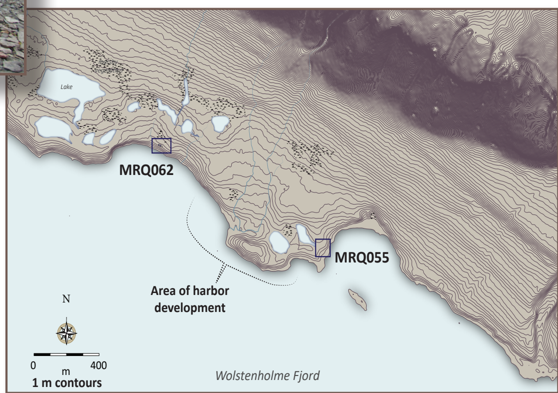
Moriusaq Archaeological Excavations 2019

Mitigation of Sites MRQ055 and MRQ062



Nunatta Katersugaasivia Allagaateqarfialu
The Greenland National Museum & Archives

John Darwent

2020

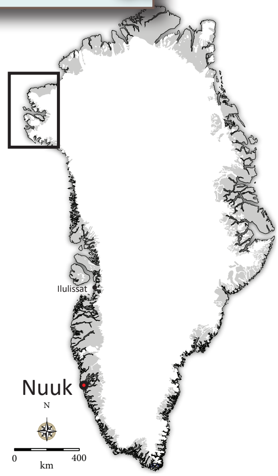


Table of Contents

Report prepared by John Darwent for the Nunatta Katersugaasivia Allagaateqarfialu/
The Greenland National Museum & Archives, submitted February 2020.

1. Introduction

The following is a report of results excavations two tent-ring sites—MRQ055 and MRQ062–by the Nunatta Katersugaasivia Allagaateqarfialu (NKA) (The Greenland National Museum) in 2019. This work was undertaken to mitigate the impacts of the construction of a harbor facility by the Dundas Titanium A/S (DT) mining company near Moriusaq, northern Wolstenholme Fjord (Uummannap Kangerlua) (Figure 1.1). This development is being carried out under Exploration License 2015/18. Completion of archaeological excavations by the NKA were to fulfill provisions of *Inatsisartutlov nr. 11 af 19. Maj 2010 om fredning og anden kulturarvsbeskyttelse af kulturminder* (the Heritage Act) for developments impacting cultural resources.

Identification of MRQ055 and MRQ062 occurred in 2018 (Myrup 2018) by an NKA archaeological team that systematically surveyed the whole coastline associated with the proposed DT mining project (Figure 1.2). This survey identified nine sites within the proposed development area that will require mitigation if impacted by mining operations. MRQ055 and MRQ062 are two of these sites. Both of these sites are within the area of impact of a new port facility, which has been partially completed and will be expanded in the near future. Both of these sites were assessed by the NKA team to have Pre-Inuit origins (ca. 2500 BC–AD 1300), with MRQ062 being specifically associated with the Late Dorset occupation of northwestern Greenland (ca. AD 800–1300) based on its unique architecture. The configuration of feature stones denotes it as a triangular midpassage (TMP), which is a rare form of tent ring known from 52 other examples known in the Canadian and Greenlandic Arctic that was constructed during the Late Dorset period (Darwent et al. 2018). The origin of the tent ring at MRQ055, however, is not clear cut. While resembling a Pre-Inuit ring on the surface, evidence from the investigation indicates that the feature is Thule in origin.

Excavations of MRQ055 and MRQ062 happened between 15 and 27 August 2019. Both the tent rings recorded during the 2018 field season at these sites were excavated in their entirety, as well as an additional ring identified during the 2019 season. The investigation of the MRQ055 tent ring revealed that it was likely constructed later in time than initially thought. Instead of being Pre-Inuit in age, its architecture, radiocarbon dating, and the (lack of) artifact assemblage strongly suggest that the feature was made later by the Thule, probably between AD 1400 and AD 1700. The excavation of the TMP confirmed the Late Dorset affiliation of the feature through radiocarbon dating, which suggests an occupation between AD 1020 and AD 1275, and produced a larger than expected artifact assemblage for the feature type. In addition, a disturbed tent ring was discovered adjacent to the original tent ring at MRQ062 and subsequently excavated at the end of the season. Based on its association with the TMP, plus some architectural considerations, this second feature likely is Late Dorset in age as well.

In the following report, there will be four sections:

1) a brief background and review of previous investigations in Wolstenholme Fjord and descriptions of the sites investigated in 2019;

2) details of the 2019 fieldwork, including excavation and recordings methods, and lab methods;

3) results of the excavations at MRQ055 and MRQ062 in terms of architecture, artifacts, faunal remains, and radiocarbon dating;

4) a discussion of the interpretation of the sites and implications of finds for understanding Late Dorset and Thule occupations of region.

1. In this report, the term Pre-Inuit will be used to designate the archaeological groups associated with the Arctic Small Tool tradition, which sporadically occupied Greenland over a period beginning around 2500 BC and lasting until AD 1300. In the past, these groups were designated the Paleoeskimo, but this moniker is being replaced because of its pejorative connotations.. Late Dorset groups were the last manifestation of the Pre-Inuit through the North American Arctic. For an overview of the cultural sequence of the high Arctic and Greenland, see articles in Friesen and Mason (2016).

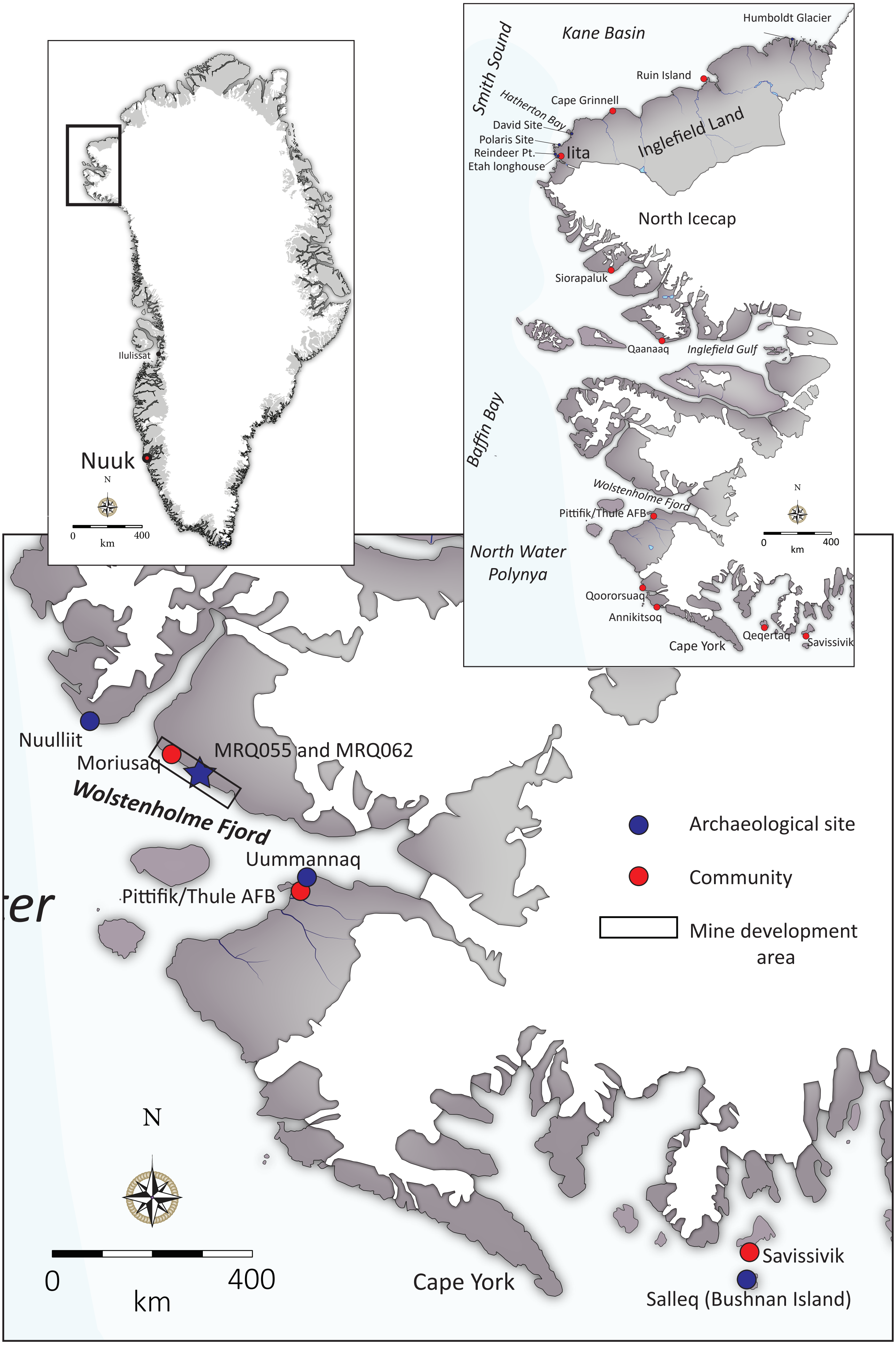


Figure 1.1 Location of project area in northwestern Greenland, with locations of locations and archaeological sites discussed in the text.

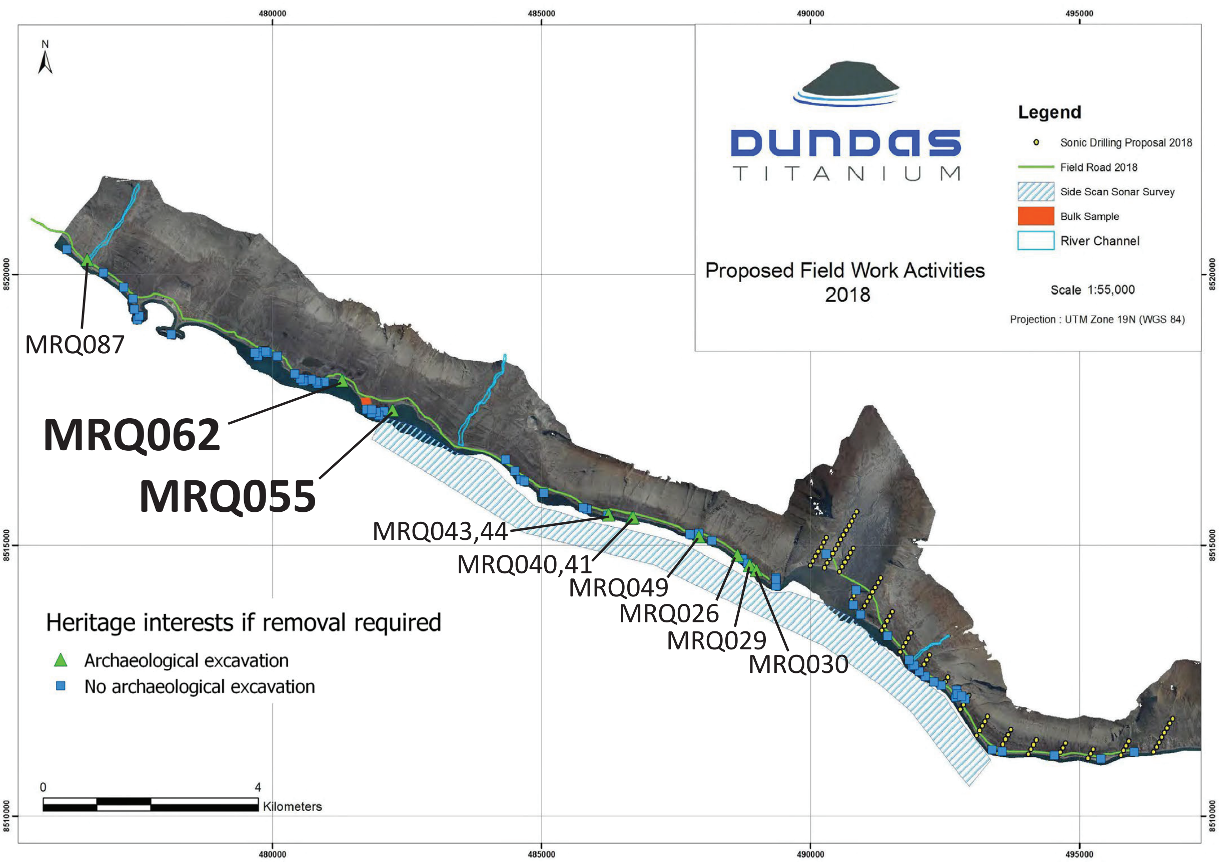


Figure 1.2. Location of the NKA survey of the proposed Dundas Titanium Mining development with the location of significant archaeological sites indicated. Modified from Myrup (2018:3).

1.1. Region Description

The project area sits on the northern side of Wolstenholme Fjord in northwestern Greenland. It is typified by wide sand and gravel-covered bench that rises slowly to the north from the shoreline for approximately one km until it rapidly slopes upwards at the bluffs associated with the walls of the fjord (Figure 1.3). The bench is lined with a series of beach ridges that parallel the fjord formed over the past 10,000–11,000 years since deglaciation in the area began (Bennike and Björk 2002:212–216). The characteristically black sands comprising the bench contain a uniquely high concentration of ilmenite (a mineral variant of titanium) (for review, see Dawes 2006:86), which is the key focus of the mining project.

Of key importance to the use and settlement of the Wolstenholme Fjord area is its proximity to the North Water (NOW) Polynya. Polynyas, which are stretches of water that remain ice-free all year round, had an immense draw to settlers in the high Arctic because of the substantial increases in the number of animals available (Schledermann 1980). For a review of the economically important animals in the region, see Sørensen (2011) and Vibe (1950). Recently, the NOW project initiated by the University of Copenhagen, the National Museum of Denmark, the University of Aarhus, and the Greenland National Museum has explored the effects of the NOW on Thule and Inughuit societies in the Thule District (see Grønnow et al. 2016; Hastrup et al. 2014).

Figure 1.3. Typical topography in the study area, with a relatively flat raised bench with a series of beach ridges that extends approximately one kilometer until reaching bluffs on the canyon walls of the fjord. Photograph: John Darwent

1.2 Previous Investigations in Wolstenholme Fjord

Wolstenholme Fjord is most renowned in arctic archaeology for the work of Erik Holtved (1944, 1954) and Eigil Knuth at Uummannaq (Thule) and Nuulliit between 1954 and 1990 (see Sørensen 2010). Uummannaq lies near Dundas on the southern side of the fjord, approximately 40 km away (Figure 1.1), and Nuullit sits on a rocky peninsula 36 km to the west at the northwestern end of the fjord. In brief, Knuth's projects (detailed in Sørensen 2010) demonstrate cultural use of the area back to the initial peopling of Greenland by Independence I groups approximately 4,500 years ago, as well as by PreDorset peoples as well. Evidence for Saqqaq and later Greenlandic Dorset period groups is lacking (except for one diagnostic Greenlandic Dorset microblade); however, people during both periods had to move through the area during their migrations to (and from) western Greenland (Sørensen 2010:140). Holtved's (1944, 1954) work, first at Uummannaq and then at Nuulliit, demonstrated the use of Wolstenholme Fjord by the Thule groups since their first arrival in the area following the Late Dorset after AD 1300. Both of these sites are large winter villages, which, when coupled with other sites such as those found by the NKA in the Morisuaq area in 2018 (Myrup 2018), showed that the Thule made extensive use of the region.

Little is known about the Late Dorset use of the Wolstenholme Fjord region. Before the NKA's survey (Myrup 2018), the known evidence for their intrusion into the area came from some scattered Late Dorset tools at Nuulliit (Sørensen 2010:124–125, 135) and an 11-m long hearth row discovered by Schledermann and McCullough (1992) when they were shipwrecked there in 1992. The presence of this feature and the tools strongly suggested that there was likely more-extensive Late Dorset habitation in the region. A radiocarbon date from the hearth row suggests that the Late Dorset were present in the region at least by AD 800, which is the time they are known to have expanded into the region from the central Canadian Arctic in what Frieson (2007) has termed the Late Dorset diaspora.

Although archaeological work goes back to the 1910s from the time of Comer's excavations at Umanaq, it could be described as opportunistic—taking advantage of areas or specific sites with extensive archaeological remains—as opposed to systematic, especially in terms of archaeological survey. Therefore, surveys such as the one undertaken by the NKA in 2018 of the proposed Dundas Titanium mining area (Myrup 2018) are rare (other such work has also been carried out by the NOW Project [Grønnow et al. 2016]). In this case, the 2018 NKA survey gives a complete snapshot of the existing evidence of use for a 28-km stretch of coastline.

Myrup (2018:3) identified that 89 features/sites within the proposed mine area (Figure 1.2); however, most of these were of recent origin and did not fall under the purview of the Heritage Act. The exceptions were in nine locations consisting of three Thule winter-house clusters (MRQ087 with five houses, MRQ026 with two houses, and MRQ030 with seven houses) and six tent ring occurrences. Of these six, four locations presented as Pre-Inuit tent rings (MRQ062 with one ring; MRQ055 with one ring; MRQ040 and MRQ041 with two rings; and MRQ042 and MRQ043 with two rings) and two classified as Thule tent rings (MRQ 029 with one ring and MQ049 with three rings). Artifacts were not observed in association with any of the rings, and therefore, temporal classifications were assigned based on architecture: Pre-Inuit rings were identified by midpassage structures (axial stone arrangements), and Thule rings by the presence of sleeping platforms. In the case of one of the Pre-Inuit structures, MRQ062, the midpassage was a unique triangular configuration of stones that identified it as a Late Dorset feature (discussed below in MRQ062 Architecture section).

Thus, taken as a whole, the overall density of positively identified pre-1900s features is ~0.8 per km of coastline, which can be described as sparse. This dearth of features is striking compared to more-intensively used coastlines, particularly in terms of tent rings, in Inglefield Land to the north (though it should be noted that similar gravel-covered benches did have lower instances of tent rings compared to rocky promontories; see Darwent et al. 2007). However, the presence of 14 Thule winter houses divided into three clusters does indicate more substantial use of the region in the winter during this period, which is especially the case if one considers these clusters as satellites of the larger winter villages at Nuulliit and Uummannaq.

1.3 MRQ055 Site Description

MRQ055 sits on the north shore of Wolstenholme Fjord 4 km east of the abandoned village of Moriusaq. The site consists of an isolated tent ring situated on a raised bench 4 m above the current sea level, approximately 30 m back from the eastern shoreline of a semi-circular bay (Figure 1.4 and 1.5). Although drained before investigations in 2019, a small lake was present 40 m to the west of the ring. While some mechanical disturbance had occurred in the area of the feature, it is isolated and no other features are present within 100 m or more.

The ring was very prominent on the surface, with all of the feature stones being considerably larger than any cobbles present in the gravels that cover the bench (Figure 1.6). Its location was such that the local topography offered little in the way of protection from wind. The bench is relatively flat until about 25 m to the east of the feature but then abruptly drops off at an exposure of bedrock or possibly large boulders. Larger stones are present in this location and likely served as the source for the feature rocks. The abrupt line of the outcrop peters out to the south, being replaced by a sloped landing down to the coastal shore.

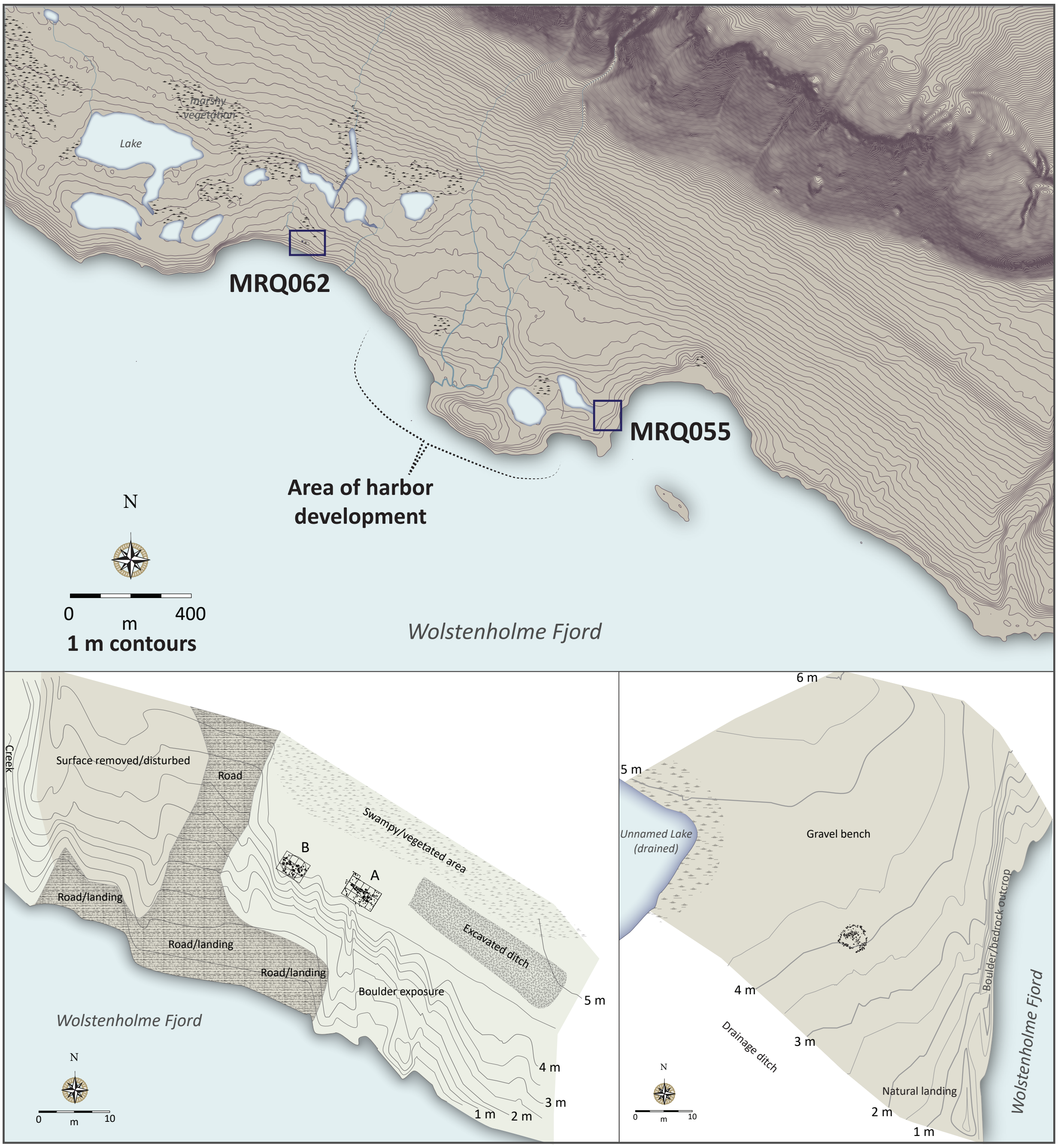


Figure 1.4. Top map: contour map of the region surrounding MRQ055 and MRQ062. Base map generated from digital elevation data obtained from the ArcticDEM (Porter et al. 2018). Lower left: contour map of MRQ062 indicating feature locations, local topography, and disturbances. Lower right: contour map of MRQ055 indicating feature location and local topography. Figure by John Darwent.

