

The Tools of Production: A Case Study of the Metal Tools Used for Leather- and Metalworking in Albaniana, The Netherlands.

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Introduction

When considering the production of military equipment such as armour and weapons, one might think of *fabricae*, large scale production, or maybe of a local blacksmith crafting a sword for a young soldier setting off to war, paid for with the family savings. Soon the thoughts may turn to the armies stationed in *castella*, fighting local enemies in remote locations, and in constant need of maintenance, repairs and new equipment. Could these armies repair and produce the equipment they needed themselves? Or did they have to depend on the import of these products, with the added risk of it being too slow in times of crisis? This paper looks at these questions with the help of the tools of this production.

Military equipment consists mainly of leather, metal, and textile items. These are materials generally worked by a trained artisan with a specific toolset. In order for these armies to produce these items they must have had artisans and their tools at their *castella*. Tools can be very versatile however, a blacksmith usually has a good set of hammers, but so would a stonemason as well as a carpenter. Luckily a tool is tailored to its task. The hammers used by carpenters generally look different from those used by stonemasons, which look different again from those used by blacksmiths. This means that understanding the tools and their exact types and shapes found at a site can give great insights into the artisans that used to work there.

A small *castellum* in the west of The Netherlands, named Albaniana, is located in the modern town of Alphen aan den Rijn, and it is perfect for the purpose of understanding the production of military equipment at *castella*. This fort was part of a series of small forts guarding the river Rhine. What is special about it is the sheer amount of metal finds excavated here, among them many tools; the wet environment is great for the conservation of metal. Figure 1 shows a metal tool from the site that has a working edge still sharp enough to be used, which is not uncommon for the site, although rust has not been kind to all objects. The fort was excavated during two expeditions (1998–1999 and 2001–2002), although part of the site could not be excavated. The material from this last part originated mostly from the riverbank and was discarded near the city. These finds were recovered by metal detectorists and published in the book ‘Gered uit de Grond’ (*Rescued from the ground*).¹ Although their exact provenance could no longer be determined, they must have come from the *castellum* or its surrounding *vicus*. In total, 218 Roman metal tools were recovered from Alphen aan den Rijn, when we combine those from excavations and those from ‘Gered uit de Grond’.

