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Landscape development and hunter-gatherer activity in Lommel Molse Nete (BE) during the Late Glacial and early Holocene
First results of an extensive survey

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1. Introduction

The development of a 240 ha large industrial zone in Lommel (Prov. Limburg, BE) instigated a large-scale preventive archaeology campaign from 2009 onwards. During the first years, the survey and subsequent excavations mainly focused on a 12 ha large strip north of the Molse Nete valley that cuts through the Campine Plateau. This area was shown to cover the remains of a spatial palimpsest of Late Glacial and early Holocene hunter-gatherer activities, in varying conditions of preservation (Van Neste *et al.*, 2009; Vanmontfort *et al.*, 2010b; Maes *et al.*, 2011; 2012). Following the survey and excavations, it was included in the Flemish Heritage List as heritage object 307803[1].

After a pause of seven years, archaeological fieldwork restarted in 2019 as a result of renewed industrial development and following the principles and procedures of the new legislative framework that was implemented in 2016. Contrary to the earlier campaigns, the entire industrial area was now the object of study. An overarching palaeolandscape survey was executed, followed by an archaeological augering survey in the areas where soil preservation was favourable for the preservation of archaeological remains *in situ*. These surveys have resulted in the identification of areas where archaeological sites are present, cannot be preserved *in situ* and therefore where subsequent excavations are necessary. Currently, several of these areas are being excavated. This paper focusses on the results of the survey.

2. Context

The study area is situated in the southwest of the Lommel territory, only a few km west of the Kattenbos hamlet on the northwestern edge of the Campine Plateau (Fig. 1). This plateau consists of coarse Early to Middle Pleistocene fluvial deposits of Rhine and Meuse and its current plateau position is the result of a relief inversion due to a combination of uplift and its protective sedimentary cover (Paulissen, 1973; Beerten *et al.*, 2018). Since the late Middle Pleistocene, it forms the watershed between Scheldt and Meuse river basins.

Our study area is flanked to the south by the Molse Nete valley. This is one of the valleys that drain the western part of the Campine Plateau towards the Campine Plain, where the Nete river links it with the Scheldt further downstream. Palaeoecological and geomorphological research in the upstream part of the Molse Nete valley showed that close to our study area it had long existed as a wet depression without a fixed river bed. Pollen data from Late Neolithic peat deposits showed that the environment evolved from a sedge meadow to an alder carr in the course of the 3rd millennium cal BC (Gelorini *et al.*, 2008).

Both north and south of the Molse Nete, land dune complexes dominate the landscape. Part of these land dunes are historical and display only limited or no pedogenesis. Following