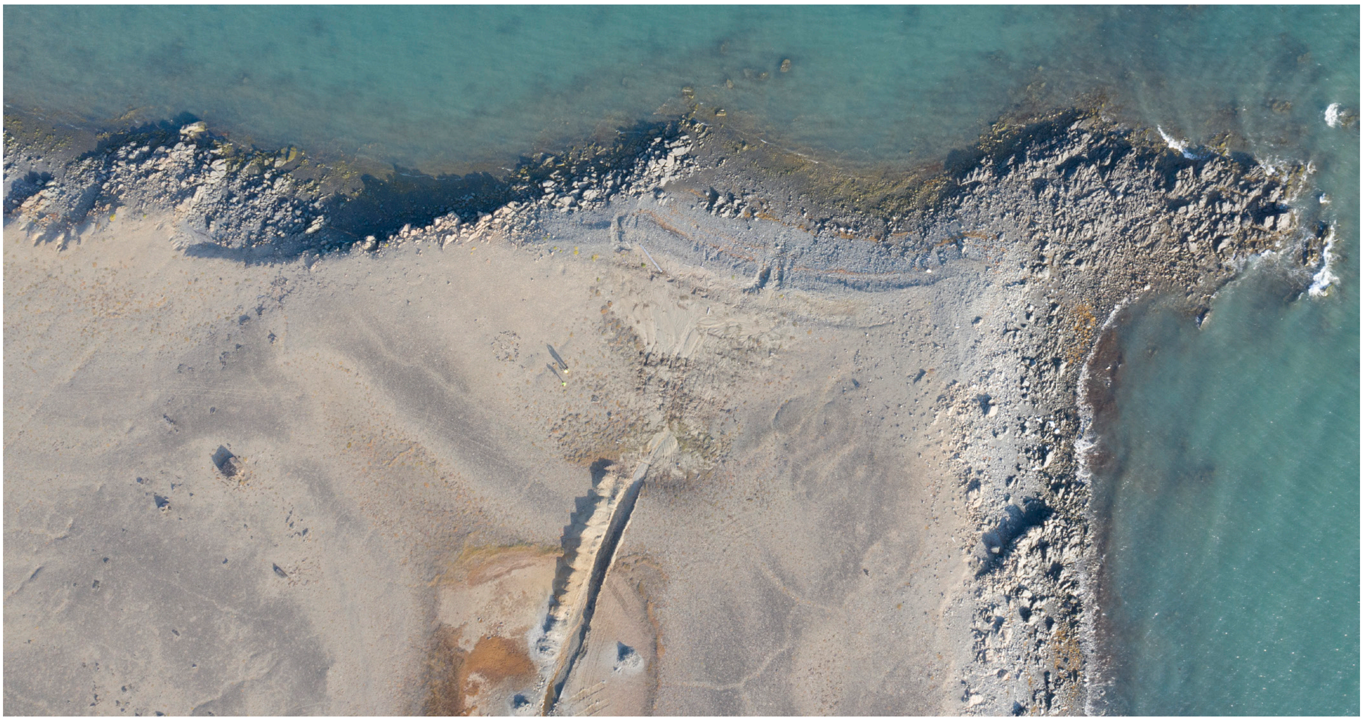


Figure 1.5. Drone image of the local topography surrounding MRQ055. Top of the image is oriented eastward. Image courtesy of Mikael Larsen

Many of the stones in the beach gravels surrounding and within MRQ055 have flaking scars and "chattering" that are similar to those produced by humans intentionally retouching, using, or manufacturing stone tools. However, this is not the case: it is most likely these scars were the product of short-distance mechanical abrasion and crushing during the deposition of the gravel. Some breaks also seem to be the result of frost cracking. When closely examining such pieces, there usually is some indication of water abrasion on the edges of the fractures and a lack of organization (irregular flake spacing and size) that indicate the breaks are natural. As a result, identifying culturally modified stones on the beaches of the region is exceptionally difficult, both during pedestrian survey and excavation.

Figure 1.6. Tent ring at MRQ055 looking to the south. Saunders Island across Wolstenholme Fjord is in the background of the photography. Image courtesy of Mikael Larsen.

1.4 MRQ062 Site Description

MRQ062 is located 3 km east of Moriusaq on the north shore of Wolstenholme Fjord. It sits at the back of a semi-circular bay, approximately 50 m to the east of an active creek that descends across an 800-m plain of raised beach terraces from bedrock bluffs (Figure 1.4 and 1.7).

Figure 1.7. Aerial view of MRQ062 near the completion of excavation of MRQ062A. Machine tracks and disturbances (borrow pit and road construction) visible. Tent ring MRQ062B is present to the left of MRQ062B in image. North is oriented toward the top of the image. Photograph courtesy of Mikael Larsen.

The site consists of two tent rings that lie on a flat, gravel-covered raised beach adjacent to the erosion embankment overlooking the coast (Figure 1.8). Discovery of the first tent ring—MRQ062A—happened during the NKA's initial survey of the project area in 2018 (Myrup 2018), and it was the primary impetus for fieldwork in the location in 2019. Identification of the second ring, designated MRQ062B, occurred in 2019 during excavations of the primary ring. As will be discussed in the results section below, some disturbance of this ring occurred prehistorically.

The raised beach upon which the features sit is 4.5 m above the high-tide mark of the fjord. The two features are spaced 10 m apart, and the area between them contains a scatter of larger lichen-covered cobbles of similar size to those used in the two tent rings. Although there were no observations of artifacts in this inter-feature area, there is a likelihood that some of these were associated with older, reworked tent rings. There is also the potential for some destroyed or reworked features to the east; however, we could not identify any irrefutable artifacts, though there were numerous candidates produced through natural mechanical action and frost cracking. Like MRQ055, the surface is covered with naturally fractured stones that mimic artifacts.

Unfortunately, ground-disturbing activities associated with the construction of the new port began before the NKA's survey of the area in 2018. As a result, both of the tent rings sustained minor damage from machine tracks. Further, more extensive disturbance relates to the construction of an access ramp from the raised beach to the shoreline on the western side of the MRQ062B. This activity resulted in the removal of the original ground surface from this area, destroying any other potential associated features from the two identified over to the creek to the west (see Figure 1.4). A borrow pit/mineral-exploration trench is also present to the east of the features, running parallel to the beach ridge over a 20 x 5 m area (see Figure 1.7). It is not known whether the excavation of this trench destroyed or disturbed any features.

Figure 1.8. Feature MRQ062A on gravel-covered bench with embankment behind it. The surface of the area is deflated. Image oriented southwest. Photography by John Darwent.

2. Fieldwork and Methods

2.1 Dates and Personnel

Fieldwork occurred between 15 and 27 August 2019, with work at MRQ062 occurring 15–20 August (MRQ062A) and at MRQ055 20–26 August. Weather during these intervals was exceptionally good, which allowed time for investigation of MRQ062B on 26–27 August (MRQ062B) (scheduled departure time from the field was 28 August).

The 2019 NKA investigation team consisted of three members, who performed the fieldwork between 15 and 27 August 2019: Dr. John Darwent, a Continuing Lecturer at the University of California Davis; Hans Lange, a Curator at the NKA; and Jens Kanuthsen, a graduate student at the University of Greenland.

2.2 Excavation Methods

Grids were laid down that divided the features into 1-m2 units before excavations began at both sites. At MRQ062, the grid was set by a baseline that ran parallel to the shoreline. The 0N E0 origin of the grid was situated immediately adjacent to MRQ062B, though the placement of this point was serendipitous because the feature was identified after excavations on the other ring began. A 5 x 5-m block was initially placed over MRQ062A, but only a 5 x 3 m area was excavated where the feature was present (plus one 1 x 0.5-m addition as well). The grid used for MRQ062B was tied to the same grid, but it was necessary only to string out a 4 x 3-m area. At MRQ055, we placed a 6 x 6-m grid over the extent of the feature, orienting the axes on a roughly on cardinal directions.

The excavation was performed with trowels, and all excavated soils and gravels were screened through 1/8-inch (3.18-mm) mesh. This gauge of screen was chosen specifically to catch small waste flakes associated with the manufacture of ASTt stone tools. Excavation proceeded in quadrants. We quickly ascertained that the cultural deposits went no deeper than 10 cm below the surface (which is largely deflated, especially at MRQ062). Therefore, all units were excavated to this depth.

All recovered artifacts were collected by quadrant. During excavation, all feature stones larger than approximately 15 cm in length were pedestaled during the excavation, with the screening of the matrix below them occurring after completion of mapping and photography. Photographs were taken of the features before and after excavations. Due to fortuitous circumstances a drone was available to image MRQ062A after and MRQ055 before excavation, courtesy of Mikael Larsen.

2.3 Site Mapping Methods

Although DEM models are available for the Moriusaq region through the Polar Geospatial Center ArcticDEM dataset at 2-m intervals (Porter et al. 2018), their sweep of the sites is too broad and do not contain disturbances cause recent earth-moving activities associated with the mining operation. Thus, both MRQ055 and MRQ062 were mapped using Emlid Reach RS+ centimeter-precision GPS units. Of primary importance during this mapping was recording the location of the features in relation to the local topography and disturbances caused by mining activities.

2.4 Lab Methods

Artifacts and non-marine-mammal faunal remains were brought to the University of California Davis for identification and cataloging. All artifacts and faunal remains were identified by John Darwent. A 10x binocular microscope was used to assist with the lithic analysis, in particular for verifying whether pieces had a cultural origin, identification of flake types and scarring, and evidence for use wear. The faunal remains, such as they were, were identified using the Zooarchaeology Lab in the Anthropology Department at the University of California Davis.

3. Results

3.1 MRQ055

Excavations at MRQ055 consisted of a total of 28 1-m² units (Figure 3.1), each of which was excavated to 10 cm below the surface. It is clear that the surface of the feature and the surrounding bench has been deflated by wind action; however, compared to MRQ062, the soil matrix present around the feature stones contains considerably more sand and is quite loose. Whether this difference is due to the age of the feature or local bench conditions is not known.

While there are 82 stones associated with the outer ring and 86 axial stones present in a well-defined ring—there is no mistaking its cultural origins—the

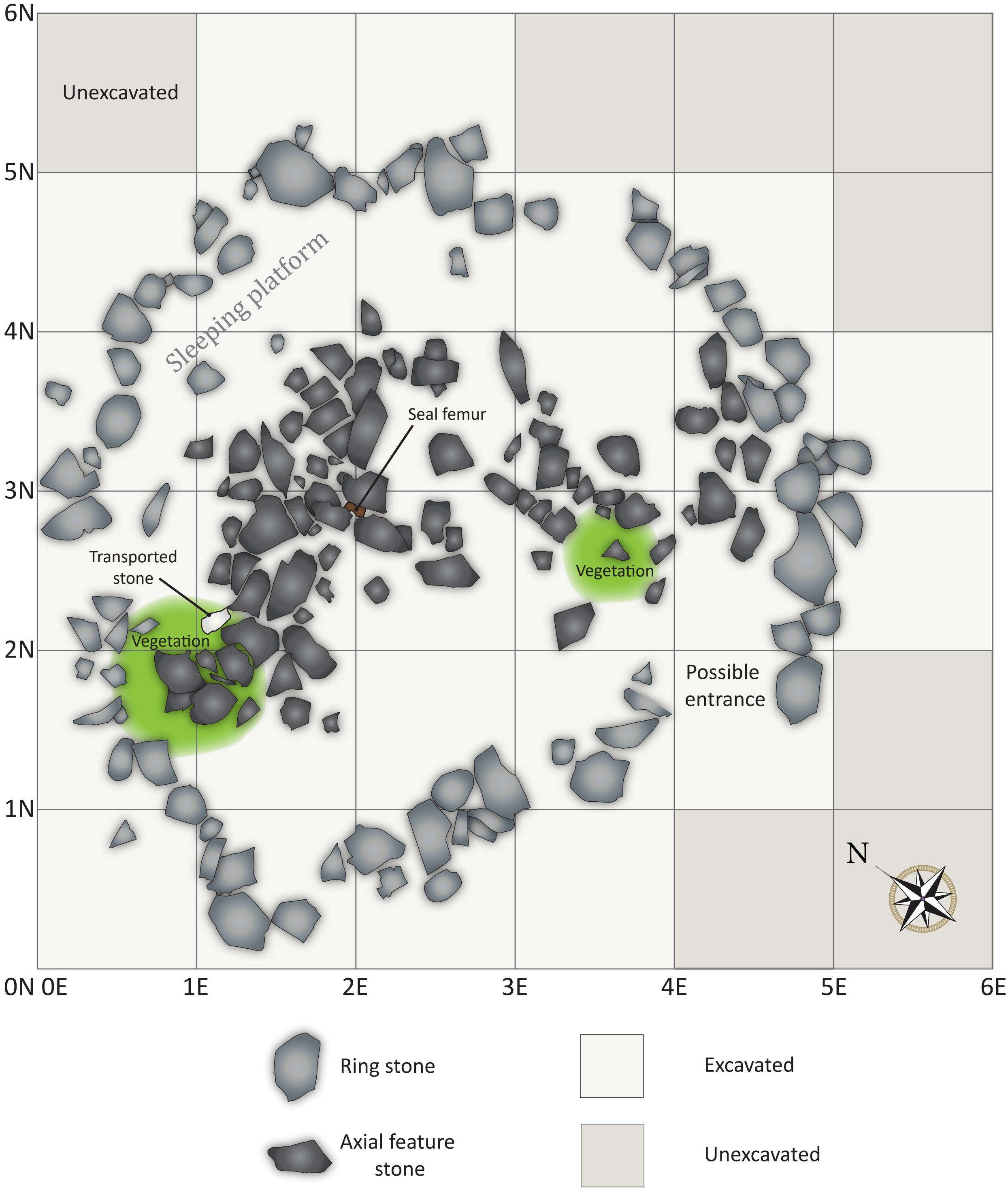


Figure 3.1. Feature map of MRQ055 showing the location of feature rocks, excavated areas, artifacts, and vegetation, along with possible architectural features. Figure by John Darwent.

quantity of artifacts recovered from the excavations is best described as meager: two pieces of stone debitage (of questionable origin), one human-transported stone, and three faunal remains.

3.1.1 Architecture

The tent ring measured 5 x 4.5 m in size, with the longest axis running in an NW/SE orientation (Figure 3.2). Around 165 stones comprise the feature. The average stone is approximately 25–30 in length and is considerably larger than naturally occurring stones present of the surface of the bench. As indicated, there is relatively even spit between rocks that are clearly associated with the outer ring and the interior area of the ring. However, while both sets of stones are similar in horizontal dimensions, the internal stones are considerably flatter than the ring rocks, which are blockier.

The ring itself is well-rounded in shape except on the southern side of the feature, where it is relatively straight for a 4-m stretch. We could not determine whether the ring's constructors intentionally shaped the ring in this fashion or resulted from a displacement of the stones during the tent's disassembly, though the former seems most probable given the symmetrical outlay of the rest of the ring. There are three gaps where an entrance to the tent might have been situated; however, the largest of these is on the eastern side of the straight section and appears to be the best candidate. Of note, in what is presumably the back of the tent based on the position of the larger entryway, it appears that the ring's constructor excavated the ring into the ground surface several centimeters—possibly to flatten the internal area of the ring.

The configuration of the flat stones inside the MRQ055 ring suggested to its original discoverers that they were associated with a midpassage feature (Myrup 2018). Midpassages are axial structures, usually rectangular in plan-view, that run through the center of tent rings and semisubterranean house depressions associated with the Pre-Inuit (ASTt) (Maxwell 1985). Often, they are oriented perpendicular to the main coastline. If this was the case, this ring had the potential to date anywhere from ~4,500 to 700 years ago. However, no artifacts were visible on the surface to the initial investigators to confirm whether the ring had a Pre-Inuit cultural affiliation. Thus, one of the main reasons for excavating the feature was to establish its age.

While surficial evidence suggested that the internal stones might be related to a midpassage, the excavation results do not support this observation. We fully discuss this conclusion at the end of this MRQ055 section; however, the main reasons for the rejection of the midpassage interpretation in architectural terms are as follows:

1. The stones were not aligned in a rectangular configuration; rather, they were in a loose arch-shaped arrangement (Figure 3.2). Except for a few possible stones, none of these feature rocks appear to be displaced through either human or natural processes (usually indicated through differences in lichen cover and gravel shadows). Thus, they are relatively in the same position as

Figure 3.2. Post excavation images of MRQ055 with the feature rocks pedestalled. Note the arch shaped axial feature, which appears to be the division between a sleeping platform and a kitchen area of a Thule tent ring as opposed to a midpassage in a Pre-Inuit feature. The image on left is oriented to the southeast, and the image on the right is toward the northeast. Both photographs by John Darwent.

their deposition, and this configuration is not consistent with we know of Pre-Inuit midpassages from other areas of northwestern Greenland (for examples, see Darwent et al. 2007; Darwent and Johansen 2010).

2. Although the alignment of the axial feature is perpendicular to one coastline, the feature is located near the base of a peninsula, and in this instance, the axial alignment of stones is roughly parallel with the other southern-oriented coast. If the gap discussed in the ring represents the entrance to the tent ring, this placement makes more sense in terms of wind directions coming from the east down Wolstenholme Fjord. In addition, the sleeping platform area is slightly elevated from the kitchen or fore area of the tent ring, which is also consistent with Thule tent rings.

3. If the "straightened" extent of the tent ring represents the intentional placement of feature stones, then the overall shape of the tent ring is not consistent with Pre-Inuit rings and is more in line with shapes associated with Thule-era tent rings (e.g., see Darwent et al. 2007:Figure 6, 7).

3.1.2 Artifacts

Artifacts were almost nonexistent in MRQ055, despite the use of 3.18-mm screen, and only three items were potentially cultural in origin (Table 3.1). Several pieces of potential debitage were collected; however, all but two were determined to be of natural origin—although they possessed evidence of conchoidal fractures or potential edge use, the margins and ridges of the pieces were rounded through water transport or erosion after breakage. None of the pieces bore an overwhelming resemblance to debitage intentionally produced during manufacturing stone tools, and thus the chances of them somehow being redeposited from a different context are insignificant (especially given the low density of cultural activity in the immediate area). The exceptions were a flake (MRQ055-2) made of what appears to be white chert, which bears a bending fracture often associated with material failure during stone-tool manufacturing, and a decortication flake (MRQ055-3) of sugary-textured light-gray silicified siltstone. Neither piece is culturally diagnostic.

Table 3.1. Artifacts recovered from excavations at MRQ055, MRQ062A, and MRQ062B during the 2019 investigations.

	MRQ055	MRQ062A	MRQ062B	Grand total
Tools				
Asymmetrical biface	-	1	-	1
Biface	-	-	1	1
Flake knife	-	1	-	1
Retouched flake	-	1	-	1
Scraper	-	1	-	1
Used flake	-	11	-	11
Debitage	2	304	26	332
Tested Cobble	-	1	-	1
Transported stone	1			1
Total	3	320	27	350

The other cultural item recovered from the ring is a “dish-shaped” rock (MRQ055-1) of light-gray silicified siltstone, which is vitreous and could have been knapped (it appears similar to silicified siltstone worked over at MRQ062) (Figure 3.3). Although very reminiscent of a lamp in form, the object is naturally shaped with the possible exception of a flake scar on one margin, which also might be the result of frost spalling. It is possible that the piece came through geological processes, but its position on the surface in association with the axial feature (for location, see Figure 3.1) suggests that it was intentionally brought to the feature by its occupants. Of note, two of the three faunal remains recovered from the tent ring were found under this specimen, which was inverted “bowl-side” down.

3.1.3 Faunal Remains

Like artifacts, faunal remains were sparse. A total of three faunal remains were recovered from the ring: one mid-shaft of a left-side ulna from a gull (Laridae), one UID bird-bone shaft fragment, and one relatively complete right-side femur from a small seal, most likely ringed seal (*Pusa hispida)*. Little can be said of such a small assemblage, other than it likely represents consumption of game during a very short occupation of the tent ring.

3.1.4 Radiocarbon Date

We obtained one AMS radiocarbon for MRQ055. Unfortunately, neither charcoal nor terrestrial animal bone (caribou, muskox, or arctic hare) was available for dating. However, due to vagaries of the tent ring’s architecture and lack of diagnostic artifacts, it was decided that the gull ulna fragment would be submitted for dating. Because most gulls have marine-based diets, the marine reservoir effect impacts radiocarbon dates obtained from their remains and therefore are not considered optimal for dating (Arundale 1981; Morrison 1989). Nevertheless, we proceeded with the date in order to determine a ballpark estimate of the feature’s age—whether it was early or late within the Pre-Inuit period or from the Thule period.

The gull ulna radiocarbon dated to 1000±30 BP (Beta-542561; Appendix B). When calibrating this date using the INTCAL13 curve (Reimer et al. 2013), the date has three intercepts at 2σ: cal. AD 983–1051, cal. AD 1082–1128, and cal. AD 1135–1152. These dates, taken at face value, suggest a Late Dorset affinity. However, for the sample, the $\delta^{15}N$ measured +17.1‰, indicating a carnivorous diet, and the $\delta^{15}O$ measured –16.6‰, which indicates a high degree of marine protein in the diet. Both of these values were not unexpected because the specimen was a gull. Because of the marine diet, the radiocarbon date is most likely older than it appears. To account for this discrepancy, we calibrated the date using CALIB 7.0.4 (Stuiver and Reimer 1993) with the marine13.14c curve (values for ΔR of 209±84 set using closest 20 dates from the 14CHRONO Marine Reservoir Database 2019). This correction produced a date of cal. AD 1390–1693 at 2σ of confidence (Figure 3.4).

Figure 3.3. a. Dish-shaped stone likely brought to the feature; b. seal femur (likely Phoca hispida) recovered from 2N 1E.

