Tarradale TAT Project 2023

Archaeological Excavations at Mesolithic Shell Midden Site 2B

Tarradale, Muir of Ord, Highland

Data Structure Report
2023 Excavations

West Coast Archaeological Services

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Permissions to carry out the excavations at Tarradale was granted by the landowners Honourable James Baillie, and tenant farmer John Fraser and Family of Tore Mains.

Looking SSE over Trench 2B, Tarradale, with the trench extension in the foreground

1 SUMMARY

A programme of archaeological excavation was carried out at the Tarradale Trench 2B Mesolithic Midden site, Muir of Ord, Ross-shire between the 26 September to the 12 October 2023, by Eric Grant and the North of Scotland Archaeology Society. The fieldwork finalised excavations at the Mesolithic midden site, after previous work carried out in 2015 and 2017. During the 2017 excavations, a rigorous programme of sampling of a shell midden layer provided information to characterise its content which consisted primarily of oyster, cockle, periwinkle, and mussel shell along with mammal and fish bone, worked bone/antler artefacts, possible coarse cobble tools, and struck stone objects. Several highly significant artefacts were recovered. These include a fragment of antler harpoon, a virtually complete antler T-axe, a fragmentary antler T-axe, modified animal teeth, and a bone point. Below the upper shell midden, excavation revealed potential structural remains in the form of stone settings associated with a lower marine shell-rich layer. Radiocarbon determinations on material recovered from the midden deposits in Trench 2B produced results ranging between 4832–3643 cal BC, suggesting that the site had been occupied between the Late Mesolithic and Early Neolithic periods.

The fieldwork in 2023 targeted the excavation of archaeological deposits and potential features identified in 2017, and also included a new trench extension to the northwest to investigate the relationship between the exposed midden deposits and the adjacent steeply sloping palaeo cliff bank above the raised beach terrace. Excavation of the midden deposits continued using a 100% sampling strategy based on 1m grid squares and by context. Most of these samples are currently being processed using wet sieving in order to recover small artefacts and ecofacts. The same process was carried out in 2017/18 on a large number of samples resulting from excavation of the midden deposits, which produced additional artefacts including lithics and worked bone and antler, along with small fish bones and other important ecofacts including charcoal. The 2023 excavations recovered an additional fragment of antler T-axe, worked antler, bone and teeth, along with animal and fish bone.

Having successfully excavated the remaining midden deposits across the site and evaluated potential associated features, wet sieving of the resulting samples will continue into 2024. A programme of post-excavation analysis and radiocarbon dating will follow before planning for final publication of this regionally and nationally important site.

2 INTRODUCTION

2.1 Eric Grant, with the aid of a wide range of volunteers, has been investigating the archaeological landscapes focused on Tarradale, near Muir of Ord, located in Ross-shire in the north of Scotland, for a number of years. The Tarradale Archaeological Project was incorporated into the North of Scotland Archaeological Society in 2011 and a major focus of their investigations included the *Tarradale Through Time Project* (TTT), which ran between 2017 and 2019. This project included the investigation of the multi-period archaeological landscapes around Tarradale, with the main aims of the project to interpret the chronological development of settlement through a series of community archaeology projects on five key sites (Grant 2022).

2.2 The project work in 2017 included the excavation and evaluation of two midden sites at Tarradale – site 2A located on a raised promontory to the east of Tarradale House and site 2B located on a truncated raised beach terrace at Tarradale House. The programme of archaeological evaluation and test pitting was led by Eric Grant and NOSAS, with archaeological assistance provided by AOC Archaeology Group and West Coast Archaeological Services and was undertaken by community volunteers. The purpose of the fieldwork was to examine the shell midden layers and associated buried archaeology present on the shell midden sites.

2.3 The archaeological potential of the 2B midden was established in 2015, when Eric Grant and members of NOSAS excavated a trial trench at the site to investigate geophysical anomalies and the potential bailey of Tarradale Castle. No evidence of the bailey or castle were found, but the excavations revealed midden deposits including marine shells, animal bone, and antler fragments overlying a natural beach deposit comprising rounded stone clasts with a gritty sand matrix. Samples of charcoal and antler recovered from the midden and submitted for AMS radiocarbon determinations produced Mesolithic dates. The 2017 excavations carried out at the site, as a part of the *Tarradale Through Time Project*, comprised an open area excavation running to the west of the 2015 trench and included a rigorous programme of sampling of the shell midden deposits. The fieldwork evaluated the archaeological deposits across the trench and produced a varied assemblage of material including marine shell consisting primarily of oyster, cockle, periwinkle, and mussel shell along with mammal and fish bone, worked bone/antler artefacts, and struck stone objects. Several highly significant artefacts were recovered including a fragment of antler harpoon, fragments of two antler T-axes, and a bone point. Below the upper shell midden, excavation revealed potential structural remains in the form of stone settings associated with a lower marine shell-rich layer. Radiocarbon determinations on material recovered from the midden deposits in Trench 2B produced results ranging between 4782–3643 cal BC, suggesting that the site had been occupied on a regular basis between the Late Mesolithic and Early Neolithic periods (see Section **4**).

2.4 The fieldwork in 2023, carried out by the North of Scotland Archaeology Society and West Coast Archaeological Services, targeted the excavation of archaeological deposits and potential features identified in 2017, and also included a new trench extension to the northwest to investigate the relationship between the exposed midden deposits and the adjacent steeply sloping bank of the palaeo-cliff (see Section **8.1**).

3 SITE LOCATION AND GEOLOGY

3.1 Midden Site 2B is located on a raised beach at the base of a degraded palaeo-cliff c 9m above the current shoreline of the Beauly Firth, on the southeast side of the grounds of Tarradale House, on a gently sloping terrace that dips down to the south (Figure **1** and **2**). The site is located under rough grasses and extends into the ploughed field on the south side. The palaeo-cliff rises quite steeply to the north and

is vegetated with long grasses, nettles, and other plants that thrive on the marginal, unimproved, and well-drained ground (Plate **1**). The site is located between 8 and 9.5 metres above Ordnance Datum and is less than 100 metres from the current high-water mark of the Beauly Firth.

Plate 1 – *Looking W across the location of Midden Site 2B showing the gently sloping terrace (where people are standing) formed at the base of the degraded palaeo-cliff*

3.2 The Tarradale landscape generally consists of raised estuarine beaches comprising deposits of gravel, sands and silts situated at the west end of the Beauly Firth on the north side of the River Beauly and its estuary, with the underlying geology dominated by the Raddery Sandstone Formation; a sedimentary bedrock formed between 393.3 and 382.7 million years ago during the Devonian period (BGS 2023). The series of eroding raised shorelines are formed from glacio-marine and deltaic outwash of late glacial and postglacial date. The sands and gravels are classified as being part of the Ardersier Silt Series. According to the British Geological Survey (Jon Merritt pers comm) a series of convoluted sands and silts located closer to the shoreline of the Beauly Firth at Tarradale are the result of earthquake activity, resulting from several earthquakes that were initiated along the Great Glen Fault at the end of the last Ice Age, after the ice had melted and the land was rebounding, and associated with the unloading of the great weight of ice off the wider landscape.

3.3 The land around Tarradale today comprises a regularly ploughed, flat or gently undulating improved landscape, which rises to the north towards the Mulbuie Ridge – a natural landscape feature containing many notable prehistoric monuments.

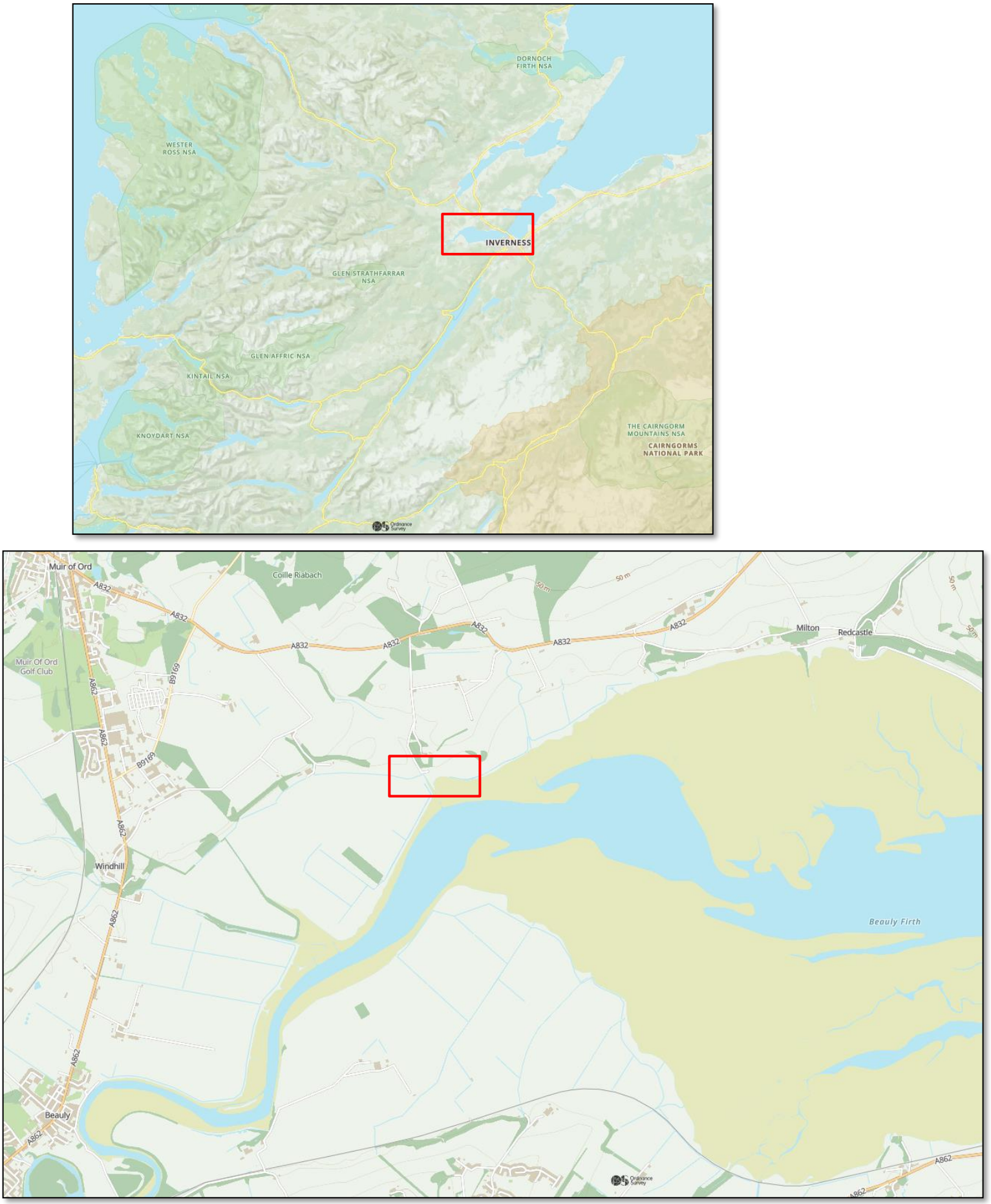


Figure 1 – *Location maps showing general location of Tarradale and midden site 2B* (contains OS data © Crown copyright and database rights 2024)

4 ARCHAEOLOGICAL AND HISTORICAL BACKGROUND

4.1 An 18th century estate map of Tarradale depicts several tenant-occupied farms, some now abandoned as a result of agricultural improvement and reorganisation from the late 18th century. Tarradale House was built in the 17th century and is located west of Tarradale Mains, dating from the early 1790s. Tarradale was a medieval parish up until the end of the 16th century with the old parish church at Gilchrist to the northwest of Tarradale House. A castle was first built nearby at Redcastle in the early 13th century, granted to Sir John Bisset, an Anglo-Norman who was married to King William I's sister and was the founding patron of Beauly Priory c.1230 AD. Documentary sources indicate that a 13th/14th century castle was also built at Tarradale, a site that was later destroyed by Robert the Bruce c.1308.

4.2 However, the area around Tarradale also contains a rich archaeological landscape, developed on a series of raised beach/estuarine terraces with well drained ground and fertile soils. Fieldwork by earlier antiquarians identified some of the more prominent monuments in the landscape, while more recently cropmarks visible on aerial photographs have identified many archaeological features buried below the agricultural soils. These include one of the largest Pictish barrow cemeteries in Scotland (Mitchell and Noble 2017, 15, fig. 9) with rectilinear, square, and circular enclosures; a linear road or track crossing the barrow cemetery; a ring-ditch near Bellevue Farmhouse; a complex of enclosures and pits between Bellevue Cottages; and Balvattie Cottage; and three or four concentric ditches at the end of a small promontory at Gilchrist representing the defences of a marsh fort.

4.3 Excavation in the 1990s, conducted by Professor Barri Jones (Jones 1996; Gregory and Jones 2001), identified the remains of a ditched enclosure, post-built structures, and hearths to the northwest of Tarradale House (in the same field and to the NW of the barrow cemetery). Evidence for Mesolithic, Bronze Age and Iron Age activity within the landscape was also uncovered during that work. In 2015, a gradiometer survey of part of this area was undertaken by AOC Archaeology (MacIver 2015). The survey identified several high positive anomalies providing evidence for the presence of archaeological remains but highlighted the difficulty of interpretation as a result of the ephemeral nature of the sites and the mixed ground conditions.

4.4 Eric Grant of Tarradale House and members of the North of Scotland Archaeology Society have been investigating the archaeological landscape around Tarradale for a number of years as a part of The Tarradale Archaeological Project. This was incorporated into the North of Scotland Archaeological Society in 2011. Their work has consisted of numerous programmes of field-walking, metal-detecting, geophysical survey, and desk-based research. The projects extensive programme of research and fieldwalking has identified significant Mesolithic evidence at Tarradale – in particular, shell midden sites, and scatters of lithics including flint, quartz, and chert microliths, blades, and struck flakes, recovered during fieldwalking in the surrounding fields (Figure **2**). A small number of test pit excavations have also identified areas of further archaeological potential, particularly at Site 2D, located on

a higher (but degraded) raised beach terrace 500m west of Tarradale House. Radiocarbon dating has successfully provided mid-late 7th century BC dates on charcoal and antler samples from these test pits.

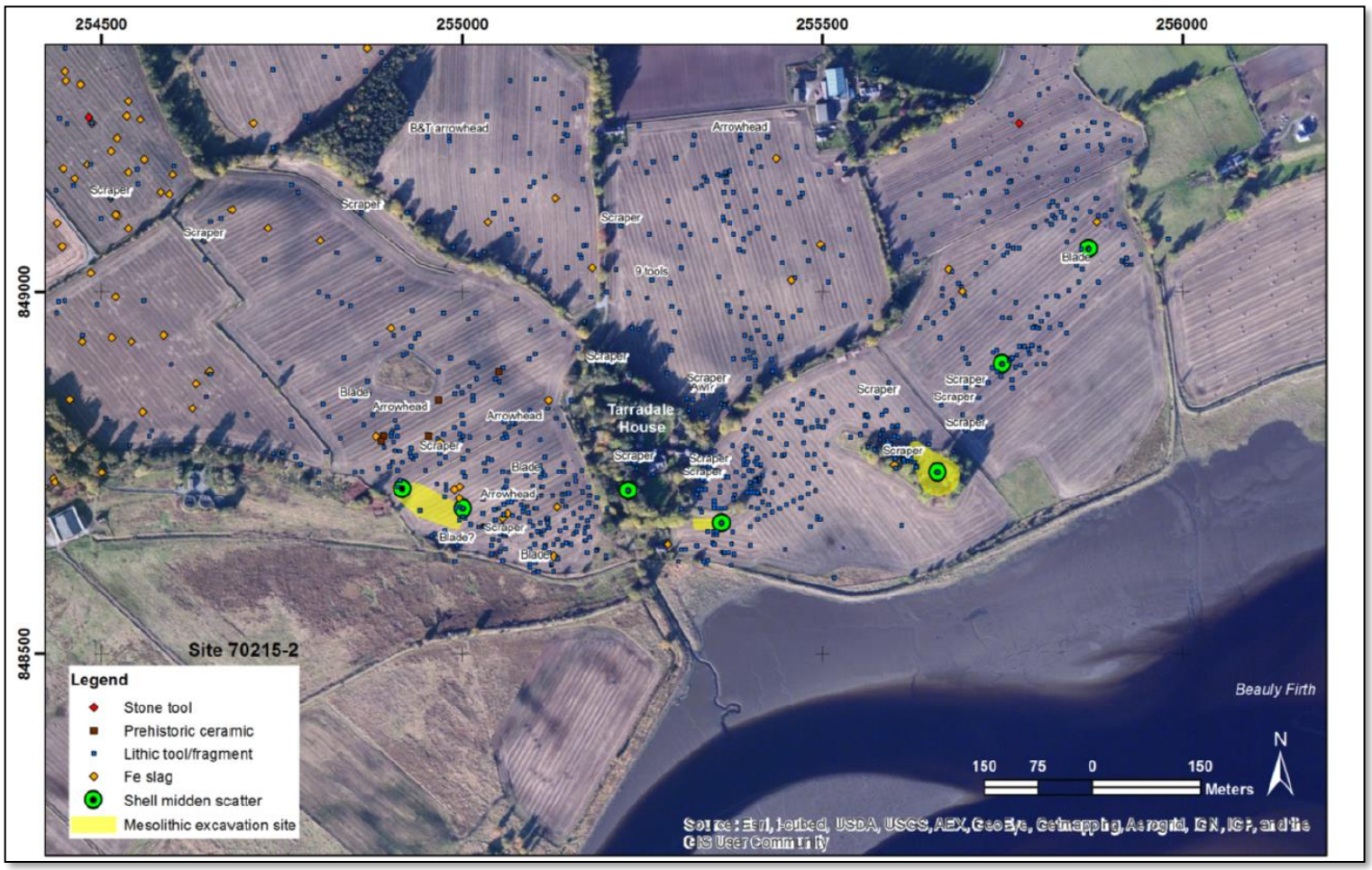


Figure 2 – *Aerial image showing location of shell midden sites, distribution of fieldwalking finds, and TTT excavation sites* (after Peteranna & Birch 2017)

4.5 The project's fieldwalking has also recovered Neolithic finds including leaf-shaped arrowheads and a stone axe, Bronze Age lithics and pottery finds including Beaker pot sherds, barbed and tanged arrowheads, a bronze socketed axe, and a copper alloy Migdale-type flat axe, with findspots recurring around the Tarradale Neolithic chambered cairn and the barrow cemetery sites. Other fieldwalking finds include medieval pottery, a horse harness pendant and 13th century silver pennies on a raised beach site immediately to the southeast side of Tarradale House. It was thought that this site could be location of a medieval motte. A 2015 magnetometer survey of the site by the University of Aberdeen identified a possible ditch enclosing a central feature in this area. Fieldwalking has also discovered a concentration of medieval pot sherds and scatters of possible metal-working slag in an area around Gilchrist, where cropmarks identified possible settlement.

4.6 Using this tantalising evidence as a guide, the Tarradale Through Time project was created to encourage the local community to engage with uncovering the

archaeological heritage of the Tarradale area. Through a series of archaeological evaluations between 2017 and 2019, the Project organised six community excavations with the aim of interpreting the chronological development of settlement across the landscape. The Project provided some exciting results and was successful in providing community outreach, training, and volunteer opportunities (Grant 2022).

4.7 In 2017, excavations uncovered a relatively extensive shell midden (also including animal and fish bone) relating to activity by hunter/gatherer/fishers in the Mesolithic period. The excavation of the midden site (Site 2B) also produced some significant artefacts including two T-axes manufactured from red deer antler and a fragment of an antler harpoon. These types of antler artefacts are rare finds on Scottish sites and the Tarradale examples provide a highly significant addition to the corpus of known objects. Potential structural features including post-settings were also revealed at the base of the midden deposits. Samples recovered from the shell middens at Tarradale and submitted for radiocarbon dating have shown their use extending from the Late Mesolithic period, through to the Early Neolithic – an important transitional period from hunting and gathering to the development of farming practices (see Section **5**).

4.8 In 2018, excavations were conducted as a part of the TTT Project at the Tarradale abandoned settlement, at the site of the marsh fort at Gilchrist, and at the complex of buried features on Balvattie farm (in the field between Bellevue Cottage and Balvattie Cottage). Aerial photographs at the latter site revealed a tantalising pattern of circular, semi-circular and linear features and excavations in 2018 revealed a complex landscape of ditches and pits. These included a flat-bottomed ring ditch around 26m in diameter by 2m wide and up to 1m deep, although it is possible that its depth had been truncated by ploughing. In the centre of the ring ditch was an area of intense burning manifested by a spread of baked silty soil intermixed with very fine charcoal. This produced a radiocarbon date of 772-486 cal BC at 95.4% probability Outside the circular ditched feature were a number of pits approximately one metre in diameter and up to a metre deep which had been filled in more than one sequence including the insertion of possible posts and packing stones. Small fragments of prehistoric pottery were found within these pits. The lower fill of one pit gave a date (from hazelnut) of 1121-933 cal BC, and hazel wood charcoal from the primary fill of a second pit gave a date of 1392-1132 cal BC, both at 95.4% probability.

4.9 A persistent crop mark suggested the presence of a large pit nearby. It turned out to be several metres across, with moderately to steeply shelving sides and up to 2m deep. Cut into the natural substrate of sand and gravel, this pit displayed a very complex pattern of fill deposits. The lowest fill consisted of sandy silts and pebbles along with significant amounts of charred material that was dated to 786-540 cal BC (at 95.4% probability) A sequence of succeeding fills was archaeologically sterile, overlain by a thick deposit of sandy silt containing abundant cobbles and some charcoal. Cut into the highest layers of the fill and located on top of the layer of cobbles was a smaller pit with a layer of reddish pink heat affected silt overlain by a rich deposit of charred wood, all suggestive of a fire pit. Charred grain from this deposit was dated to 860-985 cal AD at 95.4% probability.

4.10 A third trench at Balvattie revealed part of an extensive curved ditch interrupted by an entrance for what appears to be a path leading to the interior of the enclosed area. The curved ditch was steep or vertical sided with a carefully squared terminal by the entrance, accompanied by a post hole reinforcing the entrance feature. This ditch is interpreted as being a palisade ditch with distinctive terminals at the entranceway, the whole feature enclosing a large area within which was the inner circle described above. It is difficult to understand what the pattern of ditches and pits at Balvattie may originally have formed and it is possible that they are not all contemporary in date. Apart from a few pieces of pottery in some of the smaller pits there was an almost total absence of artefacts. It may have been a gathering area for people and animals associated with seasonal activities accompanied by feasting and ritual depositing in pits.

4.11 Gilchrist is almost in the centre of the old Tarradale estate and close to the original medieval church. Aerial photographs suggested the presence of a multi-vallate fort projecting into a marshy kettle hole that may originally have held standing water. This site was also excavated in 2018 and the main trench revealed the three ditches shown on the aerial photographs, plus an unexpected innermost ditch which may have been backed by a wall or palisade running right round the perimeter of the fort. The ditches were of varying widths and depths and their fill deposits also varied in colour and texture suggesting their infilling with differing materials, and potentially at different times.

4.12 The outermost ditch was c.3.9m wide and up to 0.82m deep, with a broad and shallow profile with a gently rounded base. The primary fill of reddish-brown stony and sandy silt with patches of charcoal was succeeded by fills of similar texture and increasingly darker colour. The second ditch was by far the largest at 6.5m wide and almost a metre deep with a U-shaped profile and flat base. The primary fill of sandy silt was succeeded by a thick tightly packed deposit of small to large cobblestones overlain by a charcoal rich soil. These lower fills were dated to 119 cal BC to 22 cal AD at 95.4% probability. Plain earthenware pottery sherds of assumed medieval date were found in the primary and subsequent fills raising questions as to how long this ditch may have lain open before it was filled. The next ditch in the sequence was 2m wide and up to 0.55m deep with a U-shaped profile and rounded base. The innermost ditch (not shown on the aerial photographs) was 3m wide and up to 0.45m deep, again with a flattish base and filled with silty sand and gravel and cobbles.

4.13 A second trench, running at right angles to the main alignment of the fort and running from the interior of the fort into the marshy area, was excavated in order to investigate the relationship between the fort and the partly surrounding wetland. On the outside of the fort, a stratified sequence of waterlogged peat deposits gradually gave way to terrestrial deposits as the ground rose towards the fort proper, the boundary defined by a concentration of small to large cobbles overlain by a very dark soil under the modern plough soil. This boundary feature was interpreted as the remains of a stone wall or the core of a stone and earth bank running around the perimeter of the fort,

just at the break of slope. The dark soil, mixed in with the stones of the collapsed wall, produced a small assemblage of very gritty pottery sherds of presumed later prehistoric type (Iron Age?) as well as half of a rotary quern. Charcoal from these soils was dated to 205-52 cal BC and 392-206 cal BC, both at 95.4% probability.

4.14 A waterlogged timber identified in the lower peat layer immediately outside the fort boundary may comprise a fallen stake or pile from a palisade-type structure from the enclosing wall of the fort. A trench opened in the interior of the fort only revealed plough furrows cut into the natural substrate suggesting that any earlier occupation deposits had been destroyed by modern agricultural activities. A second interior trench towards the western end of the promontory revealed a well consolidated layer of clay containing rounded gravel and stones. This was interpreted as a rammed clay floor surface inside a structure whose extent was not established. Only post-medieval ceramics were present in the topsoil but right on the surface of the clay layer was a fragment of what may be a crucible of unknown date.

4.15 In April 2018 the houses and kailyard sites of an abandoned township just north of Tarradale Mains farm were surveyed and partially excavated. Several houses of poor tenants (mailers) are shown on the 1788 estate map, but all had disappeared by the time of the first edition of the Ordnance Survey, c 1870. In February and March 2018, NOSAS volunteers cleared scrub vegetation from the site revealing the footings of five or six buildings, some of which coincide with buildings shown on the 1788 map. All that survives of these buildings is their outline traced in irregular blocks of stone and round field-gathered stones. The present understanding, subject to further investigation and evaluation, is that the foundations were of stone but above that the walls were made of layers of clay and turf interspersed with field gathered stones.

4.16 Finally, between the 28 August and 21 September 2019, TTT carried out a programme of archaeological evaluation, including geophysical and metal detecting surveys, and open area excavation, at the Tarradale Barrow Cemetery (Birch and Noble 2020). The cemetery and associated features at Tarradale form one of the largest barrow cemeteries to be identified through aerial imagery in Scotland. The fieldwork targeted three specific areas of the barrow cemetery and was successful in locating and evaluating a selection of archaeological features (Plate **2**).

4.17 These included a number of round and square barrows, larger circular, oval and square enclosures, and two large pit features, while the excavations also identified a number of new features including three round barrows, post-holes, pits, an unenclosed grave, a log coffin burial, and another possible log coffin grave. The excavations focused on the evaluation of some of the larger monuments that have received only limited attention at other barrow cemetery sites across Scotland. The scale of the open area trenches opened across the barrow cemetery features was found to be beneficial in gaining a better understanding of the layout of different areas of the site and the morphology and survival of the uncovered and recorded features.

4.18 The excavations at Tarradale in 2019 revealed an amazing panorama of barrows of differing shapes and sizes including some of the largest of their type in Scotland. There can be little doubt that this was an important funerary landscape of monumental proportions, with an important transition in the visibility of the dead in the archaeological record, which in many ways reverts back to earlier funerary practices during prehistory. The excavations gathered important data which will feed into and enhance the wider corpus of information on early medieval cemeteries and funerary rites. In particular, the fieldwork targeted some of the larger monuments within the Tarradale cemetery; site-types that have received little attention elsewhere in Scotland. It has been suggested that the creation of larger barrows may be linked with the emergence of elites and kingship, with the aggrandizement of grave mounds potentially increasing the status of the deceased and their descendants (Mitchell and (Noble 2017, 27-8; Noble 2019, 97-100). The results from the radiocarbon dating programme across the barrow cemetery were varied and in some instances were difficult to interpret. The dated graves and barrows produced results from the Late Iron Age into the Pictish period, while some of the barrows and associated features appear to date to the Bronze Age (Grant 2022).

Plate 2 – *View ESE over the Tarradale barrow cemetery excavations to the Beauly Firth*

5 The Tarradale Mesolithic Shell Middens

5.1 Eight shell midden sites, comprising spreads of marine shells, have been recorded by NOSAS at locations found along raised estuarine/beach terraces to the east and west of Tarradale House (Figures **2** and **3**). The raised beach at the foot of the palaeo-clii represents a former shoreline that now appears further inland due to sea level changes associated with isostatic rebound after the last ice age and the reclamation of land for farming practices. Project volunteers undertook auguring at the sites to reveal that the shell midden layers survived below the plough soil (Grant 2016). The discovery of midden Site 2D, located to the west of Tarradale House on a degraded earlier terrace, presented a dense spread of shells on the surface of the ploughsoil. Test pit excavations across the site in 2011 revealed an extensive midden below the plough soil, just above the degraded former shoreline, including marine shells, animal and fish bones, and fragments of red deer antler. The excavations revealed that a 0.25m-0.3m deep shell midden layer survived in this area, deepening towards the downslope (SW) side. Analysis of the shell layer showed that mussels and periwinkles dominated the assemblage by number and oysters dominate by weight, while at least two dark organic lenses are visible in photographs of the test pit sequence; layers that are interspersed between what appears to be an upper shell midden and a lower shell midden layer, and probably representing occupation horizons. A sample of charcoal from the midden was radiocarbon dated and produced a result of 6632–6480 cal BC, while a worked antler tine was dated to 6204–6005 cal BC (Grant 2022, 17).

5.2 In 2015 shell midden site 2B was investigated by NOSAS on a truncated terrace below the palaeo-cliff to the southeast side of Tarradale House. The midden site was unexpectedly discovered during coring in a small area of the presumed site of the bailey associated with Tarradale Castle, to assess the archaeological potential of a small area of ground which appeared to be outside the limits of modern-day ploughing. No trace of the medieval bailey or castle was found in the area, but a test pit revealed a clear layer of marine shells below an older plough soil. The test trench was subsequently extended into a linear 1-metre-wide trench orientated roughly N-S, measuring 9 metres long. The evaluation showed that the shell midden lay directly over a former raised beach largely made up of cobbles, smaller pebbles, and gravel, which probably represented materials sorted by marine action from the fluvio-glacial sands and gravels that underlie these raised estuarine beaches (Grant 2016).

5.3 The small trench evaluation located a marine mollusc shell midden, which also contained an antler tine, butchered animal bone, two dog teeth, two fragments of burnt bone, and fish bones (Ceron-Carrasco 2015). Charcoal sample analysis identified a diverse range of charcoal types including alder, birch, hazel, oak, ash, Scots pine, elm, and willow – representing use as domestic fuel from the local woodland resources that would have been present during the Holocene Period (Ramsay undated). The shell midden layer covered a surface of small stones and gravel with possible evidence for larger stone settings. A 1-metre square extension on the west side of the linear trench investigated one possible stone setting.

Radiocarbon dating of a fragment of birch (*Betula*) charcoal gave a calibrated date of 4256-4051 cal BC (SUERC-66328), while a date from an antler fragment gave a result of 4461-4351 cal BC (SUERC-66329) – both dates quoted at 95.4% probability. Four additional 1m square test pits were excavated in 2015; three in the ploughed field below and to the south of the main area of excavation (Test Pits 3, 4 and 6), and one to the east of the main trench. The test pits to the south revealed no in-situ archaeological deposits, while Test Pit 5 located c.25m to the east revealed the occasional marine shell fragment within the plough soil, a pebble deposit containing some flattish stones with several fire-cracked pebbled, and a dense area of charcoal-rich sediment (Grant 2015).

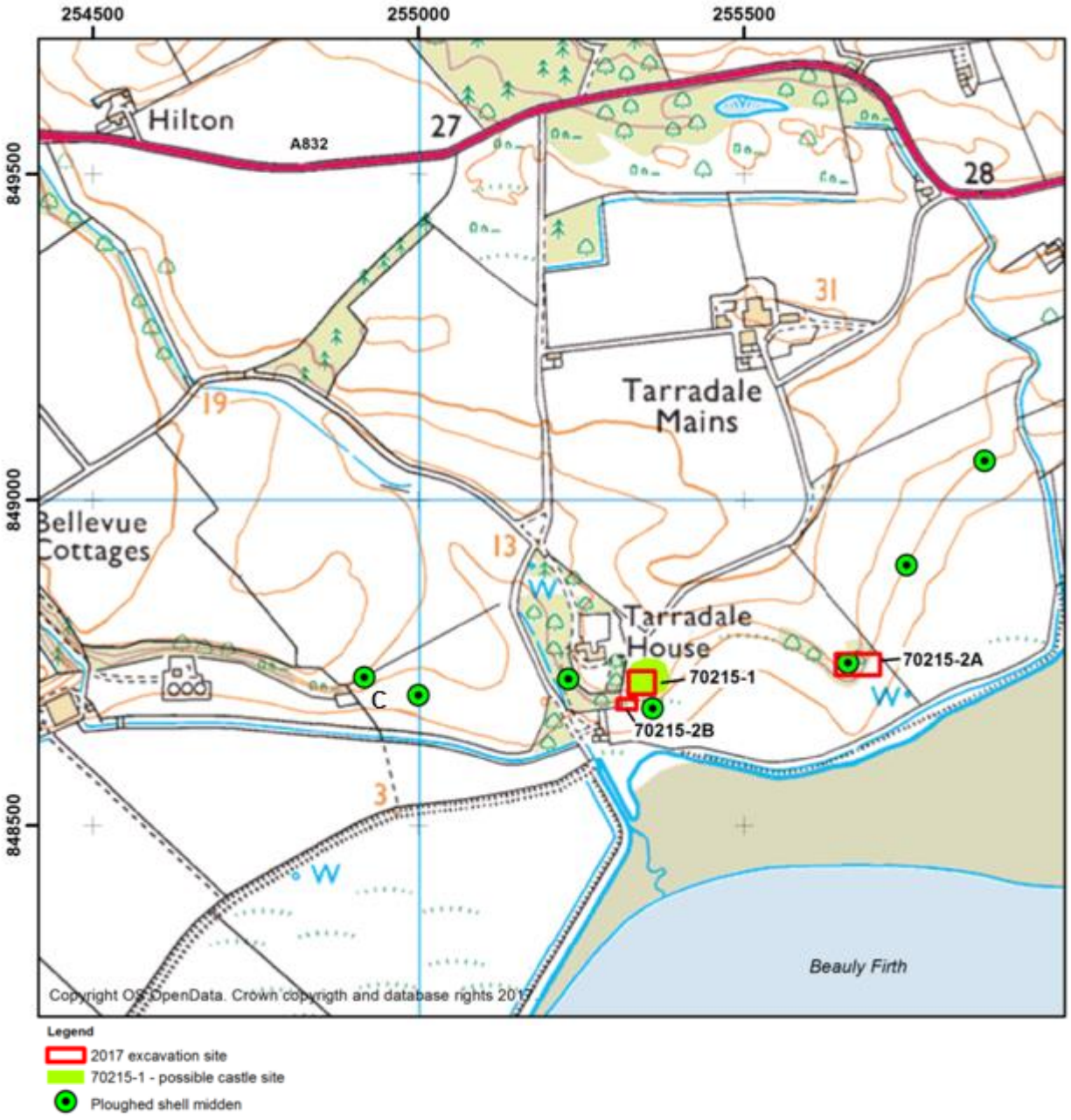


Figure 3 – *Site location map of the 2017 excavations including Site 2A, 2B and the possible castle site (after Peteranna and Birch 2017)*

5.7 Under the umbrella of the Tarradale Through Time Project, larger-scale excavations were carried out at Midden sites 2A and 2B in 2017. Site 2A is located on top and lower flanks of a promontory to the east of Tarradale House (Figure **3**). The promontory, a low ridge aligned NW-SE, is formed from the palaeo-cliff that separates two raised beach/estuarine terraces lying at approx. 9m and 17m above current sea level. The site was located under dense vegetation and had not been ploughed in recent times, although an area at the northwest end of the ridge had been reportedly quarried by local farmers in recent years for gravel extraction.

