Appendix J – Archaeological Assessment by Warren Gumbley Archaeologists

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Tamahere Country Club southern expansion: Archaeological survey and results

By Warren Gumbley **March 2023**

Introduction and background

Tamahere Country Club is proposing to expand the current site south to include Lot 1 DP 565970 (1.71 ha), Pt Lot 11 DP 9747 (3.5 ha), Lot 1 DPS 80372 (0.8 ha), Lot 1 DPS 59441 (1.1 ha). Figure 1 shows the areas examined as part of this assessment. This report follows earlier reports[1] assessing archaeological potential in earlier stages of the development of the Tamahere Country Club site. A site visit was undertaken on 15 March 2023.

[1] Gumbley, W., Laumea, M. 2018. Archaeological Appraisal for the Tamahere Country Club.
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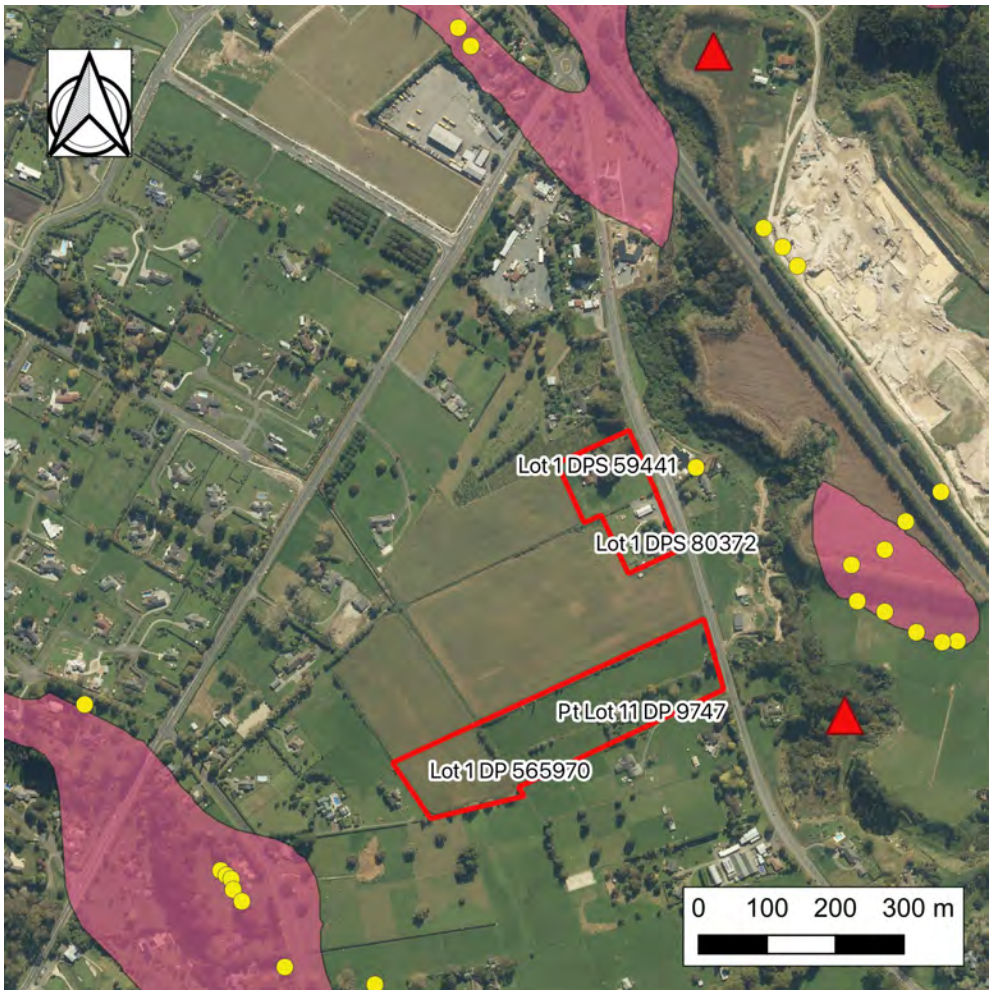


Figure 1: Map showing the potential development areas outlined in red. Pā are shown as red triangles, borrow pits as yellow dots and areas of Tamahere loam (Māori-made soils) as mapped by the Soil Bureau are shown as pink polygons.

