Frigga Kruse

Pomor Archaeology in Svalbard (RiS ID 10194)

Chemical analysis of soil samples (SEPF project no. 15/73)

Final report 10.11.2017

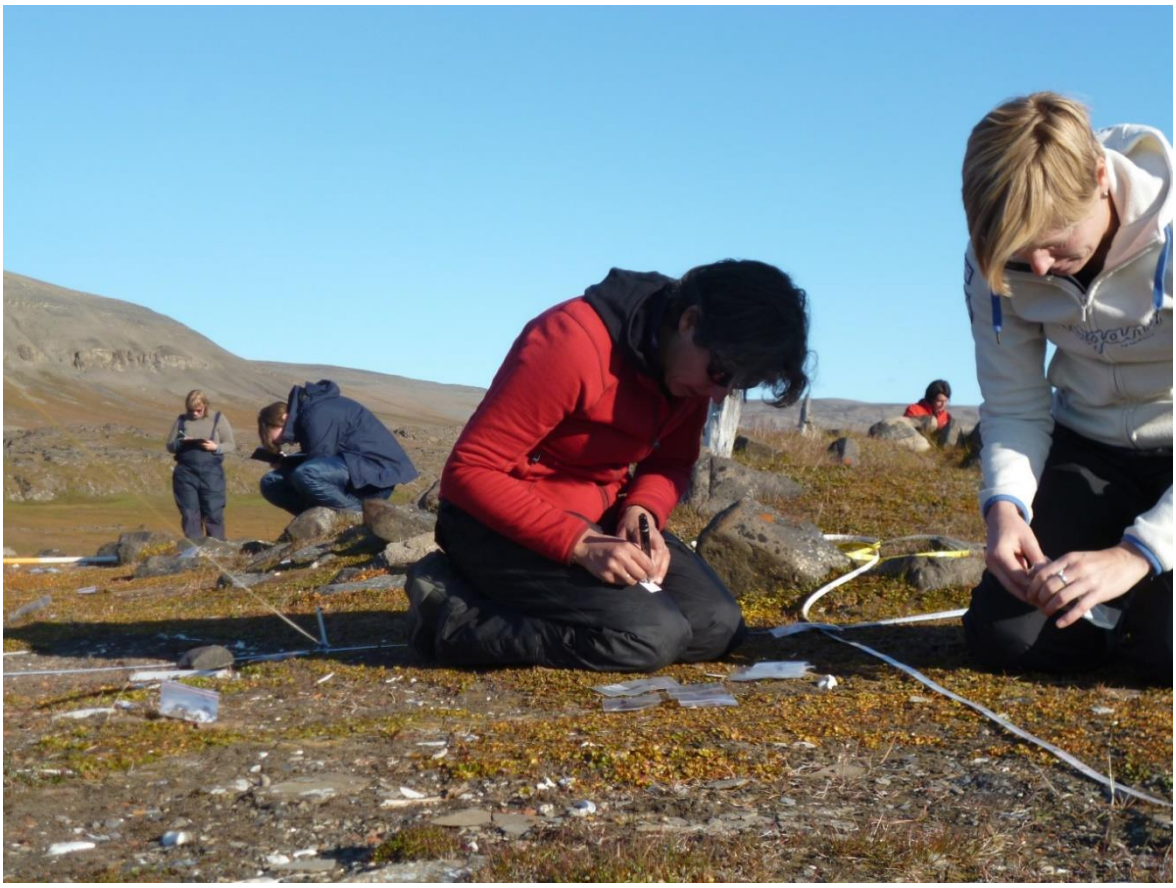


Photo: Frigga Kruse, August 2015.

Recommended citation:
Kruse, F. 2017. Pomor archaeology in Svalbard (RiS ID 10194). Chemical analysis of soil samples (SEPF project no. 15/73). Final report 10.11.2017. [Unpublished report]. Groningen: University of Groningen, Arctic Centre.

Preceded by:
Kruse, F. 2016. Pomor archaeology in Svalbard (RiS ID 10194). Chemical analysis of soil samples (SEPF project no. 15/73). Status report 23.12.2016. [Unpublished report.] Groningen: University of Groningen, Arctic Centre.

Contents

Introduction

This document is the final report of the archaeological research project *Pomor Archaeology on Edgeøya* (RiS ID 10194). Following the fieldwork in August 2015, the next important step was the chemical analysis of the soil samples. This step received crucial funding from the Svalbard Environmental Protection Fund in November 2015 (project no. 15/73). This final report of the completed analysis and preliminary interpretation of the results has been written to meet the requirements of the reimbursement. The results will form the basis of a scientific article, the publication of which will bring the project as a whole to conclusion.

Project background

The multidisciplinary Dutch *Scientific Expedition Edgeøya Svalbard*, abbreviated to SEES.nl (RiS ID 4520), took place between 19. and 28. August 2015. It had been made possible by the Netherlands Organisation for Scientific Research (NWO), Oceanwide Expeditions, the Arctic Centre of the University of Groningen (RUG), and the Dutch Embassy in Oslo. Represented among the different scientific disciplines and the 50 researchers were three archaeologists from the Arctic Centre in Groningen. These were Dr Frigga Kruse (post-doc researcher), Sarah Dresscher (PhD student), and Marthe Koeweiden (BA student).

SEES.nl had been planned to take all possible landing sites on Edgeøya into consideration without prior certainty of which bays and beaches would be accessible under unpredictable environmental constraints. In addition, time on site would be limited to a few hours. Under these circumstances, the archaeologists focussed on the material remains of the Pomors, which are relatively frequent and accessible compared to other cultural heritage on Edgeøya. Furthermore, the fieldwork would feed directly into the research of Kruse (*Ecological consequences of 400 years of natural-resource exploitation on Spitsbergen,* RiS ID 6917) and Dresscher (*Surviving off the sea and land*, RiS ID 10071). The archaeologists were able to conduct inexpensive and non-intrusive surveys (visual, topographic, and geochemical) at Dolerittneset (Kapp Lee Station) and at Kraussbukta. The final fieldwork report (KRUSE et al. 2016) has since been uploaded on the Research in Svalbard Database as well as disseminated to stakeholders and end users.

The Pomors are a Russian people from the White Sea region, who came to Svalbard in the 18th and 19th century to commercially exploit walrus and other game. Our knowledge of them is dominated by their habitation sites in the archipelago. The ruins of their huts have been measured and an alarming number excavated. Yet this structure-based approach to Pomor archaeology does little to expand our understanding of their hunting activities and the consequences thereof. Based on the assumption that the Pomors butchered and processed at least some of their game at their huts, the archaeologists selected geochemical prospecting, specifically phosphate survey, as a means to investigate such tasks.

The findings will aid the appraisal of an Arctic archaeological landscape as well as the Pomors' environmental impact on Edgeøya.

The justification for the use of geochemical survey in this project is founded on the observation that human activities can cause changes in the chemical composition of the soils and sediments these activities occur on (Leonardi et al. 1999, Heron 2001). Systematic sampling of soils enables the identification of the presence, source, and spatial extent of targeted chemical elements such as phosphorus (P). Where a detectable difference between the natural background chemistry and an anthropogenic signature exists, it should be possible to also distinguish human activity in terms of purpose, intensity, and duration. Phosphorus enrichment can be the result of occupation areas (organic waste, refuse, and ashes), burials (due to the presence of calcium phosphate in bone and organic phosphorus in soft tissue), or intensive land use (for example, manuring) (Heron 2001), while soil erosion, leaching, and continuous cropping can lead to a net loss of phosphorus from the soil (Leonardi et al. 1999). Leonardi et al. (1999) have successfully employed phosphate survey in the recognition of ancient ploughsoils in an area of Italy where traditional archaeological material is scarce. Crowther (1997), however, warns of false and misleading patterns in phosphate surveys. These can, for instance, arise from the variable capacity of soils to fix phosphates or variations in phosphate concentrations with depth. In three Welsh examples, Crowther (1997) advocates a more critical approach to phosphate surveys which considers a broad range of factors.

The references to the application of phosphate survey in the European Arctic, a region without agriculture, are few and far between. In an assessment of historical human use of mountain tundra regions, Viberg et al. (2013) employ a supplementary suite of magnetic susceptibility, soil phosphate survey, and archaeological excavation on a Stone Age site in Lapland Sweden. Although tool production debris is visible on the ground surface, settlement remains had not been identified. The temperature restrictions of the phosphate survey field kit made it useless for the purpose. Post-excavation laboratory analysis of soil samples provided the highest values of 295 ppm and 255 ppm in two areas subsequently interpreted as the focal point of the suspected settlement. The interpretation is valid in view of mean phosphate concentrations between 0 ppm and 8.3 ppm across the seven areas surveyed. The metamorphic bedrock is stated not to have had a detrimental impact on the fieldwork.

Broadbent and Olofsson (nd) report on the archaeological investigations carried out at Andreeneset on the remote island of Kvitøya in Svalbard. The S. A. Andrée site is the location where the Swedish attempt to reach the North Pole by balloon in 1897 came to an end. The three expedition members died in their tent camp under unknown circumstances. The camp is situated on a moraine in a polar desert. A geochemical study was supplemented by other methods in estimating the duration of human site use, and if relatively long, in reconstructing the camp in terms of activity areas like waste disposal and animal processing. The underlying assumptions were that almost all organic and phosphate-containing materials were brought to site by humans or animals; that a lengthy stay required hunting for food; that a human body processes 1 – 2 g of phosphorus per day, leading to enrichment due to defecation; and that enrichment was greater towards the site centre (the tent area) than away from it. For 239 samples, the mean P° was 16,4 with a minimum of 0 and a maximum of 38,0. P° is the phosphorus enrichment measured in mg P_2O_5 / 100 g dry soil. After conversion, the maximum amounts to 380 ppm. Despite exceeding the values of Viberg et al. (2013), Broadbent and Olofsson (nd) judge the high levels to be the result of increased microbiological activity in the natural drainage channels. Any pattern was probably caused by natural rather than human factors, and cryoturbation blurred the pattern. Broadbent and Olofsson (nd) concur with a short survival of the men; the expedition's own notes suggest at least 12 days.

