

an approximation of the second s **PLANNING GUIDANCE** 15 June 2018

Warren Gumbley Principal/Director

PO Box 7108, Hamilton East, Hamilton 3247 cell 027 471 2165 landline 07 856 9071 email warren@archaeologist.co.nz

Amberfield — Assessment of Archaeological Values and Effects

administration de contrate d



Warren Gumbley & Mana Laumea

April 2018

Amberfield – Assessment of Archaeological Values and Effects

By Warren Gumbley, Mana Laumea

10 April 2018

Table of Contents

Amberfield –Assessment of Archaeological Values and Effects1				
1. Introduction	2			
1.1 Statutory Provisions				
1.2 Recorded archaeological sites.	6			
2. Physiography and setting	10			
2.1 Landform				
2.2 Vegetation				
2.3 Land-use and land modification				
3. Archaeological Background Review	16			
3.1 General Review of the archaeology and history of the Waikato				
3.2 Local archaeological landscape (Hamilton/Tamahere)				
3.3 Archaeology of the Waikato Horticultural Complex				
4. Archaeological Survey: Methodology And Results				
4.1 Pedestrian auger survey				
4.2 Geotechnical Monitoring				
5. Assessment Of Archaeological Values				
6. Assessment Of Effects On Archaeological Values And Recommendations	51			
6.1 Proposed heritage reserve				
7. Conclusions				
8. References	55			
Appendices (Site Records)				

1. Introduction

The following report has been prepared for Weston Lea Ltd. in relation to the residential subdivision of farmland between Peacockes Road and the Waikato River and is known as the Amberfield project. The development area and, therefore, the area to which this report refers is shown in Figures 1 and 2. This land includes the following land parcels: Lot 1 DPS 81210 - SA66A/99, Lot 2 DPS 81210 - SA66A/99, Lot 3 DPS 81210 - SA66A/100, Lot 4 DPS 81210 - SA66A/100, Lot 1 DP 36935 - SA5D/1211, Pt Lot 6 DP 34164 - SA4B/788, Lot 5 DP 17475 - SA718/181, Allotment 87 Te Rapa Parish - SA528/20, Lot 1 DPS 78023 - SA60A/826, Pt Allotment 94 Te Rapa Parish - SA528/20, Pt Allotment 93 Te Rapa Parish - SA528/20.

Received PLANNING GUIDANCE



Figure 1: The northern end of the Amberfield project area showing land parcels in this area.

Received PLANNING GUIDANCE



Figure 2: The southern end of the Amberfield project area showing land parcels in this area.

The Amberfield project area has been subject to an archaeological survey that has identified a number of areas of Māori-made agricultural soils, totalling 33.4 hectares in 11 tracts spread the length of the project area. The nature and values of these are described in this report and the actual and potential effects identified.

1.1 Statutory Provisions

The management of archaeological historical and cultural sites and landscape is controlled by the RMA and its associated District Plans and Regional Policy Statements. Archaeological sites are also explicitly protected through the archaeological provisions of the Heritage New

Zealand/Pouhere Taonga Act. This Act prevents archaeological sites from being destroyed or modified without an authority from Heritage NZ.

1.1.1 Peacockes Structure Plan

The Hamilton City Operative District Plan provisions for the Peacockes Structure Plan includes the following provisions in relation to historical, cultural and archaeological heritage.

Cultural Environment:

Objective 3.4.1.15

Protect historic and culturally significant sites or features.

Policy 3.4.1.15a

Respect known pa sites, borrow pits and other cultural associations with waterways and the land, through the creation of protective reserves or enlightening developers to ways of integrating these features into new developments for the benefit of all stakeholders.

Policy 3.4.1.15b

Culture and heritage can be generally perpetuated through retaining familiar landmarks and also by non-physical means, such as place names.

Historic Heritage:

Objective 19.2.1

Significant buildings, structures, sites and items that define the City's historic heritage are identified and protected.

Policy 19.2.1a

The City's historic heritage shall be protected from the adverse effects of subdivision, use and development.

Policy 19.2.1b

Ensuring that where features have been destroyed or damaged, the historical heritage values of these sites are recorded and recognised to ensure the historical legibility of Hamilton City.

Policy 19.2.1c

Subdivision and development shall adhere to the conservation principles of International Council on Monuments and Sites (ICOMOS) being the New Zealand Charter (2010) for the Conservation of Places of Cultural Heritage Value where applicable.

Archaeological and Cultural Sites:

Objective 19.2.4

Significant archaeological and cultural sites shall be protected from damage or destruction.

Policy 19.2.4a

Subdivision, use and development shall be managed to avoid damage to archaeological and cultural sites where they exist, or are likely to exist.

Policy 19.2.4b

The protection and management of sites of archaeological and cultural significance shall be informed by their significance.

Policy 19.2.4c

Activities or development shall not adversely affect the physical structure and integrity of scheduled sites. This may include:

i. Inappropriate planting,

ii. The removal of vegetation where it affects the stability of the site, and

iii. Addition, excavation or compaction of any soil, rock or other materials.

Policy 19.2.4d

The relationships of tangata whenua with sites of spiritual, cultural or historical significance shall be recognised and provided for.

Policy 19.2.4e

Where features of significant cultural sites are lost, these features should be recorded and recognised through on-site marking to ensure the historical legibility of Hamilton City.

Objective 23.2.5

Subdivision occurs in a manner that recognises historic heritage and natural environments.

Policy 23.2.5a

Subdivision avoids, remedies or mitigates adverse effects on:

i. Scheduled heritage items.

ii. Scheduled archaeological and cultural sites.

1.2 Recorded archaeological sites.

Eleven archaeological sites have been recorded within the Amberfield project area. These are: S14/64, S14/176, S14/224, S14/318, S14/319, S14/475, S14/476, S14/477, S14/478, S14/479 and S14/480. All of these pre-European Māori horticultural sites. One of these, S14/176, is listed in the HCC District Plan as A100. Planning map 57B shows a polygon representing the site. However, there is no information that indicates where HCC received the information to present the polygon. Given that one of the authors (Gumbley) recorded the site in 1997 and that it has not been subject to archaeological inspection again until this project, it can only be concluded that the polygon is only generally indicative.

 Received

 PLANNING GUIDANCE

 Amberfield: Assessment of Archaeological Values

 June 2018



Figure 3: Map showing the locations and extents of archaeological sites S14/176, S14/475 and S14/224.



Figure 4: Map showing the locations and extents of archaeological sites S14/476 and S14/477.





Figure 5: Map showing the location and extents of archaeological sites S14/478, S14/479, S14/318, S14/319, S14/480, S14/64.

2. Physiography and setting

2.1 Landform

In general, the landforms in the area of the Waikato local to the development area can be characterised as drowned hill-country submerged under alluvium with the Waikato River entrenched through the alluvium.



Figure 6: Block diagram showing the principal landform units of the Hamilton Basin. From Lowe 2010 (p.4).



Figure 7: Block diagram showing the soils found in the Hamilton Basin and their relationship to the landform units. From Lowe 2010 (p. 5).

Two units of hill soils are present within the development area. In the north a ridge extends a short distance across Peacockes Road from the west and into the development area. This soil on this ridge has been mapped as Hamilton clay loam. The other set are at the southern end of the development area. These soils are moderately well-drained but few archaeological sites have been identified on these hill soils, even close to the Waikato River (Bruce 1979; Grange et al 1939, Lowe 2008, 2010; McCraw 2011).



Figure 8: Map showing the principal geological units within the project area.

The remaining soil units are located on a series of 4 alluvial terraces. The upper two are formed on the Hinuera Formation alluvium while the lower two are formed on the Taupo Pumice alluvium. Each has characteristic soils.

The uppermost terrace of the Hinuera Formation effectively forms a plain that is gently sloping from Cambridge to Taupiri. This formation represents the remains of a protected alluvial process that succeeded the eruption of Taupo 26,0000 years ago and which lasted for approximately 10,000 years. During that time the sediments steadily filled the hill and valley systems of the Waikato to the extent that the Waikato River became, effectively, a braided river system moving across the developing surface of the formation. Approximately 15,000 years ago, the sediment load decreased sufficiently to allow the river to begin flowing more freely and it started to form the deep channel we see today. As the formation of the Hinuera alluvium began two slow and stabilise. Its surface physiography reflected the braided river that the Waikato River had become, forming remnant levees, swales and back-channels on its surface that were mantled by a series of tephra deposits. Overtime these tephras aggregated into a single soil unit varying between 40 cm and 80 cm thick and assumed differing characteristics reflecting the physiographic situation where they were deposited. For all the soils that developed on the Hinuera formation this tephrogenic material formed the upper horizons, particularly the A and B horizons.

Within the development area a selection of the wide range of soils found on the Hinuera Formation area present. These are the Horotiu loam, Bruntwood loam and Te Kowhai loam. Horotiu loam is normally found on higher elements of the Hinuera formation such as the palaeo-levees and is a well-structured, free draining soil, generally considered to be of high quality. The next most common soil is the Te Kowhai loam, which because of it high silt and clay content, along with its formation in semi-gleyed environments, means the soil is poorly structured and poorly drained. The third soil is Bruntwood loam, which is a transitional soil between the Horotiu and Te Kowhai loams. The soil is usually found on the landscape at elevations between the other two soils and are described a less than perfectly drained (McLeod 1984). While examples of Māori occupation or activities (horticulture) have been found on all three soils, examples of this are very rare on Te Kowhai loams and are more commonly located on Horotiu loam, which is especially well suited to Māori horticulture.

The lower two terraces have been identified by geologists as remnants terraces of Taupo Pumice Alluvium. This was deposited at approximately 232 AD during a break-out flood flowing the eruption of the Taupō Volcano. The soils on these terraces are called the Waikato Series and because of their recent nature they are described as generally poorly consolidated and with horizons that are only weakly differentiated, even being described as 'skeletal'. Generally, these soils are considered to be excessively well-drained. Normally soils of this class will have a weakly developed A horizon approximately 10 to 20 cm thick overlying coarse (gravel and sand) rhyolite and pumice alluvium. Within the project area, the Waikato soils are unusual because they have a more defined structure that is superficially similar to Horotiu loam. They have a brown A horizon overlying a distinct B horizon which is comprised of fine sand and silt and, which, in turn overlies the coarse alluvium. The B horizon is yellow-brown and mimics the B horizon found associated with the Horotiu Series, however, this material appears to have little clay and is noticeably looser than its equivalent in the Horotiu soils. It is assumed that this B horizon and alluvial deposit formed from reworked volcanic soils that settled on top of the coarse gravelly alluvium in a relatively low energy environment.

2.2 Vegetation

Like most of the Hamilton Basin the project area has been largely converted for pastoral farming and so the dominant vegetation type is grassland with hedges at intervals and a range of amenity trees. Native and exotic shrubs and trees are present around the margins of the Waikato River.

Some evidence of vegetation in the 19th century is preserved as annotations on survey plans that relate to the project area and its immediate surrounds.

SO 380² (undated but with annotation dated to 1868) refers to the area surrounding the 'Mangakotukutu River' (Mangakotukutuku Stream) (i.e. the area immediately west of the project area). This map shows a 'Forest Timber Reserve' in the Houchens Road area. Otherwise it shows three isolated stands of 'Ti Tree' (referring to manuka/kanuka – not Cordyline). In addition, a 'Flax Field' is identified in palaeochannel adjacent to Peacockes Road in the area of Peacockes Lane and Westbrook Place.

SO 381¹ (undated but with annotation dated to 1868) shows two adjacent areas of flax immediately on the west side of Peacockes Road on either side of the head of a tributary stream flowing into the Mangakotukutuku catchment. Interestingly, one is labelled 'Flax Field' and the other 'Flax Swamp'; there is no indication what the difference is. Within the development area a 'Flax Swamp' is identified in the area of Stubbs Road, the milking shed and the paddock to its immediate west. A small annotation 'Flax Swamp' shows a narrow linear area of swamp a short distance to the north between Peacockes Road and the palaeochannel.

The absence of any further annotations referring to vegetation indicates that by the 1860s the project area was deforested, which is consistent with the earlier use of the area for Māori agriculture (see below).



Figure 9: Part of SO 381 "50 Acre Allotments South of West Hamilton" by L. Lessong, 1865. (LINZ)

2.3 Land-use and land modification

This section considers modification to the land that may have affected pre-existing archaeological sites. These have been identified through observations on the ground during site visits, from historic and recent aerial photography (including Google Earth) and as well as lidar-derived imagery. As such these refer to activities that for the most part have occurred during the 20th century and, in particular since the middle of that century.

Currently the project area is used as a dairy farm with associated infrastructure (milking shed, implement sheds, effluent treatment installation, races, drains, residential dwellings). The land has been farmed since the 1860s consequent to the confiscations following the conclusion of the invasion in 1864.



