# Rapa Nui Landscapes of Construction Project
(LOC 8)

## Excavation and Survey at Puna Pau 2013: Interim Report

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# Rapa Nui Landscapes of Construction

The Rapa Nui Landscapes of Construction Project (LOC) is funded by a grant from the Arts and Humanities Research Council in the UK. Based at the Institute of Archaeology, University College London, the project is directed by Sue Hamilton of UCL (principal investigator) and Colin Richards of the University of Manchester (co-investigator), in collaboration with Kate Welham of Bournemouth University (co-investigator). The University of the Highlands and Islands (Project Partner) is represented by Jane Downes.

On the Island, LOC works with Rapanui elders and students and in close cooperation with the *Corporacion National Forestal* (*CONAF*), Rapa Nui and the *Museo Antropológico P. Sebastián Englert* (*MAPSE*).

The main aim of the project is to investigate the construction activities associated with the Island's famous prehistoric statues and architecture as an integrated whole. These construction activities, which include the quarrying, moving and setting up of the statues are considered in terms of Island-wide resources, social organisation and ideology.

The Project is not just concerned with reconstructing the past of the island, but is also contributing to the 'living archaeology' of the present-day community, for whom it is an integral part of their identity and their understanding and use of the island. LOC is working with the Rapanui community to provide training and help in recording, investigating and conserving their remarkable archaeological past. Fieldwork between 2008 and 2013 was undertaken under a permit issued by the *Consejo de Monumentos Nacionales*, Chile (ORN No 1699 CARTA 720 DEL 31 del 01.2008).

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## Excavation and Survey at Puna Pau, 2013

by Jane Downs & Colin Richards

### 1. Introduction

The most famous aspect of Rapa Nui archaeology is the large stone statues (*moai*), many of which stand upon stone platforms (*ahu)*. Of the statue *ahu*, a number had *moai* adorned with cylinder shaped stone topknots (*pukao*). These statues can be described as composite in having a body of Rano tuff and topknot of red scoria. The *moai* on statue *ahu* are sculpted from a distinctive volcanic tuff quarried from the inner and outer surfaces of Rano Raraku which is situated in the south-east of the island. Conversely, the *pukao* are sculpted from red scoria (*hani hani*) quarried from the crater of Puna Pau (*Figure 1*), situated in the southwest of Rapa Nui. *Hani hani* is a name given exclusively to the red scoria from Puna Pau (S. Fati pers. comm.).

Until recently attention has mainly focussed on Rano Raraku, which is the only quarry to have seen any form of excavation (Routledge 1919; Skjölsvold 1961; Skjölsvold & Figueroa 1989). Equally, detailed archaeological survey has also tended to concentrate on Rano Raraku (e.g. Routledge 1919; Skjölsvold 1961; Van Tilburg 1994), with minimal attention being placed on Puna Pau (but see Routledge 1919, 199, and Shepardson *et al.* 2004). In 2008 extensive geophysical and topographic survey of Puna Pau was undertaken as phase one of the Rapa Nui Landscapes of Construction Project (LOC 2008).

On the basis of the results of these surveys excavation was undertaken in 2009 around *pukao* XIV (LOC 2009), which is one of a line of *pukao* running up the exterior northern slope of the volcanic cone. Excavation revealed that *pukao* XIV was actually positioned in a pit-like feature entered by a ramp from the south. In the western side of the trench the surface of a road (*Ara Pukao*) was detected. The road maintained a north-south orientation and from the geophysical and topographic data clearly ran from the base of the exterior outer slope to the lip of the Puna Pau crater.

In 2012, a second trench was excavated inside the crater, adjacent to the southern vertical section of exposed scoria. The cutting measured 4 x 2 m and was excavated to a depth of *c.* 1.5 m. All deposits were dry sieved on a 2 mm mesh, and small finds were three dimensionally recorded, as were samples for dating purposes. The main results of the 2012 excavation can be summarized as follows:

- The discovery of a pair of eyes carved into the rock-face.
- Evidence of quarrying taking the form of debris, toki and vertical tool marks on the rock-face.
- The uncovering at the base of the trench of the roof of a potential quarry niche.

Deposits encountered within the 2012 excavation fell into four categories. First erosion debris that ran into the trench from the east and west; second, a series of tip lines of *hani hani* representing material that had run

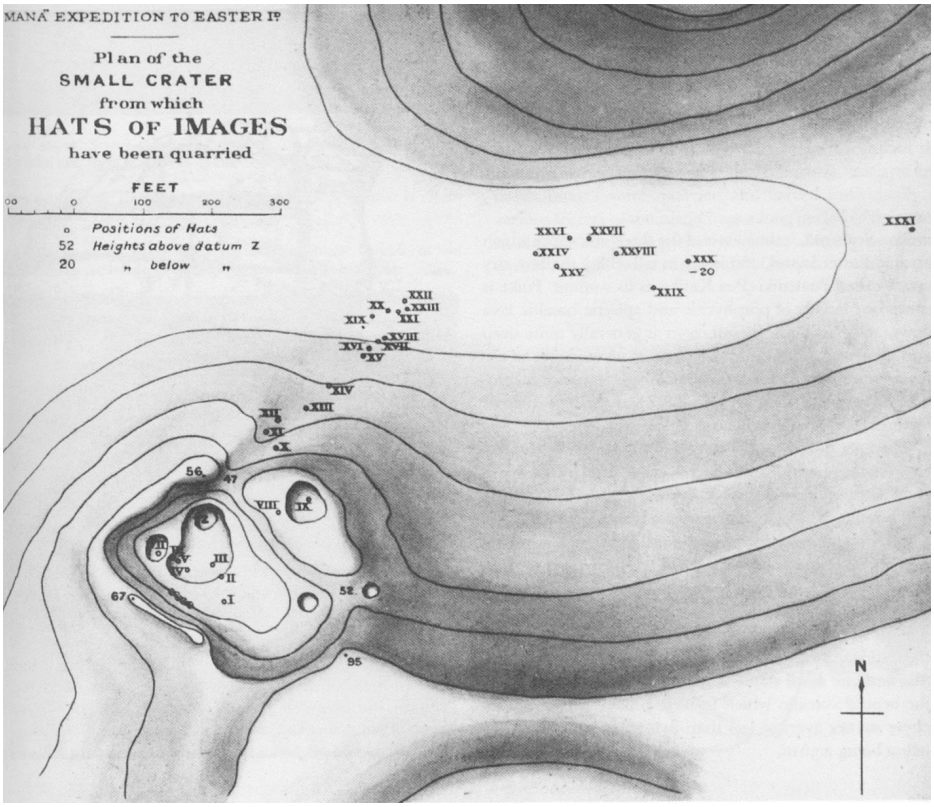


***Figure 1.***
*Plan of Puna Pau prepared by the Routledge team*
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downslope from heaps beyond the confines of the trench; third, stabilization layers [2007 & 2014] that formed or had been laid over and partially levelled this slippage; and fourth, features relating to specific activities such as a hearth [2015] associated with a 'working floor' [2010] consisting of a build-up of *hani hani*, complete and broken *toki*, and flakes and debitage produced during *hani hani* working and *toki* reflaking.

Additionally, topographic survey in 2012 revealed a shallow depression (*c.* 2 m wide) running northwest to southeast along the bottom of the crater towards the western *pukao* (III). The results of a fluxgate gradiometer survey revealed a linear anomaly corresponding directly with the topographic feature observed above. An electromagnetic survey confirmed the presence of the linear anomaly observed during the topographic and fluxgate magnetometer surveys. The anomaly was clearer in the vertical mode (where there is an effective depth of *c.* 1.5 m) (Welham 2012).

## 2. Fieldwork 2013

The 2013 excavations at Puna Pau was designed to further investigate the scoria quarrying process (Trench 2) and to evaluate the linear anomaly revealed by topographic and geophysical surveys of 2012 (Trench 3) (*Figure 2*). Further geophysical survey was undertaken in order to identify any continuation of the

anomaly on the northeast crater rim, which might link it to the route of the *Ara Pukao* outside the crater.

***Figure 2.***
*View of Trenches 2 & 3*

## 3. Trench 2

The specific aims of the continued excavation of Trench 2 were to:

- investigate the architecture of quarrying scoria, particularly the niche (the roof of which was uncovered at the base of the 2012 trench).
- recover further artefactual evidence of tool types used in the quarrying of *pukao*.
- collect stratified obsidian and carbon samples to provide a chronology for quarrying in the southern part of the Puna Pau crater.
- obtain environmental samples (e.g. pollen) to enable a degree of botanical reconstruction.
- further characterize the build-up of deposits against the southern rock-face.

The continued excavation of Trench 2 clarified the general picture of deposition recognized in 2012. This year the excavated area was expanded from 4 x 2 m to *c.* 7.6 x 3 m with an additional 3 m-extension south at the western end to investigate a recess in the rock-face. The larger size of the trench

revealed a fascinating picture of both the architecture of quarrying and the nature of the deposits that had built-up against the quarry face.

Trench 2 was positioned directly below the largest exposed scoria rock-face (*Figures 2 & 3*). While the ash spread and silt surface [2014 & 2007], associated hearth [2015], and scoria working deposit [2010] revealed in 2012 represent in situ activity, the underlying deposits are all dumps of scoria debris built-up against the rock-face. Consequently, they are later than the architecture of quarrying as revealed in the sculpted scoria rock-face. The only possible exception is an artificial cave [2079] uncovered in the western area of the trench and its associated infill deposits.

*The architecture of quarrying at Puna Pau*

Only certain strata of scoria were suitable for *pukao* production. This is demonstrated by the differential character of the rock exposed in and in the vicinity of Trench 2. 2-3 m. Above the current ground surface is a bed of dark brown-black colour consisting of large volcanic 'bombs'. Immediately above this is a narrow band of welded or fused red scoria that could have been worked but the stone above this level is poorly consolidated, and most likely unworkable. Below a band of slightly finer red scoria is welded, but series of fissures running through it, perhaps rendered it unsuitable as well. Excavation in 2012 and 2013 uncovered the continuation of a long, angled fissure, sloping down to the west. This fissure marks the interface between fissured and un-fissured layers of finer red scoria. The lower stratum displayed a series of tool marks on the rock-face demonstrating working of this surface.

Apart from tool marks, direct evidence for *pukao* extraction takes two forms. First, in the eastern area of the trench an semi-concave depression and a short section of a second running into the eastern section were visible in the rock surface. These are most likely the sockets left behind by *pukao* extraction. Second, a large cavity or niche [2106] had been cut into the rock-face, presumably to facilitate the extraction of a large object, possibly another *pukao* (*Figure 3*).

Also revealed in the central-western area of the trench, where a substantial cavity projected back into the rock-face from a higher level, was a sloping, curved semi-circular hollow [2103], which had been cut into the scoria as it shelved out in a northerly direction (*Figure 4*). This hollow can be interpreted in two ways: either a small pukao had been extracted from it or the cut was made to facilitate entry into the artificial cave [2079]. These interpretations are not mutually exclusive, as a small *pukao* extraction hollow could have later served as access to the cave. The cutting of this feature left behind a curving tongue of rock [2057] to the north of the hollow [2103]. The vertical surface of the tongue was covered in *toki* marks. Probing revealed the rock-face below this to continue *at least* 0.5m below the base of the excavation.

The working of the scoria rock-face and extraction of *pukao* produced a complex architecture within the excavated area, which resembled that visible in some of the quarry bays or niches at the *moai* quarry of Rano Raraku. Such imagery is reinforced by the discovery, at a low level in the mid-northern area of the trench, of second curving scoria tongue [2064], projecting into the trench from the north. Although the depth of excavation stopped short of the base of this scoria tongue, it is suspected that it is attached to the bedrock at a lower level.

***Figure 3.***
*View of the cut recess [2106] in the scoria rock-face*

***Figure 4.***
*Trench 2. The entrance to the artificial cave is visible in the upper right of the picture.*
Scales 1 m

From our small-scale investigation of a single rock-face within the crater, certain observations can be made regarding the general nature and imagery of quarrying at Puna Pau. It is clear that only certain strata were of sufficient quality to be used in the manufacture of *pukao* and *ahu* facia slabs. When a suitable scoria stratum was uncovered, extraction left behind a series of niches and projecting tongues. Whether there are discrete bays or niches defined by un-hewn 'walls' of rock, as seen at Rano Raraku, remains unclear. However, the excavation of Trench 2 reveals that, entirely concealed beneath the mass of scree and debris that today can be seen running into the crater of Puna Pau, there is a complex of workings and cuttings into a series of vertically cut scoria faces. Where appropriate scoria was present, these faces were sculpted by a process of quarrying and extraction.

*The residues of quarrying at Puna Pau*

The sequence of deposits that was present in Trench 2 resulted from three main activities. The upper deposits encountered [2002, 2003, 2004/6] can be attributed to the erosion of higher surfaces of the crater and their slippage and wash downslope. These deposits collected in front of the rock-face from both easterly and westerly directions. This process of material deposition was discussed in detail in the 2012 excavation report (LOC 2012). Another series of deposits represents the remnants of former spoil-heaps. These deposits take the form of sequential layers of banded material, which run steeply down-slope from a clear pinnacle or high point that has since disappeared. The remains of discrete dumps or spoil-heaps were clearly identifiable during excavation. Each appears to be the result of a particular episode of quarrying and/ or the rough shaping of *pukao* and *ahu* facia blocks, in view of which each is described separately below. Finally, a series of thinner layers (e.g. [2007 & 2014]) represent stabilization or surfaces deliberately laid for specific activities.

Taking the latter category of deposit first, a continuation of the thin yellow-green layer [2007] recorded in the western sector of the 2012 trench appeared at a high level in the western and southwestern extensions. Apart from charting its wider extent, the sequence of silt surface [2007] and overlying ashy layer [2014], provides a stratigraphic relationship between the use and blocking of the artificial cave [2079], working area [2010] and spoil-heaps in the central and eastern area of the trench. The main surface [2007 & 2014] associated with the hearth [2015] and working floor [2010] was comprehensively discussed in LOC 6 (LOC 2012, 8).

Overall, the western area of the trench, particularly the deposits running into and filling the cut scoria 'hollow' [2103] (*Figure 5*), showed a greater level of complexity with several laid surfaces and a circular feature [2056], which was probably a temporary hearth. The lowest fill [2054] of the hollow comprised red and grey scoria fragments < 4.5 cm in size in a sandy matrix. This context was extremely dry, perhaps owing to its position below the rock overhang. Two further layers, [2053], consisting of silty fine scoria gravel, and [2052], the texture and consistency of which was very similar to [2054], sequentially overlay it [2054]. The fills of the hollow were separated from the outer build-up of spoil-heap debris by the tongue of scoria [2057].

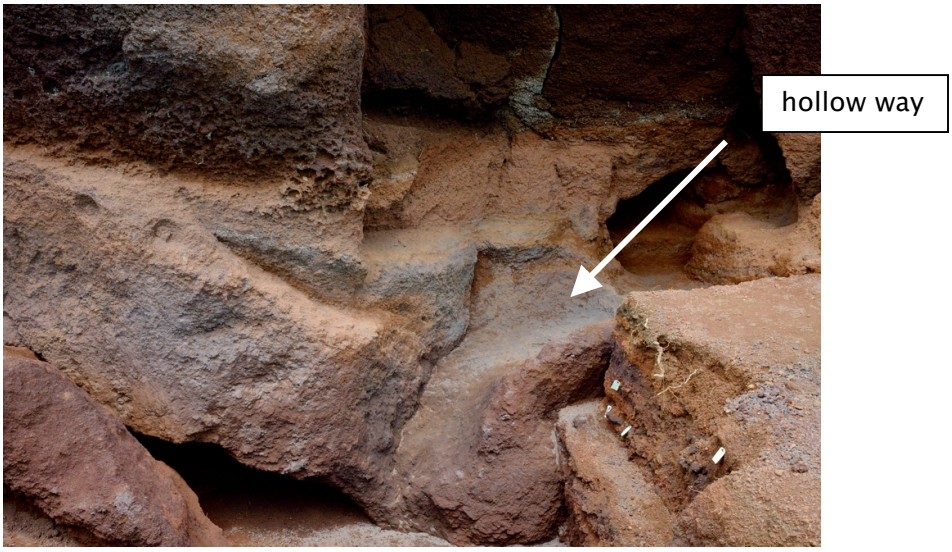



***Figure 5.***
*The 'hollow way' cut into the rock-face in the western area of Trench 2*

North of the vertical face of the scoria tongue [2057], thick spreads of scoria debris from various spoil-heaps had accumulated. At the base of the excavation, a basal layer of coarse orange-brown scoria debris [2072] underlay the westerly sloping spread of scoria debris [2058], which formed part of the central spoil-heap [2098]. Above this layer, further brown-grey scoria debris [2071] had accumulated against the vertical northern face of scoria tongue [2057]. Given that these layers [2058 & 2071] slope down to the north, this material clearly derived from scoria working spoil-heaps to the north and west of Trench 2. Undulations in this spoil-heap were filled and levelled by a spread of red-orange fine scoria debris [2063]. Above this 'stabilization' deposit, another level spread of red scoria debris [2061] then accumulated. Above this a discrete deposit of loose orange-brown scoria fragments [2060] filled a slight depression formed in the surface of [2063] adjacent to the vertical scoria face [2057]. Coinciding with the area of the depression, a thin band of red-brown silt (including charcoal flecks) [2059] was also identified.

In the north-west corner, over layer [2061], another dump of red scoria debris [2021] ran over [2061]. This relatively steep sided (south-north profile) scoria dump [2021] had a shallower profile to the east and was partially covered and encircled by a thick (*c.* 20 cm) build-up of dark red-brown scoria fragments in a silt matrix [2048]. This deposit also spread over layer [2061].

