# Geological model of the Ypresian Clay

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Commissioned by: ONDRAF-NIRAS

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*Frontispiece: extraction of Ypresian Clay (Kortrijk Formation) from the Dumoulin clay pit in Ledegem.*

# Contents

# Introduction

This study is framed in a programme, set up under coordination by Lie Sun Fan (Faninbel bvba), to create depth models for the important clay layers in the subsurface of Belgium, focussed on the clay layers of the Boom (Rupelian) and Kortrijk (Ypresian) Formations. The results concerning the Boom Clay were reported separately (Walstra & Dusar 2013). A characterisation of borehole breakouts in Ypresian clays with reference to geophysical well logs has also been reported (De Ceukelaire et al. 2012). The present document only treats the Ypresian Clay complex. It is tried to define and model the totality of the Ypresian aquiclude, including the Kortrijk Formation and overlying clay units of the Tielt Formation, irrespective of the lithostratigraphical subdivisions in use.

The model is based on high-quality borehole data and geophysical well logs from the archives of the Geological Survey of Belgium (GSB) and Databank Ondergrond Vlaanderen (DOV)[1], complemented by Dutch data (DINOloket and NLOG of TNO-GDN)[2]. Interpretations of boreholes were critically re-evaluated and modified when necessary. Models of interpretation are discussed in the next chapter.

Compared to previous mapping projects by GSB (i.e. Tertiary Isohypse Maps by Vancampenhout 2004 and Quasi-3D Model of the Lower-Rupelian and Tongrian by Vancampenhout et al. 2008), additional new data were used and existing interpretations were fine-tuned with the currently accepted lithostratigraphical subdivisions in Belgium. Because different (bio-) lithostratigraphical subdivisions exist, these are first discussed in view of their relevance for the objectives of this study, i.e. to define the Ypresian Clay complex as a single comprehensive aquiclude. This proved to be a difficult and time-consuming exercise, not only due to the palaeogeographical variability of the subunits, but also due to the variety of stratigraphic terminology in use, the different interpretation criteria applied and the inconsistent links between them.

From a technical perspective, the methodology used to realise the depth model is largely similar to the one of the Quasi-3D model of the Lower Rupelian, except that the fault blocks in the east of the study area were not treated separately. Furthermore, so-called “depth maps” were produced – indicating the depth of the top and base of the clay unit below a variable ground level instead of relative to sea-level.

In the first part of this report, an overview of the position of the modelled units within the Belgian lithostratigraphical schemes is provided and discussed.[3] The following chapters present the data used and the cartographic methodology applied. The results are presented as a number of maps and finally some problem areas are indicated where the model would benefit from further fine-tuning.

Note that the term “Ypresian Clay” (“Ieperklei”) is an informal designation – throughout this report this term covers both the Kortrijk Formation and the overlying clayey units of the Tielt Formation (assigned to the Kortemark and Egemkapel Members, as will be demonstrated).

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[1] https://dov.vlaanderen.be/dovweb/html/index.html
[2] http://www.dinoloket.nl; http://www.nlog.nl/nl/home/NLOGPortal.html
[3] We discuss usage of lithostratigraphic terms. For references to the origins of the names and for a historical overview we refer to the publications cited in this text.

This term is more restrictive than the stratigraphic denomination Ypres (Ieper) Group which encompasses also the overlying more sandy units included in the Tielt and Gentbrugge Formations. Because of its relevance for defining the upper limit of the Ypresian Clay, this study is the first attempt to systematically recognize and map the Egemkapel Member.

## Lithostratigraphic framework

The term “Yprésien” (Ypresian) was first introduced by Dumont (1849) and is still internationally used to denominate the lowest chronostratigraphic stage of the Eocene. Initially, the stage was subdivided into two parts – a lower part consisting of marine clay overlying the previously defined Landenian stage, and an upper part consisting of glauconiferous and sometimes nummulite-rich sands below the Brusselian stage. Dumont later introduced the Paniselian stage for the clayey-sandy layers between the Ypresian and Brusselian, but the modern definition more closely resembles the initial designation.

As described by Steurbaut & Nolf (1986) and De Corte (1994), the lower clayey unit has been variously referred to as “Argiles d’Ypres” (d’Omalius d’Halloy 1862), “Ypres Beds”, “Argile Yprésien” (Lyell 1852) or “Argiles des Flandres” (Ortlieb & Chelloneix 1870). The upper sandy unit has been referred to as “Sables à *Nummulites planulatus*” (Lyell 1852; Casier 1946), “Sables du Mont Panisel” (d’Omalius d’Halloy 1862), “Sables de Mons-en-Pévèle” (Ortlieb & Chelloneix 1870; Leriche 1939; Pastiels 1948; Kaasschieter 1961), “Sables du Bois de Peissant” (Briart & Cornet 1878), “Sables de Forest” (Feugueur 1951) or “Zand van Ledeberg” (De Moor & Geets 1973). Later, evidence from nannoplankton demonstrated that the sandy deposits in the northwest of France and southern Belgium were erroneously correlated with the sandy deposits in the northwest of Belgium; instead they appeared to be lateral equivalents of the lower clayey unit (Steurbaut & Nolf 1986; Steurbaut & King 1994). An attempt to correlate some of the many different historical lithostratigraphic subdivisions of the Ypresian stage is included in Appendix 1.

At present, the terminology introduced by Laga et al. (2001) is accepted by the National Commission on Stratigraphy (NCS), whereas the Tertiary geological maps of the Flemish Region and the formal interpretations in DOV are based on the nomenclature proposed by Geets (1988). Both systems are interchangeable, dividing the Ieper Group into three formations (the Kortrijk, Tielt and Gentbrugge Formations), but important differences exist at the member level:

- In DOV some names of French geographical origin have been replaced, despite the fact that they are older (Orchies and Roubaix Members vs. Saint-Maur and Moen Members).[4]
- Correlation shifts may occur between the different lithostratigraphic systems in use.[5]
- The Zoute and Egemkapel Members are not mapped or included in the DOV lithostratigraphic scheme.

In principle this study follows the official NCS scheme (Figure 1) as stratigraphic framework, but it should be noted that the subdivision of the Ypresian stage is still subject to discussion within the commission (see also p. 27). The units were originally defined on the basis of lithological and paleontological characteristics (Geets 1990; Steurbaut & Nolf 1986; Steurbaut 1998), but in practice a variety of other criteria have been applied, notably in the interpretation of well logs (De Ceukelaire & Jacobs 1998, Welkenhuysen & De Ceukelaire

[4] Although priority rules are in principle based on seniority, stratigraphic commissions may deviate from this rule and propose junior names if the senior names do not have well defined stratigraphical boundaries or pertain to another geographical area.

[5] E.g. the Mont-Héribu Member of the DOV system appears to correspond largely to the basal unit of the Orchies Member of the NCS system, whereas the Mont-Héribu Member of the NCS system is in fact a bed, so thin that it is practically not mappable.

2009). Matching of the different sets of criteria has not been formally established, is based on assumptions derived from stratigraphical investigations, e.g. in the Knokke and Doel boreholes, and may not be entirely representative for the whole sedimentary basin.

| Stage | Group | Formation | Member |
|---|---|---|---|
| (Lutetian) | Zenne Group | Brussel + Lede Formations | |
| Ypresian / Early Eocene (54.8 - 49.0 M) | Zenne Group | Aalter Formation | Oedelem Member |
| | | | Beernem Member |
| | Ieper Group | Gentbrugge Formation | Vlierzele Member |
| | | | Pittem Member |
| | | | Merelbeke Member |
| | | | Egem Member |
| | | Tielt Formation | Egemkapel Member (*) |
| | | | Kortemark Member |
| | | Kortrijk Formation | Aalbeke Member |
| | | | Roubaix (Moen) Member (& Mons-en-Pévèle Member) |
| | | | Orchies (Saint-Maur) Member |
| | | | Mont-Héribu Member |
| (Thanetian) | | | Het Zoute Member (*) |

*Figure 1: Lithostratigraphic division of the Ieper Group and Ypresian stage in Belgium as currently accepted by the NCS; different or additional names used by DOV are included between brackets; the units marked with an asterisk are not distinguished in DOV. The units included in the Ypresian Clay and subject of this study are delineated in red.*

## Lithological interpretation

As already mentioned, the presently accepted stratigraphic terminology is based primarily on lithological criteria. For a long time the “Ieper Formation” had been considered as a rather homogeneous unit, of limited interest for drillers. Gulinck (1967) recognized some different units and pointed out the increase of sand fraction towards the east of the basin. Using grain-size data, De Moor & Geets (1975) made further subdivision based on outcrops in the north of Hainaut and the south of West- and East-Flanders. This study was further extended by Geets (1990):

- Sediments similar to the Mont-Héribu Member were identified at the base of the Ieper sequence in boreholes in the entire Belgian Basin (this member was originally defined in outcrops in the Mons area by De Coninck et al. 1983).
- Within the “Flanders Member” a sequence of three sub-units could be identified in the entire basin, although the distinction becomes less sharp to the north.
- Within the “Egem Member” two sub-units were identified.
- In the northeast/east (around Mol) the Ieper sequence was divided into only two types of sediment, with characteristics comparable to the Mont-Héribu and Egem Members.