Figure 10: Map showing the areas where significant modifications may have affected archaeological deposits.

The 1930s and 1940s aerial photographs show that the extent of farm infrastructure within the project area was very limited. In the northern part of the project area broadly within the area covered by Lots 1-4 of DPS 81210 drains had been excavated, particularly on the lower river terraces to address the bogginess created by the springs that are common in the area. Pig sties also covered a significant part of this area. Although the extent to which pigs may have rooted the ground within them may have been limited by nose-rings. A cluster of farm buildings was also present on the high terrace immediately beside Peacockes Road. In the

Amberfield: Assessment of Archaeological Values June 2018

central part of the development area the landform appears to have had little modification other than the excavation of a sand quarry, which has since been expanded, along with some adjacent pig sties. At the southern end, again little modification had occurred other than the formation of Stubbs Rd and a farmhouse at the end of the road. Here another small sand quarry is visible, which was later expanded. The cottage on the hill adjacent to Peacockes Rd and south of Stubbs Rd is present by this time.

Since the 1980s further developments have been added. Overall at network of well-formed tracks were built. In the north a large house was constructed. In the middle of the project area the sand quarry was enlarged. So was the complex of implement sheds a short distance to the south and three catchment ponds were formed immediately to the east. In the southern part, the new milking shed was built and a new effluent pond was built on the site of the old Stubbs/Grey homestead. During the 1960s the small sand quarry beside the homestead was significantly enlarged and the south end of the highest ridge on the 'island' block was quarried (the north end of the quarry remains clearly visible).

The other activity of relevance to this assessment is the identification of cultivation in aerial photographs and the examination of historic imagery on Google Earth. This is relevant because of the effect this can have on the preservation of Māori-made soils. This is particularly so for more modern cultivation, which is significantly deeper than early ploughing.

3. Archaeological Background Review

3.1 General Review of the archaeology and history of the Waikato

The archaeology of Māori settlement of the inland Waikato Basins is not well understood, although archaeological research over the last 15-20 years, almost all of it driven by the need to mitigate development, is beginning to permit some coherent understanding of the archaeological landscape and more specifically the place of Māori agriculture within it. One of the outcomes of this archaeological research is an increasingly clear chronology based radiocarbon dating. The earliest robust radiocarbon dates associated with settlement in the inland Waikato¹ comes from archaeological sites at Leamington², which date to the mid-14th century AD (Gumbley & Laumea 2017). Radiocarbon dates from further investigations of horticultural sites suggest that after this point settlement became more general along the Waikato River relatively quickly (Hoffmann 2011, 2012, 2013, Gumbley and Higham 2000, Gumbley et al. 2004, Gumbley and Hoffmann 2013, Gumbley and Hutchinson 2014, Campbell and Harris 2011, Campbell and Hudson 2012). This chronology is generally consistent with the traditional history of the iwi descended from the Tainui Waka (Kelly 1949, Jones & Biggs 1995).

Cassells (1972a, 1972b, 1972c) attempted to synthesise the archaeological information available for the inland Waikato in the early 1970s. Cassells' model employed a locational analysis approach based on an examination of the distribution of archaeological sites in the

¹ A site containing the remains of moa in known on the outskirts of Tokoroa but this is one of only two known moa-hunting sites in the North Island and has not been radiocarbon dated. ² S15/639, S15/641 and S15/757.

inland Waikato in conjunction with the ecological settings of the sites. The model is, therefore, strongly environmentally focussed and ultimately proposes six "'types' of site-location" (1972a, 227), which are essentially sub-sets of the local environment where sites of varying natures can be congregated.

Not surprisingly, given that Cassells developed his hypotheses in the early 1970s, there was little data available. This largely constituted a couple of published archaeological investigations (Bellwood 1971 & 1978; Peters 1971; Shawcross 1968) at Lake Mangakawhare³ and Lake Ngaroto and the unpublished fieldwork season Cassells undertook in the wider Waikato area. Substantially more data has been accumulated and much of the data, particularly that relating to environment, has superseded that available to Cassells.



Figure 11: Map showing the distribution of paa and horticulture sites within the Hamilton Basin.

Cassells argued that lakes, and to some degree swamps, provided a form of optimal location for Māori occupation because of the range of resources available within what can be termed 'the catchment' exploited by the local inhabitants. Consequently, he argued, these locations were probably among the earliest settled. Cassells also noted that the highest density of occupation sites, in all cases paa, was associated with the soils modified for the gardening of

³ While the lake's name has been commonly spelt Mangakaware, however, information from Tom Roa is that it is correctly addressed Mangakawhare.

Amberfield: Assessment of Archaeological Values June 2018

kumara. This is the soil today classified as Tamahere loam, which was formed on soil originating on the Hinuera Formation and the more recent Taupo Pumice Alluvium. Essentially, Cassells considered the paa/made-soils complex to be the second most favoured site-location category. Both of these conclusions remain valid to some degree, although not necessarily for the reasons Cassells believed. As a generalisation, his observation that archaeological sites, particularly paa, congregate strongly around waterways and where Māori-made agricultural soils are found, remains valid, and in this sense it has provided a workable, if rather simple, predictive model. However, there is no reason to believe, as Cassells proposed, that lakes were the early focus of settlement. The weight of current evidence explicitly points to the Waikato River as the primary focus of Māori activity. This should be no surprise, it is one of New Zealand's major water-courses and is flanked by some of the islands' best soils, and it would have contained an array of fish, crustacean and shellfish resources. Given these available resources and its unparalleled value as a communications artery it is likely that it formed the earliest focus for permanent settlement rather than the more remote lakes.

In summary it is clear that Cassells understood the explicit relationship between paa and the horticultural landscape focused on the Waikato River and was correct to emphasise it.

It should be noted that the identification of pre-European archaeological sites in the inland Waikato provides a set of problems not found on, or close to the coast where most archaeological sites are found. Archaeological sites are often identified from their remaining surface-visible features. These may be terraces, pits, ditches and, often, shell middens. On the coast many archaeological sites are identified solely from the presence of shell midden, which can be seen on the surface or as a result of sub-surface testing with probes. Shell midden is virtually invisible in the inland Waikato reflecting the distance from the coastal harbours and estuaries and the typically poor preservation of the shell of freshwater mussels (Hyridella sp.). Where shell midden is present it is in very small quantities and is often quite localised. Its detection is mostly a matter of luck. This means that small occupation sites, in particular those that did not include substantial earthworks (such as paa) that are routinely identified in coastal areas only because of the presence of shell midden, are likely to be missed inland. In this sense the archaeological record in the inland Waikato probably suffers from a bias.

It is important to note that almost all of the recorded archaeological sites in the Lower and Middle Waikato Basins have been recorded on an ad hoc basis rather than as a result of systematic archaeological surveys. Where archaeological surveys have occurred almost all of them have been restricted to relatively small areas focussed on the assessment of the effects of specific activities such as a subdivision or public works projects. Therefore, as noted above, the record is partial and with a tendency to be biased toward the recording of archaeological sites that are visible on the ground surface.

3.2 Local archaeological landscape (Hamilton/Tamahere).

The archaeological landscape of Hamilton and Tamahere is largely characterised by pre-European gardening sites, paa sites and localised occupation areas, and post-European farming areas and military occupation. Although the pre- and post-European records manifest differently in the material record, it is the combination of these two that has resulted in the current form of the archaeological landscape of the area. Understanding the nature of each



record at a local scale is important for assessing potential archaeology within the Amberfield development.

3.2.1 Immediate area

The Hamilton CBD, Tamahere to the south, and the area immediately surrounding Peacockes Road is an archaeologically rich landscape, with at least 110 archaeological sites recorded within a 4 km radius by March 2016. Some general patterns are evident in the distribution of recorded sites in this area: (1) known paa are distributed exclusively in concert with the footprint of the Waikato River and its tributaries; (2) Māori horticulture sites are better preserved south of the CBD and outside of Hamilton's suburbs; (3) These sites occur no further than 3 km from the river and mostly within 1 km, and; (4) that recorded post-European sites are largely located in and close to the Hamilton CBD.

This distribution is probably not a coincidence but reflects the fact that sites within the city relating to Māori occupation have been subject to extensive damage as the city developed. It is unlikely that this is a reflection of empirical patterning in the archaeological record.



Figure 12: Distribution of recorded site types within a 4 km radius of the Amberfield development area as of March 2016.

The frequency of site types within the radius also gives an indication of the archaeological landscape. Sixty-one of the 110 sites are related to Māori horticulture (e.g. gardening soils, borrow pits), 33 are paa sites, 2 are pits and/or terraces, 4 are find spots and 13 relate to historic period occupation. As noted earlier, the Māori gardening sites cluster southwards in predominantly undeveloped areas, paa follow the waterways and most historic sites cluster in central Hamilton. Many of the sites are pertinent to archaeology within Amberfield development area east of Peacockes Road and, as such, are considered below to provide context for the assessment of the Amberfield development area.

3.2.2 Māori horticultural sites

Māori gardening sites are the most common site type within 4 km of the development area, and effectively begin just upstream of the development area, outside of Hamilton's urban footprint. The garden sites in this area have mostly been recorded via the consultation of historic aerial imagery, with at least 56 gardening sites recorded via such methods. Consequently, the remotely recorded sites mostly consist of groups of borrow pits. Although discrete spatial patterning has previously been shown to occur within the feature type (Gumbley and Hutchinson 2013), the sites recorded here are presumably arbitrary groupings based on the spatial proximity of observed borrow pits. It should also be noted that an unknown number of horticultural sites will have been destroyed by the expansion and development of Hamilton City without being recorded in any manner.

Because many of these sites have been recorded remotely, it is important to note that the visible surface features are usually part of larger archaeological gardening systems (e.g. Gumbley 2009; S14/424 – report in prep.). In this sense, these features are best considered a proxy for the empirical distribution of the archaeological record. For example, gardening soils, growing features, associated occupation areas and ancillary archaeology (e.g. crop storage pits) may be also present within the same system, yet lie outside of presently recorded site boundaries. Altogether, the Māori horticulture sites form a broader archaeological landscape that stretches south of the CBD, following tracts of suitable land along the margins of the Waikato River⁴.

3.2.3 Paa

Paa are a major component of the archaeological landscape surrounding the development area. One important paa borders the SE boundary of the Amberfield development (see section on Nukuhau Paa), while at least 5 other paa are less than 500 m from the development area across the Waikato River (i.e. S14/44, S14/77-S14/79 and S14/117). Within 1.5 km of the development area, there are an additional 4 paa sites (S14/47, S14/56, S14/84, S14/91).

As noted earlier, the location of these fortified sites corresponds to the distribution of waterways in the area. The paa are generally located on headlands or above waterway escarpments and include features such as ditch and bank systems, terraces, borrow pits and made soils, for example. It should be noted that many of the paa have suffered substantial damage from urban development (see Table 1 below for details).

⁴ No recorded archaeological sites are present in the former Rukuhia swamp.

Site	Туре	Condition	Description
S14/117	Paa	Moderate/Poor	Paa site identified using 1961 aerial photos. Probably ploughed under
S14/33	Paa	Good	Nukuhau Paa
S14/44	Paa	Destroyed	NA
S14/47	Paa	Poor	Promontory paa with double-ditch and inner bank system. Circular depressions in interior paa. Site damaged by pine plantation.
\$14/56	Раа	Moderate/Good	Gully paa. It had a deep eastern defensive ditch, now
514/50	1 aa	Woderate/ Good	
\$14/77	Paa	Moderate	Small paa with enclosing ditch, steepened scarps, oven debris
514/77	1 uu	Woderate	
S14/78	Paa	Destroyed	Headland paa with low ditch and bank (bulldozed)
S14/79	Paa	Destroyed	Promontory paa defended to north by single ditch. Cluster of borrow pits nearby
S14/84	Daa	Very poor	Paa site with a ditch at the northern end. Find spot for
514/04	r aa	very poor	arteracts, manny adzes. She annost completely destroyed
S14/01	Dee	Destroyed?	E-vidence for a reg in this location is near
514/91	Paa	Destroyed?	Evidence for a paa in this location is poor.
S14/60	Paa	Destroyed	Small paa located on hillock beside the river.
S14/46	Paa	Moderate/Good	Located on a small hill beside the river.
S14/47	Paa	Poor/Moderate	A paa located on a peninsula in the Mangakotuku Stream system. Now densely covered in pine trees which have adversely affected the paa's codition.

Table 1: Details and descriptions of paa within 1.5 km of the project area.

 Received

 PLANNING GUIDANCE

 Amberfield: Assessment of Archaeological Values

 June 2018



Figure 13: Paa within a 1.5 km of the project area.

