Technical Report 9

Archaeological Assessment

NZ TRANSPORT AGENCY
WAKA KOTAHI

1 MacKays to Peka Peka Expressway

Revision History

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A	Mary O'Keeffe		12/2011

Document Acceptance

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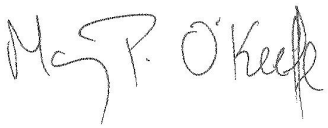
Prepared by	Mary O'Keeffe		12/2011
Reviewed by	Andy Dodd		12/2011
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on behalf of	Beca Infrastructure Ltd		

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Executive Summary

The NZ Transport Agency proposes to construct a four lane expressway along the Kāpiti Coast, between MacKays Crossing and Peka Peka. The proposed Expressway cuts through various physical environments along the coast including sand dunes. There are over 280 recorded archaeological sites on the Kāpiti Coast, most of which are located within sand dunes. The proposed Expressway therefore will impact on known sites and is likely to impact on further unknown sites.

This report sets out data on the recorded archaeological sites, and provides the background context for a predictive model to predict the likely occurrence and location of further unrecorded sites.

Avoidance of sites is not possible, as the locations of the unrecorded sites are not known, and sites are recorded located throughout the extensive sand dunes.

There is no reason on archaeological grounds why the proposed Expressway should not be constructed, provided there are appropriate mitigation measures in place. Mitigation measures include archaeological investigations, archaeological monitoring and interpretation opportunities of the history and archaeology of the coast.

1. Introduction

1.1. Background

The NZ Transport Agency ('the NZTA') is lodging a Notice of Requirement (NOR) and resource consent applications (RCA's) to construct, operate and maintain an Expressway between MacKays Crossing and Peka Peka ('the Project') on the Kāpiti Coast.

The MacKays to Peka Peka Expressway route[1] has been identified as one of eight sections within the Wellington Northern Corridor (SH1 from Levin to the Wellington Airport) which is an identified "Road of National Significance" (RoNS) in terms of the 2009 Government Policy Statement[2]. The upgrading of the Wellington Northern Corridor and the other six RoNS across the country are to be substantially progressed in the next 10 years.

The location of the proposed Expressway is shown in Figure 1.

[1] Route refers to the overall corridor of land between MacKays Crossing and Peka Peka

[2] Government Policy Statement on Land Transport Funding 2009/2010-2018/2019

Figure 1: Location of MacKays to Peka Peka Expressway, Kāpiti Coast

Mary O'Keeffe, of Heritage Solutions ("the archaeologist") was engaged by the MacKays to Peka Peka Alliance ("the Alliance") in July 2010 to provide advice and report on the effects of the Project in relation to archaeology. This report addresses the requirements of Part 1 of the Historic Places Act 1993 (HPA) and the requirements of the Resource Management Act 1991 (RMA), in particular section 6(f).

This report is assessing the effects of the Project on the existing archaeological environment and the significance of those effects. This assessment will accompany the Notice of Requirement and resource consent applications in accordance with the RMA and will also identify any requirements under the HPA.

This report will address:

- The statutory context for considering effects on archaeology
- The existing environment
- The known archaeology resources in the Kāpiti Coast area

- An assessment of the archaeology values in the area
- An assessment of the effects of the proposal on archaeology
- Mitigation options

The consultant has undertaken much archaeological research and fieldwork on the Kāpiti Coast in the last 15 years, including work for the existing Western Link Road (WLR) designation, work for KiwiRail on the double tracking of the main trunk line, work for the Kāpiti Airport, and numerous assessment for proposed residential and infrastructure developments.

1.2. Key aspects of the proposal

The archaeologist has been provided with a copy of a description of the proposal, including the different sectors of the route. That information is not repeated here. The key facts that have an impact on archaeology are:

- The proposed route traverses different physical environments, including dune systems and wetlands
- The proposed route includes extensive earthworks,
- Some areas of the route will require more cut than fill
- Cuts within sand dunes are likely to impact upon archaeological sites

The archaeologist has also reviewed the Project objectives.

- Aim for hydraulic neutrality, taking into account both increased runoff from the proposed Expressway footprint, and loss of flood plain storage under the footprint in some areas;

Treat stormwater runoff to remove entrained contaminants, in accordance with industry standard.

2. Statutory context

2.1. Resource Management Act 1991

The RMA provides for the protection of historic heritage from inappropriate subdivision, use and development as a matter of national importance in section 6(f).

Historic heritage is defined in the RMA as those natural and physical resources that contribute to an understanding and appreciation of New Zealand's history and cultures, derived from archaeological, architectural, cultural, historic, scientific, or technological qualities.

Under the RMA historic heritage includes:

- Historic sites, structures, places and areas
- Archaeological sites
- Sites of significance to Maori, including wāhi tapu
- Surroundings associated with the natural and physical resources3

Local authorities must provide for the protection of historic heritage (among other things) in their district plans and policy statements through objectives, policies and methods (including rules).[4]

Archaeological sites have intrinsic value on two levels: firstly, as monuments or as representative examples of past ways of life and people; and secondly, for the information they can contain.

Archaeological sites are, by implication, physical and tangible; they can be observed and measured. Sites can be examined by archaeological methodology, that is, by applying a variety of scientific techniques to examine and rationalise the data.

Equally, archaeological sites only have a sense of meaning if they are examined in the context of a cultural landscape, that is, when they are viewed and understood in the wider context of the physical environment in which they lie, in relation to the other sites and site types that may surround them, and in relation to the cultural context of the use and occupation of that land.

Archaeology can never definitively indicate "what happened" on a site or a landscape; instead, data and information is gathered, and a hypothesis is proposed to explain the possible relationships between data, known information and possible interpretations.

Archaeological sites may be of Maori origin and therefore of significance to Maori. There may also be other sites of spiritual or traditional significance to Maori and which may have no physical or tangible remains, and therefore do not fall within the legal definition of an archaeological site. This report focuses solely on the archaeological values within the study area, and does not attempt in any way to comment on or judge the Maori values of these sites. This is not meant to detract from or undermine the value of these places of significance to Maori; rather, it is an acknowledgement that it is inappropriate for an archaeologist to comment on matters of significance to Tangata Whenua.

[3] s2 RMA

[4] The Kāpiti Coast District Plan has specific heritage policies and these are discussed in the AEE (Part B, Chapter 4, Volume 2).

2.2. RMA analysis:

As noted, section 6(f) of the RMA provides for the protection of historic heritage from inappropriate subdivision, use and development as a matter of national importance.

Historic heritage is defined in the RMA as "...those natural and physical resources that contribute to an understanding and appreciation of New Zealand's history and cultures..." Natural and physical resources are, by implication, tangible.

"Protection" is not an absolute concept; rather, it is a continuum of possible activities and approaches. At one end of the spectrum the prohibition of certain activities can result in the active protection of an archaeological site ; while at the other, investigation of the likely nature, occurrence and location of archaeological sites within a geographic area can lead to improved care of the wider archaeological resource through the increased understanding derived from the information obtained. Protection can also, therefore, infer continued care of the wider archaeological resource through increased information on likely site nature, occurrence and location, gained through investigation. Thus, the "understanding and appreciation of New Zealand's history and cultures" requires a degree of site investigation and analysis in order to gain the information to facilitate this understanding.

Given this, the proposed Expressway presents an opportunity, through strategic archaeological investigation, to obtain a better understanding of the archaeology on the Kāpiti Coast: the proposed Expressway route runs through a contiguous corridor of unmodified land, and investigations can therefore be undertaken in a co-ordinated and comprehensive manner at one time as opposed to a piecemeal approach. In this way the archaeological sites found in different environments and locations along the corridor can be systematically compared and contrasted, with the likely prospect that the information derived will increase our understanding and appreciation of New Zealand's history, particularly in the Kāpiti Coast area.

Section 5(2) (c) of the RMA requires "avoiding, remedying, or mitigating any adverse effects of activities on the environment". In the case of the proposed Expressway avoidance of archaeological sites is not possible, as will be outlined below, as sites occur or are likely to occur throughout the sand dunes on the Kāpiti Coast, and these sand dunes are extensive. Further, the probable archaeological significance of the sites is not so high as to justify avoidance, is will be explained in section 6.3. Consequently, the proposed Expressway will have a detrimental effect on some sites but this will be offset, in part, by the information relating to the wider archaeological resource on the coast that can be derived from these sites through the process of strategic, managed investigation and destruction.

Remedying adverse effects on archaeological sites is never possible – damage or modification to sites is non-reversible. Thus mitigation is the only possible method, with the archaeological

investigations proposed in section 6.5 of this report comprising the mitigation proposed. These investigations will be high level, strategic and detailed, and are likely to yield information that contributes to our understanding and appreciation of New Zealand's history and cultures, and, through this, to an understanding and protection of the wider archaeological resource.

2.3. Historic Places Act 1993

Archaeological sites are defined in the Historic Places Act 1993 (HPA) as:

"…any place in New Zealand that

(a) Either -

(i) was associated with human activity that occurred before 1900; or

(ii) is the site of the wreck of any vessel where that wreck occurred before 1900; and

(b) is or may be able through investigation by archaeological methods to provide evidence relating to the history of New Zealand.[5]"

All archaeological sites in New Zealand that meet this definition have protection under the HPA, whether or not they are recorded or their existence is known.

Authorities must be obtained from the Historic Places Trust to modify, damage or destroy archaeological sites. As set out in this report, there are known and likely archaeological sites that will be impacted upon by the proposed Expressway, and therefore archaeological authorities will be sought in due course.

Archaeological sites in New Zealand are recorded by the New Zealand Archaeological Association (NZAA) and records entered into the NZAA file as part of its site database (Archsite). A site will be included simply by virtue of its existence; the NZAA file is a non-statutory database of recorded archaeological sites and excludes any scoring or ranking of sites. Grid references provided for archaeological sites included in the file indicate the site's location, but do not demarcate a site's full extent. In addition, some sites included in the NZAA database may no longer exist, as they may have been destroyed since they were recorded.

[5] *Historic Places Act* 1993, Section 2, Interpretation.

3. Existing environment

The physical environment is an important factor in understanding and interpreting the archaeological record. As McFadgen states

> "People in pursuit of their everyday lives exploited and changed their environment to meet their needs for food, clothing and shelter and their culture was, in turn, conditioned by it. The flow of information in this approach is two way: archaeological remains provide an historical perspective for the landscape as it appears today; and understanding the natural and cultural processes which have shaped the landscape is important for the interpretation of human and natural history"[6].

The physical environment of the Kāpiti Coast is a major influence on archaeology, both in terms of the types of sites present, and where they are found.

3.1. Dunes

The Kāpiti Coast is situated at the southern extent of a long band of coastal dunes on the southwest coast of New Zealand's North Island, running continuously from Paekakariki north to Taranaki. The topography of the Kāpiti Coast is characterised by a relatively narrow flat coastal shelf largely covered in sand dunes and wetlands, with hills inland. South of the Waikanae River the inland edge is a steep wave cut cliff. North of the river the hills form the foothills of the major Tararua Range. A major influence on the landscape is the Waikanae River, which both separates different topographic areas to its north and south, and is also a major contributor to the nature of the coastline through water borne material.

South of the Waikanae River the distance from the coast to the base of the wave cut cliff is relatively narrow, being about 3km at its widest point, and about 2km for much of the land south of Paraparaumu. The cliff runs parallel to the coast and the low lying dunes between the coast and cliff also lie generally parallel to the coast. South of the river the dunes are generally steep sided, and are relatively unstable, with weather and stock induced erosion.

In contrast, north of the Waikanae River the distance from the coast to the hills is about 4km. The dunes are gentler sided than those south of the river, and meander in a more abstract pattern, without reference to the alignment of the coast.

The dunes along the entire coast (north and south of the river) have formed during successive dune building phases. In the simplest terms, the dune sands are made up of material brought to the

[6] McFadgen, 1997:6

coast by rivers, moved along the coast by wave action. The material builds a foredune, this dune become unstable, and its material gets blown inland.

Kāpiti Island is an important factor in creating the distinct shape of the Kāpiti Coast: it has acted to block material carried down the Waikanae River, with the resultant longshore drift of material washed down the river being deflected back onto the coast forming the "bulge" in the coastline upon which Paraparaumu Beach township sits. Continued deposition and erosion of material makes the coastline, especially south of the river mouth, relatively unstable. This has implications for coastal archaeological sites, in terms of exposure and erosion by storm surges. This has been observed in the coastal dunes along the beach at Queen Elizabeth Park, where ongoing monitoring of the exposed dune section after major storm episodes identified middens freshly revealed and others completely eroded[7].

There are two main dune belts on the coast: the oldest sand dunes are generally found furthest inland[8], and subsequent, more recent, dunes have built up in front of them as the coastline extends out with deposition of more recent material building successive foredunes.

Between the two dune belts is a flat area of former and current wetlands, underlain with peat in places.

[7] Data from site record forms and from conversations with Tony Walton, 2008

[8] McFadgen, 1997

Figure 2: Dune belts within Queen Elizabeth Park, Department of Conservation

The oldest dunes on the coast are the Foxton dunes, deposited between about 6500yrs and 2000yrs BP[9]. The Motuiti Dune Building Phase followed at about 2000-800yrs BP[10]. The Motuiti Dune contains redeposited material derived from the Taupo eruption of 1720yrs BP such as lapilli and pumice, and has advanced over the Foxton dune[11].

The Taupo dune was the foredune at the time of the Taupo eruption, and is still reasonably intact in the vicinity of Waikanae[12].

The Older Waitarere Dune Building Phase dates to about 400 yrs BP, and this dune in turn is encroaching over the Motuiti dune[13]. The Younger Waitarere Dune Building Phase dates to about 150 yrs BP[14]. McFadgen postulates that these two latter dune building phases are seismic in origin, but this hypothesis needs to be tested.[15]

In general terms more recent dunes overlie older dunes, and can bury archaeological deposits that may be on the surfaces of the older dunes. It has been observed that the Motuiti overlies cultural material in Manawatu; this has not been observed in Kāpiti[16].

[9] McFadgen, 1997:8

[10] "BP" stands for "Before Present", with "Present" set at 1950AD.

[11] McFadgen, 1997:8

[12] McFadgen, 1997:8

[13] McFadgen, 1997: 8

[14] McFadgen, 1997:8

[15] McFadgen, pers.comm. July 2011

[16] McFadgen, pers.comm. July 2011

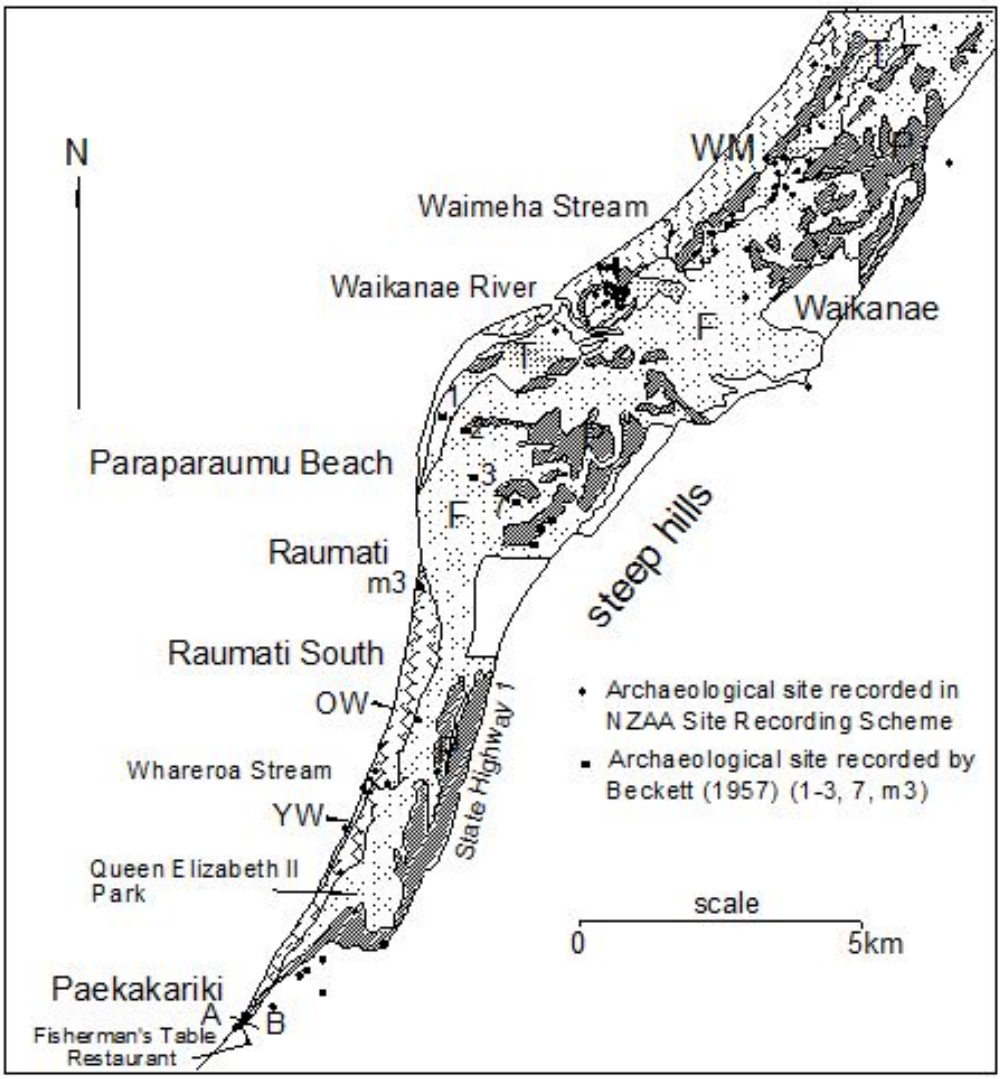

Figure 3: Sketch map of southern end of dune belt

(McFadgen, 1997: 10)

YW = Younger Waitarere

OW = Older Waitarere

WM = Waitarere-Motuiti (not separately distinguished)

T = Taupo

F = Foxton

P = peat swamp

Note that the old sea cliff formed at the end of the post-glacial sea level rise follows more or less the line of State Highway 1.

The predominant dune on the Kāpiti Coast is the Foxton dune, overlain in places by younger dunes[17]. A large band of Taupo dune sits near the coastal edge immediately north and south of the Waikanae River: this dune has formed high stable dunes, containing archaeological sites.

McFadgen[18] has recently postulated seismic activity as a major landscape factor on the Kāpiti Coast. He suggests that the Kāpiti Coast has experienced several earthquake episodes, with accompanying tsunamis, both before and during the time of human occupation. Effects on the human population from earthquakes and tsunamis would have included: uplift draining swamps and lagoons, destroying habitats of food-source birds and animals; gardens and living areas buried by landslips; inundation of gardens by water-borne salt and debris; sandwash down rivers changing river alignments and blocking estuaries; and sandwash smothering shellfish beds[19]. This hypothesis has yet to be validated by archaeological and geomorphological data.

At the time of human settlement, McFadgen considers that the dunes would have been largely forested. This is inferred through analysis of landsnails found in archaeological deposits taken from the dunes. Land snails are extremely species specific, and thus identification of the particular landsnail can infer the paleoenvironment in which the snail was living. The forest species also would have provided plant and birds species for food and utilisation[20].

3.2. Wetlands and implications for archaeological sites

As noted, there are areas of former wetland interspersed between the dunes. The areas of wetland were extensive, between the coastal and inland dune ridges. The wetlands had low ridges of sand running through them.

Figure 4 shows detail from a survey plan covering the area of what is now Paraparaumu town, with extensive sand ridges running through the swamps. The majority of the sand ridges are parallel with the coast, as they are largely formed by windblown sand redeposited from the coastal dunes by winds blowing off the sea.

[17] McFadgen, 2007:152

[18] McFadgen, 2010

[19] McFadgen, 2010

[20] McFadgen, 1997

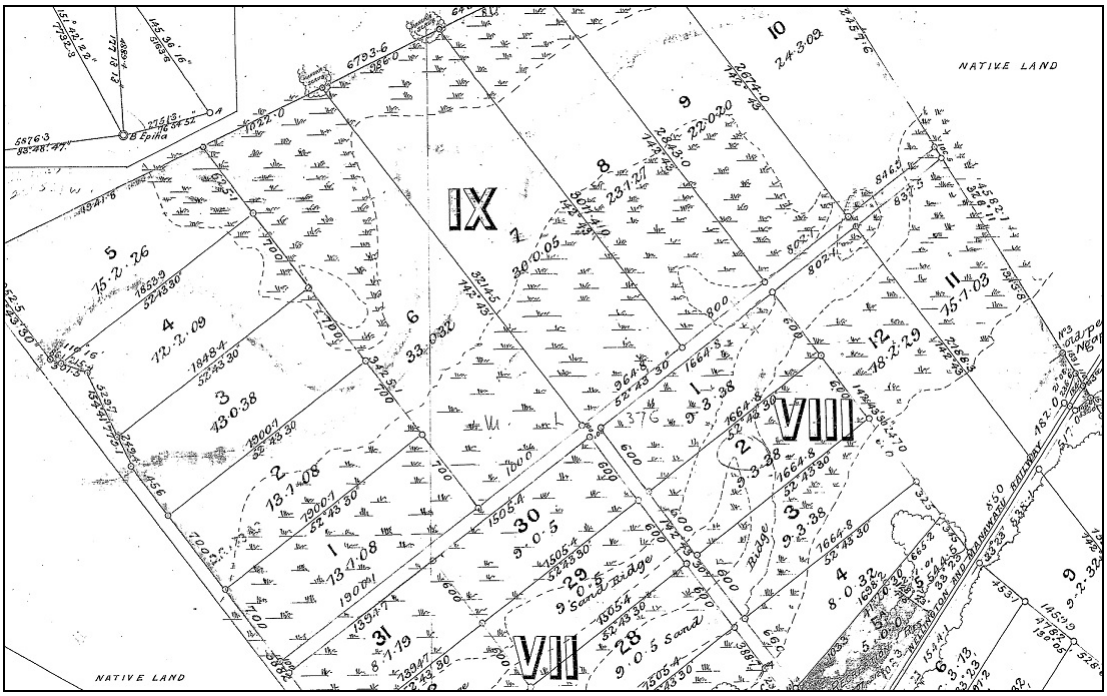

Figure 4: Detail from plan SO 12944

The wetland areas are significant in terms of human occupation as they would have been rich sources of food and raw materials, including birds, eels and plant species. Further north in the region (north of the Waikanae River, and especially north of Ōtaki) lakes and lagoons were formed within the dunes, which would have provided routes for canoe travel, birds and freshwater species, and island pa provided safe refuges.

The wetlands were used for occupation. Beckett recorded pa sites within the former low-lying wetlands in the area between what is now Paraparaumu town and Paraparaumu beach[21].

[21] Beckett, 1957:361

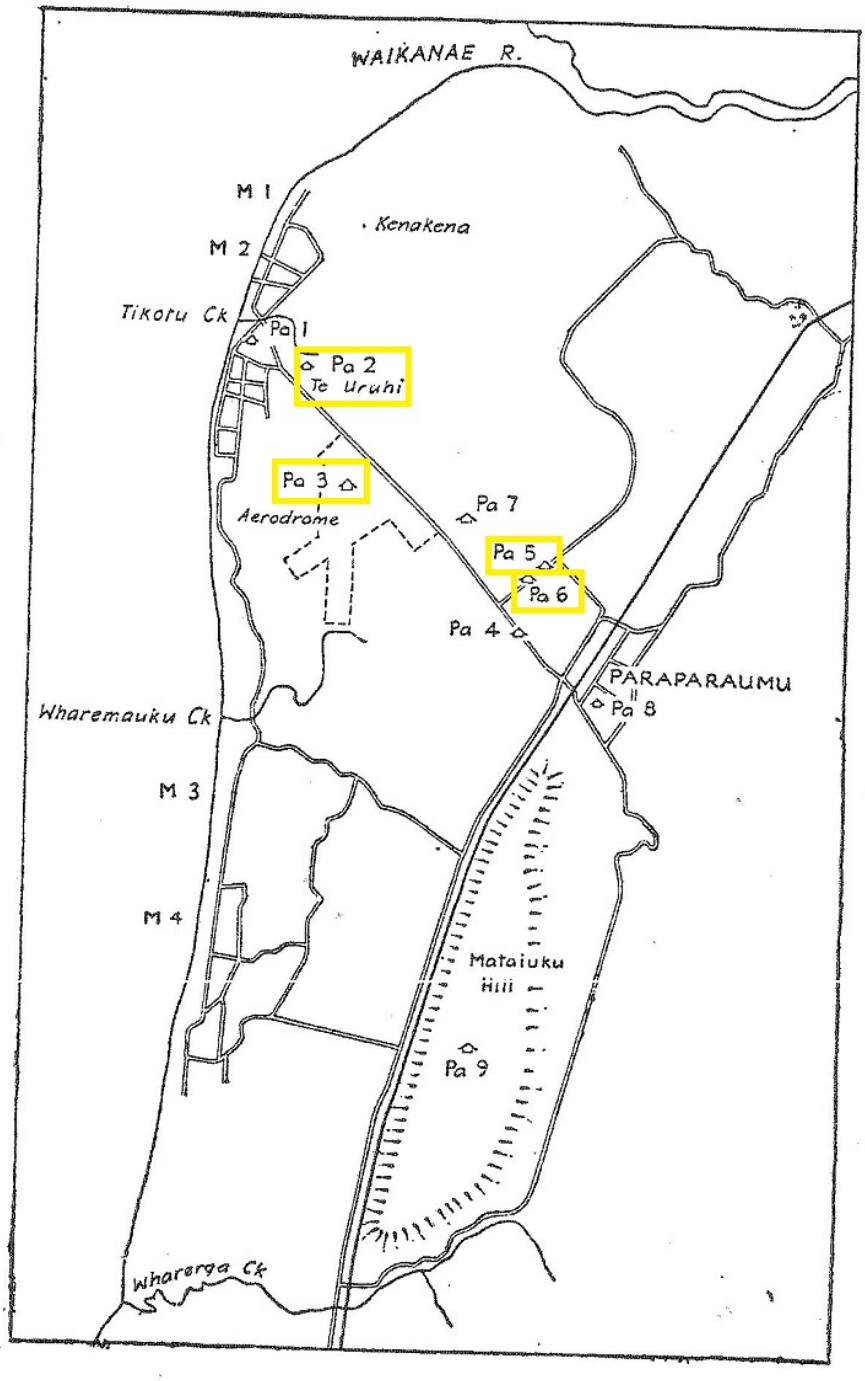

Figure 5: Pa recorded by Beckett[22]

Figure 5 shows pa recorded by Beckett in the vicinity of Paraparaumu town. The swamp pa are highlighted in yellow.

[22] Beckett, 1957: 358

Pa 2 was described by Beckett as "...a small pa, jutting into the deep swamp, built on the lower tongue of a fixed dune.....Screened on the north by higher dunes, deep swamp and water defended it on all sides except for a narrow neck on the north. This was defended by a trench which before ploughing was six feet deep and seven feet wide...."[23].

Pa 3 was in the centre of what is now the Kāpiti Airport. Due to the enforcement of emergency war provisions in 1942, this area was substantially modified by sand being dragging from the sand ridges across to fill in the wetland pockets[24]. Beckett described this pa as "...situated on an isolated dune, roughly circular in shape, the top, approximately 30 feet above swamp level..."[25]. Pa 5 and 6 "...were swamp-surrounded dunes of small size...The only evidence of occupation here were large pits which may have been *whare* sites or storage pits"[26].

In addition, pa 9 on Figure 5 is Mataihuka, which was located on the crest of the wave-cut cliff. However part of the pa was located at the base of the ridge, on the swamp edge, where rocky debris had been placed to form a hard platform. Small whare and a midden were noted by Beckett beside a stream at the foot of the pa, and there was a canoe landing site nearby[27].

In addition, low-lying pa on the coastal edge, near streams or near the wetlands are likely to have used waterways and wetlands both as natural defences and to facilitate access.

The Mackays to Peka Peka Project ecologist made the following observations concerning the wetlands in the vicinity of the proposed Expressway Alignment:

> All wetlands within the alignment, and considered to be sufficiently close in terms of hydrological connectivity to the alignment, have been mapped. There are key streams in the area and other wetlands which have been affected by drainage and construction of boreholes. Based on ecological patterns present in the wetlands along the alignment, it is suggested that the water table has dropped by about 0.5m from historical levels as a result of artificial swamp drainage and water abstraction.

[23] Beckett, 1957: 361

[24] O'Keeffe, 2010a: 1

[25] Beckett, 1957: 361

[26] Beckett, 1957: 361

[27] Carkeek, 1966:123

> Most wetlands within or near the alignment are ephemeral, that is they have standing water in winter but are dry in summer. Observations conclude that the vast majority of wetlands on the coast are dry by December, with no visible surface water.
>
> Many of the wetland areas on the coast investigated as part of this Project indicate that they consist of shallow lenses of peat in dune depressions between windblown dunes.
>
> The biggest permanent wetland in close proximity to the alignment is Te Harakeke, a QEII covenanted wetland north of Te Moana Rd (and outside the alignment). The deepest investigated wetland on the coast is at Raumati South, which gets to about 1m depth during winter.
>
> The vegetation associations present are typically species that tolerate water table changes (manuka, Sphagnum and rushes). Historically, we understand that these wetlands would have been dominated by swamp forest of swamp maire, kahikatea, and pukatea, similar to the remnant vegetation of Nga Manu Nature Reserve[28].

This description is helpful in understanding the potential archaeology of the coast. Placement of wooden artefacts is a traditional practice, and is well documented on the edge of Lake Horowhenua, some 30km north of Peka Peka. Material recovered from the lake has been described by Adkin[29], and include wooden kō (digging sticks) with elaborately carved tops, wooden agricultural tools, paddles, adze handles, wooden patu, wooden pounders, a burial chest, stone patu, pumice bowls, and many other objects.

As noted, the water table on the Kāpiti coast has dropped by about half a metre from historical levels, through the actions of recent farming drainage and construction of boreholes. It is, therefore, hard to know whether organic archaeological material such as wooden artefacts would have been deliberately placed in the wetlands, as the original water level may still have not been sufficient to keep them permanently wet, especially in summer.

Wetlands were also utilised as sources of food and resources, and as accessways.

[28] Matiu Park, pers. comm. May 2011

[29] Adkin, 1948: 83-104

4. Methodology

In undertaking the archaeological assessment of the proposed Mackays to Peka Peka route the following methodology was utilised:

- Data on recorded archaeological sites was sourced from ArchSite, the on-line database of the NZAA
- Additional data on listed and registered sites was sourced from the Kāpiti Coast District Council (KCDC) district plan, and the NZ Historic Places Trust register of historic places, historic, areas, wāhi tapu and wāhi tapu areas
- Documentary sources, including key historical texts, on the archaeology, history and settlement of the coast were sourced and researched
- Conversations were held with the iwi representatives regarding the existence of possible unrecorded sites
- Contextual data on topography, geomorphology and geology was sourced from LINZ and documentary sources
- Site visits were undertaken to check and verify recorded sites, and to check areas where archaeological surveying had previously not taken place
- A predictive model of likely site occurrence was created on the basis of the known archaeological and geomorphological data
- The proposed Expressway Designation was analysed, to determine the type and occurrence of known sites and to determine, using the predictive model, what additional unknown sites might be present, and the nature and possible extent of these sites
- Recommendations for mitigation and further investigation were made

4.1. Predictive Model

A predictive model is a technique that can be used in planning and modelling work. A predictive model takes known data on site type, site occurrence, site localities, and relationships between site localities and the underlying physical environment, and extrapolates this data into a model for further probability of site occurrence and locality

Predictive models are tools used by archaeologists to distinguish between locations where archaeological sites are likely to be present and locations where they are likely to be absent. A predictive model is a speculative tool, based on existing and verified data, but extrapolating existing data on site occurrence, site type, site density and relationship between the sites and the environment to speculate on the probability, locations and nature of further unrecorded sites.

A predictive model for the proposed Expressway is detailed in section 5.7 of this report. This predictive model was created by the author on the basis of her knowledge of the Kāpiti Coast, and on the basis of the data on recorded sites and environment. No software modelling was used.

4.2. Sources of data

Data for this report was sourced from a variety of locations:

- Archaeological sites

Data on recorded sites was obtained from Archsite, the on-line database for the NZAA. This is a database, and thus contains data on both extant sites and recorded sites that may no longer exist. In particular, details on recorded sites were gained from the site record forms contained within Archsite.

Data was also obtained from the Historic Places Trust and the Kāpiti Coast District Plan.

- Published sources

The two key archaeology texts on the Kāpiti Coast are Adkin's *Horowhenua* (1948) and Carkeek's *The Kāpiti Coast: Maori Place Names and History (*1966). Both books contain narrative and maps of sites observed in the early part of the 20th century and prior. These sources provide valuable information on sites that may no longer be present or visible, to add to the body of knowledge of site distribution.

In addition other authors have published papers on sites recorded or observed in the early part of the 20th century. The papers reviewed for the purpose of this report are listed at the end of the report.

- Historic maps and plans

Historic survey plans contain data on both recorded sites and on the environment prior to intense modification, settlement and development.

- Historic Places Trust and District Plan registers

Archaeological sites or features in the vicinity of the proposed Expressway Designation included in the Historic Places Trust register of historic places, historic areas, wāhi tapu and wāhi tapu areas include:

- Takamore wāhi tapu area (register number 7263)

There has been a request to review and extend the boundaries of the wāhi tapu area registered by the Historic Places Trust. At the time of writing this report submissions on the proposal had been lodged with HPT.

The Kāpiti Coast District Plan does not record any pre-European archaeological sites or features in the vicinity of the area of proposed work[30].

Places included in KCDC's district plan heritage register that are near (but outside) the areas of work include:

- Takamore urupa, end of Puriri Rd, item W1
- Old church building (relocated from Apiti), Waikanae Christian Holiday Park, Kauri Rd, item B42
- Maketu's grave, within macrocarpa tree, off Kauri Rd, item B78
- Greenaway homestead, 14 Kauri Rd, item B72

The proposed Expressway impinges on a corner of the Takamore wāhi tapu included in KCDC's district plan:

- Takamore wāhi tapu, Flaxmere St to Puriri Rd, item W4

Potential effects and mitigation of this impingement will be discussed below.

Historic survey plans

Historic survey plans at Land Information New Zealand were studied. Survey plans can be rich in archaeological or historical detail, as the surveyors of the time often noted many extant features, including settlements, topography and landscape, and other sites and features.

The plans consulted are listed in the sources of this report.

None of these plans contained any specific archaeological data, although several contained useful data by way of topographic information.

SO plan 11036 (not dated, but pre 1886[31]; Figure 6) shows details of topography around the sites of Paraparaumu beach and Waikanae, showing ridges, lakes and swamps, rivers, and locality names.