Soil series are important predictors of the location of archaeological sites in the Middle Waikato Basin, particularly those associated with pre-European Māori horticultural practices. allophanic soils, Horotiu and Bruntwood Series loams, were subject to modification by Māori to create particular growing environments for kumara. These modified soils are classified as the Tamahere Series. The soil survey data indicates that Horotiu, Bruntwood and Te Kowhai Series loams are found in the various subject lots.

Figure 2: Map showing the distribution of soil series as mapped by NZ Soil Bureau (McLeod 1984). Yellow dots represent the locations of identified borrow pits. Most of these cluster east of the stream gully where Māori-made soils (Tamahere Series loam) was identified by the DSIR Soil Bureau (shown as a yellow polygon). A single borrow pit has been identified west of the gully at 63 Tamahere Drive.

As well as soil survey data borrow pits are a visible identifier for the presence of archaeology in their vicinity. Single borrow pit is visible in historic aerial photography and also in the 2008 WRC LiDAR data series close to one of the survey areas. This borrow pit is located at 63 Tamahere Drive.

Soil Survey

Method

The parcels were walked over and soil exposures were examined. This was augmented by occasional examination of the soil profile using a 20 mm screw-type soil auger.

Lot 1 DPS 565970

Lot 1 DPS 565970 was considered in an earlier report (Gumbley 2021). No evidence for archaeology was detected at that date. The area is currently being used as an area where workshops and materials are stored for the current development work.

Part Lot 11 DP 9747

Recent removal of pine tree grown for Christmas trees has meant that across large areas of Part Lot 11 DP9747 to topsoil was exposed and identifiable to soil series. In other area a soil auger was used to examine the soil profile.

Figure 3: Map showing the soil observation locations for Pt Lot 11 DPS 9747.

The soil information conformed closely to the soil mapping data. No evidence for archaeological deposits was noted.

Table 1: Soil analysis results from Pt Lot 11 DPS 9747.

Site	Examination method	Soil class/Observations
4054	Auger	Te Kowhai Series
4055	Surface observation	Te Kowhai Series
4056	Auger	Horotiu Series
4057	Auger	Horotiu Series

Lot 1 DPS 80372

Much of Lot 1 DPS 80372 has been developed for a house and to accommodate a large industrial building with associated gravelled parking and outdoor storage. Three auger sites were examined in the balance of the property where it was still grassed. No evidence of archaeology was identified and, once more, the soil auger evidence conformed closely with the Soil Bureau mapping data.

Figure 4: Map showing the soil observation locations for Lot 1 DPS 80372 and Lot 1 DPS 59441.

Table 2: Soil analysis results from Lot 1 DPS 80372.

Site	Examination method	Soil class/Observations
4059	Auger	Bruntwood Series
4060	Auger	Bruntwood Series
4061	Auger	Bruntwood Series

Lot 1 DPS 59441

Most of Lot 1 DPS 80372 is grass (mostly pasture) or gardens. One of the auger sites (4062) identified Bruntwood loam while all of the other auger sites (5) determined the parent soil was Horotiu loam. However, it was clear from the auger data and from surface observation of the exposed soil surface that the Horotiu loam had been substantially modified by the addition of substantial quantities of sand and fine gravel in manner typical of Māori-made soils (Tamahere Series). These made soils are identifier of archaeological deposits associated with the Waikato Horticultural Complex. This results in a topsoil heavily enriched with sand and gravel and consequently thickened. In this case the topsoil is thickened from a typical 20 cm to 30-35 cm.

Table 3: Soil analysis results from Lot 1 DPS 59441.

