201601_1

INTERIM REPORT ON ARCHAEOLOGICAL INVESTIGATIONS IN THE VATNAHVERFI 2015

ANTICIPATING A PROJECTED CAPACITY EXPANSION OF THE QORLORTORSUAQ HYDROELCTRIC PLANT, SOUTH GREENLAND

BY

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Indhold

Site numbers listed in brackets refers to initial numbers given to sites during the 2014 survey (Madsen, 2014a).

1. DANSK RESUME

Denne foreløbige feltrapport sammenfatter arkæologiske undersøgelser af 5 norrøne lokaliteter i det nordøstlige Vatnahverfi, foretaget forud for en planlagt kapacitetsudvidelse af vandkraftværket ved Qorlortorsuaq på vegne af Nukissiorfiit, hvem vi takker for stor samarbejdsvilje og fleksibilitet under arbejdet. Undersøgelserne blev ledet af Christian Koch Madsen fra Grønlands Nationalmuseum & Arkiv, bistået af universitetsstuderende Micheal Nielsen og Fuuja Larsen og fandt sted i perioden 12. juni til 16. juli 2015. Analyser af de udgravede genstande og materialer er stadig i gang og denne foreløbige rapport tjener alene til at give et godt overblik over og dokumentere feltarbejdets udvikling og prioriteringer, samt til at informere omkring lokaliteternes fredningsmæssige status efter sommerens undersøgelser:

- NKAH 5495 (VA11): ved denne lokalitet blev 1 norrøn bygning totaludgravet, hvilket har givet os nyt detaljeret vidnesbyrd om en tidligere fuldstændig ukendt – bådformet – hustype med et sjældent fundmateriale, heriblandt Grønlands nok første depotfund. En anden bygning blev prøveundersøgt og en kødgrav dokumenteret.

  Efter sommerens undersøgelser 2015 er ruin 1-3 ved lokalitet NKAH 5495 frigivet.

- NKAH 5496 (VA10): ved denne lokalitet blev 1 norrøn fold omtrent totaludgravet og en kødgrav dokumenteret. Folden fremviste en arkitektur, som ikke tidligere er dokumenteret fra det norrøne Grønland, men som dog blev genfundet ved NKAH 5500.

  Efter sommerens undersøgelser 2015 er ruin 1-2 ved lokalitet NKAH 5496 frigivet.

- NKAH 5498 (VA13): grundet tidspres og prioritering blev denne lokalitet ikke genbesøgt i 2015, da det blev vurderet at den var tilstrækkelig dokumenteret under tidligere undersøgelser, samt ikke var af en beskaffenhed, hvor nye undersøgelser ville bibringe betydelig ny viden.

  Efter sommerens undersøgelser er ruin 1 ved lokalitet NKAH 5498 frigivet.

- NKAH 5550 (0502): ved denne lokalitet blev en norrøn økonomibygning totaludgravet og en anden grundigt prøvegravet, resulterende i en grunding ny dokumentation af arkitektoniske detaljer ved sådanne bygningstyper, samt sidstnævntes foranderlige brug over tid. Hertil blev lokaliseret 4 helt nye ruiner og lokaliteten omfortolkes til en hel gård, end dog med meget gode bevaringsforhold. Blandt ruinerne er også Grønlands første eksempel på en "sne-dæmning".

  Efter sommerens undersøgelser er ruin 1-3 ved lokalitet NKAH 5500 frigivet. Det indskærpes, at der ikke må afgraves/udsprænges materiale fra dalsiderne nord for denne lille elv uden forudgående arkæologisk undersøgelse, samt at afgravning/udsprængning af materiale syd for elven kun bør ske under arkæologisk tilsyn.

- NKAH 4318 (Ø66): ved denne lokalitet blev en eventuel konflikt imellem det planlagte vejtrace til dæmningen og to eksisterende ruiner vurderet og, i denne forbindelse, en mindre prøvegrøft udgravet.

  Efter sommerens undersøgelser kan det konstateres, at en udvidelse af den eksisterende grusvej kan foretages imod vest, så lang tid vejens maksimale bredde ikke overstiger 3 meter. Overstiger vejens bredde 3 meter skal der foretages en arkæologisk undersøgelse. Derudover indskærpes det, at der ikke må afgraves eller påfyldes materiale langs vejtraceet fra havnen ved Igaliku Kujalleq til den nuværende bro over eleven, uden at der føres arkæologisk tilsyn med arbejdet.

Derudover anbefales det, at frigivede ruiner så vidt muligt skånes for forstyrrelse, hvis det på nogen måde er muligt og ikke er begrænsende for byggeri og færdsel. Da dele af vejtraceet fra Igaliku Kujalleq går igennem arealer, der ønskes opstillet på UNESCO's verdensarvliste, vil det være ønskværdigt, om terrænet omkring vejtraceet så vidt muligt skånes for forstyrrelse.

2. INTRODUCTION

This report presents the interim results of archaeological investigations at five Norse sites NKAH 4318 (Ø66), 5495 (VA11), 5496 (VA10), 5498 VA (12), and 5500 (0502) in the summer of 2015 (June 12 – July 16.) by Nunatta Katersugaasivia Allagaateqarfialu/ Greenland National Museum and Archives (NKA) in preparation of a planned extension of the production capacity of the hydroelectric plant at Qorlortorsuaq. In total, five Norse features were fully or partially excavated: A hut/shelter, an economy-building, a sheep/goat shed (possibly reused as hut/shelter), and two animal folds, resulting in the retrieval of 83 artifacts and 27 samples. A test trenches was excavated at NKAH 4318. All archaeological features at the sites were precision surveyed (except for Ø66/KNAH 418/Igaliku Kujalleq, where a prior detail survey existed (Clemmensen & Kapel, 2011)).

The investigations were financed and logistically supported by Nukisssiorfiit (government-owned energy company). We heartily wish to thank Nukissiorfiit for their cooperation and great flexibility up to and during the fieldwork.

The field team was led by PhD Christian Koch Madsen (CKM) from the NKA, accompanied by Michael Nielsen (MN) and Fuuja Larsen (FL), both students from Ilisimatusarfik/University of Greenland with several years of prior archaeological field experience (Fig.1). Post-excavation analysis was carried out at the NKA by CKM, MN, and Marius Elisasen. All artifacts, samples and original documentation material are stored at the NKA, and filed under register no. KNK 3803. The analysis of the sites, artifacts and samples is ongoing and a complete report of the investigations will be provided at a later time.

After the archaeological investigations 2015, protection of the following heritage features have been removed, i.e. they can, if so required, be removed to allow for the construction of infrastructure in connection with the extension of the Qorlortorsuaq hydroelectric plant:

- NKAH 5495 (VA 11): Feature 1-3 (all features).
- NKAH 5496 (VA 10): Feature 1 (all features).
- NKAH 5498 (VA 13): Feature 1 (all features).
- NKAH 5500 (0502): Feature 2-3 (3 out of 9).

Figure 1 The 2015 field team: from left to right Micheal Nielsen, Fuuja Larsen, and Christian Koch Madsen. In the background the Sermeq Kangilleq glacier, which appears to have extended to about 650 m from site NKAH 5495 (photo: C.K. Madsen 2015).

1.1 EXPANSION OF THE QORLORTORSUAQ HYDROELECTRIC PLANT

In 2003-2007, a hydroelectric plant was established at Qorlortorsuaq at the head of the Alluitsup Kangilleq, South Greenland, by erecting a ca. 10 high dam wall across the waterfall draining lake Qorlortorsuup Tasia (Fig.2). However, because of water shortage in this reservoir, the existing plant is not running at optimal efficiency and there is no possibility of increasing electricity production to meet the demands of future local industries, e.g. mining projects. For this reason, Nukissiorfiit has provided a prospect for an expansion of plant capacity, which is now under legislative hearing (Fig.2):

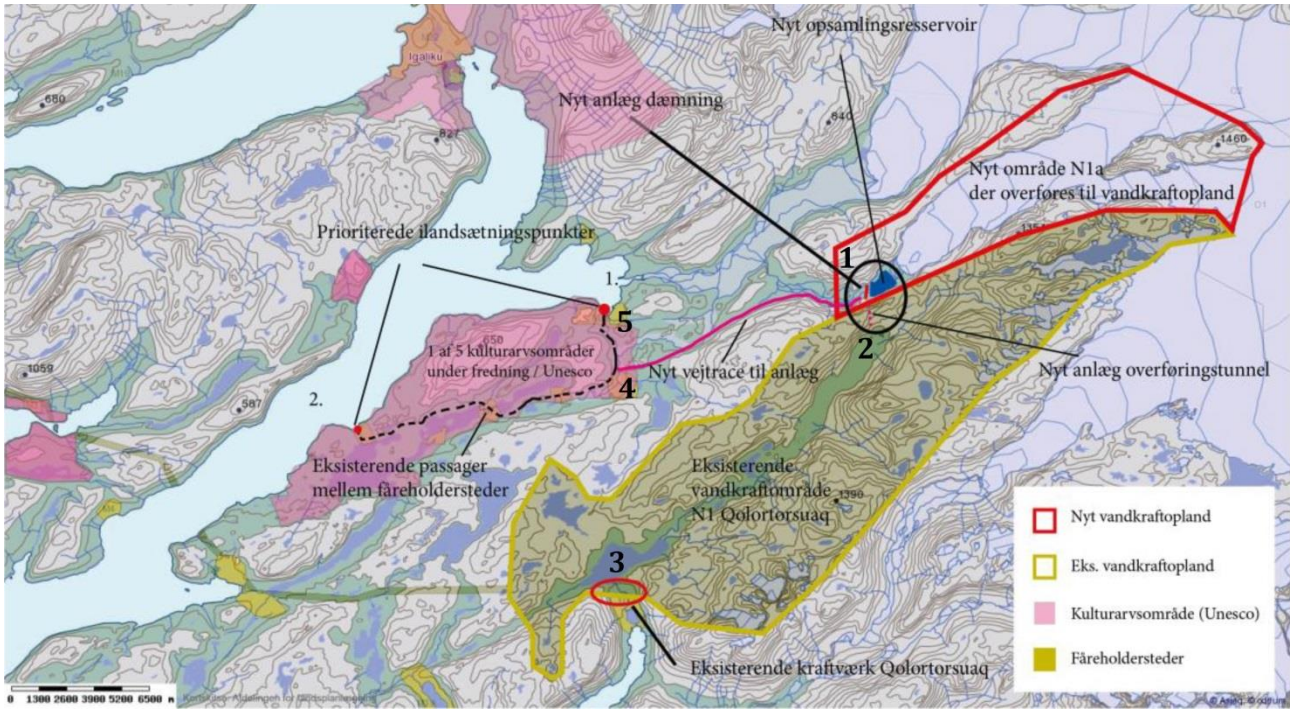

Figure 2 Map from the VVM-report of November 2015 (fig.3-1) showing the projected expansion plans for the hydroelectric plant at Qorlortorsuaq and indication of key points outlined in the text.

According to the information provided to the NKA by Nukissiorfiit (Fig.2), the extension plans involves creating a reservoir in front of Sermeq Kangelliq by building a (1) ca. 200 m wide and 14 m high dam across the outwash plain, (2) tunneling under the mountain to Amaqqup Tasia ("Ulvesøen") to feed the Qorlortorsuup Tasia reservoir (3). The building of the dam (1) requires an expansion of the existing gravel road network from Igaliku Kujalleq/NKAH 4318 (5) to the dam (1): over the first ca. 4 km to point (4) by reinforcing and expanding the existing ca. 3 meter wide gravel road, from point (4) by building an entirely new road. Note that during the 2014 survey and 2015 excavation, the NKA had been informed that the road would be ca. 3 meters wide – i.e. just a little wider the existing track – and not the 4 meters, which is reported in the VVM-report presently under hearing (February 2016). Consequently, NKA's recommendations for future heritage management at site Igaliku/Kujalleq/NKAH 4118 include a section especially concerning the width of the planned road.

1.2 LANDSCAPE AND NATURAL SETTING

The region affected by the projected expansion of the hydroelectric plant is located in the northeastern part of Tasikuluulik/ Vatnahverfi, South Greenland. From the Igaliku Kujalleq there is about 14 km to the front of the glaciers, the intermediate terrain consisting of mostly NE-SW oriented low mountains and valleys, which gradually steepens as one approaches the Ice Cap. The glacial outwash plain in front of Sermeq Kangilleq lies at an altitude of ca. 200 masl, the one in front of the neighboring Jespersen Bræ below 100 m. The area is especially characterized by the massive sandur that expands SW from these two glaciers: across this landscape aeolian materials (fine sand) has been, and is still being, deposited between and behind sheltering hills and ridges of basalts and sandstone. This has led to the creation of quite extensive meadows in the sheltered valley floors and massive dunes on the leeside of hills and ridges from the prevailing storm direction (from the NE), in places burying Norse ruins (see page 39). Elsewhere, the terrain is almost completely naked and barren showing the notable scars of violent winds and glacial movements over millennia. Along the edges of the sandur, the desert is abruptly replaced by the very lush shrub dominated vegetation, which otherwise prevails across the region.

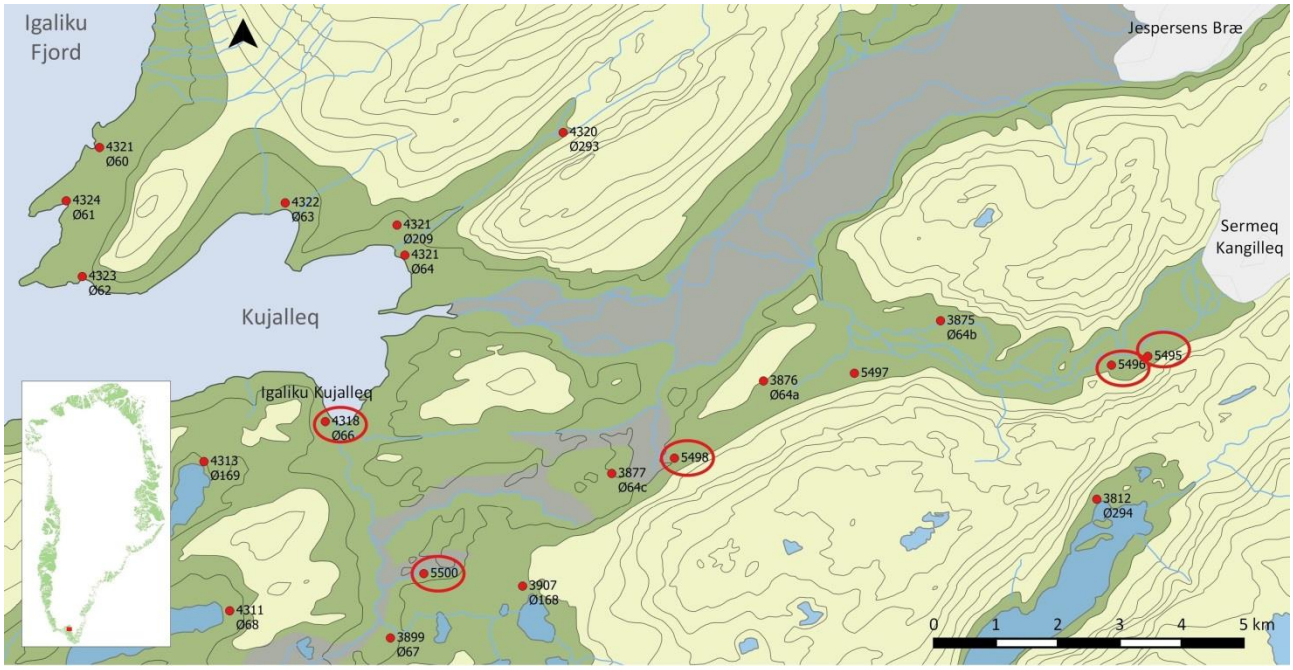

Figure 3 Map showing the northeast Tasikuluulik/Vatnahverfi and Norse sites in the region with indication of sites investigated the summer 2015.