[30] The KCDC district plan includes a list of recorded archaeological sites for information purposes; these are not subject to the district plan rules

[31] This is inferred, as the railway line, built in 1886, is not shown

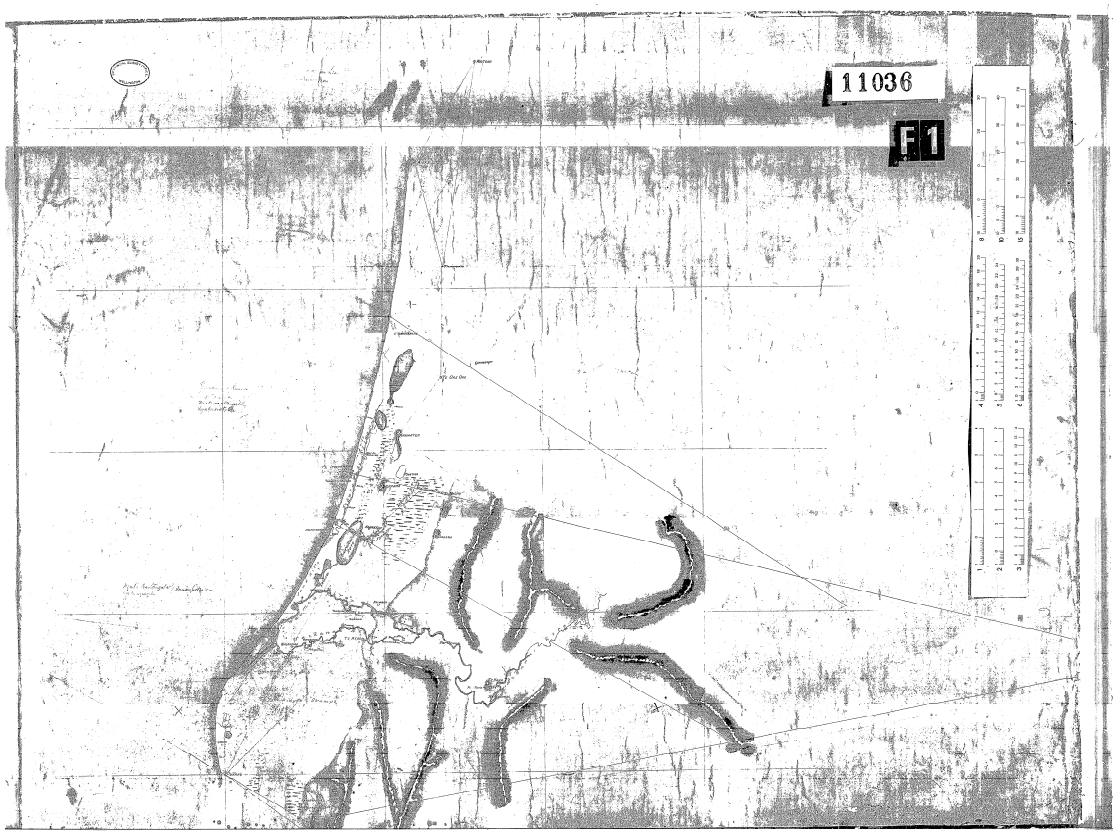

Figure 6: SO 11036, n.d.

Figure 7 shows detail of plan SO 11036:

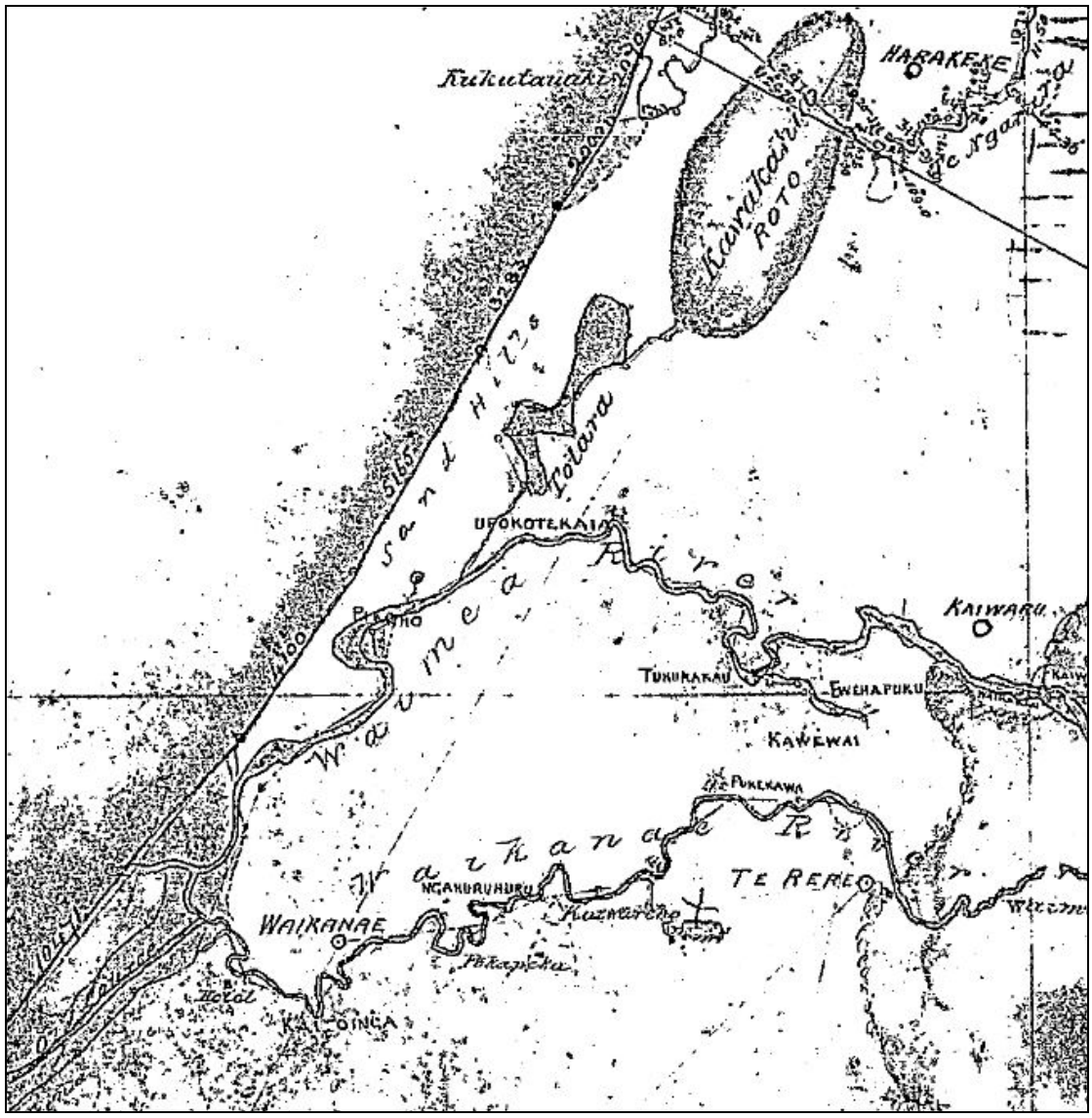

Figure 7: Detail of SO 11036

Figure 8 shows the topography between Paraparaumu township and the beach, showing the sand dunes interspersed with wetlands.

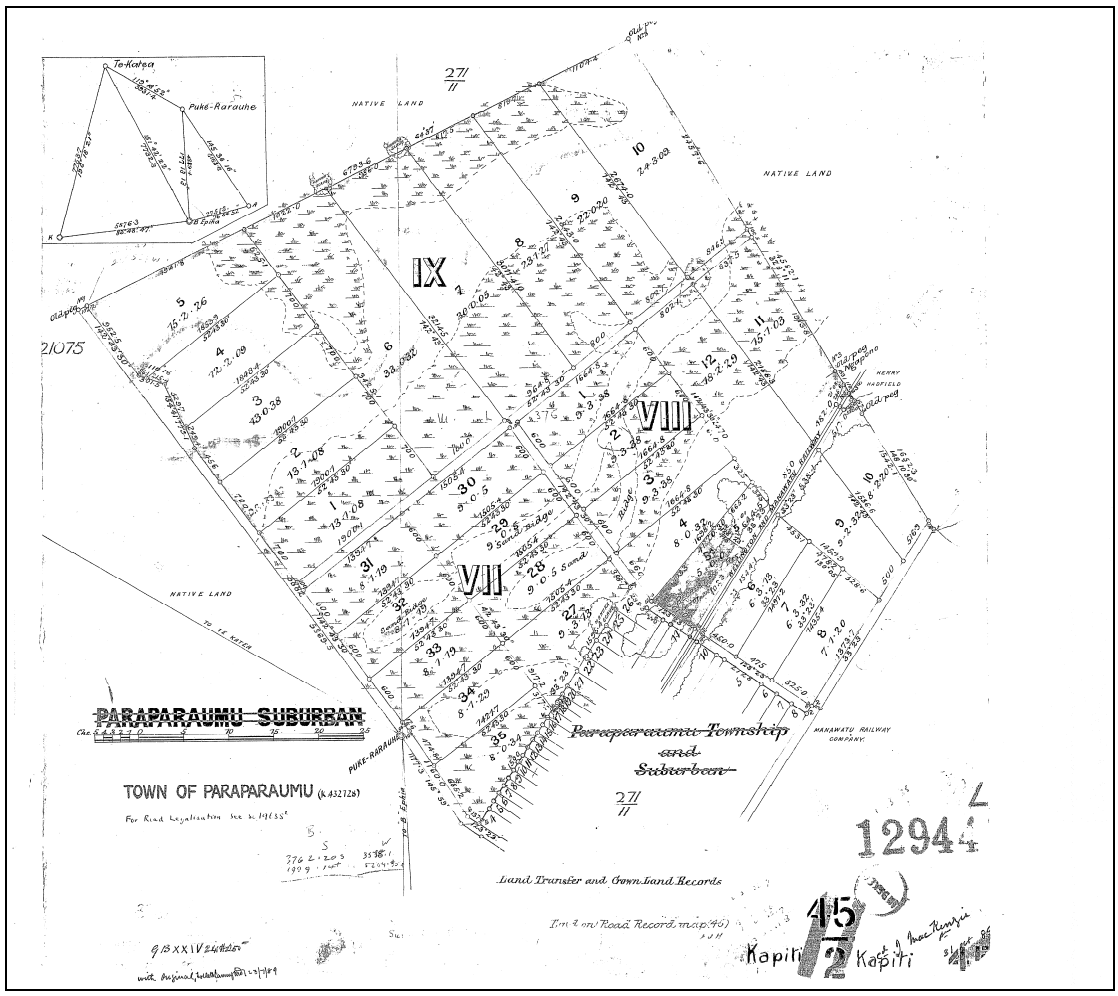

Figure 8: SO 12944, 1889

Figure 9 shows the landscape around the Waikanae River, with the meandering Waimea stream, and the inland wetlands (note that detail from this plan has already been included as Figure 4).

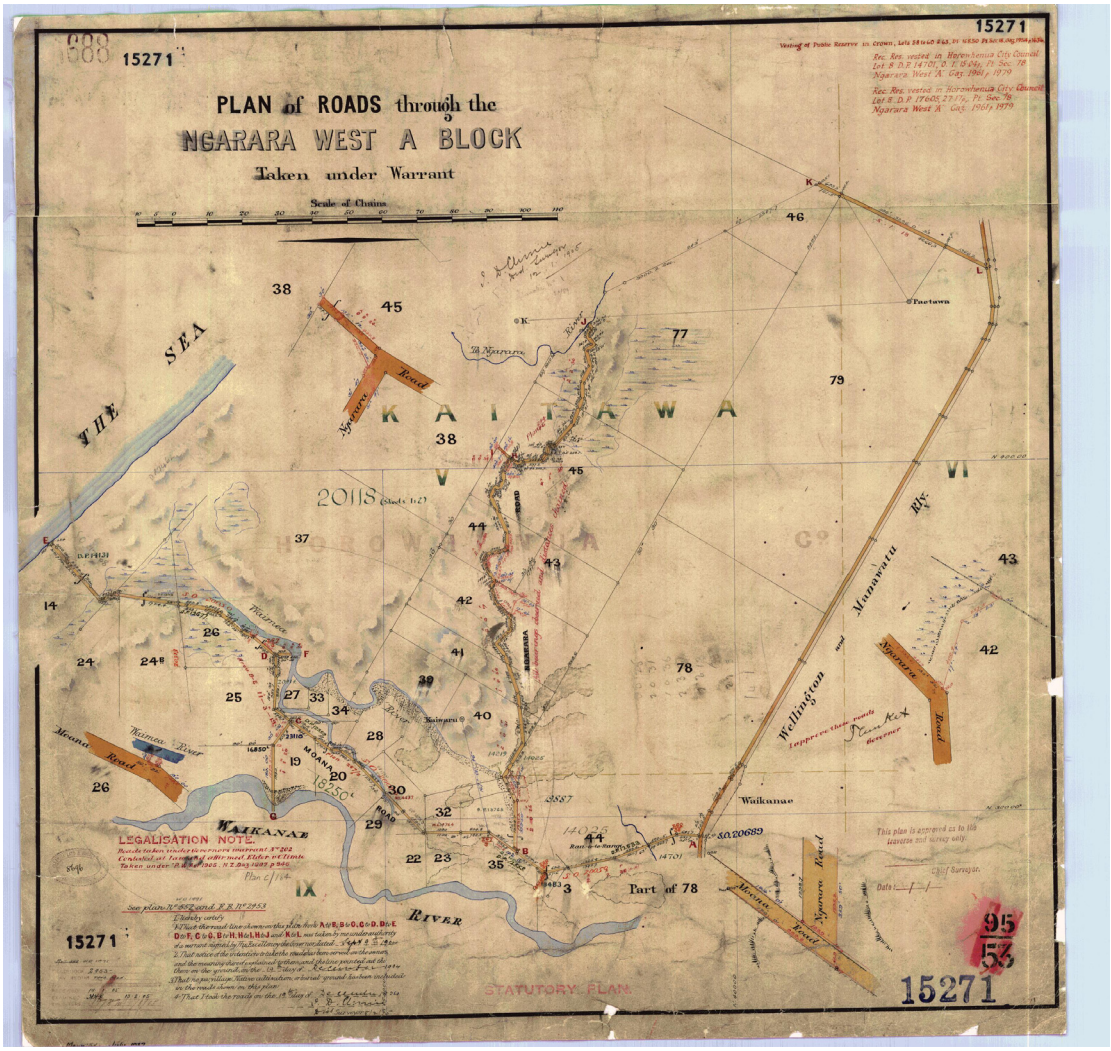

Figure 9: SO 15271, 1904

Several plans show land parcels and owners' names. Again, while not of specific archaeological interest this information is useful in tracing the development and expansion of the area, and ownership of land parcels over time.

Figure 10 shows the land parcels and owners around the Waikanae area.

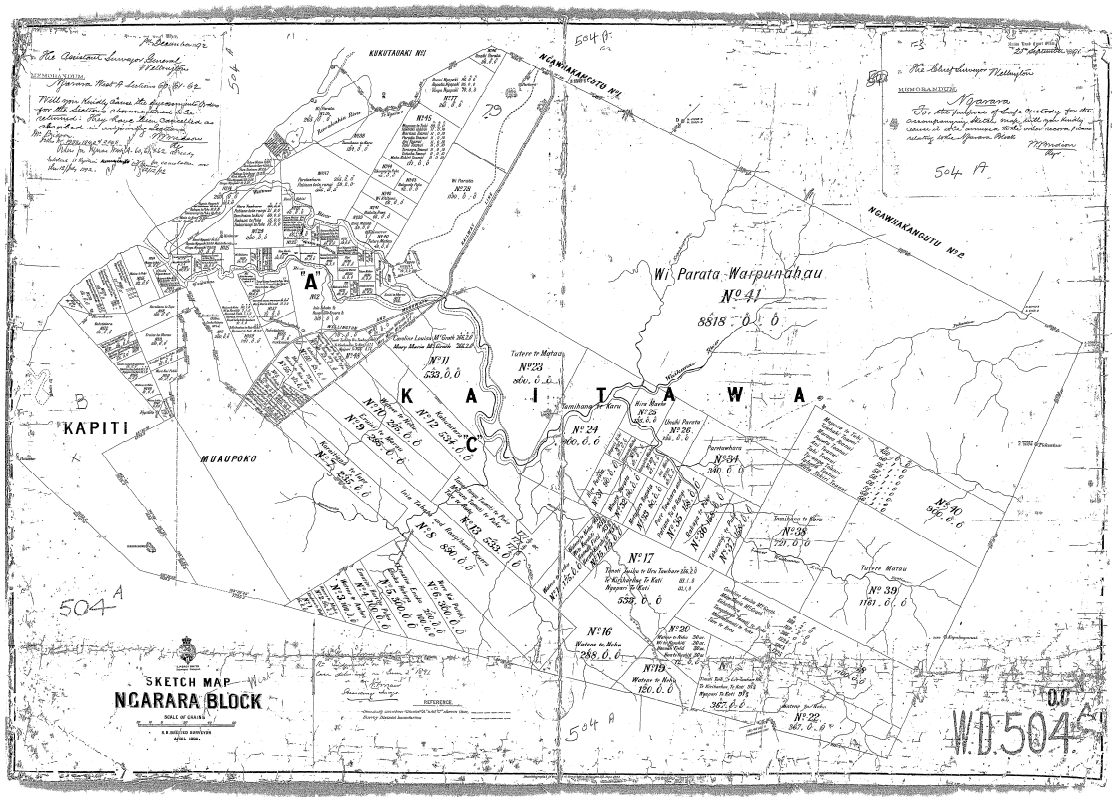

Figure 10: ML 504A, 1891

Plan ML 1491, seen in Figure 11 and Figure 12, shows the land parcels north of the Waikanae River in 1898, with some topographic detail.

Figure 11: ML 1491, 1898 part 1

Figure 12: ML 1491, 1898 part 2

SO 11089, seen in Figure 13 and Figure 14 shows the parcels to the south of Paraparaumu in 1874, indicating the development planned for the area which is now largely Queen Elizabeth Park.

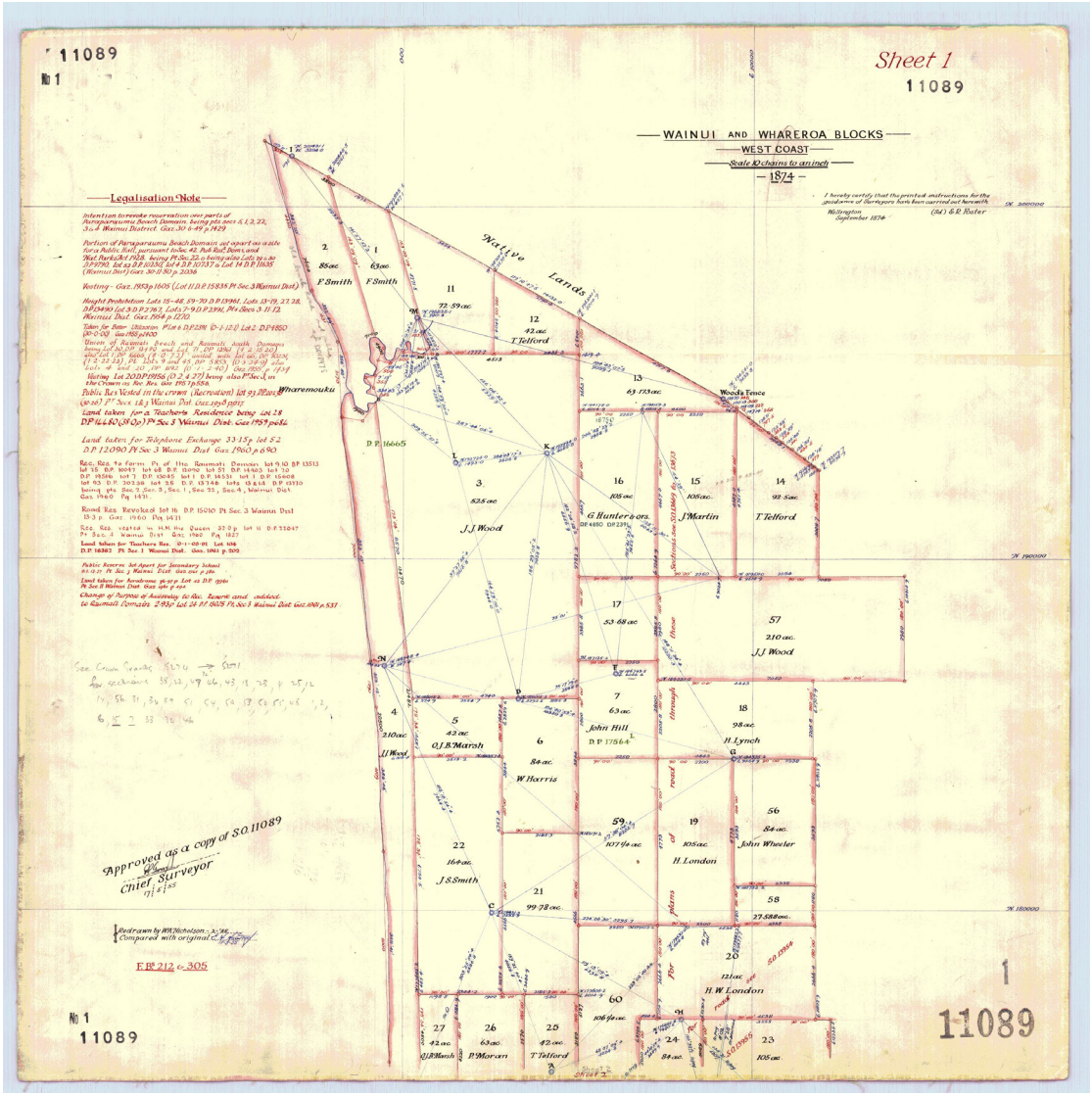

Figure 13: SO 11089, 1874 part 1

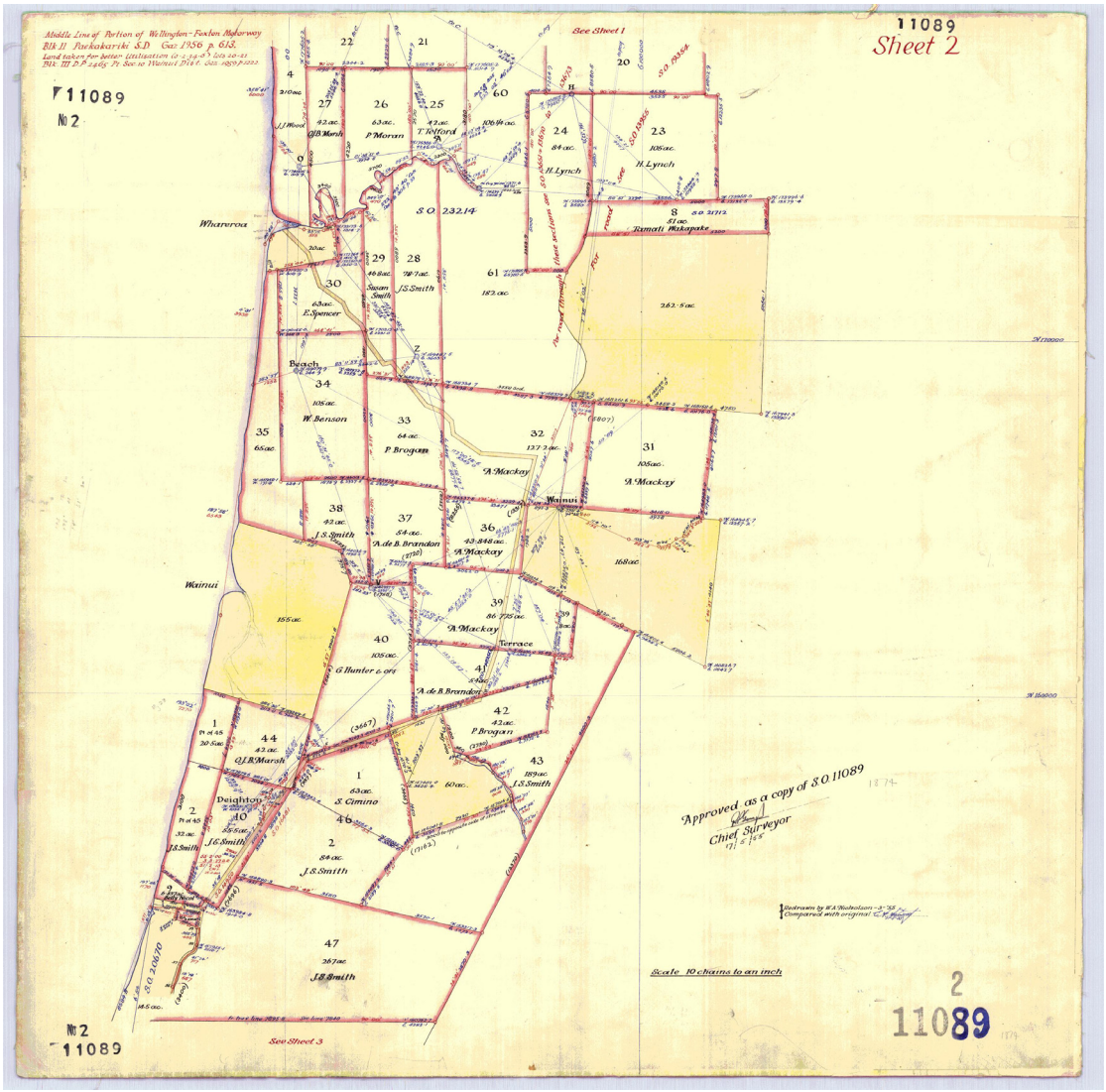

Figure 14: SO 11089, 1874 part 2

Figure 15 shows the Ngarara block, north of Waikanae in 1880, seen in ML 504. This plan contains the only detail of what might be considered archaeological data.

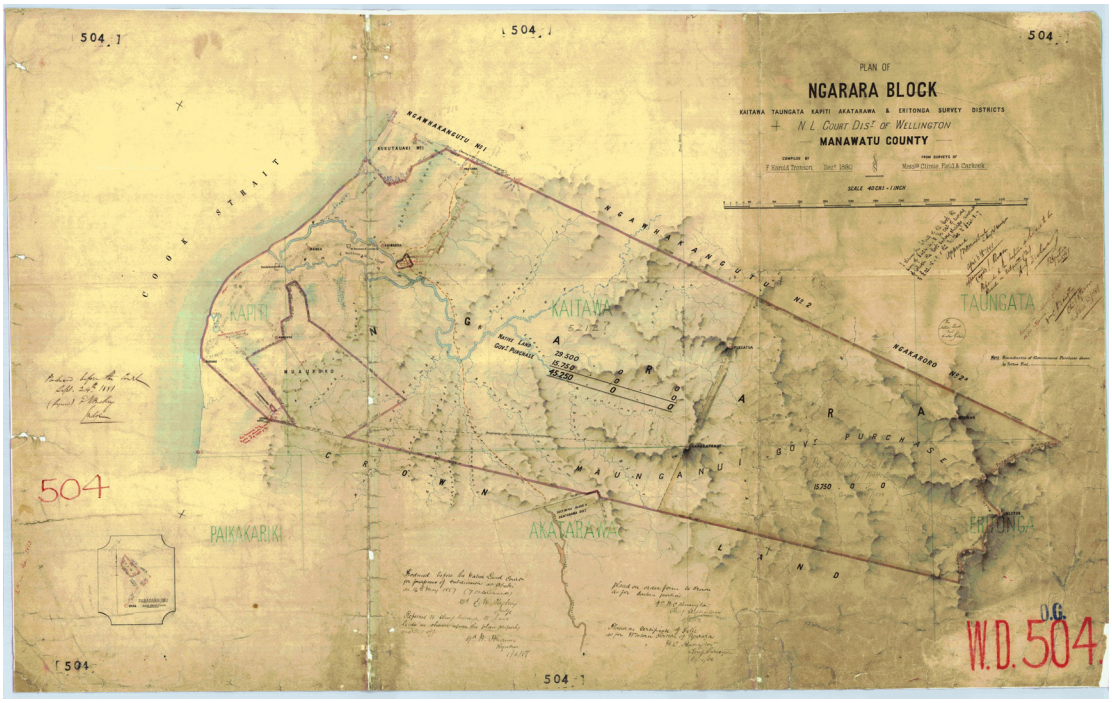

Figure 15: ML 504, 1880.

Detail from ML 504 (Figure 16) shows "Wi Parata's homestead" and "Waikanae native village" nestled between the Waikanae and Waimea Rivers. This is the site of Tuku Rakau Village, built by Wi Parata in 1849, and abandoned in 1886 when Wi Parata moved his people and marae to Waikanae township to take advantage of the newly opened rail line[32].

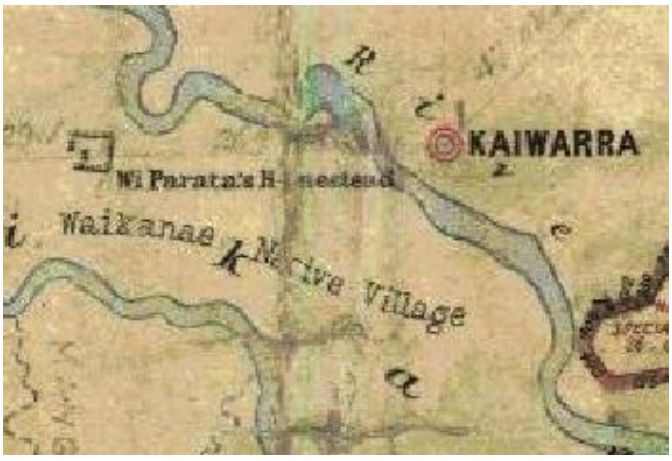

Figure 16: Detail from ML 504

[32] Carkeek, 1966:147

In summary, the historical survey plans do not supply much in the way of specific data on archaeological sites and features, with the one exception of Tuku Rakau village. They do, however, provide interesting and useful contextual information on the topography and landforms in the period around the 1880s to the turn of the century, showing the pattern of wetlands and dunes, which in turn can contribute to a model of likely site localities. Original alignments of rivers also provide useful contextual data regarding the landscape pattern that existed during this period. The historical plans also indicate the extent of the wetlands, and indicate what an important landscape feature they were prior to recent drainage.

4.3. Site visits

Numerous site visits have been made to the area of the proposed Expressway, both for the Project itself and previous visits by the archaeologist for other projects in the immediate vicinity of the Project.

In summary, the entire route has been walked or viewed by the archaeologist. Some areas were not walkable due to impassable vegetation such as gorse or blackberry; however the general landscape and topography of these areas was viewed, especially for the purposes of the predictive model postulated in section 5.7 of this report.

The specific topography and geomorphology of each section is detailed below in section 6.4.

Site visits made for this Project are listed below:

- 14 October 2010: site visit with Project team[33], to area of Queen Elizabeth Park south of Poplar Ave, to area between Poplar Ave and Raumati Rd, to area west of Ihakara St, to area on Kāpiti Rd between Arawhata Rd and Te Roto Drive, and to the area of the landfill
- 28 October 2010: Jonathan Smith property, north of Te Moana Rd to Peka Peka Rd
- December 2010: geophysical survey of Maketu Tree area
- 2 February 2011: Kensington Park property, south of Peka Peka Rd
- 17 February 2011: dune between Kāpiti Rd and Mazengarb Rd, dunes either side of Raumati Rd
- March 2011: geophysical survey of Tuku Rakau village site
- 13 April 2011: dunes south of Otaihanga Rd, land between Otaihanga Rd and the river
- 14 July 2011: drive and walk with Chris Jacomb of SPAR, to view the route and discuss the archaeological issues.

[33] This Technical Report refers to the Project team as carrying out works on behalf of and as contracted by the NZTA. The NZTA is the requiring authority and the consent holder.

Previous projects within the vicinity of the proposed Expressway that included site visits by the archaeologist include:

- 1997-98: site visits for the existing WLR designation, which covers much of the same alignment as the proposed Expressway Designation
- 2002: monitoring of earthworks at Metzenthein Estate subdivision, Raumati
- 2003: monitoring of earthworks at Langsdale Park, Raumati
- 2004: excavations of burials and other archaeological features at Waterstone subdivision, Mazengarb Rd, within same dune belt as part of proposed Expressway Alignment
- October 2008: archaeological assessment and site visit for proposed Ngarara village development on Jonathan Smith property, between Te Moana Rd to Peka Peka Rd
- 2010: assessment and test pitting at Paraparaumu Airport, which provided context for underlying dunes and geomorphology.

4.4. Iwi consultation

The archaeologist has had several meetings with the iwi for this Project, of both a formal and informal nature. Meetings have been with the Kaumatua committee of Te Ati Awa ki Whakarongotai, and with the Takamore trustees. In addition iwi members (most notably Ani Parata and Danny Mullen) have accompanied her during site visits and the geophysical investigations.

5. Archaeological resource

5.1. History of Settlement and occupation

Although relatively little strategic archaeological surveying has occurred along the Kāpiti coast, enough sites have been recorded to give a clear idea of the nature of occupation in the pre-contact period (i.e. before the early 1800s). The Maori population would have been living in an environment rich with resources and opportunities. The coast and estuaries would have provided fish and shellfish, the forested dunes would have provided birds, rats and plant species, and the swamp areas would have yielded birds, eels and further plant species.

Various tribal groups moved in and out of the region, including Waitaha and Muaupoko, who lived along the Kāpiti Coast until about 1822. At this time Te Ati Awa of Taranaki accompanied Te Rauparaha on his great heke of 1821-22, and they settled around the Waikanae estuary area[34].

[34] WRC River Flood Plain Management Plan, 1992

With the discovery that the Southern Right whale makes an annual migration along the coastline between Kāpiti Island and the mainland, whaling stations were established on the Kāpiti Coast by the late 1820s. At the same time a market for flax arose in Sydney, and a large flax industry commenced on the Kāpiti-Horowhenua coast[35].

The Haowhenua battle of 1834 was a long-running dispute between Ngati Awa and Ngati Raukawa largely over land. A group of Ngati Awa arrived in the area between Waikanae and Ōtaki in 1833, putting pressure on the land resources there. Ngati Awa attacked Ngati Raukawa in their pa at Rangiuru, and then sought refuge in their own pa of Haowhenua across the Ōtaki River. A series of battles ensued, with Ngati Raukawa coming south at one stage and attacking Kenakena pa. There was no clear victor and peace was made[36].

However, the peace did not last long, and land grievances reached a head in 1839 with the Kuititanga battle. This battle was fought at the Waikanae estuary between Te Ati Awa and their northern neighbours, Ngati Raukawa, over disputed land, and was the last tribal battle fought in the Waikanae district[37]. Although Ati Awa repelled the Ngati Raukawa attack, a large number of warriors on both sides were killed. Ngati Raukawa attacked the Waimeha pa, and forced Te Ati Awa to retreat across the Waikanae River to Arapawaiti. Here Te Ati Awa rallied and forced Ngati Raukawa back up the beach[38].

In October 1839 the New Zealand Company survey ship *Tory* sailed along the Kāpiti Coast and dropped anchor. The ship carried Colonel Wakefield, Archdeacon Henry Williams and Ernest Dieffenbach, who went ashore to help the wounded from the Kuititanga battle[39].

Land trade and acquisition occurred from the 1840s. The first Europeans to settle in the region were the missionaries of the Church Missionary Society. European settlement developed through the region, based in part on the flax industry and on farming, and Maori continued the flax trade already established. Maori also had access to new crops, and new horticultural tools and techniques, which increased the range of available food. Mills for water, flour and flax were built in the district[40].

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[35] MacLean , 1988

[36] MacLean, 1988:18-20

[37] Carkeek, 1966:55

[38] MacLean, 1988:20

[39] MacLean, 1988

[40] MacLean, 1988

Construction of the main trunk rail line in the 1880s enabled development commerce and farming along the line on the Kāpiti Coast. It also facilitated urban development: in 1886 Wiremu Parata gave land for the railway and moved the Te Ati Awa village of Tuku Rakau to the Township of Parata (modern Waikanae). The adjacent Maori land (Ngarara Block) was opened for sale as village and farmland[41].

5.2. Recorded and known archaeological sites

Historical recording

Recording of archaeological sites on the Kāpiti Coast has taken place for much of the 20th century, but observations commenced prior to this.

Field[42] described changes in the appearance and geomorphology on the coast in a forty year period based on his own observations, made between 1851 and 1891. He noted that in 1851 a constabulary station (police station) was located near the mouth of the Waikanae River, but by 1868 the river had changed course and washed part of the station away.

In particular Field described a site on the south side of the Waikanae River:

> "A sandhill 30ft to 40ft high, which formerly stood almost behind the hotel, and which from the immense amount of pipi-shells which it contained, formed a very conspicuous landmark for entering the river, has been entirely blown away, and its contents are now scattered over nearly flat ground"[43].

Field also attested to the dynamic nature of the sand dunes: "At the back of the hills a considerable extent of what was good grass-land is now buried under sand"[44].

Field also noted that with the shifting dunes

> "...many long buried articles have come to light....kitchen middens and immense numbers of old cooking stones...an ancient Maori cemetery....very many moa bones.....large numbers of obsidian flakes, adzes (more or less perfectly finished) of greenstones, chert, obsidian, and

[41] MacLean, 1988

[42] Field, 1891

[43] Field, 1891: 562

[44] Field, 1891: 563

hoop-iron, intermixed with other articles of unquestionably European origin"[45].

