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RE-CONSTRUCTING EARTHWORK FORTIFICATIONS: AN EXAMPLE FROM THE WESTERN UREWERAS, NEW ZEALAND

by

Kevin L Jones

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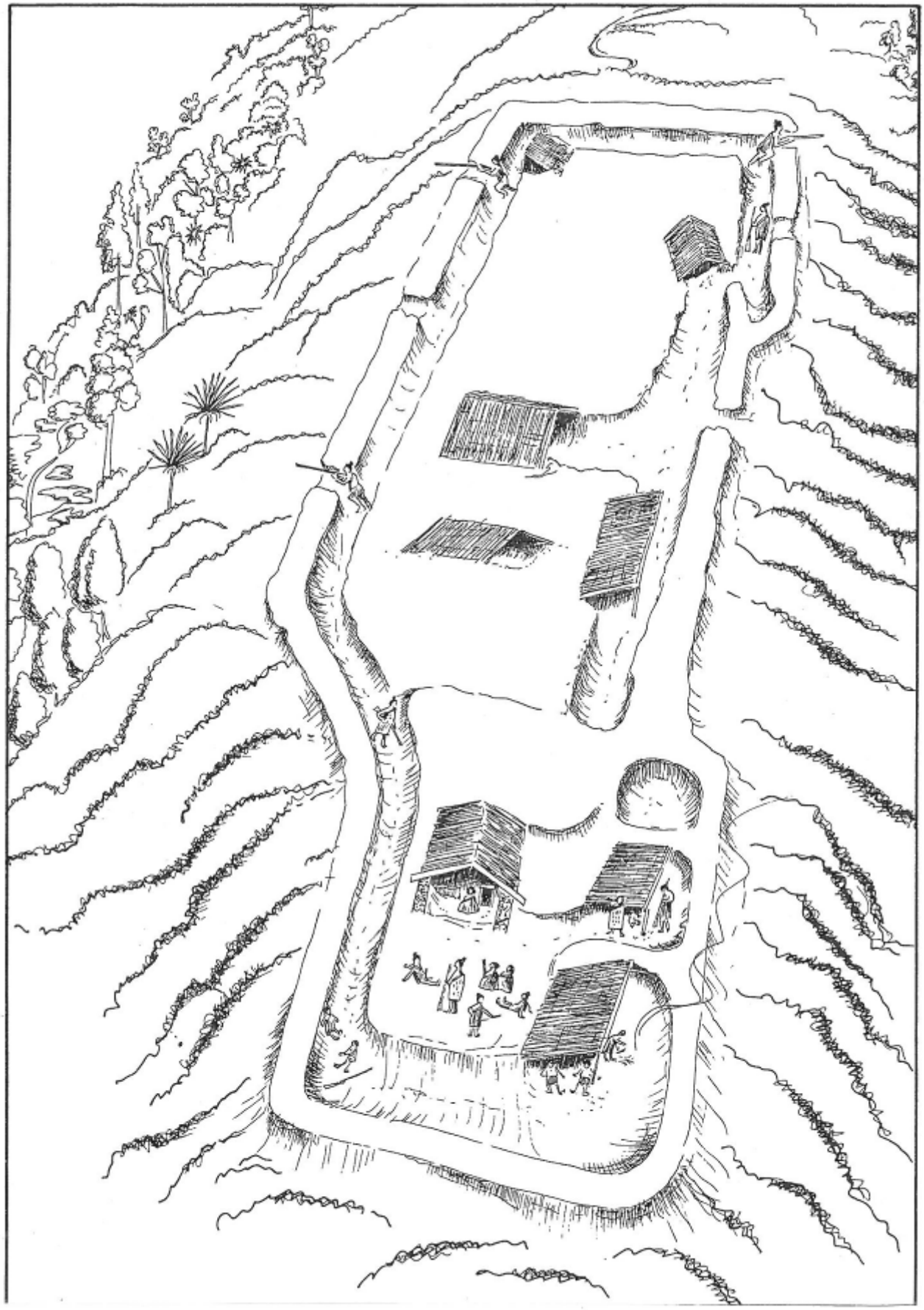
The willing cooperation and interest of elders of both Ngati Manawa and Ngati Whare has been essential to the project. The original records of David and Glenys Nevin have been of much value in carrying out the restoration. Funding for this exercise came from New Zealand Timberlands, with logistic and other material support from the Eastern Region of the Department of Conservation. In particular the support of Chris Jenkins at all stages of the exercise has been invaluable. Jim McKinlay commented on an earlier draft of the text. The Urewera District Conservator and his staff have also been helpful. The arrangements to carry out the work were the outcome of negotiations by Carol Quirk, Acting Director of the New Zealand Historic Places Trust, and her support is gratefully acknowledged.