1.3 PRIOR ARCHAEOLOGICAL INVESTIGATIONS

The area was part of one of the more densely inhabited areas of the Norse Eastern Settlement which existed from ca. AD 985-1450, Norse Vatnahverfi, today referred to in Inuit as Tasikuluulik. Vatnahverfi/Tasikuluulik covers the 6-8 km wide stretch of lowland between Eqaluit and the Ice Cap on the northern side of the peninsula between the fjords Igaliku Kangerlua and Alluitsup Kangerlua. Because it was a core Norse settlement area, the Vatnahverfi has seen quite a lot of archaeological research. Outlining prior archaeological investigations in the area affected by the plant expansion project, early site identification and description was carried out around the turn of 19th century (Bruun, 1895; Holm, 1883; Jespersen, 1912). Initial discovery was followed by various excavations, among other things at the farms NKAH 3876 (Ø64a) and 3878 (Ø64c) along the projected road to the dam (Roussell, 1941; Vebæk, 1943, 1952, 1953, 1982, 1992).

In 2005-2006, all the known Norse sites in the region were revisited and precession surveyed as part of the Vatnahverfi-Project (Møller & Madsen, 2006, 2007a, 2007b), during which the excavated NKAH 5500 was first registered and surveyed. In 2009, a precision DGPS-survey was conducted of site NKAH 4318/Ø66 in preparation of a UNESCO-nomination of the area (Clemmensen & Kapel, 2011). The latter survey was used for the 2015 investigations at NKAH 4318/Ø66.

In 2014, a survey was carried out by the NKA on behest of and financed by Nukissiorfiit to identify any potential conflicts between heritage sites and the projected plant expansions (Madsen, 2014a). This survey managed to identify three new Norse sites - NKAH 5495, 5496, 5497 – of which the former two were located in the area to be flooded by the new reservoir in front of Sermeq Kangilleq. The 2014 survey also established that the sites NKAH 5797 (ruin no.1) and NKAH 5500 (ruins nos. 2-3) would be disturbed/destroyed by the building of the planned road to the dam. These four sites were singled out for further investigations to be carried out in the summer of 2015.

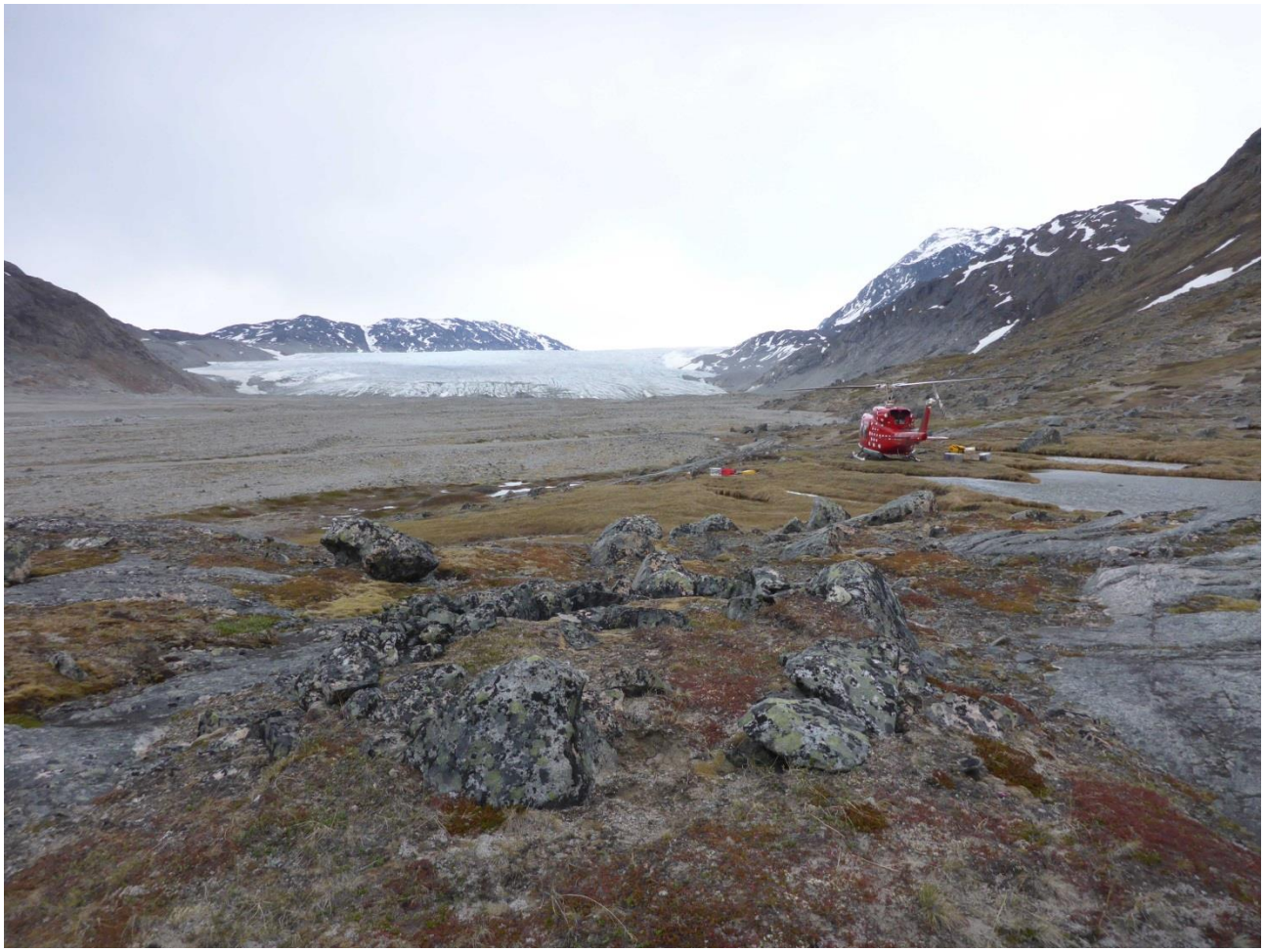

Figure 4 View of feature 1 (foreground) at NKAH 5495 just after first arrival at basecamp 1. In the background the outwash plan and the Sermeq Kangilleq glacier (*photo: C.K. Madsen 2015*).

2. FIELD DIARY 2015

The below summarizes day-to-day events throughout the field season of 2015 as they were described in CKM's field diary. They do not include all events or archaeological observations, but provides an overview of how the time was spent, as well as changes in priorities and schedule. Specific details on the excavations are reported as they appeared in the diary, i.e. as field notes that may defer from the final interpretations outlined in chapter 3.

Fri. June 12: CKM departure from Copenhagen 09.00. Connecting flights from Kangerlussuaq were delayed and CKM only arrived in Qaqortoq 18.45, where he met up with FL and MN, who arrived at roughly the same time. We were then picked up by a steward from and signed into Sulisartut Højskoliat, where we were to stay for the next couple of days.

Weather: Both in Kangerlussuaq and Nuuk clear spring day with around 5°C, once in Narsarsuaq and Qaqortoq 10-13°C, calm and cloudy.

Sat. June 13: After breakfast we went to the heliport to arrange for the transport to basecamp 1 by NKAH 5495 Monday afternoon. We then went to Stark to buy the last field equipment, as well as the wood and fittings for making a sieve. We took the gear back to Sulisartut Højskoliat, built the sieve and organized the equipment.

Weather: Overcast, but dry, calm and mild with ca. 13°C.

Sun. June 14: We had a late breakfast and then headed for the store to buy most of the needed food supplies. After lunch we went to visit Qaqortoq Museum to pick up the equipment we had sent there ahead of us, meeting up with museum leader Eleonora Jacobsen, who was helpful as ever. Unfortunately, only the kitchen tent had arrived, which meant that our freeze dried food was probably still in storage at the harbor. In the evening we had dinner with Elenora and her husband.

Weather: All day quiet, calm and cloudy.

Mon. June 15: Around 09.00 we went to the harbor to pick up the equipment coming from Nuuk and Denmark. Unfortunately, our freeze dried food had not arrived there either, only the field- and camp equipment, which luckily appeared complete. FL and MN took the equipment to the heliport to have it weighed and to arrange for the departure with pilots and the Nukissiorfiit flight controller. Meanwhile CKM went to the museum to meet up with Eleonora. After the return of MN and FL, we all went to buy gasoline and propane and had it transported to the heliport.

After lunch we went shopping for the last fresh groceries and regathered at the museum. We now received word that our freeze dried food would only arrive Monday night, i.e. after our planned departure. Also, having gone through our DGPS-equipment coming from Nuuk, we had noticed that a central wire and antenna were missing. We therefore arranged with the Nukissiorfiit flight controller to have a smaller helicopter drop off of the missing equipment in basecamp 1 once it arrived in Qaqortoq. According to plan, the field team and remaining equipment would be dropped off in basecamp 1 in the late afternoon. However, because of delays in the domestic flights, the helicopter pilots rushed us to the heliport around 14.00, lifting off at 14.30 and landing at basecamp 1 by NKAH 5495 ca. 15.00 (Fig.4). We spend the next three hours setting up camp.

Weather: Until 18.00 cloudy and calm, at basecamp 1 with some wind coming down from the ice. Once the wind calmed down it was replaced by light rains, from 22.30 heavy rains.

Tues. June 16: We stated the day by hiking to the neighboring site NKAH 5496, which we all agreed was a hunter's bed. We returned to NKAH 5495 and began setting a local measure grid. After lunch we photographed the features with drone and traditional camera. We then began planning feature 1 ([01] and [02]) and 3 (Fig.5), which we completed by evening.

We were expecting a helicopter to arrive before noon with our freeze dried food and gasoline. At 15.00 it still had not arrived and we called the Nukissiorfiit flight controller, who could inform us that our food had arrived in Qaqortoq, but that no flight time had been allocated for the lift. We kept working to 18.30 without the helicopter ever arriving.

Weather: until around 14.00 cloudy with a brisk and cool wind coming in from the fjord. After 14.00 it gradually became more sunny and warmer which continued throughout the rest of the day.

Wed. June 17: We began taking levels on feature 1's [01] and [02], while MN began drawing feature 2. In the morning we had arranged for the arrival of the remaining food and equipment, which came with a smaller helicopter ca. 13.30. Now supplied with the remaining parts for the DGPS, CKM surveyed the local measure grid and staked out new points by feature 2. Afterwards CKM and FL began removing feature 1's [01] (Fig.6), working on each site of a balk for stratigraphic control. At 18.15 we were done and we photo documented the top of [02] with camera and drone.

Weather: In the morning overcast and cool, from 10.00 it calmed down and began pouring rain. However, already from 12.00 the skies cleared again with bright sun and up to 18 °C (!) dominating until light cloud cover started drifting in ca. 17.00 with increasing wind from the fjord.

Figure 5 Fuuja Larsen (left) and Micheal Nielsen (right) planning feature 1 (foreground) and 3 (background) at NKAH 5495 (*photo: C.K. Madsen 2015*).

Figure 6 Fuuja Larsen (left) and Micheal Nielsen (right) removing the vegetation layer and topsoil [01] of feature 1 (foreground) (*photo: C.K. Madsen 2015*).

Thurs. June 18: We woke to rain, but FL and CKM began planning and taking levels on [02], as well as the top stones of [03] that had been revealed the previous day. MN continued planning feature 2, while CKM and FL started excavating feature 1's [02]: inside the feature, this proved relatively easy, because its boundary to the more gravelly [02a] was fairly distinct. However, on the walls [02] was hard to identify and separate from [02a] and [03], because it partly covered, partly rested against, partly slid between collapse stone. Because of this difficulty, and since [02] clearly consisted of several natural aeolian deposits, we decided not to spend much time separating the episodes, but lumped them into a single context [02], which appeared to stop on a more gravelly, possibly alluvial deposit [02a], on top of which most of the uppermost collapse stone [03] seemed to rest. [02a] was found outside the walls as well. In front of the entrance, flecks of charcoal – the first cultural material – appeared just above or in the top of [02a]. We completed the excavation of [02], photographed the top of [02a] with camera and drone and stopped working ca. 18.15. After dinner we hiked the ca. 2 km to the front of the glacier and went up on it.

Weather: As on the previous day, the weather was constantly changing: Rain in the morning subsided ca.9.30; it was then overcast until 13.00, at which time the sun broke through until clouds started drifting in again around 17.00. All day the wind changed direction, coming either from the ice or fjord, with temperatures between ca. 5-16 °C.

Fri. June 19: FL and CKM began excavating [02a] (Fig.7), which also soon proved to be neither uniform or distinct, but rather consisted of interchanging, and mixing, aeolian and alluvial deposits (sand, silt, gravel), especially inside the feature. Since these were all natural and sterile deposits, we decided to lump all of these deposits in [02a]. As we continued excavating [02a], it was clear that the top collapse stone [03] sat in/was surrounded by [02a]. As more collapse stone began to appear, we planned and leveled the top as [03], removed them, and designated the next layer of collapse stone as [03a] etc., since we did not attempt to separate different collapse episodes.

Figure 7 Fuuja Larsen (left) excavating [02a] inside feature 1 and Micheal Nielsen (background) planning feature 2 at the foot of the slope (*photo: C.K. Madsen 2015*).

Meanwhile MN finished documenting the surface of feature 2. Next he put in a ca. 50x50 cm test pit to retrieve soil samples and to test for cultural deposits. Ca. 30-35 cm beneath the surface he encountered charcoal in a fairly distinct cultural horizon, so we decided to open a 0.5 m wide trench across the entire inside of feature 2, which we still interpreted as an animal fold.

Weather: In the morning slightly overcast and mild with ca. 15 °C and changing wind direction from the ice and fjord. From around 15.00 clear and sunny skies.

Sat. June 20: CKM and FL continued excavating feature 1's [02a] and [03a]. We stopped on the top of a layer we initially designated [02b], which revealed itself by having inclusions of charcoal and lumps of dissolved turfs, but otherwise appeared as [02a]. MN continued the excavation of the trench in feature 2, some 30-35 cm below the surface locating the cultural layer first observed in the test pit, as well as revealing some collapse stone and lumps of turf.

Weather: We woke to slightly overcast skies and calm a wind, but after 10.00 the wind picked up and a front with heavy rains started coming in. Around 13.00 we had to stop excavating (except for planning of the newly excavated top of [03b]).

Sun. June 21: FL and CKM continued excavating feature 1: After having levelled the stones unearthed and planned the previous day, we began cleaning of the surface of [02b] after the rain, realizing that we were unearthing a completely new type of deposit, no longer natural. We then cleaned up the remaining spots of [02b], which we cancelled, simply considering it the very lowest part of [02a]. The surface now displayed two distinct layers: in the western end was an uneven deposit (with imprints of removed collapse stone from [03b]) of reddish brown fine turfy sand, which we perceived as possible roof collapse. In the eastern end of the ruin, the stratigraphy was more difficult: immediately under [02a] and overlying [05] was a small area

with burned turf/charcoal [04]. This layer proved to run under stones that we had previously believed to be the disturbed gable of the ruin! Consequently, we stopped excavating inside the ruin and started clearing collapse stone outside the ruin [03a] – [03b], to establish the certain extent of the walls, which began to appear with their slightly curved lines! Also, at this point it became obvious that there was enough collapse stone for the house to have been built almost entirely in stone.

In feature 2, MN continued excavating the trench (Fig.8), where a fairly clear turf/stone wall now divided the trench in two halves, which were differed somewhat: on the eastern side, the deposits were motley and even the layer containing charcoal appeared mixed. The trench on the western side of the ruin revealed a series of fine layers of alternating aeolian and alluvial deposits. Towards the bottom more stones appeared and a greasy charcoal layer appear almost like floor layer! To have some more working space, we decided to widen the trench to 1 m.