Adkin[46] is a key source of data for archaeology further north of Kāpiti, at Horowhenua. In his landmark book *Horowhenua* he reported on his years of observations and analysis of sites in Horowhenua as far south as Ōtaki. Two aspects make Adkin's data of particular significance: firstly, that he spoke with Maori in the area in the 1920s, and recorded place names and traditions of the area, and secondly he observed and recorded many sites from the 1920s onwards, before sites were obscured or destroyed by the more intensive farming techniques of the 1950s onwards. Many of Adkin's observations on the nature and distribution of sites can be extrapolated further south to the Kāpiti area; however an important archaeological research theme is to test and validate some of Adkin's hypotheses on the Kāpiti data.

A key observation made by Adkin was division of the Horowhenua middens into two groups:

- A group of younger middens, in a band on the present foredune closest to the sea. These are looser and more widely scattered, are almost exclusively tuatua[47], and have practically no artefacts associated with them.
- A group of older middens further inland, in dense compacted heaps, with many artefacts of bone and stone[48].

Adkin interprets the different middens as different site types: the coastal middens are singe phase food gathering sites and the denser inland middens with artefacts are "centres of community activity"[49]. It is reasonable for Adkin to assume the middens on the coastal dunes are younger, as these dunes are geologically more recent.

This pattern of younger middens on the foredune and older middens further inland may well be repeated on the Kāpiti Coast. This is based on inference, and requires testing and validating by observation and radiocarbon dating. A key research theme for archaeological work on the Kāpiti

[45] Field, 1891: 563

[46] Adkin, 1948

[47] Adkin calls the shells "pipis" but applies the scientific name *Amphidesma subtriangulata*, which is in fact the name for tuatua

[48] Adkin, 1948: 40

[49] Adkin, 1948: 40

Coast is, therefore, to see if Adkin's hypothetical differentiation of Horowhenua midden types is also seen further south on the Kāpiti Coast.

Beckett[50] wrote in 1957 of observations made in the 1920s and earlier, prior to substantial development of the area. Beckett uses terminology in a different way to that in use today: for example, he uses the term "pa" within the archaeological definition of the term to describe defended settlements and also to describe undefended settlements or kainga. Therefore, care needs to be taken when reviewing Beckett's observations. However, Beckett's notes provide invaluable data on sites that are now completely destroyed, such as occupied villages in the vicinity of Kāpiti Road.

In 1966 Carkeek compiled a history of Maori occupation of the Kāpiti Coast based on traditional accounts, detailing important historical events like the Kuititanga battle. He included a specific chapter on the middens of the coast. A major part of his book is a list and description of place names of the coast, based on traditional evidence, and maps showing the locations of these places.

There has been sporadic archaeological site recording in the Kāpiti-Horowhenua region from the 1920s through to the present. Only one planned systematic survey has been undertaken, by Colin Smart and students of the Wellington Teachers College in 1959-61. Smart was specifically sampling and analysing middens, so arguably was not concentrating on other possible sites. However, like Adkin, Smart also noted the environmental relationship between the dunes and the midden sites.

Contemporary recording

The vast majority of archaeological site recording since the 1980s has been reactive and development driven. This increased in the 1990s with the introduction of the resource consent process of the *Resource Management Act*, which introduced the requirement of Assessment of Environmental Effects.

Recent archaeological work on the coast falls into three broad categories:

- Site surveying, most usually undertaken for an assessment prior to a specific development outcome such as a subdivision or a road;
- Monitoring of development work, such as construction of subdivision or roads;
- Research-driven work, which may include research for DoC or another management body, or research to inform the archaeological record.

Table 1 lists the authors and approximate areas of the archaeological work undertaken on the coast in about the last 20 years. The primary source for this data is the Historic Places Trust's digital

[50] Beckett, 1957

library of unpublished archaeological reports. Table 1 cannot be considered an exhaustive list, as it only contains data known to the archaeologist, or that has made it into the public record though the statutory process of the HPA authority process. Occasional surveys may have been undertaken which never resulted in a statutory outcome (e.g. an archaeological authority), so the work and any resulting report has never been released into the public domain.

The locations of the work outlined in table 1 can be seen in Figure 17.

Table 1: Statutory archaeological work undertaken on the Kāpiti Coast

	Author	Report name	Date	Summary of content/coverage
1	Walton, Anthony	Archaeological Sites on Kāpiti Island : a summary	1991	Survey and recording on Kāpiti Island, Maori & European sites
2	Gumbley, Warren	Archaeological Assessment : Kotuku Subdivision, Waikanae	1998	Archaeological survey prior to subdivision, no sites noted
3	Forbes, Susan	Queen Elizabeth Park, Paekakariki : Archaeological Report	1998	Archaeological survey within the park, for upgrade of irrigation and water pipes within the park. Two new sites (midden and pits) recorded
4	Leach, Foss et al	Analysis of faunal material from an Archaeological Site at Raumati Beach near Wellington	2000	Detailed analysis of midden material recovered from site in Raumati, prior to development. Contained two species of tuatua, shell scrapers, fishbone from 14 species, including deepwater species
5	Forbes, Susan	Stage 6 Midlands Subdivision, Paraparaumu, Kāpiti Coast : Archaeological Investigation	2000	Investigation of archaeological features revealed by surface stripping. Fours middens and an oven.
6	Forbes, Susan	Wainui, Queen Elizabeth Park, Paekakariki : Archaeological Monitoring for new toilet construction, Wellington Regional Council	2001	Monitoring for construction of toilet block, midden.
7	O'Keeffe, Mary	Archaeological Assessment of Site at 10 Paetawa Rd, Pekapeka, Kāpiti Coast	2002	Assessment of land prior to sale, one surface scatter of midden

	Author	Report name	Date	Summary of content/coverage
8	Greig, Karen	Investigation of Lots 178 and 179, Kotuku Parks, Paraparaumu Beach	2002	Trenching to test for site presence, no sites present
9	O'Keeffe, Mary	Investigation of Midden at Metzenthein Estate, Raumati	2002	Investigation of midden revealed during stripping: dense tuatua midden within pit feature cut into ground surface
10	Greig, Karen	Archaeological Investigation Report : 90 Te Moana Rd, Waikanae	2003	Investigation of sites: shell middens and ovens, midden dominated by tuatua.
11	Greig, Karen	Archaeological Monitoring Report : 184 Peka Peka Rd, Kāpiti Coast	2003	Monitoring during subdivision construction: area of ovenstone, charcoal, shell (predominantly tuatua), fish, bird and rat bone in a matrix of blackened sand; two other tuatua middens nearby
12	Greig, Karen	Summary Report : 184 Peka Peka Rd, Kāpiti Coast	2003	Summary of archaeological monitoring (preliminary summary of 11)
13	O'Keeffe, Mary	Rutherford Drive - Paetawa Rd Extension: Archaeological Monitoring	2004	Monitoring of construction of road extension, two middens and an oven revealed.
14	McFadgen, Bruce G.	The archaeological value of the human burial site at Mazengarb Road, Paraparaumu : report to Pritchard Group, Ōtaki	2004	Specific commentary on burials found as part of 17
15	McFadgen, Bruce G.	Archaeology at MacKay's Crossing	2005	Investigation of a stable floor
16	O'Keeffe,	Subdivision at 183 Ngarara Road, Waikanae:	2005	Investigation of large midden on sand dune, revealed during

	Author	Report name	Date	Summary of content/coverage
	Mary	Archaeological Monitoring		earthworks.
17	O'Keeffe, Mary	Waterstone Subdivision, Mazengarb Road, Paraparaumu: Archaeological Investigations and Monitoring Report	2005	Monitoring of earthworks for subdivision: 95 midden & ovens features recorded, plus eight burials
18	Petersen, Kiri	Section 18 Investigation of R26/32 and R26/33 at Tasman Lakes, Peka Peka	2006	Investigation of two middens, to define and exclude from subdivision
19	Grouden, Victoria	Archaeological Investigation Midden Site R26/378, Weka Park, Paraparaumu	2007	Investigation of midden damaged by path forming
20	Petersen, Kiri	Archaeological Monitoring Report, Fairway Oaks, Te Moana, Waikanae	2007	Comprehensive report of all archaeological investigations at location: investigation of middens and ovens
21	Petersen, Kiri	Archaeological Monitoring Report: Peka Peka Road, Waikanae	2007	Investigation of sites to be affected by roadway for subdivision: 9 areas of dense midden
22	O'Keeffe, Mary	Earthworks at 28 Flaxmere Road, Waikanae: archaeological monitoring	2007	Monitoring of dune clearance, no sites
23	Petersen, Kiri	Summary Monitoring Report, 'Faith's Farm, Derham Road, Te Horo	2007	Summary of 28
24	Petersen, Kiri	Summary Report for Monitoring of Earthworks at Mazengarb Road, Paraparaumu	2007	Summary of 29
25	Petersen, Kiri	Summary Report For Monitoring of Earthworks at	2007	Summary of 30

	Author	Report name	Date	Summary of content/coverage
		Tasman Lakes, Peka Peka		
26	Petersen, Kiri	Summary Report on Archaeological Monitoring at Fairway Oaks, 90 Te Moana Road, Waikanae	2007	Summary of 20
27	Petersen, Kiri	Summary Report on Geotechnical Investigations For Proposed Western Link Road	2007	Summary of 32
28	Petersen, Kiri	Archaeological Monitoring Report, Faiths Farm: Te Horo, Kāpiti Coast	2008	Monitoring of earthworks for subdivision: eleven areas of middens and ovens investigated
29	Petersen, Kiri	Archaeological Monitoring Report: Mazengarb Road, Paraparaumu	2008	Monitoring of earthworks for subdivision: ten areas of middens and ovens investigated
30	Petersen, Kiri	Archaeological Monitoring Report: Tasman Lakes Subdivision, Peka Peka, Kāpiti Coast	2008	Monitoring of earthworks for subdivision: seventeen areas of middens and ovens investigated, plus wooden artefacts and whalebone
31	Aranui, Amber	Otaihanga Landfill Archaeological Monitoring Report	2008	Monitoring of earthworks for new access road: one midden and firescoop investigated
32	Jacomb, Chris & Walter, Richard	Report on Archaeological Investigations at Takamore, Kāpiti Coast, carried out under s18 Authority 2007/62	2008	Test trenching following fluxgate gradiometer survey in wetlands; no sites found
33	Aranui, Amber	Titoki Road, Raumati, Archaeological Monitoring Report	2008	Monitoring of earthworks for subdivision: 8 middens in two distinct locations investigated

	Author	Report name	Date	Summary of content/coverage
34	Petersen, Kiri	Addendum to the Archaeological Monitoring Report, Peka Peka Road, Waikanae	2009	Addition to 21
35	Petersen, Kiri	Archaeological Monitoring Report Monitoring of Earthworks at 'Sea Haven' Subdivision, Corner of Peka Peka and Paetawa Roads, Waikanae	2009	Monitoring of earthworks for subdivision: twelve areas of middens and ovens investigated
36	Petersen, Kiri	Archaeological Summary Report: Tasman Lakes, Paetawa Road, Peka Peka, NZHPT Authority 2009/01	2009	Summary of 30
37	Petersen, Kiri & McAlpine, Christen	Ferndale Archaeological Monitoring Report	2009	Monitoring of earthworks for subdivision: 13 middens and ovens investigated
38	Greig, Karen	Kotuku Park Stage 4, Paraparaumu: Archaeological Monitoring for Authority 2008/47, Summary Report	2009	Ongoing monitoring of earthworks: small patches of middens
39	O'Keeffe, Mary	Test Pitting, Paraparaumu Airport, Kāpiti Coast	2009	Test pitting in dunes to south of airport: one midden
40	O'Keeffe, Mary	Double Tracking of Main Trunk Rail Line, MacKays Crossing-Waikanae: Archaeological Monitoring Authority 2009/58	2010	Monitoring of work along main trunk line: wooden corduroying, no Maori sites
41	O'Keeffe, Mary	Test Trenching, Paraparaumu Airport, Kāpiti Coast	2010	Test trenching within airport land: ground surface modified for construction of airfield

	Author	Report name	Date	Summary of content/coverage
42	Petersen, Kiri	Waterfall Road Connection: Section 18 Archaeological Report	2010	Investigations following geophysical survey, undertaken for road construction, possible evidence of cultivation

Figure 17: Location of statutory archaeological work on Kāpiti Coast

Additional work has been undertaken by the archaeologist which has not resulted in statutory outcomes (in that no applications for archaeological authorities under the Historic Places Act 1993 have been sought), but which has a bearing on the archaeology of the proposed Expressway.

- Western Link Road: the archaeologist undertook archaeological assessments for Opus International for the existing WLR designation in 1997.
- Ngarara: the archaeologist undertook an assessment of the proposed Ngarara Village subdivision proposal in 2009 for the landowners, Jonathan Smith. Mr Smith owns a large property to the north of Te Moana Rd.

Most other archaeological recording has either been opportunistic sightings, or sites notified or recorded after exposure through development or earthworks.

5.3. Analysis of known sites

At the time of writing there are 286 recorded archaeological sites between Paekakariki and Peka Peka Rd, which is the region of the coast within which the proposed Expressway falls.

A distribution plot of recorded sites between Paekakariki and Peka Peka Rd can be seen in Figure 18.

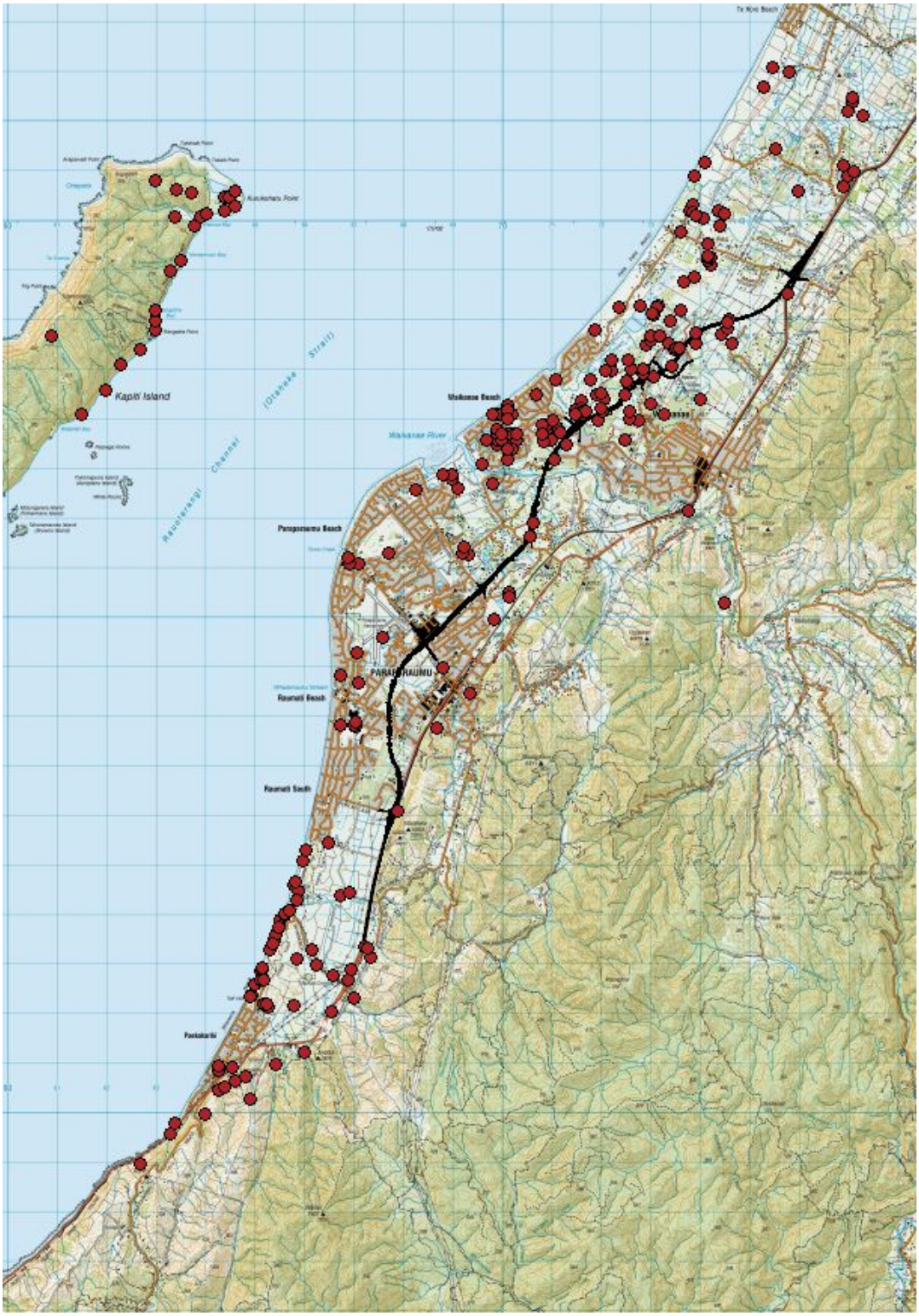

Figure 18: All recorded archaeological sites on the Kāpiti Coast
Black line on map is proposed Expressway route

There are various types of sites on the coast. The predominant site types are middens, burials, ovens, pits, terraces and platforms, and artefacts.

Middens

The most visible and most numerous site type on the Kāpiti Coast is midden. Shell deposits occur over much of the coast, and account for 65%[51] of the recorded sites. This high occurrence appears to reflect the major contribution that kaimoana made to the local subsistence economy. However, it may be that middens are disproportionately represented on the coast, as it may be possible that archaeological remains of other activities such as gardening have either not survived or are not particularly visible, thus giving a skewed picture.

The distribution of midden sites can be seen in Figure 19.

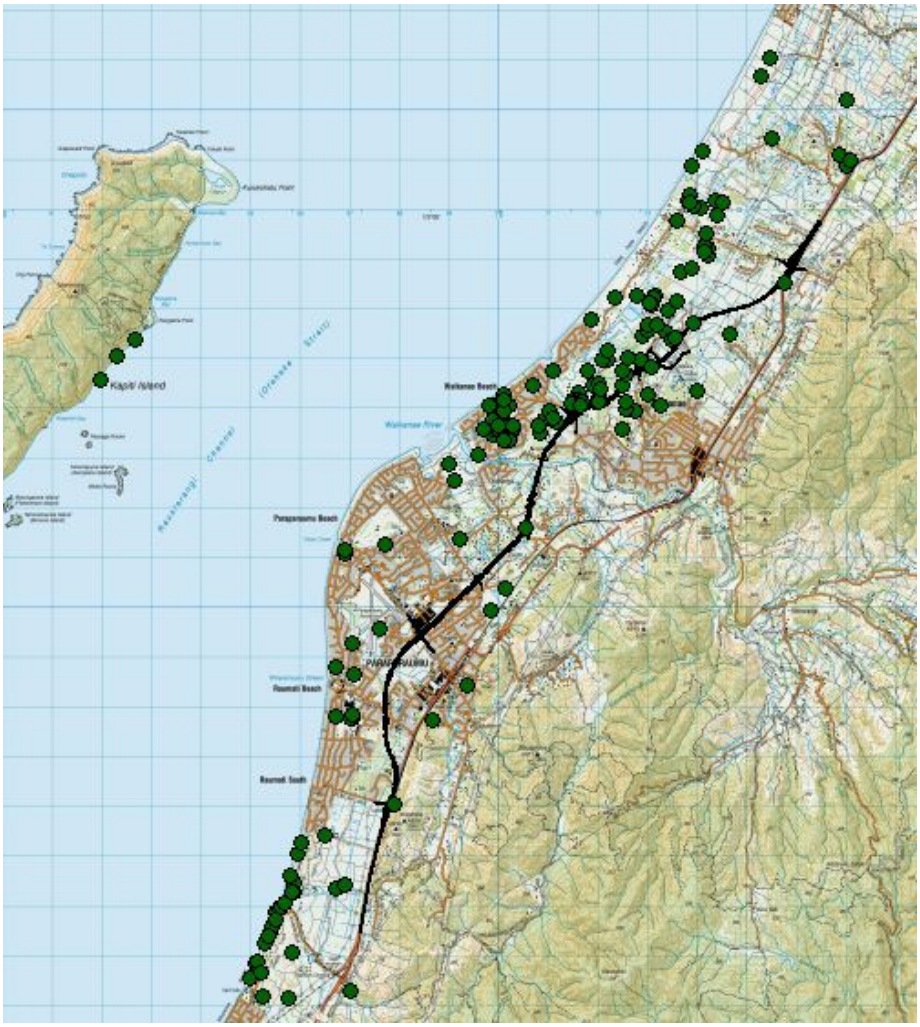

Figure 19: Recorded midden sites

[51] 187 out of the 286 total recorded sites

Middens are one of the earliest recognised archaeological features on the coast; as noted they were observed and described by Best and Adkin and others in the later 19th and early 20th century.

Middens are found exclusively on sand dunes on the Kāpiti Coast; they are not found within wetland areas. They can be located on the tops of dune ridges, or on the dune slopes, perhaps using the dune to provide shelter from the wind. In size and nature they range from sparse surface scatters to large and dense deposits, for example as seen at R26/443.

Due to the dynamic shifting nature of the dunes, middens can be located on the ground surface, and may occasionally be quite visible beneath light vegetation cover, or exposed in section in an eroded area such as a stock rub. They may also be up to several metres below the ground surface, where a dune surface has been inundated by subsequent sand.

Middens are found on both sides of the Waikanae River. No specific analysis of the middens has yet been undertaken to determine whether there is any difference in size or nature of deposits or constituent shells in middens either side of the river.

Middens are occasionally found in association with ovens. The shells themselves rarely show signs of burning, (which would be seen as grey colouring on the surface of the shell), nor are there often clear charcoal deposits around the midden shell. The most common archaeological evidence of ovens is ovenstones, which are water-rolled round cobbles which have been excessively heated, seen in surface discolouration or fracturing of the cobble.

This report proposes that middens on the coast are likely to be of three types:

- small localised scatterings of shell of a small group of people moving about the coast and stopping for a quick meal;
- larger deposits of shells associated with a larger group of people living nearby or who had stopped and camped for a period of time; and
- functional “factory floors’ where shellfish was being processed, either by smoking or airdrying, to be transported elsewhere.

This hypothesis needs to be tested by closely examining the archaeological data, both from already recorded sites and from sites that may be revealed by construction work for the proposed Expressway, should it be built.

From visual analysis, as reported in the site record forms, the most common constituent species is tuatua. Little analysis has been undertaken of midden on the coast to assess the presence of fishbone, or other bone such as rat or bird. Based on their high rate of presence, shellfish is considered to be a high part of the overall subsistence diet of the occupants of the coast. However, there may be an over-representation in the archaeological record of the importance of this resource, given the lack of analysis of other food sources such as fish or garden crops.

Earthworks sites

Earthworks sites include all sites where some excavation or modification of the ground surface has been carried out by Maori. The category includes pits, terraces, and platforms; such sites are thought to be used for living on or storing crops.

18%[52] of the recorded sites on the coast are earthworks sites.

The distribution of earthworks sites can be seen in Figure 20.

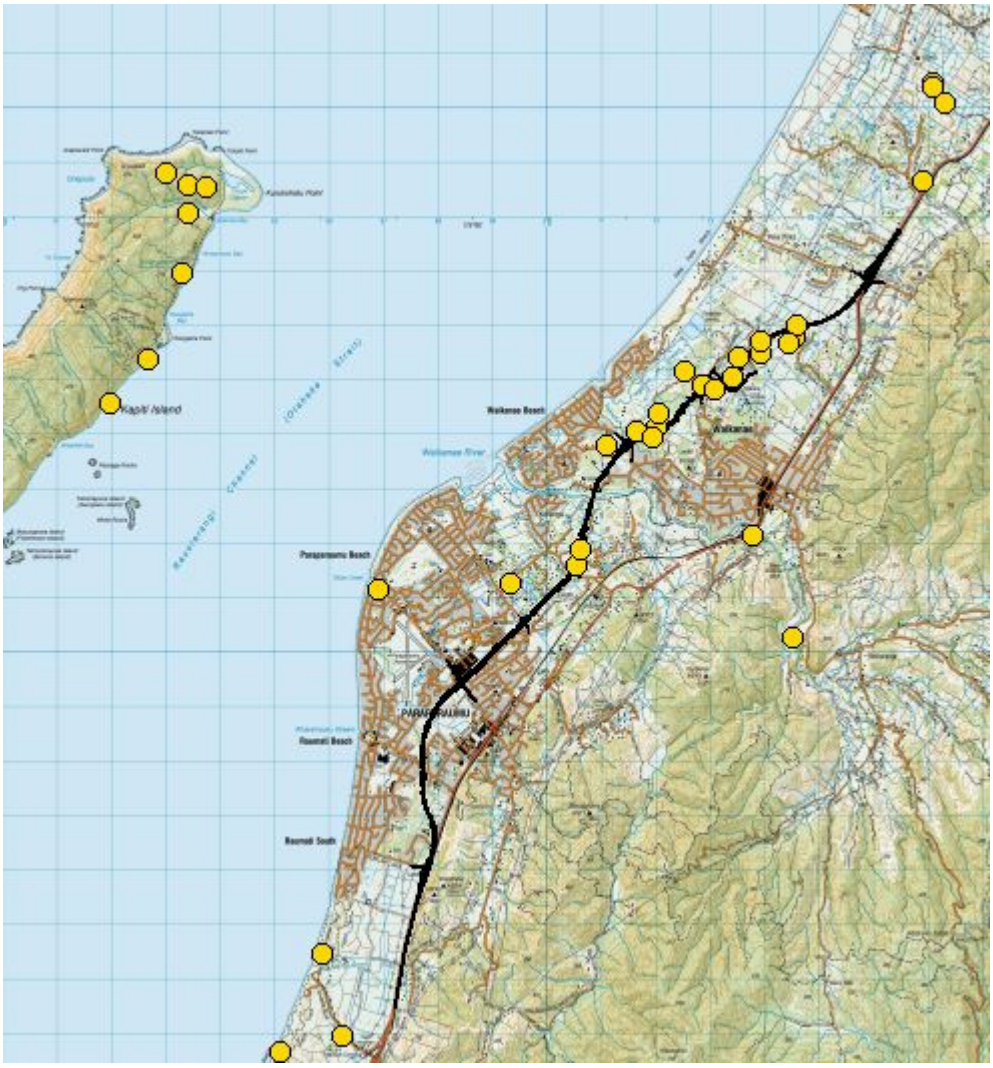

Figure 20: Recorded earthworks sites

Analysis of this distribution plot shows a particular pattern. There are far more earthworks sites on the coastal dunes north of the Waikanae river than south.

[52] 51 of the 286 total recorded sites

Four sites near the coast within Queen Elizabeth Park were recorded as pa: in an archaeological sense “pa” usually include some type of created defence such as ditches and banks or terracing, as well as the natural strategic advantage of the high site on which they are usually located. The pa within Queen Elizabeth Park have been recategorised for the purposes of this report as earthworks sites, as they do not contain defensive terracing or ditch and banks. Instead they are categorised as undefended settlement sites.

There is a marked difference in occurrence of earthworks sites south and north of the Waikanae River. South of the river the four earthworks sites on the coastal flats are pa within Queens Elizabeth Park, as noted. The other earthworks sites in the vicinity of Paekakariki are all pit sites on the edge of the wave cut costal cliff above the coastal dunes.

Far more earthworks sites have been recorded on the rolling dunes north of the river. These include pits, terraces and platforms.

This apparent difference in numbers and occurrence of recorded earthwork sites north and south of the Waikanae River is not yet understood, and no analysis of it has yet been undertaken. Several reasons are suggested: the difference could reflect a difference in resource utilisation and living practices either side of the river, or it could reflect a change in the geomorphology either side of the river, where dunes north of the river are more stable and earthworks sites have a better rate of survival.

Compared with the sharply defined features of earthworks sites in other regions round the country (for example, Bay of Plenty and Taranaki) the earthworks sites along the Kāpiti Coast tend to be vague and amorphous. This is probably due to the underlying material in which the sites are found: the Kāpiti Coast sand being far more unstable than the volcanic soils of the Bay or Plenty or Taranaki. It is therefore probable that evidence of further earthworks sites exists beneath the overlying surface vegetation on the coast. This may be the case both north and south of the Waikanae River.

Burials

Burials are a particular site type on the coast with a moderately high occurrence, constituting 5%[53] of the total recorded sites.

Burials on the coast include both individual people buried within the rolling dunes, where the shifting sand would cover them, and larger urupa. A notable example of a larger, unexpected urupa was

[53] 15 of the 286 total recorded sites

one revealed at Waterstone subdivision, Paraparaumu in 2004, where seven individuals were exposed on the top of a high dune being cut down for a subdivision[54].

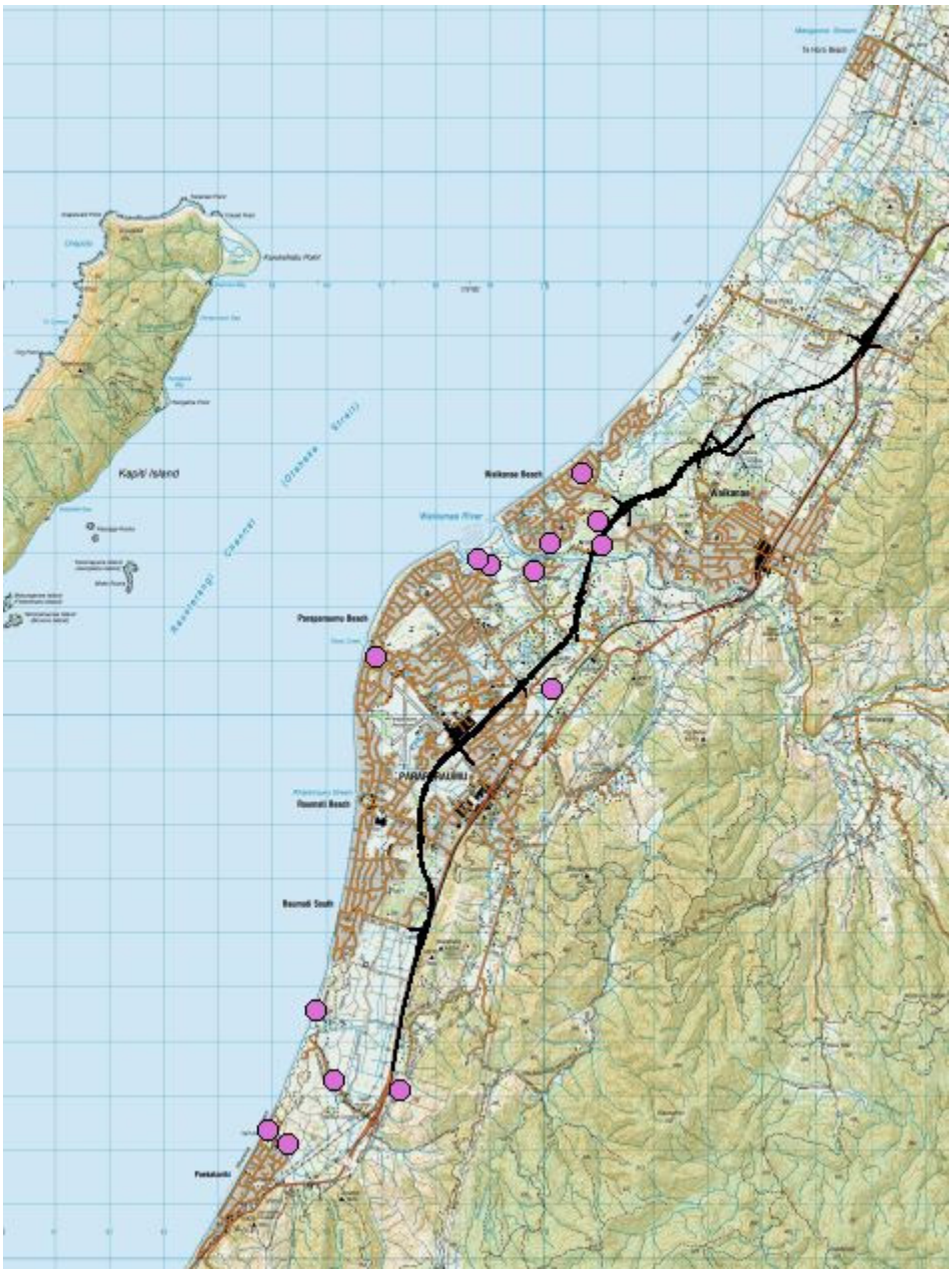

Figure 21: Recorded burial sites

[54] O'Keeffe, 2005a

5.4. Relationship between archaeology and the environment

There is a strong functional relationship between the environment and the archaeological resource. Along the Kāpiti-Horowhenua Coast the predominant site type on the coastal dunes is midden (refer Figure 19). These are deposits of shell, occasionally with oven evidence or some bone, marking either a temporary resting place of groups of people, or occasionally locations of more permanent settlements. The shell content of the midden varies. Some are almost entirely made up of tuatua, a coastal species. Other middens have a variety of species, including both coastal and estuarine species, indicating exploitation of the resource from both locations. Most middens contain either shell only, or shell with some fishbone. Relatively few artefacts have been found in the Kāpiti middens; however this statement should be qualified by the fact that very little strategic analysis of middens has taken place.

The other type of site found relatively frequently within the sand dunes is burials (refer Figure 21). Placement of a body in sand was a common burial technique of the pre-European Maori, along with secondary burial.

Archaeological work along the coast shows that due to the dynamic nature of the unstable dunes sites can be found several metres below the ground surface. Middens especially can be inundated by windblown sand.

Figure 22: Example of midden buried by windblown sand
(Petersen, 2007: 4)

In marked contrast to the dunes are the sites found in the foothills behind the coastal dunes. The types of sites recorded here include pa, pits and terraces, as a result of the more stable soils and geology.

The sites on the coastal dunes may represent more transient settlement, either small groups of people collecting resources from the coast, river, forest or swamp, or groups of people passing through the region. More permanent settlement would have occurred in the hills above the coastal flat where more stable soils and geology would have permitted the construction of more permanent shelters, and would have provided better gardening soils, along with the strategic advantage of height. Other resources were not far away, such as the food and plant resources available from Kāpiti Island, and the important lithic (stone) resources available from D'Urville Island at the top of the South Island[55].

LIDAR[56] data has been obtained for the Kāpiti Coast, which provides topographic detail for this report. When the archaeological site distribution data is placed over the LIDAR data, the relationship between sites and topography is emphasised, as seen in Figure 23.