3.2.4 Find spots/Unclassified

A Māori Waka tiwai was recorded by Andrew Dodd in 2005 on the southern side of the Waikato River near the Hamilton City Council water facility on Waiora Road (S14/193). The site was described as being a soft sediment bank where two hull sections of the waka had washed out of their original context. The sections measured 7.4 x 0.5×0.3 m and $5.4 \times 0.4 \times 0.2$ m and exhibited an intact prow. Site S14/193 lies approximately 1.5 km downstream from the NW corner of the development area.

Received PLANNING GUIDANCE

Amberfield: Assessment of Archaeological Values June 2018



Figure 14: Two hull sections of waka tiwai found at S14/193. Note steep prows at either end of the hull sections, grading into flatter cross-sections towards the centre of each object (https://archsite.eaglegis.co.nz/NZAA/Site/?id=S14/193).

A large collection of Māori artefacts was collected from Monowai Farm (Tamahere), on the spur immediately above the eastern bank of the Waikato River and 200 m west of Newell Road, between 1930-1960. The assemblage was recovered by the late Mr. John Powell during horse-drawn ploughing of the farm, and comprises 5 adzes of the Duff 2B type, 2 stone pounders and 2 hammerstones. The area of the farm has since been subdivided in life-style blocks.

The two remaining find-spots include S14/93 and S14/161. Site 14/93 is the find-spot for 2 adzes and 1 pounder. The NZAA record of the site and assemblage is very brief, and simply states that the artefacts were found during a fencing project in the 1950s. The site was described as being at the end of Mullane Street, and its current ArchSite coordinates place it roughly 1 km NE of the development project's northernmost boundary.

Site S14/161 was the find spot of a possible patu blank, showing flake scars around its edges. The artefact was found after it emerged from an eroding bank in a gully abutting the Waikato River. The find spot is located approximately 1 km downstream from the NW corner of the development, and approximately 500 m upstream from the waka tiwai find location (i.e. S14/193).

3.2.5 Nukuhau Paa

Nukuhau paa borders the southern boundary of the development area, approximately 500 m NW from the end of Gainsford Road. The following information largely comes from the NZ Archaeological Association record for the site (S14/33).

The paa is located on a headland at the intersection of the Waikato River and a tributary stream which runs parallel to the SE boundary of the development footprint. The paa is of particular importance for a number of reasons. Particularly, its features are very well

preserved; two ditches⁵, pits and terraces are visible within the fortification. Further borrow pits and made soils have been recorded nearby to the north (i.e. within the development area) and south (e.g. S14/299). In this sense, Nukuhau paa is a key complex belonging the broader archaeological landscape incorporated by the development area.

Although Nukuhau is one of the best preserved paa along the Waikato River, scant information is available regarding the history of the fortification. The first documentation of the site came from the Waikato Historical Society (WHS) in the 1960s, who recorded visible features associated with the paa, along with several burials in proximity to the paa. While the WHS documented various features of cultural and archaeological significance, their recording methodology was rather unrefined, resulting in data which has been difficult to verify. Among these features, the WHS recorded a third ditch and bank enclosing 6 ha and a canoe landing area just northwest of the end of Lowe Road (Wilkes 2003). However, no physical and/or material surface evidence has since been found to verify the presence of these features' interpretations.

The most detailed information about Nukuhau Paa was provided by an entry into the NZ Archaeological record for the site by Owen Wilkes in 2003. Wilkes describes the inner components of the fortification in detail, stating:

This is roughly in the shape of a triangle with [its] apex to the north between the steep slopes down to the Waikato river and the extremely steep slopes of the Nukuhau gully. The sides of the triangle are about 130 m long. The apex is very narrow and descends in a series of steps which apropably natural, to cliffs about 10 m high which plunge into the gully on one side and the river on the other...

The rest of the inner area is fairly flat, with an area of about 4600 sq. m.

The paa is defended by an 80 m long straight ditch and bank with an additional outer ditch and bank measuring 150 m in length. This ditch and bank is distinctive because it has a distinct angle in its centre. Wilkes notes that the interior ditch is of substantial size, measuring 5 m deep from top to bottom (i.e. the ditch and bank are each 2.5 m vertically). The interior defences measure 6 m wide at the top of the bank and 3 m wide at the bottom of the ditch. Additionally, there is a small causeway for access to the paa interior, which is clear in historic aerial imagery (see Figure 16).

⁵ The smaller ditch has been recorded as pre-European, but its unusual shape (i.e. biaxial) and morphology suggest that it may have been a 19th ditch and bank used for keeping livestock.

Received PLANNING GUIDANCE Amberfield: Assessment of Archaeological Values June 2018



Figure 15: Undated plan of Nukuhau Paa (from NZAA site record S14/33) but which probably dates to the 1960s.

Reliable information has also come from historic aerial photos taken in 1938 and 1942, clearly showing the interior and exterior components of the fortification, delimited by the two ditches. Notably, the outer ditch does not extend to the edge of the headland, reinforcing the notion that this feature could derive from historic farming practices. The interior ditch and bank system is very prominent in the historic photos, as is the causeway towards the middle of the interior ditch and bank. The aerial photos are important for establishing the extent of site modification over the last 80 years, and show that Nukuhau has remained in very good condition.



Figure 16: Aerial photo from 1942 of Nukuhau Paa. Note the visible borrow pits across the Waikato River.

Several oral histories provide differing accounts of the paa's origins. Wilkes note in the records that unverified sources place early occupation at Nukuhau Paa between 1700-1750, and that there are at least two slightly different accounts of the paa's construction. One states that Nukuhau was initially occupied by Ngati Mahuta around the year 1700, and then was conquered by Ngati Raukawa at some time after 1750 (Jones and Biggs 1995). The second reports that the paa was instead tied to Ngati Ruru, a derivative of Ngati Mahuta, and that the fortification was built by Te Tipi of Ngati Ruru⁶. Sources also report that Nukuhau was taken back by Ngati Maahanga at a later period (Phillips 1995: 151). While the exact chronology is vague, the oral histories do imply that Nukuhau was occupied by separate hapu/iwi at different points in time. The site is reported to have been abandoned from approximately 1830 onwards.

⁶ Wilkes is citing information from J.B.W. Roberton's *Māori settlement of the Waikato District*.





Figure 17: Aerial photograph from 1938 showing Nukuhau Paa.

3.2.6 Tireke flour mill

Tireke Māori flourmill was located in Nukuhau gully, directly opposite the interior ditch and bank system of Nukuhau Paa. Some information is available for the flourmill in the NZ Archaeological Association site record (S14/100), although little is known about the current condition of the mill site. Owen Wilkes, in tandem with his documentation of Nukuhau Paa, in the NZAA site record, provides information on previous investigations and the history of the mill up to 2003. The site is one of a number that reflect the agricultural revolution among Waikato Māori in the decades of the 1840s and 1850s.

The earliest mention of Tireke mill is on Reverend John Morgan's map of Waikato flourmills that dates to the period around 1850. This map tells us that at the time funds were being sought to build the mill for a cost of £320 (Figure 18). It was described in the June 1856 edition of the *Gazette* as "a very good mill" completed in 1856.

Several items relating to the mill structure have been recorded at various times. Among these is a 3-inch thick by 30 feet long iron shaft; an overflow channel, tailrace and wheel-pit. A set of 9-inch square holes cutting into the bedrock were reported by Hunt. In the NZAA record Wilkes speculates on the potential layout of the mill based on his observations in 2003, but his and Morgan's inspections were frustrated by the dense vegetation filling the gully.



Figure 18: A copy of Morgan's sketch and list of Waikato flour mills as annotated by Wilkes from NZAA sire record.

3.2.7 Kirikiriroa (the Narrows) Redoubt

The Narrows Redoubt (S14/45) is located approximately 1 km northeast of the northernmost point of the Amberfield development area, situated above the edge of the Waikato River. The redoubt was built in 1864 as an outpost to oversee and defend the river as a conduit for military supplies between Cambridge and Hamilton. The redoubt had a standard rectangular layout measuring 55 x 50 m externally and 45 x 30 m internally, and contained 6 buildings and contained 'a barrier outside the entry on the southeast side' (Prickett 2016: 58).



Figure 19: Narrows Redoubt shown on SO 381 (below the 'Hamilton' label) - Lessongs 1865 survey plan (LINZ).

3.2.8 Hamilton East Cemetery

The Hamilton East Cemetery is located approximately 1.25 km NE of the development area's northernmost boundary, and is situated between the site of Kirikiriroa Redoubt and the Hamilton Botanical Gardens. The cemetery was founded in 1865 to serve as an internment grounds for the settling militia and their families, and was initially the only operating cemetery in the Hamilton area (McEwan et al. 2013). A 40 ha area was first selected for the cemetery in 1865 by Colonel Moule, and was later gazetted as a cemetery incorporating the entirety of allotment 252 in 1868.

A paa is also recorded in the NZ Archaeological Association site file on the site of the cemetery but no supporting evidence is given.

3.2.8 Kainga – Domestic occupation areas.

No archaeological sites that might be characterised as kainga or domestic occupation sites were identified within the Amberfield project area in the course of the archaeological fieldwork. However, sites of this type have low visibility in the Waikato landscape and so are probably significantly under-represented in the archaeological record for the inland Waikato. Experience from the archaeological investigations of other sites⁷ in the inland Waikato shows that such sites are present and where they have been found they have been closely associated with the Māori-made garden soils or on the river margins, where waka landing is facilitated and garden sites are nearby. Therefore, it is likely that sites of this nature will be found in and around the areas of made-soil (pre-European gardens), and possibly at the northern mouth of

⁷ S14/195, S14/249, S15/423, S15/424 and asmall unrecorded site immediately up-stream of the old Horotiu Bridge.

the gully, where good waka landing is assured.

These sites typically include cooking areas, postholes representing shelters and fences and storage pits of varying types for food (crop) storage).

3.3 Archaeology of the Waikato Horticultural Complex

3.3.1 National context relating to pre-European Māori garden sites

Historical and archaeological sources tell us that Māori were cultivating a suite of tropical or semi-tropical domesticated plants when Europeans arrived in New Zealand. Most prominent among these was the kumara (*Ipomoea batatas*) but other prominent species were taro (*Colocasia esculenta*) and bottle gourd (*Lagenaria siceraria*). Tropical yam/uwhi⁸ (*Dioscorea sp.*) was also grown although not commonly by Cook's arrival. Others included tropical ti (*Cordyline fruticosa*) and paper mulberry (*Broussonetia papyrifera*). Understanding how the transition from the tropics to a temperate environment was made has been one of the themes of archaeological research in New Zealand (Barber 2004). Despite this, it remains relatively poorly understood.

In most parts of New Zealand, the gardens themselves are difficult to identify other than as areas where soil horizons have been mixed, often between 300 and 500 mm deep, and with distinct enrichment from charcoal (Barber 2004: 189). Sometimes ancillary structures such as stone rows indicate horticulture sites. In places the gardens are more readily identified because of the modifications made to the soil by Māori through the addition of sand and/or gravel.

Such soils modified for gardening Polynesian cultigens have been identified in a number of places in New Zealand and Barber 2004 provides a thoughtful summary of the evidence. In most cases the reports have described isolated instances of this practice. However, areas are known where this practice has occurred on a more extensive scale, to a degree where they are regionally significant. These are:

- the Kaikoura Coastal plain near the Clarence River mouth (McFadgen 1980; Trotter & McCulloch 1999),
- the Waimea and Motueka River plains in Tasman Bay (Barber 2004, 2010; Challis 1976, 1978; Rigg & Bruce 1923)
- in places in both south and north of Taranaki, particularly the Waitara River valley (Smart 1962; Buist 1964; Walton 1984; Walton and Cassels 1991; Cassels and Walton 1992),
- on the Waikato Coast between Aotea and Ruapuke (Walton 1983 and 1984)

However, the largest concentration of Māori-made soils is found in the inland Waikato, where the area of these soils probably equals or exceeds that of the other areas combined⁹. The current estimate made by Gumbley is that there is, or was, approximately 4000 hectares of Māori-made soils in the Waikato River valley.

⁸ This should not be confused with the small red tuber commonly referred to a yam in New Zealand, which is a member of the *Oxalis* family.

⁹ This is based on data supplied in McFadgen's 1980 article.



Figure 20: Part of 1943 aerial photograph 834/57 which shows the borrow pits at one pre-European Māori garden site (S14/27). Earthworks for the pa S14/26 are visible adjacent to the gully edge.

3.3.2 Pre-European Māori garden sites on the Waikato plains

In the Waikato pre-European Māori garden sites are identified by two defining features; the presence of borrow pits (Figures 11, 20 & 21)), and soils heavily modified by the addition of sand and gravel; as well as charcoal. The borrow pits are near circular depressions usually between 1 and 4 metres deep (archaeological investigations indicate they were typically 3-5 m deep originally) and often 100-300 m². It is these two features that make these garden sites so visible compared to pre-European Māori gardens in most of the rest of New Zealand. Here, the archaeological evidence is principally found in both the middle and the lower Waikato basins (Selby and Lowe 1992).