1 https://inventaris.onroerenderfgoed.be/erfgoedobjecten/307803

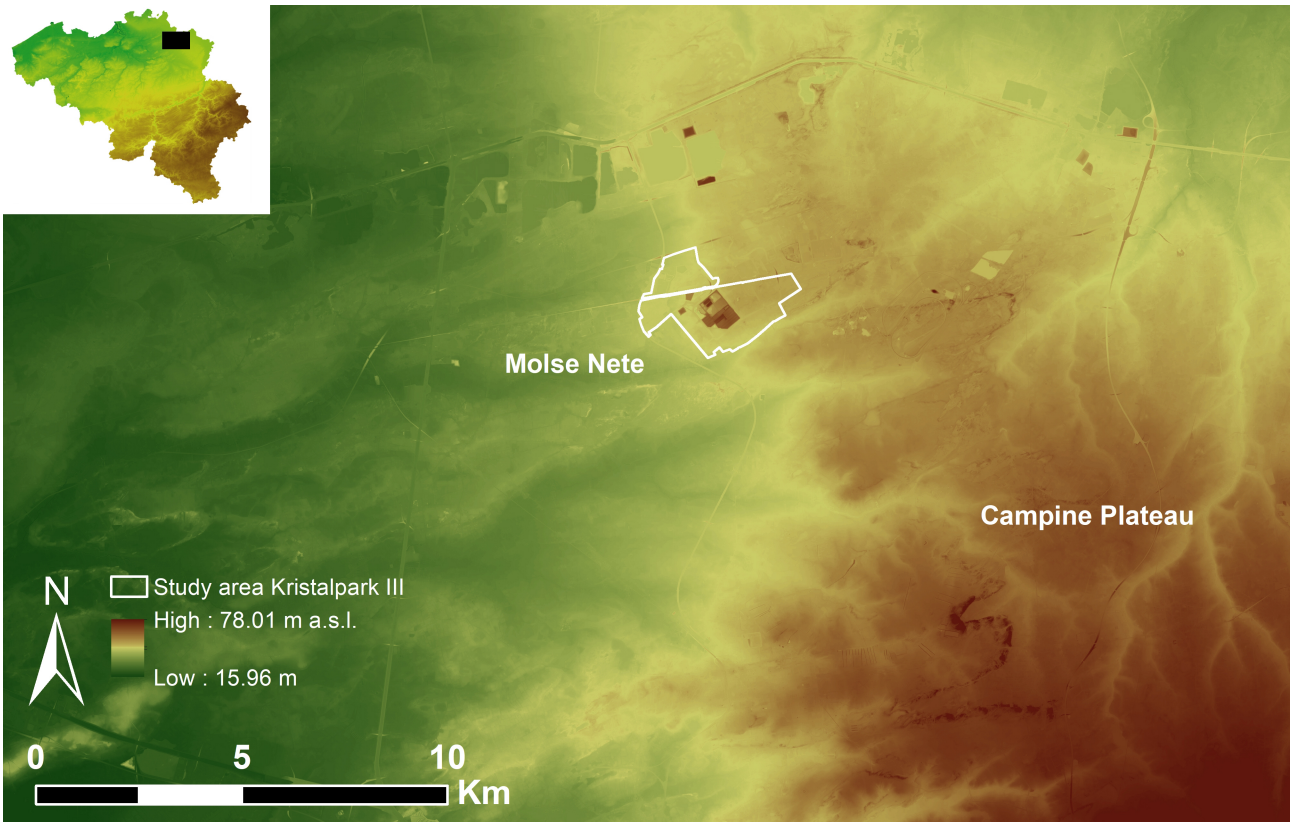

Fig. 1 – Location of the study area on the northwestern edge of the Campine Plateau. Background: 1 m raster digital terrain model, constructed on the basis of LiDAR data.
Source: Informatie Vlaanderen.

the WRB soil classification (IUSS Working Group WRB, 2015) they are Dystric Protic Arenosols. Elsewhere, but also between and below the historical land dunes, the sand soils are characterized by the migration of humus and iron and can be classified as (Albic) Podzol soils[2]. The latter soils developed on either the Middle Pleistocene deposits, wherever they reached the surface in the early Holocene period, or on Late Pleistocene coversands that thicken towards the Molse Nete valley. They are also present on top of dunes of which the formation can be dated to the Late Glacial or early Holocene. Nowadays, the relief in our study area drops down from 50 m a.s.l.[3] in its eastern part to 43.5 m a.s.l. in the west over a distance of c. 3 km. The height difference with the lowest part of the Molse Nete valley varies from 4 m in the east to 2 m in the western part of the study area.

Historically, large parts of the Campine Plateau have long been covered by heathland but in the late 19th and early 20th century, the wastelands were reclaimed for pine plantation for the coal mining industry. Historical maps show that only part of our study area was once forested, but it has been part of an industrial plant since 1881. The original Podzol soil was partially destroyed by related activities, in particular the construction of storage bunkers for the *La Forcite* factory of explosives (later *Poudreries Réunies de Belgique*, PRB). Together with the recent levelling of the terrain for the creation of the Kristalpark III industrial area, this resulted in the destruction of a Late Glacial or early Holocene dune landscape that is still present in the forested areas nearby.

From the 1930s onwards, lithic artefacts have been collected from the area, indicating the presence of archaeological sites dating back to the Palaeolithic and Mesolithic periods (Hamal-Nandrin *et al.*, 1935; Geerts, 1981). The exact locations of many of those early finds are, unfortunately, unknown but an excavation in the early 1980s confirmed the

2 Databank Ondergrond Vlaanderen - WRB soil units 40k - accessed on 31/10/2022, via https://www.dov.vlaanderen.be

3 With reference to T.A.W., *i.e.* Tweede Algemene Waterpassing.

presence of sites close to the Molse Nete valley (Geerts, 1984). More lithic concentrations were found during an augering and excavation campaign c. 1 to 1.5 km eastwards. This indicated the existence of an extensive and potentially well preserved sitecomplex on the flanks of the Molse Nete (Van Gils & De Bie, 2001; 2002; 2003). The early finds also include two concentrations that were reportedly found some 1000 m north of the Molse Nete (Geerts, 1981). The exact location and find conditions of these sites are uncertain, but they do seem to indicate the presence of archaeological sites and therefore also hunter-gatherer activity over a wider area.

The plans of a 240 ha large expansion of the Kristalpark industrial area that were unfolded in 2007 appeared to overlap with a 12 ha large stretch of the Molse Nete sitecomplex. The area was selected for a systematic augering survey, in order to map the presence of archaeological sites and determine the need for excavation. This survey confirmed the presence of an extensive hunter-gatherer sitecomplex covering the entire 12 ha, as well as the variable preservation of the Podzol soil (Van Neste *et al.*, 2009; Fig. 2). Negotiations between government agency and developer resulted in the selection of parts of this sitecomplex for excavation, as a full excavation or *in situ* preservation of this sitecomplex was not feasible. In subsequent campaigns, these excavations demonstrated the presence of both a cumulative and spatial palimpsest (*sensu* Bailey, 2007) dating back to the Late Glacial (Final Palaeolithic) and early Holocene (Mesolithic) period (Vanmontfort *et al.*, 2010b; Maes *et al.*, 2011; 2012). Part of the selection, with Final Palaeolithic remains associated with a buried palaeosol, remained untouched until recently and is the focus of ongoing excavations. The full processing and publication of the results of these excavations are programmed in the coming years.