The central and eastern spoil-heaps

The majority of deposits encountered within the eastern and central area of the trench consisted of tip lines generated by the presence of two major spoil-heaps of scoria debris — upper [2120] and lower [2098]. In the centre of the trench, at its lowest level, the very top of a possible third spoil-heap was represented by a deposit of red scoria [2118]. In their truncated state these spoil-heaps were of particular interest in that they testified to a topography of quarrying waste that no longer exists. The spoil-heaps will be described below in chronological order.

Spoil-heap [2098]
The possible cap or summit of an early spoil-heap, pre-dating [2098], was encountered at the base of the central area in Trench 2. It took the form of a sub-circular spread, *c.* 1.15 m in diameter, of fine orange-red scoria fragments [2118]. Overlying this 'cap', was a series of layers representing tip lines of scoria debris emanating from a large spoil-heap that had originally built up to the north of the trench. Today, the ground falls away sharply in this area indicating that although truncated, the northern slope of the spoil-heap may flow downslope following the angle of the current ground surface. The sequence of layers in spoil-heap [2098] is as follows:

Top [2098]
[2097] – layer of purple-grey scoria fragments (< 9 cm) in a silt matrix.-
[2058] – layer of dark-red small fragments of scoria (< 5 cm).
[2099] – layer of bright red scoria silt and small fragments (< 2 cm).
[2122] – layer of orange-red scoria silt with occasional fragments (< 3 cm).
[2096] – layer of dark-red scoria blocks and smaller debris (< 18 cm).
Bottom [2098]

Resting on the top of spoil-heap [2098] was a large red scoria boulder [2027], measuring *c.* 2.6 x 1.1 m. This was partly uncovered in 2012 and its point of rest partially blocked the large cavity or niche [2106]. The block was angled down from the east, and due to the larger size of Trench 2 in 2013, it is now clear that the block was derived from an area of the rock-face to the east of the trench and had slipped down the slope of the substantial spoil-heap [2120]. Resting on the outer surface of the spoil-heap, it effectively marked the angle of debris flow at its base. Tool marks were clearly visible on the upper surface of the block [2027] and it seems probable that the removal/ displacement of the block was related to quarrying of the rock-face to the east. Thus, it was associated with the quarrying activities that led to the accumulation of spoil-heap [2120] (see below).

Spoil-heap [2120]
The accumulation of deposits comprising spoil-heap [2120] appears to have centred on a spot just beyond the northeast corner of Trench 2 (*Figure 6*). Excavation of the latter effectively removed a quadrant allowing a fairly clear picture to be constructed of the overall diameter of the spoil-heap. The lowest deposit [2028] of spoil-heap [2120] spilled partly over the earlier spoil-heap [2098]. Overall, spoil-heap [2120] can be estimated to have originally had a diameter of approximately 7–10 m and a height of approximately 2–2.5 m. The north and northeastern sides of the spoil-heap have clearly been severely truncated. The composition of this spoil-heap is detailed below:

Top [2120]
[2111] – layer (*c.* 20 cm thick) of large — graduating to medium — purple-grey scoria blocks (< 20 cm), which angle down sharply (*c.* 55°) towards the rock face.

***Figure 6.***
*View of the west-facing (eastern) section of Trench 2, showing steep angle of the tips comprising spoil-heap [2120].* Scales 1 m

[2112] – thick layer (*c.* 50 cm) of orange-red scoria silts with numerous discontinuous tip-lines of scoria fragments (< 2 cm).
[2113] – layer, up to 15 cm thick of orange-red scoria fragments (< 2.5 cm).
[2114] – thick layer of orange-red scoria silts up to 35 cm in thickness, encompassing a discontinuous 5cm thick lens of scoria fragments (< 1.5 cm).
[2115] – continuous layer of orange red scoria silts, increasing in thickness (4-10 cm) as it reaches the base of the spoil-heap.
[2121] – layer of fine orange-red scoria silts and debris (*c.* 20 cm in thickness), which encloses a discrete pocket (12 x 11 cm) of scoria fragments (< 1.5 cm).
[2028] – thick basal layer (*c.* 50 cm deep) of silts, fragments and small blocks of red scoria (< 7 cm).
Bottom [2120]

As spoil-heap [2120] accumulated, a funnel-like hollow developed against the rock-face to the south. Initially, scoria debris [2065] filled the upper part of cavity [2106]. Once the cavity was completely filled a series of silts [2110, 2119 & 2115] comprising numerous lenses of scoria fragments, accumulated. After the hollow had filled, two further deposits of fine silts [2116 & 2117] accumulated over the level surface.

In the central and northern area of the trench two sequential dumps of large scoria debris subsequently built up over spoil-heap [2120]. Both followed

the downward slope of the large spoil-heap, and both were truncated at the top. The lower dump [2023] had a thickness of *c.* 60 cm and was purple-grey in colour and included large blocks of scoria (*c.* < 22 cm) contained in a loose matrix of fragments and silt. Resting upon its outer surface was another thick band (*c.* 45 cm) of grey-red scoria debris [2124]. Running into the trench from the west, that is to say displaying a totally different orientation, another thick deposit of grey scoria blocks and debris [2109] overlay [2124].

From this complex stratigraphy, can infer a fairly simple sequence of events. Over time a series of discrete spoil-heaps built-up at different points in and around the trench, sometimes running over each other. Later the areas between their sloping sides filled with debris and erosion material.

*The artificial cave and associated deposits*

In the western area of the trench the roof of a cave-like hollow [2079] was uncovered at a depth of 0.75 m below the ground surface. The opening into this feature [sides 2100 & 2108] was blocked by a series of deposits [2049 & 2014], which dipped down into it. The remains of a juvenile sheep were found lying in [2049] and further disarticulated sheep bones on the exposed the floor behind. The opening measured *c.* 0.9 m in height with slightly tapering sides with a general width of 1.2 m. Behind this, the hollow opened out considerably, its interior dimensions 3.2 m deep, 4.6 m wide and 1.4 m high (above the deposits comprising the floor). If the rock floor continued at the depth and angle noted at the entrance, the internal height would have been *c.* 1.8 m. It was filled to a depth of *c.* 0.4 m with a dry loose soil, containing numerous chunks of scoria (*Figure 7*). In all probability these floor deposits are a continuation of two layers that blocked its entrance [2014 & 2049].

***Figure 7.***
*View of the opening into the artificial cave and its interior*

Caves of this size and shape are unlikely to occur naturally in scoria of the type out of which Puna Pau was formed. Though cave-like, therefore, [2079] *is not* a natural feature (M Seager Thomas pers. comm.).

As excavation of the floor deposits [2067] adjacent to the entrance commenced, human teeth were encountered. At some point, therefore, the feature had been used for human burial. Pieces of burnt bone were also present and there is a possibility that cremated human remains had also deposited within it. Following our permit conditions and the wishes of our Rapa Nui supervisor Mr Sorababel Fati, when the human remains were discovered, excavation of the floor deposits ceased. The human remains were returned to the location from which they were excavated.

Outside, and to the east, the possible hearth [2056] was overlain by [2014], a dark grey/ greenish silty sediment with charcoal flecking, and [2007], a thin layer of yellow silt identified and part excavated in 2012. Layer [2014] *could* be interpreted as an old land surface, with charcoal flecking representing burnt-off of vegetation. However, immediately outside the artificial cave it was thicker and incorporated a number of darker grey-green patches or lenses within a red brown matrix. Possibly therefore it consisted of a number of different horizons, which we were unable to distinguish at the time of excavation. Accordingly, we have interpreted [2007] and [2014] *together* as a laid surface. This surface was associated with hearth [2015], which was also identified and excavated in 2012. [2014] ran into the entrance of the artificial cave under [2049], sealing layers [2067] and [2068]. These latter continued back from the entrance of the artificial cave into its interior.

Further out a number of accumulating deposits cover a fairly level scoria rock surface for 2.1 m. At this point the rock drops down, continuing the vertical face constituting the northern rock-face of tongue [2057]. Dipping from the vertical face, a thick layer of scoria debris [2046] comprises earlier scoria quarrying waste piled up against the cut rock-face. Interestingly, this layer continues towards the entrance of the cave-like feature (south) as a thin band, which runs directly over the rock surface. Hence, debris from quarrying began to cover the passage into this feature at an early date. A further dump of scoria debris [2045] lay over the northern-most area of [2046], forming a fairly level surface over the spoil-heaps.

The overall sequence of layers associated with, and extending from, the artificial cave can be characterized as follows:

Roof of artificial cave [2079]
[2049] – red-brown homogenous silt with scoria fragments, which filled the upper part of artificial cave's entrance passage. At least in part, this is recent material, as a sheep skeleton was recovered from a high level within it.
[2007] – yellow-green silt surface extending across the western area of the trench (first observed in 2012).
[2014] – ashy layer associated with [2007] – deepens close to the artificial cave. The possible hearth [2056] cuts through this layer.
[2067] – layer consisting of fine silts (*c.* 18 cm thick), with thin lenses of scoria fragments.

[2068] – a silt layer (10 cm thick), green-brown in colour with charcoal flecking and scoria inclusions and shells, which extends 1.6m north from the mouth of the artificial cave.
[2073] – a thick (85 cm long x 23 cm deep) discrete deposit of fine silt green-brown in colour. Probable area of disturbance in layer [2074].
[2074] – a thick band of dark-grey purple scoria.
[2075] – layer of dark orange-red scoria fragments.
[2076] – thick band of red-brown silty scoria running for *c.* 1.80 m beyond the entrance of the artificial cave.
[2077] = [2045] – deposit of dark orange-red scoria fragments – appears at the top of the vertical rock-face, beyond the entrance of the artificial cave.
[2046] = [2078] – thin band of 'gritty' dark purple scoria. Runs directly over rock surface beyond the entrance to the artificial cave.
Floor of artificial cave [2079]

The discovery of an artificial cave at Puna Pau was totally unexpected. Certainly it had been used for burial, and this perhaps explains its existence in the first place, but whether this was its sole function or not is unknown. Given the flow of quarry debris [2075, 2076, 2077/ 2045 & 2046/ 2078] into the area around its entrance, quarrying must have continued after the deposition of burial(s). In view of the presence of sheep bones, and an articulated juvenile sheep in surface material [2049] at its mouth, the possibility exists that a small opening was visible up to fairly recent times. Yet, there were no signs of it have been previously dug into.

## 4. Trench 3

A trench measuring 2 x 5 m running northeast from *pukao* III was positioned to investigate the linear anomaly revealed by the 2012 topographic and geophysical surveys (*Figure 8*). This was interpreted as representing the route of a possible road (*Ara Pukao*) within Puna Pau crater. The 2013 excavations not only showed this interpretation to be correct, but also provided a far more complex picture of construction and reconstruction. Trench 3 was excavated to a depth of *c.* 1.2 m. After removal of the topsoil [2080], the main sequence comprised superimposed spreads of relatively fine red scoria colluvium running into the excavated area from the north. These deposits, formed of fine lenses of scoria wash punctuated by lines of small pebbles, indicate a history of episodic wash and possibly working debris running downslope into the base of the crater. The presence of this material was not unexpected as the trench was located at the base of a steep scoria scree running down from the northern inner face of the crater. Within these deposits three road surfaces had been laid down.

The basal deposits consisted of relatively horizontal layers of red scoria debris and wash [2095] overlain by further deposits [2089] dipping in from both the north and the south of the trench. Although no surface was detected, the angled nature of these layers produced a central declivity that was to form the concave profile of subsequent roads. In the southern sector of the trench a

further dipping scoria deposit [2087] flowed over layer [2089] while a similar scoria layer [2088] ran in from the north. Together, these layers provided the supporting material for the first concave road surface composed of a thin layer of green-yellow silt [2090]. This surface had worn through in the centre of the road and was only present at higher points on either side. Above this surface a layer of red scoria silts [2084], *c.* 20 cm in depth, had accumulated across the entire trench, encompassing in the northern area a discrete spread of larger scoria fragments and blocks [2086].

***Figure 8.***
*View of Trench 3 and associated pukao III (Englert 23)*

Scoria layer [2084] continued the concave profile of the earliest road and provided the make-up for a second, but harder, silt road surface [2083]. As before, the road surface appears to have worn through at its centre and the surface was only present on each side. Once again, scoria silts [2093] built-up and filled the central concavity of the road. The presence of a thin and partial band of green-yellow silt over scoria layer [2093] indicates a third and final road surface at a higher level. Above this, a series of fine lenses of scoria wash punctuated by lines of small scoria pebbles [2092 & 2082] were deposited. It was during this period of accumulation that the large *pukao* III was set in position and propped up as it rested in the upper deposit [2092]. Subsequently, a layer of larger scoria debris, including a substantial *poro* [2081], ran in from the southern side of the trench creating a fairly level surface (*Figure 9*).

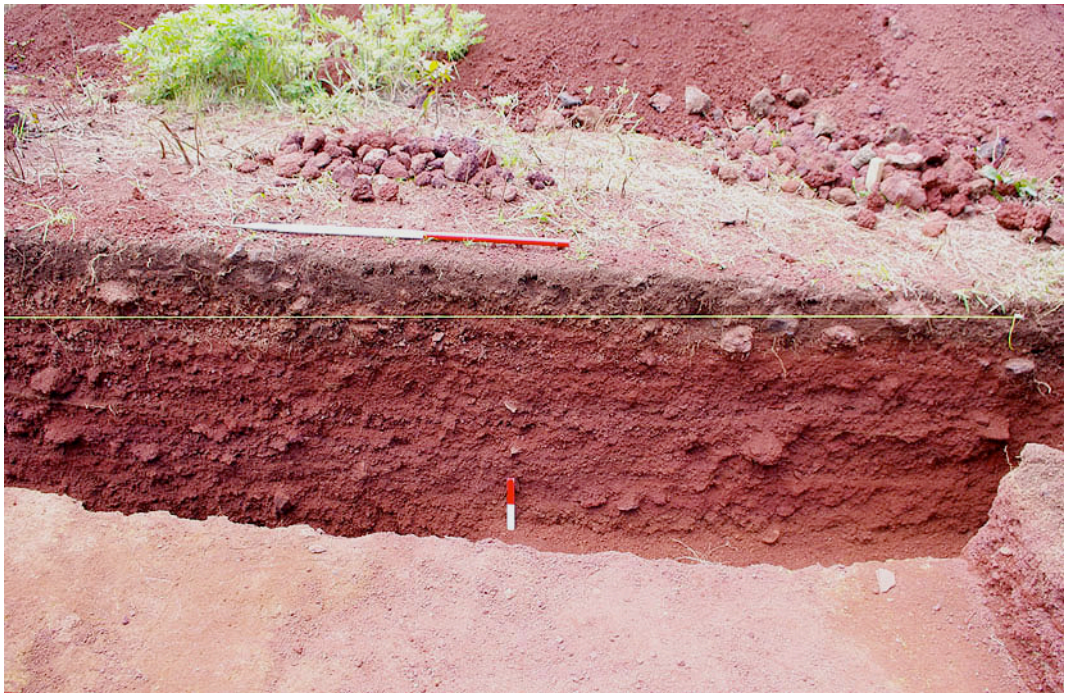


***Figure 9.***
*Eastern section of Trench 3, showing the three different surfaces of the* Ara Pukao

## 5. Discussion of the excavation

The 2013 excavations at Puna Pau achieved virtually all the previously stated aims. The expansion of Trench 2 has allowed us to understand better both the nature of scoria quarrying within the crater, and the deposits encountered in 2012. The suitability of scoria for *pukao* and *ahu* facia slabs was central to the quarrying process. The most suitable stone is located at the base of, and dips away from the crater wall visible today. From our small excavations, therefore, we can infer that the interior of the crater, which is today almost completely covered by scree, is in all probability deeply sculptured with a series of recesses and niches representing the negative impressions of extracted *pukao* and *ahu* facia blocks. When in operation the imagery of the quarry inside the crater would have resembled that seen at Rano Raraku where a relatively steep rock-face is punctuated by a series of quarry 'bays'. Quarrying, however, involved in addition the piecemeal build-up and transformation of spoil-heaps, and the burial and perhaps re-opening of bays, and so long as the quarry remained in operation, the internal topography of the crater was always changing.

Trench 3 located the *Ara Pukao* and additionally provided valuable evidence concerning the longevity of use and phases of resurfacing, and by extension quarrying. It also revealed the manner in which early roads were constructed and surfaced. Each road surface had been created by laying down a *c.* 1 cm thick spread of yellow-green silt, which apart from the final road surface had worn away in the centre. The employment of yellow-green silt for the surface was of particular interest. When dry this material maintained a

concrete-like hardness, which would have provided a durable surface. Yet, this was continually worn through. The concave profile of the road surface is similar to that of the road uncovered on the northern outer slopes of the Puna Pau cater during the 2009 excavations. It is also resembles the concave profile of the Akahanga section of the *Ara Moai* excavated by Charles Love (Love 2001). Such a profile is a characteristic of the *Ara Moai* and it is quite probable that the *Ara Pukao* forms part of the same road network.

