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RESIDENTIAL SUBDIVISION BISHOPHILL FARM, MATAKANA

Archaeological Monitoring and Excavation Report

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With contributions by
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Nick Keenleyside, Andrew McAlister and Joe Mills

Report prepared for
Oyster Capital Ltd

in fulfilment of
Heritage New Zealand Pouhere Taonga
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RESIDENTIAL SUBDIVISION BISHOPHILL FARM, MATAKANA: ARCHAEOLOGICAL MONITORING AND EXCAVATION REPORT

Prepared in fulfilment of Heritage New Zealand Pouhere Taonga Authority No. 2014/641

For Oyster Capital Ltd

July 2019

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EXECUTIVE SUMMARY

Oyster Capital Ltd has undertaken the development of a residential subdivision on land at Bishophill Farm, Matakana. The property is situated on a headland located on the southwestern part of the Tawharanui Peninsula, with shores facing onto the Matakana River estuary as well as to Kawau Bay and the Hauraki Gulf. The development covered some 113.75 hectares and consisted of the creation of 11 rural residential lots, associated access roads and a boat ramp, as well as ensuring the protection of 45.47 ha of significant native bush, and over 7800m² of significant wetland areas. The development also encompassed the protection of the headland pa Matakanakana (R09/540).

An archaeological assessment undertaken by Clough & Associates, established that five shell midden sites were likely to be affected by road accessway formation, including a large shell midden site in the northwest of the property (R09/221), and that a further five middens were likely to be impacted by planting works. Moreover, it was considered highly likely that further unidentified subsurface archaeological remains would be exposed during earthworks and associated tree clearance.

Clough & Associates were commissioned by Oyster Capital Ltd to undertake the archaeological monitoring of the subdivision works and the investigation of any archaeological remains exposed. Archaeological monitoring of subdivision works resulted in the recording of 21 new archaeological sites across the development area, 19 of which were shell midden sites, the two others relating to historic period refuse disposal. Midden relating to only two of the previously recorded sites was exposed, one of which (the large midden R09/221) was subject to a full investigation in advance of subdivision works in the immediate vicinity. With the exception of sites R09/221 and R09/2189, no artefacts relating to Māori activities were found during the monitoring and sampling of the midden sites. The historic sites, however, produced the usual array of European artefactual material discovered at sites around New Zealand.

The excavation of midden site R09/221 was undertaken in two phases. Initial topsoil stripping revealed that the midden was far larger than had been initially thought, and that it extended beyond the footprint of works to both the north and east. Three further additional large midden deposits were also recorded as part of the site.

The investigation established that a number of features were sealed by the midden deposits, including two large intercutting kumara pits, one of which contained two discrete deposits of human remains, ovens/firescoops and postholes. The human remains were lifted under the supervision of Ngāti Manuhiri, and re-interred in covenanted land on site. Later features that truncated the midden included a number of earth ovens, pits, and a horse burial (the latter being of late 19th or early 20th century date).

Artefacts recovered during the excavations consisted of obsidian and chert, a small number of which represented tools and cores. The Bishophill artefact assemblage was very modest in nature, but contained the standard material found in Māori lithic assemblages. Obsidian was well represented, while chert artefacts were sparse. Twelve samples of obsidian from R09/221 were submitted for non-destructive X-ray Fluorescence analysis (XRF) to determine the source of the obsidian in the assemblage. The XRF analysis determined that 10 samples originated on Great Barrier Island (Aotea), one from Mayor Island (Tuhua) while the other was sourced from Poor Knights Islands (Tawhiti Rahi).

Analysis of samples taken from the shell midden deposits at site R09/221, illustrate that the inhabitants exploited the local environment, with cockle being particularly represented

in the samples. Of note was the absence of fish or avifauna across all the sampled middens, which is perhaps surprising given the general estuarine location of the project area, and perhaps suggests taphonomic conditions were not favourable for the preservation of bone.

Faunal analysis of bone samples retrieved from R09/221 provided evidence for the consumption of the Māori dog (kuri) which was present in the fill of a firescoop, as well as sheep from the fill of a hangi, the latter from a late phase feature almost certainly dating to the first half of the 19th century.

Radiocarbon analysis of samples taken from site R09/221 demonstrates that it was occupied intermittently for some 500 years between the early 14th and early 19th centuries.

Further dates obtained from midden sites R09/2187 and R09/2188, indicate that Māori occupation activities across the peninsula were widespread. Sites R09/2187 and 2188 appear contemporaneous with some of the occupation phases at site R09/221 and are testament to a relatively large interconnected population.

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1 INTRODUCTION

1.1 Project Background

Resource consent was granted to Oyster Capital Ltd to subdivide land at Bishophill Farm, Whitmore Road, Matakana (Figure 1.1). The development covers 110.4572 ha and consists of 11 rural residential lots (Lots 1-11), the Balance Farm (Lot 30), the protection of 45.95 ha of significant native bush, over 7800m² of significant wetland areas, and the protection of headland pa site R09/540, known as Matakanakana – 'the glowering eyes'.

An assessment was completed for Parallax Consultants Ltd on behalf of Oyster Capital Ltd to establish whether the proposed work was likely to impact on archaeological values (Phear, Thorne and Clough 2013). The report was prepared as part of the required assessment of effects accompanying a resource consent application under the Resource Management Act 1991 (RMA) and to identify any requirements under the Historic Places Act 1993 (HPA).[1]

The assessment report established that five recorded midden sites were likely to be impacted by earthworks for road access (Figure 1.2 to Figure 1.4):

- R09/1184, R09/2146, R09/2138, R09/2139 and R09/221 (the latter by access to a boat ramp).

Five recorded midden sites were likely to be affected by enhancement planning:

- R09/216, R09/1191, R09/1192, R09/1193 and R09/2140

Two midden sites were potentially affected by future house construction within Lots 11 and 8 respectively:

- R09/2140 and R09/2141

In addition, it was considered likely that other unidentified subsurface archaeological remains would be exposed during earthworks.

An addendum report, and an updated assessment of effects were commissioned following a change in design of part of Lot 12 (now Lot 30), the Balance Farm (Phear July 2013, December 2013; Phear, Thorne and Clough February 2014). The specific changes were the addition of an access road close to pa R09/540, which extends to the shoreline, within the vicinity of three additional archaeological sites: a former Shark Oil Factory (R09/1185), a store and stone house (R09/1186), and a midden (R09/1184). In addition, several large pine trees were to be removed in close proximity to R09/1185 and R09/1186.

An authority was granted by the (then) New Zealand Historic Places Trust (NZHPT[2]) in relation to the 10 sites potentially affected by roading and enhancement planting and any additional sites exposed during the subdivision works (Authority no. 2014/641, 12 February 2014).[3]

[1] Now the Heritage New Zealand Pouhere Taonga Act 2014.
[2] Note that NZHPT has been Heritage New Zealand Pouhere Taonga (HNZPT) since 2014. Reference herein will be to HNZPT.
[3] It did not grant authority to modify sites R09/2140 and R09/2141 within Lots 11 and 8 for the purpose of house construction. If these sites are affected by future residential development, it will be the responsibility of the future landowners to obtain authorities to modify the sites from the HNZPT.

This document reports on the monitoring of earthworks, including works for formed access ways; the investigation of a midden site with associated settlement remains in the area of the boat ramp (with associated infrastructure); as well as monitoring of planting works. The archaeological monitoring took place under Authority 2014/641 in 2014.

Figure 1.1. General location map with the Bishophill Farm property in Matakana circled (1:50,000 topographic map)

Figure 1.2 Final development plan with the archaeological site extents drawn in black with corresponding NZAA site numbers. See Figure 1.3 and Figure 1.4 for detailed views

Figure 1.3 Detail northwestern part of the final development plan illustrating the extent of the recorded archaeological sites (in black)

Figure 1.4 Detail of the southwestern part of the final development plan illustrating the extent of the archaeological sites (in black)

1.2 Archaeological Monitoring

The archaeological monitoring of the Bishophill Farm development was undertaken in three main stages from January to November 2014. Archaeological works commenced in January 2014 with the monitoring of the main access road for the site, followed by the supervision of planting works in June and July, and concluded with the monitoring of minor access road and planting works in October and November 2014. When appropriate, the midden sites encountered during monitoring were excavated by hand with trowel, mattock and spade, and were planned, recorded and sampled. Where the middens were highly fragmented and sparse, records of the middens were made only, as sample collection and analysis were deemed unsuitable.

Midden site R09/221, located on the access way to the boat ramp, proved be a larger and more complex site than first thought, with multiple intercutting features and complex vertical stratigraphy, and therefore detailed archaeological investigation of the site was required.

1.3 Investigation of Site R09/221

Investigation of midden R09/221 took place over a 2 week period in March-April 2014, and October-November 2014. Topsoil stripping revealed that the midden was far larger than initially thought, at least 40 by 30m, and it extended beyond the edge of excavation to the north and east. Several features were sealed by the midden and pre-dated it: two large kumara pits, one of which contained two deposits of skeletal remains located at either end (the east and west). Protocols dealing with the discovery of human remains and approved by Heritage NZ and Ngāti Manuhiri were followed on discovery of the remains, and the NZ Police were notified. The remains were lifted under the supervision of Ngāti Manuhiri, and re-interred on site. Other features truncated the midden, such as a hearth, pits and a horse burial (the latter being of 19th or early 20th century date).

A series of trenches were placed through the midden to record stratigraphy and obtain environmental samples for analysis and radiocarbon dating. Similarly, the pits and postholes were half sectioned and sampled, following accepted archaeological practice.

Analysis was undertaken of shell midden, faunal remains, obsidian and historic artefacts, as well as wood identification and a series of radiocarbon determinations. Project Personnel

Sarah Phear directed monitoring and investigation works as the S45 archaeologist (co-held with Rod Clough). Richard Shakles led the investigation of R09/221 and supervised the field team (Carly Mailhot, Jos Piper-Jarrett, Jen Low, Bernie Larsen). Monitoring works were undertaken by Richard Shakles, Jen Low and Charlotte Judge. Aerial drone photography of site R09/221 was by Simon Bickler.

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2 HISTORICAL BACKGROUND

2.1 General Māori History

The wider area was originally occupied by the Ngāi Tāhuhu people, who traced their descent from Tāhunui, commander of the Moekākara or Te Whakatūwhenua canoe that landed near Goat Island (ARC Parks 1992). Around the 1620s a group of Ngāti Awa migrated north from Kawhia to Tamaki. Led by Maki and his brother Mataahu, they conquered Tamaki and settled at Mt Smart. They then headed north. A battle was fought between Ngāi Tāhuhu and Maki's people and Ngāi Tāhuhu were defeated. It was around this time that the descendants of Maki and Mataahu became known as Kawerau and came to occupy the land from Takapuna to Te Arai and the Gulf islands as far north as Hauturu (Little Barrier Island) (ARC Parks 1992). Maki divided the land between his sons and followers. Maeaeariki was given land at Mangatawhiri and Tawharanui and his people became known as Ngāti Raupo. Meanwhile Manuhiri's relatives, known as Ngāti Manuhiri, settled the area between Whangateau and Pakiri (ARC Parks 1992).

From the 16th century Kawerau were under attack from the Marutūahu confederation (Ngāti Maru, Ngāti Whanaunga, Ngāti Tamaterā and Ngāti Paoa) from the Hauraki Gulf (Simmonds in Keys n.d). Rights to fish for school sharks were fought over between Kawerau and the Marutūahu tribes. Battles continued until the 1790s, when a short-lived peace agreement was made (ARC Parks 1992).

During the 1790s Kawerau were part of a Marutūahu war party that travelled to the Bay of Islands, where they had engaged and defeated Ngāpuhi at Waiwhariki near Puketona. In the 1820s Kawerau found themselves under threat from the musket armed Ngāpuhi. Ngāpuhi were defeated at a battle at Mahurangi in 1820, where the Ngāpuhi leader Koriwhai was killed. In 1822 Ngāpuhi sought to avenge the death of Koriwhai. They attacked Kawerau at Te Kohuroa (Matheson's Bay) and after an initial setback emerged victorious (ARC Parks 1992).

In 1825 a large and important battle was fought at Auckland between Ngāti Whātua and the musket armed Ngāpuhi. The Ngāti Whātua force included the Kawerau people of the east coast. The battle was fought at Mangawhai and then at Te Ika a Ranganui near Kaiwaka. Ngāpuhi emerged victorious despite suffering heavy losses. The Kawerau people living between Pakiri and Whangaparoa lost many warriors and fear of further attack caused them to leave their homes. Ngāti Manuhiri sought refuge north of Whangarei with their Ngāti Wai relatives. Ngāti Rongo went to the Bay of Islands to stay with Ngā Manu relatives and Ngāti Raupo also headed for Whangarei, where they were taken in by their Te Parawhau relatives (Pritchard 1983).

At the time of European contact in the 19th century, Ngāti Raupo had returned to occupy much of Tawharanui. They maintained kainga or settlements throughout the area and migrated over their wider ancestral domain between Matakana River and Whangateau in a seasonal cycle of fishing, hunting, gathering and harvesting (Murdoch 1998). Ngāti Manuhiri visited Mangatawhiri on the eastern part of the peninsula to catch eels as well as visiting to obtain red ochre from a source on the cliffs at eastern end of Anchor Bay (M.B.3 N.L.C Kaipara 1873:39).

2.2 Early European Settlement

In 1839 an American trader, William Webster, purchased a block of c.10,000 acres of land stretching from Point Rodney to Tawharanui from the Hauraki tribes rather than the traditional occupants of the land (Judge and Clough 2007). In 1844 Webster's claim was found to be excessive and he was granted 1,944 acres on the northern side of Whangateau harbour (ibid.). Meanwhile a large tract of land that extended from Takapuna to Te Arai Point was purchased by the Crown, initially from the Ngāti Paoa and Ngāpuhi tribes in 1841. However, as the purchase was carried out between the Crown and tribes of the Hauraki without consulting Ngāti Raupo, Ngāti Rongo and Ngāti Manuhiri, the transaction was not completed for a further 13 years (Murdoch 1998). This was known as the Mahurangi Purchase (Turton 1877).

The first European settlers arrived in Matakana in the early 1840s, the majority residing either at Lower Matakana or along the coast on either side of the Matakana River mouth (Mabbett 1977). Two of these early European settlers were the Matthews brothers, Charles and James. The brothers were born in Errol, Perth and Kinross, Scotland, from which they departed in early 1851 (Jones 2000). The brothers were the sons of the Scottish Laird Patrick Matthews, himself the Chairman-Promoter of the Scots New Zealand Land Company (Jones 2000). The company had purchased land at Puponga (Cornwallis) prior to 1840 in an unfortunate attempt to establish a Scottish city in the Southern Hemisphere (Jones 2000). After departing Scotland, the brothers worked in the Californian goldfields at San Francisco, before eventually arriving in Auckland on 6 May 1854 (Jones 2000). In 1855, they purchased land at Waiwhata on the Takatu peninsula and erected a cottage a mile from the Matakana River (Jones 2000).

While the majority of relationships between the new settlers and Māori continued in a relatively peaceful manner, some alarm was created when, in 1864, a group of escaped Māori prisoners broke into the home of local resident Mr Mieklejohn in search of food (Mace and Warkworth Museum n.d.). After being captured during the Waikato Wars, the prisoners had escaped from Kawau Island and built a pa on Mt Tamahunga (ibid.). This situation led to general unease and a public meeting was held during which a petition to Governor Grey was signed by 72 people (ibid.).

2.3 Early Land Transactions opposite Sandspit

A large area of land along the Matakana River opposite Sandspit (which includes the development property) is known from both traditional histories and archaeological evidence to have been settled by Māori, and the pa site on the promontory (R09/540) is one of the more significant reminders of pre-European settlement. This land was reportedly acquired from local iwi prior to the signing of the Treaty by early settlers Thomas Millon and his partner John Skelton. An agreement was apparently made whereby an old schooner was swapped for land. The 'Story of Sandspit', a local history compiled by the Sandspit Residents & Ratepayers Association (SRRA), states that:

> 'A formal deed was entered into for the purchase of 15,000 acres (other records show 5,000 acres), consideration for which was the Schooner Thames with gear including two iron pots, one keg of powder and four kegs of tobacco to the value of £310.10.00. After 1841 they were required to register their claim.' (SRRA 1998:4).

It appears that local Māori were not necessarily satisfied with this transaction, as a report in the *Southern Cross* on 11 January 1845 describes an attack on Millon's and other settlers' properties. After an investigation by the commissioners into the various land claims in the area, Millon was awarded 794 acres including an additional 1766 acres on appeal. Two parcels of 300 and 154 acres of land across the river from Sandspit (including the subject property) were then sold to William Greenwood (SRRA 1998:4).

2.4 Greenwood House

William Greenwood built a 'substantial' kauri two-storey house close the edge of the water on an area of flat land. As his wife was reportedly 'nervous about the attacks by Māori' (SRRA 1998:4), William built a store made of local stone and a slate roof at the rear of the house, which included musket slits to allow defence if they were attacked, although use of these latter features was never required (Figure 2.1). The land and house were passed on to William's son Charles Greenwood, who became chairman of the Matakana East Highway Board and Road Board on at least 18 occasions between 1875 and 1906 (SRRA 1998:9). Years later the wooden house was reportedly moved or dismantled, while the stone store became a commercial shark processing factory.

Figure 2.1 The kauri house and stone store c.1902 (in Mabbett 1977:40)

2.5 Early Land Development in Matakana Township

The first school in Matakana opened its doors to pupils on 27 January 1862 (Jones 2010), and the school also doubled as the Presbyterian Church. In 1892 a proper Presbyterian Church was constructed on Matakana Valley Road (Jones 2010).

In 1868, a Mr Cruikshank established a post office and store, and by 1875 a library was also open to the public (Mace and Warkworth Museum n.d.) By 1881, the population of Matakana had grown to approximately 150 and the village was served by three stores, a boarding house, a church/school, post office, public hall and the library (ibid.). A gum store was attached to one of the stores to serve the Dalmatian gumdiggers who worked at Omaha Flats (previously worked by local Māori since 1863; ibid.).

On 7 February 1914, William Jackson of Matakana gifted land on Matakana Valley Road to the Anglican Church (Campbell 1989). St Leonard's Anglican Church was built in 1914 in the Gothic Revival style by the Auckland contractor I.I. Woods. However, there may have been an earlier Anglican Church on the site as Jones (2010) reports that in 1894, 'Evan Richards Senior initiated the building of an Anglican Church, a short distance away [from the Presbyterian Church on Matakana Valley Road], in 1894'.

2.6 Early Industry

Originally, kauri resources in the Upper Matakana area resulted in the settlers at Lower Matakana moving upriver in about 1848 and squatting on land there until it was surveyed in the 1850s (Mace and Warkworth Museum n.d.). John Long Heydn had been the first to purchase land at Upper Matakana and, while he resided on Moturoa Island, he erected a sawmill above the falls to supply timber to the new settlers at the Upper Matakana settlement (Jones 2000). The sawmill was in operation by 1853 (Mace and Warkworth Museum n.d.).

In addition to the timber industry, by the mid-1850s flax was also being harvested in the Matakana area and a mill was established by a Mr Whitelaw (ibid.). E.J.M. Jones, the granddaughter of James Matthew (1830-1909, and one of the earliest European settlers in Matakana), recalls that in her childhood there 'were embedded puriri blocks … beside an artificial water-race, and which was known to all, when I was a child, as the "mill site"' (Jones 2010:70). In the 1860s, 150 acres of kauri on the Matthews brothers' land was lost to a fire that had started as a result of a neighbour burning off scrub (Jones 2000). The whole of the Takatu peninsula was burned, with the only trees surviving being maimed puriri (Jones 2000).

The Matthews' nursery and orchards were spared, due to cleared and tilled ground around them, while Matakana itself was saved by the Matakana Stream (Jones 2000). By the mid-1880s, the kauri in the district had been exhausted and farming and horticulture took over as the dominant industry (Mace and Warkworth Museum n.d.). The Matthews brothers, who held university degrees in arboriculture and horticulture, had established their nursery and orchard business in the early 1850s and this thrived up until the 1880s (Jones 2000; Mace and Warkworth Museum n.d.). During the late 19th century, tourists travelled to Matakana to see the ornamental gardens that the brothers had created, though these sadly were neglected after their deaths and eventually replaced by pasture (ibid.).

2.7 Shark Processing Factory

The waters around Kawau Island are renowned for the high number of sharks at certain times of the year. This resource was hotly sought after by Māori, who 'used to fight over the fishing rights and fishing parties made annual pilgrimages to catch and dry the carcasses for later use' (SRRA 1998:13). One article discussing shark fishing in Matakana in the *Evening Post* in 1920 states:

> 'Even in pre-European days the coast in this locality was noted for its infestment by sharks, and the name Matakana, which means 'putrid fish' is said to have been given to it by Maoris from the malodorous stench arising from the practice of drying on the beach catches taken from the prolific waters of the coast.' (*Evening Post*, 7 January 1920: 7).

The Greenwood store appears to have been opened as a shark processing factory in the 19th century (c.1880s-1900) and reopened in the early 20th century, closing in 1925 (information from Auckland Council Cultural Heritage Inventory (CHI) record 330). The object was to extract oil from the livers of sharks for medicinal uses, and render down the carcasses into a useful fertiliser, and in the 20th century the fins were also exported to China (*Rodney and Otamatea Times, Waitemata and Kaipara Gazette*, 6 February 1918: 2).

However, no fixed dates for the factory could be found in the sources consulted. An article discussing the opening of a shark processing factory in 1905 appeared in the *Observer* (14 January 1905) and another article in the *Auckland Star* in 1906 describes the factory as having 'a high pressure water supply throughout with suitable and convenient modern galvanised buildings with concrete floors etc' (31 January 1906:3). It is unclear whether this was the same factory as that at the former Greenwood store, as it sounds like a larger operation. Only one source located clearly names the Greenwood store, stating that it was renovated and reopened c.1914 as a commercial venture to process sharks caught in the bay, by a Mr Vanderspeck and Mr Carter (SRRA 1998:13). Further research would be required to clarify the dates of operation of the shark factory.

3 ARCHAEOLOGICAL BACKGROUND

The archaeological landscape around coastal Matakana and Tawharanui is rich in Māori archaeological remains, with numerous sites also relating to European settlement of the area. Matakana township is largely characterised by heritage buildings and sites related to European settlement, such as St Leonard's Church and the old wharf.

The majority of archaeological projects undertaken within the Matakana and Tawharanui area have been surveys rather than excavations. A survey of the Tawharanui area was undertaken in the 1970s with the purchase of Tawharanui by the (then) Auckland Regional Authority (ARA). M. Newman and W. Spring-Rice undertook the survey in 1976 with the aim of recording all archaeological sites within the reserve and making recommendations for their protection and management (Newman and Spring-Rice 1976, cited in Judge et al. 2005). The survey included the western extent of Tawharanui, where the development property is located, and Spring-Rice recorded many midden sites along the coastline. An additional coastal survey that included the coastal extent of the development property was undertaken in 2008 by the (then) Auckland Regional Council Heritage Unit, and M. Plowman and A. Flaws recorded several new sites and made updates to those recorded in the 1970s.

Only a small number of monitoring projects and excavations have taken place within Tawharanui, both within and outside the park (e.g. Lawlor and Ross 1998; Judge et al. 2005). An investigation of midden site R09/251 by Judge and others during installation of a predator-proof fence within the park indicated a preference for the exploitation of rocky shore species, and a radiocarbon age determination was obtained indicating a date range of 1470-1640 AD, which is comparable with dates obtained from excavations further north at Omaha (Judge et al. 2005: 27).

Twenty-five archaeological sites and two other historic heritage sites had been recorded within or in the immediate vicinity of the subdivision at Bishophill Farm prior to the assessment (Phear et al. 2013) and a further 7 midden sites were recorded during field survey for the project. Their details are provided in Table 3.1 and their locations shown in Figure 3.1.

Of the previously recorded sites, the largest site is the pa (R09/540) on the promontory, c.90m long by 60m wide. Many of the midden sites are likely to be related to settlement of this pa. It is located at the end of a ridge on the southwest extent of the development area, directly opposite Sandspit. It consists of two ditches – a ditch and bank defending the northern, eastern and western sides, and a second ring ditch on the western side (Figure 3.2). Midden is located within the pa and down the southern cliff to the sea. The pa is a scheduled Historic Heritage Place on the Auckland Unitary Plan (ID 294) and is to be protected as part of the development. Six midden sites are recorded on the banks of the headland close to the pa site (R09/1187–R09/1191 and R09/1184), and most deposits are described as eroding. The midden in this area is dominated by cockle.

The remains of the former shark oil factory and store, R09/1185 and R09/1186, are also located directly below the pa site. As discussed in the historical background, this store was built by the Greenwoods and consisted of a kauri house with a stone store to the rear. All that remains today are derelict foundations, some wooden posts and pieces of ironwork. Some concrete foundations and blocks are likely related to the later factory site.

Seven sites are recorded along the banks and shoreline to the east of the pa, extending to the development boundary. Two of these are recorded on the Auckland Council Cultural CHI only – no. 17478 and no. 17442. Both consist of wooden posts, with the latter also including iron rods located in the sandstone. The remaining five sites are also middens (R09/1174-1175; R09/1179-1181). These sites are located either on the banks of, or are eroding down, the coastal escarpments. Possible living terraces were noted above midden R09/1179, although the survey could not establish whether they were natural or artificial.

To the north of the headland and pa site, seven midden sites are recorded along the shoreline or banks of the estuary beneath the pine trees (R09/1192-1197; R09/216). Site R09/216 was recorded in 1976 and consists of 15 middens located along the coastline in this area. However, many of these middens appear to have been re-recorded and assigned new numbers, and many have already been referred to. Due to the proximity of these middens to the pa, it is likely they are related to the same settlement.

The three remaining sites are two middens and a pit/terrace site recorded in the northern extent of the development area. Midden site R09/221 (CHI 5221) was recorded in 1976 and appeared to be located inland based on the coordinates listed on the NZAA site record. However, the record describes these sites as being located along the banks under the trees, not inland, suggesting that the coordinates are incorrect. Midden R09/221 consists of 5 small middens along the shoreline, and R09/222 of a collection of pits located on a small peninsula.

The seven additional sites recorded during the field survey for the project were all middens (R09/2138-2144). They were located within Lots 2, 7, 8, 10 and 11 (Table 3.1, Figure 3.1). The middens varied in size from small (4m by 4m, R09/2144), to larger deposits extending into the bush (R09/2142, 2141, 2138, 2139 and 2140). Some deposits were highly fragmented, having been damaged through cattle pugging. Most extended subsurface and their extents were determined by probing. The majority of the middens most likely relate to occupation of the pa site.

Figure 3.1 Previously recorded archaeological (prefix R09) and other sites located within or in the immediate vicinity of the property (source: Auckland Council CHI, overlaid on subdivision plan)

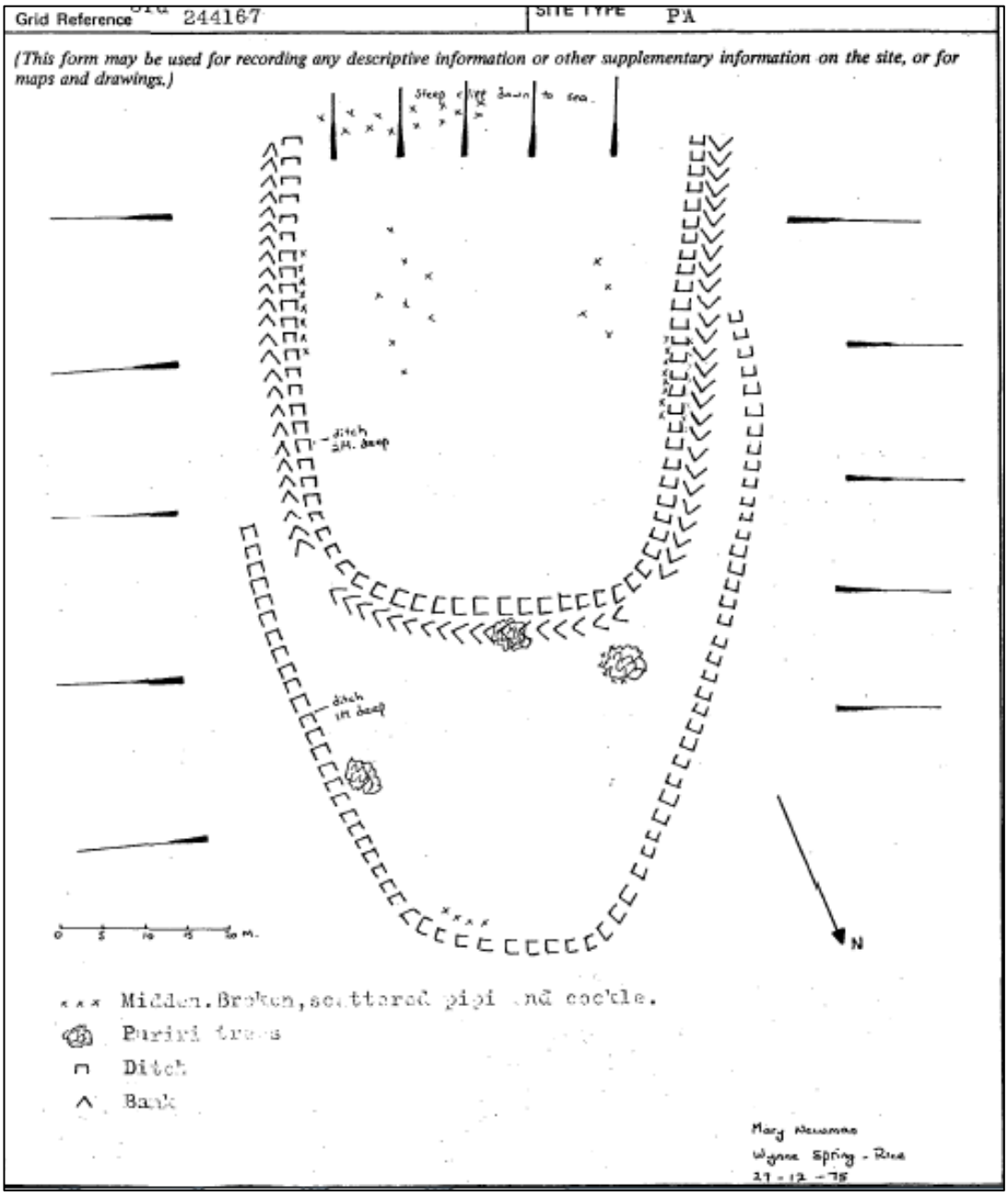


Figure 3.2 Plan of pa R09/540 from the NZAA site record form

Table 3.1 Archaeological and other historic heritage sites recorded on or in the immediate vicinity of the property (source: NZAA and CHI databases)

NZAA No.	CHI No.	Site Type	Description	Easting NZTM	Northing NZTM
R09/216	5216	Midden	15 midden sites recorded as one; however, it appears that these sites have been split and recorded separately. Partly damaged; continued erosion.	1755354	5972192
R09/221	5221	Midden	5 middens, whole and intermittent, on bank and under trees along shoreline. Partly damaged; continued erosion and damage.	1755654	5972393
R09/222	9247	Pit/terrace	Pits located along a small peninsula. Partly damaged; continued erosion and damage.	1756154	5972394
R09/223	5222	Midden	3 middens along the banks of the river. Partly damaged; continued erosion and damage.	1756153	5972594
R09/540	6771	Pa	Headland pa, ditch and bank defending northern, eastern and western sides. Second ring ditch on western side. Midden scattered around site, and down the cliffs into the sea. Scheduled on the AUP no. 294. Good condition.	1755155	5971692
R09/1174	17446	Midden	On coastal escarpment above stream, small shell midden and hangi stones. Overgrown under kikuyu grass, continued erosion.	1755862	5971745
R09/1175	17447	Midden	On bank along inlet, small midden deposit. Overgrown under kikuyu grass, continued erosion.	1755876	5971662
R09/1179	17475	Midden	In a stream bed at tip of inlet, 3 midden deposits. Possible terraces 15m west upslope. Possibly part of R09/216. Exposed, damaged and eroding.	1755894	5971746
R09/1180	17476	Midden	3 middens intermittently spannng the entire headland, below humic topsoil. Possibly part of R09/216. Overgrown under kikuyu grass, continued erosion.	1755857	5971556
R09/1181	17477	Midden	On coastal escarpment 1m above rocks under native bush; 2 small midden deposits. Possibly part of R09/216. Overgrown under kikuyu grass, continued erosion.	1755690	5971655
R09/1184	17482	Midden	On bank of estuary below pa R09/540. Dense 15m long midden with hangi stones. Overgrown under kikuyu grass, continued erosion.	1755398	5971648
R09/1185	330	Historic structure	Shark Oil Factory remains. Stone foundations and some stone walls; wooden supports and iron artefacts. Operated from c.1880 to c.1900, then later in 1920-1925 [?].	1755339	5971597
R09/1186	322	Historic house/store	Store and stone house. Built by Charles Greenwood. On 'Shark Factory Point'. 1902. Site comprises derelict foundations for buildings.	1755339	5971597

NZAA No.	CHI No.	Site Type	Description	Easting NZTM	Northing NZTM
R09/1187	17483	Midden	On beach escarpment below R09/540. Comprises a thin layer of midden 30m long. Related to pa R09/540. Possibly part of R09/216. Damaged and eroding.	1755345	5971602
R09/1188	17484	Midden	On beach escarpment below R09/540. Comprises intermittent slumped midden deposits over a 30-40m area. Related to pa R09/540. Possibly part of R09/216. Damaged and eroding.	1755235	5971684
R09/1189	17485	Midden	On coastal escarpment above rocks; 2 middens. Some deposit present under eroded soils. Related to pa R09/540. Possibly part of R09/216. Damaged and eroding.	1755180	5971805
R09/1190	17486	Midden	In beach escarpment and cattle tracks; 3 middens spanning 10m. Related to pa R09/540. Possibly part of R09/216. Damaged and eroding.	1755194	5971838
R09/1191	17487	Midden	In coastal escarpment, spans 20m of intermittent midden deposits. Relates to pa R09/540. Possibly part of R09/216. Damaged and eroding.	1755229	5971925
R09/1192	17488	Midden	Midden eroding on bank down slope, and visible in cattle pugging. Related to pa R09/540. Possibly part of R09/216. Damaged and eroding.	1755363	5971996
R09/1193	17489	Midden	5 middens, whole and intermittent, on bank and under trees along shoreline. Relates to pa R09/540. Possibly part of R09/216. Damaged and eroding.	1755474	5972037
R09/1194	17490	Midden	Exposed in cattle track on bank and extends into forest. Surface scatter of shell. Possibly part of R09/216. Damaged and eroding.	1755463	5972084
R09/1195	17491	Midden	On coastal escarpment above rocks. Dense deposit. Related to pa R09/540. Possibly part of R09/216. Damaged and eroding.	1755458	5972093
R09/1196	17492	Midden	Under totara on a coastal escarpment; dense deposit. Related to pa R09/540. Possibly part of R09/216. Damaged and eroding.	1755444	5972461
R09/1197	17493	Midden	Located in erosion face along bank of Matakana river. Related to pa R09/540. Possibly one of the middens forming a part of R09/216. Damaged and eroding.	1755490	5972467
R09/2144	n/a	Midden	Located on the surface in stock trample pasture and bush. Probing suggests it extends 4m N-S and 4m E-W and is c.1cm thick. The midden consisted of highly fragmented cockle.	1756267	5972471

NZAA No.	CHI No.	Site Type	Description	Easting NZTM	Northing NZTM
R09/2142	n/a	Midden	Exposed by stock trampling in the northwest corner of the pasture in Lot 7. Extends 2m to the west of the fence line into bush. Probing suggests it extends 14m E-W and 19m N-S; 10cm thick in densest concentration and thins out as it extends southwards up the gentle slope. Only cockle is visible, in a dark brown loam on the surface. The midden may have been related to the settlement of pa R09/540.	1755464	5972574
R09/2143	n/a	Midden	Exposed in a slumped side of a small boundary ditch running N-S and lined with trees (hedgerow) on the north-eastern extent of the field in which R09/2142 is located. Probing suggests that the midden extends down the eastern slope some 14m, and 17m N-S. Varied thickness, with 5cm being the thickest deposit and the thickness decreasing as it extends southwards. Cockle dominates.	1755559	5972653
R09/2141	n/a	Midden	Consists of 3 midden deposits. The first deposit extends 2m E-W and 1.5m N-S and is 2-3cm thick. Highly fragmented, located beneath the topsoil; consists mostly of cockle, with some gastropod. The second deposit is located at E1755545, N5972164. Probing suggests it extends 14m E-W by 11.5m N-S, and it is 5cm thick. Located beneath topsoil; highly fragmented. A third, thin deposit located further upslope at E1755563, N5972184. This midden is patchy over a 5–6m E-W area.	1755533	5972175
R09/2138	n/a	Midden	Exposed on the southern side of a farm track; probing suggests the midden extends 13m E-W and 5m N-S. Some midden is exposed on the surface; highly fragmented due to stock trampling. Cockle dominates, and there is some occasional small trumpet shell. A deposit of heavily trampled shell midden located 10m to the west at the farm gate, and is likely to be in secondary deposition, having been moved by stock and farm vehicles	1755475	5971883
R09/2139	n/a	Midden	Located beneath a stand of trees on a north facing slope, just north of R09/2138. Partially exposed on the surface. Probing suggests the deposit extends c.10m N-S and 6m E-W; up to c.20cm thick. Cockle dominates with occasional small trumpet shell; highly fragmented. It is likely to have been related to pa R09/540 which is located some 110m to the southwest.	1755468	5971913

NZAA No.	CHI No.	Site Type	Description	Easting NZTM	Northing NZTM
R09/2140		Midden	Exposed on the surface on boundary between pasture and the pine trees on the escarpment extending down to the estuary. Probing suggests the midden is c.10cm thick and extends 20m E-W and 19m N-S. Cockle dominates; highly fragmented on the surface with heavy cattle pugging. The site is probably related to pa R09/540.	1755313	5971918
N/A	17478	Historic structure	Wooden post located on shoreline. Overgrown under kikuyu grass, continued erosion.	1755560	5971720
N/A	17442	Historic structure	3 wooden posts, with associated iron rods located on the sandstone. Average condition.	1755934	5971681

4 PHYSICAL ENVIRONMENT

The property is located on the western extent of the Tawharanui Peninsula (Figure 1.1, Figure 1.2). It is separated from Sandspit (to the west) by an estuary fed by Matakana River to the north, and by Kawau Bay to the south. The wider landmass on which the development property is located consists of indurate sandstone (greywacke) basement rocks and mudstones of the Waipapa Group (120-150 million years old) and the more recent Waitemata Sandstone Group (12-16 million years old). Sandstones from this latter group are soft and weather easily into sands and clays (Judge et al. 2005), and a yellowish-brown clay was visible across the property (Figure 4.1).

The landscape of Bishophill Farm contains a ridge with two promontories, on one of which the pa (R09/540) is located (Figure 1.1). The shoreline varies from steep cliffs and cut escarpments to gentle slopes and grassed areas extending to the shoreline (Figure 4.1). The majority of the land slopes towards the shoreline, with the flattest area extending along a ridge to the spur from the end of Howelen Road to the northwest extent of the property. From Whitmore Road at the northeast end of the property the land slopes down westwards to a shoreline dominated by mangroves.

Former watercourses/streams and inlets are frequent across the landscape, and the majority of these areas are vegetated with native bush (Figure 4.1). Two large forested areas and several smaller stands of trees are located on the property, and include kauri, puriri, rata, punga and in places some exotic intrusions such as pine and macrocarpa. The pasture is dominated by kikuyu, with some wild grasses and flowers also present (Figure 4.2).

Prior to development, the farm was used for cattle farming, and stock trampling and/or ‘pugging’ was evident across most areas of pasture including along the shoreline.

Figure 4.1 The slope extending to the estuary, typical of the property, with the yellowish-brown clay subsoil exposed (foreground). A former watercourse is also evident (arrow). Facing north

Figure 4.2 Pasture dominated by kikuyu grass, with the north-eastern area of bush visible in the centre of the image. Facing northeast

5 PA MANAGEMENT PLAN R09/540

The most significant archaeological site within the subdivision is the scheduled Matakanakana Pa (R09/540; Figure 5.1). The pa is protected by a covenant which was established by a consent notice under s.221 of the RMA. A plan for the future management of the pa has been detailed in a report entitled:

> Matakanakana Pa, Site R09/540 Bishophill Farm, Matakana: Management Plan, by S. Phear and R. Clough June 2013.

The management plan was compiled in consultation with Auckland Council, Ngāti Manuhiri and the landowner.

Figure 5.1 Pa site R09/540 visible on an aerial consistent with how it appeared at the time the Pa Management Plan was completed (source: Google Maps 2013)

6 MONITORING RESULTS

Monitoring works resulted in the recording of 21 new archaeological sites across the development area. Nineteen of those were midden sites, and two were historic period sites. In addition, midden relating to two previously recorded sites was exposed, one of which was subject to a full archaeological investigation (see Table 6.1, Figure 6.1 and Figure 6.2 for details).

6.1 Midden Sites

Nineteen new midden sites were recorded during monitoring works for haul/access roads and planting activities, as well as midden from two previously recorded sites (R09/2146 and R09/221, the latter containing additional features and being subject to full archaeological investigation). Details of the middens are listed in Table 6.1.

Thirteen midden sites (R09/2190-2196, R09/2187-89, R09/2165-67) were exposed in cuts for access roads, predominantly in what is now Bishop Lane (Figure 6.1 and Figure 6.2).

These midden deposits were highly fragmented and dominated by cockle, although some pipi and mudsnail were also recorded in some deposits. The deposits varied in size from small (1.5m x 0.4m – R09/2190) to quite large (24m E-W and 8m N-S – R09/2187). The majority of the new middens extended beyond the boundary of the access road, and therefore many of the sites retain undisturbed in situ deposits (see Table 6.1 for further details).

One site, R09/2196, consisted of three spatially distinct groups of midden deposits (Figure 6.1 and Figure 6.3). The largest of the three midden groups in the north of the site consisted of four midden deposits spread over an area of 7m (east-west) by 9m (north-south). The deposits were thin, only some 2cm thick and consisted of cockle, scallop, ringed Venus and gastropod with charcoal and heat-fractured rock. Four intact ovens/firescoops were also present within this grouping. The second, central, group was situated 6m to the south of the northern group and consisted of seven midden deposits and two firescoops over an 8m x 8m area within the road cutting. The midden deposits consisted of highly fragmented and crushed cockle with heat-fractured rock and charcoal also present in a silt matrix. The final deposit consisted of a thin spread of crushed cockle shell with some heat-fractured rock and charcoal over an area of approximately 2.5m x 0.70m. Part of this site extends beyond the road. Midden analysis was undertaken for this site (see Section 9.2).

The largest midden exposed during access road formation works was midden R09/2187 (Table 6.1; Figure 6.4). The midden deposit was up to 0.17m thick and consisted predominantly of cockle with some mudsnail in an ashy matrix, with frequent charcoal and fire-cracked rock also present. The deposit was observed along the course of the road cut for some 24m (east-west) and some 8m north-south, although the midden extended beyond the southern extent of the road and was also present on a steep bank that is under dense native vegetation. The midden was sampled for analysis and a 14C sample of cockle was submitted for radiocarbon dating, which dated the midden to the last quarter of the 17th century (see Section 9.3). The area within the road was destroyed, but the site extends southward beyond the road and also down a steep escarpment.

Other smaller middens exposed in the access roads and sampled for further analysis were middens R09/2188, R09/2189 and R09/2191 (Table 6.1 and see Section 9.2). A sample of

cockle from site R09/2188 was submitted for radiocarbon dating, which dated the site to around the turn of the 18th century (see Section 9.3).

Five of the midden sites (R09/2168-72) were discovered during planting works (Table 6.1). These middens were dominated by cockle and measured c.10-12cm thick, although one (R09/2168) measured 16cm thick. As with the 13 sites noted above, the shell was quite fragmented. One midden (R09/2170), however, was exposed in tree roots and also in tree throws within a large stand of trees on a steep west-facing slope beneath a grassed flat ridge top and above the eastern shore of the Matakana River estuary, approximately 140m west-southwest of cottage R09/2175 (Figure 6.5). Probing established that the midden extended downslope (E-W) for some 65m and approximately 50m (N-S) with some exposures up to 0.40m thick. The midden consisted primarily of cockle but with concentrations of pipi and mud whelk also observed, along with oven stones and charcoal. While the midden had been disturbed by the tree roots, it survives over a substantial area, which is a covenanted native vegetation area and was not affected by subdivision works. In all, the sites exposed during planting are still largely intact with little disturbance caused by the planting works.

An additional midden site (R09/2173) was exposed during works to install a silt trap (Table 6.1; Figure 6.6). This midden lens (measuring 1.72m long) belonged to a larger midden measuring some 9m E-W and 8m N-S, the silt trap only clipping a small area of the midden. The midden was cockle dominated with some heat-fractured stones and charcoal also recorded.

Two midden deposits relating to previously recorded midden R09/2146 were exposed during access road earthworks (Table 6.1; Figure 6.1 and Figure 6.7). The first midden deposit consisted of highly fragmented and occasional whole marine shell with charcoal and heat-fractured rock. Species present included cockle, pipi and gastropods. The deposit measured 2cm thick, over a c.4m E-W by 5m N-S area. It was disturbed by wheel ruts as it was situated within the line of an old farm track. While the deposit extended to the east of the track, due to very hard ground conditions at the time, it could not be established for how far. The second deposit was located just to the south and consisted of highly fragmented shell with occasional whole shells, and species present included cockle, pipi, scallop and gastropod, with some heat-fractured rock and charcoal also present. The deposit was 0.03m thick, over a 2m N-S by 80cm E-W are; though it extended outside of the farm track to the west, it was only up to a metre beyond. The surviving midden will likely be less fragmented as it is completely located outside the boundary of the farm track. A bulk shell sample was collected and analysed (see Section 9.2).

In accordance with the conditions of the Heritage NZ Authority, all of the NZAA site record forms for all of the midden sites have been updated.

