

## 5. Case studies

### 5.1 KAURI POINT SWAMP

The Kauri Point swamp is a true swamp. It is fed by mineral-rich ground water, is eutrophic, and moderately acid—no more than pH 5.8 (Shawcross 1976: 281–282). The swamp is essentially Y-shaped with a main arm and slightly smaller tributary arm. Both arms are fed by perennial springs, which are augmented, to some extent, by run-off from the ground surface during rain. However, the surrounding volcanic ash soils are free draining and much of the rain probably feeds the springs via the ground water-table. For most of its length the swamp is less than 10 m wide, usually about 5 m, but narrower for the lower 40 m (adjacent to the pa) where it cuts down to a narrower channel. Just above this, at the junction of the two branches, the swamp is wider—approximately 15 m. Immediately below the junction of the two arms is where the swamp excavation was made.

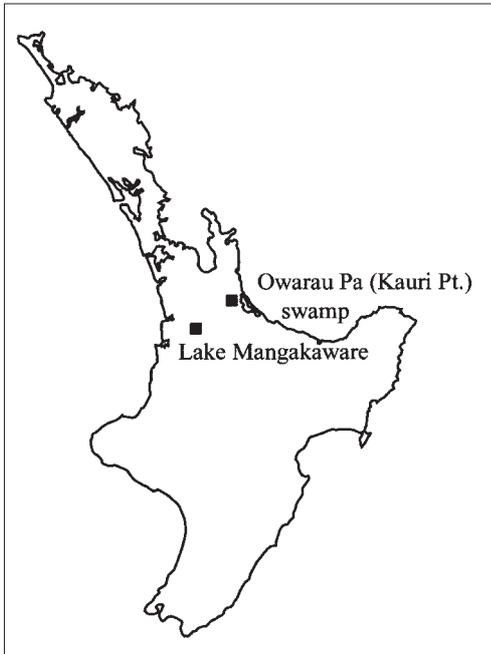


Figure 4. Locations of Lake Mangakaware and Owarau Pa (Kauri Point) swamp.

The head of the main arm of the swamp (where the principal springs are located), is vegetated above a culverted causeway. The vegetation is predominantly willow, but includes manuka, cordyline, ferns, grasses, raupo, rushes, cress, and arum lily. The vegetation continues below the causeway for approximately 50 m, but here it is less diverse with a large clump of raupo

above a large grove of willow. Below the willows the diversity of vegetation declines and it is mainly grasses and rushes.

The Kauri Point swamp site (Figs 4, 5, and 6) lies adjacent to Owarau Pa<sup>12</sup> (U13/4) (commonly, but incorrectly, called Kauri Point Pa by archaeologists). From archaeological evidence the swamp site was a functional part of that pa, contributing to its defence and containing significant artefacts interred by the pa's occupants.

Figure 5. View of Owarau Pa, Kauri Point from the north. The arrow indicates the location of the swamp excavation. (Photo: W. Gumbley)



<sup>12</sup> Name given on the 1865 survey plan SO 417.

Figure 6. View west along the swamp on the north side of Owarau Pa. The arrow indicates the location of the excavation. (Photo: W. Gumbley)



### 5.1.1 Archaeology

The pa was investigated during three seasons from 1961 to 1963, and the swamp was investigated during two seasons, 1962 and 1963 (Golson 1961; Ambrose 1962, 1967), with ‘several short spells of work in subsequent years’ (Shawcross 1976: 280). Both the investigations (the pa and the adjacent swamp) have been formative in the development of understanding of the process of human settlement of New Zealand and the development of Maori art and culture.

Owarau Pa (U13/4) underwent five periods of occupation (Ambrose 1967). Occupation began as a garden with associated kumara storage pits that were constructed and reconstructed successively up to six times in one place. After this the level of occupation intensified substantially with the construction of a set of terraces for domestic activities—including the construction of kumara storage pits—and abandonment of the garden soil on the site of the future pa. Later this terraced area was fortified with an encircling palisade and a single ditch. After a period of abandonment the pa was reconstructed with at first a single ditch. Later a double ditch and bank was formed enclosing a smaller area.

The swamp lies in a stream gully on the north-east side of the pa. Ambrose has suggested that formation of the swamp began following the soil disturbance resulting from the ‘large scale development of terraces’ (period 2), which caused the ‘rapid silting and constriction of the small stream that began the process of ponding’ (Ambrose 1967: 12). Nonetheless, it may just as easily have begun earlier with the disturbance caused by vegetation clearance and gardening.

The investigation of the swamp was directed by W. Shawcross and was an extension of comprehensive investigations being carried out on the pa (Fig. 7). The excavations began after the swamp was probed with a gum-spear, which revealed that over ‘an area of about 18 feet [5.5 m] by 9 feet [2.75 m] was found to have a layer of stone or shell at a depth of between 2 and 3 feet [0.6 m–0.9 m], and this was selected for excavation’ (Shawcross 1962: 51). Shawcross (1976: 280) gives the ultimate depth of the excavation as ‘nearly six feet’ [1.8 m].

There are three layers overlying the sandstone that forms the base of the swamp. The lowest is a very dark greyish brown plastic sandy deposit and on

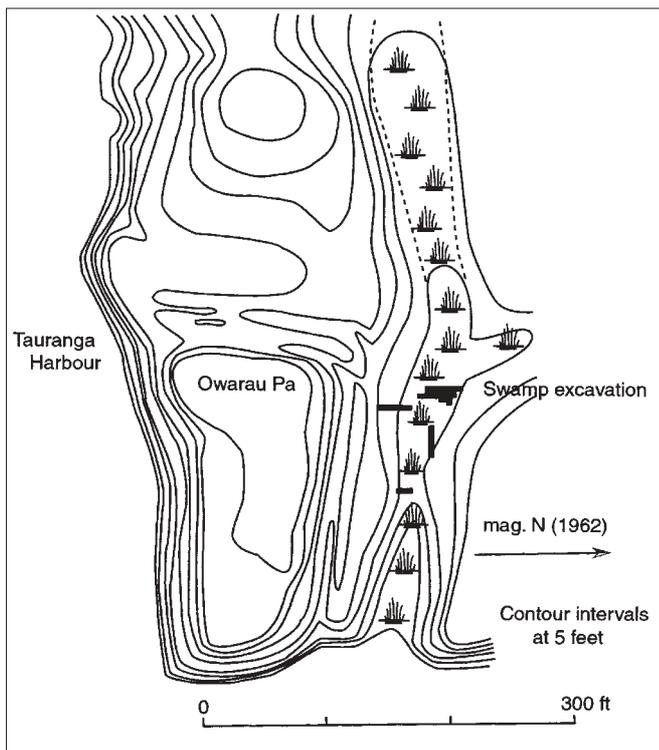


Figure 7. Plan of Owarau Pa (Kauri Point) and the locations of excavations in the swamp (after Shawcross 1976).

zontally and held in place with six vertical posts. Shawcross (1963: 52) noted that 'the structure was defined by a very large number of sticks, some of them pointed, and twigs, and by small floors formed of wood chips or subsoil carried from elsewhere' (the laminations referred to above). This structure coincided 'with the dense distribution of artefacts, particularly combs and obsidian flakes' (Shawcross 1963: 52) (Fig. 8).

The following is a brief summary of the artefacts recovered during the investigation.<sup>13</sup> Obsidian flakes were the most common type of artefact (almost 14 000 flakes), with 75% of them showing use-wear. These were found in clusters, suggesting they were placed in the swamp in vessels in the same manner as the 60 flakes and a hammer stone found in a gourd. Fragments of small gourds were found and several contained obsidian flakes and kokowai (red ochre). Other artefacts included:

- 'Ten pieces of matting, six pieces of cordage and four other items consisting of long fibres with knotted ends' (Shawcross 1976: 294). Most of the pieces of matting were made into wallets and some contained obsidian or ochre.
- Three wooden bowls, one of them carved.
- As well as a gourd nguru (a type of flute) at least two fragmentary undecorated putorino (bugle flutes) were identified.
- The broken shafts and barbed points of three spears, which Shawcross believed were weapons and not hunting tools.
- One complete ko (digging stick) and several broken ones.
- 'Some small spatulate objects' that Shawcross believed were horticultural tools because of their similarity to cultivating tools recorded historically (Shawcross 1976: 292).

top of that is a 150 mm-thick layer of dark grey soil (Shawcross 1976: 283). Above this is the principal swamp deposit layer formed from sand and organic material. The upper part of that layer has been oxidised. Shawcross believed this was caused by the lowering of the water level late in the deposition history of the swamp, but before the excavation.

The archaeological materials were deposited in the principal swamp layer, and included 'almost horizontal laminations' or 'floors' formed from local ash soil re-deposited in the swamp and from dense concentrations of crushed plants. The list of finds from the swamp is impressive (Shawcross 1963: 52-55, 1964, 1976: 285-294). The focal feature identified during the investigation was a rectangular structure which enclosed approximately 2 m x 2 m and was 0.6 m deep. All of the major timbers had been worked and used previously, mostly as building timbers. These were laid hori-

<sup>13</sup> For a fuller description of these see Shawcross (1976).

