262 Omokoroa Road, Omokoroa: archaeological investigation of site U14/3525 (HNZPTA authority 2016/1139)

report to
Heritage New Zealand Pouhere Taonga
and
Abron Properties Ltd

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Date: 27 October 2017
Reference: 16-0707

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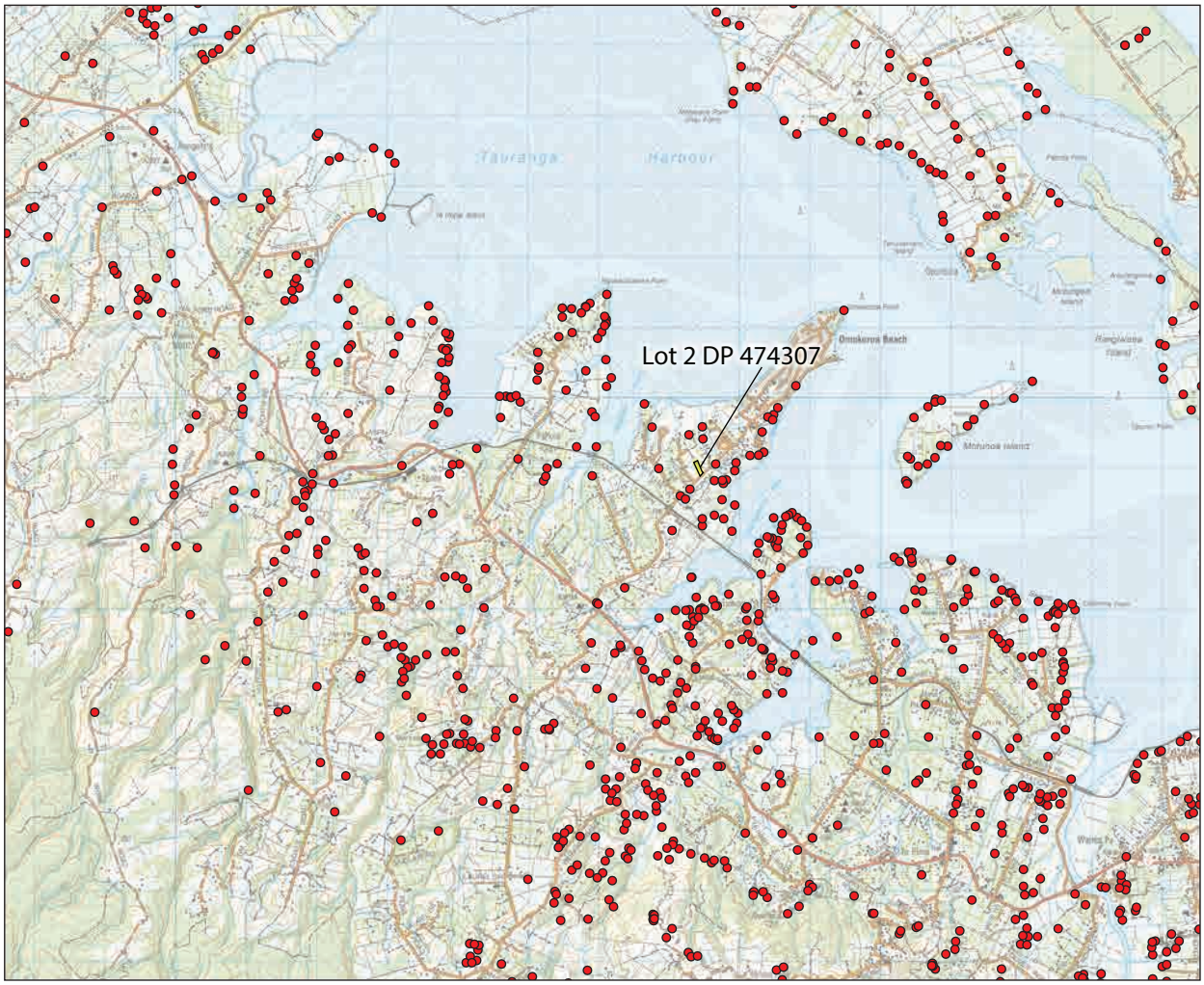
Danielle Trilford and Peter Holmes

Abron Properties Ltd are undertaking a residential subdivision at 262 Omokoroa Road, Omokoroa (Lot 2 DP 474307). The works involved stripping of topsoil and excavating service trenches. Omokoroa has a dense archaeological landscape of pre-European Maori sites. An archaeological authority was issued by Heritage New Zealand Pouhere Taonga (HNZPT) for the proposed earthworks (authority number 2016/1139). The works were monitored by Peter Holmes of CFG Heritage Ltd between 10 August 2016 and 3 February 2017. Carlton Bidois of Pirirakau was the iwi monitor. Fifteen archaeological features were exposed, mostly midden scatters, these are summarised in (Figure 1). These features have been recorded as site U14/3525 in the New Zealand Archaeological Association Site Recording Scheme.



1. Location of 262 Omokoroa Road (Lot 2 DP 474307) showing archaeological site U14/3525 and surrounding archaeological sites.

Background

The Omokoroa district is an example of an archaeological landscape comprising coastal pa sites on promontories jutting out into the harbour such as the Omokoroa Pa which was recorded at the tip of the peninsula. Apparently, these sites were once common around Tauranga Harbour. The area associated with these sites usually contains numerous shell middens, pits and garden soils (McFadgen 1980). Archaeological investigation of these features and their distribution provides further insight into the cultural history and settlement patterns of the area.

Traditional history

Ngamarama, the descendants of Toi (Te Tini o Toi), are said to be among the earliest people in the Bay of Plenty, which was soon to become the chief landing place of Polynesian settlers (Stoke 1980; Allen 1996). Other peoples followed them from the *Mataatua*, *Takitimu* and *Tainui* canoes around the mid-1300s and intermarried with Te Tini o Toi. The descendants of Ranginui, great- grandson of the captain of *Takitimu*, became the ancestor of Ngati Ranginui and Ngamarama, with the result that the former consolidated their claim to much of the coast land of the Tauranga Harbour, however Ngamarama retained their hold over coastal areas from Waihi to Omokoroa until they were displaced by the Ngatiranginui from the Hawkes Bay around 1530 (Stokes 1980; Allen 1996; Dinsdale 1959).

