

Kruisschans Member (Lillo Formation)

Unit name: Kruisschans Member

Hierarchical unit name: Lillo Formation

Type: Member

Code: LiKr

Author(s):

- Compiled by: Deckers Jef, Louwye Stephen & Goolaerts Stijn
- Modification of: De Meuter & Laga (1976)

Alternative names: The Kruisschans Member as defined here includes the America Dock gravel (de Heinzelin, 1955 after Vincent, 1889 and Delheid, 1895) and the Grobbendonk clay (Vandenberghe et al., 2000). Former names: "Sables à Laevicardium parkinsoni" (see De Meuter & Laga (1976) and Louwye et al. (2020) for overview and references)

Origin of the name: after the former 'fortress of Kruisschans', situated on the right bank of the river Scheldt, in the former municipality of Oorderen

Status: Formal

Date: 01/05/2022

How to refer: Deckers, J., Louwye, S. & Goolaerts, S., 2023. The Kruisschans Member, 01/09/2023. National Commission for Stratigraphy Belgium. <http://ncs.naturalsciences.be/lithostratigraphy/Kruisschans-Member>

Characterizing description

The Kruisschans Member was formally redefined by De Meuter and Laga (1976) as a grey-green, fine-grained to medium fine-grained, locally coarse-grained, glauconiferous quartz sand with shell debris and abundant small shells. Many clay lenses and clay layers occur. The thickness of the clay layers varies between 1 to 1.5 cm but can sometimes reach 10 cm to 20 cm. The sediment can be strongly bioturbated.

A gravel layer was described at the base of the Kruisschans Member in the America Dock (de Heinzelin, 1955 after Vincent, 1889 and Delheid, 1895) and the Boudewijn Sluice (de Heinzelin, 1952) temporary outcrops in the Port of Antwerp.

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

De Meuter & Laga (1976) named Kruisschans, a former village to the north of the city of Antwerp as type locality. These authors also selected the temporary outcrop of the Boudewijnsluis (DOV [kb7d15w-B282](#)) described by de Heinzelin de Braucourt (1955) and where the member occurs between -5.5 and -7.5 m depth TAW.

In the Tunnel Kanaaldok section of Laga (1972) (now named Tijsmanstunnel) (GSB 015W0304; DOV [BGD015W0304](#)), which is the stratotype-section of the Lillo Formation, the member outcropped between 15 and 21 m depth, translating to -10.5 and -13.5 m TAW (Figure 0-1). On the nearby CPT (DOV [GEO-20/034-S5](#)), the Kruisschans Member is characterised by relatively high friction ratios (between 2 and 3%) and low cone resistance values of around 10 MPa.

In the Verrebroekdok section of Goolaerts (2000) (DOV [TO-19990901](#)), the member outcropped between and -2.2 and -5.8 m TAW (fide Deckers et al., 2020; Figure 0-2).

Type geophysical borehole log is borehole Stabroek (GSB: 015W0216; DOV [kb7d15w-B296](#)) with the Merksem Member from 21 to 26 m depth (modified after Laga, 1979; Figure 0-3).

Description upper boundary

In its southernmost areal, it is overlain by Quaternary strata, while further north, it is consistently overlain by the Merksem Member, which is also part of the Lillo Formation. This contact is gradual, and characterized by a decrease in the number of clay layers. On Cone Penetration Tests, the boundary is, however, sometimes obvious by an upwards increase in cone resistance and decrease in friction ratio (Deckers et al., 2020; Figure 0-1). On geophysical borehole logs, this boundary coincides with an upwards decrease in gamma-ray values and increase in resistivity values (Figure 0-3).

Description lower boundary

It predominately overlies the Oorderen Member of the same formation. This contact is erosional and overlain by a shell bed. The boundary is not distinct, and the main criteria as defined by De Meuter & Laga (1976) is that the sand and clay is mixed by burrowing within the Oorderen Member, and separated in cm-thick layers or lenses in the Kruisschans Member. On Cone Penetration Tests, the boundary is more obvious by an upwards decrease in cone resistance and increase in friction ratio (Deckers et al., 2020; Figure 0-1 and Figure 0-2). On geophysical borehole logs, this boundary marks an upwards increase in gamma-ray values and decrease in resistivity values (Figure 0-3).