Table 6.1 Details of midden sites exposed and recorded during monitoring works

ID	NZAA Site #	Context/ location	NZTM Easting	NZTM Northing	Description	Shell Analysed
Midden 1	R09/2191	Access Rd	1755680	5971991	Exposure of subsurface shell midden on side of newly cut access road, beneath mature Puriri tree. Patches of midden were exposed across an area of c.4 x 2m. Probing across the grassed area around the tree identified a further 6 x 4m deposit beneath turf. Midden comprised cockle (crushed, broken and whole) in a charcoal/ashy matrix.	Y
Midden 2	R09/2192	Access Rd	1755656	5971935	Exposure of shell midden along edge of newly cut access road. 0.2m stretch of midden exposed during battering for roadside. Remainder of midden appeared to remain intact beneath topsoil – probed extent c.1.4 x 2m. Only a very small proportion of the site (<5%) was truncated by the road batter, with the remainder subsurface beneath topsoil under turf to the west of the access road.	N
Midden 3	R09/2193	Access Rd	1755627	5971922	Exposures of shell midden deposit along edge of newly cut access road, c.20m from midden 2 (R09/2192) below small Puriri. Probing indicated that midden is intact subsurface over c.7 x 7m across the broad elevated flat overlooking the harbour. Exposed midden was evident in cutting over 5m, comprising broken cockle in a charcoal-stained soil matrix. The greater majority (>90%) is subsurface and in situ beneath topsoil under turf to the north of the access road.	N
Midden 4	R09/2194	Access Rd	1755607	5971912	Small midden deposit, cockle, exposed along newly cut access road. Deposit measured approximately 2 x 2m, located 10m southwest from large Puriri tree. Majority of the deposit (>75%) is in situ and subsurface sealed beneath grassed topsoil.	N
Midden 5	R09/2190	Access Rd	1755491	5971870	Exposure of slumped shell midden on southern side of newly cut access road. Evident over 1.5 x 0.4m. Comprised whole/broken cockle. The deposit within the road cut is destroyed and 50% remains beneath the turf to the immediate south of the access road.	N
Midden 6	R09/2195	Access Rd	1755550	5971884	Very small patch of exposed shell located c.6m northwest of Kowhai tree on southern side of newly cut access road. Possibly redeposited. Comprised whole and broken cockle. The extent of the site could not be established due to dry and extremely hard ground conditions.	N
Midden 7	R09/2187	Access Rd	1755443	5971882	Shell midden was exposed during construction of an access road (Bishop Lane). The midden deposit was up to 0.17m thick and consisted predominantly of cockle with some mudsnail also present in an ashy matrix with frequent charcoal and fire-cracked rock also present. The deposit was	Y

ID	NZAA Site #	Context/ location	NZTM Easting	NZTM Northing	Description	Shell Analysed
					observed along the course of the road cut for some 24m (E-W) and some 8m N-S, although the midden extended beyond the southern extent of the road and was present on a steep bank that is under dense native vegetation. The midden was sampled for analysis and a 14C sample of cockle was submitted for dating. The area within the road cut was excavated by hand with trowel, mattock and spade, planned and recorded and sampled. The area within the road was destroyed but the site extends southward beyond the road and also down a steep escarpment.	
Midden 8-11	R09/2189	Access Rd	1755405	5971889	The site comprised four distinct midden deposits that were exposed within the cut of an access road. The deposits consisted of: (1) a small deposit 0.8m x 0.5m of highly crushed cockle (E1755405, N 5971889); (2) a 6m x 3.5m midden of crushed and fragmented as well as whole cockle shell with occasional pipi, with charcoal and oven stone fragments (E1755400, N5971889 – this deposit also produced two pieces of chert and two pieces of obsidian; (3) a small oval shaped midden 1.2m x 2m x 0.05m thick composed of cockle (E1755400, N5971891); and (4) a small deposit of crushed and fragmented pipi and cockle with charcoal 2m x 1m at E1755383 N5971886. Midden samples and artefacts were retrieved for dating and analysis. The three smaller deposits were truncated entirely by the road construction and are destroyed, while the larger extended beyond the road cut and into and possibly beyond a bank to the south, and so survives to an unknown extent.	Y midden 9
Midden 12	R09/2188	Access Rd	1755330	5971825	Shell midden was exposed in the cutting of a new access road and was visible as a deposit that extended 6.8m x 3.5m on a NW-SE alignment. The midden consisted predominantly of cockle, with pipi and mudsnail that was crushed and fragmented, but with complete shell specimens also present along with charcoal and oven stone fragments. The deposit was 0.05m thick. The midden in the road footprint was excavated by hand with trowel, sampled and recorded. The feature extends to the east into densely vegetated bush on steep slopes.	Y
Midden 15, 16 and 17	R09/2196	Access Rd	1755371	5971766	The site consists of three spatially distinct groups of midden deposits exposed by the cut of an access road. The site is situated on the eastern side of the small headland opposite Sandspit, some 50m due east of the eastern terminus of the northern transverse ditch of pa site R09/540. The largest of the three midden groups in the north of the site consisted of four midden deposits spread over an area of 7m (east-west) by 9m (north-south). The	Y midden 15

ID	NZAA Site #	Context/ location	NZTM Easting	NZTM Northing	Description	Shell Analysed
					deposits were thin, only some 2cm thick, and consisted of cockle, scallop, dosinia and gastropod with charcoal and heat-fractured rock (E1755362, N5971775). Four intact ovens/firescoops were also present within this grouping. The second central group was situated 6m to the south of the northern group and consisted of seven midden deposits and two firescoops over an 8m x 8m area within the road cutting. The midden deposits consisted of highly fragmented and crushed cockle with heat fractured rock and charcoal also present in a silt matrix (E1755371, 5971766). The final deposit consisted of a thin spread of crushed cockle shell with some heat fractured rock and charcoal over an area of approximately 2.5m x 0.70m at the eastern edge of the access road some 5m to the south of the central group (E1755380, N5972587). Much of the site has been impacted by the road cutting. However, subsurface and in situ deposits extend either side of the access road.	
Midden 18	R09/2165	Access Rd	1755601	5972587	Midden was exposed in the cutting of a haul road. The exposed material was spread over an area of some 16m (E-W) by and 4m (N-S). Only a narrow 5m long strip of midden remains in situ to the immediate south of the edge of the haul road. The midden only extends up to 0.30m back from the edge of the road. The midden consisted virtually entirely of cockle, though a few mud whelk specimens were also observed along with inclusions of charcoal and heat-fractured pieces of oven stone. The midden deposit was highly fragmented and crushed, up to 6cm thick and sealed by yellowish mid-brown topsoil. The midden deposit sealed a charcoal-rich mid brown silty soil that in turn sealed a brownish yellow very silty colluvium. The midden is situated on a pronounced slope, though as there have been historical land slips in the immediate vicinity it is probable that the midden was deposited after a slip moved a block of land en masse. Approximately 95% of site has been destroyed by the cutting of a haul road through the midden by mechanical excavator. Only a narrow 5m long x up to 0.30m wide strip of midden remains in situ to the immediate south of the edge of the haul road.	N
Midden 19	R09/2173	Silt trap	1755706	5972589	The excavation of a silt trap exposed a 1.72m long lens of midden in a W-SW facing section of the trench and a smaller 0.35m long lens of midden in the S-SE facing section. The shell midden consisted of cockle (whole and fragmented) with occasional inclusions of charcoal and small fragments of heat-fractured oven stones in a dark grey silt matrix. The midden exposed	N

ID	NZAA Site #	Context/ location	NZTM Easting	NZTM Northing	Description	Shell Analysed
					in section varied in thickness from 0.14m to 6cm and probing established that the midden was approximately 9m (E-W) x 8m (N-S), so the silt trap excavation had just 'clipped' the far western extent of the site. The midden deposit was sealed by a topsoil (dark brown silty loam) 0.14m thick, that sealed a subsoil 0.16m thick (mottled brown and yellow silty clay) which in turn sealed a light brown yellow natural clay. Only a very small portion of the westerly edge of the midden was truncated by the excavation of a silt trap. Much of the site is subsurface and in situ beneath indigenous vegetation.	
Midden 20	R09/2172	Planting	1755544	5972091	A small amount of the upper layer of midden was disturbed by the planting of flax. Probing established that the midden was subsurface and in situ and present for some 7m (N-S) and up to 3m (E-W) and was up to 0.10m thick. A west facing section exposed in a soil slip scar showed that the midden consists entirely of cockle shell (whole, fragmented and crushed) with charcoal and small pieces of heat-fractured oven stone in a greyish brown silty matrix.	
Midden 21	R09/2171	Planting	1755493	5971955	Shell midden deposit situated on lower slopes on western side of headland at Buckland's Beach, Tawharanui Peninsula, exposed by the planting of flax. Probing established that the midden extends 7m (N-S) x 3m (E-W) and is approximately 0.10m thick. Exposed midden observed as a result of the planting consisted of highly fragmented or crushed cockle shell with small pieces of heat-fractured rock also noted. Sub surface and in situ. Only slightly disturbed by the planting of flax.	N
Midden 22	R09/2170	Planting	1755629	5972105	Exposed shell midden was observed in exposed tree roots and also in tree throws within a large stand of trees on a steep west-facing slope beneath a grassed flat ridge top and above the eastern shore of the Matakana River estuary approximately 140m W-SW of cottage R09/2175 and to the west of a gravel access road. Probing established that the midden extends downslope (E-W) for some 65m and approximately 50m (N-S) with some exposures up to 0.40m thick. The midden consisted primarily of cockle but with concentrations of pipi and mud whelk also observed along with oven stones and charcoal.	N
Midden 23	R09/2169	Planting	1755669	5972166	Tree planting works partially exposed two distinct midden deposits approximately 10m apart. The larger deposit consisted of highly fragmented cockle shell with dimensions of 10m (E-W) and 7m (N-S) and was 0.12m	N

ID	NZAA Site #	Context/ location	NZTM Easting	NZTM Northing	Description	Shell Analysed
					thick. The smaller deposit also consisted of highly fragmented shell midden and was 4m x 2.5m in size and 0.10m thick.	
Midden 24	R09/2168	Planting	1755680	5972064	Shell midden was exposed by tree planting of a grassed paddock. The midden consisted of cockle and was up to 0.16m thick and was in situ and subsurface covering an area of 5m (E-W) x 10m (N-S), located on a flat ridge top to the west of a gravel access road.	N
Midden 25	R09/2167	Access Rd	1755497	5972432	Midden was observed exposed in tree roots. Probing established that the midden extended for some 18m (N-S) and some 21m (E-W) and was up to 0.24m thick. Where the midden was exposed it consisted predominantly of cockle (95%), with some pipi (4%) and mudsnail (1%) with some large oven stone fragments as well as highly fragmented pieces of heat-fractured rock and charcoal also visible. The vast majority of the site is subsurface and in situ.	N
Midden 26	R09/2166	Access Rd	1755551	5972397	Shell midden was exposed by the cutting of a gravel access road. The midden consisted of cockle and was up to 0.35m thick. The remaining in situ and subsurface deposit covers an area of 8m (E-W) x 6m (N-S) which is located at the top of a slope immediately beneath the western edge of the gravel road. Some midden was visible in exposures created by tree roots.	N
Previously recorded midden sites exposed during works:						
Midden 13 & 14	updated R09/2146	Access Rd	1755338	5971809	Two midden deposits relating to R09/2146 were exposed during earthworks for forming an access road (now Bishop Lane) as part of subdivision works. The first midden was located at E1755342 N5971802 and consisted of highly fragmented shell with occasional whole shells, charcoal and heat-fractured rock. Species included cockle, pipi and gastropods. The layer was 3cm, measuring c.4m E-W x 5m N-S area. The second deposit was 2cm thick and of almost identical composition, but it also contained scallop.	Y midden 14
Midden, pits, human remains	R09/221	Boat ramp access Rd	1755654	5972393	See Section 7 for details	Full Investigation
New Historic Sites:						
Rubbish Pit	R09/2174	Silt trench	1755717	5972546	During excavation of a 2m wide x 80m long x 0.30m deep trench for silt control 19th century artefacts were observed on the topsoil/subsoil interface across an area of some 8m x 2m. After cleaning the area with trowel and	Y context 303

ID	NZAA Site #	Context/ location	NZTM Easting	NZTM Northing	Description	Shell Analysed
					hoe it was evident that a European refuse pit had been heavily vertically truncated by 20th century ploughing, which had dispersed many of the artefacts. The remaining pit base was rectangular in shape with rounded corners and was 0.66m in length x 0.52m wide and only survived to a depth of 0.08m. After half sectioning and recording the remaining pit fill was 100% excavated. The artefacts recovered consisted of bottle glass (black beer, blue pharmaceutical, case gin, aqua etc); ceramic (willow ware, transferware in a variety of colours); iron objects (a wrought iron folded axe head, wrought iron horseshoe nails and square and rectangular rose head nails); a clay pipe bowl and fragments of tobacco pipe stems and two buttons (one cu alloy and one shell). Investigation of the wooded area immediately to the south revealed that there are 19th century artefacts that have been brought to the surface by exposed tree roots and this probably indicates the presence of further refuse pits in the area and the site of a historic house/cottage in the vicinity.	
Rubbish dump	R09/2164	Access road	1755737	5972061	A spread of historic artefacts was observed over an area of 50m x 30m on a steep S-SE facing slope descending through thick bush approximately 65m southwest of an extant historic house (R09/2175). Artefacts consisted of various glass alcohol bottles (black beer, case gin, etc), pharmaceutical bottles, windowpane glass, stoneware vessels (ink and ginger beer), ceramic (willowware, transferware), cast and wrought iron pieces, roof slates and writing slates. The majority of the artefacts appeared late 19th century in date but there was also early 20th century material present. Artefacts were visible on the surface and also protruding from the topsoil but were otherwise in good condition.	N

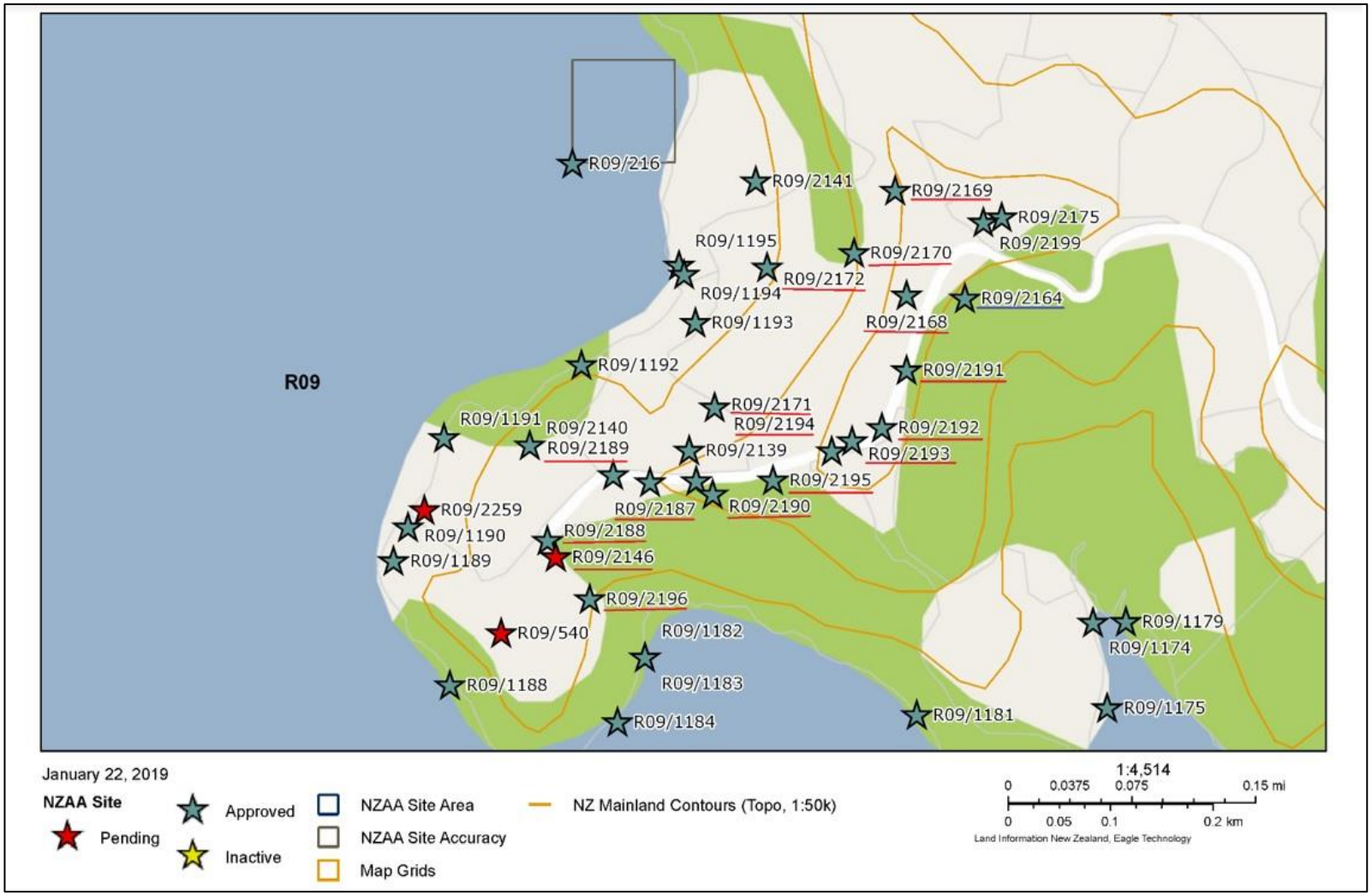


Figure 6.1 NZAA ArchSite map with the new midden sites recorded during monitoring underlined in red, historic sites underlined in blue – central and southern area

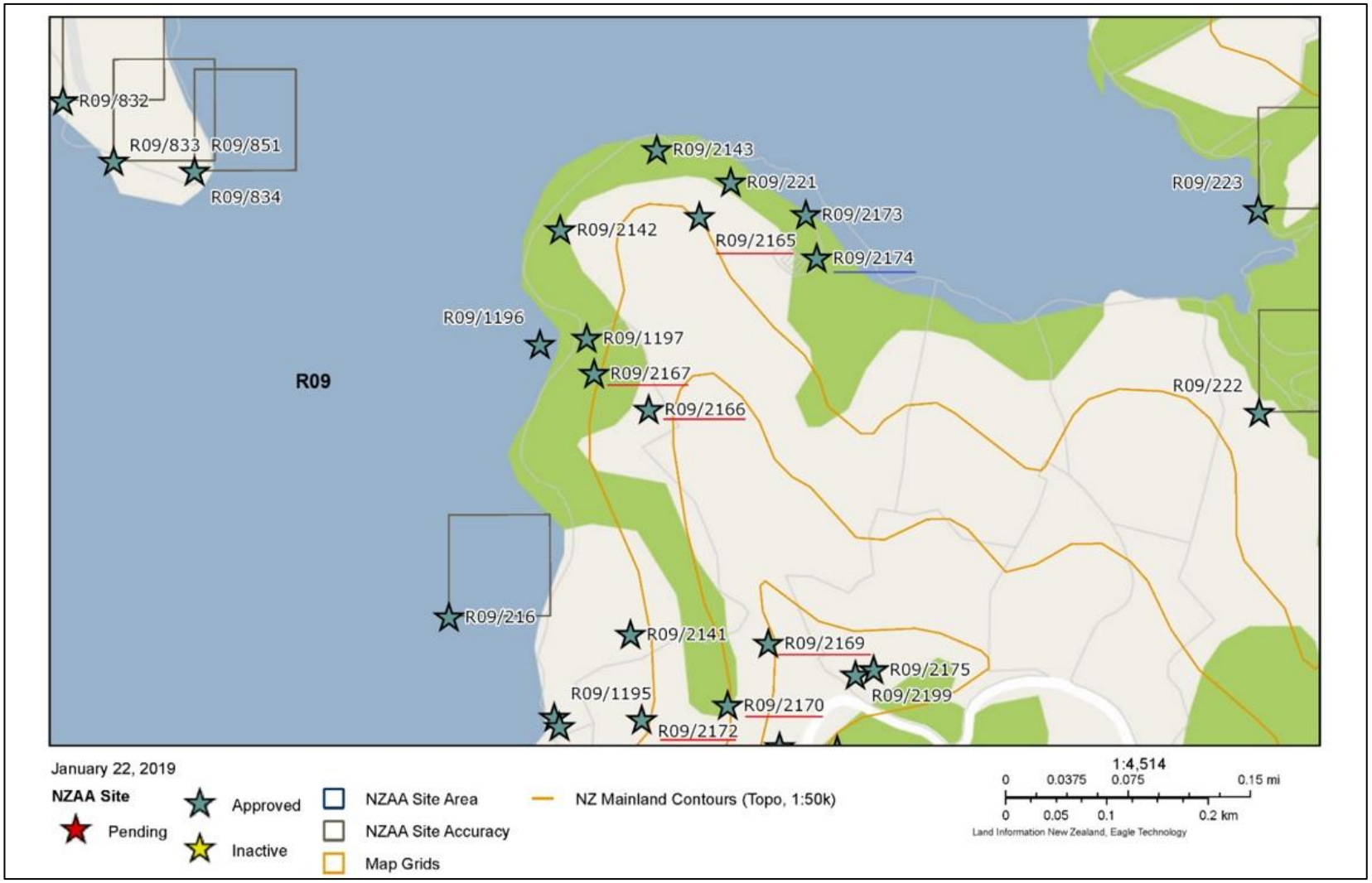


Figure 6.2 NZAA ArchSite map with the new midden sites recorded during monitoring underlined in red, historic sites underlined in blue – northern area

Figure 6.3 Midden R09/2196, identified during access road monitoring. The firescoops are indicated by the arrows (facing south)

Figure 6.4 Midden R09/2187 exposed in the access road, with the red arrows indicating the midden extents within the access road. The arrows indicate the location of the bulk samples (facing east)

Figure 6.5 Midden R09/2170 located within a stand of trees (facing south)

Figure 6.6 Midden R09/2173 identified during excavations to install a silt trap. The white dashed line indicates the extent of the midden (facing north)

Figure 6.7 Midden R09/2146 exposed during access road earthworks (facing south)

6.2 Historic Sites

Two historic refuse features were recorded during monitoring works. The first, R09/2174, was exposed in a 2m wide x 80m long x 0.30m deep trench for silt control. Nineteenth-century artefacts were observed on the topsoil/subsoil interface across an area of some 8m x 2m. After cleaning the area with trowel and hoe, it was evident that a European refuse pit had been heavily truncated by 20th century ploughing which had dispersed many of the artefacts into the surrounding topsoil. The remaining intact pit base was exposed and excavated. The base was sub-oval in plan with rounded corners and was 0.66m in length x 0.52m wide and survived to a depth of just 0.08m (Figure 6.8). After half sectioning and recording the remaining pit fill was completely excavated (see Table 6.2 for stratigraphic sequence, and section and plan drawings are shown in Figure 6.8).

The artefacts recovered varied, and have been analysed, with the results presented in Section 8.

Investigation of the wooded area immediately to the south revealed that there were additional 19th century artefacts that had been brought to the surface by exposed tree roots and which probably indicate the presence of further refuse pits in the area and the site of a historic house/cottage in the near vicinity.

The second site, R09/2164, was a spread of historic artefacts visible over an area of 50m x 30m on a steep south-southeast facing slope. The artefacts were situated on a steep slope descending through thick bush approximately 65m southwest of an extant historic house (R09/2175). Artefacts consisted of various glass alcohol bottles (black beer, case gin, etc), with pharmaceutical bottles and windowpane glass also present (Figure 6.9), as well as

stoneware vessels (ink and ginger beer), ceramic (willowware, transferware), cast and wrought iron pieces, roof slates and writing slates. The majority of the artefacts appeared to be late 19th century in date but there was also early 20th century material present.

Artefacts were visible on the ground surface and also protruding from the topsoil, but were otherwise in good condition.

In accordance with the conditions of the Heritage NZ Authority, the NZAA site record forms for the two historic sites have been updated.

Table 6.2 Contexts recorded in association with European refuse pit context 302, recorded as site R09/2174

Context Number	Description
300	Topsoil. Mid-brown, silty loam. Artefacts spread throughout via historic ploughing
301	Yellow silty subsoil, moderately compact
302	Sub-oval pit in plan, concave sides and base
303	Fill of refuse pit. Historic artefacts including glass, ceramics, and iron/nails

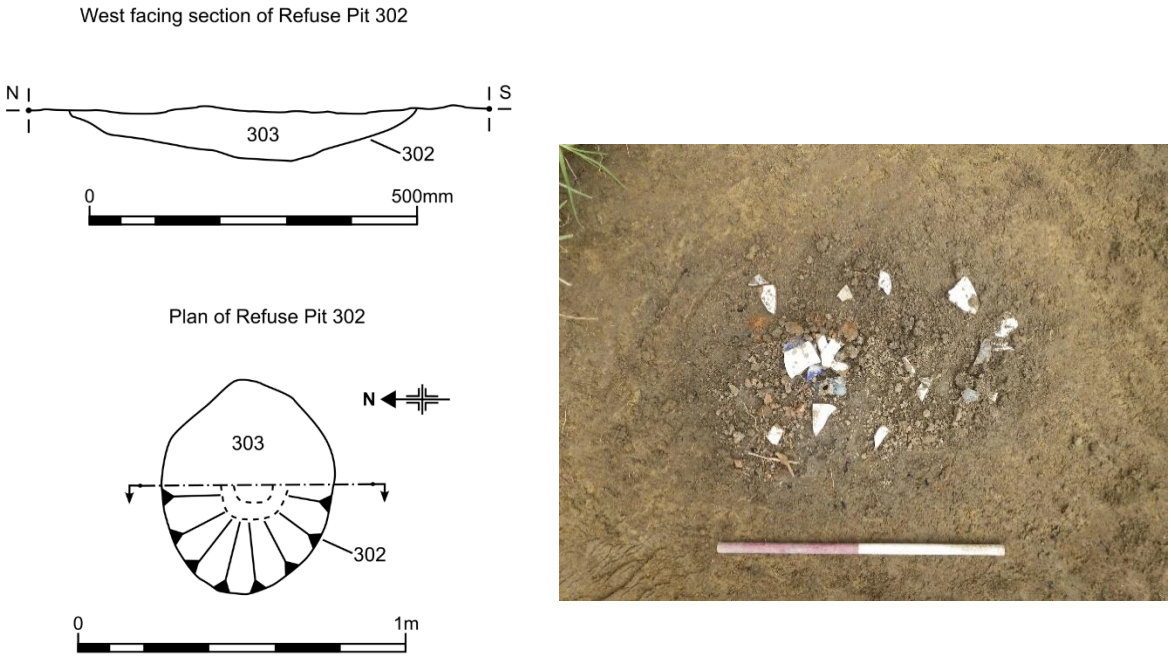


Figure 6.8 Photograph and drawings of the refuse pit, site R09/2174 (50cm scale shown in photo)

Figure 6.9 Examples of bottles present within site R09/2164

7 SITE R09/221 EXCAVATION RESULTS

Midden site R09/221 (CHI 5221) was originally recorded in 1976 and the coordinates given on the NZAA ArchSite database located the site slightly inland. However, the record described the middens as being located along the banks of a stream and under the trees, not inland, suggesting that the coordinates were incorrect. It was established at the assessment stage that the midden was partly located within the footprint of a boat ramp and access road (Figure 7.1), and as such was to be modified by earthworks. Table 7.1 provides a description of the 5 midden deposits that were originally recorded on the NZAA SRF. Midden 4 was the midden exposed by earthworks to construct the boat ramp and it was subsequently investigated.

Figure 7.1 Location of R09/221 (within in the boat ramp footprint) outlined in black and indicated by the red arrow

Table 7.1 Description of the midden deposits recorded in 1976 which made up site R09/221, with midden 4 undergoing investigation (NZAA SRF)

Midden no.	Description
1	Compact layer of whole and broken cockle 5cm thick, 1m long in grey clay soil. Under pine trees.
2	In bank of small stream. Layer of whole pipi 5cm thick, 50cm long.
3	In grove of trees. Disturbed by puriri roots. Whole and broken cockle scattered down hillside. Scatter extends 24m. One-layer 50cm thick visible.
4	Intermittent layer of whole cockle extending 30m. A layer not very concentrated in clay matrix. Layer 10cm thick.
5	Midden scatter eroding down bank. Cockle, Alcithoe and rock oyster.

7.1 Midden Excavation

The initial excavation took place over a 2-week period in March-April 2014, while an additional excavation took place in late October-early November 2014. Topsoil stripping revealed that the midden was far larger than initially thought, at least 40m by 30m, and it extended beyond the edge of excavation to the north and east. Three additional large midden deposits were also recorded as part of the site (Figure 7.2, Figure 7.3). In total, 148 contexts were recorded during the investigation (see Appendix 1).

A number of features were sealed by the midden deposits and pre-dated them (Figure 7.4): two large intercutting kumara pits, one of which contained two deposits of skeletal human remains, ovens/firescoops and postholes. Protocols dealing with the discovery of human remains approved by Heritage NZ and Ngāti Manuhiri were followed on discovery of the remains, and the NZ Police were notified. The remains were lifted under the supervision of Ngāti Manuhiri, and re-interred on site. Other features truncated the midden, such as a number of earth ovens, pits, and a horse burial (the latter being of late 19th or early 20th century date).

A series of trenches were placed through the middens to record stratigraphy and obtain environmental samples for analysis and radiocarbon dating. Similarly, the pits, postholes and firescoops were half sectioned and sampled. The results of the excavation are presented below.

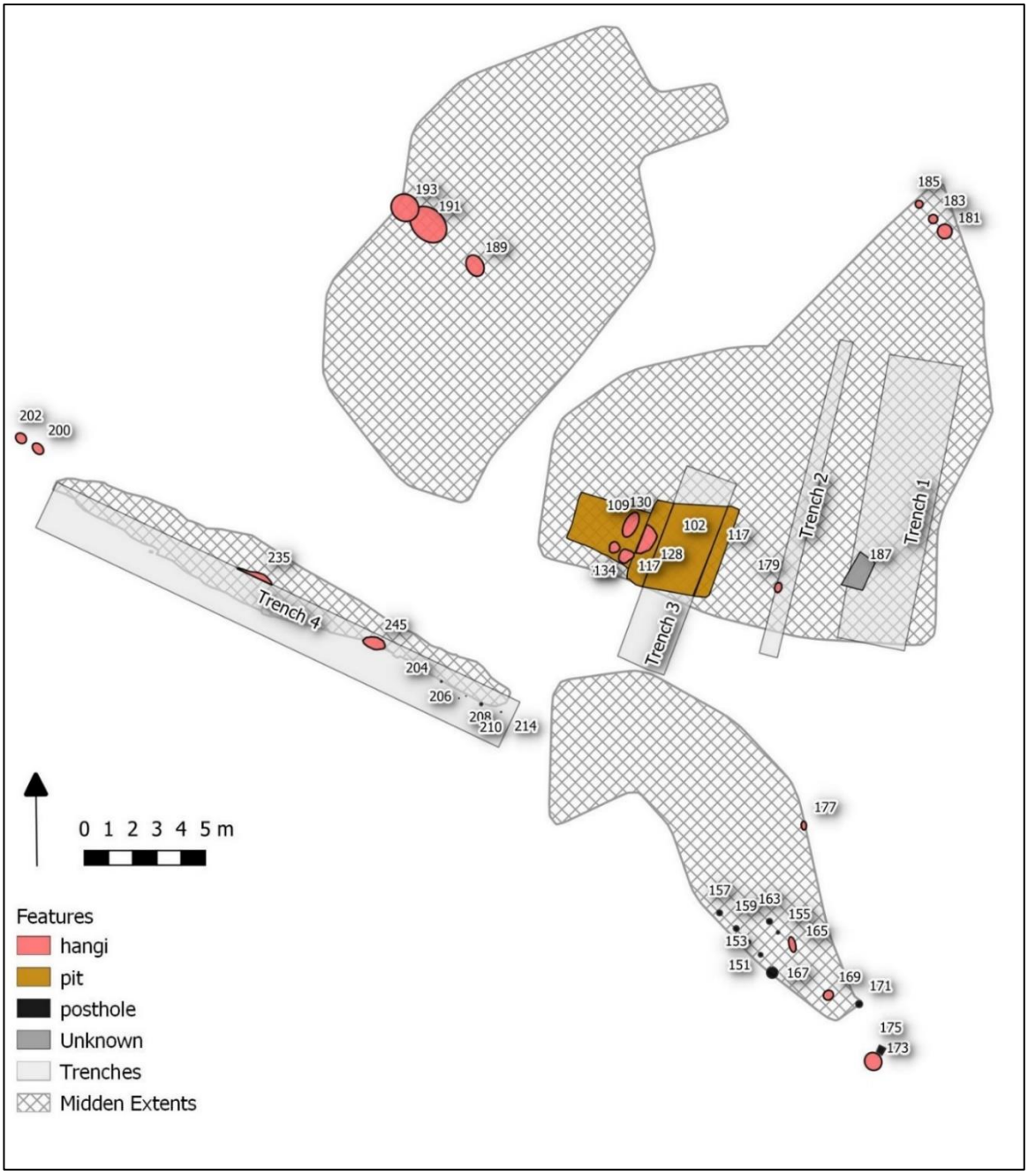


Figure 7.2 Plan of midden deposits and features relating to site R09/221 (note that not all features are included in this plan as some were only visible in section in the excavation boundary)

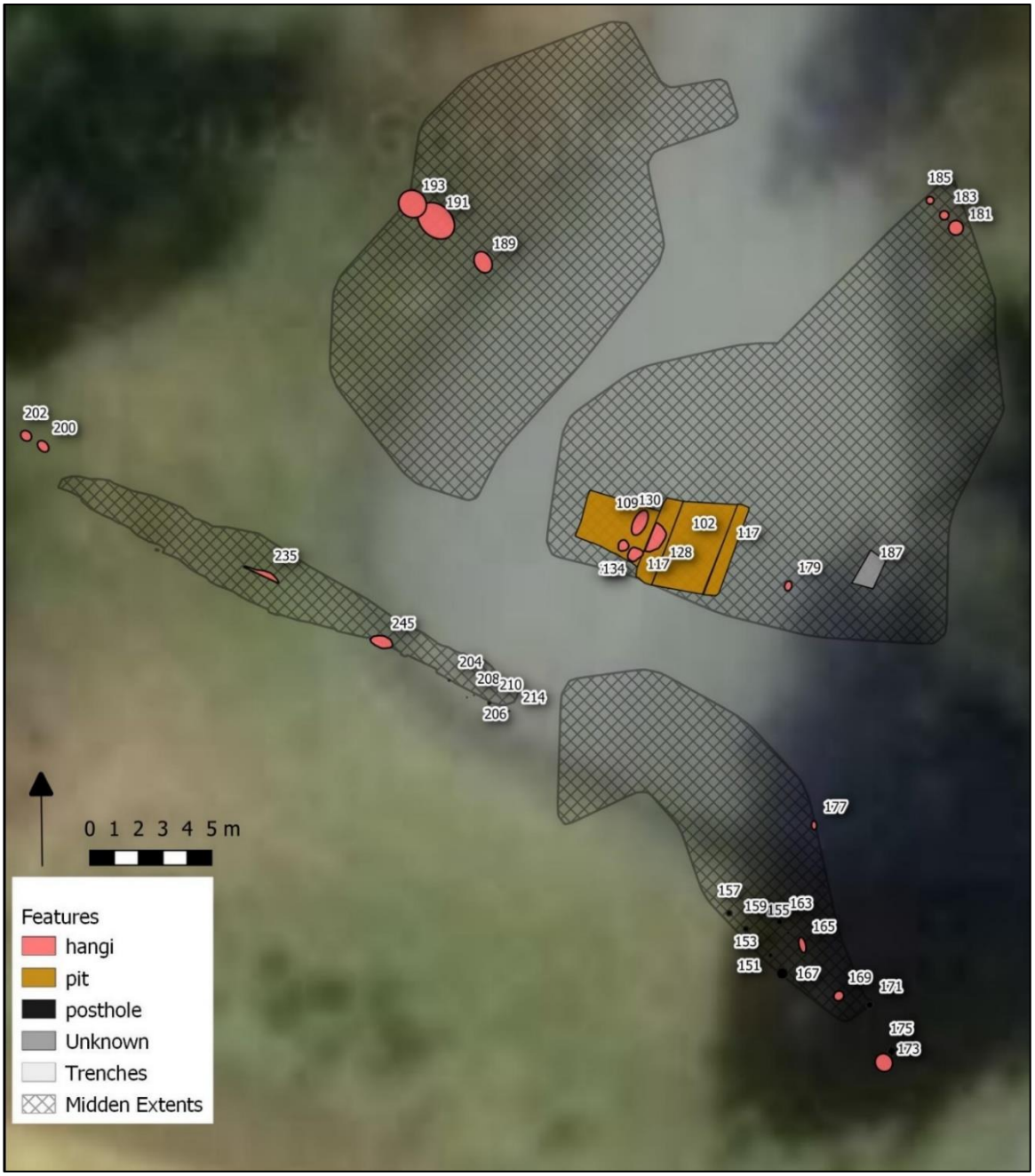


Figure 7.3 R09/221 in relation to the finished boat ramp (grey area on aerial)

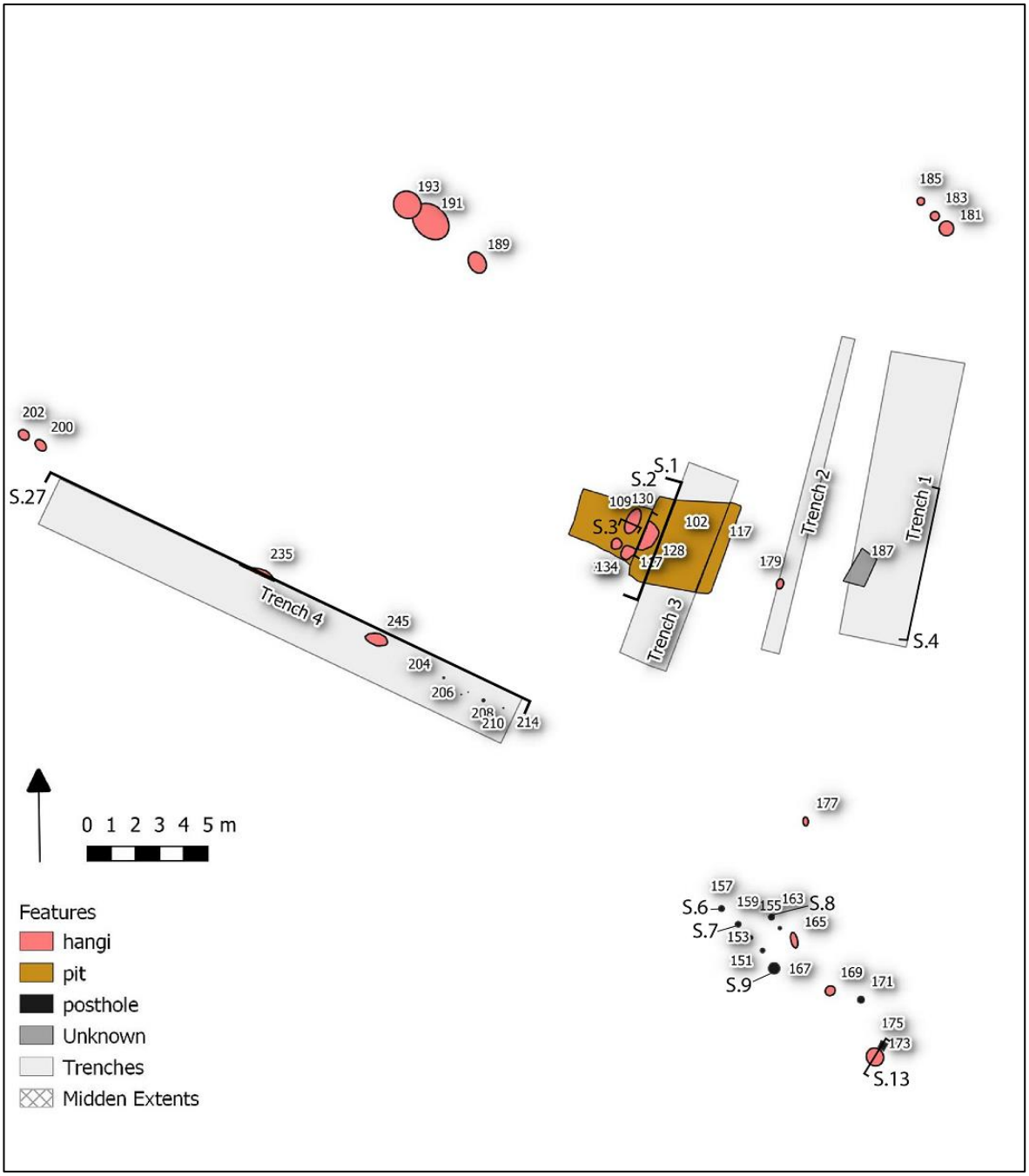


Figure 7.4 Figure illustrating archaeological features with the midden removed. Section locations indicated

7.2 Midden Deposits

Four distinct and relatively large midden deposits were exposed during topsoil stripping, all of which relate to site R09/221 (the uppermost midden layer being recorded as context 101) (Figure 7.5). The three largest of the midden deposits were exposed during initial topsoil stripping in March 2014, while the southwestern deposit (context 216) was exposed in October 2014 (Figure 7.5 and Figure 7.6). Four slot trenches were excavated through the middens (Figure 7.2), which indicated a number of different deposits, including ash rake-out from hangi and firescoops. See Appendix 1 for full context descriptions.

Trenches 1 and 2 were located roughly N-S through the large central midden deposit, which measured 17m E-W and 17m N-S, and Trench 3 was located through two kumara pits which had been sealed by the midden (Figure 7.2). The westernmost midden deposit measured 18.5m N-S by 11m E-W.

Section 4 was located on the eastern extent of Trench 1 (Figure 7.4) as it provided a section through a number of hangi/firescoops located within the midden as well as what was initially thought to represent a bin pit – discussed later in the report (Figure 7.7, Figure 7.8). The midden layers in Section 4 were predominantly characterised by cockle shell (context 101), with some shell and silty clay (context 102), and consisted of both fragmented and whole shells. The midden deposit was quite thin in this eastern extent of the deposit.

A radiocarbon determination was obtained for the shell midden (context 101) and the results are discussed in Section 9.4, while shell midden analysis is discussed in Section 9.2.

Section 27 was placed through the southwestern deposit of midden R09/221, which measured 21m E-W and 3.8m N-S (Figure 7.2, Figure 7.4, Figure 7.5, Figure 7.9 to Figure 7.11). The midden deposit was stratified and consisted of a layer of whole and partially fragmented cockle shell with some (context 216) interspersed with ashy rake-out deposits which included charcoal and small highly fragmented shell fragments and fire-cracked rock (contexts 231-233), as well as a highly fragmented shell layer (context 234). In the central part of the section two charcoal and ash rich deposits were recorded (contexts 238 and 239) which also included highly fragmented shell and small pieces of heat-fractured stones, with context 238 also appearing greasy, suggesting that something oily may have been cooked. Three additional deposits (contexts 240-242) consisted of highly fragmented shell mixed with clay silt and ash, again relating to cooking activities. The westernmost layers, contexts 242 and 243, also consisted of moderately fragmented and crushed shell mixed with ash and clay. Interspersed within the shell layers were clay layers 217 (a yellow compact mottled clay) and 218 (a burnt clay layer).

A shell midden layer (context 136) above a dark brown clay layer (context 137) was located in the easternmost midden deposit only.

A radiocarbon determination was obtained for the shell midden (context 216) and the results are discussed in Section 9.4.

Shell midden was also present within cut features as fill and will be discussed below in relation to those feature types.