5.8 Shovel pit investigation identified shell deposit locations on both the upper and lower terraces. As a result, six hand-dug, 1m square test pits were sited above the palaeo-cliff and two linear, 2m-wide trenches were excavated at the base of the degraded cliff to the southeast side of the promontory. (Peteranna and Birch 2017). Approximately 75% of the shell midden layers excavated were processed by dry sieving on-site, with the exception of approximately 100L processed by wet sieving and 50L sampled and retained for processing under laboratory conditions.

5.9 A mixed shell layer up to 0.2m deep was uncovered on the upper surface of the promontory, concentrated near the southeast edge. A small amount of archaeological material recovered from the deposits included struck stone flakes (including a worked core), a small amount of mammal bone, a few possible ferrous slag or vitrified residue lumps, and several possible struck quartz flakes. The struck stone flakes and stone core have been interpreted as material from coarse stone working. Thin mixed lenses of material (including shell) and a modified subsoil layer below the shell context indicated that further human activity may have taken place on the ridge – although the conclusions were unclear within the small area exposed.

5.10 The two trenches excavated at the base of the degraded palaeo-cliff provided the opportunity to excavate the shell midden layer on the seaward side of the ridge. It contained a mixture of marine shell species, including oyster, cockle, periwinkle, and mussel along with a small amount of animal bone, antler, and possible struck quartz flakes. A concentration of oyster shell was present close to the base of the hill, while possible ash lenses were present at the downslope end. The shell midden covered a cobbled layer and was located below another shell layer. The site formation processes relating to the shell midden, which appears to overlie a naturally laid or man-made cobbled beach deposit, are unclear. It is possible that some of the material had been reworked by natural bioturbation or human activity.

5.11 As mentioned previously, midden Site 2B and the main focus of this report, had previously been investigated with a 1m-wide trench aligned N-S from the base of the terrace (see Section 5.2). During the 2017 fieldwork campaign, a trench measuring 8m (N-S) x 6m (E-W) was set out over the area of the previous trench, extending this to the west. Turf and topsoil were stripped under archaeological supervision by a mechanical excavator fitted with a straight-edged bucket.

5.12 The excavation site was laid out in 1m square grids for excavation of the shell midden layers and a rigorous sampling strategy was employed during the excavation process. 100% bulk samples were taken on alternate grid squares per 10cm spit on a mosaic patterning for wet sieving. Individual 10L samples were also retained from each identified context and 10cm spit within the individual grid squares, for processing under laboratory conditions. Material excavated from other grid squares were subjected to 50% dry sieving to ensure that important artefacts or ecofacts were identified and retained for analysis. The sampling process generated a significant number of samples for on-site wet-sieving and laboratory processing, with approximately 60% of the total shell midden deposits exposed on site removed through excavation.

Plate 3 – *Aerial photograph looking NW over Tarradale with the Beauly Firth at bottom left and showing reclaimed land and the former shoreline. The location of midden Site 2B is shown by the red outlined rectangle* (© NOSAS/JS Bone Collection)

5.13 The excavations at Site 2B produced a complex sequence of shell midden deposits (204) comprising mussel, cockle, periwinkle, oyster, whelk and potentially other marine shells, animal, and fish bone. The site formation processes relating to the shell midden, which appears to overlie the natural cobbled beach deposit (214), displayed evidence for reworking and natural bioturbation. In particular, the surface of midden deposit (204) displayed a wave-like profile that had been created by the

formation of later rig and furrow, while the lower lenses of midden overlying the natural former shoreline cobbles showed evidence of reworking, possibly through low energy marine transgression. A number of small animal burrows and some tree root activity added to these post-depositional processes.

5.14 Upon completion of the set excavation time, the topsoil and slope-wash overburden had been completely removed from above the midden and approximately 60% of the midden deposits excavated. The results were significant in this location, showing that the shell midden layer overlay further archaeological horizons that included possible stone settings representing potential structural remains (Plates **7** and **8**).

Plate 4 – *View SSE over the Tarradale 2B excavation site in 2017, with the Beauly Firth beyond*

Plate 5 – *Excavations in progress on the 2B midden site, facing W*

5.15 Over the surface of the midden, a large shallow scoop/pit (207), measuring approximately 3.8m x 4.2m contained a homogenous clayey silt (205) mostly derived from the slope wash deposits to the north side. Within this layer, an area of larger stone clasts was uncovered (Plate **7**), revealing a roughly circular, stone-lined feature (216) and at least two arcs of stones (215). The stones were found to sit directly over the cut into the midden deposits, suggesting that these were laid down after the cut had been formed. The circular stone feature, which measured 0.35m in diameter internally, is similar in morphology to a setting uncovered at the Mesolithic site of Smittons in Dumfries & Galloway (Edwards 1996, 114), although the function is unknown.

5.16 In the northwest quadrant of the trench, a shallow curvilinear ditch (211), 0.55-0.65m wide, up to 0.12m deep and aligned NW-SE, cut through the surface of the midden. It contained a mottled silty soil (210) within which large oyster shells were noted, apparently set upright within the base of the feature. A fragment of worked antler tine (SF254) was recovered from the ditch, along with a small amount of animal bone and charcoal fragments. On the south side of the ditch, a possible large amorphous pit (212) up to 0.6m deep also had cut into the midden. It contained a mostly homogenous slope wash deposit, similar to feature (207).

5.17 The midden (204) was excavated in 1m square grids, in c.10cm spits, with sampling undertaken in bulk per spit. It was characterised as a light brown to orange loosely compact silt with occasional small cobbles and ash patches. The marine shell layer comprised mostly fragmented oyster, whelk, periwinkle, mussel and cockle shells and small amounts of small charcoal fragments. Frequent fragments of mammal bone and small amounts of fish bone were found scattered across the layer. Numerous possible struck quartz flakes and a small amount of possible worked flint was also found within the layer, with no particular concentrations noted.

***Plate 6** – Looking SE over the Site 2B excavation site*

***Plate 7** – Stone settings (215)/(216), after removal of (205)*

5.18 Several significant worked bone and antler artefacts were recovered from the shell midden site including the remains of two antler T-axes (SF203 and SF226) and a fragment from a biserial antler harpoon (SF228) from the surface of the midden on the east side of the trench (Plates **9**, **11** and **12**); and a possible worked tooth or tusk (SF229), a fragment of worked tusk/tooth (SF245), a fragment of a worked bone point (SF267), a fragment of perforated antler (SF233), and other possible worked antler fragments from shell midden deposit (204). These were the first examples of antler T-axes found in the north of Scotland.

5.19 Concentrated over the southern sector of the excavation area, a cobbled layer was uncovered (214). It contained both rounded and angular small to medium stone clasts, displayed by a wide range of stone types. The compact surface, whether natural in origin (part of a raised beach) or man-made, would have formed a good surface on which to conduct activities. Where exposed, spreads of burnt shell and organic-rich sediments were found in places overlying the cobbles; one particular patch of material in the SE sector of the trench was thought to potentially relate to a hearth. Some fire-cracked stone was noted, interpreted as related to possible cooking activities on site.

5.20 In the SE area of the trench, at least three stone clusters surrounded by charcoal-rich sediments and crushed marine shell were also identified, forming a slight arc aligned NW-SE. Two further larger settings of small boulders interpreted as post settings were also, tentatively, identified as relating to the ephemeral remains of structures set into the cobbled surface (Plates **8** and **13**; Figure **5**). The extent of these potential features was not fully excavated in 2017due to time constraints. If the stone settings uncovered below the midden at Tarradale are the remains of light-weight tent-like structures including wind-breaks and screens, they would fit with other limited forms of evidence revealed at other Mesolithic sites in Scotland including Kinloch on the island of Rhum (Wickham-Jones 1990), the Oronsay Middens (Mellars 1987), Smittons in Dumfries and Galloway (Edwards 1996, 114), Newton on Islay (McCullough 1989), and on the island of Risga in Loch Sunart (Mann 1920; Pollard et al. 1996, 165-82; Pollard 2000, 143-52). In particular, the range of features uncovered by Pollard and his team on Risga in 1997 resemble in many ways those tentatively identified in Trench 2B at Tarradale including a possible foundation slot, stone alignments, stone settings and a cobbled surface. If the features at Tarradale were confirmed, then these would be significant discoveries, especially in light of the important assemblage of antler artefacts recovered from the associated midden deposits. Such discoveries would also add to a growing number of sites displaying ephemeral structural features relating to the occupation of these sites.

5.21 Samples recovered during the 2017 excavations in Trench 2B were selected for radiocarbon dating during the initial post-excavation analysis. These were chosen to provide some bracketing dates for the site overall, although no samples were selected from the basal midden spreads, which were not fully understood at this time due to their limited excavation and exposure. The resulting determinations ranged between 4832–3643 cal BC, the range of more than 1000 years suggesting that the site had been occupied, if not continuously, at least regularly, and potentially continuing into

the Early Neolithic period (Grant 2022, 23). The dates will be discussed in more detail in Sections **9** and **10** of this report.

Plate 8 *– W-facing section of baulk, showing fill/cut 205/207 in section, and stone settings (215) and (216) in back, with underlying midden lenses*

Plate 9 *– SF203 antler mattock and tine before lifting*

Plate 10 *– SF205, antler set plus cranial fragments*

6 AIMS AND OBJECTIVES

6.1 The primary objective of the excavations at midden Site 2B in 2023 were to remove the remaining shell midden deposits and evaluate underlying deposits and any potential structures. The excavations continued with the same methodology employed in 2017 with a rigorous sampling strategy including provision for on-site wet sieving.

6.2 One additional objective for the 2023 fieldwork would include an extension of Trench 2B, in the NW corner and northern baulk, to investigate the relationship between the midden and associated deposits adjacent to the palaeo-cliff. In particular, this work would evaluate if survival of the midden was enhanced below the cliff slope, by protected from the earlier creation of rig and furrow, and the later machine ploughing.

6.3 The aims of the archaeological works were:

i) To remove the upper ploughsoil/topsoil from the proposed Trench 2B extension and any remaining areas of Trench 2B, to establish the presence or absence of archaeological features or deposits relating to Mesolithic and later use of the site, and in order to inform on their character, extent, and survival

ii) To identify the extent and condition of archaeological features and deposits associated with the Mesolithic midden site

iii) To sample archaeological deposits for the recovery of archaeological and environmental material

iv) To evaluate, sample and record the nature and extent of in situ features and deposits

v) To sample deposits for post-excavation work, including environmental analysis and dating

vi) To make recommendations for post-excavation work

vii) To provide hands-on training for volunteers in archaeological excavation and recording techniques

viii) To disseminate the results of the fieldwork with the public and research communities

ix) The general research aims and objectives for the excavations at Tarradale were guided by *ScARF* (Scotland's Archaeological Research Frameworks) and Scotland's Archaeology Strategy

7 METHODOLOGY

7.1 *Mesolithic Shell Midden Trench 2B*

7.1.1 This site had been previously investigated with a trench measuring 8m long (N-S) x 6m wide (E-W), which incorporated the earlier 2015 strip trench (6m long (N-S) x 1m wide (E-W) along its east side. Sediment overlying Teram geotextile was removed by hand to reveal the limits of the 2017 excavation horizon. After removal of the Teram,

the original site grid set out in 2017 was relocated using pegs and pins left in-situ, while additional areas of the grid were established for areas of new excavation. This included the trench extension set out in the NW corner of Trench 2B, measuring 3.5m long (N-S) x 2.7m wide (E-W). After stepping out due to the depth of deposits in this corner of the trench running into the base of the raised palaeo-cliff, the area taken down to full depth by excavation measured 2.8m long (N-S) x 2.7m wide (E-W). A strip (0.7m wide) was also excavated down the full length of Trench 2B on the west side, to investigate potential features identified in the original 2017 west baulk, and to provide a new, clean section. A strip (0.5m wide) was also excavated down the full length of the east baulk of Trench 2B, although deposits were only removed down to the top of midden deposit (204). The extension here provided a clean section for drawing, replacing the original baulk drawn in 2015.

7.1.2 The rigorous sampling strategy adopted for the 2017 excavations was also employed in 2023, with 100% bulk samples taken in this case from all grid squares by 10cm spits on a mosaic patterning for wet sieving. Individual 5-10L samples were also retained from identified contexts as required, for processing under laboratory conditions. The sampling process generated a significant number of samples for on-site wet-sieving (summary of the results in Appendix **3**; and Table **1**) and laboratory processing, with 100% of the total shell midden deposits exposed on site removed through excavation.

7.2 *General Methodology*

7.2.1 Trenches did not generally exceed 1.2 m in depth, but within the trench extension where this limit was exceeded, the trench was stepped to make them accessible and safe. Spoil was consolidated and bunded within designated areas adjacent to the trench from which it was removed, ready for reinstatement upon completion of the fieldwork. All stone was kept separate during the excavations to ensure satisfactory site reinstatement.

7.2.2 All identified deposits and features were allocated individual numbers and a full record of the full sequence of all archaeological deposits is listed in Appendix **1**. Plans were drawn at a scale of 1:20, with trench sections drawn at 1:10 or 1:20. Digital photographs were taken throughout the project, to include record shots of all deposits, features, structures and working shots. Photographs were taken and stored as .jpeg files, as per HES recommendations. As well as providing a record of the excavations as they progress, the images could also be used for publicity. Photographic images were also used where necessary to provide 3D models of archaeological features and deposits. A Trimble Geo-XR RTK GPS rover was utilised for the recording of trench locations, grids and significant findspots in three dimensions. All three-dimensional data and all site plans were entered into a GIS system referenced to the British National Grid.

7.6.3 All identified features were cleaned, planned, and recorded using a strip and map methodology. Selected features and deposits were then excavated by hand and were

subject to accepted archaeological practices. Archaeological deposits were sampled where necessary for post-excavation analysis (including environmental analysis and dating) and any artefacts retrieved for further analysis.

7.6.4 All on-site recording was carried out in accordance with standards of the MoLAS Archaeological Field Manual and current CIfA standards and practices. Records were produced using both proforma context record sheets using the single context planning method. Individual finds, sample and drawing registers were maintained for excavated areas. In addition, a trench daybook, and more specifically a site daybook were maintained throughout. Separate samples forms were used for all environmental records including radiocarbon dating samples. A register was maintained to record, quantify, and describe samples.

7.6.5 All identified artefacts were treated as small finds (irrespective of age), collected, and retained, and located in three dimensions where necessary. All hand retrieved finds were assigned a small find number in the field. The finds were bagged and labelled and where necessary, individually packed to ensure long-term stability. All finds were numbered, recorded by context and material type within the finds register. Finds were examined on site initially to assess the possible date range of the assemblage with particular reference to pottery and metalwork. Identification of finds from the site is critical as, in the absence of immediate radiocarbon dates; the team will be relying on artefacts to guide interpretations of site chronology and use. Basic conservation of artefacts (slow drying out, packaging, finds washing/dry brushing etc) was undertaken within the site environs, or within the premises designated by the management team.

7.6.6 Finds of objects will be subject to the Scots Laws of Treasure Trove and Bona Vacantia and reported by the archaeological contractor to the Secretariat of the Treasure Trove Panel for disposal to an appropriate museum.

7.6.7 For security purposes, site records and artefacts were removed from site at the end of each day and were not left on site unattended. The Archaeological Supervisor and the management team ensured that records and artefacts were stored during the project in a safe and appropriate storage facility, with all records, artefacts, and samples in appropriate conditions until deposition with post-excavation specialists or into archive.

7.3 *Site Reinstatement and Conservation Works*

7.3.1 WCAS worked closely with the TTT management team to ensure that all reinstatement on-site was professionally achieved and fit for purpose. Following the completion of the excavations, vulnerable features and archaeological deposits were carefully covered before the major backfilling stages of the work progressed. Any stone relating to the construction of features, was replaced first and then covered with soft sediments. Any stones removed from the topsoil or subsoil were placed with other field clearance material within the uncultivated area of ground. Subsoil and topsoil

were placed back in the trenches and where necessary regular raking and compression was carried out.

7.7.2 Due to the significance of the site, it was imperative that all archaeological features and deposits revealed by the excavations (whether excavated or not) were re-covered and reinstated as quickly as possible. This was especially important where parts of the midden and associated deposits had already been subjected to erosion and truncation through agricultural practices, or through erosion of excavated baulks. During the excavations, it was also important that vulnerable archaeological features and deposits were temporarily covered with Teram geotextile if heavy rain or strong winds were forecast. This reduced the erosion of features and deposits and prevented drying (the latter was particularly important where features were difficult to distinguish from the natural subsoil).

Plate 11 *– Fragment of antler biserial harpoon from Trench 2B (SF228); and* ***Plate 12*** *– One of the two T-axes recovered from Tarradale in 2017 (SF226)*

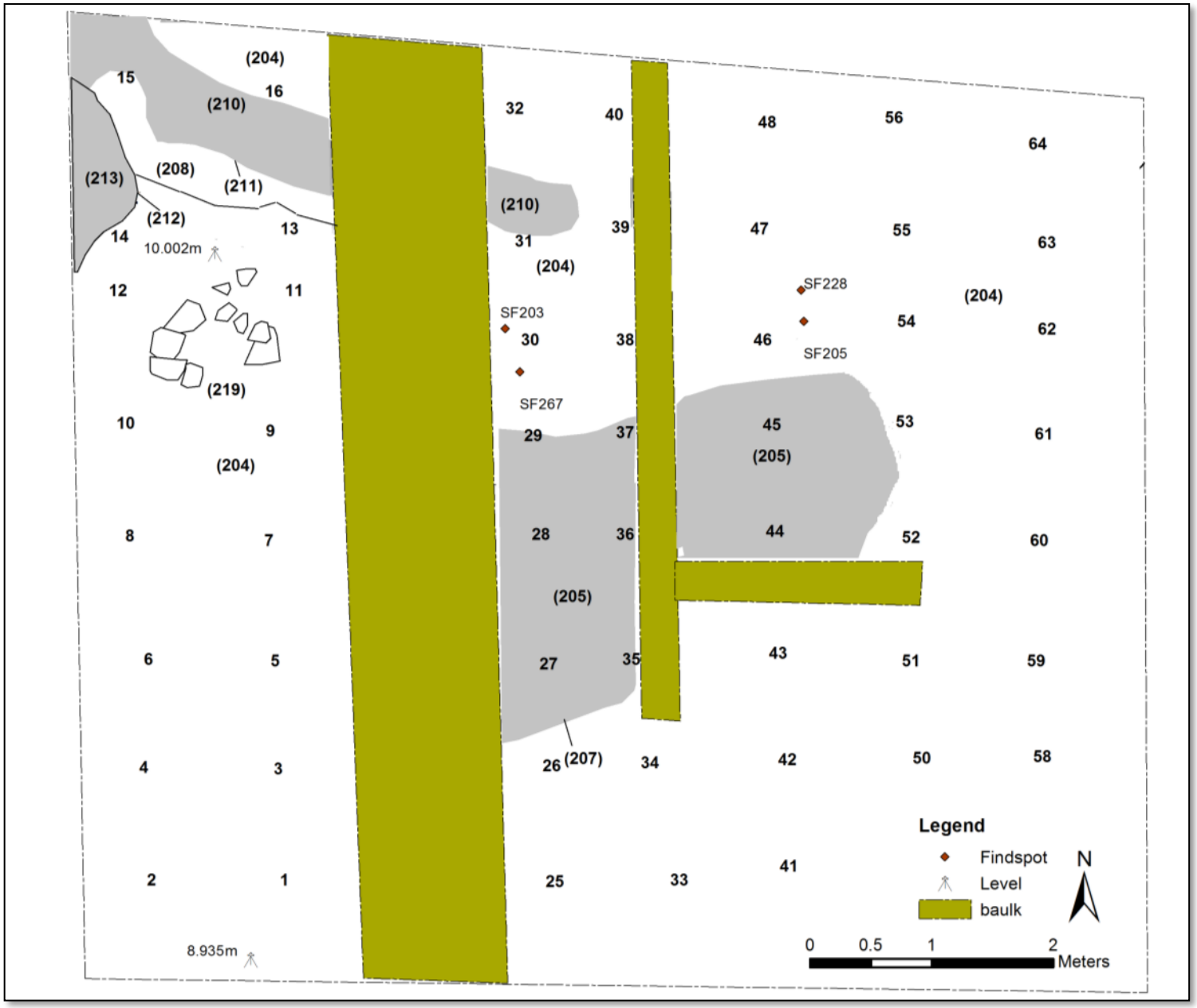


Figure 4 –*2017 Plan showing location of cut surface features (207) and (211) and midden context (204), and grid numbers (after Peteranna & Birch 2017)*

Plate 13 – *High-pole photograph (taken in 2017) of the Trench 2B, post-excavation of shell midden (204) in the SE and E sectors of the trench, showing the cobbling (214) and possible stone settings*

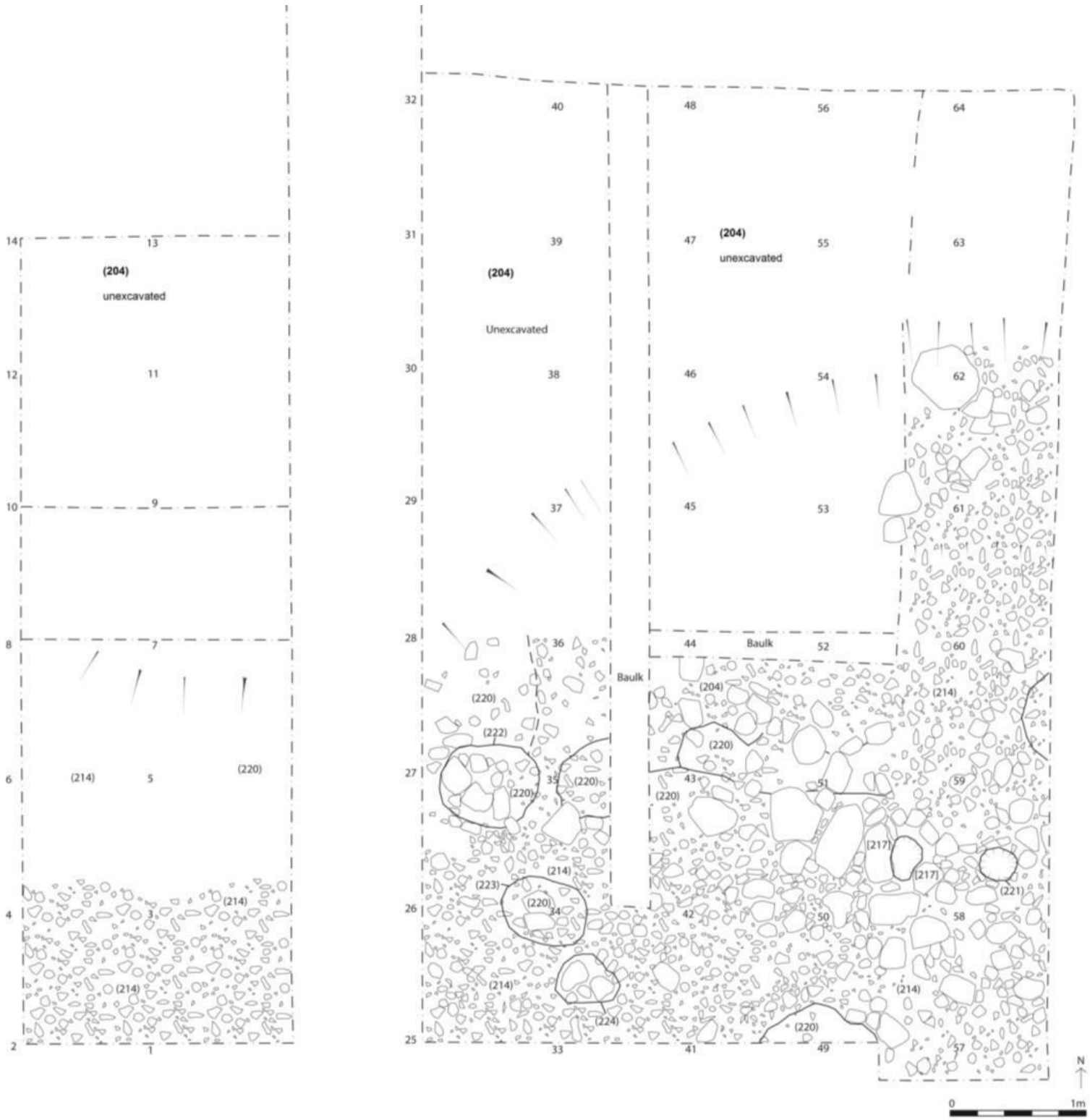


Figure 5 – *Plan of Trench 2B at the termination of excavations in 2017 showing beach surface and potential features exposed after removal of midden (204)*

8 RESULTS

This section presents the results of the continued open-area excavations at midden Site 2B, which took place at Tarradale between 26 September and the 12 October 2023. The results from the excavations will be discussed further, along with preliminary interpretations, within Sections **9** and **10** of this Data Structure Report.

8.1 *Site Excavation in 2023*

8.1.1 The excavation team comprised members of the North of Scotland Archaeology Society (NOSAS) with experience in archaeological excavation and recording, most of whom had worked on the midden sites in 2015 and 2017, while Steven Birch of West Coast Archaeological Services acted as on-site supervisor. The team size was limited in numbers, due to the generally restricted areas requiring excavation. Overall, the management of the site and excavations was overseen by Eric Grant of Tarradale House (Project Leader), and committee members of NOSAS, while on-site records were maintained by Tim Blackie and Rosemary Jones. John and Trina Wombell of NOSAS took charge of the on-site wet sieving, a process that will continue into the spring of 2024 due to the numbers of bulk samples to be processed. Sorting of residues resulting from the wet sieving campaign has already started (carried out by members of NOSAS) and will also continue in 2024.

Plate 14 – *View SE over Trench 2B after cutting vegetation and prior to remove sediment infill;* ***Plate 15*** *– View NNW showing geotextile-covered trench after removal of sediment infill, and extensions of trench to N and W*

8.1.2 Generally, the weather on-site for the excavations was dry, with light to strong winds, but with some overnight rainfall (mainly light). Two days of very heavy rain fell in the last few days of the project and caused some localised flooding in the trench, and localised failure of one of the standing baulks – this taking place in a section of the

west baulk, directly above pit feature (238/212/246), and within the northwest corner of the trench extension. These failures took place as a result of water running down the access path on the west side of the trench, which then diverted to the southeast to the edges of the trench. These slope failures did not create any problems with regards to the on-going excavations or recording of the sections.

8.1.3 After removal of the sediment used to re-instate the site at the end of excavations in 2017 (which had become heavily vegetated with ground-cover grasses and shrubs), the Teram geotextile was removed to reveal the underlying trench and limit of excavations from 2017. Most of the plant labels used to mark grid square intersections were found to be in-situ, along with labels marking contexts in the standing baulks. While the geotextile was still in-place, a strip of ground 0.7m wide running down the W side of the trench was de-turfed. The excavation of the strip would allow full grid squares to be set out in the trench, while permitting the exposure of potentially interesting features and contexts identified within the baulk on this side of the excavation area. Within the NW corner of the trench, a trench extension was laid out in the N baulk. A sufficient area of ground was de-turfed in order to allow stepping of the trench sides due to potential depth restrictions and health & safety issues. The size of the excavation area within the trench extension would be 2.5m long (N-S) by 2.2m wide (E-W). In addition, a strip of ground 0.6m wide was de-turfed running down the E side of the trench allowing a new and fresh section to be exposed (this was the E side of the 2015 original evaluation trench). After de-turfing, only the upper plough soil deposit (200) was removed to reveal the upper surface of shell midden (204), which had a wavy profile due to the excavation of rig and furrow during later periods of activity at the site.

8.1.4 After the various modifications to Trench 2B had been carried out, any newly exposed grid section intersections were labelled and inserted into the base of the trench, and a master plan of the trench drawn showing the new extensions and laid out 1m grid over the trench (Figure **6**). Additional work at this time included annotating with labels the levels at which excavation of the main midden deposits (204) had ceased using spit numbers continuing from the 2017 excavations. Although most of the grid squares containing surviving midden deposits (204) were located within the W side of the trench, small and relatively shallow areas of the deposit remained in the E side of the trench. Within the E sector of Trench 2, temporary mini-baulks established in 2017 to evaluate a roughly circular hollow (207) and its sterile fill of slope-wash material (205), were also removed. Within the base of the hollow, on its NE side, possible stone settings (215) and (216) were also removed. No additional features were found associated with these settings.

8.1.5 Excavations then commenced with the removal of midden deposit (204) by grid square and spit. The shell midden varied significantly over Trench 2B, generally comprising crushed shell of mussel, oyster, periwinkle, and cockle – but in some areas containing more complete examples of the shellfish. In particular, grid squares located in the NW sector of Trench 2B contained more complete oyster shell. Within grid squares that still retained midden (204) below the interface with the upper plough soil

(200), these were often mixed with the ploughsoil due to the more recent excavation of rig and furrow cultivation. Within some areas of the trench, especially along the E baulk and within the southern half of the trench, the furrows extending down almost to the base of the midden deposit; the residues cast up to form the rigs that contained mixed shell midden (204) and ploughsoil (200).

8.1.6 Midden deposit (204) also contained animal bone, some generally small fish bone, antler fragments, and lithics – mainly manufactured on quartz. Some areas of the midden, mainly in the NW sector of Trench 2B and to the SE of the central baulk, appeared to contain more ash, charcoal flecks, and the occasional fragment of fire-cracked stone. Although the depth of the midden varied across Trench 2B, mainly due to the later cutting of cultivation rigs and furrows through the deposit, there was a definite thickening in the NW sector of the trench – possibly suggesting a focus of deposition, or core area of the site in this area.

8.1.7 The basal deposits underlying midden (204) were complex and varied across the trench. Along the southern edge of the trench, context (204) was found to directly overlie natural cobbled surface (214) with isolated pockets of darker ash-rich material at the interface, usually in hollows and around larger stone clasts. Within the SW corner of the trench, (204) appears to have been completely removed by later mechanical ploughing with ploughsoil (200) directly overlying cobbled surface (214). However, moving north across the trench, the basal deposits below (204) displayed more complexity and comprised a number of thin midden lenses (Figure **8**).

Plate 16 *– View over Trench 2B after removal of geotextile covering and during initial clean-back of exposed surfaces in the E side of the trench. The trench extension can just be seen beyond the wheelbarrow*

8.1.8 The upper lens (226), running from the NW of the trench in an arc to the E and SE, terminated at the group of larger stone clasts (217) in the SE corner of the trench. Amorphous in outline, the deposit generally varied in depth from 10>20mm, but in some pockets attained a depth of >50mm, especially around the larger stone clasts. The deposit comprises a dark brown to light black silty matrix containing small marine shell fragments and some complete oyster, cockle, and periwinkle shells. Also contained some small animal bone and antler fragments, small fish bone, and mainly fine gravel inclusions. Fine lenses of gravel were present in some areas of the midden, which also displayed areas of charcoal/ash-rich deposits. It is possible that this degraded midden lens had derived from low energy wave action during periods of marine transgression, where thicker lenses were deposited within natural hollows and around larger stones in the former beach surface. Also located at the base of main shell midden deposit (204) and forming an isolated spread to the E of the central baulk on the surface of (226) but separated by a thin lens of small gravel clasts 8>30mm across, was a black and silty ash-rich midden (227) 10>20mm thick. This lens contained mainly crushed/trampled shell, along with the occasional spread of complete shells (periwinkle and cockle). The deposit underlies the edge of context (226) and may comprise the rake-out or dump from a hearth, contemporary with context (226). Within the same area of Trench 2B and underlying (227) and (226), three small spreads of finely crushed or trampled marine shell (228), with no visible matrix, was identified. Again, these isolated deposits may have resulted from low energy wave action during periods of marine transgression.

8.1.9 Forming a wider spread across the E side of Trench 2B, but also continuing under the central baulk and running through the W side, was a thin layer (218) of pea gravel (5>8mm across) at the interface between the cobbled surface of the original beach (214/229) and the overlying midden (204). Measuring 10>20mm thick, the deposit also contained some crushed shell fragments, ashy matrices, and just a few very small fragments of bone, which had probably winnowed down from overlying midden lenses (226), (227), and (228). This deposit did not extend to the southern edge of Trench 2B and gradually thinned out to nothing just short of the N baulk of the trench to the E of the central baulk.

8.1.10 Within the E sector of the site, at the junction of the original 2015 evaluation trench and Trench 2B, an isolated and oval-shaped spread of ashy material was identified. This appeared to fill a hollow (232) within the natural beach deposits (229), but which also appeared to cut through contexts (226) and (218). A large flat stone abutted the deposit on the S side, while other smaller stone appeared to run around the edge of the feature. Section excavation of the feature revealed the shallow scoop, which had a hardened and possible heat-affected surface, and a fill (230) comprising inter-leaved black and pale grey lenses of ashy material, with some fine marine shell fragments. The context was sampled to see if any environmental material including charcoal had survived. The scoop and its fill most likely formed a small hearth setting measuring approx. 1.2m long NW-SE by 0.7m wide and a maximum of 0.08m deep.

8.1.11 After removal of the thin lenses of midden within the E side of Trench 2B, the natural raised beach deposits (214/229) were revealed, along with several clusters of larger rounded and sub-rounded stone clasts with halos of darker, ashy material, initially interpreted as possible post settings (221/222/223/224) in 2017. Careful excavation and evaluation of these potential features revealed no negative cuts into the underlying beach deposits. It appears likely that these were natural clusters of stones, with the thin lenses of ashy midden filling shallow hollows around the larger stones. It is possible, however, that the stones could have formed blocking and packing used around the base of angled wooden posts to create temporary structures. The latter interpretation will be discussed further in Section **9** of this report. During the 2023 excavations, most of the stone clusters were completely removed, with the exception of any larger stones embedded into the underlying beach levels. Removal of the stones did reveal pockets of black, ashy midden containing finely crushed marine shell, some complete periwinkle and cockle shells, and the occasional small fragment of animal bone. These deposits most likely comprised elements of context (226) which spread through into this SE sector of the trench.