[55] D'Urville Island argillite is an important source of stone for adzes and other tools, and artefacts made from this material were being traded throughout New Zealand at least by the 12th Century AD (Davidson, 1984:195)

[56] LIDAR is an acronym for Light Detection And Ranging; LIDAR is a form of optical remote sensing

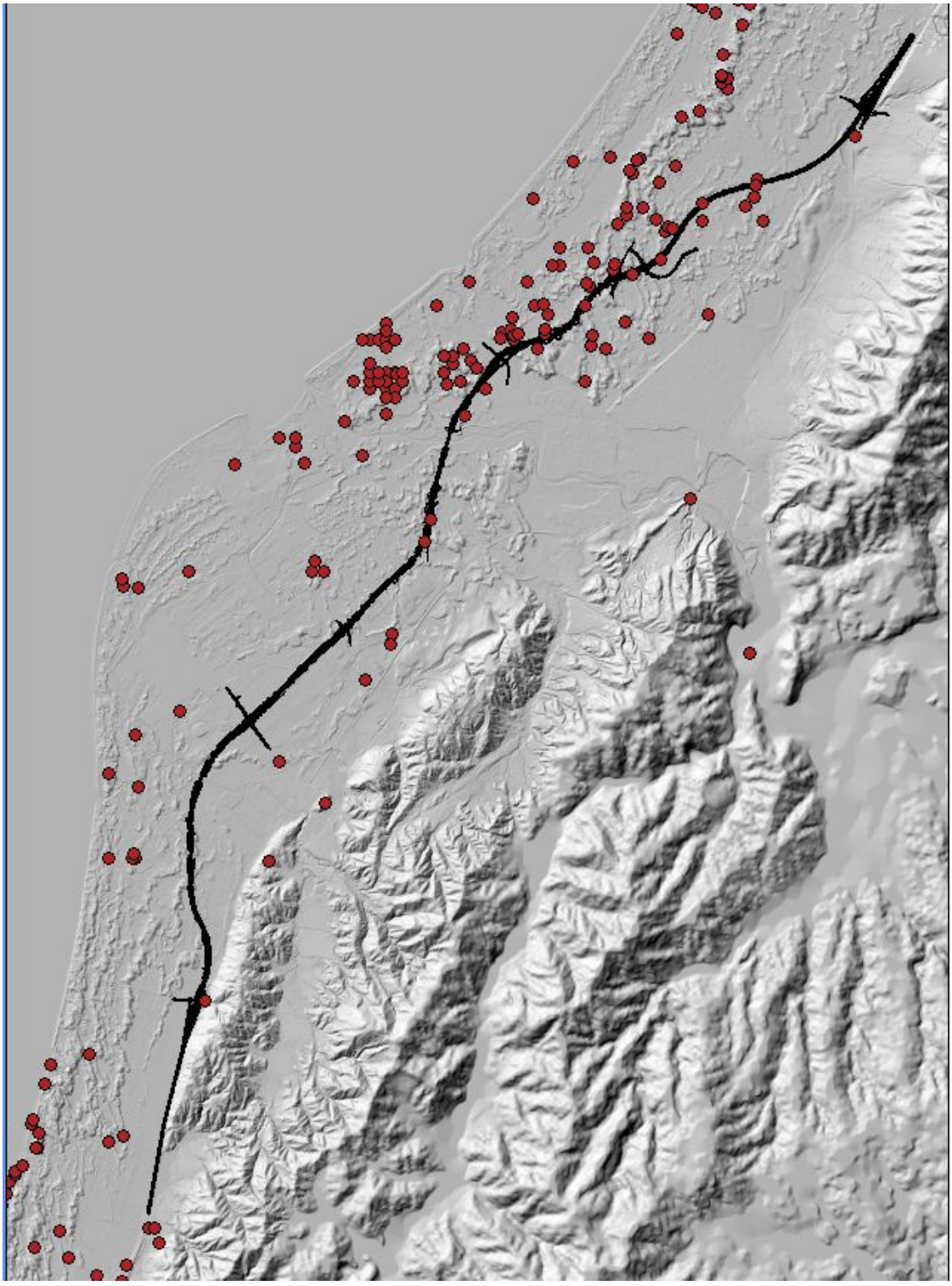

Figure 23: Archaeological site distribution and LIDAR data

Figure 24 to Figure 28 show the LIDAR data and archaeological site distribution (with the proposed Expressway Alignment) in more detail.

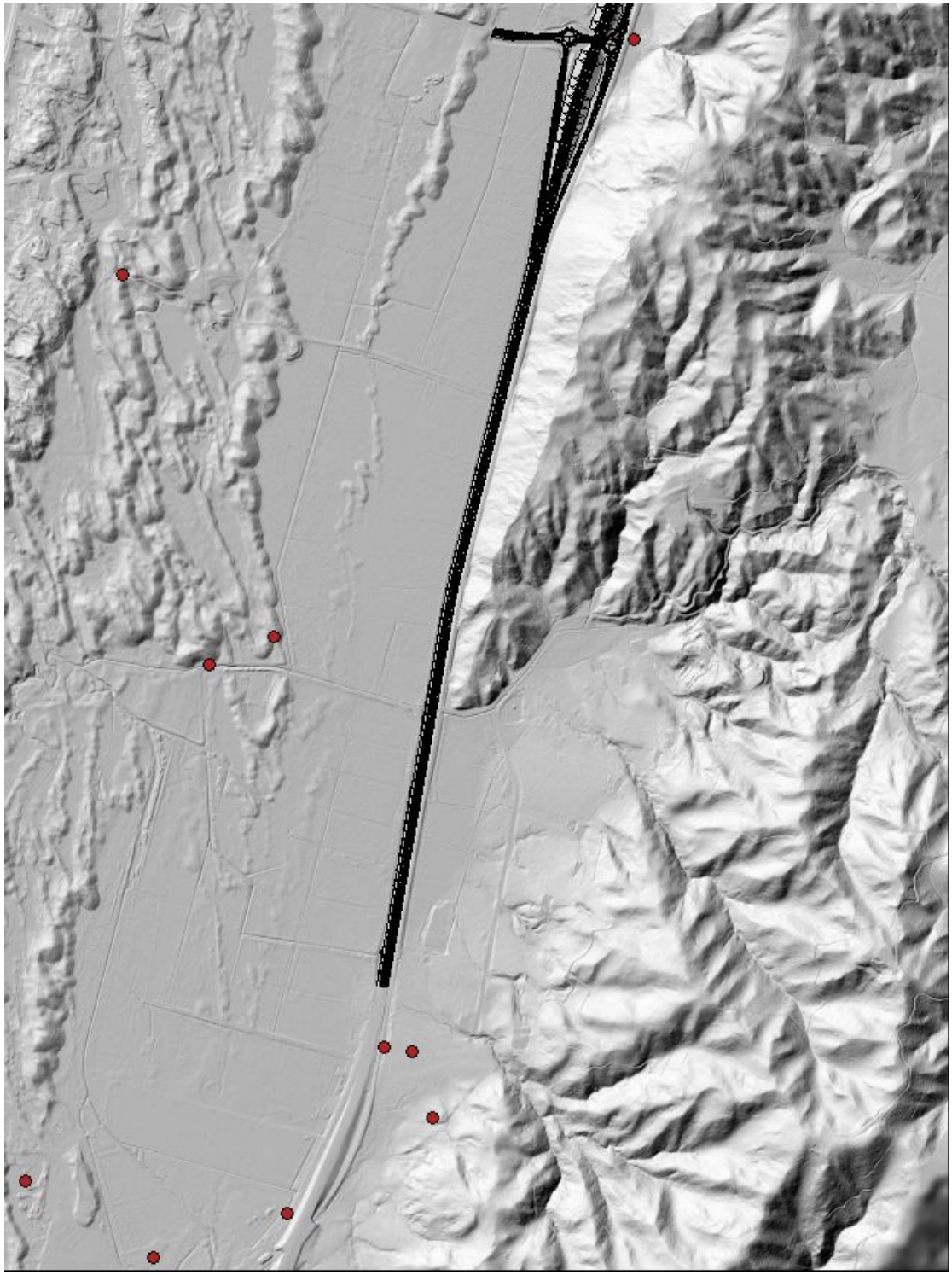

Figure 24: LIDAR data and recorded archaeological sites – south end of proposed Expressway Alignment to vicinity of Raumati Rd

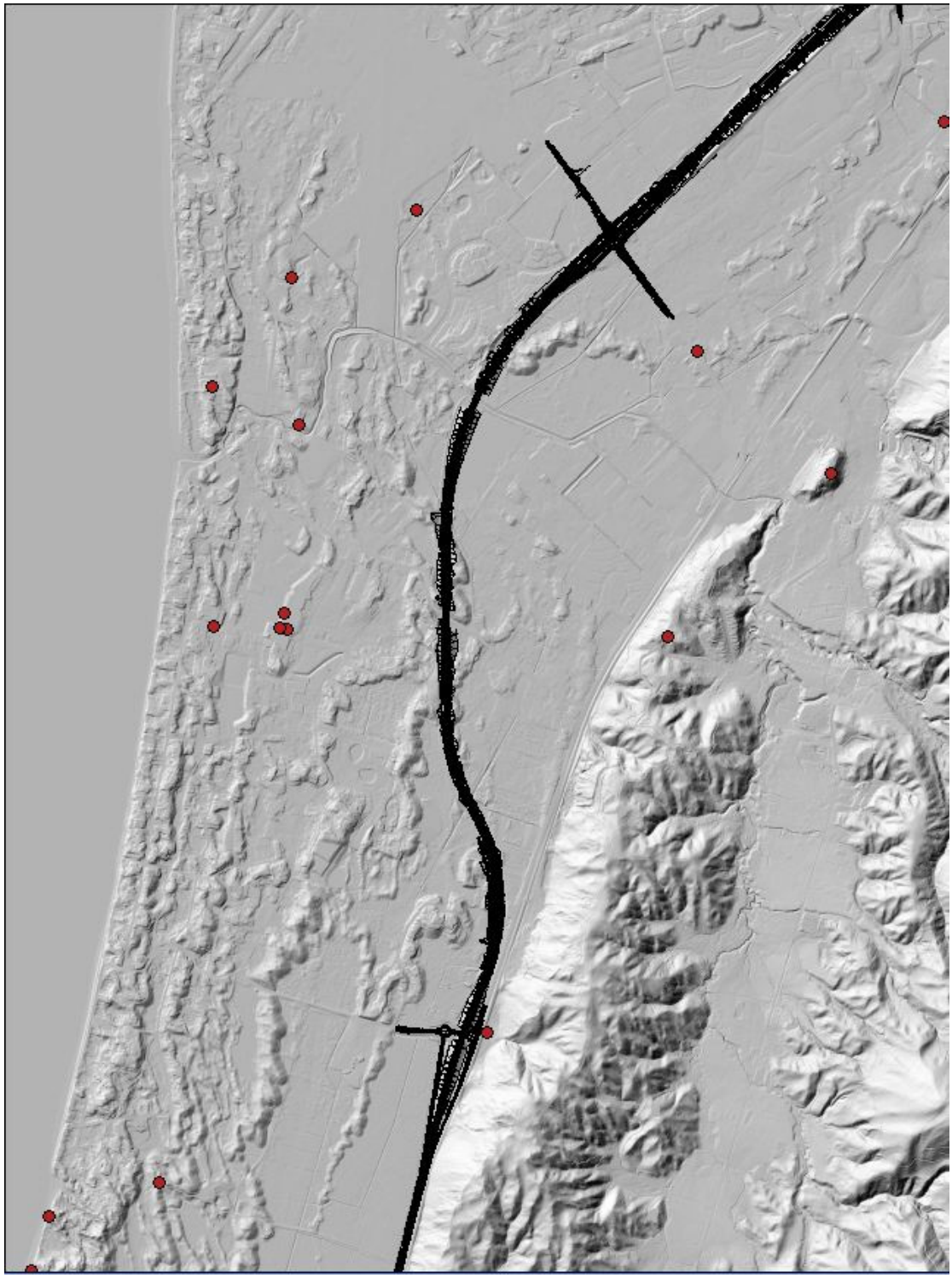

Figure 25: LIDAR data and recorded archaeological sites –vicinity of Raumati Rd to vicinity of Kāpiti Rd

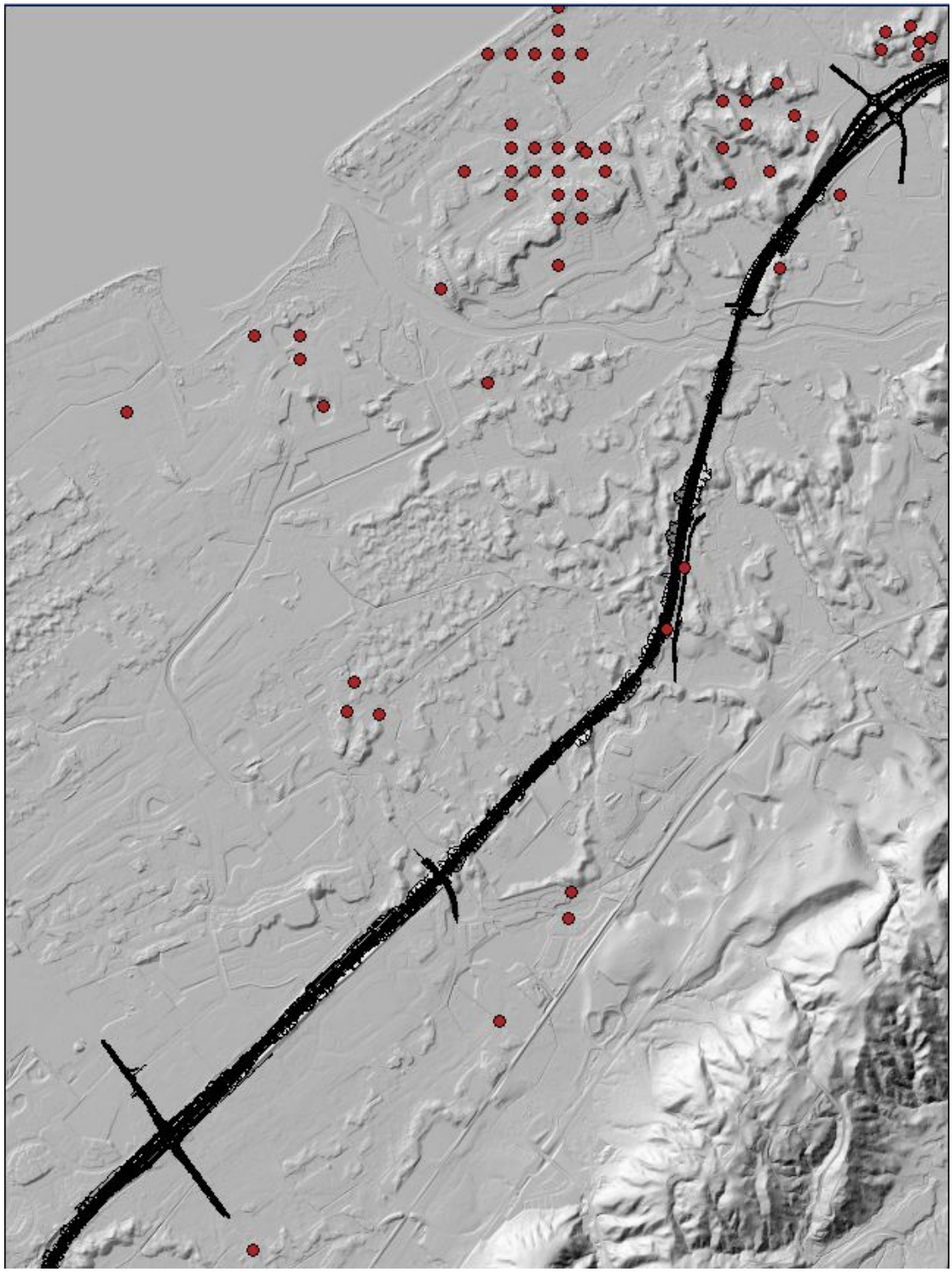

Figure 26: LIDAR data and recorded archaeological sites – vicinity of Kāpiti Rd to north of Waikanae River

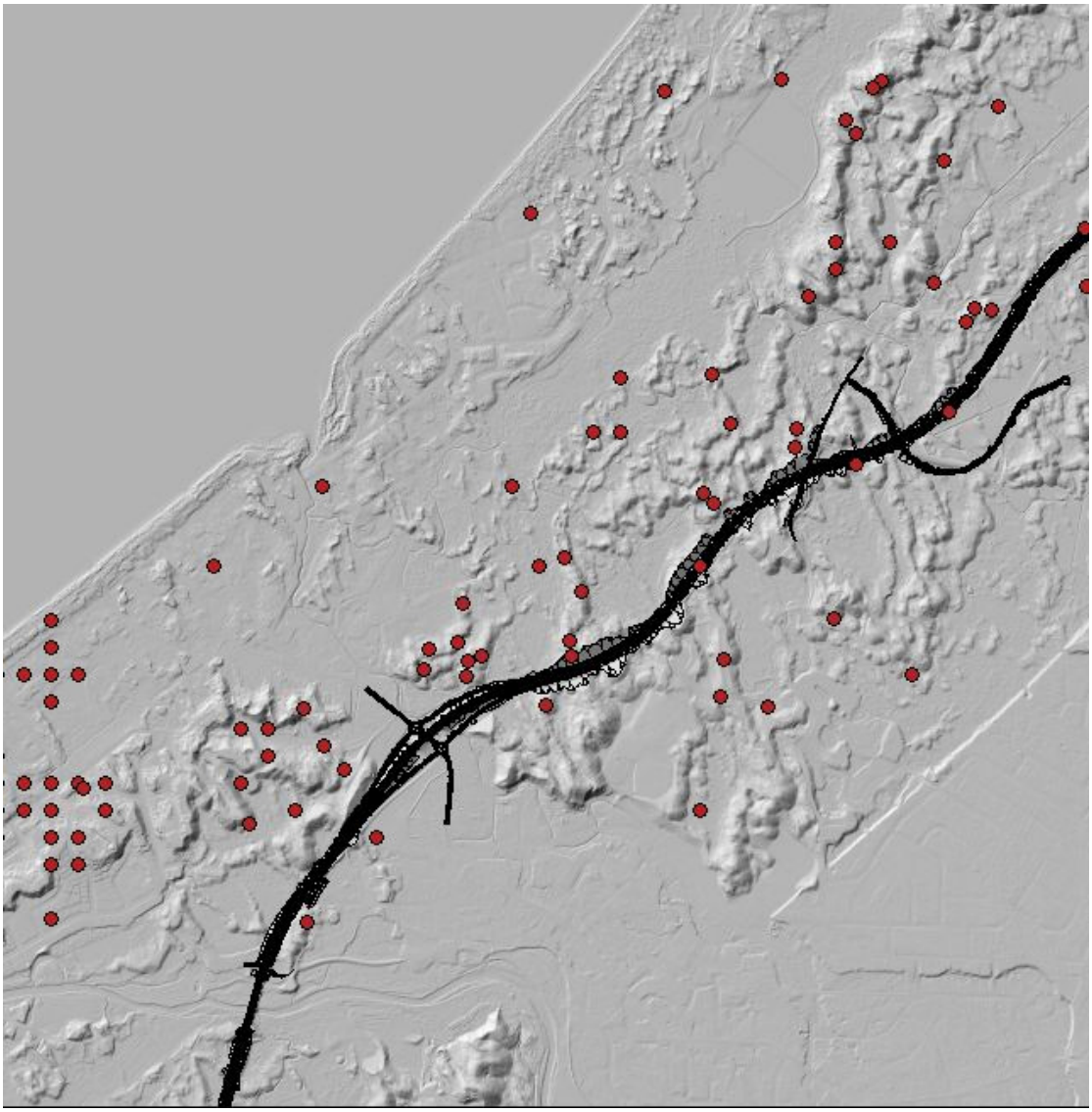

Figure 27: LIDAR data and recorded archaeological sites – Waikanae River to vicinity of Ngarara Rd

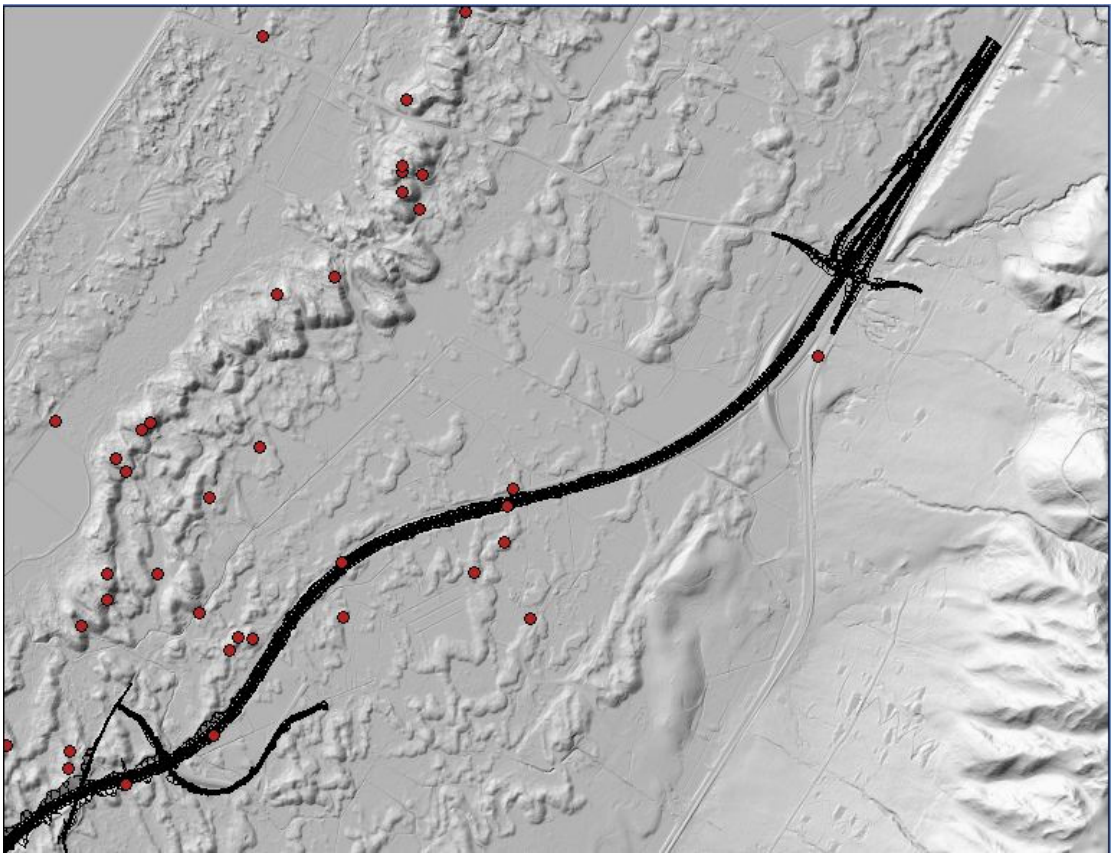

Figure 28: LIDAR data and recorded archaeological sites –vicinity of Ngarara Rd to north end of proposed Expressway Alignment

In these images two factors stand out. The linear alignment of the dunes south of the Waikanae River contrasted with the more meandering pattern of the dunes north of the river.

Secondly, the strong relationship between sites and the dunes is clear, where the majority of recorded sites are located on dunes.

Description of Environment by Sector

Section 3 of this report detailed the environment of the Kāpiti Coast.

The Project has been divided into four sectors for assessment and planning purposes. Having described both the wider environment of the Kāpiti Coast and the archaeological resource on the Coast, this part of the report briefly describes the existing environment in each sector of the Project route.

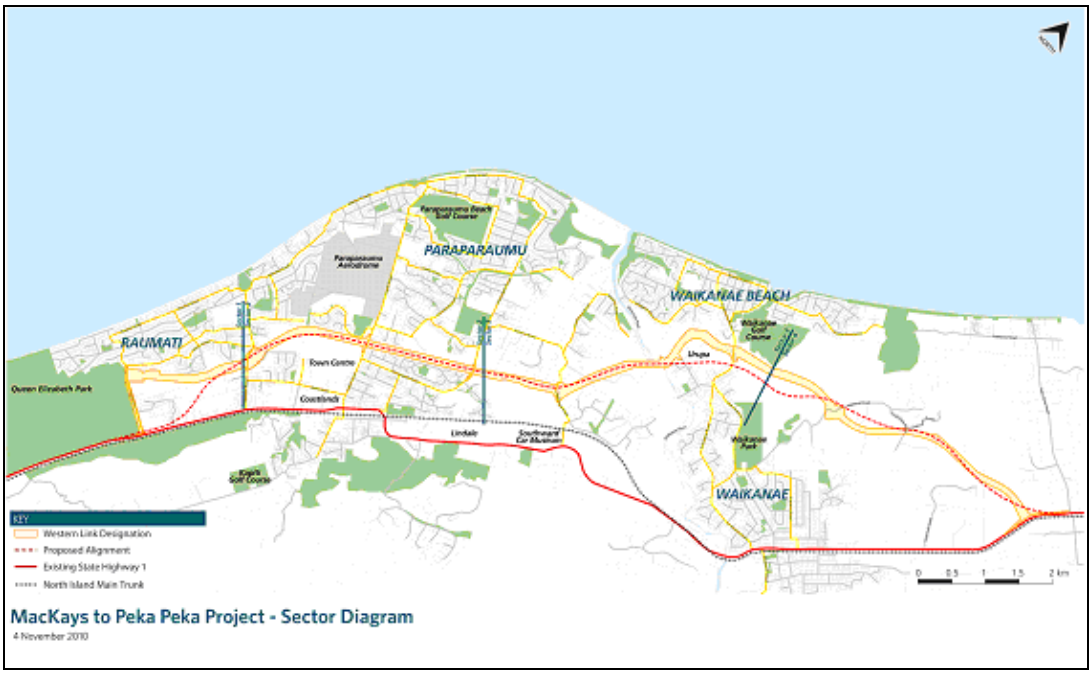

Figure 29: Map of sectors of Mackays to Peka Peka Project

a. **Sector 1:**

This sector is a mixture of low-lying former and current wetlands with lateral bands of relatively low lying dunes parallel to the coast. There are no sites recorded within the proposed Expressway Designation.

b. **Sector 2:**

This sector runs through flat low-lying land which is the flood plain for the Wharemauku Stream, and then into a band of higher inland dunes parallel to the coast. There are no recorded sites within the proposed Expressway Designation.

c. **Sector 3:**

Moderately high rolling dunes leading to the river, there are recorded sites within or near the proposed Expressway Designation include middens, pits, and terraces.

North of the Waikanae River are moderate to high meandering rolling dunes. There is an area of high cultural and archaeological significance around the Takamore cultural precinct (see section 5.5 below), and there are several recorded sites including urupa, a village, middens and ovens, terraces and pits.

d. Sector 4:

High rolling meandering dunes, not parallel to coast. There are large pockets of semi-permanent wetland between the dunes. Recorded sites within or near to proposed Expressway Designation include middens, pits, and terraces.

5.5. Takamore cultural precinct

The Takamore cultural precinct, located in the vicinity of Puriri Rd and Greenaway Rd, is made up of several sites which have archaeological significance[57]. These sites are:

- Takamore urupa: The urupa is a burial ground located on a dune ridge top. There are graves visible on the ground surface, and iwi have indicated that there are further unmarked graves on the ridge extending to the east. There are additional graves with headstones beneath the scrub immediately north of the cleared urupa. The urupa is part of the larger Takamore wāhi tapu area, which is an area of high cultural significance to iwi.
- Maketu tree: The Maketu tree is a large macrocarpa tree located at the end of Puriri Rd, off Greenaway Rd. Within the bolus of the tree is a European-style grave of the tupuna Maketu. It is assumed the tree was planted beside the grave at much the same time as the grave was constructed, towards the end of the 19th century. Over time the tree has grown and has almost totally enveloped the grave.
- Tuku Rakau village: Tuku Rakau village was established by Wiremu Parata in 1849, and occupied until 1886, when Wiremu, recognising the strategic advantage of proximity to the newly constructed main trunk rail line, moved the village to Waikanae town. The village is shown on early survey plans, (see Figure 15 and Figure 16). A large kauri tree off Greenaway Rd now marks the village site.
- Takamore wāhi tapu: An area of high significance to the iwi, which includes (but is larger than) the Takamore urupa.

[57] In addition, the sites and places within the precinct are known to be of high cultural and spiritual value to the iwi; as noted, it is not the place of this assessment to comment on the nature of these values.

Figure 30 shows the location of these sites.

Figure 30: Takamore cultural precinct

The Takamore wāhi tapu is included in the Historic Place Trust's register of historic places, historic areas, wāhi tapu and wāhi tapu areas. It was registered as a wāhi tapu area under Section 30 of the *Historic Places Act* 1993 (register number 7263) on 4 August 1995[58].

The wāhi tapu area in the registration proposal paper was described as -

> Flaxmere and Moana Rd, Waikanae
>
> Part Ngarara West A24C and A24B, lot 1 DP 23875.

The area of registration attached to the HPT documentation is shown in Figure 31.

[58] At the time of writing HPT advise that the Takamore Trustees have applied to the Trust for a review of the registration of the wāhi tapu

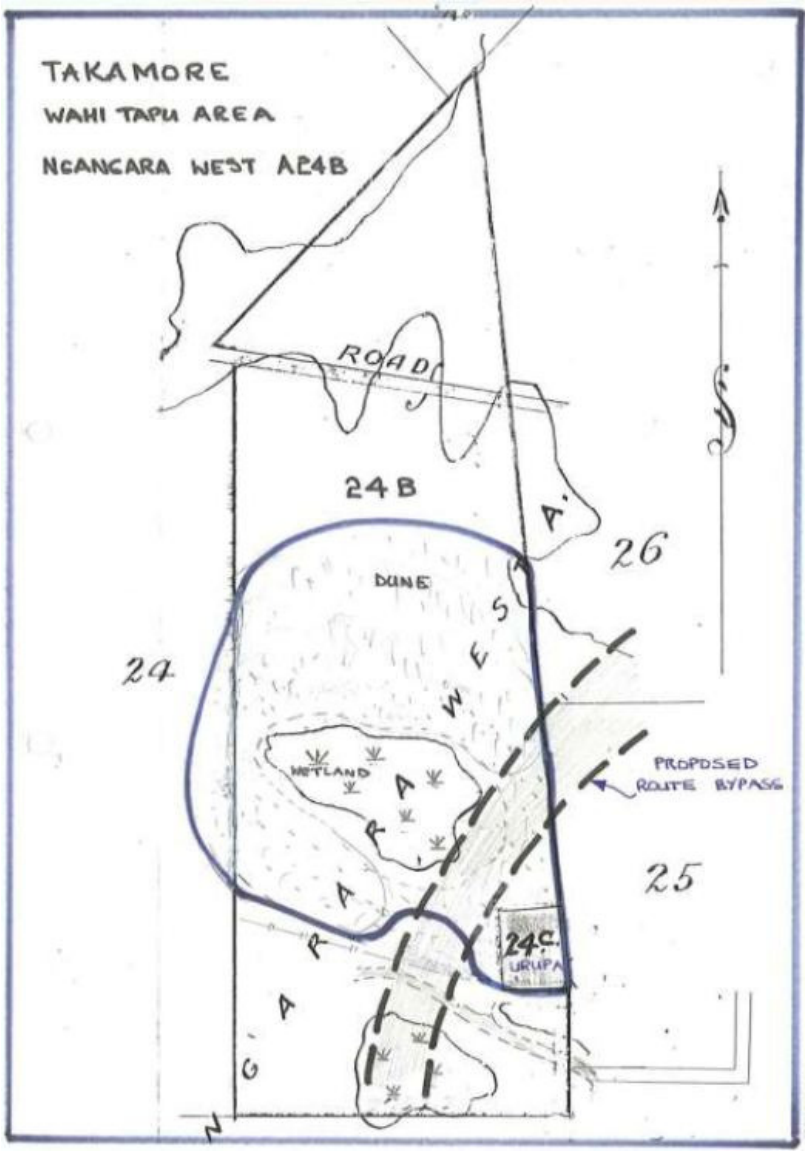

Figure 31: Map provided by Takamore Trust when wāhi tapu area was registered.

HPT file

Registration under the HPA offers no protection in and of itself; it is primarily an identification and advocacy tool. It provides an assessment of historic and cultural heritage significance, as well as linkages to protection through district plans prepared under the RMA.

The proposal for registration was lodged in May 1995 by Robert Ngaia, prior to the development of the adjacent Weggery subdivision.

The Maketu tree, the urupa and the wāhi tapu area are included in KCDC's district plan heritage register:

W1	Takamore Cemetery	Flaxmere St to Puriri Rd, Waikanae (Ngarara West A24C and A24B ML 1491, Lot 1 DP 23875 Kaitawa SD ML 1491)
W4	Takamore Wāhi Tapu Area (Note - this includes W1)	Flaxmere St to Puriri Rd, Waikanae (Ngarara West A24C and A24B ML 1491, Lot 1 DP 23875 Kaitawa SD ML 1491)
B78	Maketu's gravesite 1889	Kauri Rd, Waikanae(Lot 54 DP 14131)

Figure 32 shows KCDC's district plan map boundary.

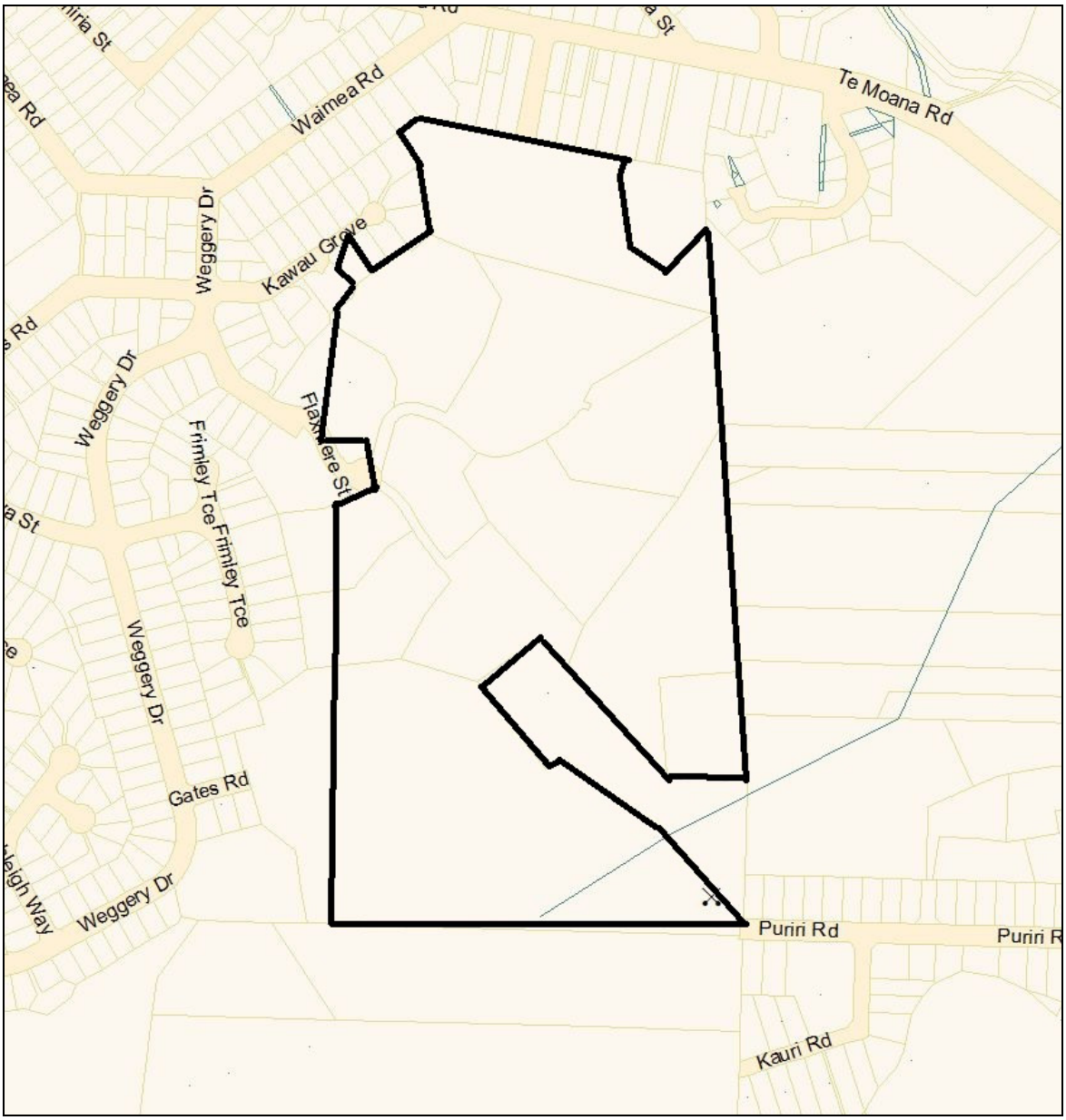

Figure 32: Extent of Takamore wāhi tapu in Kāpiti Coast District Council district plan, KCDC website

The presence of further, unmarked burials around the current urupa is also a potential issue of concern when considering development proposals in this area[59]. Iwi state there are further burials along the ridge which continues in a crescent to the east of the urupa. It is less likely that there are burials in the swamp.

There are two relevant pieces of archaeological work that inform this situation.

[59] This issue is discussed further in section 5.5.1 below

1. Weggery Subdivision

This is a subdivision built in the late 1990s, on the dunes to the west of the urupa. The developer applied for, and was granted, an authority under the HPA, to modify, damage or destroy sites (note that hapu consent for this authority was also required for the HPA authority, and was gained). As has been noted, the proposed subdivision triggered the wāhi tapu registration proposal.

The registration proposal for the wāhi tapu was lodged in May 1995 by Robert Ngaia, prior to the development of the Weggery subdivision. The HPT's Maori Heritage Council considered and granted the section 12 archaeological authority application for the Weggery subdivision at their meeting of 10 June 1996.