In 2019, archaeological fieldwork resumed following renewed economic activity on the industrial area. The application of the principles of a new legislative framework, which was implemented in 2016, resulted in a much wider geographical focus, now entailing the entire 240 ha industrial development. The fieldwork started with an extensive landscape survey. The focus of this survey was the soil preservation, in order to answer the question where and to what extent *in situ* remains of hunter-gatherer activity can be expected. Subsequent archaeological survey was directed to answering the question where in this 240 ha large (palaeo)landscape archaeological sites are actually present, what the northern limits of the sitecomplex are, to what extent hunter-gatherer activities can be mapped farther north of the Molse Nete – as is suggested by a number of early 20th century finds mentioned above – and where excavations are needed to preserve the archaeological record *ex situ*.

Fig. 2 – Results of the archaeological augering campaign in 2009 (Van Neste *et al.*, 2009: fig. 2).

3. Methods

The extensive landscape survey started with 29 mechanical corings in three strategically oriented transects. Two of these were oriented perpendicular to the Molse Nete valley, while a third transect connects the first two in the southern part of the study area and runs parallel to the Molse Nete at a distance of 150 to 300 m. For this purpose samples were collected in liners of 5 cm diameter and a length of 1 m using a dual-tube direct push sampling technique. The samples were cut open in our laboratory, cleaned and described with a full macroscopic registration with the aid of the RAAP software Deborah3. The aim was to sample well into the Middle Pleistocene substrate, which resulted in a coring depth of 2 to 4 m.

The three transects were complemented with 1834 manual augerings[4]. These were staked out in a regular grid of 30 by 35 m, which corresponds with an average density of 9 augerings per ha. A standard Edelman auger with diameter of 7 cm was used and the sediment was locally and macroscopically documented in Deborah3. The aim was to reach the Middle Pleistocene substratum in each augering. This resulted in augering depths of 1 to more than 2 m. Extra profile trenches were dug where palaeosol horizons were identified during the augering survey within the Late Pleistocene coversand sequence, in order to verify these observations. In total 14 profile sections from 11 trenches were documented in detail, with a macroscopic description in Deborah3, profile drawing and orthophotography.

All profile descriptions were imported in a GIS environment and used to create a model of the (palaeo)landscape development, including deposition, pedogenesis and geomorphology. In the revised Belgian Quaternary lithostratigraphy and related chronostratigraphic interpretation (Gullentops *et al.*, 2001; Beerten *et al.*, 2017) the Pleniglacial, Late Glacial and Holocene aeolian sediments all belong to the Gent Formation. Within the Gent Formation the Opgrimbie and Achterbos Members are relevant for our study area. The Opgrimbie Member covers the aeolian sand deposits from the Late Pleniglacial to the early Holocene, without further subdivision in beds (Beerten *et al.*, 2017). The Achterbos Member corresponds to Holocene drift sands posterior to the major Podzol formation (Paulissen, 1984; Beerten *et al.*, 2014; 2017). This framework was developed and revised to be practical for mapping purposes, but lacks the resolution necessary for our archaeological research questions. We therefore chose to apply the finer lithostratigraphic subdivision of coversands as is used by Kasse *et al.,* 2018 (referring to Van der Hammen & Wijmstra, 1971 and Vandenberghe *et al.*, 2013). As no absolute dates are available yet, all chronological indications below are interpretations based on the analogy with lithostratigraphic descriptions elsewhere.

Where the results of the landscape survey indicated favourable conditions for the preservation of archaeological remains *in situ*, continued fieldwork by means of an archaeological augering survey was planned. The aims of this survey were the identification of possible locations of hunter-gatherer sites associated with either buried (Late Glacial) palaeosols or well-preserved Podzol soils. For this purpose, an Edelman auger with diameter of 15 cm was used. In total an area of 22 ha was covered by means of 2309 augerings in a rigid triangular 10 by 12 m grid (Fig. 3). Based on the results, the density of the grid was locally raised to a triangular 5 by 6 m grid or even 2.5 by 3 m. The sampling depth depended on the results of the landscape survey. In general, the entire Late Pleistocene coversand sequence was sampled. The sediment was sampled per depth of c. 20 cm for a grip on its vertical position, and sieved wet over a mesh of 2 mm. After drying, the sieving residue was checked for the presence of archaeological indicators, *i.*e. lithic artefacts, fragments of burned bone or charred macrobotanical remains. In total 5984 augerings were executed. They add up to the 3668 archaeological augerings from the 2009 campaign that were placed with a 20 cm diameter Edelman auger in a fixed triangular 5 by 6 m grid (Van Neste *et al.*, 2009).

4 Parts of the manual augerings were placed under our supervision by teams of ABO, BAAC-Vlaanderen and RAAP.

Fig. 3 – Lommel Molse Nete study area with indication of the areas of the landscape and archaeological survey. Background: 1 m raster digital terrain model, constructed on the basis of LiDAR data. Source: Informatie Vlaanderen.

