Archaeological Investigations, U14/1465, Florence Lane, Te Puna, Tauranga

report to
The New Zealand Historic Places Trust
and
Deep Creek Developments Ltd

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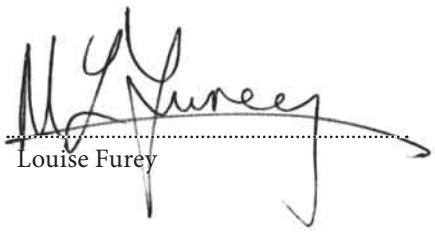
Prepared by: 
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Introduction

This report describes the archaeological investigations carried out in Florence Lane, Te Puna, Tauranga. Two midden/pit sites (U14/1465A & B) were investigated, and the surface was scraped in the vicinity of a third midden site (U14/3239) to expose any features present at the interface of the topsoil and sub-soil. The excavations were carried out on behalf of Deep Creek Developments Ltd.

An archaeological assessment (Furey 2005) prior to the subdivision of DPS68008 into five lifestyle blocks identified one previously recorded site, U14/1465, and recorded three new sites, U14/3239, U14/3240 and U14/3241. All were described as shell middens in the absence of any visible features.

Over most of the new lots there was to be minimal impact on the landscape. However the formation of the link road between the previously no-exit eastern and western parts of Florence Lane through a steep-sided, deep gully required the ridge on which U14/1465 was situated to be used for fill and as a base for the road. U14/3239 would also be destroyed through being within the road alignment. The New Zealand Historic Places Trust granted an authority to modify (2006/120) under section 14 of the Historic Places Act 1993, and the archaeological excavations took place in January 2006. Pirirakau, a hapu of Ngati Ringinui, whose rohe includes this area, gave their support for the project.

The development area, situated inland from the Wairoa River and Te Puna (Figure 1), straddles several geological formations: the northeastern edge of the Minden rhyolitic dome, the level fluvial terrace or plateau which extends from the base of the hills to the margins of the Tauranga Harbour, and on the northwest side of the unnamed creek is the Te Puna Ignimbrite. The coastal terraces of the Tauranga Basin tend to be flat to gently sloping land with steeper sided ridges trending N to NNE, ending in low coastal cliffs adjacent to the harbour (Briggs et al. 1996: 6). The terraces or plateaus are intersected by shallow valleys. However, further inland, the streams have cut down forming deep, steep sided and narrow valleys such as the one present in the Florence Lane development area.

The parent rock is mantled in a number of tephra, the last of which was deposited approximately 800 years ago. The most relevant are the Rotoehu Ash, a white shower bedded tephra typically between 300 and 500 mm deep, and the more recent post-Rotoehu tephras of which there may be up to 10 present. The most recent are the Taupo and Kaharoa tephras. Due to bioturbation and mixing of the relatively thin Holocene deposits it is difficult to distin-

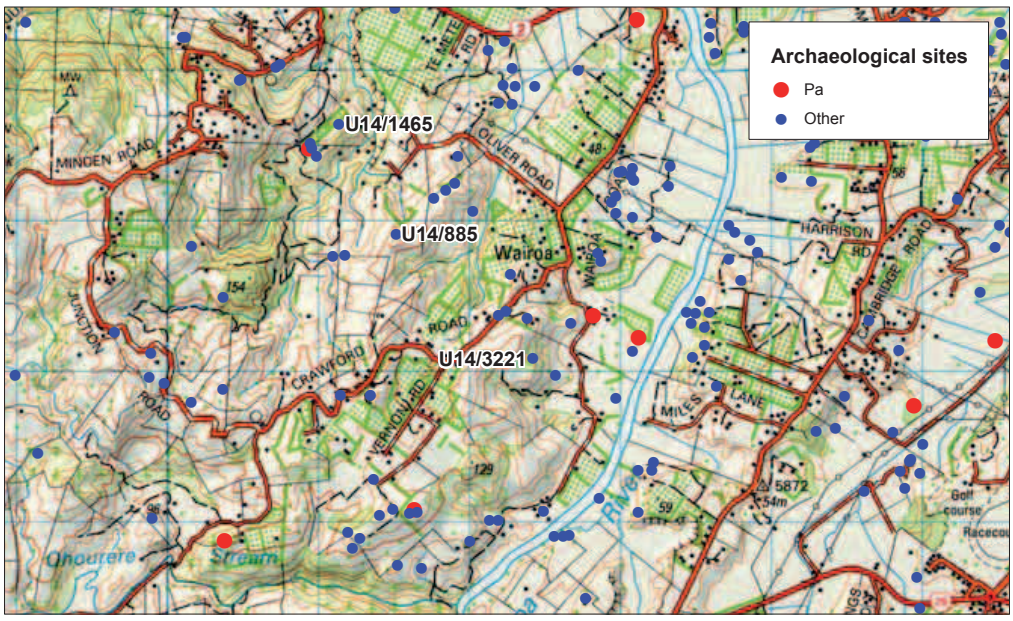

Figure 1. Location of the study area in the catchment of the Wairoa River.

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guish individual tephras (Briggs et al. 1996: 44). Although the underlying geology usually influences soil characteristics, in this case the deposition of tephras over all geological types has created similar conditions. Tephra soils are generally friable and fertile.

The unnamed creek which flows into the Wairoa River has the upper limit of tidal influence immediately downstream from the property. The stream would have been navigable by canoe for part of the way up its course, but probably not as far up as this area. The Wairoa River would be approximately a 2 km walk to the east across country, or a 3 km route via the stream to where it enters the Wairoa River.

Within the development block the rear of the fluvial terrace abutted the hill slopes of the Minden Rhyolitic Dome. A narrow steep-sided ridge, rising to 60 m contour, formed the southern boundary of the property. The toe of the ridge extended out onto the terrace in a low broad protuberance (Figure 2). The remainder of the north facing slopes in the block were of broken form and subjected to slumping and soil movement in the past. The fluvial terrace on the southern side of the stream was a relatively narrow margin at the base of the slope. The stream gully was approximately 20 m deep, with very steep sides.

Archaeological sites

U14/1465A was described in 1982 as an eroding midden on the eastern slope of the narrow ridge. The site was recorded as part of an archaeological site survey programme directed by Dr Bruce McFadgen, then archaeologist at New Zealand Historic Places Trust, to record archaeological sites in Tauranga County. The shell described was on the eastern slopes of the ridge below the highest point in the property. Adjacent to the fenceline on the highest part of the ridge there was an artificially flattened area measuring approximately 10 x 5 m, associated with shell midden. At a lower level on the ridge there was a possible terrace measuring 5 x 2 m with a possible pit depression. Probing with a stainless steel probe indicated there were "soft patches" in the subsoil where the probe met with little resistance as it was inserted into the ground. These were interpreted as likely to be the fill of kumara storage pits. Shell midden is also present on the broad toe of the ridge projecting out into the rear of the fluvial terrace. This area, designated U14/1465B, was also considered to have potential for investigation although a farm track and water trough had disturbed surface deposits.

Three other midden sites were located (Figure 2). Two (U14/3239 and U14/3240) were on the west side of the gully, with shell visible at the top of the slope to the stream. U14/3240 was to be protected and not excavated, while U14/3239 was in an area to be cut down to allow road access into the gully. The third site (U14/3241) was on the east side of the gully but had previously been disturbed and was not investigated further.

U14/3239

Located on the edge of the steep sided gully, this midden site had been partially disturbed by vegetation removal prior to the assessment. The grassed level land adjacent to the steep slope was stripped of topsoil with a mechanical excavator. The topsoil was found to be deep with none of the shell visible lower on the slope present. The depth of topsoil indicated repeated ploughing which had broken up and destroyed any shell present. No other archaeological features were present.

