NEW ZEALAND ARCHAEOLOGICAL ASSOCIATION NEWSLETTER

UNDERWATER SURVEY OF LAKE OWHAREITI, BAY OF ISLANDS DISTRICT

John Campbell
Physics Department
University of Canterbury

Doug Sutton and I have this understanding. If he can find a body of water that is scungy enough, he invites me to dive in it. Lake Owhareiti, on the southern fringe of his excavations at Pouerua in inland Bay of Islands, fitted the bill (Fig.1).

The lake is in a basin of gentle rolling hills. A large peninsula, the southernmost tongue of the lava flow from the Pouerua cone, divides the northern end of the lake (Fig.2). Many substantial occupation sites show on this peninsula, with hearth stones even at the water's edge. The original thoughts and proposals were not of a grotty lake but of artefacts lost from canoe accidents, of subsurface structures such as eel weirs, of canoes sunk at the lake edge to prevent them drying out and of fabulous carvings placed for security in swamp at the lake edge and then forgotten during later turmoil.

Many unique artefacts have come from swamps. Why wait until the swamp is drained, the artefact under drying stress and contact discovery by unfriendly giant discs? The overall philosophy was that no lake adjacent to a substantial site of Maori occupation had ever been systematically searched before. Why not just look and see what could be learned?

A week long expedition was thus mounted.

Preliminaries

The diving team of three consisted of myself, Bob Craig a Christchurch mechanic who worked with me for a season on the Pons Tirenus site in Italy and Ian Greig, an N.Z.A.A. member who had the misfortune to live in Auckland whilst Canterbury held the Ranfurly Shield. (Ian and I had our first dive concerned with underwater archaeology in New Zealand back in 1969. We swam a stretch of the Waimakariri River by the gorge bridge searching for evidence of Maori trade routes. We found no evidence but saw lots of shingle).

Good timing is an essential feature of any expedition. We arrived on site to be greeted with a feast. Not in our honour but for the elders from the four local hapu that Doug Sutton had been showing over the Pouerua site. The value of such courtesy was demonstrated when some of the speakers said they had come to tell the archaeologists to leave the mountain alone but after being shown around were quite happy to have the work done. The site was said to have few, if any, local traditions. We had expected to hold a special ceremony to raise the tapu