Te Tapiri from the north as it may have looked in 1865. Visualised and drafted by Noel Hill and the author after the original site plan by David and Glenys Nevin. Ink detailing by Ray Gilbert.

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RE-CONSTRUCTION EARTHWORK FORTIFICATIONS: AN EXAMPLE PROM THE WESTERN UREWERAS, NEW ZEALAND

Kevin L. Jones

Directorate of Science & Research, Department of Conservation,
P.O. Box 10-420, Wellington

ABSTRACT

A gunfighter pa constructed in 1865 was accidentally bulldozed in the course of putting out a fire in a forest development block. Consideration is given to previous examples of attempting to re-construct earthwork fortifications in New Zealand, and some principles for this practice are put forward. The case study was re-constructed using an existing plan derived from earlier air photographs and the archaeological traces that could still be detected beneath the cut. The site was not re-constructed to its original 1865 condition because of the lack of knowledge of the detail of it construction, the large volume of labour needed, and the destruction this would cause to the remaining archaeological features of the site. Breastwork banks were held together by stakes interwoven with manuka brush. Short term stabilisation measures also taken were the use of seed-bearing manuka brush on bare mineral soil, and grassing of bare topsoil. Because of the volume of bulldozer debris and the distance it had been moved downslope, some areas of the pa had to be left with noticeable deficits in the volume of filling, but overall the site as re-constructed gives a fair impression of its condition prior to the bulldozing.

INTRODUCTION

The Maori earthwork fortifications known as pa (Fox, 1976), and their European equivalents dating from the mid-19th Century, have long held a fascination for archaeologists and the wider public of New Zealand. With increasing visitor numbers, and accidental damage in the course of land development, there has been a need to repair the physical fabric of a number of sites. This paper reviews the methods used in such construction; discusses earlier re-construction efforts in the light of generally accepted international standards for the restoration of cultural monuments, such as the Burra Charter (I.C.O.M.O.S, 1966; Ken, 1985); and describes and discusses a recent attempt at restoration of a mid-19th Century Maori fortification, Te Tapiri, by way of a case study.

The paper by Kerr (1985) on the essentials of conservation planning disclaims potential coverage of sites of other than European origin, presumably because non-European sites introduce a range of values that are both complex and fluid in their timing and applicability. All the sites to be discussed here are of non-European origin and the detailed routine prescribed by Kerr for the formulation and approval of conservation measures will be of less relevance.

The report is in two parts: the first is a review of earlier re-constructions; the second covers the re-construction of Te Tapiri.

PART I. FORMER EXPERIENCE OF SITE RE-CONSTRUCTION

Several pa or redoubts have been re-constructed over the years in New These comprise three in the Lake Rotoaira region south of Lake Taupo, all dating to the mid-19th Century; one pre-European pa also occupied in the 19th Century at Inlet; and one pre-European pa on the Coromandel Peninsula (Furey, 1984: The following comments are based on Newman (1988) and discussions with J.R. McKinlay, formerly Senior Archaeologist for the New Zealand Historic Places Trust.

1.1 Tongariro Archaeological Project

McDonnell's redoubt and blockhouse at Poutu (N112/113) was re-constructed in the course of the Tongariro Archaeological Project for public appreciation. The re-constructions were directed by T.R. Hosking, archaeologist in charge of the Tongariro Archaeological Project. The redoubt was originally built by Te Kooti and was subsequently occupied and altered by McDonnell, although at the time of re-construction Te Kooti's part in the building of the redoubt was not known. The plan of the redoubt, derived from archaeological survey of the surface features, was strictly followed. However, the above-ground features were not known and like the plan may have existed in various forms over time. Hosking adopted a known model of redoubts in widespread use in the 1860's. The height was based on a sketch and a description of contemporary earthworks. The walls were steep-sided and as much as 2.5 m high and began to collapse within two years –despite an attempt to reinforce them with steel rods (Fig. 1). The loose pumice soil did not stand up to people walking along the walls and the rods became exposed and a hazard. Maintenance costs were high, and it was left to J.R. McKinlay, then archaeologist for the New Zealand Historic Places Trust, to arrange to have the site reduced to the stable contour covered in broom and bracken in which it remains today. Part of another site, the Wehenegaiti rifle trenches (N102/45), was re-made in the course of the Tongariro Archaeological Project. These were basically excavated on the line of the surface-visible trenches of the site and survive today, some 20 years later, in good condition.