U14/1465A

The flat area at the highest point of the ridge was considered to have the highest potential for having a residential structure. The location of the site ensured that it had not been ploughed in the past, an unusual situation in the Tauranga area. Therefore the flat area was turfed by hand to ensure no features or artefacts were destroyed or displaced during exposure of the underlying deposits. The remainder of the area was opened up for excavation with a mechanical back hoe using a 1 m weed bucket, to maximise allocation of time and resources for excavation of features and recording.

The extent of the shell midden was uncovered, and the turf and recent topsoil stripped off to ensure all archaeological features were uncovered. The topsoil was a dark grey-brown friable soil 80–120 mm in depth over a yellow brown mottled tephra. This tephra layer was distinguished by brown mottles and small pieces of a cream coloured coarse tephra indicating disturbance of a deeper underlying tephra layer. Features were cut into the mottled yellow-brown tephra which was between 50–80 mm deep. This tephra layer can be interpreted as the culturally disturbed upper horizon of the natural, undifferentiated, yellow-brown tephra which was over 800 mm deep.

Features were allocated sequential numbers, and dimensions, fill type, colour and relationship to other features were recorded for each excavated feature. All features were also mapped by hand to a 1:50 scale map (Figure 3).

On removal of the remnant topsoil, shell midden and several firescoops were visible, as were several postholes. The majority of the features were on the narrow crest of the ridge which had a slight slope from south to north. The midden layer, consisting of whole and fragmented shell and occasional fire cracked rocks within a black loam matrix, extended over an area of 5.8 x 4.2 m and had several scoops dug into the surface of the shell. To the west of the midden layer was an area of black-stained, thin tephra soil which merged into the midden. It is likely that the black-stained tephra pre-dated the shell midden. The previously identified flat area on the western side of the turfed area was not

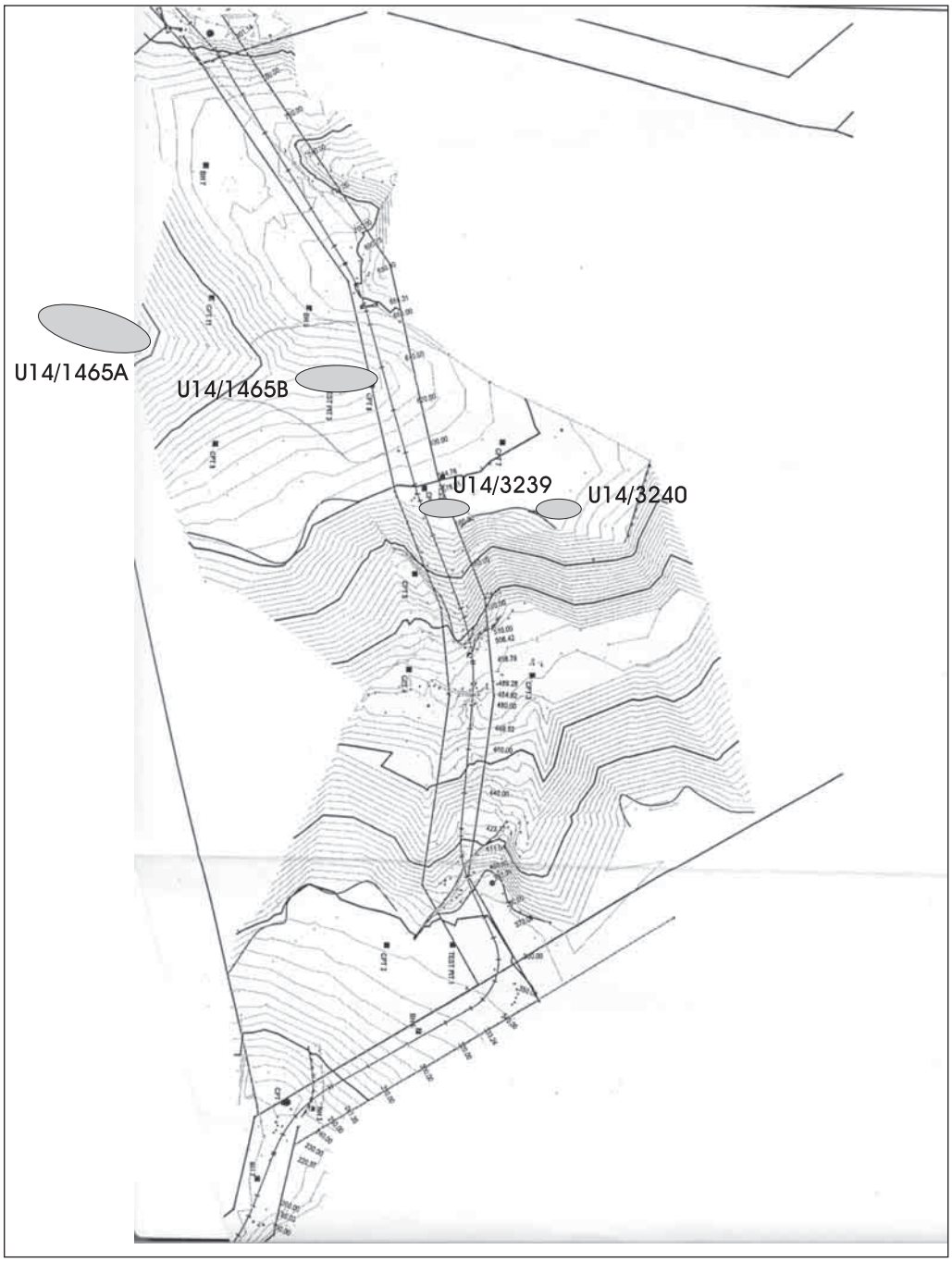

Figure 2. Contour map of development area showing archaeological sites. Based on map supplied by Apex Consultants, Tauranga.

level when the turf was removed, and was in fact, sloping. Several other individual firescoops and postholes were also apparent. Later, after rain and completion of the excavation, four infilled storage pits were visible on the eastern side of the excavated area that had not been visible when the exposed subsoil surface was dry. The superimposition of features indicates changing use of the site over time, or more likely, that more than one occupation is represented.

Firescoops 17, 18 and 51 were filled with a similar black loam with charcoal fragments, and may well have been the source of the black discolouration in this area. There was no shell in these firescoops, nor was there any in 9, 10 or 16, also firescoops, further to the west. See Appendix I for size and description of features excavated.

Within the black lens there were stakeholes and small postholes containing small fragments of shell midden (Features 12, 14, 15, 30 and 33). These were probably cut into the black lens. In contrast, Features 29, 20, 21, 32 and 36, filled with black loam, were only visible once the black lens had been removed. Similarly stakeholes 34 and 35

