Archaeological monitoring of the Tauriko Business Estate, Tauranga, Stage I: final report

report to
the New Zealand Historic Places Trust
and
IMF Backstop Ltd

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IMF Backstop Ltd. are developing a commercial/industrial subdivision at Tauriko, Tauranga, between the Route K Roundabout to the north, State Highway 29 to the west, Belk Road as far as Winterbre Lane to the south and the Kopurererua stream to the east, covering nearly 70 lots. The New Zealand Historic Places Trust issued an authority under section 14 the Historic Places Act 1993, authority 2005/132, to modify or damage archaeological sites, including the recorded midden U14/2361, within this area. Stage I of earthworks for the project took place during the 2005–06 earthworks season. As the project was scheduled to take several years to complete, and archaeological monitoring and/or investigation would be required at each stage, an interim report on Stage I was prepared. it was envisaged that similar reports would be prepared for each subsequent stage with a final report at the end of the project. As no further archaeological evidence was encountered during subsequent stages no further interim reports have been compiled and this final report is largely an adaptation of the Stage I interim report.

Two archaeological investigations have been carried out as part of the Tauriko Business Estate development but these took place on land covered by different authorities: the Mataraua site, recorded as U14/2351 in the New Zealand Archaeological Association site file, was excavated under authority 2007/92 in August 2007; U14/2402 was excavated under authority 2008/79 in April 2008. Final reports for both these excavations have been submitted to the Historic Places Trust (Campbell and Hudson 2009; Harris 2009).

The archaeological assessment of the area was carried out in two stages: the northern section as far south as Jack Straw's pumice quarry in June 2004 (Campbell 2004a); and south of here to Belk Road in November 2004 (Campbell 2004b). Only one site was relocated, U14/2361,

