

The account of North Auckland stratigraphy as outlined in preceding annual reports still holds good, and as the survey proceeds new series of sediments are placed in the table. Sometimes difficulty is experienced in deciding which of two sediments is the older, for the beds, owing to erosion, cannot be traced continuously across country and the fossil contents are not sufficiently definite.

The oldest rocks in the district are shattered non-fossiliferous greywackes and argillites of Trias-Jura (?) age. They crop out only on the east side of the district on Tawharanui Point, on Kawau, and on one or two other islands in the neighbourhood, and on Tiritiri Island. These rocks are of great thickness, and westward probably underlie the other formations.

Next in order are concretionary sandstones considered to be equivalent to the Otamatea beds, which are of upper Cretaceous age. These appear only on the east side of the district—namely, at Snell's Beach and at Orewa and Silverdale ("Wade" of the old Geological Survey reports)—where they occur as small inliers. At Snell's Beach the rock is a claystone rather than a sandstone, but it possesses other characters which agree with the Otamatea beds as defined in last year's report. At Orewa fragments of *Inoceramus* were found, but in the Silverdale area the calcareous concretions contain only the usual nests of carbonized plant-fragments.

The argillaceous limestones and claystones occur as large and small inliers, chiefly in Waiwera Survey District—that is, toward the east side of the region, but to the west of the older Otamatea beds. In many cases the argillaceous limestones occur to the west of the claystone areas, which is further evidence in favour of the view that they are the youngest beds in the series. They contain no recognizable fossils other than Foraminifera, but being similar to the argillaceous limestones and claystones of the Onerahi Formation of the Whangarei-Bay of Islands Subdivision, they are taken to be part of the same series and correlated with the Amuri limestone of late Cretaceous age.

The lower sand tones and crystalline limestone of the Whangarei Formation thin out southward of Maungaturoto and Pahi, and appear to be absent from the area surveyed this year. The thick beds of gritty sandstone that form the hilly country to the south of Warkworth and around Puhoi belong to the Waitemata Series. South of Puhoi these beds decrease in thickness and gradually become more argillaceous, and from Redvale, in the south-east corner of the area, they can be followed continuously to Auckland Harbour. In Waiwera and Tiritiri survey districts soft clayey sandstones pass downward into a peculiar calcareous grit, similar to the Parnell grit. In places this grit forms part of an apparently conformable succession, but in other places there is a distinct disconformity between its conglomeratic base and the bed of sandstone next below. Fossiliferous sandstones and conglomerates occur at the bottom of the Waitemata Series on Tawharanui Point and on Kawau Island, and on Tiritiri Island conglomerate veneers Mesozoic (Waipapa) rocks.

In the south-western portions of Tairāhema Survey District there are outliers of andesitic lavas, breccias, and conglomerates overlying the Waitemata beds. These andesitic rocks thin out in the middle of Kaipara Survey District, but appear again towards its southern border, and apparently extend southward to form the Waitakerei Hills, west of Auckland. They are succeeded by white fissile clays containing silicified wood, which may be correlated with the fresh-water lignitic beds of Hukatere Peninsula, tentatively assigned to the Purua beds of supposed Pliocene age.

Pleistocene deposits are represented by raised beaches, by occasional gravel terraces, and by the consolidated sand-dunes of Orewa on the east coast and of Kaipara South Head peninsula on the west coast. This latter formation, except where interrupted by the mouth of Kaipara Harbour, extends from Muriwai to Mangonui Bluff, a distance of nearly ninety miles.

The igneous rocks found in the district fall into three categories—namely, those in the conglomerates of the Waitemata Series, intrusions of ultrabasic rock now largely serpentinized, and the andesitic lavas and breccias previously mentioned. The Waitemata conglomerates largely consist of pebbles derived from plutonic rock-masses not known to occur in the district; the serpentinized masses intrude the late Cretaceous argillaceous limestone and claystone, and are thus of approximately Eocene age; and the andesitic lavas are Upper Miocene or Lower Pliocene.

Economic Geology.

The coaly partings so common in the Waitemata Series have led to the belief that payable coal exists in Rodney and Waitemata counties. The present survey shows that this belief is groundless. The older Onerahi and Otamatea beds, which locally appear from beneath the Waitemata Series, are likewise barren of coal, so the country as far north as Maungaturoto may now be definitely regarded as not coal-bearing.

The New Zealand Mining Handbook, 1906, while reporting the occurrence of copper and half a dozen other metals, gives little or no information with regard to them, but points out that much of the country is but little explored. The present survey has fulfilled this want. Of the metals reported, most occur as traces of no economic value, the copper of Kawau Island being the only one that might repay the miner.

The copper-lode on Kawau was worked under difficulties over seventy years ago. The ore first mined yielded 16 per cent. of copper, but its tenor fell off at the bottom of the workings to about 5 per cent. About twenty-five years ago the old shaft, situated between tide-marks, was unwatered, but, although the richest ore is said to occur here, the mine was not kept open long. The workings, except those above high-water mark, are now full of water.

Limestone suitable for cement-making occurs in quantity at Warkworth, at Cooper's Flat, at Dairy Flat, at Silverdale, and at Redvale. Calcined limestone was produced at Warkworth in 1849. Many years later cement-works were established there, but these, now owned by Wilson's (N.Z.) Portland Cement Company, were shut down in November, 1924. At Silverdale and at Redvale argillaceous limestone is pulverised, and sold locally and in Auckland for agricultural purposes. The lime-works near Kaukapakapa have been closed for the past three years.

Roadmaking material is well distributed throughout the district under review. The conglomerates in the Waitemata Series occur as thick beds in the hilly tract of country between Cooper's Flat and Wainui, and, being easily quarried, are in demand for roadmaking. Serpentinized dykes are numerous