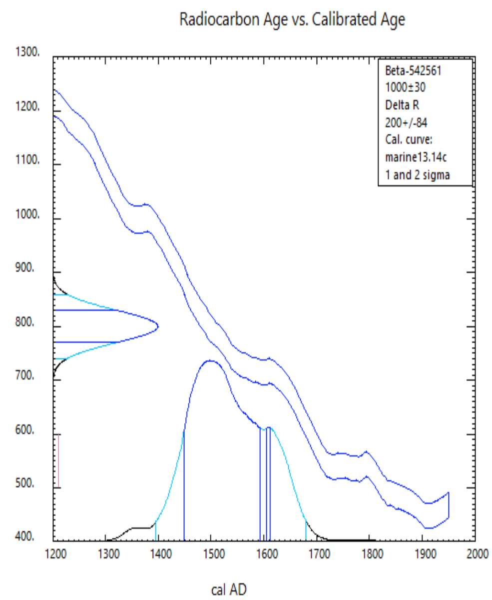


Figure 3.4. Calibration plot with marine reservoir correction for radiocarbon date Beta-542561 (obtained from MRQ055) using CALIB 7.0.4. (Stuiver and Reimer 1993).

3.2 MRQ062

At the start of the 2019 field season, one of the primary objectives of the investigations was the excavation of MRQ062A. To this end, we excavated a 15.5 m² area encompassing both the midpassage and the outer ring of this feature. The excavations of the newly discovered MRQ062B were undertaken at the end of the field season and entailed removal of a 10 m² area, which included a possible midpassage and most of its accompanying ring.
The surface of both rings sustained a considerable degree of deflation over time, which led to the matrix being highly rocky and somewhat difficult to excavate. Overall, vegetation was scant in the area in which the features were located. Like MRQ055, we determined that cultural material was unlikely to be deeper than 10 cm below the surface. Therefore, we excavated all units to this depth.

3.2.1 MRQ062A

MRQ062A was denoted by its prominent triangular midpassage but also by an area of compressed or packed surface gravel within a sporadically occurring ring of rocks. Two patches of vegetation, consisting mainly of willow, covered portions of the ring that held promise to preserve organic material. It is a classic example of what Darwent et al. (2018) termed a triangular midpassage (TMP) (Figure 3.5).

3.2.1.1 Architecture
Based on compressed gravel within the feature, MRQ062A measures 4.3 x 3 m, with the long axis roughly oriented west to east, paralleling the Wolstenholme Fjord shoreline (Figure 1.4 and Figure 3.6). Around 40 stones greater than 15 cm in size are associated with the oval-shaped outer ring, and a further ~20 stones of similar size might also be related to the ring as well but also could be naturally present.

Running through the center of the ring is a midpassage that measured ~3.9 m long, which is about a meter longer than the average length for known TMPs (Darwent et al. 2018:528) (this larger size might owe something to the completeness of MRQ062A). Approximately 50 feature stones comprise it, and as its TMP classification implies, the stones are arranged in a triangular configuration. The base of the triangle is located to the east and the apex to the west. At its base, the midpassage is about 1.75 m wide and constricts to less than 0.5 m at its western tip. The margins of the triangle are not straight but rather sweep or arc slightly inward up to the apex from the base (Figure 3.7:A). Most of the outer margin stones appear selected specifically for their shape—they are triangular or rhomboidal in cross-section so that they slope upwards from the margin towards the center of the passage. These stones were placed about two-thirds of the way up the midpassage (Figure 3.7:B). The inner area of the triangle was paved with flat stones beginning approximately one meter from the apex (Figure 3.7:C,D). The paving was sunk in between the margin stones in the west and around what could be termed a hearth area.

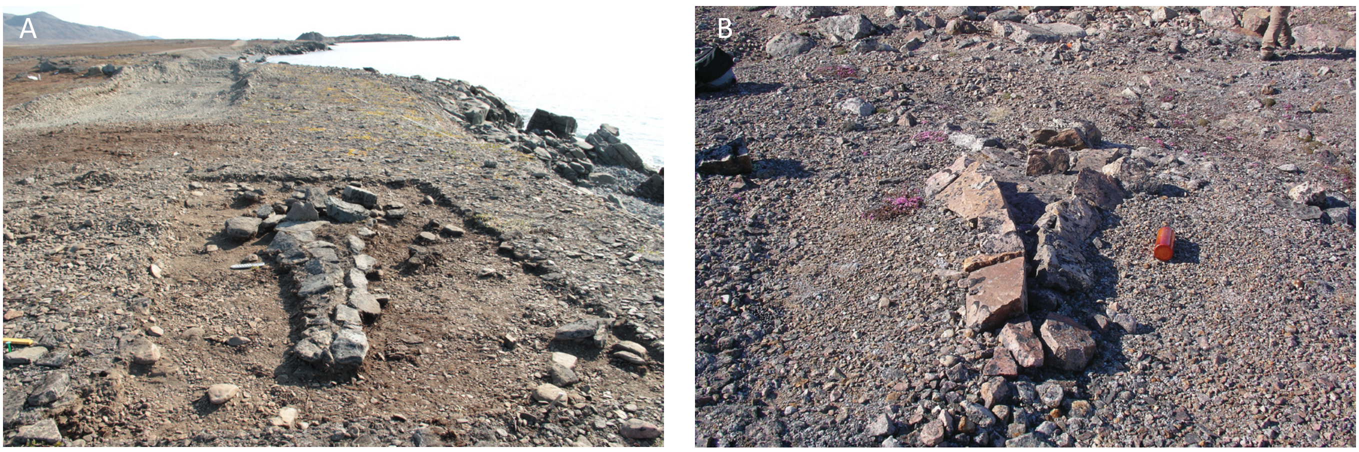


Figure 3.5. Comparison of MRQ062A with JUL2B4-5, a TMP located in Jens Jarl Fjord, Inglefield Land. Note the similarities in the swept margins of the midpassage, the choice of feature stones, and the pot stand stones. Based on the configuration of JUL3B4-5, it is clear that there is some disturbance of the feature stones in hearth area of MRQ062A. Photograph A by John Darwent and B by Trine Johansen.

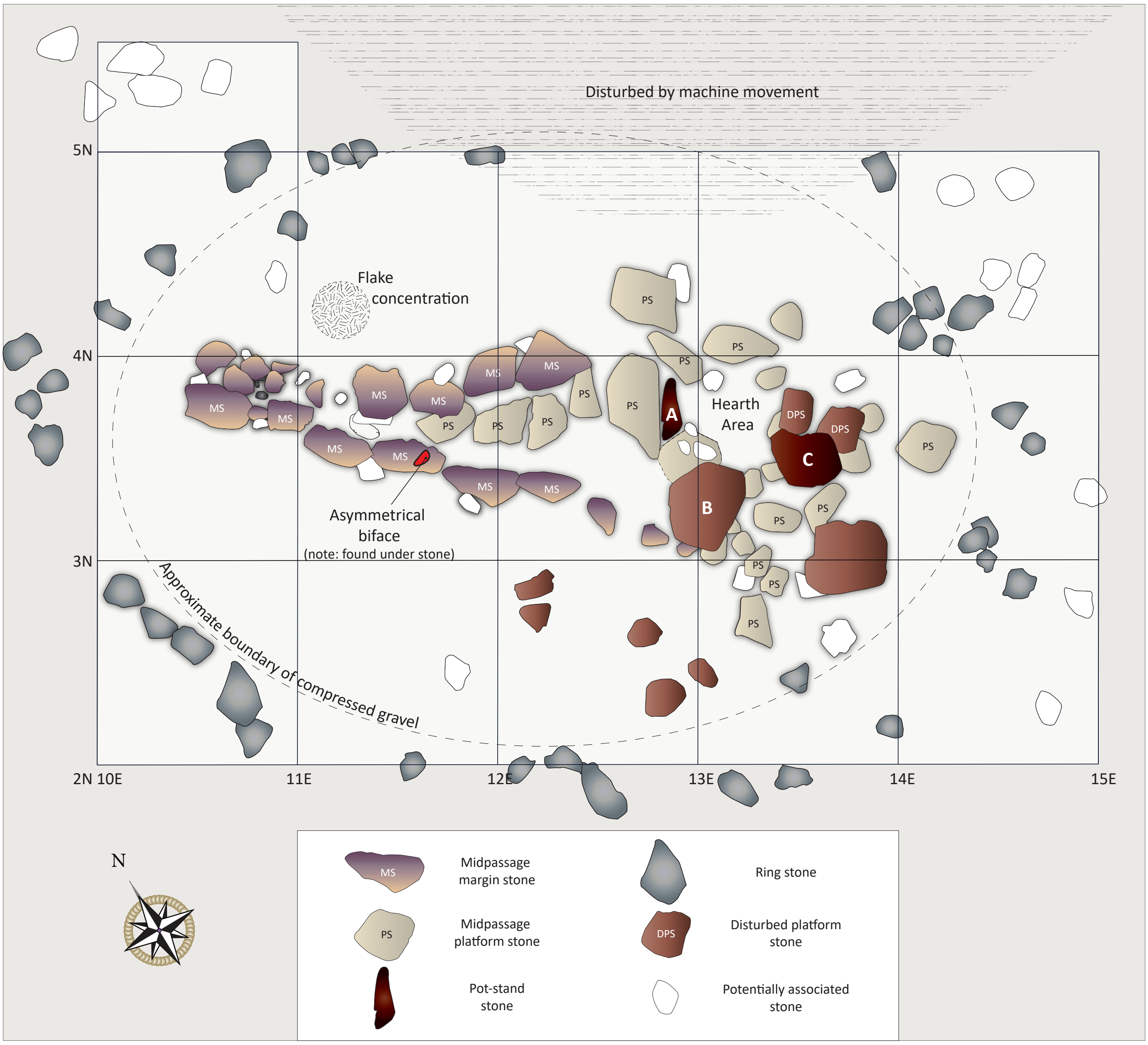


Figure 3.6. Feature map of MRQ062A showing the location of feature stones, architectural features, excavated units, and artifacts. Map by John Darwent.

The hearth area is denoted by a very prominent upright stone that has a characteristic V-notch chipped into its top edge, which likely was a component of a pot stand or lampstand (Figure 3.6:A, Figure 3.8). Just to the east of this rock is a depression, which that we believe the feature builders intentionally excavated; however, in almost all other well-preserved TMP examples where chipped pot-stand stones were present, a flat hearthstone was present where this depression is located, followed by another pot-stand stone (Darwent et al. 2018). We believe in the case of MRQ062A that the hearthstone (Figure 3.6:B) was lifted out of place and set adjacent to the hearth area. This action likely resulted in the removal of the other pot-stand stone, which we believe was Figure 3.5:C. Whether this disturbance occurred at the time of the last abandonment of the feature or later in time is not clear, but based on lichen growth and ground conditions, this event occurred at some time in the past. This disturbance was not a modern event.

Based on the choices and configuration of the stones, considerable planning went into the construction of this tent ring and midpassage. And it was built to last. No more saliently is this evident than with the creation, positioning, and setting of the undisturbed pot-stand stone. First, while the pot-stand stone might have had a natural edge with an indentation, there is evidence that the builder used percussion to finalize the V-shaped groove found at the top of the stone. Second, when the

Figure 3.7. Views of the triangular midpassage: A. Apex of the TMP with “swept” margins; B. perpendicular view of apex area of the TMP; C. and D. base area of midpassage. Note in C and D the larger rocks that appear stacked were likely moved from their original locations in the midpassage. When and why this occurred is not known. Photographs by John Darwent.

pot-stand stone was “installed,” it was a) wedged between the inner paving stones for stability (Figure 3.9), and b) it was “shimmed” using a series of smaller stones to insure a stable upright position.

Figure 3.8. Pot stand stone with V-shaped groove chipped into the top in MRQ062A. Photograph by John Darwent.

3.2.1.2 Artifacts

One of the characteristics of the TMPs found across the Canadian and Greenlandic Arctic is that relatively few artifacts are present on the surfaces of the features, and the two excavated (one on Baffin Island and one in Inglefield Land to the north) produced few artifacts (for review, see Darwent et al. 2018). Thus, we expected to find few artifacts, and based on those found in association with the TMP in Inglefield Land, we expected most to be small pieces of debitage associated with the refurbishment

Figure 3.9. Deconstruction of the pot stand at MRQ062: A. the pot stand structure was wedged into place with flat "paving" stones; B. the pot-stand stone after outer stones removed on east side; C. impression of the pot-stand stone after removal revealing the small stones used to "shim" the stone securely in a vertical position. Photographs by John Darwent.

of tools and therefore took precautions to ensure their recovery by using small-sized (3.85 mm) mesh during excavations.

Surprisingly, we found 320 artifacts, which constituted considerably more artifacts than anticipated. Most of the sample consisted of 304 pieces of debitage but also included 11 used flakes, one asymmetrical biface, one scraper, one flake knife, one retouched flake, and one tested cobble (Table 3.1). However, the distribution of these pieces was not uniform; rather, 308 (96.5%) came from a 20x20 cm area in one quadrant (4N 11E, SW quad) in what appears to be some form of dumping event. All of the pieces in this cluster were of the same type of stone material—a dark gray silicified siltstone—and essentially were piled together. There was very little in the way of artifact scatter.

3.2.1.2.1 Stone Materials

Dark-gray silicified siltstone was the dominant material by far in the assemblage (n=311; 97.2%), followed distantly by other colors of silicified siltstone, quartzite, chert, and silicified slate (Table 3.2). Although not of the highest quality, there are sources of stone for the manufacture of lithic artifacts in the region. These consist of dark gray-colored silicified siltstones and silicified shales, quartzite, and possibly nodules of poor quality flint/chert. None of the local stone possesses the high-grade flaking qual-

Table 3.2. Material types of stone artifacts recovered during excavations at MRQ055 and MRQ062 in 2019.

	MRQ055		MRQ062A		MRQ062B		Total	
Chert, beige	-	-	1	0.3%	-	-	1	0.3%
Chert, black	-	-	1	0.3%	-	-	1	0.3%
Chert, white	1	33%	-	-	-	-	1	0.3%
Total chert	**1**	**33%**	**2**	**0.6%**	**-**	**-**	**3**	**0.9%**
Quartzite, dark gray	-	-	2	0.6%	1	3.7%	3	0.9%
Quartzite, light gray	-	-	-	-	10	37.0%	10	2.9%
Quartzite, white	-	-	1	0.3%	1	3.7%	2	0.6%
Total quartzite	**-**	**-**	**3**	**0.9%**	**12**	**40.7%**	**14**	**4.0%**
Silicified siltstone, black	-	-	3	0.9%	-	-	3	0.9%
Silicified siltstone, dark gray	-	-	310	96.9%	1	3.7%	311	88.9%
Silicified siltstone, dark green-gray	-	-	-	-	14	51.8%	14	4.0%
Silicified siltstone, gray	-	-	1	0.3%	-	-	1	0.3%
Silicified siltstone, light gray	2	67%	-	-	1	3.7%	3	0.9%
Total silicified siltstone	2	67%	314	98.1%	16	59.2%	332	94.9%
Silicified slate, black	-	-	1	0.3*	-	-	1	0.3%
Grand Total	**3**		**320**		**26**		**350**	

ities of chert/flint often associated with ASTt (Paleo-Inuit) sites in the region. However, as will be evident below, this did not stop the occupants from at least attempting to use the local stone.

3.2.1.2.2 Biface

The most impressive find of the 2019 summer was a crescent-shaped biface made of black chert (MRQ062-A-1), which was recovered "tucked" underneath a midpassage stone in Unit 3N 10E, SE quad (Figure 3.10a). It measures 82.1 mm in length, 35.0 mm in width, 12.2 mm in thickness, and 34.5 g in weight. According to several of the Dundas Titanium geologists, the black chert used to make the biface is not local to the region. As we recovered no other artifacts or debitage of this material at the site, it is fairly clear that this biface was brought to the site in its current shape.

The specimen is not typical of the shape of Late Dorset bifaces (e.g., see Appelt and Gulløv 1999; Appelt et al. 1998; Maxwell 1984; Schledermann 1990; Sørensen 2012), and in many ways, it is shaped in a manner that would suggest it is an ulu. However, the "proximal" end of the biface comes to a defined, pointed tip, the "distal" end is rounded, and there appears to be a set of notches at approximately the midline of the piece that might have facilitated a haft. There is also the possibility that the deposition of the biface occurred before its completion. It does not bear any of the fine retouch flaking work with which Late Dorset flintknappers usually finished their implements.

3.2.1.2.3 Flake Tools

None of the recovered flake tools from MRQ062 could be described as elegant. Rather, they are relatively crude (especially compared to typically described Late Dorset implements) and made of locally available stone, and despite being shaped, they appear relatively expedient.

3.2.1.2.3.1 Flake Knife
MRQ062-A-10 is a key-shaped flake knife manufactured on a large primary flake of coarse gray quartzite (Figure 3.8b). The shaped "blade" area of the tool encompasses approximately the top third of the distal part of the specimen. Rather than coming to a point, the distal end of the piece was unifacially retouched to a rounded edge. Although classified as a knife, portions of the blade could have been used for a scraping function as sections of it are rounded rather than sharp. It measures 97.3 cm in length, 55.7 cm in width, 19.1 mm in thickness, and 78.6 g in weight. We did not recover debitage that could be associated with this tool in the excavated units, and thus, like the biface, it was brought to the site already manufactured.

3.2.1.2.3.2 Scraper
MRQ062-A-2 is a crude scraper formed through unifacial flaking and retouch of a broken cortical flake of coarse gray quartzite (Figure 3.8c). The working edge is rounded in plan-view and steep edged in profile (approximately 50–60°), which suggests a scraping function for the tool. The edge bears some grinding, polish, and minor flaking that probably occurred during the use of the implement. Minimally, one margin of the scraper was broken off before its discard, and possibly the other side as well, though this is not as clear cut. As a result, the original width of the tool is not known; it currently measures 57.8

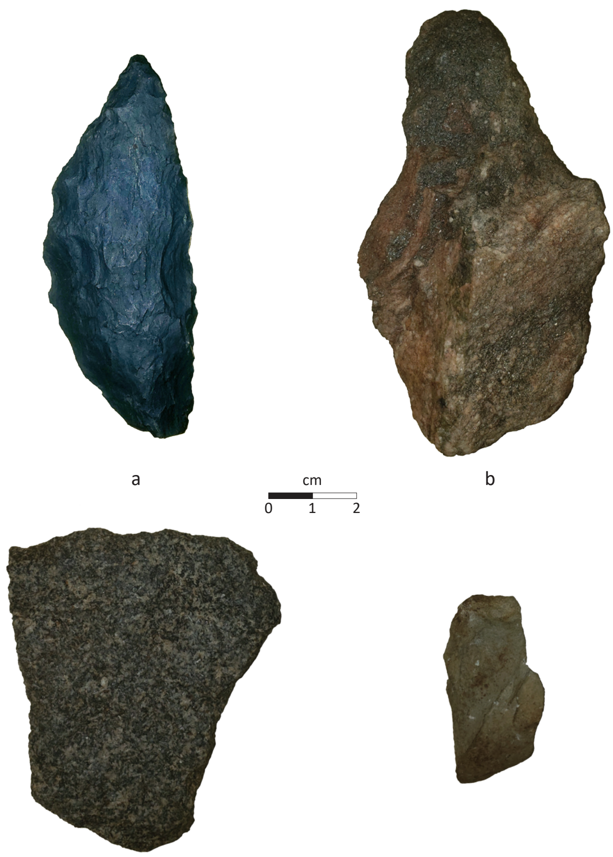


Figure 3.10. Formed artifacts recovered at MRQ062A: a. asymmetrical biface (MRQ062-A-1); b. flake knife (MRQ062-A-10); c. scraper (MRQ062-1-12); d. retouched flake (MRQ062-A-26).

mm wide. The other dimensions measure 70.9 mm in length, 13.3 mm in thickness, and 64.3 g in weight. Like the previous tools, this specimen was likely brought to the feature in its current configuration.

3.2.1.2.3.3 Retouched Flake

Specimen MRQ062-A-26 classifies as a retouched flake based on a series of what appear to be intentionally removed flakes on a short span of one of its margins (Figure 3.8d). It is made on a section of a flat pebble of gray silicified siltstone. While we believe it is intentionally flaked (as opposed to some form of spurious natural fracturing), we could not determine whether the piece a fragment of a larger implement or simply an expediently used edge. The angle of the worked edge is ~45°, which is neither steep enough nor acute enough to assess function. It is 42.1 mm long, 24.1 mm wide, 11.4 mm thick, and weighs 9.8 g.

3.2.1.2.3.4 Used Flakes

Unfortunately, as discussed previously, local geological conditions and the types of stone locally present made it exceptionally difficult to identify intentionally used stones, as many pieces bore the "chatter" marks associated with the use of stone edges. Thus, the only positively identified used flakes were recovered in conjunction with the debitage concentration excavated in Unit 4N 11E. Here, 11 pieces bore enough evidence in the form of edge rounding/polishing, microflaking (removed flakes less than 2 mm in size), and flaking (removed flakes greater than 2 mm in size).

Except for two specimens, the used flakes were whole, and the unbroken specimens averaged 15.7 mm in length, 15.7 mm in width, 3.3 mm in thickness, and 0.7 g in weight. Blanks for six of the 11 were biface thinning/reduction flakes (5 of 6 were from later biface reduction; see appendix x for debitage-analysis classifications).

The extensiveness of use was limited on all the specimens, and except for one, use-wear was limited to one area of the flake margins. Although the definitive function of the pieces is difficult to ascribe, most would likely have served as expedient cutting tools because of acute working-edge angles. The edges were a variety of shapes—convex, concave, straight, and irregular—and all likely opportunistically chosen for a one-time specific task.

All of the used flakes in the cluster were of the same stone material as the debitage. Because of this admixture, it seems likely that debitage and used flakes were generated during one tool-making session and caught or collected on a hide and then poured out after completion of the session or occupation of the feature. Conceivably, most of the debitage was produced either in or adjacent to the feature, as it is not likely that mobile people would transport debris any distance. The used flakes themselves would not have been employed during the stone-reduction process; thus, it is possible to surmise that there was the modification of organic materials during the same manufacturing session. Unfortunately, waste (e.g., bone, ivory, wood, or hide fragments) from these activities did not preserve.

3.2.1.2.4 Tested Cobble

One small cobble, measuring 85.0 x 56.5 x 34.3 mm and weighing 130.0 g, was present on the midpassage in Unit 3N 10E. Although almost not of note, the cobble is a workable beige chert internally, and its brighter outer cortical surface was distinctive compared to the surrounding gravels and cobbles. Several flakes appear to have been removed in two locations that reveal the inner material of the cobble under the cortex, which is suggestive of testing to see whether the stone could be further reduced. For whatever reason, the cobble was abandoned, but we do believe that it was carried to the feature intentionally.

3.2.1.2.5 Debitage

The excavations of MRQ062 produced 304 pieces of debitage, which broken down by material type included 302 pieces of silicified siltstone and one piece each of quartzite and silicified slate. All of these materials likely have a local source.