The brief literature review highlighted important implications for the phosphate survey on Edgeøya. In Arctic fieldwork, time is a very valuable commodity, and methods often need to be rapid and inexpensive. A supplementary suite naturally produces the best results, yet there is a trade-off of time in the field, staff available, and the number of methods a small team can practically employ. On this occasion, the visual survey of animal bones at ground surface and vegetation proceeded well, but the underlying geology and the unforeseen sensitivity of neighbouring walruses to beeping (!) rendered metal detecting futile. Complementary data on other soil properties was not collected. Leonardi et al. (1999) pinpoint bedrock geology to be the primary source of soil phosphorus, but in an area such as Edgeøya that has been glaciated, the overburden can originate from different geological sources further afield. The geological maps of both Dolerittneset and Kraussbukta have been provided in Appendix A1. A detailed statement of geological influences on the sites will form part of the planned publication of the project.

Based on their experience, Viberg et al. (2013) recommend phosphate survey as a very suitable method indeed to investigate mountain tundra regions which often only have a single soil layer, let alone a cultural one. They propose that the number of stone tool flakes per square meter of ground surface is a measure of human activity intensity which is roughly in line with the pattern obtained from the phosphate survey. The project will investigate if the same is true for surface spreads of other artefacts and ecofacts.

Materials and Methods

The archaeologists and their field volunteers collected a total of 714 soil samples during SEES.nl: 303 from Grid I at Dolerittneset, 220 from Grid II at Dolerittneset, 157 from Grid III (5cm) in Kraussbukta, and 34 from Grid III (10cm) in Kraussbukta. Besides the geological maps in Appendix A1, no location plans have as of yet been included here. The grid plans with the sample points can be found in Appendix A2.

In Grids I and II at Dolerittneset, soil samples were taken directly at the ground surface. The location of the former Pomor hut on a local highpoint, which also acts as a watershed, is not conducive to much soil build-up. Rather erosion and leaching take place, which could amount to a net loss of phosphorus on the site. The soil was relatively coarse with much coarse sand and gravel. The team tried to bag as much of the fine fraction (<2 mm) as was possible at each sample point while avoiding to go into any depth, thereby by-passing the potential problem of vertical chemical variation.

Not having been to Kraussbukta before, the archaeologists were faced with the sparse surface remains of a former Pomor hut towards the bottom of a gentle slope that had over time been covered by a highly organic layer capped with spongy moss. The team had no record of the depth of the cultural layer(s) here, so without a hand corer, they opened a 30cm x 30cm test pit to investigate. Not having permission to do so, they stopped at an inconclusive depth of ca. 10cm and decided on a strategy of sampling at 5cm deep in Grid III (5cm) and 10cm deep in Grid III (10cm). This was very speculative.

The soil samples in plastic bags were taken back to the expedition ship MV *Ortelius* and stored in aluminium boxes, which were kept on deck at air temperature until the ship returned from the Arctic to the temperate Netherlands at the end of September 2015. The samples were then kept at the Arctic Centre at room temperature until they could be taken to the laboratory in Germany at the end of the year 2015. The samples were not treated or stored in any special way.

As for choosing appropriate analytical methods, Heron (2001) summarises that field and laboratory protocols for the quantification of soil phosphorus vary so widely that the comparison of data sets is often problematic. Leonardi et al. (1999) assess a range of methods such as the estimation

of total phosphorus, extraction of organic phosphorus, extraction of labile phosphorus, investigation of forms of native inorganic phosphorus and transformation of phosphorus applied as fertilizer, and the quantification of phosphorus in different soil extract. The finesse of each was not a concern of this project, however. Rather the archaeologists wanted to know if standard phosphate survey had anything at all to offer to Svalbard archaeology. Since the targets were sites with predicted animal processing (i.e. high phosphorus enrichment due to blood and bone), the assumption was that a difference between the natural background and the anthropogenic signature would be picked up by regular laboratory practises without the need for additional and probably costly refinement.

Dr Jörg Lienemann, formerly of Arbeitsgruppe für Bodenkunde, Landschaftsökologie und angewandte Botanik (Abola GmbH) in Oldenburg, Germany, came recommended. He had previously carried out phosphate analysis for archaeological purposes for the team's colleagues at the Groningen Institute for Archaeology (GIA). In addition, he had a great personal interest to investigate what the Arctic samples would entail. His philosophy and methods are outline in Lienemann 1998, 2003, and 2013. Lienemann carried out the chemical analysis of all 714 samples.

Results

The chemical analysis of the soil samples has been completed, and the results are included in tabulated form in Appendix A3 and as distribution maps in Appendix A4. Table 1 below summarises the minimum, mean, medium, and maximum values per grid. These values, which also find expression in Fig. 1 and Fig. 2, give a first indication of the natural background concentrations, which appear much higher than in the aforementioned Arctic case studies, and point towards overall anthropogenic enrichment ("Absolute Hammerwerte." Lienemann, pers. comm., 7. Sep. 2016). They also clearly identify some extremely high values in Grid II and Grid III (5cm) as outliers that were subsequently removed from analysis and interpretation. The resultant distribution maps are discussed below in terms of the **presence, source, and extent** of any detected soil phosphorus (P), which in turn allows for an initial interpretation of human activity in terms of **purpose, intensity, and duration**.

	Min P (ppm soil)	Mean P (ppm soil)	Median P (ppm soil)	Max P (ppm soil)
Grid I	3141	5814	5831	9080
Grid II	3127	6374	6289	32873
Grid III (5cm)	95	1294	1239	21585
Grid III (10cm)	441	1897	1277	4225

Table 1. *Minimum, mean, medium, and maximum total phosphate values from soil samples collected at Dolerittneset and Kraussbukta on Edgeøya.*

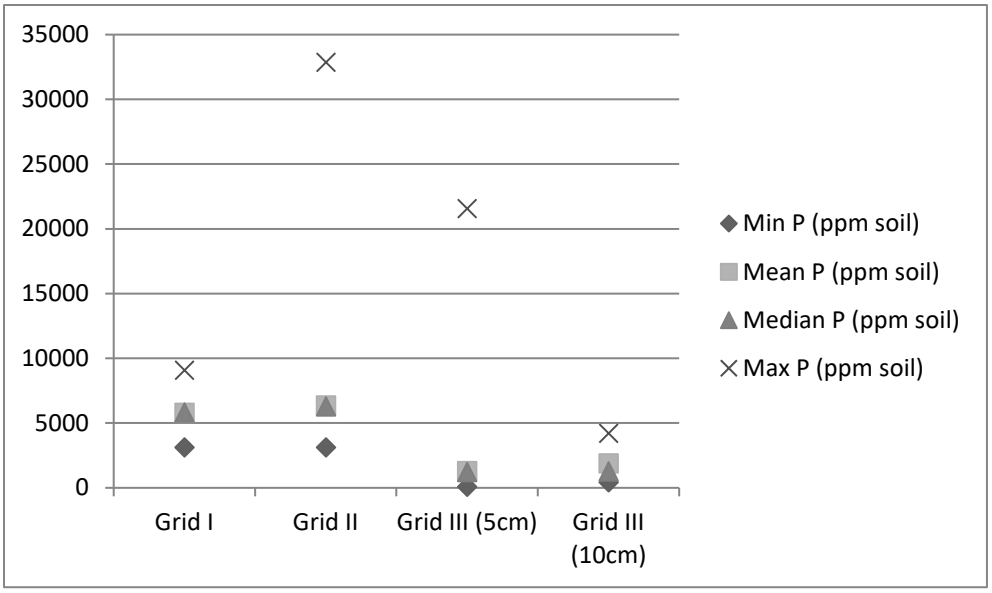


Fig. 1: *Minimum, mean, medium, and maximum total soil phosphorus (P) values obtained and the comparison between different survey areas.*

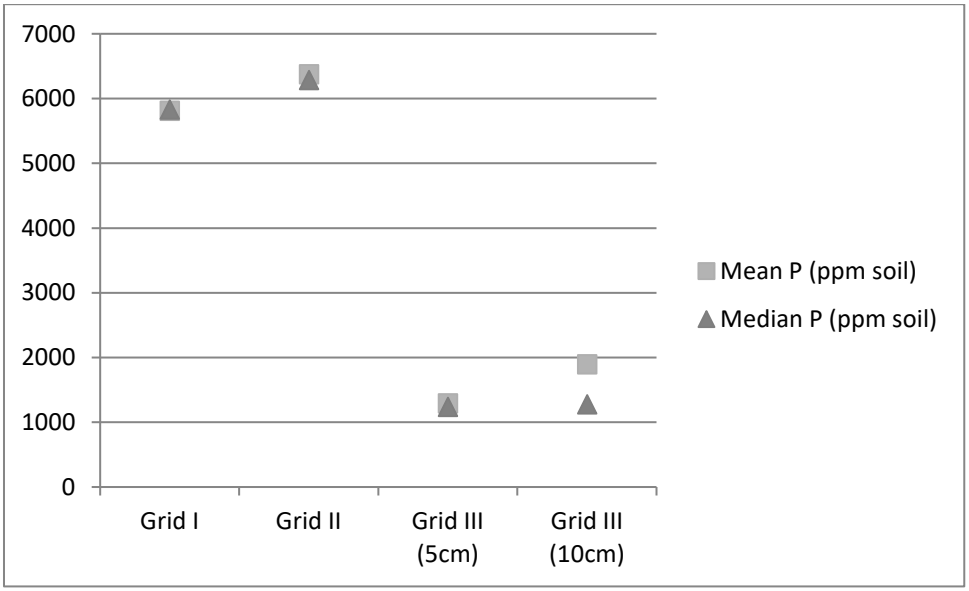


Fig. 2: *Mean and medium total soil phosphorus (P) values obtained and the comparison between different survey areas.*

Grid I (Kapp Leestasjon, Dolerittneset): In this grid (Fig. 3), total soil phosphorus (P) is present at very high concentrations reaching a maximum of 9080 ppm. Although some rock types occur on Edgeøya that are naturally high in phosphates, such extreme values are usually associated with bone. The high values appear to radiate out from the west side of the former hut towards the northwest corner of the grid. This pattern corresponds well with earlier archaeological excavations discovering two doorways in the west wall (front of house) and with the complementary bone and vegetation surveys the team carried out here. Both the concentration of animal bones and the density of vegetation cover are highest towards the northwest corner of the grid. The animal bones have been interpreted as the immediate source of the soil P, and the denser vegetation is thought to be the result of the P enrichment in the ground. Based on the presence of a former Pomor hut, the area was most likely an

occupation area (as opposed to a burial ground or an area of agricultural land use and manuring). The distribution of total soil P in front of the hut, which matches the distribution of animal bones (mostly reindeer and walrus) so well, now tells us that this area was probably used for animal slaughter as well as the processing of animal remains, most of the reindeer bones having been deliberately crushed. Although individual bones being left after a single such event would probably give rise to local P hotspots, the even spread of these high values points to a high-intensity activity over a considerable amount of time.