Plate 17 *– View W across the E sector of Trench 2B after initial clean back of all surfaces and before the mini-baulks across hollow (207) had been removed*

8.1.12 The underlying natural beach deposits varied across the trench, moving from south to north. Closer to the S baulk of the trench, the cobbled surface (214) comprised a gently sloping surface with rounded and subangular cobbles 0.05-0.1m across with some larger stones up to 0.3m across. Moving to the N the angle of slope reduced slightly and context (229), the natural gravel sub-base deposit, consisted of a gritty

yellow to buff sediment containing rounded to sub-rounded stone clasts, generally measuring 6>20mm across, but with larger clasts 50>150mm across. Further evaluation using small sondages in this area showed that (229) dipped gently downslope to the S under context (214); while at the N end of the trench, larger stone clasts within the deposit increased to where they ran under context (231). Context (231) appeared to be the same deposit has (229) in its general description but had been indurated by what appeared to be white to buff-coloured calcium-type deposits. This had cemented the cobbles and gritty matrix together and proved difficult to excavate. Context (229) below had not been affected and remained easy to excavate. Generally, the surface of the natural beach deposits at this N end of the trench formed several small steps, ascending to the N into the baulk of the trench. This may indicate the section of the natural beach deposits where they had been impacted by low-energy wave action during periods of marine transgression (possibly indicating the highest stand of the tide mark at a particular point in time during the postglacial maximum transgression).

Plate 18 *– View S over the E sector of Trench 2B showing the remaining elements of midden (204), showing here as a darker area of material*

Plate 19 *– Image showing the mini-baulks running through cut (207) and fill (205). The edge of the cut can be seen clearly arcing around to the flat boulder. Hearth scoop (232) is located to the right of the boulder*

Plate 20 *– View N over the E sector of Trench 2B showing the stone clusters (217/221/222/223 and 224) in the SE area of the trench*

8.1.13 Excavations within the west sector of Trench 2B started with removing the remaining midden deposits (204) by grid square and spit. Some of the columns of midden within some grid squares here had not been excavated in 2017, so the upper spits of the deposits were removed to bring the general area down to a working level. This allowed us to see any potential features in plan as the midden level was lowered. With the exception of small groups of larger, rounded stones protruding up through the midden from underlying beach deposit (214/229), no specific features were noted, with the exception of cut (212). This steep-sided cut, initially identified during the excavations in 2017, formed an amorphous shape in the NW corner of the trench and measured c.1.55m N-S by 0.40m wide and 0.6m deep. This was filled by a homogenous brown silty soil with small, rounded beach cobbles, fine roots and shell fragments deriving from slope wash and silting, from the palaeo-cliff to the N. The midden deposits (204) surrounding this potential feature were some of the deepest encountered on site and displayed enhanced levels of preservation, especially with regards to complete shells such as oyster. As the midden was cut back to reveal more of the cut and its fill, animal bone was observed almost directly under the W baulk of the trench (Plates **23** and **24**).

8.1.14 While excavation of midden (204) by grid square was taking place in the W sector of Trench 2B, the removal of overburden was taking place in the trench extension to the N. After removal of a thin turf and topsoil layer (200), a sequence of slope-wash deposits were encountered. The upper deposit in this sequence (234) was the thickest (>0.8m deep within the trench) and comprised a mid to light brown silty sediment with a few mainly rounded stones >40mm across and fine roots. The deposit was thickest in the NW corner of the trench extension and dipped and thinned to the S where it stopped above the cut of pit feature (212/246), while it also thinned slightly to the east. A lens of small stones divided this context from underlying slope-wash deposit (203a). The context produced some relatively modern material including fencing wire, roofing slate, and small sherds of glazed ceramics and glass.

8.1.15 The base of context (234) and the underlying slope-wash lenses of material are fairly horizontal in profile, with the exception of where they dip downslope towards cut (212/246). The next context in the sequence (203a) consisted of a light orange intermittent silty lens of material, interrupted by fine roots and worm activity. The deposit contained little stone, although the interface with (234) above was marked by a band of pea-gravel and small rounded stone clasts, while pea gravel and small stone clasts formed a more marked lens at the base of the deposit, especially where it ran to the S over cut (212/246). Glazed ceramics, roofing slate, iron, coal, and some animal bone, were recovered from the context. The next deposit in the sequence was (203b), a light brown silty sediment containing small, rounded stone clasts >12mm across. The lens of material ran from the N baulk of the trench extension and thinned out to the south after c.1.5m, before continuing with a stonier matrix into a hollow above cut (212/246). Context 203c below, comprised a light buff/yellow intermittent lens of compacted silt disrupted by fine roots and animal burrowing. The deposit contained small stone clasts 20>50mm across and ran out above the N edge of the

depression overlying pit cut (212/246) and merges into context 236 – the upper fill of pit (238).

8.1.16 The last slope-wash context in the trench extension was (203d), a lens of mid-brown silty sediment containing rounded and angular stone clasts 20>80mm across, marine shell fragments, and some complete oyster and periwinkle shells. Three small fragments of possible medieval ceramic and three quartz flakes were also recovered from this deposit, suggesting some possible mixing with (203e) below. The deposit ran from the N baulk of the trench extension for around 2.5m where it thinned above the edge of the depression overlying pit cut (212/246), then thickened and formed a slump of material running into the pit. The deposit had been cut by later pit (238).

8.1.17 Context (203e) ran below (203d) in the trench extension but stopped short of pit cut (212/246). The deposit comprised a mixed firm silt deposit, light buff-coloured, and containing small stone clasts >50mm across. The deposit contained shell fragments, some complete periwinkle shells, charcoal flecks, and antler fragments, while a fragment of antler T-axe was also recovered (SF332). It is possible that context (203e) relates to the abandonment horizon of the Mesolithic site, or a later phase of activity. Dating of bone or antler from this context is recommended as the deposit may have formed during the Early Neolithic use of site 2B.

8.1.18 Contexts (203c/236), (203d) and (249) had been cut through by pit cut (238), a later pit feature cut into the hollow formed by earlier pit cut (212/246), most likely during the medieval or post-medieval period. The pit (238) had steeply sloping sides and relatively flat base and measured c.0.8m in diameter at the top, 0.55m in diameter at the base, and was a maximum of 0.48m deep. Deposit (203b) and (236/203c) had run into the top of the pit as slope-wash deposits, while context (237) formed the primary fill. This comprised a mid-brown silty sediment with fine roots and rounded stones 20>100mm across (but mainly small at 20>40mm). This deposit contained the skeletal remains of a small carnivorous mammal, possibly a fox or small dog (Sample 394). The animal remains were located in the base of the pit and showed no signs of articulation in burial. The skull had been sliced/cleaved horizontally through the cranial vault. Osteological analysis of the animal remains will be required to determine species and age at death, and to provide evidence of any dismemberment and butchery.

8.1.19 A series of what appears to be in-situ midden lenses and deposits was recorded in the W sector of Trench 2B underlying main midden deposit (204), especially adjacent to the W baulk of the trench. To the S of pit cut (212/246), midden deposit (239) comprised a black ashy lens with some fragmented marine shell and generally rounded stones 20>100mm across. The lens of material had been cut through by pit (212/246) and ran south to where it thinned out around 1.8m before the south baulk of the trench. The deposit varied in thickness from 0.05>0.14m and the context was only apparent in the W baulk of the trench. The deposit also contained some animal bone and overlay stone setting (248). Below (239) was another well-defined midden lens (240), again only really visible in the W baulk of the trench, consisting of a black,

ash-rich lens of midden containing fragmented marine shell and rounded stones clasts 10>60mm across, but less frequent than in context (239) above. The lens varied between 0.06>0.1m thick and ran south from the cut of pit (212/246) and abutted small stone setting (248). The deposit also contained some small and fragmented animal bone, and charcoal flecks.

Plate 21 *– View E over Trench 2B extension showing slope-wash context 203a;* ***Plate 22*** *– View N over W sector of Trench 2B showing midden deposits (204) and trench extension beyond;* ***Plate 23*** *– Image showing animal remains Sample 394 in fill (237) of pit (238);* ***Plate 24*** *– Image from above of animal remains (Sample 394) in base of pit (238)*

81.20 Underlying context (240) and (239) was context (218), which comprised small pea gravel (5>8mm across) forming a thin layer at the interface between the cobbled surface of the original beach (214/229) and the overlying midden deposits. The deposit varied from 10>20mm in depth and contained some crushed marine shell fragments and ashy matrices, some of which may have percolated down from the midden deposits above. Stone setting (248), located in the W baulk of Trench 2B, rested on the natural beach deposit (229). The stones forming the structure varied in size, from a single clast 0.22m long by 0.12m thick on the south side of the feature, to

a stack of stone clasts on the north side varying from 0.08m x 0.05m up to 0.16m x 0.14m across. The stone setting created a possible post-pipe 0.12>0.14m in diameter and surviving to 0.18m deep, filled with context (250), a pale brown gritty sediment with some crushed shell and numerous small, rounded stone clasts 10>30mm across. A localised deposit of crushed marine shell (247) capped feature (248) but did not extend further to the north or south.

8.1.21 Contexts (239) and (240) had been cut through on the S side by the cut of pit (212/246). To the N, the pit had cut through midden lens (244). Context (244) underlay (203e) and (203d) and comprised a compact dark brown silty sediment (hard at the surface) with a black charcoal-rich lens towards the top of the context, which was 0.1>0.22m thick. Running from under the north baulk of the trench, the context had been truncated at the south end, most likely by the cutting of pit (212/246). The context also contained grey to buff lenses of ash with crushed shell and overlay indurated cobble layer (231) at the north end. Some charcoal flecks and small lumps were also present in the context along with rounded to sub-rounded stone clasts 20>120mm across.

8.1.22 Pit cut (212/246), located in the W baulk of Trench 2B, had angled sides and a rounded base and measured c.1.70m in diameter and c.1.22m deep. The pit appears to be one of the earlier features at the 2B midden site, cut into the underlying beach deposits (231) and (229). It is possible that the pit lay open for some time, allowing silting lens (243) to form in its base. This deposit comprised a dark black silty deposit, with grey flecks of wood ash, charcoal flecks, and lumps, and contained crushed mussel and cockle shell, numerous complete oyster and periwinkle shells, and some animal bone and teeth including a fragment of possible pig upper mandible. Rounded stones within the base of the pit ranged in size from 20>80mm across. The primary fill of the pit above (243) was context (241), a black, ash-rich midden containing abundant marine shell including fragments, complete oyster and periwinkle shells, charcoal, animal bone, and lithic material including a quartz flake and half of a small flint nodule. The deposits also included rounded to sub-rounded stone clasts 10>120mm across. The fill is similar in colour and matrix to context (240), which it abutted on the south side of the pit cut. It is possible that context (240) ran into the pit or was used as an infill deposit. A lens of slope-wash material (242), or silting from the edge of the pit, had infiltrated context (241) during its formation and comprised a light brown silty lens containing no stone.

8.1.23 Above the secondary fill (241) in pit (212/246) was a thick wedge of material (249), which appears to have entered the pit from the S side. Consisting of a mixed dark brown silty sediment containing intermittent lenses of marine shell on the south side, rounded to sub-rounded stone clasts 20>80mm across, with some larger stones up to 240mm x 180mm x 80mm thick, the stones and lenses of shell dipped downslope to the north. The context also contained patches of marine shell, most of which was crushed and fragmented, and fine rootlets. It is possible that this upper fill of the pit resulted from the collapse of midden deposits (204) on the S side or related to the excavation of the later pit cut (238) and the material cast to the side.

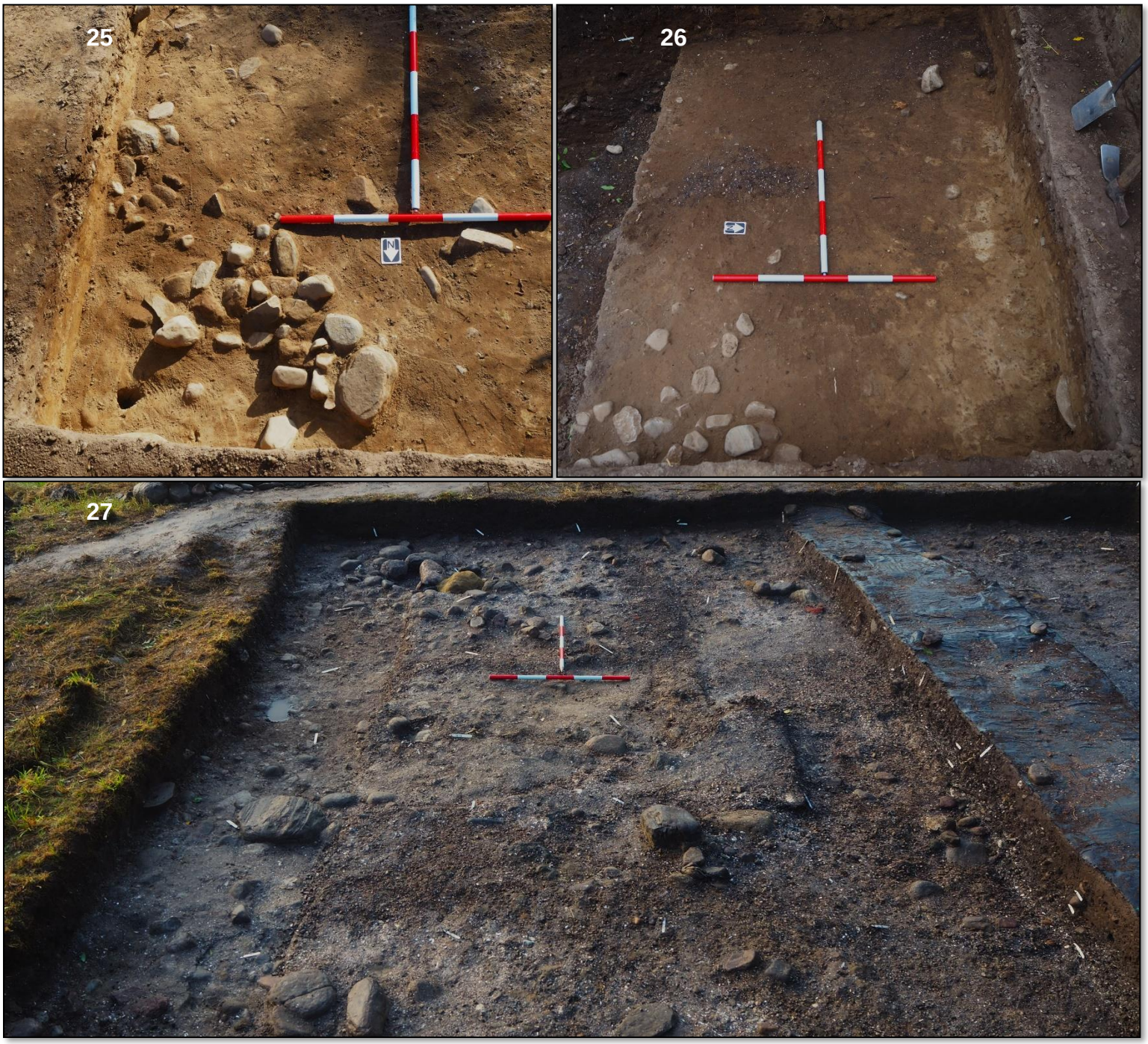


***Plate 25** – View S over trench extension showing natural stone deposit within slope-wash (203b);* ***Plate 26** – View W over trench extension showing surface of context (203e) with fine marine shell lenses and deer or cattle calcaneum;* ***Plate 27** – View S over the E sector of Trench 2B after removal of midden lenses (226), (227) and (228) to reveal (218)*

8.1.24 The archaeological deposits underlying the thick lenses of slope-wash and context (244) to the N of pit cut (212/246) within the trench extension (Sections 8.1.15, 8.1.16, 8.1.21) included (245). This thin lens of midden comprised a sequence of thin lenses of black, charcoal-rich silty deposits interspersed with finely crushed shell lenses with a grey to buff ashy matrix and containing some rounded to sub-rounded stone clasts 20>120mm across. The relationship of (245) with the cut of pit feature (212/246) was not clear. It may have been cut by the pit, but equally, the deposit may have formed

while the pit was open. Context (245) varied in depth from 0.08>0.13m and was the earliest deposit to form over the former beach cobbles, here indurated with lime deposits (231) from the overlying shell midden. The cobble layer displayed a wavy profile, with a more prominent dip and step-type feature adjacent to the N baulk of the trench. These undulations in the former beach which may have been caused by the highest stand of the marine transgression, through low-energy wave action.

Plate 28 *– Group of images facing N, S and N, showing basal deposits in E sector of Trench 2B including context (218) and deposits of midden (226) running up to, and around stone cluster (217). The earlier 2015 evaluation trench is visible with natural beach deposit (229) in its base*

8.1.25 The morphology of the basal midden deposits to the south and north of pit cut (212/246) varied significantly. The midden lenses to the south (240/239) were relatively soft and easy to excavate, while those to the north (245/244) comprised hard and compact deposits. The contrast between the deposits forming these contexts appeared to transition where the overlying slope-wash deposits thin and run out, which also happens to be where the cut of pit (212/246) is located – in effect, blurring the transition between the contexts. The deeper, overlying slope-wash deposits were relatively well-drained due to their make-up, and it is possible that the overlying weight of deposits, along with the reduced moisture content, had contributed to the hard and compact nature of the underlying midden. To the south of the pit cut, the midden deposits (240/239/204) equated to a similar depth of material but here, they were overlain by the ploughsoil (200). Here, with increased root and worm activity, water percolation through the ploughsoil was enhanced, allowing ingress into the underlying midden deposits.

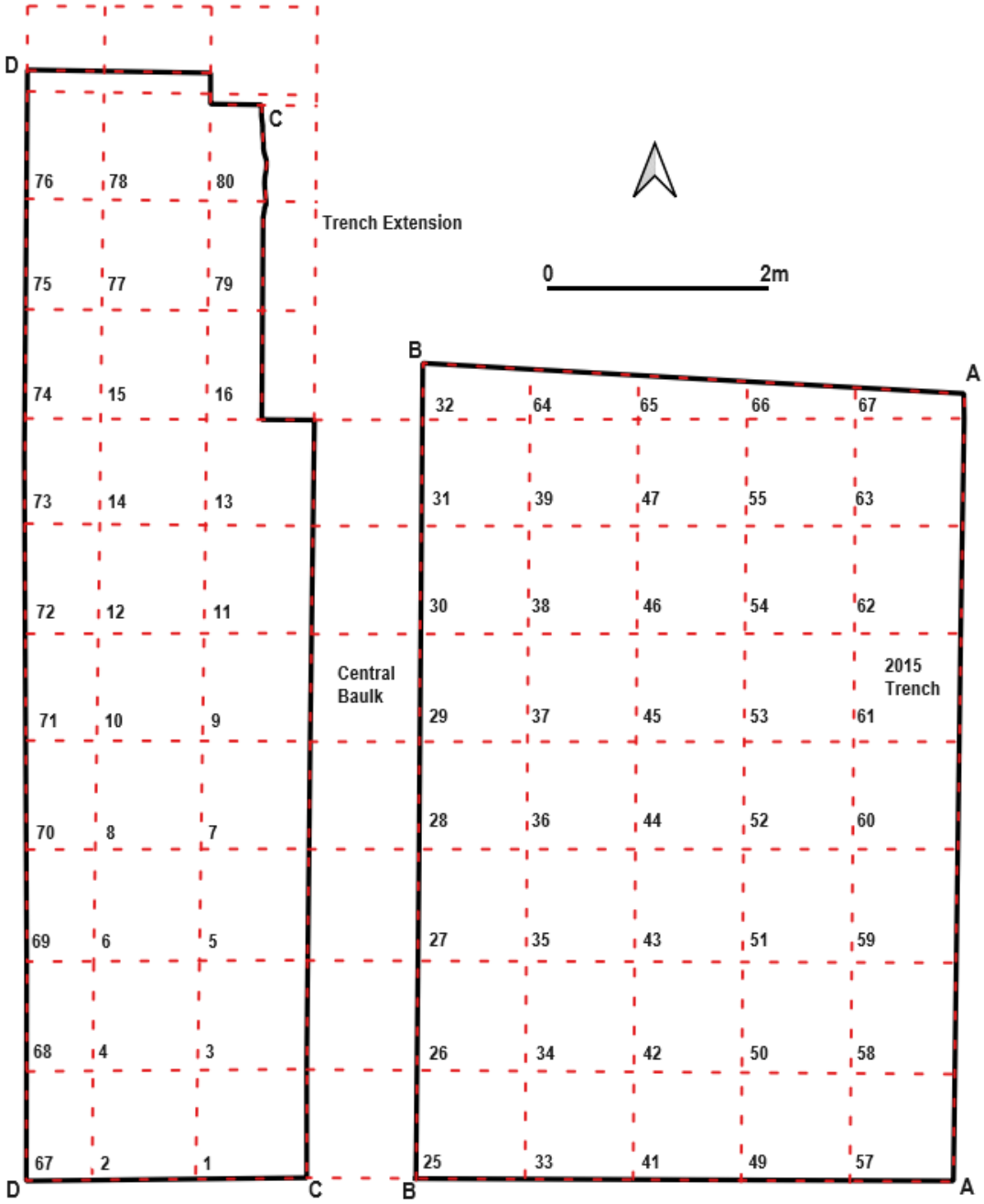
8.1.26 The excavations in Trench 2B in 2023 were successful in removing and sampling the remaining (204) midden deposits by grid square and spit, evaluating the underlying midden lenses forming the earliest deposits laid down at the site, and investigating their relationships with the underlying natural beach deposits. The recovery of another antler T-axe from the trench extension was a major find, while the discovery of the animal remains in pit (238), excavation and recording of the earlier underlying Mesolithic pit (212/246), scoop hearth (232), and possible post setting (248) comprised the first definite features at the site. The features and deposits excavated during the 2023 excavations will be discussed in further detail, along with the results from the 2017 excavations, in Sections **9** and **10** of this report. Section **9** will also look more broadly at the range of artefacts recovered from Trench 2B, and what they contribute within the wider context of midden sites straddling the important transition between the Late Mesolithic and Early Neolithic.

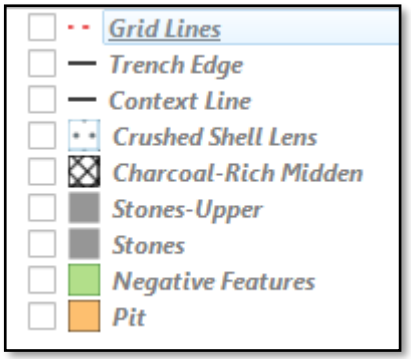
Plate 29 *– Image looking N showing E sector of trench with midden (226) around stone cluster (217) and extending to NE, and midden lenses (227) and (228) to left of scale rods;* ***Plate 30*** *– View E showing black midden lens (227) and underlying crushed shell lens (228)*

Plate 31 *– View S over trench extension showing slope-wash deposit (203d) to left and underlying midden context (203e) to right and top right*

Plate 32 *– Image showing E-facing section through hearth scoop (232) and ashy fill (230) within NE sector of Trench 2B. Note the ephemeral ring of stones arcing around and defining the feature on the W and S sides*

Plate 33 *– Image looking E showing area of rich midden (204) with some complete oyster shells in W sector of trench with edge of pit (212/246) bottom left;* ***Plate 34*** *– View N over E sector of trench with mini-baulk used while evaluating basal midden deposits (226/227/228/218) and underlying beach deposits (214/229);* ***Plate 35*** *– View N showing continued removal of basal midden deposits in E sector of trench to reveal underlying beach deposits (214/229)*





General legend for plan and section drawings

Figure 6 *– Plan of Trench 2B showing grid squares and drawn sections (the number "67" at the top right of the grid plan should be removed)*

8.2 *Wet Sieving and Residue Sorting*

8.2.1 Trench 2B was laid out in 1m square grids for excavation of the shell midden layers. A rigorous sampling strategy was employed during the excavation process, with 100% bulk samples taken on alternate grid squares, or on grid squares selected based on their richer shell and animal bone content. Deposits in the grid squares were excavated in 10cm spits, although some of the upper spits were deeper than this due to the uneven profile across the top of the midden due to the later cutting of rig and furrow. Individual bulk 10L samples were taken on a more random basis, with the decision to take a sample guided by particularly rich or interesting deposits including charcoal, ash, or bone-rich material, or the fills of identified features such as hearth scoops or pits. These samples will be assessed during the post-excavation stage of the project and samples selected for processing under laboratory conditions.

8.2.2 The sampling process generated a significant number of samples for on-site wet sieving (see summary of the results in Appendix **3** and Table **1** below), with the remaining 40-50% of the total shell midden deposits removed. Table **1** shows the total approximate number of litres of sample taken per grid square and by spit. The grid squares with the higher totals of sample correspond with the deeper sequence of midden (204), most of which are located in the west sector of Trench 2B. Particular grid squares also included deeper upper spits where the midden merged into the upper plough soil, with the later cutting of rig and furrow resulting in mixed deposits. It will also be noted from the table that some spits within specific grid squares do not appear to have been sampled. For example, Grid 73 only has a third spit, which is due to the grid corresponding with a section of the midden that has been truncated by the cutting of furrows, or later ploughing; or might relate to where midden (204) thins and becomes fragmentary, such as in Grid 16 – adjacent to the trench extension. Where a grid square is missing its middle spit (Spit 2), this relates to difficulties in matching spit levels across the trench. In these circumstances, adjustments had to be made to the excavated levels resulting in Spit 2 material being included with Spit 1 or Spit 3!

8.2.3 The wet sieving of the bulk samples from Trench 2B continued through the winter and into the spring of 2024. Sorting of the resulting residues has recovered potential lithics, antler and animal bone (some of which may be worked), small fish bone, marine shell (including a pierced cowrie shell that may have functioned as a bead), and charcoal. An initial assessment has also been made of the artefacts recovered in 2023 including lithics, coarse cobble tools, and worked bone and antler. In particular, animal bone and antler samples were examined to look for evidence of primary working. The results of this assessment can be found in Appendix **6** of this report.

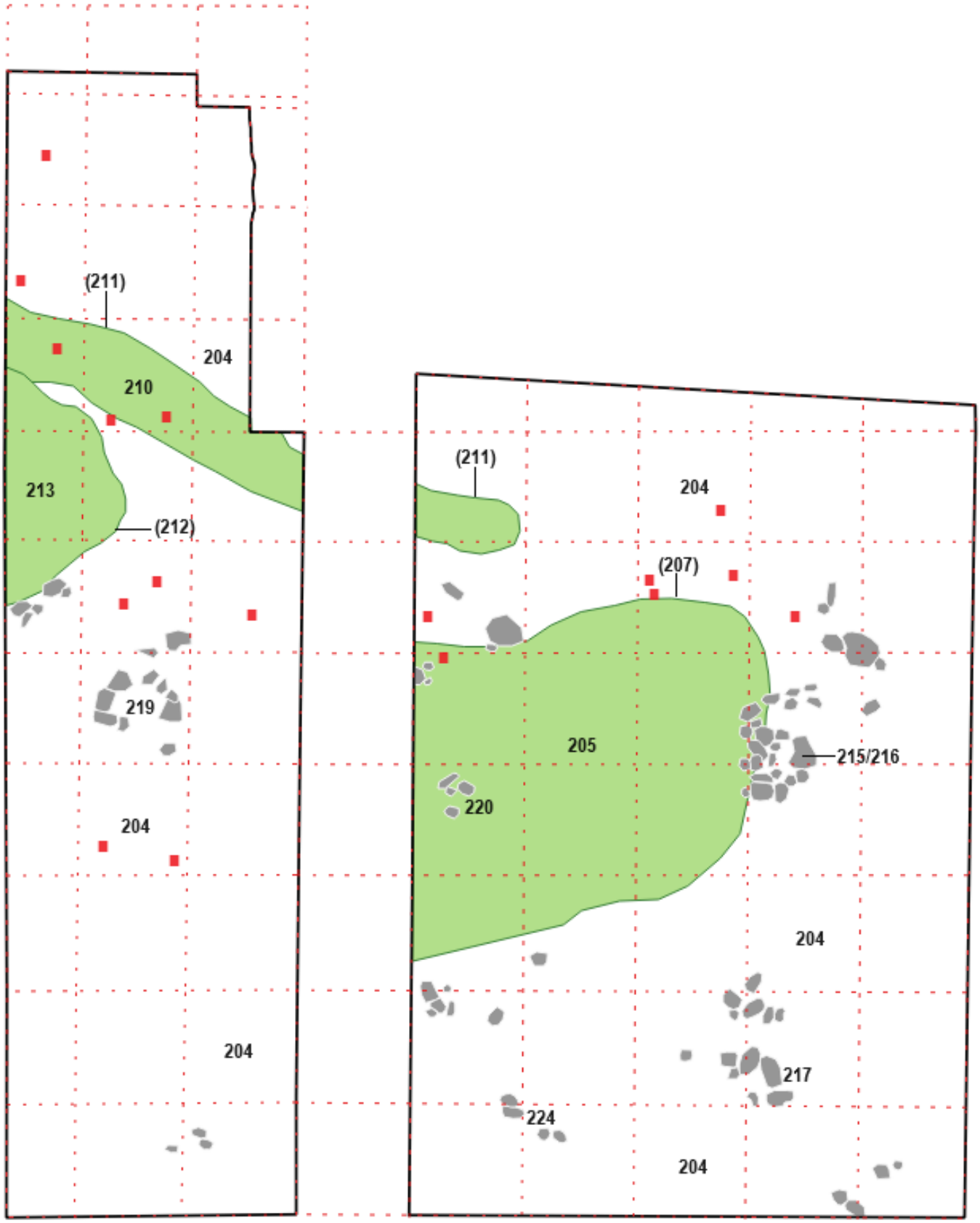


Figure 7 – *Mid-ex plan of Trench 2B showing upper contexts and features, and distribution of a selection of worked antler, bone and tooth finds (red squares). The green areas are fills of cuts.*

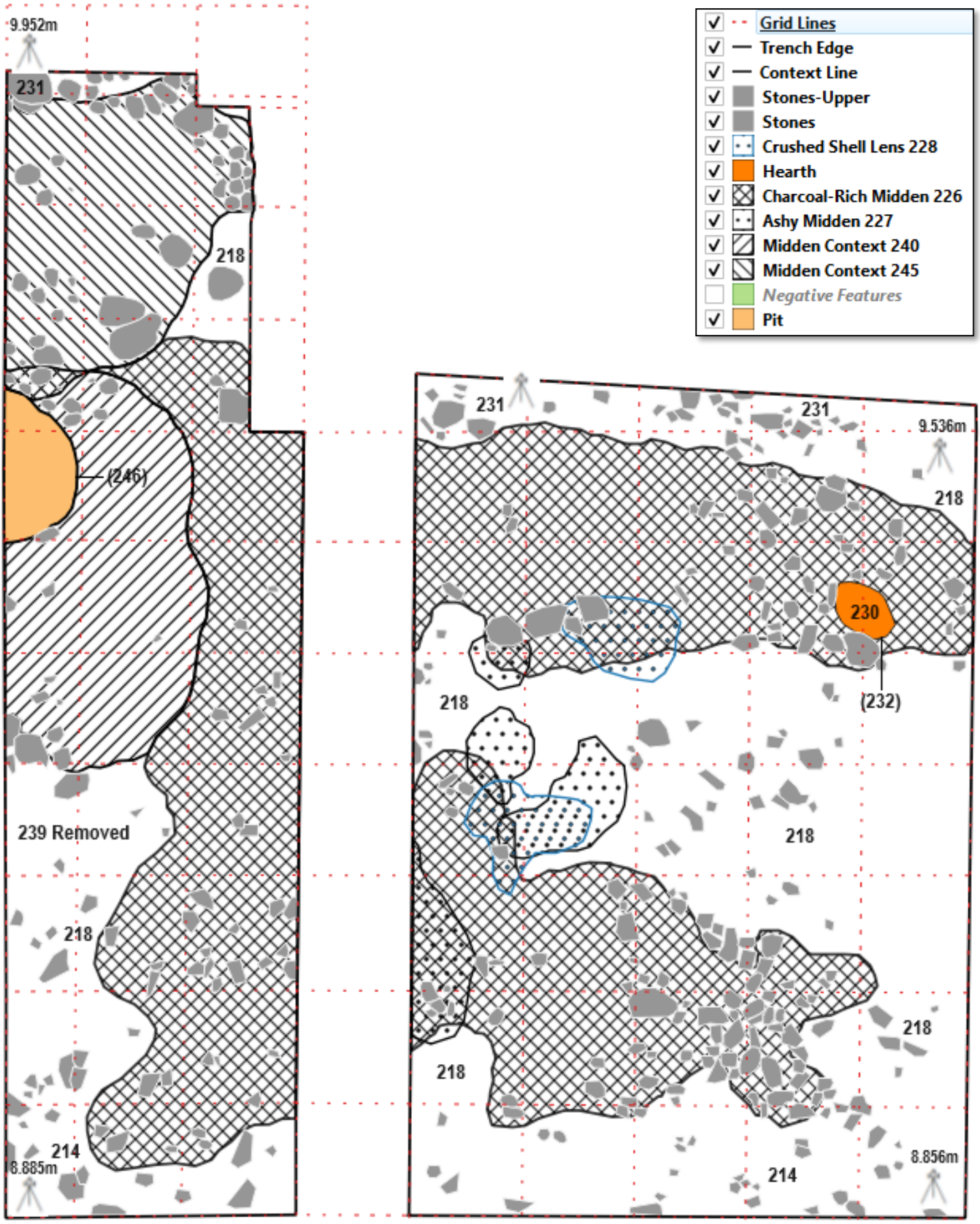


Figure 8 – *Mid-ex plan of Trench 2B showing basal midden contexts, pit (246) and cut (230) with hearth (232), after removal of contexts(239)*