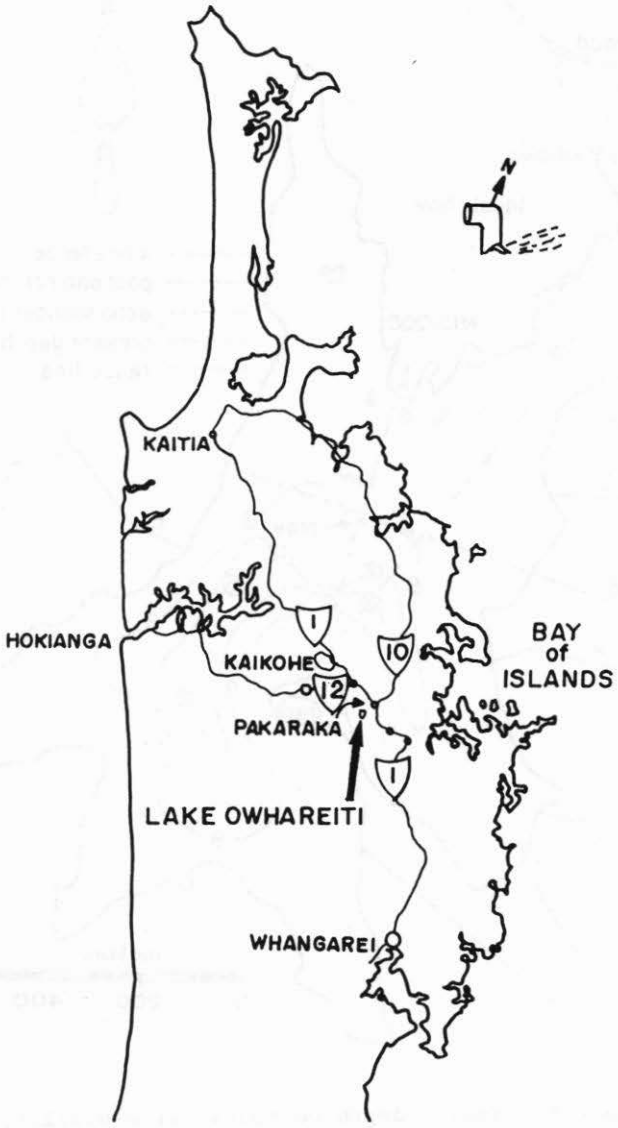

FIGURE 1. Location of Lake Owhareiti.

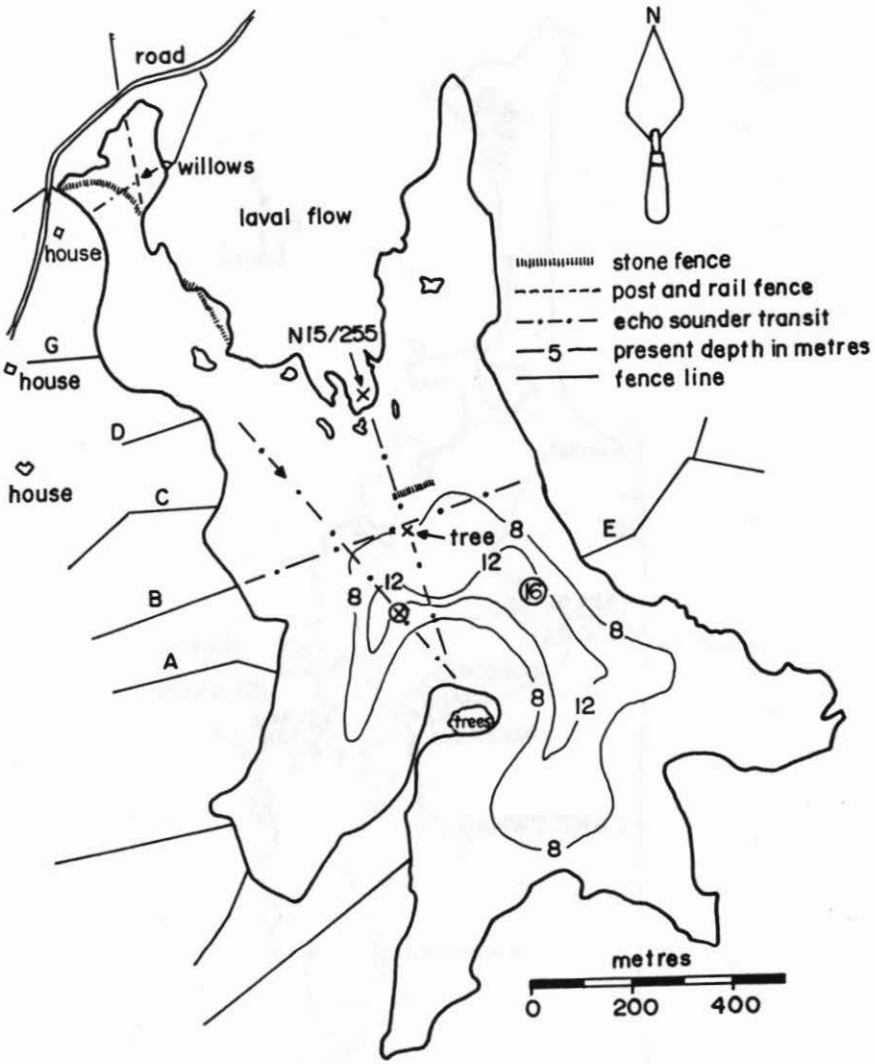

FIGURE 2.
Lake Owhareiti showing depth contours, site N15/255, lines of echo sounder transits and the location of submerged features. The depth contours are taken from the New Zealand Oceanographic Institute's Lake Series (Lake Owhareiti - Bathymetry August 1970).

on the lake but the elders deemed that it had been included in the ceremonies for the entire site. Even so I had previously wondered what the local Maori thoughts were of us diving in their lake, so well renowned for its eels. I need not have worried. Invariaby their first reaction was that we were crazy. Their second was to place an order for an eel supper.

