

Kasterlee Formation

Unit name: Kasterlee Formation

Hierarchical unit name: /

Type: Formation

Code: KI

Author(s):

- Compiled by: Verhaegen Jasper & Vandenberghe Noël
- Modification of: De Meuter & Laga (1976) after Dumont (1882)

Alternative names: /

Origin of the name: The outcrops along the Lichtaart-Kasterlee hill ridge. The meaning of the Kasterlee Formation is extended compared to the definition by De Meuter & Laga (1976) after Dumont (1882) in Lithostratigraphic scale of Belgium (Laga et al., 2001).

Status: Formal

Date: 01/05/2022

How to refer: Verhaegen, J. & Vandenberghe, N., 2023. The Kasterlee Formation, 01/09/2023. National Commission for Stratigraphy Belgium.
<http://ncs.naturalsciences.be/lithostratigraphy/Kasterlee-Formation>

Characterizing description

The main properties allowing to identify the classical Kasterlee Formation in its type area are undoubtedly the fine sand grain-size compared to the medium sand grain-size of the underlying Diest Formation and a moderate to low glauconite content giving the sand a colour from grey to green depending on the content. No grain-size contrast with the overlying Poederlee Sand exists but the boundary is marked by the characteristic Hukkelberg Gravel layer at the base of the latter. Where the Kasterlee Formation is almost devoid of glauconite grains and overlain or laterally bordered by Mol Sand, the boundary can be debatable. The Kasterlee Formation contains no carbonate and calcareous fossils are absent. Dinoflagellate cysts do occur. Muscovite flakes are common. A basal flint gravel is only observed at southern locations while otherwise no basal gravel is present.

Recent comprehensive studies of the Kasterlee Formation since the earlier review by Laga et al. (2001) have justified the subdivision into members. A thin basal part with reworked coarser Diest Formation sand, containing a larger amount of glauconite pellets and a bimodal grain-size distribution, is generally recognised and named the Hallaar Member. A clayey facies occurs in the east and south of the formation, named the Heist-op-den-Berg Member; it is characterized by an alternation of cm- to dm-scale fine sand and grey clay layers. A fine sand unit with low glauconite content named the Beerzel Member only occurs locally between the Hallaar and Heist-op-den-Berg members. In the east of the formation distribution area, a pale grey quartz sand practically without glauconite pellets occurs systematically above the Heist-op-den-Berg Member. In the archives of the Geological Survey of Belgium this facies was incorporated into the Kasterlee Formation although its colour and quartz composition relate it lithostratigraphically to the Mol Sand. The difference with the classical Mol Sand can be made by the presence of a coarser size fraction in the latter. The name of Retie Member is

proposed for this pale grey facies which for geometrical, paleogeographical reasons, and for stratigraphical nomenclature continuity, could be grouped in the Kasterlee Formation. However it is chosen to rank the Retie Member as a lithostratigraphic member of the Mol Sand Formation because of its pale grey colour and its quartz composition (for a discussion see Vandenberghe et al., 2020). In this subdivision of the Kasterlee Formation, the classical fine-grained and pale green sand type of the previous Kasterlee Formation definitions, in the northwest of the formation occurrence area, needs to be defined as a member within the formation and the name Lichtaart Member is proposed for it.

Type section, type locality, type borehole, type CPT and/or type geophysical borehole

The type section of the Kasterlee Formation selected in the Lithostratigraphic scale of Belgium (2001) are occasional outcrops in the flanks of the hills between Herentals, Lichtaart and Kasterlee on the right bank of the Kleine Nete valley. In this stratotype area the Lichtaart Member is observed and overlain by Hukkelberg Gravel at the base of the Poederlee Sand. The base of the formation cannot be observed in these outcrops. However, a CPT on the hill near Kasterlee (10-CPT-138) shows the base of the Lichtaart Member at +4.25 m TAW and the base of the formation at -2 m TAW.

As the other members occur laterally of the classical Lichtaart Member, type sections for these are also relevant and discussed in these member descriptions. For the Hallaar, Beerzel and Heist-op-den-Berg members the sunken lane in Heist-op-den-Berg is proposed (TO-20140919 / TO-20190617).

Description upper boundary

In the northwest, the formation can be overlain by the Poederlee Sand in which case the characteristic Hukkelberg Gravel occurs at the latter's base just above the top of the Kasterlee Formation. In the eastern area where the top of the Kasterlee Formation is made up by the clayey Heist-op-den-Berg Member, it is overlain by the pale grey fine quartz sand of the Retie Member (Mol Formation)

Description lower boundary

The Kasterlee Formation is always underlain by the Diest Formation. The Diest Formation has a coarser grain size. When the top of the Diest Formation is also enriched in clay or contains clay laminae, as is the case in the Mol-Dessel area, the boundary between both formations can be uncertain. However in the area east of Kasterlee, the appearance of a fraction >500 µm in the top of the Diest Formation often accompanied by a decrease in the gamma ray signal allows to mark the boundary between both formations. This boundary is consistent with a correlative signal change in CPT measurements. It has been observed that the base of the Kasterlee Formation contains reworked Diest Formation sand up to 2-3 m above the contact (Hallaar Member) influencing also the gamma ray signal.