Weather: Slightly overcast, but calm and mild in the morning. In the afternoon bright sunshine and clear skies with a slight wind from changing directions. In the late afternoon it was so warm that we went bathing in one of the nearby meltwater ponds.

Mon. June 22: FL and CKM continued planning, leveling, and removing collapse stone outside and on the walls of feature 1, most intensively by the eastern gable, where the extent of the walls was hardest to discern. Towards evening the lines of the walls were clear and we could continue remove the last collapse stone inside the feature. [04] was excavated and sampled.

In feature 2 MN continued the excavation and in the western end, a fairly well-preserved wall of alternating stone and turf was becoming increasingly clear. More burned turf and spots of charcoal were appearing in both ends of the trench and a more controlled single context excavation was initiated to resolve the stratigraphy.

Weather: During the previous night, the wind from the ice had picked up quite a bit and continued to be brisk throughout the day, which was otherwise fairly mild with scattered clouds.

Figure 8 Micheal Nielsen excavating a 0.5 wide test trench across NKAH 5495's feature 2. The trench was later widened to 1 m and extended to cut across the entire feature (*photo: C.K. Madsen 2015*).

Figure 10 Fuuja Larsen lying in NKAH 5496's feature 1, which we before excavation interpreted as a hunter's bed (*photo: C.K. Madsen 2015*).

Tues. June 23: As we woke, the brisk wind from the ice was still bearing down on our site, but we had to continue excavating even though soils were drying out as soon as we exposed them, sanding up and getting our eyes! To speed up the excavation of feature 2 – which was revealing an ever more complex stratigraphy – FL was sent there to help MN, while CKM continued the excavation of feature 1, where both inner and outer walls were now clearly defined. Towards the afternoon we were ready to take out [05], which we assumed to be the last layer before reaching the actual floor layer. This assumption proved right, because very soon after we started excavating, the first artifacts appeared, as well as horizontal flat stones, which could be some kind of flagging and appeared especially in the eastern end.

In feature 2, the excavation was continued with the appearance of more turf lumps and spots with charcoal. The layers were hard to separate in the small trench and because of the very dry and windy conditions. Continued excavation proved the deposits to be likely wall collapse with lenses of burned turf (from the wall?). No proper floor could be observed, when FL in the western half reached the bedrock, which proved to slope greatly towards the NE. In the eastern half, the layers were confusing until around 17.00 coming upon apparent natural horizon, i.e. sterile fossil vegetation/turf layers.

NKAH 5496: around 17.00 the dry wind had become so brisk that drying out of the soils, sand and dust made it impossible to excavate further at NKAH 5495. We therefore took a spade and went to NKAH 5496, which lies in a sheltered niche (Fig.10), to do a test pit, as we knew we were running out of time and had to plan in detail for the time need to investigate this site. Cutting a few test pits both inside and outside the feature revealed no traces of culture or any distinct layering other than a continual series of aeolian deposits. However, to our surprise the test pit against the stones inside the feature proved them to continue at least 90 cm downwards! Clearly, we were hardly dealing with a hunter's bed, but something else. Facing this new issue and in order to wrap up the excavation at NKAH 5495, we decided to extend our stay in basecamp 1 by a single day.

Weather: All day the temperature was mild and the skies sunny, but with a brisk wind from the ice, which from around 17.00 and throughout the evening and night grew in intensity to a proper storm.

Figure 11 The cache of artifacts hidden under a bench or platform in feature 1. Fairly well-preserved, the artifacts were completely covered and interwoven with fine roots (*photo: C.K. Madsen 2015*).

Wed. June 24: In feature 1, FL and CKM continued the excavation: FL cleaned and documented the less than 1 cm thick floor layer [06] in the western side of the feature and sampled it. FL followed the floor layer out through the doorway, where it thinned out and disappeared with a few small pieces of charcoal. In the eastern end CKM hit upon a cache of artifacts under what we thought to be the bench, but on top of [06] (Fig.11). However, there was not enough room for the continued excavation of the entire cache, and we instead concentrated on documenting and excavating the central balk in feature 1. In Feature 2 we decided postponing the final documentation of the trench because of the strong wind.

NKAH 5496: After lunch, MN headed for NKAH 5496 to start excavating the inside of the feature to reveal its extent. Because we had not observed anything other than natural aeolian deposits inside the feature, the excavation was carried out with a spade. This excavation revealed that towards the E the walls were built against a low vertical cliff. It now seemed certain that we were likely looking at a Norse animal fold rather than a hunter's bed.

Because of the strong winds, the find of a cache with several artifacts, and the still somewhat puzzling feature at NKAH 5496, we decided to postpone our departure from basecamp 1 with two days rather than one in order to finish up both investigations satisfactorily.

Weather: A mild day with bright clear skies, but with a strong dry wind from the ice that only intermittently calmed down slightly.

Thur. June 25: We intensified the excavation of feature 1 in order to document the artifacts in the cash before they dried up completely (Fig.11). The remaining part of the balk was documented and excavated. We documented the lower [05a], the foundation for the probable bench/platform. Once these stones were removed, we cleaned up the floor layer [06] for documentation and sampling. The cache proved to include quite a collection of rare and select artifacts, which appears to have been hidden behind or underneath a bench! Documenting these artifacts was slow going and we did not finish until ca. 20.00.

Weather: Yet another day with beautiful sunshine but brisk wind from the ice. Although not nearly as strong as the previous days, it was still enough to dry out the soils and making excavation difficult.

Figure 12 Drone aerial photograph of NKAH 5495øs feature 1 after completed excavation (*photo: C.K. Madsen 2015*).

Fri. June 26: CKM and FL started the final excavation and cleaning of feature 1, while MN did the same thing in structure 2. After lunch CKM finished documenting feature 1 (Fig.12), whereas MN and FL headed for NKAH 5496, where they continued the excavation.

Weather: Another warm and sunny day with strong winds from the ice.

Sat. June 27: CKM got up very early to drone photograph feature 1 before the wind from the ice would pick up. After breakfast, FL and CKM finished the documentation of feature 1 and started removing vertical stone slabs [05b], which proved to be resting upon floor similar to [06], suggesting that they were a later addition. Thin flag stones in a "post niche" on the southeast wall appeared to have been laid during the building of the house, i.e. they rest on sand filling a depression in the stone (under floor layer). By noon, we had finished excavating and documenting feature 1 (Fig.12).

At NKAH 5496 feature 1, MN continued excavating to reach the bottom of the feature. FL and CKM joined him after lunch. We found the feature to have peculiar construction being made of massive oblong boulders that were erected on one end to form a semi-circle against the cliff face, but with narrow open spaces in between. About 80-90 cm's down we reached a compact layer of fist sized stones and gravel, which we cleaned without seeing and traces of constructions, cuts or cultural material. Having documented this layer, we made a small test pit of ca. 40x40 cm in the center of the feature, just to make sure that we had actually reached natural deposits. Digging down a further 30-40 cm we found nothing but more stones and gravel, and therefore finished excavating. The decision to stop was made not only because the lack of time or cultural traces, but also

because with nothing to support the massive upright boulders, they we in danger of collapsing into the feature. To avoid anyone falling into this massive whole we had now dug, we backfilled as much of the soil as we could and concluded the excavation at ca. 18.30.

Weather: Yet another day with beautiful sunshine but brisk wind from the ice. Although not nearly as strong as the previous days, it was still enough to dry out the soil and making excavation difficult.

Sun. June 28: We expected the helicopter to land ca. 10.30, but had taken down most of the camp and packed the previous day. Thus, after an early breakfast, we mainly had to pack down our own tents and wait for our lift. The helicopter landed at 10.20 and after loaded it to the brim with our camp and excavation gear, we flew out for NKAH 5500, thereby finishing the investigations at NKAH 5495-5496.

Before reaching our new base camp at NKAH 5500, we landed on the gravel road just north of Ø67, because the pilots could not find the 5500 site and we had no intercom during the flight. After a quick talk, we flew to the right location and unloaded, which we completed ca. 11.30. We quickly set up the new basecamp and took the rest of the day of by heading for Andala Lund's house at Ø67 to have a shower and coffee.

Weather: Another mostly sunny and warm day with wind from the ice.

Mon. June 29: We took the day off! After sleeping in and having a later breakfast, we headed towards the sandur and ice, then turned north and walked over the mountains to Igaliku Kujalleq, where we had been invited for dinner in the evening by Jeppe and Inge Møhl. Afterwards we walked back to our camp 2, arriving there ca. 22.15.

Weather: Sunny and incredibly warm summer day.

Figure 13 Fuuja Larsen inside NKAH 5496's feature 1 towards the end of the excavation (*photo: C.K. Madsen 2015*).

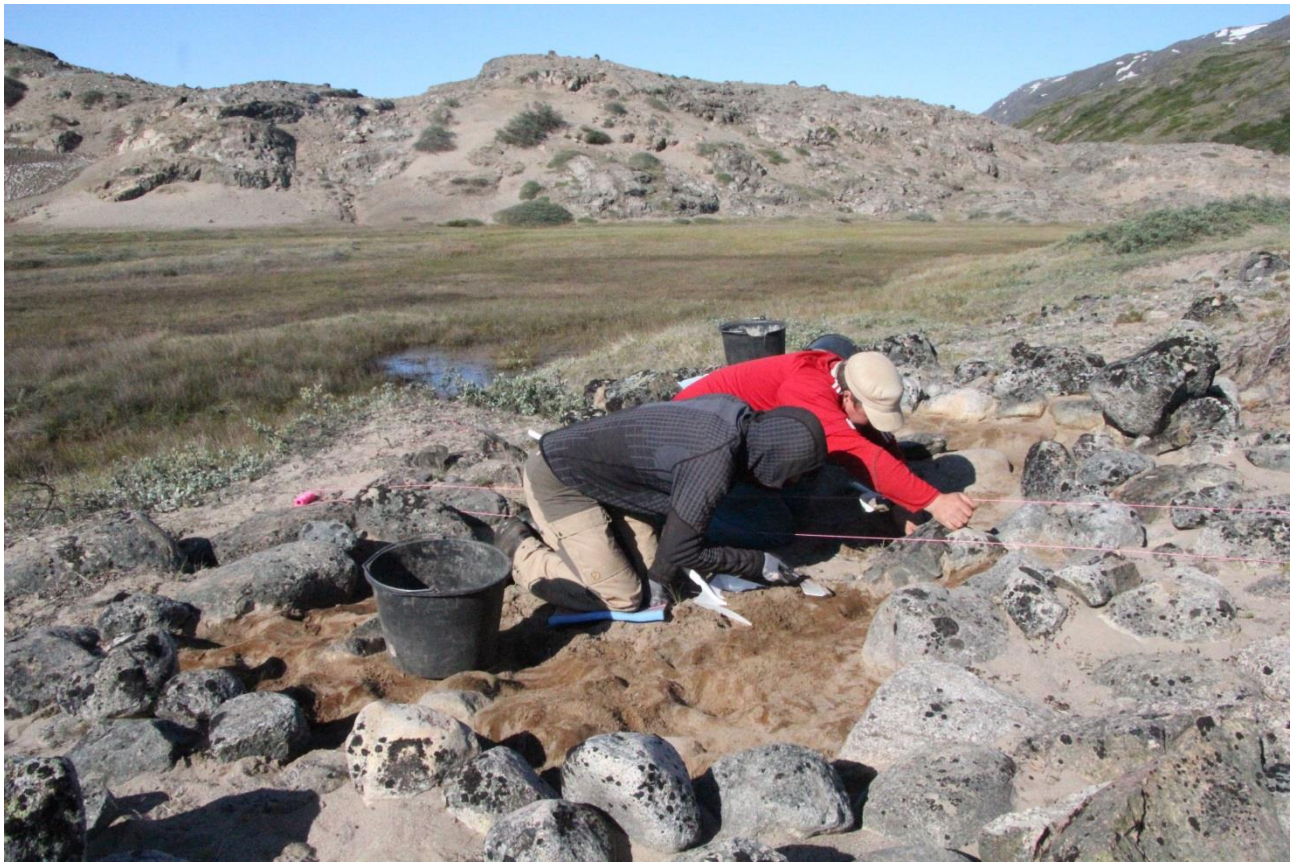

Figure 14 Early excavation of NKAH 5500's feature 2 (*photo: C.K. Madsen 2015*).

Tues. June 30: We began the day sorting the finds and samples from the previous two sites and made sure they were securely packed. We then began the excavation at NKAH 5500 by laying out a measure grid and photo documenting the ruins with drone and camera. Towards the end of the day we started planning features 2 and 3, until we received visitors from a nearby farm.

Weather: Bright and sunny skies, no wind and baking hot (+20°C) in our valley.

Wed. July 1: We continued the planning of features 2 and 3, finishing in the afternoon, after which we started excavating feature 2 (Fig.14). We put in a small test pit along the western gable to assess the depth of the cultural layers, to our surprise finding no traces of cultural deposits, but only a series of apparently natural alluvial layers indicating a wet environment. Another test pit along the southern wall displayed the same layering, meaning that only the foundations of the building remained in the form of two parallel rows of heavy stones. We decided to concentrate our efforts inside the feature, where we removed loose sand, vegetation ([01] and [01a]). Directly under the loose sand, we encountered an uneven turfy layer covering the inside of the building. It was the same reddish brown color and composition as observed in the test pits. However, specks of charcoal appeared in the eastern half of the building.

Weather: Initially bright and sunny skies, little wind and warm, but from around 11.00 with light cloud cover and some fjord wind to alleviate the heat.

Thurs. July 2: We continued excavating inside feature 2 and quickly removed [02], which appeared to be a natural turf/peat layer formed under wet conditions, but with a few specks of charcoal. Under [02] two clearly different contexts - [03] and [04] – appeared. [03] seemed a washed-out floor layer with dissolved pieces of bone and specks of charcoal, [04] an underlying fireplace. Thus, we realized that the inside must have been under – or at least soaked in – water for a long period, a mire like setting, which was also confirmed by the presence of many iron concretions in old root channels, suggesting anaerobic conditions. Note that we later realized [04] to overlay [03], i.e. the fireplace was apparently the last occupation of the house. In the eastern end of the house a row of rounded stones appeared to be a separate construction, but the washed-out floor layer made it impossible to establish for certainty, and we ended removing the stones (only later realizing that they were probably a later addition).

Weather: Another bright and sunny day, incredibly warm, and with no wind to drive off the mosquitoes until the late afternoon.

Fri. July 3: We continued excavating inside feature 1, sampling and removing [04], continuing with [05], which we at the time though was the poorly preserved remains of a floor layer associated with [04]. At this point we were also by the missing entrance and started looking for it more intensively. In the afternoon Jeppe and Inge Møhl came for visit, in the evening sheep farmers Andala and Sofianguag Lund, both couples being shown around the site.

Weather: Another bright and sunny day, almost unbearably warm, and with no wind until the late afternoon.

Sat. July 4: We continued excavating feature 1. Before noon, we finally got a handle on the layers we had been working on the previous day and which had proven exceedingly puzzling, because of the dry conditions. The slightly overcast skies allowed us to conclude that [05] was another washed out fill layer of some sort, not a proper floor layer. [05] was found to be resting on [07], a floor layer going under the probable bench in the western gable. In most of the western end [03a] was impossible to separate from [05]. In our attempt to identify a doorway, we also started excavating a 1 m area along the northern long wall, about centrally along it finding a considerable amount of collapse stone, which we surmised could have been part of a partly stone set doorway.

Weather: Slightly overcast, towards the afternoon with some sun and fjord wind. Puzzling: during one day, the mosquitoes have been replaced by flies!?