As a consequence of our excavations, we are now in a position to comment on the two *Ara Pukao* at Puna Pau. The *Ara Pukao* excavated in 2009 runs up the northern outer slope of the crater and is punctuated by a sequence of *pukao*, one of which *might* have been set in a pit. This *Ara Pukao* entered the crater at a very high level with no signs of any form of ramp leading down to the crater floor. We suggest this to have been an early *Ara Pukao*, which became redundant as scoria quarrying spread around the inside of the crater. Given the presence of *pukao* along its route we may also suggest a more formal or ceremonial role for this road. The second *Ara Pukao*, excavated in 2013, ran down into the crater from the east or southeast, and saw prolonged use as revealed by its repeated wearing through and resurfacing. The time depth of quarrying, in relation to the inner road is revealed in the high level of *pukao* III, which rested on the upper layer [2092], for by the time this *pukao* was put in position, up to three road surfaces had been laid down and worn through. The relatively high position of *pukao* III is also interesting because when it was positioned the second *Ara Pukao* appears no longer to have been functioning. It does however follow the pattern of *pukao* being positioned adjacent to roads revealed by the 2009 excavations.

Finally, the presence of an artificial cave presents the additional possibility that it is one of many within the crater. A possible external 'cave' was detected by the 2008 geophysical survey of the northern outer slopes. That the feature encountered in Trench 2 was employed for human burial is certain, but the date when this occurred is less clear. What can be said with confidence is that the deposition of human remains occurred before quarrying activities ceased.

The 2013 excavation season concludes this phase of investigations at Puna Pau. The four seasons of survey and excavation (2008, 2009, 2012 & 2013) have provided substantial information regarding the nature of quarrying and the presence of roads associated with *pukao* production. Further post excavation analysis will provide further information regarding the chronology of scoria working and road use, as well as stone types employed as tools and the general environment of working stone at Puna Pau.

Excavating team: Adele Caldwell, Jane Downes (supervisor), Sorababel Fati Teao, David Govantes Edwards, Isaias Hey Gonzalez, Francisca Pakomio Villanueva, Colin Richards, Duncan Schlee, Louise Schlee & Joaquin Soler Hotu
Environmental sampling: Sue Hamilton
Photography: Jane Downes, Colin Richards & Adam Stanford

## 6. Preliminary report on the stone objects recovered in 2013

Mike Seager Thomas

Excavations at Puna Pau in 2013 yielded approximately 400 stone artefacts (the product or by-product of human action), 309 from extended Trench 2 and 177 from Trench 3. These include tools (*toki* and smaller obsidian tools), debitage from tool use and manufacture, and burnt stone, the majority of which can be matched — using the naked eye — to specific known stone sources outside the crater. The record for 2013 is similar to that for 2012 (LOC 2012, section 6). The increased sample size provided by the 2013 excavations and a growing familiarity with Rapa Nui stone generally, however, has enabled the writer both to extend and qualify his earlier identifications and interpretations. It is upon these extensions that this report concentrates. The burnt stone, which comprises a minority of the present assemblage and was discussed in detail in the 2012 report, will not be discussed further.

27 tools have been drawn and photographed for use in the final excavation report. 4 obsidian objects have been retained for obsidian hydration dating, and 35 separated out for possible use wear analysis.

*Obsidian*

Obsidian from the site can be divided into three distinct types: the dark grey to green-grey frosty type characteristic of the M. Orito quarries, the glossy black spherulitic (speckled) type found on Rano Kau, a very black crazed type fount on Rano Kau and dark frosty type, variants of which are found on Rano Kau, M. Orito and Motu Iti. As in the 2012 assemblage, the frosty type was by far the most common on site, but there remains a suggestion that the relative proportions of frosty to glossy changes through the contexts excavated. Material *definitely* from Rano Kau is certainly more abundant in 2013 than 2012 contexts. Deliberately retouched tools are rare but traces of utilization — even of very rough flakes — common. As in 2012, the types of use wear identified include scraper damage, where one side of an edge is chipped; cutting damage, where both sides of an edge are damaged; and abrasion.

*Toki fragments & other stone-working tools*

Most of the *toki* recovered are flaked from tabular flow lava with a distinct speckled appearance originating in the Rano Kau area. They are rectangular in section with a square, rounded or pointed blade. Most are fragmentary, so it is impossible to estimate their dimensions prior to breakage. A single unbroken find, however, which we take to be a deliberate discard, measures 17 cm long, suggesting a minimum viable length for this type of tool. As with the 2012 finds, use has worn the ends of most smooth. In most cases this wear is symmetrical, and suggests a consistent and particular pattern of use (LOC 2012, 23). A significant number of broken tools, however, are unworn or only very little worn and we can infer a high rate of early tool failure.

(Note: some *toki* in this form are of a different, homogeneously grey-blue tabular flow lava not recognized in the 2012 assemblage. Most likely this too is from Rano Kau but no match has yet been identified).

While the bulk of the *toki* recovered are of the foregoing type at least four other stone (as opposed to obsidian) tool types have been identified, testifying to a wide range of quarry related activities on site. The most familiar is round-sectioned with two pointed ends. These are common all over the Island but particularly at Rano Raraku. The 2013 excavations yielded two of these, one of an unidentified stone type and one of the blue tabular stone referred to above. They also yielded several small 'hand tools': palm-sized fragments of Rano Kau *toki* and other stones including a broken beach cobble or *poro*, a large flake of a distinct blue grey stone from Viringa o Tuki, and a 'knife' — a leaf-shaped tool about the size of a man's hand fashioned from a thin tablet of Rano Kau stone. In some cases the wear on these, often quite heavy, extends all around the tool but is otherwise very similar to that on the toki and yet their proportions are quite unsuitable for deep quarrying and we have to assume therefore that they were used in finishing previously quarried stone.

Finally, as in 2012, the excavations yielded numerous flakes from the dressing and re-dressing of *toki* in tabular flow lava(s). The ratio of flakes worn prior to flaking to unworn flakes, which is lower than in the 2012 assemblage, as well as a few large but completely unworn fragments of Rano Kau stone, strongly suggests the possibility that tool manufacture was finished on site rather than at the source quarry, i.e. that tools were imported as rough-outs rather than finished tools.

*Further work/ curation of the assemblage*

Future work on the stone finds from Puna Pau will be based largely on the data presented here and preliminary report on the stone finds recovered in 2012. It will focus, firstly, on the assemblage's internal relationships and, secondly, on its relative proportions through time as reflected by the site's stratigraphic sequence. This work would be considerably enhanced, however, by a more detailed characterization both of the stones comprising it and their likely source geologies, the object of this being to place it more precisely within the context of Island stone use as a whole. In the short term therefore we recommend its retention. Ultimately, however, the bulk of these stones will not be retained, but in consultation with *MAPSE* and *CONAF*, re-buried on site.

## 7. Geophysical survey at Puna Pau, 2013

by Kate Welham

*Introduction*

Puna Pau is a small crater situated between the mountains of Maunga Tangaroa and Maunga Vai Ohao, to the east of Hanga Roa. It is the site of the quarry for the production of *pukao,* or statue topknots, and lies within the bounds of the National Park managed by *CONAF*. The site is situated in a pyroclastic centre (Haase *et al.* 1997, fig. 1) and the local geology consists of red scoria quarry debris overlying red scoria bedrock. Red scoria has a reported magnetic susceptibility of 0.2-0.3 x10-3 SI units (Fassbinder *et al.* 2007, table 1). The topsoil at the site incorporates a yellow/ brown, silty soil that has washed into the quarry from the hill to the southeast of Puna Pau.

The results of the geophysical survey inside the crater at Puna Pau in 2012 (Welham 2012) indicated the presence of a possible *pukao* road-way or *Ara Pukao* running northwest-southeast with possible exits towards the north and east sides of the quarry (*Figure 10*). The anomaly was excavated in 2013 and confirmed to be a heavily compacted road surface formed by the presence of a layer of yellow silt (see above). Based on the successful identification of this feature, further geophysical survey was conducted on the northeast crater rim to determine whether the exit point of the *Ara Pukao* could be located. The 2012 electroconductivity data indicated that the archaeological deposits at Puna Pau were most visible at the greater depth obtained via vertical surveying mode, and therefore the shallower, horizontal mode was not used here. The presence of high vegetation in the area prevented any fluxgate magnetometer survey. A high-resolution magnetic susceptibility survey was also conducted across Trench 3, the *Ara Pukao* excavation, to determine the magnetic nature of the yellow soil layer and surrounding earth. The locations of the 2013 surveys are shown in *Figure 11*.

*Method*

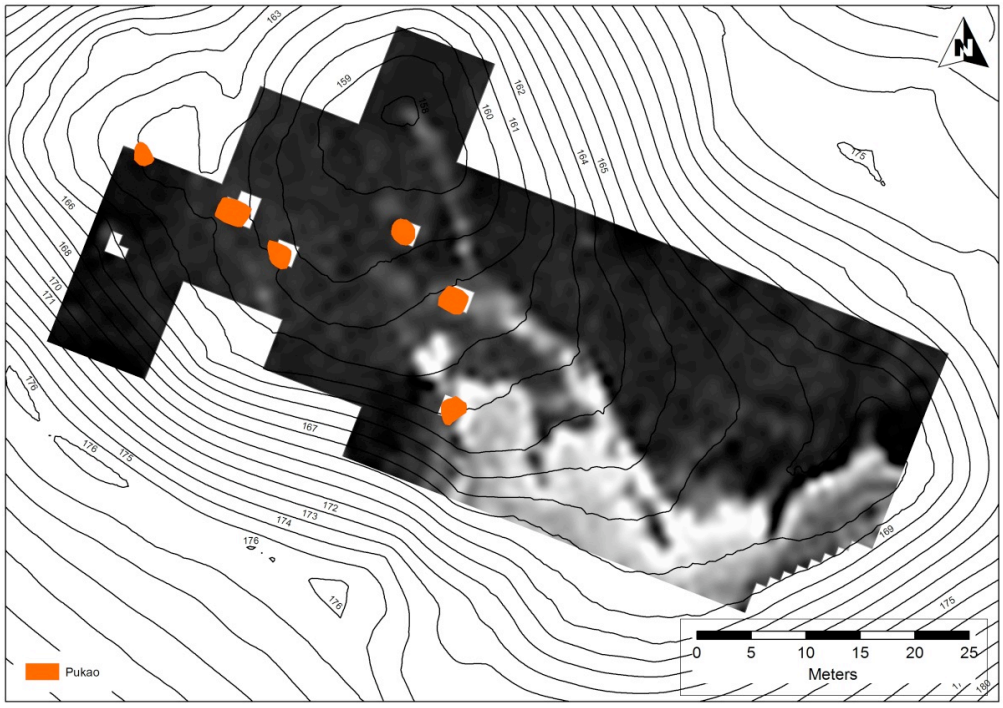
Grids for geophysical survey were located using a Leica 500 differential Global Positioning System (dGPS) and data were downloaded and processed in Leica GeoOffice v.8.0, and converted to SIRGAS2000. Plans were produced in ESRI ArcGIS v10.0 using point data exported from Leica Geo Office and base map layers provided by CONAF. The grids for the electromagnetic survey were 20 x 20 m and the survey was conducted using a Geonics EM38B instrument in vertical dipole mode. Readings were taken at 1 m intervals along north-south traverses spaced 1m apart. Data were accessed in Geonics DAT software. All data were subjected to minimal processing (e.g. despike, zero mean traverse, and clip) in Archeosurveyor v2.5, and imported into ArcGIS v10.0 for display and production of interpretation plots. The results are presented in *Figure 12*.

The magnetic susceptibility survey at Trench 3 was conducted using a Bartington MS2 field coil. An area of 1 x 6 m across the trench was surveyed, with readings taken every 0.25 m along a 0.25 m transect. Three readings per location were taken and the average calculated, and the MS2 was zeroed in air between each individual record. The data are presented in *Figure 13* and *Appendix 6*.

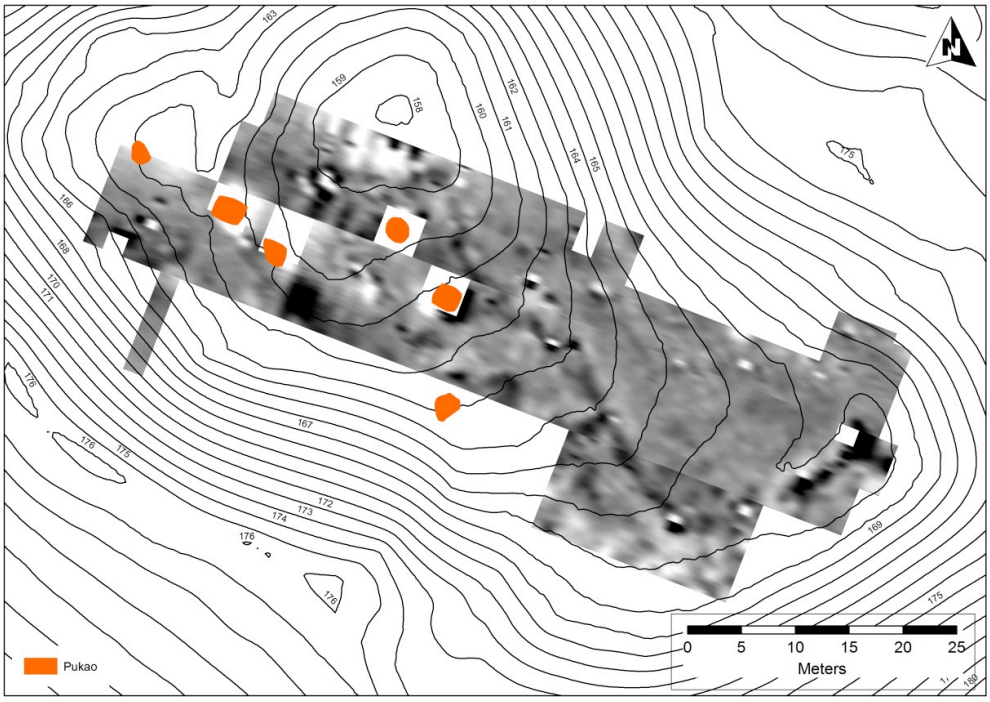
*Results*

The results of the electromagnetic survey on the crater edge at Puna Pau (*Figure 12*) indicate a possible extension of the *Ara Pukao* in the crater via an exit to the southwest. No exit was identified to the north, but much of the area here was impossible to survey due to excessive slope and vegetation. The magnetic susceptibility data in particular demonstrate the possibility of more of the *Ara Pukao* at the crater edge, and both surveys indicate a large area where there appears to be considerable deposits of soils with a higher magnetic signature.

The magnetic susceptibility data from Trench 3 across the area of the uncovered *Ara Pukao* (*Figure 13; Appendix 6*) clearly indicates that the yellow road material is significantly more magnetically enhanced in comparison to the red scoria that surrounds it. Investigations around the quarry during this field season have shown that the yellow-brown topsoil from the hill to the southeast




*A: 2012 electromagnetic data (conductivity in vertical dipole mode)*




*B: 2012 fluxgate magnetometer data*

***Figure 10.***
*Plots of the 2012 geophysical data showing the* Ara Pukao *(white in A; black in B). A possible exit from the crater can be seen to the northern (A) and eastern (B) sides of the quarry*