Based on the results of the augering samples, additional 1 m² testpits were dug to confirm the presence of lithic concentrations and to determine their stratigraphic position. Where more space was needed to properly reach the sampling depth, the testpits were expanded with an additional m². Where the testpit could not confirm the presence of a lithic scatter, up to 3 additional testpits were dug in the immediate surroundings. This was done to exclude the possibility that the lithic scatters from which the archaeological indicators originate are extremely thin and therefore difficult to catch with the augering grid and 1 m² testpit. The relevant horizons within these testpits were sampled per unit of 50 x 50 x 5 cm. The processing of the samples was identical to that of the augering samples: wet sieving over a 2 mm mesh and splitting of the dried samples in search for archaeological indicators. In total 98 m² testpits were dug, distributed over large parts of the study area. One of these appeared erroneously placed in a disturbed context and is excluded from the results in the rest of this paper. In two occasions 1 m² testpits in a fixed 3 by 3 m grid replaced the densification of the augering grid. 84 m² testpits were dug this way. The results were used to define areas where archaeological sites are present and where excavation is necessary prior to further industrial development. Several of these areas have already been excavated or are in an excavation phase at this moment.

The final stage of the archaeological survey included a trial trenching in areas where no lithic scatters were identified. The aim of these trenches was the identification of (more recent) sites with dug features for which an augering survey is not the appropriate survey technique. At the same time, the trenches allowed the continued mapping of pedogenetic features and of the Late Glacial palaeosol.

4. Results

4.1. Palaeolandscape

Two different deposits can be found at the basis of the lithological sequence. In some areas, the lower stratum consists of well sorted and rounded medium sand with a dark brown colour and occasional lighter bands. It can be classified as Formation of Mol sands, which are Pliocene estuarine deposits (Beerten *et al.*, 2018: 205; Louwye *et al.*, 2020), or reworked Mol sands during the Early Pleistocene. In other zones, the substratum consists of heterogeneous coarse sands with frequent stratification with varied clay fragments, silt, fine to very coarse sand lenses, gravel and stones. These deposits can be classified as Lommel sands. These are Early to Middle Pleistocene fluviatile deposits of Rhine and Meuse, which are part of the Sterksel Formation (Gullentops *et al.*, 2001; Beerten *et al.*, 2018). The heterogeneity of the deposits with clay fragments and coarse sand lenses are indicative of their deposition by braided rivers. Also for this substrate, a reworked position is possible, as is indicated by the Quaternary geological map of Belgium. The trench profiles show that the top of this substrate was intensely reworked by cryoturbation. On top of the substrate a gravel pavement is present, which is the result of an erosion phase and marks the top of a palaeolandscape (*cf.* Vermeersch, 2013).

Fine sand to fine silty, well sorted sand covers the gravel on top of the Pliocene and/or Early to Middle Pleistocene substrate. This old coversand is a (fluvio-)aeolian sediment that was most probably deposited during the Pleniglacial or Late Glacial (Kasse *et al.*, 2007; Beerten *et al.*, 2018). The thickness of this deposit varies from only a few decimeters in the northern part of the project area, to over 2 m in the southern part flanking the present day Molse Nete. The lower parts of this deposit display the original stratification of (fluvio-)aeolian deposition, with alternating more and less silty sands, while the upper parts have been homogenised by later pedogenesis. In a number of cases a second residual gravel bed was observed within this coversand deposit, with fine to coarse rounded gravel. The gravel often displays aeolisation traces and frost cracks that point to wind erosion in polar desert conditions. These characteristics allow us to interpret this residual gravel bed as the Pleniglacial Beuningen gravel bed that chronologically can be situated during the Last Glacial Maximum (Kasse *et al.*, 2007; Vandenberghe *et al.*, 2013). It forms the interface between older coversands (OC) I and II according to the coversand stratigraphy of Kasse *et al.* (2018).

In 172 augerings, distributed over the southern part of the study area, a bleached horizon often containing charcoal particles can be observed at the top of these Pleniglacial and Late Glacial coversands. It occurs at a depth between 0 and 180 cm below present day surface. Based on the characteristics of this eluviation horizon and its lithostratigraphic position, it can be interpreted as a Late Glacial palaeosol, most probably connected with the Allerød interstadial and thus as an equivalent of the Usselo soil (*cf.* Vandenberghe *et al.*, 2013; Vermeersch, 2013; Kasse *et al.*, 2018). In our study area, it is often associated with an underlying silty, orange-coloured (gleyic) B-horizon. A separate, underlying phase of pedogenesis that could correspond to the Lower Loamy Bed of Bølling age (LLB unit in Kasse *et al.*, 2018) and that separates the older coversands from the younger coversands I (YCI unit in Kasse *et al.*, 2018) has not been observed. The top of the palaeosol most often bears the traces of posterior (wind) erosion, with a frequent presence of some residual fine gravel that points to the cooling and drying of the climate and the reduction of vegetation during the Younger Dryas.