1.2 Te Porere

Te Porere is the third of the re-constructed sites in the Lake Rotoaira region. However, its study and re-construction were not part of the Tongariro Archealogical Project. It consists of two main structures (N112/1,2), the lower of the two better regarded as rifle trenches than as a redoubt (Smart, 1961: 63-69). It was repaired rather than reconstructed some 20 years ago by C.D. Smart, in the places where the original outlines of the trenches and banks had collapsed, to the form in which it may have existed in 1871 when built by Te Kooti. The walls were repaired using turves as a kind of formwork, tied across using flax leaves, and the space between filled with a pumice-derived soil. The walls were re-constructed to their full height and the interior dug to the original depth (some 1.8 m in overall height). One of the flanking angles was known to have contained the bodies of the many dead from this engagement. These were partly exposed in the course of re-construction but were sealed back over with reinforcing mesh and soil.

In the course of several years of visitor usage it was found that people had to get a view of the earthworks by walking on the breastwork banks. This caused the wearing of a channel in the grass on the top of the banks which eventually split open and had to be repaired. J.R. McKinlay removed the damaged portions and drove in iron fence standards lashing these across the line of the wall and then re-built the wall by filling in between with facings made of turves. This has remained stable over

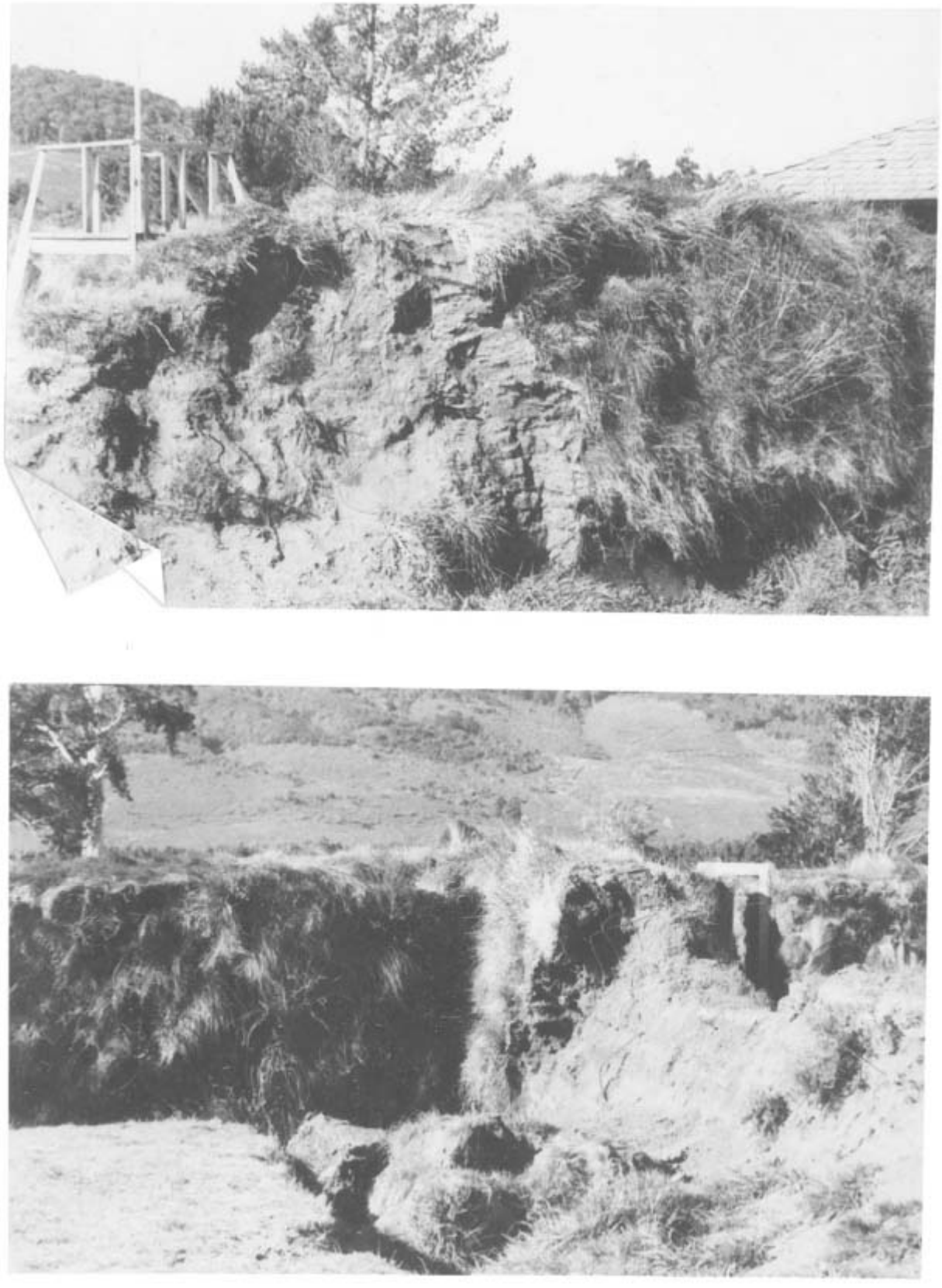

Figure 1 McDonnell's redoubt and blockhouse, Poutu, October 1976. Photograph J.R. McKinlay.

some 10 years. The long-term problem created by the desired visitor-viewing was eventually solved by placing an observation platform close by and outside the banks of the two fortifications which make up this complex. Figure 2 shows the lower rifle trenches with damage caused by visitors walking along the walls. Figure 3 is taken from the subsequently constructed viewing platform and shows the result of repairing the tops of the banks by the placing of turves. The grass seedheads demonstrate how little traffic has occurred along the walls.

1.3 Other sites

The pa N40/586 near Opito Bay on the Coromandel Peninsula was bulldozed by the N.Z. Forest Service in January 1984, and re-constructed (Furey, 1984). The case has some valuable parallels with Te Tapiri, since the area also has a volcanic substrate albeit much older and more weathered than that of the central North Island volcanic zone. The ditches had been cut into a weathered andesite of "soft rock" texture and some 30 m^3 of soft fill was removed to re-construct the full profile of ditches and banks up to 4 m high (Furey, 1984: 224). The fill was too soft to hold the profile and it was retained by driving manuka stakes into the substrate, with interwoven branches between, making a formwork. No reports are available on the longer term efficacy of this technique, but it was noted at the time that a similar technique had been used for the original construction of earthworks (Best 1975: 52-54).