Sun. July 5: We finished the excavation and documentation of the inside of feature 2, as well as collapse along the northern wall. CKM then started removing up collapse stone on the outside of the ruin to make the foundation clear, as well as to excavate the assumed entrance approximately in the middle of the northern long wall. By pure luck, we had placed the balk across the house in such a manner that it actually continued out through the doorway, allowing us to document the stratigraphy of the doorways as well, where the layers [02] and [03] could be followed flowing down slope towards the mire, meaning that they could hardly be floor layers (as initially assumed). Perhaps these layers instead represent dissolved and somewhat mixed roof/wall collapse?

After lunch MN and FL went to Igaliku Kujalleq to pick up some fresh groceries that Jeppe and Inge had gotten for us in Qaqortoq. They were back around 18.00, at which time CKM stopped excavating.

Weather: In the morning slightly overcast with a light breeze, towards noon clearing up with bright sunshine, heat and bringing swarms of flies and mosquitoes.

Mon. July 6: CKM continued excavating outside feature 2, gradually revealing the entrance. Removing the layers in the doorway, it was clear that basically all the layers observed inside the house could be followed out the doorway and down slope, proving that our interpretation of the doorway was right. Towards evening the excavation was completed and

documentation of the section could begin. The same day, MN and FL started working at feature 3 by removing the vegetation and sand deposits covering it [01]. Because of the difficulty in working their way through the willow and sedge roots and being pressed for time, we decided to cut a 1 m wide trench across the feature rather than excavate it completely. Around 18.00 they had removed ca. 50 cm of aeolian sand layers filling the ruin, finding no traces of culture, but coming upon a more compact, still sterile aeolian layer. A smaller test pit was also made outside the western wall to assess the depth of the wall. The section of this test pit also showed a long series of sterile aeolian deposits.

Weather: Early in the day some clouds and even a few drops of rain, thereafter the skies cleared with winds from changing directions until 22.00, at which time a new front with rain came in. Finally a day with proper working weather!

Tues. July 7: CKM finished the excavation of feature 1 by removing the central balk across the ruin and doorway, and continued cleaning collapse stone outside the building, and did the final planning. Meanwhile FL and MN continued the excavation of feature 3, about noon reaching the original surface, but still without observing any traces of cultural material. However, there appeared to be some separate stone built feature in the southern end of the trench. Around the wind suddenly picked up and an MN became worried about his family, who he had been in contact with earlier and which was perhaps on the way to visit the site. No being able to phone them, MN then went to Igaliku Kujalleq, where they could have arrived. As it turned out, they had been on a day-trip at another side. Meanwhile FL and CKM reconnoitered the hills around the valley.

Weather: Early in the day calm with scattered clouds, but very hot, from noon a brisk wind from the ice and clear sunshine.

Wed. July 8: CKM finished all excavation and documentation of feature 2 (Fig.15), including excavating a trench along the central balk to ascertain that there were no deeper cultural layers. In feature 3 MN and FL continued excavating, in the southern end of the building extending the trench westwards to expose the separate stone feature. It proved to be a box shaped stone setting (Fig.18), most resembling a fireplace, but with no indication whatsoever of charcoal or soot. Next to it was a flat horizontal stone that also appeared to have been deliberately placed, but with unknown function. Around 14.00 Andala Lund came to visit us with his daughters.

Weather: A beautiful sunny day without the trace of a cloud on the skies and, therefore, incredibly hot! From around 14.00 some fjord wind to alleviate the heat.

Figure 15 NKAH 5500's feature 2 after completed excavation (*photo: C.K. Madsen 2015*).

Figure 17 NKAH 5500's feature 3 during excavation of trench and walls (*photo: C.K. Madsen 2015*).

Thur. July 9: MN started planning the section of the central trench in feature 3, while FL and CKM began clearing the stone wall of sand and shrub to expose the top of the stones, and we identified an entrance (Fig.17). We chose this approach, because of lack of time prevented us from excavating all of the thick, sterile aeolian deposits inside the feature. This was, evidently, unfortunate, but as we had recovered no finds of any kind and were sure about our interpretation of the feature as an animal fold/pen, we were less disappointed.

In the afternoon we started looking at the green grass mound on the opposite side of the valley, where rows of stones on its edges had attracted our attention. We made a small test pit on the edge of the mound, immediately under the surface finding charcoal and turf. Another test pit a bit further up the mount revealed large pieces of charcoal, burned and unburned bone in a midden-like stratigraphy. A third test pit on the opposite of the mound also revealed cultural layers and finds, and as we started going over the surrounding winded eroded surface, steatite, bone, metal etc. could be collected. Thus, there can be little doubt that the mound covers one or more ruins, perhaps even a centralized farm, with excellent conditions for preservation. We also put in a fourth test pit by other lines of stones a bit above the mound, again finding cultural layers, i.e. another ruin.

Weather: In the morning thin fog. This was quickly burned off and replaced by clear, sunny skies and an incredible heat, which was only alleviated by the fjord winds towards the end of the day.

Fri. July 10: CKM spent the day recording the new features located, surveying the measure grid, test pit, and valley topography. Meanwhile, MN and FL cleaned and documented feature 3. Around 18.00, we concluded the excavation of NKAH 5500.

Weather: All day slightly overcast, but mild and with only a light breeze.

Figure 18 Fuuja Larsen sitting next to the stone built feature inside NKAH 5500's feature 3 after ended excavation (*photo: C.K. Madsen 2015*).

Sat. July 11: We woke to a light rain, which quickly ceased, allowing us to take down basecamp 2 and the final closing down of the excavation. After lunch we took a well-earned half day off by visiting Andala.

Weather: Early in the day a light drizzle, followed by a couple of hours of clear skies, which was replaced by pouring rains until evening. Otherwise a calm and mild day.

Sun. July 12: The helicopter arrived ahead of schedule ca. 10.15, just as it started drizzling again. The team was then lifted to Igaliku Kujalleq, the final basecamp 3, and next the gear was dropped off by sling (causing some apprehension with CKM). Having decided to hire one of Andala's houses rather than to set up a whole new camp, we quickly finished organizing our gear and then went to have coffee and lunch with Jeppe and Inge Møhl.

Around 14.00 we then went to assess the road near ruin no.1. At present, the smallest distance between the Norse warehouse and the modern one is 3.3 m, i.e. just a bit wider than the width of the projected road (3 m at that time), which meant that there was little conflict between the projected road and the ruin. To make sure that the latter would not disturb any part ruin no. 1 potentially hidden under the present gravel road, we began excavating a small trench by the wall of the recent warehouse. We first observed a series of aeolian layers with a few recent artifacts (shell case, nail), at a depth of 40-50 cm unearthing rather large stones, around this an old vegetation surface, which included two tiny fragments of charcoal. Under this layer, in which the stones partially appeared to rest, came very compact and sterile layers. Likely, the layer with charcoal represents the first Norse surface, some, but definitely not all, of the stones perhaps being collapse from the warehouse. With no other cultural deposits, we concluded excavation of the test pit, documented the stratigraphy and covered it up again, finishing around 17.00.

Weather: Another clear and sunny day, but less hot because of a brisk fjord wind.

Figure 19 The trench W of NKAH 4318 ruin no.1 open up against the more recent warehouse (*photo: C.K. Madsen 2015*).

Mon. July 13: We surveyed the trench made by ruin 1, tidied up our equipment and took the rest of the day off.

Weather: Scattered clouds and a brisk fjord wind, but otherwise fair and mild day.

Tues. July 14: Expecting the helicopter to arrive 10.30, we gathered our equipment after breakfast, making ready for departure. Accompanied by Jeppe and Inge Møhl, we then waited for the arrival of the helicopter, which showed up already 09.10. CKM, MN, FL were then lifted to Igaliku with their personal gear, the rest of the equipment following in a subsequent lift. From Igaliku, FL got back on the helicopter and continued on to Qaqortoq, to do the shopping for the next field team, which was bound to arrive in Qaqortoq on the 16. Meanwhile, CKM and MN hauled the equipment down to Jeppe and Hans' boat house to do repacking for shipping. In the afternoon we went to visit our colleague John Preston, who we found to be staying at the hostel.

Weather: Sunny and mild in Igaliku Kujalleq, even more so in Igaliku, and with only a light fjord wind.

Wed. July 15: CKM and MN took the day off in Igaliku. In Qaqortoq, FL did the shopping and took the rest of the day off.

Weather: Occasionally a slight fog, otherwise fair and sunny.

Thurs. July 16: CKM and MN finished the 2015 field work by hauling the equipment to the storage, where it was to be sent off for Nuuk and then started preparing for the next field season at Hvalsey. FL returned to Nuuk.

3. THE ARCHAEOLOGICAL INVESTIGATIONS 2015

As mentioned in the introduction, the analysis of artifacts, samples, and survey data, as well as digitalization of the 55 hand drawn plans, is ongoing, and the following site summaries only highlights key findings, as well as provides legislative heritage status and recommendations for future activities at the sites. A full report will be made available at a later time.

3.1 NKAH 5495 (VA 11)

Site Description: NKAH 5495 comprises three features (nos.1-3, Fig.21), which are located just on the southern edge of the outwash plain in front of the Sermeq Kangilleq glacier exactly where the lower mountainside – which otherwise slopes evenly – protrudes slightly outward to form a small foreland (Fig.20). The lowest ruin (no.2) lies just above the plain at ca. 210 masl, features 1 and 3 on the top of the small foreland at 215 masl. Judging from the erosion on the valley sides (Fig.20), this small foreland would have been only approximately 700 m from the front of the glacier during its (LIA?) maximum. Just around and behind the foreland are small patches of lush grass and some mire and above this up slope willow shrub. Otherwise, the vegetation in the area is exceedingly sparse and notably influenced by the very exposed setting, an impression confirmed by our experiences of the site during the excavation, where it was almost always windy from one or the other direction. However, as the vegetation is also presently eroding, lush areas may have extended further during the Norse occupation of the site. Yet, as the mountain rises a further ca. 300 m just behind the site before descending down into the Qooroq Daniel Bruun ("Daniel Bruun's Valley"), the site must lie in shade throughout most of the winter, which it indeed did throughout the noon and early evening even during the mid-late June excavation. In short, the setting of NKAH is marginal, supporting the interpretation that it was could never have been more than some kind of temporarily occupied shieling.

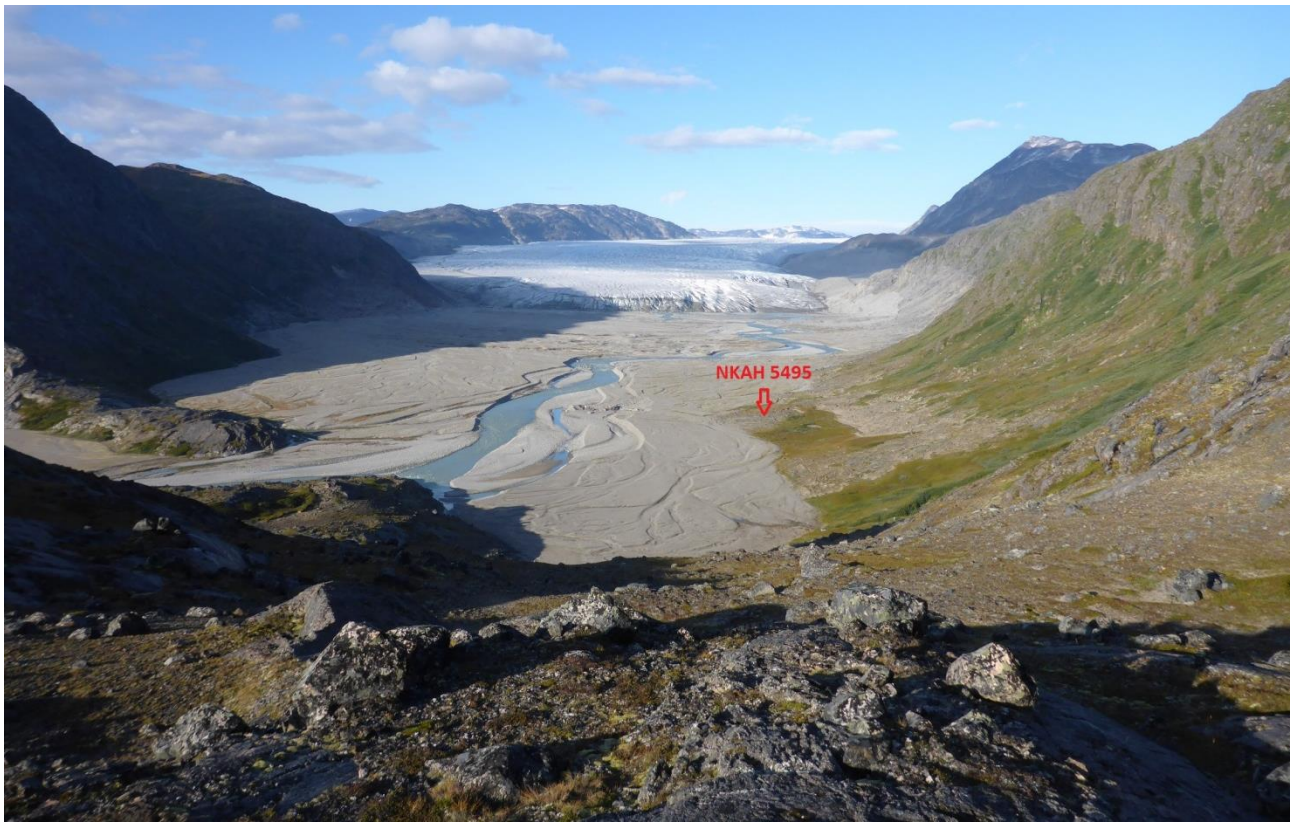

Figure 20 view of the valley and outwash plain in front of the Sermeq Kangilleq with indication of site NKAH 5495 (*photo: C.K. Madsen 2014*).