Identifying the occurrence of this palaeosol was one of the main objectives of the augering campaign, although the identification with the standard Edelman auger appeared not evident: charcoal particles are not always present and the eluviation cannot always be distinguished from other bleaching phenomena in the disturbed sample of a manual augering. Moreover, the appearance of the palaeosol varies significantly over the entire area. Mechanical coring and (even more) profile trenches were needed to allow us to get a good idea of the spatial distribution and relief of the buried palaeolandscape. It is

only preserved in the southern part of our study area and covers a total area of 23 ha. Within that area the palaeosol generally lies only a few decimeters below the B-horizon of the Holocene Podzol soil. Its top declines from 49.8 m a.s.l. in the eastern part of our study area to 42.5 m a.s.l. in the western part over a distance of 2.8 km. Within this gradient, the palaeorelief displays the existence of multiple ridges separating wetter depressions that follow the main gradient and thus flow in southwestern direction. This geomorphology is at least in part responsible for the observed variation in appearance of the palaeosol. Towards the north, where the coversands wedge out on the shoulder of the gravel covered substrate, the palaeosol disappears and is either eroded or completely masked by later pedogenesis. The preservation of a Late Glacial palaeolandscape on this scale is remarkable. It provides us with a unique chance to map Final Palaeolithic hunter-gatherer activity on the scale of the landscape. It will also allow us to complement the knowledge already acquired on the Late Glacial occupation of the wider area (a.o. De Bie *et al.*, 2009; Deeben & Arts, 2005; Vanmontfort *et al.*, 2010a; Vermeersch, 2011; Derese *et al.*, 2012; Crombé *et al.*, 2011; 2013; Kasse *et al.*, 2018).

Where the Late Glacial palaeolandscape was identified, it is covered with several decimetres of medium-fine sand containing very few fine gravel. According to the chronostratigraphic sequence, this cover can be dated to the Younger Dryas period. These younger coversands are somewhat less silty than the underlying older coversands, but a distinction between both was generally only identified with certainty where the palaeosol is present. The lack of original stratification in these sediments is attributed to the posterior development of a humus-iron Podzol in their top. This Podzol is characterized by the albic and spodic horizons. Where no (younger) coversands are present, *i.e.* in the northern part of our study area, the Podzol developed in older coversands and/or in the substrate of the Lommel Formation below the residual gravel bed. Podzol preservation is variable. In places the diagnostic albic and spodic horizons are eroded due to wind erosion, in other places they are removed or disturbed by (recent) human activity. Elsewhere, the Podzol has a moderate to good preservation with either the spodic or albic horizon on top, or rarely with the surface horizon intact.

Most often the top of the lithostratigraphic sequence witnesses the historic disturbance of the original soil profile. These vary from a single ploughing event, turning the top of the original Podzol horizon sequence, over continued ploughing to even an anthropogenic cover with grey, reworked sands or a combination of these. The disturbance can be related to different events of levelling or the breaking of the spodic horizons of the Podzol profile during the last 150 years. The causes of those events include pine plantations, the construction of storage bunkers and the more recent development of the industrial area of Kristalpark III. Locally, drift sands – the Achterbos Member of the Gent Formation in Beerten *et al.,* 2017 – are present on top of the sequence. Some of these drift sands are recent and only formed during the last decade.

4.2. Archaeological record

The nine areas selected for further survey by means of archaeological augering cover in total 22 ha. The fieldwork was executed in different subphases between 2019 and 2021 (van der Waa & Willems, 2019; van der Waa *et al.*, 2020; 2021; van der Waa & Robberechts, 2021; 2022). In this paper, the combined results of these campaigns are presented.

Of the 2309 corings placed in the original 10 by 12 m grid, only 129 (5.6 %) yielded archaeological indicators that necessitated further attention. Samples with indicators are distributed more or less evenly over the entire study area. On the basis of these results, the grid was densified to a triangular 5 by 6 m or 2.5 by 3 m grid in selected locations. The selection for densification of the augering grid was based on a combination of soil preservation and the presence of prior sampling with indicators but also extended in areas without indicators in prior sampling. It yielded an additional 218 artefacts from 50 corings or only 1.4 % of the total number of 3675 corings. Remarkably, however, these additional indicators were generally not found in the immediate surroundings of the indicators from

the previous survey phase. They appeared in areas were indicators were lacking in the previous phase and add to the image of a sparse distribution of indicators over the entire study area. The density of this distribution is, as was expected, much lower than in the 12 ha stretch along the Molse Nete where a density of 24 % (N = 863/3668) was reached (*cf. supra*; Van Neste *et al.*, 2009).