Figure 7.5 The three large midden deposits discovered during the initial phase of excavations at site R09/221, facing east

Figure 7.6 The southwest midden deposit (context 216) of R09/221, pre-excavation. Facing northwest

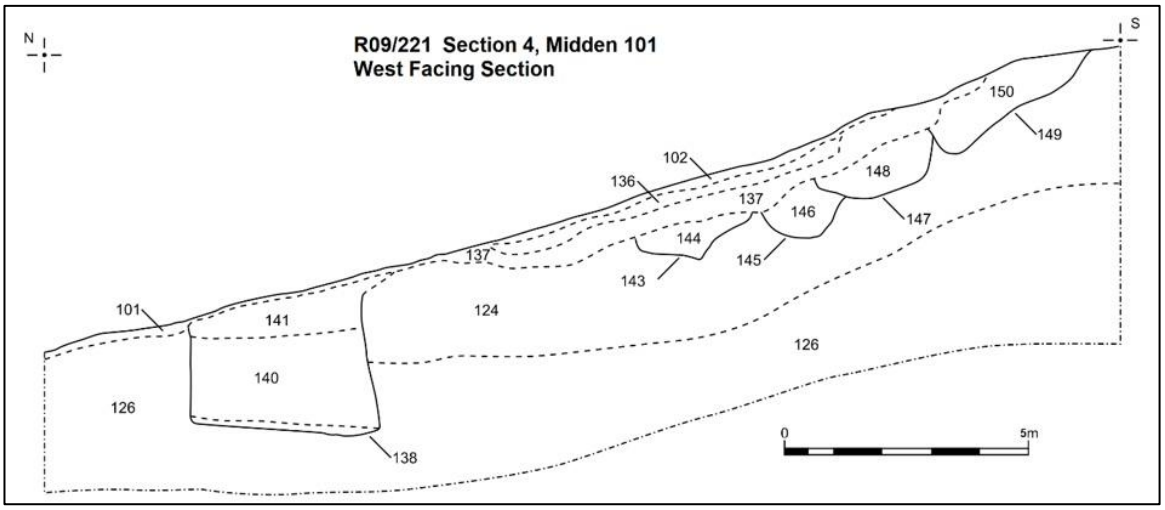


Figure 7.7 Section 4 through midden 101, site R09/221, indicating different hangi/firescoops and ash/rake out layers

Figure 7.8 Section 4 with the midden layers visible in the upper layers and the enigmatic pit feature 138 clearly visible. The arrows indicate the hangi and pit (scale bars: 1m)

Figure 7.9 Trench 4 placed through the midden (context 216), with the location of Section 27 indicated by the arrow

Figure 7.10 Part of Section 27 indicating the stratigraphy both within and beneath the midden (context 216), facing north (scale: 2m)

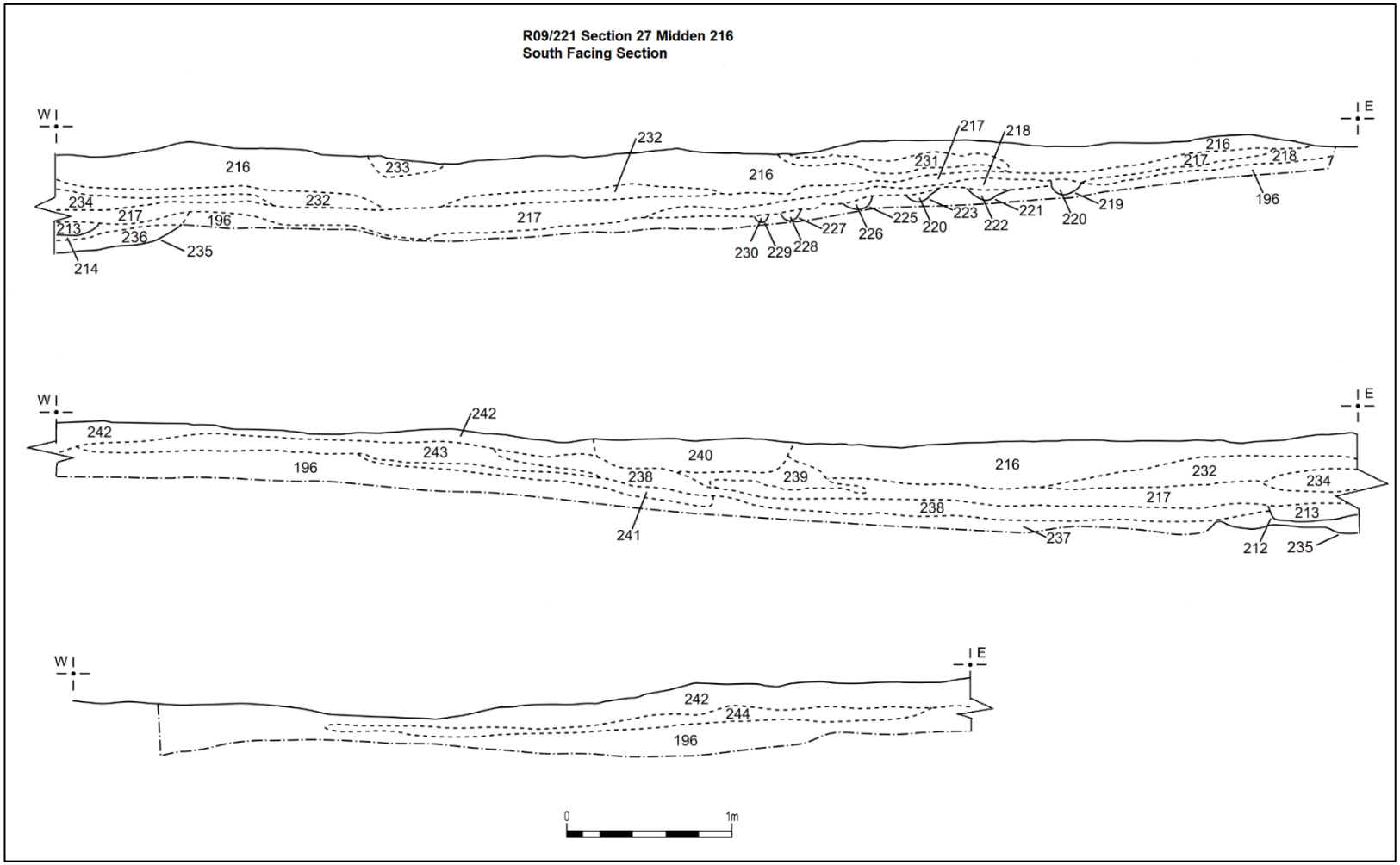


Figure 7.11 Section 27 – through midden 216 and various postholes and hangi

7.3 Kumara Pits

Two kumara pits were located beneath the central shell midden of R09/221, and Trench 3 was located within the pits (Figure 7.2, Figure 7.3, Figure 7.12). The first pit was context 117 while a later pit (context 109) was cut perpendicular to and through the fills of pit 117, following backfilling of the original feature.

7.3.1 Kumara Pit 117

This kumara pit was rectangular in plan, and oriented N-S with dimensions of 3.25m E-W by 3.6m N-S, and had a depth of 0.95m. The feature contained a drain which was visible in section at its southern end, while at the northern end a sump was present with two vertical drains in its base (Figure 7.13, Figure 7.14). The pit had 8 distinctive fills, the uppermost two of which were shell midden (contexts 102 and 103). It is likely that this shell originated from the main midden deposit above. A series of clay layers, some mottled, with rootlets and charcoal inclusions present (contexts 110, 111, 113, 114, and 115), formed the main fills on the southern extent, with one small highly fragmented shell lens (context 112). Contexts 118, 119, 121 (same as 115) and 123 (same as 110) formed the northern pit fills. The two primary fill layers (contexts 116 and 122) were located at the very base of the pit, infilling one small drain on the southern side, and the sump and two small drains on the northern side.

The pit was cut into two distinctive clay subsoil layers (contexts 124 and 125) and a thick layer of colluvium (context 126). The colluvium was present across the excavation area at varying depths.

7.3.2 Kumara Pit 109

This kumara pit was rectangular in plan, situated perpendicular to pit 117, with the eastern end of the feature also truncating the fills of pit 117 and also cut through its base (Figure 7.13). The pit was aligned east-west and was a minimum of 3.8m in length, although originally perhaps as long as 5m, since the eastern terminus of the pit was not observed as Trench 3 was placed (unwittingly) at the interface between the two pits; it was 1.82m wide and had a depth of 1.20m (Figure 7.2 to Figure 7.4). As with pit 117, the uppermost fill of pit 109 was made up of shell midden (context 102) which had likely infilled a settled hollow that formed after the pit had been backfilled. Sealed beneath this was a small hangi (context 128) which contained a single fill (context 129), which consisted of cockle and pipi shells within a dark brown clay-silt matrix. The hangi was cut into a dense layer of cockle shell interspersed with occasional patches of a mid-brown clayey silt (context 103) which formed the other upper layer of the pit, similar to kumara pit 117.

Context 103 sealed a series of fill deposits, some gleyed (evidence of former waterlogged conditions), such as contexts 104 and 105 which were heavily compacted clay layers with a small lens of highly fragmented shell (context 106) sandwiched between them, which suggests the pit was backfilled intermittently. These layers in turn sealed a compacted primary clay layer near the base (context 107) with a compacted, sticky yellowish-and-red mottled clay, with occasional charcoal inclusions present on the northern side of the pit and infilling the sump and small drain.

A sample of shell midden from context 129 was analysed and the results are presented in Section 9.2. A radiocarbon determination obtained from context 106 indicates that the deposit dates to the last quarter of the 16th century. More detailed dating analysis is presented and discussed in Section 9.4.

Figure 7.12 Kumara pits 109 and 117 with Trench 3 indicated by the black arrow. The top fill of both pits was midden deposit 102. Visible, and indicated by the red arrows, are hangi 130 (brown oval feature), hangi 134 and hangi 135. Facing east

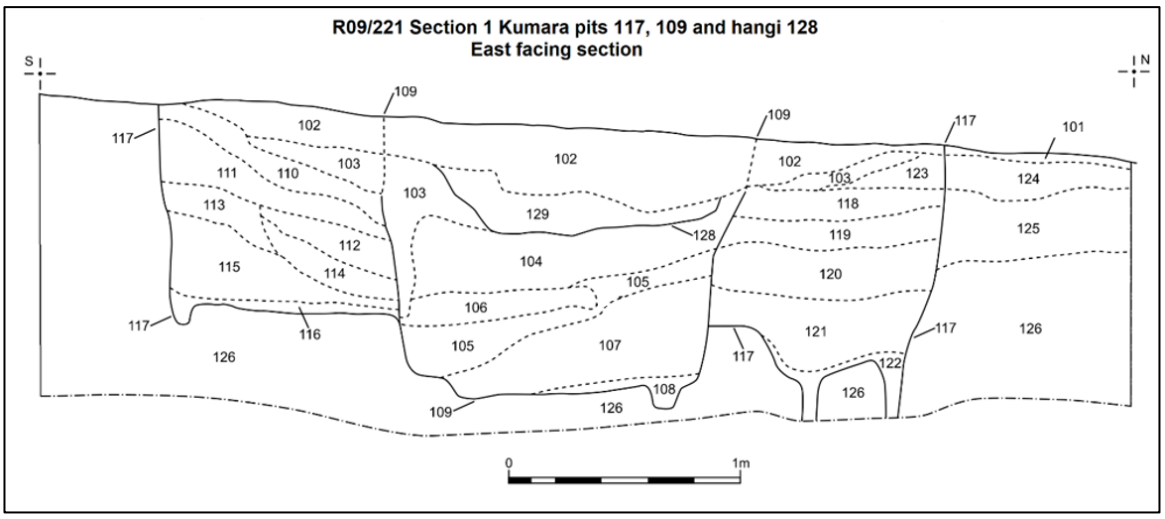


Figure 7.13 Section drawing for kumara pits 117 and 109; hangi 129 also shown

Figure 7.14 East facing of section of kumara pits 117 and 109 (scale:1m)

7.4 Human Remains

Human remains were found in two discrete clusters within kumara pit 109. The first was located at the eastern end of the pit just west of Section 3 (Figure 7.4), and located within context 106, a sticky, compacted dark brown clay with occasional heat-fractured rock and charcoal inclusions (Figure 7.15 and Figure 7.16). There was no evidence of a grave cut. The skeletal remains only consisted of the skull (the lower mandible being absent) and two neck vertebrae. The teeth were worn almost flat, suggesting an adult. It appears that the skull was deposited on the surface of a hollow within context 106, which subsequently silted up over time.

The second discrete cluster of skeletal material was located at the western end of kumara pit 109, within context 104 (Figure 7.16). The remains were oriented north-south, and consisted of both femurs, part right ulna and radius, both tibias, right fibula, metatarsals, metacarpals, two vertebrae, hip sockets and ball joints. The skull was incomplete, with only the cranium present. The remains were deposited within a highly fragmented lens of cockle shell within a sticky compact dark brown clay matrix that contained occasional heat-fractured rocks and charcoal. As with the remains at the eastern end, there was no evidence of a grave cut. A number of parallel cut marks present on the outer surface of both tibias and a radius fragment are consistent with a sharp-bladed implement such as an obsidian or chert flake, and are not considered to have been produced by taphonomic processes. It was also noted that some cockle shell was present within the cranium.

At the request of Ngāti Manuhiri, the koiwi were re-interred immediately after removal and were reburied in a grove of covenanted trees nearby, following appropriate tikanga. Therefore, no further analysis was undertaken of the skeletal material.

Figure 7.15 The arrow indicates the location of the human remains with the sticky clay within the hollow still evident (facing west)

Figure 7.16 The red arrow indicates the location of the second cluster of human remains within kumara pit 109, while the black arrow indicates the first cluster, which is also shown in Figure 7.14 (facing east)

7.5 Postholes and Stakeholes

A total of 22 postholes (some of which incorporated postpipes) and stakeholes were recorded during the investigation of R09/221 (Figure 7.2; see Appendix 1). Three clusters of postholes are likely to relate to drying racks. The first cluster was visible in Section 27 only, and consisted of 6 postholes (contexts 210 and fill 220; 221 and fill 222; 223 and fill 224; 225 and fill 226; 227 and fill 228; 229 and fill 230) located beneath the large midden deposit (context 216) and therefore pre-date the midden (Figure 7.11, Figure 7.17).The postholes were quite shallow (0.05m to 0.08m deep) and had been vertically truncated. The fills of the postholes were homogeneous and consisted of compacted yellowish-brown and pinkish-orange clay, with small patches of burnt clay and occasional charcoal inclusions present.

The second row of postholes and stakeholes was located just north of the southernmost midden (context 216) and was either contemporary with or later than the midden deposit (Figure 7.18 and Figure 7.19). These two postholes (contexts 204 and fill 205; 210 and fill 211) and 3 stakeholes (contexts 206 and fill 207; 208 and fill 209; 214 and fill 215) ranged in depth from 0.06m to 0.19m, which suggests that little vertical truncation had taken place. These postholes and stakeholes were likely part of a fish drying rack. The fills of these features were homogeneous and consisted of dark grey silt that contained frequent crushed and fragmented midden shell and moderate charcoal inclusions.

The third cluster of postholes and stakeholes was located underneath the midden deposit (Figure 7.1 and Figure 7.19). Seven of the features were postholes (contexts 151 and fill 152; 153 and fill 154; 157 and fill 158; 159 and fill 160; 163 and fill 164; 167 and fill 168; 171 and fill 172), and two were stakeholes (contexts 155, 156 and postpipe 197; 161, 162 and postpipe 198).

The fills of the postholes were homogeneous and consisted of greyish dark brown crushed and fragmented cockle shell within a silty matrix that contained occasional pieces of heat-fractured rock which had been utilised as packing stones, and frequent charcoal.

All the post and stakeholes were clustered and are likely relate to fish drying racks. One additional square posthole (context 175 with fill 176) was recorded, which related to European/historic settlement of the area (Figure 7.20).

Figure 7.17 Photo of part of Section 27/midden 216 with the row of postholes indicated by the arrows (facing north)

Figure 7.18 Row of postholes from adjacent to midden 216 which were likely part of a fish drying rack. Facing west (scale: 1m)

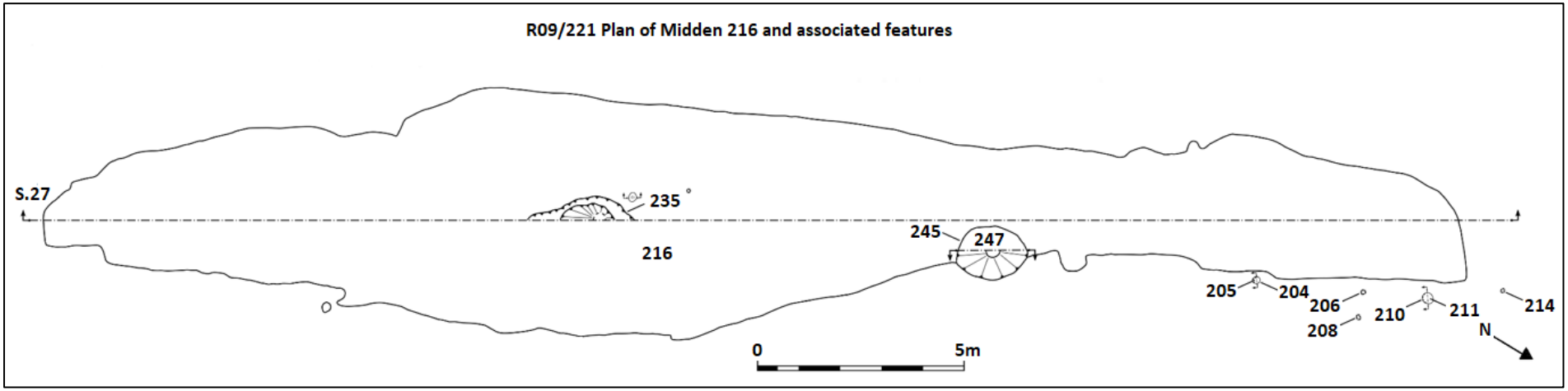


Figure 7.19 Plan of the southernmost midden deposit (context 216) and associated features

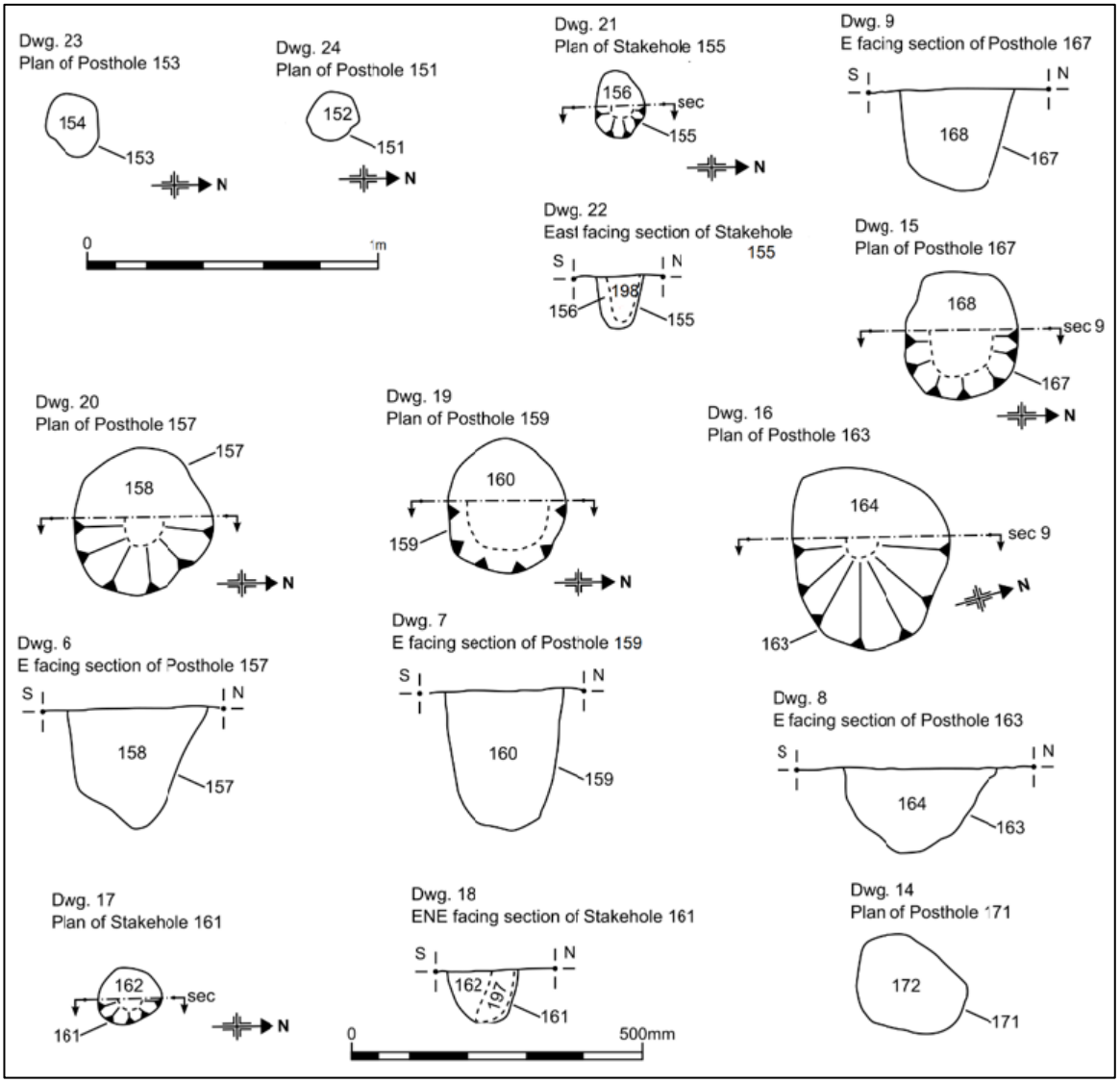


Figure 7.20 Section drawings of postholes and stakeholes that may represent one or two drying racks

7.6 Hangi and Firescoops

Twenty-two firescoops and hangi were exposed and recorded during the excavation of site R09/221, of which 19 were hangi and the remainder firescoops. Four hangi were recorded in Trench 1/Section 4 only and were not visible in plan (see Figure 7.7, Figure 7.8 and Appendix 1). The first hangi was context 143, the fill consisting of cockle midden with ash, heat-fractured rock and charcoal with some clay matrix (context 144), followed by hangi 145, which had a clear shell and ash dominated fill (context 146). This hangi was truncated by hangi 147, which had the same fill as 146 (context 148); the last hangi cut being context 149, filled with loose cockle shell and ash.

A cluster of hangi were located within the kumara pits 109 and 117. One has already been briefly discussed in the midden section (context 128) and the fill (context 129) was a mix of shell and brown clay-silt (Figure 7.13 and Figure 7.14). The hangi was cut into the shell layer 103 which formed the other upper layer of the pit. A clear oval hangi (130) was cut

into the upper shell fill (context 102) of the kumara pits (Figure 7.12) and had been cleaned out and left to backfill naturally, leaving it with a topsoil dominated fill (context 131). Another hangi located on the southern side of the pit was sub-circular and unexcavated (context 132). It had a shell-dominated fill with some clay and charcoal (context 133). To the immediate west hangi 134 (filled by context 135) was very similar in plan to 132 and 133. It was also unexcavated. Both can be seen in Figure 7.12.

A small cluster of hangi was located near one of the fish drying racks. Two of the hangi (169 and 165) were highly truncated, most likely by orchard ploughing, with only one base surviving (Figure 7.2). The fills were a mix of ash rake-out, shell, charcoal and some heat-fractured rock. A larger hangi (context 173) was located just southeast of the other two, and it was a lot larger, measuring 0.65m by 0.54m (Figure 7.22).The hangi had two fills; the primary fill (context 195) was a yellowish-grey silty subsoil with ash, charcoal and heat fractured rock, and the secondary fill (context 174) was similar, but without the silty clay component (Figure 7.21). A smaller oval unexcavated hangi was located to the northeast of this area (context 177) which had evidence of vertical truncation, although its fill was still present, and consisted of ash, silty clay, fragmented cockle and charcoal inclusions (context 178).

A hangi was also recorded in Trench 2, which extended through the large central midden deposit (Figure 7.2). This hangi (context 179) was rather isolated, away from the other clusters to the east of the kumara pits (Figure 7.2). The fill (context 180) was typical ‘oven rake-out’, highly burnt and crushed. The hangi was sealed by midden (context 102).

Three small hangi were found on a natural terrace, just north of Trench 1 (Figure 7.2 and Figure 7.23). Hangi 181 was the easternmost hangi, oriented east-west. The fills of hangi 183 and hangi 185 were identical to the fill of hangi 181. Hangi 181 was the largest of the hangi, measuring some 1.22m by 0.66m and was 0.11m deep. Hangi 183 was smaller, around 0.9m by 0.6m and also 0.11m deep, but hangi 185 remained unexcavated. The fills consisted of mid-brown clay with shell, charcoal and heat-fractured rock.

A cluster of hangi were located on the westernmost midden (Figure 7.2). The largest was hangi 191, which measured around 1.7m by 1.22m and 0.2m deep (Figure 7.21). The fill (context 192) was a black ashy deposit with charcoal, shell and some heat-fractured rock. Hangi 193 truncated hangi 191 and it had a diameter of 0.92m but was not excavated. Its fill (context 194) was the same as context 192. The third hangi (context 189) was located a short distance to the southeast and was a lot smaller (1m by 0.4m) and its fill (context 190) was consistent with context 192.

A reasonably sized hangi/firescoop (context 245) was cut through the southernmost midden deposit (Figure 7.2 and Figure 7.19). The primary fill (context 246) was loose black charcoal with occasional shell and fragments of heat-fractured rock, while the top fill (context 247) consisted of light grey ash with some shell and oven stone fragments. Two other firescoops were recorded to the northwest of the southernmost midden. Firescoops 200 and 202 were both around 0.7m by 0.5m in size and had fills (contexts 201 and 203) that consisted of sandy clays with some charcoal and heat-fractured rock; fill 203 also had a small lens of burnt bone (not identifiable).

Apart from hangi 179, the features were all in neat clusters either within or beneath the main midden deposits.

Radiocarbon determinations were obtained for hangi 173 (context 174 – fill) which dated the feature to the second quarter of the 14th century, and firescoop 200 (context 201 – fill),

which dated the feature to the end of the first quarter of the 19th century. The results are discussed more fully in Section 9.4.

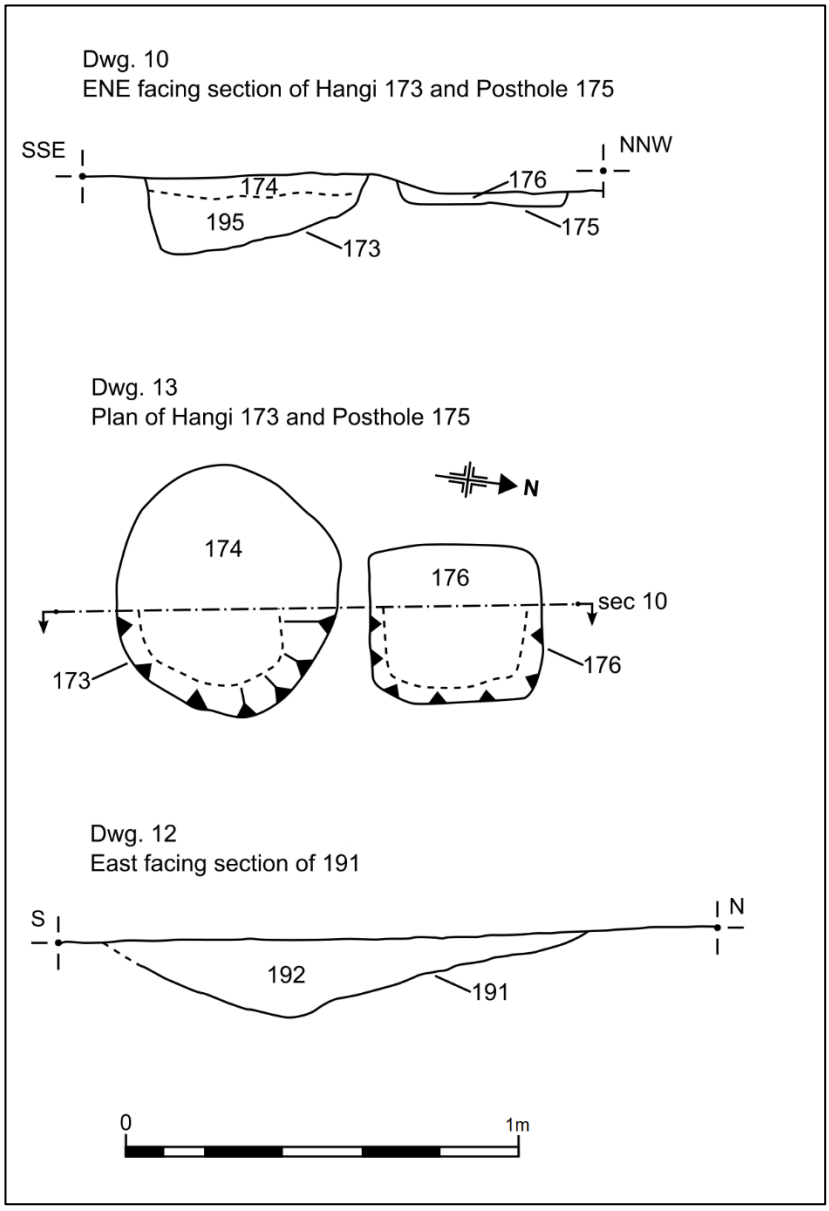


Figure 7.21 Plan and section drawings of hangi 191 and 173

Figure 7.22 Hangi 173 (left) – pre-excavation photo at the top and half-section (bottom). The square posthole on the right dates to the historic period. Facing west (scale: 1m)

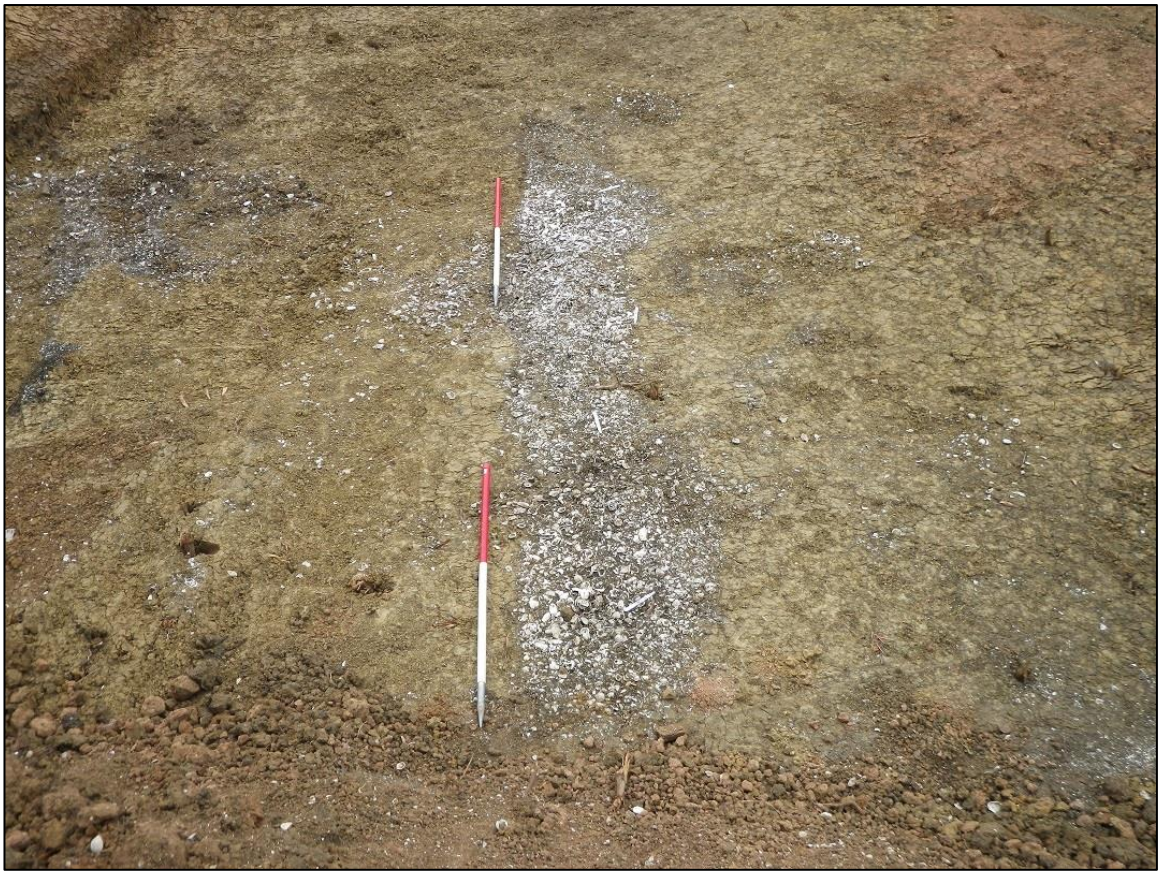


Figure 7.23 Hangi 181 (foreground), 183 (centre) and 185 (background), pre-excavation. Facing west (scale: 1m)

7.7 Other Pits and Features

A few additional features were recorded during the investigation. The first was a pit-like feature initially considered to represent an unusual style of bin pit (context 138), which was only visible in Section 4 (Figure 7.7 and Figure 7.8). The pit was 1.18m wide and 0.80m deep and had vertical sides with a slight undercut on the southern side, while the base had a pronounced slope from north to south (Figure 7.24). The pit had three fills – context 139 was the primary fill, a trample layer at the base of the pit; context 140 was a clay layer with frequent small charcoal pieces; the top fill was context 141, a clay-loam with occasional charcoal only. During the writing of this report a number of strikingly similar features were identified on an archaeological site (R10/1417) near Puhoi (exposed during works on the Puhoi-Warkworth section of the new Road of National Significance) and were also excavated by the authors. Site R10/1417 near Puhoi is also within the rohe of Ngāti Manuhiri. These features were morphologically identical to pit 138 and were of similar dimensions in section, with the same sloping base and trample layer. These pit features were located within a double palisaded enclosure and were sub-circular to oval in plan, completely intact, associated with postholes that ran around the outside edge of the pits and all had entranceways. These features are at present interpreted as rua whenua/ rua tahuhu/ rua kopiha (multiple names are used to describe very similar pits), a distinctive type of kumara storage pit examples of which were observed in the Kaipara District as late as 1922 (Graham 1922: 122).

Pit 187 was recorded on the western side of Trench 1 (Figure 7.2). As with pit 138, the feature was only visible in section and had steep sides and a flattish base with dimensions of 1.04m wide and 0.40m deep. The pit contained one fill, a silty clay with frequent charcoal, heat-fractured rock and river pebbles with occasional whole and fragmented cockle also present.

An oval pit (context 212) was visible beneath midden (Figure 7.11 and Figure 7.25). Pit 212 was oval, had gently sloping sides and a concave base and measured 0.83m in length and was 0.16m deep. Of particular note was that the base and sides of the feature had been lined with a firm, sticky yellow clay, and above this was a dark greyish black greasy matrix that contained frequent charcoal and ash. The clay layer could have served the purpose of retaining liquids and was likely utilised for the processing of a specific but unknown substance. A similar pit feature was located beneath 216 (Figure 7.25), context 235 with clay lining (context 236) and a clay dominated fill (context 237). This feature (also seen in section) was 1.4m long and 0.19m deep.

Lastly, a horse burial was excavated (Figure 7.26). The grave had been cut through midden deposit 101, and the horse had seemingly been laid to rest in a rather rushed and undignified manner. It was apparent that the original excavation of the grave had not been sufficiently large to incorporate the complete body, and rather than enlarge the grave the person/s undertaking the burial had simply decapitated the horse instead in order for it to fit within the grave – the final ignominious insult being that the head was deposited adjacent to the animal's posterior. The burial may have been historic or early 20th century in date, but due to the lack of associated artefacts a date cannot be attributed.

In accordance with the conditions of the Heritage NZ Authority, the NZAA site record form for site R09/221 has been updated.

Figure 7.24 Pit 138 with its distinctive sloping base seen in the west facing Section 4. Scale: 2 x 1m

Figure 7.25 Pit 212 with the distinctive dark fill, located beneath the midden (red arrow). The black arrow points to pit 235. Facing north (scale: 1m)

Figure 7.26 Horse burial cut through midden deposit 101. Facing east (scale: 2 x 1m)

8 ARTEFACT ANALYSIS

The artefact analysis is split here, with the historic artefacts discussed in the first half of the section, followed by the lithic artefacts.

8.1 Historic Artefacts from Site R09/2174

Historic artefacts were analysed by Jennifer Low. The artefacts derived from contexts 300 and 303, which were part of a historic rubbish pit forming site R09/2174. Artefacts analysed consisted of glassware, ceramics and buttons. The analysis presented here is discussed per artefact category.

8.1.1 Glassware

A total of 70 fragments of glass were recovered from contexts 300 and 303, representing a minimum of 10 individual vessels (Table 8.1). Fragments from both contexts may be related to one initial deposit. It is likely that the entire assemblage dates prior to 1900.

Table 8.1 Minimum Number of Individual vessels identified by subtype

Product Type	Product Subtype	MNI
Alcohol	Black Beer	1
	Case Gin	1
Food	Coffee Essence/Pickle	1
	Pickle	1
	Mustard	1
	Salad Oil	1
Household	Drinking Glass	1
	Unidentified	1
Pharmaceutical	Castor Oil	1
	Cosmetic	1

8.1.1.1 Context 300

A collection of highly fragmented glass was recovered from this context which represented six individual vessels. Two alcoholic beverage bottles were identified: 17 fragments relating to at least one black beer and 15 fragments relating to at least one case gin bottle.

A small fragment from the neck of a salad oil bottle was identified and the partial base of a square bottle may have contained a product such as coffee essence or perhaps pickles.

A partial rim fragment from a drinking glass contained no pattern, with the upper portion of the glass likely plain. No inference could be made as to the lower body of the glass. A

partial rim or edge fragment of an unidentified clear glass vessel was collected. The exterior of the glass had been affected by heat and partially melted, rendering accurate identification of the original vessel impossible; however, it did not originate from the drinking glass.

8.1.1.2 Context 303

Sixteen fragments of black beer bottle glass were collected, including two small pieces from a base and two collar skirt rim fragments, the remainder being body fragments. One shoulder fragment contained evidence of seams, indicating the bottle was manufactured in a three-piece mould. One fragment had been severely heated, leaving the fragment appearing blue in colour.

Seven pieces of at least one case gin bottle were collected, including a partial pig snout rim.

Two fragments from an aqua bottle were probably associated, consisting of a partial base from a square bottle and an embossed body fragment bearing a partial shamrock design. This particular bottle has been noted previously in archaeological contexts (Prickett 1994 and Clough & Associates 2003), with Prickett identifying the contents as possibly mustard. Two fragments of aqua glass may have been related to a pickle bottle.

A large fragment of a clear drinking glass was collected and suggested the glass had a triangular ribbed pattern when viewed from above. It could not be determined whether the fragment of drinking glass recovered from context 300 was associated, but equally this could not be ruled out.

A base and side fragment of a dark ice blue bottle was embossed '..hn Gosnell & C..' and identified as John Gosnell & Co. This particular company had a long history dating from 1677, with various names used. John Gosnell became a partner in the firm in 1814 (www.gracesguide.co.uk); however, the name as embossed was not adopted until 1840, though Gosnell himself died in 1832 and the company became a limited liability company in 1898. Due to the fragmentation of the bottle the period of manufacture could not be determined. The company manufactured cosmetics, soaps and perfumes. Four other fragments of dark ice blue glass were recovered, but could not be securely associated.

One fragment of cobalt glass was possibly related to a castor oil bottle.

8.1.2 Ceramics

Seventy pieces of highly fragmented ceramic were collected form contexts 300 and 303, representing a minimum of 32 individual items (Table 8.2). Similarity of transfer prints suggests the two contexts were likely related to a single deposit of material. Teacups were the most numerous single item, with 12 examples recorded. Plates followed closely, with 11 examples, but this number was likely to include both side plates and dinner plates. Ceramic patterns represented in the assemblage are illustrated in Figure 8.1 and Figure 8.2.

Table 8.2 Minimum Number of Individual ceramic vessels present

Ware	Vessel Form	MNI
Tableware	Cup/Mug	1
	Teacup	12
	Plate	11
	Saucer	1
	Teapot Lid	1
Kitchenware	Bowl	1
Unidentified		5

8.1.2.1 Context 300

A quantity of highly fragmented ceramic was collected, the majority of pieces being less than 2cm in size. At least 11 different patterns were recorded; however, due to the small size of the pieces only one was identified by name.

Two small fragments of a blue Willow patterned plate were identified (Figure 8.1). Two fragments of plate were decorated with a maroon print (BH1), the slightly scalloped edge decorated with a small grass-like design and the well having a scenic image (it is possible these fragments relate to a British Bird plate recovered from context 303). Three fragments of a plate were decorated in a pale grey foliage print (BH2). A small rim fragment of a teacup was also decorated with a pale grey design possibly related to the pale grey plate. A small edge fragment of a plate had a slight relief moulding with a blue transfer wave-like print (BH3). Two fragments of a plate and one fragment of a teacup were decorated with the same unidentified design in purple print (BH4).

Two fragments of a teacup were likely associated: the lower portion of the body having stylised water and the body fragment depicting the base corner of a building standing within the water (BH5). Two fragments bearing the same design (BH6) were decorated with three applied blue bands, commonly referred to as Cornish ware. One fragment originated from a plate while the second was from a saucer.

Two remaining patterned fragments were not identified to vessel form and included a blue transfer printed item (BH7) and a small fragment of flow blue (BH8). A small fragment with a green transfer print (BH9) appeared to be related to a teapot lid recovered from context 303. Two fragments of plain ceramic edge were not identified, but with a slightly raised rim could not be associated with any of the previously described items.

At least two fragments from a plain white plate were identified. Two fragments from at least one teacup were noted but may relate to one of the previous three described. Fourteen fragments of small plain white ceramic fragments were noted. Four pieces of a plain white kitchen bowl were also collected.

Figure 8.1 Ceramic pattern types identified in the assemblage BH1 – BH11 (NB. The prefix BH refers to Bishophill)

Figure 8.2 Ceramic pattern types identified in the assemblage BH12 – BH23 (NB. The prefix BH refers to Bishophill)

8.1.2.2 Context 303

Three fragments of a maroon printed plate were collected, two pieces of which rejoined. The third was associated based on colour match alone. The two rejoining fragments showed almost the complete body of a bird, possibly a sparrow. The reverse of the two fragments contained a maker's mark 'SA & C', probably that of Samuel Alcock & Co., and the pattern name 'British Birds' in a ribbon beneath a heron. The transfer of the word 'Birds' was applied badly leaving the D missing. A registration diamond was also located on the rear, providing a registration date for the pattern of 11 June 1855. Samuel Alcock & Co. operated from three plants dating from 1828 to 1859 (Godden 1991) and this registration mark suggests the plate was manufactured in the period 1855-1859. The name British Birds appears to relate to a series of patterns rather than a specific pattern as a number of British Birds patterns were located in image searching; however, this particular image was not located. Two maroon printed fragments from context 300 (BH1) may relate to this plate.

Seven fragments relating to at least two Willow patterned plates were identified, with one or more fragments possibly relating to fragments recovered from context 300.

Three further plates were noted from small fragments (Figure 8.2). One fragment was decorated with a blue print depicting a columned building behind a smaller building (BH19). One edge fragment was decorated with a blue feathered band (BH20) and one piece was decorated with a hand-painted stylised flower in red, blue and black (BH21).

Five fragments (Figure 8.1) from a flow blue teacup were recorded as related (BH10). Three other flow blue teacup fragments were noted (BH11), but the design could not be attributed to the previous example. Three further flow blue fragments from a teacup could not be attributed to either design.

The partial base of a cup or mug appeared to have been decorated at the centre with a blue scenic print (BH12). Four fragments of teacup were decorated with a grey print (BH2) and likely related to fragments recovered from context 300. A rim fragment of a teacup bore a grey print similar to the Fibre pattern (BH13).

At least six other teacups were represented by single fragments (Figure 8.2). One small maroon printed fragment showed a church and hills surrounded by foliage (BH14). A rim fragment of a blue Cornish ware (BH6) teacup was noted and likely related to Cornish ware recovered from context 300. One fragment was decorated with a black geometric design (BH15) while another fragment had a purple geometric design (BH16). One fragment was decorated both internally and externally, the internal decoration being a border design and the exterior being scenic (BH17). A small fragment was decorated internally and externally with a purple sponged design (BH18). One further teacup fragment could not be determined with certainty due to burning but may have been related to BH17.

Two rejoining fragments of a kitchen bowl were recovered and likely related to those recovered from context 300. The fragments included both the rim and a partial base which was marked 'Copeland', likely the mark of W.T. Copeland and possibly dating c.1847-1867 (Godden 1991).

A portion of a polychrome teapot lid with a floral and berry design at the edge and a green print, which matched a fragment recovered from context 300 (BH9), was noted.

Ten fragments of plain white ceramic were also collected and may relate to any of the above. Two fragments were not identified to particular vessel forms. One fragment was unglazed and was decorated with a purple sponged design (BH22) and the other fragment

was relief moulded, possibly depicting a vine with flowers or berries (BH23), and had a scalloped edge.

8.1.3 Buttons

Two buttons were recovered from context 303, one being of brass or other copper alloy, and the other ceramic (Figure 8.3). The ceramic button had a diameter of 12mm with four attachment holes at the centre. The button is consistent with that found on undergarments. The brass or copper button had a maximum diameter of 16mm and was attached via a bar shank. The button was manufactured from two pieces and was likely to have been attached to a shirt.

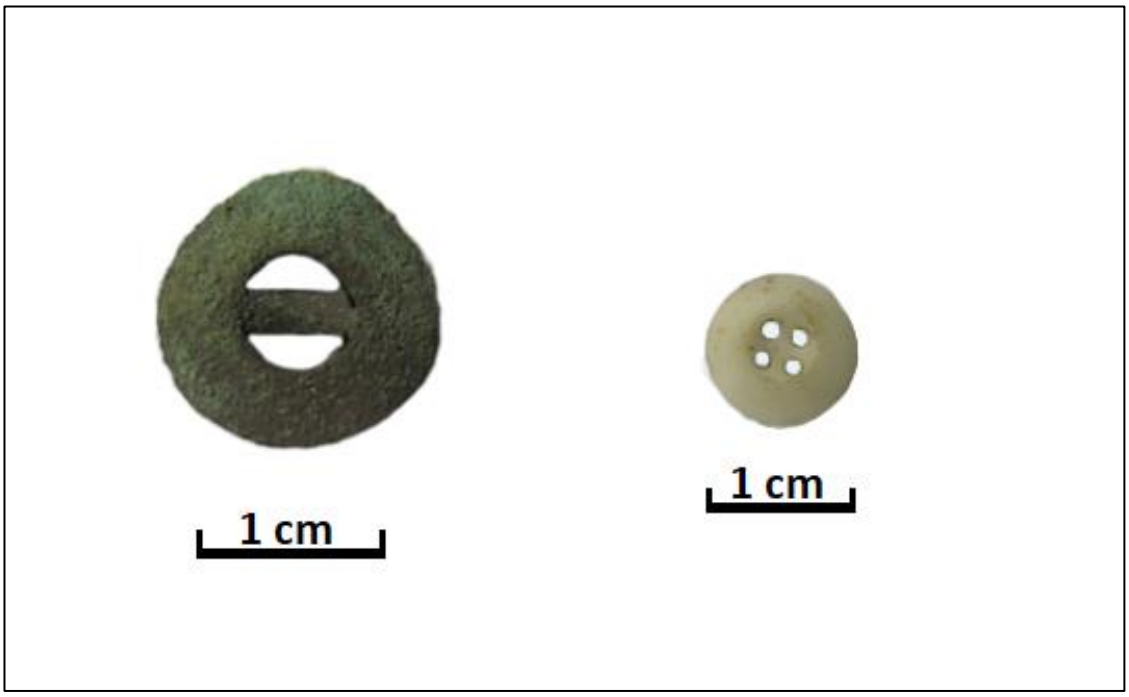


Figure 8.3 Two buttons located within context 303: brass (left) and ceramic button (right)

8.2 Carbine Ball – Midden 101 (Site R09/221)

A lead carbine pistol ball was recovered from the top of the large midden deposit (context 101) which was part of site R09/221 (Figure 8.4). The ball weighed 18.4g and was approximately 14.9mm or 0.609375 of an inch. There was some deformation on one side, which suggests the projectile was fired into a gravelly or otherwise relatively unyielding surface at quite close range to have deformed to that degree (David Rudd, pers. comm.).

Pistol and carbine balls were used during the New Zealand Wars for the contents of shrapnel shells; however, there was no other evidence of fighting in this area. It should be noted that Māori often had pistols as well, for example Hongi Hika famously wore multiple single shot pistols as secondary weapons, and he had a nock volley gun as his primary weapon (David Rudd, pers. comm.). The origin of the carbine ball is discussed further in Section 10.

