction angles, on sections normal to the albite lamellation, 16° , indicating either albite or oligoclase according to the + or - character of rotation. Inclusions rare. Both plagioclase and orthoclase feldspars are strongly zoned; zoning due not to layers of different feldspar substance, but to ultra-microscopic twinning. Quartz rare, and doubtfully primary. Ferro-magnesian silicates: Hornblende abundant in long acicular and bladed crystals, occurring in section as six-sided plates with well-marked cleavage-planes. Accompanied by strong resorption border, and altered to chlorite and magnetite. Pleochroism strongly marked— α pale greenish-yellow, β dark greenish-yellow, γ deep greenish-brown; or, stated as an absorption formula, $\gamma > \beta > \alpha$. Augite is very rare, but occurs in pale-green octagonal plates with characteristic cleavage. Secondary minerals are quartz, pyrites, magnetite, and chlorite.

The following is the mean of several analyses of the rocks:—

Silica (SiO_2)	...	...	...	...	58.50	per cent.
Alumina (Al_2O_3)	...	...	...	...	5.64	"
Iron (FeO})	...	...	...	...	17.67	"
Lime (CaO})	...	...	...	...	3.86	"
Magnesia (MgO})	...	...	...	...	1.09	"
Potash (K_2O})	...	...	...	...	7.22	"
Soda (Na_2O})	...	...	...	...	4.17	"
Loss on ignition	...	...	...	...	1.60	"

99.75

The exceedingly low percentage of alumina in the above is probably due to the preponderance of hornblende in the rock, a fact which also accounts for the high percentage of iron-oxide.