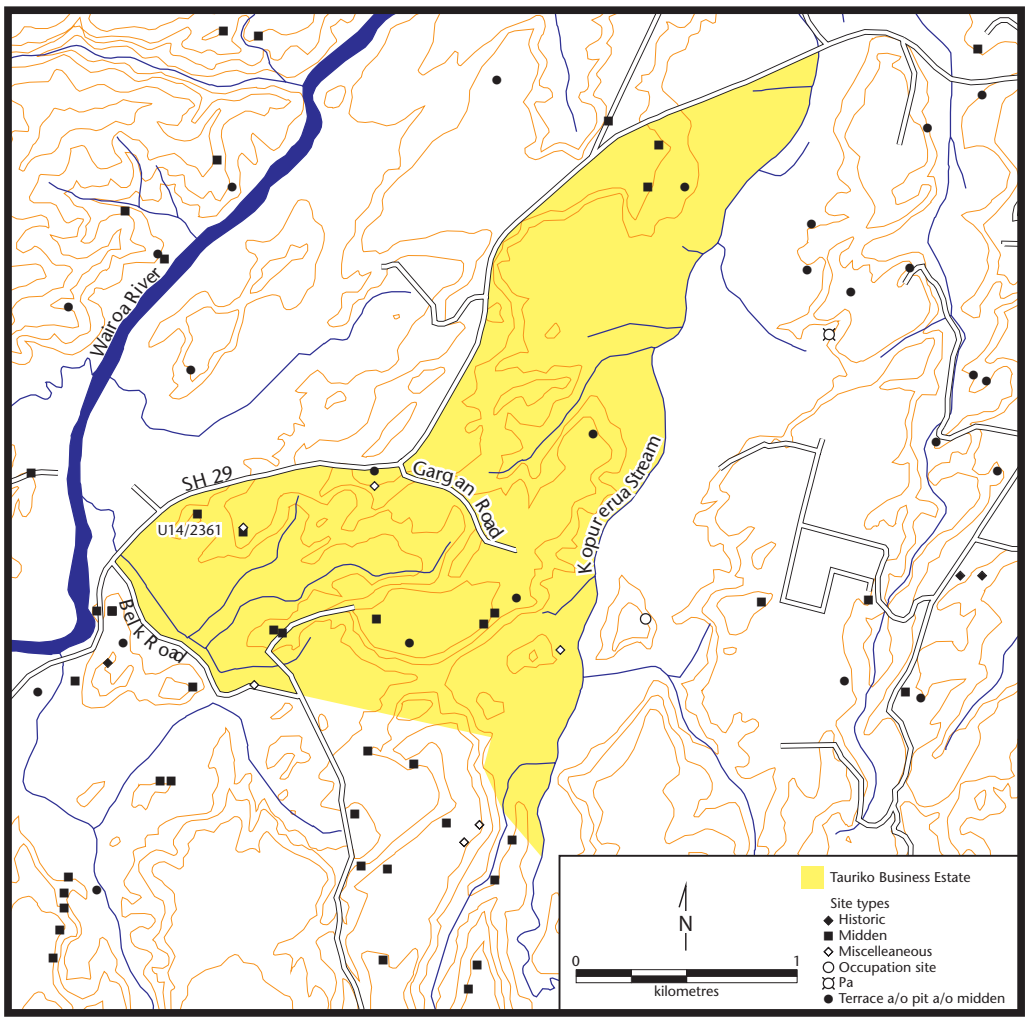

Figure 1. Location of Tauriko Business Estate, showing approximate boundaries and recorded sites. Stage I has taken place in the northern section.

with the rest presumably being destroyed since they were first recorded by a student group under the direction of Dr Bruce McFadgen in 1984. Contouring for kiwifruit orchards accounts for most of this site destruction. Originally 17 sites, all prehistoric, were recorded, most of them south of Gargan Road; it was therefore expected that other, unrecorded archaeological evidence would be found. Most recorded sites are middens, visible as shell scatters on the ground surface or in banks; other features that might be expected to be exposed by earthworks include in particular kumara pits or evidence of housing. In addition an 1866 plan, SP 436, *Plan of Military Settlements on East Side of Wairoa River, Tauranga*, appears to show a building on Lot 85, belonging to Robert Farrell. Historical research showed that Farrell lived here in 1873, being reported in the Bay of Plenty Times as "gone to settle on his acres on the Koupourererua", but died the same year. In 1874 the house was burnt down (Arabin and Campbell 2004).

Method

The investigation at this stage was undertaken in three phases.

The first of these was to more accurately locate Robert Farrell's building on Lot 85 by georeferencing the 1866 plan onto the existing cadastral data and aerial ortho-photos. The results were intended to guide a more careful monitoring programme in this area. This work was undertaken by Dr Hans Bader of Geometria Ltd.

The second phase was to take a pollen core in the former swamp close to the Route K Roundabout before it was filled in during earthworks. This was intended to provide an insight into environmental changes during the prehistoric occupation of the Kopurererua.

The final phase was archaeological monitoring of the earthworks, particularly of topsoil stripping, in order to identify any previously unrecorded sub-surface archaeological features. If any were found all work in the vicinity would cease until they could be investigated using standard archaeological methods, as described in HPT authority 2005/132.

Results

Lot 85

The georeferenced 1866 plan, SP 436, is shown in Figures 2 and 3. The 1866 cadastre and roads are easily aligned with their modern equivalents; we can be confident that the 1866 survey is accurate and so the location of Robert Farrell's building will also be accurate. The topsoil in this area was stripped in a series of five trenches about 60 m long with a 20 tonne backhoe equipped with a 2 m weed bucket. Topsoil removal by motor-scraper across the rest of the general area was also carefully monitored. No evidence of the building and no historical cultural evidence were found.

The most likely reason for this is that the building shown in the 1866 plan is not a house. The historical evidence indicates that Farrell only lived there briefly before his death in 1873 and that his widow left the next year when their house burnt down. The building on the plan is probably either simple farm shed or a hut or whare that Farrell

Figure 2. The 1866 plan, SP 436, georeferenced with the modern cadastral and road data, shown in yellow and green respectively. Robert Farrell's acres, Lot 85, and the building on them can be seen next to the large letter "XII."