Working underwater

A thick matted area of kuta reeds line the lake edge. Through this jungle, a pathway for the dingy was hacked alongside the farmer's water intake in the north-west basin. (I often wondered if he noticed a taint of ripe diver in his cocoa).

In the south-east corner of the lava peninsula, on a small hillock by the lake edge, sat a substantial house site (N15/255 in Fig.2). The lakeside retreat of a chief of importance perhaps? The lake level being high, signs of occupation went to the water's edge. Our first task was to establish the original lake edge of prehistoric times. This would give us a line above which we would expect to find evidence of dry land occupation and below which should appear items deposited in swamp and lake.

I have known more pleasant underwater environments than the edge of Lake Owhareiti. Kuta reeds grew down to a depth of 2 m. Three metre tall lake weed grew down to a depth of 6 m. The bottom consisted of a deep layer of fine silt on top of scoria boulders, the latter very sharp on water softened hands. The divers worked in zero visibility, entangled in long lake weed full of water snails and ferocious eels. It was no place for man nor beast. Unfortunately we had no female divers available so I left the other two at this task whilst I explored the north-west basin.

This area had potential. The closest part of the lake to Pouerua, it beached into low, smooth grass land not rough scoria hillocks. What better place to moor a canoe? Within fifteen minutes underwater I found what we had hoped to find - timber worked by man. The disappointment was intense. There, in the gloom at a depth of 5 m was a post and rail fence. However, one has to be lucky sometimes. Without this initial find we would have spent two or three days fruitlessly clearing weed near site N15/255.

The nature of the task now changed. From site N15/255 the team swam south into deeper water looking for signs of a prehistoric shore line. Visibility prior to stirring up the silt was one metre. The bottom consisted of fine silt on mud, the thickness of silt varying up to at least one metre. No surface details showed above a smooth sloping plane but

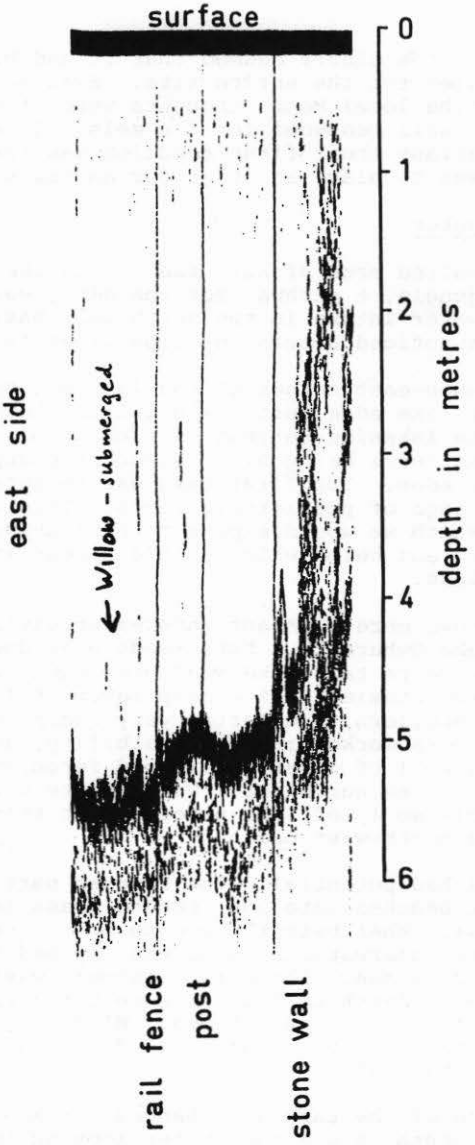

FIGURE 3. Echo sounder transect east to west across the NW basin. Note fuzzy returns from the silted bottom and weed, the sharp return from the stone wall and willow tree, the post and rail fence and isolated post. Marker lines record positions of surface bouys tied to underwater features.