In the middle Waikato Basin, pre-European Māori garden complexes are concentrated along the Waikato River from Arapuni to Taupiri, in areas on the Horotiu Plain and along the margins of the Waipa River and its tributaries. In the lower Waikato Basin, the resource is more poorly understood but it is known to exist on raised levees along the banks of the Waikato River in the area of Huntly-Rangiriri and possibly in some places lower down the river (Grange et al. 1939; Taylor 1958; Clarke 1977; Law 1968). The total original area of these sites is unknown but Taylor (1958) proposed an estimate of 5000 acres (2000 ha) based on the soil survey data available in 1958. Our analysis of the available soil survey data¹⁰ using GIS, indicates that an estimated area of 4000 hectares is probably more accurate. The locations of the gardens are strictly associated with particular series of alluvial soils.



Figure 21: Borrow pit (one of 34) at site S14/27 located at Tamahere. (photo: D Lowe)

In the middle Waikato Basin these 'made' or 'modified' soils are classified in the Tamahere series, with the two named soil types being 'Tamahere gravelly sand (on Horotiu soils) (Mh)' or 'Tamahere gravelly sand (on Waikato soils) (Mw)' (Bruce 1978, 1979; McLeod 1984). In the New Zealand Soil Classification (NZSC) (Hewitt 1998) the modified garden soils in the Waikato belong to the Artifact Fill Anthropic Soils class.

As well as modifying the well-drained Waikato series soils and Horotiu loams, the less well-drained Bruntwood silt loams were also modified. Less commonly the poorly-drained Te Kowhai silt loams are found to have been modified for gardening.

The Horotiu and Bruntwood loams (as well as the Te Kowhai soil) have formed on 18,000 — 20,000-year-old volcanogenic alluvium called the Hinuera Formation. The deposits of this formation have been overlain by a cover (500-700 mm) of thin multiple tephra-fall deposits since the Hinuera alluvium finished accumulating.

¹⁰ It must be noted that the soil survey data is incomplete and does not include areas where borrow pits have been identified south of Cambridge and along the banks of the Waikato River above Cambridge.

Amberfield: Assessment of Archaeological Values June 2018

The Waikato series soils have formed on 1800-year old coarse pumiceous alluvium (Taupo Pumice Alluvium) which formed low terraces near the Waikato River (Grange et al. 1939; Taylor 1958; Lowe 1988; Singleton 1988; McCraw 2002).

Specifically, it was the sand and gravel alluvium substrate from the Hinuera and Waikato formations that was quarried from the borrow pits and used to modify the upper soil horizons (Figure 22).



Figure 22: A photograph showing the upper horizons of Horotiu sandy loam. The upper 700-800 mm of yellowish-brown material is the accumulated volcanic tephra that overlies the Hinuera Formation alluvium. It is this alluvium that was quarried and added to the gardens. (Scale is 2 m.) (photo: W. Gumbley)

Although active research is now being carried out it remains difficult to be confident of how the material quarried from borrow pits was applied to or mixed with the parent soils to form the modified soils (Tamahere loam). Until 1999 it had been assumed that this quarried material was either; (1) added to the surface of the parent soil as mulch or puke (mounds), or (2) was well mixed into upper part of the soil (i.e. topsoil and upper subsoil parts of the profile).



Figure 23: Photograph from S14/201 (Chartwell, Hamilton) showing the sand-filled bases of puke dug into the subsoil. (Scale intervals: 0.5 and 0.25 m.) (photo: Gumbley).



Figure 24: Photograph from S14/195 (Horotiu) showing bowl-shaped depressions of puke bases with the sand and gravel removed (Scales are 1 m.) (photo: Gumbley).

Amberfield: Assessment of Archaeological Values June 2018

Archaeological investigations at an area of Tamahere soils and borrow pits (S14/201) at Chartwell in Hamilton (Gumbley and Higham 2000; Gumbley et al. 2004) revealed two adjacent areas where circular sand-filled bowls were identified at the topsoil-subsoil interface (Figure 23). Both sets of bowls, although slightly differently oriented, had similar internal organisation of the depressions where they were arranged in quincunx fashion (a form of offset rows where four bowls are arranged around a central bowl). This conformed closely to historical references, which describe orderly gardens where kumara were grown in puke organised in this fashion (Best 1925; Colenso 1880).

Since 1999 these sand-filled bowls, in similar arrangements, have also been found at Riverton Estate subdivision, on the northern edge of Hamilton on the east side of the Waikato River, when part of a large body of garden soils (S14/165) was investigated (Simmons 2008). The same type of feature has been found at several other sites: S14/158 and S14/198 at Taupiri (Campbell & Harris 2011; Gumbley in prep) S14/468 at Ngaruawahia (Gumbley in prep), at S14/164 (Simmons 2013) and S14/194 (Gumbley & Hoffmann 2013) at Horotiu and at S14/248 (Kieth in prep) at Tamahere. Outside the Waikato similar features have been identified at Whangaruru Bay in Northland (J Carpenter, pers comm.); at Mahia Peninsula (Jones 2012) and in Golden Bay (Barber 2004)

In a handful of sites containing a distinct pattern in the upper soil horizon have been identified (S14/194, S14/324, S15/424, S15/421¹¹), which appears to reflect the absence or near absence of modern cultivation. The A horizon is strongly enriched by sand and/or gravel and 25-40 cm thick. It is found with three units; the uppermost is the turf layer which is dark grevish-brown and includes organic material and, in terms of its particle size range, is wellsorted with a preponderance of material in the grades from medium sand size and finer. The middle unit is dark greyish-brown or black and includes organic matter. Texturally the middle unit is not sorted with a range of particle sizes up to coarse gravel represented. The lower unit contains the same range of particle sizes but has a paler matrix, yellowish-brown, reflective of the underlying B horizon. This unit contains relatively low quantities of charcoal. The contact between the A and B horizons is irregular with an almost wavy appearance in places. The upper element (top ~ 20 cm) of the B horizon is usually distinctly darker than the underlying material, with obvious enrichment with charcoal. It is possible that this is a buried remnant topsoil. While it is tempting to suggest that sandy and gravelly A horizon represents the remains of sand and gravel mulch, experimental gardening carried out by Gumbley indicates an alternative explanation; that this layer represents the demolished and decayed remains of sand and gravel growing mounds that have weathered to appear like a continuous layer. Importantly, when the A horizon material is removed by hand and the interface between the A and B horizons is examined with care it is clear that the irregularity visible in profile reflects the dimpled or undulating surface of the B horizon. This dimpling appears to be an artefact of the working of the soil with tools and from the castes of roots (of kumara).

¹¹ Refer Gumbley and Hoffmann 2013 regarding S14/194 but otherwise reports are in preparation.
Received PLANNING GUIDANCE

Amberfield: Assessment of Archaeological Values June 2018



Figure 25: An example of an unmodified Māori-made soil horizon.



Figure 26: Example of the dimpled interface found at S15/374 at Ngaruawahia, garden site located on Waikato series soil.

As well as the identification of 'puke', other archaeological features have been found in association with gardens. These include drains where the gardens have encroached onto poorly drained soils, postholes for structures and the remains of fireplaces and umu.

We now also have direct evidence of what was grown in the gardens from the analysis of microfossils¹² found in the fill of sand-filled bowls and oval depressions at several sites. These analyses have found abundant kumara starch grains and also taro remains (Campbell & Harris, 2011; Gumbley & Hoffmann 2013; Hoffmann, 2011 & 2013). At site S14/222 a single yam starch grain was identified (Hoffmann 2011). Yam/uwhi, a tropical cultigen, has very rarely been identified in New Zealand but this find shows that this plant was also grown in the Waikato despite its sensitivity to a temperate climate.

Microfossil analysis also provides important data enabling reconstruction of the environment at the time the gardens were created and the impacts the gardening process had on the environment. Recent results are beginning to create a picture of the environmental changes resulting from the slash-and-burn process used to form gardens by Māori.

While we now have a better understanding of the anatomy of these sites this is based on the excavation of a handful of sites in any detail. Because of this there remains the potential that the understanding of that anatomy is incomplete. We do not understand how the features found so far actually function; i.e. what their purpose was. A significant handicap lies in the lack of archaeological remains that tell us about what was present above the ground surface since this aspect of the gardens has disappeared. For example, from the presence of the sand-filled bowls and depressions we can safely infer that the material quarried from borrow pits was deposited in the depressions after the soil had been removed. However, it is unclear whether the sand and gravel were used to form the mound part of the puke. Volumetric analysis of the modified soils for S14/201 suggests this was unlikely (Gumbley et al. 2004) but without similar research from other sites this evidence is weak. In an attempt to address this experimental gardening is being undertaken by Gumbley.

In much the same way that we are unsure about how the sand and gravel were used, we remain unsure about what function the process had. Several writers have suggested that the addition of alluvial material improved the friability and heat retention of the soil, reduced the likelihood of frost damage, improved fertility, provided a disease-free growing medium, and created a sharp interface between the added materials and buried horizons to encourage larger tuber formation (Best 1925; Challis 1976; Singleton 1988). Together, it is assumed, these modifications made soils more suitable for growing the subtropical kumara in New Zealand's temperate environment (Taylor 1958).

One effect we do know occurred was that soil drainage was changed by the addition of sand and gravel. The Tamahere series soils are described as "well to somewhat excessively drained" (McLeod 1984: 24), often increasing drainage in already well-drained soils (i.e. Horotiu loam and Waikato loam). Best (1925) and others remark on the desirability of free drainage for Māori when growing kumara. However, free drainage seems to have been desirable with such soil preferred, not only in the Waikato but more

¹² Microfossils are the microscopic remains of plants. Pollen, phytoliths and remains of vegetation such as starch grains and xylem cells are what is analysed.

generally where kumara were grown in New Zealand (Best 1925). The addition of ash from burning the existing vegetation growing on the garden site probably improved nutrient levels (Grange et al. 1939; Taylor 1958; McCraw 2002), particularly potassium and nitrogen, which, together with phosphorus, are important nutrients for kumara growth (Singleton 1988).

These gardens were a major part of the economy for Waikato Māori. Their construction was part of a complex and time-consuming process. First, the area where the garden was to be established had to be cleared from forest, which would have begun well in advance of the planting season. Then the garden had to be prepared. This stage in the process would have begun with the making of tools and baskets for digging and carrying the sand and gravel. The sand and gravel had to be quarried from the borrow pits but only after the yellowish-brown loam overburden had been removed. Then the material had to be carried to the plots and the plots laid out and puke formed. Following this planting could occur followed several months after by the harvest and construction of the kumara stores.

Even to form one garden was an energy intensive activity but when we also consider there were probably over 3000 ha of these gardens in the inland Waikato we can gain some understanding of the importance of these sites for tangata whenua.

4. Archaeological Survey: Methodology And Results

An archaeological survey of the Amberfield development area was carried out between December 13 and December 19, 2017. Investigations involved two components: 1) systematic pedestrian auger survey of areas of archaeological potential, and; 2) the monitoring and recording of test pits excavated for geotechnical investigations. Primarily, the auger survey was designed to improve the accuracy of recorded soil distributions and inform on the condition of Māori horticultural soils across the development area. The excavations of the geotechnical test pits were monitored to record any archaeological information encountered and to understand the local soils along with the degree and extent of recent modification from farming activities (e.g. ploughing).

4.1 Pedestrian auger survey

A pedestrian auger survey was carried out using a 25 mm screw-type auger to record the spatial distribution of Māori-made soils previously identified during the Soil Bureau survey of Waipa County (Grange et al. 1939). Consequently, the survey focussed in and around the area indicated by the soil map and it was also informed by the locations of borrow pits identified from aerial photographs and lidar-derived imagery. The survey took place over a period of 4 days, by manually traversing and coring land within individual farm paddocks. Survey transects were run according to the shape of individual paddocks; generally, this involved orienting transects parallel to the longest fence line of the paddock to maximise the space incorporated by each transect.

Auger samples were examined at intervals varying between 30-60 m. Variation in the sampling distance related primarily to the homogeneity and consistency of nearby samples. For example, if anthropic sand and gravel had previously been identified as consistently occurring in the area, intervals were increased until the sand and gravel layer began to dissipate. Around the edge of archaeological sand and gravel deposits, sample spacing was decreased to improve the accuracy of the aggregate edge. If soil stratigraphy changed abruptly between two auger samples, additional samples were then taken between those points to evaluate that change. All cores were driven to below the natural A-B-horizon interface (i.e. generally < 0.5 m) to ensure that no additional archaeological soils were present underneath the sand and gravel and to observe the nature of the associated subsoil. Previously unrecorded possible borrow pits were also recorded with GPS points during the pedestrian survey.