Around 1650 war broke out again in two directions. Ngaiterangi from the eastern Bay of Plenty attacked the great Ngati Arawa and Ngati Ranganui pa at Mt Maunganui. Additionally, Ngaiterangi continued to move west consolidating their conquest of the Tauranga Harbour with the construction of the Wai-Huri Pa on the Omokoroa peninsula.

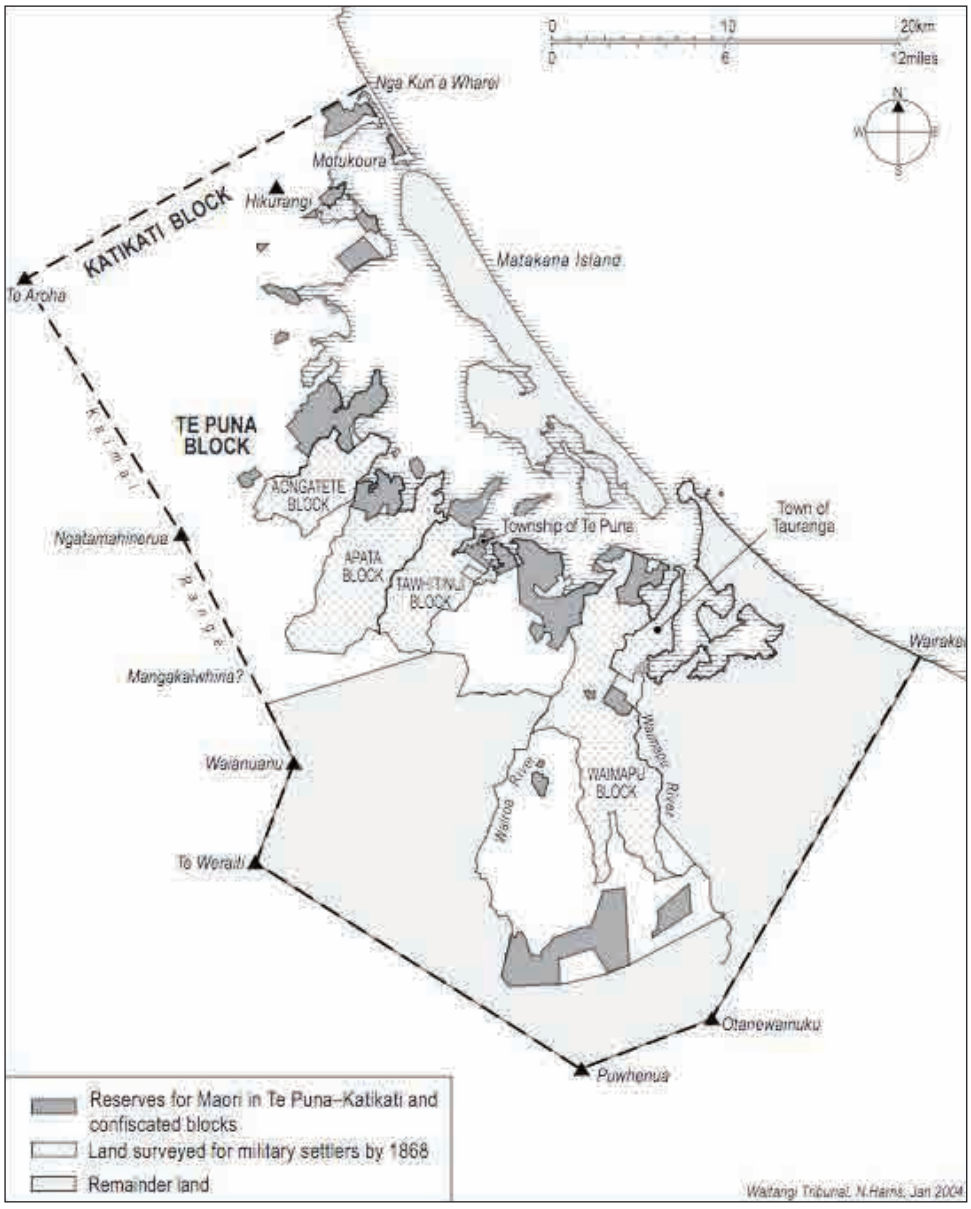
19th century history

By the time Marsden visited Tauranga in 1820 the local Maori were already showing the effects of European contact and he found pigs and potatoes growing in abundance. Viewed from Mt Hikurangi, all the land around the western end of the Tauranga Harbour was clearly visible and was, according to Marsden, covered in fern and apparently clear of large trees.

In the 1830s both mission and trading stations were established in Tauranga. Initially the missionaries were keen to see peace between the tribes, but by the 1840s it became the job of the Protector of Aborigines, who was often backed by Government troops and by the mid-1840s the warring factions were at peace (Allen 1996: 13).

The New Zealand Wars erupted during the 1860s in the Waikato and Taranaki. Government authorities suspected Maori in the Tauranga District of supplying Waikato tribes with food and arms as well as warriors; as a consequence, Government troops were sent to Tauranga in January of 1864. As a result of the ensuing battle at Te Ranga pa (7 km west of Tauranga), Governor Grey accepted the surrender subject to the confiscation of most of the western Bay of Plenty, but subsequently promised Maori reserves would be set aside, including Omokoroa, and that the Government would confiscate no more than a quarter of their land. Other land would be purchased at 3 shillings an acre.