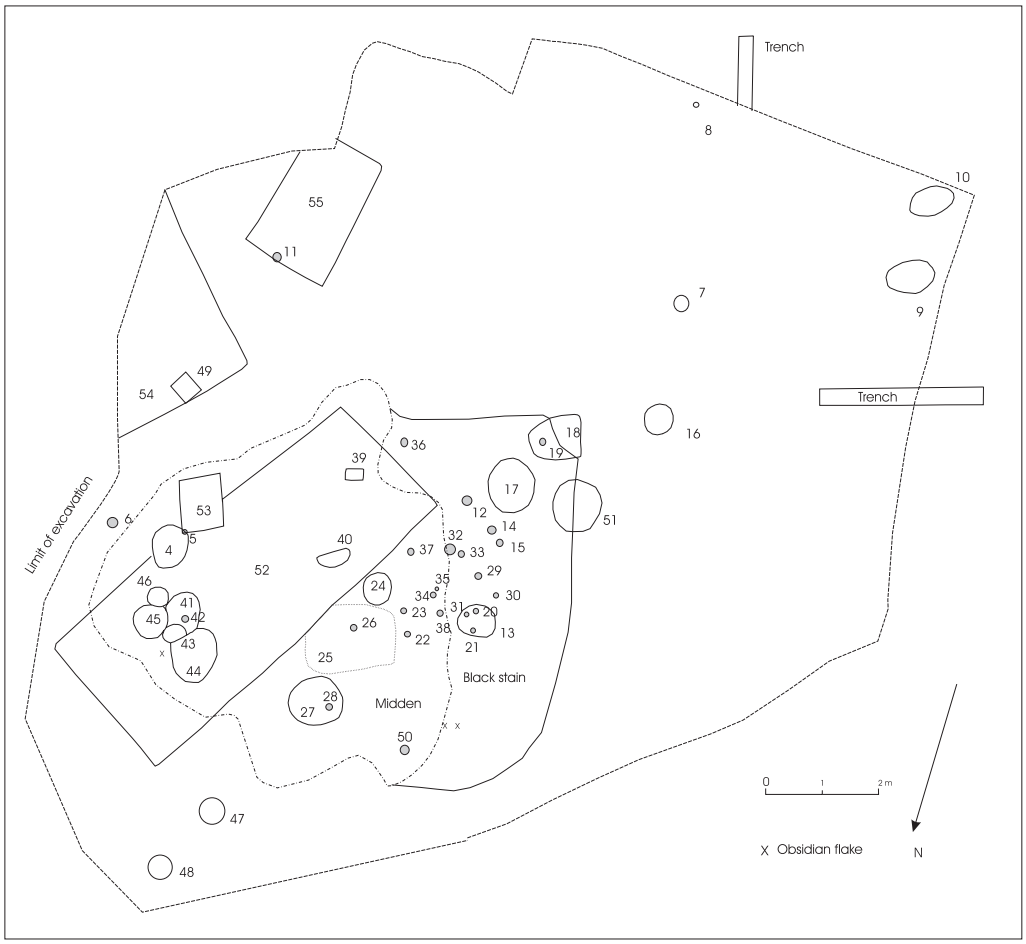

Figure 3. Features excavated, U14/1465A.

under the shell midden were filled with black loam. All these stakeholes are probably contemporary but no patterns can be made from their arrangement. Depths were shallow except for postholes 12 and 32 which were 480 and 500 mm respectively and would have been very stable (and have a greater degree of permanence than small shallowly inserted stakes). Postholes and stakeholes visible when the shell was removed were filled with black loam and fragments of shell. At least some of these pre-dated the midden: stakehole 28 was cut by firescoop 27 and only visible in the base of the scoop once the contents had been removed. Similarly 20, 21 and 31 were cut by firescoop 13. Within this area firescoop 39 was also before deposition of the midden and was only visible once the shell had been excavated.

To the eastern side of the excavation area six firescoops have been dug in a small area. Each was filled with shell in a black matrix. Posthole 42 is the earliest feature, having been cut by firescoop 41, which was in turn cut by 44 and 45. The relationship of firescoop 4 to this cluster of scoops is unknown, but it also is likely to be part of the same general activity of cooking shellfish and raking out the debris.

Miscellaneous features included Feature 49, a small so-called bin pit measuring 420 x 370 x 460 mm deep. This was the only bin pit found in the site, an unusual result for a site in the western Bay of Plenty area where pits of a range of sizes are found in large numbers.

Feature 25 is not an archaeological feature but was a hard semi-rectangular outline of natural yellow-brown tephra. It stood proud of the black discolouration under the midden deposit. At the time of excavation its purpose couldn't be explained as it appeared to be surrounded by a softer textured tephra of the same colour which was present over much of the excavated area. This in itself was not considered unusual as there is often variability in the upper horizon of the tephra layers caused by past vegetation disturbance. However on reflection and based on subsequent events, it is likely that this was the only remnant of the unmodified tephra and there are several unexcavated and undetected pit features adjacent.

While the excavations were in progress in January 2006 the weather conditions were very hot and dry. There had been no rain for some time prior, possibly up to 2-3 weeks. As a result the tephra sub-soil, with no organic material, dried out to a uniform pale colour, and freshly excavated

surfaces immediately turned loose and dusty. All visible features on this site had been excavated, the site scraped down on several occasions, and attention turned to U14/1465B at the toe of the spur. After several hours of rain one evening U14/1465A was checked for any other features which might have become visible with the moisture. Four rectangular pits were observed. Given the time constraints the pits were only investigated to the extent of determining size (where not under a spoil heap) and depth. None of the pits were fully or partially excavated to investigate the posthole pattern in the floor of the pit.

Feature 53 was the later of two pits: it had a fill of yellow-brown tephra, and on the surface there were charcoal flecks associated with the adjacent firescoops. This pit cut through the fill and wall of Pit 52 which had been filled with mottled yellow-brown tephra. Pit 52 was 6.55 x 2.75 x .95 m deep. The smaller Pit 53, which could be termed a bin, was 750 x 900 x 530 mm. Two other pits, 54 and 55, were further to the east. The dimensions of Pit 54 could not be obtained as the spoil heap was situated over part of the pit. Pit 55 was 1.80 x 1.45 x .68 m, and like the other pits was filled with a mottled yellow-brown, which with moisture was of a slightly darker colour than the surrounding soil.

Three obsidian flakes were found on the surface of the shell midden or the black layer, and three other flakes found in the wider area.

U14/1465B

This site was visible on the surface as fragmented shell midden exposed in a farm track which went across the toe of the spur. A water trough was immediately upslope of the track. There was no shell midden visible in the pugged and disturbed ground around the trough. The toe of the knoll is approximately 5 metres above the fluvial terrace abutting the hills (see Figure 2)

The flattish surface of the spur was excavated. A mechanical backhoe was used to remove the previously ploughed topsoil to a depth of between 150–180 mm over a 16 x 8 m area. Regularly spaced plough lines, on three different orientations, were evident as the topsoil was stripped off. A geotechnical test pit had disturbed part of the northern end of the site. Archaeological features were exposed on the bright yellow-brown subsoil at the base of the plough zone but the actual surface on which people had lived had been churned up into the undifferentiated ploughed soil horizon. There was a confined area of shell midden and postholes and several storage pits. There were also a number of irregularly shaped dark brown patches which, on excavation, did not turn into constructed features. It is assumed these resulted from vegetation disturbance.

The stakeholes were small and relatively shallow although the surface from which they had been dug was within the disturbed plough zone. Several had shell fragments within the fill, even where there was no overlying shell deposit. Stakeholes 60, 62 and 68, with similar shell fill, could be part of a structure as there is a linear arrangement. Other stakeholes in the same area had a grey yellow-brown, or soft brown fill. There were several postholes to the north of the storage pits and stakeholes 66 and 70 were dug into the fill of storage pits 75 and 88. There was however an absence of stakeholes in the vicinity of the shell midden.