isolated features emerged. At 5 to 6 m depth a bed of fresh-water mussel shells capped a line of rocks that turned out to be the continuation of the man-made scoria fence originally built to separate lake and peninsula. At 8 m depth stood a ghostly manuka tree. (Identified as such by Dr Brian Butter-field of the Botany Department, University of Canterbury, from a sample of branch). The tree's roots were held in the original earth, its multiple trunks 5 to 10 cm in diameter and its total height about 3 m. A cursory search was made beyond the tree until the visibility went to zero at a depth of 10 m. No other features showed up in the very small area we covered.

Clearly a new approach was needed. Under the circumstances we did what any red blooded marine archaeologist would do - we went to the pub. After drinking lots of inspiration we tripped over the late Kelly Tarlton doing the same in the high rent area of the said establishment. So I hit him up for a loan of his echo sounder.

Echo sounder survey

The echo sounder used was a Japan Marina Co. Ltd. Type JMF 602 S operating at 200 khz and powered by a 12 V battery. This model has six ranges 0-3.6 m, 0-7.2 m, 0-18 m, and 10 times each of these. The scales were modified to allow for the small difference of the speed of sound in fresh water as compared to that of salt water. The transducer hung over the bow of the aluminium dingy which was driven at slow speed to avoid turbulence noise. It took all of Bob's skill as a sailor to steer a straight line across the prevailing cross-wind. He actually 'sailed' the dingy by pointing it windward of the line of transit.

The sounder was first tested in the north-west basin against known targets - post and rail fence, scoria fence, silt, weed, submerged trees - to give us experience in reading the trace. The submerged fences had been marked with a line of buoys so that all features could be mapped from the surface. Marker pips were placed on the chart as each buoy was passed. The result of one "E to W" transit is shown in Fig.3.

The silty bottom yields a very fuzzy return as there is no sharp transition between water and bottom, the silt being almost in a fluid state. The top of the scoria fence gave a sharp return as expected. The 'thin' returns from the small branches of a drowned willow tree, from crossing the post and rail fence at right angles, and from an isolated fence post were all quite adequate to locate these objects.

The marker buoy lines to the post and rail fence were not pulled tight so as to avoid undue strain on the fence.