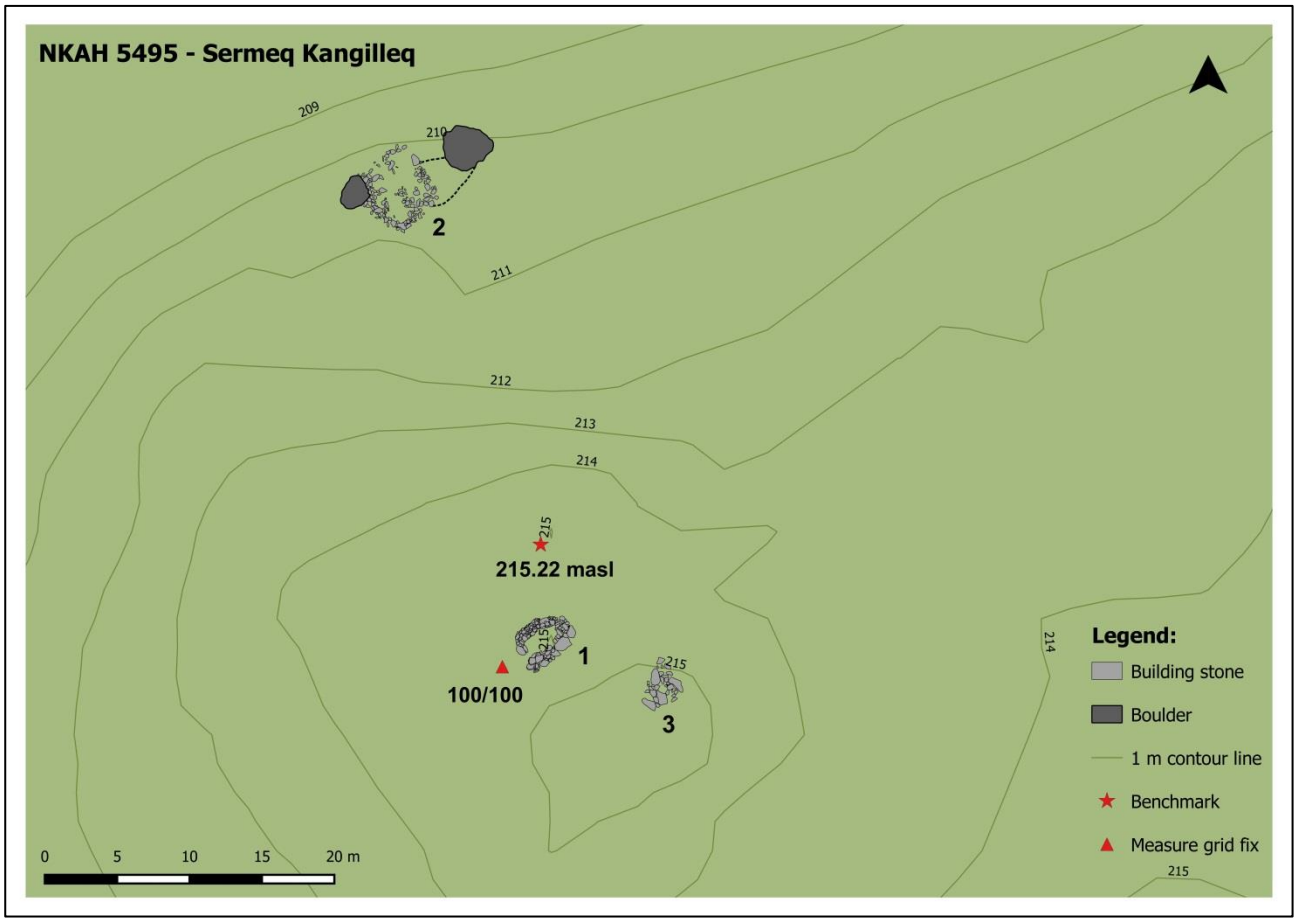

Figure 21 Survey plan of the three features at NKAH 5495: 1) hut/shelter, 2) outbuilding, 3) meat cache(?).

Excavation overview: Lacking central pieces of our DGPS, we had to set up a local measure grid by conventional methods. Using measure tape, we set up a local measure grid system with a fix of 100/100 just west of feature 1, and increasing from there towards the east and north (magnetic). Additional points were staked out with DGPS. A bench mark (BM) was established by carving an "X" into the bedrock just NE of feature 1 and with a clear view to/from all the features. The three features of NKAH 5495 were investigated differently:

- **Feature 1:** was completely excavated with trowel in single context and with 20% sieving of fill layers and 100% of floor layers.
- **Feature 2:** was investigated by a 1 m wide and 4 m long trench across the inside of the feature. The trench was excavated with trowel, and from a depth of ca. 35 cm, by single context and 20% sieving.
- **Feature 3:** was planned and leveled, but otherwise no investigated.

All features were planned by hand, point surveyed with DGPS and leveled with a dumpy level.

Feature 1 Description:

This feature was completely excavated and proved to be of a type not earlier excavated or documented in Greenland. In addition, the feature also included a rare and fairly well-preserved collection of 42 artifacts, of which most had been hidden under a bench or platform. The success of excavation allow us to outline in detail the developmental history of the tiny hut, one of the most remarkable finds to come out of the 2015 investigations:

Figure 22 Photo of sandy/silty layers with vegetation horizons [19] going under the wall of [18], but resting on top of bedrock [21] (*photo: C.K. Madsen 2015*).

Before the house was built, thin vegetation layers with a soil of fine silt [19] covered the bedrock [21] on the hill shelf. It seems likely that 2-3 of the largest boulders [20] that formed part of the hut walls were also already standing on the small hill shelf, when the Norse began building the hut. Whether these boulders were jostled into place or simply used as they lay was impossible to ascertain without demolishing the upper courses of standing wall [18]. In any case, the boulders were all incorporated into the lowest course of the hut walls [18].

The vegetation horizons [19] could be observed over most of the excavation area outside the walls, as well as in silt filled depressions. Although we did have the time to remove the walls, some parts of [19] clearly seemed to continue under the wall [18], suggesting the latter were built directly upon a vegetated surface (Fig.22). Inside the hut, there was no trace of [19]. Whether the vegetation layer was purposefully removed to expose the even bedrock surface [21] or simply worn down to the same effect, could not be established.

Probably using the boulders as a starting point, a ca. 80-85 cm wide (at the base) drystone box wall [18] (Fig.12, 23) was constructed in the shape of a boat, i.e. with a straight gable with doorway in one end, from which slightly curved longwalls extending to meet in an almost pointy opposite gable. The building measured ca. 4.1 x 3.0 m on the outside, and ca. 2.4 x 1.4 m on the inside. At first glance, the walls [18]–especially towards the pointy gable–appeared a poorly built jumble of stones. However, after closer inspection and excavation it became obvious that there was some system to the building technique:

The lower courses were built of mostly of larger stones with at least one fairly flat and even face. Most stones were then laid with this flat side facing upwards in such a manner that it would provide a horizontal building surface, or even more often, a surface slanting slightly towards the wall core. The latter technique probably served to stabilized the walls, but also effected that the walls gradually would have become thinner upwards. Generally, the building stones diminished in size and became more irregular with each course, which was also reflected in the appearance of collapse stone [03-03b], the uppermost preserved wall conveying the most unsystematic impression.

Figure 23 Outside view of the preserved ca. 50 - 60 cm lower courses of the northern long wall [18] of feature 1 (*photo: C.K. Madsen 2015*).

It is possible that the uppermost courses were built with alternating layers of stone and turf, or even pure turf on top of the stone wall. However, because no turf could be observed anywhere in the preserved wall [18], only faint traces of turf lumps could be seen in the wall fill, and the notable amount of collapse stone, it seems unlikely that turf ever constituted any major component in the walls. Judging from the amount of collapse stone [03-03b] removed (Fig.24), the stone walls alone could have stood as high as perhaps 1.4 m. They preserved wall stood to a height of 50-80 cm. The wall fill consisted mostly of silt, sand, and perhaps a few lumps of turf.

Figure 24 Fuuja Larsen next to the collapse stone [03-03b] removed from the feature 1 (*photo: C.K. Madsen 2015*).

Figure 25 The southern niche [17] for a doorframe (*photo: C.K. Madsen 2015*).

The most irregular wall construction was that of the, apparently, "pointy" gable (Fig.12). Whereas at least the lower courses of the inner wall of the gable [18] were as fairly well-built, the outer wall appeared nothing more than a heap of randomly piled stones, now spread out in a broad collapse heap. While this apparent randomness could be a result of a complete wall collapse, the shape of the gable could suggest another explanation: since the pointy gable was placed such as to face the prevailing wind, and storm, direction from the glacier, it could have been a deliberate aerodynamic design meant to lessen the brunt of the wind and storms? If so, the pile of stones could have been just what they appeared during excavation, i.e. stones more or less randomly piled against well-built parts of the gable to reinforce it without compromising its aerodynamic shape.

While building the walls, two small niches we made on each side of the inside of the doorway [16] and [17] (Fig.25), with smaller angled stones, and resting almost directly on bedrock [21]. These niches undoubtedly facilitated wooden posts for a doorframe. Thus, the doorway was only ca. 40 cm wide. Nothing can be said of its height. The posted could then have been fixed by packing the surrounding openings will soil and turfs.

Considering the small dimensions of the hut, it is questionable whether it needed posts for the roof construction, since the rafters could have rested directly upon the inner edge of the wall. However, a detail towards the eastern end of the southern longwall suggests the presence of at least one post: there a niche of ca. 25 x 20 cm was initially built into the wall (Fig.26). In the bottom of the niche, there was a small fissure in the bedrock, which was filled with silt/sand and topped with flag stones [15] (Fig.26). As no floor layer was visible under these first flag stones, they were part of the original built and, perhaps, a post pad for a roof-bearing post? Supporting this interpretation is the observation that there was a smaller niche or recess in the northern long wall directly opposite [15]. If these niches were indeed for posts, their position close to the walls would suggest a later (post-AD 1100) medieval date for the house (Madsen, 2014b). However, no matching pairs of niches or post pads were observed in the opposite end of the hut. But since the floor was solid bedrock, post pads were really not needed. Alternatively,

the niches could have had other function, as they occur commonly in the stone walls of later Norse buildings (e.g., Roussell, 1941; Vebæk, 1943). No charcoal or soot was observed in either of the niches.

A thin–0.4-0.8 cm–floor layer [14] found under the bench [10], flagstones [12], and stone slab lining [13] likely represents the first occupation of the house. The fair amount of scattered small charcoal pieces in the layer would seem to suggest a nearby fireplace, i.e. that the hut was already then used for human occupation, but this is of course by no means certain. Unfortunately, we were not able to separate floor layer [14] from completely similar looking, but stratigraphically younger floor layer [09] found elsewhere in the ruin.

The next clear phase of use of the hut involved some rebuilding and reorganization of the small room, the first two events ([12] and [13]) of which could not be separated stratigraphically: in the eastern end of the hut, the floor was covered with irregular stone flags [13]. At the same time, a number of stone slabs were placed neatly fitted against the eastern half of southern longwall and all the way to the inside tip of the pointy gable [12] (Fig.27). As floor layer [14] was found under the slabs [12], they were clearly a later addition. The exact function of the slabs is unknown, but they may have served to prevent the wall fill of the more poorly built southern long wall from spilling into the building.

Figure 26 The niche (and post pad?) [15] in the southern longwall (*photo: C.K. Madsen 2015*).

Probably at the same time, or at least very shortly after these changes, a bench/platform [10]–measuring only some ca. 1.4x0.6 m–was built of, mostly flat, stones and turf against the northern wall and towards the pointy gable (Fig.28). It was built in such a way that there was a hollow just in front of the small recess. This hollow in the bench/platform could have contained a wooden box, or wooden lining, as poorly preserved wood (x31) was found nearby. It seems most probable that it was a wooden lining, because comb x24 was found resting directly up against the wall with no traces of wood behind it. Although we found little indication of a lid, a very thin blackish layer found on top of and pressed down over some artifacts may have been the poorly preserved remains of a thin lid. In any case, the hollow must surely have had a lid, perhaps just a thin board with a turf on top? Into this hollow, the cache of artifacts [11] were placed and saved for posterity (Fig.11).

Figure 27 One of the flat slabs [12] lined up against the southern longwall (*photo: C.K. Madsen 2015*).

Figure 28 The bench/platform [10] during early excavation. The hollow in the platform is visible on the right as a different colored fill. The black patch is the possible remains of an earlier small short-lived fireplace [05] (*photo: C.K. Madsen 2015*).

A thin floor layer [09]–0.3-0.8 cm of thickness–appears reflect activity at the time when the bench/platform [10] was in use, i.e. the final use phase of the hut. While [09] was the only floor layer in the western half of the feature, stone flags and the central balk made it more difficult to establish in the eastern half. However, finds x1, 3-5 are likely associated with this floor layer.

Figure 29 In the lower right the semi-circular feature [07] in the NW corner of feature 1 (*photo: C.K. Madsen 2015*).

A feature added to the hut only a little later was a small semi-circle of stones build up against the NW corner of the hut [07] (Fig.29). Although no concentration of charcoal or soot could be observed, this could have been a small fireplace or, alternatively, place for an oil lamp? The stones did not rest directly on bedrock [21], but on, or slightly into, floor layer [09], showing that [07] was added later, perhaps shortly after other amendments.

Following the abandonment of the house, the roof appears to have caved in, represented by [06]. In the western end of the hut, the layer was fairly thin and rested directly upon the earlier deposits/ features. In the eastern half of the hut, the turfs of [06] were difficult to separate from those of the bench/platform [10], which unfortunately seems to have had its end exactly in the central balk, meaning that the profile helped little in the interpretation. Still, the profile in the central balk seem to suggest that collapse stone [03a/03b] may have partly filled the hollow, compressing the lower turfs [06] and [10] under them.

During the excavation of the probable roof collapse [06], a small area of burned material (turf and charcoal) [05] (Fig.28) was visible just south of the bench/platform [10]. This was the only place in feature 1, where such a “burned patch” was observed and it could represent a discrete event rather than burned material coming in with the turf. Perhaps [05] represents a small and very temporary fireplace and reuse of the hut as a shelter? If so, it could be associated with the nearby meat cache (feature 3), i.e. a later Thule culture occupation? This can only be resolved through C14-dating of [05].

After this even, the hut gradually fell into to ruin. Although this evidently occurred over many separate events, we could establish two main developments: a phase of “rapid” collapse [03a/03b]-[04], where most of the collapse occurred, at least inside the hut, but probably also outside. The natural infill [04] associated with this collapse phase was more coarse than the other soils excavated, suggesting that [04] was an alluvial deposit, i.e. material washing into the ruin from the collapsing walls, from higher up slope, or both.

The first phase of collapse, was followed by a second phase of less extensive collapse ([02]-[03]), but with considerable infill of aeolian soils [02] both inside and outside the hut. The amount of aeolian soils, and the lack of observable vegetation horizons in between, would seem to suggest a prolonged period of much wind/storm activity. This is also suggested by the increased thickness of aeolian deposits on the sheltered sides of the ruins.

At some point, however, the natural infill of the ruin subsided and a vegetation surface reestablished over most of the ruin [01] (Fig.30). Small deflation areas in the vegetation horizon could suggest more recent increased wind activity.

Figure 30 NKAH 5495’s feature 1 before excavation. Just behind it on the top of the small hill feature 3, a possible meat cache (*photo: C.K. Madsen 2015*).

Feature 2 Description:

Because we had earlier (Madsen, 2014a) initially interpreted feature 2 to be the foundation stones for a roughly circular enclosure, we had not set time aside for excavation of the feature. After finding cultural material in a test pit, we eventually opened a 1 x 4 m test trench across the feature to get some idea of its build and function (Fig.8, 31). However, pressed for time, excavating in very dry conditions, and working in a small trench, we never truly managed to answer these questions:

What we did manage to establish was that feature 2 was a square building measuring approximately 5x5 m divided on two evenly sized, rectangular rooms. The walls were made in alternating layers of turf and stone. The cultural deposits could be followed to a depth of 50-60 m until reaching the steeply sloping bedrock upon the building was erected. Lenses of charcoal in some layers in the western room suggest that it was, at least intermittently, used for human occupation, whereas there was little to indicate the function of the eastern room. Perhaps it was a hut with a hay yard on the side, the latter not being roofed at all. It is possible that feature 2 had an extension in its SE corner, although we did not have the time to clarify this. The ruins relation to feature one remains unclarified.

Figure 31 Drone photograph of NKAH 5495's feature 2 after ended excavation (*photo: C.K. Madsen 2015*).

Feature 3 Description:

Feature 3 is a probable emptied meat cache built 6 m southeast of feature 1. It was constructed of quite large and heavy angular stones, some perhaps taken from feature 1. The spread of collapse stones measures ca. 2.2 x 2.5 m, the chamber only ca. 0.5 x 0.6 m. Meat caches are normally associated with the paleoeskimo or Thule cultures in Greenland and the occurrence of this cache in close proximity to the Norse ruins is probably a result of Thule culture reuse of the site. As mentioned above, feature 3 could have been associated with the fireplace in feature 1 [05]. However, it should be noted that inland meat caches are fairly rare in South Greenland, probably due to the lower number of local caribou populations. Alternatively, but unlikely, the meat cache could be associated with the Norse ruins and shieling activity?