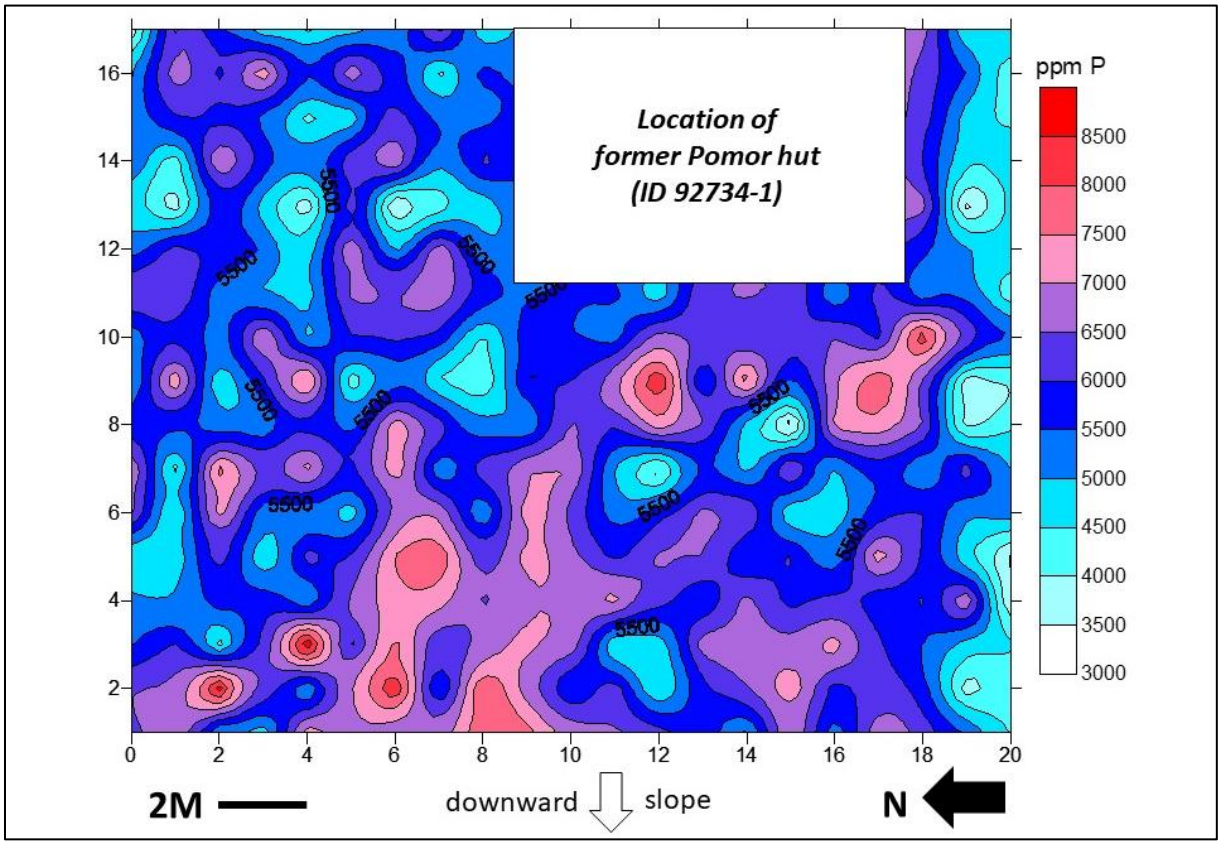


Fig. 3: *Total soil phosphorus (P) distribution in Grid I at Kapp Leestasjon at Dolerittneset, Edgeøya. Sampled at ground level.*

Grid II (Kapp Leestasjon, Dolerittneset): Whereas Grid I above represents the area in front of the Pomor hut, earlier excavations have shown this area to be the back of the house with no doorways leading to and from it (although the possibility of windows in the former east wall cannot be discounted). Total soil P (Fig. 4) is again present in high concentrations with the minimum, the mean, and the medium reflecting that of grid I. Again this is thought to be due to the presence of animal bone as opposed to urine, excrement, of blood. With the exception of a hotspot in the southwest corner of the grid, which is most certainly of anthropogenic origin, there is much variation between high and very high values. Each local high is likely to have been a bone; the bone has now gone but the fixed calcium phosphate remains in the soil. The spoil heap from the previous excavation shows up as a local low to the south of the hut. The complementary surveys of animal bones and vegetation density have shown that both are much lower at “the back of the house”. So this area has been interpreted as not having been the focus of human activity. Hardly any butchering and processing will have taken place here. Nonetheless, animal remains and refuse may have been disregarded here, perhaps thrown out

of an open window. Thus the intensity of any human activity on this side of the hut was much less, even if the duration of site use will have been the same as at the front of the hut.

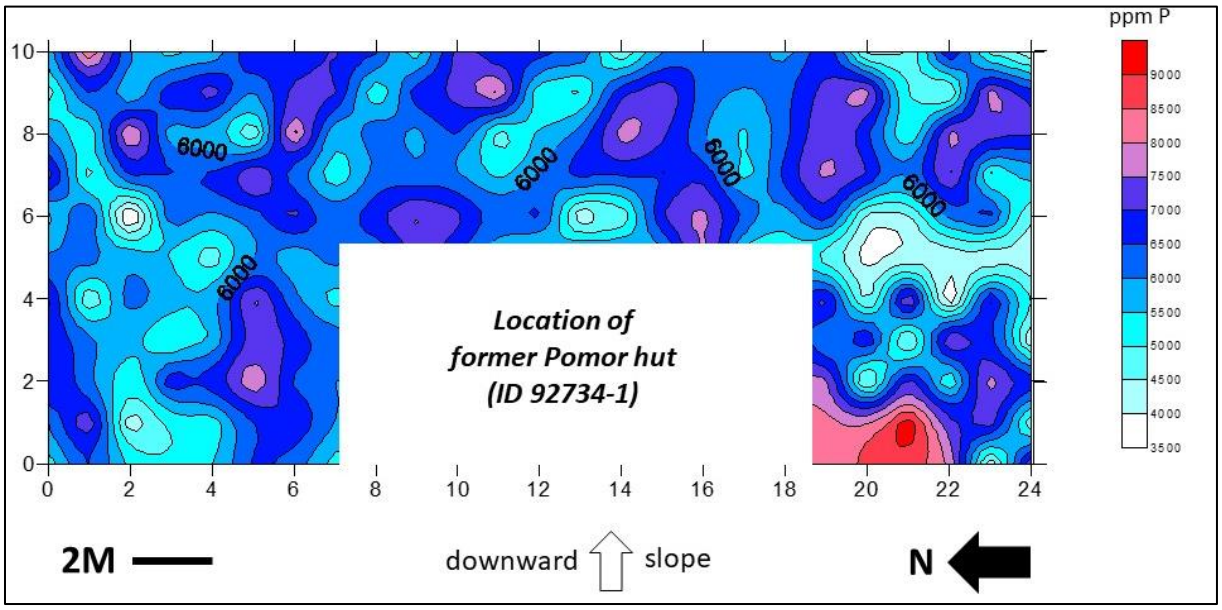


Fig. 4: *Total soil phosphorus (P) distribution in Grid II at Kapp Leestasjon at Dolerittneset, Edgeøya. Sampled at ground level. Outliers removed.*

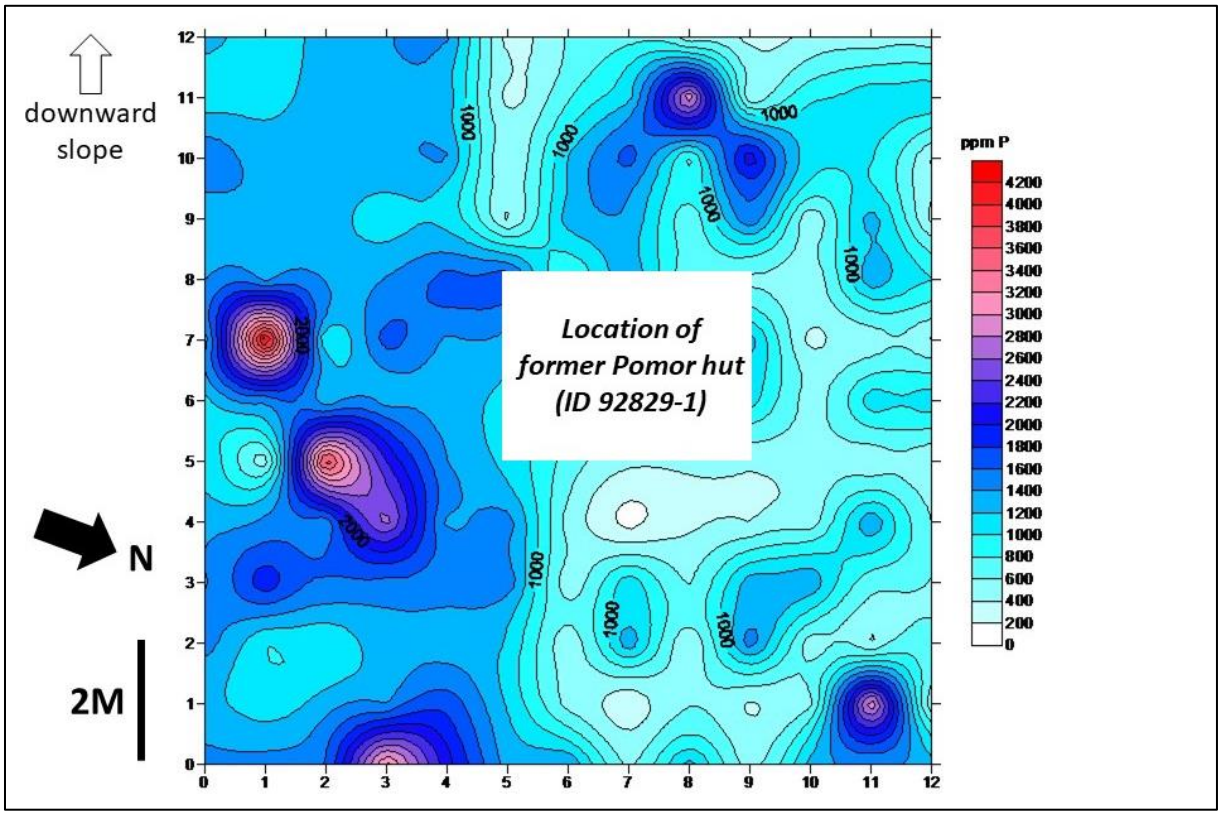


Fig. 5: *Total soil phosphorus (P) distribution in Grid III (5cm) in Kraussbukta, Edgeøya. Sampled at 5 cm depth. Outliers removed.*