Site	Examination method	Soil class/Observations
4062	Auger	Bruntwood
4063	Auger	Māori-made soil (on Horotiu)
4064	Auger	Māori-made soil (on Horotiu)
4065	Surface observation	Sand and fine gravel dominant
4066	Auger	Māori-made soil (on Horotiu)
4067	Surface observation	Sand and gravel dominant
4068	Auger	Māori-made soil (on Horotiu)
4069	Auger	Māori-made soil (on Horotiu)

Figure 5: Images of a surface exposure adjacent to auger site 4063. Note the high proportion of sand and gravel exposed. The charcoal appears to result from a fire at this location.

Figure 6: Image of soil surface at location 4065 showing the density of sand and fine gravel at this site.

Figure 7: Image of soil surface at location 4067 showing the density of sand and fine gravel at this place.

Summary of Results

The only evidence for archaeological deposit was found in Lot 1 DPS 59441 (56 Tamahere Drive) where Māori-made soils were identified. This deposit is almost certainly associated with the borrow pits visible in the historic aerial photography and the 2008 WRC LiDAR data east of Tamahere Dr. and the west of the gully. It is possible that this deposit extends into the northern part of Lot 1 DPS 80372 (70 Tamahere Dr.) where the gravel surface has been laid. This deposit of Māori-made soils and the identified borrow pit have been recorded in the NZ Archaeological Association Site Recording Scheme as S14/504. It is possibke the archaeological deposits may extend into the northern margins 70 Tamahere Drive (Lot 1 DPS 80372) but the presence of the gravelled surface along with the large shed in this area meant that it was not possible to test this.

Archaeological Values

A detailed description of the general nature of archaeological deposits typical of the Waikato Horticultural Complex can be found in Appendix 1. The previously identified deposit of Māori-made agricultural soil found at 56 Tamahere Drive, S14/504, is a hitherto unidentified Māori horticultural site in the Tamahere area and it forms part of the extensive Waikato Horticultural Complex.

Tamahere is notable as a concentration of pā and tracts of Māori-made soil remote from the Waikato River. The preservation of the horticultural sites in this area is patchy as a result of the development of rural residential lot, the recent development of the Tamahere town centre

and the construction of the Waikato Expressway. Part of the U14/504, including the borrow pit have been affected by recent residential development along with earlier construction of Tamahere Drive. The part of the site within 56 Tamahere Drive (Lot 1 DPS 80372) is almost certainly the best preserved element of the site and is likely to be relatively well preserved based on the data recovered. In this sense the archaeological deposits have the potential to inform us about the nature of the horticultural systems employed at Tamahere and also the chronology of gardening here.

Conclusions

No archaeological deposits were found associated with Lot 1 DP 565970 (92 Tamahere Drive), Pt Lot 11 DP 9747 (82 Tamahere Drive), or Lot 1 DPS 80372 (70 Tamahere Drive), although in the last case this is subject to the caveat expressed above; that archaeological deposits may be present in the northern margins of the lot.

Archaeological deposits have been identified and recorded in the south-eastern part of Lot 1 DPS 59441 (56 Tamahere Drive) that are typical of the Waikato Horticultural Complex. As such these are protected by the provisions of the Heritage New Zealand Pouhere Taonga Act and may not be modified or destroyed without an authority from Heritage New Zealand.

Appendix 1: The Waikato Horticultural Complex: Pre-European Māori horticulture sites on the Waikato plains

By Warren Gumbley **2020**

In the Waikato pre-European Māori garden sites are identified by two defining features; the presence of borrow pits, 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 6 metres deep (archaeological investigations indicate they were typically 3–5 metres deep originally) and often 100-300 m^2. 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 & Lowe 1992).

Figure 1. Borrow pit (one of 34) at site S14/27 located at Tamahere. (photo: D Lowe).

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 hectares) based on the soil survey data available in 1958. Our analysis of the available soil survey data[2] 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.

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) (TH)[3]' or 'Tamahere gravelly sand (on Waikato soils) (THw)' (Bruce 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. This appears to have happened more commonly below Hamilton in areas where gardens expanded onto adjacent, poorer soils.

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 millimetres) of thin multiple tephra-fall deposits since the Hinuera alluvium finished accumulating.

The Waikato series soils have formed on 1800-year old course 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 2).

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 3).