A disperse basal gravel, the Olen Gravel Bed, has been found only in the Beerzel, Heist-op-den-Berg and Olen outcrops, in the south of the formation occurrence area. The gravel consists of somewhat flattened flint pebbles with a characteristic spotted patina. The top of the Diest Formation in this area is much coarser, though with a larger clay fraction, less well sorted and has a higher glauconite content compared to the base of the Kasterlee Formation. Further northwards, only a somewhat coarser sand level occasionally occurs at the base of the Kasterlee Formation.

Thickness

In the type area Herentals-Lichtaart-Kasterlee a thickness of about 15 m is interpreted in sections drafted by Laga and Gulinck and confirmed by a CPT log interpretation (10-CPT-138). In the boreholes Gierle (017W0158/kb8d17w-B14) and Rees (017E0399/kb8d17e-B495), in which only the Lichtaart Member occurs underlying the Poederlee Formation, thickness is reduced to 8 to 10 m. East of Kasterlee, with the Hallaar and Heist-op-den-Berg members, thicknesses between 5 and 10 m are

interpreted in boreholes. In the Beerzel and Heist-op-den-Berg outcrops the thickness is 8 m and in the Olen outcrop 5 m; in both outcrops the Kasterlee Formation is overlain by Quaternary sediments.

Occurrence

The paleogeographical map shows the distribution of the Kasterlee Formation and its Lichtaart (open marine), Beerzel (barrier sand) and Heist-op-den-Berg (clayey facies) members (Figure 0-1). The Hallaar Member with marked reworking of underlying Diest Formation sand occurs where the latter is most strongly eroded, namely in the coastal marine realm. The Retie Member distribution is similar to that of the Heist-op-den-Berg Member.

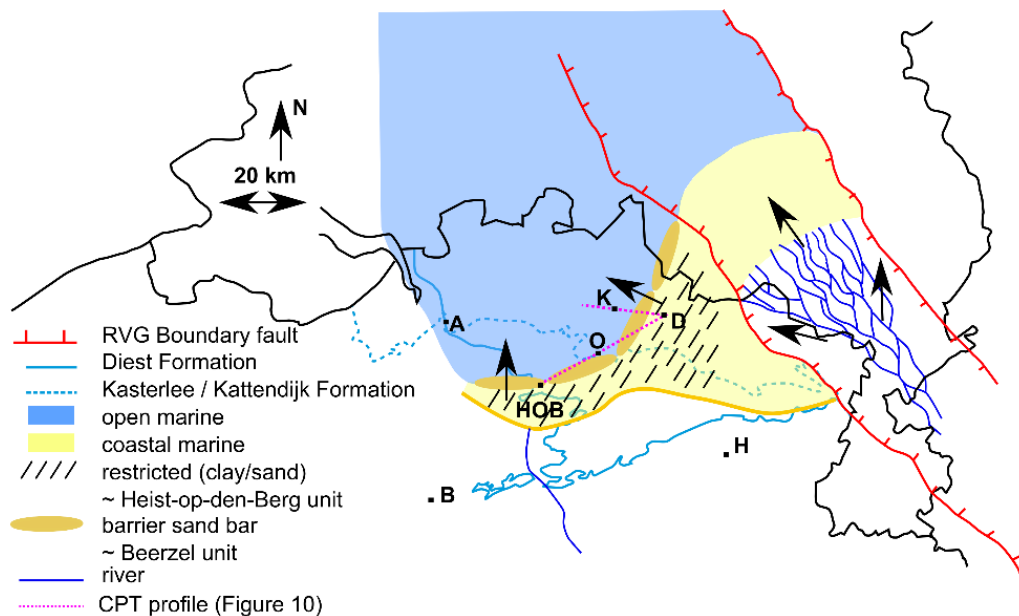


Figure 0-1. Paleogeographical map of the Kasterlee Formation (Verhaegen et al., 2020).