Nine storage pits of varying sizes were uncovered (Figure 4 and Appendix 1). Due to shortage of time, and wet weather towards the end of the excavation period, only some pits were emptied of fill, or partially emptied in order to uncover the posthole arrangement in the floor of the pit. Pits 86, 91 and 92 predated the shell midden which was on the pit fill. Firescoops 80 and 85, and 74 were probably responsible for the bulk of the shell and rakeout debris. Scoop 74, utilizing the depression in the northern end of the partly infilled storage Pit 91, was the largest and con-

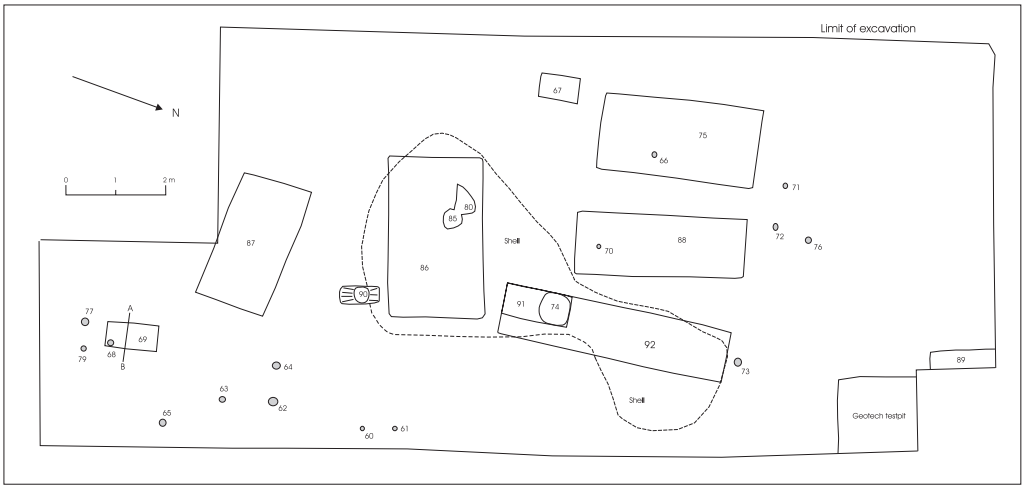

Figure 4. Features excavated, U14/1465B.

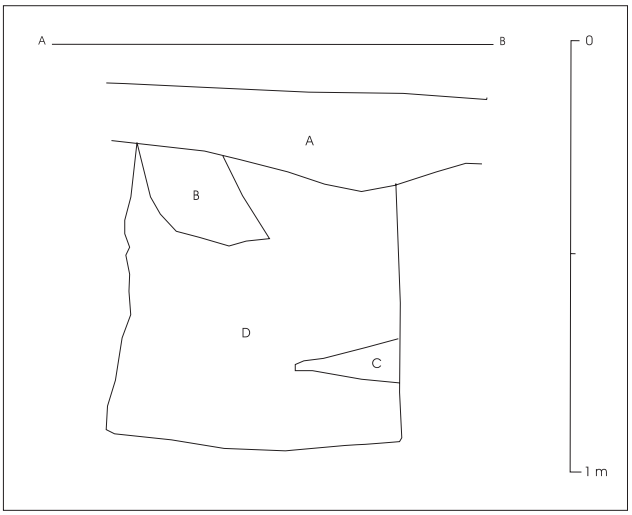

Figure 5. Cross-section through fill of Pit 69, U14/1465B. Fill layers are as described: A is grayish yellow-brown mottled; B yellow brown; c mottled yellow-brown; D dark brown loose loam with shell fragments. There are lenses of shell near the base of the pit fill.

tained fragmented shell and loam. Pit 91 was in turn cut into the southwest corner of Pit 92, only defined on the surface after rain as a darker rectangle of yellow-brown mottled fill against the yellow-brown subsoil. Pits 75, 86, 87 and 88 were filled with clean mottled fill, and backfilling probably occurred soon after the pits were no longer used for storage. In contrast Pit 67 was completely filled with clean shells with no soil matrix, and the fill of Pit 69 was a dark brown loam with several lenses of yellow-brown tephra, and lenses of shell near the pit floor (Figure 5). Pit 91 also had a lens of shell near the floor.

Pit 69 was completely excavated. A sump, 300 mm wide and 120 mm deep, extended across the width of the pit at the southern end. There were no postholes in the floor of the pit, nor were there any external to the pit which might have formed part of the roof structure. Pits 67 and 91 also had no postholes in the floor. The method of covering or weatherproofing these small pits, or bins as they are commonly called, is unknown and ploughing has destroyed the upper edges of the features.

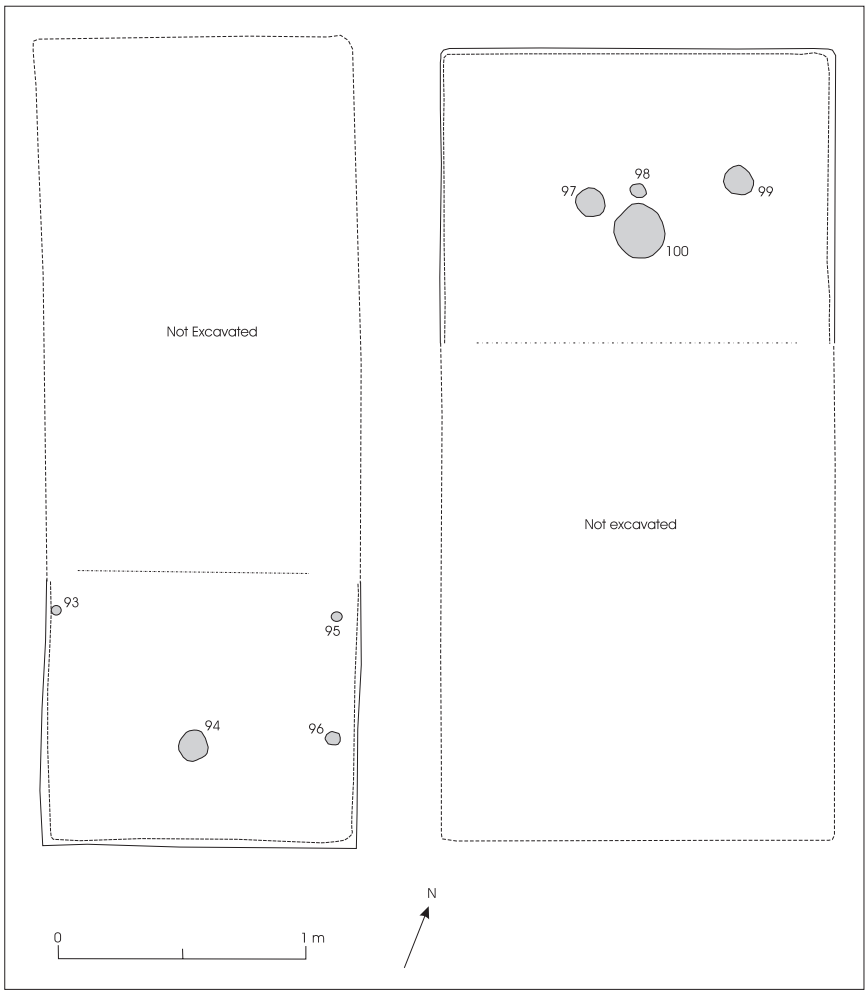

Figure 6. Plan of partly excavated storage pits showing the posthole pattern in the floor. Pit 88 is on the left, and 75 on the right.

Pits 75 and 88 were part excavated (Figure 6). The floor of Pit 75 had four postholes in the one-third excavated. The ridgepole of the roof was most likely held up by two or possibly three posts placed centrally through the pit. Posthole 100 would have been a roof support and was 450 mm deep. The remaining postholes (Features 97–99) are shallow and 100 mm or less deep. These probably supported a frame on which the kumara was placed. Pit 88 also had a centrally placed posthole (Feature 94) near one end which would have been part of the roof structure. This posthole was 170 mm deep. Three other stakeholes (Features 93, 95 and 96) between 5 and 14 mm deep were also probably part of a frame or rack arrangement within the pit.

Only three firescoops were located for this site: 74, 80/85 and 90. Each had fragmented and burnt shell in a dark matrix, with a small quantity of oven stones present. The firescoops were obviously used to cook the shellfish, and shells raked out and distributed around the area. It is likely that the firescoops were contemporary within one occupation of the site, and later than the pit storage.