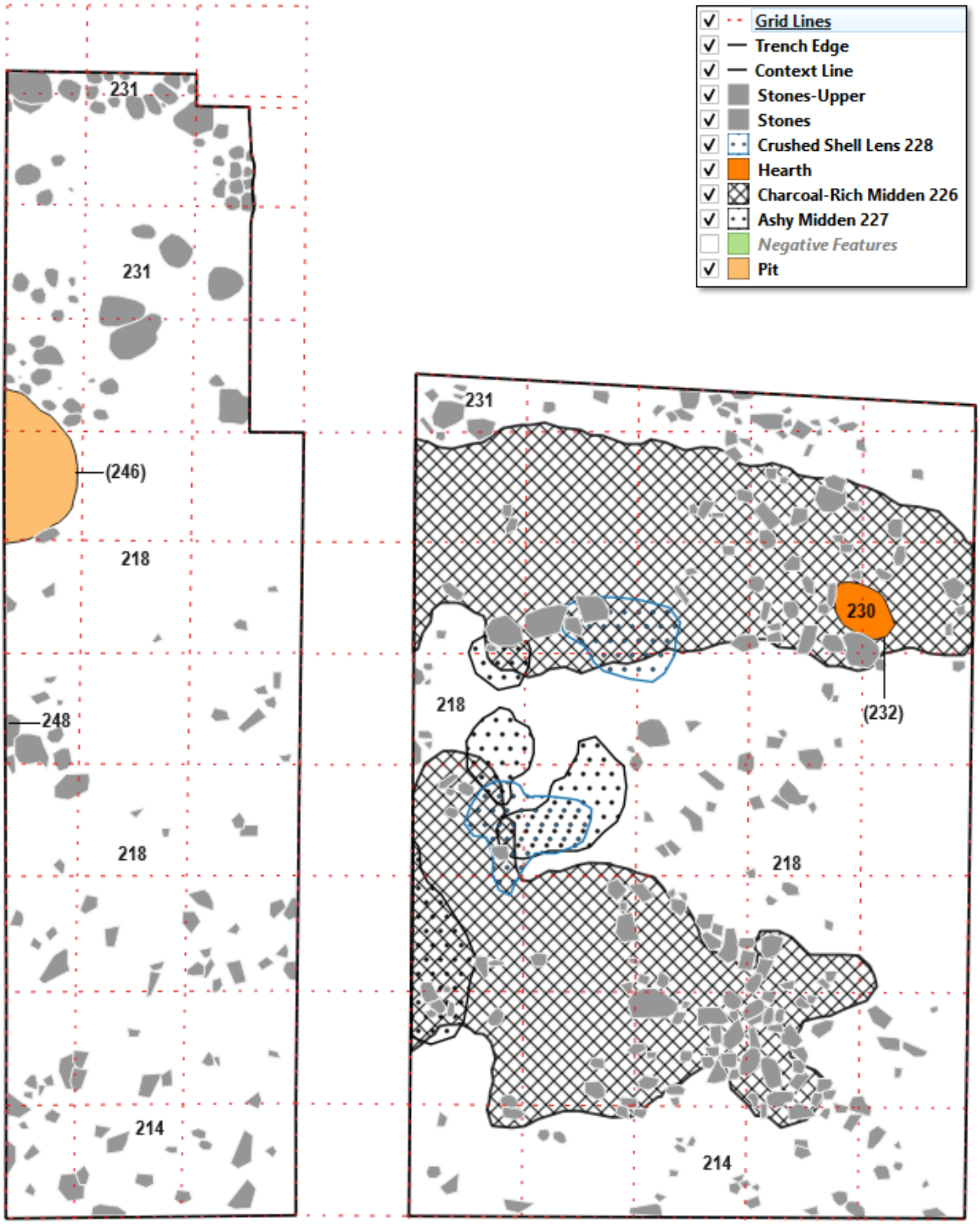


Figure 9 – *Mid-ex plan of Trench 2B showing basal midden contexts in east sector of trench and after removal of lower midden contexts in west sector of trench*

Grid Square	Spit 1	Spit 2	Spit 3	Totals	Grid Square	Spit 1	Spit 2	Spit 3	Totals	Grid Square	Spit 1	Spit 2	Spit 3	Totals	Grid Square	Spit 1	Spit 2	Spit 3	Totals
1	-	-	-		**21**	Baulk				**41**	10L	-	-	10L	**61**	Tr15			
2	20L	-	-	20L	**22**	Baulk				**42**	10L	-	-	10L	**62**	Tr15			
3	40L	15L	-	55L	**23**	Baulk				**43**	10L	-	-	10L	**63**	Tr15			
4	-	-	-		**24**	Baulk				**44**	-	-	-		**64**	-	-	-	
5	-	-	-		**25**	30L	-	-	30L	**45**	-	-	-		**65**	-	-	-	
6	-	30L	-	30L	**26**	5L	-	-	5L	**46**	80L	40L	-	120L	**66**	Tr15			
7	-	40L	70L	110L	**27**	20L	30L	-	50L	**47**	20L	-	-	20L	**67**	-	-	-	
8	-	10L	60L	70L	**28**	60L	80L	-	140L	**48**	-	-	-		**68**	-	-	-	
9	25L	80L	60L	165L	**29**	75L	75L	-	150L	**49**	-	-	-		**69**	-	45L	-	45L
10	10L	100L	20L	130L	**30**	50L	70L	-	120L	**50**	-	-	-		**70**	50L	50L	50L	150L
11	40L	130L	60L	230L	**31**	60L	20L	-	80L	**51**	-	-	-		**71**	90L	90L	70L	250L
12	30L	140L	60L	230L	**32**	10L	-	-	10L	**52**	-	-	-		**72**	80L	120L	60L	260L
13	70L	40L	30L	140L	**33**	-	-	-		**53**	-	-	-		**73**	-	-	20L	20L
14	140L	80L	65L	285L	**34**	30L	-	-	30L	**54**	-	-	-		**74**	10L	30L	-	40L
15	-	40L	30L	70L	**35**	10L	-	-	10L	**55**	50L	-	-	50L	**75**	40L	-	70L	110L
16	10L	-	-	10L	**36**	-	-	-		**56**	-	-	-		**76**	Tr Ext			
17	Baulk				**37**	20L	-	-	20L	**57**	Tr15				**77**	40L	-	30L	70L
18	Baulk				**38**	50L	-	-	50L	**58**	Tr15				**78**	Tr Ext			
19	Baulk				**39**	40L	-	-	40L	**59**	Tr15				**79**	20L	-	10L	30L
20	Baulk				**40**	-	-	-		**60**	Tr15				**80**	Tr Ext			

***Table 1** – Approximate total number of litres of samples taken by grid square and spit (the central baulk including grid squares 17>24 was not excavated, while grid squares 76, 78, and 80 were located in the trench extension where no midden material for sampling was present. Trench 15, excavated in 2015, had already been excavated down to the natural beach deposit 229)*

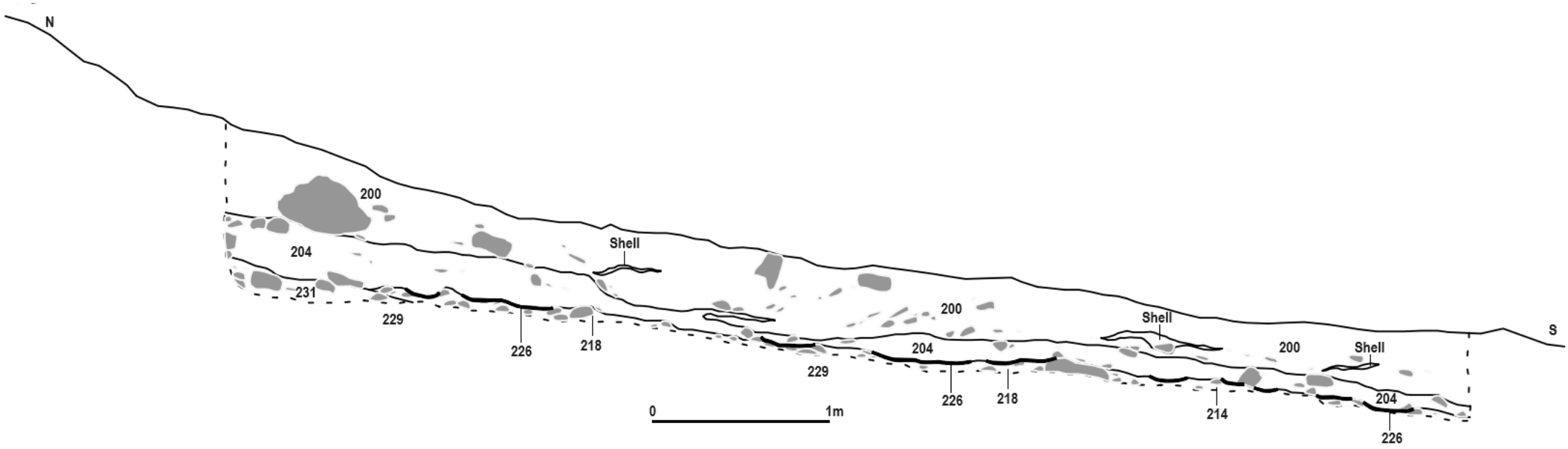
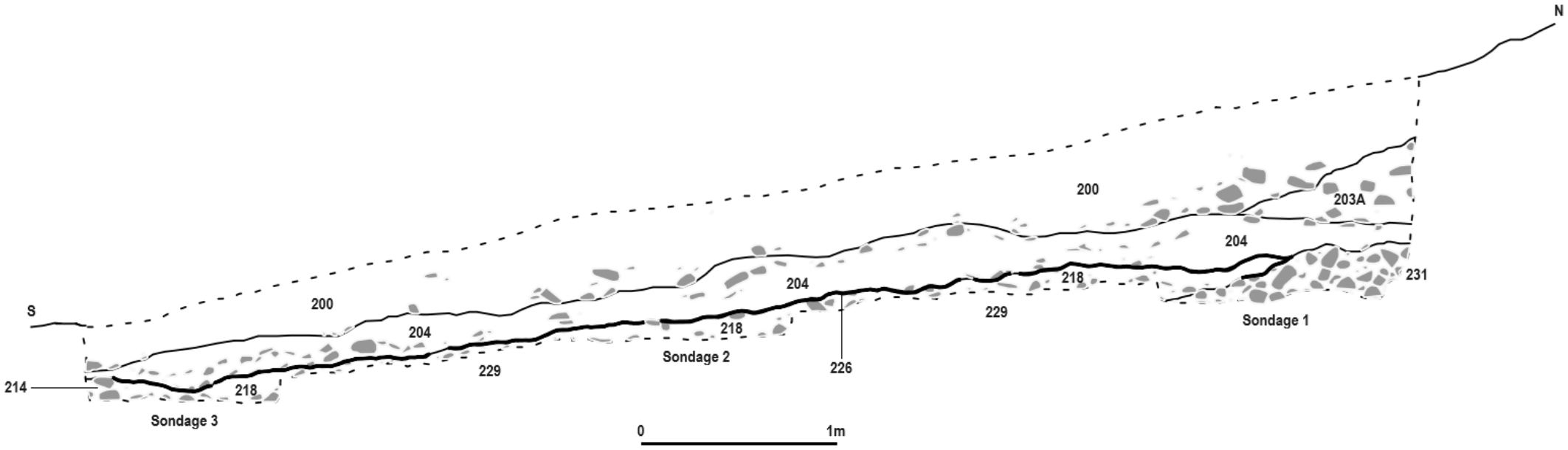


Figure 10 (top) – *West-facing section of Trench 2B (Section A-A);* ***Figure 11 (below) –*** *East-facing section of central baulk of Trench 2B showing locations of Sondages 1, 2, and 3 (Section B-B) – Scale 1:20*



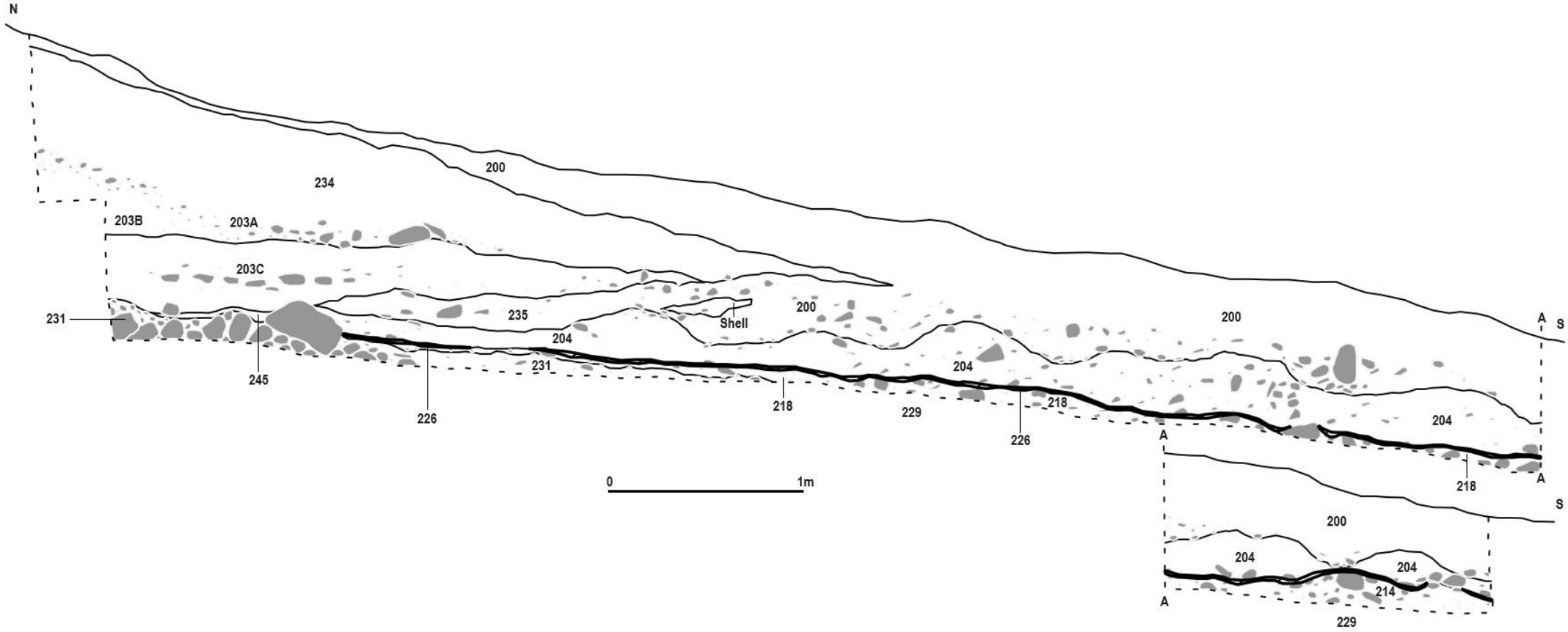


Figure 12 – *West-facing section of central baulk of Trench 2B (Section C-C) – Scale 1:20*

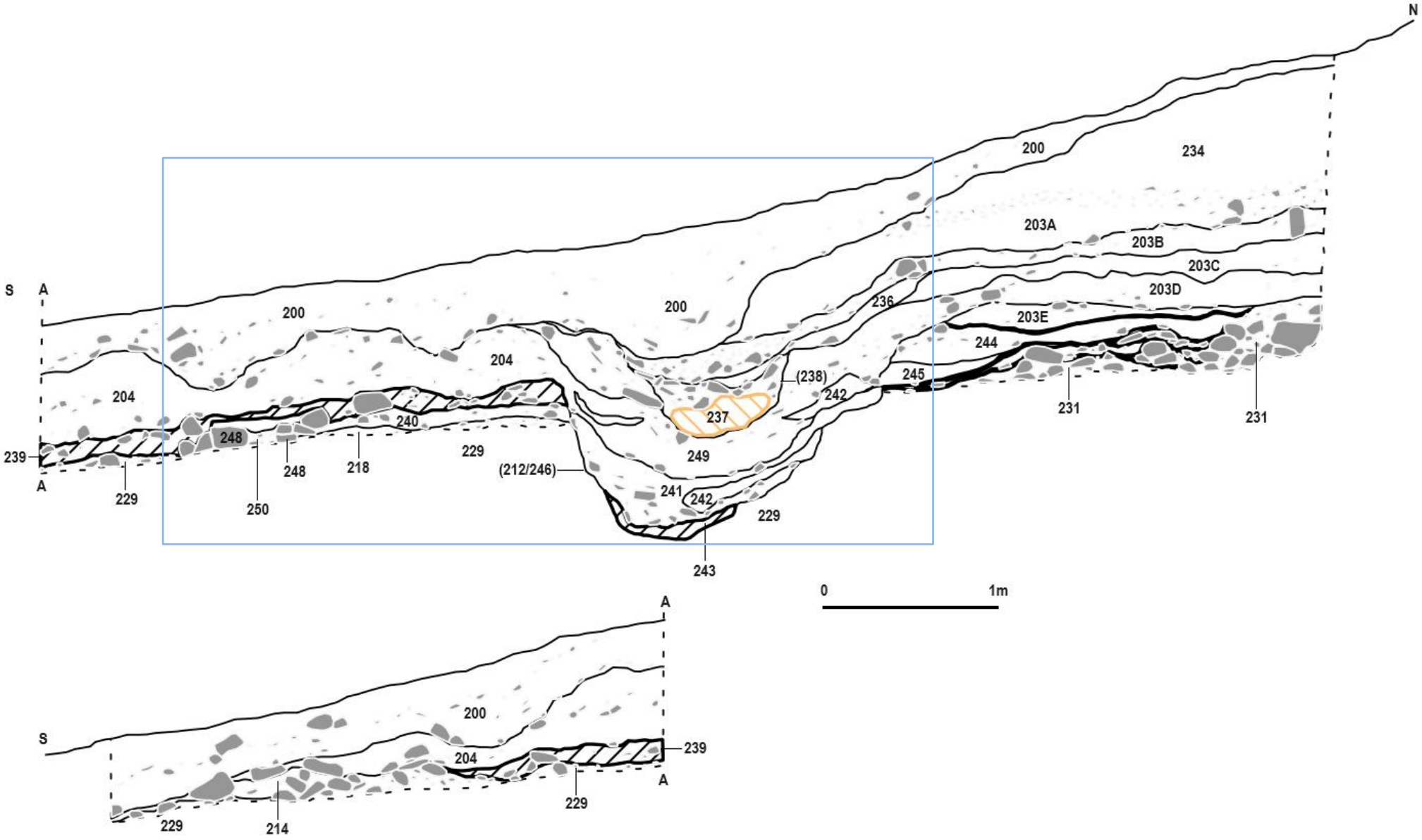


Figure 13 – *E-facing section Trench 2B Section D-D (see Figure 14 for details of section features) – Scale 1:20*

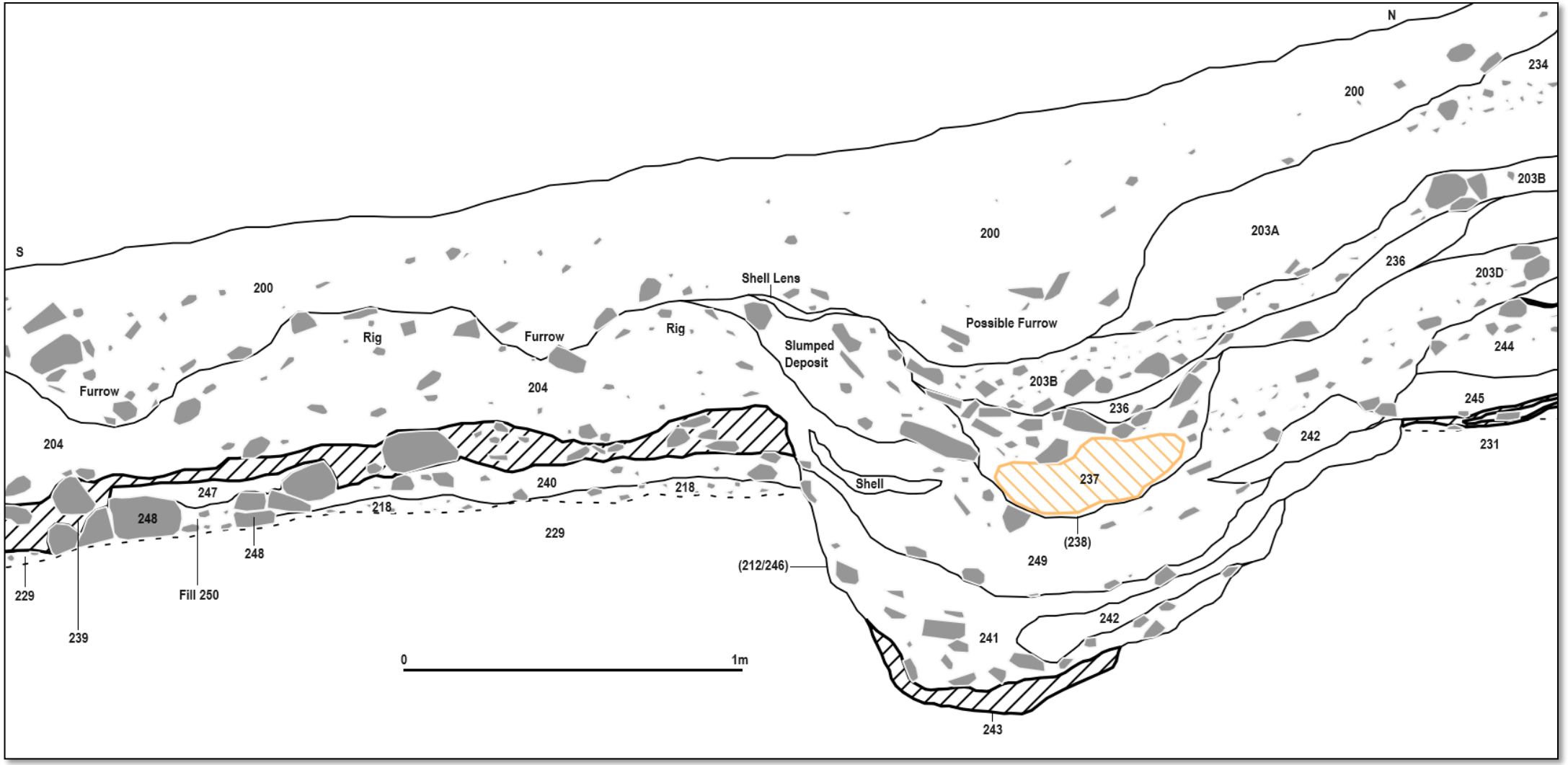


Figure 14 – *Detail of features and contexts in E-facing section of Trench 2B (see Figure 13)*

9 DISCUSSION

9.1 The 2023 excavations carried out at Tarradale and focused on Trench 2B were successful in fulfilling the main aims and objectives set out in Section **6** of this report. Generally, this included removing the remaining midden deposits identified and partially excavated in 2017 (this included extensive sampling of the deposits for wet sieving), evaluating potential features identified during the 2017 excavations underlying the midden deposits, and excavating and recording a small number of new features revealed in 2023. The fieldwork in 2023 also included extending the trench to the north and west to investigate the potential enhanced survival of midden deposits located under slope-wash from the adjacent palaeo-cliff and evaluating archaeological deposits and features identified in 2017 within the west baulk of the trench.

9.2 To maintain the methodology initiated during excavations in 2017, the midden deposits were removed by 1m grid squares and by controlled spits, with 100% sampling carried out on specific grid squares (see Table **1**, which provides details of the total grid squares sampled during 2017 and 2023 including the approximate volume in litres). The large numbers of bulk samples generated by the 2023 excavations are currently undergoing wet sieving at Tarradale, with control samples set-aside for processing under controlled laboratory conditions. In addition to materials recovered by hand during the excavations, the wet sieved samples are producing supplementary artefacts and ecofacts including small fish bones, lithics, antler fragments, and a pieced cowrie shell.

9.3 Generally, the evaluations carried out in 2015, 2017, and 2023 have proven that extensive humanly generated and modified shell layers are present within midden Site 2B at Tarradale. The complex sequence of shell midden deposits (204) comprises common mussel (*Mytilus edulis*), common cockle (*Cerastoderma edule*), edible periwinkle (*Littorina littorea*), common oyster (*Ostrea edulis*), common whelk (*Buccinum undatum*) and other less common marine shells which await specialist identification. The varied species, condition, and preservation of the marine shells across the site and by recorded spit, have the ability to inform on harvesting strategies during the Mesolithic and taphonomic processes acting on the midden. The phosphate-rich sediments created by the marine shells have also contributed to the enhanced preservation of animal and fish bone, and antler from red and roe deer. Bone does not usually survive in the acidic soils of the Scottish Highlands, so here, at Tarradale, there exists a unique opportunity to investigate subsistence strategies that are usually absent for an open-air site straddling the Later Mesolithic to Early Neolithic transition.

9.4 Now that the excavations at midden Site 2B have been concluded, the following discussions will include results from the 2015, 2017 and 2023 fieldwork seasons, bringing these together to form a provisional narrative including site formation processes, post-depositional activities and associated taphonomic processes, and a preliminary analysis of the artefacts and ecofacts recovered. This narrative, of course, will be subject to modification as the post-excavation phase of the project moves

forward including processing of the bulk samples, artefacts and ecofacts, and in light of new radiocarbon carbon dating results.

Plate 36 *– Image showing excavation of midden (204) taking place in W sector of Trench 2B with pit (212/246) and red box covering animal remains in pit (238);* ***Plate 37*** *– View S over E sector of trench showing indurated beach deposits (231) at N end of trench and remaining deposits of (218) under poles;* ***Plate 38*** *– View N over E sector of trench showing sondages 1, 2, and 3 adjacent to central baulk (left)*

9.5 The discussion will start with the earliest deposits recorded at the site, which will require new radiocarbon assays, and move forward in time through abandonment and post-abandonment periods. These later periods of the sites long history are crucial in helping us to understand taphonomic processes that have acted on the site, which include

disturbance and removal of material, and the incorporation of new sediment deposits across the area.

9.6 The natural substrate (229) underlying the 2B site comprises a gritty sediment containing rounded to sub-rounded stone clasts, generally measuring 6>20mm across, but with larger clasts 50>150mm across, which generally increase in size to the north. The surface of this deposit slopes gently, and uniformly, downslope from north to south, but shows a more uneven surface towards the northern extremity of the trench. The steps, ridges, and shallow scoops here, exhibited most clearly in the west baulk of the trench, appear to correspond with an increase in size of the stone clasts. It is possible that this uneven and ridged surface formed the high water stand of the post-glacial marine transgression, where low-energy wave action mixed and turbated the underlying deposits. Similar types of ridged features can be seen around the shorelines of the Beauly and Cromarty Firths today. Within the northern two-thirds of Trench 2B, the surface of context 229 has been cemented together (context 231), possibly through leaching of lime from the thicker deposits of overlying shell midden (204). In many ways, this hard and compact surface resembles an iron-panned deposit, and it is possible that this may correspond with low-energy wave action acting on this section of the shoreline.

9.7 Towards the south end of Trench 2B there is another concentration of larger stone clasts, forming a cobbled surface comprising rounded and subangular cobbles 0.05-0.1m across with some larger stones up to 0.3>0.4m across (214). Clusters of larger stones are distributed across the surface of this deposit on a WNW-ESE axis, especially within the southeast sector of the trench. Without more detailed analysis by a geomorphologist, it is not possible to say with any certainty what created this deposit. However, it is possible that the slight ridge formed by the larger stones and their matrices may relate to another transitional area of the former shoreline, where low-energy wave action had been concentrated during the post-glacial marine transgression. At the end of the 2017 excavations, clusters, and groups of stones in the southeast sector of Trench 2B had been interpreted as possible features associated with wind-break-type structures; the groups of stones forming settings for small wooden posts or stakes, or stones used to weigh down the associated skin coverings at their base. Similar forms of evidence have been revealed at other Mesolithic sites in Scotland including Kinloch on the island of Rhum (Wickham-Jones 1990), the Oronsay Middens (Mellars 1987), Smittons in Dumfries and Galloway (Edwards 1996, 114), Newton on Islay (McCullough, 1989), and on the island of Risga in Loch Sunart (Mann 1920; Pollard et al. 1996, 165-82; Pollard 2000, 143-52).

9.7 Overlying and surrounding the larger cobbled surface represented by (229/231) was a shallow sequence of finer deposits including a pea gravel (5>8mm across), with a gritty sand-type matrix. This formed a thin layer 10>20mm thick at the interface between the underlying cobbled surface and the overlying midden deposits. This deposit (218) may be indicative of sorting by low-energy wave action during marine transgression. This sequence of basal deposits formed the surface on which human activities had taken place and (218) contained some crushed shell fragments and ashy matrices, possibly relating to, and leached out from context (226) above. The pea gravel deposit thinned

to the south and southeast in the east sector of Trench 2B, with little surrounding the larger clusters of stones in this area (although pockets of midden (226) surrounded the stones and filled the hollows). To the north in the east sector, deposit (218) also thinned out where indurated cobble deposits (231) started to step up. Moving into the west sector of the trench, pea gravel deposit (218) also persisted through the central sector but decreased to the south where it thinned and ran out over-running context (214). It also thinned out to the north, where it abutted and partially overlay the indurated coarser gravel and stone deposit (231). It is possible that low-energy wave action collected the pea gravel in the shallow depressions formed by the shallow ridge formed by the larger cobbles and stones in (214) and the rising steps of cobbles (231) to the north, the gentle washing action removing any finer matrix material to be deposited elsewhere.

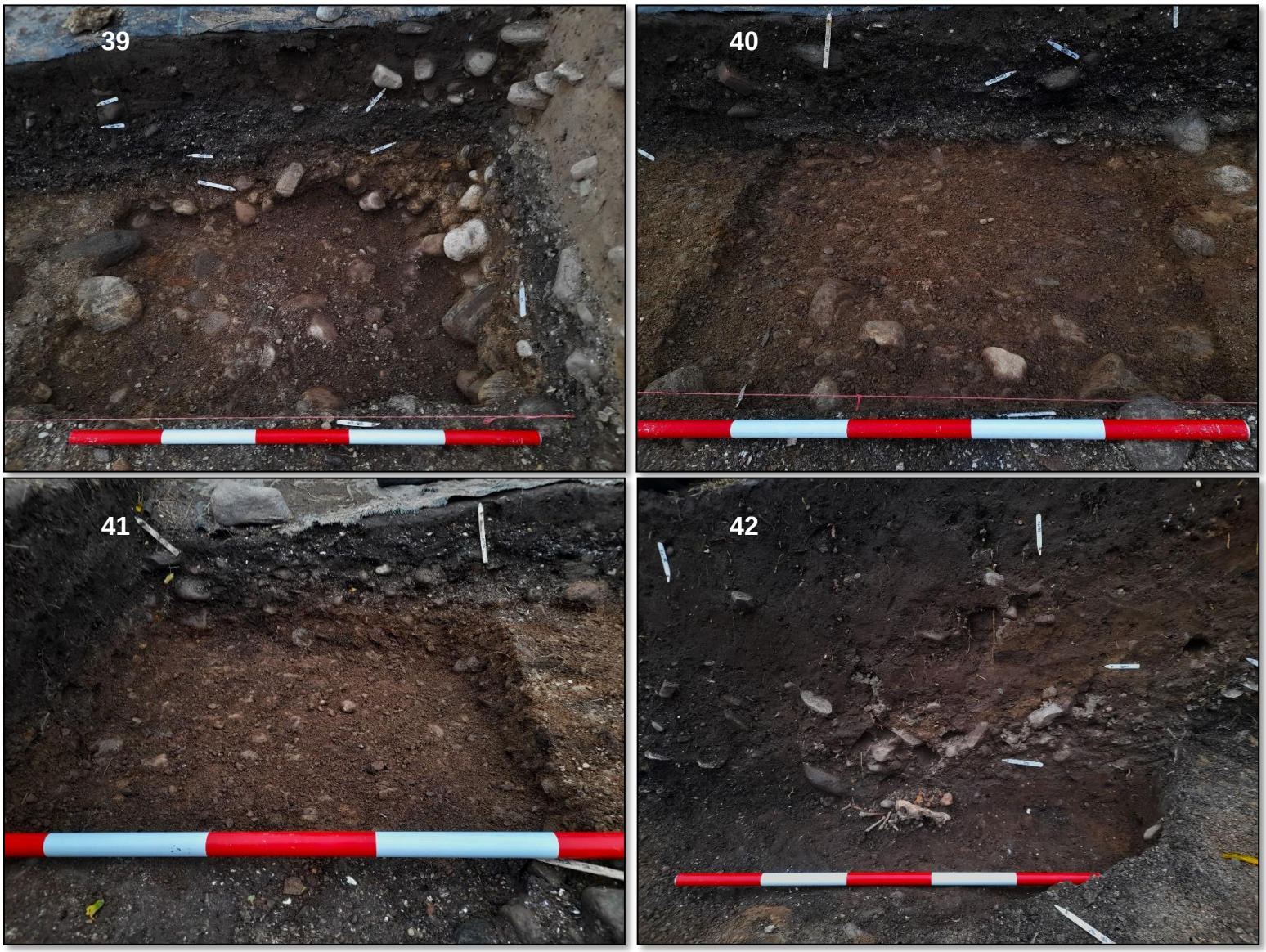


Plate 39 *– E-facing section through central baulk and Sondage 1 showing indurated cobbles (231) and underlying beach deposit (229);* ***Plate 40*** *– E-facing section through central baulk and Sondage 2 showing beach deposit (229);* ***Plate 41*** *– E-facing section through central baulk and Sondage 3 showing basal beach deposit (229) underlying cobble deposits (214);* ***Plate 42*** *– Image taken during final excavation of pit (212/246) in W sector of trench with animal bone deposit located in base of later pit (238)*

9.8 The earliest deposits overlying context (218) and surrounding the clusters of stones in the east sector of Trench 2B include thin and possibly contemporary deposits (226), (227), and (228). Pea gravel deposit (218) was mixed into the interface of the thin midden lenses which generally contained small, crushed shell fragments (but also including some complete, or near-complete shells), and some tiny fragments of animal bone, and the occasional very small antler fragment. Isolated fish bones were also noted, although it is possible more small fish bone will be revealed from wet-sieved samples from these contexts. The generally crushed nature of the marine shell in these deposits, especially the more concentrated shell fragments in context (228) with no visible matrix, may also suggest post-depositional processes acting on them. This may have included trampling, exposure to the elements over time, and low-energy wave action during marine transgression; all of which may have resulted in the sorting and grading out of the material in this context.

9.9 The thin lenses of midden overlying these crushed shell deposits were more extensive and in the east sector of the trench formed two main concentrations – one running parallel with the north baulk, and the other running from around mid-trench to the southeast where it thinned out around the southeast end of the larger clusters of stones and cobbles. To the south and southeast of the larger cobbles, the thin midden lenses (226) ran out over the more even cobble layer of context (214). When freshly excavated, context (226) and a darker area (227), located around the centre west side of the east sector of Trench 2B, appeared dark brown to black and appeared to have a high charcoal and ash content (although few fragments of charcoal were recovered). In the northeast sector of the trench, a possible shallow scoop hearth (232), with a stoney/cobble halo and a large flat slab of stone on the south side, was filled with fine ashy lenses (including some paler wood-ash) containing some crushed marine shell (230). If this was a hearth, it is one of the earliest features to be excavated at this site. The other potentially contemporary features were stone setting (248), located in the west baulk of the trench, and the large pit feature (212/246), also located centrally under the west baulk. Stone setting (248) may have formed a small post setting or a small hearth.