Figure 8. Part of the Owarau Pa swamp deposit exposed during the excavation. (Photo: from the Anthropology Photographic Archive, University of Auckland)



- A small adze blade and an adze haft.
- Four pieces of worked kauri gum.
- Two wooden figures worked from forked timbers. The better preserved of the two was made from ‘a forked tree trunk, originally a little over two metres high, with peg-like feet, knees and waist marked by a reduction in diameter, and the head and neck by a further, badly rotted, peg-like projection’ (Shawcross 1976: 292). The other, poorly preserved figure was of similar dimensions. There are no other similar examples known in New Zealand.
- 334 large comb fragments (Fig. 9) (a number with carved motifs) and ‘several thousand teeth and small fragments’ (Shawcross 1963: 53).

It is unclear from any of the published material whether the whole of the swamp deposit was excavated or not, but Ambrose believes that it was not (Ambrose in pers. comm. to D.A. Johns, June 2001).

### 5.1.2 Historic site protection

The pa U13/4 and part of the swamp is within the Kauri Point Historic Reserve. This reserve is administered by the Western Bay of Plenty District Council and was gazetted in 1982 (N.Z. Gazette 1982: 1179) and it includes 5.434 ha<sup>14</sup>. The remainder of the swamp is on the Noble property (Lot 1 DPS 14772) or on the unformed Esplanade Road. However, it appears that the part of the swamp where the 1962–63 archaeological investigation occurred is in the Historic Reserve. The Nobles lease the part of the reserve contiguous with their farm (1.3 ha of reserve) and 1.0 ha of Esplanade Road.

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<sup>14</sup> Allotment 137 Tahawai Parish, SO 50939.

Figure 9. Close-up view of a comb during excavation of the Owarau Pa swamp deposit. (Photo: from the Anthropology Photographic Archive, University of Auckland)



Examination of the reserve's management, and the implications this has for any remaining wet archaeological deposits in the swamp, is illuminating, in view of the problems and issues involved. As an Historic Reserve its management is controlled by the Reserves Act. The Act states that the purpose of an Historic Reserve is to protect and preserve in perpetuity items of 'historic, archaeological, cultural, educational, and other special interest' (Reserves Act, section 18(1)) that are within the area of the reserve. Section 41 of the Act requires that a management plan for a reserve is prepared (section 41) and must 'incorporate and ensure compliance with the principles set out in' the section of the act relating to that specific class of reserve. Moreover, that plan must be 'under constant review' (section 41).

There is a draft management plan for Kauri Point Historic Reserve which was probably written in 1992 (Bryan Norton pers. comm.<sup>15</sup>) and includes the following clauses relevant to preservation of the archaeological deposits.

'The reserve shall be managed in such a way as to comply with the provisions of the Historic Places Act 1980 and ensure that archaeological values represented by the historic sites are preserved as far as possible for future generations.

'No activity shall be permitted that is likely to cause erosion or disturb any archaeological site in any way.'

The Kauri Point Historic Reserve is leased for grazing. The lease conditions from the copy of the 1993-1998 lease (on file with the Western Bay of Plenty District Council) states:

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<sup>15</sup> Reserves Officer, Western Bay of Plenty District Council.

‘That the Licensee will ensure that the pa sites are only grazed lightly for short periods and that the surface will not be disturbed or modified in any way without first obtaining the written consent of the Licensor.’

And that:

‘(I) The Licensee will during every autumn of the term of the within license at his own cost, supply transport and spread on the said land at the rate of not less than 400 kilograms per hectare of 15% potassic superphosphate.’

The following notes on the environment of the swamp were made following a visit to the site on 29 November 2000.

Stocking rates have increased compared to past practice (Alison Noble pers. comm. 29 November 2000).

The swamp is unfenced save for a single wire along its western side adjacent to the pa, which forms a ‘T’ junction with another single wire that runs up the side stream gully. Otherwise cattle walk through freely with only the clumps of willow and raupo to prevent movement. Stock tracking through the swamp is obvious in the area below the lowest willow clump where there are only grasses and rushes. The single strand electric fence prevents tracking entirely across the swamp, but only impedes access to the swamp from the pa (western) side and is presumably sited to prevent excessive stock tracking up that side of the pa, rather than keeping stock out of the swamp.

The organic material in the swamp had been preserved by the anaerobic conditions in the swamp that largely excluded adverse microbial activity. Moreover, the natural buffering actions of the peat will also have served to ‘condition’ the water flowing down the swamp by the time it reached the archaeological deposit.

### **5.1.3 Conclusions on the management of Kauri Point swamp**

The current situation has two major areas of concern relating to the preservation of any remaining archaeological material in the swamp: the effect of agricultural fertilisers on the stability of the swamp system, and the mechanical effects of stock movement across the swamp.

Put simply, the agricultural fertiliser will encourage eutrophication and also oxidisation of the swamp environment. As well as promoting plant growth and the attendant physical damage issues, along with the added probable rise in oxidisation potential, there is a suggestion ‘that organic matter degradation is more rapid when nutrients are added’ particularly when the receiving system has ‘low nutrient status to begin with’ (L. Schipper, Landcare Research pers. comm. 16 July 2001). Nutrient enrichment should be viewed as undesirable, however, there is no monitoring of the swamp so there is no data on which to draw to assess these issues. The buffering effect of the peat is unknown, as is the flushing effect of the spring water.

Traffic of cattle through the swamp may have two effects: direct damage to artefacts, and damage to the swamp’s physical character leading to destabilisation of the soil environment. The first of these effects can be taken for granted. The changes to the swamp’s soil structure may vary with the possible introduction of oxygen into upper part of the swamp (by hoof action), and the compaction of the peat. Distortion or even crushing of artefacts may

result, and interfering with the hydraulic processes in the swamp may exacerbate changes in the chemical and nutrient state of the swamp.

The water flow through the swamp appears to remain healthy, but willows and other vegetation in the upper reaches of the main arm of the swamp mean that, when water flow is low, there is a risk that evapotranspiration may affect the saturation of the peat in the lower section of the swamp adjacent to the pa. Stock traffic puts these processes at risk and requires monitoring.

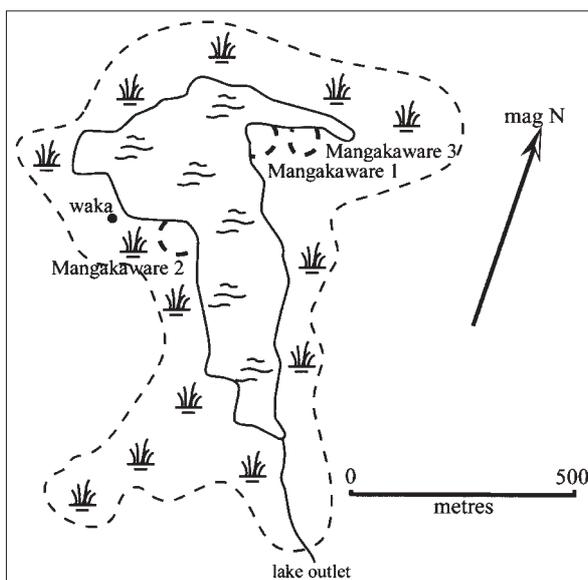
In this context, the draft management plan for Kauri Point Historic Reserve is significantly lacking in detail, both about the archaeological and cultural features in the reserve and measures needed to preserve them. It is clear that the author of that document had not done basic research into the archaeological values of the Kauri Point Historic Reserve and was generally ignorant of the particular issues pertaining to preservation in situ of archaeological deposits. Since archaeological values, along with Maori cultural values, comprise the central rationale for the creation of the reserve this is very disappointing and highlights a significant short-coming of the draft plan. A serious omission from both the lease and the draft management plan is that there is no recognition of the swamp deposit, a significant component of the reserve. Under the present regime, ongoing degradation of the archaeological values of all the archaeological deposits in the reserve (including the swamp) is assured. Finally, the status of the management plan as a draft, albeit an inadequate one, is clearly in breach of the provisions of the Reserves Act.

## 5.2 LAKE MANGAKAWARE

### 5.2.1 Archaeology

Three prehistoric artificial occupation mounds have been found on the shore of Lake Mangakaware (Fig. 10). All three are sited at the north end of the lake and have been built on peat, with two—Mangakaware 1 (MA 1) and Mangakaware 3 (MA 3)—on the eastern shore and Mangakaware 2 (MA 2) on the western (Bellwood 1969, 1971, 1978).

Figure 10. Lake Mangakaware and surrounding swamp with the three sites identified.



These sites are three of many in lakes or on shorelines in the middle and lower Waikato Basin. In this area there are—or were—over 50 lakes and thousands of hectares of swamp/wetlands, now mostly drained. Awareness of these sites and their potential developed in the mid 1960s because of efforts by members of the Waikato Archaeological Group, in particular Doug Pick (Wilkes 1997). After initial investigations, particularly at one of the three Lake Ngaroto swamp pa, this group sought assistance from the Auckland archaeological community. Wilfred Shawcross (who also continued the investigations at Lake Ngaroto), Peter Bellwood, and Karel Peters investigated MA 2 and MA 1 respectively.