The Marutuahu attempted to extinguish their claims in the Tauranga area in 1866, in what is known as the Kati Kati and Te Puna Purchases, with a series of payments. However, the final payments for the Kati Kati and Te Puna purchases were not made until 1871. Despite agreements with the various claimants the blocks continued to remain undefined. The block boundaries, or confiscation bounda-



2. Reserves for Maori in Te Puna – Kati Kati of 1868 shown as dark grey areas (Waitangi Tribunal 2004: 185).

ries were not entirely settled until after 1886. By 1877 retired minister Joseph Tice Gellibrand had already begun to purchase land on the peninsula and in Tauranga. He continued to buy blocks of land at Omokoroa until he owned practically the whole peninsula. Gellibrand constructed a large Kauri homestead out near the Point, later to become the Crapp homestead.

Previous Archaeological Investigations

Archaeological site recording in Omokoroa began in 1968 when the Waihuri Pa at the northern tip of the peninsula was recorded by David Borell for the Tauranga Historical Society.

A significant number of archaeological sites are recorded in the vicinity of the property indicating cultivation, earthworks and living areas reflecting long term

occupation of the area that may also be incorporated in land further to the north-west including the proposed development.

Several of these sites have been excavated recently, including U14/3283 and U14/3284 (Furey and Hudson 2008), which exposed considerable damage to the site from ploughing which left truncated pits, post holes and firescoops. The density of surviving features was exceptional and indicated intensive or periodic occupation with a clear shift over time in the locations of areas associated with various activities.

U14/3302 was also the subject of recent archaeological investigation (Harris and Furey 2011). Numerous pits, postholes and firescoops were excavated but there was no indication of any structural remnants such as intact post holes. Charcoal samples indicated land disturbance or clearance for horticulture as indicated by the large scale of storage facilities present. Two phases of occupation are also evident from the two changes in pit orientation, but this may represent several seasons in the horticultural cycle. Mayor Island obsidian flakes and tools were also recovered.

U14/712 was also investigated by Furey (Interim Report, 2004). Ditches were reported to have formed part of a ring-ditch pa, but the remaining ditch on the western side was destroyed by a farm road and associated features.

The large number of storage pits, fire scoops and associated midden in the area, reflects the scale of occupation in the general area generally and in the vicinity of the proposed development, such as some 200 storage pits, and associated midden recovered by Furey (2005a) at the Lynley Park subdivision.

Other investigations in the wider area include Coster (2014), Moore (2009), Hooker (2007, 2009) and Phillips (2003) and all demonstrate the considerable importance of the peninsula to Maori for longer term settlement.

Methodology

Archaeological monitoring of the site was undertaken by Peter Holmes of CFG Heritage on 10 August 2016 to 3 February 2017. The earth was stripped with a

Feature	Feature type
1	Midden
2	Bin pit with sparse flecks of midden in fill
3	Midden
4	Midden with
5	Midden
6	Midden
7	Midden or fire scoop
8	Midden or fire scoop
8A	Midden within a circular tube-like cut
9	Midden
10	Midden
11	Midden
12A	Midden
12B	Midden
13	Midden
14	Midden
15	Midden

Table 1. Archaeological features found at 262 Omokoroa Road.

hydraulic digger and works ceased while investigation and recording of any archaeological features occurred. Features were excavated in full, then photographed and recorded following standard archaeological recording procedure. A Garmin etrex 30 handheld GPS, with a reported accuracy of ± 4 m, was used to record the location of points of interest. All spatial information was uploaded to the project GIS. Samples of midden deposits were taken for analysis.

Archaeology

Fifteen archaeological features were exposed, mostly midden scatters, these are summarised in (Table 1 and Figure 3). There was no distinct cluster of deposits across the property, apart from Feature 12A and 12B and Feature 8 and 8A. Feature

3. Distribution of recorded features.

14 was the largest and most dense deposit of midden, while most others (3, 4, 5, 6, 9 10, 11, 12A, 12B, 13, 15) were small sparse patches of crushed midden within a thick matrix of mid-brown moderately consolidated silt lying immediately below the topsoil. These crushed deposits appear to be displaced from their primary contexts. Feature 2 (a small pit) and Feature 8A (a circular sided cut filled with midden) were the only non-midden deposits.

Feature 1 was a midden deposit which was 700 x 600 x 100 mm (Figure 4). The matrix within the midden was charcoal stained and there were fire cracked rock inclusions. The base and edges of the feature were not distinct enough to suggest it was a fire scoop. A sample of the deposit was taken for dating.

Feature 2 was a bin pit filled with sparse flecks of midden and a mid-brown moderately consolidated silt fill (Figure 5). The pit was 600 x 400 x 260 mm. The fill was sampled for analysis.

Feature 3 was a truncated midden, 400 x 50 x 50 mm. The deposit was sparse and very fragmented, it is likely the shell is not in its original context. The fill was sampled for analysis.

Feature 4 is a cluster of thin scattered midden deposits, covering an area of 5 x 3 meters, and 50 mm or less deep. These were identified below the top soil. The deposits were not dense and remained very shallow and wide-spread, it is possible they are displaced and have been modified, although there was no direct evidence of this in the ground. All scatters were similar in contents, mostly shell deposits with some fire cracked rock and charcoal. The cluster was sampled for dating.

Feature 5 was a thin sparse fractured midden deposit, 850 x 550 x 50 mm. The shell sat within a mid-brown silty highly-consolidated fill which was similar to the fill of Feature 2 (bin pit). The deposit was investigated, however no clear shape or markers of a storage pit was found. No sample from the deposit was taken.

Feature 6 was like Feature 4, a thin sparse area of crushed shell covering a larger area. After partial excavation Feature 6 measured 5.3 x 3.7 m x 300 mm. The deposit was not concentrated in any one area and there was no evidence of it being in primary context. Although the deposit was not entirely exposed, probing confirmed it spanned another 4 m in length (9.3 m in total). Samples for dating were taken.