The subdivision is located on the high dunes to the west of the urupa; there is a larger semi-permanent wetland between the subdivision and the urupa. A condition of the authority was a requirement for archaeological monitoring of the extensive earthworks required for the subdivision. This took place and a number of sites were recorded. No burials were recorded.

Figure 33 shows the archaeological sites in the vicinity of the wāhi tapu.

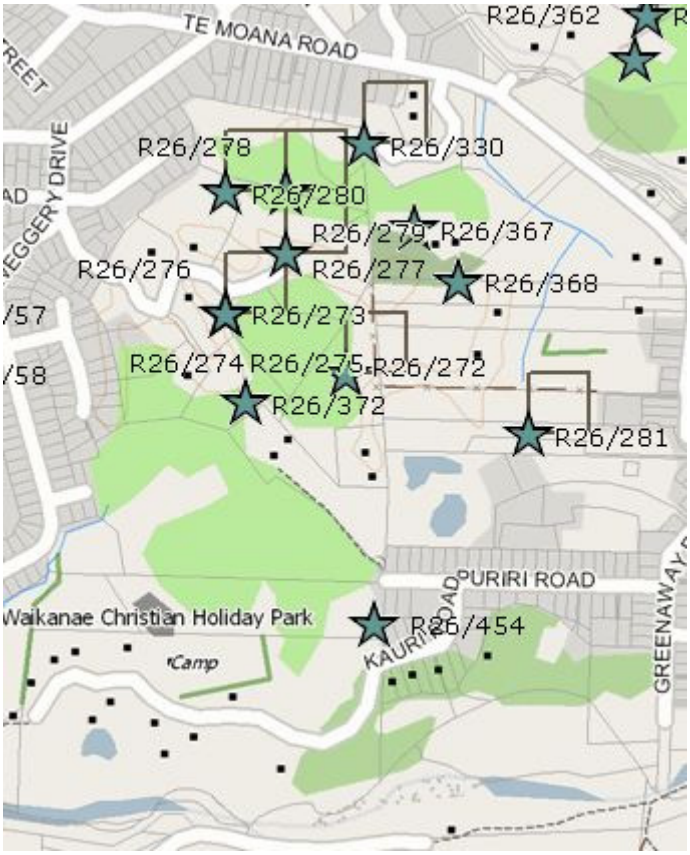

Figure 33: Recorded archaeological sites in vicinity of Takamore Archsite

The sites are:

R26/272: urupa

R26/273: Midden: dense layer of shell (Weggery subdivision)

R26/274: Midden: dense layer of shell. (Weggery subdivision)

R26/275: Midden: dense layer of shell. (Weggery subdivision)

R26/276: Midden: dense layer of shell, some charcoal & burning. (Weggery subdivision)

R26/277: Midden: large scattered spread of shells & probable ovens. (Weggery subdivision) C14 date of 474BP (1446-1513 AD)

R26/278: Hearth: single feature of burnt shell on ovenstone & charcoal. (Weggery subdivision)

R26/279: Hearth: single feature of burnt shell on ovenstone & charcoal. (Weggery subdivision)

R26/280: Hearths: scatters of hearth stones & charcoal. (Weggery subdivision)

R26/281: Tuku Rakau village site, Maketu tree

R26/330: Midden: small areas of shell & ovenstone, small subdivision off Te Moana Rd

R26/367: Midden/terrace: fragmented shell & possible terrace

R26/368: Midden: exposed on surface by erosion & cultivation

R26/372: Midden: surface scattered of fragmented shell

R26/454: Maketu tree and urupa

2. Takamore Section 18 investigation (HPA)

In January 2008 Southern Pacific Archaeological Research (SPAR) carried out excavations within the low-lying land within the footprint of the existing WLR designation, at the base of the urupa[60]. This work was done with the participation and consent of the Takamore trustees.

Nine test trenches were excavated with a hydraulic excavator; these were a mixture of smaller 2x2 and 4x4 trenches and larger 20m x 2m trenches.

Figure 34 shows the location of the SPAR trenches.

[60] Jacomb and Walter, 2008

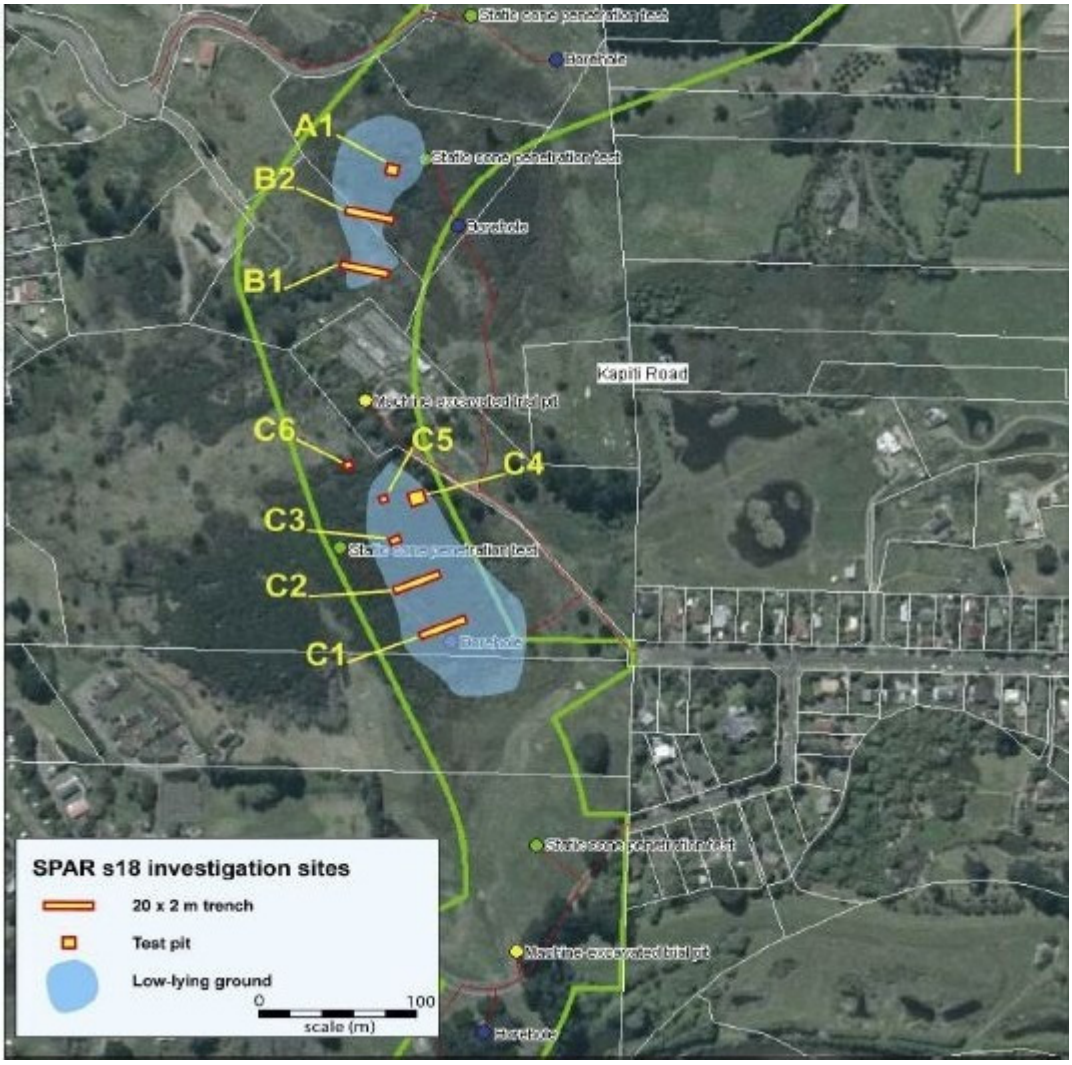

Figure 34: SPAR test trenches

Jacomb, 2008

No archaeological material was found in any of the trenches. Of additional interest was that no peat was found in any of the wetlands: the underlying sand was bluey/grey, indicating patches of ground that is wet for part of each year. There was also no evidence of any buried soils in any of the trenches, indicating that the soil profile had been developing over several centuries and that there had been no influx of sand or other material[61].

In addition three geophysical surveys have been done in the vicinity of the Takamore cultural precinct; these are discussed below in section 5.5.1

Summary of archaeological issues:

[61] *Ibid*

- Recorded sites in surrounding sand dunes
- Further unrecorded sites likely in surrounding sand dunes
- No sites recorded in wetland at base of urupa

It is noted and stressed that the opinions and statements in this report constitute background relating solely to the *archaeological context*. The urupa and wāhi tapu are known to be of very high spiritual and cultural significance to the iwi; an archaeologist cannot (and should not) say what this significance is nor assess it.

Geophysical surveys

Three specific geophysical surveys were undertaken in the area of the Takamore cultural precinct to inform this Project. These surveys were non-invasive (i.e. no soil disturbance or earthworks).

The three surveys were on land within or adjacent to the Takamore wāhi tapu (see section 5.5 of this report)

Maketu tree

Archaeology Solutions of Auckland was engaged by the Project team to undertake a fluxgate gradiometer survey of the land around the Maketu tree, to see if other koiwi[62] were present. The work was undertaken in December 2010, and the archaeologist assisted with the fieldwork.

Paddocks on the top of the dune ridge beside the grave were surveyed, as was the dune ridge heading south in the direction of the river.

The survey revealed the presence of nine further probable graves, a metal installation beside the urupa that could be an entrance gate, and also a track leading up the dune to the urupa[63]. The report on this work is included as Appendix A to this report.

Tuku Rakau village

The main part of the village is beside the kauri tree seen in Figure 30. It is east of, and just outside, the proposed Expressway Designation.

The full extent of the village, including probable ancillary activities such as gardening, is not known. Because proposed alignments for the proposed Expressway cross a probable area of the village immediately beside and south-east of the Takamore urupa, a further geophysical survey of this area

[62] Human bones

[63] Heritage Solutions, 2010: 14

was undertaken, to ensure koiwi were not present, and to identify any other apparent archaeological features.

Figure 35 shows the areas surveyed.

Figure 35: Area of geophysical survey near Tuku Rakau village

Surveyed areas outlined in red

The strategy for this survey was to sample discrete areas, rather than to achieve comprehensive coverage. Strips, rather than a large area, were surveyed, as a gas pipeline[64] that cuts through the middle of the property is highly likely to have destroyed any in-ground archaeology within its alignment. In addition, the pipeline itself would have compromised the signal from the surveying equipment.

[64] This pipeline was laid about 30 years ago; no archaeological authority was sought

No probable archaeological features were revealed in the survey. The report on this work is included as Appendix B to this report.

Takamore ridge

As noted in section 5.5 of this report, Takamore is a known and currently used urupa. The urupa is located on the western end of a crescent shaped dune, that curves around to the right (east), as seen in Figure 30.

Part of the ridge is grassed and grazed, and part of it is under gorse and other heavy vegetation.

Iwi tradition holds that the rest of the ridge beyond the currently used urupa also contains burials. As the eastern edge of the ridge could be affected by construction of the proposed Expressway, a geophysical survey was undertaken of the ridge east of the urupa. The purpose of the survey was to determine whether koiwi or other sites were present, thereby providing surety to the archaeologist and iwi, and to inform the decision making process for the alignment of the proposed Expressway.

There were no anomalies recorded that strongly suggesting possible koiwi. Several large areas of metal were discounted as were known waratahs (metal fence posts) or probable deposits of farming material (for example, fencing wire). Two small anomalies (12 and 13, see Figure 36) were recorded; the fluxgate gradiometer operator suggested they might be burial pits, but considered it unlikely, given the small shape and size of the anomalies.

Figure 36: Features recorded during geophysical survey of Takamore ridge (Archaeology Solutions, 2011c: 11)

The possibility of further burials below the 2m range of the equipment, on a previous buried ground surface cannot be discounted, as this hypothesis has not been tested. However, it is considered unlikely, as the Takamore ridge is on the Taupo dune, which is both older (deposited about 1720 years ago[65]) and stable.

5.6. Research themes

If the MacKays to Peka Peka Expressway is constructed, it will be, in simplest terms, an archaeological test trench along much of the length of the district. As it will pass through a number of geomorphological and ecological environments, it constitutes an important and unique opportunity for high level archaeological research on major themes such as chronology, settlement, resource exploitation, cultivation and geomorphology.

[65] McFadgen, 1997:8

A number of research themes are presented, which will guide the archaeological investigations and work that will take place as mitigation, if the road is constructed. Some themes are regional, and some are specific to each sector and section. These themes can be referred to in any Archaeological Management Plans that may be written to assist in guiding an archaeological research or investigations required by HPT authorities.

Regional themes:

- What is the nature of middens along the coast, in terms of age and constituent species? Is there evidence for Adkin's early and late dichotomy?
- What is the spatial distribution of middens, by size and apparent function?
- Is there clear function of middens as postulated: localised scatterings, deposits from larger residential groups, and "factory floors"?
- Is there any difference in the nature of middens north or south of the river? If so, what are the implications of these differences?
- Is there variation in the nature of middens on the older and younger sand dunes? What can such variations tell us about the changing environment, and the changing lifestyles of the people on the coast?
- Is there any apparent difference in species present in middens over time? Can any conclusions on changing environments, and the causes of these changes, be made?
- What is the nature of the utilisation of the environment? Were all types of sand dunes in different areas used in the same way, seen in similar types of sites found on them?
- What was the nature of the subsistence economy of the people living on the coast? What was the range of food they were eating? How, and in what proportions, is this represented in the archaeological record?
- Did the reliance on a particular food source increase or decrease over time? What are the environmental implications of this?
- Is there evidence for earthworks sites south of the river? What does this evidence look like in the ground?
- What is the archaeological evidence for gardening? Is gardening more widespread through the area than the current state of evidence may suggest?
- Were people living in permanent villages, or seasonal resource gathering camps? What is the archaeological evidence for this?
- What geomorphological information is revealed by stratigraphic sections through the sand dunes? What evidence on the changing natural environment does such information present? What might be the causes of such changes?
- Is there different geomorphological history and sequences north and south of the river?

- Is there geomorphological evidence for seismic events? What does this look like? How can such information be used to guide current settlement and planning on the coast?
- What is the age and duration of occupation on the coast?
- How does the nature of the lifestyle on the Kāpiti Coast compare or contrast with similar other coastal environments, such as the Bay of Plenty?
- Can dates from archaeological deposits relative to dune stratigraphy be used to tighten geological sequences which can then improve relative dating of archaeological deposits elsewhere on the Kāpiti Coast?
- Is there archaeological evidence of warfare prominent in early nineteenth century historical accounts? What does this look like?
- Is there archaeological evidence of large scale migration and population displacement prominent in early nineteenth century historical accounts? What does this look like?
- Can the nature, extent and distribution of sites encountered as a result of earthworks from the construction of the Mackays to Peka Peka Alignment provide additional information relevant to a predictive model which can assist with the protection and preservation of archaeological sites elsewhere on the Kāpiti Coast?

An overarching theme that sits above all of these themes is the implications of all of this for the human populations of the Coast. How were people living? What was their nature and quality of life? Did this change over time, and if so, how and why?

All of these themes apply over the entire length of the route. In addition there are particular research themes that apply to each sector. These are outlined in section 6.4 below.

5.7. Predictive model

Although relatively little strategic or primarily research-based archaeology has been undertaken on the coast, enough data has been gathered through investigations, surveying and opportunistic sighting to create a predictive model, which can predict likely site type and occurrence along the coast.

A predictive model for the proposed Expressway can assist in guiding archaeological investigations that may be undertaken for the construction of the proposed Expressway by determining where such investigations are likely to be required. The predictive model can detail what types of sites may be encountered in the various section of the proposed Expressway, and assist in recommending appropriate mitigation measures.

As noted in section 5.4 of this report, sites can occasionally be on buried topsoils some metres below the ground surface, and thus there may be no surface evidence of sites. In this way, a

predictive model can assist in determining where previously unknown or buried sites may be present.

The model comprises the following elements:

- There are over 280 recorded archaeological sites on the Kāpiti Coast (see Figure 18)
- They are of both pre European Maori and European origin
- The most common site type is shell midden
- Middens are occasionally, but not always, found in association with ovens
- Another common site type is individual or small group burials within the dunes
- The vast majority of sites are found on the sand dune ridges
- The dunes themselves have been identified and dated; relative ages of sites can be extrapolated from the original dune surface on which they are found
- The oldest and most stable dunes are found inland
- The younger coastal dunes are geologically dynamic
- Due to the dynamic nature of the unstable dunes sites can be found several metres below the ground surface, and thus there may be no surface evidence of them
- The dunes closer to the coast tend to be lower than the older dunes further inland
- The dunes south of the river are more linear, tend to run parallel with the coast and can be steep sided and quite high
- The dunes north of the river are more meandering, do not run parallel to the coast, and tend to be lower with less steep slopes than those south of the river
- At the time of human settlement the dunes would have been largely forested, inferred through analysis of landsnails found in archaeological deposits taken from the dunes
- The dunes are interspersed with peat swamps; these were rich sources of food and raw materials, including birds, eels and plant species.
- Earthwork sites – pits, terraces, pa – are also found on the coast, but are less likely to be visible on the surface found because their more fragile nature is prone to wind and stock erosion

- More earthworks sites have been recorded north of the Waikanae River than south. The reasons for this are not clear and require further analysis. This may be a reflection of human activity and resource utilisation, but is more likely to be a result of more stable sand and dunes in the area north of the river

- Little evidence of gardening has been recovered on the Kāpiti Coast; the archaeological evidence of gardening is thus not clear

- Very little cultural material has been recovered from swamps or wetlands by archaeologists on the Kāpiti Coast; this is in marked contrast to the material recovered from the edges of Lake Horowhenua. Adkin, and Barrow and Keyes record canoe finds from swamps in Te Horo[66], and Carkeek records a canoe and wooden maul recovered from the swamp at the foot of Mataihuka Pa[67]. A fragment of trim from a waka was recovered in 2007 from a low-lying wetland area during earthworks for a subdivision at Paetawa Rd, Peka Peka[68].

These elements are used to assess the likelihood of further sites been found and are applied to each section of the route below.

6. Assessment

6.1. Assessment of the archaeological resource

The known and potential archaeological values of the sites likely to be impacted on by the Project are assessed against a set of criteria.

- Condition/integrity value

The vast majority of midden sites are in intact condition, and can be examined or sampled to gain useful archaeological data. Earthworks sites, when they are found, are in moderate condition, and appear to have suffered from wind and stock erosion. Burials are generally in good, intact condition, and again much archaeological data can be gathered from them.

- Representativeness/rarity value – is this area unique

[66] Cited in McFadgen, 1997: 15

[67] Carkeek: 1966:123

[68] Petersen, 2007

The proposed Expressway cuts through a range of different environments on the Kāpiti Coast, including dunes, current and former wetlands, and river flood plains. Archaeological sites are found in most of these environments. The known sites are not of themselves unique or rare, either on the Kāpiti coast or in New Zealand. However they have representative value in that their presence and occurrence presents a distinct picture of the nature of archaeology and human occupation on the coast, which can be compared and contrasted with other coastal environments such as, say, the Bay of Plenty or Taranaki.

- Contextual value

The majority of recorded sites are of local significance, in that they do not contain information or features that are different to the majority of the sites on the Kāpiti Coast. Some sites which are distinctive in some way, may have regional significance, perhaps through the size or extent of the site, the density of shell in a midden, the presence of unusual shell or perhaps fish or mammal bone in a midden, or earthworks sites which are less common on the coast. However the sites collectively have regional significance beyond their individual values, as they cumulatively present a distinct picture of the archaeology of the Kāpiti Coast

- Scientific value/information potential

Every site contains scientific value, for its type and nature, its location, its extent, its relationship with its environment and with surrounding sites, and its age if a radiocarbon date is sought. The data from each site cumulatively creates an archaeological picture for the Kāpiti Coast

- Amenity value – public interpretation/education

Not many sites revealed or recorded thus far have distinct public interpretation or education value in situ, as the majority are not large or “grand” or visually distinctive, compared with, say, the large pa of the Auckland Volcanic cones or the Bay of Plenty

- Cultural associations

The author understands that the majority of sites have some cultural value with the iwi and hapu of the coast, but the nature of these associations is only for iwi to comment on.

Based on current knowledge of the nature and location of known archaeological sites, and the predictive model, the inferred significance of known and probable individual sites on the coast is local. The vast majority of the sites are similar in nature, size and environmental location. However this consistency of site nature is in itself useful and significant information about the nature of occupation and site utilisation on the coast: the data from all the sites on the coast collectively contributes to an understanding of the archaeology of the Kāpiti Coast. In this way, information on site nature and occurrence on the Kāpiti Coast can be compared and contrasted with other regional locations throughout New Zealand.

Thus the cumulative nature of the sites on the Kāpiti Coast as a collective whole is different to the individual sites – individual sites have local significance, whereas the sites as a collective whole have regional significance, and can tell a regional story.

6.2. Option evaluation and multicriteria analysis

The MacKays to Pekapeka Expressway Project team undertook an assessment of the principal alternative route options according to an RMA framework, based on accepted methodologies for evaluating the comparative impacts of the principal options.

Four options were assessed and can be seen in Figure 37:

Route 1 Expressway following the former Western Link Route

Route 2 Expressway following the Western Route

Route 3 Expressway following the Eastern Route

Route 4 Upgrade of the existing State highway to Expressway standards

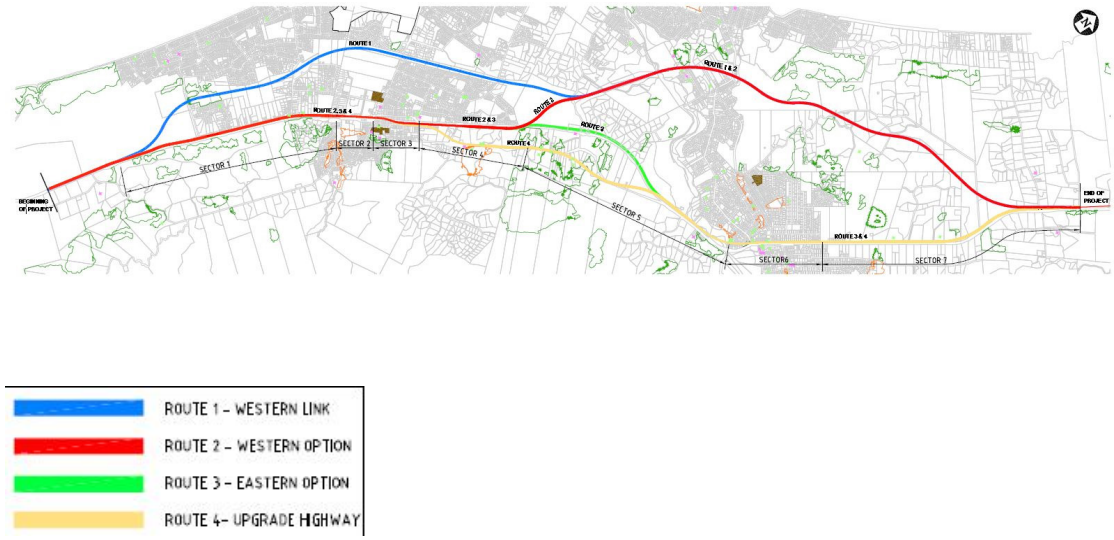

Figure 37: Plan of four assessed route options

Mackays to Peka Peka

An MCA (multi criteria analysis) process was undertaken by all the disciplines within the entire Project team, to consider and weight all these alternatives. As well as archaeology and cultural values, the other factors considered by the Project team include traffic movement, built environment, natural environment, social impacts, economic factors and implementation time.

This weighting process thus considered the possible adverse or positive effects of aspects of the Project from a number of perspectives, and balanced competing needs and effects. As a result of this process a final proposed route was selected; it is this route which is the subject of this assessment.

The discipline of archaeology was part of this analytical process, and thus archaeology was robustly and evenly considered as a contributing factor.

A summary of the archaeological values of the four routes considered in the MCA process are:

Route 1: High values. Runs though significant areas of unmodified ground (especially dunes) and runs through the Takamore wāhi tapu.

Route 2: High values. Runs though significant areas of unmodified ground (especially dunes), runs beside the Takamore wāhi tapu.

Route 3: Moderate values. Runs though some areas of unmodified ground (especially dunes) but less than options 1 and 2, avoids the Takamore wāhi tapu altogether.

Route 4: Low values. This route is modification of the existing State Highway 1, and, as such, impacts on largely modified areas.

In some cases (for example, near the Takamore cultural precinct) the archaeology of the selected route scored low; that is to say, the selected route was considered undesirable on archaeological grounds. However, when all the other MCA criteria were factored into the assessment process the selected route ranked highest, the rationale of which is understood by the archaeologist.

Several alternatives to the final proposed Expressway Alignment were considered in the development of the Project.

6.3. Potential alignments within the selected route

As part of the MCA process several possibilities for parts of the route were considered (it is not the place of this report to set these out and detail the case and justification behind their rejection). Many were relatively low impact in terms of archaeology, such as design details around intersection layouts. However several large design aspects were considered which had the potential to impact on archaeology. These were:

- **Southern end**: one option cut through Queen Elizabeth Park just south of Poplar Ave and continued across the sand dunes and wetlands north of Poplar Ave. The selected option leaves the existing SH1 just north of Poplar Ave at around 200 Main Rd. The selected option has a lower potential impact on archaeology, as it largely runs through land already modified for houses. The option through QE Park ran through some areas of lower sand dunes, which had the potential to contain sites.
- **Options north of Waikanae River**: a rejected eastern option ran east of the urupa and Maketu tree, completely avoiding the Takamore ridge, but running through properties on Puriri Rd and Greenaway Rd, including the location of Tuku Rakau Village. Because it avoided the Takamore wāhi tapu completely the author has been advised that this eastern option was more preferable than the western option on, cultural grounds. However this eastern option was less preferable than the western option on archaeological grounds as it ran through a greater length of unmodified land which has the potential for intact archaeological sites and features, including the Tuku Rakau village site, the site of which has not been modified and so has a high likelihood of intact features associated with the village such as house sites, hearths and middens. The author understands that the rejected eastern option had an adverse impact on a larger number of private properties and would have required relocation of the registered Greenaway homestead.

6.4. Potential impact of proposed work

The proposed route has been divided into six archaeological sections, from south to north:

- Section 1: QE Park to Kāpiti Rd
- Section 2: Kāpiti Rd to Mazengarb Rd
- Section 3: Mazengarb Rd to Waikanae River
- Section 4: Waikanae River to Te Moana Rd
- Section 5: Te Moana Rd to Ngarara Rd
- Section 6: Ngarara Rd to Peka Peka Rd

The six sections can be seen in Figure 38.

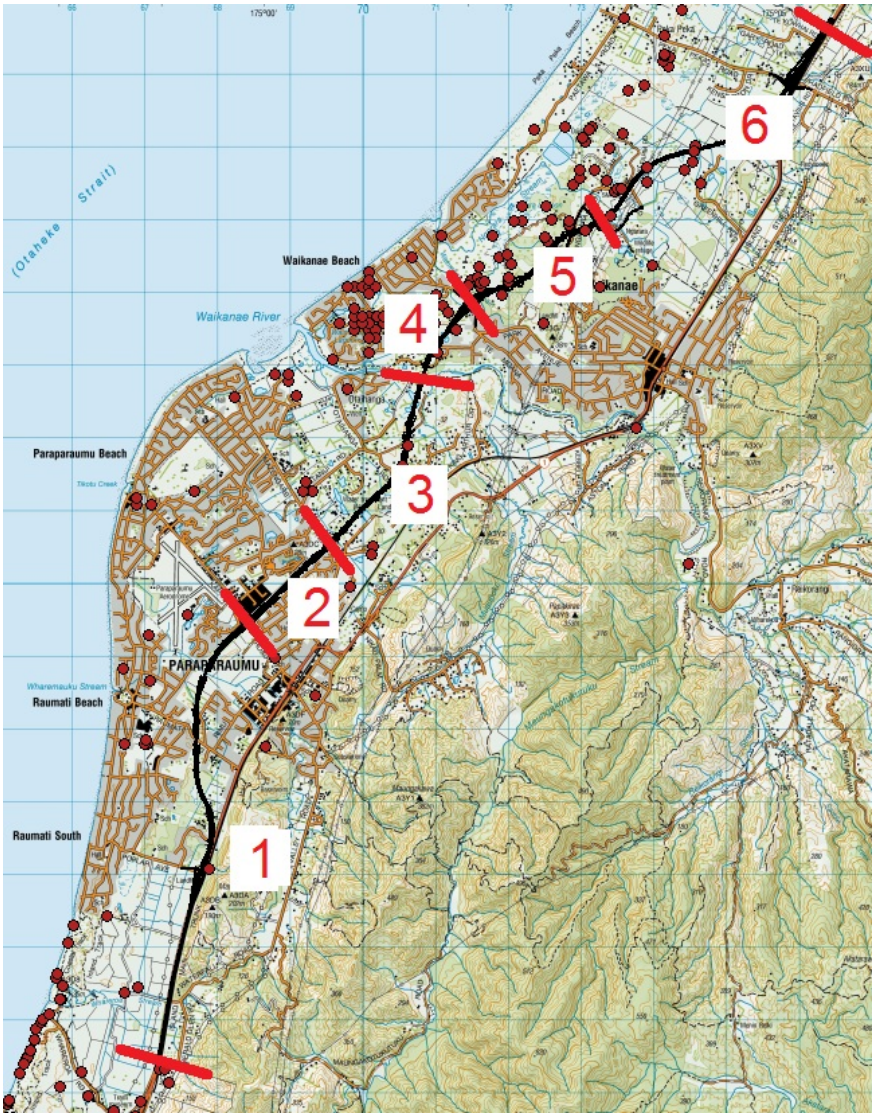

Figure 38: Archaeological sections of Mackays to Peka Peka

The known and potential archaeology, the construction impact and suggested archaeological investigation or mitigation of each section are detailed below.

A scoring model of archaeological site probability has been developed. This model brings together all the information discussed in this report – known sites, environment, and probability of sites based on the predictive model.

The archaeological score summarises the site occurrence probability, and, based on this, a corresponding archaeological mitigation method is identified.

The scoring model is outlined in Table 2:

Score	Implications	Archaeological mitigation method
0	No chance whatsoever of sites	ADP[69]
1	Sites highly unlikely	ADP
2	No sites in vicinity of proposed Designation, low chance of sites according to predictive model	Monitoring
3	Sites in wider vicinity of proposed Designation, moderate chance of sites according to predictive model	Monitoring
4	Sites in close vicinity of proposed Designation, high chance of sites according to predictive model	High level investigations
5	Sites visible within proposed Designation	High level investigation

Table 2: Archaeological scoring and mitigation

Discussion of investigation/mitigation measures

Relatively little in the way of strategic excavation or in-ground investigation has been undertaken on the Kāpiti Coast. In addition, little in-ground investigation has been undertaken to specifically inform this assessment. This is for several reasons:

- Enough recording and observation of sites through surveying and monitoring investigations has been undertaken to inform and create a predictive model of archaeological probability on the coast;
- Based on the predictive model, which is in turn based on historical records and contemporary archaeology, the most likely site type to be encountered on the dunes is middens;
- Sites, especially middens, are very likely to be present on most of the sand dunes on the coast. As the proposed Expressway Alignment cuts through sand dunes the likely impact on unknown sites is unavoidable. However avoidance is not possible, as known site distribution suggests sites are scattered densely across the dunes;
- Testing, such as probing, test trenching or test pitting could confirm the locations of these middens; however in most cases site confirmation of site presence is all that will be gained from these techniques. Such methods are reasonably destructive, and are only "snapshots" – they provide little data except to confirm site presence, and in many cases the damage outweighs the benefit of the limited information provided. More detailed

[69] ADP – Accidental Discovery Protocol. See Appendix D of this report

information on the sites, such as size, density, and spatial relationships is usually not revealed.

- Such testing will therefore only confirm the predictive model, although knowledge can be gained that will determine mitigation measures and methods.
- Furthermore, using these testing techniques to purely confirm site presence, results in permanent damage to the sites, and this damage may in the end not be required or justified if the proposed Expressway is not, in fact, built.
- Therefore, rather than undertaking ad hoc and sporadic testing, the totality of all the archaeological and scientific data from the sites likely to be present should instead be extracted in a more managed, co-ordinated, coherent manner, through a series of strategic investigations undertaken prior to construction.
- All sites present within an area will be revealed and investigated in an archaeologically appropriate manner, so data on spatial relationships as well as individual site morphology can be gathered and understood.
- As has been demonstrated in previous archaeological work (see for example the Waterstone site[70]) the possibility of burials cannot, and should not, be dismissed. However, with the exception of known urupa identified by the iwi, there is no way to predict where other such urupa may be located.

Investigative measures recommended in this report fall on a continuum of least to greatest intensity: being intensity of effort and intensity of resources required. The most intense measure is a systematic investigation, followed by monitoring, with the accidental discovery protocol being the least intensive method.

Systematic investigations

In many cases the recommendation has been made for "Systematic investigation of dunes prior to construction earthworks". These are high level detailed archaeological investigations undertaken in a strategic and integrated manner, that are likely to yield greater and more integrated information than monitoring. In a period of time prior to construction earthworks the topsoil will be stripped off in these identified areas, and the underlying archaeology then revealed.

These investigations should be programmed in well before construction commences, to allow sufficient time for the work to be undertaken to the highest possible level.

All archaeological sites and features will be systematically excavated and investigated. Further analytical work can follow the site work, such as analysis of middens, radiocarbon dating of sites,

[70] O'Keeffe, 2005b

and analysis of soils for evidence of prior gardening. Spatial data can be gathered using a total station, with high scale modelling and analysis of site distribution to follow.

This represents a high intensity type of archaeological investigation. The benefit is that all features within a geographic area can be revealed, and their location, spatial, functional and possible temporal relationships can be determined. Further, patterns across the landscape can then be identified and analysed. If, for example, a small seasonal fishing and shellfish gathering camp was revealed, all the possible features associated with that site could be revealed and examined, including house floors, ovens, and resource processing areas. The relationship between the features, and between the people and their environment, can then be more fully explored and understood.

The sites and features revealed in will be investigated in whatever way is deemed appropriate, with different archaeological features potentially requiring different methodologies to be applied. Methods that could be utilised include (but are not limited to):

- Trenching
- Half sectioning or trenching across a feature to determine stratigraphy
- Hand excavating features revealed
- Sampling of middens
- Full excavation and analysis of the content of middens (including radiocarbon dating samples)
- Excavating apparent domestic features such as house floors or pits
- Trenching or half sectioning terraces to determine their function and construction method
- Sampling apparent gardening areas to determine soil composition, and later analysis to determine the presence of starches to indicate the types of crops grown.
- Submitting shell from middens for radiocarbon dating

Monitoring

Monitoring of earthworks during the construction phase will also be required in places. This will occur during the construction phase as opposed to in the months prior, as the archaeological teams will investigate archaeological material revealed by the construction crew during earthworks. Monitoring is a methodology with lesser impact and resource requirements than the full investigation methods listed above; features that may be revealed will be quickly recorded and sampled during a short pause in earthworks, and the feature then destroyed. This type of mitigation is recommended for those areas where there is lesser likelihood of intact archaeological features.

Accidental discovery protocol

Some areas along the proposed Expressway have virtually no likelihood of archaeological material, due mainly to their geomorphological nature. An example of such area is wetland areas within the proposed Expressway alignment, which, as discussed in section 3 of this report, are almost all shallow and ephemeral and may be unlikely to contain organic cultural material. However, a precautionary approach is considered prudent, and thus work in these areas will be informed and guided by the Accidental Discovery Protocol that has been prepared for the Mackays to Peka Peka Project (see Appendix D).