[2] 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.

[3] Also sometimes annotated as Mh and Mw respectively.

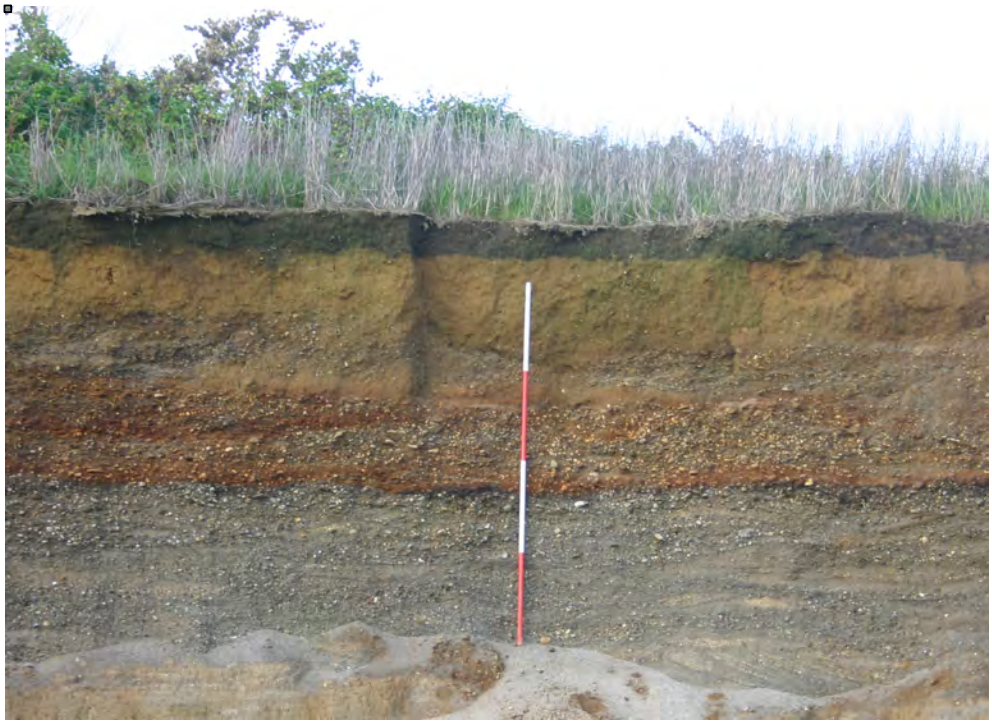


Figure 2. A photograph showing the upper horizons of Horotiu sandy loam. The upper 700-800 mm of yellowish-brown material is the accumulated volcanic tephra that overlies the Hinuera Formation alluvium. It is this alluvium that was quarried and added to the gardens. (Scale is 2 m.) (photo: W. Gumbley)