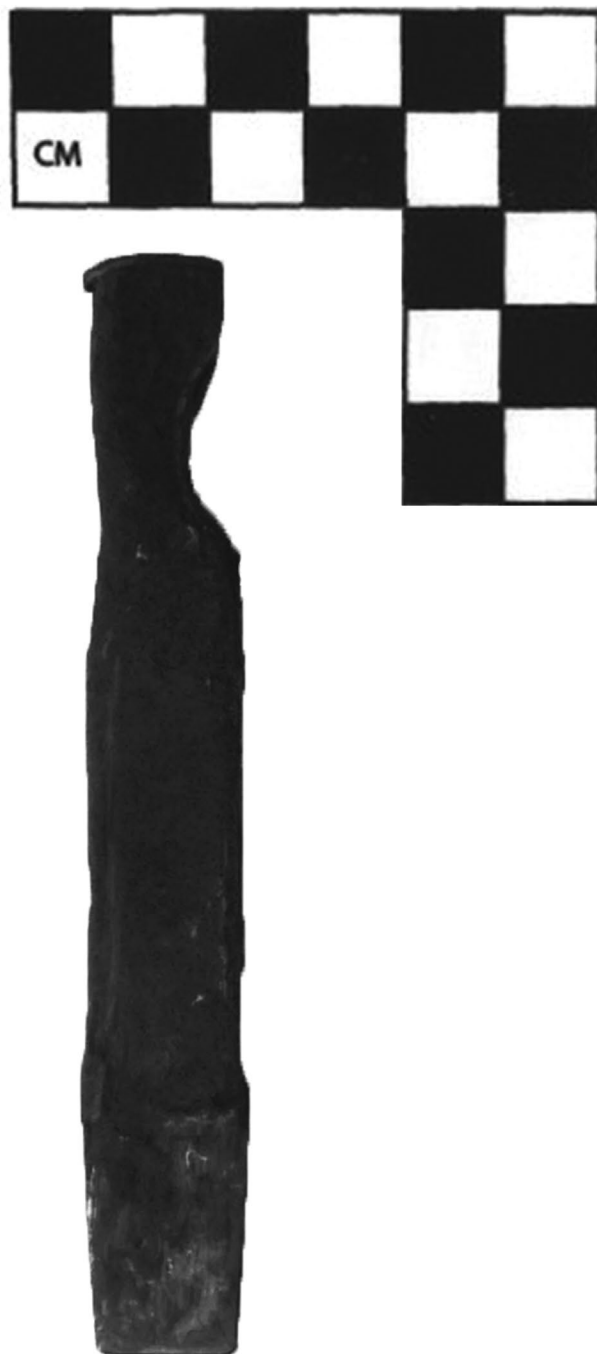


Fig. 1: A well preserved chisel (C58) for metal working found at Albaniana.

This paper builds upon the MA thesis of the author, which compared all metal tools from all crafts in Albaniana to finds from thirteen other *Limes castella* in The Netherlands, Germany, and Britain.² Accordingly, the catalogue numbers given in this paper refer to

the catalogue presented in the thesis, which can be consulted online. Numbers starting with a “C” are tools found during the excavations, and descriptions as well as pictures of these finds can be found in the thesis mentioned above. Numbers starting with a “G” refer to finds recorded in the book ‘Gered uit de Grond’ and include a chapter number for easy reference: a description of these finds can also be found in the thesis.

If the soldiers stationed at Albaniana were producing military equipment, there should be tools used for this purpose among these finds. As mentioned above, the equipment consisted mostly of metal (iron and copper alloys, simply referred to as bronze throughout this paper) leather, and textile items. Sadly however, the production of textiles is virtually invisible when focussing on metal tools. Needles (made of metal or other materials such as bone) were essential in the production process of textile and a few metal ones have been recovered from Albaniana, but most tools used for textiles were made from other materials. One cannot suitably consider textile production without incorporating tools such as the weights used for spinning and weaving. As the MA thesis was restricted to metal tools, tools made from other materials were not incorporated and consequently cannot be discussed here. This is the main reason that this paper will focus on the tools used for leather- and metalworking.

The Tools of Albaniana

Of the 218 metal tools found at Albaniana, 23 can be assigned to leatherworking and 4 can be assigned to the production of metal objects. These assignments are based on tool types described by Manning and Gaitzsch.³

Leatherworking

Most leatherworking tools are interpreted as awls (19), although some punches (3), a lunette’s knife, and a bone skin scraper were also found. The lunette’s knife (G10.36) is 6,9 by 4,7 cm long. Its small size may partially be due to corrosion, however, as it has maintained most of its crescent shape, it is likely that this tool had a rather long use life, and was worn down by sharpening. A similar knife to this one was found in Pompeii.

Three punches (C31, C36, C38) were used to create decorative patterns in leather, while the 19 awls were used to puncture the leather. Some of the tools interpreted as awls may in fact have been punches – the distinction lies in the tip, which is sensitive to corrosion. Two awls are of Manning type 2 (G10.25–6), five are of type 3 (C29–30, C32, G10.30, G10.34), three are of type 4 (C34, G10.33, G10.35), and one is of type 5 (C33). The other eight (C35, C37, C39, G10.27–9, G10.31–2) cannot be assigned to a certain type. The different types of awls have parallels at multiple sites in Austria as well as in Britain and Germany. Notable is the fact that both C34 and G10.35 of type 4 have the same type of round, bone handle with incised lines perpendicular to the longitudinal direction. Similar scratches have also been found on the wooden handles of two parallels from



Fig. 2: Detail of the teeth of the metal working file (C15).

Britain. The lines are too uniform in the same direction to be caused by use, yet are too irregular to be decorations, perhaps they were incised into the handles to create a better grip. The two thicker needles found at the site may also have been used for leather (C77–8). However, this cannot be known for sure, except perhaps through use-wear analysis, as they could also have been used for thick textiles. A skin scraper made from bone was also found.