Feature 7 was a midden filled fire scoop (Figure 6). The fire scoop was 500 x 400 x 100 mm. The fill of the deposit, aside from shell, was a dark brown dense silt, while at the base it was a charcoal stained silt with charcoal inclusions. No fire cracked rock was present. Charcoal and the midden within the scoop was sampled for analysis. Unlike several other features at the property, this deposit does not appear to be in a secondary context or to have been heavily modified.

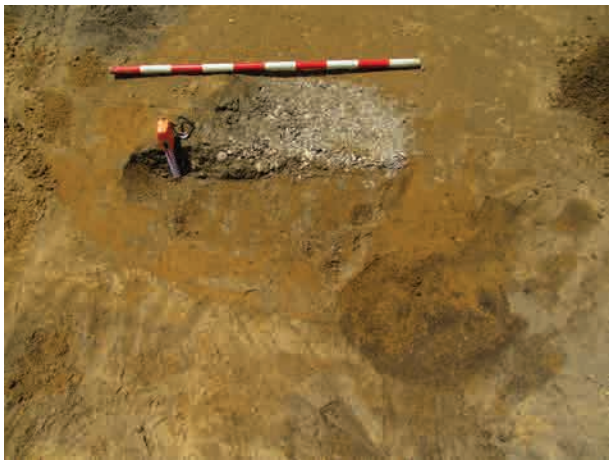
Feature 8 was a sparse and thin scattering of fractured shell covering an area of approximately 6 x 4 m, which after investigation was an area of 300 x 300 x 200 mm (Figure 7). Below the spread of thin midden was Feature 8A, a distinct circular sided midden deposit. The feature was 300 in diameter and 200 mm deep. Feature 8A was approximately 3 m south of the isolated portion of Feature 8. The deposits were investigated and Feature 8A was sampled.

Feature 9 was a thin crushed midden lens exposed in a baulk of progressing earthworks. The deposit appeared to be modified and it was not sampled.

Feature 10 was identified in the profile of earthworks as a thin layer of shell. The shell appears to be redeposited from previous unrecorded earthworks. No sample was collected.

Feature 11 was a wide-spread and thin midden deposit, covering an area of 4.2 x 2.7 m x 5 mm. The deposit is likely to be displaced from a primary context. A charcoal sample was collected.

Feature 12A and 12B were midden deposits 2 m apart. Feature 12A was a sparse midden within a roughly-circular cut. The deposit was 600 x 400 x 300 mm. The shell was not concentrated. Feature 12B was a sparse deposit of shell flecks within



4 (top left). Feature 1 before excavation.

5 (top right). Feature 2 after hand excavation.

6 (centre left). Profile of Feature 7 after investigation.

7 (centre right). Feature 8A before investigation.

8 (bottom left). Feature 14 after half sectioning.

a mid-brown silty fill, there were no distinct edges to the feature. Neither 12A or 12B are in primary contexts.

Feature 13 was a sparse deposit of shell 1000 x 900 x 120 mm. The shell was very crushed and thinly spread. The deposit is not from a primary context; however, a sample was taken.

Feature 14 was a midden deposit within an irregular but round sided cut with a sloped base (Figure 8). The feature was 700 mm in diameter, and 130 mm at the

deepest point of the sloped base. This deposit is one of the few in situ and undisturbed features on site. The deposit was sampled.

Feature 15 was a sparse and thin deposit of crushed shell, covering an area 900 x 500 x 5 mm. The shell was not in a primary context and no samples were taken.

Midden analysis

Bulk samples taken from Feature 14 were analysed; the results are summarised in Table 2. Feature 8A was also analysed but this was not a bulk sample. The midden was washed and analysed using conventional methods, with species identification based on Morley (2006). Table 2 provides the weight of the Feature 14 samples dried before sieving, and the weight after the shell was washed and dried. In disturbed and secondary deposits, up to 90% of a deposit can include additional sediment and rock (e.g., Campbell 2008b). In the smaller of the two samples, 29.2% of the weight was lost by sieving, however in the larger sample, 62.7% of the weight was lost by sieving. While there is a large variation of weight loss in the samples which suggests different depositional histories, both lost a significant amount of the deposit to washing which suggests they are secondary deposits. Feature 14 also has a high percentage of unidentifiable shell fragments (56% of total sample weight). While the deposit is disturbed, there is some limited information that can be gained from the midden.

Volume (L)	Dry weight (g)	Sieved weight (g)	% loss
6	2613	1850	29.2
9	8330	3104	62.7

Table 2. Metric statistics of two bulk samples from Feature 14.

Features 8A and 14 are the only samples which provide a large enough shell counts to provide a true representation of the midden deposits. The samples from the remaining deposits are not large enough to represent shell fishing patterns and can only be treated as informative guides (Campbell 2017a: 276–279; 2017b). The two features are dominated by tuangi shell (*Austrovenus stutchburyi*) and unidentifiable shell residue. Feature 14 has a larger breadth of species (n = 8) than Feature 8A (n = 5), as well as a larger total weight and NISP (4733g, NISP 2574) than feature 8A (348g, NISP 202) (Table 4). Feature 8A, although smaller, had a considerable amount of Tuatua (*Paphies subtriangulata*) (37% of diagnostic shell weight). This indicates people were collecting some of their shellfish from sandy shores.