Because the dumping event in Unit 4N 11E presented a unique opportunity to explore the activities surrounding a single or very short-term knapping event, we analyzed the debitage using three different approaches: flake typing, platform/dorsal scarring, and size class. See Appendix A for a review of the methods used in this analysis; here, we highlight the results.

The size-class analysis indicates that the debitage concentration in Unit 4N 11E is likely the product of a dumping event, rather than from sweeping, and though it is a secondary deposit from the initial manufacturing session, no postdepositional events altered the debitage-assemblage composition (Figure 3.11). If this were the case, there would be a deficit of small-sized debitage (G4), which is often missed during sweeping or moved by water or wind from its depositional location. In terms of manufacturing activities at the feature, the size-class analysis indicates that, based on the lack of large-sized debitage, it is likely that stone was brought to the site in preworked form. This result seems corroborated by the number of pieces possessing cortex (which is the natural rind of the stone). Of the 306 pieces in the feature, only 19 (6.2%) had cortex present.

Both the dorsal/platform-scar and flake-type analysis suggest that the knapping activities represented by the debitage relate to the middle stages of reduction (Table 3.3; Figure 3.12, 3.13, and 3.14). In other words, people were shaping and thinning stone tools (specifically silicified siltstone)—likely to reduce the weight of tools to be finished or used elsewhere. Overall, pressure flakes constitute only 27% of the identified flakes recovered, a number that should be significantly higher if the primary activity at the site were finishing tools. Because we used the 3.2-mm screen, we are confident that we did not miss the small flakes that relate to finishing and sharpening stone tools. While it is not possible to estimate from the current analysis, the overall amount of debitage could have been produced

Table 3.3. Debitage flake types recovered at MRQ062A during excavations in 2019. Green shading indicates debitage likely related to biface manufacture; gray shading indicates debitage likely from core reduction.

Flake type	Stage	Reduction strategy	FC[1]	OL[2]	Total	%	% Ident. flakes
Primary decortication	1	Either	1	-	1	0.3%	0.6%
Secondary decortication	1	Either	2	3	3	1.6%	2.9%
Secondary decortication, acute platform	1	Biface	4	1	1	1.6%	2.9%
Simple interior	2	Core	5	-	5	1.6%	2.9%
Complex interior	3	Core	25	1	26	8.6%	15.3%
Early biface reduction	2	Biface	11	-	11	3.6%	6.5%
Late biface reduction	3	Biface	52	-	52	17.1%	30.6%
Pressure	4	Either	25	-	25	8.2%	14.7%
Pressure, acute platform	4	Biface	21	-	21	6.9%	12.4%
Platform prep/pressure	n/a	Either	13	-	13	4.3%	7.6%
Platform prep/pressure, acute platform	n/a	Biface	6	-	6	2.0%	3.5%
Broken Flake	n/a	Either	131	3	134	44.1%	-
			296	**8**	**304**		**Totals**

1. Flake concentration.
2. Debitage not in the flake concentration.
3. Percentage of identified flakes (does not include broken flakes).

during the manufacture of one or two bifaces or a few more formalized flake tools—this is more in line with casual production of tools rather than feature being a primarily a lithic workshop.

The Late Dorset had several strategies to manufacture stone tools, including unifacial (core), bifacial, and blade reduction (see Sørensen 2012 for potential reconstructions of lithic reduction approaches taken by Late Dorset). None of the identified flakes related to the production of blades or microblades. Based primarily on flake types and striking-platform angles, a larger proportion of the knapping seems to have been dedicated to biface production. Biface reduction flakes (early and late) outnumber core reduction flakes (simple and com-

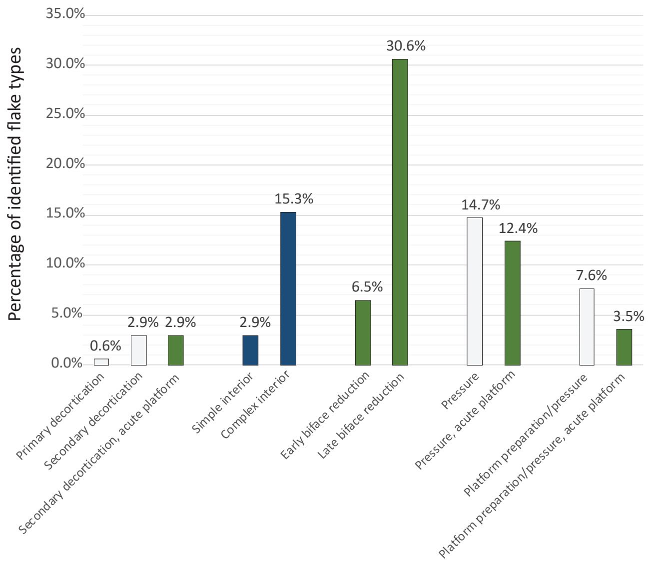


Figure 3.13. Percentage of MRQ062A debitage assemblage by identified flake types (broken flakes not included). Green bars indicate biface -reduction strategies and blue bars indicate core-reduction strategies.

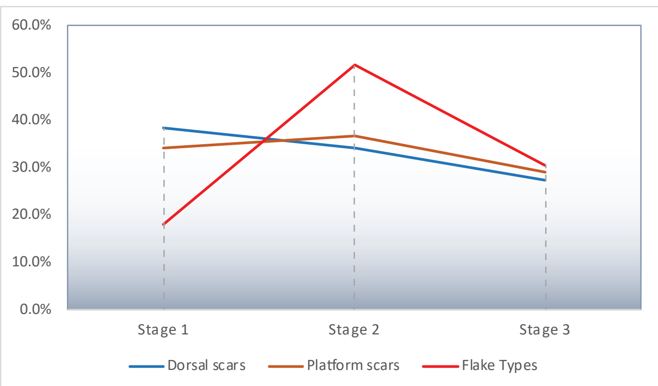


Figure 3.14. Lithic reduction stage indicated by dorsal scarring, platform scarring, and flake typing. Overall, all three methods indicate more mid-stage reduction present than late stage reduction

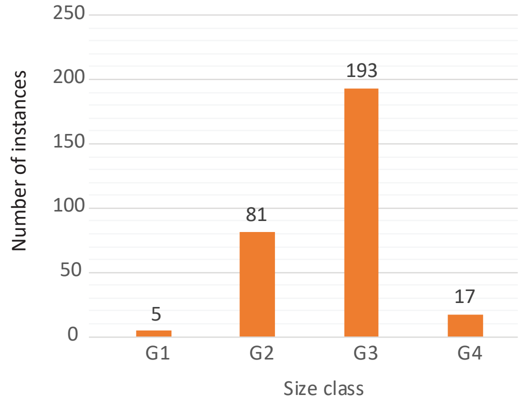


Figure 3.11. Debitage by size class (G1 > 36 mm; G2 36–16 mm; G3 16–8mm; and G4 < 8mm) from MRQ062A.

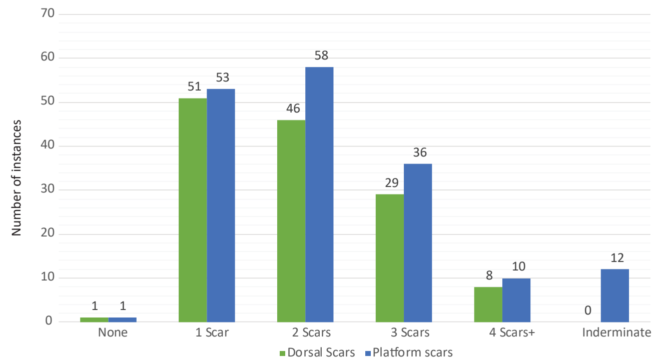


Figure 3.12. Debitage from MRQ062A classified by platform and dorsal scarring. Platform scarring is for platform bearing flakes and dorsal scaring is for broken flakes without a platform. More scars indicates later removal in a reduction sequence.

plex interiors) 2.1 to 1, and those flakes with acute platforms occur at a ratio of 1.36 to 1 across all platform-bearing flakes. Unfortunately, we did not recover any production errors (tools broken during manufacture) that would back either approach.

3.2.1.3 Faunal Remains

Four poorly preserved faunal remains were recovered, consisting of two long-bone shaft fragments from terrestrial mammals; one long-shaft fragment that likely was caribou (*Rangifer tarandus*) based on thickness; and one ungulate mandibular alveolus fragment (probably from a molar), which too is likely from a caribou. The three long-bone fragments came from locations surrounding where the hearth/lamp stand area, and the other from the apex of the midpassage. As with MRQ055, the low number of faunal remains present suggests short-term occupation of the feature.

3.2.1.4 Radiocarbon Date

We submitted one bone sample for AMS radiocarbon dating from Unit 4N 12E, which, based on its thickness and morphology, we deemed likely caribou in origin. We anticipated that it would date to the same period as those found further to the north in Inglefield Land between AD 1000 and AD 1200 (Darwent et al. 2018).

The sample dated 960±30 BP (Beta-542560), which calibrates to AD 1020–1155 at 2σ of deviation using the INTCAL13 calibration curve (Appendix C). This range falls directly within the dates ascribed to TMPs in Inglefield Land (Darwent et al. 2018) of AD 1000–1200.

However, an anomalous detail of concern is the isotope values for the sample. The $\delta^{13}C$ value for the sample is –16.8 ‰, and the $\delta^{15}N$ value is 10.5 ‰. Both of these isotopic values are outside the ranges usually found in caribou samples. In the case of the $\delta^{13}C$, the value is higher than that usually found for animals consuming a terrestrial diet. For instance, Drucker et al. (2012:497–498) report values for Peary caribou on Banks Island and Southampton Island of between –17.5 and –19.6 ‰ (for the mainland-based Central Arctic caribou herd in Alaska, these values are lower still [Barboza et al. 2017]). Similarly, the $\delta^{15}N$ is higher than typically recorded. For the same herds on Banks and Southampton Islands, the $\delta^{15}N$ values ranged from 3.9 to 7.8 ‰ (Drucker et al. 2012:7).

There are several possible explanations for the aberrant isotopic values. First, there is a possibility that the identification of bone as from a caribou was in error. However, there are limited options for what animal the fragment could be from. While the sample's $\delta^{15}N$ value is high, it is not high enough to be from a carnivore, which rules out either wolves, dogs, polar bears, or humans, for that matter. Therefore, there is a chance that there was some contamination of the sample with sea mammal oil (which could alter the sample chemistry and introduce marine carbon). Alternatively, possibly the caribou had more marine protein in its diet. Although caribou usually forage terrestrial lichens as their main food, the species has been observed to consume seaweed as well in times of nutritional stress (Hansen et al. 2019), and thus possibly the animal from which the specimen came from consumed marine protein from such a practice.

To determine whether the $\delta^{13}C$ value significantly pushed the date of the sample back in time, we used CALIB 7.0.4 (Stuiver and Reimer 1993). Like the sample from MRQ055, we used CALIB with 209 ± 84 for ΔR and its sigma to correct the date; however, in this instance, we used the Mixed Marine Northern Hemisphere correction, assuming a 25% marine protein content. Thus, using these parameters, the date corrected to AD 1161–1275 at 2σ of deviation. This date range still corresponds with the TMPs in Inglefield Land, though it does fall later in the period. Although further dates would shed light on the whole issue, it appears safe to conclude that this TMP is Late Dorset in date and coeval with those found further to the north in Greenland.

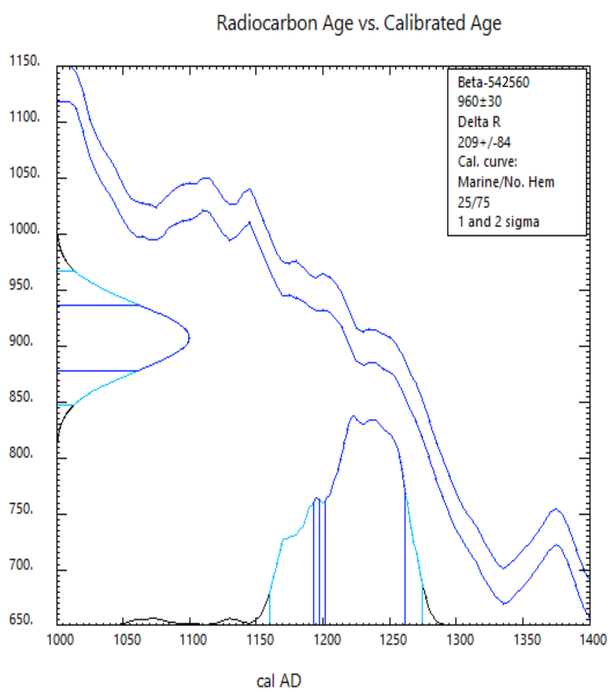


Figure 3.15 Calibration plot with marine reservoir correctio for the northern hemisphere assuming a 25% marine protein diet content for radiocarbon date Beta-542560 obtained from MRQ062 using CALIB 7.0.4. (Stuiver and Reimer 1993).

3.2.2 MRQ062B

MRQ062B was a deteriorated tent ring laying 20 m west of MRQ062A. Because of feature-rock borrowing/removal, disturbance, and surrounding topography, it was not discovered during the NKA's initial survey of the area (Myrup 2018). Rather, we became aware of the feature during the excavation of MRQ062A because of a biface fragment present on the surface in the interior of the ring. At first, this biface appeared to be an isolated surface find; however, near to it sat a flat stone with a V-shaped groove that greatly resembled the pot-stand stone present in the TMP of MRQ062A and other Late Dorset rings to the north (Figure 3.16). Upon further inspection, the gravel in the location seemed to be compressed within a ring of stones with the possible remnants of an axial feature running through the feature.

Because the excavations of MRQ055 and MRQ062A were completed with additional time to spare, and the fact that this feature was disturbed and likely to be destroyed by further construction in the area, the decision was made to excavate this feature.

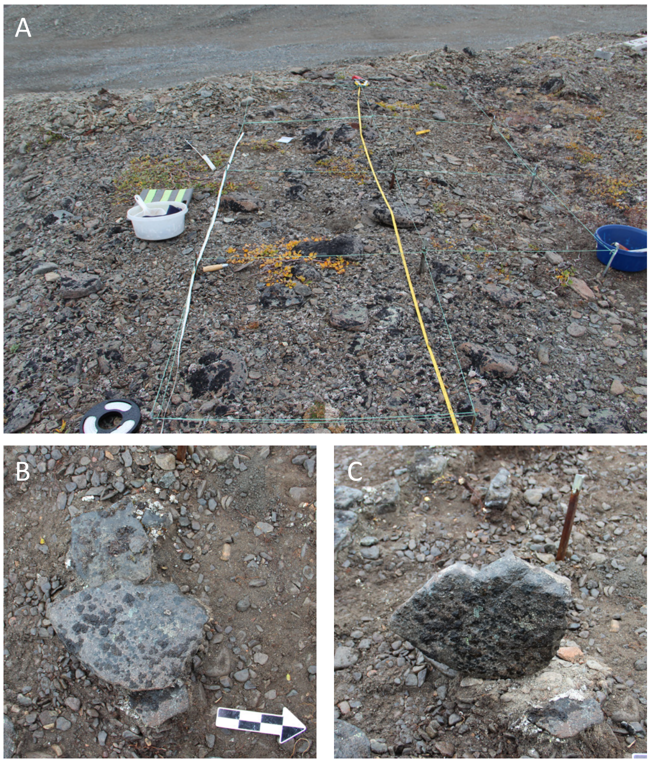


Figure 3.16. Tent ring MRQ062B: A. feature stones and compressed gravel associated with the ring; B. V-notched feature stone in situ; C. V-notched stone placed in possible original configuration. Photograph by John Darwent.

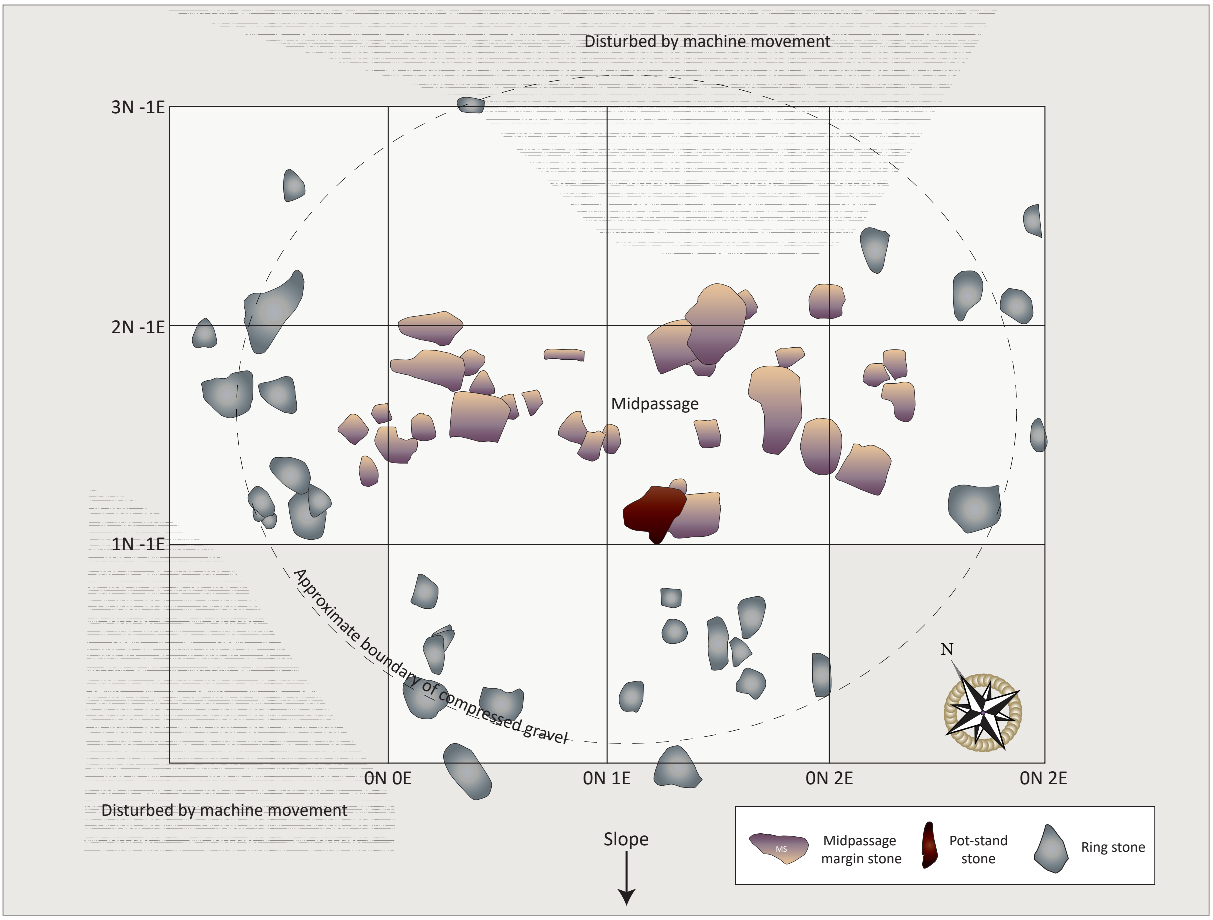


Figure 3.17. Feature map of MRQ062B displaying the location of feature stones, disturbance, and possible architectural features. Map by John Darwent.

3.2.2.1 Architecture

The tent ring of MRQ062B measured 3.75x3 m and with approximately 30 stones arranged roughly in an oval configuration (Figure 3.17). While not as compact as the gravel present in the interior of MRQ062A, there was some compression of the internal area likely associated with the use of the ring. Running through the center of the feature in an east-west orientation on the long axis of the feature is a loose arrangement of stones that appears to be a midpassage of sorts. Based on the shape of the stones present (some were elongated stones with rhomboidal cross-sections), the potential V-shaped notch pot-stand stone, the midpassage orientation (it is perpendicular to the coastline), and a vaguely triangular pattern of stone placement, this feature is possibly another Late Dorset TMP (Figure 3.18). However, we caution that this is a very tentative categorization—the midpassage was damaged extensively and many stones were moved or removed, possibly to the adjacent TMP.

While it might be suggested that the ring is Thule in age on the basis that the axial line of stones denotes the division seen between the kitchen and sleeping platform in Thule tent rings, we do not believe this was the case because of the similarities with TMPs discussed above and the presence of lithic artifacts (discussed in the next section). Also, the ring does not have the "robustness" (e.g., more numerous and larger feature rocks) often present in Thule rings.

Figure 3.18. Post excavation photo of MRQ062. The feature stones are roughly in a triangular arrangment, and the V-shaped-notch pot-stand stone is in the center of the photot adjacent to the the north arrow. Photograph by John Darwent.

3.2.2.2 Artifacts

The artifacts recovered in association with MRQ062B consist of one biface and 26 pieces of debitage. Although these pieces only fell into two different material types—quartzite (n=11) and silicified siltstone (n=15)—there were color variations that indicate the debitage came from different stones (Table 3.2). The quartzite fell into dark gray (n=1), light gray (n=9), and white (n=1) colors, and the silicified siltstone was dark gray (n=1) and dark greenish gray colors (n=14).

3.2.2.2.1 Biface

One fragmentary biface made of light-gray silicified siltstone was recovered from the surface of 1N 1E (Figure 3.14). It was broken and abandoned very early in its manufacture, and therefore, it is crude in form and represents only an end portion of a larger piece. The blank used for the biface was a secondary decortication reduction flake, which has cortex still covering much of the original flakes. It measures 49.4 mm in length, 50.1 mm in width, 13.4 mm in thickness, and 26.4 g in weight. While this biface is not likely Thule in origin, its unfinished form makes it undiagnostic of any particular archaeological culture.

Figure 3.19. Biface fragment found on surface of MRQ062B.

3.2.2.2.2 Debitage

Like MRQ055 and MRQ062A, the naturally fractured gravel on the bench made identifying culturally modified stone difficult. While 26 pieces of debitage is a small assemblage (Table 3.4), there are a few patterns that still emerged:

1. Despite the small size of the screen used during the excavation, only four of the 26 (15%) of the sample were G4 in size. Rather, most of the sample was of the larger size classes (n=22; G3=8 G2=9 and G1=5).

2. Of the sample present, 19 (73%) had some amount of cortex present on their dorsal surfaces or platforms.

3. Except for two specimens, all of the flakes complete enough to be classified to a type are from the early stages of a reduction sequence (n=15).

4. In comparison with flake types found at MRQ062A, only two (10%) show evidence of being related to biface manufacture.

Thus, taken as a whole, the structure of the assemblage suggests that it was created through a few instances of initial working of cobbles of local material. Presumably, the larger-sized debitage left behind were of substandard quality for further use and discarded.