Testpitting was performed to identify the nature of the archaeological record of which the indicators were the result. 51 corings with artefacts were selected on the basis of soil preservation and the nature of the indicators. A preference was given to locations where a well preserved Podzol soil was present and/or where the artefacts were possibly connected with a preserved palaeosol. Locations with artefacts larger than 1 cm and/or fresh artefacts that do not bear the traces of aeolisation or displacement were preferred over weathered chips. The 1 m^2 testpits were generally placed to include the core from which the archaeological indicator was sampled. The result was rather feeble, with only 111 additional artefacts from 34 of the 98 testpits. Most of these artefacts were, moreover, chips. In the selected areas where a 3 by 3 m grid of testpits was placed, 224 artefacts were found in 63 of the 84 m^2. Despite the efforts made, this led to the identification of only three locations were further study by means of excavations is necessary. The rest of the archaeological indicators from this survey rather seem to point to a situation with isolated and randomly distributed chips. The antropogenic nature of these chips is considered beyond doubt. They were critically selected and only the areas with the objects in mint condition were selected for further sampling. Still, most of them appeared unrelated to denser lithic clusters on the basis of our testpitting results. It seems rather unlikely that in each of these cases, the efforts made in placing extra augerings and testpits were insufficient to discover the concentrations from which these indicators derived. Confirming this with certainty would entail the opening of several larger excavation pits in areas where testpitting could not reach an artefact density of more than a few chips per m^2, which was not an economically realistic scenario. We therefore need to assume that they are indeed part of a random distribution of chips and that the processes involved in this distribution are of a natural rather than an anthropogenic nature. Given their small dimensions, they can be interpreted as redeposited by aeolian processes from places of human activity like lithic tool production nearby.

In a restricted number of cases testpitting could confirm the presence of artefact scatters *in situ*. These were either connected with the palaeosol in the southern part of the study area or with the present-day surface and the Podzol soil. These locations were added to the selection for further study by means of full excavations that are currently ongoing. The results of these excavations will be reported elsewhere.

5. Conclusion and prospects for future research

In 2019, archaeological fieldwork on the Final Palaeolithic and Mesolithic Lommel Molse Nete sitecomplex resumed, following renewed industrial development and in a developer-funded archaeology context. An extensive survey took place in a more than 200 ha large area north of the sitecomplex that was identified during a previous campaign in 2009. A palaeolandscape survey by means of mechanical coring, manual coring and profile trenching was followed by an archaeological survey on selected locations with favourable soil preservation and potential to contain archaeological sites. The results show the preservation of a palaeolandscape dating back to the Late Glacial period that is unique because of its extensiveness. Ongoing and future research has a large potential for the study of landscape formation during the Late Glacial period, with regard to litho- and chronostratigraphy, geomorphology and pedogenesis.

This situation also offers a unique possibility to map hunter-gatherer activity on the level of the (palaeo)landscape. The archaeological survey following the palaeolandscape survey entailed 5984 archaeological augerings on 22 ha and 182 m^2 testpits in order to locate archaeological sites. The survey yielded an image of small artefacts (chips) distributed all

over the area that can be interpreted as redeposited by aeolian processes from places of human activity like lithic tool production nearby. These observations are significant in two ways: they can be used as an indicator of human activity in the wider area, but they also allow us to confirm the absence of locations of denser activity in large parts of our study area and palaeolandscape. The attestation of the absence of sites is a significant outcome and will help us to further map and understand the use of the landscape by hunter-gatherers. It also has the potential to contribute to the improvement of the methodological framework in the context of Flemish preventive archaeology. In a restricted number of cases artefact scatters with varying density were located. The excavations at these sites as well as the continuation of the excavations at locations selected after the first survey in 2009 are currently ongoing.

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Bibliography

BAILEY G., 2007. Time perspectives, palimpsests and the archaeology of time. *Journal of Anthroplogical Archaeology*, 26 (2): 198-223.

BEERTEN K., VANDERSMISSEN N., DEFORCE K. & VANDENBERGHE N., 2014. Late quaternary (15 ka to present) development of a sandy landscape in the Mol area, Campine region, NE Belgium. *Journal of Quaternary Science*, 29: 433-444.

BEERTEN K., HEYVAERT V. M. A., VANDENBERGHE D., VAN NIEULAND J. & BOGEMANS F., 2017. Revising the Gent Formation: a new lithostratigraphy for Quaternary wind-dominated sand deposits in Belgium. *Geologica Belgica*, 20 (1-2): 95-102.

BEERTEN K., DREESEN, R., JANSSEN J. & VAN UYTVEN D., 2018. 12. The Campine Plateau. In: Demoulin A. (ed.), *Landscapes and landforms of Belgium and Luxemburg*, Springer International Publishing, Cham: 193-214.

CROMBÉ P., SERGANT J., ROBINSON E. & DE REU J., 2011. Hunter-gatherer responses to environmental change during the Pleistocene-Holocene transition in the southern North Sea basin: Final Palaeolithic-Final Mesolithic land use in northwest Belgium. *Journal of Anthropological Archaeology*, 30 (3): 454-471.

CROMBÉ P., DE SMEDT P., DAVIES N. S., GELORINI V., ZWERTVAEGHER A., LANGOHR R., VAN DAMME D., DEMIDDELE H., VAN STRYDONCK M., ANTROP M., BOURGEOIS J., DE MAEYER P., DE REU J., FINKE P. & VAN MEIRVENNE M., 2013. Hunter-gatherer responses to the changing environment of the Moervaart palaeolake (Nw Belgium) during the Late Glacial and Early Holocene. *Quaternary International*, 308-309: 162-177.