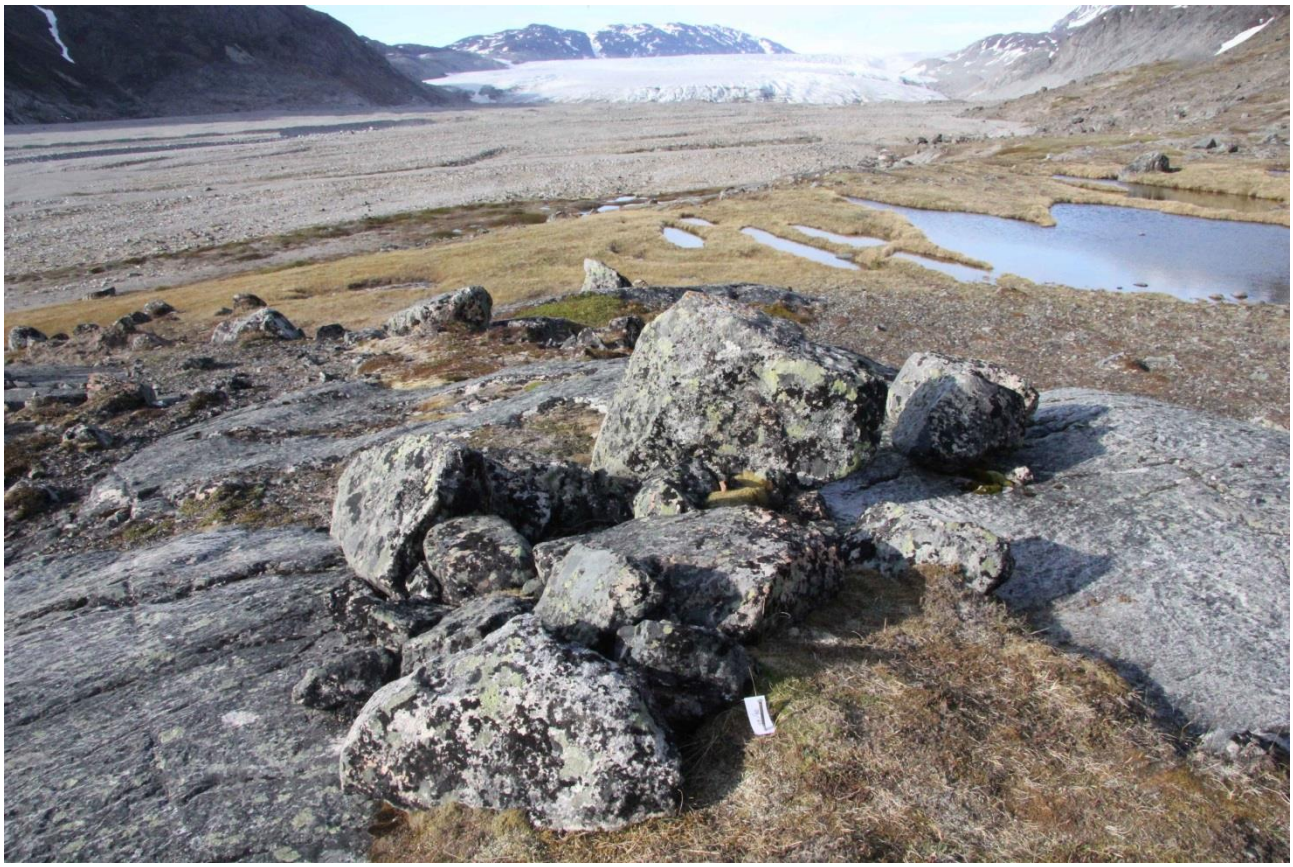

Figure 32 NKAH 5495's feature 3.

NKAH 5495 Summary and Heritage Status:

The 2015 investigations at NKAH 5495 provided new detailed evidence for a Norse house type not previously excavated in Greenland, as well as a rare cache/depot of select artifacts. The reasons why this cache was hidden under the bench/platform of the small hut (feature 1) is puzzling. There is evidence of Thule culture seasonal activity (feaure 3), i.e. a very small and temporary hunting station. Feature 2 was also a Norse outbuilding of unknown use. Although a more comprehensive excavation of feature would be preferable, excavation of a trench across the feature did not produce any finds that would immediately warrant the expenses of such an excavation.

After the 2015 excavation at NKAH 5495, the status of features 1-3 as heritage monuments protected under Inatsisartutlov nr. 11 af 19. maj 2010 has been removed.

NKAH 5495 List of Artifacts:

Artifacts 5495 2015								
X_No	No_finds	Area	Context	Mat_Type	Obj_Type	Detail	Ini	Date
1	1	1	6	Iron	Fragment		FL	23-06-2015
2	1	1	6	Walrus ivory	Worked/preform	Canine, Sawn Mid-section, no root. Ivory	CKM	23-06-2015
3	1	1	6	Iron	Fragment		CKM	23-06-2015
4	1	1	6	Flint/Calcedon	Raw material		CKM	21-06-2015
5	1	1	6	Flint/Calcedon	Raw material	Possible retouche	CKM	21-06-2015
6	1	1	6	Charcoal	Charcoal sample		CKM	25-06-2015
7	1	1	6	Charcoal	Charcoal sample		MN	25-06-2015
8	1	1	6	Charcoal	Charcoal sample		MN	25-06-2015
9	1	1	6	Charcoal	Charcoal sample		MN	25-06-2015
10	1	1	6	Flint/Calcedon	Raw material		MN	25-06-2015
11	1	1	6	Charcoal	Charcoal sample		MN	25-06-2015
12	1	1	6	Charcoal	Charcoal sample		MN	25-06-2015
13	1	1	6	Iron	Fragment		MN	25-06-2015
14	1	1	6	Bone	Other object	Caprine Tooth	MN	25-06-2015
15	1	1	6	Bone	Fragment	Unidentified fragment, Possible Seal 3rd phalanx, proximal fragment	MN	25-06-2015
16	1	1	6	Metal, unknown	Rimsherd		MN	25-06-2015
17	1	1	6	Walrus ivory	Belt buckle	Not intact belt Buckle with trace of Leather and smal nails connecting the bucle with the leather.	MN	25-06-2015
18	1	1	6	Walrus ivory	Raw material		MN	25-06-2015
19	1	1	6	Walrus ivory	Other object	Canine Almost whole, small tusk, Roots visible	MN	25-06-2015
20	1	1	6	Bone	Other object	Medium terrestial mammal Rib. Propably Caprine	MN	25-06-2015
21	1	1	6	Walrus ivory	Gaming Piece	Dam piece, Disk unifinished.	MN	25-06-2015
22	1	1	6	Walrus ivory	Worked/preform	Canine, Sawn root and mid section.	MN	25-06-2015
23	1	1	6	Steatite	Other object		MN	25-06-2015
24	1	1	6	Antler	Comb	Double sided composite comb. Caribou antler and bone?	MN	25-06-2015

Artifacts 5495 2015								
X_No	No_finds	Area	Context	Mat_Type	Obj_Type	Detail	Ini	Date
25	1	1	6	Walrus ivory	Raw material	Canine, Large part of distal tusk.	MN	25-06-2015
26	1	1	6	Charcoal	Charcoal sample		MN	25-06-2015
27	1	1	6	Bone	Other object	Unidentified fragment	MN	25-06-2015
28	1	1	6	Bone		Caprine horn core. Very dry .	MN	25-06-2015
29	1	1	6	Walrus ivory		Probably sawn, gaming piece?	MN	25-06-2015
30	1	1	6	Walrus ivory		Walrus canine or penis bone? Possible cheisel marks.	MN	25-06-2015
31	1	1	6	Wood	Other object		MN	25-06-2015
32	1	1	6	Iron	Fragment		MN	25-06-2015
33	1	1	6	Walrus ivory	Gaming Piece	Gaming piece. Disc.	MN	25-06-2015
34	1	1	6	Stone, unknown	Raw material	Heavy and hard red material with signs of worked edges.	MN	25-06-2015
35	1	1	6	Antler	Worked/preform	Drilled and sawn. Comb or comb case fragement?	MN	25-06-2015
36	1	1	6	Iron	Other object	Knife fragment?	MN	25-06-2015
37	1	1	6	Wood	Worked/preform	Wooden Panel?	MN	25-06-2015
38	1	1	6	Bone		Large cattle horn core. Bull? Very dry.	MN	25-06-2015
39	1	1	6	Charcoal	Charcoal sample		FL	27-06-2015
40	1	1	6	Iron	Fragment		MN	25-06-2015
41	1	1	6	Walrus ivory	Raw material	Was part of x2 2.Post Canine, Very large. Proximal end sawn horisontally at a 45 degree angle. Exposed dentene IGL's.	CKM	04-11-2015
42	1	1	6	Iron	Fragment	Was part of x32	MN	06-11-2015

3.2 NKAH 5496 (VA 10)

Site Description: NKAH 5496 comprises two features (nos.1-2), which are located on the top of a ridge just south of the glacial meltwater river from the Sermeq Kangilleq glacier, only some 550 m W of NKAH 5495 (Fig.33). According to the hydroelectric plant expansion plans, this ridge will constitute the southern end of the future dam, which will crosscut the valley to connect with the lower northern ridge (Fig.33). Feature no. 1 lies in a sheltered niche below the top of the ridge, whereas feature no. 2 lies in the lowest part of the saddle between the top of the ridge and the ascending mountain side. Lying at an altitude of ca. 237 masl (feature 1) and 235 masl (feature 2), none of the features will be flooded by the dam, or disturbed by the road. However, the area has been suggested as a potential quarry for building material, therefore necessitating archaeological investigation of the two features.

Before the 2015, feature no.1 was interpreted as a hunter's bed (Madsen, 2014a) and feature 2, a small meat cache under a boulder, had not been identified (which it was in 2015). The combination of these types of features and their location with a good and sheltered view of the entire glacial valley, as well as control of the only present pass over the ridge, initially led us to interpret NKAH 5496 as a caribou hunting station, something rarely identified in South Greenland. However, our excavation of feature 1 proved it to be a square Norse animal fold rather than a hunter's bed. While it is perhaps surprising that such a feature was not placed near the nearby shieling NKAH 5495, the two sites may not have been in contemporary use, or the location of feature 1 may have to do its control of passage over the ridge, i.e. controlling the movement of animals over the ridge, which would make the entire area up to the Sermeq Kangilleq glacier somewhat of a naturally delimited grazing area.

Figure 33 180 degree view of the glacial outwash plain in front of the Sermeq Kangilleq glacier with indication of the neighboring sites of NKAH 5495 and 5496 (*photo: C.K. Madsen 2015*).

Excavation overview: A local measure grid was established using measure tape with a fix of 100/100 1 m south of the feature. This grid was then later DGPS-surveyed, using the same benchmark as at NKAH 5495 (Fig.21). The two features of NKAH 5496 were investigated differently:

- **Feature 1:** First having planned the feature (Fig.34), two test pits of ca. 40x40 cm, one outside the feature, one inside and up against its western wall, were excavated with trowel without sieving. Since only natural aeolian deposits could be observed and for considerable depth in these test pits, time constraint forced us to empty the inside of the feature with spade and shovel, only the lowest layers being excavated with trowel. Finally, the bottom of the feature was photographed and the profile documented.
- **Feature 2:** being located under a boulder lying on bedrock, feature 2 was simply described, photographed and point surveyed.

Feature 1 Description:

This feature was emptied completely, providing evidence of a Norse animal enclosure with a type of architecture not hitherto observed in Greenland (until the excavation of NKAH 5500's ruin no.3 2015, see below): on three of its sites, feature 1 was built of massive oblong (80-100 cm long) stones placed on one end–similar to obelisks or gravestones–so as to form a squared enclosure measuring ca. 2.35 x 2.75 m on the outside and 1.7 x 1.8 on the inside (Fig.34). There was no trace of fill–neither smaller stones, nor turfs–between the stones, suggesting that the gaps were open (but in any case not large enough to allow even lamps to escape) (Fig.35). How the Norse managed to balance the singular stones is unclear. Perhaps they dug them somewhat into the soil, but this cannot be confirmed by any cuts. The eastern side of the enclosure was made up of a low vertical cliff face that provided complete shelter from the prevailing wind/storm direction from the ice. There was some form of wall construction in association with this cliff face, but the size of the stones and their state of collapse made it too dangerous four us to remove them.

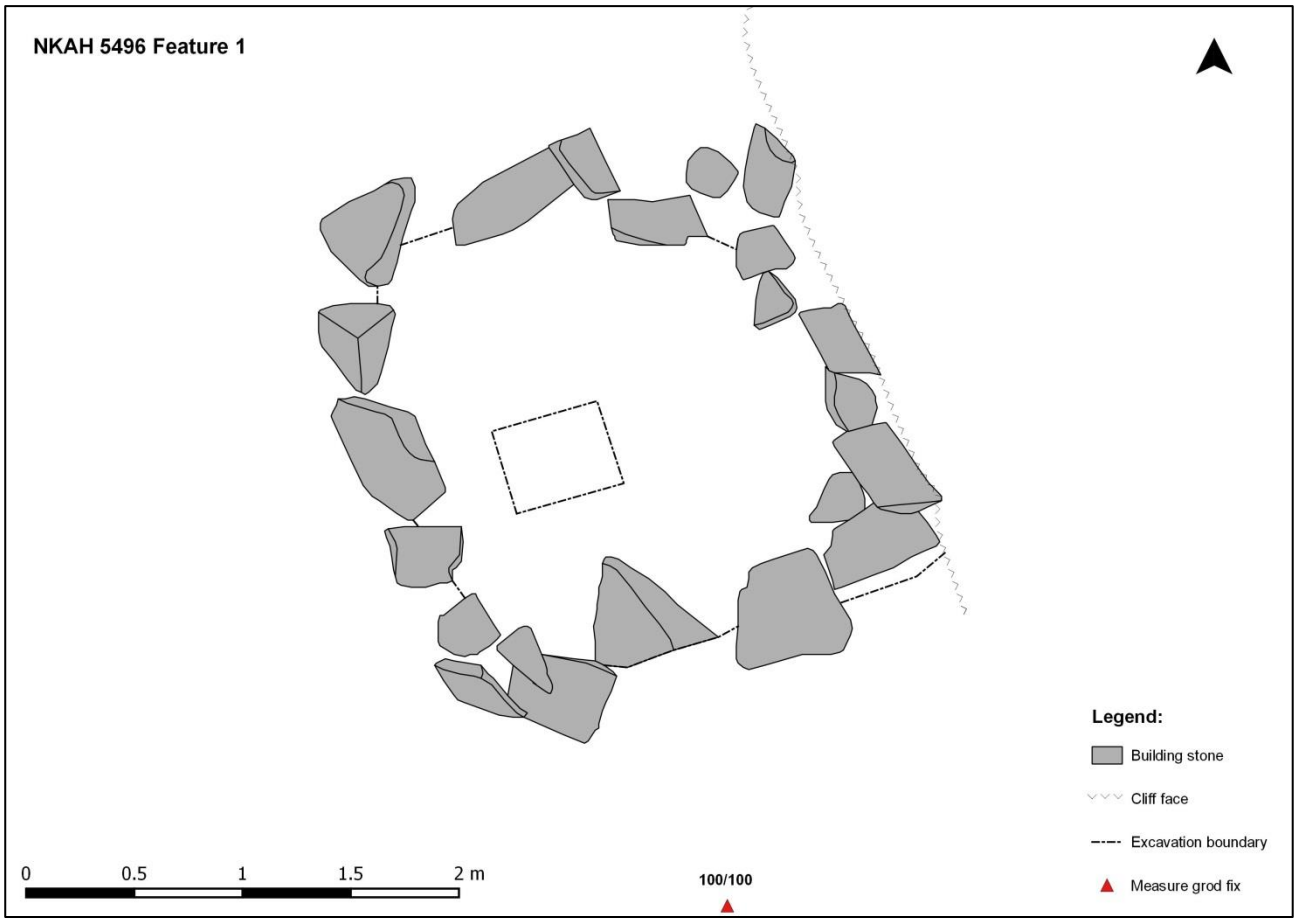

Figure 34 Excavation plan of NKAH 5496's feature 1 with indication of excavated areas, including a central test pit, and the measure grid fix 100/100.