All remaining features were small, all indicated that people gathered shellfish probably during mid or low tide, with some other species which are likely to be

Feature	NISP	Weight (g)	Average weight (g)
8A	170	50	3.4
14	2182	1667	1.3

*Table 3. Average tuangi (*Austrovenus stutchburyi*) weight differences between Feature 14 and Feature 8A.*

Feature	Taxon	NISP	Weight (g)	Environment	Tidal depth
2	*Austrovenus stutchburyi*	14	8	Soft shore	Mid to low tide
	Paphies australis	9	10	Soft / sandy shore	Mid to low tide
	Struthiolaria papulosa	1	14	Soft / sandy shore	Mid to low tide
	Mactra discors	1	3	Soft / sandy shore	Low tide
	Residue		18		
	Total	25	53		
3	*Austrovenus stutchburyi*	6	4	Soft shore	Mid to low tide
	Struthiolaria papulosa	1	9	Soft / sandy shore	Mid to low tide
	Unidentifiable shell residue		9		
	Total	7	22		
7	*Paphies subtriangulata*	79	957	Sandy shore	Low tide
	Austrovenus stutchburyi	1	2	Soft shore	Mid to low tide
	Residue		113		
	Total	80	1072		
8A	*Austrovenus stutchburyi*	170	50	Soft shore	Mid to low tide
	Paphies subtriangulata	18	31	Sandy shore	Low tide
	Paphies australis	8	2	Soft / sandy shore	Mid to low tide
	Zeacumantus lutulenus	3	<1	Soft shore	Mid tide
	Cominella glandiformis	3	<1	Soft shore	Mid tide
	Residue		263		
	Total	202	348		
12A	*Paphies australis*	4	6	Soft / sandy shore	Mid to low tide
	Austrovenus stutchburyi	8	4	Soft shore	Mid to low tide
	Residue		4		
	Total	12	14		
	Feature 12B				
	Paphies australis	5	12	Soft / sandy shore	Mid to low tide
	Austrovenus stutchburyi	4	2	Soft shore	Mid to low tide
	Residue		<1		
	Total	9	25		
13	*Austrovenus stutchburyi*	109	47	Soft shore	Mid to low tide
	Paphies australis	18	21	Soft / sandy shore	Mid to low tide
	Diloma subrostrata	5	1	Soft shore	Mid tide
	Zeacumantus lutulenus	1	<1	Soft shore	Mid tide
	Residue		26		
	Total	133	96		
14	*Austrovenus stutchburyi*	2182	1667	Soft shore	Mid to low tide
	Paphies australis	18	25	Soft / sandy shore	Mid to low tide
	Macomona Liliana	8	3	Soft / sandy shore	Mid tide
	Mactra discors	265	317	Soft / sandy shore	Low tide
	Cominella glandiformis	48	99	Soft shore	Mid tide
	Zeacumantus lutulenus	16	2	Soft shore	Mid tide
	Diloma subrostrata	34	24	Soft shore	Mid tide
	Glycymeris modesta	3	1	Varies	Low to deep tide
	Residue		2795		
	Total	2574	4733		

Table 4. Summary of shellfish species from several features. Environment and tidal depth data are based from Morley (2006) and Powell (1961).

bycatch during pipi and / or tuangi collecting from the nearby Tauranga Harbour, approximately 6.5 km away. However, some results from Feature 7 indicate some shell fish were collected from an open sandy shore. No rocky shore shellfish species, fish, bird, or mammal remains were identified during the analysis.

The size of some shellfish in Feature 14 indicates certain shellfish collection strategies. The average weight of each tuangi valve was noticeably less in Feature 14 than in Feature 8A, and although lengths were not measured, they were observed to be shorter than those in Feature 8A. This suggests that people were collecting the shellfish en masse. Supporting this scenario of a large collection event are the three small dog cockle shells (*Glycymeris modesta*) also present in Feature 14. This species is commonly washed up after storms and were probably bycatch rather than collected for consumption. This large collection event most likely took place on the harbour mudflats.

Charcoal analysis

The charcoal samples from the sites are dominated by small shrub or scrub species (82%) particularly the woody species that accompany bracken vegetation. The remainder include the coastal estuarine species saltmarsh ribbonwood and mangrove, with the only trees present being puriri, a species that tends to survive on cleared landscapes. The results suggest an open, cleared environment dominated by bracken fern.

Species	Plant type	No. Samples	No. Pieces	% Pieces
Bracken		1	1	1%
Tutu	Small shrubs or scrub	9	37	82%
Hebe		9	24	
Coprosma		5	19	
Manuka		6	14	
Ribbonwood	Marine	1	4	5%
Mangrove		1	2	
Puriri	Broadleaf tree	4	14	12%
Totals		15	115	

Table 5. Summary of charcoal results.

Chronology

Charcoal samples from four middens were submitted to the Radiocarbon Dating Laboratory at the University of Waikato for dating (Table 6). Feature 14 provides earliest date between the late 15th and early 17th centuries. Feature 1 dates from the mid-17th to late 18th centuries, more likely the latter. Feature 2 dates to the early to mid-16th centuries, but more likely to the mid-17th century. Feature 8A mostly likely dates to around the mid to late 18th century.

Although the results, apart from Feature 14, are complicated by several peaks on the calibration curve, they generally fit into the known chronology of pre-European Maori events at Omorokora Peninsula. The date for Feature 14 between the late 15th and early 17th centuries is very similar to dates for U14/3525, U14/3327 and U14/712 (Moore 2009; Furey 2011). U14/3327 and U14/712 also have 17th century dates similar to Feature 2, as does U14/701 (Moore 2009, 2010; Furey 2011).

Feature	Lab no.	CRA BP	cal AD 68%	cal AD 95%
1	Wk 46089	243 ± 15 BP	1655–1672 (26.3%) 1746–1758 (16.1%) 1781–1797 (25.8%)	1650–1675 (30.9%) 1737–1799 (64.5%)
2	Wk 46090	297 ± 17 BP	1632–1656	1512–1546 (11.4%) 1623–1667 (84.0%)
8A	Wk 46091	239 ± 15 BP	1659–1672 (20.1%) 1744–1759 (20.3%) 1780 – 1797 (27.7%)	1652–1675 (25.6%) 1737–1799 (69.8%)
14	Wk 46092	377 ± 15 BP	1497–1512 (13.2%) 1548–1563 (10.1%) 1570–1623 (44.9%)	1483–1627

Table 6. Radiocarbon dates.

U14/3276 has later dates similar to those for Features 1 and 8A (Moore 2009). The general picture for occupation at Omokoroa is from the mid-15th to late 18th centuries, and this span of time is represented at 262 Omokoroa Road.