Both MA 1 and MA 2 were constructed by identical methods, and both were associated with a remarkable

level of organic preservation at the time they were excavated even given that the upper levels of each were above lake level. Indeed Bellwood recently noted (pers. comm. 13 July 2001) that all the timbers at MA 2 were above the water-table in 1968, although the lower deposits of the eastern excavation area in MA 2 were below.

As well as the remarkable array of worked timbers and wooden tools from the two sites, preserved fibres, bark, and seeds provide information about diet, seasons of occupation, and activity, as well as functional and spatial relations of parts of each pa which could not be found in dry archaeological sites. Generally the preservation of organic and non-organic material was good in 1968 and 1969, although it is important to note that the upper parts of each mound are dry, not waterlogged.

Figure 11. Plan of the Mangakaware 1 site (MA 1) (after Bellwood 1978: fig. 3).

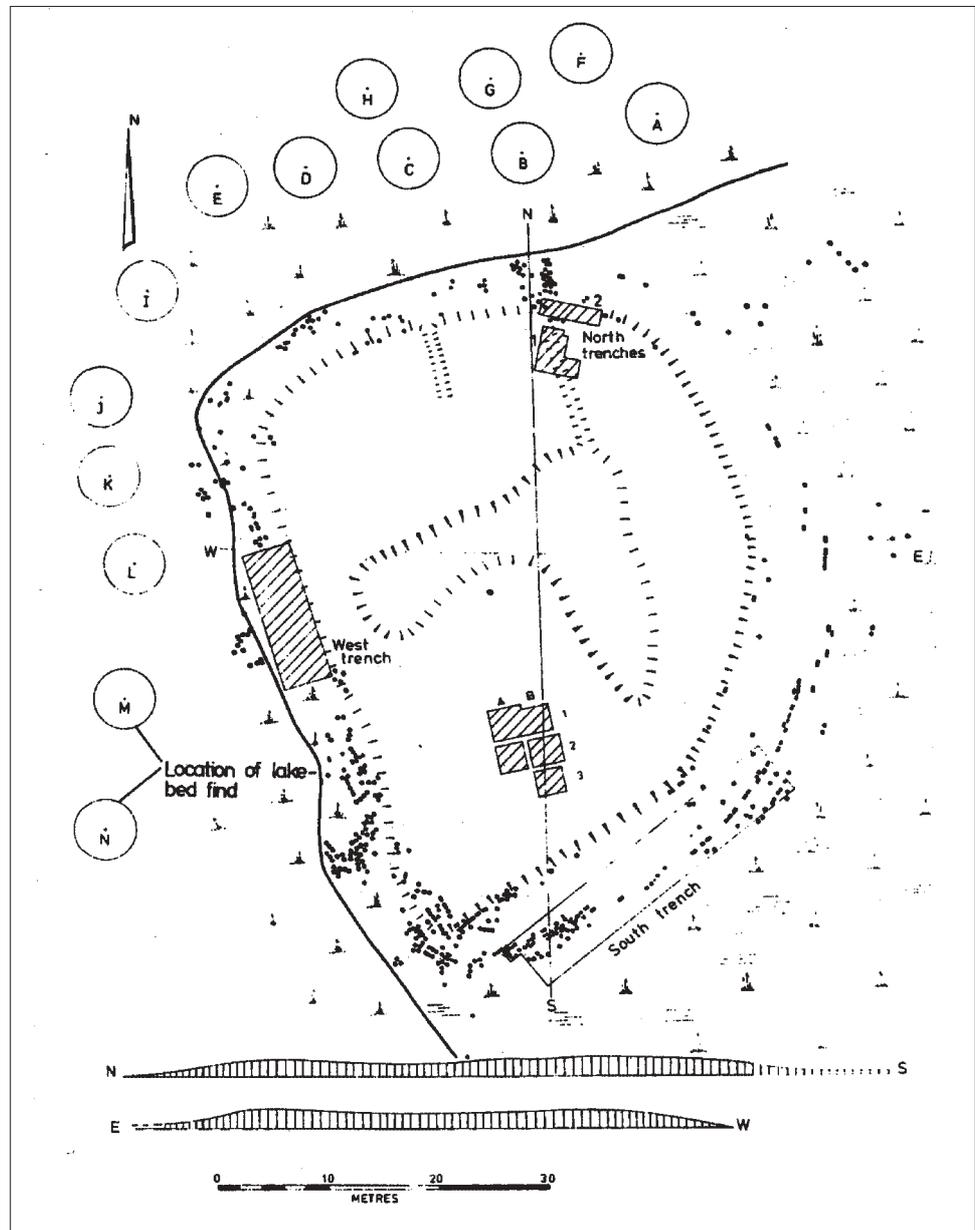


Figure 12. The northern tall palisade post at Mangakaware 1, one of two remaining tall posts in 1968. Neither remain today. (Photo: Anthropology Photographic Archive, University of Auckland)



### 5.2.2 Mangakaware 1

Pick (1968) and Peters (1971) provide detailed descriptions of MA 1 and Bellwood (1978) provides a detailed plan (Fig. 11). The area within the defences is approximately 1640 m<sup>2</sup> and in 1971 over 650 remnant posts were recorded with concentrations on the north-western and south-eastern sides of the pa (Peters 1971: 127–128). Two posts, on the northern and eastern sides, were up to 3.5 m above the ground when Peters first visited the site in April 1969 (Fig. 12). Peters reported that ‘by our return in May 1969, vandals had removed the one on the eastern side’. Pick (1968) noted that even as late as the 1930s some of the posts still had carved heads. Many of these posts were part of defensive palisades and the defences were complex (7 rows of posts in one area).

Excavations went down a metre at the deepest and Peters’ estimated that another metre of deposits underlay this. Excavations occurred in four areas of the pa, three around the margins of the mound focusing on the defences and peripheral structures with a small area (approximately 90 m<sup>2</sup>) investigated inside the defences. These showed that the mound had been built up by a series of sandy clay floors and black occupation deposits into more or less continuous low mounds around a central boomerang-shaped depression. Even given the limited nature of the investigations Peters could ‘describe the last three or four phases of activity’ in the pa including three super-imposed houses and he was sure ‘that much earlier evidence of occupation remains’ (Peters 1971: 137–139).

Approximately 280 artefacts, mostly wooden, were found. They covered the following range: palisade posts, structural timbers (some jointed), tools and implements (beaters, agricultural tools, weaving tools, adze handles), canoes and paddles, vessels, hunting and fishing gear, a wooden drum, toy tops, and weapons (see Appendix 4 for a detailed list). As well as the organic material, stone flake tools, stone chisels and adzes, a stone file, and a grinder were found. A range of food debris including remains of New Zealand quail, wood pigeon, kaka, grey duck, snapper, and stingray were also found. (Peters 1971: 136–137).

### 5.2.3 Mangakaware 2

Mangakaware 2 (MA 2) (Fig. 13) lies on the western shore of Lake Mangakaware among drained peat swamp in the same manner as the other two sites. It was a palisaded enclosure covering 2100 m<sup>2</sup>, a little larger than MA 1. While MA 1 has approximately 2 m of occupation-related deposits, MA 2 has an approximate maximum of 0.5 m (Bellwood 1971: 113). Approximately 400 m<sup>2</sup> of MA 2 were excavated (Bellwood 1978: 10). As well as excavating the mound, a search was carried out of the lake bed immediately around the site, to a depth of 1.5 m. It seems that posts and house mounds could be seen quite clearly on the site at the time of the excavation, but 'all MA2 palisades have been reduced to ground level by 1968' (Bellwood 1978: 15-16). Neither house mounds nor posts are visible now.

Bellwood's report does not detail the stratigraphy or the soil environment. He does tell us that the soil at the site was quite acid—pH 5.25 (Bellwood 1978: 28). The mound was built on a foundation of peat with timbers laid on the wet shore around the site's perimeter and this was then built up with a series of lenses of sandy loam interleaved with dark/black occupation layers.

Figure 13. Plan of the Mangakaware 2 site (MA 2) (after Bellwood 1978).