3.2.2.3 Dating

We did not recover organic material from the excavations of MRQ062B, and thus it is not possible to directly date the feature. Additionally, we did not recover any diagnostic artifacts—other than the presence of the biface and debitage suggests that the feature is Pre-Inuit as opposed to Thule in origin.

Tentatively, we believe the interior axial stones might be the vestiges of a triangular midpassage, especially because of the presence of the potential V-shape-notched pot-stand stone. Thus, these factors and its proximity to a verified TMP suggest that this feature is Late Dorset in age. As reviewed by Darwent et al. (2018), it is not uncommon for TMPs to be found in pairs.

	Quartzite				Silicified Siltstone			**Total**
	Dark gray	Light gray	White	Sub-total	Dark Gray	Dark Green-Gray	Sub-total	
Primary decortication	-	-	-		-	2	2	**2**
Secondary decortication	-	3	1	4	-	1	1	**5**
Secondary decortication, acute platform	-	1	-	1	-	-	-	**1**
Secondary decortication, cortical platform	-	-	-		-	2	2	**2**
Simple interior	-	-	-	-	-	2	2	**2**
Simple interior, cortical platform	-	-	-	-	1	-	1	**1**
Early biface reduction	-	1	-	1	-	-		**1**
Early biface reduction, cortical platform	-	-	-	-	-	1	1	**1**
Late biface reduction	-	2	-	2	-	-		**2**
Platform prep/pressure	1	1	-	2	-	-		**2**
Broken flake	-	-	-	-	-	6	6	**6**
Shatter	-	1	-	1	-	-		**1**
	1	**9**	**1**	**11**	**1**	**14**	**15**	**26**

4. Discussion

It is usual practice for arctic archaeologists to investigate locations where there are considerable archaeological resources known to be present. From the standpoint of tight budgets and restricted time, this tactic makes sense because there is a maximal amount of information recovery for the cost of the investigation (plus no one likes to come up empty-handed). Thus, this approach translates into a focus on winter houses (both Dorset and Thule) and features with considerable numbers of artifacts present on the surface. While in many ways this might be considered the best approach in times of funding shortfalls, it does enter a bias into our interpretations of landscape use. Assumptions are made about what will be found with features such as animal traps, hunting stands, caches, and tent rings—both those found in larger sites and isolated. The three tent rings investigated in this study fall into this latter category.

4.1 MRQ055

Our initial expectations were that MRQ055 was a tent ring from the Pre-Inuit period; however, the configuration of the tent ring revealed by the excavations, the marine-corrected radiocarbon date of AD 1390–1693, and the lack of artifacts diagnostic of any Pre-Inuit culture leads us to conclude that the tent ring is of Thule origin. While the marine reservoir correction procedure is fraught with complications ranging from animal diet to local marine carbon reservoir effects, the radiocarbon date suggests that this ring was constructed during the early to mid-Thule period. The configuration of the tent ring suggests it was for a summer occupation. It can be envisioned that the amount of effort to initially build the ring, which largely entailed moving rocks from the nearby bedrock/boulder exposure up onto the beach ridge and some sculpting of the bench, minimally led to at least one day/sleep cycle of occupation of the feature.

In many ways, one could perceive excavating a tent ring largely devoid of artifacts as a wasted endeavor. However, there can be value in "negative" results. In the case of MRQ055, the meagerness of both artifacts and fauna points to the brevity of the occupation, with the possible consumption of a portion of a ring seal and gull as being the only activity represented by the material culture recovered. Although the absence of evidence does not necessarily mean that specific tasks did not occur at the site, from the preserved evidence, there is no suggestion of tool manufacturing activities in the feature. Rather, it appears that the feature was merely a stopover point. The presence of the bird-bone fragments and seal femur insinuates that preservation is not a reason for the absence of organic materials such as bone, antler, ivory, or possibly wood associated with tool manufacture or repair.

It is beyond the scope of the discussion here to reconstruct the Thule use of Wolstenholme Fjord, as MRQ055 is just one small tent ring in a large pool of other recorded and excavated Thule features in the area. However, to future researchers examining Thule land use of the region, MRQ055 can serve as a "verified" representative of the feature form in the region, in terms of what should be expected in the way of artifacts and fauna, as well as how long people spent at similar tent rings.

4.2 MRQ062

While the status of MRQ062B in terms of both its original architecture and date of occupation is far from clear, MRQ062A offers some unique insight into the Late Dorset use of the Wolstenholme Fjord region.

4.2.1 Comparison to Other TMPs

MRQ062A represents the 53rd identified TMP in the Canadian and Greenlandic Arctic, and the third one excavated. Because of this uniqueness, it provides an excellent opportunity for comparison to the two other excavated rings and expand our knowledge of the feature type.

4.2.1.1 Architecture

Architecturally, MRQ062A typifies the TMP feature form as described by Darwent et al. (2018:528–530):

1. As the name implies, MRQ062 had a triangular-shaped plan view, and it classifies with other TMPs that are identified as "swept" because of its curved outer margins;

2. The rocks used to construct MRQ062 were specifically chosen on their shape, and there was the modification of some stones so that they were the proper shape. This attention to shape through both selection and modification was noted for the TMP excavated in Inglefield Land (JL2B4-5) and appears to be a universal characteristic of the feature type;

3. A pot stand was present with a V-shaped groove chipped into its upper margin (found in 79% of all TMPS);

4. There was an inset area of paving stones inside the margin stones at the base of the mid-passage triangle;

5. The feature was made to last, possibly for multiple uses, as the was shimming of many of the feature stones (in particular, the pot-stand stone) with smaller stones to wedge them into position.

It is the last point that is most important in terms of interpreting Late Dorset use of the Wolstenholme Fjord, which is discussed below in the section after next.

If MRQ062B is a TMP, then it would follow that it is the 54th excavated example. MRQ062B does have the V-shape-notched pot-stand stone, and there are some vestiges of well-set stones in what would have been the apex of a triangular midpassage if it was a TMP.

4.2.1.2 Artifacts

The discovery of the well-made chert biface and flake tools (outside those associated with the flake concentration) in MRQ062A and the fragmentary biface on MRQ062B are part and parcel with what is known from both excavated and surface recorded TMPs. The excavated JUL2B4-5 TMP in Jens Jarl Fjord in Inglefield Land produced crude flake tools made of local stone (Table 4.1) and Steensby Inlet TMP on Ellesmere Island yielded a crudely formed core. Similarly, instances of individual well-made formed tools were noted in surface contexts with two other TMPs in the Marshall Bay and Jens Jarl Fjord (Darwent et al. 2018:528–530).

If there was a surprise in the findings at MRQ062, it was the discovery of the flake concentration in MRQ062A. While our knowledge base of what is typically found in conjunction with a TMP is based on a very small sample, the quantity of material discovered in association with MRQ062A is effectively ten times the number of pieces recovered from either of the two previously excavated TMPs in Jens Jarl Fjord or Steensby Inlet (Darwent et al. 2018) (see Table 4.1). If MRQ062B is a TMP, the size of the assemblage recovered in association with it is more in line with the size of the assemblages collected at the other two excavated TMPS.

Beyond quantities of recovered artifacts, technological analysis reveals differences between MRQ062 and JUL2B4-5 debitage assemblages (a comparable technological analysis is not available for the Steensby Inlet debitage assemblage). Of the assemblage from JUL2B4-5, 20 of the 31 pieces were pressure flakes made of fine-grained cherts that likely related to the sharpening/resharpening of bifaces—essentially, tool maintenance. The remaining pieces were of local stone materials, and they either came from the production of the flake tools found with the feature or debris from shaping the feature stones of the TMP. At MRQ062A, it is possible that the quartzite and other pieces of silici-

	JUL2B4-5	Steensby Inlet	MRQ062A	MRQ062B
Biface	-	-	1	1
Flake tools	3	-	14	-
Debitage	31	21	304	26
Core	-	1	-	-
Wood fragment, worked	1	-	-	-
Wood fragment, unworked	4	-	-	-
Faunal remains	70	-	5	-

fied siltstone not recovered in the flake concentration could have been from the same sort of manufacturing production as these latter local materials at JUL2B4-5 (the same could be true for MRQ062B as well). Conversely, there is no indication of tool maintenance at MRQ062A. Rather, the debitage from the flake concentration appears to be from the shaping and thinning of bifaces and possibly other tools made from local silicified siltstone. It should be noted, however, that the amount of debitage in the flake concentration was likely the byproduct of the manufacture of a limited number of tools, and it does not suggest that the feature's past occupants of the spent a more substantial amount of time at this TMP than others.

The knapping of the local stone material into bifaces is interesting from an economic point of view. Most often Pre-Inuit stone working is associated with fine-grained high-quality stone materials, such as the chert/flint used for the asymmetrical knife. While the local silicified siltstones range in the size of their grain structure and vitreosity, they appear less than optimal for fine detail pressure flaking that is used extensively in Late Dorset stone working. Indeed, the Late Dorset stoneworkers in Inglefield Land appear to have made extensive use of blue-gray agates that come from Washington Land, over 150 km to the north.

The flake tools—in particular, those from the flake concentration—suggest that the feature's occupants undertook other manufacturing/refurbishment activities in addition to stone working. However, beyond identifying that this likely occurred, the evidence available does not allow for specifics, although the lack of osseous material (which could have preserved based on the presence of some faunal material) suggests it might not be related to the working of bone, ivory, or antler.

Taken as a whole, the analysis architecture and artifact assemblage from MRQ062A does not extensively rewrite the previous functional interpretation of what activities or role TMPs had in Late Dorset settlement systems: it still appears that they were well-built structures intended for multiple (re)occupations. Nevertheless, the MRQ062A assemblage does indicate that more than just tool finishing/refurbishment occurred at these features. In addition, there were other manufacturing activities undertaken, as noted by the flake tools present. However, in any event, both the stone working and other activities were limited in scope, and thus, they do not change the overall interpretation of the feature form's use.

4.2.2 Late Dorset in Wolstenholme Fjord

MRQ062A is one of the few Late Dorset features presently identified in the Wolstenholme Fjord, and one of the southernmost known occurrences of the archaeological culture in Greenland. Although the presence of groups associated with the culture is well documented in Inglefield Land to the north (Appelt and Gulløv 1999; Appelt et al. 1998; Darwent et al. 2007, 2008, 2019; Darwent and Johansen 2010), it is only recently that more modern surveys have started to identify southerly located Late Dorset features in Inglefield Gulf (work of Matt Wall's Inughuit Creativity and Environmental Responsiveness in NW Greenland Project, via Pauline Knudsen, personal communication 2019), Wolstenholme Fjord (Myrup 2019), and potentially some on Salleq (Bushnan Island) near Savassivik (Hastrup et al. 2014).

Based on the confirmed Late Dorset presence at MRQ062A, we can make the following statements concerning their use of Wolstenholme Fjord:

1. While a hearth row and a tent ring (possibly two tent rings if one includes MRQ062B) do not constitute a sufficiently large enough sample to make strong conclusions concerning the Late Dorset use of the region, their presence does suggest that a similar land-use system as found in Inglefield Land might be present. The hearth row at Nuulliit, while lacking the usually associated Late Dorset longhouse, is located on landfall adjacent to the NOW Polynya like the hearth rows associated with the Reindeer Point Longhouse, the Etah Longhouse (Darwent et al. 2008; Darwent and Johansen 2010), the Polaris Site longhouse, and the David Site longhouse (Appelt and Gulløv 1999; Appelt et al. 1998). As far as the implications of the MRQ062A TMP, Darwent et al. (2018) make the case that such structures may have been constructed for multiple short-term uses, possibly like a hunter's cabin. Whether such a feature represents an outpost

on the margin of the Late Dorset occupation of Greenland for exploration or repetitive reuse of the area remains to be investigated. However, if the interpretation that TMPs were not expedient structures but rather planned features made for reuse, it does suggest that the Wolstenholme Fjord area was fully integrated into a Late Dorset settlement system.

2. Although the hearth row and TMP are Late Dorset features, it is doubtful—based on the radiocarbon date from the hearth row of 1340±55 BP (Schledermann and McCullough 1992), which calibrates to AD 592–854 at 2σ of deviation (with the highest likelihood of the date preceding AD 800), compared to the date range of AD 1020–1155 (uncorrected for marine carbon bias) or AD 1161–1275 (corrected for possible marine carbon bias) associated with MRQ062A—that the features were coeval. Therefore, it cannot be said that both were part of the same Late Dorset settlement system. In Inglefield Land, it appears that there were three periods of more intensive occupation of the region (Darwent et al. 2018), and therefore, the potential for different land-use systems. It is possible that the radiocarbon date from the hearth rows at Nuulliit is too old because it was obtained from wood charcoal and could suffer from the effects that old tree rings and driftwood bring to the equation (Arundale 1981). However, even adding 300 years to the midpoint of the Nuulliit hearth row date (AD 723) only just catches the very tail end of the AD 1020-1155 date from MRQ062A.

3. TMPs appear to be associated with a population surge around AD 1050 in Inglefield Land, which lasted until around AD 1200 (Darwent et al. 2018), and not with the earliest occupations of Inglefield Land that occurred around AD 800 (Appelt and Gulløv 1999). The date from MRQ062A suggests that the use of the feature occurred at the same AD 1050–1200 time. Without further survey information, it is difficult to confirm any conclusions, but a possible hypothesis to be explored in the future is that locations farther afield from Inglefield Land were exploited during the period of time, and people expanded into Wolstenholme Fjord at this time.

5. Recommendations

5.1 Development Specific

The known features at both MRQ055 and MRQ062 were excavated in their entirety during the 2019 field season. Minimally, the disturbance of these heritage resources has been mitigated. Based on these investigations, and the archaeological survey carried out by the NKA in 2018 (Myrup 2018), there are no longer any significant archaeological features known within this area of the Dundas Titanium mining development. Consequently, there are no further heritage concerns in the 8.5 km area between MRQ087 and MRQ043 (see Figure 1.2) that need to be addressed, as set out by Myrup (2018). Therefore, we would recommend that Dundas Titanium be allowed to proceed with its operations within this area.

5.2 Future Investigations of Similar Features

In terms of our knowledge base of arctic archaeological features, both MRQ055 and MRQ062 add data to the knowledge of tent rings by the Thule and Late Dorset. Although MRQ055 did not contribute much in the way of artifacts, it did provide a date, and it is clear that the ring is not from the later part of the Thule period. Tent rings from the Thule period, while usually distinguishable from earlier Pre-Inuit because of the presence of a sleeping platform, are very difficult to classify as to when in the period they were built. With a larger database of dated Thule tent rings, like MRQ055, it might be possible to identify different architectural configurations associated with different intervals of the Thule use of northwestern Greenland. For instance, at MRQ055, one could consider the feature just a ring of stone; however, while the feature is roughly circular, it does have one area where the circle is "flattened" for a 4 m stretch. Also, the axial delineation of the sleeping platform has an arched shape. Both of these aspects of the ring might be temporally sensitive. If we are ever to be able to explore changes in Thule use of areas such as Wolstenholme Fjord in the future, we need such information to build models of changing settlement—winter houses represent just a portion of the seasonal cycle, tent rings another. Therefore, it is recommended that other such Thule tent rings, despite the likely low recovery of artifacts, be excavated for the opportunity to obtain datable materials when future land-modifying developments threaten such structures.

In many ways, the situation is the same with Late Dorset tent rings because often semi-subterranean winter houses constitute the main focus of excavations. Thus, the two tent rings at MRQ062 can add similar information. For example, even with only two Late Dorset sites known in Wolstenholme Fjord, we can tell both sites seem to come from different intervals of occupation within the Late Dorset period. Thus, as with the Thule tent rings, it is recommended that any Late Dorset features slated to be impacted by development be excavated. This situation is particularly the case for other TMP structures like MRQ062A because of their rarity. Although there were similarities between MRQ062A and the other two excavated TMPs in Inglefield Land and Steensby Inlet on Ellesmere Island, especially in terms of architecture, there was enough variation in the artifact assemblages that we cannot safely predict what other such features will have in the way of artifacts present.

Acknowledgments: Thank you to of Mikael Larsen for drone footage of both MRQ055 and MRQ062, plus effective use of the same drone for management of polar bears. Thank you as well to Dundas Titanium and their staff for logistical support for the fieldwork, in particular Hans Jensen and Bo Møller Stensgaard for arranging alternative transportation from the Qaanaaq region. Lastly, thank you to Hans Lange and Jens Kanuthsen for their assistance with the fieldwork.

6. References

Appelt, Martin, and Hans Christian Gulløv (editors)
1999 *Late Dorset in High Arctic Greenland: Final Report of the Gateway to Greenland Project*. National Museum of Denmark and the Danish Polar Center, Copenhagen.

Appelt, Martin, Hans Christian Gulløv, and Hans Kapel
1998 The Gateway to Greenland: Report of the Field Season 1996. In *Man, Culture and Environment in Ancient Greenland*, edited by Jette Arneborg and Hans Christian Gulløv, pp. 136–153. National Museum of Denmark and the Danish Polar Center, Copenhagen.

Arundale, Wendy
1981 Radiocarbon Dating in Eastern Arctic Archaeology: A Flexible Approach. *American Antiquity* 46:244–271.

Barboza, Perry S., Lindsay L. Van Someren, David D. Gustine, and M. Syndonia Bret-Harte
2017 The Nitrogen Window for Arctic Herbivores: Plant Phenology and Protein Gain of Migratory Caribou (Rangifer tarandus). *Ecosphere* 9(1):1–17.

Bennike, Ole, and Svante Björck
2002 Chronology of the Last Recession of the Greenland Ice Sheet. *Journal of Quaternary Science* 17(3):211–219.

Darwent, John, and Trine B. Johansen
2010 Archaeological Survey in the Foulke Fjord Region, Inglefield Land, Northwestern Greenland. *Geografisk Tidsskrift–Danish Journal of Geography* 110(2):297–314.

Darwent, John, Christyann M. Darwent, Genevieve M. LeMoine, and Hans Lange
2007 Archaeological Survey of Eastern Inglefield Land, Northwest Greenland. *Arctic Anthropology* 44(2):51–86.

Darwent, John, Hans Lange, Genevieve M. LeMoine, and Christyann M. Darwent
2008 The Longest Longhouse in Greenland. *Antiquity* 82(315): https:// www.antiquity.ac.uk/projgall/darwent315/.

Darwent, John, Genevieve M. LeMoine, Christyann M. Darwent, and Hans Lange
2019 Late Dorset Deposits at Iita: Site Formation and Site Destruction in Northwestern Greenland. *Arctic Anthropology* 53(1):96–118.

Darwent, John, James M. Savelle, Christyann M. Darwent, Arthur S. Dyke, Hans Lange, Genevieve M. LeMoine, and Claude Pinard
2018 Late Dorset Triangular Midpassages in the Canadian Arctic and Northwest Greenland: Origins and Dispersal. *American Antiquity* 83(3):525–535.

Dawes, Peter R.
2006 *Explanatory Notes to the Geological Map of Greenland, 1:500 000, Thule, Sheet 5.* Geological Survey of Denmark and Greenland Map Series 2. Copenhagen: Geological Survey of Denmark and Greenland, Danish Ministry of the Environment.

Drucker, D. G., K. A Hobson, S.C. Münzel, and A. Pike-Tay
2012 Intra-Individual Variation in Stable Carbon (δ13C) and Nitrogen (δ15N) Isotopes in Mandibles of Modern Caribou of Qamanirjuaq (Rangifer tarandus groenlandicus) and Banks Island (Rangifer tarandus pearyi): Implications for Tracing Seasonal and Temporal Changes in Diet. *International Journal of Osteoarchaeology* 22(4):494–504.

Friesen, T. Max
2007 Hearth Rows, Hierarchies and Arctic Hunter-Gatherers: The Construction of Equality in the Late Dorset Period. *World Archaeology* 39:194–214.

Friesen, T. Max and Owen K. Mason, editors
2016 *The Oxford Handbook of the Prehistoric Arctic.* Oxford: Oxford University Press.

Grønnow, Bjarne, Martin Appelt, Anne Birgitte Gotfredsen, and Mikkel Myrup
2016 Arkæologiske og arkæo-zoologiske undersøgelser på bopladserne Nuulliit og Uummannaq

(Avanersuaq) – en del af NOW-projektet, 2015. Sila – Arktisk Center Ved Etnografisk Samling, Nationalmuseet.

Hansen, Brage Bremset, John Runar Loretzen, Jeffrey M. Welker, Øystein Varpre, Ronny Aanes, Larissa Teresa Beumer, and Åshlid Ønvik Pedersen

2019 Reindeer Turning Maritime: Ice-Locked Tundra Triggers Changes in Dietary Niche Utlilization. *Ecosphere* 10(4):e02672.

Hastrup, Kirsten, Bjarne Grønnow, and Anders Mosbech

2014 The NOW Project: Living Resources and Human Societies around the North Water in the Thule Area, NW Greenland. Annual Report, 2014. https://now.ku.dk/documents/NOW2014AnnualReportFinal.pdf

Holtved, Erik

1944 *Archaeological Investigations in the Thule District, I-II*. Meddelelser om Grønland 141(1–2).

1954 Archaeological Investigations in the Thule District, III: Nûgdlît and Comer's Midden. Meddelelser om Grønland 146(3).

Maxwell, Moreau S.

1984 *Eastern Arctic Prehistory*. Orlando: Academic Press.

Morrison, David

1989 Radiocarbon Dating Thule Culture. A*rctic Anthropology* 26(2):48–77.

Myrup, Mikkel

2018 Moriusaq Archaeological Survey, 2018. Report on file with Nunatta Katersugaasivia Allagaateqarfialu/The Greenland National Museum & Archives.

Porter, Claire, Paul Morin, Ian Howat, Myoung-Jon Noh, Brian Bates, Kenneth Peterman, Scott Keesey, Matthew Schlenk, Judith Gardiner, Karen Tomko, Michael Willis, Cole Kelleher, Michael Cloutier, Eric Husby, Steven Foga, Hitomi Nakamura, Melisa Platson, Michael Wethington, Jr. Cathleen Williamson, Gregory Bauer, Jeremy Enos, Galen Arnold, William Kramer, Peter Becker, Abhijit Doshi, Cristelle D'Souza, Pat Cummens, Fabien Laurier, and Mikkel Bojesen

2018 ArcticDEM. https://doi.org/10.7910/DVN/OHHUKH, Harvard Dataverse, V1.

Reimer, Paula J., Edouard Bard, Alex Bayliss, J. Warren Beck, Paul G. Blackwell, Christopher Bronk Ramsey, Caitlin E. Buck, Hai Cheng, R. Lawrence Edwards, Michael Friedrich, Pieter M. Grootes, Thomas P. Guilderson, Haflidi Haflidason, Irka Hajdas, Christine Hatté, Timothy J. Heaton, Dirk L. Hoffmann, Alan G. Hogg, Konrad A Hughen, K. Felix Kaiser, Bernd Kromer, Sturt W. Manning, Mu Niu, Ron W. Reimer, David A. Richards, E. Marian Scott, John R. Southon, Richard A. Staff, Christian S.M. Turney, and Johannes van der Plicht

2013 IntCal13 and Marine13 Radiocarbon Age Calibration Curves 0–50,000 Years cal BP. Ra*diocarbon* 55:1869–1887.

Schledermann, Peter

1980 Polynyas and Prehistoric Settlement Patterns. *Arctic* 33(2):292–302.

1990 *Crossroads to Greenland: 3000 Years of Prehistory in the Eastern High Arctic.* Komatik Series, 2. Calgary: The Arctic Institute of NorthAmerica.