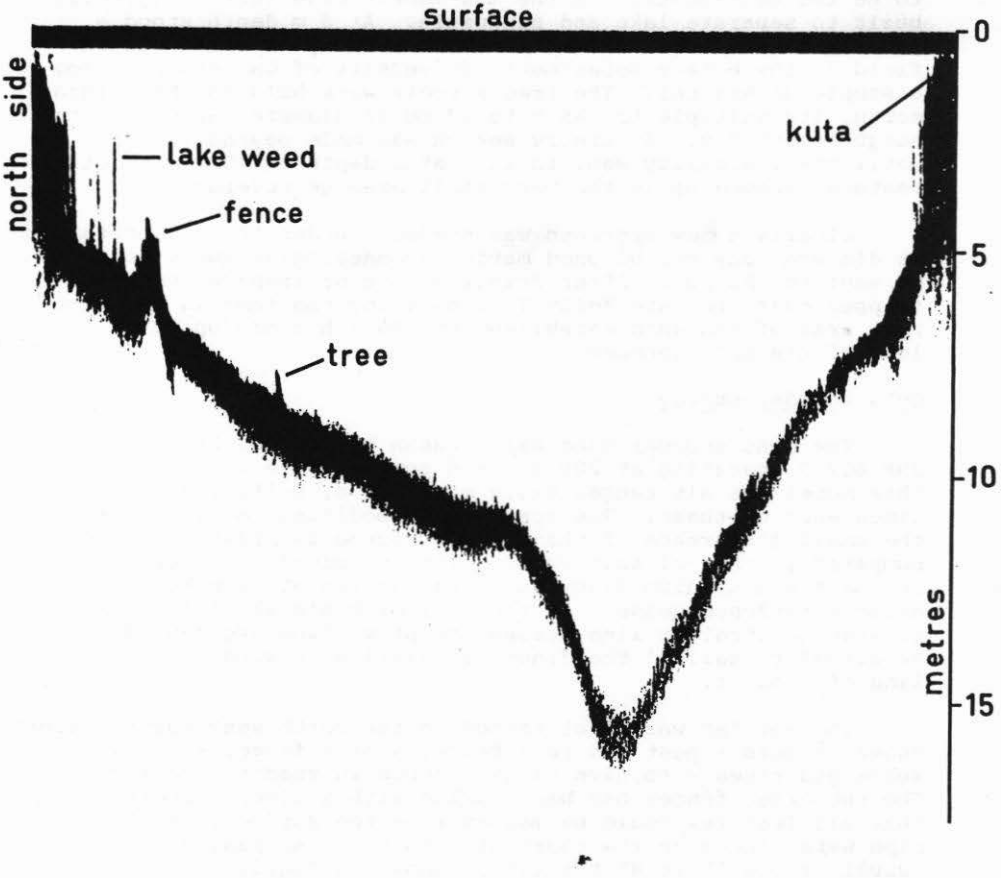

FIGURE 4. Echo sounder trace of a "N to S" transect of Lake Owhareiti chosen to traverse the submerged stone fence and manuka tree.

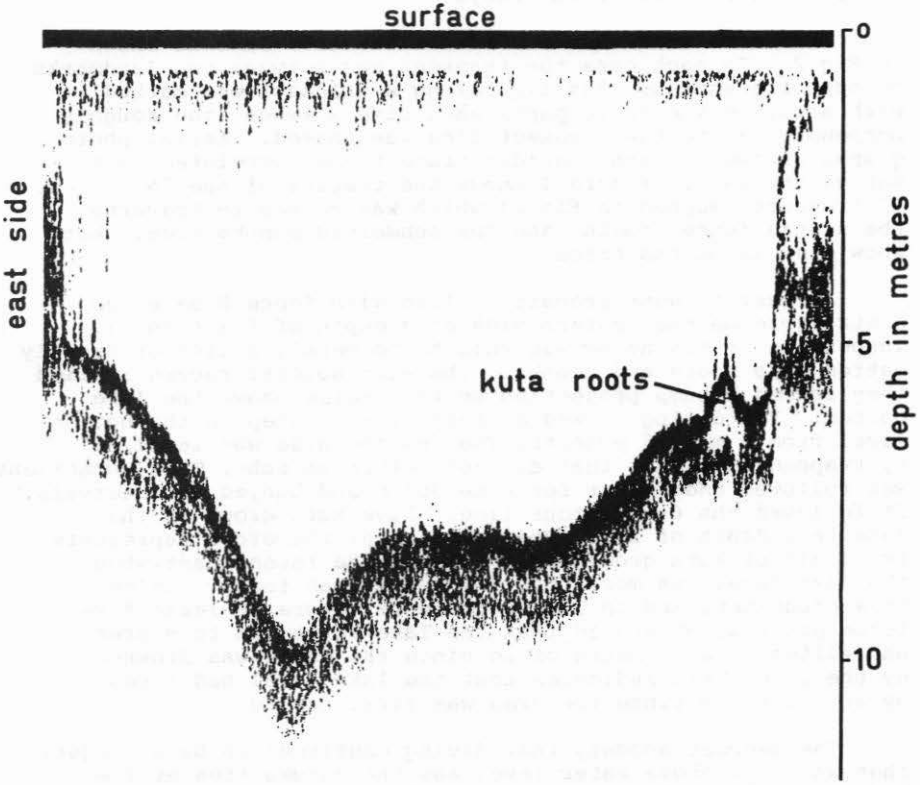

FIGURE 5. Echo sounder trace of an "E to W" transect in line with fence B showing the bank of drowned kuta roots.