Grid III – 5cm (Kraussbukta): As described in the methods above, the team had difficulty identifying the cultural layers at this location and decided to sample at the arbitrary depths of 5cm and 10cm below ground level instead. At 5-cm depth (Fig. 5), minimum, mean, and medium concentrations of total soil P (Table 1) were still considerably above those reported from other Arctic sites, but they are thought to reflect the geological background. There appears to be a gradient across the grid with increasing P values from north to south with hotspots of up to 4200 ppm P to the south of the former Pomor hut. This gradient does not reflect the natural slope of the site nor were there any obvious sources of the hotspots. The grid had been placed in such a way as to include several whale mandibles in its northwest corner and to test their effect on the soil chemistry: if these large bones are in fact responsible for the locally high P concentrations here, it seems surprising that the values are not much higher and of a larger, linear extent. Human activity at this location will again have been in the form of occupation, although without detailed excavation, structural remains, artefacts, and ecofacts were too sparse to comment on the distinct purpose of the former hut. There is a chance that the aforementioned gradient is similar to that observed in Grids I and II above: we may be seeing a higher P concentration at "the front of the house" and a much lower one at "the back of the house", but this theory could not be proven during the fieldwork. The lack of animal bones at the surface and the evenly dense vegetation cover rendered distribution surveys of both useless. Based on the chemical analysis, it is difficult to say anything about the intensity and duration of human activity at Kraussbukta.

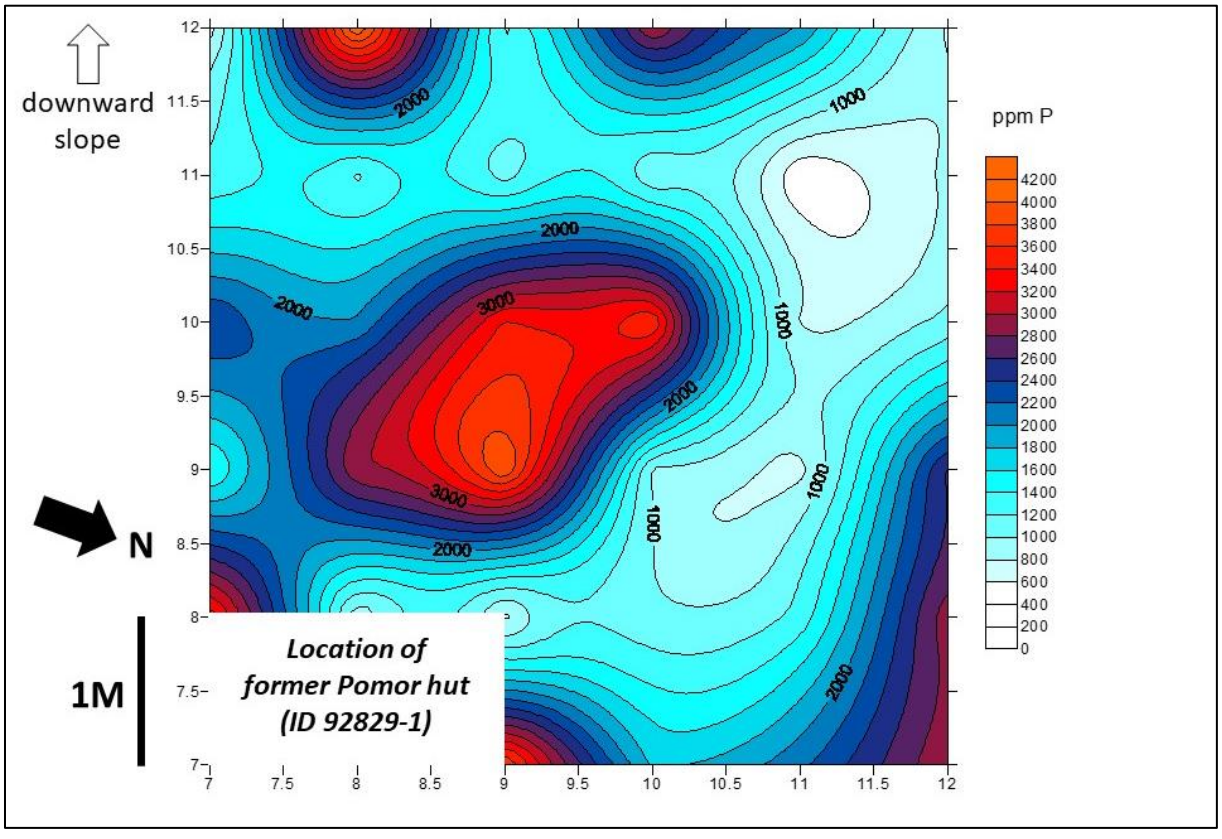


Fig. 6: *Total soil phosphorus (P) distribution in Grid III (10cm) in Kraussbukta, Edgeøya. Sampled at 10 cm depth.*

Grid III – 10cm (Krausbukta): In addition to the 5-cm depth, Grid III was also sampled at 10cm below ground level (Fig. 6), but over a much smaller area to again test the effects of the whale mandibles on the soil chemistry. The long bones spread roughly from the top left towards the bottom right of the

map. The minimum P value is much above that recorded for the shallower depth, but mean and medium are comparable (Table 1). High values reaching 4225 ppm P are evident in the centre of the plot as well as the western grid boundary, but these are not as linear as perhaps the shape of the bones would imply. The possibility that the hotspots are caused by another source entirely should not be discounted though. High values also enter the map from the edges of the former Pomor hut, and it may be possible that the soil survey has picked up the cultural layers at this depth, but this could not be proven on this occasion.

Project outcomes

The main results. The project investigated a small aspect of the lasting environmental impact of the Russian Pomors on Edgeøya. In effect a pilot study, the fieldwork moved away from narrowly investigating structural remains to looking at the archaeological landscape as a whole. It employed geochemical survey at Dolerittneset and Kraussbukta, a method seldom used in Svalbard, to answer the underlying question: *where did the Pomors do what?* The main results were:

a) At Dolerittneset, the distribution of total soil phosphorus at surface level successfully established distinct areas of human activity around the former Pomor hut. These were interpreted as zones of butchering and processing of animals and probable zones of waste disposal.
b) At Kraussbukta, the site was heavily vegetated and it was not possible to identify the cultural layers at depth. Subsequently, the wrong layers may have been sampled. Although the enrichment of total soil phosphorus was probably anthropogenic, its distribution was inconclusive.
c) The geochemical survey worked well on its own. In future, control samples must also be taken further afield to establish a regional baseline value and the grid sizes must be expanded to define the boundary of the archaeological site and reach beyond the zone of anthropogenic influence.
d) The geochemical survey worked extremely well in conjunction with visual survey (surface assemblages of animal bones, density of vegetation cover) and topographic survey, providing much new and exciting data. Due to the presence of iron in the bedrock and the sensitivity of nearby walrus to the beeping, metal detecting was cancelled.

Environmental benefits. The pilot study showed that here as in most archaeological cases, a site is larger, if not much larger, than the remains of the hut most of us tend to focus on, be it as scientists or as recreational visitors to places like Dolerittneset. Where visual pointers like structures, artefacts, and ecofacts are missing, interdisciplinary studies are key to unravelling the site's history and legacy. Geochemical surveys certainly have a role to play, and the fieldwork has proven the suitability of total soil phosphorus as an essential addition to the Arctic archaeological toolkit. Our project has taken an important step towards understanding and applying this method of detection, and it has revealed evidence for past human activities where structures and finds were limited. As such, the undertaking has been an eye-opener, and an environmental benefit not to be underestimated is that of now having a new tool in the continuing investigation of environmental impact and historical ecology. Furthermore, when my colleagues and I work as guides around Svalbard, we have already started to tell our stories of Edgeøya differently: to incorporate the clues that the soil holds of past mysteries and to add details of cutting-edge archaeology and vibrant scientific research that is going on in Svalbard

today. The project has not only added to our scientific knowledge of the site; it has also touched on and deepened the visitor experience here.

Proposed measures. In the project proposal, it was suggested that the geochemical survey would raise the knowledge and general awareness of the uniqueness and the fragility of sites such as Dolerittneset and Kraussbukta and that there may be a need to, for instance, redirect visitors to other locations that offer similar experiences but that may not be as fragile. The geochemical survey, however, has revealed that archaeological sites may also have a certain robustness with in this case phosphorus binding rather quickly to the soil and lingering there for centuries. As such, there is no need to redirect tourism away from the Pomor hut in Dolerittneset: the hut has been excavated twice already and as said before, the survey has only added to the visitor experience. Kraussbukta is a much less visited place, because of which no action needs to be taken here either.

However, two things remain to be done at Dolerittneset to safeguard its archaeological potential and to preserve the site, at least by record. Firstly, there is what appears to be a Pomor refuse heap to the northwest of the hut which is not at immediate risk from trampling or other destruction, but which may warrant excavation in the future: if animal bones were carelessly strewn across the site, what refuse has made it onto this midden and why? What information do the finds provide about the Pomor's environmental impact? Secondly, there is the nearby walrus graveyard and other surface bone assemblages which must undergo detailed survey sooner rather than later because visitors frequently disturb the bones and coastal erosion is causing increasing damage and destruction. On this note, there is also a small assemblage of walrus skulls at Kraussbukta, which should also be recorded before it disappears.

Importance for environmental management. The project served as a reminder for environmental management that in Svalbard there exist incredibly well-preserved snapshots of former Pomor structures and past activities that probably have not survived to the same extent in the White Sea region and on Novaya Zemlya. The high concentration of sites and their excellent preservation offer an unparalleled opportunity for comparison across Svalbard and across the Arctic. Management should therefore work tirelessly to protect the archaeological potential until such comparative work can be done and beyond. It could also go a step further and actively encourage more international interdisciplinary comparative research.