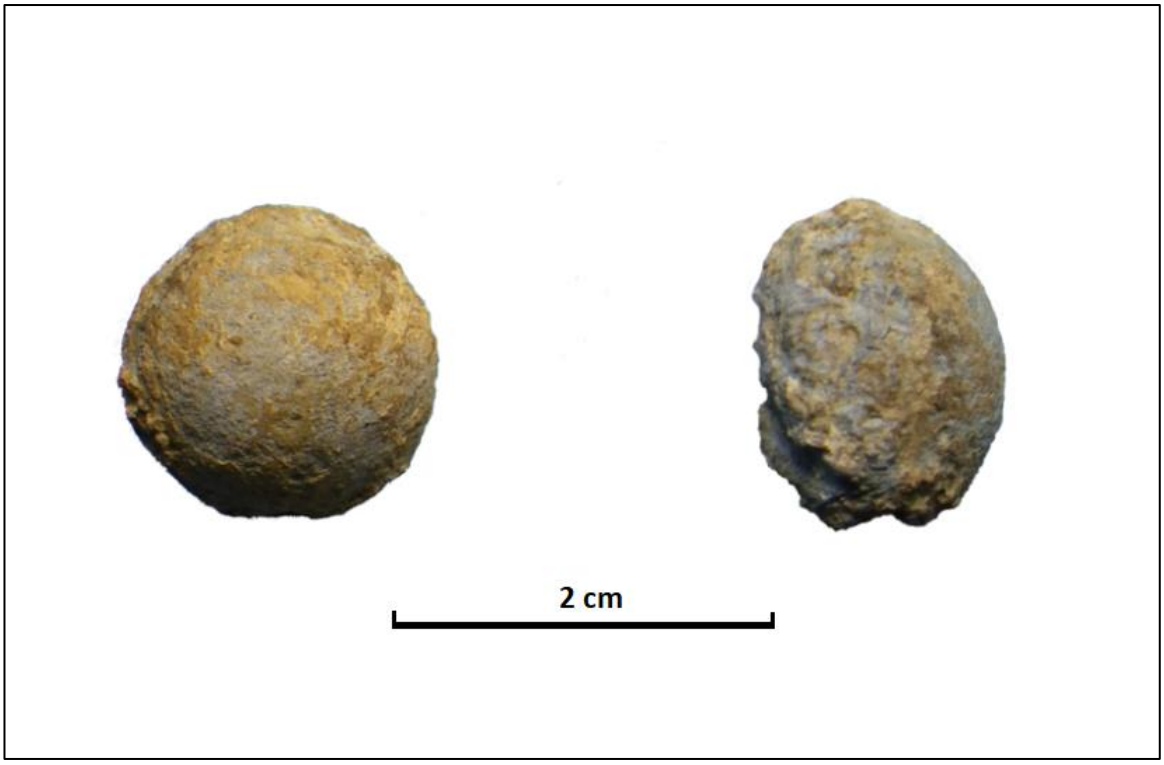


Figure 8.4 Lead carbine pistol ball recovered from the top of midden 101, with the evidence of deformation indicative of impact visible on the righthand image

8.3 Discussion of Historic Artefacts

Overall the assemblage was representative of many domestic settlement sites of the historic period and suggests that a house was located somewhere in the near vicinity. The presence of the buttons from a shirt and undergarments is of interest, and these may have fallen off during work to bury the artefacts in the pit or have been part of a collection of rubbish being transported to the rubbish pit. The highly fragmented nature of the glass artefacts suggests that some post-depositional processes may have impacted on the material. The carbine ball is of interest and evidence of it being shot suggests a story of conflict in some form or another during the latter history of the site.

8.4 Lithic Analysis

The Bishophill lithic artefact assemblage was recovered from just two of the monitored/investigated sites: R09/221 and R09/2189. The assemblage was analysed by Joe Mills and comprised 24 individual artefacts, predominantly obsidian (n=12), with smaller amounts of both chert (n=2) and fine-grained stone (n=10), including flakes, fragments (broken or incomplete flakes), manuports, tools and cores (Appendix 2). The majority of the lithics (n=20) came from midden site R09/221, with just two obsidian and two chert artefacts being recovered from midden site R09/2189 (Table 8.3). The assemblage was relatively small and fairly homogenous, allowing for limited conclusions to be drawn.

Table 8.3 Bishophill Farm, Matakana lithic artefact assemblage

Site	Sample ID	Material	Colour	Description	Context No.	Feature/Deposit
R09/221	1	Obsidian	Grey	Core	101	Midden
R09/221	2	Obsidian	Grey	Core	101	Midden
R09/221	4	Obsidian	Green	Tool	101	Midden
R09/221	5	Obsidian	Grey	Flake	101	Midden
R09/221	6	'Other Stone'	-	Fragment	101	Midden
R09/221	7	Obsidian	Grey	Flake	101	Midden
R09/221	8	Obsidian	Grey	Fragment	101	Midden
R09/221	9	Obsidian	Grey	Flake	101	Midden
R09/221	10	Obsidian	Grey	Flake	101	Midden
R09/221	11	Obsidian	Grey	Fragment	246	Firescoop Fill
R09/221	12	'Other Stone'	-	Manuport	101	Midden
R09/221	13	'Other Stone'	-	Manuport	101	Midden
R09/221	N/A (c)	Obsidian	Grey	Fragment	Unstratified	N/A
R09/221	#5	'Other Stone'	-	Flake	213	Pit fill
R09/221	#6	'Other Stone'	-	TAR†	213	Pit fill
R09/221	#7	'Other Stone'	-	TAR	213	Pit fill
R09/221	#8	'Other Stone'	-	TAR	213	Pit fill
R09/221	#9	'Other Stone'	-	TAR	213	Pit fill
R09/221	#10	'Other Stone'	-	TAR	213	Pit fill
R09/221	#11	'Other Stone'	-	TAR	213	Pit fill
R09/2189	#1(a)	Obsidian	Grey	Flake	-	Midden
R09/2189	#2(b)	Obsidian	Grey	Flake	-	Midden
R09/2189	#3	Chert	-	Core	-	Midden
R09/2189	#4	Chert	-	Fragment	-	Midden

† denotes thermally affected rock

8.4.1 Methodology

Dimensions for all artefacts were recorded, including the maximum length, width, and thickness in millimetres, and the weight in grams. Material type was noted as obsidian, chert, or other stone, and the presence of cortex was noted. The state of the artefact was recorded: whether it was a complete flake, with a readily identifiable platform, termination and lateral margins; a fragment, with some but not all flake characteristics; a core, with multiple flake removal surfaces; or a tool, either broken or complete. Non-artefactual samples were recorded as manuports or thermally affected rock (TAR). Microscopy was employed when finer details such as edge-wear or polish needed to be confirmed.

The colour of obsidian in transmitted light was noted with reference to Moore's (1998) physical characterisation method as a preliminary step prior to geochemical sourcing using XRF. All results are recorded in Appendix 2: Table 1.

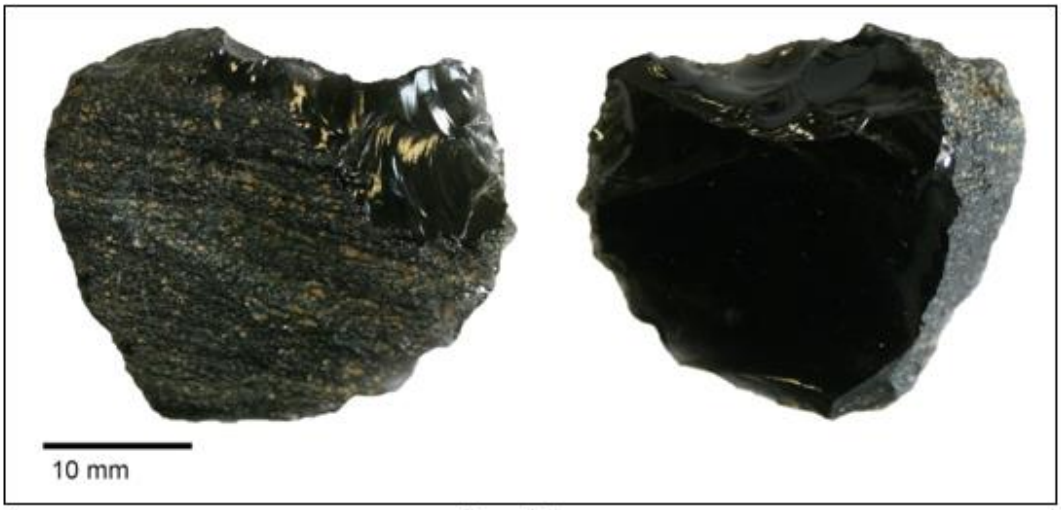
8.4.2 Obsidian

The obsidian artefacts were very varied in type. Of the 12 obsidian artefacts, 6 were flakes, 3 were fragments, 2 were cores, and there was a solitary tool (Figure 8.5–Figure 8.7).

All of the obsidian artefacts were fairly small, as expected in view of the usually diminutive nature of obsidian artefacts and cores. The mean length was 24.8, with a maximum of 45.1mm and a minimum of 15mm. The mean width was 18.1mm, with a maximum of 29.1mm and a minimum of 11.4mm. The mean thickness was 6.8mm, with a maximum of 11.3mm and a minimum of 3.7mm. All obsidian artefacts were very light, with a mean weight of 3.3g, with a maximum of 11.5g and a minimum of 0.5g.

The two cores in the assemblage were defined as such by evidence of multiple flake removals on multiple faces, with no obvious use wear (Figure 8.5). They were both the heaviest artefacts.

The solitary tool was a distinctive thin longitudinal flake with use wear on one of the lateral margins in the form of consistent micro striations along the edge, consistent with patterns expected from relatively tough cutting activity, or grinding (Figure 8.6). While these striations may equally be the result of other non-utilitarian processes, they are particularly regular and constrained to a single margin of the flake. There was no significant edge damage apart from some small micro flake removals on the opposite lateral margin, which were likely the result of post-depositional damage rather than deliberate tool construction. The relatively good condition of the flake, combined with the striations, lends support to the use of this flake as a tool, possibly for cutting.



Sample 1

Sample 2

Figure 8.5 Two cores with no obvious usewear. Both from midden deposit 101

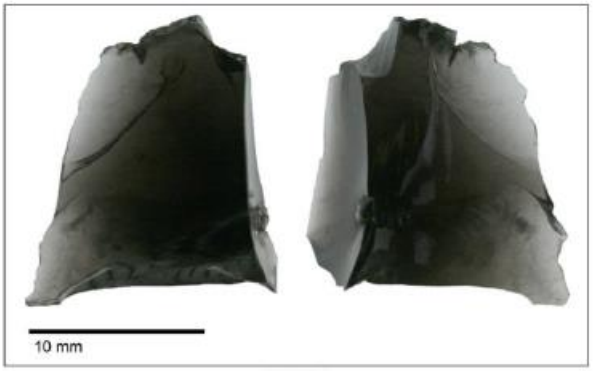
Sample 4

Sample 4 edge-wear

Figure 8.6 Obsidian tool with edge-wear present from midden deposit 101

Sample 5

Sample 7



Sample 8

Sample 9

Sample 10

Figure 8.7 Selection of obsidian artefacts analysed. All from midden 101

8.4.3 XRF/Sourcing

All 12 of the obsidian samples were subjected to analysis using non-destructive X-ray Fluorescence (XRF) to determine the likely sources for obsidian in the assemblage. The XRF analysis was undertaken by Andrew McAlister and Joe Mills at the Anthropology Laboratory, School of Social Sciences, University of Auckland (see Appendix 3), using a Bruker Tracer III SD portable X-ray Fluorescence (pXRF) analyser.

The instrument employs an X-ray tube with a Rh target and a 10mm2 silicon drift detector (SDD), with a typical resolution of 145eV at 100,000cps. The X-ray tube was operated with a setting of 40 keV at 12μA, through a window composed of 12mil Al and 1mil Ti filters (Bruker's Yellow filter).

Samples were analysed in an air path for 60 seconds. Obsidian specimens were analysed twice each on different portions of their surface areas to check for consistency and the values were averaged. A total of 13 elements were quantified (K2O, CaO, TiO2, MnO, Fe2O3, Zn, Pb, Th, Rb, Sr, Y, Zr, Nb). Concentrations were calculated as oxide percentages (%) for major elements and as parts-per-million (ppm) for trace elements using Bruker's S1CalProcess (ver. 2.2.33) software.

There are at least 27 known obsidian sources in New Zealand, which are distributed across three major geographic zones (see Moore and Coster 2015; Sheppard et al. 2011): Northland; the Coromandel Volcanic Zone; and the Taupo Volcanic Zone (Figure 8.8). However, some sources are geographically close and compositionally similar, making it difficult to separate them completely by geochemical analysis. These include the two Great Barrier Island sources (Awana and Te Ahumata), four sources near Taupo (Ben Lomond, Maraetai, Ongaroto, Whangamata Fault), and several sources around Rotorua (Ngongotaha, Hemo Gorge, Tarawera, Lake Rotokawau, Lake Okataina and Whakarewarewa). Only the sources of Whakamaru (near Taupo) and Lake Rotoiti (near Rotorua) from these areas are geochemically distinct. For this analysis 17 source groups are considered (Figure 8.8). A total of 277 reference samples from the University of Auckland's Anthropology Laboratory reference collection were used to characterise these sources.

The calibrated results for the obsidian artefacts are presented in Table 8.4. To assign the archaeological specimens to a source, two methods were used: a graphical analysis using bivariate scatterplots and a multivariate discriminant function analysis.

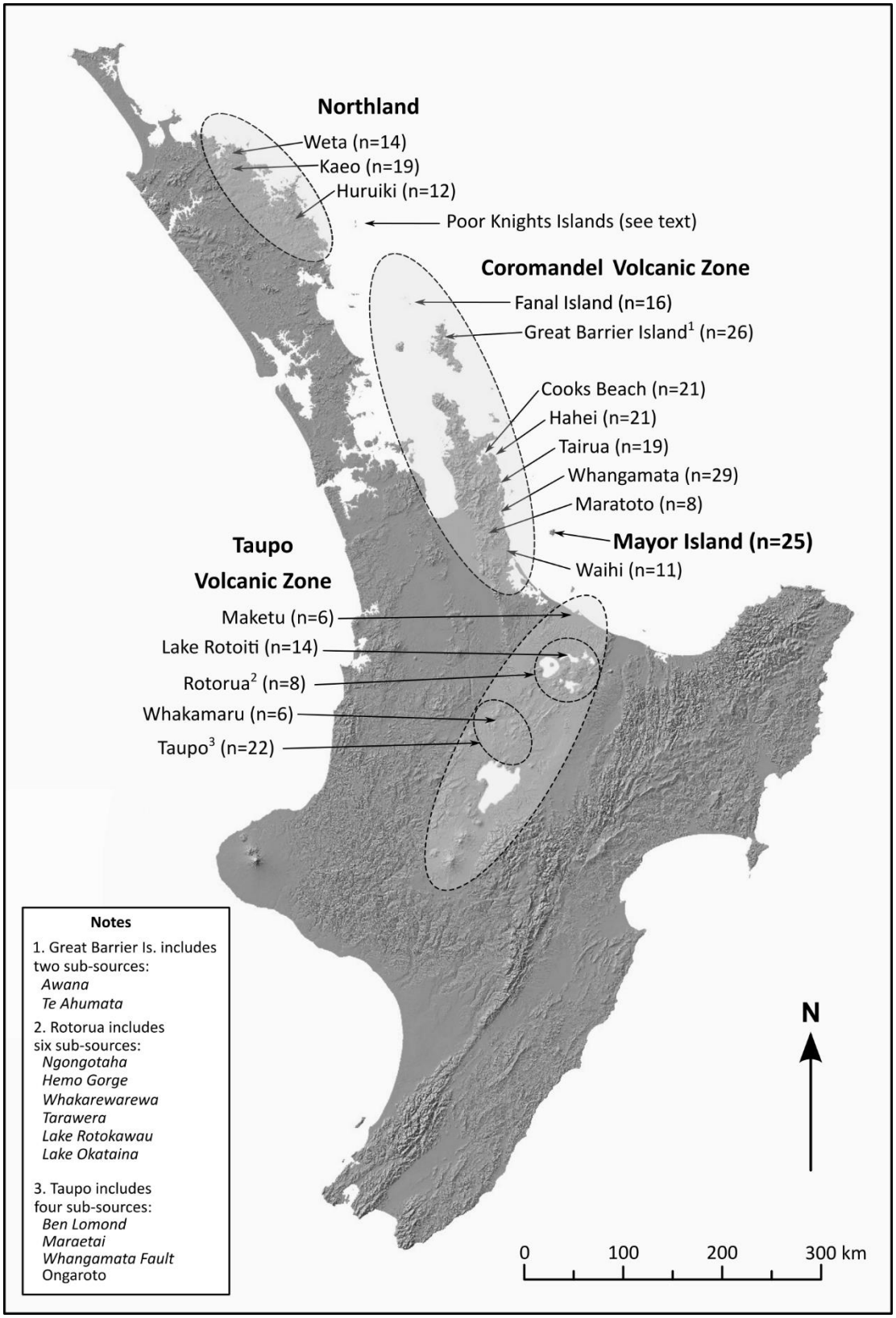


Figure 8.8 Locations of New Zealand obsidian sources. Reference sample counts are shown in brackets

Table 8.4 Calibrated XRF results for the specimens. Reported values are the means of two analyses

Sample	Assigned source	K_2O %	CaO %	TiO_2 %	MnO %	Fe_2O_3T† %	Zn ppm	Pb ppm	Th ppm	Rb ppm	Sr ppm	Y ppm	Zr ppm	Nb ppm
1	Gt Barrier Is.	4.26	0.61	0.09	0.03	1.20	33	20	15	187	21	32	123	6
2	Gt Barrier Is.	4.68	0.49	0.10	0.03	1.26	35	22	16	193	21	36	131	3
4	Mayor Is.	4.52	0.22	0.25	0.11	5.90	236	31	20	146	7	144	1243	100
5	Poor Knights Is.?	4.29	0.72	0.18	0.03	1.69	35	30	16	192	33	40	250	6
7	Gt Barrier Is.	4.33	0.59	0.10	0.03	1.23	37	21	18	191	22	34	125	7
8	Gt Barrier Is.	4.37	0.54	0.09	0.03	1.23	34	21	14	189	19	36	126	6
9	Gt Barrier Is.	4.34	0.66	0.10	0.03	1.36	31	22	16	193	30	33	136	6
10	Gt Barrier Is.	4.19	0.66	0.09	0.03	1.33	34	22	13	194	30	32	136	4
11	Gt Barrier Is.	4.16	0.65	0.09	0.03	1.18	34	21	14	188	22	31	122	8
A	Gt Barrier Is.	4.23	0.65	0.09	0.02	1.27	33	21	16	194	21	35	127	8
B	Gt Barrier Is.	4.30	0.53	0.09	0.03	1.23	33	20	15	190	20	35	127	5
C	Gt Barrier Is.	3.97	0.79	0.17	0.03	1.49	32	22	14	193	27	31	131	5

† Total Fe expressed as Fe2O3

Graphical Analysis

Because of the high number of potential sources, it is difficult to show their separation clearly on a single scatterplot. A better solution is to use a sequential approach, first separating the most geochemically distinct sources and then examining those with more similar compositions. A plot of the trace element ratios Sr/Zr against Log10(Rb/Zr) separates the reference specimens into seven groups (Figure 8.9). Five individual sources, Mayor Island, Kaeo, Weta, Lake Rotoiti and Waihi, form distinct clusters, while the other sources fall into two groups, denoted here as Groups 1 and 2 (Figure 8.9). Group 1 includes five sources, four from the Coromandel Volcanic Zone (Great Barrier Island, Fanal Island, Maratoto and Whangamata) and one Northland source (Huruiki). Seven sources are included in Group 2, three from the Coromandel Volcanic Zone (Tairua, Hahei and Cooks Beach) and four from the Taupo Volcanic Zone (Taupo, Rotorua, Whakamaru and Maketu).

Discriminant Function Analysis

Discriminant function analysis was carried out using SPSS (ver. 20). Four trace elements were used (Rb, Sr, Y, and Zr), all of which were Log10 transformed to help equalize group variances. In total, there were six misclassifications with 97.8% of the reference specimens being classified correctly. Leave-out-one-cross-validation (LOOCV) resulted in two additional misclassifications (97.1% correctly classified). The two archaeological specimens that were associated with the Mayor Island and Great Barrier Island sources in the graphical analysis were assigned the same sources (Table 2). Sample 5 was assigned to

Huruiki because this is the geochemically closest of the known sources. However, the graphical analysis indicated that this specimen possesses a distinct chemistry and is unlikely to be from Huruiki.

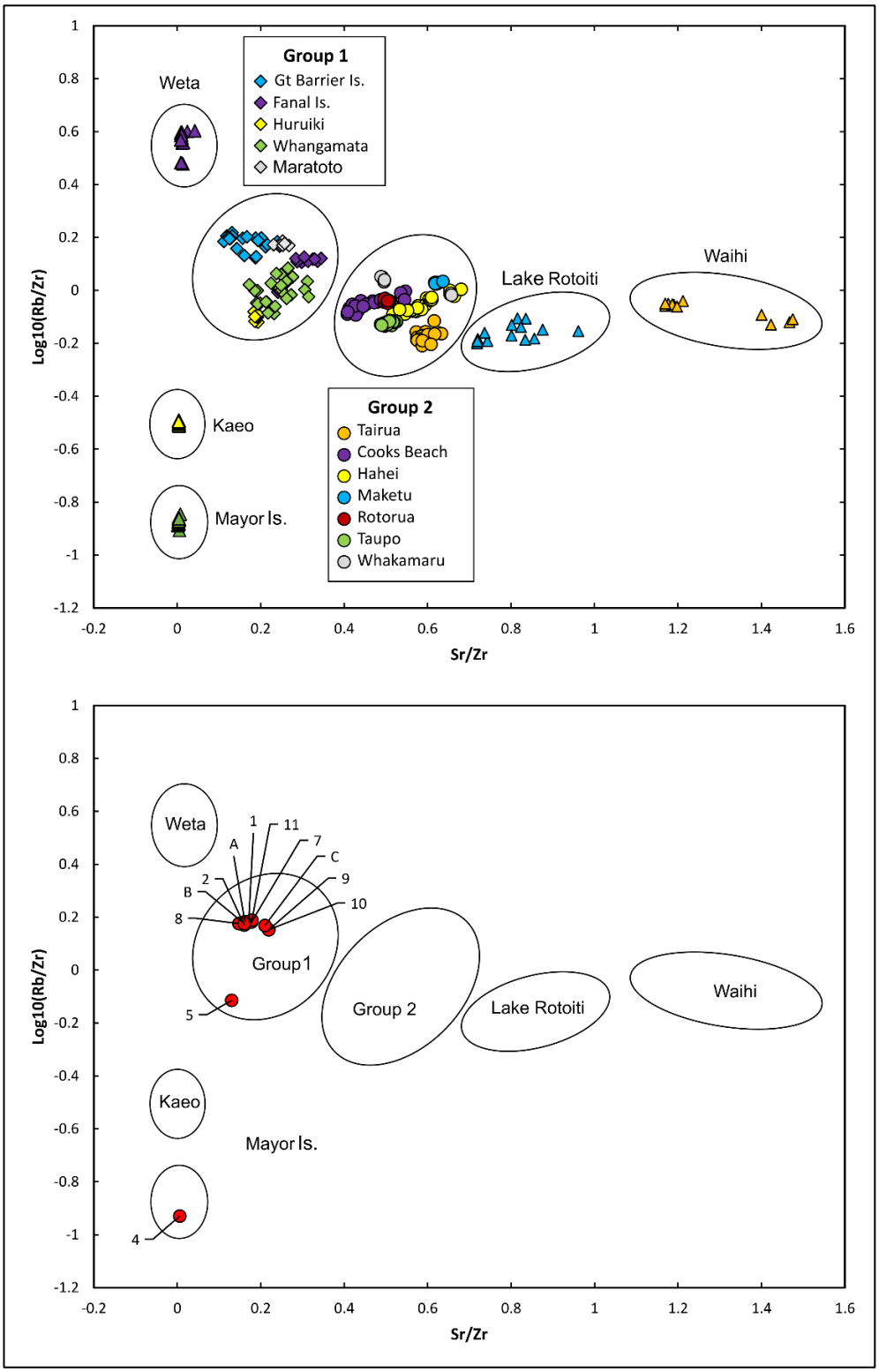


Figure 8.9 Plot of Sr/Zr against Log10Rb/Zr for the specimens. The reference samples are shown in the upper plot and the artefacts in the lower plot

8.4.4 Results

Of the 12 samples submitted for analysis, one was sourced to Mayor Island, one to a newly discovered obsidian source on the Poor Knights Island (Moore and Coster 2015; further details in the XRF report for this site), and the remaining 10 were sourced to Great Barrier Island (Figure 8.10 and Figure 8.11). Some useful observations can be drawn about the nature of the obsidian assemblage in light of these source designations.

Of the 10 samples from Great Barrier, there were two cores, five flakes, and three fragments. Two cores, three flakes, and one fragment were from the same context (101) and lend some support to the idea of a single constrained flaking event. The remaining four samples from outside this context (101) were all from disparate contexts. This indicates that obsidian from Great Barrier may have been commonly accessed and was thus used most often in different contexts across the excavated area.

The presence of cortex on four (40%) of the 10 samples from Great Barrier is particularly interesting. The removal of cortex from a core is a necessary first step in the reduction process for flake manufacture and can be seen as economising behaviour when related to resource acquisition. Cortex may be removed at the point of acquisition before transport in order to minimise the amount of less useful, extraneous material that needs to be transported (McCoy and Carpenter 2014). The presence of cortex on the Great Barrier material may indicate that access to this source was easier or more regular than access to other potential sources, resulting in less economising behaviour, meaning that cores with cortical surfaces were being transported to the site and subsequently underwent primary reduction there. The presence of multiple cores, one with extensive cortex, supports this idea. McCoy and Carpenter (2014) argue that sites with a greater than 30% rate of cortical to non-cortical flakes more likely represent direct access to a source. The 40% rate of cortical to non-cortical samples from Great Barrier indicated in this assemblage may fall into this category. In contrast, the lack of cortex on the sample from Mayor Island may indicate difficulty in accessing this source. The single sample from the Poor Knights from context 101, while small, has a relatively large cortical surface, indicating that material from the site was possibly more common than the current sample suggests, and was simply not encountered for collection during excavation. This is a very tentative conclusion, however, based on the extremely small sample size available.

The solitary sample from Mayor Island is somewhat enigmatic as it was the only tool in the assemblage. Mayor Island is also the most geographically distant source from the site (of the sources identified) at around 190km from the site by sea, navigating across the Hauraki Gulf, past the Coromandel Peninsula, and down the east coast toward the Bay of Plenty. The process of how the individual flake got to the site is puzzling in and of itself, but its designation as a tool may provide an explanation. High-quality, useful tools such as this artefact may have been curated and exchanged preferentially over long distances. The distribution of Mayor Island obsidian, as the commonly regarded highest-quality obsidian source, was expansive (Sheppard et al. 2011; McCoy and Carpenter 2014). This artefact may have been part of a much larger exchange network involving the long-distance movement of preferred obsidian.

In the same vein, the solitary sample from the Poor Knights provides some interesting speculative conclusions. It is clear that at least a small amount of material was being transported from the Poor Knights, as evidenced by the sample present, but the means of that movement is unclear. The sample does have cortex, which may indicate that this was a primary reduction flake from a larger core, which further indicates more substantial

material movement, but this is a limited conclusion given the sample size of one. Given the short distance to Great Barrier Island (the most prevalent source represented in the assemblage), it seems less likely that the Poor Knights source was a regularly accessed source for obsidian, and it is more likely that attaining this particular sample was a one-off event.

The range of sources represented is in itself particularly interesting. It shows obsidian movement (and thus either the movement of people, or the exchange of imported material) across a sizeable geographic range. Great Barrier Island is approximately 65km east of the site by sea, while the Poor Knights are around 120km to the north. The Mayor Island source is approximately 190km away by sea, as mentioned above. This supports the notion of a highly mobile population willing to move important material resources over great distances, in this case undoubtedly via seafaring (see McCoy and Carpenter 2014 for a lengthier treatment of the subject).

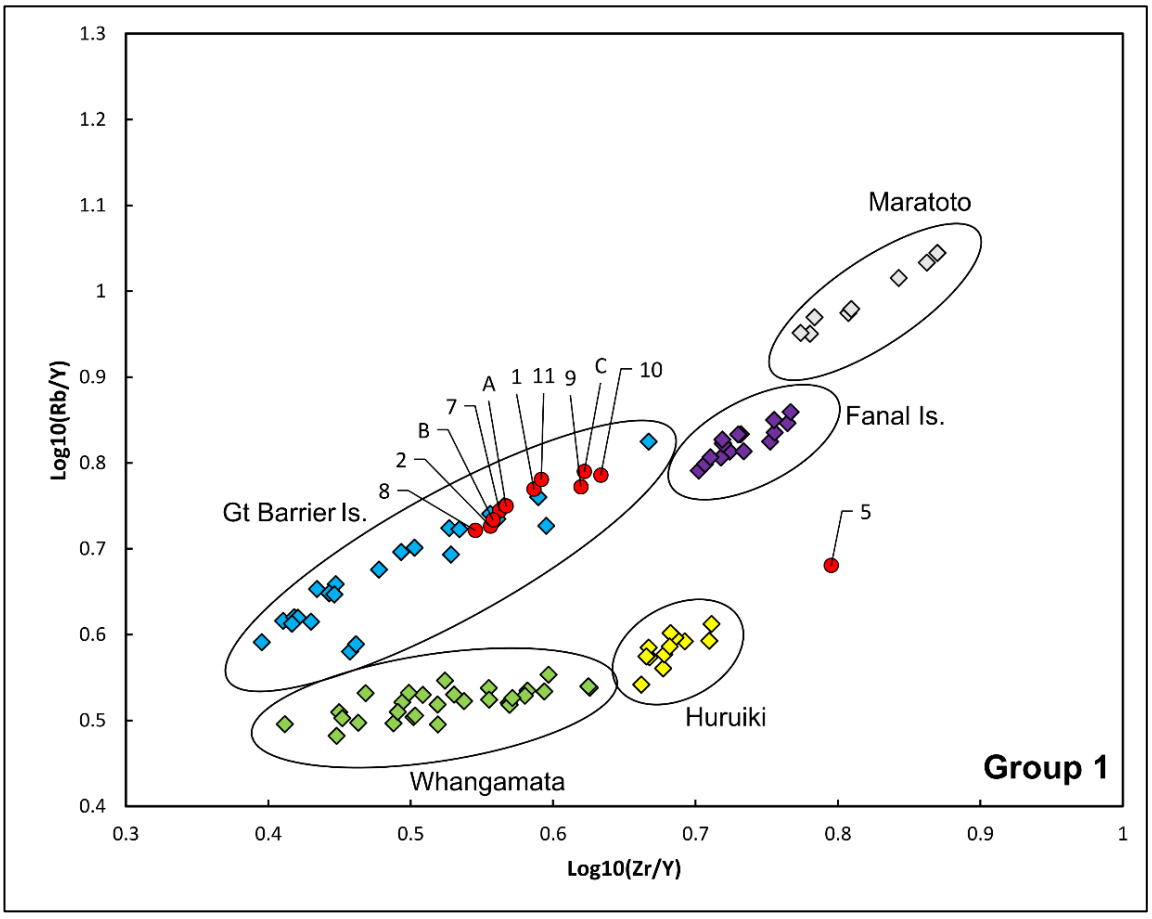


Figure 8.10 Plot of Log10 (Zr/Y) against Log10 (Rb/Y) for the Group 1 specimens. Artefacts are shown as red circles and labelled

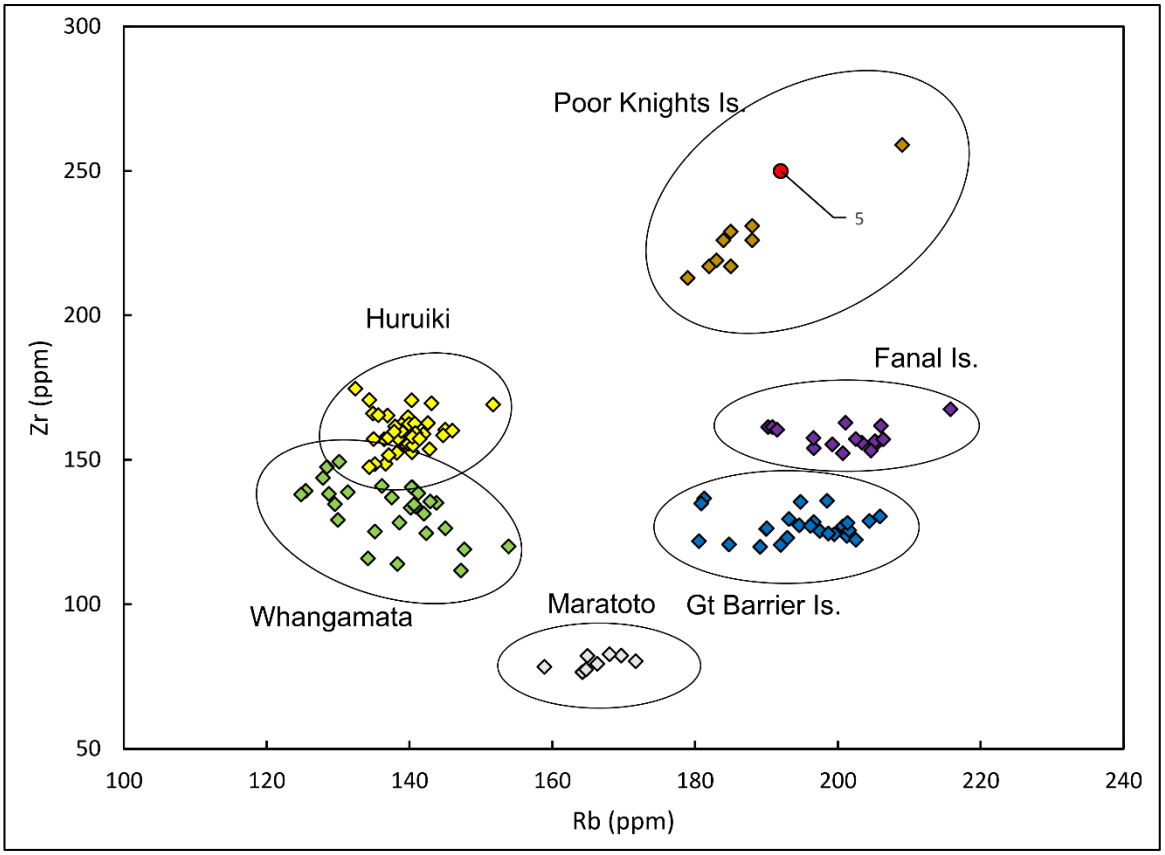


Figure 8.11 Plot of Rb against Zr for the Group 1 obsidian specimens, including Moore and Coster's (2015) data for the Poor Knights Islands. Sample 5 is shown as a red circle

8.4.5 Chert

There were only two chert artefacts recovered from the site: one core, and one fragment, both from midden R09/2189 (Figure 8.12 and Figure 8.13). Dimensions for these two samples are included in Appendix 2: Table 1.

The core was relatively small, indicating that it had likely been flaked to a point of exhaustion. Numerous flake scars could be identified attesting to its use as a core (Figure 8.13). The single fragment was particularly small, likely being debitage from earlier flaking efforts on the core or as a broken section of a larger flake (Figure 8.12). It had no evidence for use wear other than some edge damage that appeared to be the result of post depositional processes.

It is difficult to draw any strong conclusions about chert use at the site with such a small sample size, but tentative conclusions can be drawn. In the larger context of the assemblage, the scarcity of chert compared to obsidian may indicate that there was no readily available chert source to be exploited by the occupants of the site. The presence of a well-reduced core combined with the absence of any flakes may indicate the removal of useful chert flakes from the site deliberately by people, or as the result of post-deposition, or that other examples were simply absent, or not exposed and recovered from the sites during monitoring.

Sample #4

Figure 8.12 Chert artefact from midden R09/2189

Sample #3

Figure 8.13 Chert artefact from midden R09/2189

8.4.6 Other Stone

The remaining 10 artefacts have been grouped under the label of 'other stone'. This label is an admittedly clumsy catch-all but reflects the great variability of stone resources commonly encountered that are not easily identifiable, such as basalt, greywacke, or argillite. As only one of the 'other stone' samples can be easily identified as artefactual, the remaining samples will be discussed individually by context.

Context 101 contained three samples of 'other stone'. Sample 12 was a medium-grained light grey stone, with smooth cortex, and natural fracture lines running through it (Figure 8.14). These natural fractures seemed to have split, producing what looked at first glance to be a section of a possible adze preform, but on closer examination was more likely a relatively cleanly fractured natural rock. There were no physical indications that lent support to the idea of this sample being artefactual.

Sample 6 from context 101 was a distinct material from sample 12. It was much coarser grained and much darker, with a less smooth cortical surface (Figure 8.14). It had no overt flake features or markers of modification, but has been tentatively labelled as a fragment, as it may have been the distal end of a larger flake. However, the ventral surface of the fragment was particularly rough, unlike what would be expected of a flake, and there was no indication of a conchoidal fracture. This sample remains enigmatic as it was the only one of this material type and displayed no overt flake features.

Sample 13 was again distinct from the other two material types in the 'other stone' category from context 101. It was the most fine-grained of the three, light grey in colour with a very smooth cortex (Figure 8.14). It was laced with numerous veins and fractures, which would have made any flaking efforts particularly difficult. The sample itself was a cortical fragment from a larger cobble which seemed to have naturally spalled off its larger nucleus, much like a 'pot-lid'. There was no regularity to its ventral surface, with breaks occurring following natural veins. The absence of conchoidal fracture further indicated that this sample was not the result of deliberate flaking efforts. There were a number of small scars from natural spalling on the cortical surface of the sample – none of which were indicative of flake scars. The general appearance of the sample and its morphology would suggest that it had been thermally affected; however, it showed no signs of oxidation or discoloration from high temperatures. It is possible that this was simply a broken section of a larger manuport transported to the site for unknown purposes.

The samples from context 213 were equally as enigmatic as the samples from context 101 (see Appendix 2: Table 1 and Figures). The material was very fine grained, dark grey in colour, with a very smooth cortex. It appeared most similar to that of sample 13 (Figure 8.14), but darker and finer-grained. Of the seven samples from context 213, only one (sample 5) was distinctly artefactual, being a complete flake with clear flake characteristics (Figure 8.15). The remaining six samples were more difficult to classify – they all showed some signs of being heat affected, with most having a non-conchoidal, spalled ventral surface. One fragment had slight discoloration on one surface consistent with burning, while another fragment showed a level of oxidation on its cortical surface, marked by orange staining. While it is difficult to draw conclusions based on a small number of out-of-context samples, all of the context 213 samples (excepting the flake) appeared thermally affected, or at least naturally spalled (see Appendix 2 for full report).

Sample 12

Sample 6

Sample 13

Figure 8.14 'Other Stone' possible artefacts analysed

Figure 8.15 Flake from context 213

8.4.7 Summary and Discussion

Despite being relatively small, the Bishophill assemblage contained some of the standard material for Māori lithic assemblages. Obsidian was well represented, with material from multiple sources, some significant distances away from the site, indicating movement of resources into the area and possible economising behaviour for long-distance or difficult to access resources. Chert was particularly sparse, possibly indicating difficult access to a reliable source for the material. The other stone artefacts were likely locally available or were not distinctive enough to assign to a more distant source.

The lithic assemblage lends some tentative support for certain activities at the site, with obsidian used for possible butchering and manufacturing tasks, chert used as a tougher alternative to obsidian for cutting purposes, with the other stone samples providing tentative evidence for burning and curation of non-artefactual stone as manuports.

The fragmentary nature of the assemblage indicates that post-depositional processes had impacted the stone assemblage to some extent.

9 ENVIRONMENTAL ANALYSIS

9.1 Charcoal and Wood Analysis – Site R09/221

Six charcoal samples from archaeological site R9/221 were analysed by Dr Rod Wallace, primarily for identification and C14 dating sub-sample selection. The results are as follows.

9.1.1 Context 203 – Hangi/Firescoop

In total 33 charcoal pieces were identified (Table 9.1). Pohutukawa dominated, followed by Hinau seeds and Maire. A C14 sample containing Olearia was prepared.

Table 9.1 Species and count from context 203 – hangi/firescoop

Species	Count
Olearia	1
Wharangi	1
Puriri	2
Hinau seeds	9
Pohutukawa	10
Maire	8
Kahikatea	1
Kauri	1

9.1.2 Context 246 – Hangi

In total 12 charcoal samples were analysed from the hangi feature. Numbers were fairly well spread across the 6 species identified. A C14 dating sample was separated out containing Coprosma, Fivefinger, Olearia and Kanuka.

Table 9.2 Species and count from context 246 – hangi

Species	Count
Coprosma	3
Fivefinger	2
Olearia	2
Kanuka	3
Puriri/Tarairi	1
Pohutukawa	1

9.1.3 Context 174 – Hangi

A sample comprising 13 charcoal pieces was analysed for context 174, a hangi/firescoop. Only four species were identified with Puriri dominating. A C14 dating sample was separated out containing Rewarewa.

Table 9.3 Species and count from context 174 – hangi

Species	Count
Puriri	10
Hinau	1
Rewarewa twig	1
Matai	1

9.1.4 Context 106 – Fill of Kumara Pit 109

Five species were identified in context 106, with a total of 16 pieces analysed. A C14 dating sample was separated out containing Hebe and Manuka.

Table 9.4 Species and count from context 106 – pit fill

Species	Count
Seeds sp?	3
Hebe	4
Manuka	2
Puriri	2
Kauri	5

9.1.5 Context 201 – Hangi/Firescoop

Twelve pieces of kanuka were identified for context 201. A C14 sample was separated out.

9.1.6 Context 129 – Hangi

Six species were identified from 22 pieces of charcoal.

Table 9.5 Species and count from context 129

Species	Count
Coprosma	1
Fivefinger	8
Ngaio	3
Manuka	2
Kanuka	6
Mangrove	2

9.1.7 Discussion

This assemblage contained species from a broad mixture of vegetation types ranging from broadleaf conifer forest through to Manuka and Kanuka scrub (Table 9.6). The vegetation contemporary with the occupation of the sites appears to have been a mosaic of scrub and forest.

Table 9.6 Summary of charcoal results indicating percentage of species represented

Summary of Charcoal results			
Species	**Plant Type**	**#**	**%**
Hebe	Small shrubs	4	26%
Coprosma		4	
Fivefinger		10	
Olearia		3	
Wharangi		1	
Ngaio		3	
Manuka	Larger shrubs	4	24%
Kanuka		21	
Hinau	Broadleaf trees	10	43%
Rewarewa		1	
Maire		8	
Pohutukawa		11	
Puriri		15	
Kahikatea	Conifers	1	8%
Matai		1	
Kauri		6	
Mangrove	Estuarine	**2**	
Totals		105*	

*NB. Table excluded unidentified seeds from context 106

9.2 Midden Analysis

A number of samples of midden were collected from a number of sites across the wider landscape at Bishophill, Matakana and submitted for analysis by Jen Low.

9.2.1 Methodology

Identifiable shell was set aside for further analysis. Shells were sorted and analysed by taxon. Preferred habitat of taxon was also noted for further analysis. A list of all taxa identified in the analysis is presented in Table 9.7.

The analysis of each taxon examined three aspects: the Number of Identified Specimens (NISP), the Minimum Number of Individuals (MNI) and the MNI percentage. NISP is calculated by counting the total number of identifiable shells for each species. For bivalves to be counted a hinge was the minimum requirement. For gastropods whole or nearly whole terminal spires were counted. MNI for bivalve species was calculated by total number of hinge portions divided by two. The MNI percentage is calculated to show relative proportions. Summaries of NISP, MNI and percentage of MNI recorded for each species by sample are presented in Table 9.8 and Table 9.9.

Only complete whole shell specimens were measured to determine size. Using accepted age grouping size ranges of measured whole shell, it was possible to reach some general conclusions relating to the collection methods used by occupants of the site. However, it should be noted that unmeasurable shells in some cases far exceeded measurable shells. The size ranges for *Austrovenus stutchburyi* (Cockle) are as follows; juvenile (up to 10mm), pre-adult (10-20mm), young adults (18-25mm), adults (>25mm), with sexual maturity 18-20mm (www.gopi.org.nz). *Paphies australis* (Pipi) are grouped into juvenile (<40mm) and adult (>40mm), at which point Hooker and Creese (1995) suggest Pipi are sexually mature.

A total of 15 species were identified across the 13 samples analysed. *Austrovenus stutchburyi* was the dominant species identified, suggesting cockle beds were targeted with other species collected opportunistically.