Schledermann, Peter, and Karen McCullough

1992 Crossroads Project 1992 Archaeological and Ethnographic Investigations in North Greenland. Unpublished report, The Arctic Institute of North America, The University of Calgary.

Sørensen, Mikkel

2010 The Archaeology of Old Nuulliit: Eigil Knuth's Investigations in the Thule Region, North Greenland, 1952–1990. Meddelser om Grønland 349. Copenhagen: Museum Tusculanum Press, University of Copenhagen.

2012 *Technology and Tradition in the Eastern Arctic, 2500 BC–AD 1200. A Dynamic Technological Investigation of Lithic Inventories in the Paleo-Eskimo Traditions*. Meddelser om Grønland 350. Copenhagen: Museum Tusculanum Press, University of Copenhagen.

Stuiver, Minze, and Paula J. Reimer

1993 Extended 14C Data Base and CALIB 3.0 14C Age Calibration Program. *Radiocarbon* 35(1):215–230.

Appendix A: Lithic Analytical Methods

Flaked-Stone Analysis

The field of flaked stone-tool analysis —the study of stone tools made through chipping or flaking stone (as opposed to grinding)—is far from being unified, and many different methods for deriving information from stone artifacts have been developed (see Andrefsky 2001; Kooyman 2000; Shott 1994 for reviews Although some approaches have more popularity than others (e.g., Ahler's [1989] mass analysis), the overall consensus concerning the best way to approach the study of stone tools is to use methods that best suit the problems at hand (Andrefsky 2001). Thus in the following section, the analytical methods used for the analysis of the Dundas Titanium project chipped-stone artifacts are described.

Flake Tools

Flake tools are the most archetypical expedient tools. They consist of debitage that has been modified through use or are the product of opportunistic retouch flaking that was not intended to modify the tool into a preconceived form. As such, usually they have had less than half their margins retouched. Recognition that piece of debitage is in fact a tool lies in the identification of areas of undeniable wear from use on its margins. This is not always an easy task, especially considering that wear-like patterns can be produced through trampling or other taphonomic processes. Therefore, magnification was usually used to confirm whether the indications of wear—microflaking, flaking, polish, and grinding—were through use.

All flake tools were weighed and measured to maximum length, width, and thickness to the nearest 1/10th of a millimeter, with the orientation of the measurements determined by the direction the flake was originally struck from a core—length is parallel to the direction of detachment. In addition, the condition of the specimen and whether it was made on heat-treated material was recorded. The technological analysis included identifying the original type of flake that the tool was manufactured on (the definitions for which are located below in the debitage section), the number of locations where the flake had modified edges, and the percentage of the flake edges that was modified. For each modified area the working-edge shape was recorded along with the types of macro-sized use wear evident, which included polish, grinding, stepping-and-crushing, flaking (flake scars >2 mm) and micro-flaking (flake scars <2 mm).

Debitage Analysis

Of all the areas of lithic analysis, the analysis of the waste products of the lithic reduction process—referred to as debitage—has likely received the most attention but remained one most contentious in terms of results. Before the 1960s, debitage was often seen as a nuisance rather than as boon to reconstructing past lifeways. However, beginning with the increasing amount of experimental archaeology (especially that of Donald Crabtree and François Bordes in terms of lithic technology [Johnson 1978]), it was recognized that the analysis of debitage brought with it four distinct advantages: 1) it is plentiful; 2) can be culturally or chronologically diagnostic; 3) reflective of the methods used for its manufacture; and 4) more likely to be in a primary context of where it was produced compared to tools that people are more apt to carry away with them (Shott 1994:71).

The earliest approaches to debitage analysis—often referred to as the traditional approach (Shott 1994:75)—involved classifying debitage into types based on morphological attributes associated with different reduction procedures (Andrefsky 2001; Shott 1994). Since the 1970s a variety of approaches have been devised to get around perceived problems with typological approaches, which largely relate to the ability to replicate classifications (Sullivan and Rozen 1985), focus on using debitage attributes (e.g., platform and dorsal surface scarring [Magne and Pokotylo 1981; Magne 1985]), debitage size classes (e.g., mass analysis proposed by Ahler [1989], see also Hall and Larson 2004), or flake morphology (see Sullivan and Rosen 1985) to study lithic reduction. While the proponents of these approaches vied to demonstrate the superiority of one to another, by the turn of the millennium, it was clear that all the approaches suffered shortfalls in their explanatory power in one way or another (see Andrefsky 2001, 2007 for reviews). Thus, rather than rely on one universal method for examining debitage, some researchers (e.g., Andrefsky 2001; Magne 2001) endorse using a combination of approaches that best suit the analytical problem at hand.

A typological approach was used in this study to classify the debitage into types indicative of different reduction methods, largely based on types proposed by Bloomer et al. (1997), who in turn, borrowed heavily from Flenniken (1981). The debitage was sorted into size classes. The classes used for this analysis were based upon those used by Ahler (1989), which essentially follow the maximum size of an object that could pass through standard sizes of hardware cloth (as determined by the diagonal dimension of a hardware-cloth square).

Thus, the size classes were designated G1 (>36.6 mm), G2 (36.6–18.3 mm), G3 (18.3–8.9 mm) or G4 (<8.9 cm). Also, the presence of cortex was recorded. While the use of size-class data in lithic studies has come under criticism, especially when used to try to reconstruct reduction methods (see Andrefsky 2007), the goal in this analysis was to reveal broad patterns of size differences among material types and not specifically to determine reduction practices.

Lastly, the number of flake scars present on the platforms of flakes were recorded (up to four), along with the number of dorsal scars on all pieces (up to four), following Magne (1985).

Flake Types

Fourteen different debitage types were identified, with 12 of the 21 types specifically for platform-remnant bearing (PRB) flakes (which are pieces of debitage where the place where the flake was struck from the parent rock is still present). It is a primary source of information concerning how a piece of debitage was made and in combination with other traits listed below, provides the best means to determine when a flake was removed in a reduction sequence. The flake types for the PRB flakes are as follows:

Primary Decortication Flake (PD) – is a PRB flake that has its entire dorsal surface covered in cortex—the weathered outer rind of a piece of unaltered material—regardless of size. The platform may or may not be covered with cortex. PD flakes are the earliest flakes taken off in a reduction sequence.

Secondary Decortication Flake (SD) – is a PRB that has more than 25% of its dorsal surface covered with cortex, regardless of size or platform configuration. Logically, SD flakes are removed immediately after PD flakes and thus are early in the reduction of a tool. However, the 25% cortex threshold, while somewhat arbitrary, is necessary so that flakes with small amounts of cortex from later in a reduction sequence are not erroneously assigned to an early stage—even finished projectile points can have cortex present on their faces and some of the final flakes made during their manufacture could bear cortex on their dorsal surface. Like the PD, the platform may or may not be covered with cortex.

Secondary Decortication Flake with Acute Platform Angle (SDAC) – are the same as SD flake except that the platforms of SDAC flakes are acute (under 65°). Likely these flakes were produced during the early shaping of bifaces.

Simple Interior Flake (SI) – is a PRB flake that has less than 25% cortex on its dorsal surface. Although SI flakes do tend to be larger than other flake types and have lesser scarred platforms (scars left from previous flake removals on the platform surface), the defining characteristics of the type are that they have three or fewer flake scars on their dorsal surfaces and have a platform angle—the angle of the platform in relation to the parallel angle of the dorsal surface—greater than 65 degrees. This flake type is associated with the reduction of cores as opposed to bifaces.

Simple Interior Flake with Cortical Platform (SICP) – like the regular SI flake, this flake type also is a PRB flake that has less than 25% cortex on its dorsal surface. However, instead of having scarring, the platforms on SICP flakes have cortex covering their surface. Like SI flakes, the SICP is associated with core reduction; however, in this instance, it is most likely that SICPs are removed from split cobble cores where flakes are taken off the core in a direction parallel to the direction that the cobble was initially split.

Complex Interior (CI) – is a PRB flake that has three or more scars on its dorsal surface, which is its defining characteristic regardless of platform scarring complexity. However, like the SI flake, the platform angle of the CI flake is greater than 65 degrees and thus is associated with the core reduction.

Early Bifacial Reduction Flake (EBT) – is a PRB flake that has a platform that is a remnant of a biface margin and has a platform angle less than 65°. EBTs have simple dorsal scarring (three or less dorsal scars), the arrises of which often emanate from the platform. On the whole, EBTs are larger than late biface thinning flakes, but this is not used as a criterion for classification. The platform-scarring complexity of EBTs may be simple or complex

Early Bifacial Reduction Flake with Cortical Platform (EBTCP) – is a PRB flake that has an acute angle (less than 65°) like an EBT; however, the striking platform is covered with cortex. Based on the acute platform, these flakes were likely detached during early biface shaping.

Late Bifacial Reduction Flake (LBT) – is a PRB flake that has a platform that is also a remnant of a biface margin with a platform angle less than 65 degrees. The difference between an EBT and LBT is that the LBT has complex dorsal scarring (more than three dorsal scars). LBTs tend to be smaller than EBTs and more acute platform angles, but these again are not the criterion used for classification. The platform-scarring complexity of LBTs usually is quite complex.

Pressure Flake (PR) – is a small flake (does not exceed the G3 size class) removed through the use of pressure exerted on the margin of a blank (can be a flake or a biface) with a punch as opposed to striking. In classic examples, the flake's platform exhibits the point at which the punch was placed, and it is usually longer than it is wide with more-or-less parallel margins. Occasionally the lower portion of the flake "dog-legs" to one side and the platform might retain a bifacial margin. The dorsal surface of a PR is usually complexly scarred but in this case, is not the defining characteristic. If large enough, the platforms of PRs usually have complex scarring, which again was not used as a defining characteristic. However, the striking platform angle of PR flakes is greater than 65°.

Pressure Flake with Acute Platform Angle (PRAP) – are the same as pressure flakes, except that the platforms of PRAP flakes are acute (under 65°). These flakes are likely produced during the completion or sharpening of bifaces and often, there are remnants of biface margins present on PRAP specimens.

Pressure Flake/Platform Preparation Flake (PR/PP) – is a small flake (does not exceed the 0.25-0.50" size class) for which the method of detachment cannot be determined. They could be produced through pressure flaking, light retouch of flake edges, or light percussion or scrubbing of a bifacial edge before its detachment. PR/PP flakes lack the distinctive point-of-detachment platform seen on PRs, do not exhibit dorsal-scarring complexity, are irregularly sided (as opposed to parallel-sided), and could be wider than long, and thus cannot be positively identified as a pressure flake.

Two of the remaining types are for more fragmentary pieces of debitage where the platform of the flake either was missing or so severely damaged it could not be assessed. They are as follows:

Broken flake (BF) – is a fragment of a piece of debitage that can be oriented as to its direction of detachment but no longer has a striking platform.

Shatter (SH) – is a piece of debitage that cannot be oriented as to the direction of its detachment or which side of the piece is dorsal versus ventral. Shatter can occur at any point in a reduction sequence, but such pieces are most often associated with the earlier stages of reduction.

In addition to flake type, the presence of cortex either on the dorsal side of the flake or on the platform in any amount was recorded.

Interpreting Flake Types and Stage Analysis

The goals of breaking down the debitage into flake types are to assess the reduction stages represented by the assemblages and what reduction technology was used to create the debitage. Several different lines of evidence are built into the typology in order to address these questions:

1. Flake types can be attributed to the different stages of reduction. Although the stages of reduction are usually intended to describe bifacial technology, core technology follows a similar conceptual trajectory of reduction and thus flake types from the different technologies can be placed in the same reduction stages. In this study Stage 1 flakes include the PD, SD, EP, and BP types; Stage 2 flakes include the EBT and SI types; Stage 3 flakes include LBT and CI types. Following the biface trajectory, pressure flakes are found in either Stage 4 or 5 and cannot be divided into either stage. Therefore these flakes fall into a Stage 4+ category. Similarly, PR and PRAP flakes produced during the manufacture of flake tools cannot be sorted to either a Stage 4 or 5.

2. Certain flake types can be attributed to different reduction strategies. For core reduction, the sensitive flake types are SIs and CIs, which are denoted on their obtuse platform angles. For biface reduction, the EBT and LBT are reduction-sensitive flakes, which are defined on the basis of their acute platform angles. The division is not perfect but serves as a general gauge of the reduction method being used. In addition, PRAC flakes are more likely to be the product of bifacial reduction. The other flake types—PD, SD, PP/PR, PR, and BF—can be products of both reduction strategies.

3. The amount of cortex should be greater in early-stage assemblages compared to later stage assemblages. Similar to the proportion of different broken flake types, it is better for inter-assemblage comparisons than intra-assemblage analysis.

4. Following the work of Magne (Magne and Pokotylo 1981; Magne 1985), the number of platform scars and dorsal scars can be reflective (though not exacting) of when a flake was removed during a reduction sequence. In Magne's scheme, flakes with 0–1 platform scars were likely produced early in a manufacturing sequence, those with two scars come from the middle of the sequence, and pieces with three or more platform scars were removed late in a manufacturing sequence. Dorsal scars on BF follow a similar logic.

References

Ahler, Stanley

1989 Mass Analysis of Flaking Debris: Studying the Forest Rather than the Tree. *Archeological Papers of the American Anthropological Association.* Special Issue: Alternative Approaches to Lithic Analysis 1(1):85–118.

Andrefsky, William, Jr.

2007 The Application and Misapplication of Mass Analysis in Lithic Debitage Studies. *Journal of Archaeological Science* 34: 392–402

2001 Emerging Directions in Debitage Analysis. In *Lithic Debitage: Context, Form, Meaning*, edited by William Andrefsky. Pp. 2–14. University of Utah Press, Salt Lake City.

Bloomer, Walter W., S. A. Waechter, and Susan Lindström

1997 Basalt Quarrying on Watson Creek: An Archaeological and Ethnographic Study of in Northern Lake Tahoe Basin, Vol.1. Report prepared for U.S. Forest Service, Lake Tahoe Basin Management Unit, South Lake Tahoe, California.

Flenniken, Jeffrey

1981 *Replicative Systems Analysis: A Model Applied to the Vein Quartz Artifacts from the Hoko River Site*. Washington State University, Laboratory of Anthropology, Reports of Investigations No. 59, Pullman, Washington.

Hall, Christopher T., and Mary Lou Larson

2003 *Aggregate Analysis in Chipped Stone*. University of Utah Press, Salt Lake City.

Johnson, Lucy L.

1978 A History of Flint-Knapping Experimentation. *Current Anthropology* 19:337–372.

Kooyman, Brian K.

2000 *Understanding Stone Tools and Archaeological Sites*. University of New Mexico Press, Albuquerque.

Magne, Martin P.

2001 Debitage Analysis as a Scientific Tool for Archaeological Knowledge. In *Lithic Debitage: Context, Form, Meaning*, edited by William Andrefsky, University of Utah Press, Salt Lake City, pp. 21–31.

1985 *Lithics and Livelihood: Stone Tool Technologies of Central and Southern Interior British Columbia.* Mercury Series Archaeological Survey of Canada Paper No. 133. National Museums of Canada.

Magne, Martin P., and David Pokotylo

1981 A Pilot Study in Bifacial Lithic Reduction Sequences. *Lithic Technology* 10:34–47.

Shott, Michael

1994 Size and Form in the Analysis of Flake Debris: Review and Recent Approaches. *Journal of Archaeological Method and Theory* 1:69–110.

Appendix B: Beta Lab Documentation for Date Beta-542560

Beta Analytic Inc
4985 SW 74 Court
Miami, Florida 33155
Tel: 305-667-5167
Fax: 305-663-0964
info@betalabservices.com

ISO/IEC 17025:2005-Accredited Testing Laboratory

November 18, 2019

Dr. John Darwent
University of California Davis
One Shields Ave
Davis, CA 95616
United States

RE: Radiocarbon Dating Results

Dear Dr. Darwent,

Enclosed is the radiocarbon dating result for one sample recently sent to us. As usual, specifics of the analysis are listed on the report with the result and calibration data is provided where applicable. The Conventional Radiocarbon Age has been corrected for total fractionation effects and where applicable, calibration was performed using 2013 calibration databases (cited on the graph pages).

The web directory containing the table of results and PDF download also contains pictures, a cvs spreadsheet download option and a quality assurance report containing expected vs. measured values for 3-5 working standards analyzed simultaneously with your samples.

The reported result is accredited to ISO/IEC 17025:2005 Testing Accreditation PJLA #59423 standards and all pretreatments and chemistry were performed here in our laboratories and counted in our own accelerators here in Miami. Since Beta is not a teaching laboratory, only graduates trained to strict protocols of the ISO/IEC 17025:2005 Testing Accreditation PJLA #59423 program participated in the analysis.

As always Conventional Radiocarbon Ages and sigmas are rounded to the nearest 10 years per the conventions of the 1977 International Radiocarbon Conference. When counting statistics produce sigmas lower than +/- 30 years, a conservative +/- 30 BP is cited for the result. The reported d13C was measured separately in an IRMS (isotope ratio mass spectrometer). It is NOT the AMS d13C which would include fractionation effects from natural, chemistry and AMS induced sources.

When interpreting the result, please consider any communications you may have had with us regarding the sample. As always, your inquiries are most welcome. If you have any questions or would like further details of the analysis, please do not hesitate to contact us.

The cost of analysis was previously invoiced. As always, if you have any questions or would like to discuss the results, don't hesitate to contact us.

Sincerely,

Digital signature on file

Ronald E. Hatfield Director

Beta Analytic Inc
4985 SW 74 Court
Miami, Florida 33155
Tel: 305-667-5167
Fax: 305-663-0964
info@betalabservices.com

ISO/IEC 17025:2005-Accredited Testing Laboratory

REPORT OF RADIOCARBON DATING ANALYSES

John Darwent — Report Date: November 18, 2019

University of California Davis — Material Received: November 04, 2019

Laboratory Number	Sample Code Number	Conventional Radiocarbon Age (BP) or Percent Modern Carbon (pMC) & Stable Isotopes Calendar Calibrated Results: 95.4 % Probability High Probability Density Range Method (HPD)	
Beta - 542560	**MRQ062-1**	**960 +/- 30 BP**	IRMS δ13C: -16.8 o/oo IRMS δ15N: +10.5 o/oo

(95.4%) **1020 - 1155 cal AD** **(930 - 795 cal BP)**

Submitter Material: Bone (Non-heated)
Pretreatment: (bone collagen) collagen extraction; with alkali
Analyzed Material: Bone collagen
Analysis Service: AMS-Standard delivery
Percent Modern Carbon: 88.74 +/- 0.33 pMC
Fraction Modern Carbon: 0.8874 +/- 0.0033
D14C: -112.64 +/- 3.31 o/oo
Δ14C: -120.02 +/- 3.31 o/oo (1950:2019)
Measured Radiocarbon Age: (without d13C correction): 830 +/- 30 BP
Calibration: BetaCal3.21: HPD method: INTCAL13
Carbon/Nitrogen: CN : 3.3 %C: 41.15 %N: 14.60

Results are ISO/IEC-17025:2005 accredited. No sub-contracting or student labor was used in the analyses. All work was done at Beta in 4 in-house NEC accelerator mass spectrometers and 4 Thermo IRMSs. The "Conventional Radiocarbon Age" was calculated using the Libby half-life (5568 years), is corrected for total isotopic fraction and was used for calendar calibration where applicable. The Age is rounded to the nearest 10 years and is reported as radiocarbon years before present (BP), "present" = AD 1950. Results greater than the modern reference are reported as percent modern carbon (pMC). The modern reference standard was 95% the 14C signature of NIST SRM-4990C (oxalic acid). Quoted errors are 1 sigma counting statistics. Calculated sigmas less than 30 BP on the Conventional Radiocarbon Age are conservatively rounded up to 30. d13C values are on the material itself (not the AMS d13C). d13C and d15N values are relative to VPDB-1. References for calendar calibrations are cited at the bottom of calibration graph pages.

BetaCal 3.21

Calibration of Radiocarbon Age to Calendar Years

(High Probability Density Range Method (HPD): INTCAL13)

(Variables: d13C = -16.8 o/oo)

Laboratory number **Beta-542560**

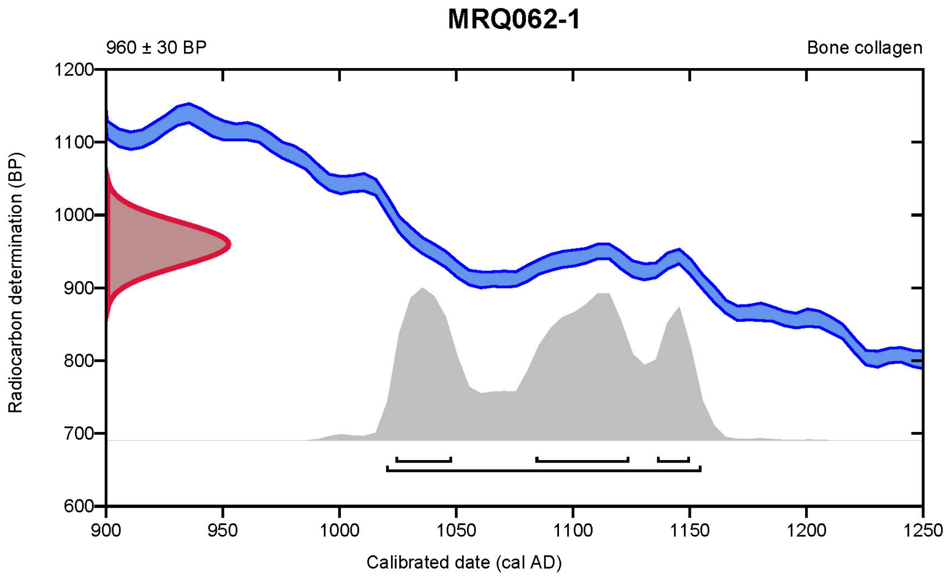
Conventional radiocarbon age **960 ± 30 BP**

95.4% probability

(95.4%)	1020 - 1155 cal AD	(930 - 795 cal BP)

68.2% probability

(34.7%)	1084 - 1124 cal AD	(866 - 826 cal BP)
(22.7%)	1024 - 1048 cal AD	(926 - 902 cal BP)
(10.9%)	1136 - 1150 cal AD	(814 - 800 cal BP)



Database used
INTCAL13

References

References to Probability Method
Bronk Ramsey, C. (2009). Bayesian analysis of radiocarbon dates. Radiocarbon, 51(1), 337-360.
References to Database INTCAL13
Reimer, et.al., 2013, Radiocarbon55(4).