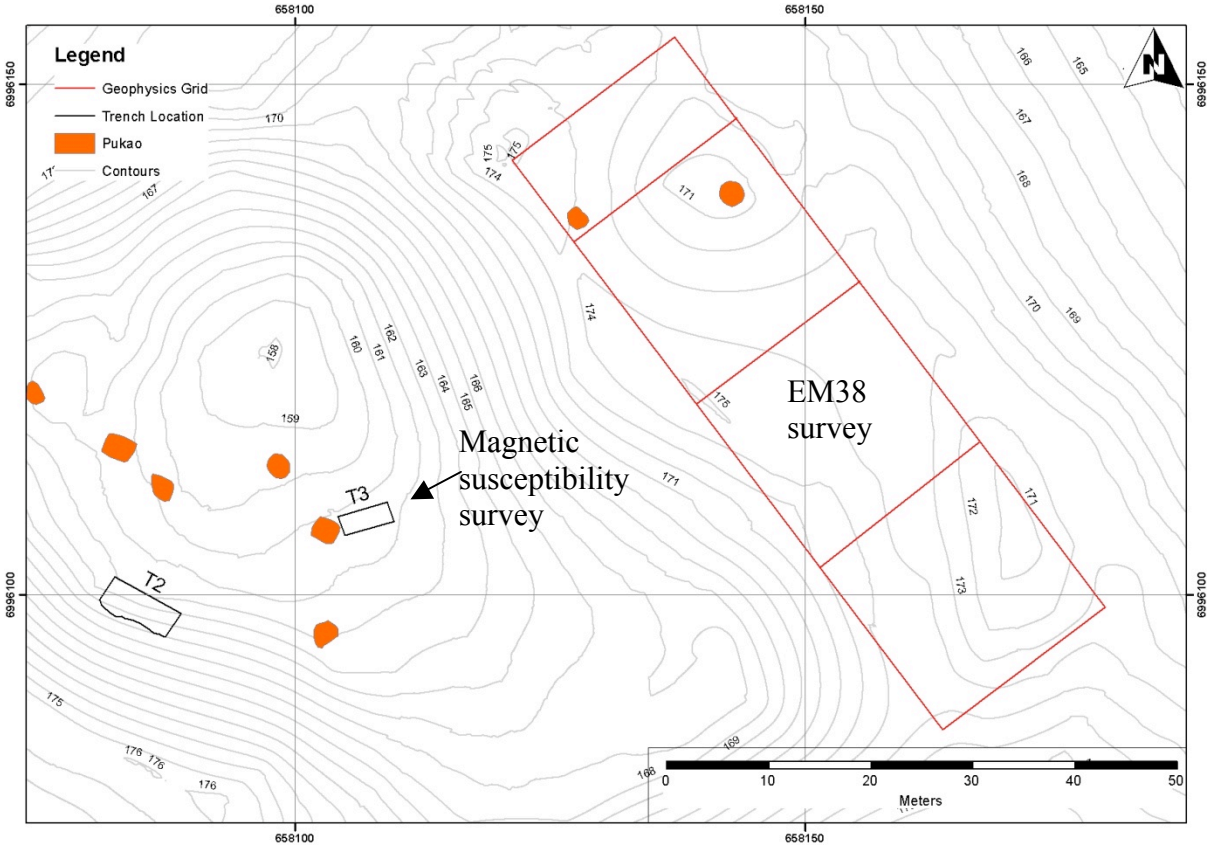


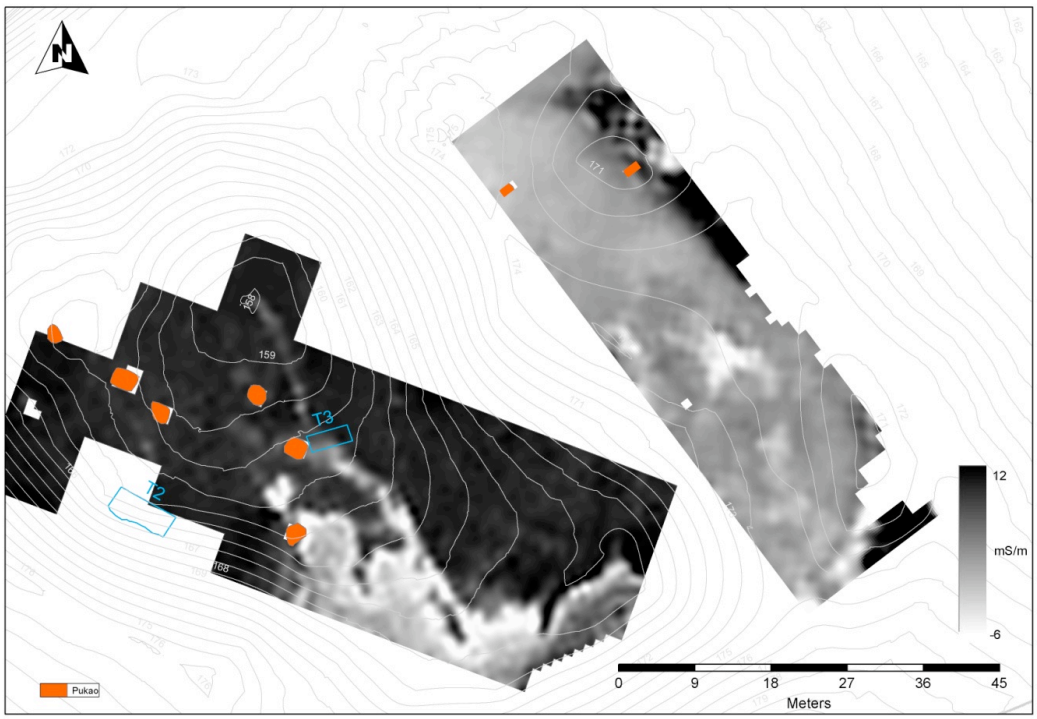

***Figure 11.***
*Location of the 2013 geophysical survey at Puna Pau*

of the trench has a magnetic susceptibility field coil reading that ranges between *c.* 550–1000. Material from this hill could therefore have been one possible source of the road material. Samples of the road and hill wash material have been taken for further analysis in an attempt to resolve this question. It is however, worthy of note that the yellow road material was visually similar to Rano Raraku tuff, which has a reported magnetic susceptibility of 1.8–2.4 x 10–3 SI units (Fassbinder *et al.* 2007, table 1).

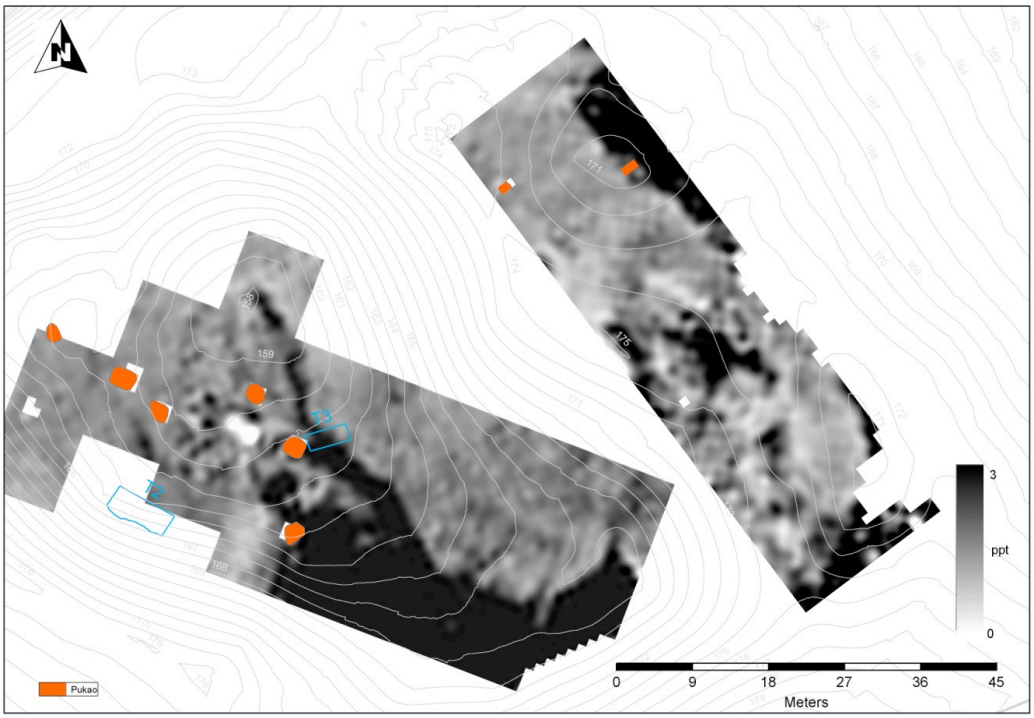
*Conclusion*

The results of geophysical survey at Puna Pau from 2012 and 2013 have demonstrated the value of using geophysical prospection techniques at archaeological sites on Rapa Nui. The significant magnetic difference between the soils at the quarry have provided the opportunity to identify anthropogenic features on the site and it is likely that the *Ara Pukao* extends out of the back of the quarry with an exit over the southern crater lip.

Surveyors: Adele Caldwell, Lawrence Shaw & Kate Welham




*A: Conductivity data (2012–13)*




*B: Magnetic susceptibility data (2012–13)*

***Figure 12.***
*Plot of Electromagnetic data in vertical dipole mode*

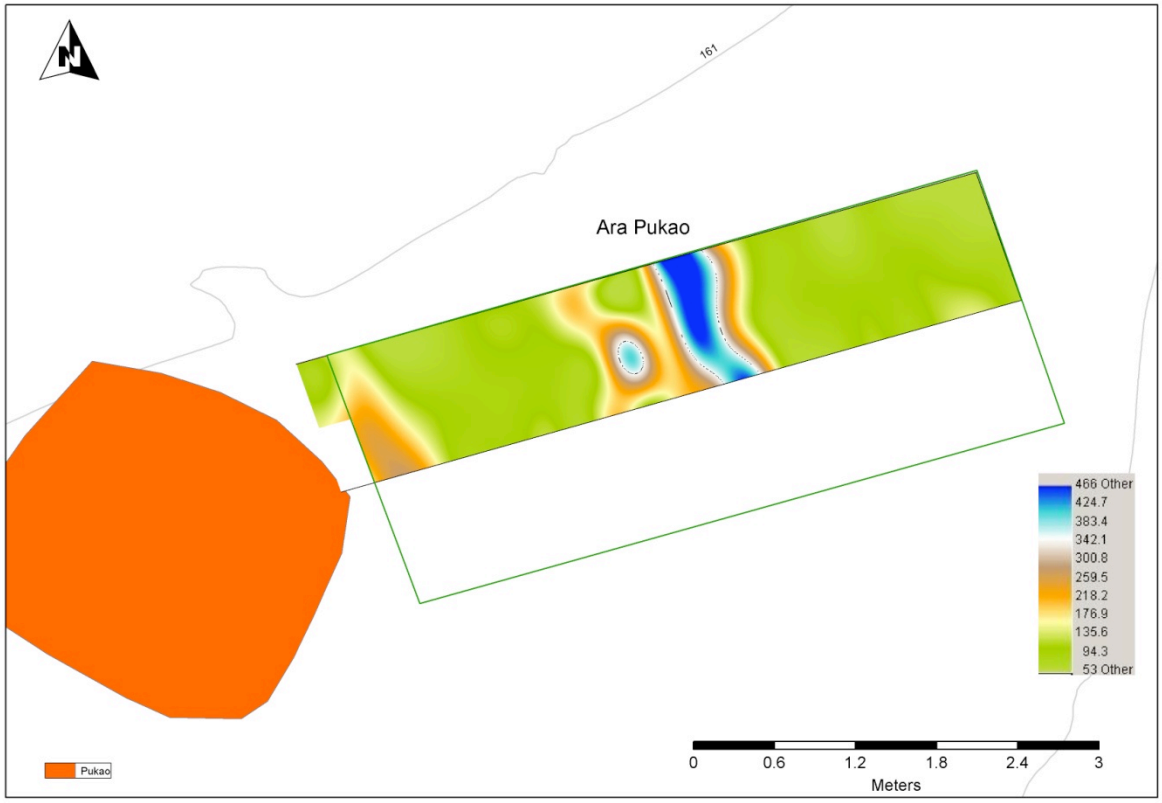



***Figure 13.***
*Magnetic susceptibility data (Bartington MS2 Field Coil) recorded at Trench 3*

## Acknowledgements

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## Appendix 1. Context record

| Context no | Assoc. nos | Site sub-division | Type | Description | Date | Initials |
|---|---|---|---|---|---|---|
| 2040 | | Tr 2 | Layer | Small red scoria fragments | 14/01/2013 | JD |
| 2041 | | Tr 2 | Layer | Fine and angular red scoria | 14/01/2013 | JD |
| 2042 | | Tr 2 | Layer | Thick red wedge of scoria fragments | 15/01/2013 | JD |
| 2043 | | Tr 2 | Layer | Thick layer of fine red scoria | 15/01/2013 | JD |
| 2044 | | Tr 2 | Layer | purply red/grey scoria layer | 16/01/2013 | ARC |
| 2045 | 2046 | Tr 2 | Layer | dark orangey red scoria | 16/01/2013 | ARC |
| 2046 | | Tr 2 | Layer | dark grey/purply red scoria | 16/01/2013 | ARC |
| 2047 | 2121 | Tr 2 | Layer | fine pebbly red/grey scoria | 17/01/2013 | JD |
| 2048 | | Tr 2 | Layer | silty red scoria gravel of mixed sizes | 17/01/2013 | JD |
| 2049 | 2079 | Tr 2 | Layer | red brown silt with small stones = deposit at cave mouth | 18/01/2013 | JD |
| 2050 | | Tr 2 | Layer | dark purple/grey layer of fine scoria debris | 18/01/2013 | JD |
| 2051 | 2056 | Tr 2 | Cut | fill of 2056; silt with small stones | 18/01/2013 | JD |
| 2052 | | Tr 2 | Layer | dry grey scoria cut by 2056 | 18/01/2013 | JD |
| 2053 | | Tr 2 | Layer | compact reddy brown layer in W of trench | 18/01/2013 | JD |
| 2054 | 2103 | Tr 2 | Layer | basal grey layer in hollow way near cave | 18/01/2013 | JD |
| 2055 | | | | | 18/01/2013 | JD |
| 2056 | 2103 | Tr 2 | Cut | shallow rounded cut in W of Trench = hollow way | 18/01/2013 | JD |
| 2057 | | Tr 2 | Structure | rock carved 'crest' in W of trench | 18/01/2013 | JD |
| 2058 | | Tr 2 | Layer | dark reddy grey layer in W of trench at lowest point | 18/01/2013 | JD |
| 2059 | | Tr 2 | Layer | lens of orangey brown silty gravel | 21/01/2013 | JD |
| 2060 | | Tr 2 | Layer | layer of dark grey and red small scoria | 21/01/2013 | JD |
| 2061 | | Tr 2 | Layer | fine lens of small red scoria | 21/01/2013 | JD |
| 2062 | | Tr 2 | Layer | dark reddy grey gritty and scoria fragments | 21/01/2013 | JD |
| 2063 | | Tr 2 | Layer | orange scoria | 21/01/2013 | JD |
| 2064 | | Tr 2 | Structure | spine of rock in centre of trench | 21/01/2013 | JD |
| 2065 | 2106 | Tr 2 | Layer | Red scoria matrix between rock 2027 and rear of recess 2106 | 22/01/2013 | DGE |
| 2066 | | Tr 2 | | | | |

| Context no | Assoc. nos | Site sub-division | Type | Description | Date | Initials |
|---|---|---|---|---|---|---|
| 2067 | 2069 | Tr 2 | Layer | red layer off cave entrance top layer - same as 2069 | 22/01/2013 | DGE |
| 2068 | | Tr 2 | layer | green layer off cave entrance and below 2067 | 22/01/2013 | DGE |
| 2069 | 2067 | Tr 2 | Layer | pea gravel | 28/01/2013 | DGE |
| 2070 | | Tr 2 | Layer | | 22/01/2013 | DGE |
| 2071 | | Tr 2 | Layer | silty brown -grey layer above 2058 | 23/01/2013 | CCR |
| 2072 | | Tr 2 | Layer | fine brown silts W cave mouth | 23/01/2013 | CCR |
| 2073 | | Tr 2 | Layer | fine red grit rubble W cave mouth | 23/01/2013 | CCR |
| 2074 | 2050 | Tr 2 | Layer | fine pea grit rubble W cave mouth | 23/01/2013 | CCR |
| 2075 | | Tr 2 | Layer | lump of red scoria w cave mouth | 23/01/2013 | CCR |
| 2076 | | Tr 2 | Layer | sorted lenses outside cave w cave mouth | 23/01/2013 | CCR |
| 2077 | 2045 | Tr 2 | Layer | Red scoria w cave mouth | 23/01/2013 | CCR |
| 2078 | 2046 | Tr 2 | Layer | dark purpley grey scoria w cave mouth | 23/01/2013 | CCR |
| 2079 | | Tr 2 | Structure | Cave | 24/01/2013 | JD |
| 2080 | | Tr 3 | layer | Topsoil | 16/01/2013 | LA |
| 2081 | | Tr 3 | layer | scoria rubble with brown soil | 17/01/2013 | LA |
| 2082 | | Tr 3 | layer | fine scoria gravel/colluvium | 17/01/2013 | DS |
| 2083 | | Tr 3 | layer | uppermost 'road' surface - yellow clay | 22/01/2013 | DS |
| 2084 | | Tr 3 | layer | scoria gravel below road surface 2083 | 22/01/2013 | DS |
| 2085 | 2084 | Tr 3 | layer | patches of eroded road surface intermingled with 2084 | 23-Jan | DGE |
| 2086 | | Tr 3 | layer | tip layer of scoria gravel with stones | 24/01/2013 | LS |
| 2087 | | Tr 3 | layer | dark red scoria gravel | 24/01/2013 | LS |
| 2088 | | Tr 3 | layer | browny red scoria gravel | 24/01/2013 | LS |
| 2089 | | Tr 3 | layer | scoria gravel | 24/01/2013 | LS |
| 2090 | | Tr 3 | layer | road surface - yellow/green grey clay | 24/01/2013 | LS |
| 2091 | | Tr 3 | Structure | pukao 111 - Englert's no. 23 at end tr 3 | 24/01/2013 | JD |
| 2092 | | Tr 3 | Layer | scoria gravel | 24/01/2013 | LS |
| 2093 | | Tr 3 | Layer | scoria gravel | 24/01/2013 | LS |
| 2094 | | Tr 3 | Layer | clay re-surface of road | 24/01/2013 | CCR |
| 2095 | | Tr 3 | Layer | lowest layer of scoria in trench | 24/01/2013 | CCR |
| 2096 | | Tr 2 | Layer | small - large blocks in E of trench | 29/01/2013 | CCR |

| Context no | Assoc. nos | Site sub-division | Type | Description | Date | Initials |
|---|---|---|---|---|---|---|
| 2097 | | Tr 2 | Layer | small - medium scoria debris rubs 2098 | 29/01/2013 | CCR |
| 2098 | | Tr 2 | Structure | Lower spoil heap in tr 2 | 29/01/2013 | CCR |
| 2099 | | Tr 2 | Layer | fine silts in tr 2 centre bottom | 29/01/2013 | CCR |
| 2100 | | Tr 2 | Structure | Cave mouth E side | 24/01/2013 | JD |
| 2101 | | Tr 2 | Structure | Quarry face - hollow way E | 24/01/2013 | JD |
| 2102 | | Tr 2 | Structure | Quarry Face - side of hollow way E | 24/01/2013 | JD |
| 2103 | | Tr 2 | Structure | hollow way to cave | 24/01/2013 | JD |
| 2104 | | Tr 2 | Structure | bedrock at cave mouth | 24/01/2013 | JD |
| 2105 | | Tr 2 | Structure | quarry face containing eyes | 24/01/2013 | JD |
| 2106 | | Tr 2 | Structure | quarry recess under eyes 'cave' recess | 24/01/2013 | JD |
| 2107 | | Tr 2 | Structure | lip of rock between hollow way and cave mouth | 24/01/2013 | JD |
| 2108 | | Tr 2 | Structure | cave mouth W side | 24/01/2013 | JD |
| 2109 | | Tr 2 | Layer | layer of grey scoria blocks | 25/01/2013 | CCR |
| 2110 | | Tr 2 | Layer | small lumps of scoria lenses/dumps | 25/01/2013 | CCR |
| 2111 | | Tr 2 | Layer | outer rubble tumble | 28/01/2013 | CCR |
| 2112 | | Tr 2 | Layer | sequence of fine tumble different angle | 28/01/2013 | CCR |
| 2113 | | Tr 2 | Layer | secondary tumble | 28/01/2013 | CCR |
| 2114 | | Tr 2 | Layer | series of angled tumble/dumps | 28/01/2013 | CCR |
| 2115 | | Tr 2 | Layer | stabilisation layer - lenses | 28/01/2013 | CCR |
| 2116 | 2115 | Tr 2 | Layer | in section stabilisation layer above 2115 | 28/01/2013 | CCR |
| 2117 | 2116 | Tr 2 | Layer | upper stabilisation layer above 2116 | 28/01/2013 | CCR |
| 2118 | | Tr 2 | Layer | loose scoria small stones orangey red | 28/01/2013 | CCR |
| 2119 | | Tr 2 | Layer | upper stabilisation silts | 28/01/2013 | CCR |
| 2120 | | Tr 2 | heap | whole spoil heap in E trench | 28/01/2013 | CCR |
| 2121 | | Tr 2 | Layer | bulk of scoria silt and lenses of frags | 29/01/2013 | CCR |
| 2122 | 2098 | Tr 2 | Layer | fine silt with scoria fragments centre tr 2 | 29/01/2013 | CCR |
| 2123 | | Tr 2 | Layer | thin layer of yellow clay visible in drawing 22 | 04/02/2013 | JD |
| 2124 | | Tr 2 | Layer | thick layer of large scoria debris | 04/02/2013 | JD |