DE BIE M., VAN GILS M. & DEFORCE K., 2009. Human occupation in a Late Glacial Landscape: the Federmessergruppen site complex at Lommel Maatheide (Belgium). In: Street M., Barton N. & Terberger T. (ed.), *Humans, environment and chronology of the Late Glacial of the North European Plain*, Tagungsbänder des Römisch-Germanischen Zentralmuseums Mainz, 6, Mainz and Bonn: 77-87.

DEEBEN J. & ARTS N., 2005. From tundra hunting to forest hunting, later Upper Palaeolithic and Early Mesolithic. In: Louwe Kooijmans L. P., van den Broeke P. W., Fokkens H. & van Gijn A. (ed.) *The prehistory of the Netherlands*, Amsterdam University Press, Amsterdam: 139-156.

DERESE C., VANDENBERGHE D. A. G., VAN GILS M., MEES F., PAULISSEN E. & VAN DEN HAUTE P., 2012. Final Palaeolithic settlements of the Campine region (NE Belgium) in their environmental context: optical age constraints. *Quaternary International*, 251: 7-21.

GEERTS F., 1981. *Enkele Epipaleolithische en Mesolithische sites te Lommel en omgeving*. Licentiaatsverhandeling, KU Leuven, Leuven.

GEERTS F., 1984. Lommel-Vosvijvers 3, a Late Mesolithic settlement. *Notae Praehistoricae*, 4/1984: 61-64.

GELORINI V., MEERSCHAERT L., BATS M., CALJON L., BOUDIN M., VAN STRYDONCK M., CROMBÉ P. & THOEN E., 2008. Laatneolithische landschappelijke ontwikkeling van de vallei van de Molse Nete. *Notae Praehistoricae*, 28/2008: 113-124.

GULLENTOPS F., BOGEMANS F., DE MOOR G., PAULISSEN E. & PISSART A., 2001. Quaternary lithostratigraphic units (Belgium). *Geologica Belgica*, 4 (1-2): 153-164.

HAMAL-NANDRIN J., SERVAIS J. & LOUIS M., 1935. Nouvelle contribution à l'étude du préhistorique dans la Campine limbourgeoise (Belgique). *Bulletin de la Société Préhistorique Française*, 32: 175-203.

IUSS WORKING GROUP WRB, 2015. *World Reference Base for Soil Resources 2014, update 2015. International soil classification system for naming soils and creating legends for soil maps*. World Soil Resources Reports, Rome.

KASSE C., VANDENBERGHE D., DE CORTE F. & VAN DEN HAUTE P., 2007. Late Weichselian fluvio-aeolian sands and coversands of the type locality Grubbenvorst (southern Netherlands): sedimentary environments, climate record and age. *Journal of Quaternary Science*, 22: 695-708.

KASSE C., TEBBENS L. A., TUMP M., DEEBEN J., DERESE C., DE GRAVE J. & VANDENBERGHE D., 2018. Late Glacial and Holocene aeolian deposition and soil formation in relation to the Late Palaeolithic Ahrensburg occupation, site Geldrop-A2, the Netherlands. *Geologie en Mijnbouw / Netherlands Journal of Geosciences*, 97 (1-2): 3-29.

LOUWYE S., DECKERS J. & VANDENBERGHE N., 2020. The Pliocene Lillo, Poederlee, Merksplas, Mol and Kieseloolite Formations in northern Belgium: a synthesis. *Geologica Belgica*, 23 (3-4): 297-313.

MAES B., WILLEMS M., LAMBRECHTS B., VAN BAELEN A. & VANMONTFORT B., 2011. Vervolgonderzoek op het sitecomplex langs de Molse Nete te Lommel (B). Opgravingscampagne 2011. *Notae Praehistoricae*, 31/2011: 61-68.

MAES B., CNUTS D., WILLEMS M., VAN BAELEN A. & VANMONTFORT B., 2012. Vervolgonderzoek op het sitecomplex langs de Molse Nete te Lommel. Opgravingscampagne 2012. *Notae Praehistoricae*, 32/2012: 37-42.

PAULISSEN E., 1973. *De Morfologie en de Kwartairstratigrafie van de Maasvallei in Belgisch Limburg*. Verhandelingen van de Koninklijke Academie voor Wetenschappen, Letteren en Schone Kunsten van België, Klasse der Wetenschappen, 127.

PAULISSEN E., 1984. Het fysisch kader van Opglabbeek. In: Molemans J. & Mertens J. (ed.), *Opglabbeek, een rijk verleden*, Gemeentebestuur Opglabbeek, Opglabbeek: 29-56.

VAN DER HAMMEN T. & WIJMSTRA T.A., 1971. The Upper Quaternary of the Dinkel valley (Twente, Eastern Overijssel, the Netherlands). *Mededelingen Rijks Geologische Dienst*, 22: 55-212.