Four sets of data were recorded for the soil surveying exercise: GPS number, presence/absence of horticultural soils, B-horizon type and notes. The GPS number and presence/absence data sets were mandatory entries, while B-horizon and notes were recorded only as necessary (e.g. when clear changes in the B-horizon were observed or when an unusual soil matrix was encountered).

After completion, a dataset containing a total of 742 GPS points was generated. The points were then loaded onto QGIS and coded based on the presence/absence of Māori horticultural soils. Following this, point distributions were examined visually to identify individual groups of horticultural soil. These point aggregates were then delimited with polygons to provide an approximate boundary and assessment of the soil extent relating to each aggregate.



Figure 27: Distribution of soil auger survey sample points coded pale blue to show the areas where actual or possible Māori-made soils were identified. Shown on a lidar-derived hillshade (source: WRC).





Figure 28: Areas of Maori-made soil (Tamahere loam) developed from interpretation of soil auger survey data along with test-pit results. Shown on a lidar-derived hillshade (source: WRC).

A total of 11 discrete Māori horticultural soil areas were identified from the data¹³, incorporating the entirety of the proposed development area. The first group (S14/176) occurs at the northern right-angle bend of Peacockes Road and probably extends west along the area between the road and the palaeochannel to the north. The second is listed as S14/224 and lies just north of the stream and the E-W race cross-cutting the development area. The third group is a small area of Maori-made soils located of a low ridge (S14/475). This site may extend to the north along the low ridge into the area where the house is located as this area was not surveyed. S14/476 is the located in the middle of the Amberfield development area and is also the largest site at 11.5 ha. It extends 650 m from north to south, covers three river terraces and includes 22 large and highly visible borrow pits.

¹³ S14/64, S14/176, S14/224, S14/318, S14/319, S14/475 – S14/480.



Amberfield: Assessment of Archaeological Values June 2018

S14/477 is another small area of made soils at the northern terminus of a ridge immediately above the mouth of the large gully and is one of four areas of made-soil on the "island". S14/178 is located 150 m south of S14/477, adjacent to the river scarp. Immediately south of this is the second largest horticultural site within the development, S14/318, which covers 10.5 ha. Immediately east of this site, that the basement escarpment is S14/479. There is some ambiguity about status of this site since it may represent the accumulation of a colluvial deposit eroding from the escarpment above.

S14/319 lies close to the southern end of the development area immediately north of the Stubbs Road and adjacent to the milking shed. The south eastern corner of this site has been destroyed by sand quarrying. Immediately south of Stubbs Road is the southernmost site, S14/64; this site continues south into the adjacent property. S14/319 and S14/64 were probably a continuous area of Māori-made soils before the formation of Stubbs Rd, the waste-water treatment pond and the sand quarrying. The last site, S14/480 is the smallest of all of the horticultural sites identified at just over 400 m². The site is located on the low river terrace immediately below S14/64.

 Table 2: The area and perimeter distance of the Maori horticultural sites identified within Amberfield (including the part of the S14/64 outside the development area) and shown in Figure 28.

Site	Area (m ²)	Perimeter (m)
S14/64	16958.7	837
S14/176	27369.5	1280
S14/224	7016.9	387
S14/476	115112.7	1978
S14/475	1949.4	169
S14/319	26626.1	661
S14/477	1274.4	146
S14/479	8732.4	415
S14/318	104522.9	2037
S14/480	423.9	78
S14/478	6489.7	309



4.2 Geotechnical Monitoring

Using a 12-tonne hydraulic digger, Geotechnical test pits were excavated at dimensions measuring approximately 1.5 x 0.75 metres in plan. While pits were dug to different depths in different areas, only the upper 0.5 m of the pits were monitored and examined for archaeological materials. Also, only a selection of the geotechnical pits was monitored – those within or close to known made soils or in locations where experience indicated there was potential for archaeological deposits (n=15). Pits were initially examined by observing soil matrices during machine-stripping to identify the Māori horticultural soils, archaeological features or signs of ploughing and/or other 'modern' soil disturbance. With regard to the latter (ploughing/soil disturbance), initial emphasis was given to the interface between the A and B horizons. Following this, the excavation was deepened into the B horizon and the profiles were then hand-cleaned to observe and record stratigraphy, and to determine whether archaeological materials were present. The pits were documented using GPS points, photographs, notes and sketches.



Figure 29: Overview of monitored Geotechnical test pit locations within investigation area. Orange polygon denotes boundary of investigation area.

Of the 31 excavated Geotechnical test pits, a total of 15 were monitored (see Figure 30 above). The 16 unmonitored Geotechnical test pits were not examined because the immediate topography and original soil map indicated a low likelihood of finding archaeological materials. Results from individual test pits are described below.

Test Pit 2

Test pit 2 was located at the northern end of the investigated area. The test pit contained a brown topsoil to a depth of 23 cm and a yellowish-brown B horizon. No archaeological materials were observed and no evidence of ploughing was present.

Test Pit 4

Test pit 4 was excavated on the lowest natural terrace/plateau near in the southeast margin of the investigated area, approx. 200 m south of test pit 16. Stratigraphically, the pit contained 13 cm deep greyish brown sandy and gravelly topsoil capping a layer of sand and gravel¹⁴ measuring 10-17 cm thick. The B-horizon was a dark yellowish-brown sandy silt with charcoal present in its upper margins.

The sand and gravel deposits represent the remains of a Māori-made soil – Tamahere loam.



Figure 30: Profile of Geotechnical test pit 4. Note the anthropic sand and gravel between the topsoil and Bhorizon.

Test Pit 6

Test pit 6 was located 200 m north of the second race cross-cutting the investigated area, and just south of the Peacockes' residence. The pit contained 18 cm of greyish brown topsoil and 8 to 10 cm of Tamahere loam soils. The subsoil graded from Bruntwood to Horotiu soil types and contained naturally occurring gravel.

The sand and gravel deposits represent the remains of a Māori-made soil – Tamahere loam.

Test Pit 7

¹⁴ Boundary with the underlying layer was diffuse.

Test pit 7 was excavated 125 m southwest of test pit 6 and 50 m east of Peacockes Road. The pit contained 8 cm of topsoil, a 10 cm thick layer of gravel from road overburden, and a yellowish-brown B-horizon.

No archaeological materials were observed.

Test Pit 8

Test pit 8 was located 15 m south of the same race, close to the Peacockes Road entrance/exit. The test pit contained 7 cm of topsoil, 3 cm of sand and gravel underneath, a yellowish-brown B-horizon. Of note, sand and gravel layer in this test pit was considerably thinner than in test pit 9 nearby (see below).

The sand and gravel deposits represent the remains of a Māori-made soil - Tamahere loam

Test Pit 9

Test pit 9 was excavated 170 m to the east of test pit 8, just south of the same farm race. The pit contained 16 centimetres of topsoil, 4 centimetres of sand and gravel, and yellowish-brown B-horizon. The profile was undisturbed and no signs of ploughing were present in the pit.

Test Pit 10

Test pit 10 was located north of a group of implements and storage sheds and 65 m south of the northern quarry¹⁵. The soil profile contained a 14 cm deep topsoil layer, a 12 cm thick Tamahere loam layer, a 4 cm thick charcoal lens and a yellowish-brown subsoil.

Test Pit 11

Test pit 11 was located 100 m directly east of test pit 10, on the eastern side of the main N-S race. The sand and gravel matrix was clearly present in the profile, but had been disturbed by extensive ploughing. The topsoil and sand and gravel soil elements were indistinguishable due to plough disturbance, and comprised the first 18 to 22 cm of the soil profile. The underlying B-horizon consisted of yellowish-brown sandy silt.

The sand and gravel deposits represent the remains of a Māori-made soil – Tamahere loam.

Test Pit 13

Geotech test pit 13 was excavated on a high natural terrace, directly east of the gully (palaeochannel) that dominates the southern end of the investigation area. The pit profile consisted of topsoil to 23 cm of depth and a yellowish-brown sandy silt B-horizon. The sub-soil was locally rich in coarse gravel. No Māori horticultural soils were found in the pit.

Test Pit 14

Test pit 14 was similarly located to test pit 13, immediately east of the gully close to the summit of the ridge. It was located approximately 115 metres north of the second (southern) quarry. The soil profile had a 20-centimtre thick A-horizon on a Horotiu series soil which had been ploughed. No archaeological deposits were present.

Test Pit 16

¹⁵ Two modern alluvium quarries are present within the investigated area. The largest, which has been partially back-filled, is located 70 m north of test pit 10. The second is located 120 m south of test 14 and 500 north of test pit 22.

Test pit 16 was excavated on the third natural terrace (i.e. the lowest flat area) near the Waikato River, on the eastern margins of the investigated area. The pit contained a 9 cm black (10YR 2/1), mottled sandy silt topsoil layer, directly capping a B-horizon which graded from light yellowish-brown to yellowish-brown. No archaeological deposits were present and no evidence of ploughing was present.

Test Pit 18

Geotech test pit 18 was approximately 600 metres east of the milking shed. The soil profile contained an unmodified topsoil and a 20 cm thick A-horizon which had been ploughed.

No archaeological deposits were present.

Test Pit 19

Test pit 19 was located between pits 16 and 14, approximately 300 metres east of the Waikato River. The soil profile contained several distinct attributes:

1) a 17 cm sand and gravel layer

- 2) an underlying orangy-brown sand measuring 3 centimetres in thickness
- 3) a an underlying silt (70%) and sand (30%) loam and/or mixed interface, and
- 4) dish-shaped features filled with a greyish brown silt (50%) and sand (50%) loam.

The profile also contained 6 centimetres of topsoil and a Horotiu series subsoil. Features in the profile were only partially visible – it was not possible to determine the overall morphology of the features, or to distinguish whether they were natural or anthropogenic.

Test Pit 21

Test pit 21 was excavated 100 metres west of the milking shed. The pit contained a 20 cm topsoil overlying a Te Kowhai series subsoil. No archaeological deposit was present in the pit.

Test Pit 22

Test pit 22 was located adjacent to the investigation area's south-eastern boundary near Nukuhau Paa, and was excavated on the third (i.e. lowest) natural terrace. The pit had a distinct profile; two very gravelly layers were present under the topsoil. The first was a light greyish-brown layer measuring 14 centimetres in depth, while the second layer was 12 cm thick layer with a similar soil matrix and 10YR 2/1 (black) Munsell colour. The underlying greyish-yellow sand was 6 cm thick. The B horizon in this area consisted of the Te Kowhai series. It should be noted that a lot of natural sand and gravel was present within the pit, and it is possible that the gravel layers occurred naturally rather than representing made horticultural soils. Further investigation will be required in the area to determine the nature of these soils.

Summary

From the 15 monitored Geotechnical test pits, 8 contained Māori-made horticultural soils preserved to varying degrees of integrity. The best preserved and thickest archaeological soils were observed in test pits 4, 10, 19 and potentially 22. Test pits 6, 8 and 9 also contained well preserved horticultural soil layers ranging from 3 to 10 cm thick. Test pit 11, which also contained horticultural soils, exhibited extensive disturbance to the horticultural soil horizon

due to ploughing. The remaining test pits did not show any evidence of archaeological materials.

Geotech	Horticultural soils	Presence of modern disturbance	Neder
1 est pit	(Tamanere loam)	(prougning)	Notes
2	No	No	
4	Yes	No	Made soils well-preserved
6	Yes	No	
7	No	No	
8	Yes	No	
9	Yes	No	
10	Yes	No	Disturbance cutting B-horizon
11	Yes	Yes	Very disturbed made soil
13	No	No	
14	No	Yes	
16	No	No	
18	No	Yes	
			Potential dish-shaped features noted in
19	Yes	No	soil profile
21	No	Yes	
			Nature of gravelly soil not determined
22	Yes	No	- potentially natural in origin

Table 3: Nature and condition of archaeology within monitored test pits.

5. Assessment Of Archaeological Values

The following assessment addresses the archaeological values of the tracts of Māori horticultural sites (all characterized by Māori-made soils) within the Amberfield project area. It assesses the pre-European Māori horticultural sites against the Historic and Cultural heritage assessment criteria in Table 10-1 of the *Waikato Regional Policy Statement*. The sites have been assessed together, as they are of the same type.