Although the excavations was far from satisfactory and we made no finds whatsoever inside the feature, we are confident in our interpretation of the feature as a Norse animal enclosure on the following grounds: Being built up against a low vertical cliff that provided complete shelter from the prevailing wind/storm direction, facing SW to maximize solar heating, and located such as to control the movement of animals between areas, are all typical characteristics of Norse animal enclosures that apply to NKAH 5496's feature 1.

Figure 35 NKAH 5496's feature 1 after finished excavation and reaching a (old vegetation?) layer with fist sized. Note the upright stones of the western wall (*photo: C.K. Madsen 2015*).

Feature 2 Description:

This feature was a small meat cache made by building a low wall (1-2) courses of rounded stones up against and, mostly, under a wind exposed boulder in the saddle between the top of the ridge and the mountain side only some 240 m SSE of feature 1. Unfortunately, no photo or further description exists.

NKAH 5496 Summary and Heritage Status:

The 2015 investigations at NKAH 5496 provided evidence of a Norse animal enclosure (feature 1) with architecture of a type not hitherto observed in Greenland (until the excavation of NKAH 5500's ruin no.3 2015, see below). Although the excavation yielded no cultural or datable material whatsoever, the excavation at least managed to exclude the prior interpretation of the feature as a hunter's bed (Madsen, 2014a). Being built up against a low vertical cliff that provided complete shelter from the prevailing wind/storm direction, facing SW to maximize solar heating, and located such as to control the movement of animals between areas, are all typical characteristics of Norse animal enclosures that apply to NKAH 5496's feature 1. The nearby meat cache (feature 2) may, as at NKAH 5495, be related to later Thule culture reuse of the Norse enclosure, or simply inland hunting activities. Considering the substantial aeolian deposits filling the inside of feature 1, it is not unlikely that other features could be buried under the sand on the sheltered sides of the ridge. This is, however, impossible to ascertain without massive excavation. Thus we conclude that:

After the 2015 excavation at NKAH 5496, the status of features 1-2 as heritage monuments protected under Inatsisartutlov nr. 11 af 19. maj 2010 has been removed.

3.3 NKAH 5498 (VA 13)

Site Description: NKAH 5498 comprises one feature (no.1) located on the side of a valley at the foot of the northeast Vatnahverfi mountains. The site was located in 2005 (Møller & Madsen, 2006) and revisited in 2014 (Madsen, 2014a). Because NKAH 5498 will likely be destroyed by the building of the road to the dam worksite, it was also on the list of sites to be investigated in 2015. However, because of the slight nature of this feature, the fact that it was established on naked bedrock, and being pressed for time, we eventually decided that any test trenching and excavation of the feature would be time ill-spend, compared to what we could achieve at NKAH 5500 (see field diary above). Thus, NKAH 5498 was not revisited in 2015, but we instead refer to the earlier descriptions.

Feature 1 Description:

Based on the earlier descriptions and photographs, feature 1 was a stone foundation for a turf wall, probably built directly onto the bedrock (Fig.36). The wall measured about 6 m in length, continuing down slope towards a small stream over another 2 m (not visible in the photo). The wall could not be seen on the other side of the stream or further up slope.

NKAH 5498 Summary and Heritage Status:

Unless the rest of the wall has completely disintegrated or been buried in soil, the single wall of NKAH 5498 could hardly have had a practical bounding/blocking function, since there is easy passage both below and above it. It seems more likely that the feature was some kind of symbolic boundary marker, perhaps demarcating grazing rights between the Norse farms 3876 (Ø64a) and 3877 (Ø64c) (Fig.3)?

Figure 36 NKAH 5498's feature 1 (*photo: C.K. Madsen 2014*).

After the 2015 investigation at NKAH 5498, the status of feature 1 as heritage monument protected under Inatsisartutlov nr. 11 af 19. maj 2010 has been removed.

3.4 NKAH 5500 (0502)

Site Description: NKAH 5500 comprises at least 9 separate features, which lie around a meadow/mire in the valley floor of a small unnamed and almost triangular valley on the southern edge of the sandur (Fig.3) (which we dubbed "Valley of the Flies"). The hills surrounding the valley rise no more than 80-110 masl, which is still enough to provide very sheltered conditions in the valley. The slopes of the valley sides are covered in meter thick layers of fine aeolian sediments, massive sand dunes and vegetation that could easily hide additional features. According to the hydroelectric plant expansion plans, the road to the work site by the dam in front of Sermeq Kangilleq will run along the southern edge of the valley, potentially disturbing ruins nos. 1-3, a documentation and excavation of which were the aims of the 2015 investigation.

NKAH 5500 was first recorded and surveyed in 2005 (Møller & Madsen, 2006), an additional brief survey and inspection being carried out in 2014 (Madsen, 2014a). During these surveys, and later analysis, NKAH 5500 was interpreted as a Norse shieling (Madsen, 2014b; Møller & Madsen, 2006). However, the 2015 investigations revealed that NKAH 5500 was in all likelihood an entire Norse farm focused on the exploitation of the natural meadow. Several additional features were located in 2015, among them a probable farmhouse that is now emerging from a sand dune. Test pits and surface finds suggest excellent preservation conditions. Also, a likely "snow managed system" was documented for the first time in Norse Greenland. The almost complete excavation of ruins nos. 2-3 in 2015 added new detail evidence on the use of the site, but await further analysis. The below only describes the features investigated 2015, refer to the prior publications for description of the other features.

Figure 37 Evening view of the small triangular valley with NKAH 5500 with indication of animal fold no.1 and the new farmhouse, ruin no.6, on opposite sides of the valley (*photo: C.K. Madsen 2015*).

Figure 37 Evening view of the small triangular valley with NKAH 5500 with indication of animal fold no.1 and the new farmhouse, ruin no.6, on opposite sides of the valley (*photo: C.K. Madsen 2015*).

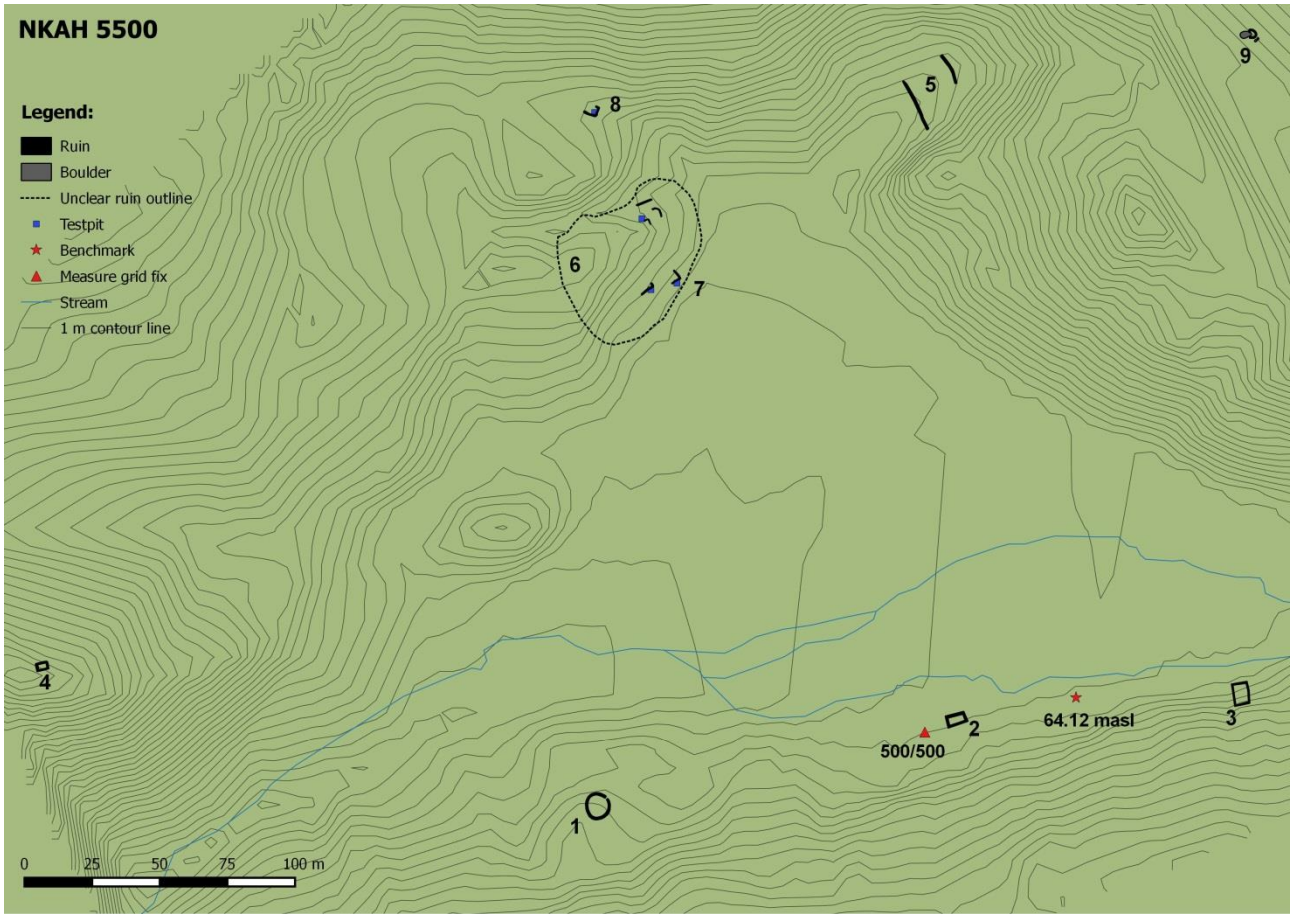

Figure 38 Temporary site plan of NKAH 5500 with indication of ruins and excavation elements. Note that the survey plan is based on several separate DGPS-surveys and only provisory (*photo: C.K. Madsen 2015*).

Excavation overview: We set up a local measure grid by conventional methods with a fix of 500/500 just west of feature 2 (Fig.38), from where the grid was extended with the DGPS. A bench mark (BM) was established by carving an "X" into a boulder about halfway between features 2 and 3, visible from both features (Fig.38). The three features excavated at NKAH 5500 were investigated by different methods:

- **Feature 2:** was completely excavated with trowel in single context and with 20% sieving of fill layers and 100% of floor layers. The ruin was not backfilled.
- **Feature 3:** was investigated by a 1 m wide and ca. 4.5 m long trench across the inside of the feature, as well as in a perpendicular area on the south side of the feature. The top of the walls were exposed as well. The upper layers were excavated with shovel and spade, the lower and the walls with trowel. No layers were sieved. The ruin was not backfilled.
- **Feature 6:** was only investigated with three ca. 50x50 cm test pits on its edges. All of these test pits were excavated with trowel. All features were planned by hand, point surveyed with DGPS and leveled with a dumpy level. The test pits were backfilled.

Figure 39 Drone photograph of feature 1, a circular animal enclosure. Note the wall running up to the enclosure from the left (*photo: M.N. Nielsen 2015*).

Feature 1 Description:

This ruin is a somewhat collapsed circular animal fold build on a gently sloping bedrock surface in the SW corner of the valley. The feature was identified and surveyed in 2005 (Møller & Madsen, 2006). Because of the large number of collapse stone and we decided it would be a poor use of our time to plan them in the field. Instead, with the DGPS we staked out 6 control points (F1-F6 written on white plastic plates), and then photographed the feature with drone for later georeferenced and feature planning (Fig.39). The aerial photography revealed a stone foundation for a wall/dyke running from the edge of the circular enclosure an up to a steep cliff face some 18 m south of the enclosure. Since feature 1 was built directly on the bedrock, there was no need to excavate.

Feature 2 Description:

Feature 2 proved very difficult to excavate because the previously water-logged conditions inside the feature. The analysis of the stratigraphy is ongoing, but an overview of the results can be summarized: Feature 2 proved to be the fairly heavy set stone foundation for a turf outbuilding. The foundation was laid out as fairly regular parallel lines of stones, with some additional stone filling in between (Fig.40). As at NKA 5495's feature 1, the stones were placed with a fairly flat surface facing upwards, or even more often, slanting slightly towards the wall core. Judging from the removed collapse stone, the gables also included a good deal of stonework. The spread of collapse stone suggest that the gables collapsed eastwards, i.e. the western

gable collapsed into the building, whereas the eastern gable collapse fell outside the building. We also excavated a ca. 1 - 1.5 m wide area along the northern long wall, which proved that the narrow (Fig.40) doorway had been, at least partially, stone set. The inside of the building revealed several use periods, the latest of which was probably human occupation, whereas it may perhaps initially have had function as a sheep/goat shed. Excavated datable material and samples may reveal this in future analyses.

Figure 40 Drone photograph of feature 2, a rectangular outbuilding after ended excavation (*photo: C.K. Madsen 2015*).

Feature 3 Description:

Feature 3 was earlier interpreted as a square outbuilding or animal fold (Møller & Madsen, 2006). The 2015 excavation clearly showed that it was an animal fold, indeed square of shape, and built of a single line of large stones/boulders (Fig.41) placed on end like obelisks or tombstones, a building style not earlier described from the Norse Greenland settlements, but very reminiscent of the technique used at NKAH 5496 (cf. Fig.36). In the southern part of the enclosure, a separate square stone feature and nearby stone slab was excavated (Fig.18). This feature could be a fireplace, i.e. a later reuse of the animal fold as a shelter? If so, the reuse must have taken place immediately after the abandonment of the primary function of feature 3, as the stone setting was located at the very bottom of feature 3, i.e. being covered by ca. one meter of aeolian deposits. Unfortunately, the excavation of feature 3 did not unearth even a single speck of charcoal or any other cultural material, resulting that the interpretation of the stone setting will remain uncertain.

Figure 41 Drone photograph of feature 3, a square animal enclosure after ended excavation. Note the small stone setting in the southern part of the feature (*photo: C.K. Madsen 2015*).

Feature 5 Description:

Feature 5–two parallel dykes cutting across a recess in the valley–was surveyed and described in 2014, at that time registered under VA14 (Madsen, 2014a). Already then, the dykes were tentatively interpreted as part of an irrigation system meant to inundate the meadow. In 2015 we able to build on this interpretation by observing (Fig.42) that the dykes were placed exactly where a sizable snowdrift managed to survive into July. According to the sheep farmer Andala Lund, this snowdrift is always one of the latest to melt, making it a lasting freshwater resource. If this was indeed the purpose of the dykes, it is the first recorded of "snow management" in Norse Greenland.

Feature 6 Description:

Feature 6 is the new presumed Norse farmhouse–perhaps of the centralized type–emerging from under a sand dune. Although we had the earlier years been puzzled by this very green dune (Fig.43), we had never seriously considered the massive sand dune a ruin. However, this spring, part of it had slid down exposing lines of stones. Upon closer inspection,

Figure 42 photograph of one of the dykes of feature 5 and the melting snow drift in the beginning of July (*photo: C.K. Madsen 2015*).

Figure 43 View of the newly discovered probable farmhouse (ruin no. 6, in the front ruin no.7 (*photo: C.K. Madsen 2015*).

these stones lay in lines with right angles, clearly indicating the presence of several rooms, in not separate outbuildings. One line of stones, at least, (feature 7) appears a separate building. The excavation of three test pits on the edge of the sand dune confirmed the presence of well-preserved cultural material in all of them. On the back side of the sand dune, bone, wood, steatite, and metal artifacts could be collected from the eroding surface.

Feature 7 Description:

Feature 7 is a probable separate outhouse on the edge of the massive sand dune covering feature 6. Little else can be said about the function and nature of this building at present.