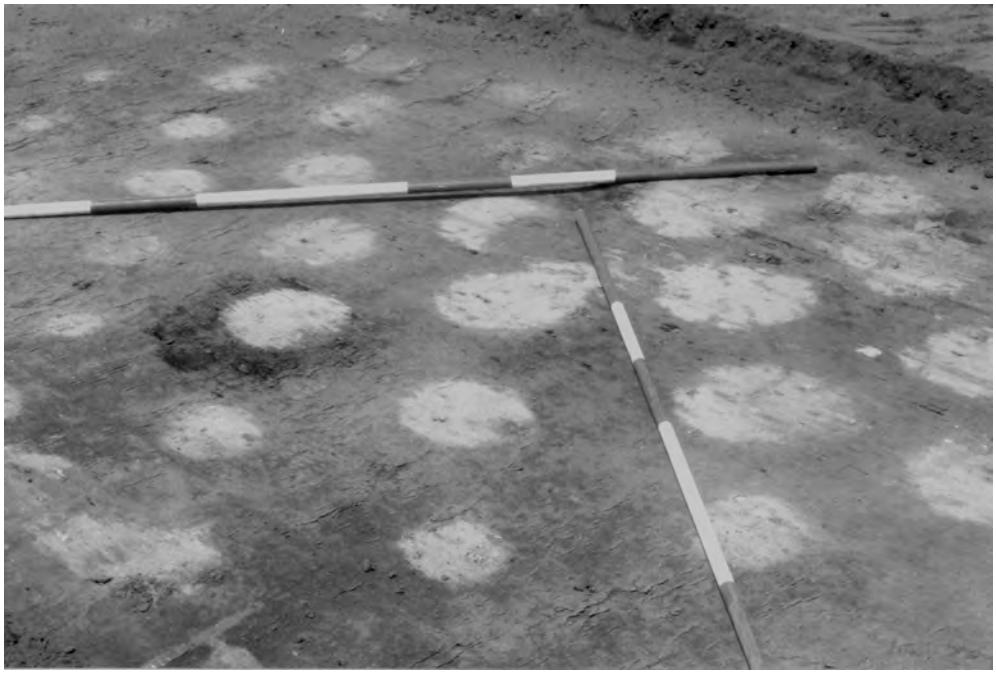


Figure 3. Photograph from S14/201 (Chartwell, Hamilton) showing the sand-filled bases of puke dug into the subsoil. (Scale intervals: 0.5 and 0.25 m.) (photo: Gumbley).

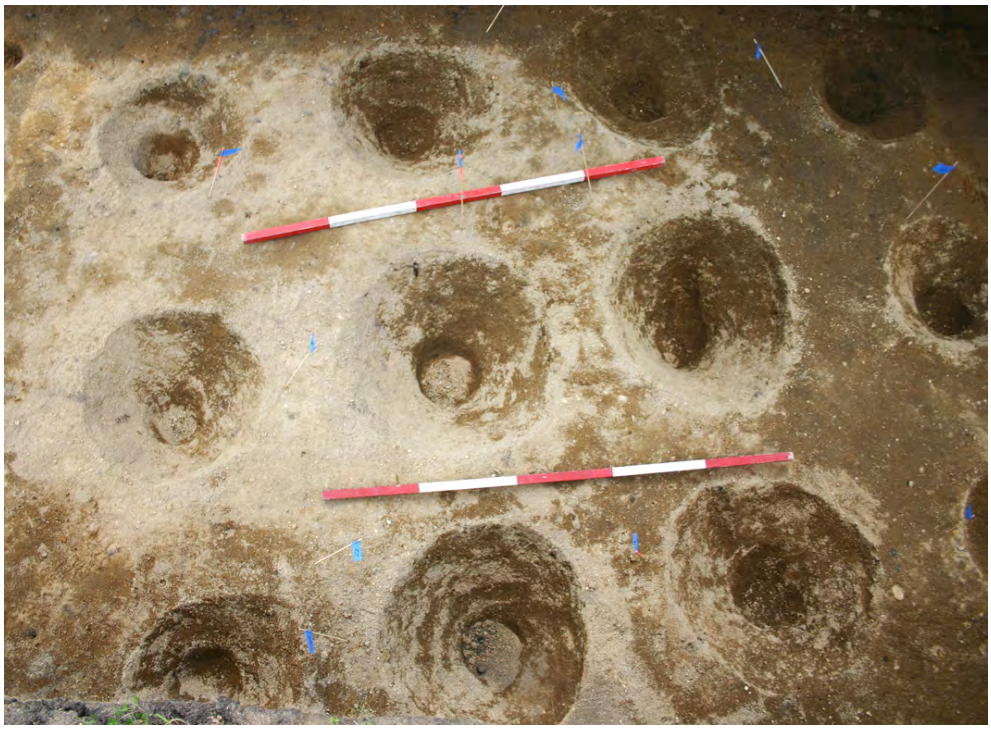
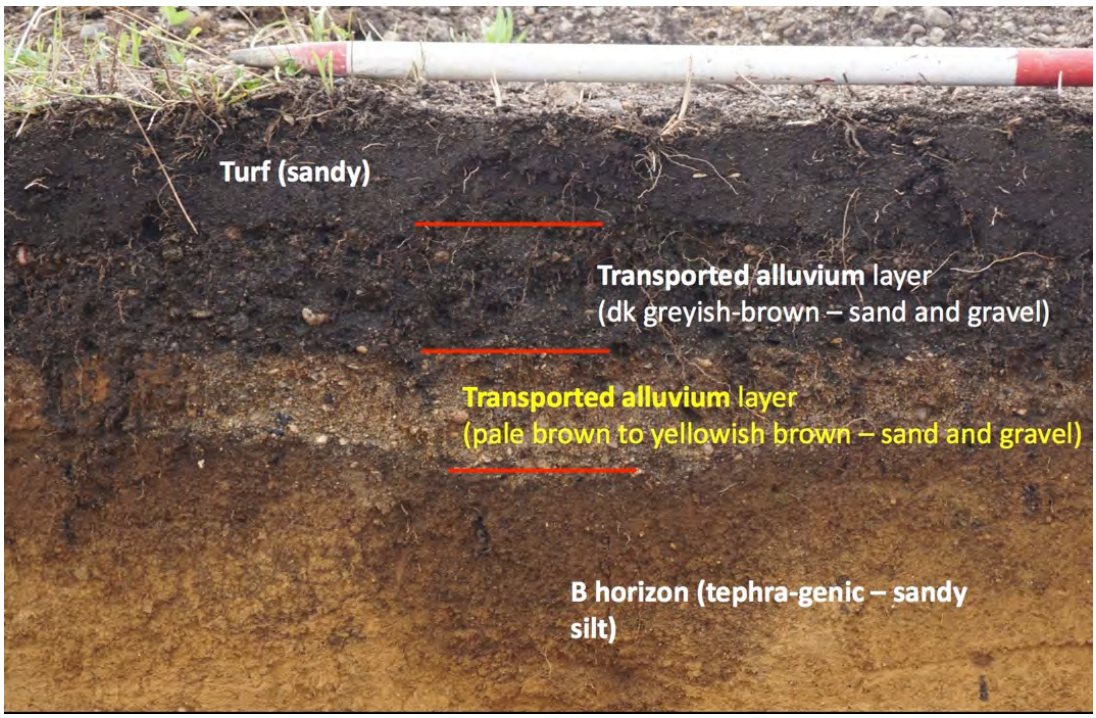