Figure 3. Detail of the modern cadastral data overlaid on the aerial orthophoto. The building, plotted from the 1866 plan, SP 436, is the dark red rectangle in the centre of the image.

used while on his land; its foundations may have been fairly shallow and any evidence will have been ploughed away in the intervening 130 or so years. This area has not been contoured for orcharding, but the topsoil/plough zone was typically 350 mm deep, deep enough to destroy the evidence of shallow foundations. However, no evidence of the later house, which would have been located within the same 80 acre lot and would probably have had more extensive foundations, was found either.

Microfossil analysis

A pollen core was extracted from the former swamp, at the time a drained paddock, though still damp, close to Highway 29 on 23 September 2005 (at NZ Map Grid 2784006 6380381 ± 5 m, recorded with a handheld Garmin etrex GPS unit). This was analysed by Dr Mark Horrocks of Microfossil Research Ltd (the full report, including figures, is reproduced in Appendix A).

The pollen record shows an undisturbed vegetation prior to the deposition of the Kaharoa tephra at around AD 1314 (Hogg et al 2003). After this event there is evidence for regional burning of the vegetation, in the form of small amounts of microscopic charcoal and bracken spores, almost certainly as a result of human activity. Some time later there is evidence of local burning, in the form of a sudden increase in charcoal; increased run-off into the swamp from the surrounding hills, where vegetation was cleared and the soils became exposed and open to erosion; and a changing swamp vegetation, including *Blechnum* spores and, as the swamp eutrophied, raupo pollens. Investigations during future stages will include radiocarbon dates; these will provide the timing of these episodes of local disturbance.

Monitoring

No subsurface archaeological material was observed during topsoil stripping. This was somewhat surprising as two middens had been recorded in the area previously: U14/2347, which was described in 1984 as "shell fragments sparsely scattered [over] 3m^2 area", though this rather ephemeral site could not be relocated in 2004; and U14/2349, described in 1984 as "shell sparsely scattered over 20m^2 area", and subsequently recorded as destroyed. In addition, U14/2348, recorded in 1984 as a pit, was later re-assessed as a stock trough depression and hence not a site.

Even though the recorded prehistoric evidence is fairly minimal it might be expected to indicate the possibility of more extensive evidence remaining intact beneath the topsoil/plough zone. This has turned out not to be the case.

Summary and conclusion

No archaeological evidence was observed during the monitoring process, despite the expectation that some would survive, particularly of Robert Farrell's shed and house. However, Farrell seems to have only lived here for about one year before the house was destroyed by fire (Arabin and Campbell 2004), so his impact on the landscape may have been quite minimal and could easily have been destroyed by subsequent ploughing.

The microfossil analysis will be crucial in interpreting any archaeological evidence that is uncovered in future. Future investigations will allow us to tie the human induced environmental disturbances visible in the pollen core to the archaeological evidence of human occupation in the Kopurererua.

Acknowledgements

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Appendix A: Pollen analysis of sediment core from Tauriko

Dr Mark Horrocks, Microfossil Research Ltd.

Methods

A gouge hand-auger (40 mm diameter) was used to sample a drained paddock, to depth of 1570 mm, in the former swamp at Tauriko. The auger was prevented from penetrating further than 1700 mm by buried wood. The sediment below 1570 mm depth was very wet and was lost during retrieval. The profile was described and sampled in the field.

Subsamples (2.5–3.0 cm^3) were prepared for pollen (and spore) analysis by the standard acetylation and hydrofluoric acid method (Moore et al. 1991). The pollen sum was at least 250 grains, excluding manuka/kanuka (*Leptospermum/Kunzea*), herbaceous swamp plants and ferns except bracken (*Pteridium esculentum*). Following convention, common taxa are excluded from the base count for graphing purposes, but are still expressed as a percentage of the pollen sum total and therefore total values per sample may exceed 100%. Fragments of microscopic charcoal, concentrated along with pollen, were counted using a method based on Clark (1982), and are expressed as a percentage of the pollen sum. Suspected tephras were checked by Dr Phil Shane, Department of Geology, University of Auckland.