Section 1: QE Park to Kāpiti Rd

Environment:	Northern end of QE Park is predominantly low-lying former swamp. There is one low band of dunes parallel to the coast, which is out of the proposed Expressway construction zone. North of Polar Ave predominantly pockets of former and current wetland. There are moderate dunes either side of Raumati Rd mainly parallel with the coast, with pockets of wetland on either side. Dunes are heavily vegetated in parts with blackberry and other species Low-lying dune belt immediately north of Raumati Rd, then former flood plain of Wharemauku Stream (low lying and wet), then a moderately high heavily vegetated sand dune from Ihakara Rd extension to Kāpiti Rd
Archaeology undertaken:	Walkover by archaeologist. No formal surveys in this part of QE Park, surveys elsewhere in the park, substantial number of sites recorded in park to the south and along the park's coastal edge Dunes walked by archaeologist as far as possible, vegetation on dunes in places precludes a walkover. Area viewed by archaeologist from various vantage points.
Known sites:	None in area of proposed Designation. Middens on dunes to west, not in close proximity. Sites in vicinity: R26/348: urupa on hill

	R26/421:	historic kainga
	R26/422:	railway flag station
	R26/250:	midden on dune ridge
	R26/265:	houses/midden (on other side of railway line. This site is in the vicinity of the low-lying portion of Mataihuka pa discussed previously)
	R26/339:	midden
	R26/340:	midden
	R26/341:	midden
	R26/264	small cache of artefacts and ovens stones on swamp-surrounded dunes, identified by Beckett in 1957
	R26/333:	midden, small scatter on surface
	R26/368:	midden
	R26/378:	midden
Potential for sites:	Low likelihood in peat wetlands, based on existing site occurrence and predictive model	
	Possible on low sand dunes based on known site occurrence and predictive model	
	High on dunes south of Kāpiti Rd	
Proposed construction:	Preload along on edge of existing SH1. Vegetation cut down to ground level; no removal of roots.	
	Slight topsoil strip immediately north of Poplar Ave, for new Poplar Ave alignment.	
	Pockets of peat between low dunes – replacement of peat by aggregate and cut to fill (cutting of dunes to required level, and dragging sand over peat pockets).	

	Bridge over Raumati Rd, deposition of fill for rising embankment to bridge height
	Embankment dropping from bridge over Raumati Rd, fill for embankment over Wharemauku Stream.
	Peat pockets within sand dunes – peat removal, and cut to fill.
	Bridge over Kāpiti Rd – some fill for embankment on south side, more fill for embankment on north side.
Archaeological score:	1[71] in QE Park through low former wetlands north of Poplar Ave
	2 in low dunes either side of Raumati Rd
	3 on dunes south of Kāpiti Rd
Investigation/mitigation:	Work in wetlands done under ADP
	Monitoring of earthworks on dunes either side of Raumati Rd, and south of Kāpiti Rd during construction
Research themes:	Any evidence of utilisation of wetland resources
	Wetland archaeological finds, preserved organic material.
	Nature of sites on low dunes within large wetland area, any evidence of utilisation of wetland resources. Nature of settlement on dunes, utilisation of coastal or forest resources. Any subsurface evidence for earthworks sites (terraces, postholes, house floors), in areas where no surface evidence – reasons for this in terms of dynamic nature and origin of dunes, implications for site distribution and preservation in dunes elsewhere south of the river.

[71] It is noted that there is a recorded site in close proximity (R26/265); however this site is on a low raised dune and the road in this area runs through wetland without impacting on dunes where sites are more likely, hence the low score.

Figure 39: Archaeological sites between QE Park and Poplar Ave

Numbers are archaeological sites on R26 mapsheet

Plan aligned to north

Section 2: Kāpiti Rd to Mazengarb Rd

Environment:	Low wetland immediately north of Kāpiti Rd, then moderately high vegetated dune to Mazengarb Rd, dune runs parallel to coast.
Archaeology undertaken:	Dune walked by archaeologist. Surface vegetated, precluding view of ground surface. Patches of blackberry preventing access in places. No sites seen, but very few fragments of shell observed that have been carried by people or horses (dune and adjacent low-lying flat paddock used for grazing and riding)
Known sites:	None in area of proposed Designation. Sites in vicinity: R26/444: midden R26/416: burials R26/417: middens and ovens
Potential for sites:	High on dunes based on known site occurrence and predictive model
Proposed construction:	Pockets of peat within dunes, so peat replacement, and cut to fill. Current level of Mazengarb Rd lowered, bridge over top, approaches to bridge at about current height of dunes.
Archaeological score:	1 in pocket of wetland 4 on high dune
Investigation/mitigation:	ADP in pocket of wetland Systematic investigation of dune prior to construction.
Research themes:	Nature of sites on low dunes within large wetland area, any evidence of utilisation of wetland resources. Nature of settlement on dunes utilisation of coastal or forest resources.

Figure 40: Archaeological sites between Kāpiti Rd and Mazengarb Rd

Numbers are archaeological sites on R26 mapsheet

Plan aligned to north

Section 3: Mazengarb Rd to Waikanae River

Environment:

Moderately high rolling dune belt between Mazengarb Rd and Otaihanga Rd, parallel to coast, covered in large pines, much pine detritus on ground surface. Dunes interspersed with pockets of wetland, hemmed in by refuse tip.

Rolling grass covered dunes north of Otaihanga Rd, dunes get higher in elevation and steeper sided towards river

Archaeology undertaken:

Dune walked by archaeologist, thick pine detritus has minimised ground vegetation but precludes a clear view of the ground surface. Sites present may have been modified or damaged by planting of pines.

Dunes north of Otaihanga Rd walked by archaeologist, previous surveying by Jacomb in 2006.

Known sites:

Four sites within or on edge of proposed Designation:

R26/370:	midden and two possible terraces
R26/369:	possible pit and terraces
R26/455:	possible terrace
R26/409:	midden and oven located in close vicinity on the dune edging Otaihanga Rd

Sites in vicinity:

R26/416:	seven burials revealed during surface stripping for a subdivision
R26/417:	middens and ovens in same vicinity as burials of R26/416
R26/322:	Three pits on low spur, projecting into a former area of swamp
R26/323:	seven pits, six rectangular and one small circular one. A whakamate (eeling channel) was also recorded adjacent.

	R26/355: midden
Potential for sites:	High on dunes between Mazengarb Rd and Otaihanga Rd based on known site occurrence and predictive model. However both planting of dunes and probable invasive work of cutting trees and extracting stumps likely to seriously compromise ability to extract useful archaeological data – consequently lower score for this area. High possibility of further middens beneath grass cover on rolling dunes north of Otaihanga Rd, which rise to river. Earthworks sites reasonably amorphous (the three sites recorded above all note "possible" earthworks) so surface stripping of vegetation and topsoil may reveal further features
Proposed construction:	Large amount of fill on north side of Mazengarb Rd. Peat removal and cut to fill. Preloading from landfill to Otaihanga Rd, because of risk of contaminants from landfill. Dunes will be cut and dragged. Bridge over Otaihanga Rd, at about current dune height. Realignment of small local road which joins Otaihanga Rd just west of proposed Expressway Alignment. Substantial cuts through dunes leading to river edge, batters up to 8m high. Rising to embankment over river, but little fill because of existing height of dunes.
Archaeological score:	3 between Mazengarb Rd and Otaihanga Rd (Dunes are same profile as dunes between Kāpiti Rd and Mazengarb Rd but action of removing pines reduces score) 5 in immediate vicinity of known sites north of Otaihanga Rd 4 elsewhere on dunes north of Otaihanga Rd
Investigation/mitigation:	Monitoring between Mazengarb Rd and Otaihanga Rd Systematic investigation of known sites to be impacted.

	Systematic investigations of selected dune ridges and crests north of Otaihanga Rd prior to construction
Research themes:	Nature of settlement on dunes, utilisation of coastal or forest resources. Survival rate of sites under pines. Any subsurface evidence for earthworks sites (terraces, postholes, house floors), in areas where no surface evidence – reasons for this in terms of dynamic nature and origin of dunes, implications for site distribution and preservation in dunes elsewhere south of the river. Are there a higher number of earthworks sites in close vicinity of river?

Figure 41: Archaeological sites between Mazengarb Rd and sector edge

Numbers are archaeological sites on R26 mapsheet

Plan aligned to north

Section 4: Waikanae River to Te Moana Rd

Environment:	Moderately high, rolling, meandering dunes (not parallel to coast). Dunes grassed. Dunes interspersed with reasonably large pockets of former or current wetlands. Immediately south of Te Moana Rd is flood plain of former Waimea River.
Archaeology undertaken:	Area of moderate archaeological and high cultural significance (Takamore urupa, Tuku Rakau village and Maketu tree and urupa), so area of relatively high activity. Area examined by archaeologist for existing WLR designation, SPAR has undertaken test trenching in wetlands adjacent to Takamore urupa[72]; archaeologist and Archaeology Solutions have undertaken fluxgate gradiometer surveys of Maketu tree[73], area around Tuku Rakau village below Takamore urupa[74], and of Takamore ridge[75].
Known sites:	Two sites within or on edge of proposed Designation:
	R26/368: Midden: exposed on surface by erosion & cultivation
	R26/281: Tuku Rakau village site
	Sites in vicinity:
	R26/272: urupa
	R26/273: Midden: dense layer of shell.
	R26/274: Midden: dense layer of shell.
	R26/275: Midden: dense layer of shell.

[72] Jacomb and Walter, 2008

[73] Archaeology Solutions, 2011a

[74] Archaeology Solutions, 2011b

[75] Archaeology Solutions 2011c

R26/276:	Midden: dense layer of shell, some charcoal & burning.
R26/277:	Midden: large scattered spread of shells & probable ovens. C14 date of 474BP (1446-1513 AD)
R26/278:	Hearth: single feature of burnt shell on ovenstone & charcoal.
R26/279:	Hearth: single feature of burnt shell on ovenstone & charcoal.
R26/280:	Hearths: scatters of hearth stones & charcoal.
R26/330:	Midden: small areas of shell & ovenstone
R26/367:	Midden/terrace: fragmented shell & possible terrace
R26/372:	Midden: surface scattered of fragmented shell
R26/454:	Maketu tree and urupa

Potential for sites: Iwi have strong tradition of further burials in curving ridge to east or Takamore urupa (ridge containing Takamore urupa curves in a crescent to east). Area immediately south of crescent dune ridge containing Takamore urupa has been investigated by geophysical survey, no sites revealed in this work. This area has also been substantially modified by the gas pipeline alignment running along the base of the dune to the river – the proposed Expressway Designation follows this gas pipeline alignment between the crescent dune and the river so virtually no possibility of sites along this stretch due to high level of modification. Possibility of middens and other archaeological sites on Takamore ridge. Possibility of middens and other archaeological sites on sloping flanks of dune containing Maketu tree (highest part of ridge with Maketu tree and urupa is avoided).

Proposed construction: Embankment leading off bridge, fill from river edge to about adjacent to Maketu tree.

	Cut through Takamore ridge, battered on each side. Embankment to bridge over Te Moana Rd, built on fill.
Archaeological score:	2 from river to adjacent to Maketu tree 4 through Takamore ridge 3 on floodplain from Takamore ridge to Te Moana Road
Investigation/mitigation:	Monitoring of construction from river. Monitoring through Takamore ridge cut Monitoring of construction on floodplain from Takamore ridge to road junction.
Research themes:	Any evidence of utilisation of wetland resources. Monitoring of excavating through wetlands in case of organic cultural material – can be done under auspices of Accidental Discovery Protocol.

Archaeologically this is the most problematic section of the proposed Expressway. The area has extremely high cultural and spiritual values for iwi; as has already been stated it is not the place of archaeology to attempt to comment on the nature or significance of cultural values.

Geophysical investigations have indicated the probable presence of further burials in the immediate vicinity of the Maketu tree. These investigation results have not been ground truthed; however the probable presence of burials is sufficient justification to recommend avoidance of the ridge containing the tree and these sites, which has occurred with the proposed Expressway Designation.

Geophysical investigations did not indicate further burials on the Takamore ridge to the east of the urupa. Again, these results have not been ground tested, nor can they be regarded as a categorical statement of site presence/absence. Geophysical surveying is a useful indicative technique, but it is not absolute, and should not be regarded as such. The data suggests there are no large disturbances of the ground on the current ground surface, which are of an expected shape or size to be burials. The possibility of burials below about 2 metres (being the range of the fluxgate gradiometer used to undertake the geophysical survey) cannot be discounted. Such burials may be considerably older than the Takamore urupa, and buried on an older, buried ground surface. However the possibility of unknown and unexpected burials on high dunes is an archaeological given on the Kāpiti Coast and as such burials could turn up on any high dune on the coast.

In addition, as noted above, the proposed Expressway Alignment follows this gas pipeline alignment between the crescent dune and the river so virtually no possibility of sites along this stretch due to high level of modification.

Therefore within this section the area with the greatest possibility of site sis the cut through the Takamore ridge. As the probability of burials appears low, due to the geophysical work, the likelihood of sites in the ridge is no greater than for any other high dune ridge of the Kāpiti Coast, and the types of sites present are likely to be similar to those encountered elsewhere in sand dunes, namely, middens and ovens.

Other sections of the proposed Expressway in this area are constructed on fill leading to bridges, so the in-ground invasive impact is virtually nil. This means that any potential archaeology resources will not be affected by the proposed works and will remain in situ.

Again, it is stressed that this is an assessment of likely archaeological occurrence and associated archaeological values; the cultural values of the area are likely to be substantially higher but it is not the place of the archaeologist to assess this.

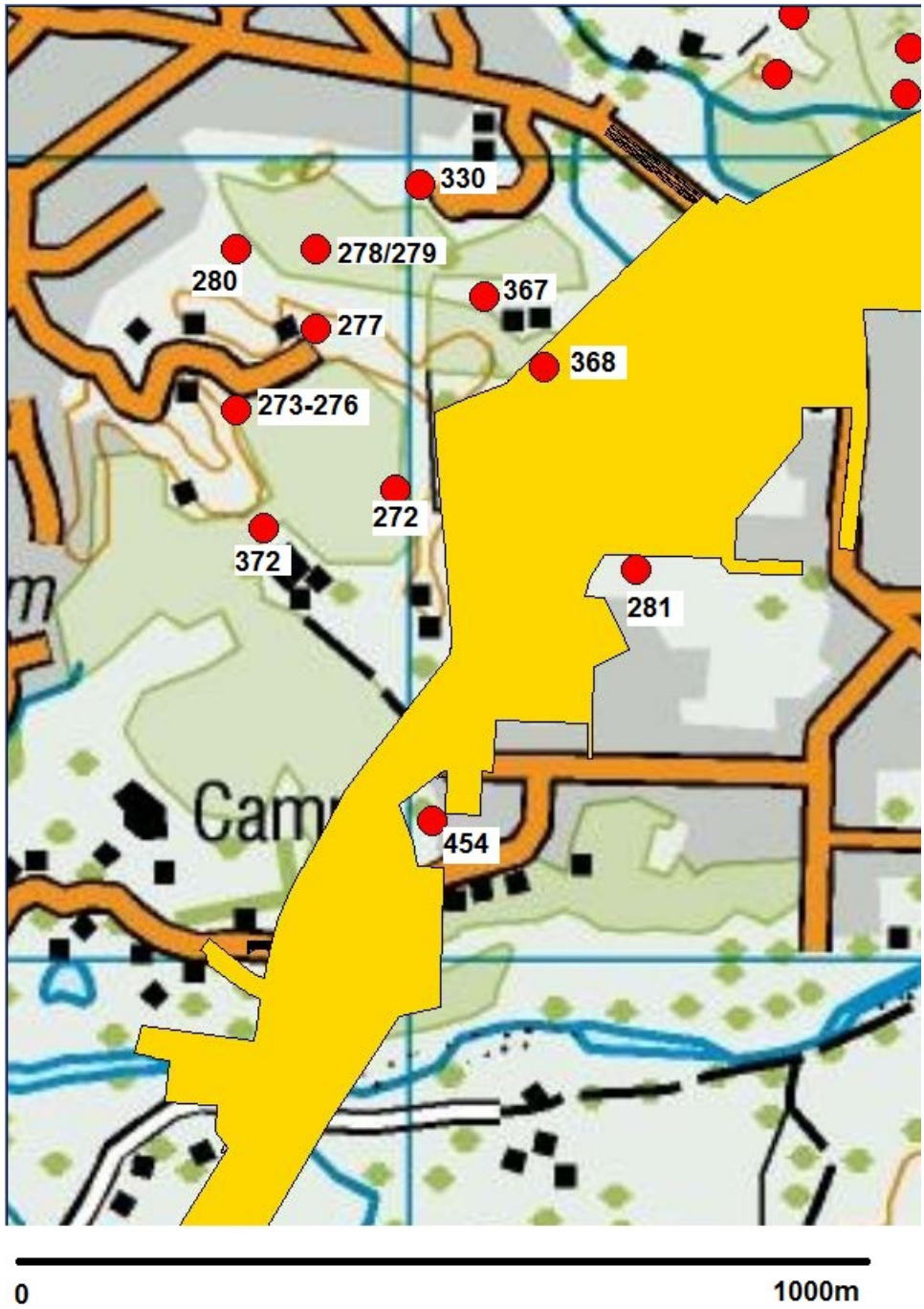

Figure 42: Archaeological sites between Waikanae River and Te Moana Rd

Numbers are archaeological sites on R26 mapsheet

Plan aligned to north

Section 5: Te Moana Rd to Ngarara Rd

Environment:	Waimeha Stream floodplain from Te Moana Rd to dunes to north of stream. Then high rolling meandering dunes (not parallel to coast, in contrast to dunes south of river). Several large dunes planted in large areas of pines, other dunes grassed or covered in gorse. There is a large pocket of semi permanent wetland between dunes.
Archaeology undertaken:	Walkover by archaeologist for this Project and for former proposed Ngarara development[76], walked over by Jacomb and Walters in 2008
Known sites:	Sites within or very close to proposed Designation:

R26/38:	Midden, shell lens in section, on top of dune, approx 1 ft below ground surface
R26/39:	Midden, reported in 1961 as all layer blown out and scattered by wind
R26/363:	Midden, thin exposure over about 7m, at base of a bank. Tuatua and charcoal
R26/365:	Group of six poorly defined terraces, possible pit and dense midden extending for 12m along road cutting
R26/429:	Platform, flattened area on high point on dune ridge, approx. 8m across, roughly circular. In clear grass, surrounded by gorse.
R26/430:	Pit & midden, small rectangular pit on ridge top, under grass and gorse, approx. 2m x 2m. Midden scattered down ridge slope immediately beside

[76] See O'Keeffe, 2009a

and below pit on south-eastern side (sheltered side). No obvious in situ lens. Multi species.

R26/431: Midden, surface scatter, no obvious source or lens, scattered over area about 3m2. In grass

R26/433: Platform, pits, terraces, flat topped ridge, two terraces and two pits immediately below it down slope. Features indistinct. In grass and pine trees (pit features are possibly tree throws)

Sites in vicinity:

R26/40: Midden, small lens in section seen, reported in 1961 as eroded and scattered

R26/41: midden on lagoon edge

R26/42: midden on lagoon edge

R26/44: midden on lagoon edge

R26/45: midden on lagoon edge

R26/186: Midden on dune ridge, consisting of tuatua, cockle and limited charcoal

R25/357: midden

R26/358: midden

R26/362: 5 pits, each approx 3-4, across, in long grass precluding detailed examination. 2 middens, one a sparse surface scatter, second a large scatter of fragmented shell over 10-15m from top of dune to base of gully

R26/364: Midden, thin exposure of fragmented tuatua over 3m under pines, on track

R26/371: Twenty terraces, some with pits, within pine plantation extending over 120 x 80m.

	R26/373:	Platform & midden, Platform on top of low knoll, approx 50m long with steep sides, midden exposed on at least two of faces by stock tracks, tuatua
	R26/374:	Midden, sparse scatter of tuatua and dosinia, scattered by rabbits and tree planting
	R26/375:	Midden, sparse exposure of shell under pine needles
	R26/376:	Midden, sparse scattered of fragmented shell, under pine needles.
	R26/411:	middens and ovens
	R26/432:	midden, surface scatter
	R26/434:	two pits
	R26/435:	midden, in situ lens
Potential for sites:	High probability of further midden beneath vegetation or pine detritus on the high rolling dunes, possibility of further earthworks sites (terraces, pits, platforms) beneath vegetation and pine detritus, or subsurface of earthworks sites where surface evidence has been obscured by wind or stock erosion	
Proposed construction:	Embankment on fill off Te Moana Rd Substantial cuts through dunes, batters up to 12m high. Some very small pockets of peat, mainly sand dunes.	
Archaeological score:	4-5 in high dunes especially in close proximity to known sites	
Investigation/mitigation:	Systematic investigation of known sites within proposed Designation. Systematic investigation of dune prior to construction earthworks.	
Research themes:	Function of earthworks sites – house floors, storage etc. Other unseen archaeological features in association with them – are the	

features in isolation or part of a large living complex. Nature of geomorphology north of the river whereby earthworks sites appear to survive in better condition and state of intactness.

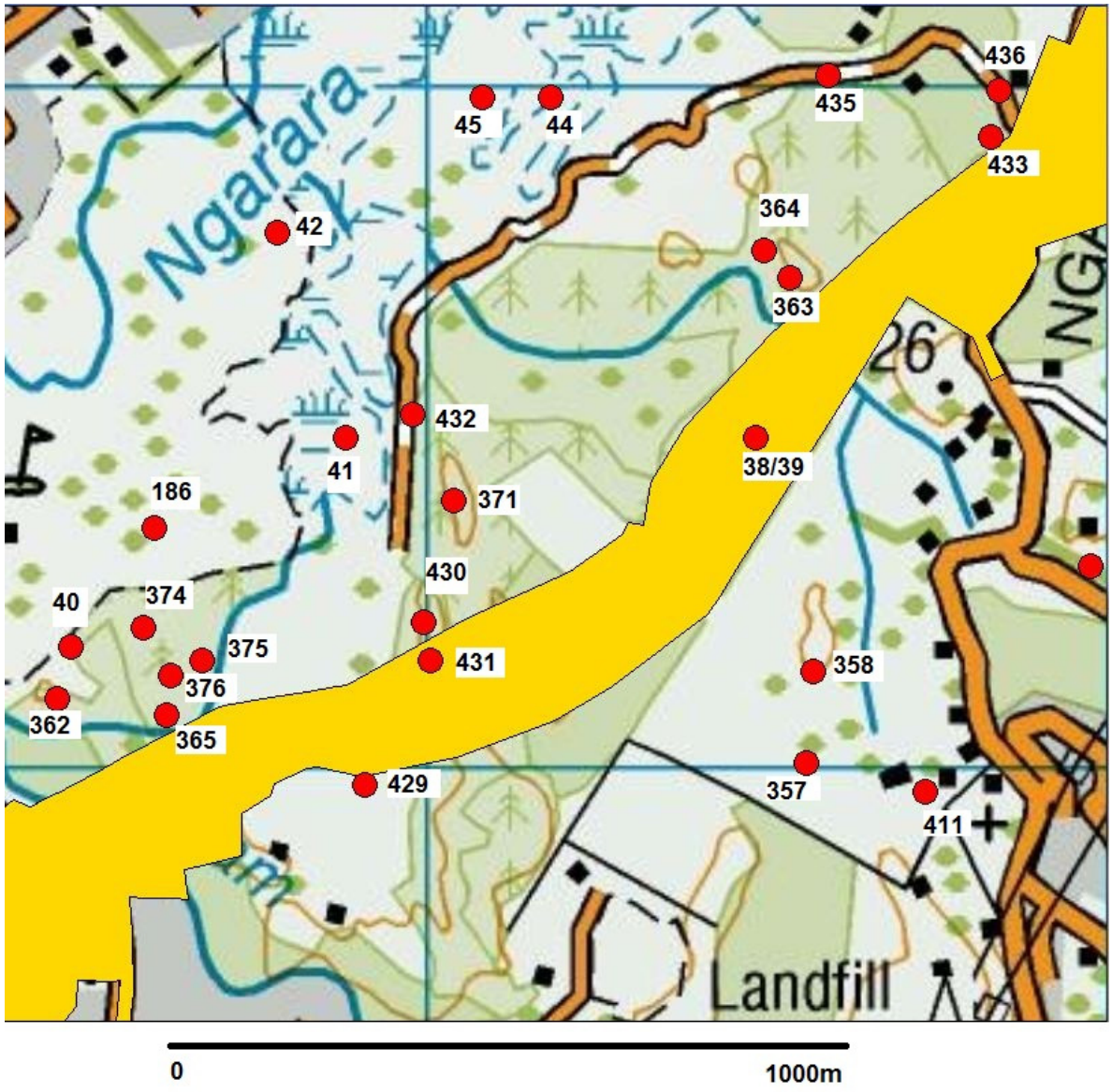

Figure 43: Archaeological sites between Te Moana Rd and sector edge

Numbers are archaeological sites on R26 mapsheet

Plan aligned to north

Section 6: Ngarara Rd to proposed Expressway end

Environment:	Rolling meandering grassed dunes (not parallel to coast), dunes get lower and sides less steep as the proposed Expressway Alignment moves inland to the east. There is a large pocket of semi permanent wetland between dunes.
Archaeology undertaken:	Walkover by archaeologist for this Project and for former proposed Ngarara development[77], walkover by Jacomb in 2007.
Known sites:	Sites within or very close to proposed Designation:

R26/373:	Platform & midden, Platform on top of low knoll, approx 50m long with steep sides, midden exposed on at least two of faces by stock tracks, tuatua
R26/377:	Terrace and depression
R26/366:	Midden & possible terrace, Possible terrace, midden exposed in small section in bank over about 10cm and scattered on stock track.
R26/447:	terrace, large terrace off north end of long low sand dune, dunes interspersed with wetlands
R26/448:	Eel channel, long straight channel approx 30m long x 0.5m wide in saddle between two long low dunes, connecting two low wetland areas. Channel now dry & grassed
R26/70:	Midden, Shell midden recorded in 1961, with some metal and glass found during 2006 Upgrade Project visit (located on edge of the existing SH1)

Sites in vicinity of proposed Designation:

R26/437:	Midden, Exposed in eroded scarp, and shell visible under grass. Lens visible in eroded scarp approx.

[77] See O'Keeffe, 2009a

0.8m long. Whole and fragmented shell; species include tuatua (*Paphies subtriangulata*), venus shell, (*Dosinia anus*), triangle shell, (*Spisula aequlilatera*).

R26/438: Pits & terrace, Features are indistinct. Three possible pit features along top of narrow ridge; two possible terrace features below pits, facing north.

R26/439: Midden, in situ lens of shell about 2m long, approx. 40cm thick. Whole and fragmented shell. Tuatua, venus shell, (*Dosinia anus*), triangle shell, (*Spisula aequlilatera*), part of a spindle-shaped shell, possibly *Alcithoe arabica*.

R26/440: Terraces, Two indistinct terrace features, facing north, each approx. 3m across.

R26/449: Platforms/pits, Two oval depressions: one is large oval depression on top of ridge of long low dune. Approx 9m across, edges very slightly raised. Could be very eroded pit or eroded house platform, features very amorphous. On long continuous dune system, interspersed with wetland. Second oval feature approx 10m to south on same dune, approx 7m long x 3m wide, deeper than first feature but still amorphous.

R26/450: Terraces, One terrace facing north, one facing west, both on top of long low dune ridge

R26/70: Midden, Shell midden recorded in 1961, with some metal and glass found during 2006 Upgrade Project visit

Potential for sites: High probability of further middens on high dunes beside Ngarara Rd, on dune surface beneath grass, possibility of further earthworks sites (terraces, pits, platforms) beneath grass, or subsurface evidence of earthworks sites where surface evidence has been obscured by wind or stock erosion.

	Low probability as proposed Expressway Alignment moves north to Peka Peka Rd because the area is largely wetlands which have a low probability of sites.
Proposed construction:	Ngarara Rd slightly realigned, Ngarara Rd is bridged over proposed Expressway, proposed Expressway running at level lower than current Ngarara Rd. Cuts through high dunes adjacent to Ngarara Rd, then dunes get lower, and interspersed with pockets of peat, peat being replaced, and cut to fill. Smithfield Rd being realigned, will run beside access road to Nga Manu. New road mostly on fill. Beyond new Smithfield Rd, peat replacement and cut to fill to point about 1.5km south of Peka Peka Rd. From this point to end of proposed Expressway Alignment is preloading on peat.
Archaeological score:	4 on high dunes in vicinity of Ngarara Rd 2 on lower rolling dunes to the north 1 on wetlands in vicinity of Peka Peka Rd
Investigation/mitigation:	Systematic investigation of dunes in vicinity of Ngarara Rd Monitoring on lower rolling dunes to the north ADP on wetlands in vicinity of Peka Peka Rd
Research themes:	Function of earthworks sites – house floors, storage etc. Other unseen archaeological features in association with them – are the features in isolation or part of a large living complex. Nature of geomorphology north of the river whereby earthworks sites appear to survive in better condition and state of intactness. Utilisation of wetlands for food & resources

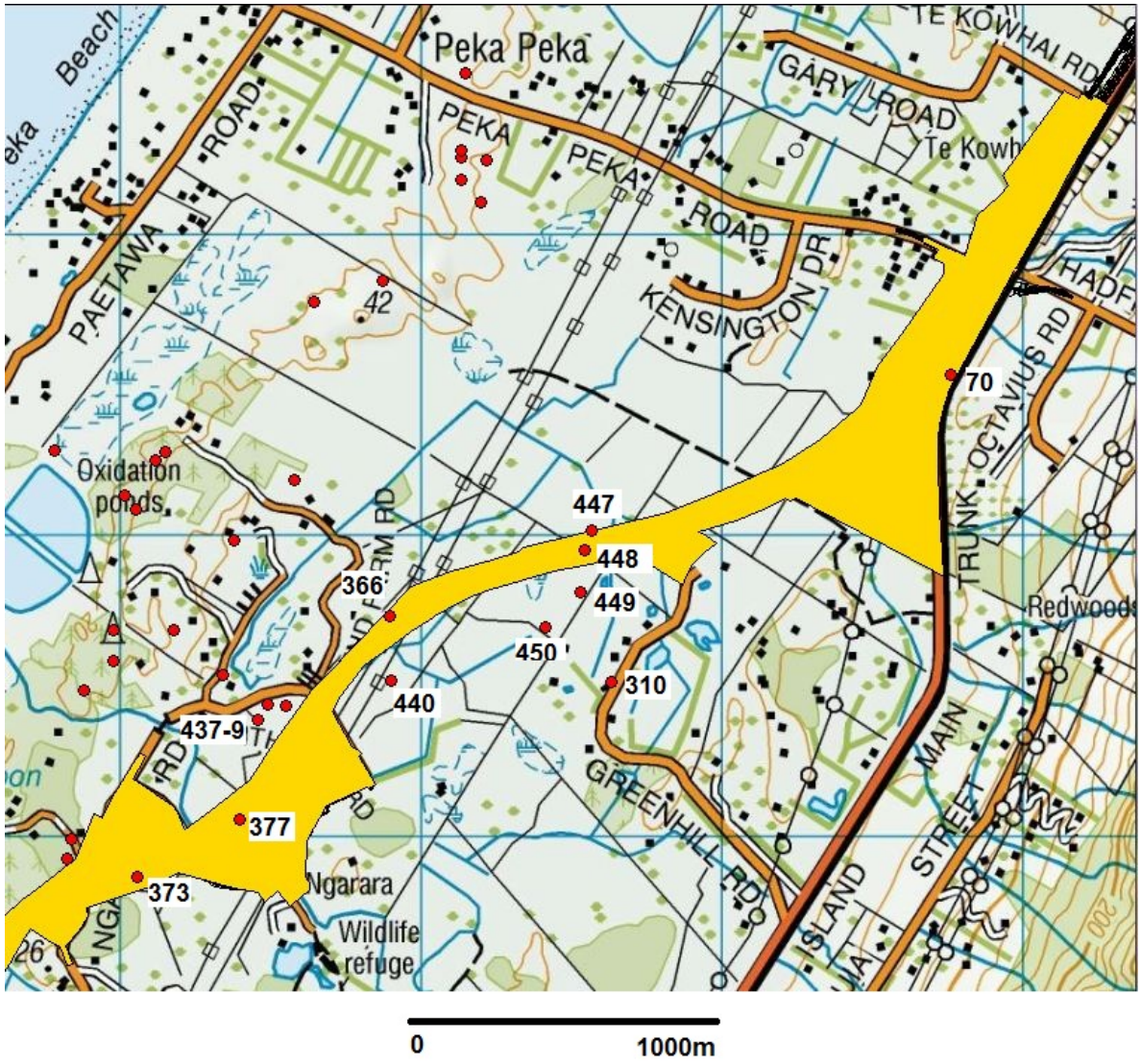

Figure 44: Archaeological sites between Ngarara Rd and Peka Peka Rd

Numbers are archaeological sites on R26 mapsheet

Plan aligned to north

Summary of impacted sites:

The following sites are within or on the edge of the proposed Expressway Designation. They are likely to be damaged or destroyed during construction work:

Section 1: none

Section 2: none

Section 3: Four sites

R26/370

R26/369

R26/455

R26/409:

Section 4: Two sites

R26/368

R26/281

Section 5: Eight sites

R26/38:

R26/39

R26/363

R26/365

R26/429

R26/430

R26/431

R26/433:

Section 6: Six sites

R26/373

R26/377

R26/366.

R26/447

R26/448

R26/70

There is a total of 20 sites being adversely affected by construction. Mitigation for these adverse effects is discussed below.

Summary of archaeological score areas:

4-5:

- High dune between Kāpiti Rd and Mazengarb Rd
- immediate vicinity of known sites north of Otaihanga Rd
- dunes north of Otaihanga Rd
- through Takamore ridge
- high dunes between Te Moana Rd and Ngarara Rd
- high dunes in vicinity of (north of)Ngarara Rd

2-3:

- low dunes either side of Raumati Rd
- dunes south of Kāpiti Rd
- dunes between Mazengarb Rd and Otaihanga Rd
- Waikanae River to adjacent to Maketu tree

- floodplain from Takamore ridge to Te Moana Road
- lower rolling dunes to the north of Ngarara Rd

1:

- QE park through low former wetlands north of Poplar Ave
- Pocket of wetland immediately north of Kāpiti Rd
- wetlands in vicinity of Peka Peka Rd

No areas had archaeological score 0.

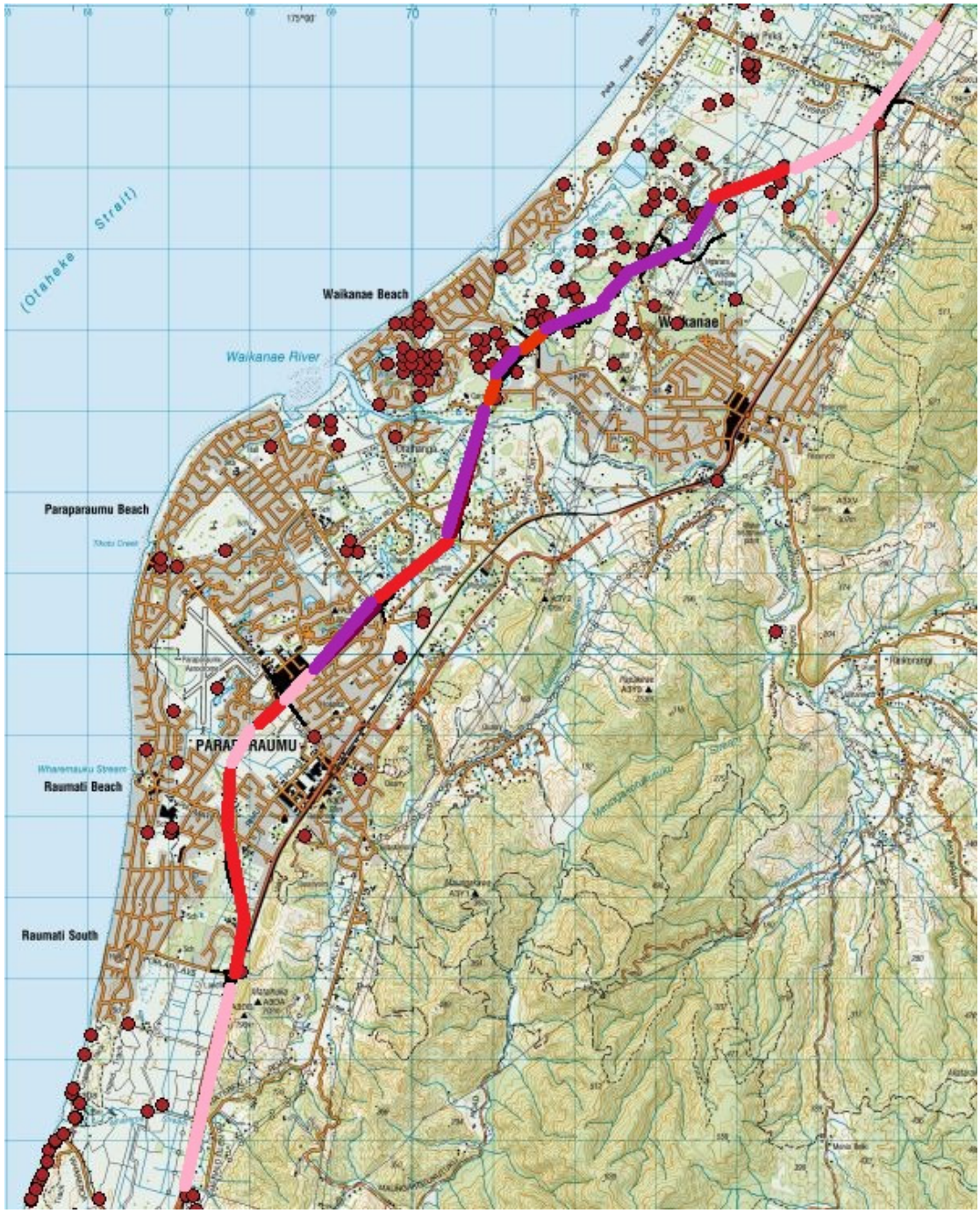

Figure 45: Archaeological scores by area

6.5. Mitigation

The planned road is approximately 18km long, and, as noted, will have a large potential adverse impact on the archaeological resource along the proposed Expressway Alignment.