VAN DER WAA M. & WILLEMS M., 2019. *Nota Lommel Kristalpark III - Vario Food Group. Verslag van resultaten*. KU Leuven archeoWorks, Leuven.

VAN DER WAA M. & ROBBERECHTS B., 2021. *Nota Lommel Kristalpark III 'Sector M-N-H'. Verslag van resultaten*. KU Leuven archeoWorks, Leuven.

VAN DER WAA M. & ROBBERECHTS B., 2022. *Nota Lommel Ciner Sector A Fase 2. Verslag van resultaten*. KU Leuven archeoWorks, Leuven.

VAN DER WAA M., CLAEYS J., VERBEECK K. & WILLEMS M., 2020. *Nota Lommel Kristalpark III Eduards Trailer Factory*. KU Leuven archeoWorks, Leuven.

VAN DER WAA M., DE BOECK S., VAN BAELEN A., VAN KERKHOVEN I. & WEEKERS-HENDRIKX B., 2021. *Archeologienota Lommel Kristalpark III – Sector A. Verslag van resultaten*. KU Leuven archeoWorks, Leuven.

VAN GILS M. & DE BIE M., 2001. Prospectie en kartering van laat-glaciale en vroegholocene sites in de Kempen: resultaten van de boorcampagne 2001. *Notae Praehistoricae*, 21/2001: 77-78.

VAN GILS M. & DE BIE M., 2002. *Prospectie en kartering van laat-glaciale en vroegholocene sites in de Kempen. Boorcampagne 2001*. IAP-rapporten 12, Brussel.

VAN GILS M. & DE BIE M., 2003. Een uitgestrekt Laat-Mesolithisch site-complex langs de *Molse Nete* in Lommel. *Notae Praehistoricae*, 23/2003: 67-69.

VANDENBERGHE D. A. G., DERESE C., KASSE C. & VAN DEN HAUTE P., 2013. Late Weichselian (fluvio-)aeolian sediments and Holocene drift-sands of the classic type locality in Twente (E Netherlands): a high-resolution dating study using optically stimulated luminescence. *Quaternary Science Reviews*, 68: 96-113.

VAN NESTE T., YPERMAN W., VANMONTFORT B., VAN GILS M. & GEERTS F., 2009. Nieuw onderzoek op het sitecomplex langs de Molse Nete te Lommel. *Notae Praehistoricae*, 29/2009: 87-91.

VANMONTFORT B., VAN GILS M., PAULISSEN E., BASTIAENS J., DE BIE M. & MEIRSMAN E., 2010a. Human occupation of the Late and Early Post-Glacial environments in the Liereman Landscape (Campine, Belgium). *Journal for Archaeology in the Low Countries*, 2: 31-51.

VANMONTFORT B., YPERMAN W., LAMBRECHTS B., VAN GILS M. & GEERTS F., 2010b. Een finaalpaleolithisch en mesolithisch sitecomplex te Lommel, Molse Nete. Opgravingscampagne 2010. *Notae Praehistoricae*, 30/2010: 29-34.

VERMEERSCH P. M., 2011. The human occupation of the Benelux during the Younger Dryas. *Quaternary International*, 242: 267-276.

VERMEERSCH P. M., 2013. *An Ahrensburgian Site at Zonhoven-Molenheide (Belgium)*. British Archaeological Reports (BAR), International Series, 2471, Archaeopress, Oxford.

Abstract

In 2019, fieldwork resumed on the Final Palaeolithic and Mesolithic sitecomplex of Lommel Molse Nete (BE). A more than 200 ha large area was the object of an extensive landscape and archaeological survey, including more than 1800 landscape corings and numerous profile trenches as well as *c*. 6000 archaeological augerings and c. 200 m² testpits. The results show the preservation of a unique Late Glacial palaeolandscape with a large potential to further map and understand the use of the landscape by hunter-gatherers. A number of locations have been selected for a full excavation.

Keywords: Lommel Molse Nete (Prov. Limburg, BE), Late Glacial, Usselo palaeosol, Podzol soil, hunter-gatherers, developer-funded archaeology, survey.

Samenvatting

In 2019 werd het terreinwerk hervat op het finaalpaleolithische en mesolithische sitecomplex van Lommel Molse Nete (BE). Op een studiegebied van meer dan 200 ha werd een extensieve landschaps- en archeologische prospectie uitgevoerd. Daarbij werden meer dan 1800 landschappelijke boringen en verschillende profielsleuven maar ook *c*. 6000 archeologische boringen en bijna 200 m² proefputten gegraven. De resultaten tonen de bewaring van een uniek laatglaciaal paleolandschap met een groot potentieel voor het verder karteren en begrijpen van het landschapsgebruik door finaalpaleolithische jager-verzamelaars. In een volgende fase vormen verschillende geselecteerde locaties het onderwerp van opgravingen.

Trefwoorden: Lommel Molse Nete (Provincie van Limburg, BE), laatglaciaal, Usselo paleobodem, Podzol bodem, jager-verzamelaars, preventieve archeologie, prospectie.

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