Only in the southernmost areas of its geographic extend, such as the northern City of Antwerp area or Grobbendonk outcrop (DOV TO-19970101), the Oorderen Member is removed by erosion and the Kruisschans Member directly overlies the Luchtbal Member or even locally even the Kattendijk Formation.

Gravel may occur at the base of the Kruisschans Member (Amerikadok or America Dock gravel of Vincent (1889), see 'Characterising description' (this LIS) and discussion in Louwye et al. (2020)).

Thickness

The thickness of this member seems rather uniform around 3 m (Deckers et al., 2019).

Occurrence

From the Port of Antwerp area in het west up to the western Campine area in the east. It presumably covers the western Campine area up to roughly the SW-NE line between Beerse and Weelde in the east. Here, the transition towards the time-equivalent Poederlee Member can be assumed (Louwye et al., 2020).

Regional correlations

It correlates with the Wouw Member of the Oosterhout Formation in the Netherlands (Vernes et al., in prep.).

Age

Early late Pliocene. See Louwye et al. (2020) and references therein.

Dataset

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

Name	GSB name	DOV name	GSB Collections URL	DOV URL
Outcrop Boudewijnsluis	015w0131	kb7d15w-B282	https://collections.naturalsciences.be/ssh-geology-archives/arch/015w/015w0131.txt	https://www.dov.vlaanderen.be/data/boring/1952-080889
Outcrop Tunnel Kanaaldok	015W0304	BGD015W0304	http://collections.naturalsciences.be/ssh-geology-archives/arch/015w/304.txt	https://www.dov.vlaanderen.be/data/boring/1999-161693
Outcrop Verrebroekdok		TO-19990901		https://www.dov.vlaanderen.be/data/boring/1999-161693
CPT Verrebroekdok		GEO-97/138-SM196		https://www.dov.vlaanderen.be/data/sondering/1998-005094
Grobbendonk outcrop		TO-19970101		https://www.dov.vlaanderen.be/data/boring/2020-175886

Extra data:

Name	GSB name	DOV name	GSB Collections URL	DOV URL
CPT Tunnel Kanaaldok		GEO-20/034-S5		https://www.dov.vlaanderen.be/data/sondering/2020-079300
Borehole Stabroek	015W0216	kb7d15w-B296	http://collections.naturalsciences.be/ssh-geology-archives/arch/015w/015w0216.txt	https://www.dov.vlaanderen.be/data/boring/2016-147541