The project also highlighted that previous archaeological excavations do not mean that a site is "done". Using methods like geochemical, visual, and topographic surveys, sites can be "re-opened", and much more information than ever before can be gained in order to reveal the whole archaeological landscape and the overall environmental impact of human activities in it. Environmental management should follow current archaeological trends away from local excavations to a far-reaching holistic approach. More should be done to stimulate systematic and integrated archaeological research in Svalbard.

Follow-up. This project was a small pilot study into the suitability of total soil phosphorus analysis as a tool to be used in Svalbard archaeology, and the initial small-scale application of the method was a success. The results are currently awaiting peer-reviewed publication.

The next step would be to try the method on a larger scale and on different sites. There are no plans yet, but if choices had to be made, it would be to return to Dolerittneset to establish the natural baseline, to sample in a larger grid around the Pomor hut in order to find the site boundaries, to include

the other huts at this location as well as parts of the walrus graveyard in order to investigate their geochemical signatures. Furthermore, Gåshamna in Hornsund could be a worthwhile target because of the high concentration of diverse archaeological sites in a relatively small area.

Acknowledgements

In addition to the financial support already mentioned, the archaeologists would like to thank Maarten Loonen, for believing in SEES, and their field volunteers: Liesbeth Noor, Monique de Vries, Karen Mulders, Kim van Dam, Miriam Vermeij, Paul Marcel, Arjen Dorst, Nienke Beintema, Judith Klostermann, Stientje van Veldhoven, Hilde de Laat, and Ronald Visser. A big thank-you to Jörg Lienemann, too, for his continued interest in the project.

References

BROADBENT, N.D. AND OLOFSSON, J. nd. Archaeological investigations of the S. A. Andrée site, White Island, Svalbard 1998 and 2000. UMARK 23 Arkeologisk rapport. Umeå: Umeå Universitet. 49 pages.

CROWTHER, J. 1997. Soil phosphate surveys: critical approaches to sampling analysis and interpretation. *Archaeological Prospection* 4: 93-102.

HERON, C. 2001. Geochemical prospecting. In: D.R. Brothwell and A.M. Pollard. Eds. Handbook of archaeological sciences. Chichester: Wiley. 565-573.

KRUSE, F. DRESSCHER, S., AND KOEWEIDEN, M. 2016 Pomor archaeology on Edgeøya, Svalbard (RiS IS 10194), August 19 – 28, 2015. Final fieldwork report. [Unpublished report.] Groningen: University of Groningen, Arctic Centre.

LEONARDI, G., MIGLAVACCA, M., AND MARDI, S. 1999. Soil phosphorus analysis as an integrative tool for recognizing buried ancient ploughsoils. *Journal of Archaeological Science* 26: 343-352.

LIENEMANN, J. 1998. Phosphatkartierungen, Möglichkeiten und Grenzen. Handbucg der Grabungstechnik, Teil 2.

LIENEMANN, J. 2003. Phosphatanalyse. In: Reallexikon der Germanischen Alterumskunde, Band 23: 497-499.

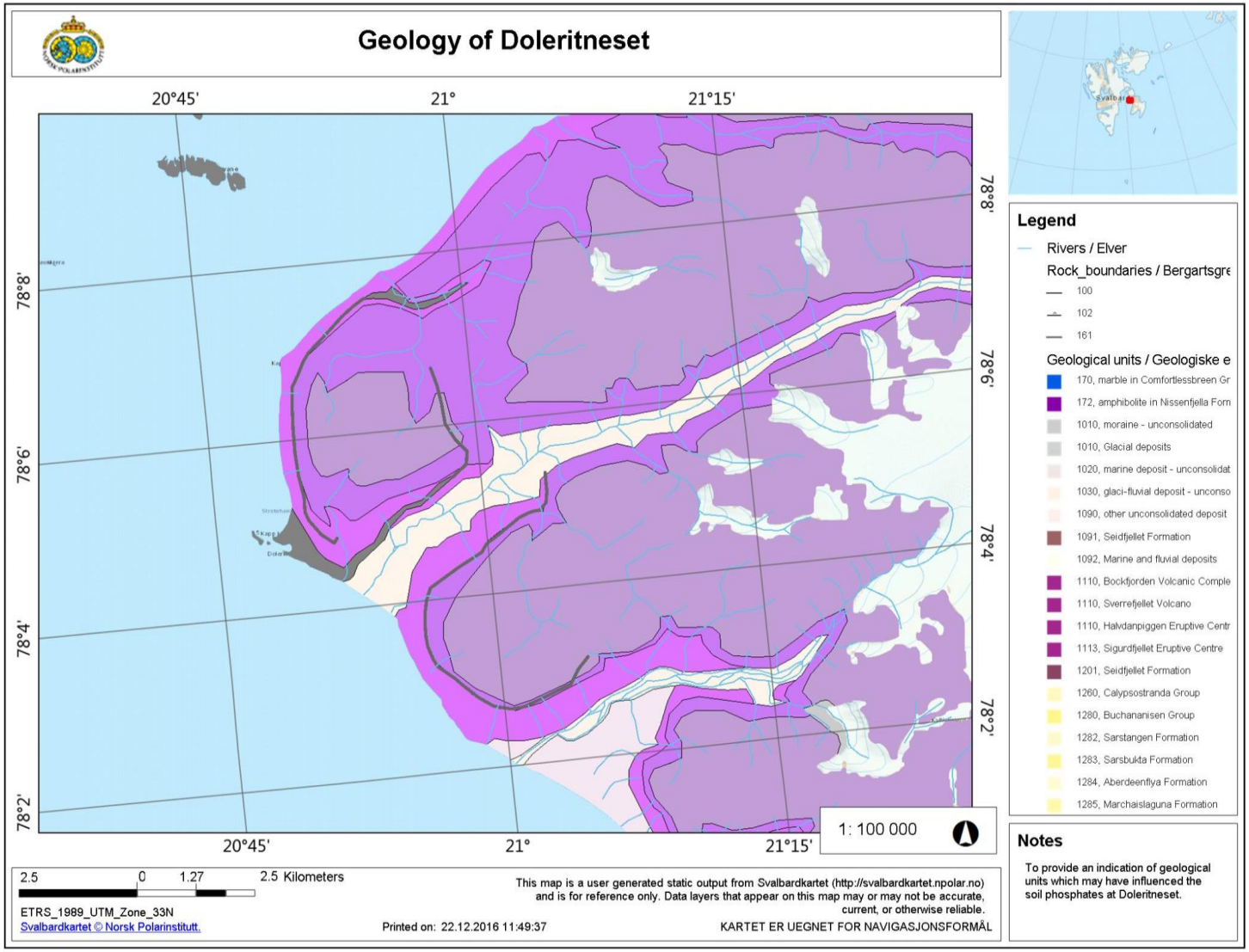
LIENEMANN, J. 2013. Hintergrundinformationen zu Phosphor und Phosphaten. http://phosphatanalyse.de/wp-content/uploads/2013/06/130912-Hintergrundinformationen-Phosphor-und-Phosphate.pdf

VIBERG, A., BERNTSSON, A., AND LIDÉN, K. 2013. Archaeological prospection of a high altitude Neolithic site in the Arctic mountain tundra region of northern Sweden. *Journal of Archaeological Science* 40: 2579-2588.

Appendix A1

Geological maps of Dolerittneset and Kraussbukta, Edgeøya

Geology of Doleritneset



Legend

Rivers / Elver

Rock_boundaries / Bergartsgre

100

102

161

Geological units / Geologiske e

170, marble in Comfortlessbreen Gr

172, amphibolite in Nissenfjella Forn

1010, moraine - unconsolidated

1010, Glacial deposits

1020, marine deposit - unconsolidat

1030, glaci-fluvial deposit - unconso

1090, other unconsolidated deposit

1091, Seidfjellet Formation

1092, Marine and fluvial deposits

1110, Bockfjorden Volcanic Comple

1110, Sverrefjellet Volcano

1110, Halvdanpiggen Eruptive Centr

1113, Sigurdfjellet Eruptive Centre

1201, Seidfjellet Formation

1260, Calypsostranda Group

1280, Buchananisen Group

1282, Sarstangen Formation

1283, Sarsbukta Formation

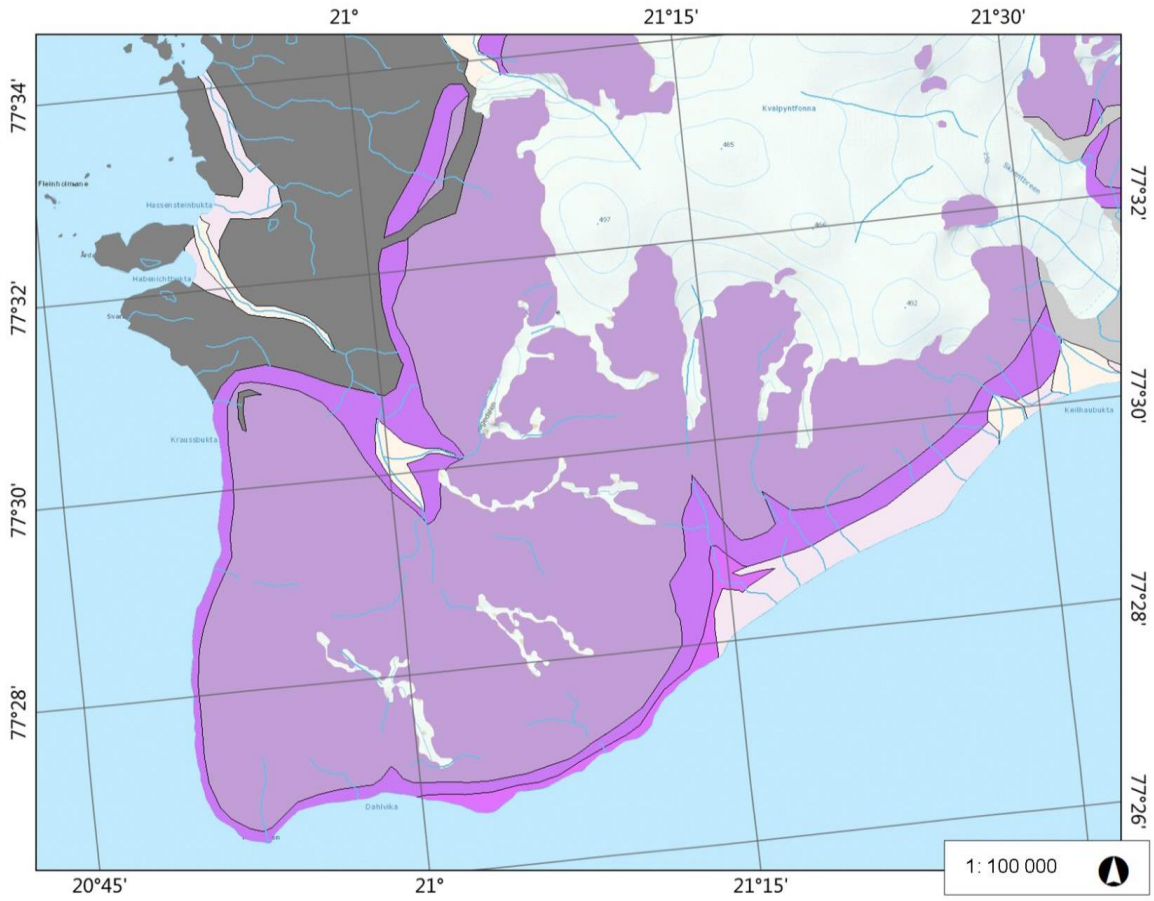
1284, Aberdeenflya Formation

1285, Marchaislaguna Formation

Notes

To provide an indication of geological units which may have influenced the soil phosphates at Doleritneset.

