

length it is two miles, and from 300 to 500 yards in width. It is composed chiefly of well-rounded gravels, the bulk of it being shingle, very little of it being over 1 ft. in diameter. The highest part is about 25 ft. above the high-water mark.

Where this spit abuts against the mainland to the west a raised beach can be seen. The length is about half a mile, with a width of 600 yards. The earthquake of 1845, which was the cause of the raised beaches along this coast, according to the old settlers, did not affect the spit. The height of these raised gravels is considerably lower than the adjoining bar of Onoke Lake, parts of it being barely above the tide. In character and contents they are much the same as the spit, of well-rounded gravels and sand, chiefly the detritus of the adjacent Pleistocene terraces, consisting of sandstone, shales, red and green rocks.

Continuing along westward a considerable development of blown sands is to be seen piled up against the vertical precipices of the gravel terraces to a height in places of 100 ft. or more. At a point about two miles north of the Mukamuka River a small length of raised beach is seen. It continues for about half a mile, and in width it is about 200 yards. It covers the rocks of the main range, the mountain-side rising abruptly from the beach to heights of 2,000 ft. or more. The material composing the beach is much coarser than the example near the spit, having a much greater quantity of small boulders. Being in the immediate vicinity of the mineral belt, and by the immense landslips in the vicinity exposing the rocks, a much greater proportion of the red jasperoid slates and green rocks are contained in these gravels. The height above the tide is about 10 ft.

A much greater and very fine example of the effects of the 1845 earthquake is the raised beach stretching without a break from a point three miles and a half eastward of Cape Turakirae to the mouth of the Wainuiomata River, fully four miles to the westward. In width it varies from 200 ft. to 300 ft. on the eastern and western extremities to three quarters of a mile at Cape Turakirae.

In all the three cases of raised beach the effect of the earth-movements has been to throw up a ridge (the old beach) of large boulders and gravel, between which and the hills or high ground is found a lagoon and swamp, which is scarcely above the tideway. In this raised beach at Cape Turakirae the whole surface from end to end is littered with big boulders from 2 ft. to 6 ft. or 8 ft., together with the small water-worn gravels of the old beach. Besides this, there are exposures of the water-worn rocks *in situ* projecting through the boulder-beach. The old beach-line keeps near to the hillsides, at a distance of about 300 yards to half a mile. Of a necessity the line of the old beach of these raised gravels forms the boundary of the dry ground that was elevated and of the sea-bottom that was raised to its present position. On both sides of the cape the boulders get smaller and smaller as this is left behind, and on the western side of the Orongorongo the character of the beach changes very much, the size of the boulders being much less.

The valley of the Wainuiomata varies in width from a few hundred feet to three-quarters of a mile wide. The lower valley is twelve miles long, and is occupied by heavy beds of shingle and clays, and a top soil forming terraces and flats.

Under the head of "Recent" must be placed the vast landslips which have occurred on both sides of the main range of the Rimutaka east of the Orongorongo. These huge slides are confined to this range, and are much greater on the western slope than on the eastern. The slips have come down from the highest points, and the uppermost part of most of the slips must be at least 2,600 ft. above the sea. In all, there must be thousands of acres, for they descend to the river-bottom in most cases at a height of only 500 ft. above the sea. In their descent they have carried away hundreds of acres of bush in each case, burying and piling it up in utter confusion.

## 2. Pleistocene: Terraces and High Level Gravels.

At the base of the recent deposits of gravels on the western shore of Onoke Lake, and immediately overlying the older rocks of the main ranges, are the gravel terraces of Pleistocene age. They occupy the coast from the spit to the lower portions of the main ridge, and penetrate inland for two miles up the Wharekauhau Creek and five miles up the Wharepapa Creek. Their general height is about 250 ft., but nearer the ranges they are found at a height of 300 ft., and adjacent to the lake as low as 70 ft. To the sea they present a line of vertical precipices for three miles and a half, and these are cut completely for their whole height by the Wharekauhau and the Wharepapa Creeks.

The terraces consist of thin and well-stratified beds of conglomerates and clays, which at the base become thicker and more indurated. These lower clays have wood- and plant-remains. The whole have on the coast-line a very slight and almost imperceptible inclination towards the west, which causes the beds containing the plant-remains and coaly material to disappear in that direction.

The materials of the conglomerates do not differ in any way from the beach-gravels and the alluvial of the spit. They consist of water-worn boulders and gravel of the rocks forming the adjacent ranges, including grey sandstones, breccias, shales, red and green rocks belonging to the mineral belt, and boulders from the reefs of calcite. The size of the included pieces is not large, 1 ft. being the maximum. At the lower beds the conglomerates are 5 ft. in thickness, and have undergone considerable induration. They form the banks of the Wharepapa in places, and are able to resist well the denudating effect of the stream; moreover, a smart blow of the hammer is necessary to obtain a specimen. In the upper beds the same beds will not stand carriage. They differ also in their having a much greater quantity of clay as a matrix, and also in the greater variation in the size of the stones, the lower conglomerates being almost a mass of small stones. The beds of clay are thicker at the base, and the coaly matter and wood- and plant-remains are confined to one thick band, which occurs on both sides of the Wharekauhau Creek and at the foot