The last of the pa to be discussed here is Kororipo, in the Inlet, Bay of Islands. The site lies on a flat promontory and the transverse ditch and bank had been badly damaged by the felling of blue gums and subsequent bulldozing to provide visitor access. Nigel Prickett re-constructed the ditch and bank as part of a general plan to interpret the site to the public. The walls of the ditch were deep and steep and they were re-built with jute sugar bags filled with earth. The face was grassed and has survived in good condition for some five years since the re-construction.

1.4 Re-construction in retrospect

The most unsatisfactory feature of the previous re-constructions described here is the general lack of a record of the site at its time of re-construction (this applies especially to the Tongariro sites, including Te Porere) and the failure in all cases to make a full description and record of the changes planned and wrought on the site. The pool of expertise available to discuss a plan to re-construct would have been small at the time, and there was doubtless intense heart-searching at the time as to the best solution. Nevertheless, the failure to document is a major one. Not only was there no opportunity in some cases for funding authorities to see the scope of the work, but also the Maori community input was not sought. Moreover, in the event of future failure, the integrity of the site cannot be judged nor do the sites retain much value as a potential subject for research. Of abiding concern is the difficulty of judging useful methods and their costs in material and labour in future re-construction cases.

Figure 2 The lower rifle trenches and breastwork at Te Porere in about 1980 prior to repair and the building of the viewing tower. This and subsequent photograph are by the author.

Figure 3. The same site from the viewing tower within a year of its construction.

PART II. RE-CONSTRUCTING TE TAPIRI

In April 1988 the Te Tapiri pa (N95/58 in the New Zealand Archaeological Association Site Recording Scheme) was bulldozed in the course of New Zealand Timberlands Ltd. land clearance on the western flanks of the Urewera Range, North Island. The pa lies on the principal ridge line immediately west of the Kaingaroa Plains. It is one of a complex of four pa built in 1865 when Ngati Whare adherents of Pai Marire attempted to move from the Whirinaki Valley into the Waikato. Two of the pa were built by Ngati Manawa on the route from the Ureweras to the Kaingaroa Plains to block the passage of Ngati Whare. Ngati Manawa are part of the broader Te Arawa tribal grouping who allied themselves with the European interests against the 'Kingites' and later Pai Marire (Cowan, 1983: 84-95).

Te Tapiri pa is one of a pair, each providing flanking defences to the other. It consists of a rough rectangle of breastwork and rifle trench, 60x15 m, enclosing hut or rifle pits some on the perimeter itself (Nevin and Nevin, 1980).