The proposed subdivision was further elaborated in the proposed lithostratigraphy of the Palaeogene by the NCS (Geets 1988) and largely adopted in the official national scheme (Laga et al. 2001). Curiously, the NCS did not follow its own proposition with all “Belgian” names for the members of the Kortrijk Formation (introduction of the names Saint-Maur and Moen in the compilation by Geets 1988) in the formal presentation of the lithostratigraphic scale (Laga et al. 2001), where the “French” names Orchies and Roubaix were retained. In the final scheme two additional members were introduced: one for the volcanic ash-containing “Unit X” at the base of the Ieper sequence in the Knokke well (King 1990b) renamed Het Zoute member, and a thin stiff clay unit within the former “Egem Member” distinguished as the Egemkapel member (Steurbaut 1998).

## Biostratigraphic interpretation

Over time and between authors the Ypresian has had different definitions and subdivisions. The stratigraphic correlations used for the old geological maps (units Yc-Yd-P1) were based on similarities in lithological succession in the north and the south of the Belgian Basin. However, micropaleontological analysis proved these correlations wrong and demonstrated that the deposits have in fact different ages (see Figure 2; Steurbaut & Nolf 1986).

Assemblages of microfossils have been used for biostratigraphic zonation of the Ypresian deposits and correlations between outcrops and boreholes in the Belgian Basin, as well as surrounding basins:

- Dinoflagellates (De Coninck 1969, 1976, 1981).
- Foraminifera (Moorkens 1968; Gulinck et al.1969; Willems 1982, 1990; De Coninck et al. 1983; King 1990a).
- Calcareous nannoplankton (Steurbaut & Nolf 1986; Steurbaut 1990a; Steurbaut 1998).
- Phytoplankton (Roche 1973, 1990; De Coninck et al. 1983; De Coninck 1990a, b).
- Ostracods (Willems 1973).

Important reference sections are provided by the (partly) cored Kallo (Gulinck et al. 1969) and Knokke wells (Laga & Vandenberghe 1990). Note that the original Kallo well (027E0148; drilled in 1965), was not logged, but the nearby ON-KALLO-1 well (014E0355; drilled in 2008) provides geophysical well log data that can be correlated.

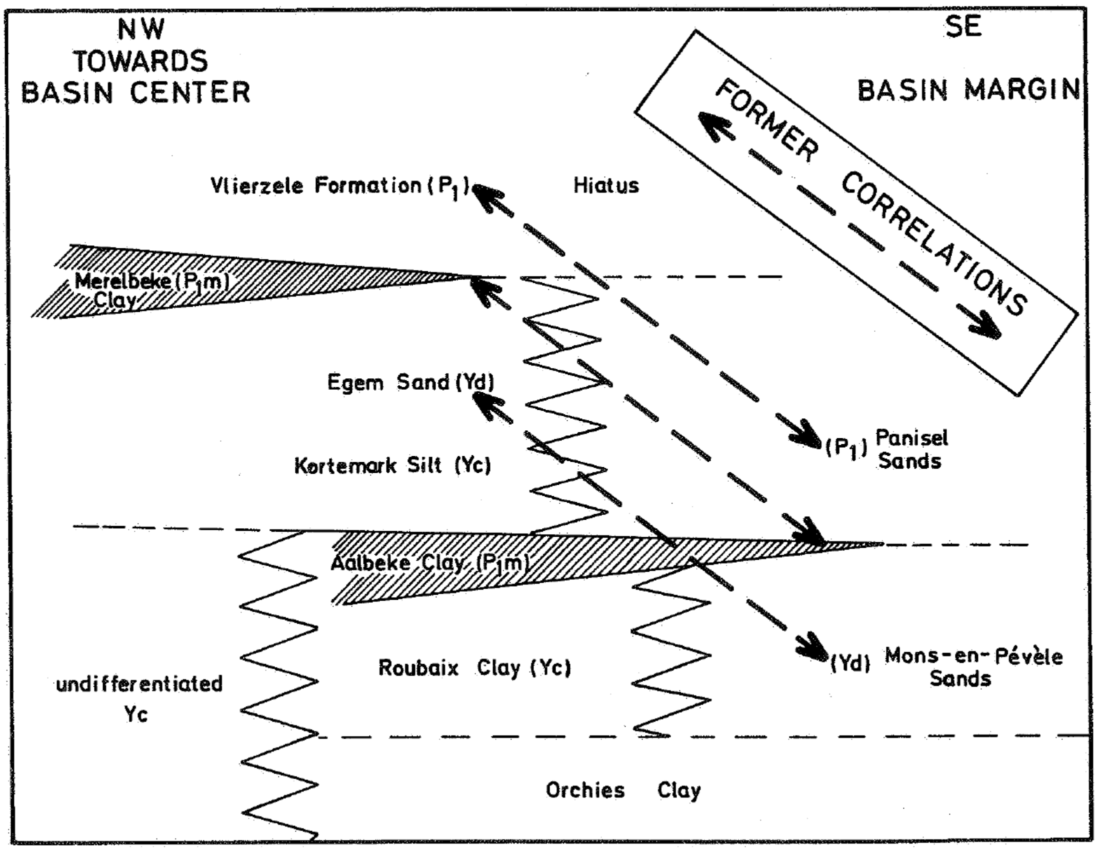


*Figure 2: Correlation scheme for the Ypresian deposits compared to the correlations used for the old Belgian geological map (Steurbaut & Nolf 1986).*

## Interpretation of geophysical well logs

Vandenberghe et al. (1990) demonstrated that systematic variations in the Ypresian Clay complex can be recognized in geophysical well logs (gamma ray and resistivity). The sedimentation cycles identified have wavelengths ranging from several tens of meters down to tens of centimetres (at the lower end of the resolution of well logs); they can be followed across facies changes and correlated throughout the Belgian Basin. Even in the south and east, where the clay becomes thinner and more sandy, the basal cycles are still observed. The correlated levels were placed at the main sequence boundaries and numbered 1-6; this sequential subdivision was further elaborated by Vandenberghe et al. (1998, 2004) – especially with some revisions in the upper sequences, introducing an additional SB6'. Steurbaut (1998) added biostratigraphic and lithostratigraphic data and attempted a correlation with lithostratigraphic units.

Another subdivision based on geophysical well logs was used during the Tertiary mapping of the Flemish Region (De Ceukelaire & Jacobs 1998). The Kortrijk Formation was divided into seven main units, based on both resistivity and gamma ray measurements, irrespective of the lithological descriptions.[6] This division was used for correlations throughout East- and West-Flanders. The identified levels were colour-coded and for practical reasons (but arguably) correlated with prevailing lithostratigraphic units. The same systematic approach was used by

[6] Lithological descriptions do not provide the same level of detail and are less reliable on the exact positioning of transitions, a general quality problem of mud logging over clayey sections.

Welkenhuysen & De Ceukelaire (2009) for the interpretation of geophysical well logs carried out by VMM across the Flemish Region.

A subdivision of the Egem and Kortemark Members of the Tielt Formation was proposed by Bolle & Jacobs (1994), based on lithological characteristics and geophysical well logs. Their ideal sequence includes the units Yd6-Yd1, with Yd1 corresponding to Kortemark and Yd6-Yd2 to Egem.[7]

The impact of clay-silt lithological alternations and drilling parameters on the wellbore was studied by means of well log analysis, as a precursor to the present study (De Ceukelaire et al. 2012).

## Sequence stratigraphy

A rapid transgression took place at the end of the Thanetian stage, resulting in the deposition of a thin clay layer (Het Zoute Member – so far only identified in the Knokke well)[8] sharply overlying the continental Landen Formation. Sedimentation is interrupted by renewed tectonic uplift of the Brabant Massif, as indicated by the presence of a pebble layer, before subsidence resumed over the whole southern North Sea Basin, marking the start of the Ypresian stage at the beginning of the NP10 chron (Vandenberghe et al. 2004).

Throughout the Ypresian several transgressions and regressions resulted in the deposition of a series of fining and coarsening-up sedimentary sequences (which can be recognised in geophysical well logs), within an overall regressive trend. Three major transgression phases can be distinguished, but higher frequency cycles are also present (see Figure 3; Vandenberghe et al. 2004). The maximum extension of the sea coincides with deposition of the Orchies/Saint-Maur Member. After a short regression in the southeast of the basin, a second (more limited and discontinuous) transgression followed, corresponding to deposition of the Aalbeke Member (Steurbaut & Nolf 1986).

The Egemkapel clay unit (here marking the top of the Ypresian Clay) can be considered as a separate sequence because of its widespread extension, its occurrence between two erosive levels and its grain-size evolution; however its limited thickness suggests a relatively short duration (Vandenberghe et al. 2004).