Midden analysis

Shell samples for analysis were taken from the firescoops and from major midden deposits. Where possible, a 10 litre bucket of shell was collected to provide a consistent-sized sample for comparable results. Where there was a lesser quantity of shell available, approximately 2–3 litres of shell was collected.

Shells were washed, dried and sorted to species. Minimum numbers of shellfish were calculated by counting the number of bivalve hinges and dividing by two to get number of individuals. Gastropod whorls were counted to obtain minimum numbers. *Austrovenus stutchburyi* (cockle) and *Paphies australis* (pipi) were the main species gathered, and are from a harbour mudflat environment. In four of the six samples pipi were present in greater numbers than cockle (Table 1). Other species were collected in such small numbers that their presence could be accidental. These species include *Turbo smaragdus* (cat's eye), *Cominella adspersa* (speckled whelk), and *Paphies subtriangulata* (tuatua). Other species such as *Zethalia zelandica* (wheel shell) and *Buccinulum vittatum* (lined whelk), *Maoricolpus roseus* (turret shell) and *Zeacumantus lutulentus* (horn shell) are considered not to have been deliberately gathered and eaten, but were gathered incidentally along with the main shellfish species of cockle and pipi. All shellfish with the exception of tuatua are found in harbour environments. Dead tuatua shells washed into the harbour from the ocean beach may have been collected from the pipi beds.

The shell midden at U14/1465A was generally highly fragmented and burnt, and analysis would have proved difficult. The quality of the shell midden also dictated the suitability of feature contents for radiocarbon dating.

Storage pits

In comparison to sites excavated adjacent to the coast, these sites have an unusually low number of pits. They are also not large in size (Figure 6 and Table 2), with none of the super-sized pits evident on other western Bay of Plenty sites present. Many sites seem to have one pit larger than all others and these two sites are no exception. Pit 92 on U14/1465B is longer than any other pits but narrow for its length at a ratio of 1:3.7. Pit 52 is the largest on U14/1465A. The relatively shallow depth of the pits can be accounted for by the plough zone: the original depth of the pits may have been up to 200 mm deeper. Unusually there are few small pits, commonly termed bin pits, which are under 1 x 1 m. Pits of this size occur more frequently on some sites than large pits. Their function is unknown but it is assumed they are for storage of a variety of food and non-food items.

		cockle	pipi	tuatua	cat's eye	whelk	other	rock
U14/1465A	F13	191	23		1	3	4	P
U14/1465B	F67	686	2629				2	P
	F74	154	336	3			3	P
	F74 10 cm	164	75					P
	F80	101	109				9	P
	Area B	35	58					P

Table 1. Shellfish MNI for each feature sampled.

U14/	Pit No.	Length x width (m)	Depth (m)
1465A	49	0.42 x 0.37	0.46
	52	6.55 x 2.75	0.95
	53	0.75 x 0.90	0.53
	54	>3.35 x >2.10	0.70
	55	>1.80 x 1.45	0.68
1465B	67	0.46 x 0.96	0.18
	69	1.13 x 0.55	0.75
	75	3.35 x 1.60	0.54
	86	3.40 x 1.90	0.70
	87	2.70 x 1.45	0.85
	88	3.60 x 1.25	0.40
	89	? x 1.05	
	91	1.30 x 0.67	0.79
	92	4.60 x 1.20	

Table 2. Pit dimensions U14/1465A and B

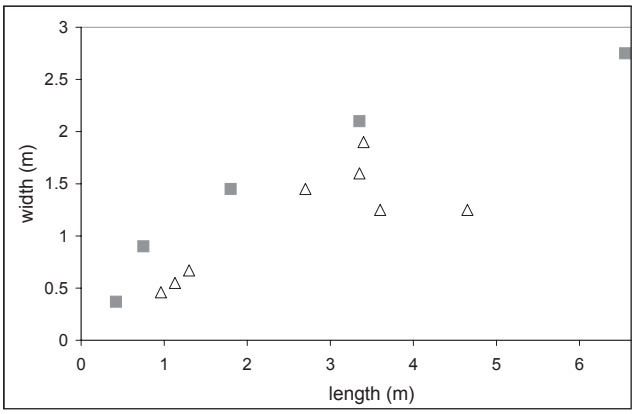

Figure 7. Pit dimensions of U14/1465A shown as squares, and U14/1465B shown as triangles. There is a spread of pit sizes in both sites, although neither site has a large number of small bin pits with less than 1 m dimensions.

Chronology

Two shell samples were submitted to the Radiocarbon Laboratory at the University of Waikato for dating. Pipi shells were used in each case. The sample from U14/1465A was from Feature 13, a firescoop. The shell is considered to be contemporary with the construction of the firescoop, and the adjacent firescoops and cooking area. A result of 714 ± 44 BP was obtained (Wk20987). Pipi shell from F74 on U14/1465B, also a firescoop, was also submitted. A result of 675 ± 41 BP was returned (Wk20988). The calibrated ages of both samples are set out in Table 3. The Radiocarbon Dating Laboratory's reports are appended to this report.

The calibrated age ranges indicate the probability that the shellfish sample died (i.e. was collected and eaten) within the calendar age range shown. The results cannot be interpreted that the site was occupied for the entire period: in fact the archaeological evidence on both sites suggest that each occupation was for a relatively short period of no more than a year, or two or three kumara harvesting seasons at most. Broadly speaking, the sites were occupied sometime between the mid 15th to mid 17th centuries.

Discussion

U14/1465A and B are typical of sites found in the Tauranga Basin although they are smaller than those generally found closer to the coast. Given their inland location, at the margin of different geological zones, the expectation was that the sites might reflect this in some way. Both sites are small in size, having four and nine pits respectively and an assortment of postholes and small cooking scoops. The limited range of features is a reflection of the small size of the sites, and the limited use to which they were put. Storage of kumara (and possibly other crops) is obviously

Lab. No.	CRA BP	cal AD 68.2%	cal AD 95.4%
Wk 20987	714 ± 44	1520–1650	1460–1690
Wk 20988	675 ± 41	1540–1680	1470–1760

Table 3. Summary of radiocarbon dates.

a major activity. The kumara would not have been carried far so it can be assumed the gardens were on the flat land in the vicinity of the sites. The limited evidence contrasts with excavated sites in the western Bay of Plenty area: sites near the coast at Lynley Park at Omokoroa (excavated by Furey, CFG Heritage report in preparation), U14/3283 (Furey & Hudson 2008), and Carmichael Block at Bethlehem (excavated by Don Prince, report in preparation); and sites further inland including at Oropi (Campbell 2004a, b), Waimapu (Furey 2004), Ohauiti (Campbell 2004c, 2005, Campbell and Harris 2007) and Ruahihi Pa further up the Wairoa River (McFadgen and Sheppard 1984). Each of these sites were larger, had more storage pits of varying size and shape, and had a greater range of occupation evidence.

Recorded sites in the immediate area are few in number. Further up the ridge from U14/1465 there are four midden sites (U14/1461–4); the ridge to the east, intersected by Oliver Road, has five recorded sites on the ridge crest (U14/670–1, 885–7); the ridge to the west also has four sites (U14/1467–70). The majority are middens although subsurface features may include storage pits. Pits are present on the ridge to the east of the development area. One of these sites (U14/885) has been investigated. Recorded as a pit and terrace site on a ridge crest at Walden Lane, the remaining intact part of the site was excavated by Phil Moore (2005). Seven storage pits, a terrace, cooking area and shell deposits were investigated. Two radiocarbon age determinations were obtained on pipi shell. At 95% probability, the sites were occupied sometime from mid-15th to early 17th. Another nearby investigation, U14/3221, was also on the hills overlooking the Wairoa River (Campbell 2008). Firescoops and shell midden were uncovered in various places along the ridge crest, but no pits were observed. A single radiocarbon age determination on pipi shell indicates that like the other sites in this area, occupation was within the period mid 15th to mid 17th centuries century.