The cleared area bounded on to a road along the ridge line except in the vicinity of the pa. The had been firebreaked on the downslope of its western margins, while the road runs to the east of the pa. During the large burn the fire jumped the break at the site of the pa. A bulldozer driver on standby saw this and drove along the ridge south from the road, entering the pa from its northern boundary and proceeding out to the west through the defences at the southern end of the pa (Fig. 4 -6). Earth from the perimeter of the pa was used to squash and bury the flame, while the interior of the pa had the surface vegetation and some topsoil removed to provide a flame-proof barrier. An exit with further removal of fill was also made from an immediate point on the western perimeter of the pa to finally enclose the burning area on the western slopes.

The result of this bulldozing was that some 20% of the defensive perimeter was destroyed in 4 separate places. The interior of the pa, in a lengthwise ribbon some 4 m wide, was some 30% modified on the surface (Fig. 5). This is somewhat less severe damage than noted in my preliminary report to the New Zealand Historic Places Trust, the discrepancy arising because the later record of damage was done from a plan and with the full area of the pa cleared of scrub. The bases of most of the whare (house floors manifested as rectangular depressions) and the perimeter rifle trench remained substantially intact. They were the lowest points of the site, had filled with substantial quantities of humus, and had been only lightly skimmed or in some places filled by the action of the bulldozer.

The values that were destroyed by this episode are of three kinds:

a) potential archaeological research values, particularly in relation to the style of fortification and equipment used by Maori forces at this period;

b) public visiting values;

c) Maori sentiment about a site related to an engagement in which several Ngati Manawa and Ngati Whare were killed.

Of these, the research values had been relatively little modified, while the public visiting potential was severely reduced.

Figure 4 Te Tapiri the south in 1981. The site has reverted very quickly from its clearance some three years earlier.

Figure 6 South end of Te Tapiri Pa following bulldozing. In the right foreground and at rear are remnants of the western perimeter bank and rifle trench.