Archaeological o	qualities
Information	The sites will offer valuable information regarding Māori agricultural systems and associated archaeology, particularly within the context of the Tamahere and Peacockes' Road areas. The sites are likely to contain archaeological evidence associated with Māori-made garden soils and borrow pits, as well as potential sub-surface features which may yield information on Māori domestic settlement associated with the horticultural sites along with crop storage structures. This information can only be recovered by archaeological methods. Information value is affected by the condition of archaeological sites, which we know to be variable with part of some sites destroyed by activities such as sand quarrying and the construction of buildings with other parts adversely affected by modern cultivation. Nonetheless, fieldwork to date indicates that some parts of these site have received little modification. Specifically, systematic investigations will allow us to record the specific nature of these horticultural sites as elements of the Waikato Māori horticultural complex, which can then be cross-compared with other parts of the Waikato.
Research	The sites allow us to further address broader questions regarding diachronic settlement patterns in the Waikato, with particular regard to the intra and inter-site dynamics in this part of the basin. More specifically the identified sites have the potential to address archaeological research questions around the adaptation of tropical Polynesian horticulture to the temperate environment of New Zealand and the Waikato particularly. This includes the relationship of forest clearance and other land modification to the development of horticulture, particularly garden preparation. It will also provide radiocarbon dates that will allow the sites to be placed in the developing regional chronology, and paleoenvironmental information that will allow a more detailed picture of the vegetation history of the area before and after human settlement. The Waikato Horticultural Complex represents a specific series of adaptations to the broader Polynesian horticultural strategies, especially those that dominate in tropical Polynesia. This includes not only identification of the crops involved but also the techniques applied to ameliorate the effects of the cooler climate on the tropical cultigens migrated to New Zealand. These sites will be important for evaluating current understandings of pre-European horticultural strategies in the Waikato by allowing comparison of the

	results with the emerging understanding of the patterns and strategies identified at other sites.
Recognition or Protection	All archaeological sites are protected under the Heritage New Zealand/Pouhere Taonga Act and cannot be destroyed or modified without authority from heritage New Zealand. One of the sites within the development area, S14/176, is itemised on Schedule 8C Group 2 (Archaeological and Cultural Sites), Hamilton City Operative District Plan as A100. Schedule 8C: Group 2 Archaeological and Cultural Sites are identified areas where there is a higher potential for finding artefacts and archaeological sites. There are no additional controls in the Hamilton District Plan on these sites that are identified for information purposes only.
Architectural Q	ualities
Style or type	NA
Design	NA
Construction	NA
Designer or Builder	NA
Cultural Qualiti	ies
Sentiment	This is a matter for iwi to comment on.
Identity	This is a matter for iwi to comment on.
Amenity or Education	The opportunities for education or amenity are limited within the scope of the report. An area of Māori horticultural land (approximately 3000 m^2) is being proposed for reservation. Otherwise the results of mitigation investigations will permit information/interpretation of sites to be developed.
Historic Qualitie	es
Associative Value	Associated with the Māori settlement of the inland Waikato, in particular the Southern Hamilton/Tamahere area. The area has an indirect association to events that occurred at Nukuhau Paa with at least some of the horticultural sites likely to be associated with the paa. Equally, other thorticultural sites are likey to be associated with one or more of the paa located on the east bank of the Waikato River adjacent to the project area. Available information suggests that Nukuhau Paa can be related back to hapu/iwi such as Ngati Mahuta/Ruru, Ngati Maahanga and Ngati Raukawa. Although the paa lies just outside of the development area, it is

	part of the same archaeological landscape.
Historical Pattern	Identified horticultural sites are parts of an extensive pattern of paa and horticulture sites developed along the Waikato River by Māori since the mid-15 th century. The development area east of Peacockes Road is part of this broader pre-European settlement of the Hamilton Basin. Evidence to date shows that the horticultural system developed on the alluvium lining the Waikato river below Arapuni is among the most intensive in Polynesia and elsewhere in island Oceania.
Scientific Qualit	ies
Information	Investigations here will contribute to our understanding of settlement patterns along this part of the Waikato River, and the subsequent pre and post-European land-use history of the sites.
Potential – Scientific Research	Pre-European Māori horticultural sites form a major element of the archaeological landscape of the Hamilton Basin with the overall level of preservation within the development area classifiable as moderate to good. Refer to the research items in the Archaeological Qualities section of the criteria.
Technological Q	Jualities
Technical Achievement	The Māori horticultural sites within the development area represent the remains a very sophisticated level of technological achievement regarding the adaptation of techniques and cultigens developed for tropical environments, with specific regards to the techniques used for horticulture. Large borrow pits litter the landscape, and the alluvium quarried from these pits has been mixed with topsoil to facilitate improved growing conditions.

6. Assessment Of Effects On Archaeological Values And Recommendations

With the exception of the allocated reserve area, the development of the Amberfield will be extensive and relatively intensive with respect to the archaeological landscape within the project area. Therefore, the archaeological deposits represented by the identified archaeological sites S14/64, S14/176, S14/224, S14/318, S14/319, S14/475-S14/488 will be destroyed.

Because of the unique and non-renewable attributes of archaeological sites mitigation for the adverse effects will form the primary remedy.

This will take the following forms:

- 1. Identification of all archaeological sites. This process has been initiated through the archaeological survey described in this report. However, the sub-surface nature of archaeological sites means that there is potential for further archaeological deposits to be identified during the development phase. To accommodate this a discovery protocol will be developed in conjunction with the haapu, with manawhenua and with Heritage New Zealand.
- 2. A representative example of the Māori horticultural landscape has been proposed for exclusion from the development and protected within a reserve. A conservation plan consistent with the principles of ICOMOS and its relevant charters will be developed. Manawhenua will participate in the development of the conservation plan. Further description of the proposed reserve is presented in Section 6.1, below.
- 3. The principal form of mitigation will be thorough substantive archaeological investigation to record the archaeological deposits impacted. The nature and form of these will be determined by Heritage New Zealand through the statutory process prescribed by the Heritage New Zealand/Pouhere Taonga Act. (Note: An archaeological authority will be applied for from Heritage NZ.)
- 4. Cultural recognition will be expressed in place, trail and street names.
- 5. A series of interpretive records will be developed in conjunction with manawhenua. It is anticipated that these may take the form of interpretation panels, pou or other installations.

6.1 Proposed heritage reserve

While the location of this reserve has been chosen primarily on archaeological grounds the term Heritage reserve is preferred here because this area includes a range of values of which archaeology forms one of the core associations.

The proposed reserve is located on the lowest two river terraces, therefore directly overlooking the Waikato River. It also has good view lines up-river to nearby Nukuhau Paa. However, the primary reason for the selection of this area is that it includes a group of borrow

Amberfield: Assessment of Archaeological Values June 2018

pits within a typical landform and so represents a typical example of a pre-European horticultural landscape. The results from a geotechnical test pit within this area also show that from an archaeological perspective it is well preserved. The reserve area is also notable for presence of a bank of material lying on the edge of the upper of the two terraces that was deposited when the lahar generated by the last eruption of Taupō moved down the river gorge. More generally the upper terrace is part of the older Hinuera Formation and the lower terrace is alluvium deposited by the lahar event and which is called Taupo Pumice Alluvium.

The area of the proposed reserve is approximately 12,580 square metres (subject to final design and survey) and its location is shown in Figures 32 and 33.



Figure 31: Map showing the location of the proposed Heritage Reserve.



Figure 32: Map showing detail of the proposed reserve (pale blue outline). The red items indicate borrow pits and the yellow lines indicate the TPA lahar deposit.

7. Conclusions

The archaeological remains identified and therefore the archaeological values relevant to the Amberfield project all relate to Māori occupation. The sites identified are all sites of Māori horticultural activity and form typical elements of the Waikato Horticultural Complex, which is a distinctive technological adaptation to the problems of growing tropical cultigens in a temperate climate. Paa form the other mainstay of this archaeological landscape, and while there are a number surrounding the development area at what was a relatively high density none are directly affected by the development.

The nature of the development means that all but approximately 0.15% of the identified archaeological deposits will be destroyed. The remainder will be protected in a reserve.

The effect will, therefore, be adverse for the archaeological sites and the already significantly diminished local (southern Hamilton and Tamahere) archaeological landscape on a moderate level. The recommendations presented in section 6 of this report are designed to off-set/mitigate this in a manner consistent with the Peacockes Structure Plan's objectives and policies.

8. References

Bellwood P., 1971. Archaeological research at Lake Mangakaware, Waikato: A summary of results. *New Zealand Archaeological Association Newsletter* 14(3): 113-125.

Bellwood P., 1978. Archaeological research at Lake Mangakaware, Waikato, 1968-1970. *Otago University Studies in Prehistoric Anthropology vol. 12; NZ Archaeological Association Monograph 9.*

Bruce J. G., 1979. Soils of Hamilton City, North Island, New Zealand. New Zealand Soil Survey Report 31, New Zealand Soil Bureau, Department of Scientific and Industrial Research, Wellington.

Campbell M., Harris J., 2011. *The Taupiri Link, S14/158 and S14/198.* Report to N.Z. Historic Places Trust and N.Z. Transport Agency.

Campbell M., Hudson B., 2012. *The Thornton Road Pa* (*S15/66*) and the Swayne Road site (*S15/324*), Cambridge Section of the Waikato Expressway: Final report (HPA authority 2013/55). Report to NZ Historic Places Trust and NZ Transport Agency.

Cassells R., 1972a. Human ecology in the prehistoric Waikato. *Journal of the Polynesian Society*, vol 81, pp. 196-247.

Cassells R., 1972b. Locational analysis of prehistoric settlement in New Zealand. *Mankind*, vol. 8, pp.212-222.

Cassells R., 1972c. Prehistoric man and his environment. In D.H. Goodall (ed), *The Waikato, man and his environment*. Waikato Branch of the N.Z. Geographical Society.

Grange L.I., Taylor N.H., Sutherland C.F., Dixon J.K., Hodgson, L., Seelye F.T., Kidson E., Cranwell L.M., Smallfield P.W., 1939. Soils and agriculture of part of Waipa County. Bulletin 76, Department of Industrial and Scientific Research, Wellington.

Gumbley W., 2009. Assessment of archaeological values: Cambridge North Stage 2 rezoning (Plan Change 66). Report for Waipa District Council.

Gumbley W., Higham T.F.G., 2000. *Archaeological investigation of prehistoric garden complexes affected by the R1 & N1 arterial routes, Chartwell, Hamilton.* Report to N.Z. Historic Places Trust.

Gumbley W., Highham T.F.G., Lowe D.J., 2004. Prehistoric horticultural adaption of soils in the middle Waikato basin: Review and evidence from S14/201 and S14/185, Hamilton. *New Zealand Journal of Archaeology*, 25:5-30.

Gumbley W., Hoffmann A., 2013. *The archaeology of pre-European Māori horticulture at Hotoriu: The Investigations of S14/194 and S14/195*. Report to NZ Historic Places Trust and NZTA.

Gumbley, W. and Hutchinson, M. 2013. *Pre-European Māori Garden Sites in Waipa District: An assessment of the state of the resource.* Report for NZ Historic Places Trust.

Gumbley W., Hutchinson M., 2014. *Te Awa Cycleway – Cambridge to Velodrome: Archaeological investigations on S15/68, S15/668, S15/676, S15/680.* Report to Heritage NZ.

Gumbley W., Laumea L., 2017. Archaeological report for sites S15/639, S15/641 and S15/757, Lot 3 DPS 90315. Report to Heritage NZ.

Hoffmann A. 2011. Archaeological investigation of S14/222 (modified soils), Horotiu, Waikato: Final Report. Unpublished report for Northgate Industrial Park Ltd and N.Z. Historic Places Trust.

Hoffmann, A., 2012 Final report: Excavation of a part of S15/300, modified soils – investigation of the area destroyed by

Hoffmann, A., 2013. *Archaeological investigation of S14/221 (modified soils), Horotiu, Waikato: Final report.* Unpublished report for Northgate Industrial Park Ltd and N.Z. Historic Places Trust.

Jones P. T. H., Biggs B., 1995. *Nga iwi o Tainui: The traditional history of the Tainui people: nga koorero tuku iho a nga tupuna*. Auckland University Press, Auckland.

Kelly L.G., 1949. *Tainui: The story of Hoturoa and his descendants*. Polynesian Society, Wellington.

Lowe D.J. 2008. Guidebook for pre-conference North Island field trip A1, 'Ashes and issues', 28th-30th November, 2008: New Zealand Society of Soil Science, Australian Society of Soil Science, 4th Joint Soils Conference, Palmerston North, 1-5 December 2008.

Lowe D.J. 2010. Introduction to the landscapes and soils of the Hamilton Basin. In D.J. Lowe, V.E. Neall, M. Hedley, B. Clothier & A. Mackay (Eds.), Guidebook for preconference North Island New Zealand "Volcanoes to ocean" 26th-30th July, 2010, 19th World Congress of Soil Science: soil solutions for a changing world: Brisbane Australia 1-6 August 2010. (pp. 1.14-1.61). Palmerston North, New Zealand: New Zealand Society of Soil Science.

McCraw J. 2011. *The Wandering River: Landforms and geological history of the Hamilton Basin.* Geoscience Society of New Zealand, Guidebook 16.

