

fans up to 8 ft. or 10 ft. in depth were built at the points where the streams issue from the hills, and the flood-waters inundated the town. The railway-line is on a low embankment along the shore, and when the stream-channels were choked the low-lying portion of the town was covered with water, which, before receding, deposited silt and mud to a depth of from 3 in. to 18 in.

With the exception of Te Hape Creek, the stream-beds are steep, and along them little loose material naturally occurs. Into all the creeks, but notably into Moanataiari and Waiotahi creeks, debris from mine-workings has found its way. In the case of the Moanataiari this material has in some parts of its course raised the stream-bed several feet, while along parts of the courses of all the streams the tips from the adits have so encroached on the narrow valley-floors as now to form the banks of the streams.

The debris deposited by the streams in their lower valleys or on the flat was either scoured from their beds and banks or derived from slips from the hillsides. In the case of Moanataiari Creek very little of the coarse material carried down originated from slips; probably 90 per cent. of it was mining debris. There are many slips in the upper part of the Waiotahi basin, and two large ones at the time of the writer's visit on the 3rd April, 1917, had not reached stability. Many hundreds of yards of spoil will reach the stream-bed from these slips during the next year. Much debris from mine-tips was also removed by this creek during the flood, and probably a third of the material deposited was derived from this source. In the upper part of the basin of Karaka Creek there are many large slips, and much timber, soil, &c., found its way into the stream. Of the material deposited by this stream not more than a fifth came from mine-tips. When compared with the other streams little mining has taken place along the Te Hape Valley, and the spoil brought down by this creek contains little mine-debris.

Mr. E. F. Adams, Thames Borough Engineer, estimates the quantity of debris deposited in the town by the streams at 69,586 cubic yards, made up as follows:—

	Cubic Yards.	Area of Watershed. Square Miles.
Moanataiari Creek (in shingle-fan)	7,500	0.47
Waiotahi Creek (in shingle-fan)	7,666	0.54
Karaka Creek (in shingle-fan)	10,520	2.13
Te Hape Creek (in shingle-fan)	2,000	1.40
Silt on streets, reserves, &c.	41,900	...
	69,586	

The silt on the streets varied in depth from 3 in. to 18 in., and cannot be distinguished from ordinary river-silt. No doubt, however, a proportion of it consists of finely divided rock from the mine-tips. The rest of the material brought down ranges from coarse gravel to sand.

Tararu Creek, which enters the sea one mile and a half north of Thames and is larger than any of the streams mentioned above (area of watershed 6.50 square miles), was also in high flood on the 21st February, 1917. Mr. Adams estimates that 35,200 cubic yards of material was deposited by this stream in its lower course and on the flat it crosses before reaching the sea. The flood-plain, which forms part of this area, narrows to insignificant dimensions 10 chains from the sea, and the scouring of the stream-channel becomes prominent 10 chains above its upper end. The road-bridge on this low-lying area was not injured by the flood, the stream overflowing its banks and taking a more direct route to the sea. Many logs and large stones were deposited, both in the stream-channel and on the flood-plain. The largest boulder observed by the writer is on the roadside about 5 chains south of the bridge and 2 chains from the nearest point of the bed of the creek. It is a rounded boulder of andesitic breccia, with axes of 5 ft., 4 ft., and 3 ft., and must weigh considerably more than 2 tons. Another large stone, at least 1½ tons in weight, lies on the opposite side of the road more than 3 chains from the stream-channel. In addition, there are at least a dozen stones close at hand of from 15 cwt. to 20 cwt. in weight, while a few of about 10 cwt. have been transported by the flood-waters 7 chains or 8 chains from the bed of the stream.

14. ERUPTION AT FRYING-PAN FLAT, NEAR WAIMANGU, ROTORUA DISTRICT.

[This and the following reports have been written or compiled by P. G. MORGAN.]

During the past year an eruption, which may be classed as a true volcanic outburst, took place at Frying-pan Flat, near Waimangu Geyser. The locality was not visited by any member of the staff, but there is good reason for keeping a watch on the danger-points of the so-called "thermal district" of the North Island, and therefore attention is called to the occurrence.

Waimangu Geyser was first observed in eruption in January, 1900, and for several years thereafter almost daily outbursts of great intensity took place. These eruptions so far exceeded ordinary geyser activities that they might well be considered true volcanic manifestations. Towards the end of 1904 Waimangu became almost quiescent, but several spasmodic outbreaks at somewhat long intervals have since occurred.

During the more violent eruptions of Waimangu vast quantities of water, mingled with solid debris, were thrown into the air to a height of 1,000 ft. or more, and clouds of vapour rose to heights which at times may have been as much as 12,000 ft. On one occasion two sight-seers and the two attendant guides unfortunately lost their lives, and the recent eruption at Frying-pan Flat was unhappily fatal to the wife and infant child of the guide at the neighbouring accommodation-house, whilst the guide himself, Mr. McCormick, was severely injured.

The eruption, according to newspaper accounts, began on the morning of Sunday, 1st April, at 6.20 a.m. Stones, mud, water, and steam were shot up to a height of 600 ft. to 800 ft. A