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Annexes

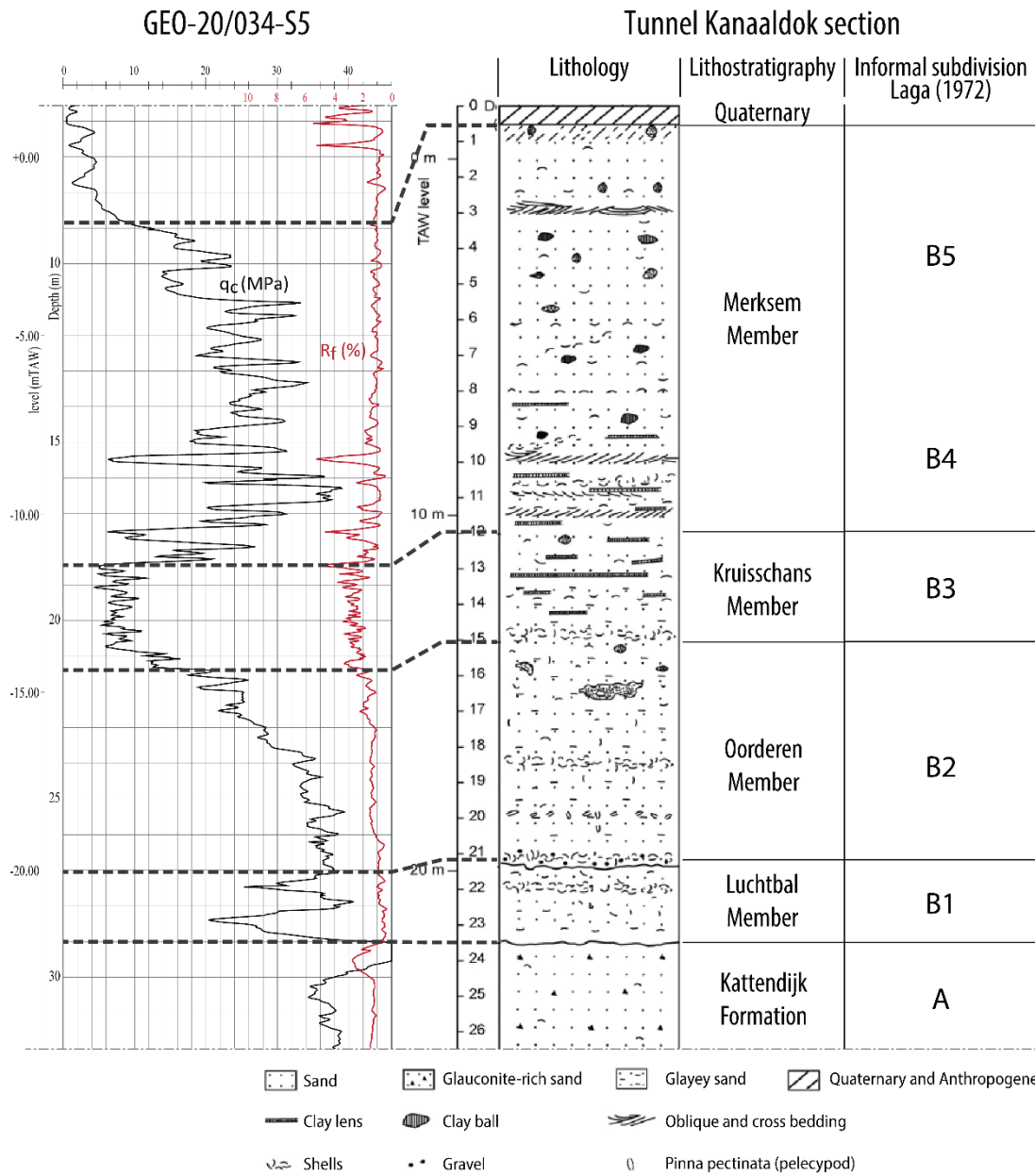


Figure 0-1: The Kruisschans Member at the Tunnel Kanaaldok section as described and interpreted by Laga (1972) and correlation with a nearby CPT by this study.