Hence the pips marking the passing of a buoy did not correspond to the return from the object marked by the buoy because of the down wind drift of the buoys.

Transects were then run across the main lake as shown in Fig.2. In each case the transect was between two landmarks on opposite shores. Position along a transect was marked with a pip on the chart paper each time a fence line roughly perpendicular to the transect line was passed. Aerial photographs allowed an echo sounder trace to be correlated to a map of the lake. Figure 4 shows the results of one "N to S" transect (mapped in Fig.2) which was chosen to traverse the scoria fence (rocks) and the submerged manuka tree. Both show clearly on the trace.

An east to west transit in line with fence B detected a structure on the western side at a depth of 6 m (Fig.5). Inspection by diving showed this to be merely a line of densely matted kuta roots and stalks. The echo sounder record implied they formed a hump projecting up to a metre above the lake bottom. Yet diving showed a sharp, .5-1 m step in the bottom level from 6 m to 5 m depth. The inshore side was levelled by trapped fine silt that did not return an echo. This embankment was followed underwater for some 300 m and buoyed at intervals. It followed the 6 m contour line. Live kuta grows in the lake to a depth of 2 m. This embankment therefore represents the limit of kuta growth some time in the recent past when the lake level was more than 4 m lower than today. Below this embankment and in line with fence C were at least five fence posts which showed that the lake bottom in this area had silted up by a metre or so since the fence was drowned by the lake. This indicates that the lake level had risen by at least 7 m since the area was first farmed.

The deepest anomaly that diving confirmed to be an object that was once above water level was the manuka tree at 8 m bottom depth. Only one other anomaly was detected at a greater depth. The relevant echo sounder trace is shown in Fig.6. Its depth is 11 m and its position is marked on the transect from the north-west arm to the south peninsula as shown in Fig.2. This was the first transect of the central part of the lake. The object was not investigated by diving. From the echo returned it appears not to be a drowned tree nor a clean outcrop of rock. It seems to be broad, covered with silt to a depth of a metre or so and to retain a thicker than normal layer of fine silt on its shallower side. This information implies the feature was 'longish' roughly perpendicular to the transect line. That is to say it was a feature that quite likely followed the 11 m contour line. It protrudes a metre or so above the bottom but due to the thickness of the surrounding silt this is no true indication of the height of the feature.