U14/1465A has at least two separate periods of activity. The storage pits and some of the postholes can be assigned to the earlier occupation. The pits would have been in use for at least one season, i.e., dug prior to kumara harvest in March/April, and the crop stored and used over the next five to six months. Bin pit 53 which has been cut through the wall and fill of Pit 52 must have been used at a later time, and the midden over both pits suggests the site was either occupied for several sequential seasons with shifting of activity areas on an annual basis, or three separate

occupations are represented. The main activity area is the centre of the narrow ridgeline—the slope to the west had little evidence of occupation apart from several firescoops, but the trench placed through the slope deposits indicated that tephra soil, probably from pit digging, had been thrown out over the slope. There was no cultural debris such as shell or oven stones in these slope deposits which fits with the general evidence of the midden being later than the pits.

One of the difficulties in archaeology is in determining contemporaneity of features, particularly in these situations where ploughing has destroyed the upper levels of stratigraphy. Aligned pits are generally taken to indicate contemporaneous use, or pits with distinctive similar fills are likely to have been filled in at the same time. Using these assumptions, pits 75 and 88 with the same alignment are likely to be contemporary. Similarly pits 86 and 87, while not aligned with one another (or with 75 and 88), have the same type of fill consisting of yellow-brown subsoil and shell lenses. Features such as postholes and firescoops, and midden, over both pairs of pits suggest there may have been two or three uses of the site, and certainly over several seasons. Stakeholes are scattered to the east, on slightly sloping ground, separated from the midden deposit and firescoops which are likely to be contemporary with them. Although no patterns or alignments can be detected, these stakeholes probably anchored small temporary structures.

The sites can be interpreted as places where harvested kumara, grown in the immediate area, were stored. There is little evidence on U14/1465B of cooking – what is present is partly on the fill of storage pits but any earlier cooking associated with the pits was not found, nor were there any dumps of shell midden. U14/1465A had a defined area of cooking and midden rakeout, but again it was later than the infilled storage pits.

Both of these sites present similar evidence to other sites excavated in the Bay of Plenty, where disused storage pits are filled in relatively quickly after they ceased to be used for storage. There is no evidence of organic staining from collapsed or burnt roofs or roof support posts left in the ground. Although the pits were not fully excavated, the fill was generally indistinguishable in colour and texture from the surrounding natural subsoil, and without charcoal inclusions or debris associated with the occupation.

These sites, together with sites excavated in the wider area, suggest gardening and occupation in this area from the mid-to-late 15th century. A similarly early chronology from Oropi area near Welcome Bay (Campbell 2004a,b; Furey 2004), suggests that forest clearance and gardening well inland from the coastal margins was widespread in the western Bay of Plenty from this time.

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Site U14/	Feature	Feature type	Description	Dimensions mm	Association
1465A	1	Layer	Dark grey brown topsoil with crumb texture. 80–120 mm in depth		
1465A	2	Layer	Yellow brown mottled ash. Distinguished by brown mottles and small pieces of 'cream cake'. Between 50–80 mm depth, negligible in places. Features cut through this layer.		
1465A	3	Layer	Dark grey brown with shell surrounded by dark loam. Crushed cockle, pipi, fragment of ovenstone. Firescoops dug into midden and under midden. Depth to 100 mm.		
1465A	4	Firescoop	Filled with pipi, cockle, ovenstone fragments. Sloping sides. Posthole 5 filled with shell intersected the wall and earlier than scoop	80 x 90 x 18	
1465A	5	Posthole	Fill of shell midden and dark y-b loam	60 x 60 x 90	
1465A	6	Posthole	Fill of shell fragments and y-b loam	190 x 190 x 350	
1465A	7	Depression	Fill of dark y-b loam and one fragment of obsidian	280 x 200 x 90	
1465A	8	Posthole	Dark brown loam, soft	130 x 80 x 130	
1465A	9	Firescoop	Black loam, small fragments of charcoal. Sloping sides	540 x 470 x 110	
1465A	10	Firescoop	Dark y-b loam, fine charcoal. Concentration of oven stones 460 x 580 within shallow scoop 750 x 750, filled with grey-brown ash. On sloping ground.		
1465A	11	Posthole	Yellow brown ash, soft. Fill darker than surrounding soil	130 x 170 x 110	
1465A	12	Posthole	Dark y-b loam with fine shell fragments and one oven stone	160 x 170 x 480	
1465A	13	Firescoop	Dark brownish black loam with crushed shell midden and charcoal fragments. Within area of midden rakeout.		Cuts 20, 21
1465A	14	Posthole	Shell midden in dark y-b matrix.	90 x 90 x 120	
1465A	15	Posthole	Dark y-b matrix with shell fragments	80 x 100 x 130	
1465A	16	Firescoop	Dark brownish black loam, soft. Circular, sloping sides	460 x 570 x 80	
1465A	17	Firescoop	Irregular scoop filled with conc. Burnt shell, merging in with deep nutty, crumbly dark g-b loam which has flecks of shell throughout	600 x 600 x 100	
1465A	18	Firescoop	Black nutty loam with some shell and small oven stones. Irregular shape and base	950 x 750 x 180	Cuts 19
1465A	19	Posthole	Dark grey y-b with small shell flecks, soft	100 x 120 x 280	Cut by 18
1465A	20	Posthole	Black loam	60 x 60 x 60	Cut by 13
1465A	21	Posthole	Black loam	80 x 80 x 180	Cut by 13
1465A	22	Posthole	Grey y-b loam, with shell, soft texture.	130 x 90 x 160	
1465A	23	Posthole	Dark grey y-b, soft, with shell and ovenstones	130 x 120 x 200	
1465A	24	Firescoop	Dark grey to black loam with burnt shell. Scoop within midden rakeout area. Classic saucer shaped scoop	500 x 500 x 50	
1465A	25	Posthole	Y-b loam with shell fragments	150 x 130 x 150	

Site U14/	Feature	Feature type	Description	Dimensions mm	Association
1465A	27	Firescoop	Dark g-b with burnt shell. No charcoal	900 x 850 x 150	Cuts 28
1465A	28	Posthole	Shell. Found in base of scoop 27	70 x 80 x 90	Cut by 27
1465A	29	Posthole	Dark grey brown loam, soft	90 x 90 x 110.	
1465A	30	Posthole	Shell	70 x 50 x 60	
1465A	31	Posthole	Shell fragments	20 x 30 x 90	on edge of 13
1465A	32	Posthole	Shell fill on surface to depth of 200 mm then y-b black fill, hard in places over fine soft tephra with whole pipi and cockle	240 x 300 x 500	
1465A	33	Posthole	Shell	50 x 50 x 80	
1465A	34	Posthole	Shell over dark grey brown soft fill	110 x 90 x 120	
1465A	35	Posthole	Grey brown loose fill	50 x 50 x >100	
1465A	36	Posthole	Shell over dark grey brown fill	160 x 170 x 200	
1465A	37	Posthole	Shell	60 x 60 x 100	
1465A	38	Posthole	Shell	70 x 870 x 100	
1465A	39	Firescoop	Black loam. Predates shell midden and covered by midden	780 x 430 x 60	overlain by 3
1465A	40	Natural	Shell fragments. Probably a root hole	550 x 350 x 350	
1465A	41	Firescoop	Shell. Series of 5 intercut firescoops	450 x 600 x 100	Cuts 42, related to 43, 44, 45, 46
1465A	42	Posthole	Black loam, soft	140 x 120 x 110	Cut by 41
1465A	43	Firescoop	Shell and black loam and oven stones. One of a series of intercutting firescoops	580 x 430 x 120	
1465A	44	Firescoop	Shell and black loam, irregular base	500 x 460 x 120	Cuts 43
1465A	45	Firescoop	Shell and black loam.	400 x 300 x 60	Cut by 43
1465A	46	Firescoop	Shell	300 x 400 x 100	
1465A	47	Scoop	Black loam with shell. Shallow, flat bottomed	210 x 200 x 70	
1465A	48	Firescoop	Black loam. On slope	470 x 320 x 100	
1465A	49	Bin pit	Upper level of g-b ash to depth of 90 mm, over y-b soft ash with whole and fragmented shell scattered through	420 x 370 x 460	
1465A	50	Posthole	Grey y-b loam	160 x 120 x 420	
1465A	51	Firescoop	Black loam	850 x 900 x 120	
1465A	52	Pit	Mottled dark y-b fill, no shell	6550 x 2750 x 950	Cut by 4,5, 39–46,53
1465A	53	Pit	Mottled yellow brown fill, charcoal flecks on surface	750 x 900 x 530	Cuts 52
1465A	54	Pit	Mottled yellow brown fill, charcoal flecks on surface	>3350 x >2100 x 700	Cut by 49
1465A	55	Pit	Mottled y-b fill	>1800 x 1450 x 680	Cut by 11