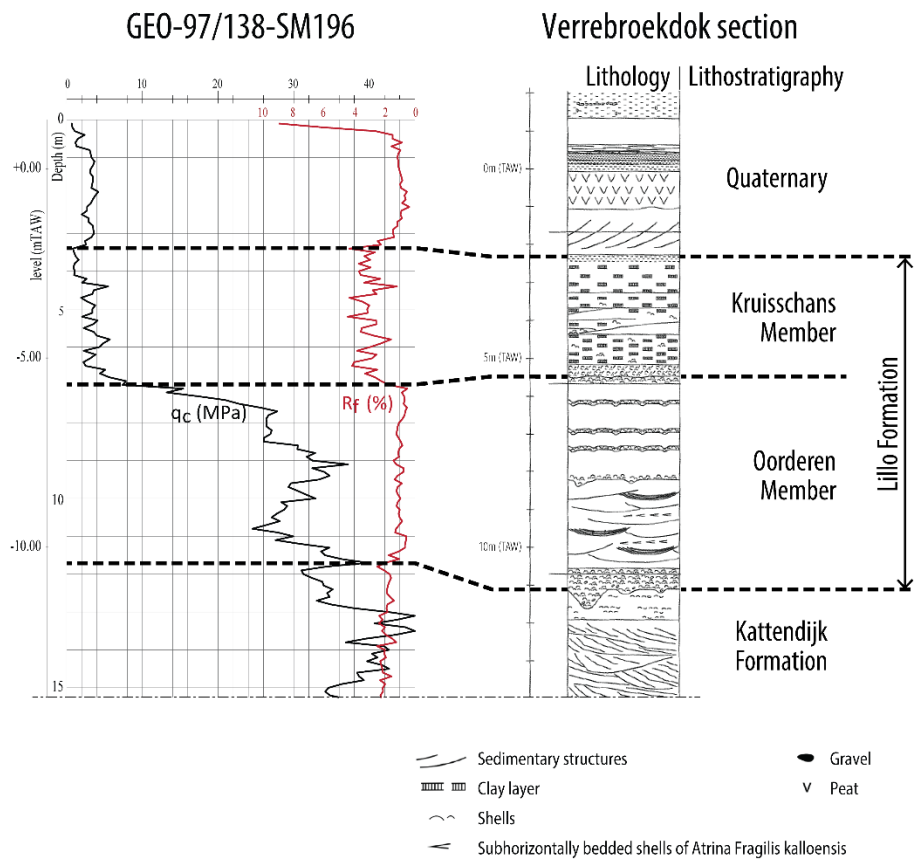


Figure 0-2: The Kruisschans Member at the Verrebroekdok section of Goolaerts (2000), with formal lithostratigraphic interpretation and expression on a nearby CPT by Deckers et al. (2020).

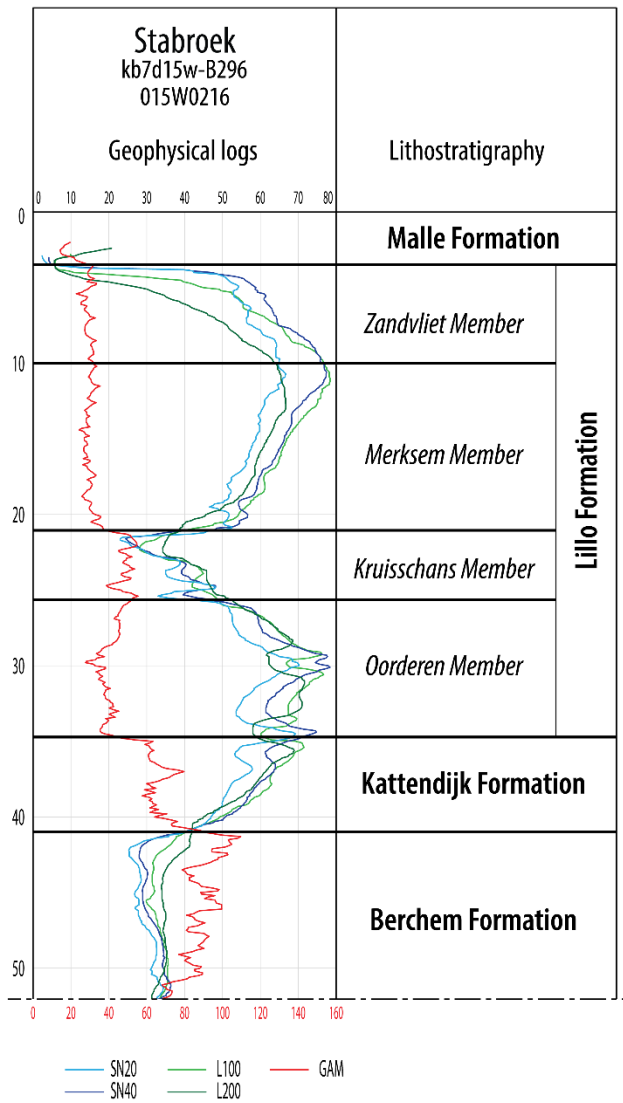


Figure 0-3: Log-expression of the Kruisschans Member in borehole Stabroek. Modified after Laga (1979).