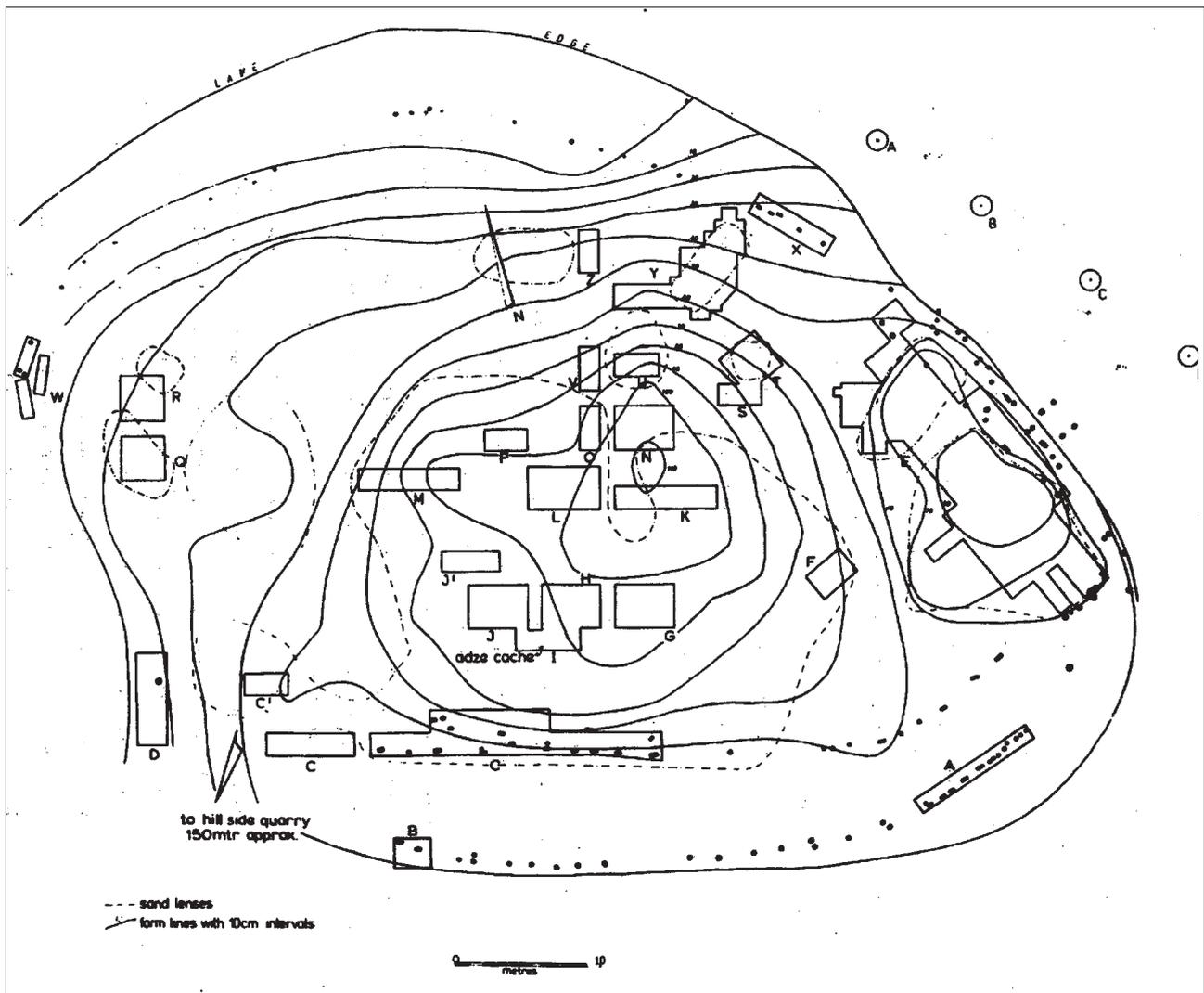


Figure 14. The excavation of the eastern area of Mangakaware 2 in progress. Palisade posts are prominent in the foreground.

(Photo: Anthropology Photographic Archive, University of Auckland)



A total of 110 post butts were visible at the ground surface<sup>16</sup> (Bellwood 1978: 16–17). Some of the posts were large (up to 0.5 m diameter) and buried up to 3 m deep in the peat. The defences of MA 2 were much simpler than MA 1. Here most of the remaining post stubs showed a single line of palisades except on the southern side where there were two rows. An investigation of the palisades on the southern side revealed a ngutu-style gateway where two rows of palisades tightly overlap (0.6 m–1 m wide) before entrance is gained to the pa through a very narrow (0.5 m) portal. Inside the entrance, in the centre of the pa, a large area had been built up with at least two sand lenses (Bellwood 1978: 20–21). Houses and other structures surrounded a large artificially raised courtyard.

During intensive excavations of the eastern side of the pa, a complex succession of structures was identified. These included a remarkable array of organic material relating to furniture, foods, and industrial materials.

Within the palisades, a total of 81 fireplaces or hearths were found, and evidence for the following structures:

- 6 m × 2.2 m house with slab walls (Wharepuni)
- 2 m × 2.5 m shelter
- A structure represented only by floors
- A possible 4 m × 4 m shelter
- House 1 (3 m × 2.8 m) used through four phases, the last possibly as a cook house
- House 2 (2.5 m × 1.8 m—phases 3 and 4)
- Shelter abutting house 1 (phases 1 and 2)
- Shelter (3.6 m × 1.5–2.5 m) replacing above shelter (phases 3 and 4)
- Drying racks

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<sup>16</sup> John Krippner can only remember the posts as short stubs protruding a few centimetres from the soil (pers. comm. 17 July 2001).

- Isolated posts in the body of the pa which may relate to structures like pataka (store houses)

As well as the seeds and berries mentioned, the remains of one dog (possibly two); one pukeko (plus two unidentified birds); and parts relating to five or more Elasmobranchs (sharks and rays). There were also marine shellfish, mostly pipi, plus fewer cockle and scallop, as well as *Hyridella* (freshwater mussel/kakahi) (Bellwood 1978: 31-33).

Within the pa, the 23 recovered artefacts included: weapons, tools, and vessels (see Appendix 5 for more detail), but only 3 of these were organic. Over 57 artefacts were found in the lake surrounding the pa, and 55 were organic, approximately half of these were palisade posts. The rest included agricultural implements, paddles, eel traps, clubs, bowls, and beaters, with some items of uncertain function.

#### 5.2.4 Description of the environment

Lake Mangakaware (see Fig. 10) was formed approximately 17 000 years ago by deposition of Hinuera formation sediments damming the opening of a small valley (Green & Lowe 1985). Today the lake covers 15 ha (Bellwood 1978: 11) with a maximum depth of 4.8 m, within a catchment of a little more than 300 ha. The outlet drain is cut through the peat swamp at the south end of the lake. It then flows west through the gap in the hills, where it becomes Mangakaware Stream, which eventually joins the Waipa River. In the past, the lake outlet was a natural stream following the same general route as the drain.<sup>17</sup>

Peat has developed on the western, southern, and eastern sides of the lake, between the shore and the surrounding hills. The northern edge of the lake is formed by the hill-slope. The peat is part of the Kaipaki soil series, which varies from loamy or sandy peat to peaty sand or loam (Grange et al. 1939).

The 1865 survey plan (SO 177) shows the area around the lake to be in forest or shrubland (probably the latter) that extended beyond the peat and onto the surrounding hill-slopes. Analysis of pollen sampled from the peat at the base of Mangakaware 2 (MA 2) (on the western shore of the lake) indicated that the lake was in 'an area surrounded by coniferous forest, but with local clearances' at the time MA2 was built (Bellwood 1978: 12).

Any marginal forest or shrubland has been cleared and the peat has been drained and converted to pasture, as have the surrounding hill-slopes. Exotic trees surround the lake on its margins. These are predominantly willows, although a number of other species were planted by the Acclimatisation Society and farmers to promote waterfowl—nonetheless the lake is managed (passively) as a wildlife sanctuary. The willows were more extensive surrounding the lake, but most were felled in the late 1960s and early 1970s to improve access for grazing cattle (H. Bridson, pers. comm. 1 March 2001) (see below). As well as exotics, native plant species, principally rushes and flax, also grow around the lake. A patch of water lilies planted in the lake is apparently spreading slowly.

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<sup>17</sup> It could not be determined precisely when the drain was dug, but see opinions expressed later in this section.

Herds of dairy cattle graze the reserve area surrounding Lake Mangakaware, along with the hills forming the lake's catchment. Less than half of the lake edge is fenced, and that mostly on the eastern side. Thus for most of the lake circumference cattle have access right to the water's edge. West made pertinent comments on issues associated with grazing and conservation that remain relevant today:

'The margin of Mangakawhare is developed pasture with little to distinguish it from the surrounding farmland. This is not unexpected of the peat lakes where there is little or no esplanade but in the case of Mangakawhare [sic] it is an indication of the ambivalent attitudes by all parties, that have prevailed to the present time. Farmers often see the lakes as useful water sources, or end points for a drainage scheme on the one hand or as difficult and unproductive land on the other.' (West 1993: 9)

A good deal of research has been conducted on the peat lakes of the middle Waikato Basin. Specifically two surveys have been carried out of the lakes in the Waipa County/District; the first by Chapman & Boubee (1978) and the second by Page (1988). Page, when comparing data from 1978 and 1988 made a number of general comments that apply to all or most of the Waipa peat lakes, including Mangakaware (Page 1988: 17-19). The lakes have become 'less dystrophic and more eutrophic' (Chapman & Boubee described them as generally dystrophic), with increases in pH and increases in water clarity (assisting chlorophyll production). Farming practices in lake catchments is probably responsible for these changes, but the large swan and geese populations on the lake will also contribute. Specifically Lake Mangakaware was described as hypertrophic in 1978 and 1988 with the pH unchanged (7.2 at the lake surface and 6.7 on the bottom) and chlorophyll levels rising from 32 mg per cubic metre to 39.1 mg per cubic metre (Page 1988: fig. 12, table 6b, table 10).

Although there are no specific data on the oxidation rates for the peat soils surrounding Mangakaware, oxidation rates for other Waipa peat lakes are approximately 40-50 mm per year (Grant Barnes, Environment Waikato, pers. comm.).