Discussion and conclusion

Earthworks at U14/3525 show the site has been damaged by previous unrecorded earthworks, however a few deposits remain in situ. Evidence of site damage is found in the large amount of fragmented shell residue in the deposits, the difference in bulk sample weights once washed, a truncated bin pit, and the sparsity of shell in some midden. While the damage has limited the integrity of the archaeology, it was still possible to get dates from the site.

The small pit, commonly termed bin pit, was likely used for storage for a variety of food and non-food items. The midden fill of the pit was probably deposited during an event after the construction and use of the pit. More interestingly on the site is the absence of other storage pits. It is common for storage pits in the Western Bay of Plenty to come in a variety of sizes (e.g. Furey 2008). There are two possible reasons other storage pits were not present: they were either never constructed or they have been destroyed by modern earthworks. Storage pits are the most common feature type in the Omokoroa Peninsula, meaning their absence at this site is uncharacteristic of the archaeological landscape. Their absence is also not out of the question and U14/3525 may have simply had different functions to the typical storage sites on the peninsula. However, given the damage seen to deposits at U14/3525, and density of storage pits from surrounding sites it seems most likely that more storage pits were originally present but were subsequently destroyed.

From the limited reported archaeological investigations on the Omokoroa Peninsula, it appears sites in the area are typically storage pits and midden deposits of harbour shell fish species, deposited at some stage between the 15th to late 18th centuries. While the results of this investigation at U14/3525 are not dissimilar, most of the ambiguity or differences can be attributed to the visible site damage. Chronological dating of the U14/3525 suggests occupation was between 15th and 17th centuries, and then possibly again in the 18th century. However, site damage has greatly reduced the available information about the precise site function, chronology, and extent compared to those nearby less damaged sites.

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Appendix 1 Charcoal Identification

	Species	No. pieces
Feature 1	Tutu	1
	Hebe	2
	Coprosma	12
	Manuka	4
	Puriri	5
Feature 2	Tutu	8
	Manuka	1
Feature 3	Tutu	2
Feature 4	Tutu	2
	Manuka	2
	Puriri	2
Feature 4 Sample 13	Tutu	1
	Hebe	2
	Saltmarsh ribbonwood	4
	Mangrove	2
Feature 6	Hebe	2
	Puriri	1
Feature 7	Bracken	1
Feature 8	Tutu	1
	Hebe	5
Feature 8A Sample 11	Tutu	6
	Hebe	3
	Coprosma	1
Feature 8A Sample 12	Tutu	15
	Hebe	4
	Coprosma	3
Feature 11	Hebe	1
Feature 12A	Coprosma	2
Feature 12B	Hebe	1
	Manuka	2
Feature 13	Manuka	3
Feature 14	Tutu	1
	Hebe	4
	Coprosma	1
	Manuka	2
	Puriri	6

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Thursday, 5 October 2017

Radiocarbon Dating Laboratory

Report on Radiocarbon Age Determination for Wk- 46089

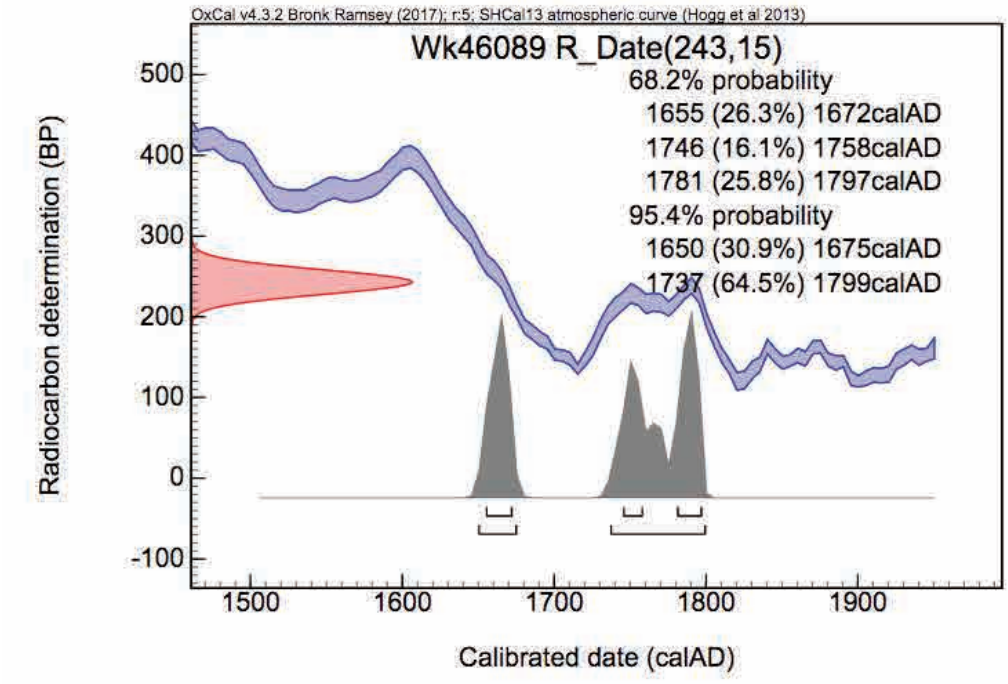
Submitter	M Campbell
Submitter's Code	U14/3525 F1 coprosma
Site & Location	262 Omokoroa Road, Tauranga., New Zealand
Sample Material	coprosma
Physical Pretreatment	Sample cleaned.
Chemical Pretreatment	Sample washed in hot HCl, rinsed and treated with multiple hot NaOH washes. The NaOH insoluble fraction was treated with hot HCl, filtered, rinsed and dried.

$D^{14}C$	-29.8 ± 1.8 ‰
$F^{14}C$%	97.0 ± 0.2 %
Result	**243 ± 15 BP**

(AMS measurement)

Comments

Please note: The Carbon-13 stable isotope value ($\delta^{13}C$) was measured on prepared graphite using the AMS spectrometer. The radiocarbon date has therefore been corrected for isotopic fractionation. However the AMS-measured $\delta^{13}C$ value can differ from the $\delta^{13}C$ of the original material and it is therefore not shown.