9.10 Thin midden lens (226) in the west sector of Trench 2B appeared more friable, and closer to the west baulk this basal midden deposit thickened. The deposit could be identified and assessed more easily in section, within the west baulk. Running north from stone setting (248) was a black, ash-rich lens of midden containing fragmented marine shell, small and fragmented animal bone and charcoal flecks, and rounded stones clasts 10>60mm across (240). This lens of material varied between 0.06>0.1m thick, continues to the north, and appears to be contemporary with the primary fill (241) of pit (212/246). Although pit (212/246) disrupts the continuation of midden lens (240), it most likely continued on the north side of the pit as context (245). However, the midden here forms a compact version of (240) and comprises a sequence of thin lenses comprising black, charcoal-rich silty deposits interspersed with finely crushed shell lenses with a grey to buff ashy matrix. The deposit here appears similar to context (226), especially within the east sector of the trench, but is much harder and has possibly been indurated with lime-rich deposits from above, similar to what is seen in

the underlying cobble deposit (231). Context (245) thins to the north as it rises over the slight steps in underlying cobble layer (231), to where it eventually stops before reaching the north baulk of Trench 2B.

9.11 Located to the north of pit (212/246) and lying over (245), is a thicker midden lens (244) comprising a compact dark brown silty sediment (hard at the surface) with a black charcoal-rich lens towards the top of the context, which is 0.1>0.22m thick. Running from the north baulk of the trench, the context has been truncated at the south end, most likely by the cutting of pit (212/246). The context also contains grey to buff lenses of ash with crushed shell and overlies indurated cobble layer (231) at the north end. The deposit contains some charcoal flecks and small lumps, along with rounded to sub-rounded stone clasts 20>120mm across. Another midden lens located to the north of the pit and sitting above context (245), comprises a mixed firm silt deposit, light buff-coloured, which contained small stone clasts >50mm across, shell fragments, some complete periwinkle shells, charcoal flecks, antler fragments, and a fragment of an antler T-axe (SF332). It is likely that this mixed deposit (203e), which is also localised and runs out before the north baulk of the trench, relates to the abandonment of the site, or a later period of activity during the Early Neolithic. The thinning and ending of contexts (244), (245) and (203e) before reaching the north baulk of the Trench 2B extension, indicates the northern limits of the midden in this area of the site.

9.12 Unfortunately, the cutting of the large pit (212/246) makes it impossible to directly relate contexts to the north and south. The sequence of midden deposits to the south of the pit, their texture, and content, vary significantly to those to the north – the latter being more compacted and display finer lenses of charcoal-rich midden interspersed with wood ash, within a matrix that is paler in colour. It is possible that the overlying slope-wash deposits to the north of the pit have created a drier sediment sequence below with limited water ingress, which has helped to form these variations. To the south of the pit, the next midden lens in the sequence, located above (240), is a black ashy lens with some marine shell, animal bone fragments, and generally rounded stones 20>100mm across (239). The lens of material has been cut through by pit (212/246) and runs south to where it thins out around 1.8m before the south baulk of the trench. The deposits runs over stone setting (248) but is separated from this by a thin lens of fragmented marine shell (247). Context (239) varies in thickness from 0.05>0.14m and was best observed in the west baulk of the trench.

9.13 During the formation of these basal midden layers, it appears that pit (212/246) remained open for long enough to receive a thin basal silt in its base (243), which was overlain by context (241), comprising a black, ash-rich midden containing abundant marine shell including some complete oyster and periwinkle shells, charcoal, animal bone, a quartz flake and half of a small flint nodule. This fill has a similar colour and matrix to context (240), which it abuts on the south side of the pit cut. On the north side, a thin lens of light brown silt (242) runs into context (241) and probably represents erosional silting from the edge of the pit cut. This suggests that the pit may have filled slowly at this time, at a similar rate to the formation of the midden deposits to north and south. However, it would appear that the secondary fill of the pit (249) was deposited

fairly quickly, with midden lens (239) forming a surface potentially contemporary with context (244) on the north side.

9.14 The major spread of midden across Trench 2B (204) formed above context (239) adjacent to pit (212/246) but was not present on the north side of this feature. The general thickening of all midden lenses adjacent to, and within the west baulk of Trench 2B, including context (204), would suggest that the main focus of the site is located here and with the bluff of the adjacent raised palaeo-cliff presenting more favourable preservation. Although context (204) retained some depth to the east and southeast as far as the central baulk, overall the depth decreases to the east where it was only 0.26m deep in the northeast corner of the trench and decreasing to 0.08m deep in the southeast corner where it runs out over cobbled beach context (214). Generally, midden (204) also decreases from north to south over the trench, where it also thins out over cobbled beach surface (214).

Plate 43 *– Image showing red deer antler tine located in midden (204), Grid 28, Spit 1*

9.15 The context of midden deposit (204) varied considerably across the trench. Generally, it contained heavily fragmented marine shell, but in the northwest sector of the trench, to the east and southeast of pit (212/246), the presence of complete marine shells increased, resembling context (240). In particular, clusters of oyster shells, along with some periwinkles and clam shells were identified and sampled. The midden contained the occasional fragment of fire-cracked stone, animal bone, antler fragments, and a relatively small assemblage of lithics. Other materials recovered from context (204) included worked bone and antler, animal, and fish bone, a small number of possible stone cobble tools, fragments of fire-cracked stone, and charcoal. These are discussed in more detail in Section **10** of the report.

9.16 Midden deposit (204) displayed evidence for reworking and natural bioturbation, with the latter including some animal burrowing and tree root activity. At this stage, without further expert analysis, it is proving difficult to explain why preservation of marine shell within the midden varies across the site. The fragmentation of the shell across the trench, including the analysis of material recovered from wet-sieving residues from the different grid squares and spits, can hopefully help in answering this important question. In addition, analysis of the breakdown of species represented by grid square and spit may also display evidence for preferential gathering strategies at the time of the site's use.

9.17 During the 2017 excavations a number of features were identified cutting into the top of midden (204) and these features were evaluated further during the 2023 fieldwork. These comprised what appeared to be a roughly oval shallow scoop (207) located within the east sector of Trench 2B; and a curvilinear, shallow ditch cut (211) running NW-SE from the west baulk of the trench and running under the central baulk to re-appear in the east sector of the trench, where it shallowed out. The upper cut (212) of pit (212/246) was also initially identified in 2017, forming an amorphous shape located against the west baulk of the trench. These features are discussed below.

9.18 The sub-oval, shallow scoop (207) appeared to have cut into the top of shell midden (204), with the cut on the south and east sides less clear where the underlying midden thins and runs out onto the cobbled beach surface (214). It was defined around its perimeter by clusters of larger stones (216/217/220), which were interpreted as possible post settings, or were the remains of stones used to weigh down a tent-like structure (tent-ring), defining an internal area around 1.9m N-S by 2.8m E-W, most of which was also respected by the spread of basal midden deposits (226/227). The hollow was filled with a yellow/buff clayey silt (205), which appeared to be sterile and devoid of any artefacts or ecofacts. The deposit most likely derived from slope-wash running off the palaeo-cliff to the north and was devoid of any stone, which highlighted the shape of the hollow, with the stone clusters around the edge (Plate **53**).

9.19 Stone setting (215) located at the northeast side of the hollow (top left in Plate **53**), displayed some similarities with stone settings recorded at other Mesolithic sites in Scotland including Kinloch on the island of Rhum (Wickham-Jones 1990), the Oronsay Middens (Mellars 1987), Smittons in Dumfries and Galloway (Edwards 1996, 114), Newton on Islay (McCullough 1989), and on the island of Risga in Loch Sunart (Mann 1920; Pollard et al. 1996, 165-82; Pollard 2000, 143-52). During the excavations in 2023 to further evaluate these features, no negative elements such as post or stake holes were identified, although concentrations of midden (204) filled some of the deeper hollows around the stones. The dark midden around the stones created a distinctive halo, leading to the initial interpretations as possible post settings. If the hollow formed a later structure at the site, possibly a skin-covered hut, there were no internal features with the exception of stone setting 215/216. One other explanation for cut (207) in the surface of the midden, is that the marine shell had been harvested for fertiliser during historic-period activities at the site.

Plate 44 *– Mid-ex image looking N through W sector of trench showing context (214) in foreground, (218) under scales, pit feature (212/246), and trench extension;*
Plate 45 *– View N over W sector of trench showing new control baulk and exposed basal beach deposits (229) to each side, with pit (212/246) in left baulk*

Plates 46-51 *– Post-ex sequence of images showing the W baulk of Trench 2B (E-facing) with stone setting (248) visible in* ***47***,***48*** *and* ***49****, cut of pit (212/246) in images* ***49>51****; and indurated cobbles (231), midden lenses (245), (244) and (203e), and overlying slope-wash deposits in image* ***51***

Plate 52 *– Modelled view of W baulk (E-facing section) of Trench 2B with boxes and attached images showing stone setting (248) at left, and right image showing indurated beach cobbles (231) and overlying midden deposits (245), (244) and (203e). Overlying slope-wash deposits above. Note hollow in cobble layer (231) which may relate to wave action at the high tide mark, or a possible pit or post-setting*

Plate 53 – *W-facing section of mini-baulk, showing fill/cut 205/207 in section, and stone settings (215) and (216) at the back and (220) lower right, with underlying midden (204)*

9.20 The gully-type feature (211) cut into the top of midden (204) had gently sloping sides and varied in width between 0.55-0.65m and attained a depth of 0.12-0.26m. The feature widened at the northwest end where it ran up against pit cut (212) and ran under the west baulk of the trench. Where the gully-type feature changed direction at the northwest end, it appeared to underlie the northwest side and cut of pit (212). From the west baulk of the trench, the gully feature arced to the southeast, running under the central baulk, and terminating in the east sector of Trench 2B. The feature was filled by a buff-brown mottled silty soil (210), a possible slope-wash deposit, that contained a number of complete oyster shells, some of which were found in a vertical plane in the base of the fill. The fill also produced a few small fragments of animal bone and antler, and an antler fragment with a possible perforation towards one end (SF254). Initially interpreted as a foundation gully for a temporary structure, this feature most likely relates to early agricultural activities taking place at the site during the Historic period and may be the remains of a furrow.

9.21 The undulating nature of the top of the main midden deposit (204) has already been briefly mentioned. In section, within all of the recorded baulks but in particular the west and central baulks, the top of the midden resembled a series of uneven waves. On completion of the excavations in 2023, and including initial assessments made after the trial trench evaluations in 2015 and 2017, we can be more certain in our interpretations that these undulations relate to the creation of rig and furrow cultivation. Several important pieces of evidence substantiate this interpretation including the mixing of the underlying midden (204) into the upper ploughsoil (200) creating what appeared to be a ‘diluted’ version of (204), with the mixed marine shell and soil thrown onto the top of the surviving rigs, and clusters of stones that had gathered together in the base of some of the furrows. The sediment filling the furrows

(202) was a slightly different shade of colour to the main topsoil/ploughsoil (200) and contained some stone clasts, many of which followed ‘tip-lines’ into the furrows.

Plate 54 – *Excavation in Trench 2B in 2017 showing the removal of the upper ploughsoil (200) and fill of furrows (202) revealing the upper, wave-like surface of midden (204)*

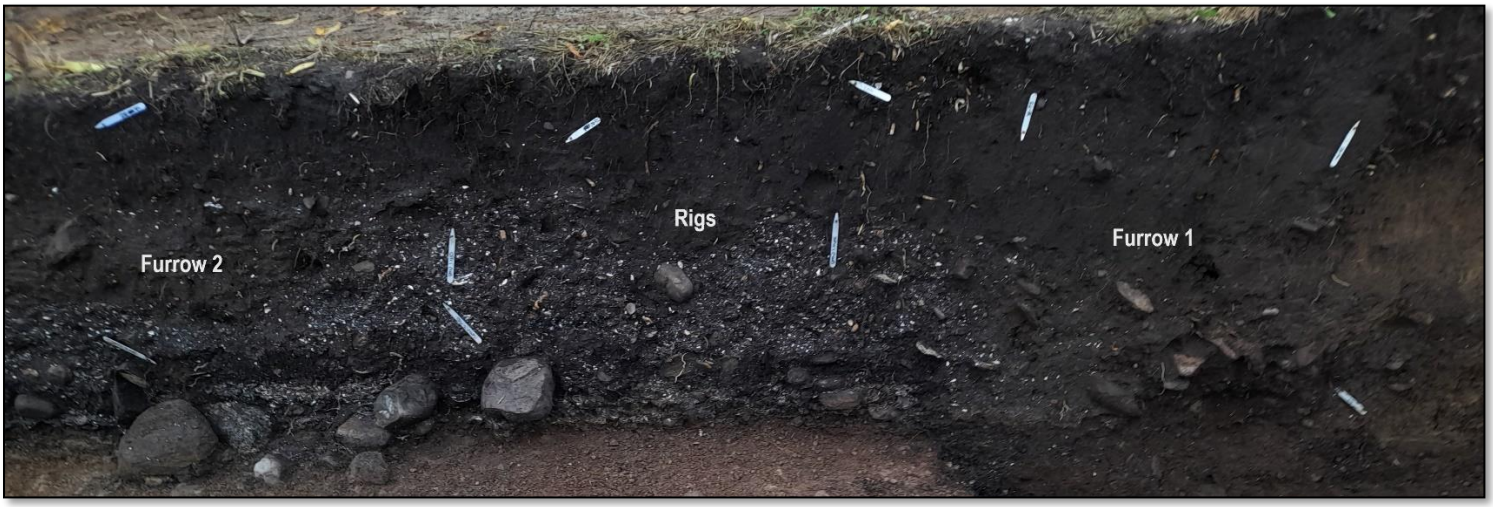


Plate 55 – *Section of W baulk of Trench 2B showing rig and furrow cultivation cutting underlying midden (204)*

9.22 These rigs ran across the base of the slope adjacent to the palaeo-cliff on a NNW-SSE alignment and may have extended further to the south before later machine ploughing removed them. The outline of the rig and furrow was also identified as a landscape feature on the current ground surface, their survival due to the small area of ground at the base of the steepening palaeo-cliff being not suitable for later, heavier machine ploughing. The 1788 estate map of Tarradale also clearly shows rigs in this area at the foot of the steepening bank of the palaeo-cliff. The profile of the rigs can be seen to best advantage in the west baulk of the trench (Plate **55**) and become less evident moving to the east where shallower midden deposits and a generally decreasing depth of overlying sediments have resulted in shallower features.

However, they can still be seen in the east baulk of the trench. The west-facing section of the central baulk presents a rather more confusing picture. Here, the northern rig appears to have slumped downslope (to the south) with midden material (204) pushed into the adjacent furrow. A wedge of sediment located to the north (235) overlying and cutting into midden (204) extends to the north where it has been over-run by slope-wash deposit (203c). The wedge of sediment, which comprises a reddish-brown material contains the occasional shell fragment, animal bone and antler. It may represent the remains of a furrow, or an earlier slope-wash deposit. However, it is possible that this context relates to the final activity and abandonment of the site, being contemporary with (203e). A large fragment of worked antler (SF362) was recovered. Several small and abraded sherds of red-glazed medieval ceramic were recovered from the fill of the rigs, suggesting these features may be early evidence for agricultural practices at Tarradale. Post-medieval ceramics and glass sherds were also recovered from the fills and sediments associated with these features, although these artefacts may have been introduced by later agricultural activities, along with antler, bone and lithics (most likely disturbed from underlying midden (204) during the cutting of the rig and furrow).

9.23 One important find recovered on the west side of cut feature (207) at the interface between the underlying midden (204) and the base of deposit (202) filling one of the furrows, was a virtually intact antler T-axe (SF203). Close by were fragments of antler attached to cranial fragments (SF205), also recovered from the interface between (204) and (202). These finds may relate to activities at the site during the Late Mesolithic/Early Neolithic transition, including the use of a potential structure represented by hollow (207), or were disturbed from context (204) and redeposited during the cutting of the later rig and furrow cultivation.

9.24 An interesting discovery during the 2023 excavations in Trench 2B was animal bone deposit (Sample 23/394) recovered from the fill (237) of pit cut (238). It appears this pit had been excavated within, or adjacent to, a furrow relating to the later cultivation remains, or within a depression in the ground created by slumping from the earlier, underlying pit (212/246). The disarticulated bones of this small carnivorous animal (possibly a dog or fox) had been deposited in the base of the pit. A full analysis of the skeletal remains will be required to answer specific questions such as if the animal was dismembered before deposition, species, and age. One thing we can be certain about is that the skull of the animal had been split quite neatly along a horizontal plane – an unusual method when compared to the more normal technique of splitting animal crania along the saggital line (a vertical cut splitting the crania in half), to possibly access the brain.

9.25 The remaining deposits to discuss at the Midden 2B site at Tarradale relate to slope-wash activity, which generally took place sometime after the Mesolithic-Neolithic transitional site had been abandoned; activity which continued well into the historic period. Although slope-wash material had been identified at the site during the excavations in 2017, including the quite sterile sediments filling earlier cuts and hollows in the top of the midden within the east sector of the trench (including cut of hollow (207)), the most informative evidence for slop-wash came from the extension made to Trench 2B in the northwest corner. This extension, which was cut into the base of the sloping palaeo-cliff to the north, enabled the excavation team to establish the limits of the archaeological site in this area and to observe the series of deposits relating to slope-wash activity overlying the midden. Another important input of material that may have contributed to the slope-wash deposits was highlighted by Eric

Grant, the project leader. Eric had noted and photographed some years back a significant bank of material running along the top edge of the palaeo-cliff, extending from the WSW to the ENE and overlooking the 2B midden site. This bank of material may have derived from modern machine ploughing moving the material downslope to this location and may also have had input from slope-wash from the sloping field to the north, or may be related to the medieval castle that was located in this area.. At some stage in the recent past, this bank of material was pushed over the edge of the palaeo-cliff, coming to rest on the southern slope of this cliff, and at its base.

Plate 56 *– The N end of the W baulk of Trench 2B (within the trench extension) showing indurated cobbles (231), and the overlying midden deposits (245/244/203e) petering out over the cobbles, with slope-wash deposits above*

9.26 Within the Trench 2B extension, the west baulk of the trench displayed several slope-wash deposits interspersed with sediments that may relate to the formation of a ground surface. Above context (203e), which most likely relates to the latest activities and abandonment of the midden site during the Late Mesolithic/Early Neolithic transition, context (203d) comprised a mid-brown silty sediment containing rounded and angular stone clasts 20>80mm across, marine shell fragments, some complete oyster and periwinkle shells, and produced three fragments of glazed redware (SF349) of possible medieval date, and three small quartz flakes. This deposit had been cut through by later pit feature (238). Above this, context (203c) included a light buff/yellow lens of compacted silt disrupted by fine roots and animal burrowing. The deposit contained small stone clasts 20>50mm across and the thinning lens ran to the south, merging into context (236), the upper fill of pit (238). This context proved to be

quite sterile and produced no finds. Overlying this context was (203b), a light brown silty sediment containing small, rounded stone clasts >12mm across. This deposit contained more stone in relation to (203c) below and extended to the south, running into the top of pit (238). No finds were recovered from this context. Context (203a), the overlying and thicker lens of material, comprised a light orange intermittent silty sediment containing little stone. However, at the interface with (234) above, a band of pea-gravel and small rounded stone clasts was noted, while pea gravel and small stone clasts formed a more marked lens at the base of the deposit. This lens of material extended to the south, partially overrunning pit (238). Context (203a) produced a mix of modern material including glazed ceramics, roofing slate, iron fragments, coal, and some animal bone. The thick wedge of material above (234), comprised a mid to light brown silty sediment with a few mainly rounded stones >40mm across. This lens of material was most prominent in the northwest corner of the trench where it attained a depth of 0.8-0.9m, this dipping to the south and thinning. Excavation of this deposit produced some modern material including fencing wire, roofing slate, and small sherds of post-medieval glazed ceramics and glass.

9.27 The S and W-facing sections of the trench extension displayed some major variations in these upper contexts when compared to the E-facing section described above. Here, the individual lenses of material proved more difficult to define, partly due to baulks containing less moisture. The compact and dry nature of the deposits was especially notable during excavation, especially in the northeast sector of the trench extension. The colours of the deposits also varied to those seen in the west baulk. It was also obvious that some contexts including (203e) and (203d) were not present in the east baulk, suggesting that these lenses of material thinned and ran out moving from west to east. This observation substantiates earlier interpretations in this report that the focus of the midden site lay towards the northwest of Trench 2B. Analysis of the Ordnance Survey contours show they run in a NNW-SSE direction, suggesting that the former shoreline and palaeo-cliff above, ran on this alignment.

9.28 Contexts (203d), (203c), (203b) and (203a), appeared as relatively horizontal lenses of material within the limits of the trench extension. If these were indeed slope-wash deposits, their source must have been from the palaeo-cliff. Containing marine shell, quartz flakes, and the three possible sherds of medieval glazed redware, it is possible that context (203d) formed a ground surface that developed above the abandonment horizon of the underlying prehistoric site. However, the finer, silty deposits of (203c) and (203b) produced no artefacts, so may relate to slope-wash from the adjacent slopes of the palaeo-cliff. Contexts (203a) and (234) both contained modern material, displayed a profile that slopes to the south (especially context 234), and contain two distinctive lenses of generally small stones. It is probable that these deposits related to a combination of slope-wash activity and to the major event involving the pushing of the bank of material, located at the top of the slope, over the palaeo-cliff in the recent past (Grant pers comm).

Plate 57 *– Image showing the N end of the central baulk of Trench 2B (W-facing) showing indurated cobble deposit (231), overlying midden (204) running over the cobbles, and slope-wash deposit (203c)*

Plate 58 *– Image showing central section of same baulk (W-facing) showing basal beach deposit (229), overlying midden (204), furrow containing (200) to left, and mix of soil and midden cast up to the right to form the rig*

9.29 The importance and chronology of Midden 2B site at Tarradale has been confirmed by the fieldwork campaigns of 2015, 2017, and 2023, and through a programme of post-excavation analysis including radiocarbon dating. The post-excavation analysis will continue into the foreseeable future, paving the way towards final publication.

Section **10** will set the site within its wider context and includes recommendations for the continuing programme of post-excavation analysis and radiocarbon dating.

Plate 59 *– Image showing the S end of the W-facing section of the central baulk of Trench 2B, the undulating surface of midden (204), and a prominent furrow in the centre above the large stone, containing a ruckle of smaller stones that fill the base of the furrow*

Plate 60 *– Image showing the E-facing section through pit (212/246) with midden-rich basal (243) and primary (241) fills, upper secondary fill (249), and upper pit (238) – after removal of animal remains*

10 CONCLUSION AND RECOMMENDATIONS

10.1 The excavations undertaken on shell midden Site 2B at Tarradale in 2015, as a part of the *Tarradale Through Time Project* in 2017, and comprising the *TAT23* fieldwork in 2023, have confirmed Late Mesolithic activity, which also likely extended into the Early Neolithic period. This section of the report discusses the wider results of these excavations, includes recommendations for the continuing programme of post-excavation analysis, and sets the site into its wider Scottish and European context.

10.2 The archaeological investigation of shell middens has a long and rich history. By the mid-1830s, the presence of artefacts found with large accumulations of shell along the Danish coast had successfully demonstrated that these sites were the result of human activity rather than natural processes. At about the same time in other parts of Europe, shell middens were also being discovered and written about – a process which continued throughout Europe as time went on. Until recently, European Atlantic shell middens attracted only sporadic interest from archaeologists and scientists. However, there has been a notable resurgence in the excavations of shell middens over the last few decades which has been accompanied by the development of a range of new scientific methods applicable to shells and other midden components. There now exists a sizeable amount of information on shell middens, their variability, and the insights that they have revealed through scientific investigation.

10.3 The role of the rich coastal and marine biotopes of Atlantic Europe in sustaining relatively dense Mesolithic populations and thereby facilitating, delaying, or otherwise moderating the introduction of prehistoric farming into Atlantic Europe has been the focus of a long-standing and unresolved debate. Opinions are strongly divided both about the degree of discontinuity across the transition and the processes involved - cultural, demographic, social or environmental. Recent stable isotope work (d13C and d15N) on human bone has re-opened the debate by emphasising the contrast between marine-based diets in the late Mesolithic and terrestrial-based Neolithic ones, results which seem to be in conflict with other sources of palaeoeconomic data. Therefore, the Mesolithic-Neolithic transition, and the debate over whether Neolithic populations turned their backs on the sea, forms an overarching theme in discussions focusing on coastal shell midden sites, especially in Western Europe.

10.4 Many questions have evolved out of such discussions relating to shell midden sites and their distribution around our coasts. These include potential bias introduced through archaeological investigations, how the resource potential of certain areas may have had an effect on site distribution, and to what extent does relative sea level change affect our understanding of coastal distribution of sites through time? The latter may have had a major impact on site taphonomy and may well form an increasing threat to coastal sites in the future as a result of climate change and rising sea-levels.

10.5 Middens have always loomed large in the study of Mesolithic Europe (Milner et al. 2007), including here in the British Isles. In Scotland, the historical legacy of the

'Obanian' has exerted a powerful influence on perceptions of coastal habitation and the significance of shell midden deposits; so much so that midden sites have been considered a defining characteristic of the Scottish Mesolithic, often viewed as part of a putatively mobile life cycle. This site-type is relatively rare in the Scottish Mesolithic and new Mesolithic sites are rarely middens. Existing midden sites display little consistency in size and content, with some containing evidence for internal structures; and others appearing to result from specialised activities. Middens occur in a variety of locations from rock-shelters and caves to open-air shorelines and there is considerable chronological variation. Some middens go on to be used into later periods and are often associated with Neolithic and Bronze Age activity, including burial (Pollard 1996; Saville et al. 2012). Nevertheless, research has tended to group them together as if they represent a uniform phenomenon, despite the fact that in many cases all that they share in common is the presence of marine shells within a coastal location.

10.6 The Mesolithic of Scotland has generally been characterised by lithic scatters, distinctive bone and antler artefacts, and shell middens, especially in coastal locations (ScARF 2012). Few in situ features survive on many sites, while organic or faunal material is usually absent on open-air lithic scatter sites. However, a wealth of faunal evidence is preserved in the alkaline conditions of some of the shell middens and within caves and rock shelters. Shell midden sites are by no means common in the Scottish Mesolithic record, but because of the rich environmental and artefactual remains they produce, they play a dominant role in accounts of the period. This makes the investigation of the shell midden sites at Tarradale of paramount importance to the understanding of some of the earliest settlers of Scotland, including the associated economic evidence. The period as a whole provides the foundation for the human occupation of Scotland and is crucial for understanding prehistoric society, both in Scotland and across Northwest Europe.

10.7 The end of the 1970s witnessed the start of a campaign to investigate shell middens including the large and enigmatic sites along the Forth Valley (Sloan 1982; 1983). The sites, located at Nether Kinneil, Inveravon, Mumrills, Cadger's Brae and Braehead, are extensive, extending to between 27 metres and over 150 metres in length, and primarily made up of oyster shells. The anthropogenic origin of the middens has continued to be suspected, however the presence of anthropogenic indicators including butchered domestic animals and ceramics at Nether Kinneil suggests otherwise, while radiocarbon dates place activity at the site in the 5th millennium BP (5-4000 cal BC). Some of the sites have produced earlier dates in the 6th millennium BP (6-5000 cal BC), thus a Mesolithic date for some of the sites at least seems probable (Ashmore 2004b). These findings have been backed up by the discovery of a series of Mesolithic bone and antler tools from the same area, but there has been no detailed work of the scale carried out on the west coast sites, and that which has taken place shows that some of these middens continue in use into the Iron Age (Sloan 1982).

10.8 Other importance shell midden sites were investigated on the island of Oronsay between 1970 and 1979 (Mellars 1987). Scottish middens rarely occur as upstanding monuments, so the large, mounded middens of Oronsay are almost unique. Only Risga, Loch Sunart, Highland, provides an example of an upstanding midden and it is much smaller in size. Other Scottish middens are also much smaller than those seen on Oronsay. At Loch a Sguirr, Skye, little more than a vestige of midden survives inside a small rock-shelter (Hardy and Wickham-Jones 2009). Perhaps this is closer to the norm for Mesolithic sites generally. Even where conditions are favourable it is the presence of shells rather than bone that gives the Mesolithic midden its characteristic form. All sites must have contained some organic material, but most of it has decomposed over the millennia to leave only a black sticky deposit. Between Oronsay and Loch a Sguirr a series of sites completes the size range. The recently excavated midden at Sand, Applecross, measures roughly 8 x 8m (no more than 50 cubic metres) and could have built up over one or two intensive episodes of shellfish exploitation (idem. 2009). That at An Corran, Skye, on the other side of the Inner Sound, is larger and has Neolithic and later activity in the upper levels, including burials (Saville et al. 2012).

10.9 The middens of the well-known Oban Cave sites are difficult to estimate in terms of size due to the early date of excavation and the fact that they were often disturbed before archaeological work took place. This latter factor also applies to those Oban sites discovered in recent times such as Raschoille (Connock 1985) and Carding Mill Bay (Connock et al. 1992). In the east of Scotland there are fewer surviving middens, but the best known, at Morton, was neither upstanding nor large, though upstanding middens may have existed along the mouths of the River Tay (e.g. Broughty Ferry; Lacaille 1954), and around the Moray Firth (e.g. Milltown of Culloden; Wordsworth 1992).

10.10 Many middens date to the later part of the Mesolithic: Oronsay, Morton, and the Forth valley sites all have dates in the fourth and fifth millennia BC (Ashmore 2004a; 2004b). There are other midden sites with earlier dates however, such as those excavated at Sand, Druimvargie (Oban), and Ulva; all of which have dates that relate to the sixth and seventh millennia BC (Ashmore 2004a; 2004b). The comprehensive list of dates held in the ScARF data list serve as a reminder that middens can occur at any point in the Mesolithic, but can continue through into the Neolithic, and even later periods of prehistory (Table **2**).

10.11 The differences in midden composition are not confined to food remains. There is evidence for internal structures at Oronsay and Morton, but not at Sand or An Corran. There is also variation in the artefactual component, though this is more difficult to quantify due to the differing standards of excavation over the years. Some middens contain microliths (Sand), others do not (Oronsay). The lithic assemblages often lack formal ‘retouched’ tool types, such as scrapers. Few midden excavations have considered remains lying outwith but adjacent to the midden. The fieldwork at Risga yielded large quantities of lithic artefacts including knapping debris, microliths, and scrapers from an area to the side of the midden (Pollard et al. 1996), and these were

also present at Morton (Coles 1971). It would therefore appear that midden data are essentially incomplete until the adjacent non-midden areas that relate to each site have been excavated. At Sand, for example, large quantities of heat-fractured stone were found on the slope below the midden. In other (later) circumstances this might have been considered more akin to the remains from a burnt mound, but at Sand it was regarded integrally as evidence of the broader spectrum of activities that had taken place there (Hardy and Wickham-Jones 2009). Bone and antler artefacts such as bevel-ended tools are present on many sites, as is a range of cobble tools including hammerstones and bevelled pebbles.

Site Years BC	**7500-7000**	**7000-6500**	**6500-6000**	**6000-5500**	**5500-5000**	**5000-4500**	**4500-4000**	**4000-3500**
Druimvargie, Oban	X	X	X					
Sand, Applecross		X	X	X	X			
An Corran, Skye		X	X		X			X
Raschoille, Oban		X	X	X	X			X
Ulva, Island of Ulva		X	X			X		X
Castle Street, Inverness		X	X	X				
Loch a Sguirr, Raasay		X	X					
Lon Mor			X		X		X	
Morton B				X	X	X	X	X

Site Years BC	7500-7000	7000-6500	6500-6000	6000-5500	5500-5000	5000-4500	4500-4000	4000-3500
MacArthur Cave, Oban				X		X		X
Risga, Loch Sunart					X	X		
Caisteal nan Gillean, Oronsay					X	X	X	
Forth Valley sites					X	X	X	X
Cnoc Sligeach, Oronsay						X	X	X
Cnoc Coig, Oronsay						X	X	X
Priory Midden, Oronsay						X	X	
Muirtown, Inverness						X	X	
Carding Mill Bay, Oban							X	X
Caisteal nan Gillean 2, Oronsay							X	X

Site Years BC	7500-7000	7000-6500	6500-6000	6000-5500	5500-5000	5000-4500	4500-4000	4000-3500
Site 2A, Tarradale (upper and lower terrace)				X			X	X
Site 2B, Tarradale (lower terrace)						X	X	X
Site 2D, Tarradale (upper terrace)		X	X					
Site 2E, Tarradale (upper terrace)			X					
Site 1C, Tarradale (lower terrace)								X

Table 2 – Date spans for midden sites in Scotland (information from Scarf 2012, Ashmore 2004a and 2004b, and Grant 2024, pers comm). NB: these dates are based on a variety of raw materials, and some were taken several years ago. The dates from Morton A have not been included because of uncertainties over the (mixed) sample.

10.12 The fieldwalking and excavations carried out at Tarradale have provided solid evidence for midden formation along the shores of the Beauly Firth – within an area generally neglected in the past for Mesolithic and hunter-gatherer-fisher studies. Indeed, the discovery of at least five shell midden sites at Tarradale, a midden site at Muirtown, Inverness (Myers and Gourlay 1991), and two shell middens around Munlochy Bay (HHER MHG7108; Birch pers comm.), clearly display procurement of shellfish and other resources in the area during the Mesolithic and Mesolithic-Neolithic transition. The site at Muirtown, Inverness, produced a shallow shell midden and the seemingly patchy nature of the shell deposits suggested a series of short-term occupations, with the well-defined concentrations of particular shellfish species representing the refuse from individual gathering trips or meals. However, the absence of stone tools and debitage, combined with the limited evidence for exploitation of other food resources other than shellfish, suggested a restricted function for this site. A single radiocarbon date obtained from Muirtown indicates

activity for the earliest sequence of deposits in the 4th millennium BC, the final stages of the Later Mesolithic.

10.13 The shell middens that have been investigated to date at Tarradale have shown variations in the marine shells and other food remains they contain, while there is also considerable variation in their artefactual component. Test-pitting of the shell middens at Sites 2A and 2D produced antler waste, animal bone, and lithics. The shellfish remains from Site 2A included oyster, periwinkle, mussel, and cockle, while animal bone generally comprised deer (*Cervus*) and cattle (*Bos*). The more thorough and extensive trench excavations at Site 2B also recovered a similar shellfish assemblage and in some areas of the trench particular species dominated. Hopefully, the wet sieving and sorting of residues will shed more light on the distribution of various types of shellfish across the trench, both spatially and through time.