Lake level is a crucial variable for the preservation of organic materials in and around the three pa on the shore of Mangakaware: it determines the level to which the archaeological deposits and their organic contents are saturated and aerobic decomposition prevented. The lake level is currently managed (by a rock rubble weir on the outlet drain) to maintain a minimum summer level. Nonetheless, the level ranges by up to 0.5 m, reaching a maximum only following heavy persistent rain, and then only for a couple of days a year (H. Bridson pers. comm. 19 July 2001). Similarly, John Krippner (pers. comm. 17

TABLE 4. MAXIMUM HEIGHTS OF THE THREE LAKE MANGAKAWARE PA SITES ABOVE THE LAKE LEVEL.

DATE	MANGAKAWARE 1 (m)	MANGAKAWARE 2 (m)	MANGAKAWARE 3 (m)
17 July 2001	1.40	(0.80-inferred)	0.50
19 July 2001	1.65	1.05	(0.75-inferred)

July 2001) remarked that after heavy and persistent rain MA2 would occasionally become an island.

The maximum heights of the occupation mounds at each of the three sites were measured on two occasions (Table 4). The first followed heavy rain in winter, and the second (also in winter) followed two days of occasional showers with fine periods. The results indicate what is probably a typical variation in lake level: 0.25 m.

Because no records of lake levels have been kept, it is difficult to determine historic levels. Bellwood believed that water levels had changed, and that at the time the site was occupied the lake was lower than in 1968<sup>18</sup> (Bellwood 1978: 42). John Krippner did not know when the outlet drain was dug, but believed it would have been by the end of the 1920s at the latest (the Krippner family bought the farm in the 1920s). He believed that the lake level would have originally have been higher, prior to the cutting of the outlet drain to replace the outlet stream. Surrounding farmers would have felt it desirable to lower the water level to increase pasture around the lake, as is known for nearby Lake Ngaroto (Law 1968: 35–36). Grant Barnes (Environment Waikato) is similarly confident that the drain would have been dug to lower the lake level and bring in more pasture.

There was a recent attempt by one of the adjacent leaseholders to lower the lake by excavating the outlet drain. This action led to the establishment of the rock rubble weir, aimed at restoring the approximate level of the lake prior the deepening of the drain. The current lake level is arbitrary because of this recently implanted weir.

We also have to consider the possibility that the occupants of the Mangakaware pa carried out an act of lake-level control similar to their neighbours on Lake Ngaroto, who blocked the outlet of the lake to raise the water level, presumably to aid defence (Pick 1968).<sup>19</sup>

The evidence relating to lake level in the past is equivocal, however, we believe that if the lake level was historically different before the present outlet channel was dug, it is likely to have been higher, although by how much would be a guess.

### 5.2.5 Land status

The lake and its surrounding land are a Recreation Reserve<sup>20</sup> of 121 acres (49 ha) gazetted in 1904. Earlier, it was administered by the Pirongia Domain Board, but now the reserve is vested in Waipa District Council whose job it is to administer reserves.

As a Recreation Reserve, Lake Mangakaware and its environs are subject to the Reserves Act 1977. While the lake is a scenic resource, the Act (section 17(2))

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<sup>18</sup> Bellwood believed this because the lower occupation levels in trench E of MA 2 were below lake level in 1968.

<sup>19</sup> Pick estimated that the level of Ngaroto 'has fallen possibly eight feet since the war of 1863' (Pick 1968). We are sceptical of this eight feet (2.4 m) figure because this would have meant that two, if not all three of the lake pa on Ngaroto would have been completely underwater.

<sup>20</sup> Allotment 75A SO 177/2.

requires that ‘where scenic, historic, archaeological, biological, geological, or other scientific features or indigenous flora or fauna or wildlife are present in the reserve, those features or that flora or fauna or wildlife shall be managed and protected to the extent compatible with the principal or primary purpose of the reserve.’<sup>21</sup>

The Reserves Act (section 41) also requires that a management plan is prepared to ‘ensure compliance with principles set out in section 17’ of the Act. A management plan was prepared in 1993 by D. West for Waipa District Council. This plan argues strongly for care and management for the reserve—emphasising the unsuitability of the reserve for active recreation, and its value for education and research. West put forward eight development proposals, which promote the potential for restoration and protection of native flora and fauna, and protection of the archaeological sites. With regard to the archaeological sites, the plan has little specific to say, even though the sites were clearly considered important and they are mentioned further in the Education section of the resource inventory. There are no management policies referring to them, but development proposal (g) contends that:

‘The archaeological sites and visible remains are being destroyed by stock. These sites need some form of practicable protection which makes them available to the interested observer but not overgrown due to the prevention of grazing livestock.’ (West 1993: 16)

The grazing lease maintains the status quo, with no specific provisions regarding the archaeological sites. The leases allow for the removal of any of the sites from grazing with six months notice should this be needed. Waipa District Council consider the management of the pa a matter for iwi to determine (Greg Bowden, Waipa DC, pers. comm. 31 July 2001).<sup>22</sup>

### 5.2.6 Condition of Mangakaware 1 and 2 in 2001

Because of the work done in the late 1960s we can gather some basic information on the changing conditions of the pa on the lake edge (Figs 15, 16, and 17).

The sites are mounds constructed to provide dry habitation on the swampy edge of the lake, so it is not surprising that the upper parts of the sites are relatively dry. Fluctuation of the lake level means that there will be strata that will be periodically wet and dry, and others which are permanently wet. At Mangakaware 2 the comparatively thin cultural layer on the mound means that most of the mound deposits are relatively dry. Even so the organic materials, especially those from the eastern excavated area, have been remarkably well-preserved, indicating the partial or periodic wetting of these deposits has helped to preserve them. The thicker mound of MA 1 (probably about 2 m of deposit) is likely to have a greater volume of deposits permanently wet, and so should have an even better degree of preservation of organic material in its lower levels. However, the degree of preservation in the higher areas is hard to

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<sup>21</sup> West (1993: 2) points out that Mangakaware is the only one of 23 peat lakes in the middle Waikato Basin to be fully enclosed in a Recreation Reserve.

<sup>22</sup> The Waipa District Plan protects the lakes by prohibiting soil surface modification within 500 m of a peat lake, or the distribution or discharge of nutrients within any lake catchment.

Figure 15. View south from the Mangakaware 1 occupation mound across the area where seven concentric rows of palisades were visible in 1969. The range pole indicates the approximate outside row of palisades. (Photo: W. Gumbley).



Figure 16. View of the eastern end of Peters' south trench showing palisade posts during excavation of Mangakaware 1 taken in 1969. The scrub has since been removed. (Photo: Anthropology Photographic Archive, University of Auckland)



Figure 17. View of the same area of Mangakaware 1 as in Fig. 16, but taken in 2001. (Photo: W. Gumbley)





Figure 18. From a 1943 aerial photograph (SM 837/40) showing the north end of Lake Mangakaware. (Crown Copyright. Reproduced by permission.)



Figure 19. From a 1971 aerial photograph (SN 3470 4515/3) showing the north end of Lake Mangakaware. (Crown Copyright. Reproduced by permission.)



Figure 20. Photograph of the lake shore on the eastern side of Mangakaware 2 c. 1972. Note the posts in the lake that were interpreted as the remains of a raised storehouse. (Photo: *Anthropology Photographic Archive, University of Auckland*)

assess. Certainly Peters (1971) describes less material from his investigation within the pa, but it was less than a quarter of the area investigated inside MA 2 and was comparatively shallow—finishing well above the waterlogged levels.

Both pa are grazed year round by dairy cattle, under pastoral leases—the mounds are popular as relatively dry places within the surrounding peat. Stock have had, and continue to have deleterious effects. Stock traffic up and down the steeper banks of MA 1 causes slow, but steady erosion. Also those parts of the pa defences in the low-lying peat-land are subject to pugging from stock. The stock traffic damages the upper few centimetres (approximately 10–15 cm) of archaeological material. In particular this has meant that the remains of the palisade posts have been substantially damaged. At MA 1 over 650 visible posts could be recorded in 1968–69, but in 2001 only a handful remain visible, and these (with a couple of exceptions) are now just butts less than 15 cm high (locations are shown in Fig. 11, above). Three dispersed post butts are all that remain of the seven rows visible on the south-eastern defences described by Pick (1968)

(see Figs 15, 16, and 17). This indicates a substantial change in the condition of the site over thirty years.

A few trees (no more than six, without doubt willows) are shown growing around MA 1 in the 1943 aerial photograph SN 837/39 (Fig. 18). These were all growing on the shore, mostly the western side. The rest of the pa was covered in some form of low growth, probably fern or rushes. By 1971 the aerial photograph SN3470 4515/3 (Fig. 19) shows trees had spread along the western

Figure 21. Photograph of the same eastern side of Mangakaware 2 as shown in Figs 14 and 20, but taken in 2001. (Photo: *W. Gumbley*)





Figure 22. A waka is exposed in the peat beside a drain, 140 m west-north-west of MA 2.

shore of the site, part of the northern shore, and on the swampy land along the eastern side.