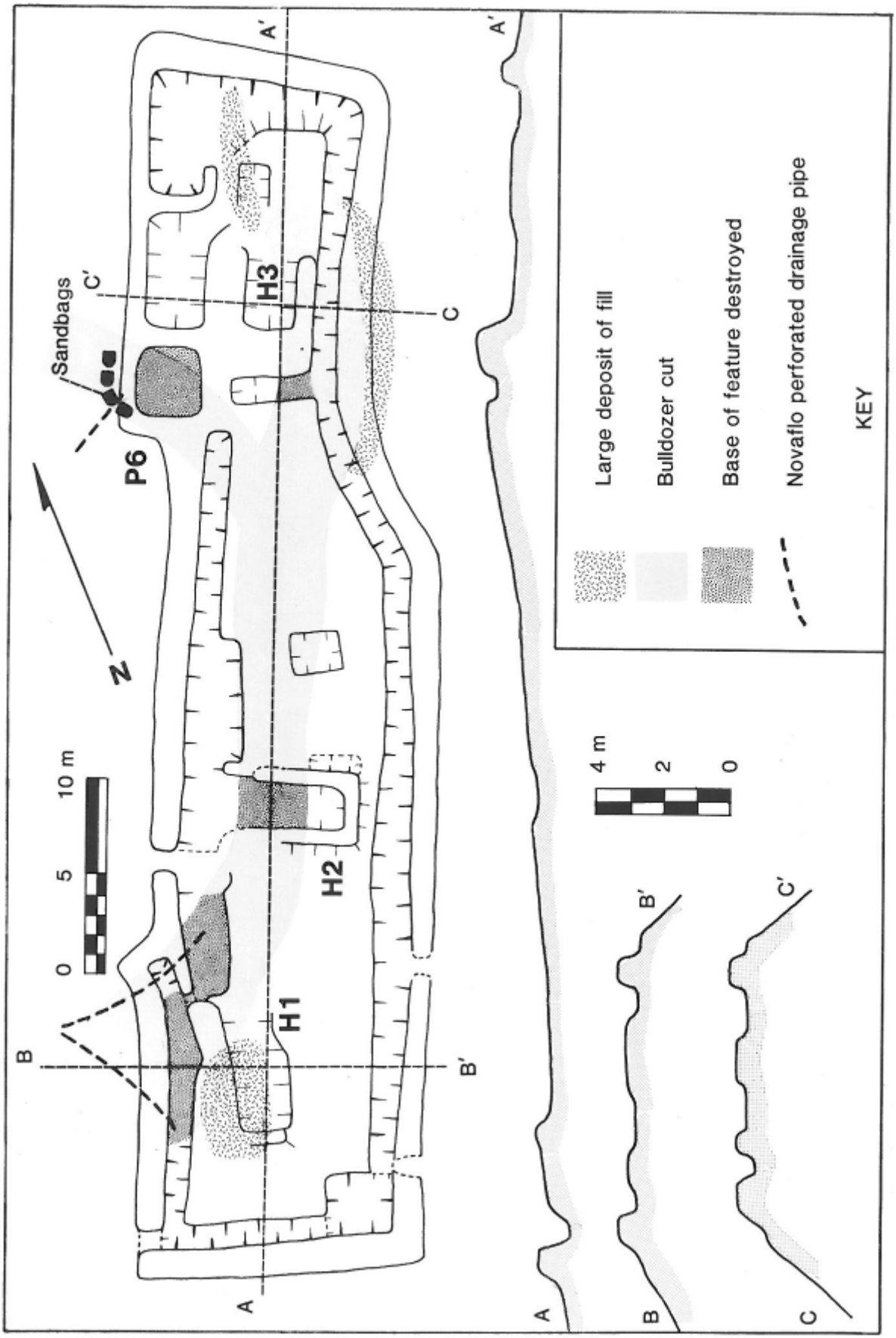

Figure 5. Plan of Te Tapiri Pa showing bulldozer track, and deposits of fill left on the site. The plan and feature numbers follow that of nevin's New Zealand Archaeological Association site record.

2.1 Restoration philosophy

The formulation of the proposal to re-construct was stimulated by several considerations:

1. the Department of Conservation had wider environmental issues to discuss with forestry companies in the region and a prosecution under s. 46 of the Historic Places Act 1980 was deemed unhelpful;

2. constructive involvement of Timberlands Ltd., in the reparation work was desirable;

3. a view quickly formed amongst elders on a visit to the site was that the matter was best dealt with quickly and forgotten, and that re-construction suited that purpose.

No formal plan to re-construct the pa was promulgated other than the original report and re-construction budget estimates forwarded to the New Zealand Historic Places Trust. These were discussed between the then Acting Director of the Historic Places Trust and New Zealand Timberlands, Ltd., management, and agreement reached on the proposal to re-construct. (New Zealand Timberlands, Ltd., is the company formed by the New Zealand Forestry Corporation to manage the former New Zealand Forest Service exotic forest holdings.)

The object of the restoration was therefore to restore the public visiting potential of the site, which has some value in the prospects for Maori-led tourism in this district, and to avoid further damage to the intact features especially where these were buried under fill within the perimeter of the pa. There was also a prospect that in handling large volumes of fill within the perimeter of the pa that artefacts would be found. None were.

The Tongariro sites discussed earlier provided several constructive lessons since they are all in an area with pumice-derived soils not dissimilar to those of the Te Tapiri ridge. In particular, no attempt was made to restore the site to its condition as it may have appeared in 1865. This would have been possible, albeit somewhat speculative, since a certain amount is known of the construction of Maori fortifications from the archaeological record to make a reasonable re-construction. The difficulties encountered in maintaining sites with strong surface relief such as banks the height of a person, not to speak of earth-walled huts, showed that this would not have been a realistic objective. Such a practice would also have destroyed the integrity of the surviving archaeological features.

2.2 Work on the site

The site was re-constructed in the week 8-12 August 1988, in a period when there was much heavy rain and showers at intervals. The site had suffered little or no erosion in the time since its bulldozing some 3 months before. This was because the pa is on a low crest in the ridge and suffers no run-off from areas outside its perimeter. This situation for obvious tactical reasons is shared by most earthwork fortifications in New Zealand. The work was carried out by a gang recruited from the Ngati Manawa of Murupara, some 4 men, under the joint direction of the author and elder, George Barry.

Re-construction proceeded initially by clearing the site of a covering of bracken fern and light scrub consisting of tutu, flax, Hebe, five-finger and manuka/kanuka. This enabled a clearer view of the damage in the overall context of the site. The original condition of the site was in part judged by the original plan at a scale of 1:100 done by the Nevins and filed as part of the New Zealand

Archaeological Association site record. A vertical aerial photograph flown at a low height had also been taken at this time but unfortunately not as a stereo pair. Figure 4 shows the Te Tapiri site as it looked three years after the scrub clearance carried out by the Nevins and five years before the bulldozing. The surface features of the site are invisible.