Appendix C: Beta Lab Documentation for Date Beta-542561

Beta Analytic Inc
4985 SW 74 Court
Miami, Florida 33155
Tel: 305-667-5167
Fax: 305-663-0964
info@betalabservices.com

ISO/IEC 17025:2005-Accredited Testing Laboratory

November 18, 2019

Dr. John Darwent
University of California Davis
One Shields Ave
Davis, CA 95616
United States

RE: Radiocarbon Dating Results

Dear Dr. Darwent,

Enclosed is the radiocarbon dating result for one sample recently sent to us. As usual, specifics of the analysis are listed on the report with the result and calibration data is provided where applicable. The Conventional Radiocarbon Age has been corrected for total fractionation effects and where applicable, calibration was performed using 2013 calibration databases (cited on the graph pages).

The web directory containing the table of results and PDF download also contains pictures, a cvs spreadsheet download option and a quality assurance report containing expected vs. measured values for 3-5 working standards analyzed simultaneously with your samples.

The reported result is accredited to ISO/IEC 17025:2005 Testing Accreditation PJLA #59423 standards and all pretreatments and chemistry were performed here in our laboratories and counted in our own accelerators here in Miami. Since Beta is not a teaching laboratory, only graduates trained to strict protocols of the ISO/IEC 17025:2005 Testing Accreditation PJLA #59423 program participated in the analysis.

As always Conventional Radiocarbon Ages and sigmas are rounded to the nearest 10 years per the conventions of the 1977 International Radiocarbon Conference. When counting statistics produce sigmas lower than +/- 30 years, a conservative +/- 30 BP is cited for the result. The reported d13C was measured separately in an IRMS (isotope ratio mass spectrometer). It is NOT the AMS d13C which would include fractionation effects from natural, chemistry and AMS induced sources.

When interpreting the result, please consider any communications you may have had with us regarding the sample. As always, your inquiries are most welcome. If you have any questions or would like further details of the analysis, please do not hesitate to contact us.

The cost of analysis was previously invoiced. As always, if you have any questions or would like to discuss the results, don't hesitate to contact us.

Sincerely,

Digital signature on file

Ronald E. Hatfield Director

Beta Analytic Inc
4985 SW 74 Court
Miami, Florida 33155
Tel: 305-667-5167
Fax: 305-663-0964
info@betalabservices.com

ISO/IEC 17025:2005-Accredited Testing Laboratory

REPORT OF RADIOCARBON DATING ANALYSES

John Darwent — Report Date: November 18, 2019

University of California Davis — Material Received: November 04, 2019

Laboratory Number	Sample Code Number	Conventional Radiocarbon Age (BP) or Percent Modern Carbon (pMC) & Stable Isotopes Calendar Calibrated Results: 95.4 % Probability High Probability Density Range Method (HPD)	
Beta - 542561	**MRQ055-1**	**1000 +/- 30 BP**	IRMS δ13C: -16.6 o/oo IRMS δ15N: +17.1 o/oo

(70.7%)	**983 - 1051 cal AD**	**(967 - 899 cal BP)**
(19.4%)	**1082 - 1128 cal AD**	**(868 - 822 cal BP)**
(5.3%)	**1135 - 1152 cal AD**	**(815 - 798 cal BP)**

Submitter Material: Bone (Non-heated)
Pretreatment: (bone collagen) collagen extraction; with alkali
Analyzed Material: Bone collagen
Analysis Service: AMS-Standard delivery
Percent Modern Carbon: 88.29 +/- 0.33 pMC
Fraction Modern Carbon: 0.8829 +/- 0.0033
D14C: -117.05 +/- 3.30 o/oo
Δ14C: -124.39 +/- 3.30 o/oo (1950:2019)
Measured Radiocarbon Age: (without d13C correction): 860 +/- 30 BP
Calibration: BetaCal3.21: HPD method: INTCAL13
Carbon/Nitrogen: CN : 3.3 %C: 41.39 %N: 14.65

Results are ISO/IEC-17025:2005 accredited. No sub-contracting or student labor was used in the analyses. All work was done at Beta in 4 in-house NEC accelerator mass spectrometers and 4 Thermo IRMSs. The "Conventional Radiocarbon Age" was calculated using the Libby half-life (5568 years), is corrected for total isotopic fraction and was used for calendar calibration where applicable. The Age is rounded to the nearest 10 years and is reported as radiocarbon years before present (BP), "present" = AD 1950. Results greater than the modern reference are reported as percent modern carbon (pMC). The modern reference standard was 95% the 14C signature of NIST SRM-4990C (oxalic acid). Quoted errors are 1 sigma counting statistics. Calculated sigmas less than 30 BP on the Conventional Radiocarbon Age are conservatively rounded up to 30. d13C values are on the material itself (not the AMS d13C). d13C and d15N values are relative to VPDB-1. References for calendar calibrations are cited at the bottom of calibration graph pages.

BetaCal 3.21

Calibration of Radiocarbon Age to Calendar Years

(High Probability Density Range Method (HPD): INTCAL13)

(Variables: d13C = -16.6 o/oo)

Laboratory number **Beta-542561**

Conventional radiocarbon age **1000 ± 30 BP**

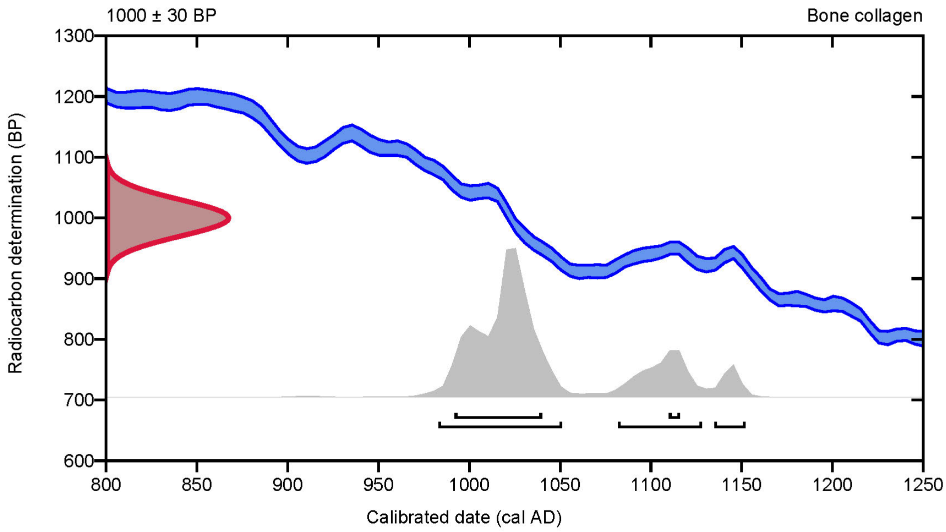
95.4% probability

(70.7%)	983 - 1051 cal AD	(967 - 899 cal BP)
(19.4%)	1082 - 1128 cal AD	(868 - 822 cal BP)
(5.3%)	1135 - 1152 cal AD	(815 - 798 cal BP)

68.2% probability

(63.9%)	992 - 1040 cal AD	(958 - 910 cal BP)
(4.3%)	1110 - 1116 cal AD	(840 - 834 cal BP)

MRQ055-1



Database used

INTCAL13

References

References to Probability Method

Bronk Ramsey, C. (2009). Bayesian analysis of radiocarbon dates. Radiocarbon, 51(1), 337-360.

References to Database INTCAL13

Reimer, et.al., 2013, Radiocarbon55(4).

Appendix D. Artifact Catalog

Catalog

OBJECT	MATERIAL	SITE	FEATURE	CATNO	N	E	QUAD	LEVEL	NORTH	EAST	CLASS	NUMBER	WEIGHT	EXCAVATOR	DISC DATE	NOTES
HUMAN TRANSPORTED STONE	SILICIFED SILTSTONE	MRQ055		1	2	1	SW	1			LITHIC	1	0	JENS KANUTHSEN	8/26/2019	
DEBITAGE	CHERT	MRQ055		2	2	2	NE	1			LITHIC	1	2.7	JENS KANUTHSEN	8/26/2019	
DEBITAGE	SILICIFED SILTSTONE	MRQ055		3	2	2	NE	1			LITHIC	1	3	JENS KANUTHSEN	8/26/2019	
ASSYMETRICAL BIFACE	CHERT, BLACK	MRQ062	A	1	3	10	NE	1			LITHIC	1	34.5	HANS LANGE	8/19/2019	
SCRAPER	QUARTZITE, GRAY	MRQ062	A	2	3	12	SE	1			LITHIC	1	64.3	JOHN DARWENT	8/18/2019	
DEBITAGE	SILICIFIED SILTSTONE, GRAY	MRQ062	A	3	3	12	SE	1			LITHIC	1	3.3	JOHN DARWENT	8/18/2019	
DEBITAGE	QUARTZITE, WHITE	MRQ062	A	4	3	12	SE	1			LITHIC	1	0.6	JOHN DARWENT	8/18/2019	
TESTED COBBLE	CHERT, BEIGE	MRQ062	A	5	3	10	NW	1			LITHIC	1	130	JOHN DARWENT	8/18/2019	TWO FLAKES REMOVED
DEBITAGE	SILICIFIED SILTSTONE	MRQ062	A	6	2	12					LITHIC	1	0	JENS KANUTHSEN		
DEBITAGE	CHERT, BLACK	MRQ062	A	7	2	11	NW	1			LITHIC	1	0	JENS KANUTHSEN		
DEBITAGE	QUARTZITE, GRAY	MRQ062	A	8	2	10	NE	1			LITHIC	1	0	JENS KANUTHSEN		
DEBITAGE	SILICIFIED SILTSTONE	MRQ062	A	9	4	11	SW	1			LITHIC	296	56.8	JENS KANUTHSEN	8/17/2019	
FLAKE KNIFE	QUARTZITE, GREY	MRQ062	A	10	2	12	SW	1	37	47	LITHIC	1	76.8	JOHN DARWENT		
USED FLAKE	SILICIFIED SILTSTONE	MRQ062	A	11	4	11	SW	1			LITHIC	1	1.8	JENS KANUTHSEN	8/17/2019	
USED FLAKE	SILICIFIED SILTSTONE	MRQ062	A	12	4	11	SW	1			LITHIC	1	0.9	JENS KANUTHSEN	8/17/2019	
USED FLAKE	SILICIFIED SILTSTONE	MRQ062	A	13	4	11	SW	1			LITHIC	1	1.1	JENS KANUTHSEN	8/17/2019	
USED FLAKE	SILICIFIED SILTSTONE	MRQ062	A	14	4	11	SW	1			LITHIC	1	0.3	JENS KANUTHSEN	8/17/2019	
USED FLAKE	SILICIFIED SILTSTONE	MRQ062	A	15	4	11	SW	1			LITHIC	1	0.9	JENS KANUTHSEN	8/17/2019	
USED FLAKE	SILICIFIED SILTSTONE	MRQ062	A	16	4	11	SW	1			LITHIC	1	0.8	JENS KANUTHSEN	8/17/2019	
USED FLAKE	SILICIFIED SILTSTONE	MRQ062	A	17	4	11	SW	1			LITHIC	1	0.4	JENS KANUTHSEN	8/17/2019	
USED FLAKE	SILICIFIED SILTSTONE	MRQ062	A	18	4	11	SW	1			LITHIC	1	0.4	JENS KANUTHSEN	8/17/2019	
USED FLAKE	SILICIFIED SILTSTONE	MRQ062	A	19	4	11	SW	1			LITHIC	1	0.3	JENS KANUTHSEN	8/17/2019	
USED FLAKE	SILICIFIED SILTSTONE	MRQ062	A	20	4	11	SW	1			LITHIC	1	0.2	JENS KANUTHSEN	8/17/2019	
RETOUCHED FLAKE	SILICIFED SILTSTONE	MRQ062	A	26	4	12		1			LITHIC	1	9.8	HANS LANGE	8/17/2019	
DEBITAGE	SILICIFIED SLATE	MRQ062	A	31	3	10	SE	1	70	80	LITHIC	1	0	HANS LANGE	8/19/2019	
DEBITAGE	SILICIFED SILTSTONE	MRQ062	A	32	4	11	SE	1			LITHIC	2	1.1	JENS KANUTHSEN	8/18/2019	
USED FLAKE	SILICIFED SILTSTONE	MRQ062	A	33	4	11	SE	1			LITHIC	1	0.4	JENS KANUTHSEN	8/18/2019	
DEBITAGE	QUARTZITE	MRQ062	B	21	1	0	SW	1			LITHIC	1	3.5	JENS KANUTHSEN	8/26/2019	
DEBITAGE	QUARTZITE	MRQ062	B	22	1	0	NE	1			LITHIC	2	1.4	JENS KANUTHSEN	8/26/2019	

Catalog

OBJECT	MATERIAL	SITE	FEATURE	CATNO	N	E	QUAD	LEVEL	NORTH	EAST	CLASS	NUMBER	WEIGHT	EXCAVATOR	DISC DATE	NOTES
DEBITAGE	QUARTZITE	MRQ062	B	23	1	0	SE	1			LITHIC	2	2.3	JENS KANUTHSEN	8/26/2019	
DEBITAGE	QUARTZITE	MRQ062	B	24	1	1	SW	1			LITHIC	1	9	JENS KANUTHSEN	8/26/2019	
BIFACE	SILICIFIED SILTSTONE	MRQ062	B	25	1	1	SW	1	3	31	LITHIC	1	26.4	JENS KANUTHSEN	8/26/2019	
DEBITAGE	QUARTZITE	MRQ062	B	27	1	-1	NW	1			LITHIC	4	1.7	JENS KANUTHSEN	8/26/2019	
DEBITAGE	SILICIFED SILTSTONE	MRQ062	B	28	1	-1	SE	1			LITHIC	1	0.6	JENS KANUTHSEN	8/26/2019	
DEBITAGE	SILICIFED SILTSTONE	MRQ062	B	29	1	3	SE	1			LITHIC	14	177.1	JENS KANUTHSEN	8/27/2019	
DEBITAGE	SILICIFED SILTSTONE	MRQ062	B	30	1	3	NE	1			LITHIC	1	1.2	JENS KANUTHSEN	8/26/2019	

Appendix E. Flake Tool Data

Flake Tools																			
KNM Number	Sub Number	MATERIAL	COLOR	Tool type	Blank	Portion	Length	Width	Thickness	Working type	Number of working faces	Edge 1	Shape 1	Use 1	Edge 2	Shape 2	Use 2	Percentage modified	Comments
MRQ062	2	QUARTZITE	DG	SC	SD	MED	70.8	-59.4	13.7	F/UR	1	UF/UR	CV/IR	P; MF; F					
MRQ062	11	SSI	DG	UF	LBT	WHL	31.5	19.1	3.9	UF	2	UUN	CC/N	MF; F	UUN	CV;IR	P	1-25%	
MRQ062	12	SSI	DG	UF	LBT	WHL	17.1	19.7	3.6	UF	1	UUN	CC/IR	P; MF				1-25%	
MRQ062	13	SSI	DG	UF	LBT	WHL	18.6	17.8	4.3	UF	1	UUN	CV/IR	P; F; MF				1-25%	
MRQ062	14	SSI	DG	UF	EBT	MRG	10.9	-10.9	2.4	UF	1	UUN	ST	F; P; MF				1-25%	
MRQ062	15	SSI	DG	UF	LBT	WHL	24.1	14.5	3	UF	1	UUN	IR/SN	P; F				1-25%	
MRQ062	16	SSI	DG	UF	SD	WHL	11.3	16.8	4.7	UF	1	UUN	CV	P; MF; P				1-25%	
MRQ062	17	SSI	DG	UF	CI	WHL	13.9	12.3	2	UF	1	UUN	CV	F; P				1-25%	
MRQ062	18	SSI	DG	UF	LBT	WHL	8	15.2	4.1	UF	1	UUN	CV	P				1-25%	
MRQ062	19	SSI	DG	UF	BF	WHL	9.4	15.1	2.5	UF	1	UUN	CV	P; F; MF				1-25%	
MRQ062	20	SSI	DG	UF	CI	WHL	12.1	11.1	2.2	UF	1	UUN	IR	P; MF; F				1-25%	
MRQ062	10	QUARTZITE	DG	FK	CI	WHL	96.6	55.5	18.1	F/UR	2	UF/UR	CV	P; F; MF	UF/UR	CV	P; F; MF	50-75%	
MRQ062	26	SSI	G	RF	PEBBLE	IND	-42.1	-24.1	-11.2	UR	1	UR	CV	F				(1-25%)	
MRQ062	33	SSI	DG	UF	IN	FRG	-13.2	-10	-3.8	UF	1	UUN	IR	MF; F				(25-50%)	COULD BE A FRAGMENT OF A LARGER WORKING EDGE BUT IS TOO FRAGMENTARY TO DETERMINE

Appendix F. Debitage Data

DEBITAGE										
KNM Number	Sub number	Material	Color	Flake type	Completeness	Cortical Cover	Dorsal Scars	Platform scars	Platform Angle	Size Class
MRQ062	3	SSI	DG	SD	WHL	75-99	1	CRUSHED	IN	G2
MRQ062	9	SSI	DG	LBT	PRX	0	4	2	<65	G3
MRQ062	9	SSI	DG	SI	WHL	0	2	CRUSHED	>65	G2
MRQ062	9	SSI	DG	BF	DST	50-75	2			G3
MRQ062	9	SSI	DG	LBT	WHL	0	4	1	<65	G2
MRQ062	9	SSI	DG	LBT	PRX	0	3	3	<65	G2
MRQ062	9	SSI	DG	LBT	WHL	0	4	3	<65	G3
MRQ062	9	SSI	DG	LBT	WHL	0	4	4	<65	G3
MRQ062	9	SSI	DG	LBT	PRX	0	4	2	<65	G3
MRQ062	9	SSI	DG	SDAC	PRX	75-99	1	4	<65	G3
MRQ062	9	SSI	DG	LBT	PRX	0	4+	1	<65	G3
MRQ062	9	SSI	DG	LBT	PRX	0	4	4	<65	G2
MRQ062	9	SSI	DG	SI	WHL	0	2	1	>65	G3
MRQ062	9	SSI	DG	CI	PRX	0	4	2	>65	G3
MRQ062	9	SSI	DG	LBT	PRX	0	3	3	<65	G3
MRQ062	9	SSI	DG	CI	PRX	0	4+	CRUSHED	IN	G3
MRQ062	9	SSI	DG	BF	MID	0	4			G2
MRQ062	9	SSI	DG	SDAC	WHL	50-75	2	1	>65	G3
MRQ062	9	SSI	DG	LBT	WHL	0	3	3	<65	G3
MRQ062	9	SSI	DG	LBT	WHL	0	4	1	<65	G3
MRQ062	9	SSI	DG	SI	PRX	0	2	1	>65	G3
MRQ062	9	SSI	DG	LBT	PRX	0	4+	CRUSHED	<65	G3
MRQ062	9	SSI	DG	BF	DST	0	4			G3
MRQ062	9	SSI	DG	BF	MID	0	3			G3
MRQ062	9	SSI	DG	LBT	PRX	0	4	CRUSHED	<65	G3
MRQ062	9	SSI	DG	CI	PRX	0	3	4	>65	G3
MRQ062	9	SSI	DG	LBT	WHL	0	4	2	<65	G3
MRQ062	9	SSI	DG	LBT	WHL	0	3	2	<65	G3
MRQ062	9	SSI	DG	LBT	WHL	0	4	2	<65	G3
MRQ062	9	SSI	DG	BF	DST	0	2			G3
MRQ062	9	SSI	DG	LBT	PRX	0	4	3	<65	G3
MRQ062	9	SSI	DG	SI	SF	0	2	1	>65	G3
MRQ062	9	SSI	DG	EBT	PRX	0	2	1	<65	G3
MRQ062	9	SSI	DG	EBT	WHL	0	2	1	<65	G3
MRQ062	9	SSI	DG	SD	WHL	50-75%	2	1	>65	G3
MRQ062	9	SSI	DG	BF	MID	0	3			G3
MRQ062	9	SSI	DG	CI	WHL	0	4+	2	>65	G3
MRQ062	9	SSI	DG	LBT	SF	0	4	3	<65	G3
MRQ062	9	SSI	DG	BF	MID	0	2			G3
MRQ062	9	SSI	DG	BF	MID	0	3			G3
MRQ062	9	SSI	DG	SI	PRX	0	2	1	>65	G3
MRQ062	9	SSI	DG	PF	WHL	100%	0	3	>65	G3
MRQ062	9	SSI	DG	BF	MID	0	2			G3
MRQ062	9	SSI	DG	LBT	PRX	0	4	1	<65	G3
MRQ062	9	SSI	DG	CI	WHL	0	3	3	>65	G3
MRQ062	9	SSI	DG	SDAC	WHL	50-75	1	2	<65	G3
MRQ062	9	SSI	DG	LBT	WHL	0	4	1	<65	G3
MRQ062	9	SSI	DG	LBT	WHL	0	3	2	<65	G3
MRQ062	9	SSI	DG	CI	WHL	0	4	1	>65	G3
MRQ062	9	SSI	DG	BF	DST	0	1			G3