Today the trees on the eastern side are gone, but those on the western and northern shores remain and have grown to substantial size. It is conceivable that during the removal of the trees on the eastern side many, if not all of the remaining posts were damaged and this may account, at least in part, for the absence of posts in this area. While the willows on the northern and western shores provide protection from erosion by wave action, their root systems are undoubtedly damaging archaeological structures. Moreover the willows have reached a size where branches have collapsed into the lake and this is advancing the trees further into the lake. This has probably both obscured some posts, and also broken or destroyed others.

By July 2001 none of the 128 palisade post stumps at MA 2 which were visible above the soil surface in 1968 (Fig. 20) could be relocated, although a single post was visible in the lake close to the shore at the southeast corner of the site. Four decaying logs were visible at the ground surface around the periphery of the site, three in the vicinity of the 'inland' palisades that

may be fallen posts, or logs captured by the peat swamp. John Krippner (pers. comm. 17 July 2001) remembered that none of the posts had ever been more than a few inches above the ground surface, in contrast to those at MA 1. The four posts in the lake adjacent to the eastern excavation area are no longer visible. Today a small jetty is sited one or two metres south of where the posts were located and a small launching ramp for a dinghy has been formed immediately adjacent to the jetty on its south side (Fig. 21).

A waka is exposed on the ground surface beside a drain, 140 m west-north-west of MA 2. It appears to have been truncated during the digging of the drain (Fig. 22). In its current situation it is exposed to both aerobic decomposition processes and cattle trampling. It also serves to illustrate the fact that further artefacts associated with Maori settlement of the lake will be present in the drained peat soils beside the lake, even some distance from the shoreline.

### 5.2.7 Conclusions on the management of the pa

We have enough information to know that the environment in which the archaeological deposits around Lake Mangakaware are lodged is not stable. The present lake level, which is fixed by a rock rubble weir, is arbitrary. The peat is oxidising at a rate of 40–50 mm per year and the lake waters have become increasingly eutrophic in the period from 1978 to 1988. The water pH has also increased over that time. The eutrophication is probably directly related to fertilisation of the pastures surrounding the lake, as well as cattle and wild-fowl

manure in and around the lake. The uncertainty of the relationship of the current lake level to past levels does not help assessment of the state of the environment. The suspected lowering of the level will have had adverse effects, since it will have aided oxidation of the organic archaeological remains.

The specific requirements of the Reserves Act to manage and protect archaeological and historic features in a manner compatible with its designation as a Recreation Reserve have not been adhered to. It is clearly inappropriate for cattle to graze the occupation mounds. Use as a cattle camp and dry-ground resort from the surrounding peat erodes the mounds. Similarly, there has been physical damage to both exposed posts and shallow buried deposits by cattle traffic. Since the lake is not actually used for recreation (other than by the immediate neighbours) the implementation of basic management measures to protect the archaeological deposits should be straight-forward. Removal of grazing cattle from the sites would seem to be a sensible first measure, but the new grazing lease agreed upon in 2001 continues to allow grazing on the three mounds. It also seems clear that the classification of the reserve for recreation is inappropriate.<sup>23</sup>

### 5.3 MANAGEMENT ISSUES

The two case studies investigated for this project suffer from a significant absence of data about their physical condition, even to the point where we are no longer clear whether archaeological material remains in the Kauri Point Pa swamp. It is no surprise that research to provide such data is a primary concern. A thorough assessment needs to be carried out (as outlined in Section 4.1), and a monitoring programme developed for each site.

There are some management issues common to both Kauri Point swamp and Lake Mangakaware. These issues are probably widely applicable to other wet archaeological sites. The extent and nature (both horizontally and vertically) of the two sites involved in this study have not been fully documented. While a detailed map of the archaeological features at Kauri Point is available, a similar quality map is not available for the Lake Mangakaware sites. Such plans are important as a basis for data recording for both the assessment and monitoring phases. Thorough mapping of the site will allow other workers easy access to important information so that at-risk wetland components of the sites will suffer minimal or no damage.

Both the Kauri Point swamp and the sites at Lake Mangakaware suffer from the presence of stock—dairy cattle. At Mangakaware each of the pa sites provide dry raised localities within the surrounding peat soils which the cattle use. Cattle should be excluded from the sites. This would require amendment to the grazing leases. The presence of cattle ensures there are no large plants

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<sup>23</sup> The 1994 Waipa District Plan acknowledges the scientific and ecological values of the peat lakes in the district and imposes rules to help protect them. In the case of Lake Mangakaware these do not seem to have been applied. The grazing of cattle within 50 m of the edge of the lake appears to contradict Rule 2.4.3. This rule also prohibits the distribution or discharge of any nutrient-rich substances within the catchment of any peat lake. The grazing of cattle close to the lake, as well as the application of fertilizer, seems to be contradictory to this prohibition.

establishing on the sites, so vegetation control mechanisms will need to be developed to keep the sites clear of undesirable plant species when stock are excluded. All three sites at Mangakaware are all adversely affected by the growth of willow trees. At MA 2 there are only two large willows remaining on the site, but both MA 1 and MA 3 are fringed by large willows. There is also a very real need for a well-considered reserve management plan for the Kauri Point Historic Reserve—one which recognises the presence and importance of the swamp deposits.

Further research to determine past lake levels is needed at Lake Mangakaware. In particular, establishment of the historic level of the lake relative to the cultural deposits in the pa prior to the excavation of the drainage channel is essential. The results of this research will determine whether the current minimum lake level is appropriate. Although emphasising the importance of the pa, the current management plan for the reserve lacks detail and appropriate management measures to protect them. It should be redrafted to include these.

The following approaches and strategies must be implemented to ensure the survival of these sites in the future:

- Detailed surveys and maps of both the sites, Lake Mangakaware and Kauri Point, need to be undertaken.
- The gathering of knowledge for both sites is required before further strategies can be implemented, including monitoring and site-specific data (see Section 4.2).
- Evaluation of the monitoring programmes and a conservation plan (designed using information collected during monitoring) could be implemented after the first year of data-gathering is complete.
- Re-vesting of the reserve in a national agency such as the Historic Places Trust may be warranted.

## 6. Conclusions

It has become clear that there is a poor understanding of the nature of the valuable wetland archaeological site resource in New Zealand. We have demonstrated that the New Zealand Archaeological Association records contain information that allowed 177 wet archaeological sites to be identified. We have also shown that this record is incomplete because comparisons with the records in the Te Awamutu Museum contain evidence of a number of sites not recorded in the NZAA records. We do not know the current condition of these identified sites.

In February of 2001 Van de Noort et al. (2001) posted a draft of a review of the issues relating to the management of wetland archaeological sites for information and comment. Their report, entitled 'Monuments at risk in English wetlands' (MAREW), draws on 30 years of detailed research into the management of such sites to outline the problems encountered, and to propose some directions for the future. Even with all of the data available from a series of wet-site identification and assessment projects in districts around England, they experienced difficulty estimating the density and distribution of wet archaeological sites. As they note, the problem of 'masking of monuments beneath deep peat and alluvial sediments has not been resolved'. This situation is common to all wetland archaeological sites, no matter where they are in the world.

That point notwithstanding, there is more that can be done to improve our understanding of just what constitutes the resource in New Zealand. Targeted archaeological survey projects are needed, directed at areas where wet sites are likely (based on our knowledge of similar environments where such sites are known). An example, mentioned above, are the lakes and wetlands of the lower Waikato Basin, which have never been systematically surveyed. Similarly, the riverside sites on the Hauraki Plains should be re-assessed with regard to their water-logged status. Elsewhere, lakes and wetlands within areas where there is a reasonable density of 'dry' archaeological sites should be examined.

Improving the quality of the inventory will enhance the advocacy for the protection of known sites. It will also mean that more robust arguments can be made for the protection of other areas where there is considered to be a significant chance of buried wet archaeological deposits. Similarly, it will also improve our ability to argue for archaeological assessments where wetlands are threatened by development.

The Resource Management Act gives New Zealand a coherent planning and resource management process that should facilitate effective advocacy for protection of known and potential wetland archaeological sites in a manner not possible through the Historic Places Act. This is especially so where sites are suspected, but not known. As one of the lessons of the last thirty years in England, Kendall et al. (2001) emphasise the need to seek common ground with other groups interested in preserving wetlands. This lesson stems from the realisation that the only way to effectively preserve water-logged archaeological material is through control of the hydrology. This really means the preservation

of the whole of the wetland in which the material lies, not just what Kendall et al. (2001) describe as 'monument islands'. This is a lesson we should learn in New Zealand.

International research on the physical management of archaeological sites in wetlands means there is now a body material which can be drawn upon for application within New Zealand. It is clear that the management of sites is not easy. While there is a commonly accepted process to follow to achieve the preservation of wet archaeological sites, there is a complex array of variables to be understood and controlled for this to be effective. Coles (2001) suggests the key to success in the protection of wetland sites lies in accurate and persistent monitoring. However, each wetland archaeological site has different features and site-specific problems, and conservation measures will have to be tailored to suit.

Inevitably there will be situations where the water-level or the water and soil chemistry cannot be controlled, and where sites will not be able to be preserved. These sites should be excavated.