An important sea level fall resulted in a new regression, accompanied by a northward shift of the coastline. The Ypresian Clay is overlain by several thin, less extensive stratigraphic units of glauconitic sands and silty clays, deposited during the third major transgression cycle, grouped in two sequences and each with erosive boundaries. The first sequence starts around the NP12/NP13 limit and comprises the sands of the Egem Member (including the informal and/or locally known sandy units of Mont-Panisel, Hyon and the Kwatrecht Complex cf. Steurbaut & Nolf 1986; De Moor & Geets 1975) and the clay of the Merelbeke Member. The second sequence comprises the sands and clays of the Pittem Member. These latter sequences were largely removed by erosion over the southern part of Flanders (Vandenberghe et al. 2004).

[7] This division does not comply with the tripartition in the NCS scheme, where the Egemkapel Member would correspond to unit Yd3.
[8] The present study indicates that the associated typical log signature at the base of the Ypresian sequence is also present in other well logs in this part of the basin.

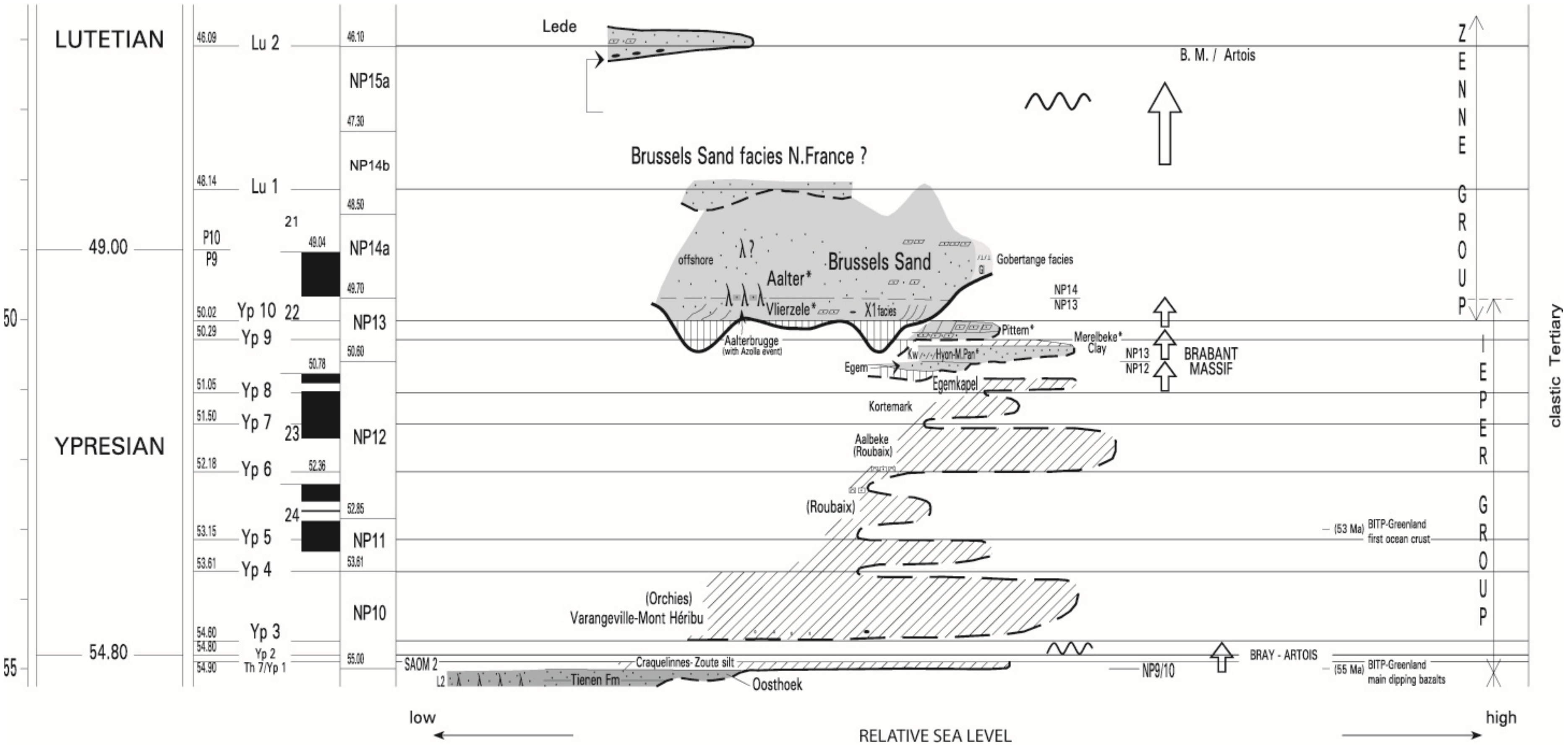

*Figure 3: Sequence-stratigraphic interpretation of the Ypresian stage (Vandenberghe et al. 2004); for symbology see next page.*

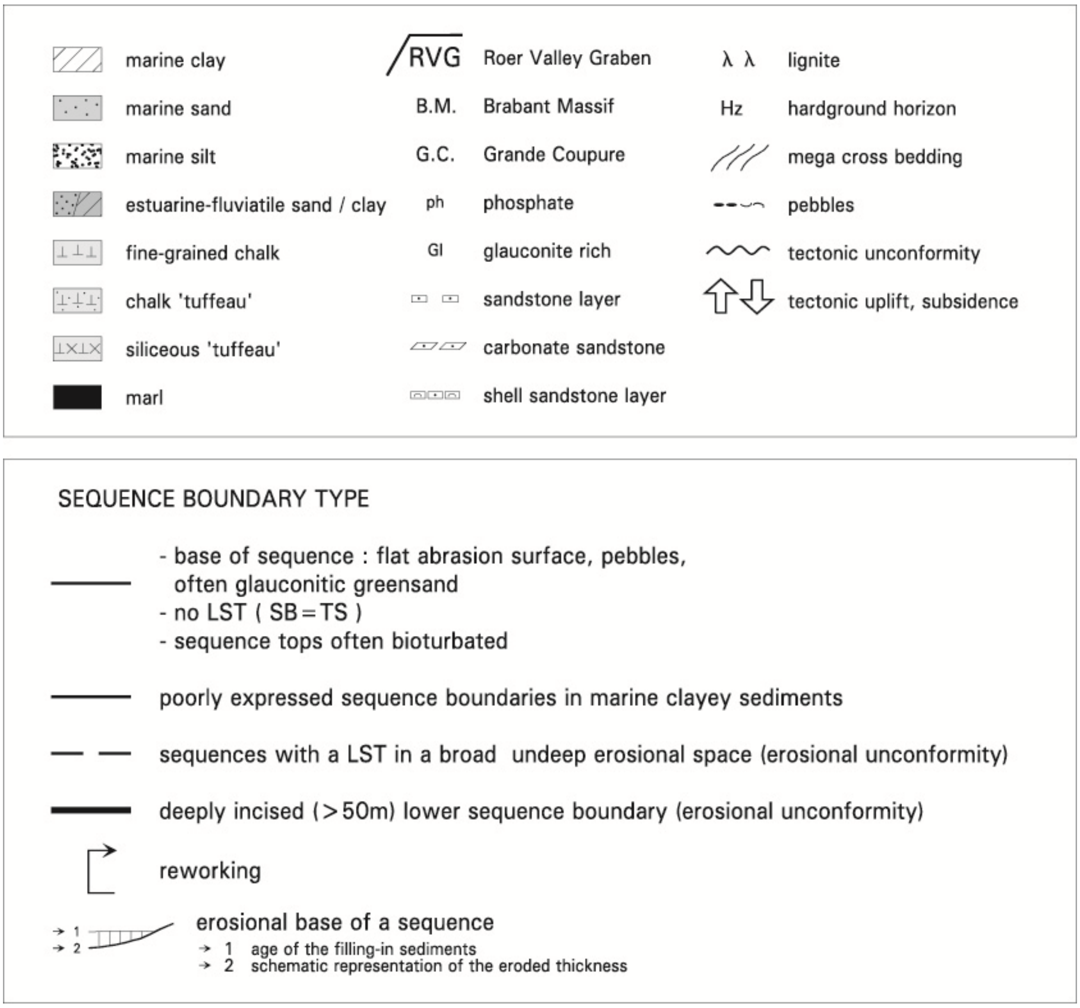


*Figure 3 (cont.): Legend of sequence-stratigraphic interpretation (Vandenberghe et al. 2004).*

A major sequence boundary is marked by deep incision and subsequent deposition of the Brussel Formation (in the east) and the Vlierzele and Aalter units (in the west) – their precise geometric relationship remains difficult as biostratigraphic data are limited and sometimes conflicting. The markedly erosive bases of these Late Ypresian and Early Lutetian sequences are an indication of active uplift of the Brabant Massif (Vandenberghe et al. 2004).