As a first step in the re-construction, a map record and notes were taken of the extent of the damage (Fig. 5-6). There had been extensive damage to the superficial stratigraphy of the site from pig-rooting. The site occurs in an area of fern and shrubland which has had periodically high numbers of pigs in the past. Their activities are noticeable because of a general "humpiness" of the surface of the site and undermining of the earthwalls of the whare within the pa. This action has probably done further damage in the richer soils in the base of whares or the perimeter ditch but it is not as noticeable on the surface in those areas.

In the two places where the bulldozer had left the western side of the pa, after entering from the north, a considerable quantity of fill had been left, as much as 15 m outside and 5 m below the pa. There were, however, two areas within the pa where a large deposit of fill occurred. These were at the southern end, where the whare site H1 had some 4 m^3 of topsoil dumped on it (Fig. 6), and near the whare site H3 where the fill had been pushed over the eastern bank. The latter fill was derived from a slightly elevated platform which lay immediately south of the rifle trench inside the northern defences and may have been as much as 5 m^3 volume. An attempt to retrieve some fill from the points outside the pa and to stockpile fill from the bulldozed track into the pa using a front-end loader was not possible because of the greasy surface conditions. The lack of access for anything other than tracked vehicles (which would have been unacceptable) also meant that turves to re-construct the banks could not be taken from a log-loading site nearby. In any event the turves that were tested for possible use on the site crumbled too easily to be of much use.

Soils on the pa consisted of a subsoil of very free-draining lapilli sometimes with lenses of a slightly clayey sand near the surface. On this had formed some 15-20 cm of a dark brown or black loam, greasy when wet, with many rootlets and fern rhizomes throughout. Initial trials showed that this topsoil could be readily formed into walls which held together very well without eroding even in spells of heavy overnight rain. In two places outside the western defensive perimeter, fill was back on to the site to make up as far as possible the estimated level of the original site. The levels could not be judged accurately since the plan by the Nevins although accurate as to surface feature was done by tape and compass and could not have carried such information. However, some estimate of the degree of cutting was possible by the character of the exposed subsoil. In one area, where the bulldozer had cut down through P6, the general level of the cut was made up by using filled synthetic fertiliser bags. This was to steepen the slope while maintaining its strength and reducing the volume of fill needed. The bags will not rot unless exposed to sunlight. The intention was to have them a permanent feature of the fill at this point. They were covered with a layer of soil over which scrub will grow. P6 was eventually re-created as a pit of full depth (some 1.2 m) also to save on filling.

The banks were laid out using untreated pine stakes 1.2 m long and 50x25 mm in section driven by mallet according to the layout of the original plan (Fig. 7, 8). The stakes would have a ground life of about 18 months. In most areas except where the cuts had been deepest, it was possible to detect the base of the original trenches, pits or house-floors, so that the plan of re-construction is accurate. In two places minor damage was done to extant features covered by fill: these were the inner side of the rifle trench adjacent to H1 where the bank may be too close in on the original line and the trench is rather too wide (actually cutting intact deposits), and the western bank adjacent to H3 where the outer side was inadvertently cut some 30 cm in the course of taking fill outside the bank to re-construct the inner features at this point.

Figure 7 Filling behind the formwork of stakes and manuka brush on the eastern perimeter of the site.

Figure 8 South-western perimeter after re-construction of the rifle trench and bank. This photo is detail of the area shown in Fig. 5. Whare site H1 is being cleared at left.

The stakes were tied across to ensure rigidity and were driven at approximately 60 cm intervals along the length of the bank sloping in towards the centre (Fig. 7, 8). Where the bank still survived in part the stakes were tied in by small in the fill. The ties were made of synthetic twine so that they would retain their holding power until after the stakes had rotted. Any surface unsightliness will be able to be made good by judicious clipping. The twine will also clearly indicate the extent of re-construction in the event of future excavation. The fill was retained by brushwork of manuka laid inside the stakes, and was compacted by foot. Where the levels had been made up the walls were made relatively thinner than they should have been because of the shortage of fill. The topsoil fill was to make up the walls. It should hold its shape and take and grow grass very well.

In two places on the western perimeter, in the base of the rifle trench and under areas that were filled to make up levels, "Novaflo" perforated 65 drain pipe was installed as a precaution against the subsoil becoming fluid by holding water. It was probably not necessary because of the extremely porous nature of the substrate.