Geology of Kraussbukta



Legend

Rivers / Elver

Rock_boundaries / Bergartsgre

- 100
- 102
- 161

Geological units / Geologiske e

- 170, marble in Comfortlessbreen Gr
- 172, amphibolite in Nissenfjella Forn
- 1010, moraine - unconsolidated
- 1010, Glacial deposits
- 1020, marine deposit - unconsolidat
- 1030, glaci-fluvial deposit - unconso
- 1090, other unconsolidated deposit
- 1091, Seidfjellet Formation
- 1092, Marine and fluvial deposits
- 1110, Bockfjorden Volcanic Comple
- 1110, Sverrefjellet Volcano
- 1110, Halvdanpiggen Eruptive Centr
- 1113, Sigurdfjellet Eruptive Centre
- 1201, Seidfjellet Formation
- 1260, Calypsostranda Group
- 1280, Buchananisen Group
- 1282, Sarstangen Formation
- 1283, Sarsbukta Formation
- 1284, Aberdeenflya Formation
- 1285, Marchaislaguna Formation

Notes

To provide an indication of geological units which may have influenced the soil phosphates at Kraussbukta.

2.5 0 1.27 2.5 Kilometers

ETRS_1989_UTM_Zone_33N

Printed on: 22.12.2016 11:54:49

Appendix A2

Grid plans with sample points

Pomor archaeology on Edgeoya; SEPF 15/73
Grid I (Kapp Leestasjon, Dolerittneset)

X

Y	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Y
0	292	293	294	295	296	297	298	299	300										301	302	303	0
1	280	281	282	283	284	285	286	287	288										289	290	291	1
2	268	269	270	271	272	273	274	275	276										277	278	279	2
3	256	257	258	259	260	261	262	263	264										265	266	267	3
4	244	245	246	247	248	249	250	251	252										253	254	255	4
5	232	233	234	235	236	237	238	239	240										241	242	243	5
6	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	6
7	190	191	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210	7
8	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	8
9	148	149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	9
10	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	10
11	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	11
12	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	12
13	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	13
14	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	14
15	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	15
16	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	16

Location of ruined Pomor hut

X

missing samples

Pomor archaeology on Edgeoya; SEPF 15/73
Grid II (Kapp Leestasjon, Dolerittneset)

X

Y	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Y
10	498	499	500	501	502	503	504	505	506	507	508	509	510	511	512	513	514	515	516	517	518	519	520	521	522	10
9	473	474	475	476	477	478	479	480	481	482	483	484	485	486	487	488	489	490	491	492	493	494	495	496	497	9
8	448	449	450	451	452	453	454	455	456	457	458	459	460	461	462	463	464	465	466	467	468	469	470	471	472	8
7	423	424	425	426	427	428	429	430	431	432	433	434	435	436	437	438	439	440	441	442	443	444	445	446	447	7
6	398	399	400	401	402	403	404	405	406	407	408	409	410	411	412	413	414	415	416	417	418	419	420	421	422	6
5	373	374	375	376	377	378	379	380	381	382	383	384	385	386	387	388	389	390	391	392	393	394	395	396	397	5
4	359	360	361	362	363	364	365	366												367	368	369	370	371	372	4
3	345	346	347	348	349	350	351	352												353	354	355	356	357	358	3
2	331	332	333	334	335	336	337	338												339	340	341	342	343	344	2
1	317	318	319	320	321	322	323	324												325	326	327	328	329	330	1
0	303/1	304	305	306	307	308	309	310												311	312	313	314	315	316	0
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	

location of ruined Pomor hut

X

missing samples

Pomor archaeology on Edgeoya; SEPG 15/73
Grid III - sample depth 5cm (Kraussbukta)

X

Y	0	1	2	3	4	5	6	7	8	9	10	11	12	Y
12	667	668	669	670	671	672	673	674	675	676	677	678	679	12
11	654	655	656	657	658	659	660	661	662	663	664	665	666	11
10	641	642	643	644	645	646	647	648	649	650	651	652	653	10
9	628	629	630	631	632	633	634	635	636	637	638	639	640	9
8	615	616	617	618	619	620	621	622	623	624	625	626	627	8
7	606	607	608	609	610					611	612	613	614	7
6	597	598	599	600	601					602	603	604	605	6
5	588	589	590	591	592					593	594	595	596	5
4	575	576	577	578	579	580	581	582	583	584	585	586	587	4
3	562	563	564	565	566	567	568	569	570	571	572	573	574	3
2	549	550	551	552	553	554	555	556	557	558	559	560	561	2
1	536	537	538	539	540	541	542	543	544	545	546	547	548	1
0	523	524	525	526	527	528	529	530	531	532	533	534	535	0
	0	1	2	3	4	5	6	7	8	9	10	11	12	

X

missing samples

area also sampled at sample depth 10cm

Pomor archaeology on Edgeoya; SEPF 15/73
Grid III - sample depth 10cm (Kraussbukta)

X

	7	8	9	10	11	12	
	708	709	710	711	712	713	**12**
	702	703	704	705	706	707	**11**
	696	697	698	699	700	701	**10**
	690	691	692	693	694	695	**9**
	684	685	686	687	688	689	**8**
			680	681	682	683	**7**

missing samples

Y **Y**

X

Appendix A3

Results in tabulated form

Pomor archaeology on Edgeoya; SEPF 15/73
GRID I (Kapp Leestasjon, Dolerittneset)

X	Y	ppm P	comment	sample no.
0	16	6338		1
1	16	6958		2
2	16	4887		3
3	16	4690		4
4	16	7352		5
5	16	6775		6
6	16	6634		7
7	16	6704		8
8	16	7915		9
9	16	7718		10
10	16	6789		11
11	16	6592		12
12	16	6197		13
13	16	5831		14
14	16	4845		15
15	16	7000		16
16	16	5183		17
17	16	6873		18
18	16	6338		19
19	16	5451		20
20	16	4479		21
0	15	6479		22
1	15	6620		23
2	15	8820		24
3	15	6338		25
4	15	4901		26
5	15	6955		27
6	15	8507		28
7	15	5352		29
8	15	8042		30
9	15	6718		31
10	15	5437		32
11	15	6352		33
12	15	4366		34
13	15	5880		35
14	15	6451		36
15	15	7324		37
16	15	5775		38
17	15	6254		39
18	15	5732		40
19	15	3732		41
20	15	4352		42
0	14	5460		43
1	14	6042		44
2	14	4296		45

3	14	6127		46
4	14	9080		47
5	14	5831		48
6	14	7620		49
7	14	6014		50
8	14	6690		51
9	14	7113		52
10	14	6845		53
11	14	4479		54
12	14	4648		55
13	14	6800		56
14	14	6669		57
15	14	6620		58
16	14	7254		59
17	14	6056		60
18	14		missing	61
19	14	4761		62
20	14	4577		63
0	13	5160		64
1	13	5070		65
2	13	5775		66
3	13	5789		67
4	13	4944		68
5	13	6580		69
6	13	7280		70
7	13	7211		71
8	13	6437		72
9	13	6930		73
10	13	6887		74
11	13	7197		75
12	13	6197		76
13	13	5507		77
14	13	6648		78
15	13	5803		79
16	13	6099		80
17	13	5680		81
18	13	5423		82
19	13	7040		83
20	13	3465		84
0	12	4465		85
1	12	4648		86
2	12	6254		87
3	12	4507		88
4	12	6254		89
5	12	6042		90
6	12	7549		91
7	12	7920		92
8	12	6197		93
9	12	7183		94
10	12	6662		95

11	12	5845		96
12	12	6577		97
13	12	6493		98
14	12	5493		99
15	12	6099		100
16	12	5141		101
17	12	7324		102
18	12	5915		103
19	12	4577		104
20	12	3380		105
0	11	6690		106
1	11	4437		107
2	11	7254		108
3	11	5064		109
4	11	5254		110
5	11	4648		111
6	11		missing	112
7	11	6930		113
8	11	4930		114
9	11	7254		115
10	11	6352		116
11	11	5254		117
12	11	5831		118
13	11	6662		119
14	11	6451		120
15	11	4577		121
16	11	4648		122
17	11	5760		123
18	11	6042		124
19	11	5080		125
20	11	5310		126
0	10	7042		127
1	10	4225		128
2	10	7780		129
3	10	6394		130
4	10	7260		131
5	10	5887		132
6	10	7338		133
7	10	5026		134
8	10	6268		135
9	10	6958		136
10	10	7042		137
11	10	4940		138
12	10	3718		139
13	10	5549		140
14	10	4817		141
15	10	6775		142
16	10	4901		143
17	10	5732		144
18	10	4958		145

19	10	6268	146
20	10	4986	147
0	9	5718	148
1	9	5592	149
2	9	5183	150
3	9	5000	151
4	9	5860	152
5	9	5225	153
6	9	7358	154
7	9	6254	155
8	9	5211	156
9	9	4930	157
10	9	6577	158
11	9	6014	159
12	9	7394	160
13	9	6549	161
14	9	4817	162
15	9	3141	163
16	9	7197	164
17	9	7324	165
18	9	6549	166
19	9	3820	167
20	9	4451	168
0	8	4940	169
1	8	7507	170
2	8	4507	171
3	8	5915	172
4	8	7817	173
5	8	4099	174
6	8	5360	175
7	8	4451	176
8	8	4070	177
9	8	6056	178
10	8	5972	179
11	8	6845	180
12	8	8507	181
13	8	5254	182
14	8	7901	183
15	8	5408	184
16	8	6930	185
17	8	7817	186
18	8	6423	187
19	8	3660	188
20	8	4042	189
0	7	5120	190
1	7	5915	191
2	7	5211	192
3	7	7120	193
4	7	4817	194
5	7	6014	195

