APPENDIX.

AUCKLAND.

Dr. Hector to the Under Secretary, Public Works.

(No. 74-72.)

Sir,— Geological Survey Office, Wellington, 4th July, 1872.

I have the honor, in reply to your reference made during my absence, to afford the following information respecting the occurrence of coal seams in the Wangaroa and Mongonui districts.

Having examined the district in 1866, I am able to speak from personal knowledge on the subject, and perhaps the notes I made will be sufficient to guide the local explorers for coal until a more definite survey of the district has been made, which will be at as early a date as the other calls on the Department will permit.

Wangaroa Harbour.

This is a deep, land-locked harbour, surrounded by bold, almost precipitous, cliffs of volcanic rock, trachytes, and trachytic agglomerate. These rocks rest on tufaceous sandstones and conglomerates, with beds of fine smooth-grained mudstone, containing fossil leaves of very recent-looking character, comprising dicotyledonous plants and ferns, among the latter being a *Pteris* that closely resembles the common bracken, still growing on the hills. These plant-beds are well displayed in the cliffs, at the base of St. Peter's, a dome-shaped hill 500 feet high, on the north side of the harbour, and opposite to which is a similarly-formed hill called St. Paul's. The above strata have a general dip at a low angle E. and N.E.

At the head of the harbour the cliffs recede, and there is a large extent of low land, with mud flats covered with mangroves. In the low promontory round this part of the harbour a totally different formation is exposed, consisting of green sandstones, grit, and sandy shales, containing mica, vegetable remains, and small irregular seams of coal of fair quality. The thickest seam is only 2 ft., and cannot be traced far. It is exposed in a mud flat beneath the high watermark, and dips to N.W. at 27°. On the adjacent shore, a hole was sunk 12 ft. from the line of the outcrop, and cut the coal again at a depth of 6 ft.; but three other shafts 9 ft., 15 ft., and 27 ft., in good situations, failed to strike the coal, only alum shales, with carbonaceons markings, being found. Over these beds are sandy clays, with nodules of calcareous ironstone, containing a few casts of fossil shells. In the Kaiou Creek, which enters the harbour from the south, a tough gray clay marl, with irregular ferruginous partings, is to be seen in the road cuttings for several miles, and is probably an upper member of this older series of rocks, which I suppose to be the equivalent of the coal formation at Kawa Kawa and Whangarei.

Subsequently to my visit, a thick coal seam was found, associated with green sandstone, in the upper part of this valley, but I am not aware of the precise locality. Specimens were however forwarded for analysis by Mr. H. Williams. The external appearance of this coal, and especially its bright, lustrous fracture, resembles that of the Grey River coal, but from its composition it is much inferior to either that coal or the Kawa Kawa coal in useful qualities. It is hydrous pitch coal, compact, with very irregular cleavage, and a dark brown powder and glistening streak. It burns freely, containing 84·60 per cent. of combustible matter, the rest being water and a very small quantity of ash. It has not been received in sufficient quantity to test practically its efficiency as a steam generator, but its theoretical evaporating power is 6·5, that of the Kawa Kawa coal being 6·8, while that of the Newcastle coal and the Grey River coal is about 8·0. Its specific gravity, upon which depends the comparative space it will occupy in bunkers of a steamer, is quite as good as that of the Kawa Kawa coal, one ton occupying 1·018 cubic yards. It is a non-caking coal, and in this respect, and in the rather large percentage of water it contains, it resembles common brown coals. It yields half its weight of bright, glistening coke, with a fair amount of gas, but rather less in quantity and of feebler illuminating power than the Kawa Kawa coal, to which it is however superior in respect to the small quantity of sulphur it contains.

Excepting in the low ground at the head of the Wangaroa Harbour and in the tributary valleys, the coal series was not observed, the rest of the district consisting of broken ridges, and shallow swampy valleys in the upper volcanic rocks; and no formation was detected between this place and Mongonui except the volcanic rocks and the Palæozoic, which form the framework of the district, and on the hills give rise to a stiff clay soil, generally known as Kauri land.

Mongonui.

The rocks round Mongonui Harbour belong partly to this formation and in part to the volcanic series; but on crossing to the west several interesting formations are exposed along the coast, some containing carbonaceous beds.

Greenstone slates extend for one-third of a mile in this direction, and are succeeded by a tertiary deposit of brown, yellow, and dark blue clays covered with sandstone, passing in places into a pebble conglomerate. In Cooper's Bay, at the level of the beach, the lower beds of the formation, which is 200 feet thick, were found to contain fossil leaves similar to those now existing, and fruits like that of the mangrove; also masses of lignite, but no defined beds.

In one place, the lignite has at some time or other been on fire, and parts of it converted into a bituminous mineral resembling very much a mineral obtained on the Chatham Islands, that has been formed under similar circumstances.

The section of the formation which extends across Cooper's Bay and for a few miles inland on the tops of the hills is as follows:—