- Explanation of the calibrated Oxcal plots can be found at the Oxford Radiocarbon Accelerator Unit's calibration web pages (http://c14.arch.ox.ac.uk/embed.php?File=explanation.php)
- Result is *Conventional Age or Percent Modern Carbon (pMC)* following 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.
- The isotopic fractionation, $\delta^{13}C$, is expressed as ‰ wrt PDB and is measured on sample CO_2.
- $F^{14}C$% is also known as *Percent Modern Carbon (pMC)*.

Alt Hogg

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Thursday, 5 October 2017

Radiocarbon Dating Laboratory

Report on Radiocarbon Age Determination for Wk- 46090

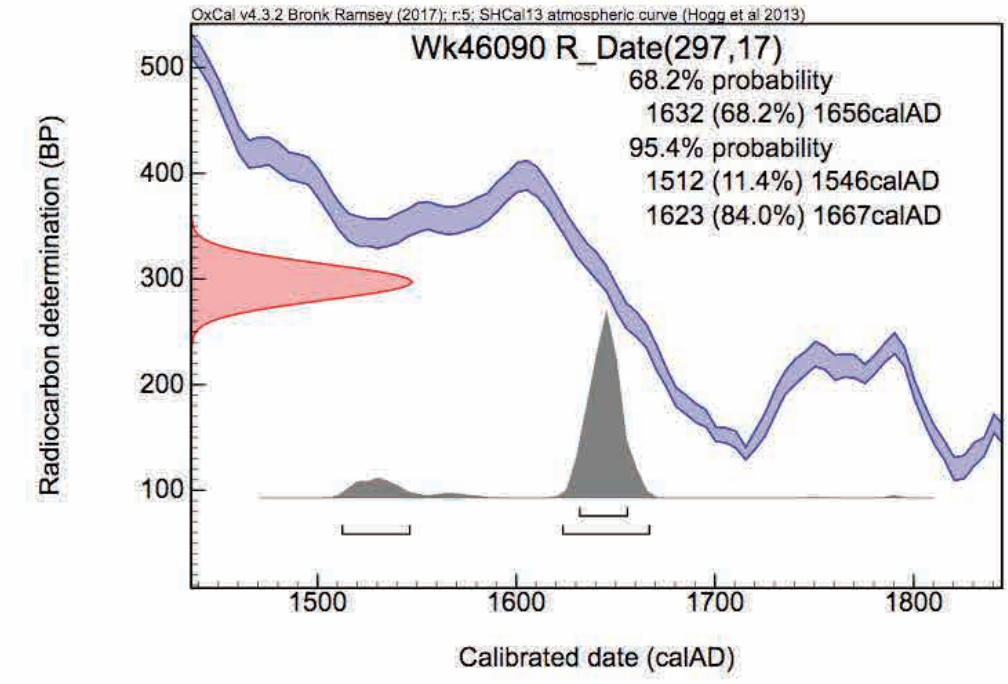
Submitter	M Campbell
Submitter's Code	U14/3525 F2 tutu
Site & Location	262 Omokoroa Road, Tauranga., New Zealand
Sample Material	
Physical Pretreatment	Sample cleaned.
Chemical Pretreatment	Sample washed in hot HCl, rinsed and treated with multiple hot NaOH washes. The NaOH insoluble fraction was treated with hot HCl, filtered, rinsed and dried.

$D^{14}C$	-36.3 ± 2.1 ‰
$F^{14}C$%	96.4 ± 0.2 %
Result	**297 ± 17 BP**

(AMS measurement)

Comments

Please note: The Carbon-13 stable isotope value ($\delta^{13}C$) was measured on prepared graphite using the AMS spectrometer. The radiocarbon date has therefore been corrected for isotopic fractionation. However the AMS-measured $\delta^{13}C$ value can differ from the $\delta^{13}C$ of the original material and it is therefore not shown.



- Explanation of the calibrated Oxcal plots can be found at the Oxford Radiocarbon Accelerator Unit's calibration web pages (http://c14.arch.ox.ac.uk/embed.php?File=explanation.php)
- Result is *Conventional Age or Percent Modern Carbon (pMC)* following 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.
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- The isotopic fractionation, $\delta^{13}C$, is expressed as ‰ wrt PDB and is measured on sample CO_2.
- $F^{14}C$% is also known as *Percent Modern Carbon (pMC)*.

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Thursday, 5 October 2017

Radiocarbon Dating Laboratory

Report on Radiocarbon Age Determination for Wk- 46091

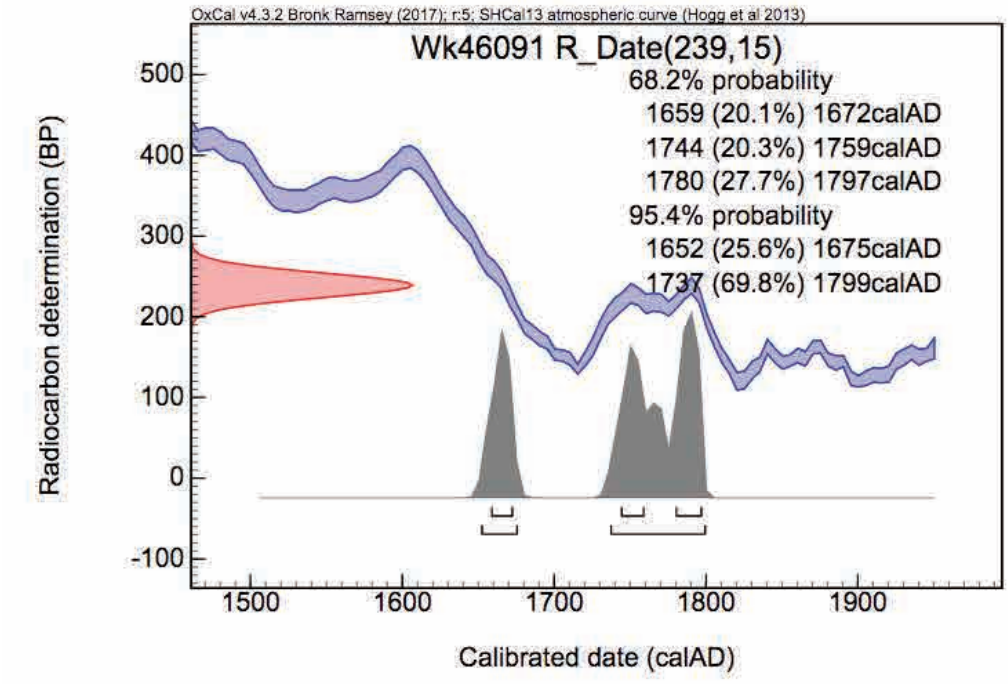
Submitter	M Campbell
Submitter's Code	U14/3525 F8A hebe
Site & Location	262 Omokoroa Road, Tauranga., New Zealand
Sample Material	Hebe
Physical Pretreatment	Sample cleaned.
Chemical Pretreatment	Sample washed in hot HCl, rinsed and treated with multiple hot NaOH washes. The NaOH insoluble fraction was treated with hot HCl, filtered, rinsed and dried.