## Lithostratigraphic subdivision

### *Kortrijk Formation*

**Lithological description:** The formation is a marine deposit, consisting mainly of clayey sediments. A sequence typically contains from bottom to top (Geets 1988):

- Alternation of horizontally laminated, glauconiferous clayey sands or sandy clay and compact, silty clay or clayey silt, locally bioturbated. The base consists of oxidized and indurated clayey sand with lenses of pure sand.
- Homogeneous deposit of very fine silty clay with some thin intercalations of coarse silty clay or clayey very fine silt.
- Less homogeneous deposit of clayey, coarse or medium silt, with some sand-containing layers and fossil-rich layers. The deposit becomes sandier to the east and the south.
- Very fine silty clay.

**Lateral and vertical trends:** Thickness of the formation reaches a maximum of 125/140 m when fully preserved in the northern part of West-Flanders (Geets 1988/Steurbaut 1998), but decreases in eastern and southern direction; the deposits generally become sandier to the east (Brabant and Campine) and south (Mons Basin) (Geets 1988, 1990; Steurbaut 1998). Alternations in grain-size distribution are less sharp to the north, where the deposits generally become finer-textured (Geets 1990).

The formation usually rests on deposits of the Landen Group (or locally on Palaeozoic bedrock) and is covered by the Tielt Formation (or younger units due to later erosive events); both formations are more sandy at the contact with the Kortrijk Formation (Geets 1988).

**Area:** The formation is present in the western and central part of Belgium and outcrops in the north of Hainaut, the southern and central part of West-Flanders, the south of East-Flanders and the southwest of Brabant; outliers occur in the Mons Basin and south of the river Sambre (Geets 1988). Towards the north it becomes part of the Dongen Formation – Ieper Clay Member in the Dutch stratigraphic nomenclature (see Appendix 1). Towards the east the subsurface occurrence extends till the western part of the Campine coal basin (colliery Beringen), but is not known from within the Rur Valley Graben.

**Biostratigraphy:** From the base of zone NP10 up to the middle of zone NP12 (at boundary of subzones V and VI; Steurbaut 1998).

**Sequence stratigraphy:** The base of the formation is represented by the transgressive surface of the first Ypresian third order sequence Y-A, the top falls within the lower part of the highstand system tract of the fifth Ypresian third order sequence Y-E (Steurbaut 1998). Vandenberghe et al. (1998) distinguish four main sequences between SB1 and SB5. In accordance with the sequence-chronostratigraphic subdivision of Hardenbol et al. (1998), the base of the formation is situated somewhat below Yp1 and the upper limit corresponds to boundary Yp7 (Figure 3) (Vandenberghe et al. 2004).

**Notes:**

- Distinction between the different members (especially Mont-Héribu, Orchies/Saint-Maur and Roubaix/Moen) is difficult, based on borehole descriptions, especially if the formation is not completely cored (Jacobs et al. 2001). Based on qualitative interpretation of geophysical well logs, correlation of “type boundaries” is possible (De Ceukelaire & Jacobs 1998).
- To the east (map sheets 23, 31-39) it becomes impossible to distinguish the different members, as the deposits become sandier towards the base. On these map sheets the Saint-Maur and Mont-Héribu Members were mapped as one single unit (Buffel et al. 2009; Buffel & Matthijs 2009). In the NCS system this unit should correspond to the Orchies Member.
- On map sheets 32 and 33 the formation is locally removed by the erosion channel of the Brussel Formation (Vandenberghe & Gullentops 2001; Claes & Gullentops 2001).

### *Het Zoute Member*

**Lithological description:** A thin silt layer, containing volcanic ash particles.

**Area:** Knokke well ("Unit X"; King 1990b), possibly extending in the surrounding area.

**Biostratigraphy:** Base of zone NP10 (Steurbaut 1998).

**Geophysical interpretation:** Its base corresponds to the "base level" (Vandenberghe et al. 1990) or level "brown" (De Ceukelaire & Jacobs 1998). The top is not formally defined in well logs, but it should have a distinct signature showing a FU trend and a sharp boundary with the overlying clays (corresponding to SB1 of Vandenberghe et al. 1998).

**Sequence stratigraphy:** The transgressive tract of the first Ypresian sequence Y-A (Steurbaut 1998); situated below SB1 (Vandenberghe et al. 1998) or Yp1 (Hardenbol 1998; Vandenberghe et al. 2004).

**Notes:**

- The use of the article "Het" in the name of this member make translations awkward. We prefer to translate "the Zoute member" instead of "the Het Zoute member".
- The unit has been correlated with the silt of Craquelinnes in Normandy (Vandenberghe et al. 2004).
- So far, it has only been described in the Knokke well – partly due to its limited distribution (restricted to the eastern coastal area?), but also because this borehole was cored and examined in greater micropaleontological detail than other wells in the area.
- As the unit has not been formally defined in well logs, it is unclear to what extent the unit can be distinguished from the Mont-Héribu Member – especially if both have a reduced thickness.
- Because of its limited exposure, restricted to one borehole, reduced thickness and possible overlapping criteria (in well logs, granulometric) with Mont-Héribu, this unit cannot be considered for modelling.

### *Mont-Héribu Member*

**Lithological description:** According to the interpretation in use for the geological mapping **t**his member consists of an alternation of horizontally laminated, dark brownish-grey to bluish-grey, glauconiferous clayey sand or sandy clay, and compact silty clay or clayey silt; locally bioturbated. The base consists of oxidized and indurated clayey sand with lenses of pure sand; often with a basal pebble bed (De Coninck et al. 1983; Geets 1988; Steurbaut 1998).

**Lateral and vertical trends:** According to the interpretation in use for the geological mapping the thickness increases from a few meters in the south and east (c. 4 m in the type area near Mons; De Coninck et al. 1983) up to 10-15 m at the centre of the basin/East- and West-Flanders (De Coninck et al. 1983/Geets 1988; Steurbaut 1998). The deposits of the underlying Landen Group usually consist of more homogeneous sand, resulting in a sharp boundary on geophysical well logs. The lower boundary is marked by the presence of subangular flint pebbles – this level should also enable distinction from the underlying Zoute Member, if present, although the relation between the two remains poorly understood.[9]

**Area:** It is probably present in the entire basin in which the Kortrijk Formation occurs; it outcrops in the north of Hainaut[10] and the southwest of Brabant (Geets 1988).

**Biostratigraphy:** Within zone NP10 (Steurbaut 1998).

**Geophysical interpretation:** A rapid FU trend at the base of the clays (Vandenberghe et al. 1998); the interval between levels "brown" and "red" (De Ceukelaire & Jacobs 1998).

**Sequence stratigraphy:** The transgressive tract of sequence Y-B (Steurbaut 1998), 1-2 (Vandenberghe et al. 1998) or Yp3-Yp4 (Hardenbol 1998; Vandenberghe et al. 2004).

**Notes:**

- Variations in the quoted thickness are probably due to mixing of lithological and biostratigraphic criteria to define the upper boundary. Based on grain-size distribution Geets (1990) recognises only 1 m of the Mont-Héribu facies in the Kallo well and 4 m in the Knokke well. Based on micropaleontology a sample from the Mont-Héribu type locality would correspond to a 15 m interval in the Kallo well (De Koninck et al. 1983); this interval corresponds largely to the lower sub-unit of the "Flanders Member" of Geets (1990), i.e. the present Orchies/Saint-Maur Member. Similarly, in the Knokke well biostratigraphic markers from the Mont-Héribu section were found occurring within the "Flanders Member" and it was concluded that the boundary between both members is significantly diachronous (King 1990b). In addition, based on distinct mineralogical properties King (1990b) attributed the basal layer of the Ieper sequence to a new "Unit X" (i.e. the Zoute Member), with the typical Mont-Héribu facies either absent or very thin (less than 1 m).
- The stratified Mont-Héribu facies is recognised from a single bed, less than 1 m, up to over 5 m in thickness at the base of the Kortrijk Formation in Wallonia. However, it cannot sufficiently be distinguished from the following Orchies/Saint-Maur Member and is not considered a mappable unit; instead it is incorporated in the Orchies Member (e.g. Vanneste & Hennebert, 2005a, b).
- Steurbaut (1998) identifies this unit as a member, but previously in the rank of bed, part of the Orchies Member and restricted to its type area around Mons (Steurbaut & Nolf 1986; Steurbaut 1988). According to its original concept by Steurbaut & Nolf (1986), possibly only the lowermost sandy transgressive layer of the Kortrijk Formation should be correlated with the Mont-Héribu Member as defined in the type area of the Mons basin outlier. Following this definition, the Mont-Héribu Member would not be a mappable unit. It is unclear on what evidence the quoted maximum thickness of 15 m is based – this value probably reflects the biostratigraphic correlation between the Mont-Héribu type locality and the Kallo well by De Coninck et al. (1983).
- The lithological description would become quite different if Mont-Héribu is considered as a bed instead of as a member with some vertical extent.
- During the Tertiary mapping of West- and East-Flanders other criteria were used, based on geophysical well logs: the name "Mont-Héribu" was assigned to the basal part of the

[9] Het Zoute Member has only been described in Knokke well; presence of Mont-Héribu in same borehole is questionable. Moreover, presence of flint pebbles is rarely documented from borehole cuttings.
[10] The stratigraphic nomenclature in use for the geological map of Wallonia refers to this unit as Mont Héribus.