Figure 4. Photograph from S14/195 (Horotiu) showing bowl-shaped hollows forming bases for growing mounds, with the sand and gravel removed (Scales are 1 m.) (photo: Gumbley).

Archaeological investigations at an area of Tamahere soils and borrow pits (S14/201) at Chartwell in Hamilton (Gumbley & Higham 2000; Gumbley et al. 2004) revealed two adjacent areas where circular sand-filled bowls were identified at the topsoil-subsoil interface (Figure 3). 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 off-set 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 mounds 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 & Gainsford 2020a) S14/468 at Ngaruawahia (Gumbley and Gainsford 2018), at S14/164 (Simmons 2013) and S14/194 (Gumbley & Hoffmann 2013) at Horotiu, S15/465 (Gumbley & Laumea 2019) and at S14/248 (Keith 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, less convincingly, in Golden Bay (Barber 2004).

In a handful of sites, a distinct pattern in the upper soil horizon has been identified (S14/194, S15/424, S15/421[4]), 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 greyish-brown and includes organic material and, in terms of its particle size range, is well-sorted with a preponderance of material grading from medium sand size and finer. The middle unit is dark greyish-brown or black and includes organic matter (Figure 5). Texturally the middle unit is not sorted with a range of particle sizes represented up to coarse gravel. 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 (Figure 6). 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 tubers (of kumara?).



[4] Refer Gumbley & Hoffmann 2013 re S14/194; Gumbley et al 2018 re S15/421; Gumbley et al 2021 re S15/424.

Figure 5. An example of an unmodified Māori-made soil horizon.

Figure 6. Example of the dimpled interface found at S15/374 at Ngaruawahia, garden site located on Waikato series soil (Gumbley & Gainsford 2018).