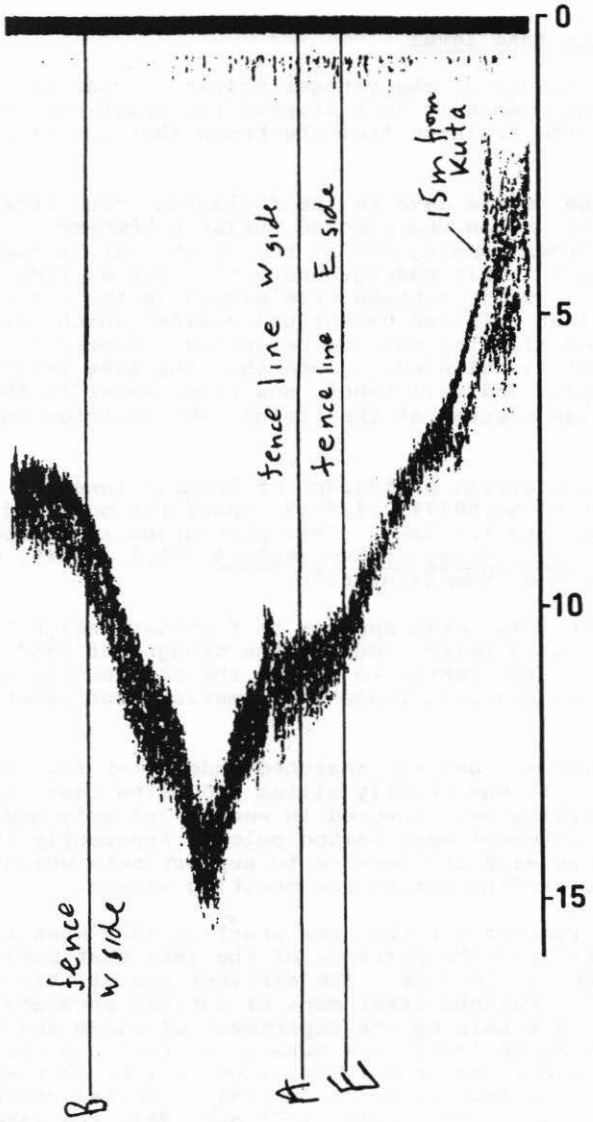

FIGURE 6. Echo sounder trace of the first "NW arm to S peninsula" transect showing an unidentified feature at a depth of 11 m.

History of the lake level

Pouerua is one of the younger volcanic cones in inland Bay of Islands. When it last erupted the south-east laval flow blocked the drainage from the basin that is not Lake Owhareiti.

Lady Rose Henare gave me the following local knowledge. Lake Owhareiti has an underground outlet somewhere in the north east corner, coming out at the creek that is near the Pakaraka school. This underground outlet was a productive eeling spot. A split cabbage tree placed in the water, middle up, gave a light coloured background against which the eels clearly showed allowing them to be gaffed. Some forty years ago the outlet was blasted. Since then the lake level has risen. The post and rail fence, now under water in the north-west basin, was erected as the rising lake broached the earlier scoria fence.

An oblique aerial photograph of Pouerua taken in 1959 (Whites Aviation No.50174, 14/4/59) shows the post and rail fence running into the lake. This photograph is reproduced in Suggate's The Geology of New Zealand Vol.2, p.649, where it is mislabelled "Maungaturoto".

Today the lake level appears to fluctuate slightly with climate by about a metre. During the drought of 1983 the level dropped sufficiently to expose the tops of the south end of the post and rail fence (information from Janet Letherby, 1983).

The north-east arm was searched underwater for indications of an outlet. It was thickly silted and being less than 5 m deep was generally well covered in weed. The only underwater artefacts of interest were bamboo poles. Apparently these are used by the Wildlife Service to support nets whilst collecting geese for banding during the moulting season.

Written records for the area start in 1829 when Archdeacon Williams negotiated the purchase of the land that borders the north edge of the lake. The earliest map of this shore is dated 1857. Various other maps of dubious accuracy and dubious dates are held by the Department of Lands and Survey. All border on to ML 13379 Lake Owhareiti which was sketched in 1948. This may have been taken from earlier maps and may not represent the true shoreline in 1948. Aerial photographs were taken in 1957, 1961, 1968, 1977 and 1981, the lake level being essentially the same over this period.

Figure 7 shows an attempt to transcribe the older maps onto the modern one. Scaling was done by matching property