## Appendix 2. Drawings

| Drawing no | Sheet no | Section | Plan | Description | Scale | Initials | Date |
|---|---|---|---|---|---|---|---|
| 20 | | yes | | section through E side trench 2 | 01:10 | JD | 15/01/2013 |
| 21 | | yes | | section through N side trench 2 | 01:10 | ARC | 16/01/2013 |
| 22 | | yes | | section through W side trench 2 | 01:10 | JD | 18/01/2013 |
| 23 | | yes | | section through E side tranch 2 | 01:10 | CR | 22/01/2013 |
| 24 | | yes | | section through W end after cave trench 2 | 01:10 | CR | 24-24/01/2013 |
| 25 | | | yes | Plan of road trench 3 | 01:20 | LA | |
| 26 | | yes | | Section NW joining - trench 3 | 01:10 | LA | 21/01/2013 |
| 27 | | | yes | plan of surface trench 3 | 01:20 | LA | 16/01/2013 |
| 28 | | yes | | E facing mid section trench 2 | 01:10 | CR | 28/01/2013 |
| 29 | | yes | | overlay to section showing sample locations trench 3 | 01:10 | SH | 28/01/2013 |
| 30 | | yes | | elevation of quarry face trench 2 | 01:10 | CR | 28/01/2013 |
| 31 | | | yes | sketch plan showing location of total station co-ordinates trench 2 | 01:20 | JD | 27/01/2013 |
| 32 | | yes | | overlay to drawing number 31 showing section locations | 01:20 | JD | 01/02/2013 |

## Appendix 3. Small Finds

| SF no | easting | northing | elip. height | date | context | artefact | material | notes |
|---|---|---|---|---|---|---|---|---|
| SF300 | 658085.733 | 6996099.375 | 162.1587 | 14/01/2013 | 2021 | toki | flow lava | also in 2109 |
| SF301 | 658086.5919 | 6996098.291 | 162.3691 | 14/01/2013 | 2021 | toki | flow lava | |
| SF302 | 658083.2208 | 6996099.743 | 162.4377 | 14/01/2013 | 2109 | toki | flow lava | |
| SF303 | 658084.4419 | 6996099.278 | 161.7766 | 14/01/2013 | 2109 | toki | flow lava | |
| SF305 | 658086.5284 | 6996096.302 | 163.1667 | 15/01/2013 | 2004 | flake | obsidian | large |
| SF306 | 658086.448 | 6996096.316 | 163.13 | 15/01/2013 | 2004 | flake | obsidian | |
| SF307 | 658086.2802 | 6996096.35 | 163.1386 | 15/01/2013 | 2004 | toki | flow lava | |
| SF308 | 658087.0426 | 6996097.179 | 163.0184 | 15/01/2013 | 2004 | flake | obsidian | large |
| SF309 | 658086.2238 | 6996096.428 | 163.081 | 15/01/2013 | 2004 | scraper | obsidian | |
| SF310 | 658083.8865 | 6996099.435 | 161.7629 | 15/01/2013 | 2109 | toki | flow lava | |
| SF311 | 658087.1866 | 6996098.524 | 162.8764 | 15/01/2013 | 2002 | toki | flow lava | fragment |
| SF312 | 658087.3573 | 6996097.85 | 162.3607 | 15/01/2013 | 2043 | toki | flow lava | |
| SF313 | 658083.9656 | 6996100.145 | 162.1332 | 15/01/2013 | 2109 | toki | flow lava | |
| SF314 | 658084.274 | 6996100.518 | 162.0674 | 15/01/2013 | 2109 | toki | flow lava | |
| SF315 | 658084.2143 | 6996100.204 | 162.0902 | 15/01/2013 | 2109 | toki | flow lava | |
| SF316 | 658084.7066 | 6996099.731 | 162.0791 | 15/01/2013 | 2109 | toki | flow lava | |
| SF317 | 658085.1395 | 6996099.387 | 162.0581 | 15/01/2013 | 2109 | toki | flow lava | |
| SF318 | 658082.3848 | 6996097.437 | 162.2713 | 16/01/2013 | 2014 | shells | shells | fragments |
| SF319 | 658082.8726 | 6996097.386 | 162.2021 | 16/01/2013 | 2014 | flake | obsidian | |
| SF320 | 658082.5799 | 6996097.428 | 162.2019 | 16/01/2013 | 2014 | flake | obsidian | |
| SF321 | 658082.2586 | 6996097.674 | 162.336 | 16/01/2013 | 2014 | toki | flow lava | fragment |
| SF322 | 658082.1683 | 6996097.747 | 162.3642 | 16/01/2013 | 2014 | flake | obsidian | |
| SF323 | 658086.7273 | 6996097.867 | 162.1867 | 16/01/2013 | 2028 | toki | flow lava | |
| SF324 | 658086.7535 | 6996098.008 | 162.1107 | 16/01/2013 | 2028 | toki | flow lava | |
| SF325 | 658081.8807 | 6996097.281 | 162.3682 | 16/01/2013 | 2014 | toki | flow lava | |
| SF326 | 658084.0688 | 6996098.313 | 161.4855 | 17/01/2013 | 2014 | toki | flow lava | |
| SF327 | 658079.888 | 6996097.565 | 162.0142 | 18/01/2013 | 2049 | hammerstone | sea pebble | |
| SF329 | 658082.8628 | 6996098.727 | 161.6572 | 21/01/2013 | 2061 | toki | flow lava | |

| SF no | easting | northing | elip. height | date | context | artefact | material | notes |
|---|---|---|---|---|---|---|---|---|
| SF330 | 658081.7986 | 6996098.393 | 162.407 | 21/01/2013 | 2014 | toki | flow lava | |
| SF331 | 658081.3015 | 6996098.015 | 162.1491 | 21/01/2013 | 2051 | toki | flow lava | |
| SF332 | 658081.1135 | 6996098.088 | 162.0437 | 21/01/2013 | 2051 | flake | obsidian | |
| SF333 | 658081.3225 | 6996097.616 | 162.0816 | 21/01/2013 | 2052 | toki | flow lava | |
| SF334 | 658081.282 | 6996097.565 | 162.0203 | 21/01/2013 | 2052 | toki | flow lava | |
| SF335 | 658080.709 | 6996097.589 | 161.9279 | 22/01/2013 | 2052 | hammerstone | sea pebble | |
| SF337 | on section 23 | | | 24/01/2013 | 2049 | burnt bone | bone | |
| SF338 | 658084.523 | 6996098.304 | 160.927 | 26/01/2013 | 2058 | flake | obsidian | |
| SF339 | 658084.523 | 6996098.304 | 160.927 | 26/01/2013 | 2058 | flake | obsidian | |
| SF354 | 658084.523 | 6996098.304 | 160.927 | 26/01/2013 | 2058 | flake | obsidian | |

## Appendix 4. Samples

| Sample no | Context no | Volume | Sample type/ purpose | Context description & notes | Date | Initials | notes/ reason for sampling |
|---|---|---|---|---|---|---|---|
| 201 | 2007 | <1 ltr | small bulk multi analysis | | 23/02/2012 | JC | |
| 202 | 2008 | <1 ltr | small bulk multi analysis | | 23/02/2012 | JC | |
| 203 | 2009 | <1 ltr | small bulk multi analysis | | 23/02/2012 | JC | |
| 204 | 2007 | <1 ltr | small bulk multi analysis | | 23/02/2012 | JC | |
| 205 | 2007 | <1 ltr | small bulk multi analysis | | 23/02/2012 | JC | |
| 206 | 2008 | <1 ltr | small bulk multi analysis | | 23/02/2012 | JC | |
| 207 | 2010 | <1 ltr | small bulk multi analysis | | 23/02/2012 | JC | |
| 208 | 2010 | <1 ltr | small bulk multi analysis | | 23/02/2012 | JC | |
| 209 | 2010 | <1 ltr | small bulk multi analysis | | 23/02/2012 | JC | |
| 210 | 2011 | <1 ltr | small bulk multi analysis | | 23/02/2012 | JC | |
| 211 | 2016 | <1 ltr | bulk sediment | | 24/01/2012 | JC | |
| 212 | 2017 | <1 ltr | bulk sediment | | 24/01/2012 | JC | |
| 213 | 2019 | <1 ltr | bulk sediment | | 25/01/2012 | JC | |
| 214 | 2007B | <500g | soil block | | 25/01/2012 | JC | |
| 215 | 2007D | 1 pce | charcoal frag | | 25/01/2012 | JC | |
| 216 | 2007D | 1 pce | charcoal frag | | 25/01/2012 | SH | |
| 217 | 2014F | 1 pce | charcoal frag | | 25/01/2012 | JC | |
| 218 | 2014 | 1 pce | charcoal frag | | 30/01/2012 | SH | |
| 219 | 2008 | frags | charcoal | | 23/01/2012 | JC | |
| 220 | 2021 | 3 pces | charcoal C14 | | 27/01/2012 | SH | |
| 221 | 2006 | 125 gms | for pollen | P1 | 30/01/2012 | SH | |

| Sample no | Context no | Volume | Sample type/ purpose | Context description & notes | Date | Initials | notes/ reason for sampling |
|---|---|---|---|---|---|---|---|
| 222 | two 0 one four | 125 gms | for pollen | P2 | 30/01/2012 | SH | |
| 223 | 2021 | top 125 gms | for pollen | P3 | 30/01/2012 | SH | |
| 224 | 2021 | middle 70 gms | for pollen | P4 | 30/01/2012 | SH | |
| 225 | 2021 | bottom 80 gms | for pollen | P5 | 30/01/2012 | SH | |
| 226 | 2022 | 125 gms | for pollen | P6 | 30/01/2012 | SPIT | |
| 227 | 2023 | 50 gms | for pollen | P7 | 30/01/2012 | SPIT | |
| 228 | 2005F | | for OHD | OHD 1 | 30/01/2012 | SH | |
| 229 | 2005E | | for OHD | OHD 2 | 30/01/2012 | SH | |
| 230 | 2006E | | for OHD | OHD 3 | 30/01/2012 | SH | |
| 231 | 2007 SF 256 | | for OHD | OHD 4 | 30/01/2012 | SH | |
| 232 | 2009 | | for OHD | OHD 5 | 30/01/2012 | SH | |
| 233 | 2011 | | for OHD | OHD 6 | 30/01/2012 | SH | |
| 234 | 2014E | | for OHD | OHD 7 | 30/01/2012 | SH | |
| 235 | 2016G | | for OHD | OHD 8 | 30/01/2012 | SH | |
| 236 | 2010 | | for OHD | OHD 9 | 30/01/2012 | SH | |
| 237 | 2020B | | for OHD | OHD 1 | 30/01/2012 | SH | |
| 238 | 2021D | | for OHD | OHD 11 | 30/01/2012 | SH | |
| 239 | 2023 | | for OHD | OHD 12 | 31/01/2012 | MST | |
| 240 | 2024 | | for OHD | OHD 13 | 31/01/2012 | SH | |
| 241 | 2014 | | charcoal C14 | | 31/01/2012 | SH | |
| 242 | 2021 | | charcoal C14 | | 31/01/2012 | SH | |
| 243 | 2021 | | charcoal C14 | | 31/01/2012 | SH | |
| 244 | | | | | | | |
| 260 | 2014 | <1ltr | bulk sediment | | | | carbon dating |
| 261 | 2014/ 2051 | 50cm | Kubiana | | | CR | 50cm long kits in 2014, 2051 in section 22 (disaggregated in transit) |
| 262 | 2054 | <1ltr | bulk sediment | | | | in section 22 |

| Sample no | Context no | Volume | Sample type/ purpose | Context description & notes | Date | Initials | notes/ reason for sampling |
|---|---|---|---|---|---|---|---|
| 263 | 2014 | <1ltr | bulk sediment | | | | in section 22 |
| 264 | 2058 | | XRF | | | CR | in section 22 |
| 265 | 2063 | | XRF | | | CR | in section 22 |
| 266 | 2048 | | XRF | | | CR | in section 22 |
| 267 | 2051 | | charcoal C14 | | | | carbon dating |
| 268 | 2065 | | XRF | | | CR | |
| 269 | 2065 | | XRF | | | CR | |
| 270 | 2065 | | bulk sediment | | | | in hope of getting some charcoal 2 bags |
| 271 | 2083 | | soil block | | | | not for floating - particle size analysis 2 bags |
| 272 | 2007 | | micromorph | | | | |
| 273 | 2083 | | micromorph | | | | not for floating - micromorph |
| 274 | 2083 | | pollen | | | SH | west facing section T3 bottle had gone slightly up into over-lying strata |
| 275 | 2083 | | pollen | | | SH | second pollen sample from 'road' surface |
| 276 | 2083 | | pollen | | | SH | 3rd bulk sample from 'road' surface |
| 277 | 2084 | | pollen | | | SH | 4th pollen sample from 'road' surface |
| 278 | 2092 | | pollen | | | SH | 5th pollen sample from 'road' surface |
| 279 | 2090 | | pollen | | | SH | 6th pollen sample from 'road' surface |
| 280 | 2090 | | pollen | | | SH | 7th pollen sample from 'road' surface |
| 281 | 2028 | | pollen | | | SH | bulk T2 section - drawing number 23 |
| 282 | 2028 | | pollen | | | SH | bulk T2 section - drawing number 23 |
| 283 | 2068 | | pollen | | | SH | T2 section drawing 24 green/brown less secure sample |
| 284 | 2068 | | pollen | | | SH | T2 section drawing 24 layer with marine shells less secure sample |
| 285 | 2076 | | pollen | | | SH | T2 section drawing 24 immediately beneath brown shelly layer |
| 286 | 2069 | | pollen | | | SH | T2 section drawing 24 immediately |

| Sample no | Context no | Volume | Sample type/ purpose | Context description & notes | Date | Initials | notes/ reason for sampling |
|---|---|---|---|---|---|---|---|
| | | | | | | | above brown shelly layer |
| 287 | 2007 | | pollen | | | SH | T2 section drawing 24 adjacent to sample 272 |
| 288 | 2118 | | pollen | | | SH | T2 bulk pollen D28 context 2118 strat older than context 2065 |
| 289 | 2065 | | pollen | | | SH | T2 bulk D28 context 2065 |
| 290 | 2058 | | pollen | | | SH | T2 bulk D22 earlier than context 2071 |
| 291 | 2071 | | pollen | | | SH | T2 bulk D22 later than context 2058 |
| 292 | 2067 | | charcoal C14 | | | | Tr2 charcoal pieces from 55cm inside cave mouth E side C14 |
| 293 | 2067 | | burnt bone | | | | Tr 2 fragments of mixed bone for ID from cave mouth |
| 294 | 2067 | | bulk sediment | | | | for sieving – charcoal, burnt bone, etc. |
| 295 | 2068 | | bulk sediment | | | | for sieving – shell, charcoal, etc. |
| 296 | 2015 | | XRF | | | CR | scoria sample from W side of crater same as 299 |
| 297 | | | XRF | | | CR | scoria sample from side of crater |
| 298 | | | XRF | | | CR | scoria sample from side of crater |
| 299 | | | XRF | | | CR | scoria sample from side of crater |
| 300 | | | XRF | | | CR | scoria sample from side of crater |
| 301 | | | XRF | | | CR | scoria sample from side of crater |
| 302 | | | XRF | | | CR | scoria sample from side of crater |
| 303 | | | XRF | | | CR | scoria sample from side of crater |
| 304 | 2051 | | obsidian hydration | | | | sf332 for dating |
| 305 | 2084 | | obsidian hydration | | | | sf353 for dating |
| 306 | 2058 | | obsidian hydration | | | | sf354 for dating |
| 307 | 2058 | | obsidian hydration | | | | sf339 for dating |
| 308 | 2058 | | obsidian | | | | sf338 for dating |

| Sample no | Context no | Volume | Sample type/ purpose | Context description & notes | Date | Initials | notes/ reason for sampling |
|---|---|---|---|---|---|---|---|
| | | | hydration | | | | |
| 309 | | | XRF | | | | soil sample back of crater |