Table 9.7 List of identified taxa by scientific and common names and preferred habitat

Scientific Name	Common Name	Preferred Habitat
Austrovenus stutchburyi	Cockle	Muddy shore
Paphies australis	Pipi	Muddy and/or sandy shore
Alcithoe Arabica depressa	Depressed Volute	Sandy Shore
Amalda australis	Southern Olive	Sandy Shore
Amphibola crenata		Muddy shore
Cominella glandiformis	Mud Whelk	Muddy Shore
Cominella quoyana	Quoy's Whelk	Sandy Shore
Melagraphia aethiops	Dark Top Shell	Rocky Shore
Pecten novaezelandiae	Queen Scallop	Sandy Shore
Saccostrea glomerata	Auckland Rock Oyster	Rocky Shore
Struthiolaria papulosa	Ostrich Foot	Muddy and/or sandy shore
Tucetona laticostata	Large Dog Cockle	Sandy Shore
Turbo smaragdus	Cat's Eye	Rocky Shore
Xymene plebius	Common Trophon	Muddy Shore
Zeacumantus lutulentus	Horn Shell	Muddy Shore

Table 9.8 NISP, MNI and percentage by taxa for middens 1, 7, 9, 12, 14 and 15

Scientific Name	Common Name	NISP	MNI	MNI %
Midden 1 R09/2191				
Austrovenus stutchburyi	Cockle	1101	551	99.6
Paphies australis	Pipi	1	1	0.20
Unidentified gastropoda	Mud Whelk	1	1	0.20
Midden 7 R09/2187	**Sample 1**			
Austrovenus stutchburyi	Cockle	1809	905	97.6
Cominella glandiformis	Mud Whelk	4	4	0.43
Cominella quoyana	Quoy's Whelk	2	2	0.21
Paphies australis	Pipi	20	10	1.0
Struthiolaria papulosa	Ostrich Foot	1	1	0.14
Turbo smaragdus	Cat's Eye	1	1	0.14
Xymene plebius	Common Trophon	3	3	0.32
Zeacumantus lutulentus	Horn Shell	1	1	0.14
Midden 7 R09/2187	**Sample 2**			
Austrovenus stutchburyi	Cockle	1255	628	99.4
Amphibola crenata		1	1	0.1
Cominella glandiformis	Mud Whelk	1	1	0.1
Melagraphia aethiops	Dark Top Shell	1	1	0.1
Paphies australis	Pipi	1	1	0.1
Unidentified gastropoda	Whelk	2	2	0.2
Midden 9 R09/2189				
Austrovenus stutchburyi	Cockle	1562	781	97.7
Amphibola crenata		5	5	0.62
Cominella glandiformis	Mud Whelk	4	4	0.50
Paphies australis	Pipi	3	2	0.25
Xymene plebius	Common Trophon	6	6	0.75
Midden 12 R09/2188				
Austrovenus stutchburyi	Cockle	882	441	96.7
Cominella glandiformis	Mud Whelk	6	6	1.31
Paphies australis	Pipi	1	1	0.24
Xymene plebius	Common Trophon	7	7	1.50
Unidentified gastropoda		1	1	0.24
Midden 14 R09/2146				
Austrovenus stutchburyi	Cockle	368	184	97.3
Paphies australis	Pipi	2	1	1.05
Pecten novaezelandiae	Queen Scallop	1	1	0.52
Unidentified gastropoda		3	3	1.58
Midden 15 R09/2196				
Austrovenus stutchburyi	Cockle	119	60	96.8
Pecten novaezelandiae	Queen Scallop	1	1	1.60
Tucetona laticostata	Large Dog Cockle	1	1	1.60

Table 9.9 Midden R09/221 NISP and MNI by context

Scientific Name	Common Name	NISP	MNI	MNI %
Context 101 - 1 Midden				
Austrovenus stutchburyi	Cockle	757	379	96.9
Amphibola crenata		10	10	2.55
Paphies australis	Pipi	3	2	0.55
Context 101 - 2 Midden				
Austrovenus stutchburyi	Cockle	970	485	96.0
Amphibola crenata		11	11	2.18
Cominella glandiformis	Mud Whelk	1	1	0.21
Paphies australis	Pipi	1	1	0.21
Xymene plebius	Common Trophon	7	7	1.39
Context 113 Fill of Kumara pit				
Austrovenus stutchburyi	Cockle	123	62	100
Context 129 Fill of Hangi				
Austrovenus stutchburyi	Cockle	1074	537	94.8
Amphibola crenata		18	18	3.18
Paphies australis	Pipi	22	11	1.94
Context 146 Fill of Hangi				
Austrovenus stutchburyi	Cockle	849	425	86.3
Amalda australis	Southern Olive	1	1	0.20
Amphibola crenata		51	51	10.3
Cominella glandiformis	Mud Whelk	1	1	0.20
Paphies australis	Pipi	4	2	0.40
Saccostrea glomerata	Auckland Rock Oyster	1	1	0.20
Xymene plebius	Common Trophon	10	10	2.03
Zeacumantus lutulentus	Horn Shell	1	1	0.20
Context 182 Fill of Hangi				
Austrovenus stutchburyi	Cockle	458	229	77.89
Amphibola crenata		7	7	2.38
Cominella glandiformis	Mud Whelk	6	6	2.04
Paphies australis	Pipi	101	51	17.3
Pecten novaezelandiae	Queen Scallop	1	1	0.30
Xymene plebius	Common Trophon	1	1	0.30
Context 192 Fill of Hangi				
Austrovenus stutchburyi	Cockle	458	229	77.10
Amphibola crenata		54	54	18.18
Cominella glandiformis	Mud Whelk	3	3	1.01
Paphies australis	Pipi	11	6	2.02
Struthiolaria papulosa	Ostrich Foot	2	2	0.67
Xymene plebius	Common Trophon	3	3	1.01
Context 216 Midden				
Austrovenus stutchburyi	Cockle	590	295	65.55

Alcithoe Arabica depressa	Depressed Volute	1	1	0.22
Amphibola crenata		101	101	22.44
Cominella glandiformis	Mud Whelk	7	7	1.55
Paphies australis	Pipi	30	15	3.33
Saccostrea glomerata	Auckland Rock Oyster	20	10	2.22
Xymene plebius	Common Trophon	21	21	4.66

9.2.2 Habitat

Given the location of Bishophill, Matakana on an estuarine mudflat environment with occasional rocky areas, it is not surprising that the inhabitants were consuming local food resources predominantly from the local muddy shore environment.

To examine this, each species was separated in one of the following environmental niches:

- Muddy Shore
- Muddy and/or Sandy Shore
- Sandy Shore
- Rocky Shore
- Sandy, Rocky or Muddy Shore
- Other/Unknown

The environmental niche associated with each species is presented in Table 9.7. The MNI of all species in each niche was summed to provide the total MNI for each niche. The relative proportions for these niches are presented for sites in each area in Figure 9.1 and Figure 9.2. All of the samples analysed showed the muddy shore habitat was the largest contributor of shellfish with relatively few species being procured from other habitats. While pipi may be collected from either a muddy or sandy shore, in this instance they were likely to have been collected from the muddy shore environment.

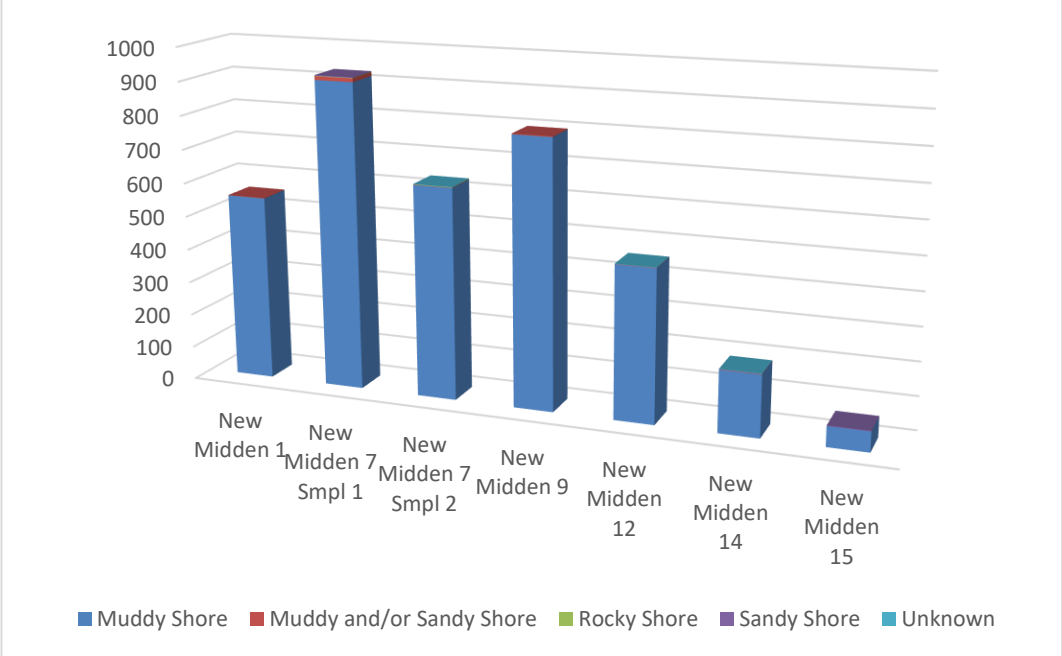


Figure 9.1 Sample environmental niche MNI as a percentage of the total sample environmental niche MNI, middens 1, 7, 9, 12, 14 and 15

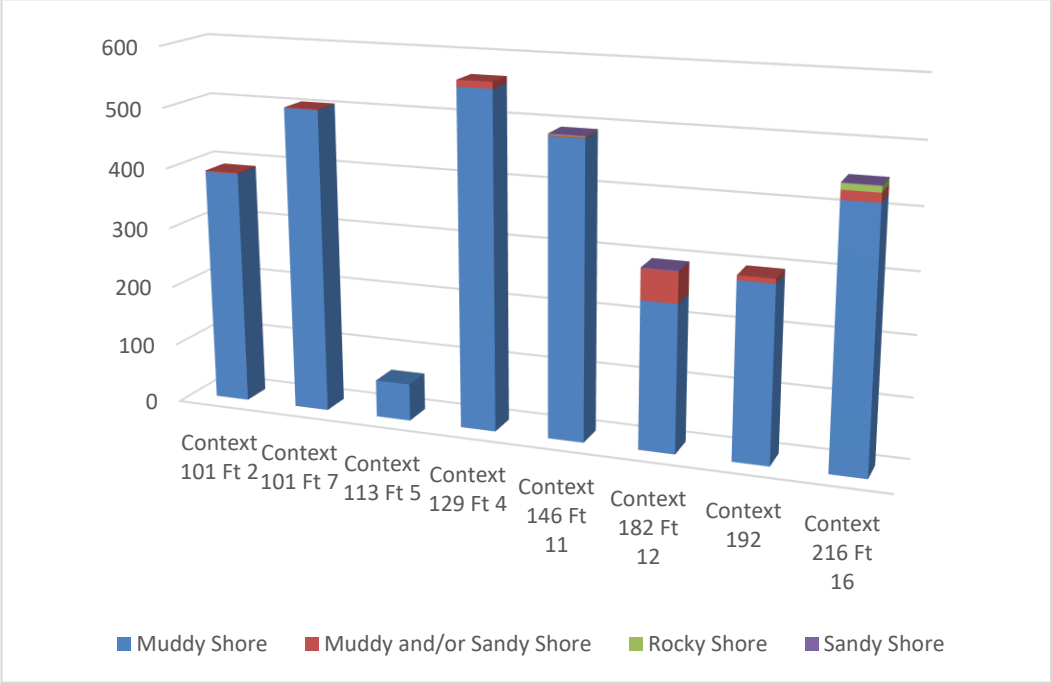


Figure 9.2 Sample environmental niche MNI as a percentage of the total sample environmental niche MNI, numbered contexts, R09/221

9.2.3 Fragmentation Ratio

A fragmentation ratio was calculated to assess the level of fragmentation. The reasoning for this follows the argument that greater quantities of broken shells indicate greater levels of damage to the deposit. Therefore, greater quantities of intact shells would indicate a deposit in 'good/whole' condition. Interpretation of this ratio needs to consider various

taphonomic factors influencing the site, such as the level of plough damage, cattle trampling or vehicle movements across the site, or even environmental factors such as chemical weathering.

In order to calculate the ratio, the identifiable shells were separated into fragmented or whole shell categories. Due to the low numbers of other species present in the samples, only specimens of cockle were counted. The NISP of each portion was calculated and the fragmented shell portion was divided by the whole shell portion. This creates a ratio of broken shells to whole shells, with a higher number indicating more broken shells. The NISP numbers of each sample and the ratio is presented in Table 9.10.

Calculation of the ratio suggests five of the middens suffered minimal post-depositional damage, consisting of Midden 1 (R09/2191), Midden 7 sample 1 (R09/2187), Midden 9 (R09/2189), context 182 (R09/221) and context 216 (R09/221).

Midden 7 sample 2 (R09/2187), Midden 12 (R09/2188), context 113, context 129, context 146 and context 192 (all R09/221) suffered low to moderate post-depositional damage, all with a ratio greater than 2 but less than 3.

Middens 14 (R09/2146) and 15 (R09/2196), context 101-1 and context 101-2 (R09/221) all suffered a much greater degree of damage with ratios above 4.

Midden 1 (R09/2191) was sited alongside a farm track and beneath a mature puriri tree, and was the only midden to contain a greater number of whole cockle shell than fragmented shell.

Table 9.10 NISP of fragmented and whole cockle and the ratio for each sample

Site	Fragmented	Whole	Ratio
Midden 1 (R09/2191)	492	609	0.80
Midden 7 Sample 1 (R09/2187)	1062	747	1.42
Midden 7 Sample 2 (R09/2187)	878	377	2.32
Midden 9 (R09/2189)	887	675	1.31
Midden 12 (R09/2188)	612	270	2.26
Midden 14 (R09/2146)	302	66	4.57
Midden 15 (R09/2196)	99	20	4.95
Site R09/221			
Context 101 - 1	626	131	4.77
Context 101 - 2	822	148	5.55
Context 113	87	36	2.41
Context 129	798	276	2.89
Context 146	569	280	2.03
Context 182	290	168	1.72
Context 192	321	137	2.34
Context 216	360	230	1.12

9.2.4 Shell Dimensions

Shell dimension is a variable that can reveal changes in the levels of predation over time. A dense occupation over a considerable period of time could harvest a particular species with great enthusiasm and thereby reduce the size of the individuals available to little more than juveniles. Conversely a targeted harvest conducted by individuals moving quickly across the landscape may select simply the largest available individuals.

All of the whole cockle shell was measured to avoid any conscious or unconscious bias in selection, to obtain data on individual shellfish size to determine maturity of shellfish collected. Descriptive statistics for maximum dimensions of cockle are presented in Table 9.11, where 100 or more whole shell were recorded.

Using accepted age grouping size ranges of measured whole *Austrovenus stutchburyi* (cockle) shell it was possible to determine some general conclusions relating to the collection methods used by occupants of the site. The size ranges are as follows; juvenile (up to 10mm), pre adult (10-20mm), young adults (18-25mm), adults (>25mm), with sexual maturity 18-20mm (www.gopi.org.nz).

The descriptive statistics suggest cockle were predominantly adult.

Table 9.11 Maximum cockle dimension mean, median, mode and standard deviation

Site	Count	Mean	Median	Mode	Standard Deviation
Midden 1 (R09/2191)	609	23.23	23	23	2.93
Midden 7 Sample 1 (R09/2187)	747	23.40	23.19	22.27	2.75
Midden 7 Sample 2 (R09/2187)	377	22.88	22.89	20.82	2.84
Midden 9 (R09/2189)	675	24.15	24.36	23.28	0.12
Midden 12 (R09/2188)	270	27.94	27.72	26.79	3.14
Site R09/221					
Context 101	131	26.86	27.01	21.09	3.42
Context 101	148	27.95	27.44	24.1	3.89
Context 129	276	28.16	28.33	27.95	4.08
Context 146	280	21.36	21.53	21.63	3.11
Context 182	168	30.61	30.94	31.15	4.00
Context 192	137	28.48	28.66	27.36	2.97
Context 216	230	26.64	26.88	23.74	3.26

9.2.5 Discussion

There was a clear dominance of cockle shell across the samples, indicating adult cockles were regularly harvested for subsistence purposes. Muddy shore environments therefore dominated with some sandy shore, and this fits well with the local environment. Of note was the absence of fish or avifauna across all the middens, which is surprising given the general location of the site near the Mahurangi Harbour and the ubiquity of fish and shellfish in New Zealand middens (Smith 2011). This suggests taphonomic conditions were not favourable for bone preservation.

9.3 Faunal Analysis

An assemblage of faunal remains from three contexts within site R09/221 was analysed by Nicholas Keenleyside.

9.3.1 Methodology

Each individual sample was sorted by hand into diagnostic and non-diagnostic elements. The samples were not washed before sorting as Sample 1 especially could have been lost in the process. Bone was analysed to the lowest taxonomic category – to species where possible or to the broader classification of fish, mammal, avifauna, shellfish. For the identifiable faunal material, two standard quantification measures were applied: the Number of Identifiable Specimens (NISP) and the Minimum Number of Individuals (MNI). Each individual species and material type was weighed using digital scales with 0.01-gram increments. Where samples weighed less than 1 gram their weight was recorded as >1g.

9.3.2 Results

A total of 118 faunal specimens (vertebrate and invertebrate) were identified in the samples supplied. The results of the analysis of the samples are set out below. The samples were identified by the information shown on the bags containing each faunal assemblage.

9.3.2.1 Sample 1 – Context 213 (Pit Fill)

This sample was from a fill of a clay-lined pit (context 212) and it consisted of eight small faunal fragments described on the sample bag as burnt bone (1m in weight). Examination identified four probable animal bone fragments and four probable shellfish fragments, too small to be classified to species level. There were signs of charring on most fragments.

9.3.2.2 Sample 2 – Context 203 (Fill of Firescoop)

This sample was from the fill of a firescoop (context 202). It comprised four small pieces of what was most likely to be dog bone (*Canis familiaris*), plus 16 fragments of mammal bone which were also likely to be dog from the context but were too fragmented to be identified (7g in weight). The identifiable dog bone elements consisted of a phalange, the end of a tibia and partial metatarsus or metacarpus. Most of the bone appeared to have been heated or burnt. The dog bone was recovered by sieving a bulk sample from the firescoop. Inclusions in the bulk sample included fire-cracked rock and a significant quantity of charcoal.

9.3.2.3 Sample 3 – Context 178 (Fill of Hangi)

This sample consisted of sheep (*Ovis aries*) and unidentified mammal bone (73g in weight). One segment of a sheep's left mandible and seven teeth were identified, along with 80+ fragments of mammal bone, which were also likely to be from the same individual but were

too fragmented for any identification of elements. The teeth included four molars, two premolars and an incisor, probably from a mature individual. No butchery marks were evident; the bone appeared to have been shattered rather than cut. The sample was obtained from a small hangi.

Table 9.12 Counts per sample of faunal material from R09/221

Sample	Context	Dog [MNI]	Dog [NISP]	Sheep [MNI]	Sheep [NISP]	Unidentified Mammal [NISP]	Unidentified Bone [NISP]	Unidentified Shellfish [NISP]
1	213	-	-	-	-	-	4	4
2	203	1	4	-	-	16	-	-
3	178	-	-	1	8	80	-	-
Total		1	4	1	8	96	4	4

9.3.3 Discussion

The samples analysed were dominated by two introduced domesticated species: dogs and sheep. Dogs were introduced to New Zealand by the original settlers from East Polynesia but the original breed, the kuri, was supplanted by breeds introduced by Europeans from the early 19th century onwards (Clark 1997). Evidence from middens dating from the pre-European period shows that dogs were often an important source of food and that their bones and pelts were a valuable resource (ibid.). The flesh was consumed; teeth were used in body ornaments and tool manufacture; mandibles were of particular use for the construction of fishing lures. Dogs were often fed on a diet of fish, but no fish remains were found in this sample.

Sheep are domesticates associated with European settlement in New Zealand. After an unsuccessful attempt by Captain James Cook to land sheep in the South Island in 1773, the first sheep were introduced in the Bay of Islands by Reverend Samuel Marsden in 1814 (Meadows 2008). Sheep were reportedly farmed in the vicinity of Bishophill Farm from the earliest period of European settlement in the Mahurangi area; however, the archaeological context suggests that the sheep remains in this sample may not have been disposed of by a sheep farmer. Historical documents record that there were Māori living on the property until 1843, when the land was first purchased by Europeans and clearance and subsequent farming began (see Section 2). Further, the morphology of the earth oven from which the sheep bones were derived is consistent with Māori hangi. Therefore, it is likely that this hangi relates to Māori occupation of the site during the first half of the 19th century.

9.4 Radiocarbon Dating Analysis

Prior to the residential subdivision of Bishophill Farm, there was no radiocarbon dating evidence for this part of the Tawharanui Peninsula. However, three shell midden sites were sampled, and charcoal was submitted for radiocarbon dating analysis – sites R09/221, R09/2187, and R09/2188 (Figure 9.3, Figure 9.6, Table 9.13 and Table 9.14). In addition, a shell midden date was obtained for site R09/2199 located up on the ridge during development of the old villa (R09/2175; Authority no. 2015/1388, Shakles, Phear and Low 2016), and this too is included and presented within the radiocarbon dataset (Figure 9.3, Table 9.13) as well as in the discussion. Details for all radiocarbon determinations can be found in Table 9.13 and Table 9.14, and details for each sample are provided in Appendix 4. Details of the chronology of the Bishophill Farm site as a whole, and where the dates fit into the wider areas chronology, are represented in Figure 9.13 and Figure 9.14.

9.4.1 Results from Midden Sites R09/2187 and R09/2188

Middens R09/2188 and R09/2187 were located in the vicinity of the pa site (R09/540) on the spur leading up to the flattened high ridge that bisects much of the former farm (Figure 9.3). The sample from R09/2187 consisted of cockle shell and produced a result of 652 ± 26 BP (Wk41535), with a calibrated radiocarbon date range of 1513-1765 AD (1σ) (Figure 9.4, Table 9.13). A cockle shell sample from R09/2188 produced a result of 567 ± 26 BP (Wk41536), with a calibrated date range of 1640-1900 AD (1σ) (Figure 9.5; Table 9.13). The radiocarbon data suggests that site R09/2187 was formed around the last quarter of the 17th century, while R09/2188 appears to be a little later, likely dating to just after the turn of the 18th century (Figure 9.4 and Figure 9.5; Table 9.13).

Table 9.13 Details of the radiocarbon dates from R09/2187, R09/2188 and R09/2199

			CRA		Years AD			
Lab No	Sample	Material	years BP	Error	-2σ	-1σ	1σ	2σ
Wk41535	R09/2187	Cockle shell	652	26	1785	1513	1765	1804
Wk41536	R09/2188	Cockle shell	567	26	-	1640	1900	-
Wk43986	R09/2199	Cockle shell	776	19	1452	1468	1577	1644

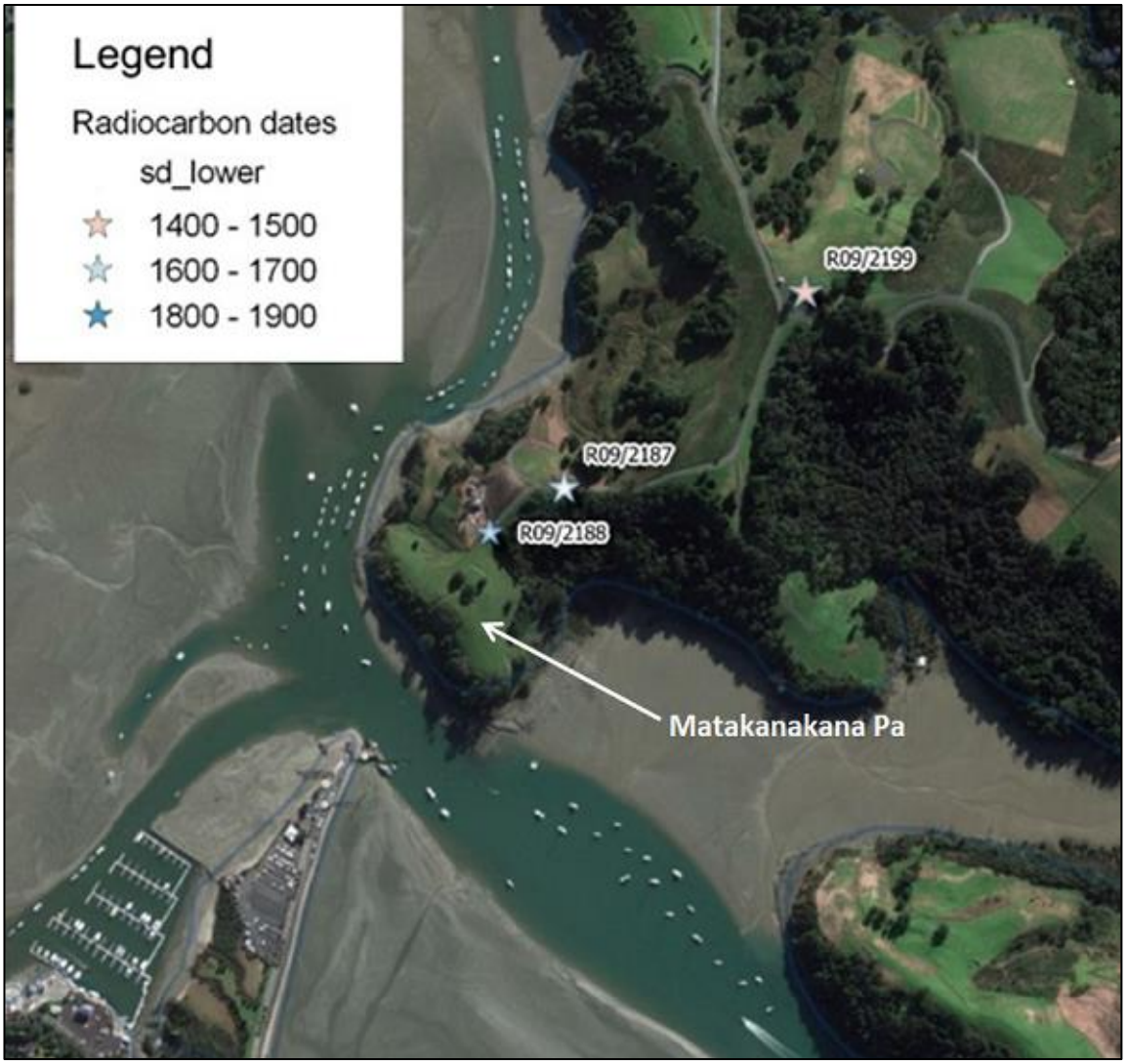


Figure 9.3 Aerial showing location of radiocarbon dates obtained from sites R09/2187 and R09/2188 during archaeological monitoring of the southwestern ridge spur on the Bishophill Farm property at 1 standard deviation. Also shown is the location of site R09/2199 located on the central ridge top, investigated during works under HNZ Authority (No. 2015/1388)

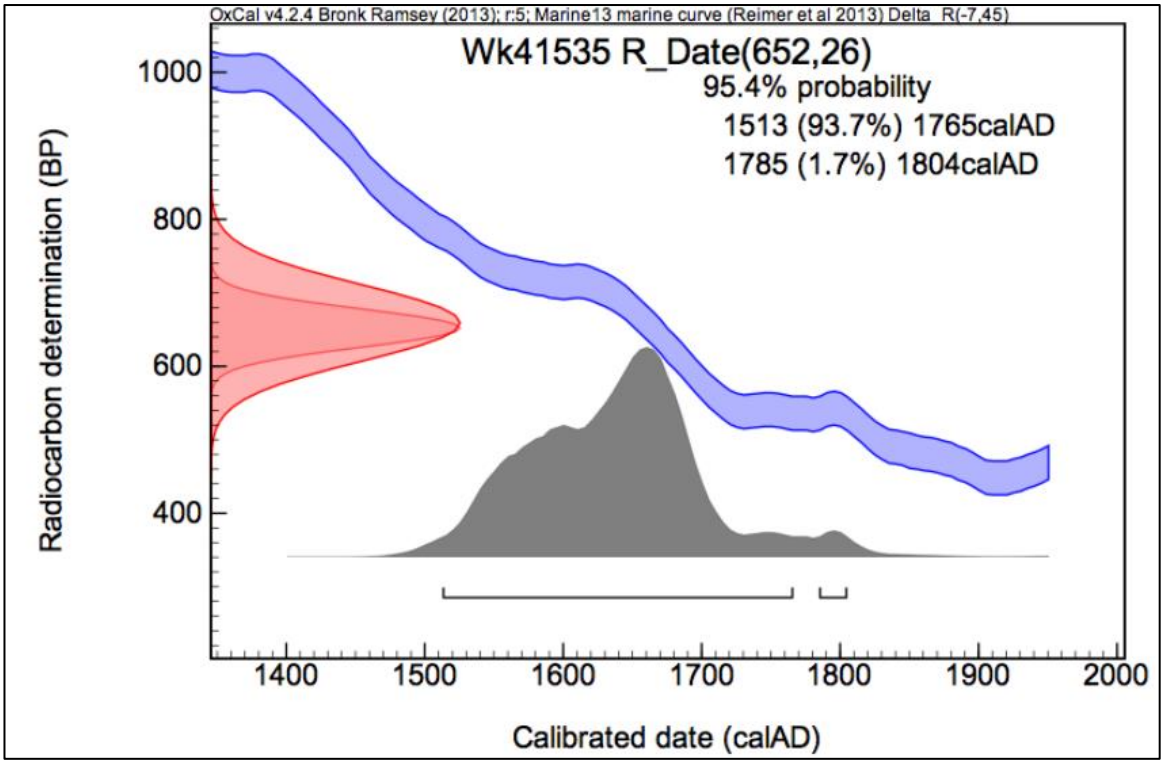


Figure 9.4 Calibrated radiocarbon date range from shell midden site R09/2187

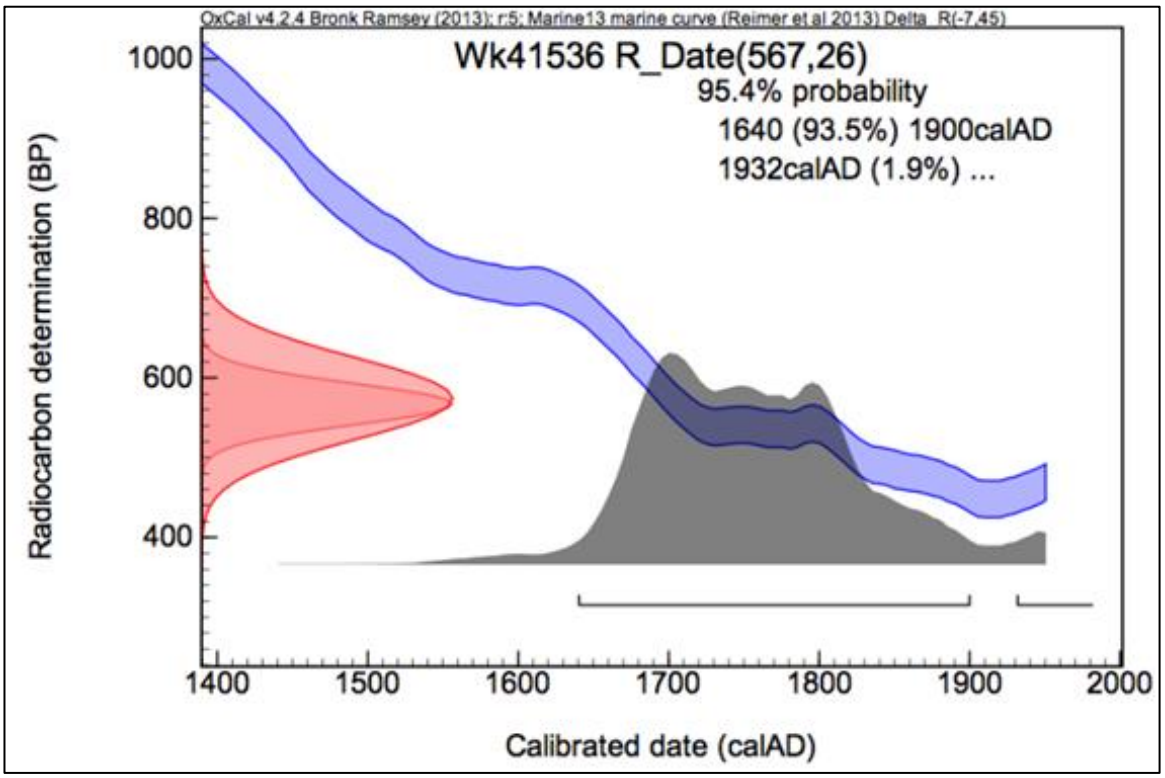


Figure 9.5 Calibrated radiocarbon date range from shell midden site R09/2188

9.4.2 Results from Midden Site R09/221

As discussed previously, site R09/221 (Figure 9.6) was recorded prior to the subdivision as a large shell midden site, and it proved to be a far more complex site than expected. Topsoil stripping over the site exposed a relatively large volume of stratified deposits and features relating to multiple occupation phases of both pre-European and early post-contact period Māori settlement. Six radiocarbon dating samples (including two that were subjected to Accelerator Mass Spectrometry – AMS) were submitted to the University of Waikato Radiocarbon Dating Laboratory from this site (Figure 9.6, Table 9.14).

Two shell samples were submitted for dating. A cockle sample from context 216 (midden) produced a result of 1468-1581 AD (1σ) (Figure 9.7), and a cockle sample from context 101 (midden) produced a result of 1553-1861 AD (1σ) (Figure 9.8).

The remaining four samples consisted of charcoal. A sample from context 106 (fill of kumara pit 109) produced a result of 1475-1630 AD (1σ) (Figure 9.9); a sample from context 174 (hangi) produced a result of 1310-1400 AD (1σ) (Figure 9.10); a sample from context 201 (hangi) produced a result of 1810-1944 AD (1σ) (Figure 9.11); and a sample from context 213 (pit fill) produced a result of 1510-1640 AD (1σ) (Figure 9.12). See Table 9.14 for details.

Table 9.14 Details of the radiocarbon dates for site R09/221 of the Bishophill subdivision

			CRA		Years AD			
Lab No	**Sample**	**Material**	**years BP**	**Error**	**-2σ**	**-1σ**	**1σ**	**2σ**
Wk41725	R09/221 - 216	Cockle shell	776	26	1450	1468	1581	1647
Wk41534	R09/221 - 101	Cockle shell	600	28	-	1533	1861	-
Wk41513	R09/221 - 106	Hebe & manuka charcoal	380	20	1490	1475	1630	1625
Wk41514	R09/221 - 174	Rewarewa charcoal	633	23	1310	1320	1400	1410
Wk41512	R09/221 - 201	Kanuka charcoal	71	25	1707	1810	1944	1723
Wk42039	R09/221 - 213	Kanuka, mahoe, pohutukawa	344	20	1500	1510	1640	1650

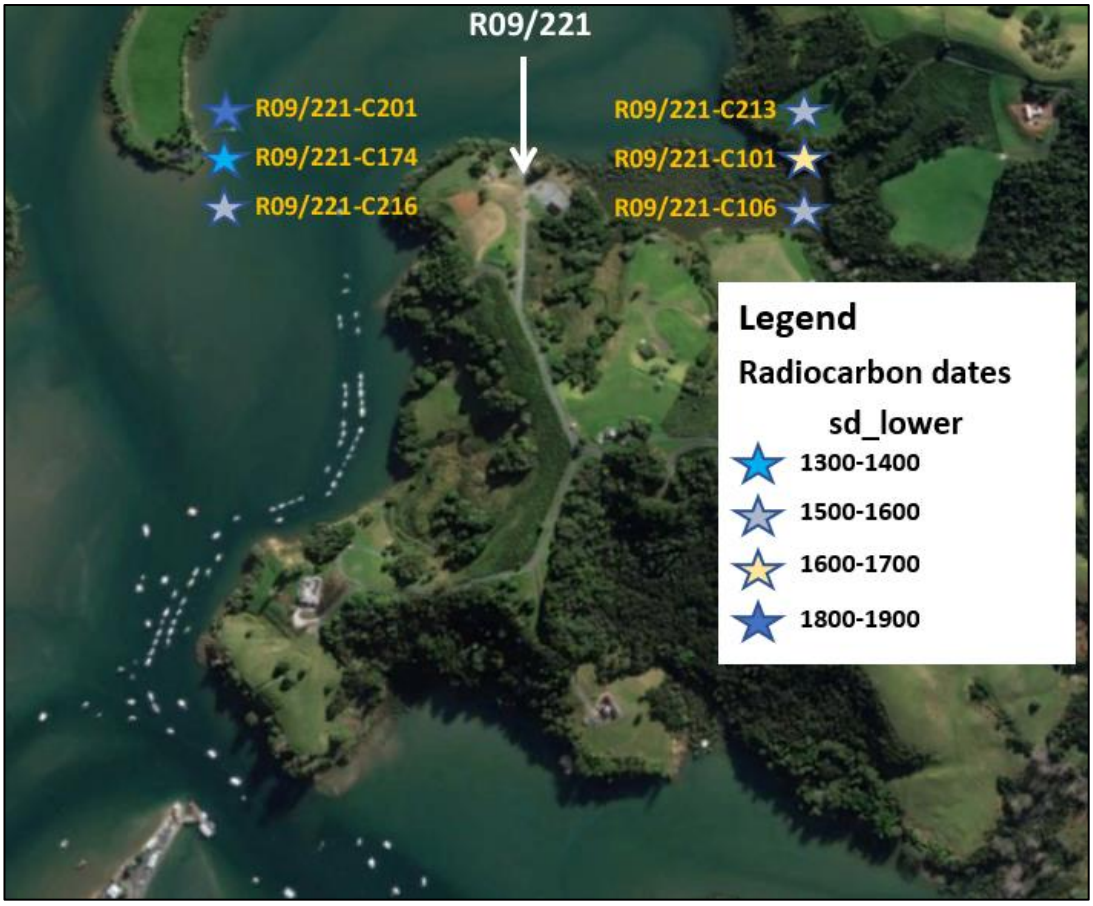


Figure 9.6 Aerial showing location of site R09/221 in the northwest of the Bishophill Farm property and the radiocarbon dates obtained from the investigation at 1 standard deviation.

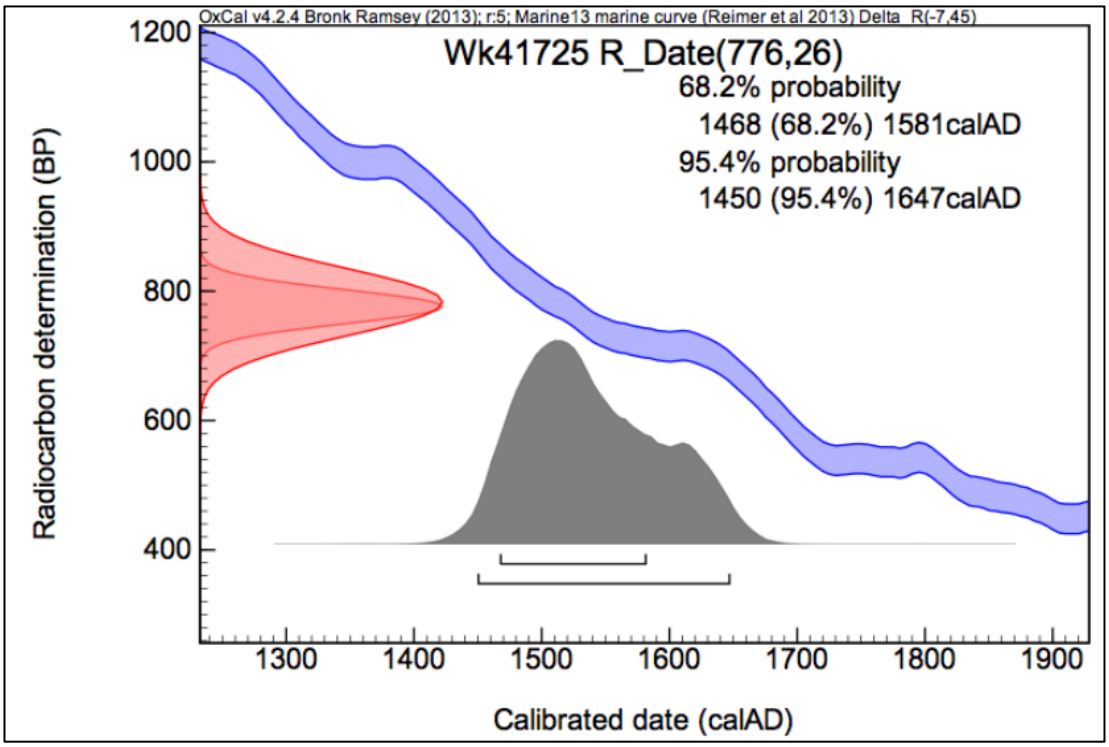


Figure 9.7 Calibrated radiocarbon date range from shell midden site R09/221 context 216

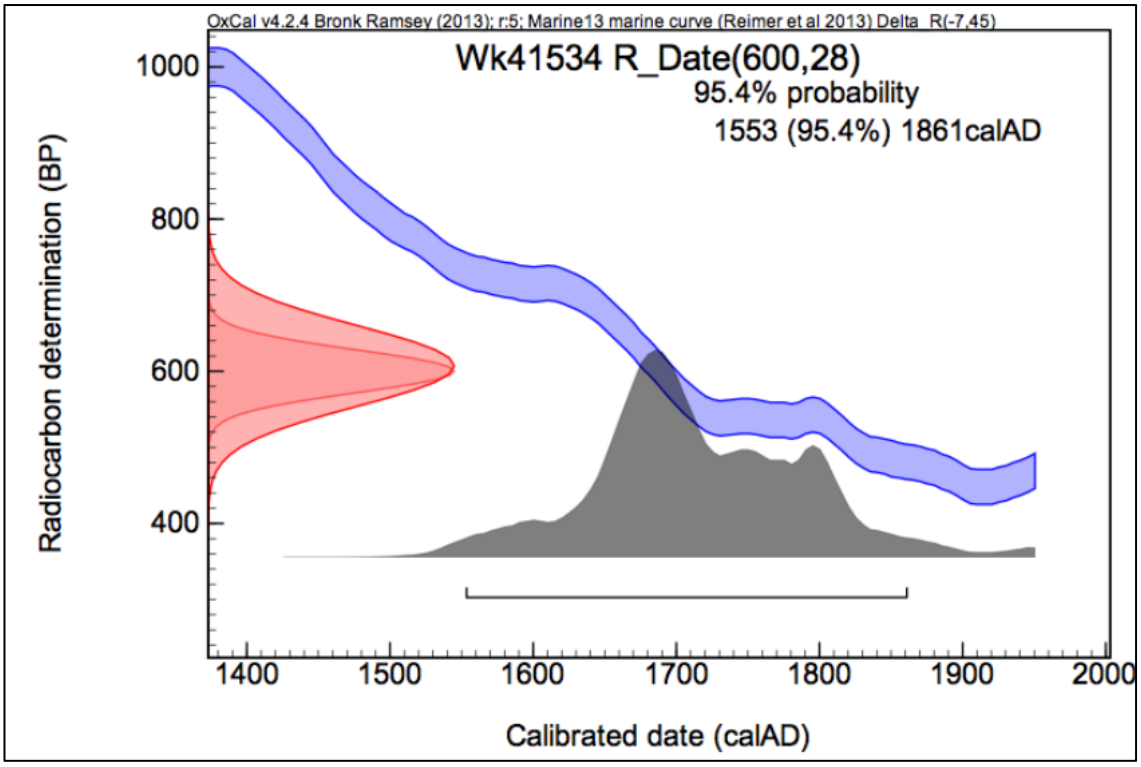


Figure 9.8 Calibrated radiocarbon date range from shell midden site R09/221 context 101

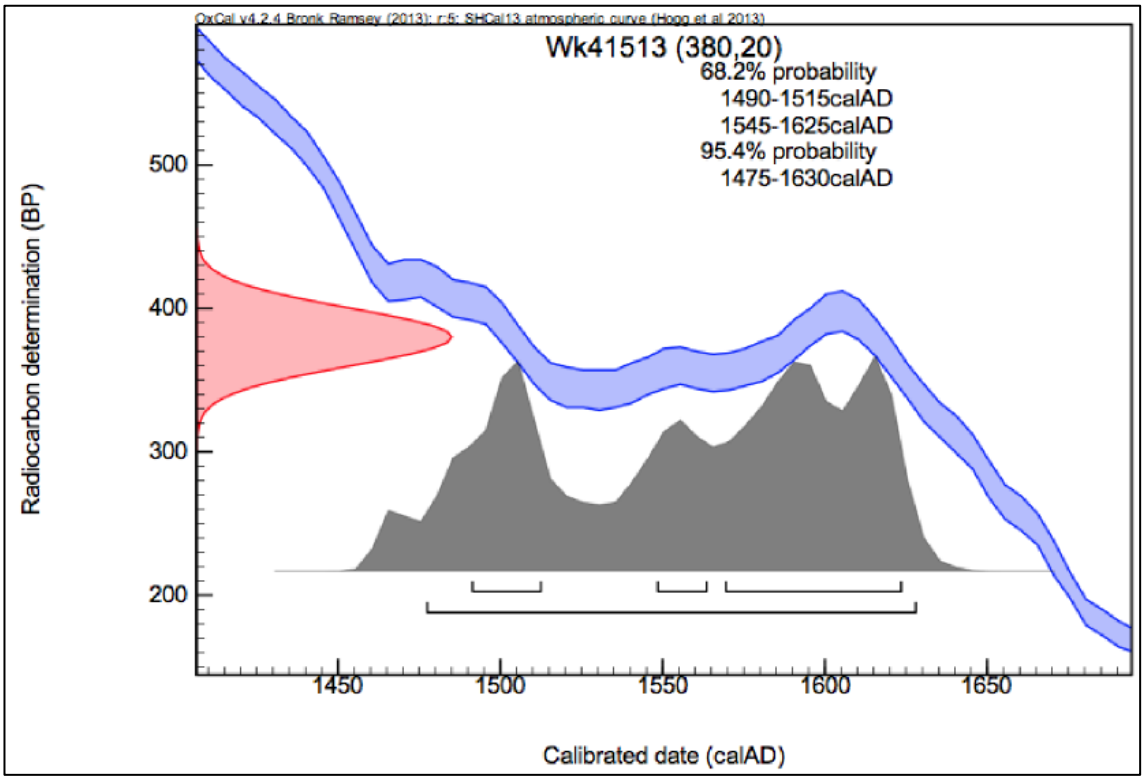


Figure 9.9 Calibrated radiocarbon date range from shell midden site R09/221 context 106

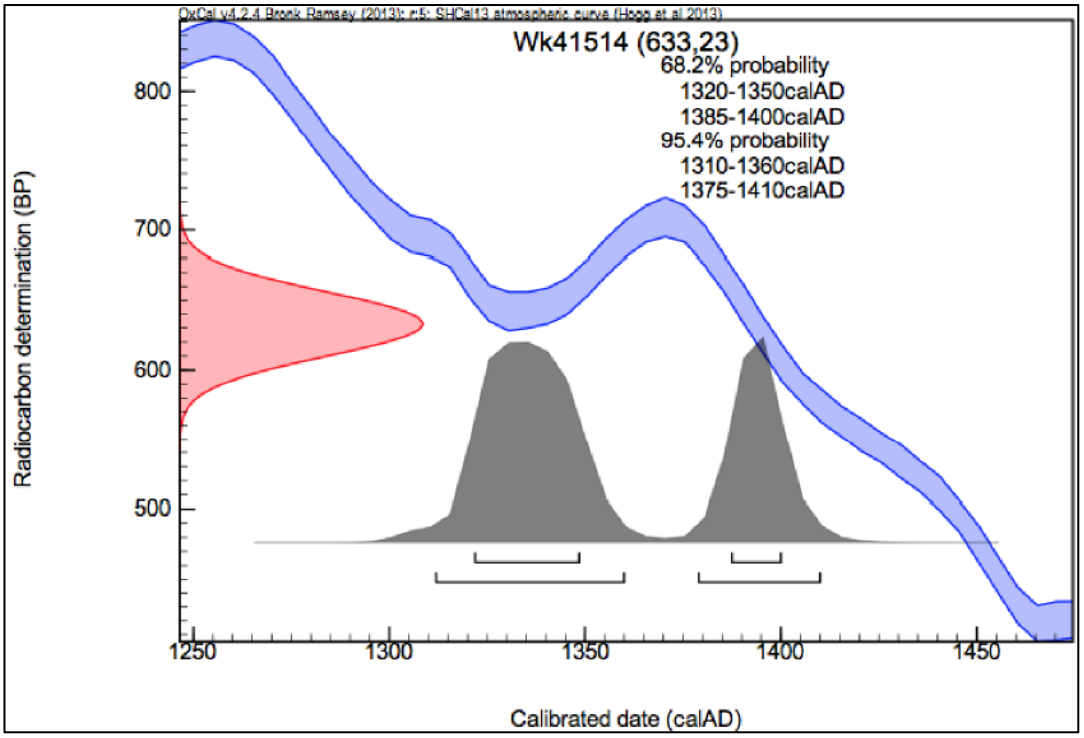


Figure 9.10 Calibrated radiocarbon date range from shell midden site R09/221 context 174