Regional correlations

As no calcareous microfossils occur in the Kasterlee Formation, its lateral geometry with the fossiliferous Kattendijk Formation was used to consider both formations as each other's lateral equivalent. However, dinoflagellate cyst biozone DN10 identified in the Lichtaart Member (Rees borehole, 017E0399; [kb8d17e-B495](#)) and in the Heist-op-den-Berg Member (ON-Dessel-2 borehole 031W0338 / [kb17d31w-B299](#)) attributes a late Tortonian to Messinian Miocene age to the Kasterlee Formation compared to the early Zanclean Pliocene age of the Kattendijk Formation. The difficulty to distinguish between the Kattendijk and Kasterlee formations in the subsurface of the Antwerp province is apparent in several profiles of Laga and Gulinck (Laga, 1976) and probably also explains the possibly 40 m thickness for the Kasterlee Formation in the northeast of the Antwerp province cited in the Lithostratigraphic scale of Belgium (2001). Based on the DN10 biozonation, the Kasterlee Formation is laterally equivalent to the top of the Diest Formation to the west. In the east, the Kasterlee Formation partly underlies (Heist-op-den-Berg Member) and is partly lateral to (Lichtaart Member) the base of the Mol Formation (Retie Member).

Age

Dinoflagellate cyst biozone DN10 was identified in the Lichtaart Member (Rees borehole, 017E0399; [kb8d17e-B495](#)) and in the Heist-op-den-Berg Member (ON-Dessel-2 borehole 031W0338 / [kb17d31w-B299](#)), attributing a late Tortonian to Messinian Miocene age to the Kasterlee Formation.

Dataset

Data in the LIS are part of the [DOV-Neogene data collection](#), including links to the GSB-collection data sheets.

Subset of the Kasterlee Formation: <https://www.dov.vlaanderen.be/data/opdracht/2020-021580>

References

Buffel, P., Vandenberghe, N., Goolaerts, S. & Laga, P., 2001. The Pliocene sediments in 4 boreholes in the Turnhout area (North-Belgium): the relationship with the Lillo and Mol Formations. *Aardkundige Mededelingen*, 11, 1–8.

De Meuter, F. & Laga, P., 1976. Lithostratigraphy and biostratigraphy based on benthonic Foraminifera of the Neogene deposits of northern Belgium. *Bulletin van de Belgische Vereniging voor Geologie*, 85/4, 133–152.

Dumont, A., 1882. *Mémoires sur les terrains crétacé et tertiaires préparés par feu A. Dumont pour servir à la description de la carte géologique de Belgique*, 2 éd. par Murlon, M. IV Terrains tertiaires, partie 3, 1–702.

Fobe, B., 1995. Lithologie en lithostratigrafie van de Formatie van Kasterlee (Pliocene van de Kempen). *Natuurwetenschappelijk Tijdschrift*, 75, 35–45.

Gullentops, F. & Huyghebaert, L., 1999. A profile through the Pliocene of Northern Kempen, Belgium. *Aardkundige Mededelingen*, 9, 191–202.

Laga, P., 1976. Geologische Doorsneden. *Archieven Belgische Geologische Dienst*. <http://collections.naturalsciences.be/ssh-geology/geology/profiles-neogeen2020>, accessed 15/03/2020.

Laga, P., Louwye, S. & Geets, S., 2001. Paleogene and Neogene lithostratigraphic units (Belgium). In Bultynck, P. & Dejonghe, L., (eds), *Guide to a revised lithostratigraphic scale of Belgium*. *Geologica Belgica*, 4/1-2, 135–152. <https://doi.org/10.20341/gb.2014.050>

Louwye, S., De Schepper, S., Laga, P. & Vandenberghe, N., 2007. The Upper Miocene of the southern North Sea Basin (northern Belgium): a paleoenvironmental and stratigraphical reconstruction using dinoflagellate cysts. *Geological Magazine*, 144, 33–52. <https://doi.org/10.1017/S0016756806002627>

Schiltz, M., 2020. On the use of CPT's in stratigraphy; recent observations and some illustrative cases. *Geologica Belgica*, 23/3-4, 399–411. <https://doi.org/10.20341/gb.2020.019>

Vandenberghe, N., Wouters, L., Schiltz, M., Beerten, K., Berwouts, I., Vos, K., Houthuys, R., Deckers, J., Louwye, S., Laga, P., Verhaegen, J., Adriaens, R. & Dusar, M., 2020. The Kasterlee Formation and its relation with the Diest and Mol Formations in the Belgian Campine. *Geologica Belgica*, 23/3-4, 265–287. <https://doi.org/10.20341/gb.2020.014>

Verhaegen, J., Adriaens, R., Louwye, S., Vandenberghe, N. & Vos, K., 2014. Sediment-petrological study supporting the presence of the Kasterlee Formation in the Heist-op-den-Berg and Beerzel hills, southern Antwerp Campine, Belgium. *Geologica Belgica*, 17, 323–332.



Verhaegen, J., Frederickx, L. & Schiltz, M., 2020. New insights into the stratigraphy and paleogeography of the Messinian Kasterlee Formation from the analysis of a temporary outcrop. *Geologica Belgica*, 23/3-4, 253-263. <https://doi.org/10.20341/gb.2020.015>