## Appendix 5. Photographs

| Photo no | Description | Direction of shot | Taken by | Date |
|---|---|---|---|---|
| 2050 | trench 2 working shot | SE | JD | 16/01/2013 |
| 2051 | trench 2 working shot | SE | JD | 16/01/2013 |
| 2052 | trench 2 working shot | SE | JD | 16/01/2013 |
| 2053 | trench 2 working shot | SE | JD | 16/01/2013 |
| 2054 | trench 2 working shot | SE | JD | 16/01/2013 |
| 2055 | trench 2 working shot | SE | JD | 16/01/2013 |
| 2056 | trench 2 working shot | SE | JD | 16/01/2013 |
| 2057 | trench 2 south facing section | SE | JD | 16/01/2013 |
| 2058 | trench 2 south facing section | SE | JD | 16/01/2013 |
| 2059 | trench 2 south facing section | SE | JD | 16/01/2013 |
| 2060 | trench 2 south facing section | SE | JD | 16/01/2013 |
| 2061 | trench 2 east facing section | SE | JD | 16/01/2013 |
| 2062 | trench 2 east facing section | SE | JD | 16/01/2013 |
| 2063 | trench 2 working shot backfill removal | SW | JD | 09/01/2013 |
| 2064 | trench 2 working shot backfill removal | N | JD | 09/01/2013 |
| 2065 | trench 2 working shot backfill removal | S | JD | 09/01/2013 |
| 2066 | trench 2 working shot backfill removal | SE | JD | 12/01/2013 |
| 2067 | trench 2 working shot backfill removal | E | JD | 12/01/2013 |
| 2068 | trench 2 working shot backfill removal | E | JD | 12/01/2013 |
| 2069 | trench 2 working shot backfill removal | W | JD | 12/01/2013 |
| 2070 | trench 2 working shot backfill removal | N | JD | 12/01/2013 |
| 2071 | trench 2 working shot backfill removal | SW | JD | 12/01/2013 |
| 2072 | trench 2 working shot backfill removal | SE | JD | 12/01/2013 |
| 2073 | trench 2 working shot backfill removal | SE | JD | 12/01/2013 |
| 2074 | trench 2 working shot backfill removal | E | JD | 12/01/2013 |
| 2075 | west facing baulk section | E | JD | 14/01/2013 |
| 2076 | west facing baulk section | E | JD | 14/01/2013 |
| 2077 | trench 2 from crater rim | W | JD | 15/01/2013 |

| Photo no | Description | Direction of shot | Taken by | Date |
|---|---|---|---|---|
| 2078 | trench 2 from crater rim | N | JD | 15/01/2013 |
| 2079 | trench 2 and 3 from crater rim | N | JD | 15/01/2013 |
| 2080 | trench 2 and 3 from crater rim | N | JD | 15/01/2013 |
| 2081 | west facing baulk section | E | JD | 15/01/2013 |
| 2082 | west facing baulk section | E | JD | 15/01/2013 |
| 2083 | west facing baulk section | E | JD | 15/01/2013 |
| 2084 | working shot trench 2 | W | JD | 15/01/2013 |
| 2085 | SF313 in situ | ABOVE | JD | 15/01/2013 |
| 2086 | SF313 in situ | ABOVE | JD | 15/01/2013 |
| 2087 | working shot trench 2 | W | JD | 15/01/2013 |
| 2088 | working shot trench 2 | W | JD | 15/01/2013 |
| 2089 | | | | |
| 2090 | trench 2 east side of trench | E | JD | 15/01/2013 |
| 2091 | trench 2 east side of trench | E | JD | 15/01/2013 |
| 2092 | trench 2 east side working shot | E | JD | 16/01/2013 |
| 2093 | trench 2 east side working shot | E | JD | 16/01/2013 |
| 2094 | trench 2 cave entrance working shot | S | JD | 16/01/2013 |
| 2095 | trench 2 sheep bones in 2049 cave entrance | S | JD | 16/01/2013 |
| 2096 | trench 2 sheep bones in 2049 cave entrance | S | JD | 16/01/2013 |
| 2097 | south facing section record shot trench 2 | | JD | 17/01/2013 |
| 2098 | south facing section record shot trench 2 | S | JD | 17/01/2013 |
| 2099 | trench 2 west facing section record shot | E | JD | 17/01/2013 |
| 2100 | trench 2 east facing section record shot | W | JD | 17/01/2013 |
| 2101 | trench 2 east facing section record shot | W | JD | 17/01/2013 |
| 2102 | trench 3 record shot upper layers under topsoil | S | JD | 17/01/2013 |
| 2103 | trench 3 record shot upper layers under topsoil | S | JD | 17/01/2013 |
| 2104 | trench 3 poro in situ | W | JD | 17/01/2013 |
| 2105 | trench 3 poro in situ | W | JD | 18/01/2013 |
| 2106 | trench 2 west end of trench working shot | W | JD | 18/01/2013 |
| 2107 | trench 2 west end of trench working shot | W | JD | 18/01/2013 |

| Photo no | Description | Direction of shot | Taken by | Date |
|---|---|---|---|---|
| 2108 | trench 2 East end spoil heap in section | E | JD | 18/01/2013 |
| 2109 | trench 2 East end spoil heap in section | E | JD | 18/01/2013 |
| 2110 | trench 2 west end working shot | W | JD | 18/01/2013 |
| 2111 | trench 2 west end section through hollow way | W | JD | 18/01/2013 |
| 2112 | trench 2 west end section through hollow way | W | JD | 18/01/2013 |
| 2113 | trench 2 west end section through hollow way | W | JD | 18/01/2013 |
| 2114 | trench 2 west end while section including hollow way | W | JD | 18/01/2013 |
| 2115 | trench 2 west end while section including hollow way | W | JD | 18/01/2013 |
| 2116 | trench 2 deposits 2049, 2067, 2068 in cave mouth | S | JD | 21/01/2013 |
| 2117 | trench 2 deposits 2049, 2067, 2068 in cave mouth | S | JD | 21/01/2013 |
| 2118 | trench 2 deposits 2049, 2067, 2068 in cave mouth | S | JD | 21/01/2013 |
| 2119 | trench 2 deposits 2049, 2067, 2068 in cave mouth | S | JD | 21/01/2013 |
| 2120 | trench 2 cave mouth deposits and hollow way | S | JD | 21/01/2013 |
| 2121 | trench 2 cave mouth deposits and hollow way | S | JD | 21/01/2013 |
| 2122 | trench 2 hollow way | S | JD | 21/01/2013 |
| 2123 | trench 2 section through deposits cave mouth | W | JD | 22/01/2013 |
| 2124 | trench 2 section through deposits cave mouth | W | JD | 22/01/2013 |
| 2125 | trench 2 section through deposits cave mouth | W | JD | 22/01/2013 |
| 2126 | section perpendicular to cave mouth section | S | JD | 22/01/2013 |
| 2127 | section perpendicular to cave mouth section | S | JD | 22/01/2013 |
| 2128 | section perpendicular to cave mouth section | S | JD | 22/01/2013 |
| 2129 | trench 3 working shot | NE | JD | 22/01/2013 |
| 2130 | trench 3 working shot | NE | JD | 22/01/2013 |
| 2131 | crater working shot trench 2 and 3 | E | JD | 22/01/2013 |
| 2132 | trench 3 working shot | E | JD | 22/01/2013 |
| 2133 | trench 3 working shot | E | JD | 22/01/2013 |
| 2134 | crater working shot | S | JD | 22/01/2013 |
| 2135 | crater working shot | S | JD | 22/01/2013 |
| 2136 | trench 3 working shot | SE | JD | 22/01/2013 |
| 2137 | trench 3 working shot | SE | JD | 22/01/2013 |

| Photo no | Description | Direction of shot | Taken by | Date |
|---|---|---|---|---|
| 2138 | crater working shot | S | JD | 22/01/2013 |
| 2139 | crater working shot | S | JD | 22/01/2013 |
| 2140 | trench 2 working shot from Adam's pole | S | JD | 22/01/2013 |
| 2141 | trench 2 and working shot | SW | JD | 22/01/2013 |
| 2142 | trench 2 and working shot | SW | JD | 22/01/2013 |
| 2143 | trench 3 west facing section | E | JD | 24/01/2013 |
| 2144 | trench 3 west facing section | E | JD | 24/01/2013 |
| 2145 | trench 3 west facing section | E | JD | 24/01/2013 |
| 2146 | trench 2 sheep bones in 2049 cave entrance | S | JD | 16/01/2013 |
| 2147 | hill to east of Puna Pau | W | JD | 02/02/3013 |
| 2148 | crater with trenches backfilled | W | JD | 02/02/3013 |
| 2149 | crater with trenches backfilled | W | JD | 02/02/3013 |
| 2150 | trench 2 backfilled | SW | JD | 02/02/3013 |
| 2151 | pukao with maki-maki | SE | JD | 02/02/3013 |
| 2152 | pukao with maki-maki | SE | JD | 02/02/3013 |
| 2153 | pukao with maki-maki | SE | JD | 02/02/3013 |
| 2154 | trench 2 backfilled | SW | JD | 02/02/3013 |
| 2155 | trench 2 west side of hollow way | E | CCR | 23/01/2013 |
| 2156 | trench 2 2065 in recess 2106 | S | CCR | 23/01/2013 |
| 2157 | trench 2 2065 in recess 2106 | S | CCR | 23/01/2013 |
| 2158 | trench 2 2065 in recess 2106 | S | CCR | 23/01/2013 |
| 2159 | rock 'west' 2057 | S | CCR | 23/01/2013 |
| 2160 | rock 'west' 2057 | S | CCR | 23/01/2013 |
| 2161 | rock 'west' 2057 | S | CCR | 23/01/2013 |
| 2162 | tool marks on rock surface 2105 | S | CCR | 23/01/2013 |
| 2163 | tool marks on rock surface 2105 | S | CCR | 23/01/2013 |
| 2164 | tool marks on rock surface 2105 | S | CCR | 23/01/2013 |
| 2165 | tool marks on rock surface 2105 | S | CCR | 23/01/2013 |
| 2166 | tool marks on rock surface 2105 | S | CCR | 23/01/2013 |
| 2167 | tool marks on rock surface 2105 | S | CCR | 23/01/2013 |

| Photo no | Description | Direction of shot | Taken by | Date |
|---|---|---|---|---|
| 2168 | tool marks on rock surface 2105 | S | CCR | 23/01/2013 |
| 2169 | trench 2 tool marks on rock face 2105 | S | CCR | 23/01/2013 |
| 2170 | trench 2 tool marks on rock face 2105 | S | CCR | 23/01/2013 |
| 2171 | trench 2 tool marks on rock face 2105 | S | CCR | 23/01/2013 |
| 2172 | trench 2 tool marks on rock face 2105 | S | CCR | 23/01/2013 |
| 2173 | trench 2 rock crest 2057 and cave mouth | SW | CCR | 23/01/2013 |
| 2174 | trench 2 rock crest 2057 and cave mouth | SW | CCR | 23/01/2013 |
| 2175 | trench 2 rock crest 2057 and cave mouth | SW | CCR | 23/01/2013 |
| 2176 | finds in east of trench obsidian and toki | DOWN | CCR | 15/01/2013 |
| 2177 | finds in east of trench obsidian and toki | DOWN | CCR | 15/01/2013 |
| 2178 | trench 2 complete view excavated | W | CCR | 23/01/2013 |
| 2179 | trench 2 complete view excavated | SW | CCR | 23/01/2013 |
| 2180 | trench 2 rock face 2105 and hollow way | S | CCR | 23/01/2013 |
| 2181 | trench 2 rock face/quarry bay and trench | S | CCR | 23/01/2013 |
| 2182 | trench 2 rock face/quarry bay and trench | S | CCR | 23/01/2013 |
| 2183 | trench 2 cave mouth | S | CCR | 23/01/2013 |
| 2184 | trench 2 cave mouth | S | CCR | 23/01/2013 |
| 2185 | trench 2 whole trench including east end of rock face | ESE | CCR | 23/01/2013 |
| 2186 | trench 2 whole trench including east end of rock face | SE | CCR | 23/01/2013 |
| 2187 | trench 2 whole trench including east end of rock face | SE | CCR | 23/01/2013 |
| 2188 | trench 2 rock face and cave mouth | S | CCR | 23/01/2013 |
| 2189 | trench 2 end of trench | E | CCR | 23/01/2013 |
| 2190 | trench 2 tool marks on rock face 2105 | S | CCR | 23/01/2013 |
| 2191 | trench 2 tool marks on rock face 2105 | S | CCR | 23/01/2013 |
| 2192 | trench 2 west end of trench and cave mouth | SW | CCR | 23/01/2013 |
| 2193 | trench 2 west end of trench and cave mouth | SW | CCR | 23/01/2013 |
| 2194 | trench 2 west end of trench and cave mouth | SW | CCR | 23/01/2013 |
| 2195 | trench 2 west end of trench and cave mouth | SW | CCR | 23/01/2013 |
| 2196 | trench 2 west end of trench and cave mouth | SW | CCR | 23/01/2013 |
| 2197 | trench 2 west end of trench and cave mouth | SW | CCR | 23/01/2013 |

| Photo no | Description | Direction of shot | Taken by | Date |
|---|---|---|---|---|
| 2198 | trench 2 west end of trench and cave mouth | SW | CCR | 23/01/2013 |
| 2199 | trench 2 west end of trench and cave mouth | SW | CCR | 23/01/2013 |
| 2200 | hollow way | S | CCR | 23/01/2013 |

## Appendix 6. Magnetic susceptibility data (Bartington MS2 Field Coil) recorded at Trench 3

| Distance (m) | 0.00 | 0.25 | 0.50 | 0.75 |
|---|---|---|---|---|
| 0.00 | 53 | 56 | 78 | 93 |
| 0.25 | 62 | 72 | 87 | 127 |
| 0.50 | 73 | 88 | 108 | 116 |
| 1.25 | 94 | 89 | 93 | 86 |
| 1.50 | 83 | 73 | 98 | 111 |
| 1.75 | 92 | 89 | 93 | 83 |
| 2.00 | 73 | 84 | 84 | 68 |
| 2.25 | 100 | 123 | 88 | 123 |
| 2.50 | 235 | 340 | 280 | 386 |
| 2.75 | 390 | 466 | 456 | 343 |
| 3.00 | 285 | 153 | 179 | 191 |
| 3.25 | 206 | 230 | 406 | 225 |
| 3.50 | 267 | 172 | 140 | 178 |
| 3.75 | 121 | 106 | 82 | 76 |
| 4.00 | 118 | 103 | 93 | 109 |
| 4.25 | 120 | 97 | 86 | 93 |
| 4.50 | 105 | 80 | 89 | 91 |
| 4.75 | 86 | 77 | 103 | 103 |
| 5.00 | 139 | 114 | 160 | 210 |
| 5.25 | 160 | 204 | 247 | 261 |
| 5.50 | 141 | 135 | pukao | pukao |