Kortrijk Formation with natural gamma values distinctly higher than the Saint-Maur Member (possibly related to higher glauconite content?). This practice (respecting the DOV stratigraphic scheme) was followed in a subsequent study based on well log interpretation (Welkenhuysen & De Ceukelaire 2009). Nevertheless, this concept does not match the original lithostratigraphic definition: the silty base immediately overlying the transgressive surface should only include a thin FU tract showing increasing gamma ray and the mapped "Mont-Héribu" unit in fact corresponds largely to the basal section of Orchies/Saint-Maur Member sensu the NCS system.

- During the Tertiary mapping of map sheet Brussels (31-39) distinction between the different members proved difficult and the Mont-Héribu Member was not mapped separately but included in the Saint-Maur unit (Buffel & Matthijs 2009).
- Based on mineralogical and grain size analysis of boreholes in Oostham and Kwaadmechelen, Fobe (1989) concluded that the Ieper sequence is here limited to a clayey basal part (Orchies Member) and a sandy top (Mons-en-Pévèle Member); the upper members that are still present in the nearby Mol well are missing here; hence the "eastern facies" (sensu Geets1990) would correlate to a relatively sandy Orchies (sensu Steurbaut & Nolf 1986) instead of Mont-Héribu (sensu De Coninck et al. 1983). Due to a general lack of microfossils in the Orchies Member (Steurbaut & Nolf 1986) this correlation remains uncertain; nevertheless, for the mapping of map sheet Hasselt (25) only the Moen/Mons-en-Pévèle and Orchies/Saint-Maur Members were distinguished (Matthijs 1999).
- In summary three different definitions of the Mont-Héribu Member have been applied: (1) a thin (hence non-mappable) bed at the base of the Ypresian Clay, (2) a unit that both vertically and laterally passes gradually into the Orchies/Saint-Maur Member, or (3) a practically mappable unit based on geophysical well log signature, but with no formal coupling with any lithological or biostratigraphic criteria.

### *Orchies/Saint-Maur Member*

**Lithological description:** This member is represented by more homogeneous deposits consisting of greenish- or bluish-grey to brown (when oxidised), heavy clay, with some thin intercalations of silty clay or clayey very fine silt (Geets 1988, 1990).

**Lateral and vertical trends:** It is distinguished from the underlying and overlying members (Mont-Héribu and Roubaix/Moen) by the lower sand fraction. The thickness ranges from 10-16 m in the outcrop area in the north of Hainaut to 106 m in the Knokke well (Geets 1990: based on grain size criteria), or up to 45/30 m (Steurbaut & Nolf 1986/ Steurbaut 1998: using biostratigraphic criteria). It should be noted that lithological changes are gradual. Arbitrary ad-hoc picking of a boundary layer will lead to differences in thickness estimates.

**Area:** This unit occurs in the north of Hainaut, East- and West-Flanders and parts of Brabant and Antwerp; according to Geets (1988) it is absent in the eastern area of the Kortrijk Formation, but Steurbaut & Nolf (1986) regard distribution throughout the entire basin. The member outcrops only in the north of Hainaut (Geets 1988).

**Biostratigraphy:** Upper part of NP10 and lower part of NP11 (Steurbaut 1998).

**Geophysical interpretation:** More or less corresponding to the two lowermost FU-CU cycles (= fining-up & coarsening-up sedimentary sequences) developed in heavy clay (Vandenberghe et al. 1998); the interval between levels "red" and "orange" (De Ceukelaire &

Jacobs 1998). In the lower part a very heavy clay is recognised (e.g. Vanneste & Hennebert, 2005a, b), also characterised by much higher gamma-ray readings (included in the Mont-Héribu Member in Welkenhuysen & De Ceukelaire, 2009). So far, this particular unit is not named in the lithostratigraphic schemes.

**Sequence stratigraphy:** The highstand system tract of sequence Y-B (Steurbaut 1998), 1-2 (Vandenberghe et al. 1998) or Yp3-Yp4 (Hardenbol 1998; Vandenberghe et al. 2004); its base corresponds to the maximum flooding surface.

**Notes:**

- "Orchies" is the official denominator used by the NCS; for the Tertiary mapping of the Flemish Region the name "Saint-Maur" was used.
- Differences in quoted thickness (Steurbaut & Nolf 1986 vs. Steurbaut 1998) are at least partly due to the change in status of the Mont-Héribu Member, which was initially included as a bed in Orchies.
- Geets (1988) explains the absence of this member in the east by the lateral transition from clay to sand, hence losing its typical clay character (transition into Mont-Héribu facies). Steurbaut & Nolf (1986) consider the occurrence of sandy intercalations in the east (Mol well) as part of the same lithostratigraphic unit, although due to a general lack of microfossils in the unit this correlation remains uncertain. Fobe (1989) also correlates this "eastern facies" to the Orchies rather than Mont-Héribu Member, conceding lateral facies changes. These differences depend on criteria used: changes in lithology (granulometry) or continuity of sedimentation (despite changes in granulometry).

### *Roubaix/Moen Member*

**Lithological description:** Heterogeneous deposits, consisting of grey to greyish-brown, clayey medium or coarse silt, with some sand containing layers (alternation of soft silty and solid clayey layers); some calcareous fossil-rich layers may occur (*Nummulites*[11] and shell grit) (Geets 1988; Steurbaut & Nolf 1986).

**Lateral and vertical trends:** The thickness varies from 40 m in the outcrop area to 94 m in the Kallo well (Geets 1990: based on grain size criteria), averaging throughout its area about 50 m (Steurbaut & Nolf 1986: using biostratigraphic criteria). It rests on the Orchies/Saint-Maur Member and is covered by the Aalbeke Member; from both it is distinguished by a marked heterogeneity and presence of sandy layers. The whole deposit becomes more homogeneous and heavier-textured towards the north (Geets 1988); especially in the Kortrijk region the variability in grain-size is large (Geets 1990). It transits into a sandier facies (the Mons-en-Pévèle Member) towards the east and south (Steurbaut & Nolf 1986).

**Area:** The member occurs in the north of Hainaut, East- and West-Flanders; its outcrop area is limited to the north of Hainaut and the south of West-Flanders (Geets 1988). Depending on the criteria used it also extends further east in the province of Antwerp.

**Biostratigraphy:** Upper part of NP11 and lower part of NP12 (Steurbaut 1998).

[11] The predominant large but flatttened nummulite specimens are referred to in literature as *Nummulites planulatus*. However, the nomenclature of large Eocene nummulitic foraminifera is in revision (Jan Baccaert, personal communication).

**Geophysical interpretation:** Includes several FU-CU cycles up to the maximum flooding surface of sequence 4-5 (Vandenberghe et al. 1998); between levels "orange" and "yellow" (De Ceukelaire & Jacobs 1998).

**Sequence stratigraphy:** The base corresponds to sequence boundary Y-B/Y-C (Steurbaut 1998), SB2 (Vandenberghe et al. 1998) or Yp4 (Hardenbol 1998; Vandenberghe et al. 2004); the top corresponds to the maximum flooding surface of sequence Y-E, 4-5 or Yp6/Yp7.

**Notes:**

- "Roubaix" is the official denominator used by the NCS; for the Tertiary mapping of the Flemish Region (DOV) the name "Moen" was used.
- As a consequence of the discrepancies between lithostratigraphic and sequence boundaries the boundary between the Roubaix and Aalbeke Members may not always be placed at the base of the massive clay, characterising the Aalbeke Member, but instead in the transitional layers below.
- The Mons-en-Pévèle Member is commonly used to describe a sandier lateral equivalent in the east and southwest (cf. Steurbaut & Nolf 1986; Steurbaut 1998; Figure 4). However, up to now this unit has not been formally accepted by the NCS. It is nevertheless included in this overview.

### *Mons-en-Pévèle Member*

**Lithological description:** This unit comprises an alternation of glauconiferous silty sands and silty clays; rich in *Nummulites* and shells (Steurbaut & Nolf 1986).

**Lateral and vertical trends:** It passes from the more clayey Roubaix/Moen Member towards the north and west into very fine sands towards the south and east and. Maximum recorded thickness is 40 m, not unlike the Roubaix/Moen Member itself. It rests on the stiff clays of the Orchies/Saint-Maur Member and is overlain by the stiff clays of the Aalbeke Member or eventually the sandy deposits of the Gentbrugge or Brussel Formations whenever the section is incomplete (Steurbaut & Nolf 1986). On the geological mapsheets of Wallonia, where the Aalbeke Clay is generally not recognised, it is nevertheless noted that the top of the Mons-en-Pévèle Member contains stiff clays.

**Area:** It is only present in the southern part of the Belgian Basin (Steurbaut & Nolf 1986), and has been interpreted as far north as Halle and Brussels (Buffel & Matthijs 2009; Houthuys 2010).

**Biostratigraphy:** Upper part of NP11 and lower part of NP12 (Steurbaut 1998).

**Geophysical interpretation:** Not formally defined, but in principally the same limits as Roubaix/Moen should apply.

**Sequence stratigraphy:** The base "probably" coincides with the base of sequence Y-C2, the top with the maximum flooding surface of sequence Y-E (Steurbaut 1998).