6	7	6113	196
7	7	5873	197
8	7	4400	198
9	7	5775	199
10	7	5521	200
11	7	5239	201
12	7	6732	202
13	7	6380	203
14	7	6070	204
15	7	5986	205
16	7	6520	206
17	7	5803	207
18	7	8420	208
19	7	6420	209
20	7	5606	210
0	6	6500	211
1	6	6451	212
2	6	5225	213
3	6	4972	214
4	6	4746	215
5	6	6634	216
6	6	6451	217
7	6	6873	218
8	6	5775	219
9	6	missing	220
10	6	5563	221
11	6	5634	222
12	6	4592	223
13	6	6451	224
14	6	6549	225
15	6	6479	226
16	6	5070	227
17	6	6169	228
18	6	5070	229
19	6	5280	230
20	6	4099	231
0	5	5220	232
1	5	6211	233
2	5	5930	234
3	5	5521	235
4	5	4648	236
5	5	6980	237
6	5	4817	238
7	5	6958	239
8	5	5085	240
18	5	missing	241
19	5	5085	242
20	5	4887	243
0	4	4780	244
1	4	3676	245

2	4	5775		246
3	4	4803		247
4	4	3634		248
5	4	6254		249
6	4	3366		250
7	4	4211		251
8	4	4761		252
18	4	6789		253
19	4	3268		254
20	4	4648		255
0	3	5580		256
1	3	4169		257
2	3	7099		258
3	3	5803		259
4	3	5340		260
5	3	6338		261
6	3	7000		262
7	3	5085		263
8	3	6155		264
18	3		missing	265
19	3	4592		266
20	3	4958		267
0	2	5141		268
1	2	5986		269
2	2	5845		270
3	2	5338		271
4	2	4310		272
5	2	4606		273
6	2	6197		274
7	2			275
8	2	5324		276
18	2	6280		277
19	2	4760		278
20	2	4380		279
0	1	4930		280
1	1	6789		281
2	1	5900		282
3	1	7423		283
4	1	5521		284
5	1	6930		285
6	1	5774		286
7	1	4310		287
8	1	5676		288
18	1		missing	289
19	1	5493		290
20	1	4200		291
0	0	3563		292
1	0	6549		293
2	0	5563		294
3	0	4662		295

4	0	4394	296
5	0	4803	297
6	0	5028	298
7	0	6770	299
8	0	4634	300
18	0	6761	301
19	0	4479	302
20	0	5028	303

Pomor archaeology on Edgeoya; SEPF 15/73
Grid II (Kapp Leestasjon, Dolerittneset)

X	Y	ppm P	comment	sample no.
0	0	5183	use 303/1	303
1	0	6535		304
2	0		missing	305
3	0	5141		306
4	0	5479		307
5	0	6620		308
6	0		missing	309
7	0	5254		310
19	0	8169		311
20	0	32873		312
21	0	29915		313
22	0	7944		314
23	0	4000		315
24	0	7507		316
0	1	5986		317
1	1	7507		318
2	1	4099		319
3	1	5155		320
4	1	5120		321
5	1	6437		322
6	1	7042		323
7	1	5986		324
19	1	8254		325
20	1	7972		326
21	1	9408		327
22	1	7113		328
23	1	7324		329
24	1	4507		330
0	2	6930		331
1	2	6099		332
2	2	5070		333
3	2	6972		334
4	2	6775		335
5	2	7986		336
6	2	6366		337
7	2	6000		338
19	2	7718		339
20	2	4014		340
21	2	7268		341
22	2	4789		342
23	2	7761		343
24	2	6873		344
0	3	7014		345
1	3	6155		346
2	3	5634		347

3	3	4887		348
4	3	5479		349
5	3	7183		350
6	3	6840		351
7	3	6310		352
19	3	5901		353
20	3	7127		354
21	3	4113		355
22	3	7662		356
23	3	6662		357
24	3	3930		358
0	4	7169		359
1	4	4394		360
2	4	6310		361
3	4	5775		362
4	4	5775		363
5	4	7718		364
6	4	6127		365
7	4	5282		366
19	4	7282		367
20	4	4155		368
21	4	7901		369
22	4	3324		370
23	4	7183		371
24	4	5028		372
0	5	6056		373
1	5	6268		374
2	5	5915		375
3	5		missing	376
4	5	4592		377
5	5	6000		378
6	5	5563		379
7	5	6254		380
8	5	5803		381
9	5	7056		382
10	5	6420		383
11	5	5451		384
12	5	5099		385
13	5	6634		386
14	5	6507		387
15	5	5451		388
16	5	7901		389
17	5	4958		390
18	5	5239		391
19	5	4718		392
20	5	3746		393
21	5	4155		394
22	5	4042		395
23	5	4014		396
24	5	3944		397

0	6	5254		398
1	6	6634		399
2	6	3127		400
3	6	6394		401
4	6	5845		402
5	6	6225		403
6	6	7211		404
7	6		missing	405
8	6	6930		406
9	6	7606		407
10	6	7155		408
11	6	6352		409
12	6	6718		410
13	6	3944		411
14	6	4535		412
15	6	7014		413
16	6	7690		414
17	6	6437		415
18	6	5676		416
19	6	6915		417
20	6	4225		418
21	6	4352		419
22	6	6211		420
23	6	6789		421
24	6	4563		422
0	7	7352		423
1	7	4732		424
2	7	6620		425
3	7	6549		426
4	7	6600		427
5	7	7690		428
6	7	6169		429
7	7	5056		430
8	7	6169		431
9	7	6070		432
10	7	6028		433
11	7	5366		434
12	7	6085		435
13	7	6775		436
14	7	6577		437
15	7	6423		438
16	7	6930		439
17	7	5239		440
18	7	6690		441
19	7	7648		442
20	7	7056		443
21	7	6056		444
22	7	7634		445
23	7	4732		446
24	7	5648		447

0	8	6000	448
1	8	5028	449
2	8	8282	450
3	8	5592	451
4	8	5718	452
5	8	4338	453
6	8	8268	454
7	8	5451	455
8	8	6479	456
9	8	5845	457
10	8	6549	458
11	8	4690	459
12	8	5592	460
13	8	6211	461
14	8	7761	462
15	8	7085	463
16	8	6028	464
17	8	5408	465
18	8	6338	466
19	8	7366	467
20	8	6521	468
21	8	4859	469
22	8	7746	470
23	8	7197	471
24	8	7099	472
0	9	4718	473
1	9	6521	474
2	9	5394	475
3	9	6887	476
4	9	7380	477
5	9	5930	478
6	9	7155	479
7	9	7070	480
8	9	4972	481
9	9	6831	482
10	9	7183	483
11	9	8169	484
12	9	5056	485
13	9	4845	486
14	9	6930	487
15	9	7480	488
16	9	6254	489
17	9	5930	490
18	9	6338	491
19	9	7197	492
20	9	7915	493
21	9	4986	494
22	9	4225	495
23	9	7746	496
24	9	6732	497

0	10	5662	498
1	10	8620	499
2	10	5986	500
3	10	5296	501
4	10	5520	502
5	10	6944	503
6	10	6479	504
7	10	7056	505
8	10	6592	506
9	10	5127	507
10	10	7197	508
11	10	6408	509
12	10	6732	510
13	10	6549	511
14	10	4366	512
15	10	5986	513
16	10	6380	514
17	10	6437	515
18	10	5761	516
19	10	6873	517
20	10	4169	518
21	10	4451	519
22	10	7225	520
23	10	4761	521
24	10	4000	522
220	**220**	**6374**	
No. samples		Average	

Pomor archaeology on Edgeoya; SEPF 15/73
Grid III - sample depth 5cm (Kraussbukta)

X	Y	ppm P	comment	ample number
0	0	1496		523
1	0	1495		524
2	0	1593		525
3	0	3275		526
4	0	2081		527
5	0	1312		528
6	0	1417		529
7	0	542		530
8	0	1287		531
9	0	495		532
10	0	1264		533
11	0	1386		534
12	0	1254		535
0	1	1252		536
1	1	1081		537
2	1	1320		538
3	1	1373		539
4	1	1746		540
5	1	1171		541
6	1	518		542
7	1	192		543
8	1	592		544
9	1	360		545
10	1	511		546
11	1	3042		547
12	1	391		548
0	2	1489		549
1	2	993		550
2	2	1000		551
3	2	1326		552
4	2	1312		553
5	2	1176		554
6	2	451		555
7	2	1359		556
8	2	383		557
9	2	1526		558
10	2	472		559
11	2	367		560
12	2	711		561
0	3	1373		562
1	3	1963		563
2	3	1588		564
3	3	1533		565
4	3	1454		566
5	3	1532		567

6	3	454	568
7	3	1151	569
8	3	573	570
9	3	1313	571
10	3	1384	572
11	3	656	573
12	3	592	574
0	4	1343	575
1	4	1456	576
2	4	1444	577
3	4	2676	578
4	4	1350	579
5	4	1496	580
6	4	514	581
7	4	95	582
8	4	347	583
9	4	396	584
10	4	465	585
11	4	1391	586
12	4	595	587
0	5	1199	588
1	5	444	589
2	5	3796	590
3	5	21585	591
4	5	1400	592
9	5	434	593
10	5	493	594
11	5	430	595
12	5	389	596
0	6	1139	597
1	6	1444	598
2	6	1241	599
3	6	1312	600
4	6	1285	601
9	6	1097	602
10	6	511	603
11	6	1130	604
12	6	1134	605
0	7	1287	606
1	7	4393	607
2	7	970	608
3	7	1717	609
4	7	1364	610
9	7	1301	611
10	7	326	612
11	7	459	613
12	7	371	614
0	8	1396	615
1	8	1310	616
2	8	1387	617