Site U14/	Feature	Feature type	Description	Dimensions mm	Association
1465A	56	Layer	Present western side of site overlying features, grey-brown ashy loam. Possibly original topsoil.		
1465B	60	Posthole	Dark y-b loam, soft. A few shell fragments at the base	140 x 140 x 180	
1465B	61	Posthole	Grey y-b	100 x 100 x 80	
1465B	62	Posthole	Grey y-b, soft, a few shell fragments	160 x 170 x 300	
1465B	63	Posthole	Brown, soft	100 x 100 x 90	
1465B	64	Posthole	Brown, soft	180 x 100 x 360	
1465B	65	Posthole	Brown, soft	170 x 110 x 180	
1465B	66	Posthole	Mixed brown and y-b, soft	120 x 130 x 220	
1465B	67	Pit	Whole shell, Very little soil matrix. No burnt shell, no ovenstones	460 x 960 x 180	
1465B	68	Posthole	Black with shell	100 x 100 x 170	Cuts 69
1465B	69	Pit	Black with charcoal, shell and ovenstones. Capping of grey y-b mottled very mixed layer over top of pit and extending further out from sites. No posthole in floor or outside under mottled layer. Upper edge not vertical, sloping in for upper 30 cm. Sump 120 mm deep x 300 mm wide across one end of pit.	1130 x 550 x 750	Cut by 68
1465B	70	Posthole	Shell	100 x 100 x 120	
1465B	71	Posthole	Grey y-b, soft	90 x 120 x 130	
1465B	72	Posthole	Grey, y-b	90 x 90 x 100	
1465B	73	Posthole	grey y-b, with shell fragments	200 x 200 x 360	
1465B	74	Firescoop	Steep sided, fragmented midden and loam not visible on surface as a definite feature	900 x 800 x 400	Cuts 91
1465B	75	Pit	Y-b mottled, slightly darker than natural, difficult to find in plan view but evident in section. Top 200 mm of pit fill finer grey y-b, compact, then underneath a softer looser mixed y-b with lighter mottles onto level hard floor. Only 1/3 excavated.	3350 x 1600 x 540	81, 83, 84
1465B	76	Posthole	Grey y-b	40 x 40 x 95	
1465B	77	Posthole	mixed fill and shell fragments, post mould had small cockles in dark g-b post hole cut into yellow natural	110 x 110 x 240 (mould) 250 x 200 x 270 (hole)	
1465B	78	Posthole	Grey y-b, fine	170 x 170 x 120	
1465B	81	Posthole	Y-b, same as pit fill, soft. Central alignment in floor of pit. Top of ph wider than base, looks like post pulled out	250 x 250 x 460	75, 82, 83, 84
1465B	82	Posthole	Y-b same as pit fill	50 x 50 x 80	75, 81, 83, 84

Site U14/	Feature	Feature type	Description	Dimensions mm	Association
1465B	83	Posthole	Y-b, soft	50 x 50 x 90	75, 81, 82, 84
1465B	84	Posthole	y-b, soft	350 x 350 x 300	75, 81, 82, 83
1465B	85	Firescoop	Shell fragments and black loam. Dug into fill of pit 86	450 x 400 x 160	cuts 86
1465B	86	Pit	Lenses of shell, mottled y-b, large lumps of lighter colour. Darker mottling to 30 cm below scraped surface. Upper part of wall sloping inwards on western side (only small test trench dug so possibly not representative). Floor found in test pit. Posthole arrangement not known	3400 x 1900 x 700	Cut by 85
1465B	87	Pit	Mottled y-b with some shell lenses and black lenses, soft	2700 x 1450 x 850	
1465B	88	Pit	Y-b, upper 30 cm grey y-b with some black splodges on surface. Shell also on surface	3600 x 1250 x 400	
1465B	89	Pit	Orange brown mottled. Adze fragment found on fill surface. Not excavated.	1.05 x ?	
1465B	90	Firescoop	Black loam and concentrated crushed shell	450 x 600 x 350	Cuts 86
1465B	91	Pit	Y-b, surface stained black, shell lens (100 mm thick) in black 200 mm above floor, y-b clean fill below.	1300 x 670 x 790	cut by 74
1465B	92	Pit	Mottled y-b, slightly darker than surrounding sub-soil	4650 x 1250 x ?	cut by 74, 91
1465B	93	Posthole	Soft y-b fill in floor of pit 88	4 x 4 x 5	Floor pit
1465B	94	Posthole	Soft y-b fill in floor of pit 88	13 x 13 x 17	Floor pit
1465B	95	Posthole	Soft y-b fill in floor of pit 88	4 x 4 x 9	Floor pit
1465B	96	Posthole	Soft y-b fill in floor of pit 88	6 x 6 x 14	Floor pit
1465B	97	Posthole	Soft y-b fill in floor of pit 75	21 x 12 x 10	Floor pit
1465B	98	Posthole	Soft y-b fill in floor of pit 75	7 x 7 x 3	Floor pit
1465B	99	Posthole	Soft y-b fill in floor of pit 75	12 x 12 x 3	Floor pit
1465B	100	Posthole	Soft y-b fill in floor of pit 75	21 x 23 x 45	Floor pit

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Report on Radiocarbon Age Determination for Wk- 20987

Submitter	L Furey
Submitter's Code	U14/1465A F13
Site & Location	Te Puna, Tauranga, New Zealand
Sample Material	Austrovenus stutchburyi
Physical Pretreatment	Surfaces cleaned. Washed in an ultrasonic bath. Tested for recrystallization: aragonite.
Chemical Pretreatment	Sample acid washed using 2 M dil. HCl for 100 seconds, rinsed and dried.

$d^{14}C$	-35.2 ± 5.3	‰
$\delta^{13}C$	1.2 ± 0.2	‰
$D^{14}C$	-85.1 ± 5.0	‰
% Modern	91.5 ± 0.5	%

Result **714 ± 44 BP**

Comments

AG Hogg

14/5/07

- Result is *Conventional Age or % Modern* as per Stuiver and Polach, 1977, Radiocarbon 19, 355-363. This is based on the Libby half-life of 5568 yr with correction for isotopic fractionation applied. This age is normally quoted in publications and must include the appropriate error term and Wk number.
- Quoted errors are 1 standard deviation due to counting statistics multiplied by an experimentally determined Laboratory Error Multiplier of 1 .
- The isotopic fractionation, $\delta^{13}C$, is expressed as ‰ wrt PDB.
- Results are reported as *% Modern* when the conventional age is younger than 200 yr BP.