KNM Number	Sub number	Material	Color	Flake type	Completeness	Cortical Cover	Dorsal Scars	Platform scars	Platform Angle	Size Class
MRQ062	9	SSI	DG	CI	WHL	0	3	1	>65	G3
MRQ062	9	SSI	DG	BF	DST	0	3			G3
MRQ062	9	SSI	DG	CI	WHL	0	3	2	>65	G3
MRQ062	9	SSI	DG	LBT	WHL	0	3	3	<65	G3
MRQ062	9	SSI	DG	EBT	WHL	0	2	3	<65	G3
MRQ062	9	SSI	DG	CI	WHL	0	4	2	>65	G3
MRQ062	9	SSI	DG	CI	WHL	0	4	2	>65	G3
MRQ062	9	SSI	DG	BF	FRG	0	2			G3
MRQ062	9	SSI	DG	CI	PRX	0	3	1	>65	G3
MRQ062	9	SSI	DG	BF	MRG	0	2			G4
MRQ062	9	SSI	DG	BF	DST	1-25%	2			G3
MRQ062	9	SSI	DG	BF	MED	0	2			G3
MRQ062	9	SSI	DG	BF	MED	0	2			G3
MRQ062	9	SSI	DG	LBT	WHL	0	3	2	<65	G3
MRQ062	9	SSI	DG	BF	DST	0	2			G3
MRQ062	9	SSI	DG	BF	MRG	0	2			G3
MRQ062	9	SSI	DG	CI	PRX	0	3	1	>65	G3
MRQ062	9	SSI	DG	BF	DST	0	3			G3
MRQ062	9	SSI	DG	BF	MRG	0	3			G3
MRQ062	9	SSI	DG	EBT	WHL	0	3	2	<65	G3
MRQ062	9	SSI	DG	SD	PRX	75-99%	3	2	>65	G3
MRQ062	9	SSI	DG	CI	WHL	0	3	2	>65	G3
MRQ062	9	SSI	DG	BF	MED	0	3			G3
MRQ062	9	SSI	DG	LBT	PRX	0	3	2	<65	G3
MRQ062	9	SSI	DG	CI	PRX	0	3	2	>65	G3
MRQ062	9	SSI	DG	BF	MED	0	3			G3
MRQ062	9	SSI	DG	EBT	PRX	0	2	3	<65	G3
MRQ062	9	SSI	DG	CI	WHL	0	3	3	>65	G3
MRQ062	9	SSI	DG	BF	MED	0	1			G3
MRQ062	9	SSI	DG	SDAC	WHL	50-75%	3	2	<65	G3
MRQ062	9	SSI	DG	LBT	WHL	0	4+	1	<65	G3
MRQ062	9	SSI	DG	LBT	WHL	0	3	3	<65	G3
MRQ062	9	SSI	DG	BF	FRG	0	1			G3
MRQ062	9	SSI	DG	BF	MED	0	2			G3
MRQ062	9	SSI	DG	CI	WHL	0	3	3	>65	G3
MRQ062	9	SSI	DG	CI	WHL	0	4	3	<65	G3
MRQ062	9	SSI	DG	BF	MED	0	2			G4
MRQ062	9	SSI	DG	LBT	WHL	0	4	1	<65	G4
MRQ062	9	SSI	DG	BF	MED	0	3			G4
MRQ062	9	SSI	DG	BF	MRG	50-75%	1			G4
MRQ062	9	SSI	DG	LBT	WHL	0	3	3	<65	G4
MRQ062	9	SSI	DG	BF	MRG	0	2			G4
MRQ062	9	SSI	DG	BF	DST	0	3			G4
MRQ062	9	SSI	DG	LBT	PRX	0	4	1	<65	G4
MRQ062	9	SSI	DG	LBT	WHL	0	4	3	<65	G4
MRQ062	9	SSI	DG	PP/PR	PRX	0	3	1	>65	G4
MRQ062	9	SSI	DG	BF	MED	0	3			G4
MRQ062	9	SSI	DG	LBT	PRX	0	3	2	<65	G4
MRQ062	9	SSI	DG	PP/PR	PRX	0	3	1	>65	G4
MRQ062	9	SSI	DG	BF	MED	0	2			G4

DEBITAGE										
KNM Number	**Sub number**	**Material**	**Color**	**Flake type**	**Completeness**	**Cortical Cover**	**Dorsal Scars**	**Platform scars**	**Platform Angle**	**Size Class**
MRQ062	9	SSI	DG	BF	MRG	0	1			G4
MRQ062	9	SSI	DG	LBT	PRX	0	3	3	<65	G4
MRQ062	9	SSI	DG	EBT	PRX	0	2	1	<65	G4
MRQ062	9	SSI	DG	LBT	PRX	0	3	2	<65	G4
MRQ062	9	SSI	DG	CI	PRX	0	3	2	>65	G4
MRQ062	9	SSI	DG	CI	WHL	0	3	1	>65	G4
MRQ062	9	SSI	DG	LBT	PRX	0	3	3	<65	G4
MRQ062	9	SSI	DG	EBT	WHL	0	2	2	<65	G4
MRQ062	9	SSI	DG	CI	WHL	0	3	1	>65	G4
MRQ062	9	SSI	DG	BF	DST	50-75	1			G4
MRQ062	9	SSI	DG	PR	PRX	0	3	1	>65	G4
MRQ062	9	SSI	DG	LBT	PRX	0	4	4	<65	G4
MRQ062	9	SSI	DG	BF	MED	0	1			G4
MRQ062	9	SSI	DG	PR	WHL	0	3	1	>65	G4
MRQ062	9	SSI	DG	LBT	PRX	0	3	4	<65	G4
MRQ062	9	SSI	DG	BF	DST	0	2			G4
MRQ062	9	SSI	DG	PR	WHL	0	3	1	>65	G4
MRQ062	9	SSI	DG	PP/PRAC	WHL	0	2	2	>65	G4
MRQ062	9	SSI	DG	BF	DST	0	2			G4
MRQ062	9	SSI	DG	BF	MRG	0	1			G4
MRQ062	9	SSI	DG	BF	DST	0	3			G4
MRQ062	9	SSI	DG	CI	WHL	0	3	3	>65	G4
MRQ062	9	SSI	DG	PRAC	WHL	0	4+	1	<65	G4
MRQ062	9	SSI	DG	BF	MRG	0	2			G4
MRQ062	9	SSI	DG	BF	MRG	0	1			G4
MRQ062	9	SSI	DG	PRAC	WHL	0	2	1	<65	G4
MRQ062	9	SSI	DG	PPPR	WHL	0	4	1	>65	G4
MRQ062	9	SSI	DG	PPAC	WHL	0	4	2	<65	G4
MRQ062	9	SSI	DG	BF	MRG	0	2			G4
MRQ062	9	SSI	DG	PPPR	WHL	0	4	2	>65	G4
MRQ062	9	SSI	DG	LBT	PRX	0	3	3	<65	G4
MRQ062	9	SSI	DG	LBT	PRX	0	3	2	<65	G4
MRQ062	9	SSI	DG	PRAC	WHL	0	3	2	<65	G4
MRQ062	9	SSI	DG	CI	WHL	0	4+	1	<65	G4
MRQ062	9	SSI	DG	BF	MED	0	3			G4
MRQ062	9	SSI	DG	LBT	WHL	0	3	2	<65	G4
MRQ062	9	SSI	DG	BF	DST	0	1			G3
MRQ062	9	SSI	DG	LBT	WHL	0	4	4	<65	G4
MRQ062	9	SSI	DG	LBT	PRX	0	3	CRUSHED	<65	G4
MRQ062	9	SSI	DG	BF	MED	0	2			G4
MRQ062	9	SSI	DG	BF	DST	0	1			G4
MRQ062	9	SSI	DG	BF	MRG	0	1			G4
MRQ062	9	SSI	DG	BF	MRG	0	1			G4
MRQ062	9	SSI	DG	PR	WHL	0	2	3	<65	G4
MRQ062	9	SSI	DG	LBT	WHL	0	4+	2	<65	G4
MRQ062	9	SSI	DG	LBT	WHL	0	3	2	<65	G4
MRQ062	9	SSI	DG	BF	DST	0	3			G4
MRQ062	9	SSI	DG	BF	MED	0	2			G4
MRQ062	9	SSI	DG	BF	MRG	0	2			G4
MRQ062	9	SSI	DG	BF	MED	0	1			G4

DEBITAGE										
KNM Number	Sub number	Material	Color	Flake type	Completeness	Cortical Cover	Dorsal Scars	Platform scars	Platform Angle	Size Class
MRQ062	9	SSI	DG	BF	DST	0	3			G4
MRQ062	9	SSI	DG	BF	MED	0	1			G4
MRQ062	9	SSI	DG	BF	MRG	0	1			G4
MRQ062	9	SSI	DG	PP/PRAC	WHL	0	4	1	<65	G4
MRQ062	9	SSI	DG	BF	MRG	0	1			G4
MRQ062	9	SSI	DG	CI	WHL	0	4	1	>65	G4
MRQ062	9	SSI	DG	PRAC	WHL	0	4	1	<65	G4
MRQ062	9	SSI	DG	PRAC	WHL	0	2	2	<65	G5
MRQ062	9	SSI	DG	PR	WHL	0	3	2	<65	G4
MRQ062	9	SSI	DG	LBT	WHL	0	3	2	<65	G4
MRQ062	9	SSI	DG	BF	DST	0	3			G4
MRQ062	9	SSI	DG	PR	WHL	0	3	2	>65	G4
MRQ062	9	SSI	DG	PR	PRX	0	2	1	>65	G4
MRQ062	9	SSI	DG	CI	WHL	0	3	3	>65	G4
MRQ062	9	SSI	DG	PRAC	WHL	0	4	1	<65	G4
MRQ062	9	SSI	DG	LBT	WHL	0	3	2	<65	G4
MRQ062	9	SSI	DG	BF	MRG	0	1			G4
MRQ062	9	SSI	DG	PP/PRAC	WHL	0	2	2	<65	G4
MRQ062	9	SSI	DG	PP/PR	WHL	0	1	CRUSHED	>65	G4
MRQ062	9	SSI	DG	BF	DST	0	2			G4
MRQ062	9	SSI	DG	PP/PR	WHL	0	3	2	>65	G4
MRQ062	9	SSI	DG	PP/PR	WHL	0	2	2	>65	G4
MRQ062	9	SSI	DG	BF	MED	0	2			G4
MRQ062	9	SSI	DG	BF	DST	0	1			G4
MRQ062	9	SSI	DG	PRAC	WHL	0	2	3	<65	G4
MRQ062	9	SSI	DG	BF	DST	0	3			G4
MRQ062	9	SSI	DG	BF	MRG	0	3			G4
MRQ062	9	SSI	DG	PRAC	WHL	0	3	1	<65	G4
MRQ062	9	SSI	DG	EBT	PRX	0	2	1	<65	G4
MRQ062	9	SSI	DG	BF	FRG	50-75%	1			G4
MRQ062	9	SSI	DG	BF	MED	0	2			G4
MRQ062	9	SSI	DG	BF	MRG	0	1			G4
MRQ062	9	SSI	DG	BF	DST	0	4			G4
MRQ062	9	SSI	DG	BF	DST	1-25%	2			G4
MRQ062	9	SSI	DG	BF	DST	0	3			G4
MRQ062	9	SSI	DG	PRAC	WHL	0	3	1	<65	G4
MRQ062	9	SSI	DG	PRAC	WHL	0	4	CRUSHED	<65	G4
MRQ062	9	SSI	DG	BF	MED	0	2			G4
MRQ062	9	SSI	DG	LBT	WHL	0	3	4	<65	G4
MRQ062	9	SSI	DG	BF	DST	0	4+			G4
MRQ062	9	SSI	DG	CI	PRX	0	2	4	>65	G4
MRQ062	9	SSI	DG	BF	DST	0	4+			G4
MRQ062	9	SSI	DG	PR	WHL	0	3	2	>65	G4
MRQ062	9	SSI	DG	PR	WHL	0	3	3	>65	G4
MRQ062	9	SSI	DG	LBT	PRX	0	3	3	<65	G4
MRQ062	9	SSI	DG	BF	MED	0	3			G4
MRQ062	9	SSI	DG	PRAC	WHL	0	1	3	<65	G4
MRQ062	9	SSI	DG	BF	DST	0	4+			G4
MRQ062	9	SSI	DG	PR	WHL	0	3	3	>65	G4
MRQ062	9	SSI	DG	PR	SF	0	3	SPLIT	>65	G4

DEBITAGE										
KNM Number	**Sub number**	**Material**	**Color**	**Flake type**	**Completeness**	**Cortical Cover**	**Dorsal Scars**	**Platform scars**	**Platform Angle**	**Size Class**
MRQ062	9	SSI	DG	BF	MED	0	1			G4
MRQ062	9	SSI	DG	LBT	PRX	0	3	3	<65	G4
MRQ062	9	SSI	DG	PRAC	WHL	0	3	2	<65	G4
MRQ062	9	SSI	DG	PRAC	WHL	0	3	2	<65	G4
MRQ062	9	SSI	DG	BF	MED	0	2			G4
MRQ062	9	SSI	DG	PRAC	WHL	0	3	3	<65	G4
MRQ062	9	SSI	DG	PP/PRAC	WHL	0	2	2	<65	G4
MRQ062	9	SSI	DG	BF	MED	0	2			G4
MRQ062	9	SSI	DG	BF	DST	0	4			G4
MRQ062	9	SSI	DG	BF	DST	0	3			G4
MRQ062	9	SSI	DG	BF	MRG	0	1			G4
MRQ062	9	SSI	DG	PRAC	WHL	0	3	2	<65	G5
MRQ062	9	SSI	DG	BF	DST	0	4			G4
MRQ062	9	SSI	DG	LBT	PRX	0	3	2	<65	G4
MRQ062	9	SSI	DG	PR	WHL	0	4	2	>65	G4
MRQ062	9	SSI	DG	PR	PRX	0	2	2	>65	G4
MRQ062	9	SSI	DG	PP/PR	WHL	0	2	2	>65	G4
MRQ062	9	SSI	DG	BF	DST	0	3			G4
MRQ062	9	SSI	DG	BF	MRG	0	2			G4
MRQ062	9	SSI	DG	BF	MRG	0	2			G4
MRQ062	9	SSI	DG	BF	DST	0	3			G4
MRQ062	9	SSI	DG	PRAC	WHL	0	4	2	<65	G4
MRQ062	9	SSI	DG	BF	MRG	0	2			G4
MRQ062	9	SSI	DG	BF	MRG	0	1			G4
MRQ062	9	SSI	DG	BF	MRG	0	1			G4
MRQ062	9	SSI	DG	BF	MED	0	3			G4
MRQ062	9	SSI	DG	BF	MRG	0	2			G4
MRQ062	9	SSI	DG	PR	WHL	0	3	3	>65	G4
MRQ062	9	SSI	DG	BF	MRG	0	1			G4
MRQ062	9	SSI	DG	PR	WHL	0	3	1	>65	G4
MRQ062	9	SSI	DG	EBT	SF	0	2	3	<65	G4
MRQ062	9	SSI	DG	BF	MED	0	2			G4
MRQ062	9	SSI	DG	BF	MRG	0	2			G4
MRQ062	9	SSI	DG	LBT	WHL	0	4	2	<65	G4
MRQ062	9	SSI	DG	BF	MRG	0	1			G4
MRQ062	9	SSI	DG	BF	MRG	0	2			G4
MRQ062	9	SSI	DG	PR	WHL	0	1	3	<65	G4
MRQ062	9	SSI	DG	BF	MRG	0	1			G4
MRQ062	9	SSI	DG	PRAC	PRX	0	3	2	<65	G4
MRQ062	9	SSI	DG	PRAC	WHL	0	3	2	<65	G4
MRQ062	9	SSI	DG	BF	DST	0	1			G4
MRQ062	9	SSI	DG	BF	MED	0	3			G4
MRQ062	9	SSI	DG	BF	MED	0	2			G4
MRQ062	9	SSI	DG	BF	FRG	0	1			G4
MRQ062	9	SSI	DG	BF	MED	0	2			G4
MRQ062	9	SSI	DG	EBT	WHL	0	1	3	<65	G4
MRQ062	9	SSI	DG	BF	MRG	0	1			G4
MRQ062	9	SSI	DG	LBT	PRX	0	1	3	<65	G4
MRQ062	9	SSI	DG	PR	WHL	0	3	4	<65	G4
MRQ062	9	SSI	DG	PP/PRAC	WHL	0	1	2	<65	G4

DEBITAGE										
KNM Number	**Sub number**	**Material**	**Color**	**Flake type**	**Completeness**	**Cortical Cover**	**Dorsal Scars**	**Platform scars**	**Platform Angle**	**Size Class**
MRQ062	9	SSI	DG	BF	DST	0	3			G4
MRQ062	9	SSI	DG	PRAC	WHL	0	3	CRUSHED	<65	G4
MRQ062	9	SSI	DG	PRAC	WHL	0	3	1	<65	G4
MRQ062	9	SSI	DG	PR	WHL	0	3	2	>65	G4
MRQ062	9	SSI	DG	BF	MRG	0	1			G4
MRQ062	9	SSI	DG	BF	MRG	0	1			G4
MRQ062	9	SSI	DG	PPPR	WHL	0	2	CRUSHED	>65	G4
MRQ062	9	SSI	DG	PR	WHL	0	3	1	>65	G4
MRQ062	9	SSI	DG	LBT	PRX	0	3	3	<65	G4
MRQ062	9	SSI	DG	BF	MRG	0	1			G4
MRQ062	9	SSI	DG	BF	MRG	0	1			G4
MRQ062	9	SSI	DG	PR	PRX	0	3	2	>65	G4
MRQ062	9	SSI	DG	PR	WHL	0	3	2	>65	G4
MRQ062	9	SSI	DG	PR	WHL	0	3	1	>65	G4
MRQ062	9	SSI	DG	PR	WHL	0	3	1	>65	G4
MRQ062	9	SSI	DG	PR	WHL	0	2	1	>65	G4
MRQ062	9	SSI	DG	BF	FRG	0	1			G4
MRQ062	9	SSI	DG	BF	MRG	0	2			G4
MRQ062	9	SSI	DG	PPPR	WHL	0	1	1	>65	G4
MRQ062	9	SSI	DG	PPPR	WHL	0	3	2	>65	G4
MRQ062	9	SSI	DG	BF	MRG	0	1			G4
MRQ062	9	SSI	DG	BF	MED	0	1			G4
MRQ062	9	SSI	DG	PRAC	WHL	0	2	1	>65	G4
MRQ062	9	SSI	DG	BF	DST	0	2			G4
MRQ062	9	SSI	DG	PPPR	WHL	0	3	1	>65	G4
MRQ062	9	SSI	DG	PR	WHL	0	3	2	>65	G4
MRQ062	9	SSI	DG	PPPR	WHL	0	2	1	>65	G4
MRQ062	9	SSI	DG	BF	FRG	0	1			G5
MRQ062	9	SSI	DG	BF	FRG	0	1			G5
MRQ062	9	SSI	DG	BF	FRG	0	1			G5
MRQ062	9	SSI	DG	BF	FRG	0	1			G5
MRQ062	9	SSI	DG	BF	FRG	0	2			G5
MRQ062	9	SSI	DG	BF	FRG	0	1			G5
MRQ062	9	SSI	DG	BF	FRG	0	1			G5
MRQ062	9	SSI	DG	BF	FRG	0	1			G5
MRQ062	9	SSI	DG	BF	FRG	0	2			G5
MRQ062	9	SSI	DG	BF	FRG	0	1			G5
MRQ062	9	SSI	DG	BF	FRG	0	1			G5
MRQ062	9	SSI	DG	BF	FRG	0	1			G5
MRQ062	9	SSI	DG	BF	FRG	0	1			G5
MRQ062	9	SSI	DG	BF	FRG	0	3			G5
MRQ062	9	SSI	DG	BF	FRG	0	1			G5
MRQ062	9	SSI	DG	BF	FRG	0	2			G3
MRQ062	9	SSI	DG	EBT	SF	0	2	1	<65	G4
MRQ062	9	SSI	DG	BF	MRG	0	1			G4
MRQ062	9	SSI	DG	BF	MRG	0	2			G4
MRQ062	9	SSI	DG	BF	MRG	0	3			G4
MRQ062	21	QZT	LG	SD	WHL	50-75%	1	1	>65	G2
MRQ062	22	QZT	LG	SD	WHL	25-50%	1	1	>65	G2
MRQ062	22	QZT	LG	EBT	WHL	1-25%	2	1	>65	G4

DEBITAGE										
KNM Number	**Sub number**	**Material**	**Color**	**Flake type**	**Completeness**	**Cortical Cover**	**Dorsal Scars**	**Platform scars**	**Platform Angle**	**Size Class**
MRQ062	23	QZT	LG	SDAC	WHL	25-50%	3	CRUSHED	<65	G3
MRQ062	23	QZT	LG	LBT	WHL	0	4	2	<65	G3
MRQ062	24	QZT	LG	SH	WHL	50-75%	1			G3
MRQ055	2	CCS	WH	CI	PRX	0	4+	1	>65	G2
MRQ055	3	SSI	LG	SD	WHL	50-75%	1	1	>65	G3
MRQ062	4	QZT	WH	SD	WHL	50-75%	2	1	>65	G3
MRQ062	6	SSI	BL	CI	WHL	0	4	CRUSHED	>65	G4
MRQ062	7	SSI	BL	BF	MED	0	3			G3
MRQ062	8	SSI	BL	SDAC	WHL	25-50%	2	1	<65	G4
MRQ062	30	SSI	DG	SICP	WHL	1-25%	1		>65	G3
MRQ062	31	SS	BL	BF	MED	25-50	2			G2
MRQ062	32	SSI	DG	BF	DST	0	2			G3
MRQ062	32	SSI	DG	SDCP	WHL	1-25%	4	0	>65	G3
MRQ062	29	SSI	DGG	SD	PRX	50-75%	3	CRUSHED	>65	G1
MRQ062	29	SSI	DGG	PF	SF	100%	0	0	>65	G1
MRQ062	29	SSI	DGG	PF	WHL	100%	0	0	>65	G1
MRQ062	29	SSI	DGG	BF	MED	0	1			G2
MRQ062	29	SSI	DGG	BF	MRG	1-25%	1			G2
MRQ062	29	SSI	DGG	SDCP	WHL	75-99	1	0	>65	G2
MRQ062	29	SSI	DGG	EBTCP	WHL	1-25%	2	0	<65	G2
MRQ062	29	SSI	DGG	SI	SF	0	2	1	>65	G2
MRQ062	29	SSI	DGG	SDCP	WHL	50-75%	2	0	>65	G2
MRQ062	29	SSI	DGG	BF	DST	1-25%	2			G1
MRQ062	29	SSI	DGG	BF	DST	75-99%	1			G1
MRQ062	29	SSI	DGG	SI	PRX	0	2	CRUSHED	>65	G2
MRQ062	29	SSI	DGG	BF	DST	0	1			G3
MRQ062	29	SSI	DGG	BF	DST	0	1			G4
MRQ062	27	QZT	LG	LBT	WHL	1-25%	4	1	<65	G3
MRQ062	27	QZT	LG	PPPR	WHL	1-25%	3	1	>65	G4
MRQ062	27	QZT	LG	SD	WHL	50-75	1	1	>65	G3
MRQ062	27	QZT	DG	PPPR	WHL	0	3	1	>65	G4
MRQ062	28	QZT	WH	SD	WHL	75-99%	1	0	>65	G3