McEwan, A., Williams, L., Mathews, J., Mathews, A., McMullin, M. and Puke, W. 2013. *Conservation Plan for Hamilton East Cemetery & Hamilton West Cemetery for Hamilton Park Cemetery, Hamilton City Council.* Unpublished report.

Norris H.C.M., 1956. Armed settlers: The story of the founding of Hamilton, New Zealand, 1864-1874. Paul's Book Arcade, Hamilton.

Peters K., 1971. Excavations at the Lake Mangakaware Site 1, N65/28. *New Zealand Archaeological Association Newsletter* 14(3): 126-140.

Phillips, F.L. 1995. Nga Tohu a Tainui: Landmarks of Tainui. Tohu Publishers, Otorohanga.

Prickett, N. 2016. Fortification of the New Zealand Wars. Report to the New Zealand Department of Conservation.



Shawcross W., 1968. The Ngaroto Site. *New Zealand Archaeological Association Newsletter* 11(1): 2-29.

Appendices (Site Records)



Printed by: warrengumbley

15/04/2018

SITE RECORD	HISTORY
-------------	---------

NZAA SITE NUMBER: S14/64

Site description

Updated 10/04/2018 (Field visit), submitted by warrengumbley , visited 07/03/2018 by Gumbley, Warren Grid reference (E1804508 / N5810653)

This site was originally recorded as a paa or urupaa on the basis of possible earthworks visible on an aerial photograph and located on a ridge (river terrace) forming the northern bank of Nukuhau Stm. Recently field inspection shows that the earthworks were a pair of borrow pits. This along with soil auger testing and excavation of test trenches in the paddocks to the north confirm that this is a Maori horticultural site including Maori-made soils (Tamahere loam).

Received

Updated 17/08/2017 (other), submitted by warrengumbley Grid reference (E1804626 / N5810637)

The original site record (by Edson, 1977) describes the site as located 300 m north-west of Nukuhau Pa, which places it within the application area. This is one many sites recorded by Edson through analysis of the historic aerial photographs available at the time and, like a number of sites recorded thoughout this project was not inspected. The next entry on the site record is by Morgan in 1986. This is a sparse record with the total information being: "Largely under bracken and gorse, the outline of one large ditch seems to [be] visible. Needs to be cleared before closer examination."

The grid reference given by Morgan places it at the mouth of the gully opposite Nukuhau (i.e. outside the project area) as shown in the NZAA site recording scheme. A more recent (2010) attempt by Keith was focused generally within the project area but no evidence of the site could be found. She did not visit the location indicated by the grid reference as this was not within the survey zone.

Because of the nature of the information on the site records, particularly the original it is a mystery about the origins of the information. Edson's entry describes the recording process as "aerial photographs inspection only" and refers to the aerial photographs 2169/24 and 25. While these images could not be found a review of a number of other aerial photographs of the area were examined (SN 107/D/3 (1938); SN 107/E/2 (1939); SN 266/832/51 (1943); SN 2053/A/4 (1967); SN 3569/A/3 (1972); SN 5479/G/34 (1979)). Of these the 1938 and 1939 photographs show linear features on the northern side of the gully mouth opposite Nukuhau Pa that appear to be remains of earthworks (ditches). By 1943 the same area had become sufficiently overgrown that these features were no longer clearly visible and the 1967 photograph shows the same area more overgrown. The 1972 aerial photograph shows the area less overgrown with traces of linear features again visible. Again by 1979 the area had become considerably more overgrown. It seems from the aerial photographic evidence that there is a pa on the north side of the gully in the location given by Morgan.

This leaves Edson's verbal location of the site as 300 m north-west of Nukuhau Pa to be explained. Examination of the same set of aerial photograph along with examination of recent lidar-derived hillshade imagery for this general location shows no evidence for earthwork remains indicative of pa. However, a pa symbol is shown in this location on NZ topographic maps of NZMS 260 and Topo50 series. Interestingly the symbol is absent from earlier topographic maps (e.g. NZMS 1, 1969 edition) suggesting that the location was picked up from Edson's record. In summary we can be confident that there is no pa 300 m north-west of Nukuhau Pa.

Updated: 03/08/2010 - Grid coordinates amended to E1804626 / N5810637. Note: coordinates are approximate only, pending future field checks and/or additional historical information.

Adjacent property visited in July 2010. Area in question is in open pasture and no surface evidence relating to the pa was observed. The original aids to location note that the pa was under scrub - this scrub area is located at approximately: E1804626 / N5810637.

No documentary information relating to a burial ground in this vicinity has been found to date. No visible evidence was noted from the adjacent property during July 2010.

Sian Keith (Opus International Consultants Ltd).

Condition of the site

Printed by: warrengumbley

15/04/2018

2 of 6

Updated 10/04/2018 (Field visit), submitted by warrengumbley , visited 07/03/2018 by Gumbley, Warren

The southern part of the site, adjacent to Nukuhau Stream has been planted in pine trees.

Updated 17/08/2017 (other), submitted by warrengumbley

Unknown - never visited. However, the site has been planted with pine trees.

Statement of condition

Updated: 12/04/2018, Visited: 07/03/2018 - Below surface - Surface evidence has been obliterated, however, there is likely to be subsurface material present. Note that this is different from a destroyed site.

Current land use:

Updated: 12/04/2018, Visited: 07/03/2018 - Grazing, Production forest Updated: 25/10/2017 - Production forest

Threats:

Updated: 12/04/2018, Visited: 07/03/2018 - Farming practices, Subdivision, Tree planting (other than forestry), Property development

Updated: 25/10/2017 - Farming practices, Tree planting (other than forestry)

Printed by: warrengumbley

15/04/2018 3 of 6

	Received
	PLANNING GUIDANCE
Amberfield: Assessment of Archaeologi	cal Valu 45 June 2018

SITE RECORD INVENTORY	NZAA SITE NUMBER: S14/64	

Supporting documentation held in ArchSite

NEW ZEALAND ARCHAEOLOGICAL ASSOCIATION SITE RECORD FORM	SITE NUMBER N65/94
Map name Hamilton Map edition NZMS 1 4th ed. Grid Reference 831420	SITE TYPE ?Pa and Burial ground
 Aids to relocation of site E283/00 Some 300m no: on the northern bank of the Nul and Stubbs Road. 	N542000 rth-west cf N65/1 (Nukuhau Pa), kuhau Stream and between the latter
2. State of site; possibility of damage or destruct	tion
To be ascertained.	
3. Description of site (NOTE: This section is to be a be prepared.)	completed ONLY if no separate Site Description Form is to be
4. Owner To be ascertained. Address	Tenant/Manager Address Attitude
 Owner To be ascertained. Address Attitude Methods and equipment used Aerial pho 	Tenant/Manager Address Attitude oto inspection only.
 4. Owner To be ascertained. Address Attitude 5. Methods and equipment used Aerial pho Photographs taken: Yes/No (Describe on Photo Date recorded February, 1977 	Tenant/Manager Address Attitude oto inspection only. tograph Record Form)
 Owner To be ascertained. Address Attitude Methods and equipment used Aerial pho Photographs taken: Yes/No (Describe on Photo Date recorded February, 1977 Aerial photograph or mosaic No. 2169/24 	Tenant/Manager Address Attitude oto inspection only. tograph Record Form) & 25 Site shows: Clearly/hadly/not-at-all
 Owner To be ascertained. Address Attitude Methods and equipment used Aerial pho Photographs taken: Yes/No (Describe on Phot Date recorded February, 1977 Aerial photograph or mosaic No. 2169/24 Reported by Address S. Edson, Waikato Art Museum, Box 937. Hamilton. 	Tenant/Manager Address Attitude oto inspection only. tograph Record Form) & 25 Site shows: Clearly/hadly/not-at-all Filekeeper WAIKATO ART MUSEUM

Printed by: warrengumbley

15/04/2018

4 of 6

NEW ZEALAND ARCHAEOLOGICAL ASSOCIATION SITE RECORD FORM (NZMS260) NZMS 260 map number NZMS 260 map name	NZAA METRIC SITE NUMBER DATE VISITED 10-2-86 SITE TYPE SITE NAME: MAORI OTHER
NZMS 260 map edition Easting	Northing 723
Grid References	
 Aids to relocation of site (attach a sketch map) 	
2. State of site and possible future damage	
 Description of site (Supply full details, history, local environn include a summary here) 	nent, references, sketches, etc. If extra sheets are attached,
	•
Largely under bracken and gorse, the outlivisible. Needs to be cleared before closer	ne of one large ditch seems to examination
4. Owner Ten Address Add	int/Manager ress
5. Nature of information (hearsay, brief or extended visit, etc.)	Visit
Photographs (reference numbers, and where they are held) Aerial photographs (reference numbers, and clarity of site)	
6. Reported by P.H.Morgan File Address c/o 13 Preston Ave Date Auckland 9	keeper
7. Key words	
8. New Zealand Register of Archaeological Sites (for office use) NZHPT Site Field Code	
Latitude S Longitude E	E
, Type of site	resent condition and future danger of destruction
Local environment today S	any with code
	ecurity code

Printed by: warrengumbley

15/04/2018 5 of 6

Yellow polygon shows the location and extent of S14/64.



Printed by: warrengumbley

15/04/2018 6 of 6



Printed by: warrengumbley

12/04/2018

1 of 4



SITE RECORD HISTORY	NZAA SITE NUMBER: S14/176
Site description	
Updated 10/04/2018 (Field visit), submitted by warrengumble Grid reference (E1804118 / N5812646)	y, visited 07/03/2018 by Gumbley, Warren
An area of Maori-made soils (Tamahere loam) defined followir borrow pits can be recognized on the ground surface.	ng soil auger testing and excavation of test trenches. Six to 8
Condition of the site	
Statement of condition	
Current land use:	
Threats:	

Printed by: warrengumbley

12/04/2018 2 of 4

SITE RECORD INVENTORY

,

,

.

.