$D^{14}C$	-29.3 ± 1.8 ‰
$F^{14}C$%	97.1 ± 0.2 %
Result	**239 ± 15 BP**

(AMS measurement)

Comments

Please note: The Carbon-13 stable isotope value ($\delta^{13}C$) was measured on prepared graphite using the AMS spectrometer. The radiocarbon date has therefore been corrected for isotopic fractionation. However the AMS-measured $\delta^{13}C$ value can differ from the $\delta^{13}C$ of the original material and it is therefore not shown.



- Explanation of the calibrated Oxcal plots can be found at the Oxford Radiocarbon Accelerator Unit's calibration web pages (http://c14.arch.ox.ac.uk/embed.php?File=explanation.php)
- Result is *Conventional Age or Percent Modern Carbon (pMC)* following 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.
- The isotopic fractionation, $\delta^{13}C$, is expressed as ‰ wrt PDB and is measured on sample CO_2.
- $F^{14}C$% is also known as *Percent Modern Carbon (pMC)*.

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Thursday, 5 October 2017

Radiocarbon Dating Laboratory

Report on Radiocarbon Age Determination for Wk- 46092

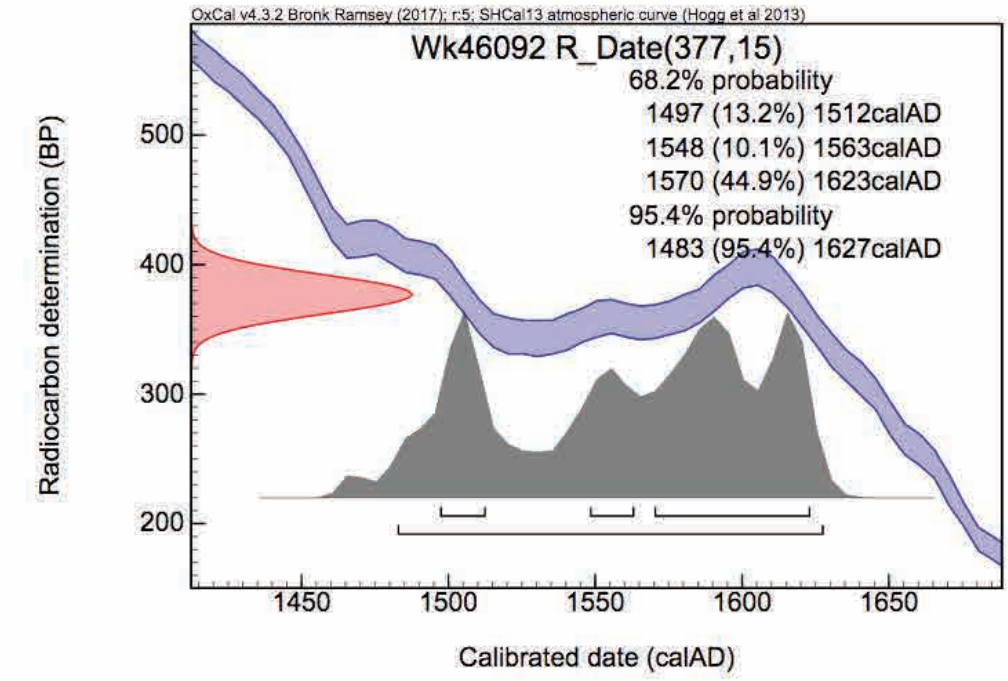
Submitter	M Campbell
Submitter's Code	U14/3525 F14 hebe
Site & Location	262 Omokoroa Road, Tauranga., New Zealand
Sample Material	
Physical Pretreatment	Sample cleaned.
Chemical Pretreatment	Sample washed in hot HCl, rinsed and treated with multiple hot NaOH washes. The NaOH insoluble fraction was treated with hot HCl, filtered, rinsed and dried.

$D^{14}C$	-45.9 ± 1.8 ‰
$F^{14}C$%	95.4 ± 0.2 %
Result	**377 ± 15 BP**

(AMS measurement)

Comments

Please note: The Carbon-13 stable isotope value ($\delta^{13}C$) was measured on prepared graphite using the AMS spectrometer. The radiocarbon date has therefore been corrected for isotopic fractionation. However the AMS-measured $\delta^{13}C$ value can differ from the $\delta^{13}C$ of the original material and it is therefore not shown.



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- Result is *Conventional Age or Percent Modern Carbon (pMC)* following 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.
- The isotopic fractionation, $\delta^{13}C$, is expressed as ‰ wrt PDB and is measured on sample CO_2.
- $F^{14}C$% is also known as *Percent Modern Carbon (pMC)*.

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