Metalworking

The four metal tools for metalworking are a pair of tongs, a file, and two chisels (C58, C65). The pair of tongs (G10.1) is 30 cm long and thus falls into the larger category (ca. 25–65 cm). These must have been used for larger pieces and for putting pieces of metal in and out of the fire. Generally, smaller pairs of tongs (< 20 cm) are used for the finest work.⁴ The tongs from Albaniana are on the smaller side of the large category. This means that although they were not used for the finest of work, they also were not heavy-duty tongs. Their size might mean they were used mostly to create iron objects, as bronze objects tended to be smaller. Extraordinary are the bent legs of the tongs. This seems to be an original feature of the tongs as the legs are bent very similarly and in a very fluent line. No example from known literature has bent legs like these; they were all either straight or mangled. Similar shapes of the beak and hinge are known from Britain and Pompeii.

Files were used for both metals and wood. There are many different known types, such as flat, half-round, square, and triangular files. It is not always clear for which craft a file was used, but the square file of Alphen aan den Rijn (C15) has teeth that are very close together (fig. 2). This indicates that the file was used for metal, not wood. The file likely has parallels in Vindolanda, Britain, but the file is so corroded along most of its length that the original shape is impossible to determine.

In addition to these metal tools, a fragment of a crucible was also found.

The Craftsmen of Albaniana

Leather

The finds of tools show that leather was worked. The awl is the most commonly found tool, which is not surprising, as a leatherworker often uses a large array of awls of different shapes and sizes. The bone skin scraper shows that fresh hides were cleaned of dirt/hair at Albaniana. There is no evidence for the actual tanning of the leather, which may mean that the hides were transported to another location to be tanned after they had been cleaned (which keeps them from rotting). This fits very well in the model constructed by Van Driel-Murray in 1985.⁵ She supposed that hides were not tanned at Roman *castella* but were instead cleaned to diminish the effects of rot and then sent to specialised tanneries in central locations. The model was based on a few sites only, but the evidence found at multiple sites investigated since then support this model, as does the evidence found at Alphen aan den Rijn.⁶ Together the tools are proof of the presence of one or several trained leatherworkers. As the conservation circumstances of the site are remarkable, some leatherworking waste was also found. This waste indicates repair work on military equipment and small-scale production of shoes.⁷

Metal

Although the crucible fragment and the metal tools show that metal was being worked at Albaniana, they do not show which metals were worked. However, additional evidence gives insight into this, which will be discussed below per type of metal.

Only a few objects made from gold or silver are known from Alphen.⁸ The near absence of these objects suggests they were not locally produced; out of a total of 3675 metal finds (not counting coins) from the 2001–2002 excavations, only two were made from silver and none were made from gold.⁹ This is consistent with the type of metalworking tools found. They are not of the smaller types associated with the working of delicate pieces, which silver and gold objects tend to be. It can therefore be assumed that these metals were not worked in Alphen, which is consistent with evidence found at other *Limes castella*.¹⁰ As the working of lead does not require the use of specialist tools, the metal tools found must have been used to work either bronze or iron, or both.

Many objects of iron and bronze were found at the site. However, the objects themselves are not evidence for their local production. Bronze production is evidenced by finds of semi-finished decorative nails, a semi-finished pendant and two semi-finished unknown objects, as well as over sixty pieces of bronze casting waste (such as bronze drops) and bronze repair fragments. A concentration of these pieces of evidence for bronze production was found in the right *retentura* of the *castellum*. This is the part of the *castellum* where a *fabrica* is thought to have stood.¹¹ Evidence for bronze production has also been found at a fair number of other *Limes castella*.

The production of iron is evidenced by semi-finished nails, as well as by repaired fragments of iron. At multiple locations within the *castellum* and its surrounding *vicus*, iron slag was found. In the *castellum* alone 480 pieces of slag were found, mainly in the supposed *fabrica* and in the river. All this slag is forging waste: it was not produced by melting iron from ores but by forging iron.¹² This means that iron is unlikely to have been extracted from ores locally. The presence of forging slag is not direct evidence for the forging of iron at a site, because iron slag has special physical and chemical properties, such as the capacity to absorb water. This makes it very suitable for road construction, and the roads become sturdy as well as dry. The Romans already used iron slag for this purpose and it is still used in some countries today.¹³ Slag was often moved from its original location for this purpose, which therefore means that iron slag is not direct evidence for local forging of iron. Excavations in Alphen also unearthed fragments of clay-forging hearths. In contrast to slag, these fragments are very unlikely to have been moved far. These finds, combined with the other evidence means it is likely that (at least part of) the slag from Albaniana was also produced there. It seems therefore that the inhabitants regularly repaired and produced both bronze and iron objects. Clues for iron working have also been found at a significant part of other *Limes castella*.