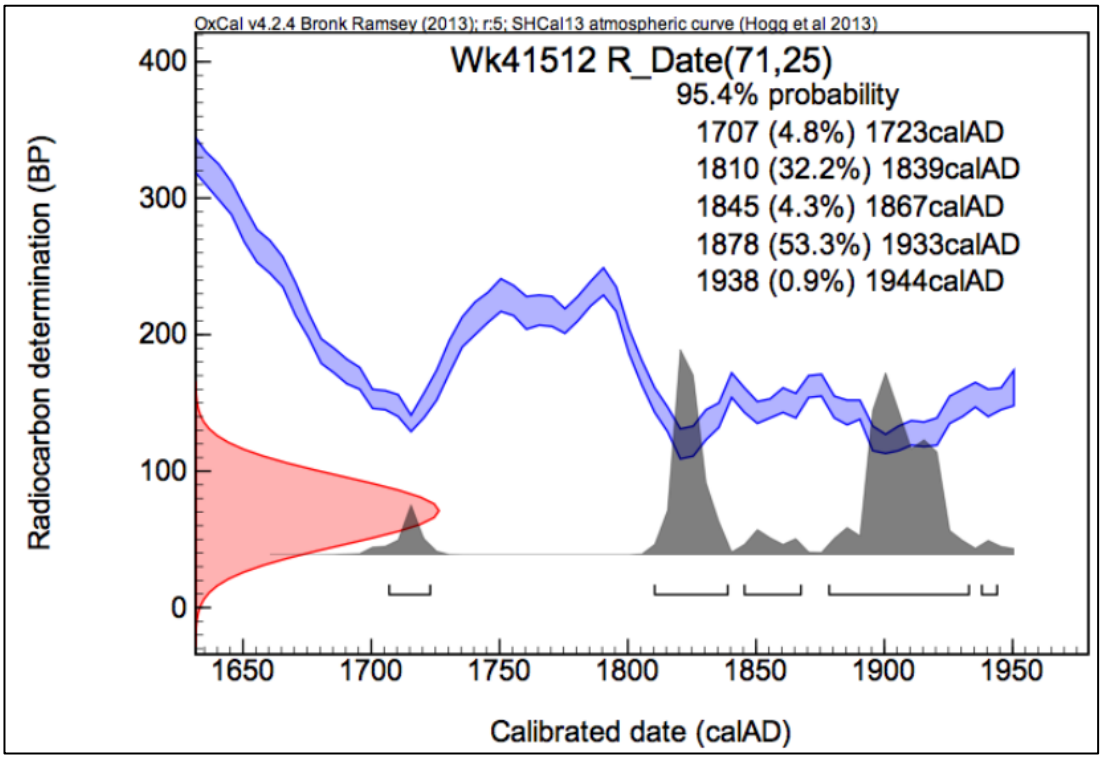


Figure 9.11 Calibrated radiocarbon date range from shell midden site R09/221 context 201

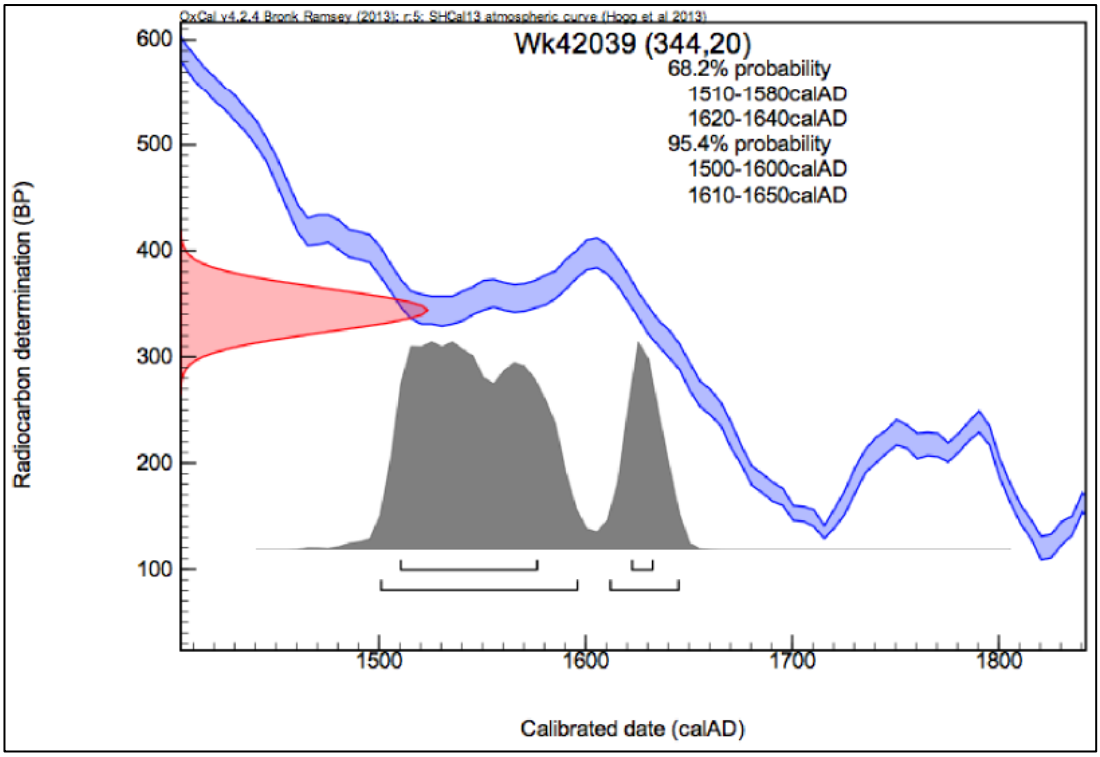


Figure 9.12 Calibrated radiocarbon date range from shell midden site R09/221 context 213

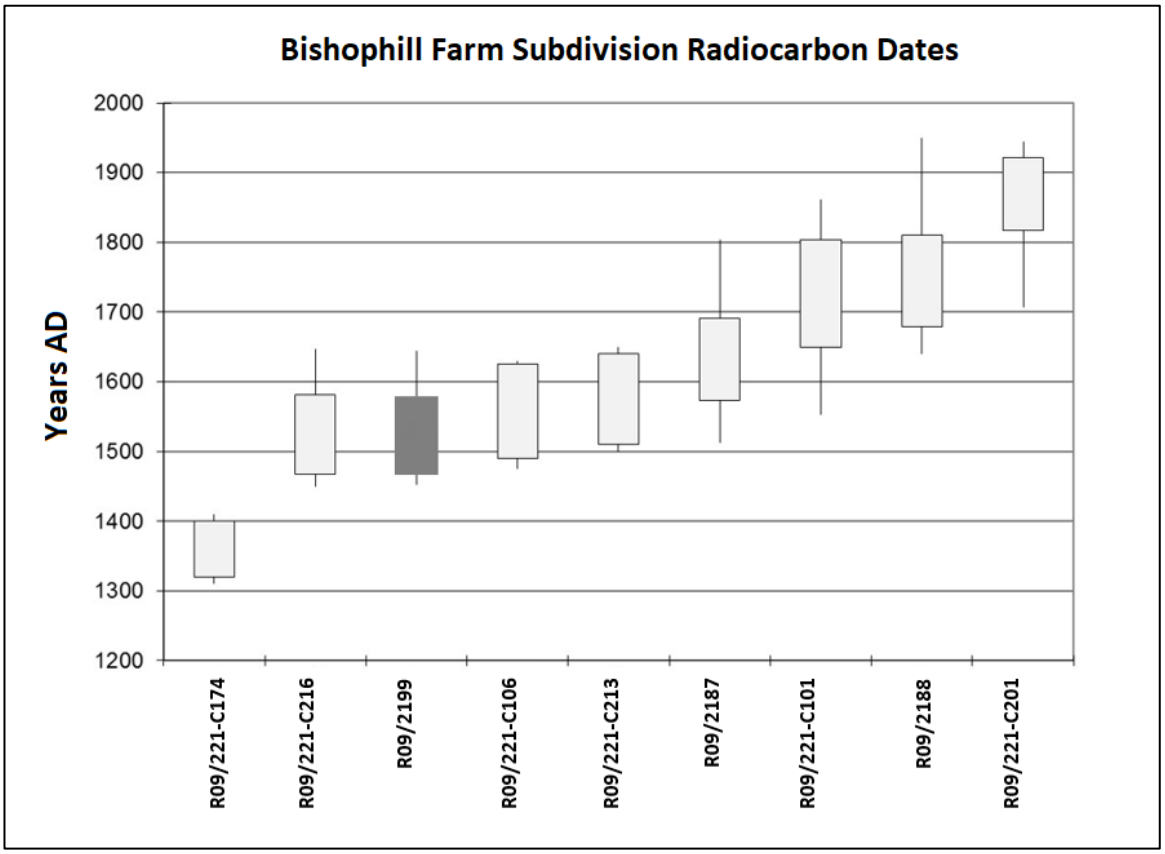


Figure 9.13 Radiocarbon dates from the Bishophill Farm Subdivision. NB. The dark grey shaded date is from R09/2199 which, while part of the subdivision property, was investigated under a different Heritage NZ Authority (No. 2015/1388, Shakles, Phear and Low 2016)

9.4.3 Discussion

The radiocarbon analysis of site R09/221 demonstrates that the site was occupied intermittently for some 500 years between the early 14th and early 19th centuries.

The earliest date came from a charcoal sample taken from the fill (context 174) of hangi 173, which produced an AMS determination of 633 ± 23 BP (Wk41514), with a calibrated radiocarbon date range of 1310-1410 AD (1σ) (Figure 9.10, Table 9.14, Appendix 4). Hangi 173 appears to date towards the end of the first half of the 14th century. The feature was located close to a small cluster of hangi and an associated posthole group, the latter likely representing fish drying racks.

The next two dates in the sequence consisted of the fill of a somewhat enigmatic pit feature (context 212), and a shell midden deposit (context 216) which sealed it. A charcoal sample taken from the fill of pit 212 (context 213) produced a determination of 344 ± 20 BP (Wk42039), with a calibrated radiocarbon date range of 1510-1640 AD (1σ) (Figure 9.12, Table 9.14, Appendix 4). The pit was of unclear function, however, a clay lining and the greasy/oily nature of the fill contained within, likely indicates that it was utilised in processing a specific but indeterminate resource. A sample of cockle shell from midden 216 produced a determination of 776 ± 26 BP (Wk41725), with a calibrated radiocarbon date range of 1468-1581 AD (1σ) (Figure 9.7, Table 9.14, Appendix 4). While at first glance this date appears incongruous as the feature clearly sealed pit 212, examination of the radiocarbon data suggests the features were contemporaneous, or at the least near contemporary, and both date to the first quarter of the 16th century. It is probable that the midden deposition in this area was rapid, occurring not long after the features such as pit 212 had ceased use.

Context 106, one of the fills of kumara pit 109, is particularly interesting as it was the deposit that produced two discrete clusters of human remains. A charcoal sample taken from the deposit consisted of hebe and manuka and produced an AMS determination of 380 ± 20 BP (Wk41513), with a calibrated radiocarbon date range of 1475-1630 AD (1σ) (Figure 9.9, Table 9.14, Appendix 4). The radiocarbon data suggest that the human remains were deposited at some point during the last quarter of the 16th century. Also, of note here is that as pit 109 truncated kumara pit 117, and context 103 is quite late in the depositional sequence; this indicates that the original kumara pit (context 117) is much older than expected, perhaps being contemporary with pit 212 and midden 216 and dating to the early 16th century.

A sample of cockle shell from the main midden deposit (context 101) produced a determination of 600 ± 28 BP (Wk41534), with a calibrated radiocarbon date range of 1553-1861 AD (1σ) (Figure 9.8, Table 9.14, Appendix 4). The radiocarbon data suggest that activities associated with the deposition of midden 101 were occurring during the last couple of decades of the 17th century and around the turn of the 18th century.

The final and most recent date in the R09/221 sequence was obtained from the fill (context 201) of a firescoop (context 200) that was located in association with an earth oven to the northwest of midden 216. A sample of kanuka charcoal from the firescoop produced a determination of 71 ± 25 BP (Wk41512), with a calibrated radiocarbon date range of 1810-1944 (1σ) (Figure 9.11, Table 9.14, Appendix 4). The radiocarbon data, when considered with the known history of European ownership of the land upon which site R09/221 was located, indicate that the feature was in use at some point between 1815 and 1830. This is substantially later than the other dates produced from the site and almost certainly

represents the final phase of Māori activity in that area of the peninsula prior to coming under European ownership in the early 1840s.

The radiocarbon dates produced from site R09/221 indicate that the northwestern part of the peninsula was utilised by Māori from as early as the first quarter of the 14th century up until the first half of the 19th century (Figure 9.6, Figure 9.13, Table 9.14). The site would have undergone intermittent phases of occupation and abandonment until European settlement commenced.

The dates obtained from midden sites R09/2187 and R09/2188, together with the date from midden R09/2199, indicate that Māori occupation activities across the peninsula were widespread, incorporating both the coastal zone and the high central ridge (Figure 9.3, Figure 9.13, Table 9.13). It is highly likely that sites R09/2187, 2188 and 2199 were individually contemporaneous with some of the occupation phases at site R09/221 and are testament to a large interconnected and resourceful population.

In the wider area, a number of dates have been obtained from the Omaha Sandspit on the Gulf Coast, as well as from the Inner Whangateau Harbour and Ti Point near Leigh, which cover a date range from the beginning of the 14th century to the late 1800s (Figure 9.14). The dating evidence obtained from site R09/221 can be seen as a microcosm of the dating picture across the wider region, and indicates that the site has always been an advantageous and desirable place for settlement (Figure 9.14). R09/2187 and 2188 fit well into the later classic period occupation of the region, while R09/2199 sits at the end of the earlier part of the sequence (Figure 9.14).

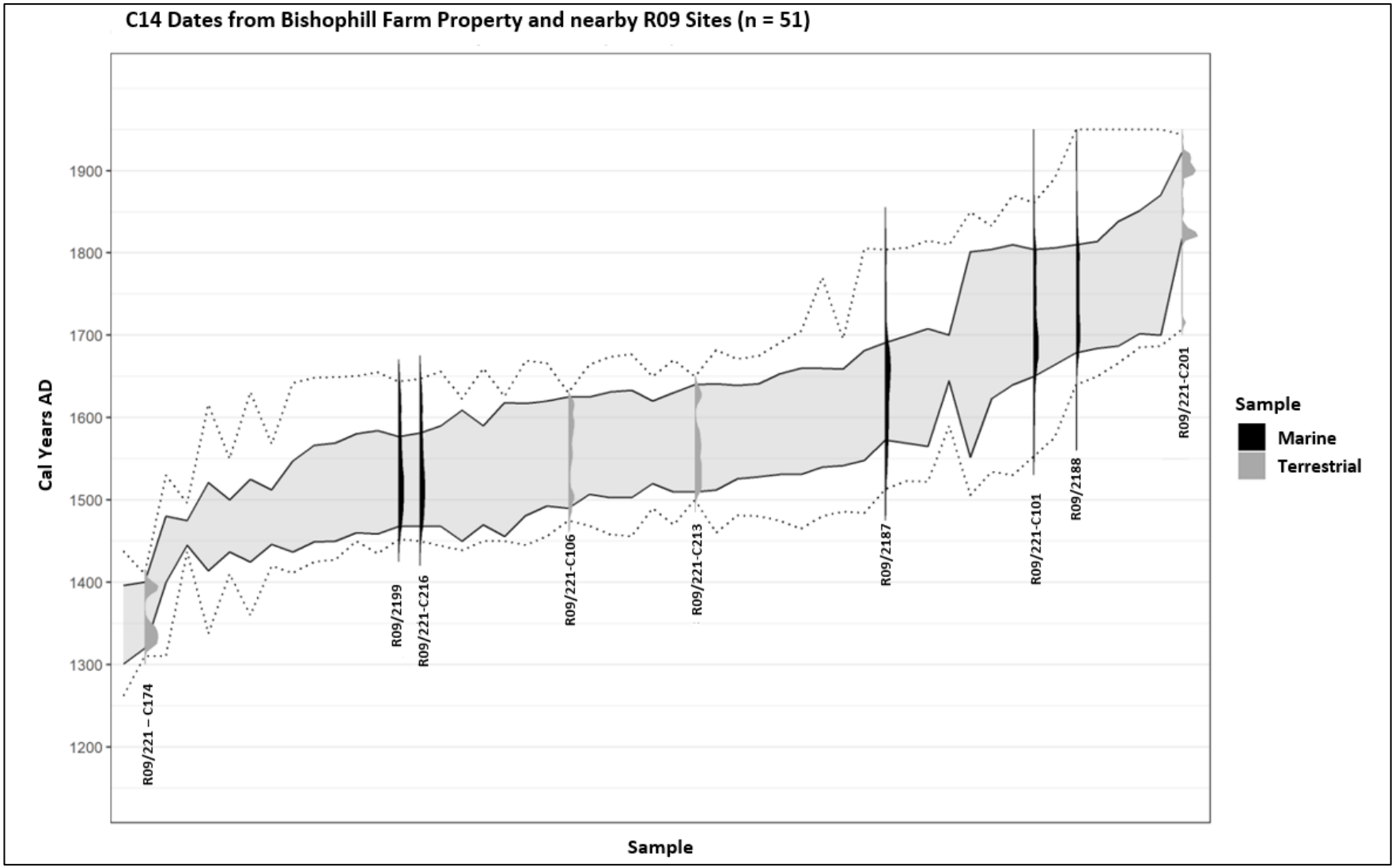


Figure 9.14 Radiocarbon dates from the Bishophill subdivision area in relation to dated sites in the wider area. Midden site R09/2199 was investigated under a separate Authority following sale of the lot (see Shakles, Phear and Low 2016). NB. The large grey band represents radiocarbon dating data from 51 sites in the wider area. Source of data: University of Waikato New Zealand Radiocarbon Database

10 DISCUSSION

10.1 Introduction

The archaeological monitoring and investigation works for the Bishophill Farm subdivision resulted in 21 new archaeological sites being recorded across the development area. Nineteen of those were midden sites, and two were historic period sites. In addition, midden relating to a previously recorded site (R09/2146) was exposed, recorded and sampled, while a detailed investigation of another previously recorded site (R09/221) was carried out.

The results of the monitoring and investigation, including the results of the artefact and environmental analysis, will be discussed below. The discussion will look at the known evidence for Māori settlement patterns both locally and regionally, and assess how the results from Bishophill Farm fit within those patterns, including: the chronology of settlement; the vegetation history as suggested by the charcoal analysis; the evidence of stone tool technology and consideration of resource procurement and trade; shellfish procurement and subsistence patterns; and finally the evidence for European/historic settlement and changes that would have taken place which are visible in the archaeological record.

10.2 Maori Settlement Remains and Chronology of Settlement

The location of the development site within the wider Tawharanui Peninsula, which extends into the Hauraki Gulf, is an area known to have been favoured by Māori for shark fishing and processing, as well as being rich in other marine and estuarine resources such as shellfish. The soils on the slopes and in the general Tawharanui area were favourable for agriculture, particularly the north-facing slopes and low-lying areas where swamps were also useful for other resources such as raupo, harakeke, birds and taro (Murdoch 1998).

At the time of European contact in the 19th century, Ngati Raupo occupied much of Tawharanui. They maintained kainga or settlements throughout the area and migrated over their wider ancestral domain between Matakana River and Whangateau in a seasonal cycle of fishing, hunting, gathering and harvesting (Murdoch 1998). Ngāti Manuhiri used to visit Mangatawhiri on the eastern part of the peninsula to catch eels as well as visiting to obtain red ochre from a source on the cliffs at eastern end of Anchor Bay (M.B.3 N.L.C Kaipara 1873:39).

Ngāti Manuhiri are Mana Whenua for the development area, which is part of a larger rohe which includes the east coast, extending to islands such as Kawau, Hauturu (Little Barrier) Aotea (Great Barrier) and Tiritiri Matangi. Ngāti Manuhiri were predominantly a coastal tribe, largely due to the vast kaimoana resources available and the many rivers, harbours and estuaries providing safe landings and routes inland (McKenzie 2013). A site of significance to Ngāti Manuhiri is Matakanakana Pa – ‘The glowering eyes’. This pa was one of several protecting the upper and lower reaches of the Matakana River. McKenzie (2013) states that ‘it is likely a very old pa, potentially occupied by a previous tribe Ngāi

Tāhuhu, but Ngāti Manuhiri were the last occupants. The surrounding midden are undoubtedly associated with the pa or undefended settlements close to it'.

The radiocarbon chronology demonstrates intermittent phases of occupation across five centuries on the headland. This archaeological record is the tangible evidence of Maori activities including the movement of people through the landscape for both seasonal exploitation of resources and activities associated with more permanent settlement.

10.2.1 Phasing

Interpretation of the radiocarbon determinations suggests there are four phases of occupation recorded on the property, and all four of these phases are evidenced in the settlement history of the coastal site R09/221.

The most recent dated feature is a hearth that forms part of site R09/221 which provided a probable date at the end of the first quarter of the 19th century, indicating Māori settlement during the early historic period.

The sites that relate to occupation of Matakanakana Pa are R09/2188 (see Figure 6.1), which likely dates to the last quarter of the 17th century, and midden R09/2187, which is located a bit further up the ridge to the north of the pa and dates slightly later, perhaps around the turn of the 18th century. Of note here is the contemporaneity with midden deposit 101, part of the coastal site R09/221, indicating settlement of the pa and lowland coastal terrace at the same time. Other midden sites in similar locations on the property, including some recorded during the duration of the project, are also likely to date to this period.

Middens dating to an earlier period of settlement are midden R09/2199, located to the south of site R09/221, up the ridge spur and on top of the ridge, and midden deposit 216, which forms part of R09/221. Both middens are likely to date to the early 16th century, and it is likely that a hangi (context 213), the kumara pit (context 117) and some of the postholes at R09/221 relate to a similar period. No other settlement features (such as hangi, postholes and pits) were recorded in association with midden R09/2199; however, it is likely that they were not located within the boundaries of the site investigation, which was limited to the footprint of the residential development (see Shakles, Phear and Low 2016).

The earliest dated feature is a hangi from R09/221, indicating occupation, if only temporary, towards the end of the first half of the 14th century AD. Previous archaeological investigations in the wider geographical area, such as Omaha Sandspit on the Gulf Coast, the inner Whangateau Harbour and Ti Point near Leigh, had only produced dates from the 15th century AD onwards (Shakles, Phear and Low 2016). In terms of the immediate area, an investigation of midden site R09/251 by Judge and others during installation of a predator-proof fence within the Tawharanui Regional park produced a radiocarbon determination with a date range of 1470-1640 AD (Judge et al. 2005: 27). This is the only date known for the peninsula, and it is comparable with dates obtained from excavations further north at Omaha. Therefore, it appears that site R09/221 provides the only evidence placing Māori occupation within the wider Tawharanui area to the first half of the 1300s AD.

10.2.2 Settlement Type

The largest settlement sites on the Tawharanui Peninsula are reported by Murdoch to be located along the high ridgeline above the southeastern coast, on the highest points above each end of Jones Bay. The fortified settlement known as 'Pa-hi' (R09/242) extends nearly half a kilometre along the ridgeline and includes many terraces and pits. Along the western end of the bay is another defended settlement site R09/244, with a similar number of pits and terraces (Murdoch 1998). Murdoch goes on to state that these ridgetop settlements provided warm, well-drained positions for kumara storage which would have been cultivated on the adjoining warm north-facing slopes as well as on the fertile flats in the area.

While there is a lack of visible evidence for kumara pits within the Bishophill landscape, except for the pits recorded during the investigation of site R09/221, this might relate to the use of the property as a farm since the 19th century, with bulldozing and land alteration likely to have infilled any pits outside of the pa site. The north-facing slopes of the property would certainly have been suitable for growing kumara. The two kumara pits located within site R09/221 date from two distinct periods, indicating that kumara was being grown somewhere in the near vicinity over quite a period of time.

While no evidence was found of structural remains relating to a whare or more permanent settlement outside of the pa site, it is likely that such sites were present on the property, with some of the midden sites extending tens of metres in size, indicating a large temporary settlement or seasonal visits to the area. For example, there would have been areas of houses/whare related to occupation of Matakanakana Pa. However, as it is well known that the area was utilised seasonally for shark fishing, processing, gathering ochre and other resources, seasonal sites are also present and visible at R09/221. The little clusters of hangi and small fish drying rack areas beneath the larger midden deposits likely represent seasonal activities, with fish drying and preserving and gathering of resources. Further, with there being evidence of colluvial build-up over the R09/221 investigation area, it is possible that the site extends further and within the lowland coastal zone. Also, large areas of land were not affected by the subdivision earthworks, including other lowland areas and natural terraces suitable for settlement. Thus, an absence of settlement evidence from these investigations is not necessarily evidence of absence.

10.3 Conflict

The presence of Matakanakana Pa on the southwestern extent of the project area, opposite Sandspit and near the entrance of the Matakana River, attests to the importance of the place to pre-European Māori. As the pa is protected from development, no further evidence directly relating to occupation of the pa itself was recovered.

That there was intense inter-tribal warfare has been well documented. During the 1790s Kawerau were part of a Marutūahu (Hauraki tribes) war party that travelled as far as the Bay of Islands, where they had engaged and defeated Ngāpuhi at Waiwhariki near Puketona. In the 1820s Kawerau found themselves under threat from the musket-armed Ngāpuhi. Ngāpuhi were defeated at a battle at Mahurangi in 1820, where their leader Koriwhai was killed. In 1822 Ngāpuhi sought to avenge the death of Koriwhai. They attacked Kawerau at Te Kohuroa (Matheson's Bay) and after an initial setback emerged victorious (ARC Parks 1992).

In 1825 a large and important battle was fought at Auckland between Ngāti Whātua and Ngāpuhi. The Ngāti Whātua force included the Kawerau people of the east coast. The battle was fought at Mangawhai and then at Te Ika a Ranganui near Kaiwaka. Ngāpuhi emerged victorious despite suffering heavy losses. The Kawerau people living between Pakiri and Whangaparoa lost many warriors and fear of further attack caused them to leave their homes. Ngāti Manuhiri sought refuge north of Whangarei with their Ngāti Wai relatives.

The fact that a carbine/pistol ball was found on the surface of one of the middens forming site R09/221 could indicate that conflict of some type occurred here. It is known that Māori often armed themselves with pistols, particularly during the New Zealand Wars; Hongi Hika famously wore multiple single shot pistols as secondary weapons, and he had a nock volley gun as his primary weapon (David Rudd, pers. comm.). The pistol ball had been fired and had hit a surface hard enough to deform one side. It might be that the ball relates to a raid on stock by Māori. However, it could also relate to inter-tribal warfare during the musket wars period.

10.4 Vegetation History

Analysis of the charcoal and seed samples from R09/221 gives come indication of the vegetation growing in the immediate area during Māori occupation. As a whole, the assemblage represents a broad mixture of vegetation types ranging from broadleaf conifer forest through to Manuka and Kanuka scrub. A range of trees were utilised across all the phases of settlement. The main indication is that prior to adaptation for farming by Europeans, the landscape would have contained more forest and scrubland. Certainly, there are remnant pockets of native vegetation across the property, particularly on slopes and gullies and a large percentage of these were protected through the consenting process. The presence of larger tracts of forest in pre-European times would have provided a broad resource for construction of all manner of wooden items – waka, posts for whare, pataka, pou whenua, as well as utilitarian items such as bowls, utilising a mix of hardwoods and softer woods available in the area.

10.5 Resource Procurement

10.5.1 Lithics

The lithic assemblage from Bishophill was relatively small. Of the 12 obsidian artefacts recovered, 6 were flakes, 3 were fragments/debitage, 2 were cores, and one was a ‘tool’. Eight of the samples from R09/221 came from midden deposit 101, while the other two examples were found in the fill of a firescoop (context 246) and from an unstratified provenance respectively. The other two obsidian artefacts were found on the surface of a separate midden site (R09/2189). The artefacts from midden deposit 101 were predominantly derived from obsidian from Great Barrier Island, which is relatively close. However, one (the tool) was derived from Mayor Island in the Bay of Plenty, and another from a newly identified site in the Poor Knights islands, Northland. The obsidian from midden R09/2189 was also from Great Barrier.

Great Barrier Island obsidian would be expected to be recovered in the archaeological record as it is located nearby in the Hauraki Gulf only some 65km away. The presence of obsidian from Poor Knights and Mayor Island indicates that the material was transported some distance to this coastal site alongside the Matakana River. Whether it was a resource acquired through trade or both the core and tool came with people during times of warfare

and unrest, which we know was prevalent in the area, is not clear. Of note, however, is that the Poor Knights islands are within the rohe of Ngāti Wai, who had kinship connections with Ngāti Manuhiri. This resource is also rare in the archaeological record, having only been recovered from two other sites to date (see Moore and Coster 2015; Judge et al. 2016). It has been speculated that obsidian from Poor Knights in particular is an indicator of trade/exchange (Mills 2015, see Appendix 2); however, with such a small assemblage any such conclusions are tentative at best.

While other stones such as chert were analysed, their source was not identified.

10.5.2 Subsistence

The large midden deposits recorded during the development works indicate that shellfish was a readily available and exploited resource, which is consistent with most Māori occupation sites throughout the region. There was a clear dominance of cockle shell across the samples, indicating adult cockles were regularly harvested for subsistence purposes. Muddy shore environments therefore dominated, with only a small number of sandy shore species (such as pipi and scallop), and this fits well with the local environment.

Of note was the absence of fish or other avifauna across all the midden, which is surprising given the general location of the site near the Mahurangi Harbour and the ubiquity of fish and shellfish in New Zealand middens (Smith 2011). The Tawharanui area is documented as having been visited seasonally for obtaining fish, including shark. Indeed, much of the fighting that took place between the Marutūahu tribes and Kawerau iwi in the Mahurangi region from the mid-1700s was not motivated by land, but control over the 'famed Taranga mango shark fishing grounds found on the coastline north of Whangaparoa' (Murdoch 1998). The dominance of the Hauraki tribes was clear through their annual occupation of the Matakana River mouth during the summer shark fishing season (Murdoch 1998).

At Tawharanui midden sites fishbone, particularly of the tamure snapper, are found in almost every midden (Murdoch 1998). At Omaha, fishbone was also recorded in the many middens analysed by Campbell, Bickler and Clough (2004), with mackerel most commonly represented across 30 middens, followed by snapper, barracouta, kahawai, red gurnard, blue mackerel and probable flounder (Campbell et al. 2004: 140). One explanation for the survival of fishbone in the Omaha case may be due to the taphonomic conditions – sand dunes, which would be less acidic and preferable for bone preservation. The middens at Bishophill Farm are located within clay and colluvial environments, which might not have been conducive to good bone preservation. However, another explanation is that fish was processed and disposed of in a different location to the shell midden, for example on beaches similar to where Māori processed and dried the sharks: 'the name Matakana which means "putrid fish" is said to have been given to it by Māoris from the malodorous stench arising from the practice of drying on the beach catches taken from the prolific waters of the coast' (*Evening Post*, Vol. 99, issue 6, 7 Jan 1920). The evidence for fish drying racks indicates that fish were being caught and processed on terraces as well, and this is typical of coastal sites across the region. However, if most of the occupation was seasonal and predominantly for resource procurement, then drying whole fish and then taking it back to the permanent settlements could also account for the lack of fishbone in the midden.

Other faunal remains recovered included mammal from three hangi, with one hangi clearly containing dog bone – kuri (*Canis familiaris*). There is no radiocarbon date for this feature; however, it was located close to another hangi (context 200) which dates to the early-mid 19th century. Their contemporaneity is not clear, however. This same hangi contained nine

hinau seeds. This is of interest because hinau fruit used to be processed and the pulp turned into little cakes, which were baked. The seeds may also have been discarded during eating, but their association with the dog bone is notable.

As stated above, the two kumara pits indicate that kumara was being grown in the vicinity of the site, possibly on the upper north-facing slopes. The storage of kumara tubers in semi-subterranean storage pits was an essential part of the Māori horticultural cycle (Davidson et al. 2007). Storage pits were but one of a number of adaptations Māori had made to successfully cultivate what is essentially a perennial tropical cultivar in temperate conditions (Yen 1961, quoted in Davidson et al. 2007:5). Kumara cannot survive the low temperatures of the New Zealand winter, and after the growing plant itself had died, Māori stored tubers in a variety of pits through the winter to use as a seed crop for the next planting season (Davidson et al. 2007:6), as well as for consumption during the winter. The morphology of the two pits discussed above is typical of rectangular roofed storage pits found across the North and upper South Islands. However, the unusual pit feature (pit 138), is completely different morphologicallyand, as the feature bears striking similarities with a number of pits that have recently been excavated during the construction of the Puhoi-Warkworth section of the new Road of National Significance, it is tentatively interpreted as a rua whenua / rua tahuhu, erroneously referred to as rua kopiha by Graham (1922: 122). This type of feature incorporates a sunken pit approximately 0.90m to 1.20m in depth with a rounded roof structure constructed around the pit at ground level to enclose the storage area (Figure 10.1). The features were described in detail by Elsdon Best in his book: Maori Storehouses and Kindred Structures (1916: 80-81), which the following passages are quoted from:

> 'Te Whatahoro[4] contributes the following notes regarding this type of storehouse: The rua tahuhu was a storehouse formed by excavating a hole about 3 ft. deep in the earth, and then putting over it a rounded roof, and covering the same with earth. The better part of the kumara crop was placed in such stores—tubers selected for the purpose of cooking for guests. The two heke ripi (maihi) of a rua tahuhu were sometimes ornamented with notched patterns, termed whakatatara, but never with such carvings as are seen on a dwellinghouse, or the elaborate pataka carvings. Such notched heke ripi boards were also sometimes painted with horu, or red ochre, but never the plain ones. Only the store-pits of persons of importance were so treated.
>
> The rua whenua seems to have been much the same as a rua tahuhu—an excavated pit, with the roof above the ground-level. The excavated part was sometimes lined with slabs of tree-fern (ponga). To roof these pits pliant poles of manuka were thrust down into the earth, bent over into the form of an arch, and tied together in that position. Horizontal battens were then tied on to these poles, and the thatch lashed to these battens. The back wall was formed by inserting poles in the earth and bending their pliant tops over the rear end of the house (prior to thatching), and so lashing them. The front wall was vertical, and furnished with a small door and a pihanga, or, more correctly speaking, a koropihanga – a small opening for ventilation. When thatched the roof was covered with earth, thus leaving merely the front wall exposed. This is a Wai-

[4] Hoani Te Whatahoro Jury (1841–1923) was a Ngāti Kahungunu scholar, recorder, interpreter and a prolific writer on Māori traditions and customs (Parsons 1990).

rarapa form. The roof was always made with a slope; it was never flat. In the Whanga-nui district, we are told that the trunks of Dicksonia squarrosa were used for lining these food-pits, as well as for other purposes. Among the Tuhoe Tribe the trunks of several species of tree-ferns were used, and broad slabs or flakes of the trunks of Dicksonia fibrosa (punui) were employed therewith to cover the roof-frame of pit stores.

When storing kumara, or sweet-potatoes, in such pits, the tubers are not allowed to come into contact with the slabs that form or line the walls, as such contact would cause decay to set in. The walls are lined, often with rushes, in order to prevent such contact. Many of such places had no wall-lining save rushes or fern.'

It is notable that both the example from site R09/221 and the examples recently excavated at site R10/1417 near Puhoi, are both within the rohe (territory) of Ngāti Manuhiri and may reflect a preference for this style of structure, or perhaps, a response to localised ground conditions.

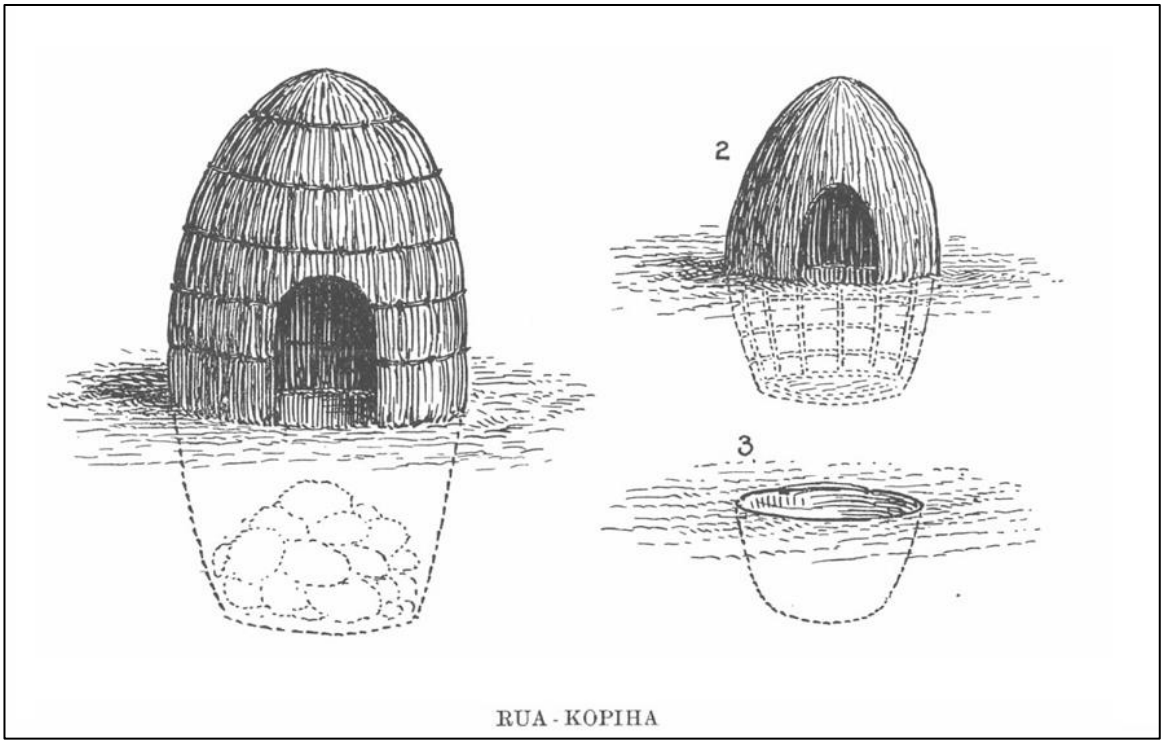


Figure 10.1 Image erroneously titled 'Rua Kopiha' which in fact depicts the form of a rua whenua / rua tahuhu. Image reproduced from Graham 1922

10.6 European/Historic Settlement Period

As previously discussed, the early settlers Thomas Millon and his partner John Skelton reportedly took ownership of the project property, as well as adjoining land around 1843-44. However, by 1845 two parcels of land across the river from Sandspit, including the subject property, were sold to William Greenwood. Once Greenwood occupied the land, he built a 'substantial' two-storey kauri house close to the water's edge on an area of flat

land. William also built a store made of local stone and a slate roof at the rear of the house, which included musket slits to allow defence if they were attacked, although use of these latter features was never required.

At some point the kauri house was dismantled and relocated, possibly somewhere else on the property. There was an old cottage located up slope from R09/221 on top of the ridge, which was recorded as archaeological site R09/2175. The land was purchased by Greenwood in 1859 and remained within the Greenwood family for three generations. The farm was known as the 'Pah Farm' and referred to as such in various newspaper announcements at the time. The cottage was recorded as an archaeological site following completion of a Heritage Assessment by Dave Pearson Architects (Dave Pearson Architects 2014) for the new owners (see Shakles, Phear and Low 2016). This established the house was of late 19th century date and that it was in its original context. The house was recently renovated and expanded, which included installation of modern services, accessways, and a swimming pool. A large midden site was recorded during the project which has already been discussed (R09/2199). Also, a substantial historic rubbish dump was present across an area measuring some 50m x 30m on a steep south-southeast facing slope that descends through thick bush, approximately 65m southwest of the historic cottage. The glass bottles, ceramics, roof slates, writing slates and other artefacts date to the 19th and 20th centuries and relate to occupation of the house. However, as the site lay outside the footprint of development works, it was recorded but not sampled or analysed.

Other evidence of 19th century European occupation was recorded within the vicinity of R09/221 to the rear of the flat/terraced area close to an old orchard in the form of a rubbish pit. Analysis of artefacts from the rubbish pit, which has been recorded as a separate site R09/2174, suggest they derived from domestic activities. Alcohol and salad oil bottles, fragmented willowware and other domestic ceramics, and even two buttons from a shirt and undergarment, all provide a brief snapshot of early settlers' lives in a previously Māori dominated landscape. As the earthworks for the project did not extend into the area of the old orchard, it is not clear if any house remains are present, but it is expected that postholes and possibly other rubbish pits do survive subsurface. It is possible that these archaeological remains relate to the Greenwood family or their relatives.

However, of note is that there was evidence to suggest historic Māori settlement just nearby at site R09/221 in the first half of the 19th century. This was evidenced by a hangi which contained sheep bones. The oven itself appeared typical of Māori pre-European settlement until the bones were discovered. We know that items such as muskets were readily acquired once Europeans settled in New Zealand, and it was not long before axes, cast iron pots, pans, blankets and other items were also utilised and adapted by the Māori population. A study looking at both pre- and post-contact Māori gardening has identified that traditional gardening and storage methods continued to be practiced throughout the 19th century (and even into the 20th century), and that introduced European crops and tools were adopted and used within the traditional agricultural system (Leach 1984:109; cited in Bedford 1996:424). What the presence of the hangi does suggest is that we have evidence for that crossover between Māori and European occupation of the area, prior to the landscape becoming modified to one suitable for European farming.

11 CONCLUSION

The subdivision of Bishophill Farm in Matakana led to the discovery of a number of new archaeological sites, relating to both Māori and historic European settlement, which has added a considerable amount of information to the history of the local area. With Matakanakana Pa being located (and protected through covenanting) on the property, the known midden sites identified during previous assessment, as well as the European settlement history relating to the shark oil factory, the property was known to have clear archaeological and historical values. The archaeological work carried out in response to development has added to our understanding of those values, indicating that both the ridgelines and spurs and lowland coastal zone had extensive evidence for Māori occupation both pre- and post-European settlement. Further, excavation of site R09/221 has produced the earliest date thus far for Māori occupation in this small part of the southwestern Tawharanui Peninsula, and indeed the wider area extending as far north as Omaha, which indicates settlement in the area earlier than previously recorded.

Overall, the project has been positive in providing evidence for the changing use of the landscape, one that was favoured by Māori and Europeans alike, with the dominance of shark fishing a consistent theme throughout settlement history in the area as a whole. In particular, the location of site R09/221, occupied by Māori intermittently for some five centuries, followed immediately by early European settlers, shows that the site has always been an advantageous and desirable place for settlement.