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Report on Radiocarbon Age Determination for Wk- 20988

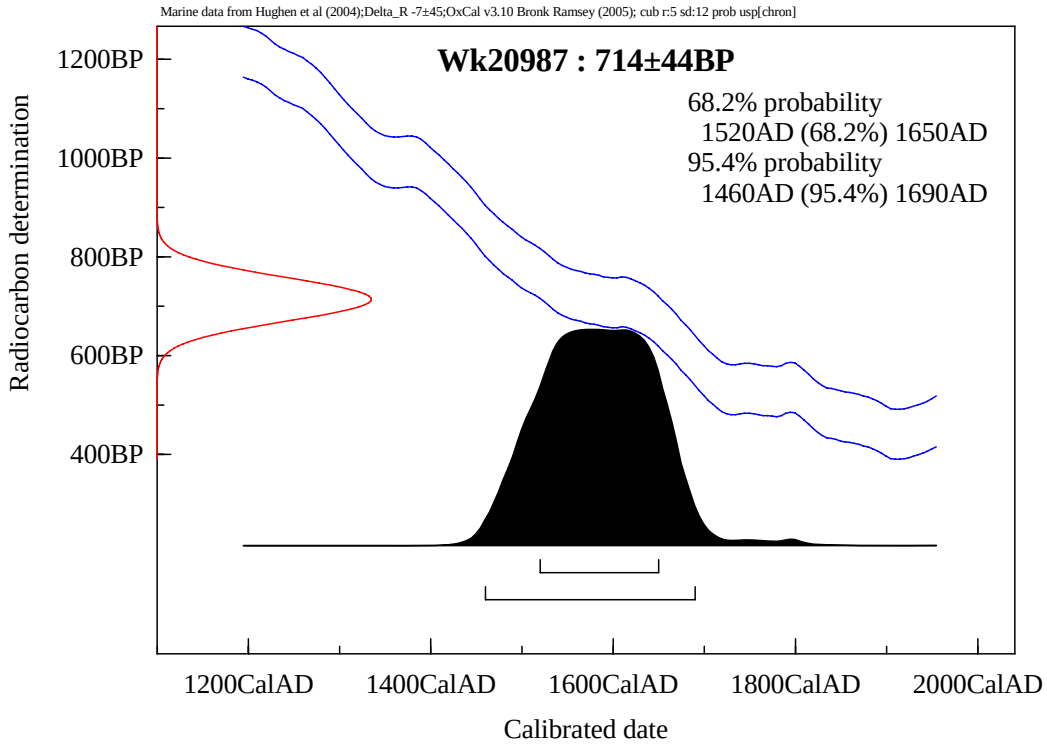
Submitter	L Furey
Submitter's Code	U14/1465B F74
Site & Location	Te Puna, Tauranga, New Zealand
Sample Material	Austrovenus stutchburyi
Physical Pretreatment	Surfaces cleaned. Washed in an ultrasonic bath. Tested for recrystallization: aragonite.
Chemical Pretreatment	Sample acid washed using 2 M dil. HCl for 100 seconds, rinsed and dried.

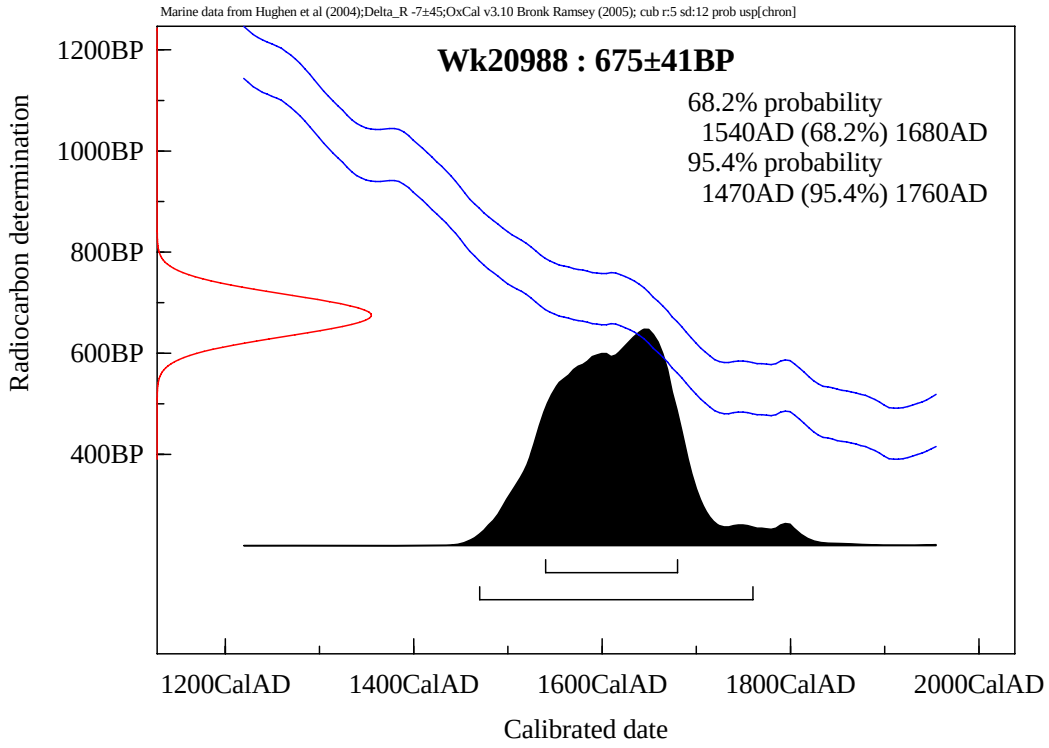
$d^{14}C$	-30.8 ± 4.9	‰
$\delta^{13}C$	1.1 ± 0.2	‰
$D^{14}C$	-80.6 ± 4.6	‰
% Modern	91.9 ± 0.5	%
Result	**675 ± 41 BP**	

Comments

14/5/07

- Result is *Conventional Age or % Modern* as per Stuiver and Polach, 1977, Radiocarbon 19, 355-363. This is based on the Libby half-life of 5568 yr with correction for isotopic fractionation applied. This age is normally quoted in publications and must include the appropriate error term and Wk number.
- Quoted errors are 1 standard deviation due to counting statistics multiplied by an experimentally determined Laboratory Error Multiplier of 1 .
- The isotopic fractionation, $\delta^{13}C$, is expressed as ‰ wrt PDB.
- Results are reported as *% Modern* when the conventional age is younger than 200 yr BP.


Marine data from Hughen et al (2004);Delta_R -7±45;OxCal v3.10 Bronk Ramsey (2005); cub r:5 sd:12 prob usp[chron]
Wk20987 : 714±44BP
68.2% probability
1520AD (68.2%) 1650AD
95.4% probability
1460AD (95.4%) 1690AD
Radiocarbon determination
1200BP
1000BP
800BP
600BP
400BP
1200CalAD
1400CalAD
1600CalAD
1800CalAD
2000CalAD
Calibrated date


Marine data from Hughen et al (2004);Delta_R -7±45;OxCal v3.10 Bronk Ramsey (2005); cub r:5 sd:12 prob usp[chron]
Wk20988 : 675±41BP
68.2% probability
1540AD (68.2%) 1680AD
95.4% probability
1470AD (95.4%) 1760AD
1200BP
1000BP
800BP
600BP
400BP
Radiocarbon determination
1200CalAD
1400CalAD
1600CalAD
1800CalAD
2000CalAD
Calibrated date