10.14 More animal bone and antler was recovered from Trench 2B at Tarradale, with the assemblage so far dominated by cattle (*Bos*) and deer (*Cervus*), the latter certainly including antler from mainly red, but also some roe deer. Pig (*Sus*), most likely wild boar, is also well-represented, with smaller amounts of horse, goat or sheep, some cetacean bone, pine marten, and cat. However, due to the fragmented nature of the bone, many elements could only be assigned to large, small, or indeterminate mammal/ungulate. Identifiable bird bone included auk (guillemot or razorbill), Galliform, and a single talon from an eagle species, possibly a Golden Eagle. The Tarradale talon is unburnt and not accompanied by any other eagle bones, so it is possible that it had been collected and kept as a piece of personal adornment, or as a keepsake (Smith 2019). Further analysis of the animal bone is required (especially the assemblages recovered in 2023) to say with more certainty if the cattle bone belongs to the now extinct wild aurochs (*Bos primigenius*) or their domesticated descendants (*Bos taurus*). Bone survival in general is rare on open-air Mesolithic sites in Scotland, mainly due to various taphonomic processes acting on them and the generally acidic soils. At Tarradale, as with a small number of other sites across Scotland (mainly along the west coast), bone survival can be generally attributed to their burial within the shell midden environment, where the pH of the acidic soil has been neutralised, or at least raised. However, many of the bones from Tarradale display signs of bioerosion caused by, among other things, bacteria, and fungal hyphae, the results of which are sometimes known as ‘rootlet marks’ (idem 2019). It is likely that much organic material including animal and fish bone has been lost through general degradation in the Tarradale middens.

10.15 Fish bone recovered from the midden was mainly small, but preliminary analysis in 2015 identified Saithe (*Pollachius virens*), Cod (*Gadus morhua*), Herring (*Clupea harengus*), Plaice (*Pleuronectes platessa*), and Goby (*Pomatoschistus microps*). The fish remains recovered are further evidence of anthropogenic activity at the Tarradale middens including fishing from inshore shallow waters, from boats close to the shore, and within tidal pools (Ceron-Carrasco 2015).

10.16 Only the charcoal recovered from the 2015 excavations has so far been subject to analysis (Ramsay 2016). The carbonised assemblage contained a diverse range of charcoal types including alder (*Alnus cf glutinosa*), birch (*Betula spp*), hazel (*Corylus cf avellana*), oak (*Quercus spp*), ash (*cf Fraxinus*), Scots pine type (*Pinus sylvestris*), elm (*Ulmus sp*), and willow (*Salix spp*). Fragments of carbonised hazel nutshell were also recovered. The charcoal recovered from the site is consistent with the types of trees that would have been available in the local woodlands throughout much of the Holocene period. However, the wide range of wood types that have been used as domestic fuel (particularly oak and elm) is more indicative of an earlier prehistoric date as the local woodlands would still be relatively undisturbed (idem 2016).

10.17 The initial assessment of the lithic assemblage carried out by AOC Archaeology Group after the 2017 excavations at Trench 2B (Engl 2018), identified a small range of raw materials had been utilised at the site. These included a white, grainy quartz, a translucent, grey quartz with good knapping properties, quartzite, and crystal quartz. Supplementary materials consist of flint, and chert. The flint is typical of east coast assemblages with colours ranging from pale grey to red, most likely deriving from till. The majority of the flint is patinated with a single piece appearing heat affected. The majority of the assemblage is comprised of debitage including chunks and fragments, chips, and generally small flakes. Of the flakes, six showed blade-like characteristics, while the majority appear to represent an expedient reduction strategy with the majority of the flakes having been created through a poorly applied, hard hammer technique. The flakes are generally short and squat with crushed platforms. A number of cores were identified within the assemblage, with the majority comprising well-worked bipolar/scalar pieces, with other artefacts being either platform or amorphous flake cores. A small number of lithics displayed secondary modification. These included a flint side scraper and a piercer made on translucent quartz. Most of the lithics recovered in 2017 were recovered from context (204), with other stone tools recovered from the context including two possible cobble hammer stones (SF222 and SF253) as well as an out-of-context anvil stone. The lithic materials recovered from the 2023 site excavations will add significantly to this initial assessment, while overall, the stone assemblage includes other potential cobble stone tools.

10.18 However, it is the worked antler, bone, and modified tooth artefacts that stand out at this important site. Modified teeth of pig (Sus) were recovered from the main midden deposits in 2017. Three examples (SF210, SF229, SF293) exhibited modification through splitting, flaking, and polishing and are comparable with known examples recovered from French sites of Mesolithic date, where they are known as *tranchets de cordonnier* (Smith 2019). Elsewhere, these are referred to as chisels or chisel-edged tools (Mellars 2004). Additional pig teeth including a tusk from a possible wild boar were recovered during the 2023 excavations and await analysis. Three possible bone points have also been identified by Smith (2019) from the 2017 excavations comprising expedient-type mammal bone shafts that have been split sagitally. Additional worked bone was also recovered during the excavations in 2023, some of which may comprise points and a bevel-ended tool. Long bones of possible deer (Cervus) were also recovered in 2023 which display longitudinal splitting and working

to remove the ends (joints of the bones); possibly the initial preparation of the bone to produce artefacts such as points.

Plate 61 *– Image showing retent drying after wet sieving*

Plate 62 *– Image showing retents drying after wet sieving before sorting*

Plate 63 *– Image showing modified pig (Sus) tusk*

Plate 64 *– Image showing fragment of antler T-axe recovered during the 2023 excavations*

10.19 The assemblage also included a significant number of fragments of red and roe deer antler, recovered from Trench 2B during fieldwork in 2015, 2017, and 2023. The offcuts include tines, beam sections, and burr, while an almost complete set of antlers were found still attached to the top of the skull. Along with a large red deer skull fragment from midden Site 2A and a roe deer antler also attached to a small part of cranium, this shows that some antler was sourced from living animals, as well as collecting naturally shed antlers from the surrounding landscape (Smith 2019). Significant antler artefacts identified so far include a red deer tine that has been hollowed out at the opposite end to the tine, possibly to form a handle or armature (Plate **68**); a fragment from a biserial harpoon (Plate **67**); worked bone points; a possible antler pick; and the remains of three antler T-axes (two recovered in 2017 and one during excavations in 2023 – Plates **64-66**). Most of these finds were recovered from midden context (204), although some were found at the interface between the midden and the overlying slope-wash deposits, or in negative features such as ditch/gully (211).

10.20 The T-axes, are important and relatively rare antler tools on Scottish midden sites, manufactured from red deer antler, and which had a hole drilled through them in order to take a wooden shaft. Antler is very hard but also resilient and makes a surprisingly effective axe. We are not sure what the axes were used for, but they were certainly capable of chopping up large pieces of meat (from whales, seals, cattle, and deer) or skinning bark off trees and digging up roots. They are called T-axes because of their distinctive shape and only three or four have been discovered in Scotland before. The discovery of three T-axes at Tarradale is therefore a highly significant addition to that total.

10.21 The study of Mesolithic antler T-axes, or ‘mattocks’ as they are more usually called in Britain can be traced back to the late nineteenth century and has been taken up sporadically by various authors ever since. The most direct and exhaustive discussion of these artefacts was by Smith (1989), who defined antler mattocks as being made from antler, featuring some form of perforation, and an oblique working edge where the antler has been truncated (Elliot 2014, 1). However, since the publication of Smith’s typological framework for British mattocks, the development and application of AMS radiocarbon dating techniques to antler artefacts has allowed a more nuanced understanding of their chronological distribution. The vast majority of the British mattocks are made from Cervus elaphus (red deer) antler and are defined by five typological groups, based on variations in the part of the antler being used, the location of the perforation, and the angle of the working edge. Types A-D are manufactured from red deer antler, while Type E uses Elk. In terms of chronological distribution, Smith stated that they are Mesolithic in date, with red deer antler replacing elk as the material of choice at around 8000 BC due to dwindling elk populations in Early Mesolithic Britain (idem, 2).

10.22 Antler T-axes, or mattocks recovered from the coastal sites of Oronsay and Risga, were found in association with seal bones, which suggested that they may have been used to butcher marine mammals at coastal sites. Experimental work carried out in

Britain and Denmark suggests that mattocks can be used to fell trees, split timbers, and remove large portions of bark, indicating that the tools had the potential to have been used for a range of activities during the British Mesolithic.

Plate 65 *– Image showing antler T-axe (SF203) recovered during the 2017 excavations*

Plate 66 *– Image showing the second fragment of antler T-axe (SF226) recovered during the 2017 excavations*

10.23 Elliot's doctoral thesis based on a thorough analysis of these antler tools (Elliott, 2014) has provided little direct evidence for the use of the red deer antler artefacts as mattock tools. That is not to say that the form of these tools would prevent them from being used in digging activities, but that this single function cannot be given primacy over other possible activities such as the butchery, carpentry, and bark processing tasks. As an alternative, a more traditional distinction between axes (as defined by a working edge being aligned with the direction of the perforation) and adzes (as defined by a working edge that is aligned at 90° to that of the perforation) has been suggested by Elliot (idem, 9-10). This brings terminology in line with that used elsewhere in northwest Europe for osseous technology, and also facilitates comparisons with contemporary lithic technologies without overtly implying a single function. Following this redefinition by Elliot, twenty-three of the twenty-seven artefacts analysed from Britain can be re-termed 'red deer antler beam axes'. Furthermore, Elliot found that the red deer antler axes can be subdivided based on the location of the perforation, with a small but distinctive group of T-axes being identified as occurring within Scottish contexts (idem, 11-12). The radiocarbon dates available for this artefact type suggest the relatively rapid dispersal of T-axe technology across the North Sea Basin during the early fifth millennium cal BC. This can be interpreted as evidence of a large network of contact and communication, linking hunter-gatherer groups around this area of northwest Europe, and allowing the dispersal of specific ideas and technologies across land and seascapes, prior to the arrival of agricultural practices. This pattern requires further investigation if it is to be fully confirmed, and high-resolution dating of key sites and artefacts is necessary in order to move this particular discussion forward (idem, 19).

Plate 67 *– Image showing fragment of biserial antler harpoon (SF228) recovered from the main midden (204)*

10.24 Two of the antler T-axes were recovered from the upper contexts of the midden site in Trench 2B, which may relate to a later period of use or abandonment, while the third was recovered from the main midden deposit (204). AMS dates on bone and charcoal recovered from these contexts range from 4231-3643 cal BC (calibrated to 2 sigma level of confidence). Table 3 below provides direct radiocarbon dates on antler T-axes/mattocks recovered from Scottish sites.

Site	Lab No.	14C Age BP	Calibrated BC (95.4%)
Meiklewood	OxA-1159	5920±80	5207-4706
Isle of Risga	OxA-2023	6000±90	5207-4706
Priory Midden	-	-	4600-3740

***Table 3** – T-shaped antler pick/mattocks recovered from Scottish sites (after Elliot, 2014)*

10.25 Generally, the radiocarbon dates from deposits in Trench 2B suggest the site was in use during the later stages of the Mesolithic, when hunter-gatherer-fishers roamed the shoreline and adjacent woodlands of the Beauly Firth, and at the start of the Neolithic period, which saw the arrival of the first farmers (see Table **4**). As with the Ertebølle sites investigated in Denmark, is it possible we are seeing specific groups of people continuing with a hunter-gatherer-fisher lifestyle after the introduction of farming, or are these types of subsistence practices being pursued at the same time? Further dates are recommended to tie down activities taking place at this important site. In particular, samples of animal bone, antler and charcoal recovered from the west side of Trench 2B should be submitted for dating. This area of the site displays enhanced preservation of the midden and the materials it contains, supports several identifiable features, and may have formed the central focus of the Later Mesolithic activity. In particular, context (203e), from which the most recent fragment of antler T-axe was recovered during the 2023 excavations, should also be targeted for radiocarbon dating as the deposits here may relate to the final stages of the sites use – potentially during the Early Neolithic.

10.26 The Mesolithic shell middens identified at Tarradale have the capacity to fill a significant void in our knowledge, understanding and distribution of this site type in Scotland. Trench 2B in particular, located to the east of Tarradale House, has already produced a nationally significant range of antler artefacts and potential features relating to temporary structures. In order to extract the maximum amount of data from the sampling of the midden and other deposits associated with these discoveries, it is imperative that adequate funds and specialist's analysis are secured to undertake what will be an extensive post-excavation plan. The 2023 excavations generated a significant number of bulk samples for wet sieving. This process is ongoing and sorting of the resulting residues is taking place on a regular basis. It is imperative that these processes are concluded. The results from the sorting of the residues has already produced small fragments of animal bone and antler, which may contain waste from the manufacture of tools at the site; fish and bird bones; lithics; and just recently a perforated cowrie shell that was most likely used as a bead (see Appendix **6**).

Lab Code	Context	Description	Calibrated Date at 2-Sigma (95.4%)
SUERC-66328	3 (204?)	Charcoal (birch)	4256-4051 cal BC
SUERC-66329	3 (204?)	Antler fragment	4461-4351 cal BC
SUERC-80586	210	Animal long bone	4832-4619 cal BC
SUERC-80587	204	Charcoal (apple/pear/hawthorn/quince/rowan)	3981-3805 cal BC
SUERC-80588	204	Animal bone (cattle phalanx)	4038-3805 cal BC
SUERC-80589	204	Charcoal (elm)	4231-3996 cal BC
SUERC-80590	204	Animal bone (cattle humerus)	3766-3643 cal BC

***Table 4** – AMS radiocarbon dates on materials recovered from Trench 2B, Tarradale*

10.27 In addition to the bulk samples recovered from Site 2B for on-site wet sieving and processing, a significant number of samples containing animal bones, charcoal, and marine shells were recovered during the 2017 and 2023 excavations. Artefacts were also recovered individually by hand including lithics, worked bone and antler, and a small number of possible stone tools. The animal bones from Site 2B in particular are a remarkable survival in a Scottish Mesolithic context. The radiocarbon assays take us back to the Mesolithic-Neolithic transition, marking the borderline between the period of hunting and gathering and fishing and the first exploitation of domestic animals, and as such, provides a unique opportunity to investigate the changes in lifeways at this important time in the past. Some of the animals found at Site 2B were not domesticated but were hunted for their meat, skins for fur, their teeth, antler, and bones being utilised for tool manufacture. Antler was a particularly valuable resource in the Mesolithic and the range of tools and waste recovered confirms this. The small tools manufactured from wild boar canines and tusks appear similar to the chisel-edged tools recovered from MacArthur's Cave in Oban and from the Oronsay middens, but further work is required to confirm this. The suite of animal species represented at Site 2B tells us much about the surrounding environment at this important transitional period. Most of the mammals represented so far including aurochs, wild boar, red and roe deer, and pine marten, are primarily woodland species and it might be supposed that the surrounding land was covered by trees, as has been suggested for most of the lower-lying ground of the British Isles during this period.

10.28 However, here at Tarradale (but also seen at sites such as An Corran in Skye), the people using this site had access to a wider range of resources including the waters of the Beauly Firth, the marginal marshy interface between land and sea, and freshwater rivers such as the Beauly. Here, gathering shellfish, trapping, fishing for marine fish, the hunting of sea birds and waders and their eggs, and fishing for migratory fish such as salmonids, all provided a varied and wild resource for

exploitation. In addition, the natural stranding of marine cetaceans and hunting of seals, which still haul out on the mudflats of the firth today, would have provided food, skins, and other valuable materials such as oil.

Lab Code	Site	Context	Description	Calibrated Date at 2-Sigma (95.4%)
SUERC-80594	2A	304 (Trench 2)	Animal bone (cow)	4225-3961 cal BC
SUERC-80595	2A	312 (Trench 1)	Charcoal (alder)	3012-2895 cal BC
SUERC-80596	2A	405 (Test Pit 4)	Charcoal (birch)	4352-4261 cal BC
SUERC-80597	2A	413 (Test Pit 8)	Animal bone	6071-5925 cal BC
SUERC-80598	1C	11	Animal bone (pig)	3710-3543 cal BC
SUERC-46140	2D	-	Antler tine	6204-6005 cal BC
SUERC-46141	2D	-	Charcoal	6632-6480 cal BC

***Table 5** – AMS radiocarbon dates on materials recovered from other Tarradale shell middens*

10.29 The Scottish Mesolithic has been increasingly studied over recent years, particularly in the western coastal areas including the offshore islands. However, there still remain many questions related to chronology and cultural development, subsistence, and settlement and especially the transition to the Neolithic. The shell midden sites at Tarradale, along with other recorded sites around Munlochy Bay, provide a unique opportunity to study shell midden sites and their associated artefacts and ecofacts within an area of Scotland that has so far received little research and fieldwork relating to this important transitional period. In many ways, the shell middens at Tarradale, especially Site 2B, share many similarities with a number of sites on the western seaboard of Scotland including Risga on Loch Sunart (Pollard et al. 1996), Cnoc Coig on the island of Oronsay (Mellars 1987), and some of the shell middens found in former sea caves around Oban. The artefact assemblages from these sites included bone and antler tools such as awls, harpoons, mattock heads and ‘limpet scoops’, stone bevel-ended tools, worked shells, and a chipped stone assemblage dominated by bipolar-on-anvil technology, with no microliths and few other formal tools. Initially classified as ‘Obanian’ (Lacaille 1954; Pirie et al. 2006), these assemblages found in association with shell middens, have been characterised as a late phase of Mesolithic coastal adaptation.

10.30 The Obanian as a tightly defined cultural and chronological entity has, however, been deconstructed over the last 20-30 years (e.g. Bonsall 1997; Mithen 2000a; Mellars 2004). Artefacts from ‘Obanian’ assemblages such as Druimvargie Rockshelter (Bonsall 1996) and Ulva Cave (Bonsall et al. 1992) have returned Mesolithic dates

contemporary with narrow blade assemblages, while shell middens such as Sand on Skye (Hardy & Wickham-Jones 2003), and Risga, Loch Sunart (Pollard et al. 1996) have been shown to have a microlithic chipped stone component. Many questions thus remain about what role these sites played, particularly during the later Mesolithic/Neolithic transition, a period for which we have few dated sites. The five shell middens recorded and excavated on the Inner Hebrides island of Oronsay (Mellars 1987) have been at the heart of many debates about the nature of late Mesolithic occupation of coastal west Scotland, which have been dated to 6500–5500 BP (Mithen 2000b). This has supported Mellars' contention (1987 & 2004) that these sites represent near-sedentary occupation of the tiny island during this period, rather than forming a part of a wider mobile settlement pattern involving exploitation of adjacent larger islands for land-based resources.

10.31 Many questions remain about these types of shell midden sites relating to intensity and duration of occupation, the range of activities carried out, and their relationship to other Mesolithic or early Neolithic sites. Therefore, the full analysis and publication of the data relating to the investigations carried out on the shell middens at Tarradale, will allow comparisons to be made with the west coast sites. Furthermore, the highly significant results relating to the excavation of Site 2B at Tarradale, along with other midden sites located around the northern shore of the Beauly Firth, will bring this area of northern Scotland into the known sphere of Mesolithic antler working, a distribution that extends from Eastern Europe through central Europe, the low countries and Denmark to Scotland (Grant 2022). Within a European context, the Tarradale midden sites (especially Site 2B) share many similarities to the large 'kitchen middens' and Ertebølle settlements in northwest Europe and especially on the shores of Denmark (although the Tarradale sites are much smaller in their extent). Changes in sea-level have resulted in some of these sites becoming submerged, or partially submerged, with the generally sheltered, underwater conditions of the Baltic providing enhanced preservation. Here, many objects have been recovered that are usually absent on other Mesolithic sites including those made of wood and other organic materials.

10.32 One particular site, Tybrind Vig, is located on the edge of a large expanse of 'inland sea', is sheltered by an offshore barrier island, and is characterised by shallow bays, low peninsulas, and has a number of freshwater streams. In particular, two low headlands located to each side of an estuary/river course, extending out into the sea, were identified as major areas of Mesolithic activity. This included areas of settlement, human burials, and a significant number of fish-traps set within the inter-tidal zone (Andersen 2013, 73). The preservation of the Mesolithic remains here is due to the site being transgressed by the sea, with diving required to investigate this important site. The sites do extend up onto the dry land at Tybrind Vig, but the maximum postglacial stand of the sea has all but eroded the remains away. A significant number of radiocarbon dates have been secured for the site showing it was occupied between 5300-4000 cal BC (idem, 75-6, 317). The settlement was coeval with a rise in the sea level, but this did not, however, involve any significant change in its location. On the contrary, it remained stable, in the same place, throughout.

10.33 If the location of the approximate position of the post-glacial shoreline is projected onto the current landscape at Tarradale, midden sites 2B and 2A would have been located at the water's edge, on quite prominent peninsulas of land with access to sheltered bays, inlets, and a minor stream course (Figure **15**); the sites at Tarradale fit within well-recognised models for the locations of hunter-fisher settlements around the Baltic Sea (Fischer 1995). It is thought that the post-glacial maximum transgression of the sea in the Beauly Firth took place between c.5630-5440 cal BC, reaching a high stand of approximately 9 metres above Ordnance Datum (Firth and Haggart 1990, 135-36; Grant 2022, 14). Midden site 2B is located between c.8.8>9.9 metres OD (Figure **8**), so is located at this important transitional point in the sea-level curve. However, none of the stone tools/lithics, or antler and bone artefacts recovered from Site 2B display any evidence of water-rolling, which suggests the site was never transgressed for any significant period of time. However, some lithics recovered from the field to the south of Site 2B have been water-rolled indicating that they predate the last transgression of the sea (Grant 2014, pers comm).

10.34 The investigation of shell midden sites at Tarradale, therefore, have an important role to play in our understanding of the Mesolithic – Neolithic transition, with the potential to build new narratives that describe and explain what happened in this area of Scotland, including the appearance of new life ways at some time between 4500 BC and 4000 BC. From the excavation of sites elsewhere, it is very clear that the sea and the coastal zone were of enormous importance for Stone Age people in terms of communication, transport, subsistence, and social contact between population groups. The archaeological record shows that food of marine origin (especially fish and marine mammals) made up a significant proportion of the contemporary diet. The coastal zone, sea, and associated landscapes must have been essential habitats of vital necessity for the hunter-fisher population of the time.

Plate 68 *– Antler tine most likely used as a handle/armature*

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Figure 15 *– Annotated aerial image showing OS contours, route of stream course, approximate location of Post-Glacial shoreline, and shell midden sites at Tarradale (contains OS data © Crown copyright and database rights 2024)*

Appendix 1 List of Contexts

Context No.	Type	Description	Under	Over	Cuts	Fill of	Filled by	Interpretation
200	Deposit	Dark brown-black soil with occasional flecks of charcoal and 5% small, rounded stones; burrowing and root disturbance	-	202, 203	-	-	-	Topsoil
201	Deposit	Mixed soil/subsoil removed from excavation in NOSAS 2015 evaluation trench	200	218	-	-	-	Trench backfill from 2015
202	Deposit	Mid brown loose soil with mixed small shell fragments; visible bands of rig and furrow 1-3m wide orientated NE-SW (see context 225)	200, 203	204	-	-	-	Soil layer that has been mixed by disturbance from rig & furrow cultivation (see Context 225)
203	Deposit	During the 2017 excavations this context was described as a light brown loosely compacted silt with frequent small, rounded stones; contains some animal bone and shell. During the 2023 excavations this deposit was divided into five sub-contexts (see below). The detail in the contexts was identified in the NW corner of Trench 2B, including in the new trench extension	200	202, 204	-	-	-	Slope-wash deposit from former raised beach and result of agricultural activities
203a	Deposit	Light orange intermittent silty lens of material tipping downslope to the S and interrupted by fine roots and worm activity. Contains little stone, although the interface with 234 above is marked by a band of pea-gravel and small rounded stone clasts, while pea gravel and small stone clasts form a more marked lens at the base of the deposit. Overruns cut of pit (238)	203b, 238	200, 234	-	-	-	Lens of slope-wash material deriving from flanks of raised beach and material pushed over raised beach by agricultural activities
203b	Deposit	Light brown silty sediment containing small, rounded stone clasts >12mm across. The lens of material runs from the N baulk of the trench extension and thins out to the south after c.1.5m	203c	203a	-	-	-	Lens of slope-wash material deriving from flanks of raised beach and material pushed over raised beach by agricultural activities
203c	Deposit	Light buff/yellow intermittent lens of compacted silt disrupted by fine roots and animal burrowing. Contains small stone clasts 20>50mm across. The lens of material runs out above the N edge of the	203d, 203e	203b, 203a	-	-	-	Lens of slope-wash material deriving from flanks of raised beach and material pushed over raised beach by agricultural activities

Context No.	Type	Description	Under	Over	Cuts	Fill of	Filled by	Interpretation
		depression overlying pit cut (212/246) and merges into context 236 – the upper fill of pit (238)						
203d	Deposit	Lens of mid-brown silty sediment containing rounded and angular stone clasts 20>80mm across, marine shell fragments, and some complete oyster and periwinkle shells. The deposit runs from the N baulk of the trench extension for around 2.5m where it thins above the edge of the depression overlying pit cut (212/246), then thickens and forms a slump of material running into the pit. Cut by later pit (238)	203e, 244, 245, 231	203c, 236	-	212, 246	-	Lens of slope-wash material deriving from flanks of raised beach to north
203e	Deposit	Mixed firm silt deposit is light buff-coloured and contains small stone clasts >50mm across, shell fragments, some complete periwinkle shells, charcoal flecks, antler fragments, and a fragment of an antler T-axe	231, 244	203d	-	-	-	Possible upper abandonment deposit associated with Mesolithic activity
204	Deposit	Light brown loosely compacted silt with occasional small, rounded stone and ash patches; contains shell, crushed shell (including oyster, mussel, and periwinkle), fragments of animal bone and antler and some fragments of charcoal. Forms an undulating surface dipping down to the south and NW, cut through by modern ploughing at south side and by 2015 evaluation trench to the east	202, 203, 205, 206, 210, 213	214, 217, 218, 219, 220	207, 211, 212	-	-	In situ shell midden deposit – same as 208
205	Fill	Yellow/buff clayey silty fills oval hollow (207) deriving from slope-wash and same as 203	202, 203	206, 215, 216, 204	-	207	-	Sterile slope-wash filling hollow/depression in top of 204
206	Deposit	Medium-large beach cobbles (0.1-0.4m) lying on surface of midden within context 205; forms an arc from NE to E	205	204	-	204	-	Possible structural stone setting?
207	Cut	Sub-oval, shallow scoop or pit that forms a hollow in the shell midden; cut is unclear on the S side where it forms a flat surface	202, 203, 205, 206, 207, 215, 216	204	-	-	205	Hollow/depression within surface of midden 204 - antler artefacts found in close proximity to the possible feature

Context No.	Type	Description	Under	Over	Cuts	Fill of	Filled by	Interpretation
208	Deposit	Oyster shell-rich deposit within shell midden 204 is 0.1-0.2m thick and abuts 210. Curvilinear in plan	204	204	211	204	-	Oyster-rich shell midden deposit within context 204
209	Deposit	Two linear patches of shell-rich midden >0.1m thick running WNW-ESE	204	204	211, 212	204	-	Shell midden bands within context 204
210	Deposit / Fill	Mid orange-brown mottled silty soil that contains a number of upright large oyster shells and filling a possible cut or depression within midden 204; up to 0.12m deep with gently sloping sides	203	211, 204	-	211	-	Fill of possible curvilinear ditch cut 211
211	Cut	Curvilinear, shallow ditch cut running NW-SE with gently sloping sides is 0.55-0.65m wide and 0.12m deep. Continues under N baulk of trench and runs out at SE end	210	204	204, 208, 209	-	210	Curvilinear ditch may be structural and cut into surface of midden 204
212	Cut	Steep-sided cut forms an amorphous shape in the NW corner of trench and measures 1.55m N-S by 0.40m wide and 0.6m deep (see context 246)	213	204	204, 211	-	213	Possible pit, stone hole, or small tree-throw? (see context 246)
213	Fill	Homogenous brown silty soil with small, rounded beach cobbles, fine roots and shell fragments deriving from slope wash and silting (same as 236)	203	212, 214, 204	-	212	-	Fill of cut 212 comprises material from slope- wash and silting (same as 236)
214	Deposit	Gently sloping cobbled surface comprising rounded and subangular cobbles 0.05-0.1m across with some larger stones up to 0.3m across. Some clusters of larger stones distributed across the surface, especially within the SE sector of the trench. The interface of 214 with the shell midden 204 above in the east side of the trench is marked by a thin lens of highly compacted marine shell with an ashy matrix and in some areas contains some complete periwinkle shells and small, degraded fragments of animal bone (218/220/226). A thin lens of pea gravel (5>8mm across) is also present at this interface (218/220/226), possible indicating some low-energy marine wave action. The gravel runs in between the	204, 217, 218, 220, 226, 230	229	-	-	-	Cobbled surface of natural beach deposit over which midden layers have formed. The deposit becomes compacted and indurated with calcium deposits working north through the trench (see context 231) and may be an indicator of areas of the cobbled surface that have not been impacted by later marine transgression

Context No.	Type	Description	Under	Over	Cuts	Fill of	Filled by	Interpretation
		cobbles forming 214, while deeper hollows in the cobbles are also filled with deeper deposits of the compacted marine shell and ash matrix, and some complete periwinkle shells. At the south end of the trench, midden deposit 204 directly overlies cobbled surface 214, with no interface lenses (218/220/226) as described above. Working to the north in Trench 2B, the cobbled surface becomes compact and indurated with possible calcium deposits (see context 231)						
215	Structure	Curving arc of rounded stones aligned NW-SE, comprises stones 0.1-0.3m long set in 2 courses deep over the base of midden 204. A second, smaller arc runs off the feature to the NE	203, 205	204, 207, 218	204	204	-	Possible remains of wind break, with the stones used to hold down a temporary structure?
216	Structure	Circular stone setting comprising stones 0.15-0.3m long and measuring 0.35m x 0.4m internally and 0.18m deep; set within cut 207	205	204, 207, 218	204	-	-	Possible post setting or other structural setting, similar to features identified at Risga and Smittons sites
217	Structure	Possible stone setting comprising large stones 0.2-0.4m long, measures 0.25m diameter internally and 0.2m deep; overlain by midden 204	204	218	204	-	-	Possible post setting or other structural setting, similar to features identified at Risga and Smittons sites
218	Deposit	Pea gravel (5>8mm across) forms a thin layer at the interface between the cobbled surface of the original beach (214) and the overlying midden (204), especially in the east sector of the trench. Measuring 10>20mm thick, the deposit also contains some crushed shell fragments and ashy matrices (226)	214, 231	204, 226, 240	-	-	-	Pea gravel deposit that has filled hollows in the top of the former cobbled beach (214) and may be indicative of low energy sorting of material by marine transgression
219	Deposit	Subcircular spread of small-medium rounded stones measures 0.6m N-S x 0.5m. Initially thought to be a possible post-setting/structural feature, after further excavation they appear to form a concentration of stones within the original	204, 218, 226	214, 229	-	-	-	Natural concentration of larger stones within former shoreline/beach deposit

Context No.	Type	Description	Under	Over	Cuts	Fill of	Filled by	Interpretation
		beach surface. Patches of dark, ashy midden and burnt shell surround the stones and fill deeper hollows between them						
220	Deposit	Thin, intermittent ash spread (black-grey wood ash?) overlying cobbled beach surface 214 at base of midden 204. Contains charcoal flecks and some burnt/crushed shell. The deposit varies over the trench, in some places displaying higher concentrations of crushed shell and ash (see context 226)	214, 218, 229, 231	204, 218	-	-	-	Degraded midden deposits at interface of main midden 204 and surface of former beach 214/231. May have been sorted through low energy wave action during periods of marine transgression
221	Deposit	Roughly circular depression within cobbled surface 214, measuring c.0.22m in diameter and 0.5m deep, defined by group of larger rounded stones. Initially interpreted as a post setting, after additional excavation this appears to be a group of larger stones within the cobbled surface (as per context 219)	204, 220	214	-	-	220	Natural concentration of larger stones within former shoreline/beach deposit, forming a natural hollow
222	Deposit	Subcircular depression within stone cobbles forming former beach surface 214 measures 0.55m x 0.45m and contains context 220. Initially interpreted as a post setting, after additional excavation this appears to be a group of larger stones within the cobbled surface (as per contexts 219 and 221)	204, 220	214	-	-	220	Natural concentration of larger stones within former shoreline/beach deposit, forming a natural hollow
223	Deposit	Subcircular depression within stone cobbles forming former beach surface 214 measures 0.55m x 0.42m and contains context 220. Initially interpreted as a post setting, after additional excavation this appears to be a group of larger stones within the cobbled surface (as per contexts 219, 221 and 222)	204, 220	214	-	-	220	Natural concentration of larger stones within former shoreline/beach deposit, forming a natural hollow
224	Deposit	Subcircular depression within stone cobbles forming former beach surface 214 measures 0.4m in diameter x 0.15m deep and contains context 220	204, 220	214	-	-	220	Natural depression within former shoreline/beach deposit, forming a natural hollow

Context No.	Type	Description	Under	Over	Cuts	Fill of	Filled by	Interpretation
225	Deposit	Linear spread of rounded stones c.50>80mm across with occasional larger stones 200x150mm across, within a matrix of mid-brown silty sediment, with some grit content. Section excavation revealed on depth or complexity to the feature, which most likely forms a natural spread of stone within context 202	202	202	-	-	-	Natural spread of stone concentrated in base of modern furrow
226	Deposit	Arcing mixed lens of material running across the north sector of the east side of Trench 2B, down the east side of the central baulk, and then arcing to the SE, stopping at concentration of stones 215 in the SE corner of the trench. Comprises small gravel clasts 8>20mm across with a dark brown to light black silty matrix containing small marine shell fragments and some complete oyster, cockle, and periwinkle shells. Also contains some small animal bone fragments. The deposit varies between 10>40mm thick, with some thicker deposits around larger stones and within natural voids in underlying beach deposit 214. Pea gravel lenses are present in some areas of the midden, which also displays areas of charcoal/ash-rich deposits (see contexts 218 and 220 – most likely the same deposits)	204	214, 218, 231	-	-	-	Degraded midden deposits at interface of main midden 204 and surface of former beach 214/218/231. May have been sorted through low energy wave action during periods of marine transgression, where thicker lenses were deposited within natural hollows and around larger stones in the former beach surface
227	Deposit	Located at base of main shell midden deposit 204 in the central area of the west half of Trench 2B but separated by a thin lens of small gravel clasts 8>30mm across (218?), is a black and silty ash-rich midden 10>20mm thick. Contains mainly crushed/trampled shell, along with the occasional spread of complete shells (periwinkle and cockle). The deposit underlies the edge of context 226 and may	218, 228	204, 226	-	-	-	Degraded midden deposits at interface of main midden 204 and surface of former beach 218. May have been sorted through low energy wave action during periods of marine transgression