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APPENDICES

APPENDIX 1 – CONTEXT RECORDS

Context No.	Type	Description	Length (m)	Width (m)	Depth thickness (m)	Diameter (m)
100	topsoil	Greyish mid-brown loamy silt, moderately compact; occasional charcoal and small stone inclusions.			0.05-0.1m	
101	midden	Predominantly cockle shell midden.			0.1-0.15m	
102	midden	Mix of cockle shell predominantly, with a silty brown clay.			0.05-0.15m	
103	midden fill of kumara pit 109	Dense layer of cockle shell with occasional patches of brown clay-silt.			0.05-0.9m	
104	fill of kumara pit 109	Greyish-brown with some red mottles clay, compact; occasional charcoal flecks.			0.20m	
105	fill of kumara pit 109	Greyish-red clay, with some brown clay mottling, compact; occasional charcoal flecks.			0.06m	
106	fill of kumara pit 109	Highly fragmented lens of cockle shell within a sticky compact dark brown clay with occasional heat fractured rock and charcoal.			0.06m	
107	fill of kumara pit 109	Yellowish-brown and grey mottled compacted clay, with occasional rootlets and charcoal flecks.			0.05-0.4m	
108	primary fill of kumara pit 109	Compacted, sticky yellowish-and red mottled clay, with occasional rootlets and charcoal flecks.			0.11m	
109	kumara pit, cuts pit 117	Kumara pit. Rectangular pit in plan, steep sides, stepped base. Cuts fills of pit 117.	3.80m NS	1.82m EW	1.20m	
110	upper fill of kumara pit 117	Greyish-brown with occasional red mottled clay, compact; occasional charcoal flecks.			0.11m	

Context No.	Type	Description	Length (m)	Width (m)	Depth thickness (m)	Diameter (m)
111	fill of kumara pit 117	Yellowish-brown with some red mottled clay, compact; occasional rootlets and charcoal flecks.			0.26m	
112	fill of kumara pit 117	Highly fragmented lens of shell midden; occasional silty brown clay.			0.12m	
113	fill of kumara pit 117	Greyish-brownish grey clay, compact; occasional charcoal flecks.			0.12m	
114	fill of kumara pit 117	Greyish-brown with occasional red mottled clay, compact; occasional charcoal flecks.			0.10m	
115	fill of kumara pit 117	Yellowish brown clay, compact; occasional rootlets.			0.37m	
116	primary fill of kumara pit 117	Dark brownish yellow with some grey mottled clay, compact; occasional charcoal flecks.			0.03m	
117	kumara pit, cut by 109	Rectangular kumara pit in plan, sharp break from surface, vertical sides, flat base with 3 visible drains extending around the inside of the pit.	3.3m NS	3.3m EW	0.95m	
118	fill of kumara pit 117	Yellowish-brown with some grey mottled clay, compact; occasional rootlets.			0.11m	
119	fill of kumara pit 117	Yellowish-brown with some grey and red mottled clay, compact; occasional rootlets.			0.11m	
120	fill of kumara pit 117	Yellowish-brown with reddish pink mottled clay, compact; occasional charcoal flecks.			0.20m	
121	fill of kumara pit 117 same as fill 115	Brown with reddish pink mottled clay, compact; occasional charcoal flecks.			0.31m	
122	primary fill of pit 117 within drain	Yellowish-brown clay, compact; occasional rootlets.			0.18m	
123	upper fill of kumara pit 117. same as fill 110	Greyish-brown with occasional red mottled clay, compact; occasional charcoal flecks.			0.12m	

Context No.	Type	Description	Length (m)	Width (m)	Depth thickness (m)	Diameter (m)
124	subsoil	Yellowish silty clay subsoil; occasional charcoal and moderate root action.			0.19m	
125	subsoil	Reddish brown clayey silt; occasional charcoal and moderate root action.			0.22m	
126	colluvium	Brownish red silty clay moderately compact to loose; frequent flecks of shattered sandstone; present across the excavation area at various depths.			0.60m+	
127	void	Void.	void	void	void	void
128	cut of sub-circular /oval hangi	Oval in plan, moderate to concave sides, concave base.	1.2m NS	90cm?	0.40m	
129	fill of hangi 128	Frequent cockle and pipi shell layer in a dark brown clay silt, with occasional charcoal inclusions.			0.40m	
130	cut of hangi	Oval in plan; concave sides; flat base.	1m	0.54m	0.11m	
131	fill of hangi 130	Mid-brown topsoil moderately compact; occasional fragmented cockle, frequent charcoal, oven stones on base (small and very burnt).	1m	0.54m	0.11m	
132	cut of hangi	Sub-circular in plan. Unexcavated.				0.55m
133	fill of hangi 132	Cockle shell midden, whole and fragmented with occasional brown silty clay, moderately compact; frequent charcoal.				
134	cut of hangi	Circular in plan. Unexcavated.				0.45m
135	fill of hangi 134	Cockle shell midden, whole and fragmented with occasional brown silty clay, moderately compact; frequent charcoal.				
136	midden	Cockle shell, compact, whole and fragmented beneath 102 .			0.8m	

Context No.	Type	Description	Length (m)	Width (m)	Depth thickness (m)	Diameter (m)
137	layer	Dark brown topsoil, loose, within layers of shell midden.			0.12m	
138	Storage pit?	Sharp break of slopes, vertical sides to near-undercut on S side; base slopes from N for about 0.7m to a flat base on S side.	n/a	1.18m e-w	0.80m	
139	primary fill of pit 138	Brown silty clay, compact; trample layer at base of pit.			0.20m	
140	secondary fill of pit 138	Yellowish to light brown clay, compact, occasional red mottling; frequent small charcoal pieces.			0.50m	
141	upper fill of pit 138	Yellowish brown clay silty-loam; occasional charcoal, moderately compact.			0.02m	
142	skeletal remains w/in fill 104 in pit 109	Skeletal remains consisted only of the skull, mandible, and two neck vertebrae. Located at the eastern end of kumara pit.			0.42m below 102	
143	cut of hangi	Sharp break from surface, steep to gently sloping sides, pointed base. Visible in section only.	0.70m EW	n/a	0.19m	
144	fill of hangi 143	Yellowish grey silt with ash, moderately compact; frequent whole and fragmented cockle shell, occasional charcoal and small pieces of FCR.	0.70m EW	n/a	0.19m	
145	cut of hangi	Concave sides and base. Visible in section only	0.48m EW	n/a	0.32m	
146	fill of hangi 145	Shell midden cockle dominated, loose; occasional FCR, frequent ash and charcoal.	0.45m EW	n/a	0.32m	
147	cut of hangi	Sharp break from surface, moderate sloping sides to flattish base. Visible in section only.	0.71m EW	n/a	0.29m	
148	fill of hangi 147	Cockle shell midden, loose; occasional FCR, frequent ash and charcoal.	0.71m EW	n/a	0.29m	

Context No.	Type	Description	Length (m)	Width (m)	Depth thickness (m)	Diameter (m)
149	cut of hangi	Steep western break from surface, concave west end base, sloping eastern sides. Visible in section only.	1.1m EW	n/a	0.22m	
150	fill of hangi 149	Cockle shell midden, loose; occasional FCR, frequent ash and charcoal.	1.1m EW	n/a	0.22m	
151	posthole	Sub-circular; unexcavated.				0.18m
152	fill of PH 151	Greyish dark brown crushed and fragmented cockle midden within a silty matrix, moderately compact; occ. burnt stone (packing stones), frequent charcoal.				0.18m
153	posthole	Sub-circular; unexcavated.				0.22m
154	fill of PH 153	Greyish dark brown crushed and fragmented midden within a silty matrix, moderately compact; occasional burnt stone (as packing stones), frequent charcoal, and moderate crushed and fragmented cockle shell.				0.22m
155	stakehole	Sub-circular; steep sloping sides; concave base.				0.12m
156	fill of SH 155	Greyish dark brown crushed and fragmented midden within a silty matrix, moderately compact; occasional burnt stone (as packing stones), frequent charcoal, and moderate crushed and fragmented cockle shell.				0.12m
157	posthole	Circular in plan; sides steep almost vertical then 45 degree break to base; concave base.			0.18m	0.26m
158	fill of PH 157	Greyish dark brown crushed and fragmented midden within a silty matrix, moderately compact; occasional burnt stone (as packing stones), frequent charcoal, and moderate crushed and fragmented cockle shell.			0.18m	0.26m
159	fill of PH 157	Greyish dark brown crushed and fragmented midden within a silty matrix, moderately compact; occasional burnt stone (as packing stones), frequent charcoal, and moderate crushed and fragmented cockle shell.			0.18m	0.26m

Context No.	Type	Description	Length (m)	Width (m)	Depth thickness (m)	Diameter (m)
160	posthole	Circular in plan; sides vertical then 45 degree break to base; concave base.				0.22m
161	stakehole	Sub-circular in plan; sides slope 70 degrees then 45 degree break to base; concave base.	0.14m	0.11m	0.90m	
162	fill of SH 160	Greyish dark brown crushed and fragmented midden within a silty matrix, moderately compact; occasional burnt stone (as packing stones), frequent charcoal, and moderate crushed and fragmented cockle shell.	0.14m	0.11m	0.90m	
163	posthole	Sub-circular in plan; sides slope 70 degrees then 45 degree break to base; concave base.	0.14m	0.27m	0.12m	
164	fill of PH 164	Greyish dark brown crushed and fragmented midden within a silty matrix, moderately compact; occasional burnt stone (as packing stones), frequent charcoal, and moderate crushed and fragmented cockle shell.	0.14m	0.27m	0.12m	
165	cut of hangi	Oval in plan; unexcavated.	0.50m	0.25m		
166	fill of hangi 165	Mid-grey ashy charcoal and highly fragmented cockle, moderately compact; occasional whelks; shell is a mix of burnt mix (oven rake-out) with occasional oven stones and medium sized pieces of charcoal.	0.50m	0.25m	120	
167	posthole	Circular in plan, sharp break from surface, steep sides, concave base.	0.21m EW	0.18m NS	0.18m	
168	fill of PH 167	Mid-grey ashy charcoal and highly fragmented cockle, moderately compact; occasional whelks; shell is a mix of burnt mix (oven rake-out) with occasional oven stones and medium sized pieces of charcoal.	0.21m EW	0.18m NS	0.18m	
169	cut of hangi	Likely oval in plan (vertically truncated so not enough survives to determine shape); unknown sides; irregular base.	0.35m	0.25m		
170	fill of hangi 169	Mid-grey ashy charcoal and highly fragmented cockle, moderately compact; occasional whelks; shell	0.35m	0.25m		

Context No.	Type	Description	Length (m)	Width (m)	Depth thickness (m)	Diameter (m)
		is a mix of burnt mix (oven rake-out) with occasional oven stones and medium sized pieces of charcoal.				
171	posthole	sub-circular in plan; unexcavated.	0.20m NS	0.15m EW		
172	fill of PH 171	Mid-grey ashy charcoal and highly fragmented cockle, moderately compact; occasional whelks; shell is a mix of burnt mix (oven rake-out) with occasional oven stones and medium sized pieces of charcoal.	0.20m NS	0.15m EW		
173	cut of hangi	Oval in plan; sides steep 70 degrees on S side, 45 degrees on N side; slightly concave base.	0.65m	0.54m	0.18m	
174	upper fill of hangi 173	Black ash-rich silt moderately compact; frequent charcoal and frequent large fragments of FCR.	0.65m	0.24m	0.11m	
175	cut of pit/posthole	Rectangular in plan; vertical sides; flat base.	0.22m NS	0.18m EW	0.05m	
176	fill of PH 175	Greyish light brown silty loam moderately compact; re-deposited topsoil; occasional charcoal and FCR.	0.22m NS	0.18m EW	0.05m	
177	cut of hangi	Oval in plan; unexcavated and truncated.	0.40m	0.30m		
178	fill of hangi 177	Mid-yellowish brown silty soil moderately compact; frequent oven rake-out with whole and highly fragmented cockle, occasional pipi and charcoal, occasional animal bone fragments.	0.40m	0.30m		
179	cut of hangi	Sub-circular in plan; unexcavated.	0.57m	0.58m		
180	fill of hangi 179	Blackish mid to light grey ashy clay moderately compact; highly fragmented shell; frequent charcoal pieces; occasional oven stones.	0.57m	0.58m		
181	cut of hangi	Oval in plan; concave sides; flattish, slightly irregular base.	1.22m	0.66m	0.11m	

Context No.	Type	Description	Length (m)	Width (m)	Depth thickness (m)	Diameter (m)
182	fill of hangi 181	Mid brown clay, moderately compact mixed with cockle shell with occasional pipi; frequent charcoal, occasional oven stones.	1.22m	0.66m	0.11m	
183	cut of hangi	Oval in plan; unexcavated.	0.90m	0.52m	0.11m	
184	fill of hangi 183	Mid brown clay, moderately compact mixed with cockle shell with occasional pipi; frequent charcoal, occasional oven stones.	0.90m	0.52m		
185	cut of hangi	Oval in plan; unexcavated.	0.68m	0.60m		
186	fill of 185	Mid brown clay, moderately compact mixed with cockle shell with occasional pipi; frequent charcoal, occasional oven stones.	0.98m	0.60m		
187	cut of pit	Rectangular in plan; very steep (80 degrees) sides; flattish base.	n/a	1.03m	0.40m	
188	fill of pit 187	Yellowish mid brown silty clay compact; frequent charcoal, occasional FCR and re-deposited river pebbles; occasional cockle shell midden, fragmented and whole.	1.5m	1.03m	0.40m	
189	cut of hangi	Likely oval in plan; concave/curved sides; concave base. Truncated.	1.00m	0.40m	0.25m	
190	fill of 189	Blackish grey loose shell – whole cockle; occasional small amount of pipi and several whelk; occasional ashy silty soil between shells; very frequent charcoal, some oven stones.	1.00m	0.40m	0.25m	
191	cut of hangi	Irregular oval in plan; concave (curved) sides; concave/irregular base.	1.70m	1.22m	0.2m	
192	fill of hangi 191	Blackish grey, loose shell - whole cockle; occasional small amount of pipi and several whelk; occasional ashy silty soil between shells; very frequent charcoal, some oven stones.	1.20m	1.22m	0.2m	

Context No.	Type	Description	Length (m)	Width (m)	Depth thickness (m)	Diameter (m)
193	cut of hangi	Sub-circular in plan; unexcavated.				0.92m
194	fill of hangi 193	Blackish grey loose shell – whole cockle; occasional small amount of pipi and several whelk; occasional ashy silty soil between shells; very frequent charcoal, some oven stones.				0.92m
195	primary fill of hangi 173	Yellowish grey with black nodules ash-rich silty subsoil; moderately compact; re-deposited; frequent charcoal and occasional FCR .	0.65m	0.54m	0.11m	
196	yellow subsoil	Yellowish to light brown silt moderately compact; subsoil.	n/a	n/a	n/a	
197	postpipe w/in SH 161	Charcoal and crushed shell within postpipe of posthole 161.	0.60m		0.16m	
198	postpipe w/in SH 155	Charcoal and crushed shell within postpipe of stakehole 155.	0.10m			
199	human remains w/in fill 106 pit 109	NS oriented partial skeleton. Both femurs, part right ulna and radius, both tibia, right fibula, some metatarsals, metacarpals, vertebrate x 2, hip sockets and ball joints. Skull incomplete, cranium only. Cut marks visible on part of both tibias & radius fragment.	n/a	n/a	n/a	
200	cut of firescoop	Sub-oval in plan; sloping at N, E, and W sides, near vertical at S side; flattish base.	0.71m	0.55m	1m	
201	fill of 200	Medium greyish brown slightly sandy clay moderate-firm; burnt stone and charcoal inclusions.	0.71m	0.55m	1m	
202	cut of firescoop	Circular in plan; sloping sides; undulating base.	0.70m	0.70m	1m	
203	fill of 202	Dark greyish brown silty clay, compact to loose; burnt stone, shell, and occasional bone fragments.	0.70m	0.70m	1m	
204	posthole	Sub-circular in plan; vertical on S side, vertical and undercut on N side; flattish concave base.			0.14m	0.14m

Context No.	Type	Description	Length (m)	Width (m)	Depth thickness (m)	Diameter (m)
205	fill of PH 204	Dark grey silt, compact; frequent shell and moderate charcoal.			0.14m	0.14m
206	stakehole	Sub-circular in plan; steep except undercut on W side; concave base.			0.2m	0.10m
207	fill of SH 206	Dark grey silt, compact; frequent shell and moderate charcoal.			0.2m	0.10m
208	stakehole	Oval in plan; steep 70 degree sides; concave base.	0.12m	0.09m	0.11m	
209	fill of SH 208	Dark grey silt, compact; frequent shell and moderate charcoal.	0.12m	0.09m	0.11m	
210	posthole	Sub-circular in plan; vertical sides; concave base.			0.19m	0.16m
211	fill of PH 210	Dark grey silt, compact; frequent shell and moderate charcoal.			0.19m	0.16m
212	cut of oval pit	Likely oval or circular in plan; 45 degree smooth sides; flat or slightly concave base. Seen in section only.	0.83m		0.16m	
213	stakehole	Circular in plan; steep 70 degree sides; concave base.			0.06m	0.07m
214	fill of SH 215	Dark grey silt, compact; frequent shell and moderate charcoal.			0.6m	0.07m
215	midden	Mix of whole and partially fragmented cockle midden with frequent mudsnail throughout. Dense stratified midden.	20m NS	3m EW	0.2-0.25cm thick	
216	layer	Mottled pinkish red, brown, yellow brown clay, compact; occasional charcoal and occasional FCR.			0.11m	
217	layer	Mottled yellow brown orange silty clay, compact; occasional charcoal and occasional FCR.			0.05m	
218	posthole	Likely circular in plan; steep 70 degree sides; concave base. In section only.		0.2m EW	0.1m	

Context No.	Type	Description	Length (m)	Width (m)	Depth thickness (m)	Diameter (m)
219	fill of PH 219	Yellowish brown clay, moderately compact. Occasional orange pebbles (as 228).		0.2m EW	0.1m	
220	posthole	Likely circular in plan; 45 degree sides; concave base. In section only.	0.21m NS		0.08m	
221	fill of PH 221	Mottled yellowish brown and pinkish orange clay, moderately compacted; with burnt clay patches and occasional charcoal inclusions.	0.21m NS		0.08m	
222	posthole	Likely circular in plan; 20 degree slope on S side, 45 degree on W side; concave base.	0.19m NS		0.05m	
223	fill of PH 223	Mottled yellowish-brown and pinkish-orange clay, moderately compact; small patches of burnt clay and occasional charcoal inclusions.	0.19m NS		0.05m	
224	stakehole	Circular in plan; steep 70 degree sides; concave base.			0.06m	0.07m
225	posthole	Likely circular in plan; 20 degree slope on S side, 45 degree on W side; concave base. In section only.	0.19m NS		0.06m	
226	fill of PH 225	Yellowish-brown and pinkish-orange clay, compact; small patches of burnt clay and occasional charcoal inclusions.	0.19m NS		0.06m	
227	posthole	Likely circular in plan; 45 degree sides; concave base. In section only.	0.11m NS		0.06m	
228	fill of PH 227	Mottled yellowish-brown and pinkish-orange clay, moderately compact; small patches of burnt clay and occasional charcoal inclusions.	0.11m NS		0.06m	
229	posthole	Likely circular in plan; 70 degree sides; concave base. In section only.	0.08m NS		0.05m	
230	fill of PH 229	Yellowish brown w/ pinkish orange mottled silty loam, moderately compact; occasional charcoal and occasional burnt clay inclusions.	0.08m NS		0.05m	

Context No.	Type	Description	Length (m)	Width (m)	Depth thickness (m)	Diameter (m)
231	layer	Brownish grey ashy silt, moderately compact; frequent crushed cockle shell midden, occasional small pieces of FCR, frequent charcoal.			0.08m	
232	layer	Brownish grey ashy silt, moderately compact; frequent crushed cockle shell midden, occasional small pieces of FCR, frequent charcoal.			0.12m	
233	layer	Brownish grey ashy silt, moderately compact; frequent crushed cockle shell midden, occasional small pieces of FCR, frequent charcoal.	0.38m NS		0.08m	
234	midden	Greyish dark brown silty clay, moderately compact; frequent crushed and fragmented shell (cockle and occasional queen scallop) inclusions.			0.12m	
235	cut of pit	Likely circular/oval in plan; 45 degree sides; flat to concave base. In section only.	1.45m NS		0.19m	
236	clay fill of 235	Yellowish brown clay, compact; no visible inclusions but some ash and charcoal on upper surface.	1.45m NS		0.19m	
237	layer	Yellowish brown clay, compact; occasional shell fragments and charcoal fragments.	2.31m NS		0.06m	
238	layer	Dark brownish-black silty ashy matrix, moderately compact; frequent charcoal, occasional fragmented midden shell, occasional FCR (small pieces).	4.7m NS		0.1m	
239	layer	Dark grey silty ash matrix, moderately compact; frequent crushed shell, frequent charcoal, moderate small pieces of FCR.	0.89m NS		0.2m	
240	midden	Whitish grey ash, loose and friable, with highly fragmented shell midden.	1.2m NS		0.21m	
241	midden	Greyish brown clayey silt, moderately compact; frequent cockle shell (whole, fragmented, and crushed), occasional FCR.	2.05m NS		0.06m	

Context No.	Type	Description	Length (m)	Width (m)	Depth thickness (m)	Diameter (m)
242	midden	Whitish dark greyish-black ashy-silt, with mottled crushed, fragmented and occasionally whole shell, moderately compact; frequent charcoal inclusions.	7.2m		0.18m	
243	layer	Yellowish mid brown clay, compact; ash, charcoal, moderate crushed and fragmented shell.	3m		0.1m	
244	layer	Dark greyish-black ashy-silt, with fragmented and crushed shell; moderately compact.	3.6m		0.08m	
245	cut of firescoop	Oval in plan; curved sides; flat base.	1.13m	0.78m	0.14m	
246	fill of firescoop 245	Loose black charcoal; occasional highly fragmented shell and oven stone inclusions.	1.13m	0.78m	0.8m	
247	fill of firescoop 245	Light grey ashy rake-out material; highly fragmented shell, predominately cockle; frequent charcoal, occasional oven stones.	1.13m	0.78m	0.6m	

APPENDIX 2 – LITHIC ANALYSIS REPORTS

Bishop Hill Matakana (R09/221) Stone Artefact Assemblage

Prepared for Richard Shakles

Clough & Associates Ltd

By Joe Mills

June 2015

Introduction

The stone artefact assemblage from the Bishop Hill site (R10/221) at Matakana comprised 24 individual artefacts, predominantly obsidian (n=12), with smaller amounts of both chert (n= 2) and fine-grained stone (n=10), including flakes, fragments (broken or incomplete flakes), manuports, tools and cores. The assemblage is relatively small and fairly homogenous, allowing for limited conclusions to be drawn.

Methods

Dimensions for all artefacts were recorded, including the maximal length, width, and thickness in millimetres, and the weight in grams. Material type was noted as obsidian, chert, or other stone, and the presence of cortex was noted. The state of the artefact was recorded: whether it was a complete flake, with a readily identifiable platform, termination and lateral margins; a fragment, with some but not all flake characteristics; a core, with multiple flake removal surfaces; or a tool, either broken or complete. Non-artefactual samples are recorded as manuports or thermally affected rock (TAR). Microscopy was employed when finer details such as edge-wear or polish needed to be confirmed.

The colour of obsidian in transmitted light was noted with reference to Moore's (1998) physical characterisation method as a preliminary step prior to geochemical sourcing using XRF. All results are recorded in Table 1 at the end of this document.

Results

Obsidian

3 were fragments, 2 were cores, and there was a solitary tool.

All of the obsidian artefacts were fairly small, as expected in terms of the usually diminutive nature of obsidian artefacts and cores. The mean length was 24.8, with a maximum of 45.1mm and a minimum of 15mm. The mean width was 18.1mm, with a maximum of 29.1mm and a minimum of 11.4mm. The mean thickness was 6.8mm, with a maximum of 11.3mm and a minimum of 3.7mm. All obsidian artefacts were very light, with a mean weight of 3.3g, with a maximum of 11.5g and a minimum of 0.5g.

The two cores in the assemblage were defined as such by evidence of multiple flake removals on multiple faces, with no obvious use wear (Figures 1 and 2). They were both the heaviest artefacts. The solitary tool was a distinctive thin longitudinal flake with use wear on one of the lateral margins in the form of consistent micro striations along the edge, consistent with patterns expected from relatively tough cutting activity, or grinding (Figures 3 and 4). While these striations may equally be the result of other non-utilitarian processes, they are particularly regular and constrained to a single margin of the flake. There was no significant edge damage apart from some small micro flake removals on the opposite lateral margin which are likely the result of post-depositional damage rather than deliberate tool construction. The relatively good condition of the flake, combined with the striations, lends support to the use of this flake as a tool, possibly for cutting.

XRF/Sourcing

All 12 of the obsidian samples were subjected to analysis using X-ray Fluorescence (XRF) to determine the likely sources for obsidian in the assemblage. Of those 12 samples, one was sourced to Mayor Island, one to a newly discovered obsidian source on the Poor Knights Island (Moore and Coster 2015; further details in the XRF report for this site), and the remaining 10 were sourced to Great Barrier Island. Some useful observations can be drawn about the nature of the obsidian assemblage in light of these source designations.

Of the 10 samples from Great Barrier, there are two cores, five flakes, and three fragments. Two cores, three flakes, and one fragment are from the same context (101) and lend some evidence to the idea of a single constrained flaking event. The remaining four samples from outside this context (101) are all from disparate contexts. This indicates that obsidian from Great Barrier may have been commonly accessed and was thus used most often in different contexts across the excavated area.

The presence of cortex on four (40%) of the 10 samples from Great Barrier is particularly interesting. The removal of cortex from a core is a necessary first step in the reduction process for flake manufacture and can be seen as economising behaviour when related to resource acquisition. Cortex may be removed at the point of acquisition before transport in order to minimise the amount of less useful, extraneous material that needs to be transported (McCoy and Carpenter 2014). The presence of cortex on the Great Barrier material may indicate that access to this source was easier or more regular than access to other potential sources, resulting in less economising behaviour, meaning that cores with cortical surfaces were being transported to the site and subsequently underwent primary reduction there – the presence of multiple cores, one with extensive cortex lends evidence to this idea. McCoy and Carpenter (2014) argue that sites with a greater than 30% rate of cortical to non-cortical flakes more likely represent direct access to a source. The 40% rate of cortical to non-cortical samples from Great Barrier indicated in this assemblage may fall into this category. In contrast, the lack of cortex on the sample from Mayor Island may indicate difficulty in accessing this source. The single sample from the Poor Knights from context 101, while small, has a relatively large cortical surface, indicating that material from the site was possibly more common than the current sample suggests, and was simply not encountered for collection during excavation. This is a very tentative conclusion however, based on the extremely small sample size available.

The solitary sample from Mayor Island is somewhat enigmatic as it is the only tool in the assemblage. It is also the most geographically distant source from the site (of the sources identified) at around 190km from the site by sea, navigating across the Hauraki Gulf, past

the Coromandel Peninsula, and down the East coast toward the Bay of Plenty. The process of how the individual flake got to the site is puzzling in and of itself, but its designation as a tool may provide an explanation. High-quality, useful tools such as this artefact may have been curated and exchanged preferentially over long distances. The distribution of Mayor Island obsidian, as the commonly regarded highest-quality obsidian source, was expansive (Sheppard et al. 2011, McCoy and Carpenter 2014). This artefact may have been part of a much larger exchange network involving the long-distance movement of preferred obsidian.

In the same vein, the solitary sample from the Poor Knights provides some interesting speculative conclusions. It is clear that at least a small amount of material was being transported from the Poor Knights, as evidenced by the sample present, but the means of that movement is unclear. The sample does have cortex, which may indicate that this was a primary reduction flake from a larger core, which further indicates more substantial material movement, but this is a limited conclusion given the sample size of one. Given the short distance to Great Barrier Island (the most prevalent source represented in the assemblage), it seems less likely that the Poor Knights source was a regularly accessed source for obsidian, and it is more likely that attaining this particular sample was a one-off event.

The range of sources represented is in itself particularly interesting. It shows obsidian movement (and thus either the movement of people, or the exchange of imported material) across a sizeable geographic range. Great Barrier Island is approximately 65km east of the site by sea, while the Poor Knights are around 120km to the north. The Mayor Island source is approximately 190km away by sea, as mentioned above. This supports the notion of a highly mobile population willing to move important material resources over great distances, in this case undoubtedly via seafaring (see McCoy and Carpenter 2014 for a lengthier treatment of the subject).

Chert

There were only two chert artefacts recovered from the site: one core, and one fragment. Dimensions for these two samples are included in Table 1. Both samples are from the same context (New Midden 9) and are of the same material (Figure 21 and 22).

The core is relatively small, indicating that it had likely been flaked to a point of exhaustion. Numerous flake scars can be identified attesting to its use as a core (Figure 22). The single fragment is particularly small, likely being debitage from earlier flaking efforts on the core or as a broken section of a larger flake (Figure 21). It has no evidence for use wear other than some edge damage that appears to be the result of post depositional processes.

It is difficult to draw any strong conclusions about chert use at the site with such a small sample size, but tentative conclusions can be drawn. In the larger context of the assemblage, the scarcity of chert compared to obsidian may indicate that there was no readily available chert source to be exploited by the occupants of the site. The presence of a well-reduced core combined with the absence of any flakes may indicate the removal of useful chert flakes from the site deliberately with people, or as the result of post-deposition, or simply having not been recovered during excavation.

Other Stone

The remaining ten artefacts have been grouped under the label of 'other stone'. This label is an admittedly clumsy catch-all but reflects the great variability of stone resources commonly encountered that are not easily identifiable basalt, greywacke, or argillite. As only one of the 'other stone' samples can be easily identified as artefactual, the remaining samples will be discussed individually by context.

Context 101 contains three samples of 'other stone'. Sample 12 is a medium-grained light grey stone, with smooth cortex, and natural fracture lines running through it (Figure 12). These natural fractures seem to have split, producing what looks at first glance to be a section of a possible adze preform, but on closer examination is more likely a relatively cleanly fractured natural rock. There are no physical indications that lend support to the idea of this sample being artefactual.

Sample 6 from context 101 is a distinct material from sample 12. It is much coarser grained and much darker, with a less smooth cortical surface (Figure 6). It has no overt flake features or markers of modification, but has been tentatively labelled as a fragment, as it may be the distal end of a larger flake. However, the ventral surface of the fragment is particularly rough, unlike what would be expected of a flake, and there is no indication of a conchoidal fracture. This sample remains enigmatic as it is the only one sample of this material type and displays no overt flake features.

Sample 13 is again distinct from the other two material types in the 'other stone' category from context 101. It is the most fine-grained of the three, light grey in colour with a very smooth cortex (Figure 13). It is laced with numerous veins and fractures, which would make any flaking efforts particularly difficult. The sample itself is a cortical fragment from a larger cobble which seems to have naturally spalled off its larger nucleus, much like a 'pot-lid'. There is no regularity to its ventral surface, with breaks occurring following natural veins. The absence of conchoidal fracture further indicates that this sample was not the result of deliberate flaking efforts. There are a number of small scars from natural spalling on the cortical surface of the sample – none of which are indicative of flake scars. The general appearance of the sample and its morphology would suggest that it had been thermally affected; however, it shows no signs of oxidation or discoloration from high temperatures. It is possible that this was simply a broken section of a larger manuport transported to the site for unknown purposes.

The samples from context 213 are equally as enigmatic as the samples from context 101 (Figures 14 to 20). The material is very fine grained, dark grey in colour, with a very smooth cortex. It appears most similar to sample 13 but darker and finer-grained. Of the seven samples from context 213, only one (#5 in Table 1) is distinctly artefactual, being a complete flake with clear flake characteristics (Figure 16). The remaining six samples are more difficult to classify – they all show some signs of being heat affected, with most having a non-conchoidal, spalled ventral surface. One fragment has slight discoloration on one surface consistent with burning, while another fragment shows a level of oxidation on its cortical surface, marked by orange staining. While it is difficult to draw conclusions based on a small number of out-of-context samples, all of the context 213 samples (excepting the flake) appear thermally affected, or at least naturally spalled.

Summary

material for Māori lithic assemblages. Obsidian is well-represented with material from multiple sources, some significant distances away from the site, indicating movement of resources into the area and possible economising behaviour for long-distance or difficult

to access resources. Chert is particularly sparse, possibly indicating difficult access to a reliable source for the material. The other stone artefacts are likely locally available or are not distinctive enough to assign to a more distant source.

The lithic assemblage lends some tentative support for certain activities at the site, with obsidian used for possible butchering and manufacturing tasks, chert used as a tougher alternative to obsidian for cutting purposes, with the other stone samples providing tentative evidence for burning and curation of non-artefactual stone as manuports.

The fragmentary nature of the assemblage indicates post-depositional processes have impacted the stone assemblage to some extent and this, combined with selective sampling of material, has limited conclusions.

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Lithic Artefact Inventory

Table 1: Bishophill Matakana (R09/221) artefact inventory and associated data

Site	ID	Material	Obsidian Colour	XRF Characterisation	Type	Cortex	Max Length (mm)	Max Width (mm)	Thickness (mm)	Weight (g)	Context
R09/221	4	Obsidian	Green	Mayor Is.	Tool	No	45.1	14.7	9.2	5.6	101
R09/221	1	Obsidian	Grey	Great Barrier Is.	Core	Yes	31.8	27.7	11.3	9.1	101
R09/221	2	Obsidian	Grey	Great Barrier Is.	Core	No	38.9	29.1	10.7	11.5	101
R09/221	5	Obsidian	Grey	Poor Knights Is.	Flake	Yes	29.9	19.6	8.6	3.6	101
R09/221	7	Obsidian	Grey	Great Barrier Is.	Flake	No	21.8	14	4.9	1.1	101
R09/221	8	Obsidian	Grey	Great Barrier Is.	Fragment	No	15.2	15.2	9.5	1.5	101
R09/221	9	Obsidian	Grey	Great Barrier Is.	Flake	Yes	19.6	16.6	3.7	0.9	101
R09/221	10	Obsidian	Grey	Great Barrier Is.	Flake	Yes	22.8	22.4	4.1	1.8	101
R09/221	11	Obsidian	Grey	Great Barrier Is.	Fragment	No	16.6	14.1	5.1	0.9	246
R09/2189	#1(a)	Obsidian	Grey	Great Barrier Is.	Flake	Yes	22.1	18.7	6.6	2.1	Surface of midden
R09/2189	#2(b)	Obsidian	Grey	Great Barrier Is.	Flake	No	15	11.4	3.8	0.5	Surface of midden
R09/221	N/A(c)	Obsidian	Grey	Great Barrier Is.	Fragment	No	19.1	13.8	4.2	0.7	Unstratified surface find
R09/221	12	Other stone			Manuport	Yes	61.4	58.8	26	109.5	101
R09/221	13	Other stone			Manuport	Yes	75.2	73.3	23.8	156.5	101
R09/221	6	Other stone			Fragment	Yes	43.3	33.5	8.6	13	101

Site	ID	Material	Obsidian Colour	XRF Characterisation	Type	Cortex	Max Length (mm)	Max Width (mm)	Thickness (mm)	Weight (g)	Context
R09/2189	#3	Chert			Core	No	35.6	32.2	15.7	13.9	Surface of midden
R09/2189	#4	Chert			Fragment	No	18	8.2	4.2	0.3	Surface of midden
R09/221	#5	Other stone			Flake	No	34.2	27.1	6.2	5.1	213
R09/221	#6	Other stone			TAR	Yes	36.7	20.3	6.4	3.8	213
R09/221	#7	Other stone			TAR	Yes	37.6	23.1	9.9	4.5	213
R09/221	#8	Other stone			TAR	Yes	20.4	17.5	2.9	1.3	213
R09/221	#9	Other stone			TAR	Yes	25.2	19.7	3.6	1.5	213
R09/221	#10	Other stone			TAR	Yes	22.9	9.6	1.8	0.5	213
R09/221	#11	Other stone			TAR	No	14.1	6.8	1.8	0.1	213

Figures

Figure 1: Sample 1

Figure 2: Sample 2

Figure 3: Sample 4

Figure 4: Sample 4 edge-wear

Figure 5: Sample 5

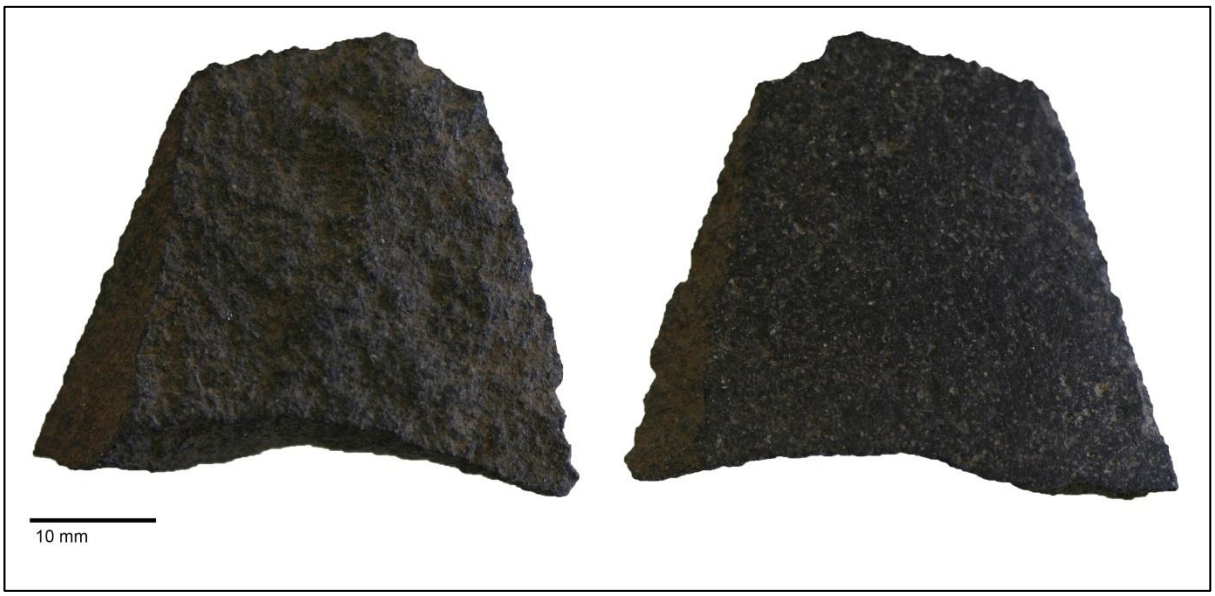

Figure 6: Sample 6

Figure 7: Sample 7

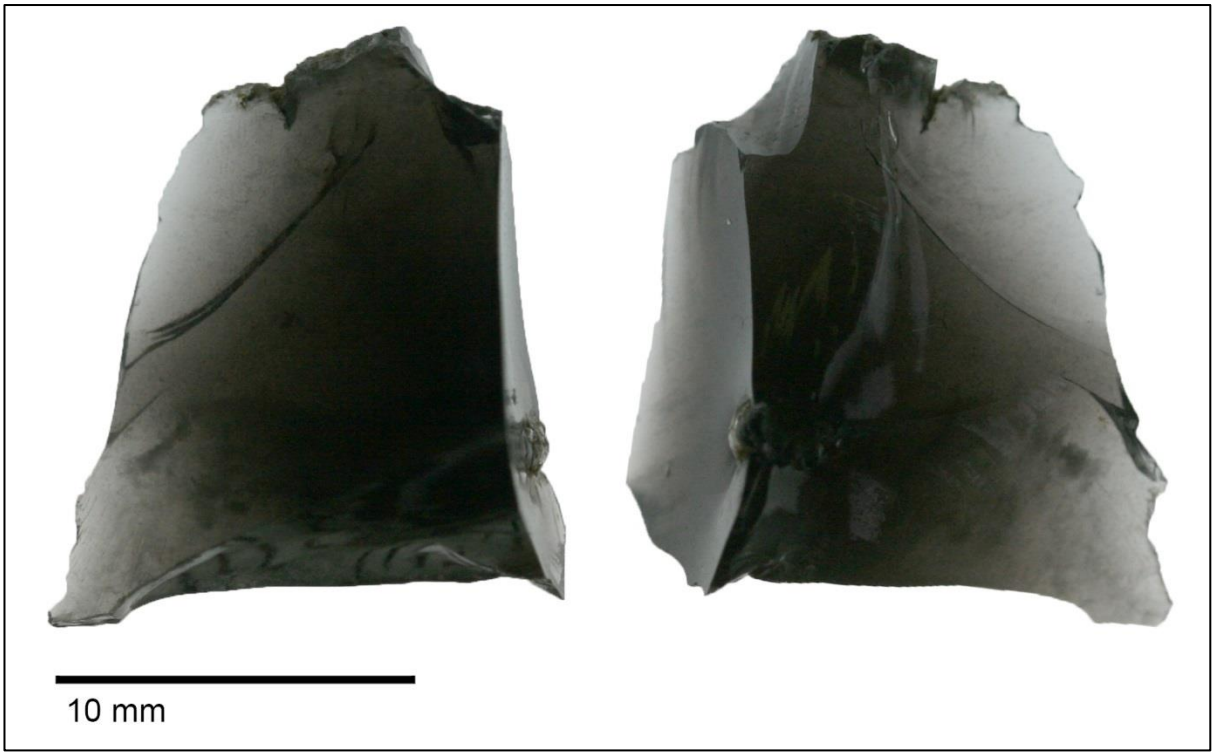

Figure 8: Sample 8

Figure 9: Sample 9

Figure 10: Sample 10

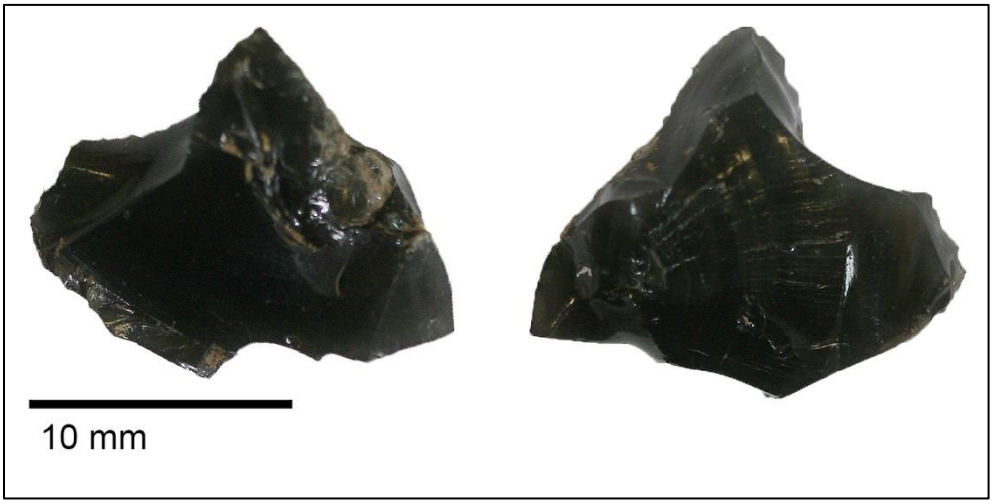

Figure 11: Sample 11

Figure 12: Sample 12

Figure 13: Sample 13

Figure 14: Sample #6

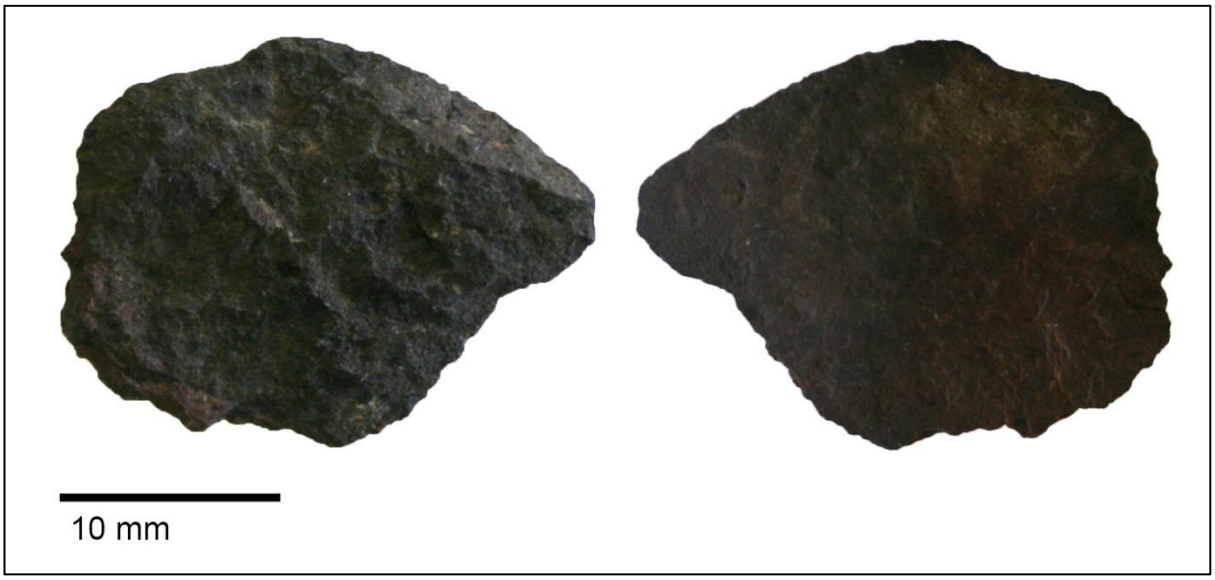

Figure 15: Sample #9

Figure 16: Sample #5

Figure 17: Sample #8

Figure 18: Sample #10

Figure 19: Sample #7

Figure 20: Sample #11

Figure 21: Sample #4

Figure 22: Sample #3

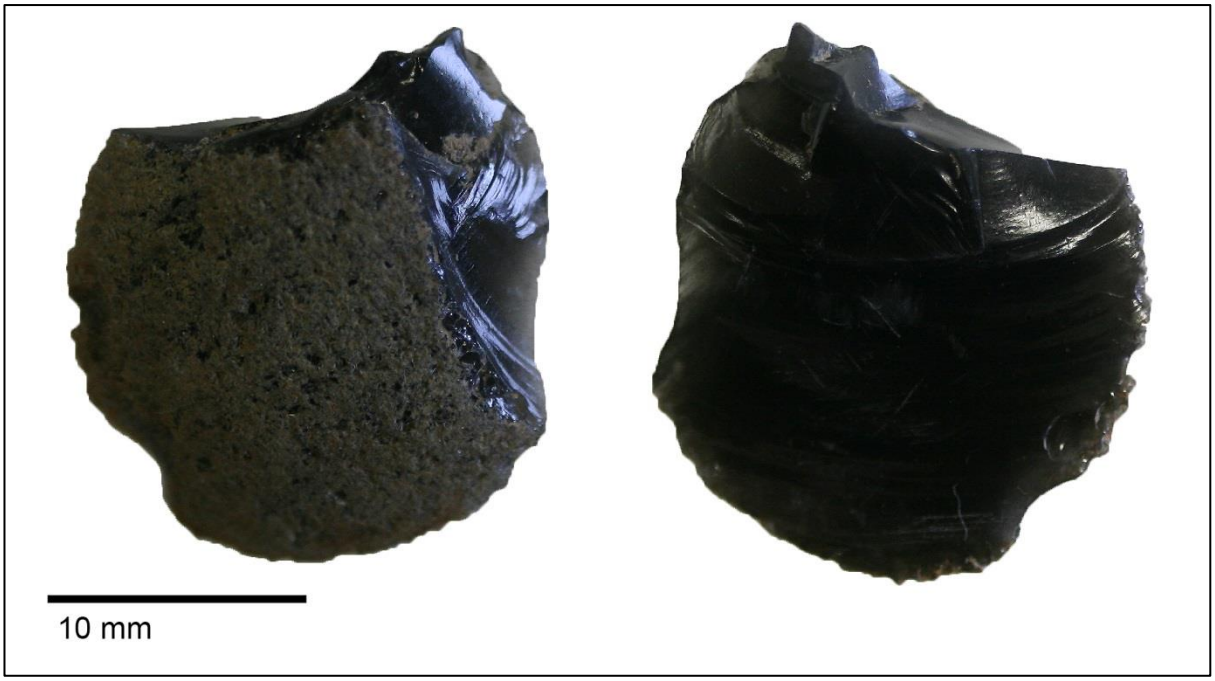

Figure 23: Sample #1

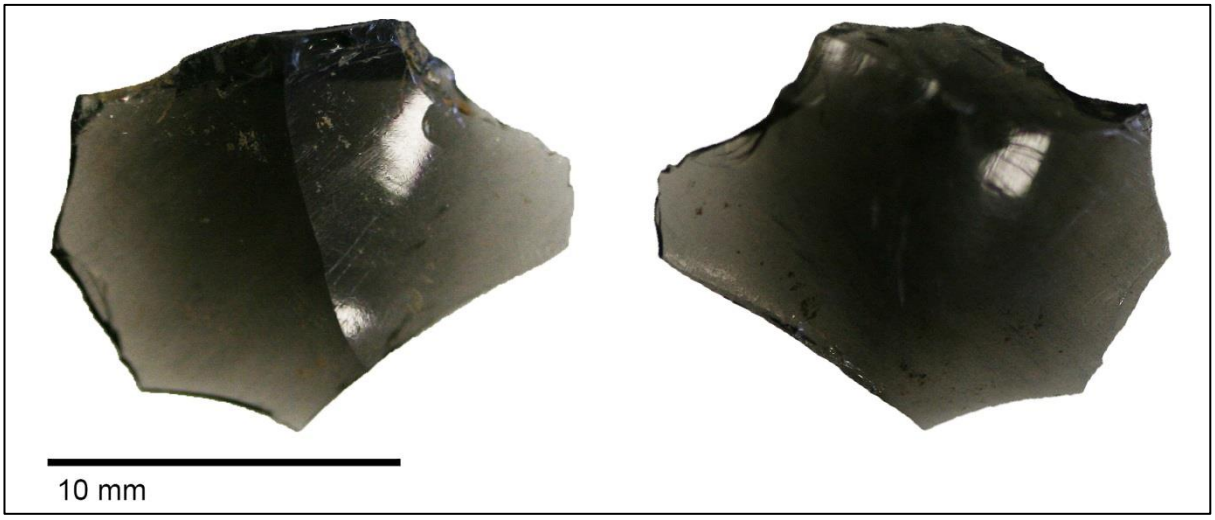

Figure 24: Sample #2

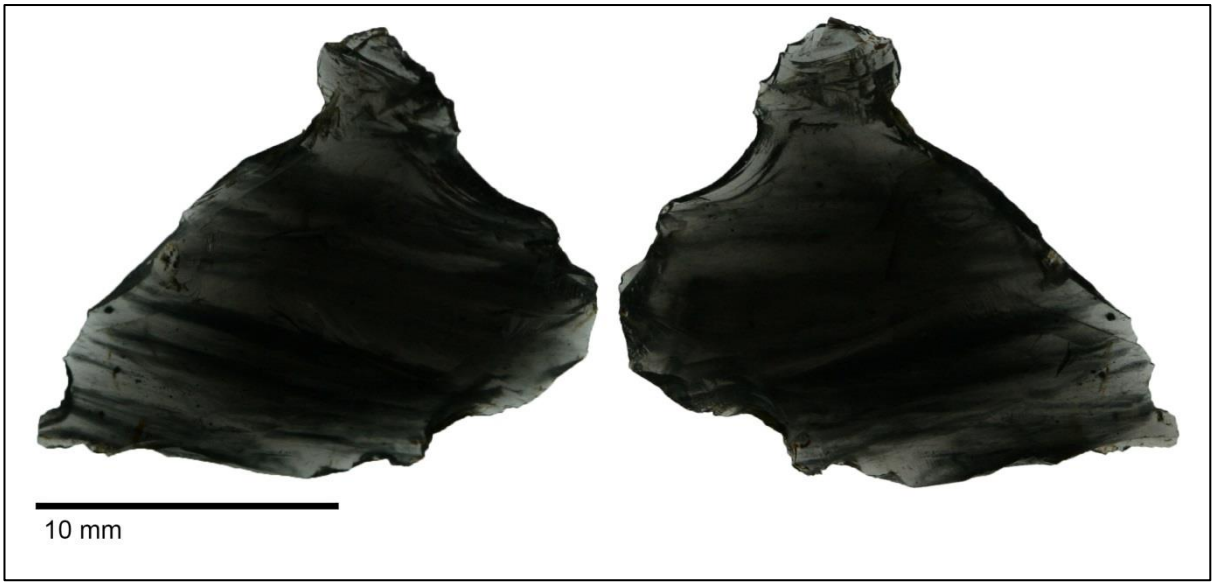

Figure 25: Unstratified sample

APPENDIX 3 – X-RAY FLUORESCENCE ANALYSIS REPORT

X-Ray Fluorescence Analysis of Selected Artefacts
Bishophill – Site R09/221

Prepared for

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by

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June 2015

Introduction

A sample of 12 obsidian flakes from site R09/221 at Bishop Hill Matakana, was characterised using non-destructive X-ray Fluorescence (XRF) and assigned to geological sources.