**Notes:**

- This member is not officially recognized by the NSC, but the term is commonly used to distinguish a sandier and more calcareous lateral equivalent of the Roubaix Member (see Figure 4). The unit is included in the DOV system, although it was mapped as Moen (map sheet Brussels: Buffel & Matthijs 2009). In the geological map of Wallonia a Mons-en-Pévèle Member is inserted in the lithostratigraphic scale either to replace the Roubaix Member (e.g. Doremus & Hennebert 1995; Hennebert & Doremus 1997) or in between the Roubaix and Aalbeke Members of the Kortrijk Formation (Vanneste & Hennebert 2005) while acknowledging that Roubaix and Mons-en-Pévèle contain the same fossils and are lateral equivalent.

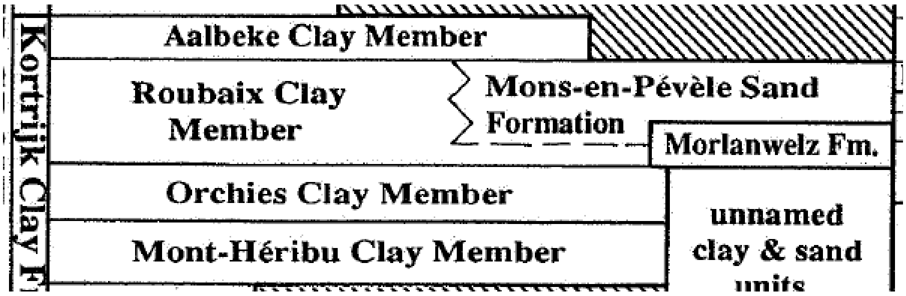


*Figure 4: Relation of the Mons-en-Pévèle Member to the stratigraphic subdivision in the type area, according to Steurbaut (1998).*

- Ypresian nummulitic limestone and sandstone has been widely used as a building stone around the Dender valley, from where this rock type must originate ("Zandbergse steen") despite the fact that no occurrences are known and no borehole information is available. By the presence of *Nummulites planulatus* the limestone has been associated to the Mons-en-Pévèle Sand or Vorst Sand (Yd). The geographic distribution of this nummulitic building stone strongly suggest that these beds, hence also the stratigraphic units to which they are associated, represent sandy-calcareous facies included in the Roubaix/Moen Member (for the Dender valley) or lateral equivalent to it in the Mons-en-Pévèle Member (for the occurrences in Brabant and Hainaut) (Dusar et al, 2009).
- The local names "Zand van Vorst" (map sheet Brussels: Matthijs & Buffel 2009) and "Zand van Bierbeek" (map sheet Leuven: Vandenberghe & Gullentops 2001) should correlate with the Mons-en-Pévèle Member, although correlation of the latter was never proven. Together with the building stone link, circumstantial evidence makes this correlation plausible, however.
- The member is included in the hydrogeological model of the Flemish Region (Meyus et al. 2000: unit 0923, part of the "Ieperiaan Aquitard system"). Eppinger & Thomas (2006) characterize the Mons-en-Pévèle Sands (unit 75) as an aquifer sensitive to nitrate pollution (at least where it outcrops in hilly terrain); their map displays the unit occurring in the entire Kortrijk outcrop area east of the river Scheldt – a disputable limit not firmly based on lithostratigraphic evidence.
- Steurbaut & King (1994) identify four groups of lithofacies within the unit, each reflecting different sedimentation conditions, and several minor hiatuses marked by abrupt changes in lithology or by glauconitic levels; some of these levels can be correlated regionally.
- Van Marcke & Laenen (2005) distinguish the Mons-en-Pévèle Member in the Mol well.

### *Aalbeke Member*

**Lithological description:** This unit consists of greenish-grey to greyish-blue, occasionally rose, micaceous, homogeneous heavy clay, without sand fraction[12] (Geets 1988, 1990; Steurbaut & Nolf 1986).

**Lateral and vertical trends:** According to Geets (1988, 1990: based on grain size criteria) the thickness varies from around 10 m in the outcrop area around Kortrijk, up to 20 m in the west (Ieper and Knokke wells) and only 4 m in the north (Kallo well). Steurbaut & Nolf (1986) also quote an average thickness of 10 m, ranging from 4 to 15 m. It is distinguished from the underlying and overlying units (Roubaix/Moen Member and Tielt Formation) by its homogeneity and heavier texture. However, in the far east of its extent (Mol well) some thin silty and sandy intercalations are present (Steurbaut & Nolf 1986; Van Marcke & Laenen 2005).

**Area:** This member outcrops in the southern hills of West-Flanders (around Kortrijk) and is also found in boreholes in East- and West-Flanders (Geets 1988). According to Geets (1990) it is absent in the area of Aalst-Dendermonde and further east, but on the Tertiary map of the Flemish Region it is also present in the Brussels area (Buffel & Matthijs 2009).Steurbaut & Nolf (1986) and Van Marcke & Laenen (2005), probably using slightly different criteria, including a somewhat sandier facies in the east, argue that it is present in the entire basin except the extreme south.

**Biostratigraphy:** Within zone NP12 (Steurbaut 1998).

**Geophysical interpretation:** The base corresponds to the clayey highest sea-level deposit of sequence 4-5; the top is represented by a sudden shift to a more sandy signature (Vandenberghe et al. 1998); above level “yellow” (De Ceukelaire & Jacobs 1998).

**Sequence stratigraphy:** Basal part of the highstand tract of sequence Y-E (Steurbaut 1998), 4-5 (Vandenberghe et al. 1998) or Yp6/Yp7 (Hardenbol 1998; Vandenberghe et al. 2004); its base corresponds to the maximum flooding surface.

**Notes:**

- The large maximum thickness (Geets 1988, 1990) is based on lithological (diachronous) criteria, probably including a transitional facies from the Roubaix/Moen to Aalbeke Member in the west of the basin, where boundaries are generally less sharp. Also the rather large thickness quoted by Steurbaut & Nolf (1986) must be based on the same grain-size criteria (rather than biostratigraphic data) as the authors indicate that no calcareous fossils were recorded in the stratotype.
- Steurbaut & Nolf (1986) interpret a somewhat sandier facies above the Roubaix/Moen Member in the east (Mol) as Aalbeke – this is based on a “rather poor” sample from the Mol well (031W0237: 367.60-359.50 m), which correlates to the middle part of biozone NP12 (“unit VI”); the authors suggest that the base of the Aalbeke Member is diachronous – being younger in the east than in the west (Kortrijk area). Note that the same biostratigraphic unit includes the younger Kortemark Member. Based on grain-size data

[12] Although from the authors’ personal experience, a small sand fraction may be present, particularly confined in bioturbations.

Geets (1990) includes the same interval in the “Egem Member”. Van Marcke & Laenen (2005) follow the interpretation of Steurbaut & Nolf (1986). Summing up, the typical Aalbeke lithofacies cannot be recognised in Mol; the corresponding strata are located in the Moen to Egem interval: it is mostly by inference that the strata are assigned to Aalbeke (also on the profile).

- During the Tertiary mapping of the Flemish Region differences in the interpretation of alternating heavy clay and clayey sand layers resulted in connectivity problems between adjacent map sheets: in the area between Brussels and Geraardsbergen three clay layers (Merelbeke, Aalbeke and a heavy clayey interval within Moen) appeared lithologically very similar and easily confused on the basis of simple borehole descriptions. The problem was solved during a supplementary study with additional boreholes and re-evaluation of the existing data (De Ceukelaire 2009).
- Discrepancies persist between lithological and sequence-stratigraphic boundaries; at least from a hydrogeological perspective lithological boundaries are preferably – i.e. marking the limits of the stiff Aalbeke clay proper, rather than in the transitional layers above/below it. Also on geophysical well logs the boundary can and should be defined based on the typical stiff clay signature.[13]

### *Tielt Formation*

**Lithological description:** The Tielt Formation is a marine unit, consisting predominantly of very fine sandy silt with clay layers; upwards there is a transition into very fine sand (Geets 1988).

**Lateral and vertical trends:** The thickness reaches more than 50 m in the centre of the outcrop area and decreases to the south and east and probably to the north (Geets 1988); maximum of 65 m according to Steurbaut (1998). The formation usually rests on stiff clay of the Aalbeke Member, from which it is clearly distinguished by its heterogeneity and coarser texture; towards the east this distinction becomes less clear due to facies changes. The formation is covered by clayey deposits of the Gentbrugge Formation and by coarser sands of the Brussel Formation in the east (Geets 1988); in the system of Steurbaut (1998) it is covered by the “Hyon Sand Formation”.

**Area:** The formation occurs in the western and northern part of Belgium; it outcrops in the north of Hainaut, the south and the centre of East- and West-Flanders and the western and south-western part of Brabant. Outliers occur in the Mons Basin and south of the river Sambre (Geets 1988). In the system of Steurbaut (1998) its distribution is restricted to the western part of the basin.