Crafting Locations

The *castellum* existed through three periods, each with different building phases. Period 1 consists of the wood building period of the mid first century A.D.; Period 2 comprises the wood building period after 70 A.D., and period 3 is the stone building period of the late second century A.D. Most of the datable features and finds come from the first two periods. Only little is known of the third period, as these features have been almost completely erased by later habitation.¹⁴ Figure 3 shows a map of Albaniana including interpretations of its features and structures. The structures in green are a *horeum* (grain storage), a supposed *fabrica* (workshop), and a barrack zone (barakken) with two or three barracks. The excavated bank of the river Rhine (Rijnsoever) has also been indicated in green, as the bank continues in the southern and northern directions.

The supposed *fabrica* has been recognised by hearths and metal working waste from period 1, although an alternative interpretation as a barracks is also given. The locations may have kept their functions throughout the second period, but evidence from the third period is too scarce to draw conclusions.

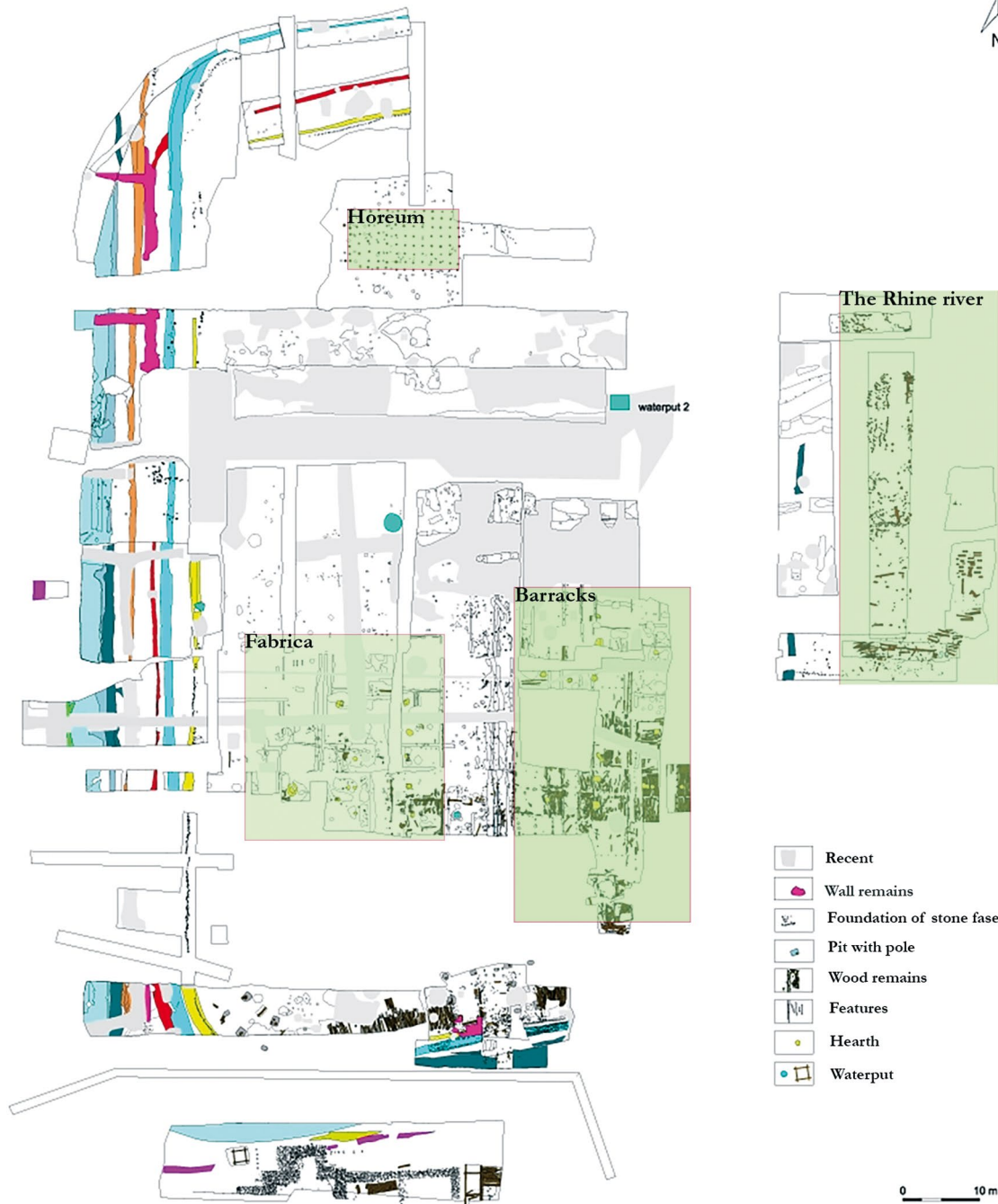


Fig. 3: Excavation map of the *castellum* Albaniana, including interpretation of the features.

Figure 4 shows the distribution of all 218 metal tools (not just those for leather and metalworking) per excavation pit from the excavations of 1998–1999 and 2001–2002. These are the same pits as in figure 3, with the addition of a pit underneath the current

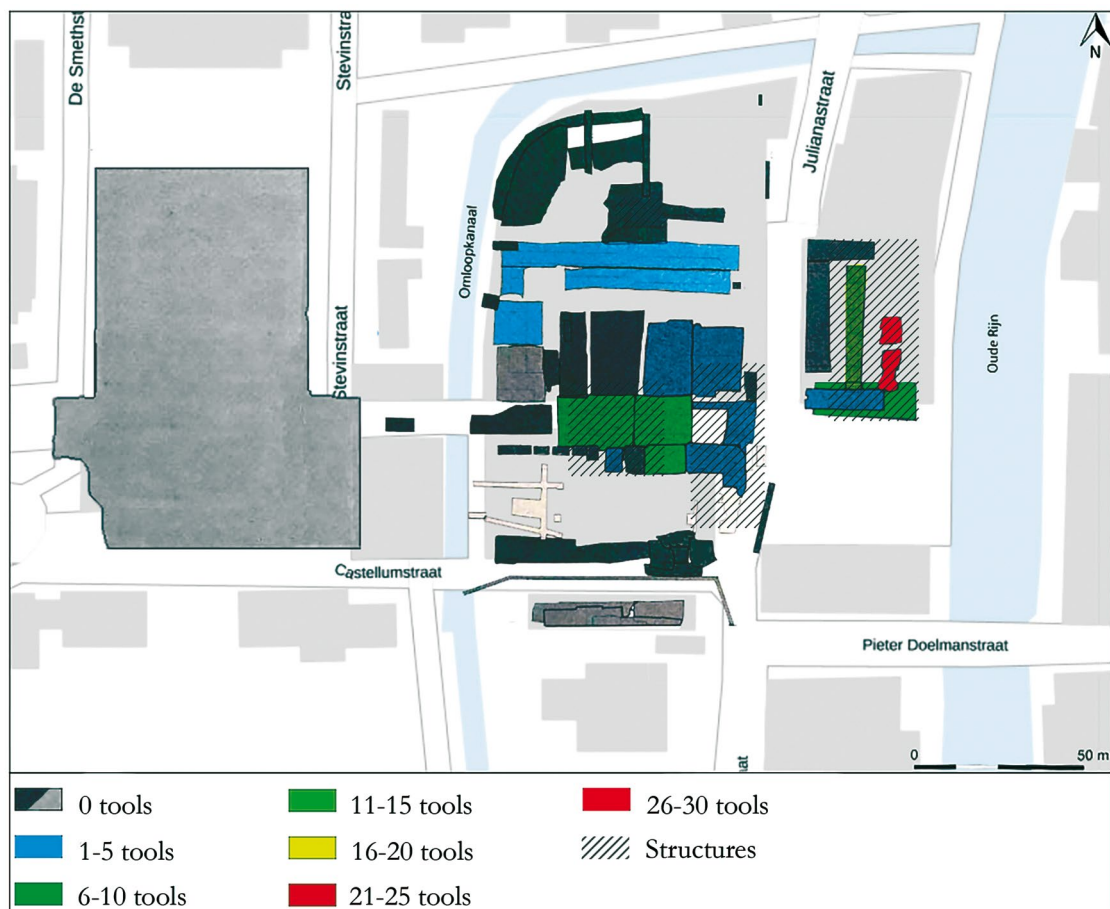


Fig. 4: Known distribution of tools per excavation pit. Lighter pits are from the 1998–1999 excavations, darker ones from the 2001–2002 excavations. The two red planes together form one pit.