Context No.	Type	Description	Under	Over	Cuts	Fill of	Filled by	Interpretation
		comprise the rake-out or dump from a hearth, contemporary with context 226						
228	Deposit	Located within east sector of Trench 2B and adjacent to/abutting midden deposits 226/227, are three distinct and isolated patches of small marine shell fragments with no visible matrix.	218	204, 226, 227	-	-	-	Degraded midden deposits at interface of main midden 204 and surface of former beach 218. May have been sorted through low energy wave action during periods of marine transgression
229	Deposit	Natural gravel sub-base deposit comprises a gritty yellow to buff sediment containing rounded to sub-rounded stone clasts, generally measuring 6>20mm across, but with larger clasts 50>150mm across. Surface of deposit slopes gently downslope from north to south. Larger stone clasts within the deposit increase to the north where they run under context 231	214, 218, 230, 231	233	-	-	-	Natural sub-base deposit (lower beach deposit) underlying all contexts
230	Deposit	A roughly oval and shallow depression (232) within the natural beach deposit (229) is filled by ashy lenses (230), with inter-leaved black and pale grey lenses of material. Also contains a little crushed shell.	232	226	-	232	-	Fill of scoop hearth within natural beach deposit comprises thin ash lenses
231	Deposit	Located within the north two-thirds of Trench 2B is an indurated stoney deposit. It appears that the surface of contexts 231 and 229 has been cemented together, possibly through leaching of lime from the overlying shell midden. Sondage 001, located at the north end of the trench, revealed a thicker wedge of this material, containing marine shell fragments and two small fragments of bone. The deposit contains some larger stones at the north end of the trench, but the deposit generally thins and fades out to the south. In the NW corner of the trench, the deposit contains two undulations and two slight, rounded ridges, which may indicate low-energy wave	204, 244, 245, 218	229, 233	-	-	-	Indurated stone and cobble deposit of the former beach surface. May indicate area of low-energy wave action towards the high tide mark where there is a slight steepening in the beach deposits

Context No.	Type	Description	Under	Over	Cuts	Fill of	Filled by	Interpretation
		action during periods of marine transgression, or former high-tide mark						
232	Cut	Located within the NE sector of Trench 2B is a shallow scoop within the underlying natural beach deposits (229). The surface of the depression/cut displays a hard, compact surface, possible affected by heat, and contains ash lenses (230). A large, flat-surfaced stone abuts the feature on the SSE side	229	226, 230	229	-	230	Scoop within natural beach surface filled with ash lenses most likely formed a small hearth setting
233	Deposit	Natural beach deposit located in the base of sondages 001, 002 and 003, and adjacent to the central baulk of Trench 2B. Comprises a coarse, gritty sand with rounded, regular-sized stone clasts 20>80mm across. Contains the occasional marine shell fragment (which may be natural in origin). Matrix of coarse grits and some finer gritty sand is light brown to orange in colour	-	229, 231	-	-	-	Natural beach surface
234	Deposit	A wedge of slope-wash material deriving from the palaeo-cliff above the site, possibly influenced by later agricultural activity. Comprises a mid to light brown silty sediment with a few mainly rounded stones >40mm across and fine roots. The material is most prominent in the NW corner of the trench where it attains a depth >0.8-0.9m, this dipping to the south and thinning. The deposit peters out above pit features (212/246) and (238), while it also thins out to the east. A lens of small stones divides this context from underlying slope-wash deposit (203a). Contains some modern material including fencing wire, roofing slate, and small sherds of glazed ceramics	203a	200	-	-	-	Slope-wash material from the palaeo-cliff above the site, possibly enhanced by later agricultural activities
235	Deposit	A wedge of sediment located in the NW corner of the trench and only visible in the west face of the central baulk. Comprises a	203c, 204	203c,234	-	-	-	Material possibly relating to a post-medieval rig that has been covered by slope-wash

Context No.	Type	Description	Under	Over	Cuts	Fill of	Filled by	Interpretation
		mid to dark brown sediment with some stone clasts mainly 10>30mm across, but with some larger clasts >150mm across, and fine roots. There is no shell in the deposit, suggesting it may relate to slope-wash from the palaeo-cliff above. However, the deposit is darker in colour when compared with context 203c and may relate to slumping activity at the base of the terrace, or represents the remains of a post-medieval rig						deposits, or to slumping of slope-wash deposits at the base of the palaeo-cliff
236	Fill	Mid-brown silty sediment forms the upper fill of pit (238) and contains some rounded stone 20>60mm across. The lens of material is intermittent on the north side of the pit where slight slumping of slope-wash material has occurred	237, 238	203b	-	238	-	Upper fill of pit (238) may include some slope-wash activity and may be same as context 203c
237	Fill	Lower primary fill of pit (238) is a mid-brown silty sediment with fine roots and rounded stones 20>100mm across (but mainly small at 20>40mm). This deposit contains the skeletal remains of a small carnivorous mammal, possibly a fox or small dog (sample 394). The animal remains are located in the base of the pit and show no signs of articulation in burial. The skull has been sliced/cleaved horizontally through the cranial vault.	238	236	-	238	Bone sample (394)	Primary fill of small pit feature (238) containing remains of small mammal (sample 394)
238	Cut	Cut of pit located in east-facing section of Trench 2B, towards to the north end of the trench. The pit, which has steep sides and a relatively flat base and measures c.0.78m in diameter and 0.50m deep, has been cut into an earlier, larger pit feature (212/246), which is most likely Late Mesolithic in date and contemporary with the formation of the main midden deposits. It is possible that the depression formed by slumping of deposits in the earlier Mesolithic pit created a hollow	236, 203d, 245	237, 236, 203b, 200	203c, 203d, 245	-	236, 237	Cut of small, late pit feature containing remains of small carnivorous mammal (fox or small dog-sample 394)

Context No.	Type	Description	Under	Over	Cuts	Fill of	Filled by	Interpretation
		feature suitable for excavation of the later pit?						
239	Deposit	Located in the west baulk of Trench 2B and to the south of pit (212/246) is a black ashy lens with some marine shell and generally rounded stones 20>100mm across. The lens of material has been cut through by pit (212/246) and runs south to where it thins out around 1.8m before the south baulk of the trench. Varies in thickness from 0.05>0.14m and context only appears in the west baulk of the trench. Contains some animal bone	240, 229, 247, 248	204	-	-	-	In-situ midden lens in west baulk of trench cut through by pit feature (212/246)
240	Deposit	Located in the west baulk of Trench 2B and to the south of pit (212/246) is a black, ash-rich lens of midden containing fragmented marine shell and rounded stones clasts 10>60mm across, but less frequent than in context 239 above. The lens varies between 0.06>0.1m thick, runs south from the pit cut and stops against small stone setting 248. Contains some small and fragmented animal bone and charcoal flecks	218	239, 248	-	-	-	In-situ midden lens in west baulk of trench cut through by pit feature (212/246)
241	Fill	Secondary fill of pit (212/246) comprises a black, ash-rich midden containing abundant marine shell including fragments, complete oyster and periwinkle shells, charcoal, animal bone, and lithic material (quartz flake and half of a small flint nodule). Contains rounded to sub-rounded stone clasts 10>120mm across. The fill is similar in colour and matrix has context 240, which it abuts on the south side of the pit cut	243, 212/246	249		212/246	242	Secondary fill of pit cut (212/246)
242	Fill	Light brown silty lens runs into pit feature (212/246) from the north and is located within context 241	241, 212/246	241	-	212/246	-	Lens of slope-wash-type material within pit cut (212/246) probably relates to a brief silting episode while the pit was open and partially filled by context 241

Context No.	Type	Description	Under	Over	Cuts	Fill of	Filled by	Interpretation
243	Fill	Primary, basal fill of pit feature (212/246) comprises a dark black silty deposit, with grey flecks of wood ash, charcoal flecks, and lumps, and contains crushed mussel and cockle shell, numerous complete oyster and periwinkle shells, and some animal bone and teeth including a fragment of possible pig upper mandible. Rounded stones within the base of the pit 20>80mm across	212/246	241	-	212/246	-	Primary, basal fill of pit cut (212/246)
244	Deposit	Located within the NW corner of Trench 2B, within the trench extension, there is a compact dark brown silty sediment (hard at the surface) with a black charcoal-rich lens towards the top of the context, which is 0.1>0.22m thick. Running from under the north baulk of the trench, the context has been truncated at the south end, most likely by the cutting of pit (212/246). The context also contains grey to buff lenses of ash with crushed shell and overlies indurated cobble layer 231 at the north end. Some charcoal flecks and small lumps also present along with rounded to sub-rounded stone clasts 20>120mm across	245, 231	203e, 203d	-	-	-	Midden deposit running over former beach cobbles and earlier midden lenses, truncated by pit cut (212/246). Context only visible within the west baulk of Trench 2B
245	Deposit	Running off the indurated beach cobbles 231 in the NW corner of the Trench 2B extension, and below context 244, is a sequence of thin lenses comprising black, charcoal-rich silty deposits interspersed with finely crushed shell lenses with a grey to buff ashy matrix. Contains some rounded to sub-rounded stone clasts 20>120mm across. The deposit appears to have been truncated at the south end by the cut of pit feature (212/246) and is 0.08>0.13m thick. This context is the earliest deposit to form over the former beach cobbles, here indurated with lime deposits from the	249, 241, 231	244, 203d	-	-	-	Midden deposit running over former beach cobbles 231 and truncated by pit cut (212/246). Context only visible within the west baulk of Trench 2B and appears to be the earliest archaeological deposit laid down over the former beach

Context No.	Type	Description	Under	Over	Cuts	Fill of	Filled by	Interpretation
		overlying shell midden, and at a prominent lip and undulations in the former beach which may have been caused by the highest stand of the marine transgression						
246	Cut	Cut of pit (212/246) located in west baulk of Trench 2B, towards its north end. The pit has angled sides and a rounded base and measures c.1.70m in diameter and c.1.22m deep. The pit appears to be one of the earlier features at the excavated section of the 2B midden site, cut into the underlying beach deposits 231 and 229	229, 231	243, 241, 249, 245, 240, 218	229, 231	-	243, 241, 249	Cut of Late Mesolithic pit is one of the earliest features at the site
247	Fill	A small, and dense lens of crushed marine shell overlies a hollow formed by stone setting 248. The deposit contains no stone, is c.0.58m in diameter and is a maximum of 0.08m thick. Located in the west baulk of Trench 2B	248, 229	239	-	248	-	A small, isolated, and compact lens of marine shell filling the top of a possible post-setting or circular stone feature.
248	Structure	Stone setting located in the west baulk of Trench 2B, rests on the natural beach deposit 229. The stones forming the structure vary in size, from a single clast 0.22m long by 0.12m thick on the south side of the feature; to a stack of stone clasts on the north side varying from 0.08m x 0.05m up to 0.16m x 0.14m across. The stone setting creates a possible post-pipe 0.12>0.14m in diameter and surviving to 0.18m deep	229	247, 239	229	-	250, 247	Possible stone setting to secure a wooden post
249	Fill	Upper fill of pit cut (212/246) located in the west baulk of Trench 2B. Comprises a mixed reddish brown silty sediment containing intermittent lenses of marine shell on the south side, rounded to sub-rounded stone clasts 20>80mm across, with some larger stones up to 240mm x 180mm x 80mm thick, these dipping downslope to the north, along with the shell lenses. Contains patches of marine shell, most of	241	200, (238)	-	212/246	-	A thick wedge of mixed material appears to have collapsed and slumped into the top of pit feature (212/246), from the south side. The deposit has been cut by the later pit (238) containing the small mammal burial and the deposit may have been mixed

Context No.	Type	Description	Under	Over	Cuts	Fill of	Filled by	Interpretation
		which is crushed and fragmented, and fine rootlets. 0.14>0.22m thick						and disturbed by the process of cutting the later feature
250	Fill	Possible post pipe within stone setting 248 is filled by a pale brown gritty sediment with some crushed shell and numerous small, rounded stone clasts 10>30mm across. The feature was not excavated below the maximum depth of excavation in Trench 2B in this location, so the maximum depth of the possible post-pipe was not explored	229?	247	-	248	-	Possible lower fill of post-pipe in stone setting 248

Appendix 2 Small Finds Register

Find No.	Context No.	Description
293	200	Mixed finds from topsoil includes glazed post-medieval ceramics, animal bone, and a small piece of antler
294	202	Fragment of redware medieval jug handle
295	204	Two pieces of animal bone
296	204	One small fragment of roofing slate
297	204	One fragment of animal bone
298	204	One quartz flake
299	204	Seven pieces of animal bone
300	200	One possible sherd of medieval cooking pot
301	204	Animal bone fragments including one possible worked point
302	204	One piece of marine shell – periwinkle tip on identification
303	204	Four pieces of animal bone
304	204	Fragment of fire-cracked stone
305	204	Animal bone fragments
306	204	One piece of animal bone
307	204	Animal bone and tooth fragments
308	204	Animal bone
309	204	Animal bone fragments
310	204	Charcoal and bone fragments
311	204	Fragment of fire-cracked stone
312	204	One piece of worked quartz
313	204	Animal bone from Grid 13 Spit 1
314	204	Animal bone (calcaneum) from base of (202/204)
315	234	Fragment of roofing slate
316	204	Animal bone from Grid 35 Spit 1
317	204	Quartz flake from Grid 35 Spit 1
318	204	Animal bone from Grid 26 Spit 1
319	204	Animal bone fragments
320	204	Animal bone from interface of (202/204)
321	204	Three pieces of antler (1 worked)
322	214	Animal bone fragment from Grid 27
323	214	Animal bone fragment from Grid 31
324	214	Two fragments of animal bone from Grid 30
325	214	Three pieces of animal bone from Grid 26
326	204	Animal bone from Grid 37 Spit 2
327	203a	Mixed material including Glazed ceramics, roofing slate, iron, and coal
328	203a	Animal bone fragments
329	204	Worked antler fragment from Grid 11 Spit 2
330	204	Possible quartz core from Grid 11 Spit 2
331	203e	Antler fragments from trench extension
332	203e	T-axe antler fragment from trench extension
333	204	Animal bone (possibly worked) from Grid 12 Spit 3
334	204	Quartz flake from Grid 11 Spit 2

Find No.	Context No.	Description
335	210	Antler fragment from possible ditch fill in Grid 41
336	210	Possible hammer stone from possible ditch fill in Grid 41
337	204	Possible fragment of worked bone
338	204	Wild Boar tusk fragments from Grid 75
339	204	Small quartz flake from Grid 75
340	204	Antler tine from Grid 15 Spit 3
341	204	Possible worked bone from Grid 15 Spit 3
342	204	Antler tine from Grid 28 Spit 1
343	204	Antler tine and antler fragments from Grid 12 Spit 2
344	204	Antler fragments from Grid 8 Spit 3
345	204	Antler fragments from Grid 7 Spit 3
346	204	Antler fragment from Grid 13 Spit 2
347	204	Antler fragments from Grid 63 (E baulk)
348	204	Antler fragment from clean back of W baulk (trench extension)
349	203d	Three small fragments of possible medieval ceramic (trench extension)
350	203d	Three quartz flakes (trench extension)
351	204	Antler fragments from Grid 75
352	204	Two quartz flakes from Grid 27
353	214	One quartz flake from interface with (204)
354	241	One quartz flake and one fragment of flint (half small nodule) from secondary fill of pit (212/246)
355	241	Animal bone fragment from secondary fill of pit (212/246)
356	243	Animal jaw fragment (pig) and teeth from primary/basal fill of pit (212/246)
357	204	Worked antler fragment comprising part of a strip removed using a burin (from antler beam) and then a blank removed with another cut, leaving this waste piece
358	204	A possible worked bone fragment with a polished/worn bevel – Grid 77 Spit 3
359	204	Worked and shaped antler tine which may have functioned as a small fabricator – Grid 12 Spit 2
360	204/214	Polished bone point recovered from interface of contexts 204 and 214
361	204	A large fragment of antler core material with what appears to be the remains of three drilled holes (all represented by half-sections)
362	235	Large fragment of modified antler from the base/brow area with a rounded surface that appears to have been used for pounding or grinding
363	204	Modified articular end of a large limb bone. The end of the bone, possibly from a large red deer or auroch, has been broken off and rounded and used in a pounding or grinding motion (similar tool recovered from Tybrind Vig in Denmark)

Plate 69 *– Image showing cut of pit (212/246), later pit (238), and midden lenses to each side*

Plate 70 *– View SW showing E-facing section of Trench 2B with stone setting (248) to left, pit (212/246) by scale poles, and indurated beach cobble deposit (231) to right*

Appendix 3 Samples Register

Sample No.	Context No.	Description	Size (litres)
23/01	204	Bulk sample from Grid 31 Spit 1	60L
23/02	204	Bulk sample from Grid 30 Spit 1	50L
23/03	204	Bulk sample from Grid 29 Spit 1	75L
23/04	204	Bulk sample from Grid 28 Spit 1	60L
23/05	204	Charcoal sample from Grid 29 Spit 1	-
23/06	204	Control sample from charcoal-rich midden from Grid 29 Spit 1	5L
23/07	204	Bulk sample from Grid 32 Spit 1	10L
23/08	204	Bulk sample from Grid 31 Spit 2	20L
23/09	204	Bulk sample from Grid 30 Spit 2	70L
23/10	204	Bulk sample from Grid 29 Spit 2	75L
23/11	204	Bulk sample from Grid 28 Spit 2	80L
23/14	204	Bulk sample from Grid 38 Spit 1	50L
23/16	204	Bulk sample from Grid 39 Spit 1	40L
23/19	204	Bulk sample from Grid 37 Spit 1	20L
23/29	204	Bulk sample from Grid 47 Spit 1	10L
23/34	204	Bulk sample from Grid 55 Spit 1	10L
23/55	204	Clean back of remaining 204 to 214	5L
23/58	204	Dog whelk shell from interface between 204 and 214	-
23/59	214	Control sample from surface of 214 Grid 64	5L
23/60	214	Control sample from surface of 215 Grid 46	5L
23/61	214	Small fragments of animal bone and teeth	-
23/62	214	Charcoal fragments	-
23/64	204	Bulk sample from Grid 72 Spit 1	80L
23/65	204	Bulk sample from Grid 71 Spit 1	90L
23/66	204	Bulk sample from Grid 70 Spit 1	50L
23/74	204	Bulk sample from Grid 13 spit 1	70L
23/77	204	Charcoal sample from Grid 13 spit 1	-
23/81	204	Bulk sample from Grid 70 spit 2	50L
23/105	204	Bulk sample from Grid 14 spit 1	110L
23/106	204	Bulk sample from Grid 69 spit 2	30L
23/111	204	Animal bone from Grid 70 spit 2	-
23/114	204	Bulk sample from Grid 71 spit 2	90L
23/122	204	Bulk sample from Grid 69 spit 2	15L
23/123	204	Animal bone fragments from Grid 71 spit 1	-
23/127	204	Animal bone from Grid 70 spit 1	-
23/130	204	Animal bone from Grid 72 spit 1	-
23/131	204	Animal bone from Grid 69 spit 2	-
23/135	204	Animal bone from Grid 68 spit 3	-
23/136	204	Animal bone from Grid 71 spit 2	-
23/137	204	Animal bone from Grid 72 spit 2	-
23/138	204	Animal bone from Grid 69 spit 3	-
23/139	204	Animal bone from Grid 14 spit 1	-
23/140	204	Bulk sample from Grid 72 spit 2	30L

Sample No.	Context No.	Description	Size (litres)
23/141	204	Animal bone from Grid 14 spit 1	-
23/142	204	Bulk sample from Grid 9 spit 2	80L
23/143	204	Bulk sample from Grid 10 spit 2	40L
23/147	204	Animal bone from Grid 72 spit 2	-
23/152	204	Control bulk sample from Grid 9 spit 2	5L
23/156	204	Animal bone from Grid 10 spit 2	-
23/157	204	Animal bone from Grid 9 spit 2	-
23/160	226	Bulk sample of thin midden lens with charcoal and crushed marine shell from Grid 31	5L
23/162	204	Bulk sample from Grid 15 spit 2	40L
23/163	204	Animal bone from section clean, W baulk of trench	-
23/164	204	Animal bone from Grid 15 spit 2	-
23/165	226	Bulk sample of thin midden lens with charcoal and crushed marine shell from Grid 30	5L
23/166	226	Bulk sample from midden-rich area of thin midden lens	5L
23/167	204	Bulk sample from Grid 14 spit 1	30L
23/172	204	Animal bone from Grid 16 spit 1	-
23/173	204	Bulk sample from Grid 13 spit 2	40L
23/175	204	Bulk sample from Grid 12 spit 2	90L
23/176	226	Bulk sample from thin midden lens in Grid 43	5L
23/178	226	Bulk sample from thin midden lens in Grid 28	5L
23/179	226	Bulk sample from thin midden lens in Grid 29	5L
23/180	226	Bulk sample from thin midden lens in Grid 27	5L
23/181	204	Bulk sample from Grid 8 spit 3	50L
23/183	226	Bulk sample from thin midden lens in Grid 27	5L
23/184	204	Animal bone from Grid 13 spit 2	-
23/185	204	Charcoal from Grid 9 spit 2	-
23/186	204	Animal bone from Grid 9 spit 2	-
23/187	226	Animal bone from Grid 43 spit 2	-
23/188	226	Bulk sample from thin midden lens in Grid 25	5L
23/189	226	Bulk sample from thin midden lens in Grid 46	5L
23/197	204	Bulk sample from Grid 11 spit 2	70L
23/207	226	Control bulk sample of thin midden lens in E side of trench rich in charcoal and crushed shell	5L
23/210	226	Bulk sample from thin midden lens in Grid 41	5L
23/213	226	Bulk sample from thin midden lens in Grid 46	5L
23/215	203e	Charcoal sample from trench extension	-
23/216	203e	Animal bone from trench extension	-
23/217	203e	Fish bone from trench extension	-
23/218	203e	Burnt bone from trench extension	-
23/220	203e	Tooth enamel fragments from trench extension	-
23/221	204	Animal teeth from Grid 11 spit 2	-
23/222	204	Animal bone from Grid 8 spit 3	-
23/223	204	Bulk sample from Grid 8 spit 3	10L
23/225	204	Bulk sample from Grid 7 spit 3	60L
23/227	204	Bulk sample from Grid 70 spit 3	50L

Sample No.	Context No.	Description	Size (litres)
23/232	204	Bulk sample from Grid 16 spit 1	10L
23/240	227	Control bulk sample of thin midden lens in Grid 28	5L
23/243	204	Bulk sample from Grid 74 spit 1	10L
23/244	227	Control bulk sample of thin midden lens in Grid 28	5L
23/245	204	Bulk sample from Grid 10 spit 2	50L
23/246	204	Bulk sample from Grid 75 spit 1	40L
23/248	204	Bulk sample from Grid 71 spit 3	70L
23/258	204	Bulk sample from Grid 9 spit 3	60L
23/260	204	Bulk sample from Grid 14 spit 2	80L
23/266	204	Bulk sample from Grid 77 spit 1	40L
23/272	204	Bulk sample from Grid 11 spit 3	60L
23/275	204	Bulk sample from Grid 72 spit 3	60L
23/276	204	Bulk sample from Grid 12 spit 3	60L
23/285	204	Bulk sample from Grid 79 spit 1	20L
23/289	204	Oyster shell sample from Grid 14 spit 2	-
23/296	204	Bulk sample from Grid 74 spit 2	30L
23/302	204	Bulk sample from Grid 73 spit 3	20L
23/303	204	Bulk sample from Grid 13 spit 3	30L
23/304	204	Bulk sample from Grid 10 spit 3	20L
23/305	226	Bulk sample from thin midden lens in Grid 46 spit 1	5L
23/306	226	Bulk sample from thin midden lens in Grid 46 spit 1	5L
23/307	226	Bulk sample from thin midden lens in Grid 47 spit 1	5L
23/308	226	Bulk sample from thin midden lens in Grid 46 spit 2	5L
23/309	226	Bulk sample from thin midden lens in Grid 42 spit 1	5 L
23/310	226	Bulk sample from thin midden lens in Grid 54 spit 1	5L
23/319	204	Bulk sample from Grid 79 spit 3	10L
23/320	204	Bulk sample from Grid 77 spit 3	30L
23/322	204	Bulk sample from Grid 75 spit 3	70L
23/323	226	Bulk sample from thin midden lens in Grid 46 spit 2	5L
23/325	204	Bulk sample from Grid 14 spit 3	65L
23/326	231	Bulk sample from indurated cobble deposit in Grid 31	5L
23/329	204	Bulk sample from Grid 15 spit 3	30L
23/333	226	Charcoal sample deposit	-
23/344	230	Bulk sample from possible hearth deposit in Grid 54	5L
23/335	226	Bulk sample from thin midden lens in Grid 31	10L
23/349	204	Animal bone from Grid 79 spit 2	-
23/350	226	Bulk sample from midden lens with crushed shell in Grid 46	10L
23/351	204	Animal bone from Grid 72 spit 2	-
23/352	204	Animal bone from Grid 14 spit 2	-
23/353	204	Animal bone from Grid1 10 spit 3	-
23/354	204	Animal bone from Grid 77 spit 1	-
23/355	204	Animal bone from Grid 71 spit 2	-
23/356	204	Charcoal sample from Grid 77 spit 3	-
23/357	204	Animal bone from Grid 43	-
23/358	204	Animal bone from Grid 75	-

Sample No.	Context No.	Description	Size (litres)
23/359	204	Animal bone from interface of 204 and 213 in Grid 13	-
23/360	204	Animal bone from Grid 79	-
23/361	226	Charcoal sample from context	-
23/362	204	Animal bone from Grid 74 spit 3	-
23/363	204	Animal bone from Grid 79 spit 2	-
23/364	204	Animal bone from Grid 14 spit 3	-
23/365	204	Animal bone from Grid 71 spit 3	-
23/366	204	Animal bone from Grid 15 spit 3	-
23/367	204	Animal bone from Grid 10 spit 2	-
23/368	204	Animal bone from Grid 14 spit 2	-
23/369	204	Animal bone from Grid 7 spit 3	-
23/370	204	Animal bone from Grid 13 spit 2	-
23/371	204	Animal bone from Grid 15 spit 1	-
23/372	204	Animal bone from Grid 15 spit 2	-
23/373	204	Charcoal sample from Grid 29 spit 2	-
23/374	226	Animal bone from Grid 46	-
23/375	204	Animal bone from Grid 74 spit 1	-
23/376	203d	Animal bone and charcoal from trench extension	-
23/377	204	Animal bone from Grid 70 spit 3	-
23/378	204	Animal bone from Grid 16 spit 2	-
23/379	204	Animal bone, tooth, and charcoal from Grid 9 spit 3	-
23/380	204	Animal bone and charcoal from Grid 75	-
23/381	204	Animal bone and charcoal from Grid 77 spit 3	-
23/382	204	Grab sample of oyster shells from Grid 27	1L
23/383	204	Charcoal sample from Grid 27	-
23/384	235	Sample from deposit located in W baulk of trench containing animal bone, antler, and some marine shell	5L
23/385	243	Sample from primary fill of pit (212/246) containing marine shell, bone, teeth, and charcoal	5L
23/386	241	Sample from secondary/upper fill of pit (212/246) containing marine shell, bone, and charcoal	5L
23/387	241	Sample from secondary/upper fill of pit (212/246) containing marine shell, bone, and charcoal	5L
23/388	214	Animal bone from clean-back of surface on W side of trench	-
23/389	214	Animal bone from clean-back of surface on W side of trench	-
23/390	235	Animal bone and antler from deposit in W baulk of trench	-
23/391	235	Charcoal sample from deposit in W baulk of trench	-
23/392	243	Animal jaw fragment and teeth (pig) and charcoal from primary/basal fill of pit (212/246) – C14 dating?	-
23/393	237	Oyster shell from base of pit (238) containing animal burial	-
23/394	237	Animal burial recovered from pit (238)	-

Appendix 4 Drawing Register

Drawing No.	Trench	Description	Scale	Date
TAT23/01	2B	Plan of west side of Trench 2B after removal of midden deposits (204) and showing trench extension to north	1:20	12.10.23
TAT23/02	2B	Plan of east side of Trench 2B after removal of midden (204) and showing underlying midden deposits (218,226,227,228)	1:20	12.10.23
TAT23/03	2B	West-facing section of east baulk of Trench 2B, cut back to east beyond limits of 2015 evaluation trench	1:20	11.10.23
TAT23/04	2B	East-facing section of central baulk of Trench 2B including evaluation sondages S1, S2 and S3	1:20	11.10.23
TAT23/05	2B	West-facing section of central baulk of Trench 2B including 2023 trench extension to north	1:20	11.10.23
TAT23/06	2B	Detail of Sondage 1 in east-facing section of central baulk of Trench 2B	1:10	11.10.23
TAT23/07	2B	Detail of Sondage 2 in east-facing section of central baulk of Trench 2B	1:10	11.10.23
TAT23/08	2B	Detail of Sondage 3 in east-facing section of central baulk of Trench 2B	1:10	11.10.23
TAT23/09	2B	East-facing section of west baulk of Trench 2B including 2023 trench extension to north, pit cut (238), pit cut (212/246), and possible post setting (248)	1:20	12.10.23

Plate 71 *– Plan view of part of W sector of Trench 2B showing pit cut (212/246) within W baulk, and natural beach deposits (229). The transition from (229) to indurated cobble deposit (231) can be seen at top left*

Appendix 5 List of Photographs

Photo No.	Trench	Context	Description	Direction Facing	Date
1	2B	225, 234	Stone spread 225 within context 202 in trench extension	E	28.9.23
2	2B	225, 234	Stone spread 225 within context 202 in trench extension	E	28.9.23
3	2B	-	General image showing excavation in E side of trench against N baulk	E	28.9.23
4	2B	204	Removing remaining deposits of midden 204 within E side of trench, with stone settings 215 and 216 behind	SE	28.9.23
5	2B	204, 205, 207	View over E side of trench to central baulk and showing basal deposits of midden 204, cut of hollow/depression 207, and mini baulks of fill in hollow (205)	W	28.9.23
6	2B	204, 228, 214, 218, 207	View over E side of trench showing black basal deposits of midden 204, buff to grey shell and ash deposit 228/218, and cut of hollow/depression 207 after removal of stone setting 215	S	28.9.23
7	2B	204, 228, 214, 218, 207, 229	View over E side of trench showing black basal deposits of midden 204 (top), buff to grey shell and ash deposit 228/218, and cut of hollow/depression 207 after removal of stone setting 215, and cut of 2015 evaluation trench showing cobbled surface 214/229	W	29.9.23
8	2B	204, 228, 214, 218, 207, 229, 216	View over E side of trench (see above) showing black basal deposits of midden 204 (top), buff to grey shell and ash deposit 228/218, and cut of hollow/depression 207 after removal of stone setting 215,stone setting 216, and cut of 2015 evaluation trench showing cobbled surface 214/229	W	29.9.23
9	2B	204, 228, 214, 218, 207, 229, 216	General mid-ex view over trench showing mini baulks through infill deposit 205 within cut of hollow/depression (207), the central baulk, and excavations taking place in the W side of the trench including trench extension to the right. Note the ridge of thicker midden deposit 204 in the W side of the trench	W	29.9.23
10	2B	See above	As image 9 above	W	29.9.23
11	2B	204, 228, 214, 218, 207, 229, 216	General mid-ex view over trench showing mini baulks through infill deposit 205 within cut of hollow/depression (207) before removal, and the central baulk to right	S	29.9.23
12	2B	204, 228, 214, 218, 207, 229, 216	General mid-ex view over trench showing mini baulks through infill deposit 205 within cut of hollow/depression (207) before removal, and the central baulk to right. Closer view showing possible stone settings around hollow (207)	S	29.9.23
13	2B	204, 228, 214, 218, 207, 229, 216	General mid-ex view over trench showing mini baulks through infill deposit 205 within cut of hollow/depression (207), the central baulk to left, and showing possible stone settings around hollow (207); shown by arc of larger stones within beach deposit 214	N	29.9.23
14	2B	204, 228, 214, 218, 207, 229, 216	General mid-ex view over trench showing mini baulks through infill deposit 205 within cut of hollow/depression (207), the central baulk to left, and showing possible stone settings around hollow (207); shown by arc of larger stones within beach deposit 214. Note darker areas of ashy midden 226 in, and around, possible stone settings	N	29.9.23
15	2B	204, 214, 200	View over W side of trench with central baulk to right, black midden deposits 204, trench extension to left with sediment context 200, and stones of underlying beach 214 just showing through within lower half of image	N	29.9.23

Photo No.	Trench	Context	Description	Direction Facing	Date
16	2B	204, 214, 200, 234, 203a	As image 15 above, but showing N baulk of trench with slope wash deposits 234 and 203a, and trench extension under excavation	N	29.9.23
17	2B	204, 214, 200, 234, 203a	As image 15 above, but showing N baulk of trench with slope wash deposits 234 and 203a, and trench extension under excavation	N	29.9.23
18	2B	As above	As Image 17 above	N	29.9.23
19	2B	200, 203a, 236, 237, 238, 212	Mid-ex image showing pit cut (238) with animal remains, within larger/earlier cut (221/246) within W baulk of trench and showing overlying ploughsoil sediment 200, paler slope-wash deposit 203a, and upper fills of pit 236 and 237	W	29.9.23
20	2B	200, 203a, 236, 237, 238, 212	Mid-ex image showing pit cut (238) with animal remains, within larger/earlier cut (221/246) within W baulk of trench and showing overlying ploughsoil sediment 200, paler slope-wash deposit 203a, and upper fills of pit 236 and 237	W	29.9.23
21	2B	200, 203a, 236, 237, 238, 212	Vertical view over pit cuts (238) and (212/246) in W baulk of trench. The full cut and depth of the earlier pit (212/246) had not been revealed at this stage (mid-ex). Note the clean cleave of the cranium of the animal in the pit	W	29.9.23
22	2B	As above	As Image 21 above but closer view showing animal remains and cleaved/split cranium	W	29.9.23
23	2B	238, 249, 236	Close vertical view of animal remains in pit 238 showing articulated lower limb bones to left, the cleaved/split cranium, and disarticulated vertebra and other elements	W	29.9.23
24	2B	As above	As Image 23 above	W	29.9.23
25	2B	238, 249, 236, 236	Oblique view of animal remains in pit 238 showing articulated lower limb bones to left, the cleaved/split cranium, and disarticulated vertebra and other elements	W	29.9.232
26	2B	As above	As Image 25 above	W	29.9.23
27	2B	-	General working shot showing removal of basal midden deposits 204 in E side of the trench, adjacent to the central baulk	SE	29.9.23
28	2B	234	View over trench extension showing slope wash silt 202 and random stone cobbles in NE corner of extension. These proved to be a natural deposit in the silt	SSE	29.9.23
29	2B	234	As Image 28 above, but closer view of stones/cobbles	SSE	29.9.23
30	2B	-	General working shot over Trench 2B with trench extension in foreground	SE	29.9.23
31	2B	-	General working shot over Trench 2B	NW	29.9.23
32	2B	-	View over Trench 2B with palaeo-cliff behind and trench extension top left	NE	29.9.23
33	2B	-	General view over Trench 2B with central baulk, W-facing section, and palaeo-cliff behind	NE	29.9.23
34	2B	204	Image showing in-situ antler brow tine from red deer lying within midden deposits 204 spit 1, grid square 28	E	29.9.23
35	2B	203b, 203c	View over trench extension showing random stone in foreground in context 203b, with darker lens of material 203c containing some crushed marine shell	W	30.9.23
36	2B	203b, 203c	View over trench extension showing random stone in context 203b to left, with darker lens of material 203c containing some crushed marine shell. Cattle bone visible next to stone	S	30.9.23
37	2B	203b, 203c	View over trench extension showing random stone in context 203b at top, with darker lens of material 203c containing some crushed marine shell and animal bone arcing around below the tip of the scale rod	E	30.9.23