3	8	1412		618
4	8	1692		619
5	8	1782		620
6	8	690		621
7	8	1370		622
8	8	641		623
9	8	549		624
10	8	442		625
11	8	1368		626
12	8	1007		627
0	9	1261		628
1	9	1382		629
2	9	1268		630
3	9	1049		631
4	9		missing	632
5	9	336		633
6	9	1303		634
7	9	1373		635
8	9	637		636
9	9	1602		637
10	9	394		638
11	9	1296		639
12	9	336		640
0	10	1595		641
1	10	1320		642
2	10	1375		643
3	10	1356		644
4	10	1431		645
5	10	411		646
6	10	1229		647
7	10	1690		648
8	10	718	check label	
8	10	7507	check label	
9	10	2157		650
10	10	1063		651
11	10	1015		652
12	10	381		653
0	11	1085		654
1	11	1095		655
2	11	1298		656
3	11	1271		657
4	11	1303		658
5	11	313		659
6	11	782		660
7	11	1127		661
8	11	3004		662
9	11	404		663
10	11	982		664
11	11	1127		665
12	11	1178		666

0	12	1262	667
1	12	1151	668
2	12	1236	669
3	12	1393	670
4	12	1431	671
5	12	310	672
6	12	627	673
7	12	712	674
8	12	439	675
9	12	330	676
10	12	458	677
11	12	458	678
12	12	477	679

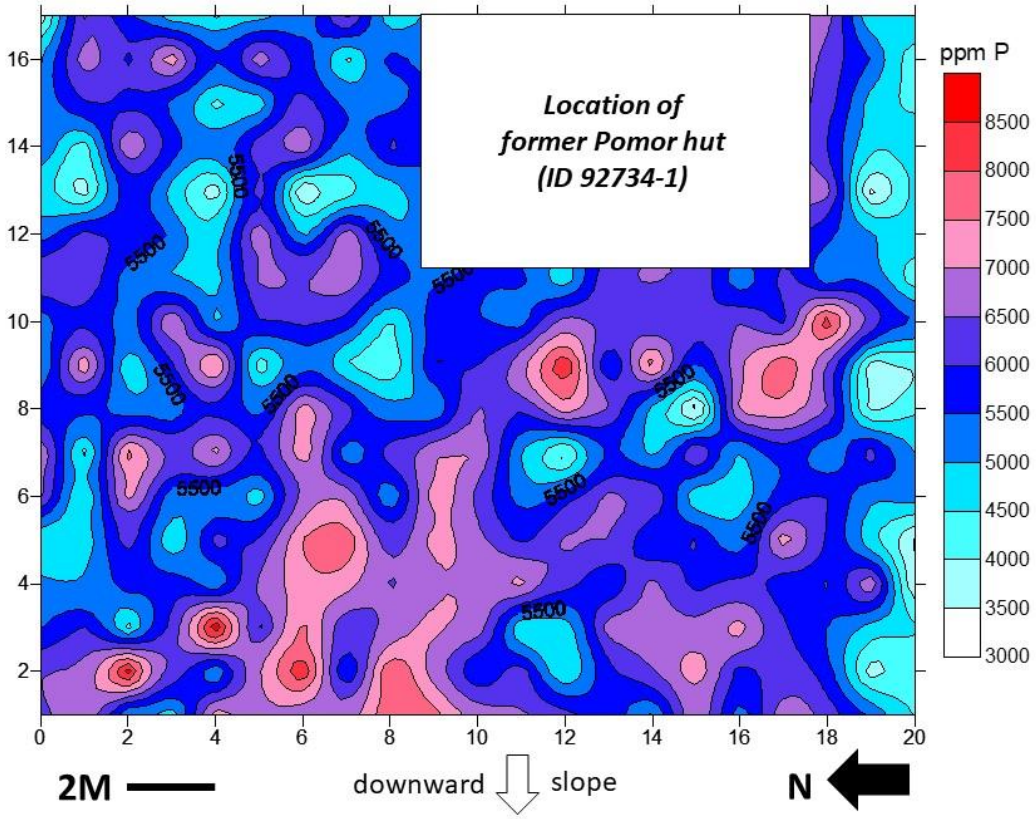
Pomor archaeology on Edgeoya; SEPF 15/73
Grid III - sample depth 10cm (Kraussbukta)

X	Y	ppm P	comment	Column1
9	7	3817		680
10	7	1773		681
11	7		missing	682
12	7	2958		683
7	8	3563		684
8	8	840		685
9	8	737		686
10	8	1069		687
11	8	1277		688
12	8	2915		689
7	9	1371		690
8	9	2959		691
9	9	3986		692
10	9	965		693
11	9	734		694
12	9	2634		695
7	10	2418		696
8	10	2023		697
9	10	3418		698
10	10	3592		699
11	10	784		700
12	10	1063		701
7	11	1255		702
8	11	1167		703
9	11	1119		704
10	11	1040		705
11	11	441		706
12	11	838		707
7	12	697		708
8	12	4225		709
9	12	1153		710
10	12	3000		711
11	12	1991		712
12	12	778		713

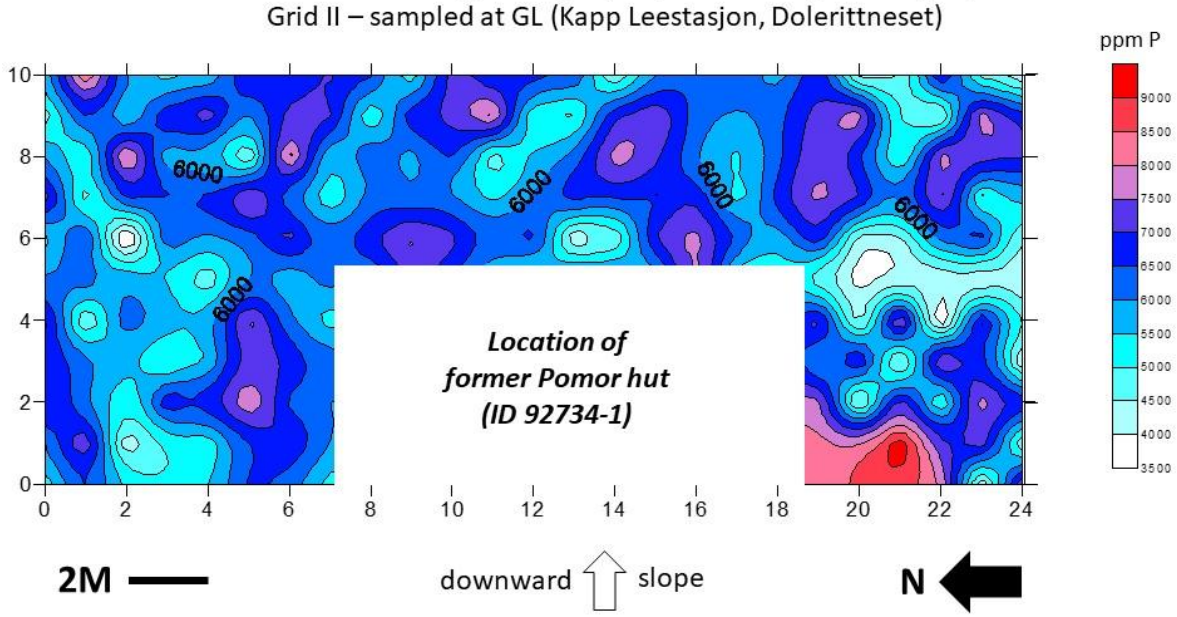
Appendix A4

Results as distribution maps

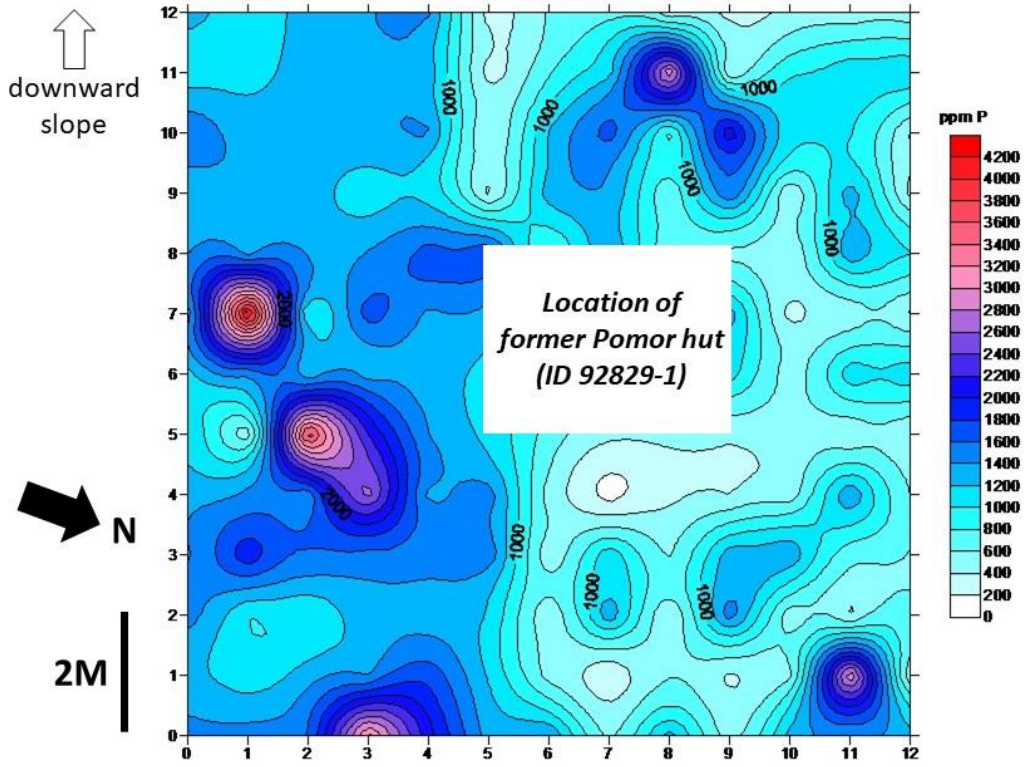
"Pomor archaeology on Edgeøya" (RiS ID 10194; SEPF 15/73)
Grid I – sampled at GL (Kapp Leestasjon, Dolerittneset)



"Pomor archaeology on Edgeøya" (RiS ID 10194; SEPF 15/73)
Grid II – sampled at GL (Kapp Leestasjon, Dolerittneset)



"Pomor archaeology on Edgeøya" (RiS ID 10194; SEPF 15/73)
Grid III – sampled at 5 cm depth (Kraussbukta)



"Pomor archaeology on Edgeøya" (RiS ID 10194; SEPF 15/73)
Grid III – sampled at 10 cm depth (Kraussbukta)