Feature 8 Description:

Feature 8 was also visible on the surface as almost buried, but parallel lines of stones, behind and up slope from feature 6 (Fig.44). A single test pit with cultural deposits revealed that this is undoubtedly another building. Little else can be said about the function and nature of this building at present.

Feature 9 Description:

Feature 9 is a dry stone masonry building lying some 100 m east of the valley on the wind exposed side of a cliff (Fig.45). The walls are in places preserved to a height of 1 m (5 courses) and are ca. 80 cm wide. The bottom of the feature is filled with alluvial deposits coarse sand. The feature is undoubtedly a skemma, i.e. a building for drying meat.

Figure 44 the newly discovered feature 8 (*photo: C.K. Madsen 2015*).

NKAH 5500 Summary and Heritage Status:

The 2015 investigations at NKAH 5500 transformed our interpretation of the site from that of a shieling to a full-fledged Norse farm, and furthermore one with excellent preservation. The excavation of feature nos. 2-3, which are still undergoing analysis, provided new evidence on the architecture of domestic livestock buildings, as well their changing use over time. Additional ruins we located, and a pair of walls interpreted as part of a "snow management" system. To summarize:

After the 2015 investigation of NKAH 5500, the status of feature nos. 1-3 as heritage site protected under Inatsisartutlov nr. 11 af 19. maj 2010 has been removed, i.e. the ruins can be removed if need be, although it is preferably avoided. Furthermore, with the findings of new ruins with excellent preservation completely buried under sand deposits, we stress that no part of the valley north of the stream may be used for digging out materials. Also, we advice that an archaeologist be present if sand dunes or similar deposits are excavated south of the stream.

Figure 45 the newly discovered feature 9 (*photo: C.K. Madsen 2015*).

NKAH 5500 List of Artifacts:

Finds 5500 2015								
X_No	No_finds	Area	Context	Mat_Type	Obj_Type	Detail	Ini	Date
1	1	2	2	Charcoal	Charcoal sample	Sample	M.N	02-07-2015
2	1	2	2	Charcoal	Charcoal sample	Sample	M.N	02-07-2015
3	1	2	2	Bone			M.N	02-07-2015
4	1	2	4	Sandstone, other	Whetstone	Fragile, with traces of other materials.	F.L	02-07-2015
5	1	2		Bone	Other object	?	C.K.M	02-07-2015
6	1	2	3	Charcoal		Western half of structure	F.L	02-07-2015
7	1	2	3	Charcoal		Kontext 03? Western half of structure	C.K.M	02-07-2015
8	1	2		Bone	Other object		C.K.M	02-07-2015
9	1	2	3	Bone	Other object	Fragile Pieces of Bone	FL	02-07-2015
10	1	2	3	Bone	Other object	Fragile sample of Scabula	FL	03-07-2015
11	1	2		Bone	Other object		M.N	03-07-2015
12	1	2		Charcoal	Charcoal sample		M.N	03-07-2015
13	1	2	4	Bone	Other object	Calf tooth?	M.N	03-07-2015
14	1	2	4	Charcoal	Charcoal sample	Eastern side of structure	M.N	03-07-2015
15	1	2	5	Bone	Other object	Tooth,sheep?	F.L	04-07-2015
16	1	2	5	Bone	Other object		F.L	04-07-2015
17	1	2	5	Charcoal	Charcoal sample		F.L	03-07-2015
18	1	2	7	Charcoal	Charcoal sample	Sample for dating the oldest chronology east end of the building	C.K.M	05-07-2015
19	1	2	7	Charcoal	Charcoal sample	Sample for dating the oldest chronology west end of the building	F.L	05-07-2015
20	1	2	7	Charcoal	Charcoal sample	Under the Bench, for dating	F.L	05-07-2015
21	1	2	5	Charcoal	Charcoal sample	from the entrence opening	C.K.M	06-07-2015
22	1	6		Stone, unknown	Other object	Stray find around feature 6	M.N	01-07-2015
23	1	6		Stone, unknown	Other object	Stray find around feature 6	M.N	01-07-2015
24	1	6		Steatite	Rimsherd	Stray find around feature 6	M.N	01-07-2015
25	1	6		Steatite	Other object	Stray find around feature 6	M.N	01-07-2015
26	1	6		Steatite	Rimsherd	Stray find around feature 6	M.N	01-07-2015
27	1	6		Steatite	Other object	Stray find around feature 6	M.N	01-07-2015
28	1	6		Steatite	Vessel fragment	Stray find around feature 6	M.N	01-07-2015
29	1	6		Steatite	Rimsherd	Stray find around feature 6	M.N	01-07-2015
30	10	6		Bone	ZooArch sample	Stray find around feature 6	M.N	01-07-2015

Finds 5500 2015								
X_No	No_finds	Area	Context	Mat_Type	Obj_Type	Detail	Ini	Date
31	4	6		Steatite	Other object	Stray find around feature 6	M.N	01-07-2015
32	1	6		Sandstone, other	Fragment	Stray find around feature 6	M.N	01-07-2015
33	1	6		Flint/Calcedon	Fragment	Stray find around feature 6	M.N	01-07-2015
34	1	6		Iron	Iron nail	Stray find around feature 6 Could be between Norse and to 18-1900. No certain kontext.	M.N	01-07-2015
35		6		Charcoal	Charcoal sample	Testhole 2	M.N	01-07-2015
36		6		Bone	ZooArch sample	Testhole 2	M.N	01-07-2015
37	1	6		Steatite	Spindle	Testhole 3	M.N	01-07-2015
38	1	6		Bone	Worked/preform	Testhole 3	M.N	01-07-2015
39	1	6		Steatite	Fragment	Testhole 3	M.N	01-07-2015
40		6		Bone	ZooArch sample	Testhole 3	M.N	01-07-2015
41		6		Charcoal	Charcoal sample	Testhole 3	M.N	01-07-2015

3.5 NKAH 4318 (Ø66)

Site Description: NKAH 4318 (Ø66) comprises at least 30 individual features, of which no.1 by the planned harbor was the only feature investigated archaeologically in 2015 (Fig.46). Presently, a gravel road of about 2.8 m width leads from the harbor at Igaliku Kujalleq and into the central Tasikuluulik/Vatnahverfi. This gravel road has already disturbed ruin no. 1–a stone built Norse ware- or boathouse–"cutting off" its western end. In the late 19th century when ruin no.1 was first recorded in detail (Holm, 1883), it was almost an entirely preserved and impressive building. At some point after the early 20th century establishment of a sheep farming community at Igaliku Kujalleq, ruin no. 1 was partially demolished and most of the stones of the Norse warehouse used to build a new warehouse on the other side of the gravel road (not shown on the map, Fig.47). Today, ruin no. 1 is only visible as 1-2 courses of uneven wall. Nonetheless, the ruin is important to our understanding of the Norse church manor at Igaliku Kujalleq. Because the latter is a key site in a present UNESCO world heritage application, the warehouses have gained in heritage importance, as it is the first ruins visible as one embarks from the harbor.

In 2015, the aim of our investigation was to establish whether a widening of the existing road to ca. 3 m in connection with the hydroelectric plant extension would cause disturbance of any of the two warehouses (Fig.46). The minimum distance between the two warehouses is ca. 3.3 m, suggesting that there was no immediate conflict. However, to make sure that the road would not disturb any remaining part of ruin no.1 potentially buried under the road and younger sediments, we put in a small test trench up against the wall of the more recent warehouse (Fig.19, 48.).

Figure 46 View of the existing gravel road between the two warehouses, on the left the more recent one, on the right Norse ruin no.1 (photo: C.K. Madsen2015).

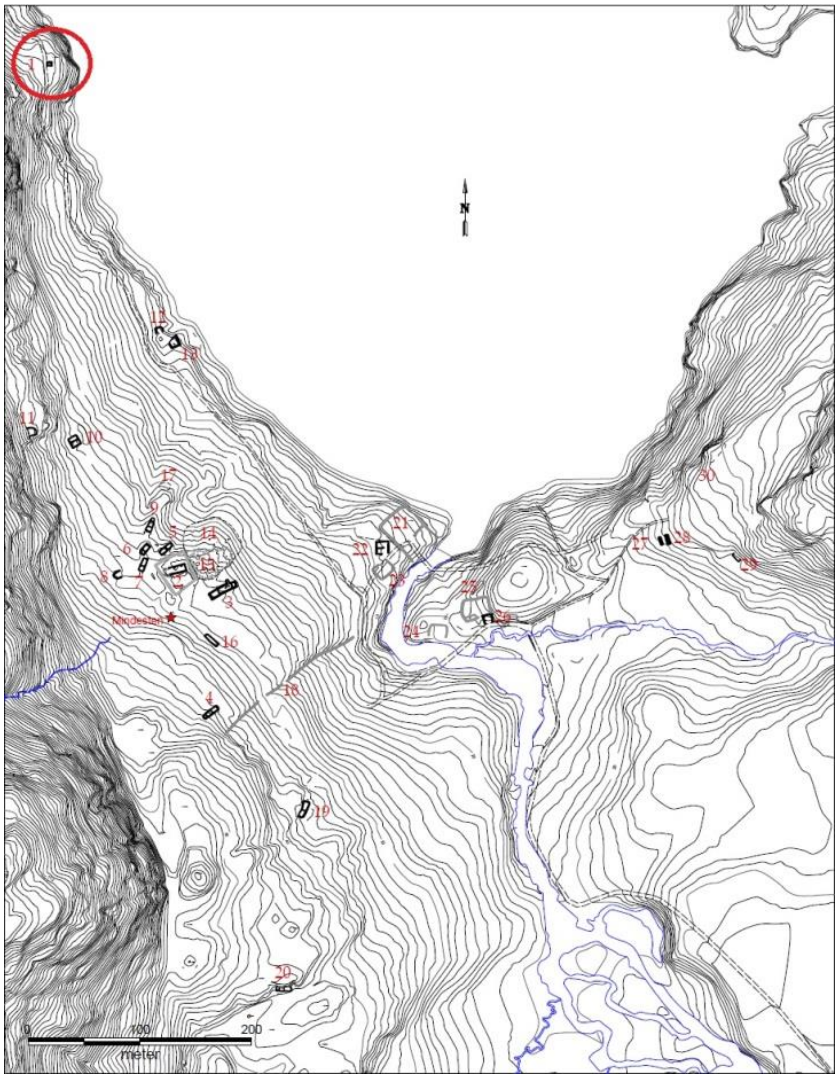

Figure 47 Plan of the ruins and terrain at NKAH 4318 (Ø66) with indication of ruin no.1 (*plan modified after Clemmensen and Kapel 2011*).

Excavation overview: A small trench of 80 x 50 cm up extending towards the gravel road from the wall of the recent warehouse was established with measure tape. The trench was then excavated with trowel without sieving. The trench bottom and southern section (Fig.19) was planned (Fig.47) and photographed. Since a precision survey already existed of the ruin (Clemmensen & Kapel, 2011), we only DGPS-surveyed the outline of the trench, which was finally backfilled.

NKAH 4318 Summary and Heritage Status:

Only a single 80 x 50 cm trench was excavated at NKAH 4318 (Fig.19, 48), which revealed few cultural traces. Thus it seems that the Norse warehouse (ruin no. 1) did not extent further west than the present gravel road. The minimum distance between the recent and the Norse warehouse is 3.3 m.

In terms of archaeological evidence, the investigations at NKAH 4318 provided little new information. However, the trench did allow us to propose that ruin no.1 never extended beyond the current gravel road. In terms of road construction, we therefore stress that:

All ruins at NKAH 4318 are protected under Inatsisartutlov nr. 11 af 19. maj 2010. Any expansion of the existing gravel road between ruin no,1 and the more recent warehouses that ***exceeds 3 m*** *must by law be preceded by an actual archaeological investigation. Furthermore, we ?? that an archaeologist must be present if sediments are removed from or filled onto the existing terrain, as such activity could easily disturb existing or buried heritage features.*

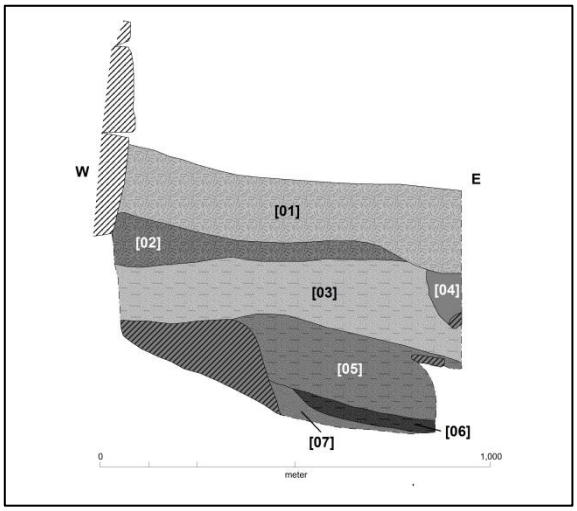

Fig.48 The northern profile of the trench excavated at NKAH 4318.

4. CONCLUSION

This report has presented the preliminary results from an archaeological field campaign carried out June 12 to July 16 2015 in preparation of a planned expansion of the hydroelectric plant of Qorlortorsuaq. The campaign was carried out by Greenland National Museum & Archives on behalf of and funded by Nukussiorfiit. In total, five Norse sites (NKAH 4318 (Ø66), 5495 (VA11), 5496 (VA10), 5498 (VA13), and 5500 (0502)) in the northeastern Vatnahverfi were investigated. The sites represent 2 shielings (NKAH 5495, 5495), a boundary marker (NKAH 5498), and two farms (NKAH 4138, 5500), the latter newly discovered during the campaign. Five Norse features were fully or partially excavated: A new type of hut/shelter, an economy-building, a sheep/goat shed (possibly reused as hut/shelter), and two animal folds, resulting in the retrieval of 83 artifacts and 27 samples. In addition, test trenches were excavated at NKAH 4318 - 5500. All archaeological features at the sites were precision surveyed (except for Ø66/KNAH 418/Igaliku Kujalleq, where a prior detail survey existed). Considering time pressure and difficult excavation conditions, we consider the campaign a great success. After the 2015 investigations, the heritage status of the sites can be summarized accordingly:

- *At NKAH 5495 (VA 11), the status of features nos. 1-3 as heritage monuments protected under Inatsisartutlov nr. 11 af 19. maj 2010 has been removed.*

- *At NKAH 5496 (VA 10), the status of features nos. 1-2 as heritage monuments protected under Inatsisartutlov nr. 11 af 19. maj 2010 has been removed.*

- *At NKAH 5498 (VA 13), the status of feature no. 1 as heritage monument protected under Inatsisartutlov nr. 11 af 19. maj 2010 has been removed.*

- *At NKAH 5500 (0502), the status of feature nos. 1-3 as heritage site protected under Inatsisartutlov nr. 11 af 19. maj 2010 has been removed. Furthermore, with the findings of new ruins with excellent preservation completely buried under sand deposits, we stress that no part of the valley north of the stream may be used for digging out materials. Also, we advice that an archaeologist be present if sand dunes or similar deposits are excavated south of the stream.*

- *At NKAH 4318 (Ø66), all the ruins are protected under Inatsisartutlov nr. 11 af 19. maj 2010. Any expansion of the existing gravel road between ruin no,1 and the more recent warehouses that* ***exceeds 3 m*** *must by law be preceded by an actual archaeological investigation. Furthermore, we stress that an archaeologist must be present if sediments are removed from or filled onto the existing terrain, as such activity could easily disturb existing or buried heritage features in an area that is being nominated as a UNESCO world heritage area.*

Although the protection of several heritage monuments has been removed, we advise that the monuments be spared from destruction/disturbance if at all possible. We also advise that disturbance caused by building activities in the nominated UNESCO areas be kept to a minimum.

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