**Biostratigraphy:** Upper part of zone NP12 (subzones VI, VII and VIII; Steurbaut 1998).

**Geophysical interpretation:** Units Yd6-Yd1 (Bolle & Jacobs 1994); increased variations in grain-size are reflected in well log signal – 3rd and 4th-order variations are difficult to define and correlate unambiguously (Vandenberghe et al. 1998).

[13] From the authors’ personal experience the thickness of the stiff clay proper is much less than the quoted maximums of up to 20 m based on a variety of criteria. It is therefore recommended to use more restrictive criteria that match its original definition.

**Sequence stratigraphy:** Highstand tract of sequence Y-E up to and including the low-level tract of sequence Y-G (Steurbaut 1998); upper part of sequence 5-6 and above (Vandenberghe et al. 1998); upper part of sequence Yp6/Yp7 and lower part of Yp8/Yp9 (Hardenbol 1998; Vandenberghe et al. 2004).

**Notes:**

- According to the NSC lithostratigraphic scheme three members are distinguished, but during the Tertiary mapping of the Flemish Region a twofold subdivision was used. For the map sheets in the south of Flanders no subdivision was made due to insufficient data (Jacobs et al. 2001; Buffel et al. 2009).
- The discrepancy in distribution between Geets (1988) and Steurbaut (1998) is possibly caused by the fact that the Tielt Formation sensu NCS is more inclusive, containing the Hyon Formation sensu Steurbaut (1998).

### *Kortemark Member*

**Lithological description:** Heterogeneous deposits consisting compact clayey, fine to very fine silt with clay lenses, upwards transition from fine-to coarse sandy silt with sandy intercalations; contains few fossils (Steurbaut & Nolf 1986).

**Lateral and vertical trends:** Its maximum thickness of 33 m is reached in the Tielt well (068E0169 – Steurbaut & Nolf 1986).[14] Towards the top the unit becomes coarser. It is clearly distinguished from both underlying and overlying deposits (Aalbeke and Egemkapel Members) by its siltier facies (Steurbaut 1998), although to the northwest this is more difficult as all units gradually become more clayey and boundaries less sharp (Van Marcke & Laenen 2005). Towards the south and east it becomes sandier and thins rapidly (Van Marcke & Laenen 2005).

**Area:** The unit outcrops north of Kortrijk in West-Flanders and "presumably" also occurs in the central part of East-Flanders, south of Gent; it disappears towards the north, south and east (Geets 1988);[15] rapidly thins to the east (Ghent area: Steurbaut 1998). Some authors recognise this facies as far east as Mol (Steurbaut & Nolf 1986; Van Marcke & Laenen 2005).

**Biostratigraphy:** Within subzone VI of NP12 (Steurbaut 1998).

**Geophysical interpretation:** Unit Yd1 (Bolle & Jacobs (1994); several higher order cycles are present, at the top clear CU trend (Vandenberghe et al. 1998).

**Sequence stratigraphy:** Upper part of the highstand tract of sequence Y-E, including three sub-sequences (Steurbaut 1998); upper part of sequence 5-6 (Vandenberghe et al. 1998) or Yp6/Yp7 until sequence boundary Yp8 (Hardenbol 1998; Vandenberghe et al. 2004).

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[14] The authors speak of 27 m in the text, but this does not correspond to the specified interval between 26.80-59.80 m; in any case it includes the ca. 3.8 m thick clay layer later renamed Egemkapel; Geets (1988, 1990) mentions a thickness of 24 (25) m in the same borehole (46-71 m – Figure 2, Geets 1990); Steurbaut (1998) mentions a thickness of ca. 40 m (28.80-70 m – Figures 4 & 5, Steurbaut 1998), excluding the Egemkapel clay.
[15] It may become more difficult to distinguish towards the north/northwest, but it does not disappear; this was already recognised by other authors (e.g. Van Marcke & Laenen 2005) and is confirmed in the present study.

**Notes:**

- The unit was redefined by Steurbaut (1998) to include all silty deposits between the clayey Aalbeke and Egemkapel Members. However, the discrepancies in maximum thickness (Steurbaut & Nolf 1986 versus Steurbaut 1998) are more probably due to different interpretation of the Tielt well (based on the same grain-size data from Geets 1990).
- Geets (1990) found a comparable facies in the north-eastern part of the basin (Mol area); Steurbaut & Nolf (1986) and Van Marcke & Laenen (2005) identify it also accordingly, overlying a unit which they interpret as the Aalbeke Member.
- In the west (map sheets 19-20 and 4-5-11-12) the Kortemark Member is very clayey and the transition to the underlying Kortrijk Formation is often gradual (sometimes over a thickness of 10 m), hindering the distinction based on borehole descriptions (Jacobs & De Ceukelaire 2002; Jacobs et al. 2002).[16] Also the upper boundary with the Egemkapel Member can be difficult.
- Although the main lithological component is silt, the frequent admixture with clays and the frequent intercalation of thin clay layers has as a consequence that the Kortemark Member hydrologically acts as a clayey formation without aquifer properties; it is of no interest for water production.

### *Egemkapel Member*

**Lithological description:** Stiff clay with a glauconiferous sandy base (Steurbaut 1998).

**Lateral and vertical trends:** The maximum thickness is 6 m (Steurbaut 1998), but it becomes thinner and sandier towards the south and east. Distinction from underlying silty deposits (Kortemark or Roubaix/Moen Member) and overlying sandy deposits (Egem Member) is based on its heavy texture.

**Area:** It occurs throughout West- and East-Flanders and extends southwards as far as Tournai, and eastwards to Rijkevorsel and Poederlee (Steurbaut 1998; Van Marcke & Laenen 2005). According to the map by Van Marcke & Laenen (2005) it extends beyond the limits of the two other members of the Tielt Formation (see Figure 6).

**Biostratigraphy:** Within subzone VIb of NP12 (Steurbaut 1998).

**Geophysical interpretation:** Unit Yd3 (Bolle & Jacobs 1993); it may include the top of Yd1 in the SW (map sheet 19-20: Jacobs & De Ceukelaire 2002); sharp boundaries are generally reflected in the well logs (Vandenberghe et al. 1998).

**Sequence stratigraphy:** Sequence Y-F; the base corresponds to the transgressive surface (Steurbaut 1998); lower part (up to and including the first highstand) of sequence Yp8/Yp9 (Hardenbol 1998; Vandenberghe et al. 2004); by Vandenberghe et al. (1998) tentatively named sequence 6-6'.

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[16] Using more restrictive criteria, such a gradual transition should be included in the Kortemark Member, separating the stiff Aalbeke clay from the alternations.

**Notes:**

- This unit was previously part of the Kortemark Member sensu Steurbaut & Nolf (1986).
- This unit corresponds to Yd3 in the well log scheme of Bolle & Jacobs (1994) – during the Tertiary mapping of the Flemish Region it was included in the Egem Member. Welkenhuysen & De Ceukelaire (2009) followed this concept.
- To the west the sandy intercalation Yd2 (with the characteristic double peak) disappears and the clayey top of Yd1 is included in a single, relatively thick clay unit.
- Separating the Egemkapel Member from the Egem Member sensu DOV will also move the eventual sandy "Egem" beds (Yd2) below the Egemkapel clay out of the Egem Member and into the Kortemark Member.

### *Egem Member*

**Lithological description:** Greyish-green, glauconiferous and micaceous, very fine sand with a clear horizontal and cross-bedded lamination; contains clay lenses and shell-rich layers (*Nummulites* and shell grit) (Geets 1988).

**Lateral and vertical trends:** The thickness is 25-30 m in the centre of its area and decreases to the south and east (Geets 1988).[17,18] The unit becomes coarser upwards as well as to the south (West-Flanders). It is usually distinguished from the underlying deposits (Egemkapel Member?) by its sandier characteristics. It is usually covered by the heavy or sandy clays of the Gentbrugge Formation (Steurbaut & Nolf 1986).

**Area:** Its extent is restricted to the north-western part of the Belgian Basin (Steurbaut & Nolf 1986).

**Biostratigraphy:** Subzones VII and VIIIa of NP12 (Steurbaut 1998).

**Geophysical interpretation:** Unit Yd6-Yd4 (Bolle & Jacobs 1994); clear CU trend, becoming almost constant towards top, sharp boundary to overlying deposits (Vandenberghe et al. 1998).

**Sequence stratigraphy:** Lowstand system tract of sequence Y-G (Steurbaut 1998); above SB6' (Vandenberghe et al. 1998); sequence Yp8/Yp9 (Hardenbol 1998; Vandenberghe et al. 2004).

**Notes:**

- Discrepancies in thickness are possibly related to how the unit is defined, i.e. whether it includes or excludes the Egemkapel Member.
- Steurbaut & Nolf (1986) consider the "Panisel Sand Member" as a lateral equivalent of the Egem Member in the south and east. Using biostratigraphical evidence, Steurbaut &

[17] According to Steurbaut & Nolf (1986) and Steurbaut (1998) the maximum thickness of 22.4 or 19 m is reached in the Tielt well (068E0169: 4.40-26.80 (or 25) m, depending whether the later renamed Egemkapel clay is included or not; Geets (1990 – Figure 2) shows a thickness of ca. 33 m in the same borehole (14-47 m) for "sandy Egem".