Analytical Methods

The XRF analysis was carried out at the Anthropology Laboratory, School of Social Sciences, University of Auckland, using a Bruker Tracer III SD portable X-ray Fluorescence (pXRF) analyser. The instrument employs an X-ray tube with a Rh target and a 10mm2 silicon drift detector (SDD), with a typical resolution of 145eV at 100,000cps. The X-ray tube was operated with a setting of 40 keV at 12μA, through a window composed of 12mil Al and 1mil Ti filters (Bruker's Yellow filter).

Samples were analysed in an air path for 60 seconds. Obsidian specimens were analysed twice each on different portions of their surface areas to check for consistency and the values were averaged. A total of 13 elements were quantified (K2O, CaO, TiO2, MnO, Fe2O3, Zn, Pb, Th, Rb, Sr, Y, Zr, Nb). Concentrations were calculated as oxide percentages (%) for major elements and as parts-per-million (ppm) for trace elements using Bruker's S1CalProcess (ver. 2.2.33) software. Calibration details are given in the appendix.

Artefacts are cleaned in warm water to remove loose soil where necessary, but no cleaning agents are used. Tests at the University of Auckland have shown that the use of chemical cleaning agents, such as dilute hydrochloric acid, is generally unnecessary and sometimes detrimental to XRF analysis of major elements, such as K2O, CaO and Fe2O3. Additionally, cleaning agents may remove surface residues and preclude future use-wear analyses.

Obsidian Analysis Results

There are at least 27 known obsidian sources in New Zealand, which are distributed across three major geographic zones (see Moore 2012; Sheppard et al. 2011) — Northland, the Coromandel Volcanic Zone and the Taupo Volcanic Zone (Figure 1). However, some sources are geographically close and compositionally similar, making it difficult to separate them completely by geochemical analysis. These include the two Great Barrier Island sources (Awana and Te Ahumata), four sources near Taupo (Ben Lomond, Maraetai, Ongaroto, Whangamata Fault), and several sources around Rotorua (Ngongotaha, Hemo Gorge, Tarawera, Lake Rotokawau, Lake Okataina and Whakarewarewa). Only the sources of Whakamaru (near Taupo) and Lake Rotoiti (near Rotorua) from these areas are geochemically distinct. For this analysis 17 source groups are considered (Figure 1). A total of 277 reference samples from the University of Auckland's Anthropology Laboratory reference collection were used to characterise these sources.

The calibrated results for the obsidian artefacts are reported in Table 1. To assign the archaeological specimens to a source, two methods were used: a graphical analysis using bivariate scatterplots and a multivariate discriminant function analysis.

Graphical Analysis

Because of the high number of potential sources, it is difficult to show their separation clearly on a single scatterplot. A better solution is to use a sequential approach, first separating the most geochemically distinct sources and then examining those with more similar compositions. A plot of the trace element ratios Sr/Zr against Log10(Rb/Zr) separates the reference specimens into seven groups (Figure 2); five individual sources, Mayor Island, Kaeo, Weta, Lake Rotoiti and Waihi, form distinct clusters, while the other sources fall into two groups, denoted here as Groups 1 and 2 (Figure 2). Group 1 includes five sources, four from the Coromandel Volcanic Zone (Great Barrier Island, Fanal Island, Maratoto and Whangamata) as well as one Northland source (Huruiki). Seven sources are included in Group 2, three from the Coromandel Volcanic Zone (Tairua, Hahei and Cooks Beach) and four from the Taupo Volcanic Zone (Taupo, Rotorua, Whakamaru and Maketu).

One of the specimens (Sample 4) clusters with the Mayor Island reference samples, while the remainder are associated with the Group 1 samples (Figure 2). The sources that were combined as Group 1 in Figure 2 can be separated using a scatterplot with different ratios of the same elements, Log10(Zr/Y) against Log10(Rb/Y) (Figure 3). All but one of these specimens' plot with the Great Barrier Island reference samples, while the remainder (Sample 5) does not plot closely with any of the known sources but is closest to Huruiki.

Discriminant Function Analysis

Discriminant function analysis was carried out using SPSS (ver. 20). Four trace elements were used (Rb, Sr, Y, and Zr), all of which were Log10 transformed to help equalize group variances. In total, there were six misclassifications with 97.8% of the reference specimens being classified correctly. Leave-out-one-cross-validation (LOOCV) resulted in two additional misclassifications (97.1% correctly classified). The two archaeological specimens that were associated with the Mayor Island and Great Barrier Island sources in the graphical analysis were assigned the same sources (Table 2). Sample 5 was assigned to Huruiki because this is the geochemically closest of the known sources. However, the

graphical analysis indicated that this specimen possesses a distinct chemistry and is unlikely to be from Huruiki.

Discussion and Conclusion

The majority of the specimens analysed in this report can be confidently assigned to Great Barrier Island, while one (Sample 4) is assigned to Mayor Island. One specimen (Sample 5), however, could not be assigned a definite source. Both the graphical and discriminant function analyses indicate that this artefact is chemically closest to the Huruiki source, but it does not plot within the known variation of that source (Figure 3). To ensure that there was not a calibration problem with the pXRF instrument, this specimen was analysed for a third time, alongside a selection of reference standards and 31 Huruiki source samples. The results for all specimens were almost identical to previous analyses.

Other New Zealand obsidian studies that include chemical data for the Huruiki source (McCoy and Carpenter 2014; Moore 1982; Sheppard et al. 2011) are in agreement with the values obtained from the recent University of Auckland analyses (Table 3). Sample 5 differs considerably for several elements (K2O, TiO2, Fe2O3, Rb and Zr), indicating that Huruiki is unlikely to be the source of these specimens.

Comparing the mid-Z elements for Sample 5 to all known New Zealand sources shows that none are a good match (Table 4). In particular, the Zr values p are distinct from all other known sources. The Kaeo and Mayor Island sources have Zr values in excess of 1000 ppm, while all other sources are less than 200 ppm.

Very recently Moore and Coster (2015) have reported data for eight obsidian flakes, which they attribute to a source in the Poor Knights Islands, based on Moore's unpublished data for that source. Only three trace elements were published by Moore and Coster (Rb, Sr and Zr) so it is not possible to include this source in the previous graphs and analyses because data for more elements (specifically Y) are required. The three trace elements do, however, provide a close match to Sample 5 (Table 4, Figure 4). While data for other elements would be preferable to conclusively assign specimens to a source, on the basis of the three elements published by Moore and Coster, we suggest the Poor Knights Islands is the most plausible source for Sample 5.

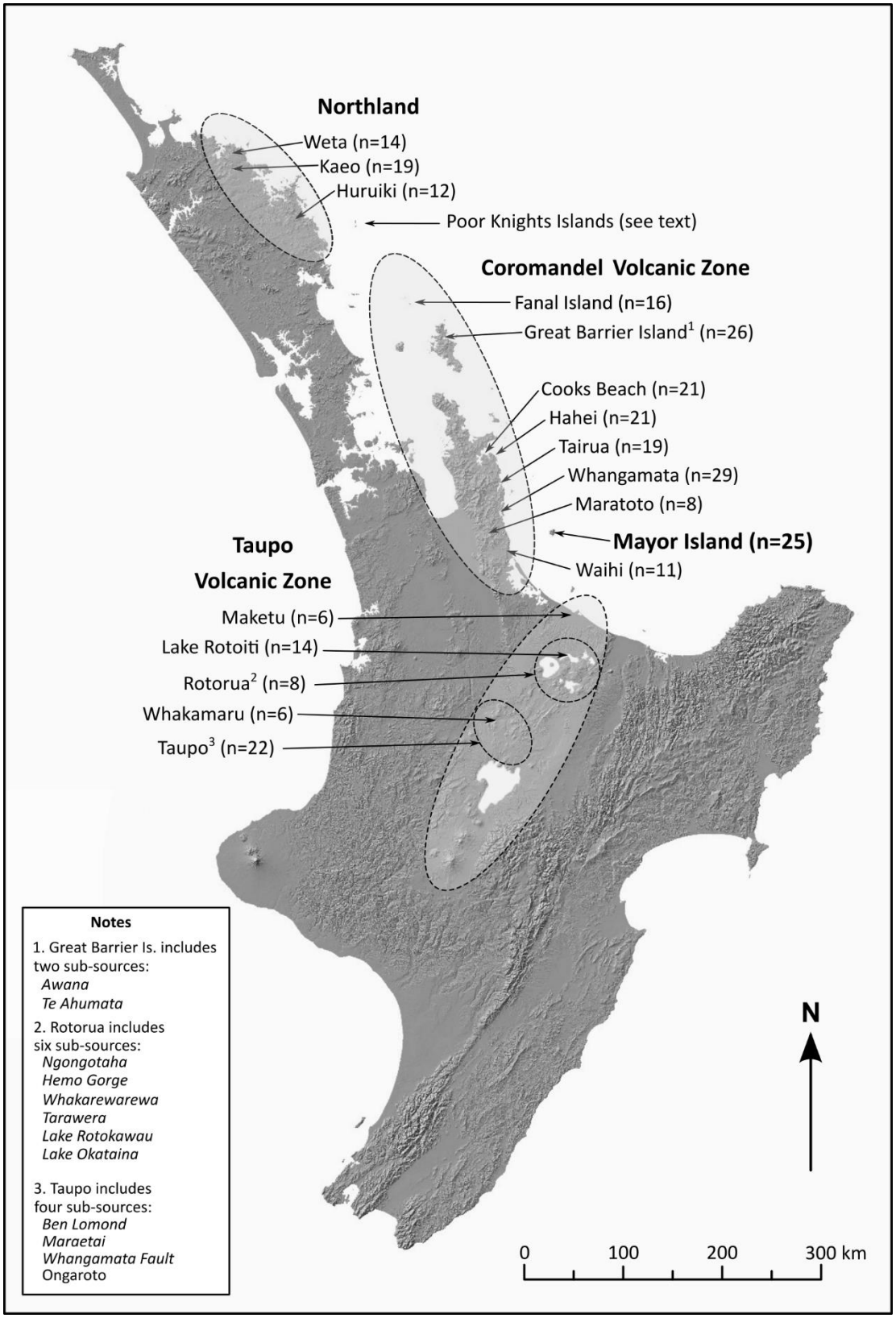

Figure 1. Locations of New Zealand obsidian sources. Reference sample counts are shown in parentheses.

Table 1. Calibrated XRF results for the specimens. Reported values are the means of two analyses

Sample	Assigned	K_2O	CaO	TiO_2	MnO	$Fe_2O_3T^{\dagger}$	Zn	Pb	Th	Rb	Sr	Y	Zr	Nb
	source	%	%	%	%	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
1	Gt Barrier Is.	4.26	0.61	0.09	0.03	1.20	33	20	15	187	21	32	123	6
2	Gt Barrier Is.	4.68	0.49	0.10	0.03	1.26	35	22	16	193	21	36	131	3
4	Mayor Is.	4.52	0.22	0.25	0.11	5.90	236	31	20	146	7	144	1243	100
5	Poor Knights Is.?	4.29	0.72	0.18	0.03	1.69	35	30	16	192	33	40	250	6
7	Gt Barrier Is.	4.33	0.59	0.10	0.03	1.23	37	21	18	191	22	34	125	7
8	Gt Barrier Is.	4.37	0.54	0.09	0.03	1.23	34	21	14	189	19	36	126	6
9	Gt Barrier Is.	4.34	0.66	0.10	0.03	1.36	31	22	16	193	30	33	136	6
10	Gt Barrier Is.	4.19	0.66	0.09	0.03	1.33	34	22	13	194	30	32	136	4
11	Gt Barrier Is.	4.16	0.65	0.09	0.03	1.18	34	21	14	188	22	31	122	8
A	Gt Barrier Is.	4.23	0.65	0.09	0.02	1.27	33	21	16	194	21	35	127	8
B	Gt Barrier Is.	4.30	0.53	0.09	0.03	1.23	33	20	15	190	20	35	127	5
C	Gt Barrier Is.	3.97	0.79	0.17	0.03	1.49	32	22	14	193	27	31	131	5

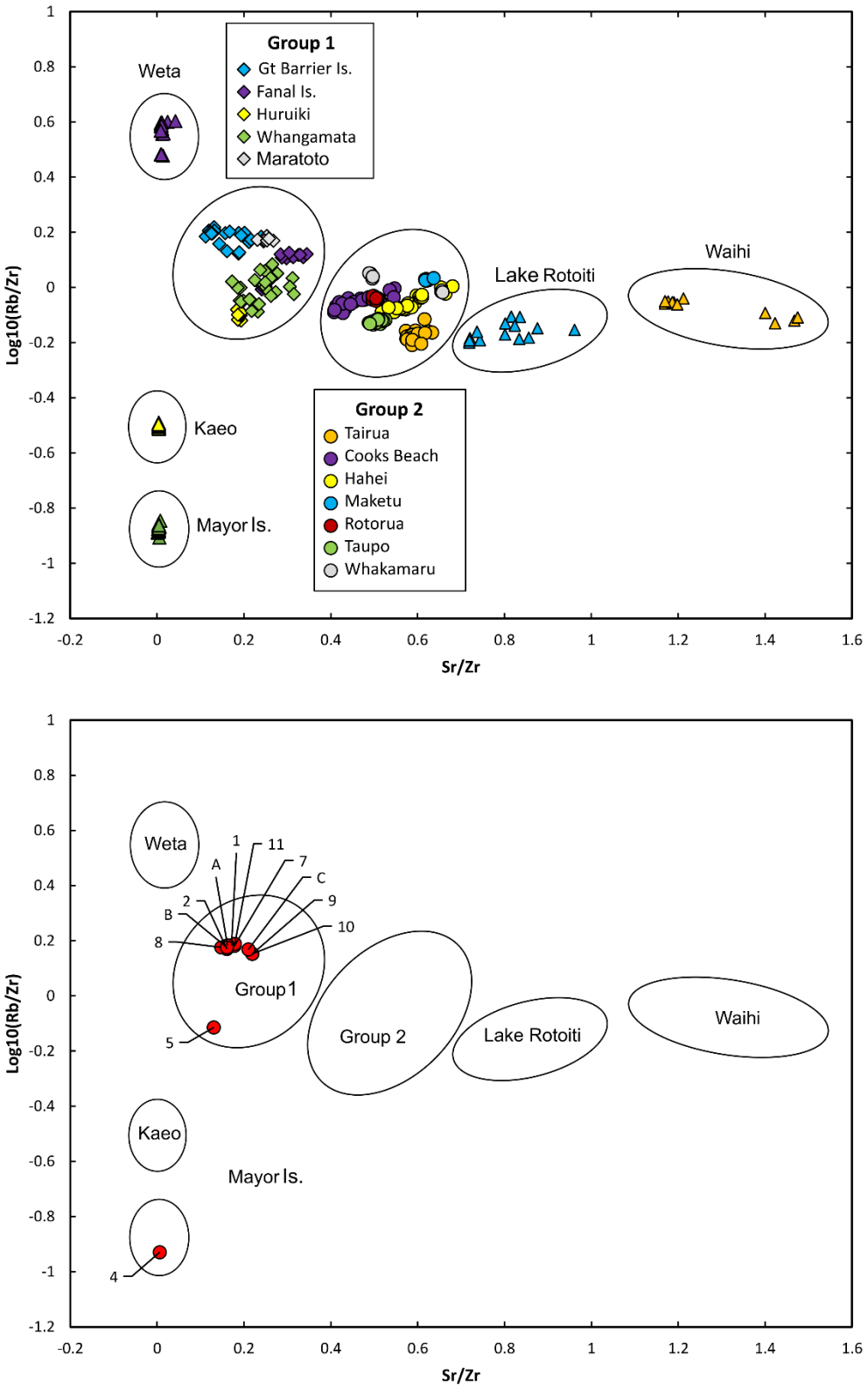

Figure 2. Plot of Sr/Zr against Log10Rb/Zr for the specimens. The reference samples are shown in the upper plot and the artefacts in the lower plot.

Table 2. Results of discriminant function analysis for the artefacts

		Predicted group membership																
		Weta	Kaeo	Huruiki	Mayor Island	Fanal Island	Great Barrier Is.	Cooks Beach	Hahei	Tairua	Whangamata	Maratoto	Waihi	Taupo	Whakamaru	Rotorua	Lake Rotoiti	Maketu	Total
	Original																		
Actual group membership	Weta	14																	14
	Kaeo		19																19
	Huruiki			12															12
	Mayor Island				25														25
	Fanal Island					16													16
	Great Barrier Is.						26												26
	Cooks Beach							19	1							1			21
	Hahei								21										21
	Tairua									19									19
	Whangamata			2							27								29
	Maratoto											8							8
	Waihi												11						11
	Taupo													22					22
	Whakamaru														4			2	6
	Rotorua															8			8
	Lake Rotoiti																14		14
	Maketu																	6	6
	Artefacts			**1**	**1**		**10**												**12**
	Cross-validated																		
	Weta	14																	14
Actual group membership	Kaeo		19																19
	Huruiki			12															12
	Mayor Island				25														25
	Fanal Island					16													16
	Great Barrier Is.					2	24												26
	Cooks Beach							19	1							1			21
	Hahei								21										21
	Tairua									19									19
	Whangamata			2							27								29
	Maratoto											8							8
	Waihi												11						11
	Taupo													22					22
	Whakamaru														4			2	6
	Rotorua															8			8
	Lake Rotoiti																14		14
	Maketu																	6	6

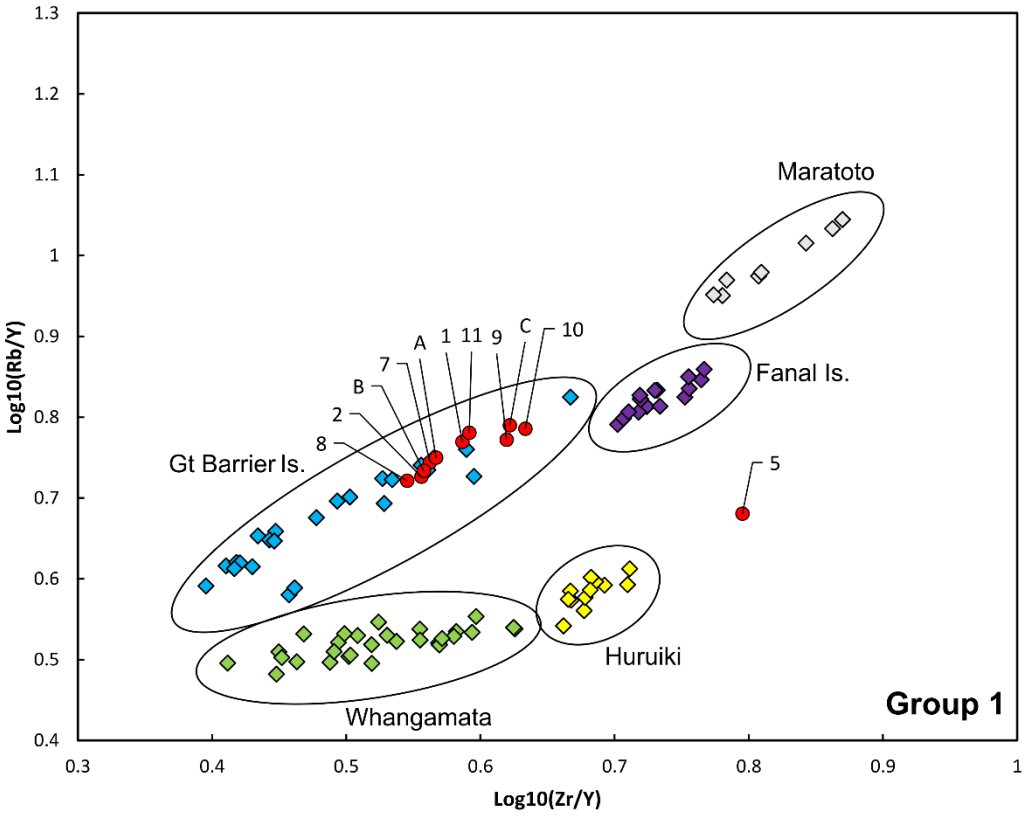

Figure 3. Plot of Log10(Zr/Y) against Log10(Rb/Y) for the Group 1 specimens. Artefacts are shown as red circles and labelled.

Table 3. Comparison of Sample 5 to Huruiki source averages from this report and other studies.

Reference	**K_2O**	**CaO**	**TiO_2**	**MnO**	**$Fe_2O_3T^{\dagger}$**	**Zn**	**Pb**	**Th**	**Rb**	**Sr**	**Y**	**Zr**	**Nb**
	%	%	%	%	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Moore 1982	-	-	-	-	-	-	-	-	145	38	36	172	12
Sheppard *et al.* 2011	-	-	0.11	0.03	1.14	37	21	-	137	38	-	145	-
McCoy and Carpenter 2014	3.91	0.76	0.09	0.03	1.42	46	23	13	143	35	42	158	10
This report	3.79	0.84	0.09	0.03	1.30	40	23	9	141	35	35	160	5
Sample 5 (this report)	***4.29***	0.72	***0.18***	0.03	***1.69***	35	30	16	***192***	33	40	***250***	6

Table 4. Comparison of Sample 5 to known sources for the five mid-Z trace elements. Also included are Moore and Coster's (2015) data for obsidian flakes attributed to a source in the Poor Knights Islands

		Rb		Sr		Y		Zr		Nb	
	n	Mean	*S.D.*	Mean	*S.D.*	Mean	*S.D.*	Mean	*S.D.*	Mean	*S.D.*
Weta	*14*	440	*20*	2	*1*	90	*13*	121	*10*	33	*2*
Huruiki	*19*	141	*3*	35	*1*	35	*1*	160	*4*	5	*1*
Kaeo	*12*	635	*23*	9	*1*	227	*8*	2009	*53*	287	*9*
Fanal Is.	*16*	190	*19*	46	*5*	27	*6*	160	*6*	9	*1*
Gt. Barrier Is.	*26*	204	*26*	22	*6*	41	*8*	133	*18*	10	*2*
Cooks Beach	*21*	124	*5*	65	*5*	30	*2*	140	*7*	10	*2*
Hahei	*21*	133	*4*	88	*3*	32	*1*	150	*9*	10	*1*
Tairua	*19*	122	*6*	108	*5*	25	*2*	182	*6*	9	*2*
Whangamata	*29*	136	*7*	32	*5*	41	*3*	138	*12*	10	*1*
Maratoto	*8*	148	*2*	25	*1*	15	*1*	99	*1*	8	*1*
Waihi	*11*	118	*5*	180	*25*	19	*4*	141	*5*	8	*1*
Mayor Island	*25*	141	*2*	4	*1*	122	*4*	1056	*41*	80	*4*
Maketu	*6*	136	*1*	79	*1*	24	*1*	127	*2*	10	*1*
Lake Rotoiti	*14*	99	*7*	115	*9*	30	*3*	143	*5*	8	*2*
Lake Rotorua	*8*	131	*2*	72	*2*	27	*1*	143	*2*	10	*0.3*
Whakamaru	*6*	129	*2*	68	*15*	18	*1*	122	*7*	8	*1*
Taupo	*22*	126	*3*	85	*3*	23	*1*	167	*4*	9	*1*
Poor Knights Islands	*8*	187	*9*	35	*2*	-	-	226	*14*	-	-
Sample 5 (this report)	*11*	193	-	33	-	40	-	250	-	6	-

APPENDIX 4 – RADIOCARBON DATING

Radiocarbon Determination – R09/221

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Radiocarbon Dating Laboratory

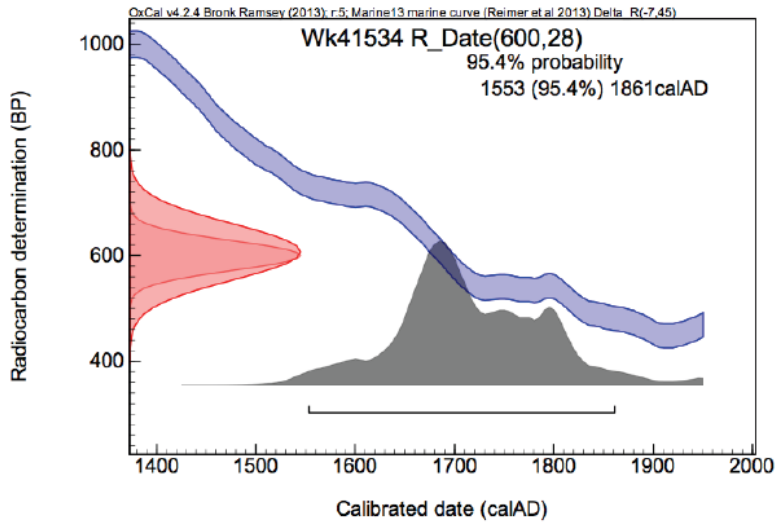
Thursday, 18 June 2015

Report on Radiocarbon Age Determination for Wk- 41534

Submitter	R Shakles
Submitter's Code	R09/221 Context 101
Site & Location	Bishophill Farm, Matakana, 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 120 seconds, rinsed and dried.

$\delta^{13}C$	-0.4 ±	0.2 ‰
$D^{14}C$	-72.0 ±	3.2 ‰
$F^{14}C\%$	92.8 ±	0.3 %
Result	**600 ± 28 BP**	

Comments



- 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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Tuesday, 12 May 2015

Radiocarbon Dating Laboratory

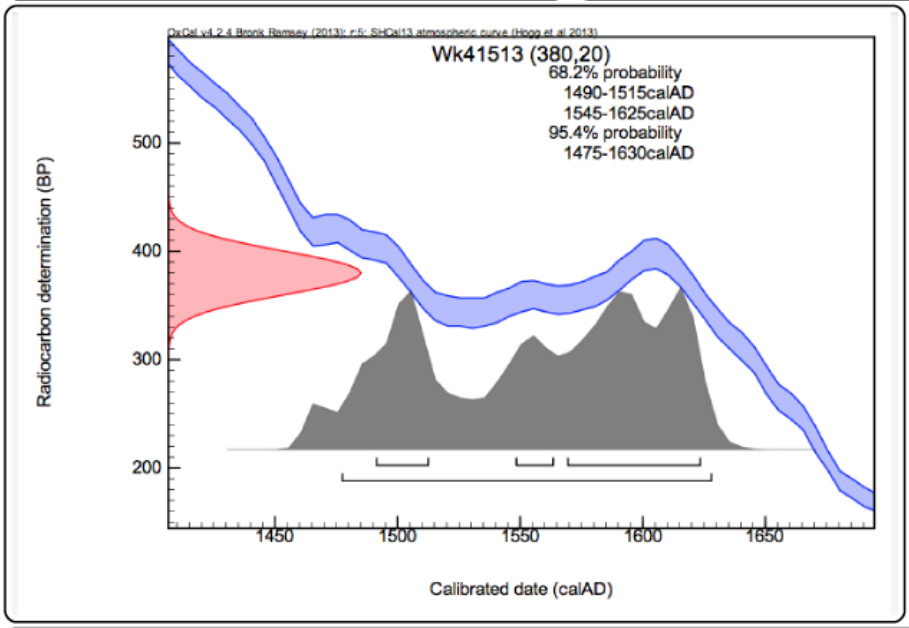
Report on Radiocarbon Age Determination for Wk- 41513

Submitter	R Shakles
Submitter's Code	R09/221-Context 106
Site & Location	Bishop Hill Farm, Matakana, New Zealand
Sample Material	Hebe and manuka charcoal
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.

$D^{14}C$	-46.1 ±	2.4 ‰
$F^{14}C$%	95.4 ±	0.2 %
Result	**380 ± 20 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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Tuesday, 12 May 2015

Radiocarbon Dating Laboratory

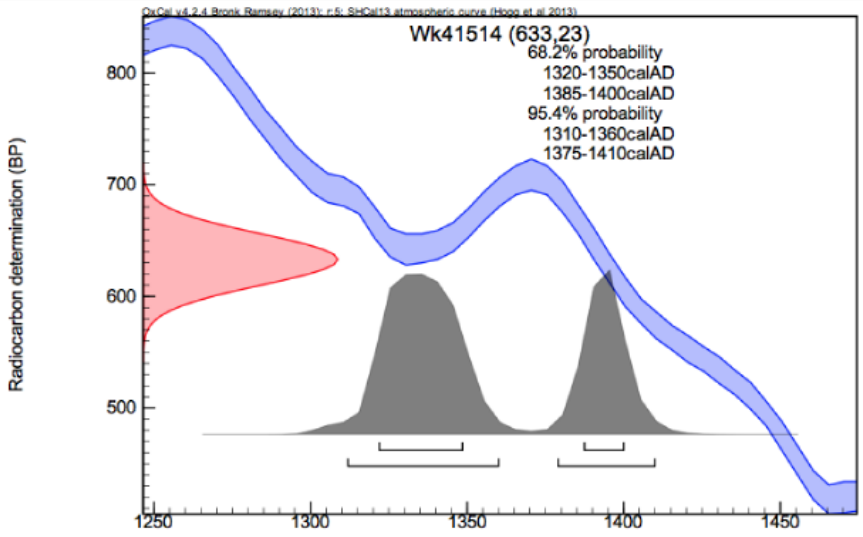
Report on Radiocarbon Age Determination for Wk- 41514

Submitter	R Shakles
Submitter's Code	R09/221-Context 174
Site & Location	Bishop Hill Farm, Matakana, New Zealand
Sample Material	Rewarewa charcoal
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.

$D^{14}C$	-75.8 ±	2.7 ‰
$F^{14}C\%$	92.4 ±	0.3 %
Result	**633 ± 23 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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Tuesday, 2 June 2015

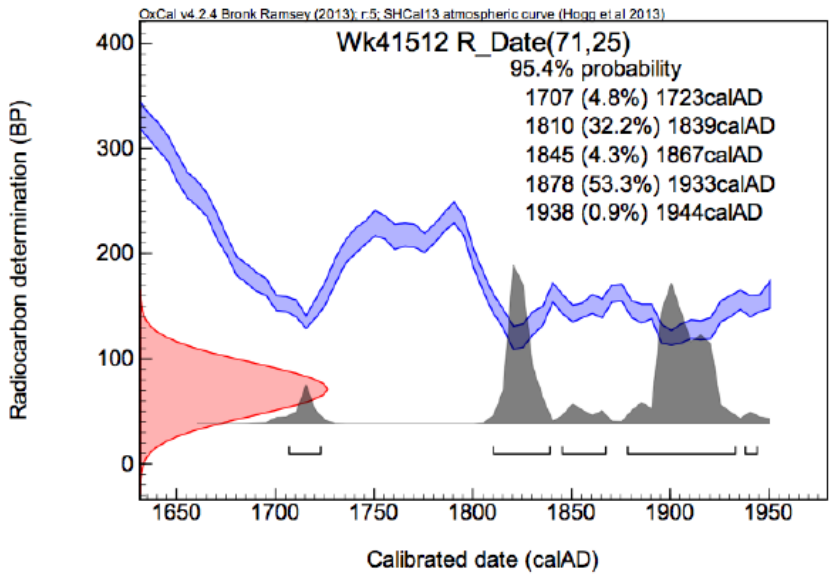
Radiocarbon Dating Laboratory

Report on Radiocarbon Age Determination for Wk- 41512

Submitter	R Shakles
Submitter's Code	R09/221-Context 201
Site & Location	Bishop Hill Farm, Matakana, New Zealand
Sample Material	Kanuka charcoal
Physical Pretreatment	Possible contaminants were removed. Washed in ultrasonic bath.
Chemical Pretreatment	Sample washed in hot 10% HCl, rinsed and treated with hot 1% NaOH. The NaOH insoluble fraction was treated with hot 10% HCl, filtered, rinsed and dried.

$\delta^{13}C$	-24.3 ±	0.2 ‰
$D^{14}C$	-8.8 ±	3.1 ‰
$F^{14}C\%$	99.1 ±	0.3 %
Result	**71 ± 25 BP**	

Comments



- 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)
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- 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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Friday, 17 July 2015

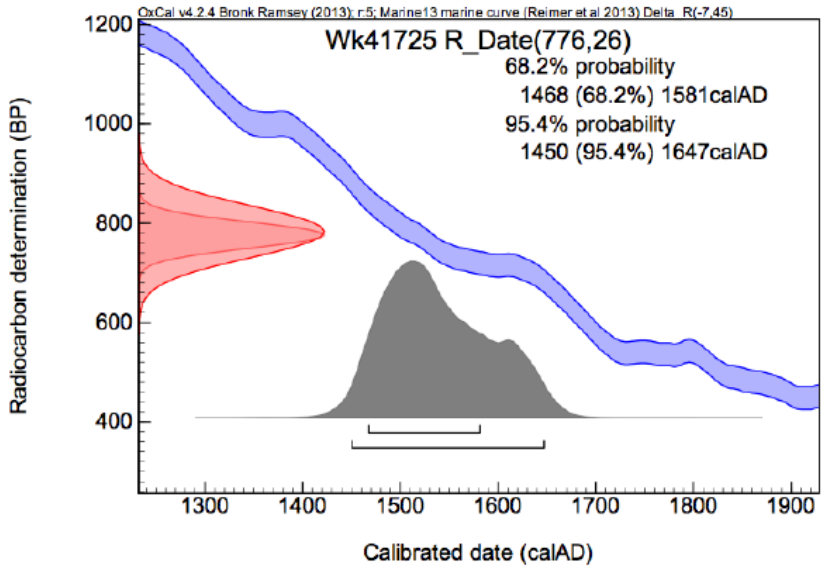
Radiocarbon Dating Laboratory

Report on Radiocarbon Age Determination for Wk- 41725

Submitter	R Shakles
Submitter's Code	Context 216 - site R09/221
Site & Location	Bishophill Farm, Matakana, 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 120 seconds, rinsed and dried.

$\delta^{13}C$	0.6 ±	0.2 ‰
$D^{14}C$	-92.1 ±	2.9 ‰
$F^{14}C\%$	90.8 ±	0.3 %
Result	**776 ± 26 BP**	

Comments



- 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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Monday, 17 August 2015

Radiocarbon Dating Laboratory

Report on Radiocarbon Age Determination for Wk- 42039

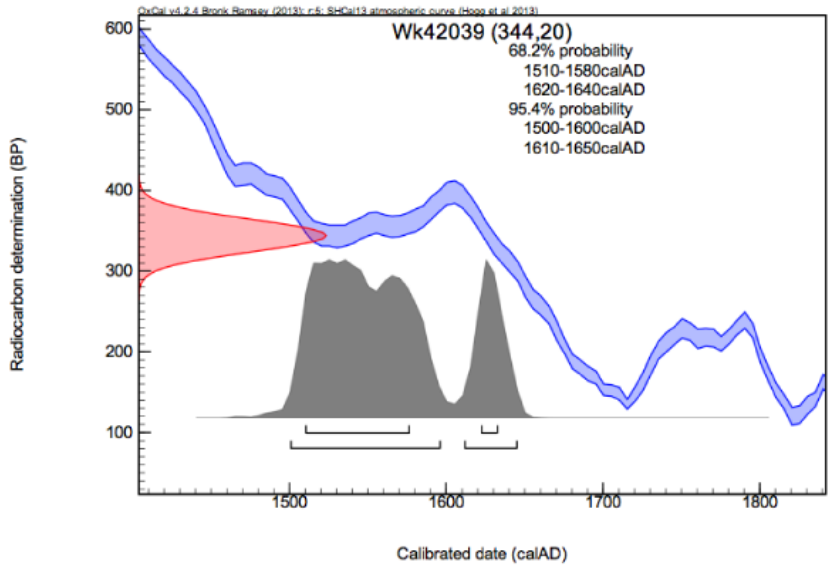
Submitter	R Shakles
Submitter's Code	R09/221 Context (213)
Site & Location	Bishop Farm Matakanna Midden with storage pits and houses, New Zealand
Sample Material	Charcoal - small diameter kanuka, mahoe and pohutakawa
Physical Pretreatment	Sample cleaned.
Chemical Pretreatment	Sample washed in hot HCl, rinsed and treated with multiple hot NaOH washes. The NaOH insoluble fraction was treated with hot HCl, filtered, rinsed and dried.

$D^{14}C$	-41.9 ±	2.4 ‰
$F^{14}C\%$	95.8 ±	0.2 %
Result	**344 ± 20 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)
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- 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)*.

Radiocarbon Determination – R09/2187

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Thursday, 18 June 2015

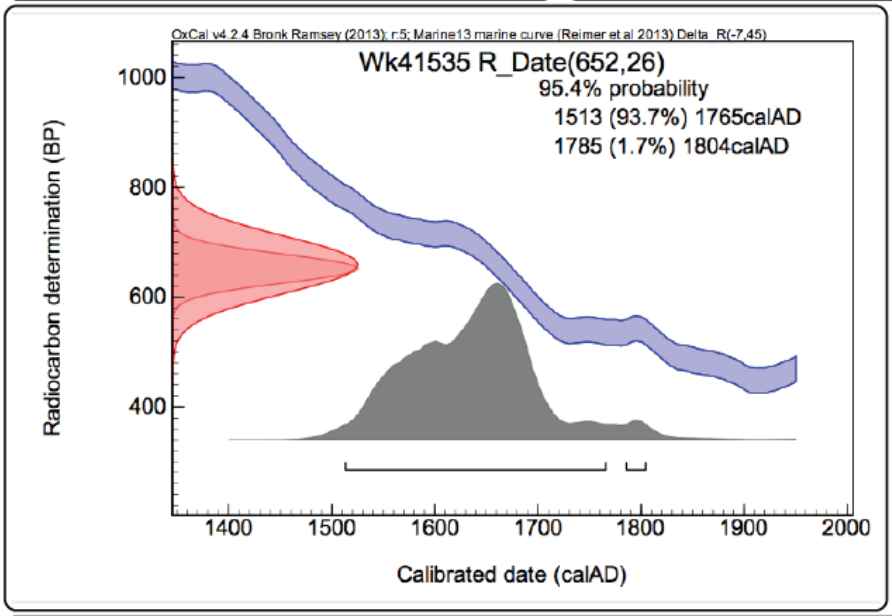
Radiocarbon Dating Laboratory

Report on Radiocarbon Age Determination for Wk- 41535

Submitter	R Shakles
Submitter's Code	R09/2187
Site & Location	Bishophill Farm, Matakana, 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 120 seconds, rinsed and dried.

$\delta^{13}C$	0.3 ±	0.2 ‰
$D^{14}C$	-78.0 ±	2.9 ‰
$F^{14}C\%$	92.2 ±	0.3 %
Result	**652 ± 26 BP**	

Comments



- 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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Radiocarbon Determination – R09/2188

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Thursday, 18 June 2015

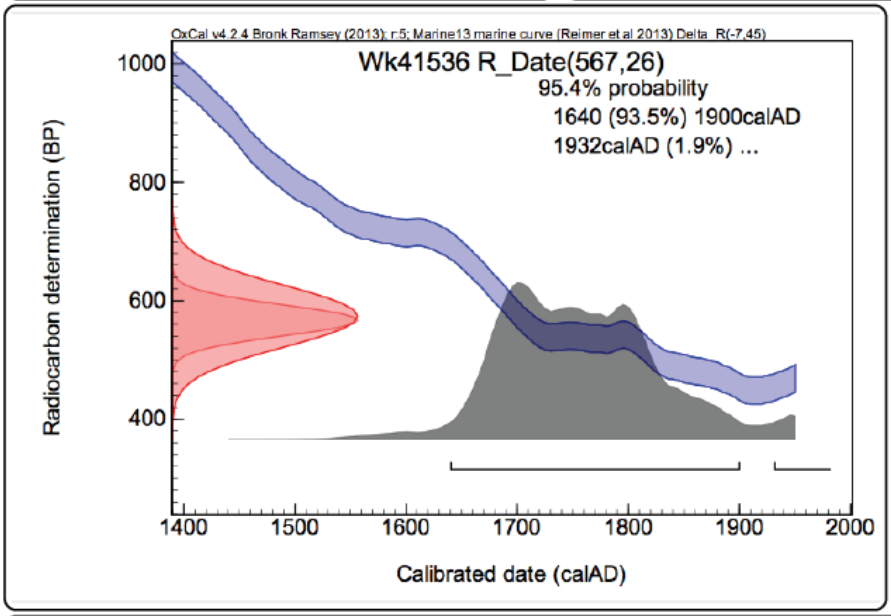
Radiocarbon Dating Laboratory

Report on Radiocarbon Age Determination for Wk- 41536

Submitter	R Shakles
Submitter's Code	R09/2188
Site & Location	Bishophill Farm, Matakana, 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 120 seconds, rinsed and dried.

$\delta^{13}C$	-0.1 ±	0.2 ‰
$D^{14}C$	-68.2 ±	3.0 ‰
$F^{14}C\%$	93.2 ±	0.3 %
Result	**567 ± 26 BP**	

Comments



- 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)*.

AG Hogg

Radiocarbon Determination – R09/2199

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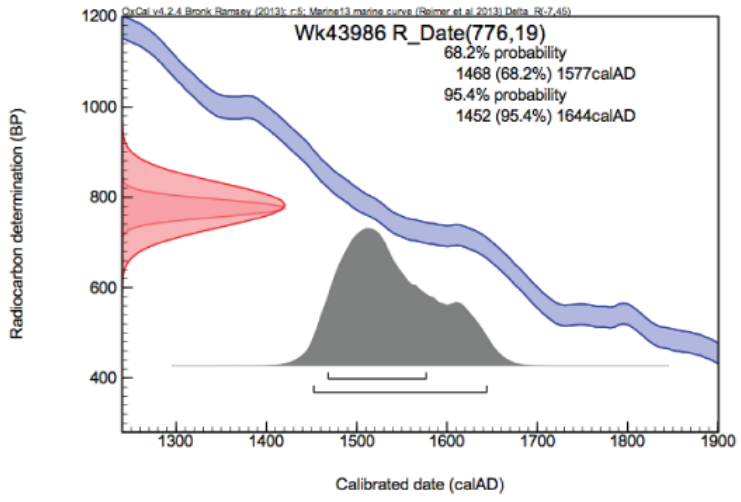
Radiocarbon Dating Laboratory

Report on Radiocarbon Age Determination for Wk- 43986

Submitter	R Shakles
Submitter's Code	R09/2199
Site & Location	Lot 6, Bishop Hill Farm, Matakana, New Zealand
Sample Material	Cockle
Physical Pretreatment	Surfaces cleaned. Washed in an ultrasonic bath. Tested for recrystallization: aragonite.
Chemical Pretreatment	Sample acid washed using 2 M dil. HCl for 120 seconds, rinsed and dried.

$\delta^{13}C$	0.2 ±	0.2 ‰
$D^{14}C$	-92.1 ±	2.1 ‰
$F^{14}C\%$	90.8 ±	0.2 %
Result	**776 ± 19 BP**	

Comments



- 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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