Results

Stratigraphy

The lower part of the Tauriko profile, from 1700–1570 mm depth, comprises a layer of sloppy, dark brown organic material (Fig. 1). Overlying this, to 1400 mm depth, is cream-coloured mud. From 1400–1140 mm depth there is a layer of light grey mud with dispersed cream-coloured mud. Light brown mud with decomposed wood forms a layer above this to 840 mm depth. From 840–540 mm depth the profile comprises a mixture of tephra (fairly clean from 840–690 mm depth) and light brown mud. Because the tephra has biotite, it cannot be the 1850 ± 15 BP (Lowe et al. 1998) yr BP Taupo tephra and therefore, considering its stratigraphic position, is almost certainly the 665 ± 15 yr BP (Lowe et al. 1999) Kaharoa tephra.

From 540–415 mm depth is a layer of fibrous peat with abundant wood and monocotyledon leaf material. The piece of wood shown in Figure 1 (at 470 mm depth), which is highly degraded, was identified as undifferentiated podocarp. A light coloured layer, muddy in the upper part and not tephra, is present at 415–355 mm depth. Overlying this is a layer of light grey mud to 315 mm depth, followed by silty peat with banded charcoal to 195 mm depth. Immediately above this is a thin layer (195–170 mm) of fine aggregates, probably also not tephra. The uppermost layer of the core comprises clayey silt, with pods of the underlying thin layer to 140 mm depth and pockets of iron staining to the surface.

Pollen

The pollen sum in the lowermost sample of the Tauriko profile is dominated by rimu (*Dacrydium cupressinum*) and maire tawaki (*Syzygium maire*). Spores of *Cyathea* tree ferns also record high values. Pollen of herbaceous swamp plants is not recorded and all other pollen types are present as traces. At 1300 mm depth, pollen of rimu and especially kahikatea (*Dacrycarpus dacrydioides*) increases at the expense of maire tawaki. This is maintained until deposition of the 665 ± 15 yr BP Kaharoa tephra at 840 mm depth. Small amounts of pollen of other forest trees, namely *Elaeocarpus*, pukatea (*Laurelia novaezelandiae*), *Metrosideros* and *Phyllocladus* are also recorded. Shrubs and small trees, including manuka/kanuka, generally record low values. Pollen of herbaceous swamp plants, namely sedges (Cyperaceae), appears for the first time, although in generally small amounts.

The significant change in the pollen after deposition of the Kaharoa tephra is an increase in maire tawaki pollen to previously