Avoidance, as stated previously, will also not be possible as:

- there is a high likelihood of unknown and unrecorded archaeological sites being present in the dunes, and
- the precise location of the sites is not known.

The nature of a possible archaeological mitigation response comprises a hierarchy from low to high in terms of implementation requirements and potential results. A low level response would consist of basic periodic archaeological monitoring, whereas a high level response would entail strategic, detailed archaeological investigations.

Because of the large-scale impact and adverse effect of the road on the potential archaeological resource within the proposed Expressway Alignment, the mitigation recommended is generally at the upper end of the hierarchy of archaeological response. Although the impact of the road on this resource is high, its construction presents the opportunity for some region-wide directed archaeological research and investigations to be undertaken, to inform the general state of knowledge and understanding of the archaeology of the Kāpiti Coast.

Mitigation measures:

1. Archaeological Investigations

It could be said that archaeological investigations are not a mitigation measure, but are instead a requirement under the *Historic Places Act* 1993. However it is argued that the nature of the recommended investigations does constitute mitigation: the recommended high level investigations are at the top of the continuum of possible archaeological outcomes, in direct response to the wide ranging adverse impact of the road. Given the potential for recovery of high level, detailed data, and the valuable contribution that it would make to our understanding of the history of settlement on the Kāpiti Coast, such investigations are considered to be a mitigation measure.

The anticipated archaeological investigations will be of two types:

- high level strategic investigations of discrete sections of the planned route (those sections with archaeological scores 4 and 5 in section 6.4 of this report). This investigative work would be undertaken by a team of archaeologists, with virtually every archaeological feature present within each section of road being investigated, so as to understand the physical, spatial, temporal and social relationships between all the sites within an area. These investigations would take place prior to construction. The benefit of this type of

investigation is that it enables data to be gathered from a large number of archaeological sites and for the values of these sites to be analysed collectively as opposed to on a sporadic site by site basis; and

- monitoring during construction (those sections of the road with archaeological scores 2 and 3, and where site density is not expected to be as high). Monitoring will enable sites to be briefly recorded and sampled during construction, but not to the same level of detail and analysis is for the high level investigations.

It is noted that work in areas of very low archaeological probability (those sections of road with an archaeological score 1 in section 6.4 of this report) will be done under the direction of the Accidental Discovery Protocol.

There remains the possibility that significant sites may be discovered within areas previously designated as being of low archaeological sensitivity and that low-level recording and sampling as indicated may not be an appropriate level of mitigation. This is a standard archaeological risk in much development throughout areas of New Zealand with high archaeological potential. As construction work for the proposed Expressway is likely to be occurring in more than one area at any time, work around the newly discovered significant site can stop to allow a strategy to be developed and implemented, without causing a major and significant delay to the overall construction programme.

2. Roadside interpretation

It is proposed that a series of fixed interpretation panels are developed that reflect the story of the history of human occupation of the Kāpiti Coast, as seen through the archaeological resource and cultural tradition (as deemed appropriate by the iwi), and linking these stories visually to the landscape. The panels should be placed along the cycleway/walkway, to enhance the experience of users.

Unlike other parts of the country (for example the large pa of Auckland or the Western Bay of Plenty) there are no key visual sites on the coast where the panels could logically be placed. Instead they could be placed at significant or strategic locations, such as near the Takamore cultural precinct, or near a suitable resting place or viewpoint along the cycleway/walkway. However where investigations of individual sites undertaken for the proposed Expressway construction have yielded significant information specific to that place it could be appropriate to include additional panels near to those locations.

3. Travelling stories

In addition to the fixed interpretive panels a set of smaller portable panels are also proposed. As these panels are intended to be moveable they could be displayed in a variety of community locations, such as marae, schools, or the local library or civic centre.

4. Recording at Takamore urupa

A detailed geophysical survey could be undertaken at Takamore urupa. This would result in two outcomes:

- unmarked burials of tupuna could be identified and marked on the ground surface with pegs or similar to both show their location and to indicate available unused ground for further burials;
- the cadastral boundary of the property could be marked out on the ground with tape or similar, to show the legal boundaries as opposed to the current fences.

7. Conclusions and recommendations

7.1. General conclusions

Despite the fact that relatively little strategic archaeological investigation has been undertaken on the Kāpiti Coast, enough is known of the history and environment, and sufficient sites have been recorded, to give a good indication of pre-European Maori and European settlement and lifestyles.

The pre-European Maori were living in an environment rich with resources, from the sea, lakes and rivers, bush and forested hills. Europeans moved into the region and introduced flax and wheat crops, and other agricultural practices.

Although sufficient sites have been recorded and examined to enable general statements on site types, distribution and geomorphological context, far more research is required before detailed hypotheses can be developed and tested.

However, an adequate level of data has been gathered to create a predictive model of the archaeology of the area. The model postulates the likely nature of sites, their occurrence and distribution and their relationship with the underlying geomorphology. The key archaeological aspects reflected in the model are that sites are wide-spread, occur mainly in association with the sand dune ridges, and are often not visible on the ground surface.

The Mackays to Peka Peka Project will have a large and significant effect on the non-renewable archaeological resource on the Kāpiti Coast. Given the scale of the road, its placement relative to dunes which are known or predicted to contain archaeological sites, the location and high

occurrence of sites, and the fact that sites are often subsurface and thus cannot be seen, avoidance is not an achievable outcome in most instances. Based on the predictive model sites are extremely likely to exist on sand dunes, with the most likely site type on these dunes being midden. Other site types that are also likely to be present, but to a lesser extent, are ovens, burials and earthworks sites (pits, terraces, platforms).[78]

There is no reason on archaeological grounds why the road should not be built provided there are appropriate mitigation measures in place. Known and probable archaeological sites will be destroyed by the construction; however, this loss is balanced against the potential for retrieval of detailed archaeological data through a series of well planned high level investigations.

7.2. RMA requirements

The RMA calls for the avoidance, remedying or mitigation of adverse effects. In this case, avoidance is not possible as the proposed Expressway runs through sand dunes along the Kāpiti Coast, and these dunes are a major and widely spread landform feature of the coast. Archaeological sites are found mainly on the sand dunes, seen in the data for the distribution of recorded sites. Therefore any construction through dunes is very likely to adversely impact on sites.

Remedying is never an option for archaeological sites - damage to sites is permanent and irreversible.

Mitigation is therefore the only option available, and this can be achieved through the measures outlined in the previous chapter.

7.3. Historic Places Act authorities

Any earthworks or clearing work required for the road will require an authority to modify, damage or destroy sites in terms of Part 1 of the *Historic Places Act*. It is anticipated in due course that six authorities will be applied for, as outlined above in Section 6.4. The authorities are likely to be made under Section 12 of the HPA, as the potential for the presence of unknown sites has been discussed in this report.

The authorities, if granted, are likely to contain conditions specifying how the archaeological work is to be undertaken. An Archaeological Management Plan will also accompany the applications, detailing procedures of how the archaeological work is to be carried out, and detailing roles and responsibilities of the various parties involved.

[78] As noted in section 6.6 earthworks sites have been recorded in greater numbers north of the Waikanae River; the reasons for this are not yet clear

8. Sources

Note: A number of these sources are not explicitly cited in the text; this is a list of all sources consulted rather than references.

Primary:

Land Information New Zealand survey plans:

Plan No.	Plan Date	Location/Parent Block
ML 1130	n.d.	Ngarara Block West C
SO 10187	n.d.	Ngarara Block
SO 10188	n.d.	Ngarara Block
SO 11036	n.d.	Ngarara Block
SO 11759	189? (date obscured)	Kāpiti District Trigonometric Plan
SO 11502	1865	Kaitawa District
ML 3104	1873	Paraparaumu Block
ML 46	1873	Arapawaiti No 2 (pre-Ngarara Block)
ML 47	1873	Arapawaiti No 1 (pre-Ngarara Block)
SO 11089	1874	Wainui and Whareroa Blocks
ML 376	1879	Muaupoko Block
ML 504	1880	Ngarara Block
SO 10193	1881	Kāpiti Island
SO 11791	1881	Ngarara Block
SO 11881	1881	Ngarara Block
ML 820	1887	Muaupoko Block No.1
DP 463	1888	Plan of Pt Muaupoko Block - Paraparaumu Suburban
ML 962	1889	Muaupoko Block A No.1
ML 963	1889	Muaupoko Block A No.3
SO 12944	1889	Town of Paraparaumu
ML 504a	1890	Ngarara Block

Plan No.	Plan Date	Location/Parent Block
ML 999	1890	Muaupoko A Blocks Nos. 7,8 & 9
SO 13278	1891	Ngarara Block
A 333	1892	Ngarara West A No. 44
ML 1115	1892	Ngarara West B
ML 1122	1892?	Ngarara West A Subdivisions Nos. 13, 63, 64, 65, 66, 72, 73, 74
SO 13444	1892	Ngarara Block
SO 13529	1893	Ngarara Block West C
DP 669	1894	Pt Muaupoko, Pt. Ngarara West and Pt land to south of these blocks (Akatarawa District)
SO 13200	1895?	Ngarara Block
ML 1407	1896	Kaitawa Block 5
DP 1031	1897	Parata Township, Ngarara Block
SO 14102	1897	Ngarara Block
SO 14414	1897	Town of Parata (Waikanae)
ML 1491	1898	Ngarara Block West A
A 1067	1900	Plan of Subdivisions 1,2,3,4,5 & 6, Muaupoko A No.2 Sec 2
SO 14639	1900	Ngarara Block, Crown Grant Record Map Parata Township
ML 1771	1903	Ngarara and Paraparaumu Blocks, Section1 West B Block Ngarara
SO 15032	1903	Ngarara West A
SO 15271	1904	Ngarara West A
ML 1886	1905	Ngarara and Paraparaumu Blocks, Ngarara West B
DP 2391	1907	South of and adjacent to Ngarara Block
DP 2767	1907	South of and adjacent to Ngarara Block ,Plan of Raumati Township Extension No.1
ML 2041	1908	Kaitawa Block 5

Plan No.	Plan Date	Location/Parent Block
SO 15832	1908	Muaupoko Block A No.2
ML 2404	1912	Ngarara West B secs 2A, 2B, 2C, 3A, 3B, 3C,
DP 4106	1913	South of, Ngarara Block
ML 2601	1913	Ngarara West B sec 7
SO 17362	1919	Ngarara West A Sub Secs 12, 67, 68, 69, 70, 71 and part secs 8, 9, 10, 11, 72
B 401	1921	Ngarara Settlement: Sub Secs 12, 67, 68, 69, 70, 71 & Pts 8,9,10,11 & 72 of Ngarara West A and Pt Muaupoko A No1
ML 4075	1928	Ngarara Block West A Sections 63A & 63B
SO 20216	1938	Ngarara West 7
ML 4489	1951	Ngarara Block West A 78a
DP 16850	1953	Ngarara West A
ML 4533	1953	Ngarara Block West A Block Sec's 80A, 80B, 80C, 80D, & 80E & 80F
DP 17617	1954	Plan of Pts 24A and 24B Ngarara Block
ML 4604	1956	Ngarara Block West A78E1 to A78E17

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Appendix 9.A

Fluxgate Gradiometer survey of Maketu Tree

Archaeological Geomagnetic Report 1, Takamore, Kapiti Coast

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Date: February 2011

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Author(s): Dr. Hans-Dieter Bader

Revision History:

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Review	20.Feb.2011	O'Keeffe
Final	7. Mar. 2011	Bader

Front page picture: So called Maketu Tree, which grew over the known grave.

Contents:

Figures:

1.0 Introduction

Heritage Solutions instructed Archaeology Solutions Ltd to undertake an archaeological geomagnetic survey in the area of Takamore, Kapiti Coast. This is for a proposed roading development. Detailed archaeological information is sought to help determining various alignment option.

2.0 Brief

The brief was to investigate an area of 1.5 to 2 ha around a ridge line overlooking a swamp for archaeological features. The main concern was an identified 19th century burial now enclosed by a large Macrocarpa, and known as the Maketu burial and the question if any further burials had taken place in its vicinity. The large Macrocarpa which has overgrown the grave is a distinct landmark in the survey area (Figure 1, Area 2).

Figure 1: Area 2 showing the area of the survey on the ridge line surrounding the large tree (Graphics by Heritage Solutions).

3.0 Background

3.1 Project Background

The project background is described at the archaeological assessment by Mary O'Keeffe of Heritage Solutions (O'Keeffe, forthcoming).

3.2 Archaeological Background

The wider archaeological background is described at the archaeological assessment by Mary O'Keeffe of Heritage Solutions.

Hans-Dieter Bader of Archaeology Solutions Ltd, formerly one of the Directors of Geometria Ltd undertook an archaeological geomagnetic survey for Kapiti Coast District Council in the same area (Bader 2008). One of the survey grid results was re-used for this report.

3.3 Historical Context

The historical background is described at the archaeological assessment by Mary O'Keeffe of Heritage Solutions.

4.0 Methodology

4.1 Geomagnetics

Nine survey grid plots were laid out to cover the area of the ridge line north and south of the 'Maketu tree', the known burial. These were surveyed using a Fluxgate Gradiometer Foerster Ferex 4.032 DLG STD in a two probe configuration. Transects were walked across these plots at 0.5 metre intervals and data taken in 0.2 metre intervals. Recorded data was normalized to reduce errors resulting from walking transects over uneven ground surfaces and Teslaview 1.0 software was used to analyse the data.

Palaeomagnetism can be recorded by magnetometric methods such as through the use of a fluxgate gradiometer. These are widely employed in archaeological research competing mainly

with soil resistivity using electrical resistance and ground penetrating radar using the reflection of radar waves usually in the 200 MHz to 900 MHz range (Goldberg et al 2006, p.313). Magnetometry is the method most commonly used due to its speed and reliability in widely different soil conditions (Goldberg et al 2006, p. 315, Johnson 2006, ch.9 by K. Kvamme).

The fluxgate gradiometer measures small underground magnetic anomalies. Both geomorphological changes and human-induced soil changes can be detected. A geomagnetic survey is influenced by three components (Zickgraf 1999, p.107-9):

A. The magnetic field of the earth is constantly changing and influenced by outside changes such as the intensity of the sun. The arrangement of the survey instrument as a gradiometer using a magnetometer close to the soil surface and a second magnetometer in about 1 metre height compensates for those changes.

B. Magnetic susceptibility of any material inside a magnetic field changes the magnetic signature of different materials to different degrees. This allows recognition of foreign material in the soil (e.g. shell midden concentrations in the topsoil). Ferromagnetic materials (e.g. iron) can have a magnetic signature on their own (remnant magnetism).

C. Le Borgne effect: The susceptibility of the topsoil to about 30 cm depth can be up to 100 times stronger than the susceptibility of the soil at 100 cm depth. This is due to chemical reactions of the soil close to the surface. Therefore any trench or pit back filled with mainly topsoil shows a much stronger magnetic signature than the surrounding soil.

Fireplaces, houses and pits are standard features commonly recognised in archaeological geophysical surveys (Zickgraf, 1999, for examples see Duensberg p.130, Glauberg p.140, Mardorf-3 p.144 and Mardorf-23 p.146. The examples are mainly Neolithic and early Celtic earth built structures and settlements in Central Europe for which the archaeological signature is not dissimilar to pre-European Maori structures and archaeological deposits in New Zealand).

Fire events and shell midden has been recognised by geomagnetic surveys at Long Bay (Bader 2007a and b). The results underwent a rigorous ground testing (Phillips and Geometria 2007).

The distribution of small metal artefacts can also indicate patterns of historic settlements (Brooks et al 2009). Kvamme (in: Johnson 2006, p.216ff.) provides categories of detectable human activities using magnetometry:

1. Fires including hearth, fireplaces, burn-offs and accidental fires all create thermo-remnant anomalies.
2. Fired construction material like bricks can create the same effect.
3. Human occupation can enhance the Le Borgne effect (see above) and show the extent of settlements compared to unoccupied areas.
4. Accumulation of topsoil such as in the walls of sod houses can create anomalies. Often the natural backfill of a pit increases the amount of topsoil in the pit area and creates the same effect.

5. Removal of topsoil for ditch features or by footpaths or animal traffic can result in anomalies. The quick backfill of pits can result in similar anomalies as the topsoil ends up at the bottom of the pit and the subsoil on the top of the backfill.
6. Imported stone used as buildings or floor material often shows a difference to the surrounding soil matrix.
7. Iron objects will create a dipolar anomaly. Often these anomalies are not part of the archaeological site and can 'hide' weaker anomalies of the archaeological site.

4.2 Background "noise"

The plots surveyed were accessible and suited for gradiometric survey as the background soil readings were generally 'quiet' along the ridge line. This means that there is limited variation in the overall soil readings and that where there is change it is typically gradual. Against a quiet background, sharp changes in data are more easily observable and increase the confidence with which subterranean features can be identified. The identification of pit features was hampered by the presence of gas pipelines and a number of rubbish dumps close to the residential houses.

4.3 Other Data

The survey results were georectified using two base lines which were surveyed by the project surveyors.

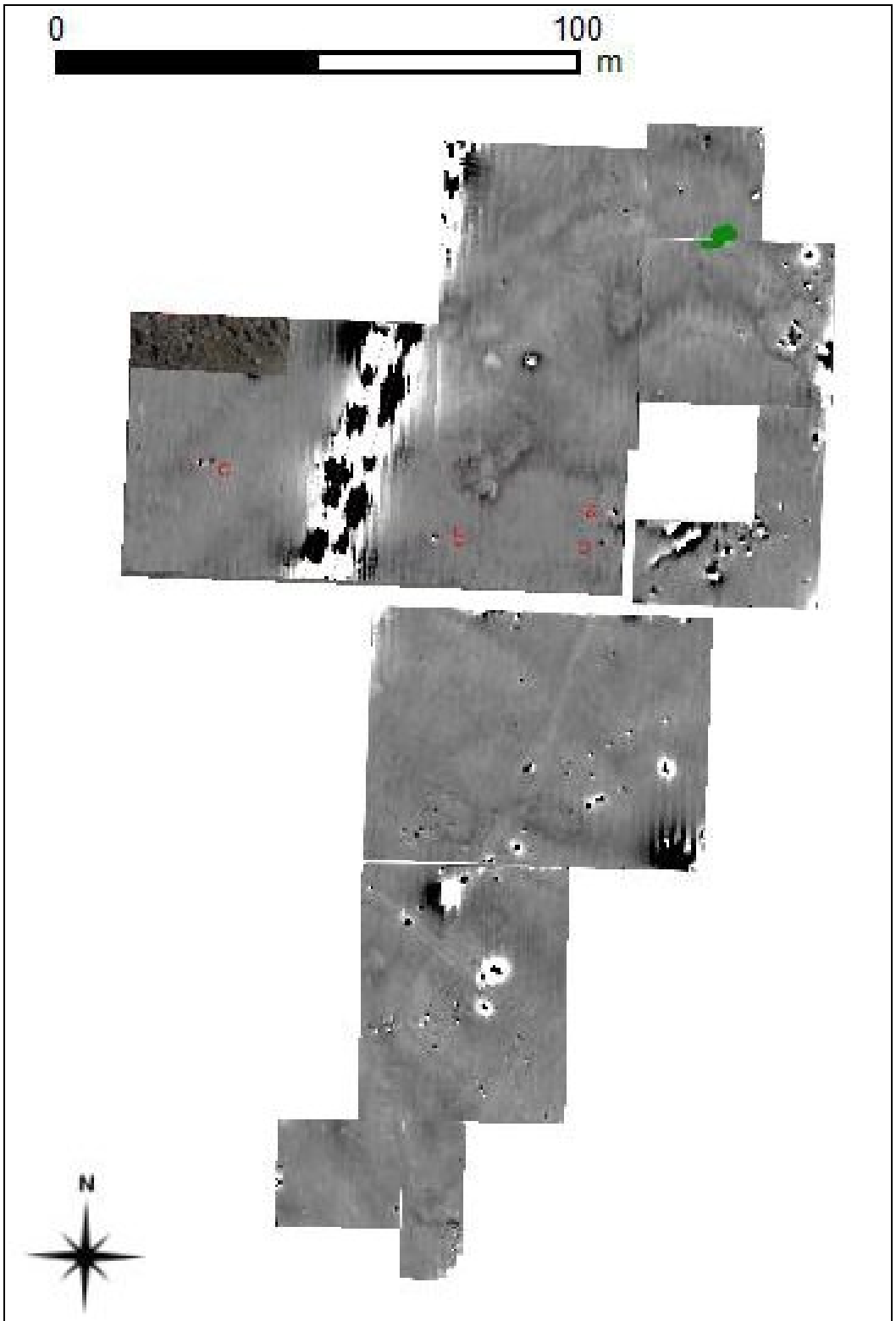

Figure 2: Overview of all geomagnetic areas. Large white area in the middle is the location of the tree.

5.0 Results

5.1 Geomagnetic anomalies

Types of geomagnetic anomalies:

a) An area of high values close to an area of low values (black and white) is the signature for metal underground. Ferrous material has remnant magnetism which shows up as a positive and a negative pole surrounding the object. Iron tubes can sometimes show these poles not close together, but as an inside/outside magnetic field. Both the larger and smaller of these metal anomalies comprise the majority of anomalies in the survey area.
b) Similar to type a) but showing a number of areas of high and low values close together, not just one each.
c) Long narrow anomalies with slightly higher values than the surrounding soil.
d) Small anomalies with lower values than the surrounding soil.

5.2 Classification of anomalies

Geomagnetic anomalies recorded in the survey were classified as either:

a) Metal remains indicating rubbish dumps,
b) Possible or likely burial pits with coffins,
c) Paths,
d) Pits with no metal in the backfill, possibly Maori storage pits

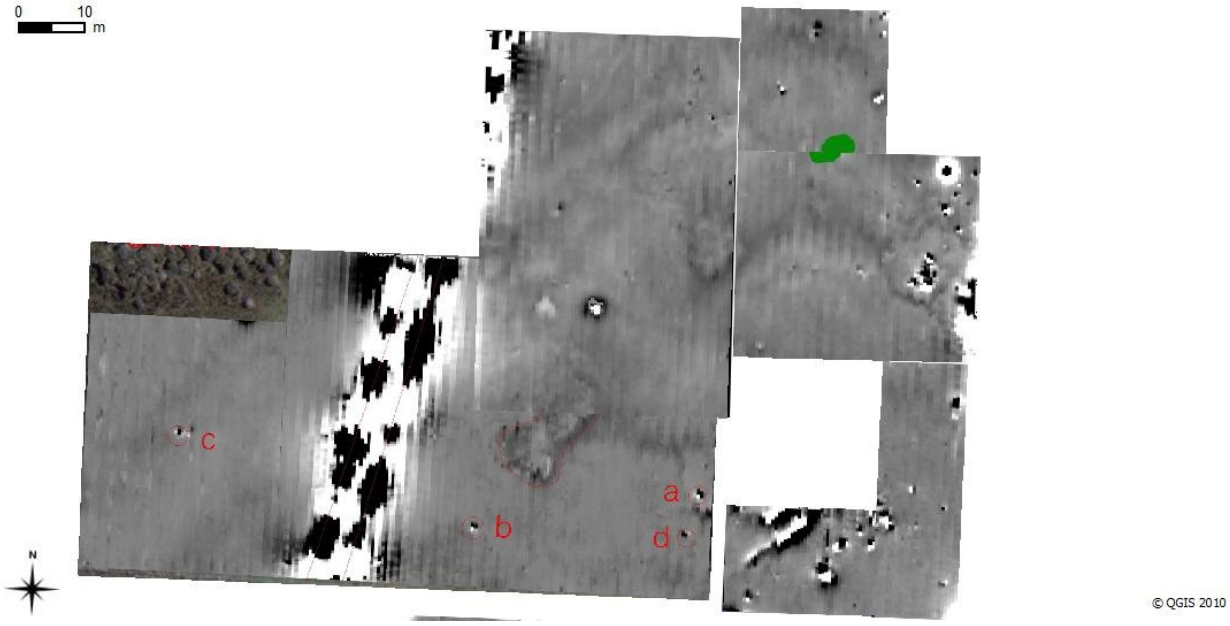

Figure 3: Northern section geomagnetic results.

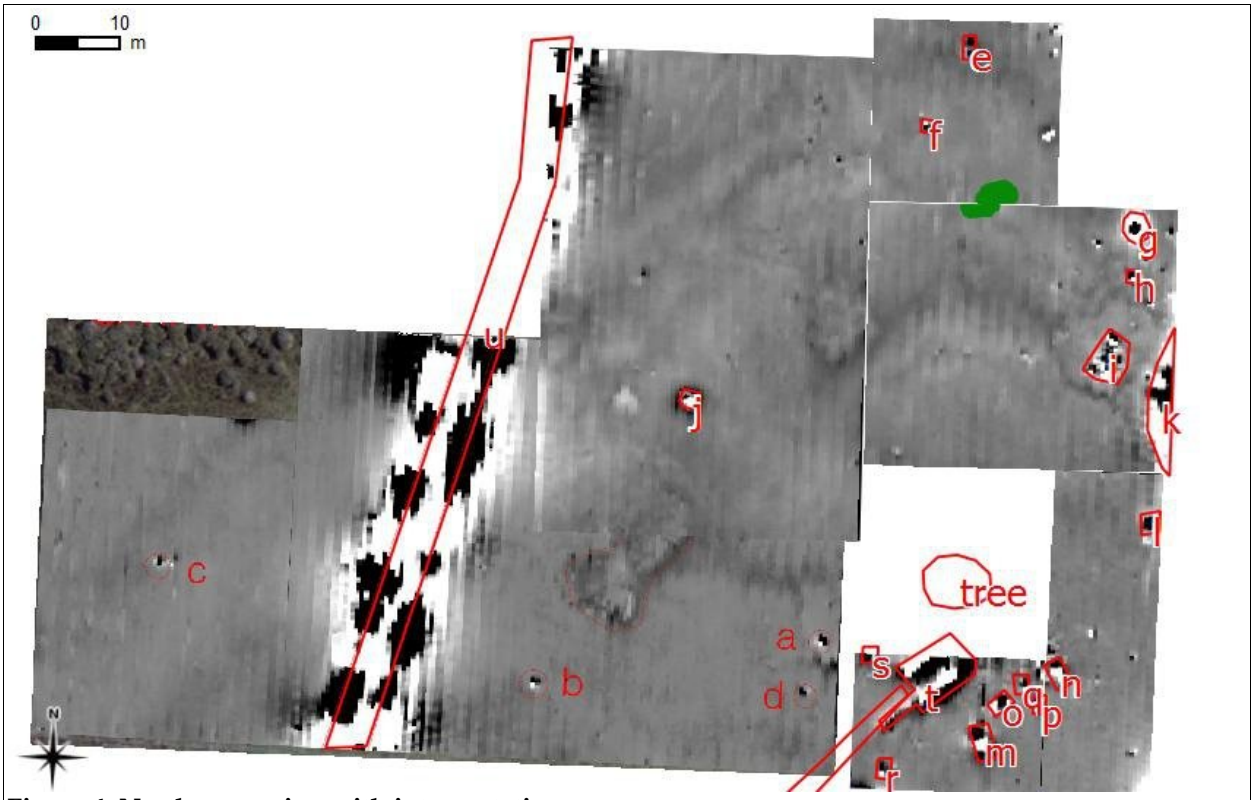

Figure 4: Northern section with interpretation.

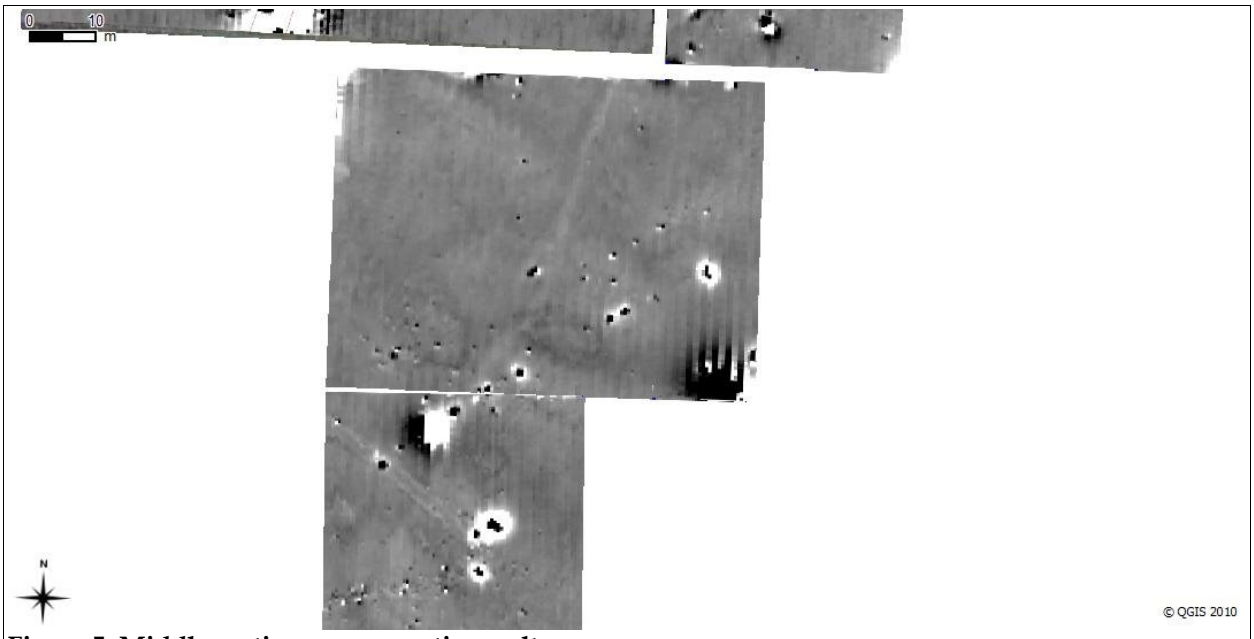

Figure 5: Middle section geomagnetic results.

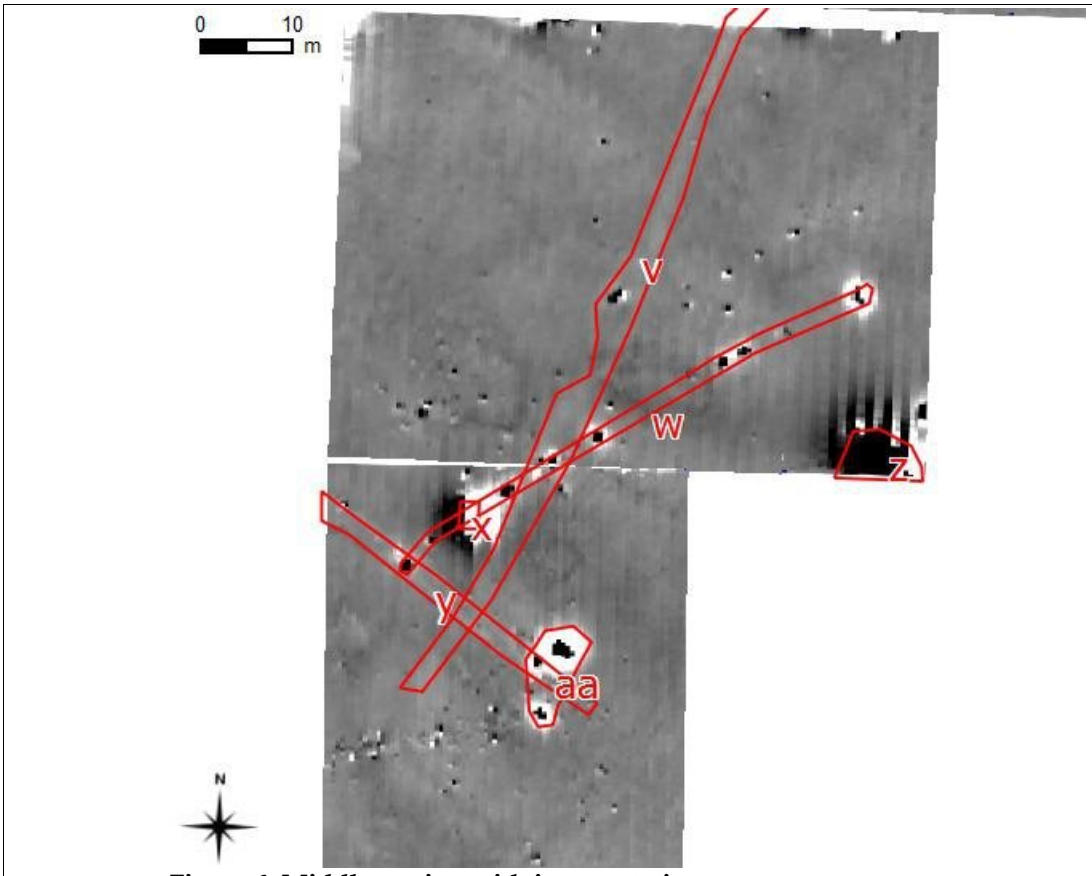

Figure 6: Middle section with interpretation.

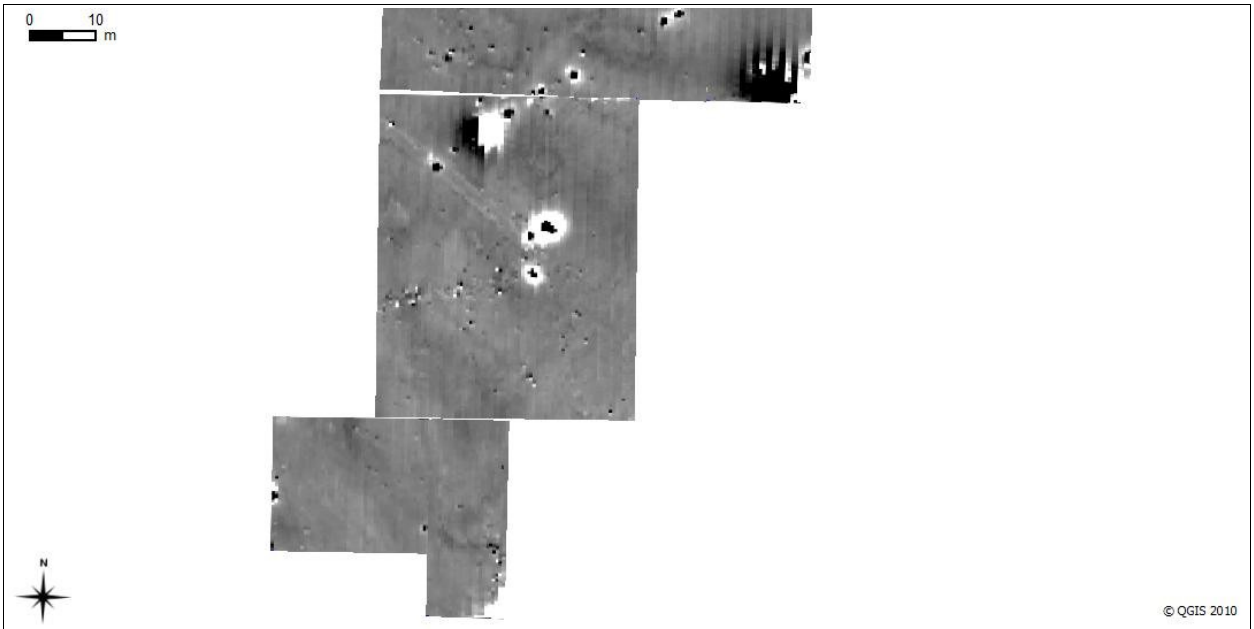

Figure 7: Southern section geomagnetic survey.