As well as the identification of the bowl-shaped hollows, 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 microfossils[5] found in the fill of bowl-shaped hollows (BSHs) 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 possible yam starch grain was identified (Hoffmann 2011). Yam/uwhi, a

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

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.

While we now have an improving 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 can be improved substantially. 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 bowl-shaped hollows we can safely infer that the material quarried from borrow pits was deposited in the hollows after the soil had been removed. However, it is unclear whether the sand and gravel were used to form a mound. Volumetric analysis of the modified soils for S14/201 suggests this was possible (Gumbley et al. 2004) but without similar research from other sites this evidence is weak.

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 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), 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, time-consuming process and energy intensive 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 (possibly 1–2 years). 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 tephra deposit (B-horizon) had been removed. Then the material had to be carried to the plots and the plots laid out and mounds formed. Following this planting could occur, followed several months after by the harvest and construction of the kumara stores.

While even the development one garden was an energy intensive activity when we also consider there were over 3000 hectares of these gardens in the inland Waikato, we can gain some understanding of the importance of these sites for tangata whenua.

Features of the Waikato Horticultural Complex

The following provides a brief description of relevant feature types associated with the Waikato horticultural complex to contextualise results from this report. The base attributes and characteristics of different features are outlined to enable an understanding of how phenomena contribute to the formation and manifestation of horticultural site in the Waikato.

Borrow pits

Borrow pits are large and readily identifiable features in the landscape. The larger borrow pits can be up to 40 metres across and they are generally 3–4 metres deep. However, the larger ones can be over 5 metres deep. Essentially, they are quarries used to access alluvial sands and gravels in the underlying substrate utilised to make gardening soils. Medium to large borrow pits are commonly an aggregation of multiple 'shafts'. This process is also illustrated by the identification of borrow pits ~ 2 metres wide by ~ 2 metres deep as individual features[6]. These, presumably, are borrow pits in their 'youth'. Examples of quarries dug into river banks (S14/249) and into the toes of escarpment (S14/194) have also been found (Gumbley & Gainsford 2020b; Gumbley & Hoffmann 2013). Notably excavation of the sand and gravel substrate was accompanied by the immediate back-filling of the quarry shafts with a mixture of the unwanted tephritic material (re-worked B-horizon) and the sand and gravel substrate. This measure seems to have been employed to stabilise the pits from collapse and also demonstrates clearly that the fertile tephritic material was unwanted.

Bowl-shaped hollows (BSH)

The term 'bowl-shaped hollow' reflects the in-ground morphology of these features. The hollows are, typically, 25–40 centimetres in diameter and 20–30 centimetres deep. They are characteristically filled with sand and gravel alluvium quarried from the Hinuera Formation alluvium (C horizon). Occasionally the remains of digging stick (kō) marks can be found at their base, evident as a 'dimple'. BSHs are usually found in groups, laid out regularly in parallel rows, in either a grid or quincunx pattern. BSHs represent the remains of structures for the growing of individual plants. It is inferred that a mound was raised above, and in which the plants were grown.

Sand/gravel layers

These are extensive charcoal enriched layers of sand and gravel, 10–20 centimetres thick (Gumbley & Laumea 2017). This phenomenon presents as a topsoil enriched with transported

[6] S14/249, S14/195, S15/464, S15/641 and S15/757.

sand and gravel quarried from borrow pits which has also deepened the topsoil. Generally, these soils overlie a darkened B(w) horizon that sits on the principal sediments of the B-horizon. This B(w) horizon has been interpreted as buried topsoil (Grange et al 1939; Bruce 1978 & 1979). Charcoal is often found in the B(w) horizon, sometimes as obvious remains of charred root systems. In other instances, the B(w) is missing and the sand and gravel layer wholly covers the B-horizon.

When the sand and gravel layer is well-preserved the topsoil divides into three elements; the turf layer ~15 centimetres thick with well-sorted medium sand and finer material; a very dark greyish brown to black layer of coarse material ~15 centimetres thick; a pale brown layer of course material ~ 15 centimetres thick. The darkening of the upper element is believed to be a product of soil formation processes but anthropogenic causes cannot be excluded. The uppermost element is a recent soil horizon developed under pasture turf with bioturbation accounting for the well-sorted nature of the sediments.