Figure A.1. Composite photograph of the Tauriko profile

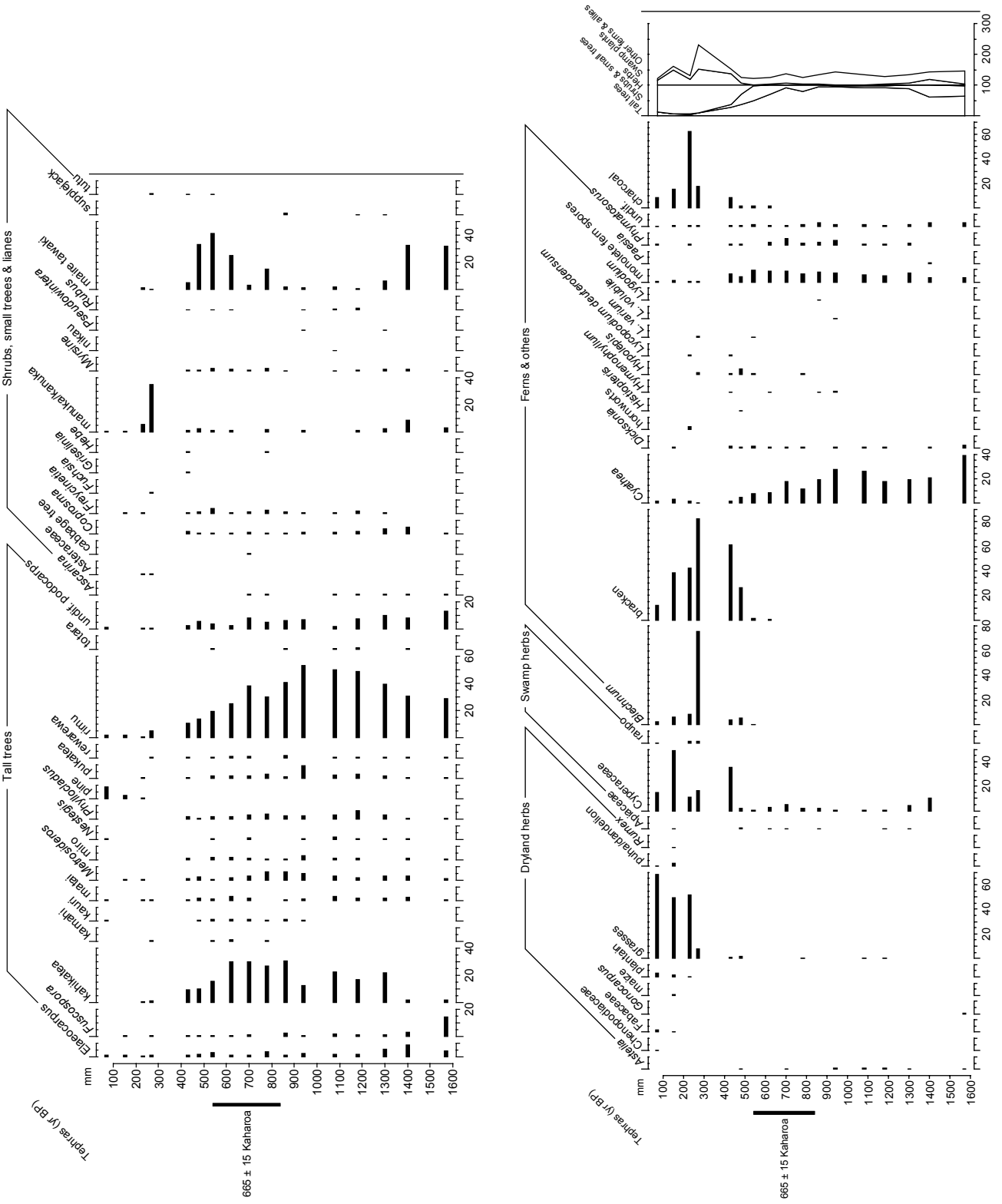

Figure 2. Percentage pollen diagram from Tauriko.

high levels, at the expense of rimu and kahikatea. *Cyathea* spores also decline. Microscopic charcoal and spores of the ground fern bracken (*Pteridium esculentum*) appear for the first time. Then pollen of maire tawaki declines suddenly, bracken spores and sedge pollen increases dramatically, and tutu (*Coriaria*) pollen and spores of two other ground ferns, namely *Blechnum* and *Hypolepis*, appear for the first time. All forest taxa decline to trace levels, and manuka/kanuka and *Blechnum* show sharp peaks. Bracken spores continue to show high values, raupo (*Typha orientalis*) pollen appears for the first time (at 270 mm depth) and charcoal increases. At 230 mm depth, exotic pollen of pine (*Pinus*) trees and plantain (*Plantago lanceolata*) herbs is first recorded, and grass (Poaceae) pollen shows a dramatic increase. A trace of pollen of maize (*Zea mays*), another exotic, was also found in the top of the profile.

Pollen and spores are fairly well preserved throughout the Tauriko profile. However, preservation shows a marked deterioration in the uppermost, pine/plantain samples.