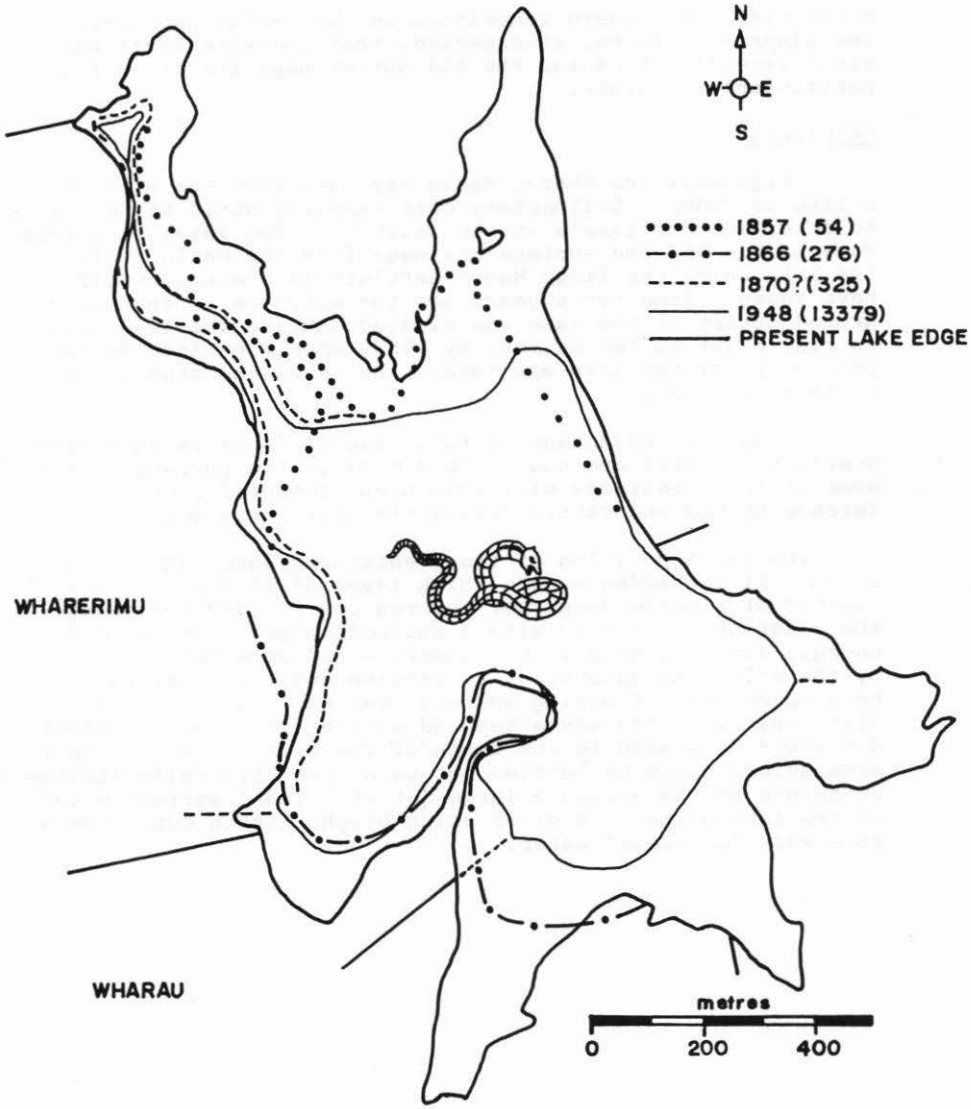

FIGURE 7. The historical lake edge of Lake Owhareiti taken from early survey maps.

boundaries with modern fencelines on the aerial photographs. The diagram confirms, as expected, that the lake level has risen several metres and the old survey maps are often not particularly accurate.

Conclusions

Originally the Wharau Basin may have been the site of a lake or swamp. Sedimentary core sampling would be necessary to determine the lake's ancient history. The laval flow from Pouerua blocked the surface drainage from the basin to form the lake which the first Maori settlers in the area would have known. Some forty years ago the entrance to the underground outlet of the lake was blasted causing the lake level to rise eight to ten metres. By 1957, when the first aerial photograph of the lake was taken, the level had stabilised to that of today.

A possible advantage of this rise in level is that many prehistoric sites are now up to 8 m below the surface so that some of their features will have been protected from interference by man and cattle during the last forty years.

The exact position of the prehistoric lake edge is not known. It is hidden by the thick layer of silt which is a minimum of a metre deep over the regions flooded following the blasting. A survey with a sub-bottom profiler (a high energy, low frequency echo sounder) would show features buried by the silt. An excavation to examine any such feature would be a major feat of diving and engineering. The fluidised silt would flow into any attempted excavation hole. A coffer dam would be needed to the depth of the silt at least. Spot excavations could be carried out using the late Kelly Tarlton's technique of channeling a large jet of 'clean' surface water to the lake bottom. A diver using bright lights could therefore work in 'clear' water.