## Appendix 7. New stone finds from Trench 2

| Context | Square | Sf no | Material | Variety | Type/ suggested origin | Type of object | Qty | Size in mm or wentworth scale | Usewear | Comments | Photo |
|---|---|---|---|---|---|---|---|---|---|---|---|
| n/a | cave entrance/ section | n/a | obsidian | glossy — small sperulites | Kau | core | 1 | 20x18x15 | none | none | no |
| n/a | cave entrance/ section | n/a | obsidian | frosty | Orito | rough mataa | 1 | 75x58x17 (tang 25) | none visible but badly damaged | none | no |
| n/a | cave entrance/ section | n/a | flow lava | blue tabular | ?Kau | rough flake | 1 | 48x27x12 | light preflaking smoothing | none | no |
| n/a | cave entrance/ section | n/a | flow lava | water-rolled | beach | hammerstone | 1 | medium pebble | faint traces of batter on one end | none | no |
| 2021/23 2023 renumbered to 2019 | n/a | 300 | flow lava | tabular | Kau | toki (pick type)/ near whole — pointed blade | 1 | 190x78x55 | heavily smoothed on blade | burnt | yes |
| n/a | n/a | 326 | flow lava | blue tabular | ?Kau | toki fragment/ working end — pointed blade | 1 | 143x70x25 | heavily smoothed blade; lightly smoothed edges near blade | soot soaked/ burnt | yes |
| n/a | ne ext | n/a | obsidian | frosty | Orito | chip | 1 | 37x30x20 | none | none | no |
| n/a | ne ext | n/a | flow lava | tabular | Kau | rough flake | 1 | 64x23x7 | none | none | no |
| n/a | ne ext | n/a | flow lava | tabular | Kau | rough flake | 1 | 100x67x9 | none | burnt/ possible a fire spall | no |
| n/a | ne ext | n/a | flow lava | tabular | Kau | formless chunk | 1 | 90x70x18 | none | abortive toki | no |
| n/a | ne ext | n/a | flow lava | blue vitreous | Viringa o Tuki-type | rough flakes | 2 | 70x30x20 & 76x34x14 | none | none | no |
| n/a | nw ext | n/a | flow lava | tabular | Kau | rough flakes | 4 | 36x24x6-71x38x9 | one lightly smoothed | wear possibly post knapping | no |

| Context | Square | Sf no | Material | Variety | Type/ suggested origin | Type of object | Qty | Size in mm or wentworth scale | Usewear | Comments | Photo |
|---|---|---|---|---|---|---|---|---|---|---|---|
| n/a | nw ext | n/a | flow lava | blue tabular | ?Kau | rough flake | 1 | 40x27x10 | none | none | no |
| n/a | nw ext | n/a | flow lava | blue tabular | ?Kau | toki fragment/ working end — rounded blade | 1 | 89x50x16 | light smoothing on end | well knapped unifacially on end & both edges | yes |
| n/a | nw ext | n/a | flow lava | tabular | ?Kau | unutilized foreign stone | 1 | 160x120x20 | none | poor stone — no obvious use | no |
| n/a | nw ext | n/a | flow lava | water rolled | beach | fire-cracked stone | 4 | 50x30x25-65x55x50 | none | none | no |
| n/a | nw ext | n/a | flow lava | unknown | unknown | fire-cracked stone | 1 | 40x30x10 | none | none | no |
| n/a | nw ext | n/a | flow lava | tabular | Kau | toki fragment/ working end — square blade | 1 | 110x70x37 | light smoothing on ends and sides near end | bi-facially flaked | yes |
| n/a | nw ext | n/a | flow lava | blue tabular | ?Kau | rough flake | 1 | 52x52x16 | none | has weak hinge fracture | no |
| n/a | nw ext | n/a | flow lava | blue vitreous | Viringa o Tuki-type | rough flake | 1 | 76x48x22 | none | none | no |
| n/a | nw ext | n/a | flow lava | water rolled | beach | flake | 1 | 96x70x20 | none | utilizable but probably fire spall | no |
| n/a | nw ext | n/a | flow lava | ?aa | unknown | rough flake | 1 | 62x51x12 | none | none | no |
| n/a | nw ext | n/a | flow lava | tabular/ sparsely vesicular | ?outside crater | naturally flat stone with possible artefactual damage | 1 | 195x135x25 | none | broken on one edge near end | no |
| n/a | nw ext | n/a | obsidian | glossy — small sperulites | Kau | rough utilized flake | 1 | 50x40x11 | unifacial flaking on one edge | none | yes |
| n/a | nw ext | n/a | obsidian | glossy — small sperulites | Kau | rough flake | 1 | 26x19x5 | none | none | no |

| Context | Square | Sf no | Material | Variety | Type/ suggested origin | Type of object | Qty | Size in mm or wentworth scale | Usewear | Comments | Photo |
|---|---|---|---|---|---|---|---|---|---|---|---|
| n/a | nw ext | n/a | obsidian | glossy — small sperulites | Kau | glossy — small phenocrysts | 2 | 25x17x7 & 41x28x14 | none | none | no |
| n/a | nw ext | n/a | obsidian | frosty | Orito-type | rough flakes | 7 | 15x109x2-35x22x7 | none | none | no |
| n/a | nw ext | n/a | obsidian | frosty | Orito-type | rough flakes | 2 | 50x41x17 & 58x50x14 | none | none | no |
| n/a | nw ext | n/a | obsidian | frosty | Orito-type | chips | 3 | 23x13x9-31x21x12 | none | none | no |
| n/a | nw ext | n/a | obsidian | frosty | Orito-type | chip | 1 | 57x38x30 | none | none | uw/yes |
| n/a | nw ext | n/a | obsidian | frosty (black type) | Orito/Kau/Iti | utilized chip | 1 | 63x31x20 | battered along short edge | | |
| n/a | nw ext | n/a | obsidian | frosty | Orito-type | rough mataa | 1 | 50x33x8 (tang 15) | unifacial flaking in tang; indeterminate abrasion on blade | none | uw/yes |
| n/a | nw ext | n/a | obsidian | frosty | Orito-type | ?hand-held pick | 1 | 120x72x14 | possible crushing on narrow end | wide end blunted | yes |
| n/a | nw ext | n/a | obsidian | frosty | Orito-type | rough utilized flakes | 2 | 55x36x13 & 35x35x15 | patches of unifacial flaking | none | uw/yes |
| n/a | nw ext | n/a | obsidian | frosty | Orito-type | utilized chip | 1 | 38x22x8 | flaked notch in short side | none | uw/yes |
| n/a | nw ext | n/a | obsidian | frosty | Orito-type | utilized chip | 1 | 70x55x17 | possible unifacial flaking in incurve | none | uw/yes |
| n/a | nw ext | n/a | obsidian | glossy | Kau | rough flake | 1 | 35x29x7 | none | none | no |

| Context | Square | Sf no | Material | Variety | Type/ suggested origin | Type of object | Qty | Size in mm or wentworth scale | Usewear | Comments | Photo |
|---|---|---|---|---|---|---|---|---|---|---|---|
| n/a | nw ext | n/a | obsidian | frosty | Orito | rough utilized flakes | 2 | 25x13x8 & 27x18x9 | unifacial flaking on one edge of smaller; unifacial flaking on one end of larger | none | yes |
| n/a | nw ext | n/a | obsidian | frosty | Orito | utilized flake | 1 | 34x18x7 | unifacial notch on one edge; possible wear on other | none | no |
| n/a | nw ext | n/a | obsidian | frosty | Orito | rough flakes | 4 | 28x12x8-34x23x9 | nothing visible | none | no |
| n/a | nw ext | n/a | obsidian | frosty | Orito | chunks | 3 | 55x45x26-65x50x30 | 1 possibly utilized | none | no |
| n/a | nw ext | n/a | flow lava | tabular | Kau | rough flakes | 2 | 67x33x15 & 115x56x15 | none | smaller soot soaked | no |
| n/a | nw ext | n/a | flow lava | water rolled | beach | fire-cracked rock | 1 | 82x32x23 | none | none | no |
| n/a | nw ext | n/a | obsidian | frosty | Orito | rough utilized flakes | 3 | 50x33x8-48x45x20 | 2 with unifacial flaking on one edge; 1 with possible wear on both edges | none | uw/yes |
| n/a | nw ext | n/a | obsidian | frosty | Orito | rough flakes | 2 | not measured | none | none | no |
| n/a | nw ext | n/a | obsidian | frosty | Orito | core | 1 | 100x90x40 | none | none | no |
| n/a | nw ext | n/a | flow lava | tabular | Kau | toki fragment (from middle) | 1 | 90x90(total width of tool)x26 | light smoothing on one side | none | no |
| n/a | sw ext | n/a | obsidian | frosty | Orito | rough utilized blade | 1 | 26x9x2 | bifacial flaking on on 1 edge | none | no |
| n/a | sw ext | n/a | flow lava | tabular | Kau | toki fragment (from middle) | 1 | 130x72(wide)x26 | none | none | no |
| n/a | sw ext | n/a | flow lava | blue tabular | ?Kau | toki fragment (from middle) | 1 | 90x68(wide)x25 | light wear on smaller | close to end | no |

| Context | Square | Sf no | Material | Variety | Type/ suggested origin | Type of object | Qty | Size in mm or wentworth scale | Usewear | Comments | Photo |
|---|---|---|---|---|---|---|---|---|---|---|---|
| n/a | sw ext | n/a | flow lava | tabular | Kau | chunks | 3 | 70x32x10-65x63x17 | none | ?broken toki | no |
| n/a | sw ext | n/a | flow lava | tabular | Kau | very rough flakes | 6 | 40x30x10-60x37x21 | none | none | no |
| n/a | sw ext | n/a | flow lava | sugary | Rua Toki Toki | rough flake | 1 | 82x45x18 | none | none | no |
| n/a | sw ext | n/a | flow lava | water-rolled | beach | unaltered | 1 | small pebble | none | none | no |
| n/a | sw ext | n/a | flow lava | water-rolled | beach | fire-cracked-rock | 3 | medium & large pebbles | none | none | no |
| n/a | sw ext | n/a | flow lava | water-rolled | beach | fire-cracked-rock (spall | 1 | 50x40x10 | none | none | no |
| n/a | sw ext | n/a | obsidian | glossy — small sperulites | Kau | rough flakes | 3 | 19x14x3-25x20x5 | none | none | no |
| n/a | sw ext | n/a | obsidian | frosty | Orito | rough utilized flakes | 4 | 55x30x7-70x60x23 | traces | none | no |
| n/a | sw ext | n/a | obsidian | frosty | Orito | rough flakes | 3 | 23x17x11-55x41x10 | none | none | no |
| top 50cm | e ext | n/a | obsidian | frosty | Oritio-type | rough flake | 1 | 68x40x21 | none | none | no |
| top 50cm | e ext | n/a | flow lava | tabular | Kau | rough flake | 1 | 40x21x5 | none | from knapped edge | no |
| top 50cm | e ext | n/a | flow lava | water-rolled | beach | ?hammerstones | 2 | medium & large pebble | none | none | yes |
| top 50cm | e ext | n/a | flow lava | water-rolled | beach | hammerstones | 1 | medium-large pebble | batter in two places | none | yes |
| 2001-3 | ne/sw ext | n/a | obsidian | frosty (black) | Kau/ Iti | rough blade | 1 | 57x25x13 | none | none | no |
| 2001-3 | ne/sw ext | n/a | obsidian | frosty | Orito-type | rough utilized flake | 2 | 48x37x12 & 45x29x12 | unifacial & bifacial | none | no |
| 2001-3 | ne/sw ext | n/a | obsidian | frosty | Orito-type | chip | 1 | 35x26x13 | none | none | no |
| 2001-3 | ne/sw ext | n/a | obsidian | frosty | Orito-type | core/ hammerstone | 1 | 47x42x37 | battered facet | none | no |

| Context | Square | Sf no | Material | Variety | Type/ suggested origin | Type of object | Qty | Size in mm or wentworth scale | Usewear | Comments | Photo |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2001-3 | ne/sw ext | n/a | obsidian | frosty | Orito-type | rough utilized flake | 1 | 90x47x18 | very fine unifacial flaking on one end | none | uw/yes |
| 2001-3 | ne/sw ext | n/a | obsidian | frosty | Orito-type | rough flake | 1 | 70x42x27 | none obvious | none | no |
| 2001-3 | ne/sw ext | n/a | obsidian | frosty | Orito-type | flake core | 1 | 60x45x35 | none | none | no |
| 2001-3 | ne/sw ext | n/a | flow lava | tabular | Kau | toki (near whole)/ working end — square blade | 1 | 205x85x30 | smoothing on blade, on edges near blade & on one edge near broken end | none | yes |
| 2001-3 | ne/sw ext | n/a | flow lava | tabular | Kau | toki fragment; thin/ working end — rounded blade | 1 | 75x105 (wide)x13 | heavily smoothed, focused on centre of blade | none | yes |
| 2001-3 | ne/sw ext | n/a | flow lava | tabular | Kau | toki fragment | 1 | 55x50x19 | none | from centre of tool | no |
| 2001-3 | ne/sw ext | n/a | flow lava | tabular | Kau | flake | 1 | 85x52x6 | none | from side of tool | no |
| 2001-3 | ne/sw ext | n/a | flow lava | vesicular (?aa) | ?outside crater | ?fire-cracked stone | 3 | 110x55x13-120x80x50 | none | 2 large flakes & 1 chunk; traces of burning on latter | no |
| 2001-3 | ne/sw ext | n/a | flow lava | water-rolled pebble | beach | hammerstone | 1 | large pebble | batter in two places | none | yes |
| 2002 | n/a | 311 | flow lava | blue tabular | ?Kau | toki fragment (from middle) | 1 | 130x75x30 | none | none | no |
| 2004 | n/a | 305 | obsidian | frosty | Orito | utilized flake | 1 | 135x95x15 | unifacial flaking on one side; bifacial on distal end | none | yes |

| Context | Square | Sf no | Material | Variety | Type/ suggested origin | Type of object | Qty | Size in mm or wentworth scale | Usewear | Comments | Photo |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2004 | n/a | 306 | obsidian | frosty | Orito | utilized flake | 1 | 130x73x13 | unifacial wear on several places on rounded distal edge | none | yes |
| 2004 | n/a | 307 | flow lava | tabular | Kau | toki fragment (from middle) | 1 | 80x49x25 | light smoothing on sides | none | no |
| 2004 | n/a | 308 | flow lava | tabular | Kau | toki (knife or scraper)/ whole | 1 | 175x105x6 | both long edges smoothed | none | yes |
| 2004 | n/a | 309 | obsidian | frosty | Orito | re-touched tool (oval) | 1 | 70x55x25 | not obvious | thick, oval tool heavily retouched on both long sides — working edge ?broken | yes |
| 2004 | ne ext | n/a | flow lava | tabular | Kau | toki fragment/ working end— square blade | 1 | 80x62x25 | light smoothing on blade | bifacially flaked on end& sides; battered on one side | yes |
| 2004 | ne ext | n/a | flow lava | tabular | Kau | toki fragment/ working end — broken blade | 1 | 554x52x24 | smoothing | probably pointed | no |
| 2004 | ne ext | n/a | flow lava | tabular | Kau | chunks | 2 | 62x38x18 & 90x65x32 | traces of batter on larger piece | larger piece burnt | no |
| 2004 | ne ext | n/a | flow lava | tabular | Kau | rough flakes | 3 | 56x30x6--100x68x20 | none | none | no |
| 2004 | ne ext | n/a | flow lava | tabular | Kau | rough flakes | 2 | 34x33x8 & 47x30x14 | pre-flake wear on x1 piece | none | no |
| 2004 | ne ext | n/a | flow lava | blue vitreous, slightly vesicular | Viringa o Tuki-type | rough flakes | 2 | 35x28x9 & 68x50x8 | none | none | no |

| Context | Square | Sf no | Material | Variety | Type/ suggested origin | Type of object | Qty | Size in mm or wentworth scale | Usewear | Comments | Photo |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2004 | ne ext | n/a | obsidian | glossy — small sperulites | Kau | rough flakes | 3 | 32x17x3-36x21x9 | none | none | no |
| 2004 | ne ext | n/a | obsidian | glossy — small sperulites | Kau | flake core | 1 | 44x40x32 | none | none | no |
| 2004 | ne ext | n/a | obsidian | frosty | Orito-type | chip | 1 | 45x19x16 | none | blunting/ possible core rejuvenation flake | no |
| 2014 | n/a | n/a | obsidian | glossy | Kau | rough flake | 1 | 28x25x7 | none | none | no |
| 2014 | n/a | n/a | obsidian | frosty | Orito | rough utilized flake | 1 | 22x22x3 | unifacial flaking on 1 edge | none | no |
| 2014 | n/a | n/a | flow lava | tabular | Kau | rough flakes | 3 | 47x24x7-47x35x7 | light preflaking smoothing on 1 | none | no |
| 2014 | n/a | n/a | obsidian | glossy — sperulitic | Kau | rough utilized blade | 1 | 28x11x3 | unifacial flaking on one side | no | uw/yes |
| 2014 | n/a | n/a | obsidian | glossy — small sperulites | Kau | rough utilized flake | 1 | 40x24x7 | abrasion on incurved edge | no | uw/yes |
| 2014 | n/a | n/a | obsidian | glossy — small sperulites | Kau | rough flakes | 4 | 21x19x4-45x20x12 | none | none | no |
| 2014 | n/a | n/a | obsidian | glossy — sperulitic | Kau | rough flake | 1 | 28x19x20 | none | none | no |
| 2014 | n/a | n/a | obsidian | glossy — sperulitic | Kau | rough flakes | 2 | 36x21x8 | possible edge wear | none | uw/yes |

| Context | Square | Sf no | Material | Variety | Type/ suggested origin | Type of object | Qty | Size in mm or wentworth scale | Usewear | Comments | Photo |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2014 | n/a | n/a | obsidian | frosty | Orito | rough flakes | 5 | 15x15x4-22x20x2 | 3 with possible edge wear; 2 with clear unifacial flaking, 1 on an outcurved and & 1 on an incurved | none | uw/yes |
| 2014 | n/a | n/a | obsidian | frosty (black grading into grey) | Iti | rough flakes | 25 | 7x6x1-42x37x10 | none | none | no |
| 2014 | n/a | n/a | flow lava | tabular | Kau | rough flake | 1 | 51x26x7 | none | none | no |
| 2014 | n/a | 319 | obsidian | frosty (black) | Orito/ Kau/ Iti | utilized flake | 1 | 72x50x10 | probable | none | no |
| 2014 | n/a | 320 | obsidian | frosty | Orito | rough flake | 1 | 42x40x4 | none obvious | edge damaged | no |
| 2014 | n/a | 321 | flow lava | tabular | Kau | toki fragment/ working end — square blade | 1 | 110x65x20 | light smoothing on blade | none | yes |
| 2014 | n/a | 322 | obsidian | frosty | Orito | flake | 1 | 45x37x8 | probably but very battered | none | no |
| 2014 | n/a | 326 | flow lava | tabular | Kau | toki fragment/ working end — round edge | 1 | 90x70x22 | none! | burnt (light grey) | yes |
| 2014 | n/a | 330 | flow lava | water-rolled | beach | utilized broken stone | 1 | 100x70x30 | striations on flat face at right angles to broken edge; smoothing on point of break | none | yes |
| 2021 | n/a | 301 | flow lava | blue tabular | ?Kau | toki fragment/ working end — square edge | 1 | 125x55x20 | smoothing on blade | tranchet flaked | yes |
| 2028 | n/a | 323 | flow lava | tabular | Kau | toki fragment/ working end — round edge | 1 | 100x80x18 | smoothing on round edge | burnt | yes |