city hall. The structures (green in figure 3) are indicated with shading. The tools from ‘Gered uit de Grond’ have been excluded, as their exact provenance is unknown. Immediately noticeable is the number of finds recovered from the western bank of the river Rhine. In some cases, these may have been lost during use, such as fishhooks and boat hooks, but this cannot be the case for most tools. They are likely to have been dumped in the river with other waste as part of repair work on the riverbank. A second concentration of tools is located near the supposed *fabrica*, the rest was found spread throughout the *castellum*.

Metal and leatherworking tools specifically were found in the river as well as near the *fabrica*. The metal file was found in a feature that also held bronze working waste in Zone “J”, which was rich in iron working waste as well, leading to the assumption that this zone was used as a metalworking location. Large amounts of iron slag and

fragments of hearths were also found to the south in the *vicus*. Perhaps the location for metalworking was moved outside of the *castellum* at a certain point, or they tended to dump their waste there.

Thanks to Julia Chorus, a few of the tools could be dated with the help of the other finds in the feature in which they had been excavated. Three of those tools were used for metal or leatherworking. One of the chisels as well as an awl could be dated to the first period. A second awl could be dated to the second period, but none of the metal or leatherworking tools could be dated to the third period. However, there are barely any features that could be dated to the third period to start with. The dating of these tools (and the dating of tools from other crafts) does suggest that the *fabrica* was indeed situated where the excavators concluded it may have been, at least in the first two periods; it also suggests that leather and metals were worked inside the *castellum* in the *fabrica* area.

Conclusions

The leatherworking tools and waste found at Albaniana indicate that leather was worked in the *fabrica*; it seems that most activity was involved the repair of personal military equipment, but not their actual production. Untanned hides were cleaned using skin scrapers, but there is no evidence for the tanning of hides. The metalworking tools and waste indicate that bronze as well as iron were also worked in the *fabrica*, but possibly in the *vicus* as well. Semi-finished products show that these activities did not only involve repair work but also the local production of certain objects. It is unclear if this local production also involved the production of personal military equipment. The production of military gear seems most efficient when a smith and a leatherworker cooperate, as many pieces of gear consist of both materials; it is also possible that the leather pieces were imported and adorned locally with metal attachments. However, it seems likely that the metalworking followed a similar trend as the leatherworking regarding the personal military equipment. The equipment may have been repaired locally, but was not (regularly) produced in Albaniana. The large amount of metalworking waste does not interfere with this interpretation, as the smith may have produced a range of other types of metal products used throughout the *castellum* and *vicus*, such as materials for building and tools.

The inhabitants of Albaniana must have relied on import for new military equipment, but they actively maintained and repaired the equipment in their possession. The presence of dedicated smith and leatherworker tools in such a small fort shows their dedication to quality, and great care must have been given to the equipment. This likely allowed for a long use-life and little imports of new equipment to this small fort at the edge of the empire.

Notes

- ¹ Bakker – Bron 2013.
² Van Hees 2017.
³ Gaitzsch 1980; Manning 1985.
⁴ Manning 1985.
⁵ Van Driel-Murray 1985.
⁶ Van Driel-Murray 2002.
⁷ Van Driel-Murray 2004.
⁸ Bron 2013a; Polak et al. 2004.
⁹ Polak et al. 2004.
¹⁰ Van Hees 2017.
¹¹ Bron 2013b; Nieuwenkamp 2013; Polak et al. 2004.
¹² Kok 2000; Polak et al. 2004.
¹³ Oluwasola et al. 2014.
¹⁴ Polak et al. 2004.

Image Credits

Figure 1–2: photo: L. M. A. van Hees. – Figure 3: after Polak et al. 2004, appendix map B. – Figure 4: after Haalebos – Franzen 2000; Polak et al. 2004.

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