One aspect not discussed in this report is the issue of Maori cultural values and their relationship with the sites and the material incorporated within them, however, it is important that this aspect is canvassed. Most wet archaeological sites in New Zealand originate from the actions of Maori. In many cases the material contained was highly valued, and cached for safe-keeping. This relationship means that Maori with interests in the site should be involved in both the advocacy for preservation of the site and its subsequent management. Maori should not be underestimated as powerful allies in the planning process, and are an immediate example of a group with common cause.

## 7. Acknowledgements

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### ***Management plan***

Lake Mangakaware Reserve Management Plan. Waipa District Council, Te Awamutu.

# Appendix 1

## INVENTORY OF WET ARCHAEOLOGICAL SITES IN NEW ZEALAND

REGION	NZMS 260	NZ ARCHAEOLOGICAL ASSN SITE NO.	SITE TYPE	NOTES
Northland				
	L01	7	swamp drains	
	N02	572	swamp drains	
		577	swamp drains	
		1005	swamp drains	
	N03	1	swamp cache	
		113	swamp pa	
		114	swamp pa	
		268	swamp pa	
		392	swamp drains	
		394	swamp drains	
		419	swamp drains	
		599	swamp drains	
		637	swamp drains	
		638	swamp drains	
		639	swamp drains	
		640	swamp drains	
		641	swamp drains	
		642	swamp drains	
	O03	87	swamp drains	
	O04	49	swamp drains	
		192	swamp drains	
		857	swamp drains	
	P04	2	swamp drains	
		10	swamp drains	
		56	swamp drains	
		280	swamp drains	
		379	swamp pa	
	N05	192	swamp pa	
	O05	62	swamp drains	
		181	swamp drains	
	P05	78	swamp drains	
		85	swamp drains	
		204	swamp cache	
		288	swamp drains	
		332	swamp drains	
		441	swamp drains	
	Q05	119	swamp drains	
		120	swamp drains	
		124	swamp drains	
		132	swamp drains	
		143	swamp drains	
		183	swamp drains	

REGION	NZMS 260	NZ ARCHAEOLOGICAL ASSN SITE NO.	SITE TYPE	NOTES
		185	swamp drains	
		238	swamp drains	
		448	swamp drains	
		793	swamp drains	
		1102	swamp cache	
	O06	478	swamp drains	
	P06	60	swamp pa	
		76	swamp drains	
		77	swamp drains	
		78	swamp drains	
		79	swamp drains	
		80	swamp drains	
	Q06	54	swamp cache	
		241	swamp cache	
		325	swamp drains	
	Q07	50	mudflat cache	
		399	swamp drains	
		404	swamp drains	
		421	swamp drains	
		422	swamp drains	
		423	swamp drains	
		424	swamp drains	
		463	swamp drains	
		465	swamp drains	
		542	swamp drains	
		711	swamp drains	
		897	swamp drains	
<hr/>				
Auckland				
	Q09	36	swamp pa	
		543	swamp cache	
	T09	4	swamp drains	
		15	drain	
	Q11	21	swamp pa	
	R11	34	swamp cache	firewood
		57	swamp cache	destroyed
		60	swamp cache	destroyed
	R12	160	swamp cache	
	S12	198	swamp cache	
<hr/>				
Waikato / Hauraki / King Country				
	T10	355	eel weir	
	T11	267	findspot	
	T12	17	swamp pa	
		192	swamp pa	
	S13	46	findspot	
		47	findspot	
		51	swamp pa	
	T13	24	swamp pa	
	R14	240	cache	
	S14	5	swamp pa	
		124	findspot	
	T14	91	trackway	
		92	swamp cache	

REGION	NZMS 260	NZ ARCHAEOLOGICAL ASSN SITE NO.	SITE TYPE	NOTES
	R15	553	findspot	waka
	S15	5	swamp pa	
		6	fishing camp	lake edge
		7	lake pa	island
		9	lake pa	
		12	lake pa	
		13	swamp pa	
		14	swamp pa	
		16	lake edge pa	Mangakaware 1+3
		18	lake edge pa	Mangakaware 2
		58	lake edge pa	
		59	swamp pa	
		72	swamp pa	
		73	swamp pa	
		82	findspot	
		186	swamp pa	
		280	findspot	
		284	eel weir	
		292	eel weir	
		312	eel weir	
		313	eel weir	
		314	eel weir	
		315	eel weir	
Western Bay of Plenty				
	U13	4	swamp cache	Kauri Point
	U14	220	river/swamp pa	lower Kaituna River
		1726	swamp pa	Papamoa
		1738	river/swamp pa	lower Kaituna River
		1740	kainga	lower Kaituna River
		1743	river/swamp pa	lower Kaituna River
		1849	kainga	Kaituna swamp
		1850	kainga	Kaituna swamp
		2821	swamp pa	Papamoa
		2872	swamp pa	Papamoa
		3039	kainga	lower Kaituna River
		3040	kainga	lower Kaituna River
		3041	kainga	lower Kaituna River
Eastern Bay of Plenty				
	V15	15	corduroy road	Armed Constabulary
		46	swamp pa	
		80	swamp pa	Kohika
		88	swamp pa	
		1197	swamp pa	Law's
	W15	121	kainga	
		332	kainga	
East Coast / Hawkes Bay				
	Y18	73	corduroy road	in estuary
		75	swamp pa	Tapui
	V22	46	swamp pa	Te Awarua o Porirua

REGION	NZMS 260	NZ ARCHAEOLOGICAL ASSN SITE NO.	SITE TYPE	NOTES
Taranaki / Wanganui				
	P20	19	Swamp finds	adjacent to Tapuinikau Pa (P20/21–22)
	Q18	3	swamp pa	
	Q22	15	swamp cache	Waitore
		27	swamp pa	Te Oika
		77	swamp cache	Waverley
Rangitikei / Manawatu				
	S23	61	swamp cache	Awamate
		63	eel weir	
		66	eel channel	now dry
	S24	3	camp	Foxton site, part wet
Horowhenua / Kapiti				
	S25	10	lake pa	Lake Papaitonga
		11	lake pa	Lake Papaitonga
		29	lake pa	Lake Horowhenua, Karapu
		42	swamp pa	Lake Horowhenua
		43	lake pa	Lake Horowhenua
		52	lake pa	Lake Horowhenua
		53	lake pa	Lake Horowhenua
		54	lake pa	Lake Horowhenua
		55	lake pa	Lake Horowhenua
		71	swamp pa	Lake Horowhenua, Te Rae o te Karaka
	R26	263	swamp pa	
Canterbury				
	M35	7	swamp pa	Kaiapoi
Otago / Southland / Stewart Island				
	J43	2	archaic village	Shag River Mouth
	I44	9	swamp find	
	C45	3	findspot	waka
	H45	1	swamp find	
		3	swamp find	
		4	swamp find	
		5	swamp find	
	H46	35	swamp find	
	E47	41	swamp find	toki handle
	F47	43	swamp find	paddle
		61	swamp find	waka
	D49	28	findspot	Waka, Mason Bay, Stewart Island
		33	findspot	Waka fragment, Doughboy Bay, Stewart Island

# Appendix 2

## TE AWAMUTU MUSEUM COLLECTION OF ARTEFACTS

(From wetland archaeological sites in the Waikato and King Country)

FIND TYPE	CAT. NO.	SITE	NOTES
Kumete	450	Mangapiko	Hey Brothers farm, swamp find
Ta (maul)	2494	Mangapiko	swamp find c. 1949
Patu aruhe	2516	Mangapiko Stream	found in stream bank
Ta (maul)	2519	Mangapiko Stream	found in stream
Ta (maul)	3034	Mangapiko Stream	found in stream at 10 ft depth
ko	10 045	Kihikihi	Bryant Farm (1930), Tiki Rd swamp find
Kumete	1107	Te Kawa	Waipa, swamp find
Patu aruhe	2335	Pokuru	Waipa (reclaimed) swamp find
Patu aruhe	2336	Pokuru	as above
Patu aruhe	2337	Pokuru	as above
Kaheru	509	Kiokio, King Country	swamp find
Patu aruhe	510	Kiokio, King Country	swamp find (probably same location as 509)
Patu aruhe	511	Kiokio, King Country	swamp find (probably same location as 509)
Patu aruhe	512	Kiokio, King Country	swamp find (probably same location as 509)
Kumete	10511	Pirongia	O'Shea's Road, swamp find
Teka (ko footrest)	13 160	Waipa	Whitehead's farm (c. 1985) Te Tahī Road (100 m from Waipa River), swamp find
Kakau (adze handle)	13 745	Korakanui	Corner Bayly and Lethbridge Rds (below pa), swamp find
Patu aruhe	14 684	Te Mawhai	swamp find
Ko	948		Mr Wing's farm, swamp find
Porotaka	2196		swamp find
Patu aruhe	13 253		swamp find
Hoe	425	Lake Ngaroto	
Hoe	426	Lake Ngaroto	
Hoe	427	Lake Ngaroto	
Uenuku	2056	Lake Ngaroto	
Uenuku iti	2085	Lake Ngaroto	
Taiaha	2086	Lake Ngaroto	
Patu tuna	2087	Lake Ngaroto	
Hoe	2088	Lake Ngaroto	
Patu muka	2090	Lake Ngaroto	
Potaka	2091	Lake Ngaroto	
Patu muka	2885	Lake Ngaroto	
Carved stick	3878	Lake Ngaroto	Bourne Collection
Carved stick	3879	Lake Ngaroto	Bourne Collection
Hoe	10 439	Lake Ngaroto	c. 1930
Patu paraoa	12 948/2	Lake Ngaroto	
Rakau	14 629	Lake Ngaroto	
Ko	14951/1	Lake Ngaroto	c. 1969
Handle	14951/2	Lake Ngaroto	c. 1969
Patu aruhe	15035/1	Lake Mangakaware	western lake edge, 1998
Patu aruhe	15035/2	Lake Mangakaware	western lake edge, 1998

# Appendix 3

## LITERATURE REVIEW OF WETLAND ARCHAEOLOGICAL PUBLICATIONS

References quoted in this Appendix are included in the Section 8: References list in the main report. (Starts on page 64.)