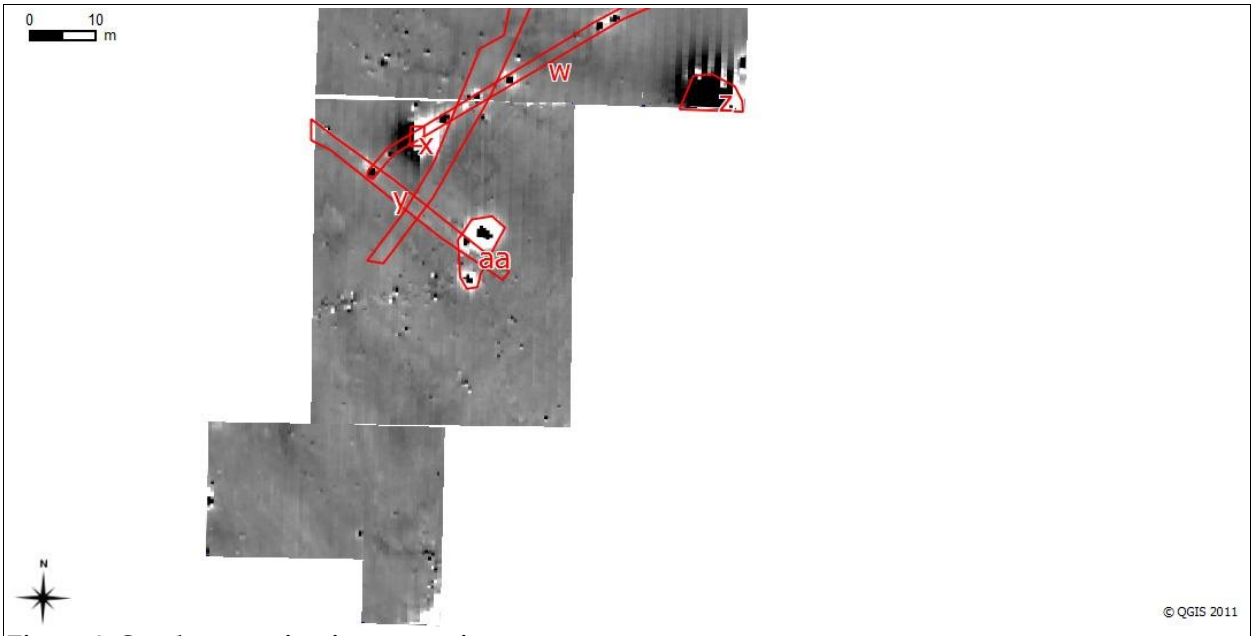

Figure 8: Southern section interpretation.

Following is a break down of all geomagnetic anomalies as marked on the illustrations above with their interpretation. The possible archaeological anomalies are highlighted.

ID	Interpretation	Confidence level	Possible Archaeology
a	burial pit with metal	moderate	yes
b	metal	high	no
c	metal	high	no
d	burial pit with metal	high	yes
e	possible storage pit	low	yes
f	metal	high	no
g	control survey tube	moderate	no
h	metal	high	no
i	modern burn off	high	no
j	recent pit	high	no
k	metal	high	no
l	metal	high	no
m	burial pit	high	yes
n	burial pit	high	yes
o	burial pit	high	yes
p	burial pit with metal	moderate	yes
q	burial pit with metal	moderate	yes
r	burial pit with metal	moderate	yes
s	burial pit with metal	moderate	yes
t	urupa installation	high	yes
u	Pipeline	high	no
v	path	high	yes
w	Waratah fence	high	no
x	power pole	high	no
y	farmtrack	high	no
z	metal	high	no
aa	metal, survey tube?	high	no

6.0 Discussion and Interpretation

One possible storage pit is shown at the very edge of the survey area (Fig.4). This would not be surprising as the area was especially in the 19th century known to be occupied by Maori and the sandy soil is probably good kumara growing soil.

All other possible archaeological remains belong to a single complex (Fig.9). Around the burial underneath the tree a number of burials are situated. They display pit like size and a number of small metal items, probably from coffin handles within the fill. The location on the high ground close to the known burial, size and magnetic signature is consistent with a small burial ground.

A path of which parts are barely visible on the ground leads up to this complex. Where the path meets the burial ground two large narrow anomalies indicate two metal structures parallel to each other. These could be the remains of metal fences. 19th century burial grounds often show a small structure at the entrance of the burial ground to leave the hearse during the burial (see Fig. 10 for an example from the East Coast).

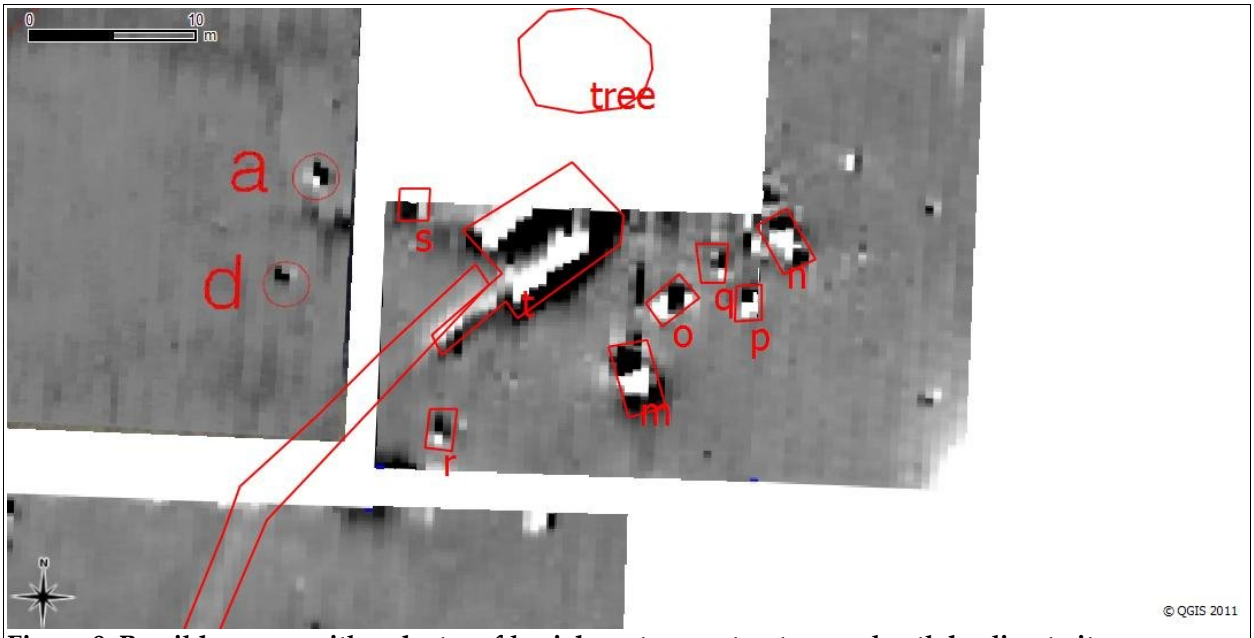

Figure 9: Possible urupa with a cluster of burials, entrance structure and path leading to it.

Figure 10: Entrance structure for hearse at East Coast urupa.

7.0 Recommendations

- Keep the development area outside the urupa
- Inform local hapu of the findings of this report

8.0 Acknowledgements

The author would like to thank Mary O'Keeffe and Daniel Parker for their help on the ground. He also would like to thank the surveyors for the survey data on the base line. Further thanks goes to Danny Mullins of Whakarongotai Ki Te Ati Awa who visited the site during the field survey.

9.0 References

Bader, H.D., 2008, *Takamore Area Geophysical Survey,* Report prepared by Geometria Ltd for Kapiti Coast District Council, Auckland.

Bader, H.D., 2007a. *Geophysical survey, Long Bay, North Shore, Auckland*. Report prepared by Geometria Ltd for Landco Okura Ltd, Auckland.

Bader, H.D., 2007b. *Geophysical survey, R1098-10, North Shore, Auckland: Long Bay No. 3*. Report prepared by Geometria Ltd for Landco Okura Ltd, Auckland.

Brooks, A., Bader, H.D., Lawrence, S. and Lennon, J., 2009, Ploughzone Archaeology On An Australian Historic Site: A Case Study from South Gippsland, Victoria. *Australian Archaeology No. 68*: 37 – 44.

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Zickgraf, B., 1999. *Geomagnetische und Geoelektrische Prospektion in der Archaeologie. Systematik – Geschichte –Anwendung*, MA Thesis, Seminar fuer Vor- und Fruehgeschichte, Philipps Universitaet Marburg.

Appendix 9.B

Fluxgate Gradiometer survey of Tuke Rakau

Archaeological Geomagnetic Report 2, Takamore, Kapiti Coast

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Date: May 2011

Quality Information

Title: Archaeological Geomagnetic Report 2, Takamore, Kapiti Coast

Reference: ASL10_30

Author: Dr. Hans-Dieter Bader

Revision History:

Draft	27. May. 2011	Bader
Review	30. May. 2011	O'Keeffe
Final	23. Jun. 2011	Bader

Front page picture: Ridge line on the East of the survey area.

Contents:

Figures:

1.0 Introduction

Heritage Solutions instructed Archaeology Solutions Ltd to undertake a second archaeological geomagnetic survey in the area of Takamore, Kapiti Coast. The first archaeological geomagnetic survey was undertaken to the South West around a small urupa which is not in use anymore. Both surveys were undertaken for a proposed roading development. Detailed archaeological information is sought to help determining various alignment option.

2.0 Brief

The brief was to investigate an area of 1.5 ha on a low lying area below a hill still used as an urupa for archaeological features. The main concern is remains of a kainga and further burials outside the marked area of the urupa.

3.0 Background

3.1 Project Background

The project background is described at the archaeological assessment by Mary O'Keeffe of Heritage Solutions (O'Keeffe, forthcoming).

3.2 Archaeological Background

The wider archaeological background is described at the archaeological assessment by Mary O'Keeffe of Heritage Solutions.

Hans-Dieter Bader of Archaeology Solutions Ltd, formerly one of the Directors of Geometria Ltd undertook an archaeological geomagnetic survey for Kapiti Coast District Council in the same area (Bader 2008). Another archaeological geomagnetic was undertaken by ASL in 2011 (Bader 2011) around the so called Maketu Tree about a kilometre to the West of this survey area.

3.3 Historical Context

The historical background is described at the archaeological assessment by Mary O'Keeffe of Heritage Solutions.

4.0 Methodology

4.1 Geomagnetics

Five survey grids were laid out to cover strategic areas beyond obvious earthworks and the known pipeline routes. These were surveyed using a Fluxgate Gradiometer Foerster Ferex 4.032 DLG STD in a two probe configuration. Transects were walked across these plots at 0.5 metre intervals and data taken in 0.2 metre intervals. Recorded data was normalized to reduce errors resulting from walking transects over uneven ground surfaces and Teslaview 1.0 software was used to analyze the data.

Palaeomagnetism can be recorded by magneto-metric methods such as through the use of a fluxgate gradiometer. These are widely employed in archaeological research competing mainly with soil resistivity using electrical resistance and ground penetrating radar using the reflection of radar waves usually in the 200 MHz to 900 MHz range (Goldberg et al 2006, p.313). Magnetometry is the method most commonly used due to its speed and reliability in widely different soil conditions (Goldberg et al 2006, p. 315, Johnson 2006, ch.9 by K. Kvamme).

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A. The magnetic field of the earth is constantly changing and influenced by outside changes such as the intensity of the sun. The arrangement of the survey instrument as a gradiometer using a magnetometer close to the soil surface and a second magnetometer in about 1 metre height compensates for those changes.

B. Magnetic susceptibility of any material inside a magnetic field changes the magnetic signature of different materials to different degrees. This allows recognition of foreign material in the soil (e.g. shell midden concentrations in the topsoil). Ferromagnetic materials (e.g. iron) can have a magnetic signature on their own (remnant magnetism).

C. Le Borgne effect: The susceptibility of the topsoil to about 30 cm depth can be up to 100 times stronger than the susceptibility of the soil at 100 cm depth. This is due to chemical reactions of the soil close to the surface. Therefore any trench or pit back filled with mainly topsoil shows a much stronger magnetic signature than the surrounding soil.

Fireplaces, houses and pits are standard features commonly recognized in archaeological geophysical surveys (Zickgraf, 1999, for examples see Duensberg p.130, Glauberg p.140, Mardorf-3 p.144 and Mardorf-23 p.146. The examples are mainly Neolithic and early Celtic earth built structures and settlements in Central Europe for which the archaeological signature is not dissimilar to pre-European Maori structures and archaeological deposits in New Zealand).

Fire events and shell midden has been recognized by geomagnetic surveys at Long Bay (Bader 2007a and b). The results underwent a rigorous ground testing (Phillips and Geometria 2007).

The distribution of small metal artifacts can also indicate patterns of historic settlements (Brooks et al 2009). Kvamme (in: Johnson 2006, p.216ff.) provides categories of detectable human activities using magnetometry:

1. Fires including hearth, fireplaces, burn-offs and accidental fires all create thermo-remnant anomalies.
2. Fired construction material like bricks can create the same effect.
3. Human occupation can enhance the Le Borgne effect (see above) and show the extent of settlements compared to unoccupied areas.
4. Accumulation of topsoil such as in the walls of sod houses can create anomalies. Often the natural backfill of a pit increases the amount of topsoil in the pit area and creates the same effect.

5. Removal of topsoil for ditch features or by footpaths or animal traffic can result in anomalies. The quick backfill of pits can result in similar anomalies as the topsoil ends up at the bottom of the pit and the subsoil on the top of the backfill.
6. Imported stone used as buildings or floor material often shows a difference to the surrounding soil matrix.
7. Iron objects will create a dipolar anomaly. Often these anomalies are not part of the archaeological site and can 'hide' weaker anomalies of the archaeological site.

4.2 Background "noise"

The plots surveyed were accessible and suited for gradiometric survey as the background soil readings were generally 'quiet'. This means that there is limited variation in the overall soil readings and that where there is change it is typically gradual. Against a quiet background, sharp changes in data are more easily observable and increase the confidence with which subterranean features can be identified. The identification of pit features was hampered by the presence of gas pipelines and a rubbish dumps.

4.3 Other Data

The survey results were georectified using a handheld GPS ans overlaid on geo-rectified aerials supplied by the client.

5.0 Results

5.1 Geomagnetic anomalies

Types of geomagnetic anomalies:

a) An area of high values close to an area of low values (black and white) is the signature for metal underground. Ferrous material has remnant magnetism which shows up as a positive and a negative pole surrounding the object. Both the larger and smaller of these metal anomalies comprise the majority of anomalies in the survey area.
b) Similar to type a) but showing a number of areas of high and low values close together, not just one each. These anomalies form in two cases large and long strings.
c) Small anomalies with lower values than the surrounding soil.

5.2 Classification of anomalies

Geomagnetic anomalies recorded in the survey were classified as either:

a) Metal remains indicating modern structures above and below the surface
b) One likely burial pit without metal,

Figure 1: Grid in SE corner of survey area.

Figure 2: Grid in middle of survey area, clipping the artificial lake.

Figure 3: Grid on top of ridge East of the house.

Figure 4: Grid in Western part of the survey area.

Figure 5: Grid in Northern part of the survey area, just below the marked urupa area.

Figure 6: Geomagnetic survey grids below the urupa, just visible at bottom of picture (North to the left).

Figure 7: Geomagnetic Interpretation; North to the left (#1=possible burial pit, red=modern disturbances, grey areas are geomagnetic grids).

6.0 Discussion and Interpretation

Two pipelines crossing the flat area below the marked urupa. The alignment is clearly visible in three of the geomagnetic grids (Figure 7). Originally the area seem to have been quite low and wet. Earthworks relating to the pipes and the recent creation of a wet land with several small lakes have changed the surface considerably. At least one soil covered recent rubbish dump can be seen in the SW corner of the survey area.

The ridge line behind the house shows the effects of modern planting but could contain small scale archaeological features in the southern part of the grid which would not be necessarily visible within the modern planting and earthworks.

The narrow geomagnetic grid in the NW corner of the area just below the marked urupa shows just one feature that is consistent with a back filled pit, possibly a burial pit (marked 1 in Figure 7). This same area seem to have been used by the current landowner as a pet cemetery, though the geomagnetic feature seems to be too large to be part of this. The banks below the marked urupa do not seem to be disturbed by the modern earthworks and it seems likely that burials are present beyond the fence lines of the urupa.

7.0 Recommendations

- The development should not impact upon the banks below the fences of the urupa on the ridge line.
- Inform local hapu of the findings of this report.

8.0 Acknowledgments

The author would like to thank Mary O'Keeffe for her help on the ground. He also would like to thank the surveyors for the geo-rectified aerials. Further thanks goes to Danny Mullins of Whakarongotai Ki Te Ati Awa who visited the site during the field survey.

9.0 References

Bader, H.D., 2011, *Archaeological Geomagnetic Report 1, Takamore, Kapiti Coast*, Report prepared by Archaeology Solutions Ltd for Heritage Solutions, Auckland.

Bader, H.D., 2008, *Takamore Area Geophysical Survey,* Report prepared by Geometria Ltd for Kapiti Coast District Council, Auckland.

Bader, H.D., 2007a. *Geophysical survey, Long Bay, North Shore, Auckland*. Report prepared by Geometria Ltd for Landco Okura Ltd, Auckland.

Bader, H.D., 2007b. *Geophysical survey, R1098-10, North Shore, Auckland: Long Bay No. 3*. Report prepared by Geometria Ltd for Landco Okura Ltd, Auckland.

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Appendix 9.C

Fluxgate Gradiometer survey of Takamore Ridge

Archaeological Geomagnetic Report 3, Takamore, Kapiti Coast

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Front page picture: Urupa on the same ridge line where the survey took place.

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1.0 Introduction

Heritage Solutions instructed Archaeology Solutions Ltd to undertake a third archaeological geomagnetic survey in the area of Takamore, Kapiti Coast. The first archaeological geomagnetic survey was undertaken to the South West around a small urupa which is not in use anymore (referred to as the Maketu Tree) (Bader 2011/1). The second one was to the South on a low lying area below a hill still used as an urupa (Bader 2011/2). All three surveys (Fig.1) were undertaken for a proposed roading development. Detailed archaeological information is sought to help determining various alignment option.

Figure 1: All geomagnetic survey areas and magnetic anomalies (red).

2.0 Brief

The brief was to investigate a ridge line part of which is still used as an urupa for archaeological features. The main concern are further burials outside the marked area of the urupa.

3.0 Background

3.1 Project Background

The project background is described at the archaeological assessment by Mary O'Keeffe of Heritage Solutions (O'Keeffe, forthcoming).

3.2 Archaeological Background

The wider archaeological background is described at the archaeological assessment by Mary O'Keeffe of Heritage Solutions.

Hans-Dieter Bader of Archaeology Solutions Ltd, formerly one of the Directors of Geometria Ltd undertook an archaeological geomagnetic survey for Kapiti Coast District Council in the same area (Bader 2008). Another archaeological geomagnetic was undertaken by ASL in 2011 (Bader 2011/1) around the so called Maketu Tree about a kilometre to the West of this survey area and another in the flat area to the East of the so called Maketu Tree (Bader 2011/2).

3.3 Historical Context

The historical background is described at the archaeological assessment by Mary O'Keeffe of Heritage Solutions.

4.0 Methodology

4.1 Geomagnetics

Seven survey grids were laid out to cover the high part of the ridge line (Fig.2). These were surveyed using a Fluxgate Gradiometer Foerster Ferex 4.032 DLG STD in a two probe configuration. Transects were walked across these plots at 0.5 metre intervals and data taken in 0.2 metre intervals. Recorded data was normalized to reduce errors resulting from walking transects over uneven ground surfaces and Teslaview 1.0 software was used to analyze the data. The geomagnetic data is displayed in a range between +30nT (white) and -30nT (black).

Palaeomagnetism can be recorded by magneto-metric methods such as through the use of a fluxgate gradiometer. These are widely employed in archaeological research competing mainly with soil resistivity using electrical resistance and ground penetrating radar using the reflection of radar waves usually in the 200 MHz to 900 MHz range (Goldberg et al 2006, p.313). Magnetometry is the method most commonly used due to its speed and reliability in widely different soil conditions (Goldberg et al 2006, p. 315, Johnson 2006, ch.9 by K. Kvamme).

The fluxgate gradiometer measures small underground magnetic anomalies. Both geomorphological changes and human-induced soil changes can be detected. A geomagnetic survey is influenced by three components (Zickgraf 1999, p.107-9):

A. The magnetic field of the earth is constantly changing and influenced by outside changes such as the intensity of the sun. The arrangement of the survey instrument as a gradiometer using a magnetometer close to the soil surface and a second magnetometer in about 1 metre height compensates for those changes.

B. Magnetic susceptibility of any material inside a magnetic field changes the magnetic signature of different materials to different degrees. This allows recognition of foreign material in the soil (e.g. shell midden concentrations in the topsoil). Ferromagnetic materials (e.g. iron) can have a magnetic signature on their own (remnant magnetism).

C. Le Borgne effect: The susceptibility of the topsoil to about 30 cm depth can be up to 100 times stronger than the susceptibility of the soil at 100 cm depth. This is due to chemical reactions of the soil close to the surface. Therefore any trench or pit back filled with mainly topsoil shows a much stronger magnetic signature than the surrounding soil.

Fireplaces, houses and pits are standard features commonly recognized in archaeological geophysical surveys (Zickgraf, 1999, for examples see Duensberg p.130, Glauberg p.140, Mardorf-3 p.144 and Mardorf-23 p.146. The examples are mainly Neolithic and early Celtic earth built structures and settlements in Central Europe for which the archaeological signature is not dissimilar to pre-European Maori structures and archaeological deposits in New Zealand).

Fire events and shell midden has been recognized by geomagnetic surveys at Long Bay (Bader 2007a and b). The results underwent a rigorous ground testing (Phillips and Geometria 2007).

The distribution of small metal artifacts can also indicate patterns of historic settlements (Brooks et al 2009). Kvamme (in: Johnson 2006, p.216ff.) provides categories of detectable human activities using magnetometry:

1. Fires including hearth, fireplaces, burn-offs and accidental fires all create thermo-remnant anomalies.
2. Fired construction material like bricks can create the same effect.
3. Human occupation can enhance the Le Borgne effect (see above) and show the extent of settlements compared to unoccupied areas.
4. Accumulation of topsoil such as in the walls of sod houses can create anomalies. Often the natural backfill of a pit increases the amount of topsoil in the pit area and creates the same effect.
5. Removal of topsoil for ditch features or by footpaths or animal traffic can result in anomalies. The quick backfill of pits can result in similar anomalies as the topsoil ends up at the bottom of the pit and the subsoil on the top of the backfill.
6. Imported stone used as buildings or floor material often shows a difference to the surrounding soil matrix.
7. Iron objects will create a dipolar anomaly. Often these anomalies are not part of the archaeological site and can 'hide' weaker anomalies of the archaeological site.

4.2 Background "noise"

The plots surveyed were accessible and suited for gradiometric survey as the background soil readings were generally 'quiet'. This means that there is limited variation in the overall soil readings and that where there is change it is typically gradual. Against a quiet background, sharp changes in data are more easily observable and increase the confidence with which subterranean features can be identified. The identification of pit features was hampered by the presence of what seems to be rubbish dumps from farming processes.

4.3 Other Data

The survey results were georectified using a handheld GPS and overlaid on geo-rectified aerials supplied by the client.

Figure 2: Geomagnetic survey areas in grey overlaid onto aerial photograph.

5.0 Results

5.1 Geomagnetic anomalies

Main types of geomagnetic anomalies (other smaller value ones present):

a) An area of high values close to an area of low values (black and white) is the signature for metal underground. Ferrous material has remnant magnetism which shows up as a positive and a negative pole surrounding the object. Both the larger and smaller of these metal anomalies comprise the majority of anomalies in the survey area.
b) Similar to type a) but showing a number of areas of high and low values close together, not just one each.
c) Small anomalies with lower (darker) values than the surrounding soil.
d) Large anomalies with either lower or higher values than the surrounding soil.

5.2 Classification of anomalies

Geomagnetic anomalies recorded in the survey were classified as either:

a) Metal remains indicating modern farming debris and rubbish dumps below the surface (a.+b.)
b) Waratah from modern fences (d.)
c) Two possible burial pits without metal (c.)

ID	interpretation	(see Fig.3)
1	dune blow out	
2	dune blow out	
3	waratah	
4	waratah	
5	waratah	
6	farming	
7	farming	
8	farming	
9	farming	
10	farming?	
12	pit?	Possible burial pit, though unlikely
13	pit?	Possible burial pit, though unlikely
14	farming?	
15	disturbed soil	

Figure 3: Interpretation of geomagnetic anomalies.

Figure 4: Detail of mid section of survey area.

Figure 5: Open ridge line on the NW of the survey area.

Figure 6: Mid section of survey area.

Figure 7: Mid section of the survey area on Southern property.

Figure 8: Area of disturbance (#15).

Figure 9: Southern section of survey area. Deep bank beyond survey area.

6.0 Discussion and Interpretation

A few sand blow outs are visible in the geomagnetic survey (#1 +2), which indicate that even small ground disturbances should be visible in the geomagnetic survey. Three waratah from modern temporary fencelines are within the survey area (#3,4,5). Accumulation of metal debris seem to indicate rubbish dumps (#6 to 10 and 14), most likely from farming processes or related to a large scale ground disturbance caused by a bulldozer or mechanical digger (#15).

Close to anomaly #10 two small single anomalies with only lower values (#12 and #13) are shown. These could possibly indicate pits without metal. But being so close to other anomalies that look like rubbish dumps it seems unlikely that these two are burial pits. Nonetheless it cannot be ruled out.

7.0 Recommendations

- No probable burial pits are visible, but two possible, but unlikely pits are shown. These could be investigated by carefully removing the topsoil and exploring any features showing in the subsoil. If they are carefully cut regular back-filled features the investigation should stop, as it is likely that they are burial pits. If they are irregular and rubbish/artefacts turning up soon beyond the topsoil, they are most likely rubbish dumps and any material culture turning up should date them.
- Inform local hapu of the findings of this report.

8.0 Acknowledgments

The author would like to thank Mary O'Keeffe for her help on the ground. He also would like to thank the surveyors for the geo-rectified aerials.

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Appendix 9.D

Accidental Discovery Protocol

Accidental Cultural Discovery Protocol

1. Purpose

The MacKay's to Peka Peka Alliance is currently undertaking investigations as part of the development of the MacKays to Peka Peka Expressway project.

This includes limited engineering investigations and design, and environmental assessment work, plus the preparation of documents ready to lodge applications for the various consents necessary for the project.

This protocol outlines the steps to be taken in the event of the accidental discovery of cultural or historic artefacts, as the result of any physical disturbance to the existing ground surface.

2. The Historic Places Act 1993

An archaeological site is defined in the *Historic Places Act* 1993 (the HPA) as any place associated with pre-1900 human activity, including shipwrecks, where there is evidence relating to the history of New Zealand that can be investigated using archaeological methods.

If you wish to do any work that may affect an archaeological site you must obtain an authority from the New Zealand Historic Places Trust (NZHPT) before you begin. This work could include, amongst other things:

- Invasive geo-tech investigations
- Earthworks for road construction
- Earthworks for relocation of buildings or structures, creation of accessways, etc.
- Earthworks for landscaping,
- Trenching for stormwater management, and waste disposal
- Quarrying building demolition or removal.

It is an offence to do work that may affect an archaeological site without a written authority from the NZHPT.

3. Identifying Archaeological Sites

For Maori sites the largest and most obvious site types are pa, pits and terraces. However, evidence may be of a smaller nature, in the form of bones, shells, charcoal, burnt stone etc; a midden is an archaeological rubbish tip, in which many of these items can be found consolidated together. Evidence of disturbance of a midden can be a scattering of shell across a wide area; this can be confusing if it is near a beach. Pieces of obsidian or chert, together with stone tools, may also be recovered.

In later sites of European origin artefacts such as bottle glass, iron/metal, crockery etc. may be found, or evidence of old foundations, wells, drains or similar structures. Burials/koiwi tangata may be found from any period.

Some examples include:

- Shell midden

- Discoloured soils indicating burning or cooking
- Animal bone
- Historic pottery on a roadside scrape
- Shell midden uncovered in road scraping

4. Procedures

Prior to ground investigation work commencing, the field team shall be briefed on the likely nature of cultural and historic artefacts in the area, and on this procedure.

If any suspected archaeological material is uncovered, all work within 100m of the discovery shall stop immediately.

The Alliance, including any sub-consultants and sub-contractors, is required to keep confidential all discoveries.

The Alliance is responsible for on-site safety and may from time to time need to restrict access, for the safety of all parties.

The Alliance Cultural Adviser is responsible for ensuring all iwi groups are advised of the find and provided an opportunity to participate in decision-making.

In coordination with the Construction Manager, the Archaeologist shall conduct exploratory work to determine the nature of the find.

The Alliance Construction Manager, in consultation with the Archaeologist and Cultural Adviser shall coordinate the response as follows:

a) If the event of the discovery of any Taonga artefacts or other signs of previous Maori presence or occupation, work with the iwi representatives to ensure that the appropriate steps are taken to make the site safe,

b) Inform the consultant where work can continue around the site,

c) The archaeologist shall coordinate the appropriate consent process in accordance with the requirements of the Historic Places Act (1993).

d) Works affecting the archaeological site shall not resume until the New Zealand Historic Places Trust and iwi are satisfied that the site has been identified, the find recorded, and cultural protocols appropriately observed.

The Alliance Archaeologist and Cultural Adviser shall first liaise on all issues with the Construction Manager, who will keep the other parties informed.

If any artefacts are removed from a find site the Ministry for Culture and Heritage will be advised to ensure that the correct procedures under the *Protected Objects Act 1975* are adhered to.

Any media statements in relation to this protocol will be prepared with the assistance of iwi and only after discussions between the Alliance and iwi.

Archaeological finds in wetlands may include organic material preserved as a result of anaerobic conditions. Typically these remains are extremely fragile and susceptible to rapid decay in the event of any changes in environment, so usually require specialist attention. Finds can include (but are not limited to) wooden artefacts such as adze handles, weapons or horticultural implements and woven flax, or artefacts made from organic materials such as gourds.

Where wooden or organic artefacts are found in wetlands:

a) Finds should remain, where possible, in-situ until professional advice has been obtained;

b) In the event that items are inadvertently removed from their original context, the construction manager shall ensure the organic material is kept wet by being placed in a suitable storage container filled with water;

c) Work in that location shall cease and the Alliance Archaeologist and Cultural Adviser shall be called;

d) The Alliance Archaeologist shall obtain specialist conservation services and advice from an appropriate specialist, such as a wet wood conservator, to ensure the survival and appropriate conservation treatment of the artefact;

e) The Ministry of Heritage and Culture will also be notified in accordance with the statutory requirements of the *Protected Objects Act 1975*; and

f) The Alliance shall be responsible for all transportation and conservation costs that may be incurred.

5. Koiwi Tangata/Human Remains

As soon as practicable after the Alliance has given notice to the appropriate iwi representatives that koiwi have been discovered, iwi representatives will inspect the site and advise the Alliance whether iwi wish to undertake any cultural ceremonies at the site. The Alliance Construction Manager will arrange access.

If Iwi wish to undertake such ceremonies, the iwi representative will make the necessary arrangements for these ceremonies to occur at the site as soon as possible. Once these ceremonies are completed, the Alliance Archaeologist, in consultation with the Cultural Adviser and iwi representatives, will inspect the skeletal remains. The Project Archaeologist will record the details of the koiwi, the site of discovery, and any other relevant facts and will make these records available to iwi and the police if required.

If the discovery area is found to contain an archaeological site, approvals must be obtained from the New Zealand Historic Places Trust (NZHPT) to permit the removal of koiwi. If the koiwi are Maori, and the police and/ or coroner have no uncertainty or suspicion about the koiwi, the iwi representatives will then gather up the koiwi and remove them from the site. In the event that the police and/ or coroner have any uncertainty or suspicion about the koiwi, they are responsible for making any records they require and for any koiwi that they remove from the site.

If the koiwi are Maori and the police and/ or coroner remove only part of the koiwi, the iwi representative will arrange removal of the remaining koiwi. If the koiwi are non-Maori, the police and/ or the coroner will be responsible for removing any remaining exposed Koiwi.

ADVICE TO ALL CONTRACTORS/SITE WORKERS/OWNERS -
IF IN DOUBT, STOP AND ASK; TAKE A PHOTO AND SEND IT TO THE PROJECT ARCHAEOLOGIST

6. Tangata Whenua/Manawhenua

The Mackays to Pekapeka Expressway crosses the tribal jurisdiction of Ngati Toa Rangatira, Te Ati Awa ki Whakarongotai, Ngati Raukawa and Muaupoko, therefore in the event of an accidental discovery within any of the Expressway sectors the following iwi representatives will be contacted:

Ngati Toa Rangatira	Jenny Smeaton	04 238 4952
Te Ati Awa ki Whakarongotai	Danny Mullen	04 902 5208 027 235 8762
Ngati Raukawa	Te Waari Carkeek	06 364 5121 027 667 4477
Muaupoko	Steve Hirini	06 3673311 021651958
Takamore Trustees	Ben Ngaia	04 472 3872 021 0203 0299

7. Alliance Contact Details

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8. Additional Contact Details

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Ministry for Culture and Heritage (MCH)

Liz Cotton
Heritage Operations, Heritage Services Branch
Phone: +64 4 499 4229

Accidental Discovery Procedures

Artefact Find	Koiwi Tangata/Human Remains Discovery
Immediately stop work.	Immediately stop work
Find site is cordoned off	Find site is cordoned off
Contractor to contact Alliance Construction Manager Steven Wright.	Contractor to contact Alliance Construction Manager Steven Wright.
Alliance Construction Manager contacts Alliance Archaeologist (Mary O'Keefe) and Cultural Adviser (Amos Kamo).	Alliance Construction Manager contacts Alliance Archaeologist (Mary O'Keefe) and Cultural Adviser (Amos Kamo).
Cultural Adviser contacts all iwi representative groups.	Cultural Adviser contacts all iwi representative groups.
Alliance Archaeologist advises NZHPT and co-ordinates site inspection.	Alliance Archaeologist advises NZHPT and Kapiti Police Station.
Iwi representatives are provided the opportunity to inspect the site and advise on appropriate protocols to be followed	Kapiti Police in coordination with the Coroner will analyse the remains to determine if it is a crime scene.
The Alliance Archaeologist will contact the Ministry for Culture and Heritage if artefacts are removed from the find site.	If the remains are not associated with a crime then the iwi representatives will determine how the remains will be reinterred.
Work recommences once NZHPT and iwi are satisfied that correct procedures have been followed.	Iwi representatives will be provided sufficient time to perform appropriate rituals and customary practices.
	The Alliance Archaeologist will contact the Ministry for Culture and Heritage if artefacts are removed from the find site.
	Work recommences once NZHPT and iwi are satisfied that correct procedures have been followed.