Fireplaces and domestic activities

Cooking and other domestic activities are found associated with horticultural sites. Fireplaces, including well-formed umu (earth ovens used to cook hāngi), are found both within and on the periphery of horticulture sites. Postholes and storage pits are also clustered with these collections of fireplaces. These have been documented at a number of sites; S14/195, S14/249, S15/757, S15/423, S15/424 (Gumbley & Hoffmann 2013; Gumbley & Gainsford 2020b); Gumbley & Laumea 2017; Gumbley et al in prep; Potts 2019).

Drains

Features relating to garden drainage have been identified at three sites in the inland Waikato, S14/194 (Gumbley and Hoffmann 2013), S14/250 (Gumbley and Gainsford 2020c), S14/203 (Gumbley & Higham 1999). In each case these have been found around the peripheries of all otherwise dry horticultural sites. By this it is meant, that most of the associated horticulture had taken place on adjacent, slightly higher and well-drained soils, in particular Horotiu loam but also Bruntwood loam. In each case the drainage features were situated on poorly drained Te Kowhai silt loam. At each site the drains have been relatively shallow, narrow and generally dendritic in pattern, with smaller ‘limb’ channels feeding a ‘trunk’ unit carrying the collected water away to a nearby gully or waterway. Altogether, the patterns suggest ad hoc solutions to episodic problems rather than as a planned element of the original garden design.

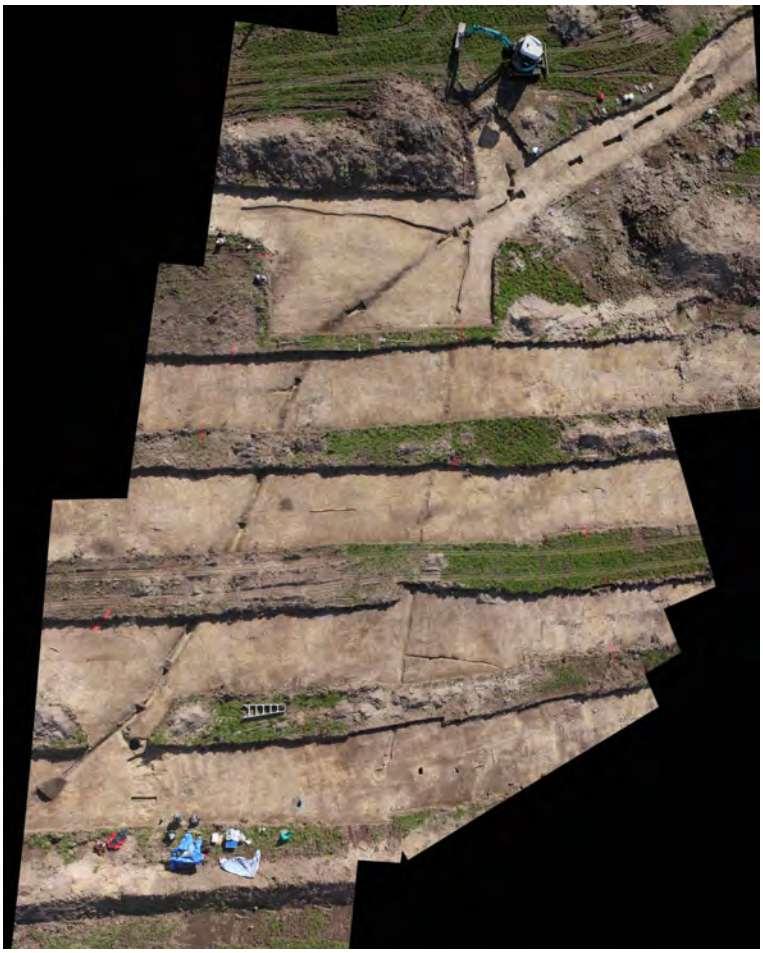


Figure 7: Drainage system identified at S14/250 (Taupiri) (Gumbley & Gainsford 2020c)

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