NZAA SITE NUMBER: S14/176

Supporting documentation held in ArchSite

NEW ZEALAND	NZAA METRIC SITE NUMBER S14/176
AKUMAEULUGICAL ASSOCIATION	DATE VISITED 14 November 1997
SITE RECORD FORM	SITE TYPE Borrow pits and plaggen soil
NZMS260 map number S14 NZMS260 map name Hamilton	SITE NAME: MAORI
NZMS260 map edition	OTHER
1. Aids to relocation of site (attach a ske Site is located on a river terraces on the river side Raod.	tch map) of a sharp bend in Peacockes Road, NE of Peacockes
 State of site and possible future dama In pasture. Hard to assess state although any feature Residential subdivision planned. 	ge ures under plaggen soil are unlikely to be damaged.
3. Description of site (Supply full detail sketches, etc. If extra sheets are attack The parent soil appeared to be Horotiu Silt Loam	s, history, local environment, references, hed, include a summary here)
Five borrow pits were confidently identified identified. Plaggen soils were identified around the	in the area inspected and a sixth probable pit was al hese (Figure 1).
treat of the home or with the challow, and these	interpretation lines made often corring with the soil over
These produced consistent results in all cases; a mixed soil always extended below the base of approximately 40cm. The bottom of the mixed (marked * in Figure 1) has been re-excavated in p	A mixed soil including sand, 'B' horizon, charcoal. The of the surrounding unmodified 'B' horizon which w soil was not achieved in any case. One of the borrow p part by Mr Murray for refuse disposal.
Pach of the borrow pits was shallow and there These produced consistent results in all cases; <i>A</i> mixed soil always extended below the base of approximately 40cm. The bottom of the mixed (marked * in Figure 1) has been re-excavated in p Plaggen soils were defined by the inclusion of component), gravel, and charcoal with a depth of the plaggen soils. Plaggen soils occurred on: • the uppermost terrace adjacent to Peacockes F • below that terrace on the main flat, • on the lower terrace north of the main flat.	A mixed soil including sand, 'B' horizon, charcoal. The of the surrounding unmodified 'B' horizon which we soil was not achieved in any case. One of the borrow p part by Mr Murray for refuse disposal. of course sand (parent soil appears to have a fine sa '20-40cm. The charcoal was found througout the profile Road, (see attached plan.)
 Each of the borrow pits was shallow and there These produced consistent results in all cases; <i>i</i> mixed soil always extended below the base of approximately 40cm. The bottom of the mixed (marked * in Figure 1) has been re-excavated in p Plaggen soils were defined by the inclusion of component), gravel, and charcoal with a depth of the plaggen soils. Plaggen soils occurred on: the uppermost terrace adjacent to Peacockes F below that terrace on the main flat, on the lower terrace north of the main flat. 4. Owner R Murray Address Peacockes Rd RD 2. Hamilton 	A mixed soil including sand, 'B' horizon, charcoal. The surrounding unmodified 'B' horizon which we soil was not achieved in any case. One of the borrow p part by Mr Murray for refuse disposal. of course sand (parent soil appears to have a fine sa '20-40cm. The charcoal was found througout the profile Road, (see attached plan.) Tenant/Manager Address
 Each of the borrow pits was shallow and there these produced consistent results in all cases; a mixed soil always extended below the base of approximately 40cm. The bottom of the mixed (marked * in Figure 1) has been re-excavated in possible of the plaggen soils were defined by the inclusion of component), gravel, and charcoal with a depth of the plaggen soils. Plaggen soils occurred on: the uppermost terrace adjacent to Peacockes Fe below that terrace on the main flat, on the lower terrace north of the main flat. 4. Owner R Murray Address Peacockes Rd RD 2, Hamilton 5. Nature of information (hearsay, brief or extended visit, etc.) Photographs (reference numbers and where they are held) Aerial photographs (reference numbers and clarity of site) 	Interpretation was made after comparing with the soft add A mixed soil including sand, 'B' horizon (charcoal. T of the surrounding unmodified 'B' horizon which w soil was not achieved in any case. One of the borrow p part by Mr Murray for refuse disposal. of course sand (parent soil appears to have a fine sa '20-40cm. The charcoal was found througout the profile Road, (see attached plan.) Tenant/Manager Address Extended visit
 Bach of the borrow pits was shallow and there these produced consistent results in all cases; <i>A</i> mixed soil always extended below the base of approximately 40cm. The bottom of the mixed (marked * in Figure 1) has been re-excavated in possible of the plaggen soils. Plaggen soils courred on: the uppermost terrace adjacent to Peacockes Feedback below that terrace on the main flat. on the lower terrace north of the main flat. Owner R Murray Address Peacockes Rd RD 2, Hamilton Nature of information (hearsay, brief or extended visit, etc.) Photographs (reference numbers and where they are held) Aerial photographs (reference numbers and clarity of site) Reported by Warren Gumbley Address 42 Oaklea Lane RD 3 Hamilton 	Interpretation was made after comparing with the solit alignment of the solit alignment of the surrounding unmodified 'B' horizon which with we soil was not achieved in any case. One of the borrow private by Mr Murray for refuse disposal. of the surrounding unmodified 'B' horizon which we soil was not achieved in any case. One of the borrow private by Mr Murray for refuse disposal. of course sand (parent soil appears to have a fine sa '20-40cm. The charcoal was found througout the profile Road, (see attached plan.) Tenant/Manager Address Extended visit Filekeeper Owen Willnes . 10/1/98.
 Each of the borrow pits was shallow and there these produced consistent results in all cases; a mixed soil always extended below the base of approximately 40cm. The bottom of the mixed (marked * in Figure 1) has been re-excavated in portion of the plaggen soils were defined by the inclusion of component), gravel, and charcoal with a depth of the plaggen soils. Plaggen soils cocurred on: the uppermost terrace adjacent to Peacockes F below that terrace on the main flat, on the lower terrace north of the main flat. 4. Owner R Murray Address Peacockes Rd RD 2, Hamilton 5. Nature of information (hearsay, brief or extended visit, etc.) Photographs (reference numbers and where they are held) Aerial photographs (reference numbers and clarity of site) 6. Reported by Warren Gumbley Address 42 Oaklea Lane RD 3 Hamilton 7. Department of Conservation (for office CIT type of site 	Filekeeper Owen Willess Tenant/Manager Address Extended visit $10/1/98$.
 Each of the borrow pits was shallow and there these produced consistent results in all cases; a mixed soil always extended below the base of approximately 40cm. The bottom of the mixed (marked * in Figure 1) has been re-excavated in portion of the plaggen soils were defined by the inclusion of component), gravel, and charcoal with a depth of the plaggen soils. Plaggen soils cocurred on: the uppermost terrace adjacent to Peacockes Fe below that terrace on the main flat, on the lower terrace north of the main flat. 4. Owner R Murray Address Peacockes Rd RD 2, Hamilton 5. Nature of information (hearsay, brief or extended visit, etc.) Photographs (reference numbers and where they are held) Aerial photographs (reference numbers and where they are held) 6. Reported by Warren Gumbley Address 42 Oaklea Lane RD 3 Hamilton 7. Department of Conservation (for offic Liz Type of site 	Interpretation was made after comparing with the solit all solit

Printed by: warrengumbley

12/04/2018

3 of 4

	Received
	PLANNING GUIDANCE
Amberfield: Assessment of Archaeologi	cal Valu 45 June 2018

The purple-shaded polygon shows the identified extent of the made soils. There is evidence in aerial imagery for the site continuing west onto Lot 1 DPS 83083 and Lot 5 DPS 10393 between Peacockes Rd and the palaeochannel.



Printed by: warrengumbley

12/04/2018 4 of 4



Printed by: warrengumbley

12/04/2018 1 of 3

SITE RECORD HISTORY	NZAA SITE NUMBER: S14/224
Site description	
Updated 10/04/2018 (Field visit), submitted by warrengumbley , visited 07/03/2018 by Gumbley, Warren Grid reference (E1804260 / N5812187)	
An area of Maori-made soils (Tamahere loam) defined following soil auger testing and excavation of test trenches. 3 to 4 borrow pits can be recognized on the ground surface.	
Updated: 27/07/2010, Visited: 20/07/2010 - Four or more circular/oval depressions, identified through very limited hand- augur testing, consistent with borrow-pit soil profiles.	
Refer to:	
Keith, S. 2009. Unpublished Opus report.	
Condition of the site	
Statement of condition	
Updated: 27/07/2010, Visited: 20/07/2010 - Fair - Some intact features, but others may be unclear or damaged	
Current land use:	
Updated: 27/07/2010, Visited: 20/07/2010 - Grazing	
Threats:	
Updated: 27/07/2010 Visited: 20/07/2010 - Subdivision	

Printed by: warrengumbley

12/04/2018 2 of 3
SITE RECORD INVENTORY

NZAA SITE NUMBER: \$14/224

Supporting documentation held in ArchSite

Yellow polygon shows the location and extent of S14/224



Printed by: warrengumbley

NEW ZEALAND ARCHAEOLOGICAL ASSOCIATION



Printed by: warrengumbley

SITE RECORD HISTORY	NZAA SITE NUMBER: S14/318	
Site description		
Updated 10/04/2018 (Field visit), submitted by warrengumbley , visited 07/03/2018 by Gumbley, Warren Grid reference (E1804854 / N5811233)		
An area of Maori-made soils (Tamahere loam) defined following soil auger testing and excavation of test trenches. The site is located on 3 river terrace with the lower 2 on Taupo Pumice Alluvium and the upper part is Hinuera Formation. A number of borrow pits (at least 6) are identifiable on the ground surface and including some cut into the top of the river terrace escarpments. Testing identified at least two filled borrow pits invisible on the ground surface. The site covers 10.5 ha.		
Updated: 18/01/2014 - to follow		
Condition of the site		

Statement of condition

Current land use:

Threats:

Printed by: warrengumbley

SITE RECORD INVENTORY

NZAA SITE NUMBER: S14/318

Supporting documentation held in ArchSite

Yellow polygon shows the location and extent of S14/318.



Printed by: warrengumbley



Printed by: warrengumbley

12/04/2018

SITE RECORD HISTORY	NZAA SITE NUMBER: \$14/319	
Site description		
Updated 10/04/2018 (Field visit), submitted by warrengumbley, visited 07/03/2018 by Gumbley, Warren Grid reference (E1804490 / N5810980)		
An area of Maori-made soils (Tamahere loam) defined following soil auger testing and excavation of test trenches. Approximately 10 borrow pits are visible on the ground surface or on lidar-derived hillshade images. The south-eastern corner of the site has been destroyed by sand quarrying. The site covers 2.6 ha.		
Updated: 18/01/2014 - to follow		
Condition of the site		
Updated 10/04/2018 (Field visit), submitted by warrengumbley, visited 07/03/2018 by Gumbley, Warren		
The new milking shed has probably affected the site and sand quarrying has destroyed the SE corner of the site.		
Statement of condition		
Current land use:		
Threats:		

Printed by: warrengumbley

SITE RECORD INVENTORY

NZAA SITE NUMBER: \$14/319

Supporting documentation held in ArchSite

Yellow polygon shows the location and extent of S14/319.



Printed by: warrengumbley



Printed by: warrengumbley



SITE RECORD HISTORY	NZAA SITE NUMBER: S1	14/475
Site description		
Updated 10/04/2018 (Field visit), submitted by warrengumbley , visited 07/03/2018 by Gumbley, Warren Grid reference (E1804346 / N5812290)		
An area of Maori-made soils (Tamahere loam) defined following soil auger testing and excavation of test trenches. The site may extend further to the north along the ridge crest.		
Condition of the site		
Statement of condition		
Current land use:		
Threats:		

Printed by: warrengumbley

SITE RECORD INVENTORY

NZAA SITE NUMBER: S14/475

Supporting documentation held in ArchSite

Yellow polygon shows the location of S14/475.



Printed by: warrengumbley



Printed by: warrengumbley

SITE RECORD HISTORY

NZAA SITE NUMBER: S14/476

Site description

Updated 10/04/2018 (Field visit), submitted by warrengumbley , visited 07/03/2018 by Gumbley, Warren Grid reference (E1804420 / N5811890)

An area of Maori-made soils (Tamahere loam) defined following soil auger testing and excavation of test trenches. Approximately 25 borrow pits can be recognized on the ground surface. This is a large site covering 11.5 ha. An area of the site has been destroyed by a farm quarry active since at least the 1940s. Paddocks have been cultivated.

Condition of the site

Statement of condition

Current land use:

Threats:

Printed by: warrengumbley

SITE RECORD INVENTORY

NZAA SITE NUMBER: S14/476

Supporting documentation held in ArchSite

Yellow polygon shows the location and extent of S14/476.



Printed by: warrengumbley





Printed by: warrengumbley

12/04/2018

1 of 3

SITE RECORD HISTORY	NZAA SITE NUMBER: \$14/477	
Site description		
Updated 10/04/2018 (Field visit), submitted by warrengumbley , visited 07/03/2018 by Gumbley, Warren Grid reference (E1804719 / N5811700)		
An area of Maori-made soils (Tamahere loam) defined following soil auger testing and excavation of test trenches. The is small and constrained to the ridge top.		
Condition of the site		
Statement of condition		
Current land use:		
Threats:		

Printed by: warrengumbley

SITE RECORD INVENTORY

NZAA SITE NUMBER: S14/477

Supporting documentation held in ArchSite

Yellow polygon shows the location and extent of S14/477.



Printed by: warrengumbley



Printed by: warrengumbley



SITE RECORD HISTORY	NZAA SITE NUMBER: S14/478	
Site description		
Updated 10/04/2018 (Field visit), submitted by warrengumbley , visited 07/03/2018 by Gumbley, Warren Grid reference (E1804870 / N5811535)		
An area of Maori-made soils (Tamahere loam) defined following soil auger testing and excavation of test trenches. The site contains two borrow pits visible on the ground surface.		
Condition of the site		
Statement of condition		
Current land use:		
Threats:		

Printed by: warrengumbley

SITE RECORD INVENTORY

NZAA SITE NUMBER: \$14/478

Supporting documentation held in ArchSite

Yellow polygon shows the determined extent and location of S14/478.



Printed by: warrengumbley



Printed by: warrengumbley



SITE RECORD HISTORY

NZAA SITE NUMBER: S14/479

Site description

Updated 10/04/2018 (Field visit), submitted by warrengumbley , visited 07/03/2018 by Gumbley, Warren Grid reference (E1804700 / N5811267)

An area of Maori-made soils (Tamahere loam) defined following soil auger testing and excavation of test trenches. The site lies on a flat area at the eastern toe of a high escarpment and west of a drain. Site may represent colluvial deposit from the Kirikiriroa soils on the slope above.

Condition of the site

Statement of condition

Current land use:

Threats:

Printed by: warrengumbley

SITE RECORD INVENTORY

NZAA SITE NUMBER: S14/479

Supporting documentation held in ArchSite

Yellow polygon shows the determined extent and location of S14/479.



Printed by: warrengumbley



Printed by: warrengumbley



SITE RECORD HISTORY	NZAA SITE NUMBER: \$14/480	
Site description		
Updated 10/04/2018 (Field visit), submitted by warrengumbley, visited 07/03/2018 by Gumbley, Warren Grid reference (E1804586 / N5810682)		
A small area (420 m2) of Maori-made soils (Tamahere loam) defined following soil auger testing and excavation of test trenches.		
Condition of the site		
Statement of condition		
Current land use:		
Threats:		

Printed by: warrengumbley

SITE RECORD INVENTORY

NZAA SITE NUMBER: \$14/480

Supporting documentation held in ArchSite

Yellow polygon shows the location and extent of S14/480.



Printed by: warrengumbley