The intensive study and conservation of wetland sites has a long history in Europe and North America. Books such as Bryony and John Coles' 'People of the wetlands' (Coles & Coles 1989) and 'Enlarging the past' (Coles & Coles 1995) give excellent overviews of wetland projects throughout the world. The history of wetland exploration from the early nineteenth century to the present day, and changes in the science of archaeology and conservation, particularly over the last 30 years, are also discussed.

Barbara Purdy's book 'Wet site archaeology' (Purdy 1988) was the result of an international conference on this topic during 1986. This volume contains interesting papers, ranging from the location and assessment of wet sites using remote sensing and the multidisciplinary investigations at Somerset Levels to the treatment of waterlogged wood. This volume is also interesting in relation to the history of wetland archaeology and how it has progressed over the last 13 years, particularly because Barbara Purdy hosted a further Wetland Archaeological Research Project (WARP) conference in Gainesville in 1999, and a volume: 'Enduring records: The environmental and cultural heritage of wetlands' has been produced<sup>24</sup> (Purdy 2001).

Further books that address the global issues of applied science used in wetland archaeological and conservation research are: 'Science and site: Evaluation and conservation' (Beavis & Barker 1995), 'Hidden dimensions: The cultural significance of wetland archaeology' (Bernick 1998), 'Preserving archaeological remains in situ' (Corfield et al. 1996), and 'Bog bodies, sacred sites and wetland archaeology' (Coles et al. 1999).

'Science and site' (Beavis & Barker 1995) has several papers which are pertinent to this project including 'Groundwater modelling in archaeology' and 'Wet site curation and monitoring in the Somerset Levels and Moors' and 'Assessment of the environment of archaeological sites underwater'. 'Hidden dimensions' (Bernick 1998) contains papers which range from human adaptation in wetlands, through to wet site perspectives—past and present, and conservation issues such as the role of monitoring in the assessment and management of archaeological sites. Perhaps the most important of the four works mentioned above for initial archaeological studies of wet sites, is Corfield et al. (1998). This book explores engineering and geotechnical methods which can be used to preserve archaeological remains with the minimum of damage. Several of the papers examine the physical, chemical, geochemical, and biological nature of the burial environment. Parameters for monitoring anoxic environments and the functional assessment of wetland environments are also discussed.

In 'Bog bodies, sacred sites and wetland archaeology' (Coles et al. 1999), participants of the WARP conference covered topics including wetland survey

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<sup>24</sup> In which a paper by D.A. Johns was published.

and management, and in situ conservation of wetland archaeological sites. A paper of particular interest on in situ conservation is Richard Brunning's 'The in situ preservation of the Sweet Track'. Brunning concludes that accurate assessment of organic remains, together with local hydrological analysis, is vital to the formulation of a successful management strategy. This, and other papers—for example 'The Hoko River wet site: A joint tribe/university research effort', which has interesting parallels when working with iwi—could be useful in this project.

The Wet Organic Archaeological Materials Conference<sup>25</sup> has been held seven times since 1981 (Grattan 1982; Ramiere & Colardelle 1985; MacLeod 1989; Hoffman 1991, 1994; Hoffman et al. 1997; Bonnot-Diconne et al. 1999). Each international meeting covers several aspects of wetland archaeology and conservation. Papers cover environment, degradation, and preventive conservation; scientific research and analysis; wetland archaeological techniques; treatment of waterlogged wood and other organic archaeological materials recovered from wet sites; assessment of burial environments; and large-scale conservation projects. These volumes are usually published within a year of the conference being held and are essential reading for anyone contemplating undertaking a wetland archaeological conservation project.

Wetland archaeological sites and their significance have been recorded in New Zealand since the early part of the twentieth century (e.g. Adkins 1948). In the early 1920s a surveyor (Wilson 1921) drew careful maps of what he believed to be pre-European drains near Kaitaia. Nonetheless, appreciation of the archaeological value of wetland sites in New Zealand along with most of the rest of the world has developed slowly. Only in the last five years has some attention returned to the management and conservation of remaining wet archaeological sites.

New Zealand's earliest wet site excavations were those at Kauri Point in the Bay of Plenty (Shawcross 1963), Lake Ngaroto (Shawcross 1968), and Lake Mangakaware, the latter two both in the Waikato (Bellwood 1971, 1978). Later excavations were at Waitore, in Southern Taranaki (Cassels 1979) and Kohika, a swamp pa, located within the once-vast Rangitaiki swamp (Irwin 1975; Lawlor 1979). Over the last 15 years several sites with waterlogged components have been excavated. These include; Oruarangi on the Hauraki Plains (Best 1979; Furey 1996; Prickett 1990, 1992), Shag River Mouth in Otago (Anderson et al. 1996), the Johnston Site in South Taranaki (C. Jacomb pers. comm.), and more recently a rescue excavation at P6/82 near Kaikohe (Maingay pers. comm.).

To date little has been written on the conservation of wetland sites in New Zealand apart from Barr's thesis which explores an ecological approach for the management of wet sites (Barr 1989), and recent works by D.A. Johns<sup>26</sup> (Johns 1999, 2001).

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<sup>25</sup> D.A. Johns has been an active member of this group since its third meeting in Fremantle in 1987.

<sup>26</sup> Recently D.A. Johns has been involved with securing funding for a three-year wetland project to investigate the cultural significance of North Taranaki wetlands. This project, based at the University of Auckland, has assembled a multi-disciplinary team of investigators from throughout New Zealand. One of the project's main objectives is the development of conservation strategies and guidelines to protect and maintain some of the remaining wetland archaeological sites in the rohe of Ngati Mutunga, our study area.

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# Appendix 4

## ORGANIC ARTEFACTS FOUND IN THE LAKE SURROUNDING MANGAKAWARE 1

ARTEFACT TYPE	NO. OF ARTEFACTS
Wooden beaters	12
Weaving sticks	6
Narrow pointed and spatulate agricultural tools	12 + fragments
Paddle shaped agricultural tools	8 + fragments
Grubbers	2 + fragments
Spades and handles	10
Paddles	3 + fragments
Canoes	3 + sections
Wooden bowls	2
Eel clubs	2
Eel spear tines (?)	2
Adze handles	2
Wooden tops	2
Spears	5
Taiaha/pouwhenua	2
Patu	1
Bone box slabs (wooden)	2
Wooden points	4 + fragments
Wedges	6
Notched wall slabs	6
Tenonned rafters	4
Door jambs	5
Other house elements	5
Plain house or storehouse slabs	6
Tree fern posts	5
Type B palisade posts	15
Palisade bindings	2 + sections
Type C palisade posts	17
Blunt ended rods of wood	4
Cleft stake	1
Wooden drum	1

Source: Bellwood (1978: 49-67).

# Appendix 5

## ARTEFACTS FOUND ON-SITE AND IN THE LAKE SURROUNDING MANGAKAWARE 2

TABLE A5.1 ARTEFACTS FOUND DURING THE EXCAVATION OF MANGAKAWARE 2.

ARTEFACT TYPE	NO. OF ARTEFACTS
Stone patu onewa	3
Stone adzes of Duff type 2B	4
Bone bird spear	1 or 2
Bone pendant	1
Hematite	many small pieces found
Hollow-surfaced stone 'grinder'	1
Stone pounders ('flax pounder' type)	3
Ceremonial bone fork	1
Pumice bowl	1
Wooden knife handle	1
Tool kit of quartzite for working soft organic (?) materials	3
Bark bowl	1
Wooden beater	1
Spherical stones	2

Source: Bellwood (1978: 34–41).

TABLE A5.2 ARTEFACTS FOUND IN THE LAKE AROUND MANGAKAWARE 2 (ALL ARE ORGANIC EXCEPT THE STONE POUNDER).

ARTEFACT TYPE	NO. OF ARTEFACTS
Stone pounder	1
Wooden beaters	2
Digging sticks and spatulate agricultural tools	6
Handles	1 + fragments
Spade blades	1
Paddles	2
Steering oar	1
Stone net sinker	1
Eel trap	1
Eel club	1 + fragments
Spear sections	3
Bowls	1
Wooden points	3
Wedges (?)	4
Type B palisade posts	20
Type C palisade posts	5
Unidentified objects	4

Source: Bellwood (1978: 42–49).