| Context | Square | Sf no | Material | Variety | Type/ suggested origin | Type of object | Qty | Size in mm or wentworth scale | Usewear | Comments | Photo |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2028 | n/a | 324 | flow lava | blue tabular | ?Kau | rough flake | 1 | 103x48x22 | none | none | no |
| 2043 | n/a | 312 | flow lava | tabular | Kau | toki fragment/ working end — round edge | 1 | 100x70x23 | pre-redressing smoothing on part of edge | re-dressed then immediately broken | yes |
| 2049 | cave entrance | n/a | obsidian | glossy — sperulitic | Kau | blade core | 1 | 38x37x30 | none | no | yes |
| 2049 | cave entrance | n/a | flow lava | tabular | Kau | rough flakes | 2 | 40x35x9 & 43x33x4 | one has preflaking smoothing on both faces | ?from tip of toki | no |
| 2049 | cave entrance | n/a | flow lava | water-rolled | beach | fire-cracked rock | 1 | very large pebble | none | none | no |
| 2049 | n/a | n/a | obsidian | glossy — small sperulites | Kau | rough flakes | 2 | 15x8x3 & 31x24x6 | none | none | no |
| 2049 | n/a | n/a | obsidian | frosty | Orito | rough blade | 1 | 47x21x6 | none | none | no |
| 2049 | n/a | n/a | obsidian | frosty | Orito | rough utilized flakes | 2 | 20x15x 3 & 26x18x6 | unfacial flaking | none | no |
| 2049 | n/a | n/a | obsidian | glossy — sperulitic | Kau | core | 1 | 50x43x25 | none | none | no |
| 2049 | n/a | n/a | obsidian | glossy — sperulitic | Kau | rough flake | 1 | 25x12x7 | none | none | no |
| 2049 | n/a | n/a | obsidian | glossy — small sperulites | Kau | core | 1 | 35x29x22 | none | none | no |
| 2049 | n/a | n/a | obsidian | glossy — small sperulites | Kau | rough utilized flakes | 2 | 223x17x2 & 27x25x9 | unifacial flaking on one; abrasion on the other | none | us/yes |
| 2049 | n/a | n/a | obsidian | frosty | Orito | rough utilized flake | 1 | 30x25x9 | unifacial flaking in notch | none | uw/yes |
| 2049 | n/a | n/a | obsidian | frosty | Orito | rough flakes | 5 | 15x7x3-52x30x18 | none | none | no |

| Context | Square | Sf no | Material | Variety | Type/ suggested origin | Type of object | Qty | Size in mm or wentworth scale | Usewear | Comments | Photo |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2049 | n/a | n/a | obsidian | frosty/ black type | Orito/ Kau/ Iti | rough utilized flakes | 3 | 33x22x4-42x40x12 | unifacial flaking on on 2; rough bifacial on 1 | none | uw/yes |
| 2049 | n/a | n/a | obsidian | frosty/ black type | Orito/ Kau/ Iti | rough flake | 1 | 46x30x6 | none | none | no |
| 2049 | n/a | n/a | flow lava | tabular | Kau | rough flakes | 12 | 17x8x8-61x25x6 | 4 with traces of preflake smoothing | none | no |
| 2049 | n/a | n/a | flow lava | blue tabular | ?Kau | rough flakes | 5 | 15x12x253x45x6 | 1 with traces of preflake smoothing | none | no |
| 2049 | n/a | n/a | flow lava | water-rolled | beach | fire-cracked rock | 1 | small pebble | none | none | no |
| 2049 | n/a | 327 | flow lava | water rolled | beach | hammer stone | 1 | small pebble | battered on both ends | flat, oval | no |
| 2051 | cave entrance | n/a | obsidian | glossy — sperulitic | Kau | utilized flake (oval) | 1 | 40x28x7 | fine unifacial flaking on both ends | none | uw/yes |
| 2051 | cave entrance | n/a | obsidian | glossy | Kau | rough ?utilized flake | 1 | 40x31x8 | bifacial chipping on both ends | none | uw/yes |
| 2051 | cave entrance | n/a | obsidian | glossy | Kau | rough ?utilized blade | 1 | 38x17x8 | unifacial chipping on one edge | none | uw/yes |
| 2051 | cave entrance | n/a | obsidian | frosty | Orito type | retouched tool (triangular) | 1 | 40x27x14 | none obvious | blunted down long sides | yes |
| 2051 | cave entrance | n/a | obsidian | frosty | Orito type | rough utilized flakes | 3 | 38x19x10-40x28x11 | unifacial chipping on 2; bifacial one 1 | none | uw/yes |
| 2051 | cave entrance | n/a | obsidian | frosty | Orito type | rough utilized chip | 1 | 33x19x11 | unifacial chipping on narrow end | none | uw/yes |
| 2051 | cave entrance | n/a | flow lava | tabular | Kau | rough flakes | 5 | 35x20x5-61x41x9 | pre-flaking ware on 2 | none | no |

| Context | Square | Sf no | Material | Variety | Type/ suggested origin | Type of object | Qty | Size in mm or wentworth scale | Usewear | Comments | Photo |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2051 | cave entrance | n/a | flow lava | tabular | Kau | toki fragments | 3 | 72x40x17-110x70x17 | light smoothing on dressed edges of 2 | flake-dressed edges | no |
| 2051 | cave entrance | none | flow lava | blue vitreous | Viringa o Tuki-type | rough utilized flake | 1 | 120x105x40 | traces of smoothing on point of flake | cortex present | no |
| 2051 | cave entrance | n/a | flow lava | water-rolled | beach | fire-cracked rock | 2 | medium-large pebbles | none | none | no |
| 2051 | n/a | 331 | flow lava | tabular | Kau | rough flake | 1 | 130x85x27 | none | none | no |
| 2052 | n/a | 333 | flow lava | tabular, slightly vesicular | Kau | toki fragment ( from middle) | 1 | 125x77x26 | none | burnt | yes |
| 2052 | n/a | 334 | flow lava | water-rolled | beach | toki fragment/ fire-cracked rock | 1 | 68x45x25 | rounded edge of split pebble smoothed prior to fire-cracking | none | no |
| 2058 | n/a | 338 | obsidian | frosty | Orito | rough flake | 1 | 25x13x1 | unknown/ not washed | none | oh/no |
| 2058 | n/a | 339 | obsidian | frosty | Orito | rough flake | 1 | 35x16x3 | unknown/ not washed | none | oh/no |
| 2058 | n/a | 354 | obsidian | frosty | Orito | rough flake | 1 | 14x10x5 | unknown/ not washed | none | oh/no |
| 2058 | pukau hollow | n/a | obsidian | frosty | Orito-type | chip | 1 | 30x9x7 | none | none | no |
| 2058 | pukau hollow | n/a | flow lava | tabular | Kau | rough flakes | 19 | 19x7x2-60x37x10 | possible pre-flaking ware on 1 | manufacturing flakes | no |
| 2058 | pukau hollow | n/a | flow lava | blue tabular | ?Kau | rough flake | 1 | 65x53x15 | none | burnt | no |
| 2058 | pukau hollow | n/a | flow lava | water rolled | beach | fire-cracked rock | 1 | medium pebble | none | none | no |
| 2058 | n/a | sieved | obsidian | frosty | Orito-type | rough flake | 1 | 20x10x3 | none | none | no |
| 2058 | n/a | sieved | flow lava | tabular | ?Kau | rough flakes | 8 | 15x8x2-40x31x4 | none | examined wet | no |

| Context | Square | Sf no | Material | Variety | Type/ suggested origin | Type of object | Qty | Size in mm or wentworth scale | Usewear | Comments | Photo |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2061 | n/a | 329 | flow lava | tabular | Kau | toki fragment/ working end — square blade | 1 | 122x68x29 | very light wear on blade only | good indicator of quality of primary knapping | yes |
| 2023 renumbered to 2019 | n/a | 302 | flow lava | tabular | Kau | toki fragment/ working end — pointed blade | 1 | 160x90x23 | light smoothing of blade | none | yes |
| 2023 renumbered to 2019 | n/a | 303 | flow lava | tabular | Kau | toki/ working end – pointed blade | 1 | 180x62x35 | heavy smoothing on end; light on sides | none | yes |
| 2023 renumbered to 2019 | n/a | 310 | flow lava | blue vitreous | Viringa o Tuki-type | toki fragment (pick type)/ working end — pointed end | 1 | 120x70x42 | none | ?butt end | yes |
| 2026 renumbered to 2109 | n/a | 313 | flow lava | tabular | Kau | toki fragment/ working end — blade broken | 1 | 15x8x22 | heavy smoothing on surviving end and one side | none | yes |
| 2026 renumbered to 2109 | n/a | 314 | flow lava | tabular | Kau | toki fragment/ working end — rounded blade | 1 | 140x78x17 | light wear on blade | burnt | yes |
| 2026 renumbered to 2109 | n/a | 315 | flow lava | bomb | Puna Pau | unmodified natural flake | 1 | not measured | none | none | no |
| 2026 renumbered to 2109 | n/a | 316 | flow lava | tabular | Kau | toki/ whole — square blade | 1 | 172x68x38 | light smoothing on blade | none | yes |
| 2026 renumbered to 2109 | n/a | 317 | flow lava | blue tabular | K?au | toki frag (from near butt end) | 1 | 83x61x25 | none | none | no |

## Appendix 8. Stone finds from Trench 3

| Context | Area | Sf no | Material | Variety | Type/ suggested origin | Type of object | Qty | Size in mm or wentworth scale | Usewear | Comments | Photo |
|---|---|---|---|---|---|---|---|---|---|---|---|
| topsoil | n/a | none | flow lava | tabular | Kau | toki fragment/ working end — pointed blade | 1 | 110x72x18 | end & sides slightly smoothed | roughly knapped — end & both edges; unifacially on end & one edge, bifacially on other edge | yes |
| n/a | topsoil | n/a | flow lava | unknown | unknown | toki/ oval sectioned pick type | 1 | 147x54x41 | smoothed hoof-like end — stiations at right-angles to blade edge | pointed proximal end; greenish weathering rind | yes |
| n/a | topsoil | n/a | obsidian | frosty | Orito | broken mataa | 1 | 57x57x11 | none | tang broken off | no |
| n/a | topsoil | n/a | obsidian | frosty/ glossy | Kau/ Iti (probably Kau) | rough flake | 1 | 50x40x9 | none | none | no |
| n/a | topsoil | n/a | obsidian | frosty | Orito | rough ?utilized flake | 1 | 95x65x20 | possible wear on short edge | none | no |
| n/a | topsoil | n/a | obsidian | frosty | Orito | rough utilized flake | 1 | 57x50x20 | heavy unifacial flaking on slightly incurved edge | possible deliberate blunting of proximal edge | no |
| n/a | topsoil | n/a | obsidian | frosty | Orito | rough mataa (heart-shaped) | 1 | 60x52x14 (tang 20) | none obvious | none | no |
| n/a | topsoil | 350 | flow lava | light green-grey | ?Poike | polished tool fragment | 1 | 66x50x27 | none | none | no |
| 2052 | n/a | 328 | flow lava | blue tabular | ?Kau | toki fragment/ working end — square blade | 1 | 80x75(wide)x31 | lightly smoothed blade | no | no |
| 2065 | n/a | n/a | flow lava | blue phenocrystalline | Viringa o Tuki | rough flake | 1 | 45x25x8 | none | none | no |
| 2065 | n/a | n/a | flow lava | tabular | Kau | rough flake | 1 | 22x16x2 | none | none | no |
| 2065 | n/a | n/a | flow lava | blue tabular | ?Kau | rough flakes | 2 | 32x21x4 & 37x24x6 | none | none | no |

| Context | Area | Sf no | Material | Variety | Type/ suggested origin | Type of object | Qty | Size in mm or wentworth scale | Usewear | Comments | Photo |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2070 | n/a | n/a | flow lava | water-rolled | beach | fire cracked stone | 1 | small cobble (off a ?large cobble) | traces of pre-cracking batter | none | no |
| 2070 | n/a | n/a | obsidian | frosty | Orito | ?utilized flake | 1 | 25x17x4 | possible abrasion on edge | none | no |
| 2080 | n/a | n/a | obsidian | glossy — small spherulites | Kau | flake | 1 | 50x42x15 | unclear | none | no |
| 2080 | n/a | n/a | obsidian | frosty | Orito | flake core | 1 | 65x45x30 | none | none | no |
| 2080 | n/a | n/a | obsidian | frosty | Orito | core/rough tool | 1 | 55x43x17 | none | none | no |
| 2081 | n/a | n/a | obsidian | glossy — small spherulites | Kau | rough utilized flake | 1 | 27x20x5 | unifacial flaking on long edge | none | no |
| 2081 | n/a | n/a | obsidian | frosty | Orito | flake core rejuvenation flake | 1 | 40x30x20 | none | none | no |
| 2081 | n/a | n/a | flow lava | tabular | Kau | reused toki fragment | 1 | 120x85x31 | breaks lightly smoothed; 1 edge heavily battered/ smoothed | none | no |
| 2081 | n/a | n/a | flow lava | tabular | Kau | rough flakes | 13 | 10x8x2-62x40x12 | none | none | no |
| 2081 | n/a | n/a | flow lava | blue tabular | ?Kau | rough flakes | 12 | 17x9x2-35x31x9 | none | none | no |
| 2081 | n/a | n/a | flow lava | blue tabular | ?Kau | rough flake | 1 | 82x60x8 | none | none | no |
| 2081 | n/a | n/a | flow lava | sugary | Rua Toki Toki-type | rough flake | 1 | 76x41x12 | none | none | no |
| 2081 | n/a | n/a | flow lava | water rolled | beach | rough flake | 1 | 61x50x12 | none | none | no |
| 2081 | n/a | n/a | flow lava | vesicular | outside crater | rough flake | 1 | 35x30x10 | none | none | no |
| 2082 | n/a | n/a | obsidian | glossy | Kau | rough flake | 1 | 10x10x2 | none | none | no |

| Context | Area | Sf no | Material | Variety | Type/ suggested origin | Type of object | Qty | Size in mm or wentworth scale | Usewear | Comments | Photo |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2082 | n/a | n/a | flow lava | tabular | Kau | reused toki fragment/ working end – rounded blade | 1 | 100x73x18 | all edges smoothed | none | yes |
| 2082 | n/a | n/a | flow lava | tabular | Kau | rough flakes | 34 | 12x7x2-70x35x19 | none | none | no |
| 2082 | n/a | n/a | flow lava | blue tabular | ?Kau | rough flakes | 19 | 21x13x3-103x60x8 | 1 the worn tip of a toki | none | no |
| 2082 | n/a | n/a | flow lava | blue tabular | ?Kau | toki fragment (from middle) | 1 | 67x77(wide)x13 | none | none | no |
| 2082 | n/a | n/a | flow lava | unknown | unknown | chunk | 1 | large pebble | none | none | no |
| 2082 | n/a | n/a | flow lava | tabular & blue tabular | Kau/?Kau | rough flakes | 22 | 15x7x2-55x30x9 | 3 with traces of preflake smoothing | none | no |
| 2082 | n/a | n/a | flow lava | tabular | Kau | rough flake | 1 | 107x53x15 | none | none | no |
| 2082 | n/a | n/a | flow lava | water-rolled tabular | Kau via beach | toki fragment | 1 | 128x80x35 | none | looks unfinished | no |
| 2082 | n/a | n/a | flow lava | tabular | Kau | rough flakes | 41 | 12x8x2-80x41x15 | 6 with preflake smoothing including 1 toki tip | none | no |
| 2082 | n/a | n/a | flow lava | unknown | unknown | toki tip — pointed blade | 1 | 53x44x17 | smoothed — striations at right angles to blade | none | no |
| 2082 | n/a | n/a | flow lava | blue phenocrystalline | Viringa o Tuki | rough flake | 1 | 63x30x14 | none | none | no |
| 2082 | n/a | 351 | flow lava | tabular | Kau | toki fragment/ working end — rounded blade | 1 | 115x100x20 | smoothing around blade | none | no |
| 2084 | n/a | 352 | flow lava | tabular | Kau | toki fragment/ working end — square blade | 1 | 80x70(wide)x28 | light wear on surviving blade | blade damaged | no |
| 2084 | n/a | 353 | obsidian | frosty | Orito | chunk | 1 | 76x71x17 | unknown/ | none | oh/no |

## Appendix 9: Obsidian samples for use wear analysis

| Context/ locus | Use wear analysis sample no | Object |
|---|---|---|
| NW EXT | UW1 | chunk/core |
| NW EXT | UW2 | rough flake |
| NW EXT | UW3 | rough flake |
| NW EXT | UW4 | rough flake |
| NW EXT | UW5 | mataa |
| NW EXT | UW6 | rough flake |
| NW EXT | UW7 | rough flake |
| NW EXT | UW8 | rough flake |
| NW EXT | UW9 | chunk |
| NW EXT | UW10 | rough flake |
| NW EXT | UW11 | rough flake |
| NW EXT | UW12 | chip |
| NW EXT | UW13 | rough flake |
| 2014 | UW14 | rough blade |
| 2014 | UW15 | rough flake |
| 2014 | UW16 | rough flake |
| 2014 | UW17 | rough flake |
| 2014 | UW18 | rough flake |
| 2014 | UW19 | rough flake |
| 2014 | UW20 | rough flake |
| 2014 | UW21 | rough flake |
| 2049 | UW22 | rough flake |
| 2049 | UW23 | rough flake |
| 2049 | UW24 | rough flake |
| 2049 | UW25 | rough flake |
| 2049 | UW26 | rough flake |
| 2049 | UW27 | rough flake |
| 2049 | UW28 | rough flake |
| 2049 | UW29 | rough flake |
| 2051 | UW30 | chip |
| 2051 | UW31 | rough flake |
| 2051 | UW32 | rough flake |
| 2051 | UW33 | retouched tool |
| 2051 | UW34 | rough flake |
| 2051 | UW35 | rough flake |

| Context/ locus | Use wear analysis sample no | Object |
|---|---|---|
| 2051 | UW36 | rough flake |
| 2051 | UW37 | |