Photo No.	Trench	Context	Description	Direction Facing	Date
38	2B	226, 227, 228, 214	Mid-ex view over E side of trench showing basal midden and stone deposits after removal of mini baulks, some larger stone clasts, and midden 204	N	1.10.23
39	2B	226, 227, 228, 214	Mid-ex view over E side of trench showing basal midden and stone deposits after removal of mini baulks, some larger stone clasts, and midden 204	S	1.10.23
40	2B	As above	As Image 39 above	S	1.10.23
41	2B	226, 227, 228, 214, 229	Mid-ex view over E side of trench showing basal midden including darker ashy midden 226, crushed shell lenses 227, and pea gravel 218. Natural beach deposits 229 within base of 2015 evaluation trench cut to the right	N	1.10.23
42	2B	As above	As Image 41 above	N	1.10.23
43	2B	As above	As Image 41 above	N	1.10.23
44	2B	226, 227, 228, 214, 229	Mid-ex view over E side of trench showing basal midden including darker ashy midden 226, crushed shell lenses 227, and pea gravel 218. Natural beach deposits 229 within base of 2015 evaluation trench cut to the left, and central baulk to the right	S	1.10.23
45	2B	As above	As Image 44 above	S	1.10.23
46	2B	226, 227, 228, 214, 229	Mid-ex view over E side of trench, southern half, showing basal midden including darker ashy midden 226, crushed shell lenses 227, and pea gravel 218. Natural beach deposits 229 within base of 2015 evaluation trench cut to the right. Cluster of stone in context 216 from 2019 excavations	N	1.10.23
47	2B	216, 226, 228	Close view of stone cluster 216 before removal, within the E side of Trench 2B	N	1.10.23
48	2B	204	General view over the W side of the trench showing removal of midden deposits 204 by grid square and spit; with trench extension top left	N	2.10.23
49	2B	226, 227, 228, 218	View over the E side of the trench showing removal of thin basal midden deposits by grid square and spit	SSE	2.10.23
50	2B	As above	As Image 49 above, but lower angle of view	S	2.10.23
51	2B	204	General view over the W side of the trench showing removal of midden deposits 204 by grid square and spit; with trench extension at top of image. Note exposed slope wash deposits in N baulk	N	2.10.23
52	2B	-	General working shot in W side of Trench 2B	NNE	2.10.23
53	2B	-	General working shot of excavations taking place in E side of Trench 2B	E	2.10.23
54	2B	226, 227, 228, 214, 229	Mid-ex view over E side of trench showing basal midden including darker ashy midden 226 (darker around stones), crushed shell lenses 227, and pea gravel 218. Natural beach deposits 229 within base of 2015 evaluation trench cut to the right. Cluster of stone in context 216 from 2019 excavations	N	2.10.23
55	2B	226, 227, 228, 214, 229	Mid-ex view over E side of trench showing basal midden including darker ashy midden 226 (darker around stones), crushed shell lenses 227, and pea gravel 218. Natural beach deposits 229 within base of 2015 evaluation trench cut to the right. Cluster of stone in context 216 from 2019 excavations	N	2.10.23
56	2B	As above	As Image 55 above and showing N baulk of trench	N	2.10.23
57	2B	226, 227, 228, 214, 229	Mid-ex view over E side of trench showing basal midden including darker ashy midden 226 (darker around stones), crushed shell lenses 227, and pea gravel 218. Natural beach deposits 229 within base of 2015 evaluation trench cut in foreground	W	2.10.23

Photo No.	Trench	Context	Description	Direction Facing	Date
58	2B	226, 227, 228, 214, 229, 230	Mid-ex view over E side of trench (N half) showing basal midden including darker ashy midden 226 (darker around stones), crushed shell lenses 227, pea gravel 218, and shallow scoop of possible hearth 230 lower right. Natural beach deposits 229 within base of 2015 evaluation trench cut in foreground	W	2.10.23
59	2B	As above	As Image 58 above, but with no sun/shadows	W	2.10.23
60	2B	226, 227, 228, 218	Image showing thin midden lenses within the E side of Trench 2B with pea gravel and crushed shell 218 to left and above	E	2.10.23
61	2B	As above	As Image 60 above	E	2.10.23
62	2B	As above	As Image 60 above	E	2.10.23
63	2B	226, 227, 228, 214, 229, 230	Mid-ex view over E side of trench showing basal midden including darker ashy midden 226, crushed shell lenses 227, pea gravel 218, and stone cluster 216. Natural beach deposits 229 within base of 2015 evaluation trench cut at top	ESE	2.10.23
64	2B	203d, 203e, 204	View over trench extension showing deposit 203d to left and foreground, darker sediment 203e to right, and patches of midden 204	S	2.10.23
65	2B	As above	As Image 64 above, but differing light levels	S	2.10.23
66	2B	218, 230, 232, 229	View of E-facing section through possible hearth scoop (232), ashy fill 230, and hard, compacted surface of scoop in foreground, within beach surface 229	W	2.10.23
67	2B	As above	As Image 66 above, but low and closer angle of view	W	2.10.23
68	2B	As above	As Image 67 above	W	2.10.23
69	2B	204, 212/246, 203d, 203e	Image showing step in excavation between Trench 2B and trench extension adjacent to W baulk showing cut of pit 212/246 (not fully defined) and thin shell midden horizons interspersed by thin slope wash lenses	N	4.10.23
70	2B	204, 203d, 203e	Image showing step in excavation between Trench 2B and trench extension adjacent to central baulk showing thin shell midden horizons interspersed by thin slope wash lenses	N	4.10.23
71	2B	As above	As Image 70 above	N	4.10.23
72	2B	204, 214	Image showing W side of trench and excavation of midden deposits 204 by grid square and spit, with context 214 starting to show in foreground. Trench extension with visible slope wash deposits at top of image	N	4.10.23
73	2B	204	View over middle section of W side of trench showing stepped excavation by grid square with midden context 204 spit 2 to right and 204 spit 3 to left (near base of midden)	W	4.10.23
74	2B	204	View over middle section of W side of trench showing stepped excavation by grid square with midden context 204 spit 2 to left and 204 spit 3 to right (near base of midden)	E	4.10.23
75	2B	204, 212/246	Mid-ex image showing stepped excavation by grid square with midden context 204 spit 2 below and 204 spit 3 above, with dense cluster of oyster shells in spit 2. Pit (212/246) outline to right not yet fully defined, with red container covering animal bone deposit in pit (238)	S	4.10.23
76	2B	226, 227, 228, 214, 219, 229	Mid-ex image of E side of trench showing control baulk to investigate thin, inter-lensed midden deposits 226, 227, 228, 218; with orange-coloured natural beach deposits 229 showing through. The E baulk has been extended back with the upper sediment deposits 200 removed to show the undulating nature of the top of the midden 204. This is primarily due to hand-excavated rigs cutting through the midden deposits across the site. Stone cluster 216 removed	N	5.10.23

Photo No.	Trench	Context	Description	Direction Facing	Date
77	2B	As above	As Image 76 above	N	5.10.23
78	2B	As above	As Image 76 above, but slight change in angle of direction	NNE	5.10.23
79	2B	226, 227, 228, 214, 219, 229	Mid-ex image of E side of trench showing control baulk to investigate thin, inter-lensed midden deposits 226, 227, 228, 218; with orange-coloured natural beach deposits 229 showing through. The E baulk has been extended back with the upper sediment deposits 200 removed to show the undulating nature of the top of the midden 204. This is primarily due to hand-excavated rigs cutting through the midden deposits across the site. Stone cluster 216 removed	S	5.10.23
80	2B	As above	As Image 79 above	S	5.10.23
81	2B	As above	As Image 80 above, but also showing scoop of possible hearth cut (232) mid-left	S	5.10.23
82	2B	-	General working shot showing excavations in the W side of Trench 2B – note the large number of sample bags from the gridded excavation of midden deposits 204	SW	5.10.23
83	2B	-	General working shot showing excavations in the W side of Trench 2B – pit (212/246) and animal bone deposit (238) under red container in W baulk	SW	5.10.23
84	2B	-	As Image 83 above, but showing slope-wash deposits in trench extension to right	WSW	5.10.23
85	2B	226, 214	Image taken in SE corner of trench showing rich deposits of ashy and shelly midden 226 lying in, and around, stones of natural beach 214	N	5.10.23
86	2B	As above	As Image 85 above	N	5.10.23
87	2B	218, 214, 231, 229	Mid-ex image of E side of Trench 2B after removal of thin midden lenses to reveal underlying beach cobble 214 and gritty sediments 229. Pea gravel with crushed shell 218 at top of image, while indurated cobble deposit 231 is just visible in the top left corner of the trench	N	5.10.23
88	2B	As above	As Image 87 above	N	5.10.23
89	2B	As above	As Image 87 above	N	5.10.23
90	2B	218, 214, 231, 229	Mid-ex image of E side of Trench 2B after removal of thin midden lenses to reveal underlying beach cobble 214 and gritty sediments 229. Pea gravel with crushed shell 218 at top of image, while indurated cobble deposit 231 is just visible in the top left corner of the trench	N	5.10.23
91	2B	218, 214, 231, 229	Mid-ex image of E side of Trench 2B after removal of thin midden lenses to reveal underlying beach cobble 214 and gritty sediments 229. Pea gravel with crushed shell 218 at top of image, while indurated cobble deposit 231 is just visible in the top left corner of the trench	N	5.10.23
92	2B	218, 214, 231, 229	Mid-ex image of E side of Trench 2B after removal of thin midden lenses to reveal underlying beach cobble 214 and gritty sediments 229. Pea gravel with crushed shell 218 in foreground, while indurated cobble deposit 231 is visible at lower right, adjacent to the central baulk section	S	5.10.23
93	2B	As above	As Image 92 above	S	5.10.23
94	2B	218, 214, 231, 229	Mid-ex image of E side of Trench 2B after removal of thin midden lenses to reveal underlying beach cobble 214 and gritty sediments 229. Indurated cobble deposit 231 is visible at top right, adjacent to the central baulk section	SW	5.10.23
95	2B	218, 231, 232	Image showing E side of trench showing context 218 (under scales), indurated cobble deposit 231 to right, and hearth scoop (232) in centre foreground	W	5.10.23

Photo No.	Trench	Context	Description	Direction Facing	Date
96	2B	218, 214, 231, 229	Mid-ex image of E side of Trench 2B after removal of thin midden lenses to reveal underlying beach cobble 214 and gritty sediments 229. Pea gravel with crushed shell 218 in centre of image, while indurated cobble deposit 231 is visible at lower right, adjacent to the central baulk section	S	5.10.23
97	2B	As above	As Image 96 above, but lower light levels	S	5.10.23
98	2B	218, 214, 231, 229	Post-ex image showing E side of Trench 2B and strip trench to left with mini sondages S1, S2, and S3, to evaluate underlying beach deposits	N	6.10.23
99	2B	As above	As Image 98 above, but lower light levels	N	6.10.23
100	2B	218, 214, 231, 229	Post-ex image showing E side of Trench 2B and strip trench to right with mini sondages S1, S2, and S3, to evaluate underlying beach deposits	S	6.10.23
101	2B	As above	As Image 100 above	S	6.10.23
102	2B	218, 214, 231, 229	Post-ex image showing E side of Trench 2B and strip trench with mini sondages S1, S2, and S3, to evaluate underlying beach deposits	S	6.10.23
103	2B	234, 203c, 204, 231, 229	Post-ex image showing S-facing section of Sondage 1 in E side of Trench 2B showing basal beach deposits 229, indurated beach cobbles 231, midden deposit 204, and slope wash deposits 234 and 203c	N	6.10.23
104	2B	200, 204, 231, 229	Post-ex image showing E-facing section of Sondage 1 in E side of Trench 2B showing basal beach deposits 229, indurated beach cobbles 231, midden deposit 204, and plough soil 200	W	6.10.23
105	2B	229	Plan view of Sondage 2 in E side of Trench 2B showing basal beach deposits 229	N	6.10.23
106	2B	200, 204, 226, 218, 229	Post-ex image showing E-facing section of Sondage 2 in E side of Trench 2B showing basal beach deposits 229, thin midden lenses 218 and 226, midden deposit 204, and plough soil 200	W	6.10.23
107	2B	As Above	As Image 106 above	W	6.10.23
108	2B	229	Plan view of Sondage 3 in E side of Trench 2B showing basal beach deposits 229	S	6.10.23
109	2B	200, 204, 218, 229	Post-ex image showing E-facing section of Sondage 3 in E side of Trench 2B showing basal beach deposits 229, thin midden lens 218, and mixed midden deposit 204 and plough soil 200	W	6.10.23
110	2B	218, 231, 229	Post-ex image showing location of Sondages 1, 2, and 3, in the E side of Trench 2B, adjacent to the central baulk	N	6.10.23
111	2B	246, 238, 236, 203d 203b, 203a, 200	Mid-ex image showing animal bone deposit in pit cut (238), located within the W baulk of Trench 2B, and overlying/abutting contexts. Prior to removal of animal bone protruding from section	W	6.10.23
112	2B	As above	As Image 111 above but wider angle of view showing cut of larger pit (212/246) before fully defining the feature and midden 204	W	6.10.23
113	2B	As above	As Image 112 above	W	6.10.23
114	2B	218, 229	General image looking along the W side of Trench 2B to the trench extension and pit (212/246) visible to the left with animal bone deposit 238	NW	6.10.23
115	2B	214, 218, 229	General image looking along the W side of Trench 2B to the S baulk, with excavation of the remaining thin midden lenses 218	SSW	6.10.23
116	2B	218, 229	Image looking along the W side of Trench 2B towards the trench extension and pit (212/246) visible to the left with animal bone deposit 238; after removal of midden deposit 204 (with exception of end of trench closest to camera	NW	6.10.23

Photo No.	Trench	Context	Description	Direction Facing	Date
117	2B	As above	As Image 116 above, showing how the thin underlying midden lenses vary in colour and thickness along the trench	N	6.10.23
118	2B	As above	As Image 117 above but showing the trench extension under excavation at the N end of the trench	N	6.10.23
119	2B	-	General image showing clearing up spoil from small collapses of the W and N baulks after prolonged and heavy rain	NNW	9.10.23
120	2B	214, 218, 229	Post-excavation image of the W side of Trench 2B showing new control baulk with evaluation trenches to each side revealing the natural beach deposit 229. Trench extension at far end, to N	N	9.10.23
121	2B	As above	As Image 120 above, but wider angle of view showing trench extension to N and overlying deposits in baulk	N	9.10.23
122	2B	200, 204, 214, 229	Post-excavation image of E-facing section of W baulk of Trench 2B (south end) showing basal beach deposit 229, cobble horizon 214, overlying midden 204, and ploughsoil 200	W	9.10.23
123	2B	200, 204, 247, 248, 250, 214, 229	Post-excavation image of E-facing section of W baulk of Trench 2B (south end) showing basal beach deposit 229, cobble horizon 214, overlying midden 204, and ploughsoil 200. Stone setting 248 to right with overlying shell lens 247	W	9.10.23
124	2B	200, 204, 239, 247, 248, 250, 214, 229	Post-excavation image of E-facing section of W baulk of Trench 2B (central to south end) showing basal beach deposit 229, cobble horizon 214, overlying midden 204, and ploughsoil 200. Stone setting 248 at centre with overlying shell lens 247 and underlying fill 250. Note the undulating nature of the surface of midden deposit 204 due to hand-excavated rig and furrow	W	9.10.23
125	2B	200, 204, 239, 240, 247, 248, 250, 214, 218, 212/246, 238, 249, 237, 236, 203d, 203b, 203a, 229	Post-excavation image of E-facing section of W baulk of Trench 2B (central to south end) showing basal beach deposit 229, cobble horizon 214, overlying midden 204, and ploughsoil 200. Stone setting 248 to left with overlying shell lens 247 and underlying fill 250. Also showing later pit cut (238) and overlying fills 237, 236, 203b; and upper fill (249) of earlier pit (212/246) – only mid-ex here. Note the undulating nature of the surface of midden deposit 204 due to hand-excavated rig and furrow; although this may also comprise midden deposit excavated and cast out to form the earlier pit	W	9.10.23
126	2B	200, 204, 239, 240, 218, 212/246, 238, 249, 237, 236, 203d, 203b, 203a, 229	Post-excavation image of E-facing section of W baulk of Trench 2B (central section) showing basal beach deposit 229, midden deposits 204, 239 and 240, and ploughsoil 200. Also showing later pit cut (238) and overlying fills 237, 236, 203b; and upper fill (249) of earlier pit (212/246) – only mid-ex here.	W	9.10.23
127	2B	200, 203a, 203b, 203c, 203d, 236, 237, 238, 249, 212/246, 244, 245, 231	Post-excavation image of E-facing section of W baulk of Trench 2B (central to north end) showing basal beach deposit 229, indurated cobble deposit 231, midden deposits 245, 244 and 203e, overlying slope wash deposits 203d, 203c, 203b, 203a and 234, and ploughsoil 200. Also showing later pit cut (238) and overlying fills 237, 236, 203b; and upper fill (249) of earlier pit (212/246) – only mid-ex here.	W	9.10.23

Photo No.	Trench	Context	Description	Direction Facing	Date
128	2B	200, 203a, 203b, 203c, 203d, 236, 237, 238, 249, 212/246, 244, 245, 231	Post-excavation image of E-facing section of W baulk of Trench 2B (north end) showing basal beach deposit 229, indurated cobble deposit 231, midden deposits 245, 244 and 203e, overlying slope wash deposits 203d, 203c, 203b, 203a and 234, and ploughsoil 200. Also showing later pit cut (238) and overlying fills 237, 236, 203b; and upper fill (249) of earlier pit (212/246) – only mid-ex here.	W	9.10.23
129	2B	212/246, 214, 218, 231, 229	Post-excavation image of the W side of Trench 2B showing control baulk with evaluation trenches to each side revealing the natural beach deposit 214, 229 and indurated cobbles 231. Also showing mid-ex shape of pit feature (212/246) prior to final excavation	S	9.10.23
130	2B	As above	As Image 129 above	S	9.10.23
131	2B	248, 212/246, 218, 231, 229	As Image 129 above but showing in closer detail contexts at N end of trench. The stones relating to setting 248 can be seen protruding from the W baulk, beyond the pit	S	9.10.23
132	2B	248, 212/246, 244, 245, 218, 231, 229	Oblique view of the W side of Trench 2B showing all excavated contexts post-ex, with the exception of pit cut (212/246) which is mid-ex. Note the reddened area of beach deposit 229, to the right of the pit, with overlying compacted lenses of wood ash (mixed with some marine shell), and darker charcoal-rich lenses	SW	9.10.23
133	2B	248, 212/246, 244, 245, 218, 231, 229	As Image 132 above, but closer angle of view showing relationship of pit (212/246) with contexts to the N and S. Note that the collapse of part of the section above the pit resulted in fresher, more varied colours for some of the overlying contexts	SW	9.10.23
134	2B	212/246, 249, 218, 231, 229	Plan view over central section of the W side of Trench 2B showing the central control baulk, natural beach 229 and indurated beach deposits 231, and mid-ex of pit (212/246) with current fill at base of 249	E	9.10.23
135	2B	200, 203a, 203b, 236, 237, 238, 249, 241, 242, 243, 212/246, 229	Post-ex image of pit (212/246) cut into natural beach deposits 229. Showing primary/basal deposit 243, secondary fill 241 and intruding lens 242, and upper fill 249. The latter, along with slope wash deposits 203d and 203c, were cut by later pit (238). This is filled by 237, 236 and 203b. Overlying the later pit is slope wash deposit 203a and ploughsoil 200. The earlier pit cut through midden deposits 204, 239 and 240 on the S side, and 244 and 245 on the N side. The cavity that contained the animal bone in 238 can be seen at 0.8m on the vertical scale pole	W	12.10.23
136	2B	As above	As Image 135, but closer view showing fills and base of pit (212/246)	W	12.10.23
137	2B	As above	As Image 136, but steeper angle of view into pit (212/246)	W	12.10.23
138	2B	As above	As Image 137 above	W	12.10.23
139	2B	As above	As Image 137 above, but wider angle of view showing cut contexts	W	12.10.23
140	2B	As above	As Image 139 above	W	12.10.23
141	2B	As above	Post-ex image showing pit (212/246) from a lower angle and showing abutting and cut contexts to each side. Note lower grey ash lens to each side cut through by pit cut (238)	W	12.10.23

Photo No.	Trench	Context	Description	Direction Facing	Date
142	2B	As above	As Image 137 above, but showing cavity where animal remains (238) were removed from context 237	W	12.10.23
143	2B	200, 204, 239, 240, 247, 248, 250, 214, 218, 212/246, 238, 249, 237, 236, 203d, 203b, 203a, 229	Oblique post-ex image of E-facing section of W baulk of Trench 2B (central section) showing basal beach deposit 229, cobble horizon 214, overlying midden 204, and ploughsoil 200. Stone setting 248 to left with overlying shell lens 247 and underlying fill 250. Also showing later pit cut (238) and overlying fills 237, 236, 203b; and upper fill (249) of earlier pit (212/246). Note the undulating nature of the surface of midden deposit 204 due to hand-excavated rig and furrow; although this may also comprise midden deposit excavated and cast out to form the earlier pit (212/246)	NW	12.10.23
144	2B	200, 204, 239, 240, 247, 248, 250	Close view of stone setting 248, overlying dense shell lens 247, and lower fill between stones 250. Above natural beach deposit 229 is grey lens 218, then black ashy lens 240 to right and black ashy lens 239 covering the stone setting and 240. Above is the main midden 204, with the furrows clearly seen with a slightly different coloured sediment to ploughsoil 200 above	W	12.10.23
145	2B	As above	As Image 144 above, but showing more of section in detail to right (N)	W	12.10.23
146	2B	237, 236, 203d, 203c, 203b, 203a, 200, 238, 212/246, 244, 245, 231, 229	Close image of W baulk of Trench 2B showing relationship of pit (212/246) and its fills, later pit (238) and its fills, and contexts to N and above pits. Note that the collapse of part of the section above the pit resulted in fresher, more varied colours for some of the overlying contexts, especially at the interface between the (212/246) pit cut and associated contexts/contexts that were cut	W	12.10.23
147	2B	203d, 203c, 203b, 203a, 200, 212/246, 244, 245, 231, 229	Image showing detail of context relationships immediately to the N of the cut for pit (212/246). Starts with natural beach deposit 229, then indurated beach cobbles 231 to right, over which lies the earliest midden lens comprising 245, which merges into and is overlain by context 244. This is overlain by 203e and 203d, then working up the sequence are slope-wash deposits 203c, 203b, 203a, 234, and 200. The midden here is compact	W	12.10.23
148	2B	As above	As Image 147 above, but showing deposits to the left including midden lenses 245 and 244 thinning out to the right (N) on the indurated beach cobbles 231	W	12.10.23
149	2B	As above	As Image 148 above, but wider angle of view. In this area 203e merges with the underlying contexts 245 and 244, with the brown intermittent lens above 203D; the buff layer above 203c, and the mixed darker layer above 203b. Context 203a is the paler deposit above this with 234 above	W	12.10.23
150	2B	200, 234, 203a, 203b, 203c, 235, 204, 231	Post-ex image showing the W-facing section of the central baulk, at the N end including the stepped trench extension. Shows at the base the indurated beach cobble layer 231, above which is a thinning lens of midden 204, which becomes thicker to right beyond the beach cobbles, where the natural beach falls away. Above the midden 204 are contexts 235 and 203c, and above these in ascending order 203b, 203a, 234, and 200. The indurated cobble deposit 231 appears to form a step which may relate to the highest stand of the high tide when the site was in use, or post-abandonment	E	12.10.23

Photo No.	Trench	Context	Description	Direction Facing	Date
151	2B	203c, 235, 204, 218, 231, 229	Post-ex image as Image 150, but to the S and showing the indurated cobble deposit 231 running into the natural beach deposit 229. Above these contexts is the lower thin midden deposit 218, with 204, the main midden above. This is topped by slope wash context 235, 203c, and the fill of the rigs and ploughsoil 200	E	12.10.23
152	2B	235, 204, 218, 229	Post-ex image as Image showing the central section of the W-facing central baulk of Trench 2B, with the same sequence as described in Image 151 (blurred due to fading daylight)	E	12.10.23
153	2B	As above	Post-ex image as Image 152 above showing the mixed and varied nature of the main midden deposit 204, which has been heavily disturbed by the creation of rig and furrow	E	12.10.23
154	2B	200, 204, 218, 229	Post-ex image showing the south end of the W-facing section of the central baulk of Trench 2B. The image shows a similar profile to Image 153 above, including the main midden deposit 204 which has been truncated by the creation of the later rig and furrow	E	12.10.23

Plate 72 *– Image showing modified animal bone splinters used as points*

Plate 73 *– Image showing probable cowrie shell bead recovered from wet sieving retent*

Plate 74 *– Image showing articular end of probable red deer metapodia that has been modified into a grinding or pounding tool (SF363)*

Appendix 6 Assessment of Potential: Recovered Artefacts and Samples

As mentioned in the previous chapters of this report, the excavation of midden Site 2B in 2017 and 2023 at Tarradale generated a significant number of bulk samples for on-site wet sieving, totalling c.3,475 litres (Table **1**). The samples (all recovered from context 204) from 2017 have already been processed and the resulting residues sorted. Processing of the 2023 samples is well underway, while the 1000+ litres of remaining samples are being prioritised. This has proved to be a challenging task, especially the sorting of the residues which includes the identification of generally small ecofacts and a limited amount of artefacts.

A preliminary examination of the sorted residues has shown a wide range of materials, most of which were not visible at the time of excavation. In particular, some of the key grid squares have produced significant amounts of charcoal, some burnt hazelnut shell fragments, generally small fish bone mainly comprising vertebrae, small and fragmented animal bone including some burnt and calcined fragments, antler fragments, and small land snails. Potential lithics, mainly comprising quartz and quartzite, but with some flint, also await identification, while a complete perforated cowrie shell has also been recovered (Plate **73**).

A number of bulk samples were also recovered from the basal contexts across Trench 2B (especially contexts 226, 227 and 228), along with samples of specific shell and charcoal-rich sediments within broader contexts, and samples from identified fills of features including hearth (232) and pit (212). These samples will require processing/wet sieving using a finer micron mesh to retain flots, which may contain small-scale palaeo-environmental assemblages such as seeds. The flots should be retained for laboratory analysis by specialists, but the main residues resulting from the samples can be sorted as per context (204) samples.

Hand-collected samples from the excavations include marine shells, charcoal, animal bone, antler, possible lithics, and a small number of potential cobble tools. These samples will require careful analysis by specialists in order to gather the maximum amount of data relating to subsistence and tool-making activities at the site. A brief examination of the animal bone and antler from these samples display evidence of primary and secondary working and produced a number of potential artefacts manufactured on these materials. Objects of antler included a large antler tine possibly used as a chisel point (Plate **75a**), an antler tine potentially used as a fabricator (Plate **75b**), an antler tine that showed evidence for modification including trimming and smoothing to form a possible slender form of fabricator, a fragment from the base of a very large red deer antler which has been modified into a pounding type tool with pitting and abrasion on the rounded end, and a sizeable chunk of the porous inner core of an antler that displays evidence of at least two perforations.

Plate 75 *– Images (below) showing two modified antler tines possibly used as fabricators (A-B), and a polished bone point (C)*


A
15CM
B
15CM
CM
C

Artefacts manufactured on bone included long splinters that may be pre-forms for expedient-type tools such as points, a bone fragment with a polished point at one end (Plate **75c**), and the articular end of what appears to be a large red deer metapodia which has been modified to form a rounded profile at the opposite end to the articulated section. The articulated section forms a perfect handle, while the working end of the tool displays evidence of pounding or grinding wear (Plate **74**). Similar forms of tool have been recovered from Tybrind Vig in Denmark. Finally, a broken fragment from a large wild boar tusk (Sus) displays evidence for modification, and probably functioned as a knife or side scraper (Plate **63**). This object will add to other modified pig teeth recovered from the site in 2017 (Smith 2019), tentatively identified as *tranchets de cordonnier* with known examples recovered from French Mesolithic sites, and with other potential examples recovered from MacArthur Cave, Oban and at the Oronsay shell mounds.

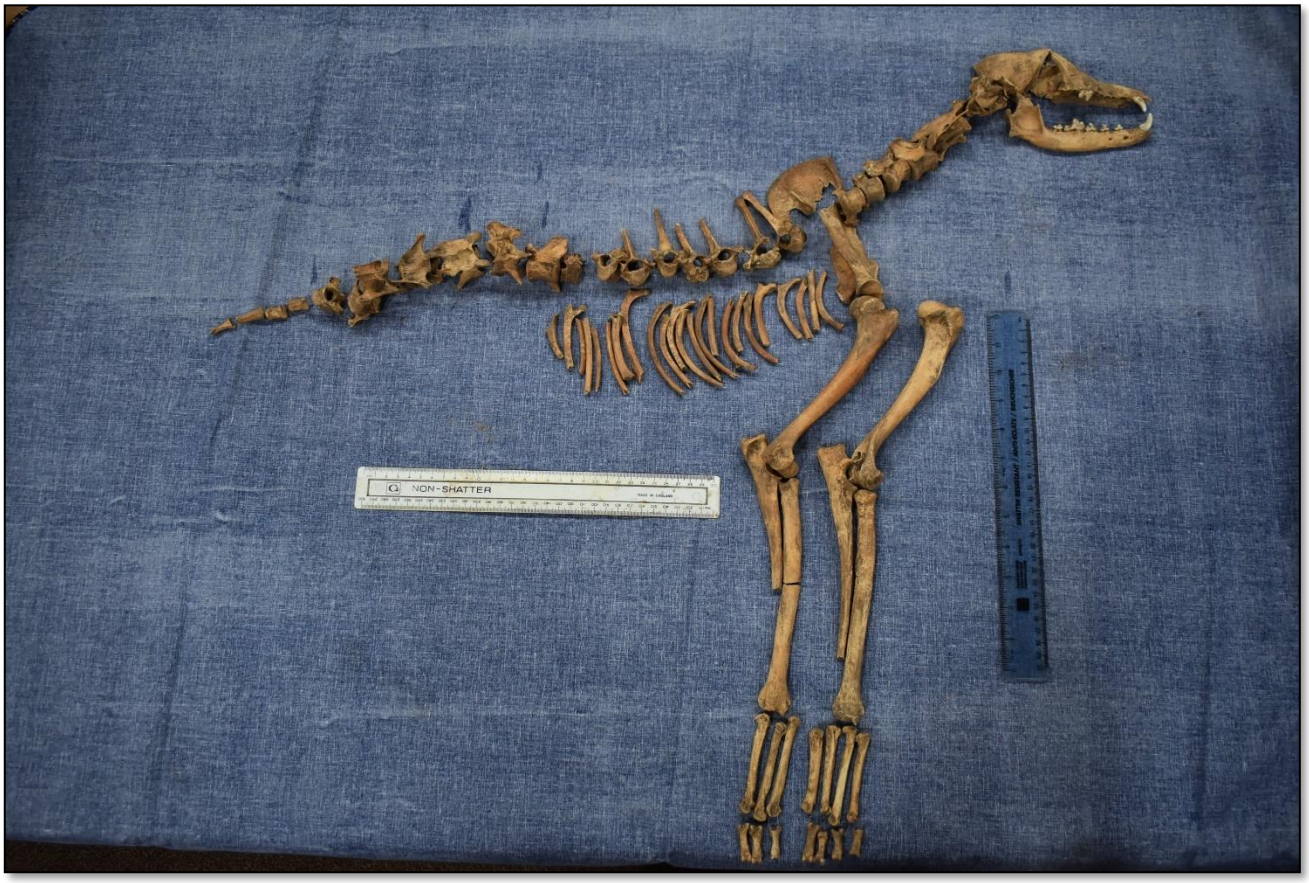

Plate 76 *– The reconstructed skeletal remains of the dog recovered from pit (238), context (237)* (© Eric Grant)

The detailed analysis of the animal bone and antler by a specialist will no doubt identify other tools, along with manufacturing waste, adding to the important assemblage of objects recovered from Tarradale midden Site 2B. In addition, the more general analysis and identification of the animal bone assemblage will provide important information on the species exploited, seasonality, and other specific data, including the use of additional resources to their meat including skins or fur, teeth, antlers, and bones. Smith (2015; 2019)

in her preliminary analysis of the animal bone and antler from the 2015 and 2017 excavations in Trench 2B identified a broad range of terrestrial animals including red and roe deer, wild boar, large cattle, horse, sheep/goat, cat, pine marten, and cetacean; but also including a large number of bone fragments only identifiable to indeterminate mammal, large or small ungulate. From her preliminary analysis, it appears that the bones of the cattle, pig, and red deer, appear to be quite large in comparison to the same types of animals from Neolithic, Iron Age, and later contexts. In particular, the large cattle (Bos) bones from Tarradale are intriguing as they may represent the true wild aurochs, or the large Neolithic cattle descended from them, which are the predecessors of today's domestic cattle. Their presence at the Tarradale middens including Site 2B has important implications for the wider debate regarding their exploitation at the Late Mesolithic-Early Neolithic transition. Although relating to later activities at the site (although not yest established by radiocarbon dating) the remains of the dog recovered from pit cut (238), fill (237), require detailed analysis. The unusual nature of the deposition of what appears to be the partial remains of the dog, and the manner in which the skull has been split, require further study (Plate **76**).

Not only mammals were exploited at midden Site 2B. Although only a few bird bones survived they provide a clue as to the species that were exploited for meat, but also with the potential use of their eggs, feathers, and bones for tools. Bird species present in the assemblage include auk (guillemot/razorbill – although the bones from the now extinct Great Auk were recovered from the An Corran rockshelter in Skye), galliform (gull), gannet, and golden eagle (although this last species was only represented by a talon - a possible talismanic object!).

Combined, the analysis of the ecofacts and environmental materials, provide a unique opportunity to investigate the broader resources available to the occupants of the shell midden sites at Tarradale, with charcoal, land snails, and other potential palaeo-environmental remains enabling the reconstruction of the surrounding landscapes during the Mesolithic-Neolithic transition.