Discussion

The widespread 1850 ± 15 BP yr BP Taupo tephra, not recorded in the Tauriko profile, is probably at a depth deeper than the auger was able to penetrate. The Tauriko pollen record thus commences at an undetermined time between the eruption of the Taupo tephra and the 665 ± 15 yr BP Kaharoa tephra. Lack of disturbance indicators (such as charcoal and bracken spores, see below) in the lower part of the profile indicates pre-human times. The pollen evidence shows that the regional vegetation at the time, including that on the hills surrounding the local swamp, was rimu-dominated podocarp-hardwood forest. Vegetation in the immediate vicinity of the core site was swamp forest composed principally of maire tawaki trees, with rimu and abundant *Cyathea* tree ferns. Pukatea trees were also part of this forest. Very low pollen values for taxa of open conditions (ie herbaceous swamp plants) indicate mostly dense forest with a closed canopy, with the few gaps present filled by manuka.

The swamp surface was then invaded by kahikatea trees which largely replace maire tawaki, and the forest canopy became more open with the appearance of sedges, probably due to an increase in wetness in the swamp. Following deposition of the Kaharoa tephra, maire tawaki regained dominance and tanekaha and rimu declined. The tephra possibly affected drainage of the swamp; it may have provided a drier surface or alternatively may have increased wetness due to damming of the basin outlet.

The bracken spores and microscopic charcoal that appear around the same time as deposition of the Kaharoa tephra at Tauriko reflect Polynesian deforestation by firing in the region. The virtual disappearance of maire tawaki pollen indicates that the swamp forest in the immediate vicinity of the sampled site was included. Tutu pollen is also an indicator of early Polynesian disturbance of vegetation. This timing is consistent with pollen records that include Kaharoa tephra from elsewhere (Newnham et al. 1998). Bracken became abundant on drier areas surrounding the swamp while the sedge and manuka cover on the swamp surface increased. The monocotyledon leaf material at 540–415 mm depth in the core is most likely from sedges. In addition, *Blechnum* fern became a significant part of the swamp vegetation.

The appearance of raupo pollen in the later Polynesian period suggests eutrophication of the swamp. Pine and plantain pollen in sample 4 indicates European times. Pine in particular produces abundant pollen, much of which is wind-transported long distances. Although the European era commenced in New Zealand in the very early 19th century, except for the Bay of Islands in the far north European presence was minor until large-scale immigration began mid-century. However, maritime pine (*Pinus pinaster*) was naturalised in New Zealand by the 1830s (Webb et al. 1988). Nonetheless, large-scale commercial plantations of pine, mostly in the central North Island, commenced in the 1920s. A cautious approach would be to interpret pine pollen in New Zealand sedimentary deposits as coming from later (i.e., early 20th century) rather than earlier in the European era. The dramatic increase in grass pollen and appearance of maize pollen in the top of the profile reflect conversion of the area to European style, pasture and crop farming.

The fairly good preservation of pollen and spores in the pre-European part of the Tauriko profile suggests that the water table was permanently at the surface, thus preventing aerobic activity and decomposition or organic material. The persistence of forest cover on the swamp for the entire pre-burning period despite this water-logging may be due to the tephra-rich profile providing sufficient nutrients for this. Kahikatea prefers wet and fertile soils (Beveridge 1983), while pukatea favours base-rich swamps (Macphail & McQueen 1983). Swamp forests generally do not grow on deep peat, and are more typical of gleyed or shallow organic soils (McGlone & Neall 1994), such as in the Tauriko profile. The pre-burning Tauriko basin sediments were therefore formed by a succession of wet forest soils, with changes in forest composition probably due mainly to changes in drainage. Some of the lighter coloured material in the profile may be weathered tephra redeposited during floods. The deterioration of pollen preservation in the upper, European influenced samples suggests that drainage of the swamp (resulting in increased aerobic activity) was carried out only in European times and not also in the Polynesian period.

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