2.3 Vegetation cover

Areas of bare pumice making up the levels outside the walls had flax planted on them and seed-rich manuka brush staked on to it. This will reduce the likelihood of erosion on these areas which are critical to the stability of the banks. Manuka brush with seed was also staked to several areas within the pa where there was exposed pumice subsoil (Fig. 9, 10) (for technical details of this method, see and Jones (1982)). Elsewhere, the exposed topsoil including the re-constructed tops of the banks and the bases of the trenches was grassed with ‘Nui”. Relatively warm, wet conditions followed the re-construction and by mid-September the grass had struck well. Because of the presence of the rhizome, the topsoil will also continue to grow fern. Consideration was given to applying both short-and longer-term-acting fertilisers to the bare areas. However, fertility of the site is moderate, and experience of overnight rain showed that there was little need for very rapid stabilisation of surfaces. Furthermore, in the longer term, enhancing the growth of shrubs by the use of slow-acting fertiliser would obscure the features from visitors, increasing the risk of accidental bulldozing and damage to the archaeological stratigraphy from root growth.

2.4 Re-construction 6 months after

Figures 11 and 12 show two views of the site in February 1989. The vigorous fern growth is on undisturbed areas, while the stakes marking the re-constructed lines are almost obscured by a vigorous growth of grass and lotus (a broad-leaved weed with a scrambling habit similar to clover). This will provide a very stable cover for the banks in the short term. On the areas of bare mineral pumice, the manuka branchlets are still in place and should have released their seed. In the near future, decisions will need to be made about the most satisfactory way to keep the site open for prospective public visiting, since it is clear that the site will be invisible after a few years.

2.5 Future public access

Some provision for future public access was made in the course of the work. Some limited carparking was created at the road edge and a scarp formed at the foot of the bulldozed ridge so that 4-wheel drive vehicles cannot get to the site. At the northern defensive bank a gap was left where one appeared to have been worn in the past, although not recorded on the Nevins' plan (Fig. 5). This will guide visitors into the site where they will tend to follow the repaired bulldozed trail through the site towards another exit worn through the bank at the southern end.

The entwined stakes on top of the repaired banks will tend to prevent walking on the walls in the short term. Walking on the banks to see the view of the Plains will not be needed since tall burnt scrub to the west of the site will be removed, and the pine trees themselves are established some 20 m vertically below the pa. In the long term, monitoring of numbers and possible damage to the banks will be warranted even although the banks are in a fairly stable contour. On the whole, visitors have to be guided to the site as part of park summer programmes and their behaviour can be controlled so as to avoid damage.

CONCLUSIONS AND RECOMMENDATIONS

In New Zealand the documentation of previous efforts at re-construction has been poor and it is highly desirable that any future work in this field be reported in detail and monitored. Although the labour castings of the present exercise were substantially to the original estimate, it is clear that they could easily have been under-or over-estimated. This is particularly so where the exact techniques for re-construction cannot be gauged without some initial experimentation. Fill budgets should also be carefully examined before costing the work. This is unlikely to be easy since the site will invariably be difficult to examine in its damaged state. In the case of Te Tapiri, a thick cover of low vegetation increased the difficulty. Judging from the volume of the replaced banks and the limited re-construction of the interior whare walls, the total volume of fill replaced in the course of re-construction was about 25 m^3. This was replaced in the course of about 25 person-days of work. The original disturbance of the site may have involved volumes as great as 40 m^3. Some 5-10 m^3 was up to 5 m in the course of replacement. The work was made easier by the soft nature of the fill although there were masses of flax roots in some places. The fill deficits led to some areas of the banks not being restored to their original heights, to the banks being narrower than they should be in some places, and to a general lowering of levels in the bulldozed areas within the pa. The overall impression of the restored site, however, is close to that of its condition prior to the bulldozing. This effect is contributed to in part by the attention paid to retaining intact features even where these had been partly disturbed or buried under rapidly consolidating fill. It is expected that the site will not suffer badly from erosion and that the banks will stabilise into a rounded contour not inconsistent with their state prior to the bulldozing. Further monitoring of the site is warranted, particularly if it continues to carry increasing loads of visitors. Cosmetic work to remove rotted stakes, trim the synthetic twine, and in the medium term to remove larger shrubs, will be needed.

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Figure 9 Southern half of the pa looking south after re-construction. Note whare H2 in centre, and bare patches of pumice subsoil in the cut.

Figure 10 Northern end of the pa looking north. Whare H3 is right foreground, with manuka branches staked on to bare subsoil in centre. Stakes outline the destroyed breastwork which is in process of being re-constructed.

Figure 11 The southern end of the pa showing the western perimeter trench in February 1989. This is a similar view to that shown in Figure 8.

Figure 12 The northern end of the pa looking north in February 1989. This is a similar view to that shown in Figure 10.