[18] Thicknesses provided in stratigrapical publications tend to refer to the type sections studied, which often do not expose the boundaries with over- and underlying units. Thicknesses therefore are not constrained by mapping attempts.

King (1994) demonstrate that this unit (then called “Mont-Panisel Sand Member” and accommodated in the newly defined “Hyon Sand Formation”) in fact was deposited later than the Egem Member – situated in the biostratigraphic zone NP12-VIIIb and lower part of NP13. This reasoning is followed for the geological map of Wallonia in the area between Zwevegem and Ronse (Vanneste & Hennebert 2005a, b): the Mont-Panisel Member (clay with sandstone, cf. d’Omalius d’Halloy 1862) supersedes the Egem Member as the top unit of the Tielt Formation, but is not mapped beyond the formation level.

- The Mont-Panisel unit is described as glauconiferous, clayey sand with thin banks of sandstone, on top of greyish-green, sandy clay (cf. Dupuis et al. 1988). The unit outcrops in the area between Ghent, Brussels and Ronse; its rests on deposits of the Egem Member or older deposits towards the south; in the Mont-Panisel well it rests on the Mons-en-Pévèle Member, with a major hiatus of approximately 1 million years; this hiatus decreases progressively towards the N and NW, up to an almost conformable succession in the extreme NW of Belgium. Correlation with deposits in the NW remains poorly understood (Steurbaut & King 1994).
- During the Tertiary mapping of sheets 22, 29 and 30 (Jacobs et al. 1996; 1999a; 1999b) the Egem Member was observed as becoming more clayey towards the south (even though it is traditionally considered sandy). In soundings this “clayey Egem facies” was divided into three units (less clear in borehole descriptions): at the base a heterogeneous clayey sand (with sandstone banks), followed by a clay layer and on top a homogeneous clayey sand. These three units would correspond to the Yd6 (sandy), Yd5 (clayey) and Yd4 (sandy) units of Bolle & Jacobs (1994). For this mapping, the units Yd3 and Yd2 were also considered as part of the Egem Member, but possibly not present in the area.
- During the mapping of sheets 27-28-29, 19-20 (Jacobs et al. 2001; Jacobs & De Ceukelaire 2002) and 31-39 (Buffel & Matthijs 2009), the same threefold division (called Mp3-Mp1) was observed, but now correlated with the entire Tielt Formation (with the middle clay unit correlating with Egemkapel). However, it is more likely that this sequence corresponds to units Yd6-4 (cf. map sheets 22, 29 and 30) and that units Yd3-1 are possibly not present in this area. It was also noted that this lithological succession is very similar to sequences observed in the Gentbrugge and Kortrijk Formations, leading to confusion if insufficient data are available (see note in section Aalbeke Member).
- The Mont-Panisel terminology used during the Tertiary mapping clearly does not correspond to the definition by Steurbaut & King (1994). The equivalent of the “Hyon Sand” in the NW might be incorporated in the Egem or Pittem Members on the geological maps; the base of the Hyon Formation has been correlated with “bed X”[19] in the Egem quarry, which was previously incorporated in the Pittem Member (Steurbaut & King 1994).The presence of a hiatus below the Hyon Formation (which decreases towards the North) and other hiatuses within the Tielt Formation may have caused the difficulties of interpreting and correlating “typical” lithological successions across the basin.

[19] Note that “Unit X” in the Knokke well represents a different layer and is now formally described as the Zoute Member.

## Geographical zonation

Because the different transgressions did not extent to the same scale, the succession of the different members and their composition varies from place to place (Figures 5 & 6). Van Marcke & Laenen (2005) divide the depositional area of the Ieper Group into five areas (see Figure 7):

- Area I (coast): slick shelf sediments were deposited during the whole Ypresian with no clear distinction between the different members. The Kortrijk Formation and Kortemark Member form together an undifferentiated, homogeneous clay complex.
- Area II: adjoining towards the east, the distinction between members of the Kortrijk Formation becomes more obvious. In this zone the complete, typical sequence of the Ypresian Clay is present, including a thin silty to sandy Mont-Héribu Member, the homogeneous clay of the Orchies/Saint-Maur Member, the more heterogeneous Roubaix/Moen Member and on top the homogeneous clay of the Aalbeke Member.
- Area III: the Roubaix/Moen Member is replaced by sandy deposits of the Mons-en-Pévèle Member. The Aalbeke Member becomes thinner to the southeast.
- Area IV: only the homogeneous clay of Orchies/Saint-Maur is present, overlain by the sands of Mons-en-Pévèle. The Aalbeke Member is missing in this zone.
- Area V: at the edge of the basin only the Orchies/Saint-Maur Member is present as a fine clayey layer.

The paleogeographic interpretation by Van Marcke & Laenen reflects the distinction between the type area in central and southern West-Flanders where the successive members are well defined (area II) and the clay pits are concentrated, and the adjoining areas which are subject to facies change compared to the type area. It is confirmed that the Ypresian Clay becomes more clayey and homogeneous towards the north and west (area I). The transitions towards the east and south-east may be more differentiated, involving different patterns of stratigraphic thinning and lateral change into more sandy lithologies (however, still retaining clayey hydrological properties).

The Orchies/Saint-Maur Member is generally described as a relatively homogeneous clay (or at least when compared to the underlying and overlying units). This may be true in the vertical direction, but similar to the other members, the unit seems to change laterally into a more silty deposit. In the Mol area, based on grain-size distribution, Geets (1990) describes a “northeastern facies” comparable to the Mont-Héribu Member. Using geophysical well log data, it is clear that this interval in fact corresponds to the lower sequences of the Ypresian Clay (Vandenberghe et al. 1990, 1998) and thus should be correlated to the Orchies/Saint-Maur Member in the west (Steurbaut 1998), accepting lateral facies changes.

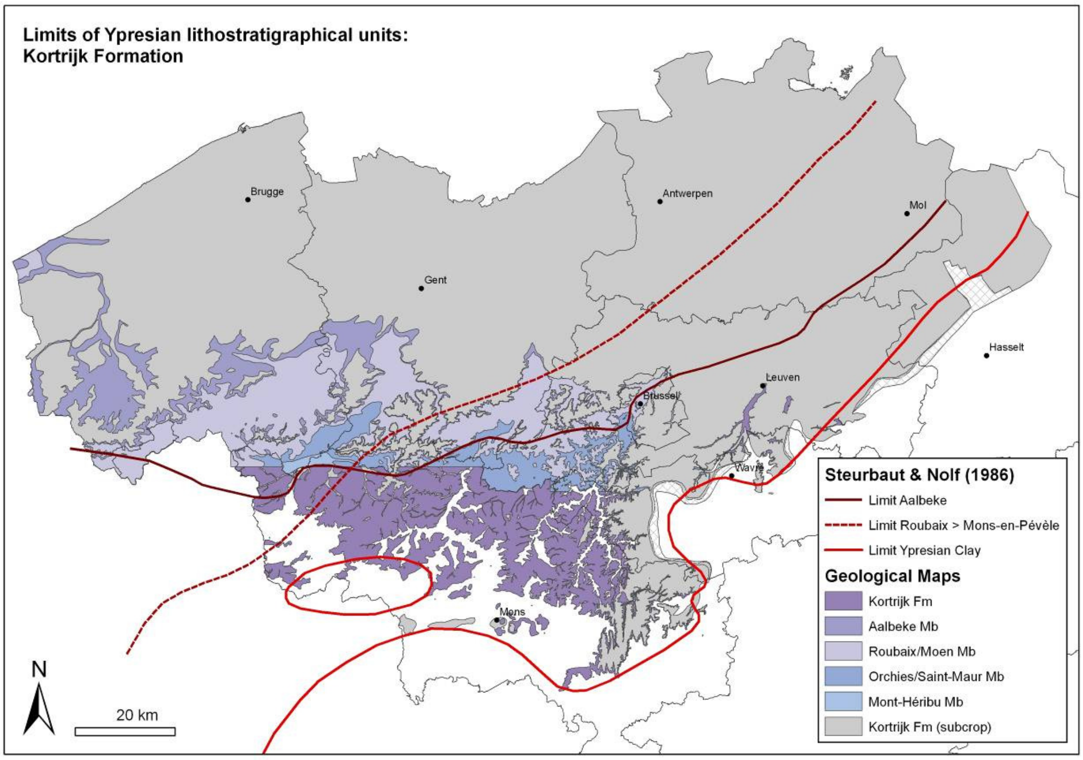


*Figure 5: Comparing the limits of some Ypresian units (Kortrijk Formation): southern/transitional limits after Steurbaut & Nolf (1986), outcrop areas from the Tertiary map of the Flemish Region (Flanders and Brussels) and the geological map of Belgium (Wallonia), subcrop area from Vancampenhout (2004).*

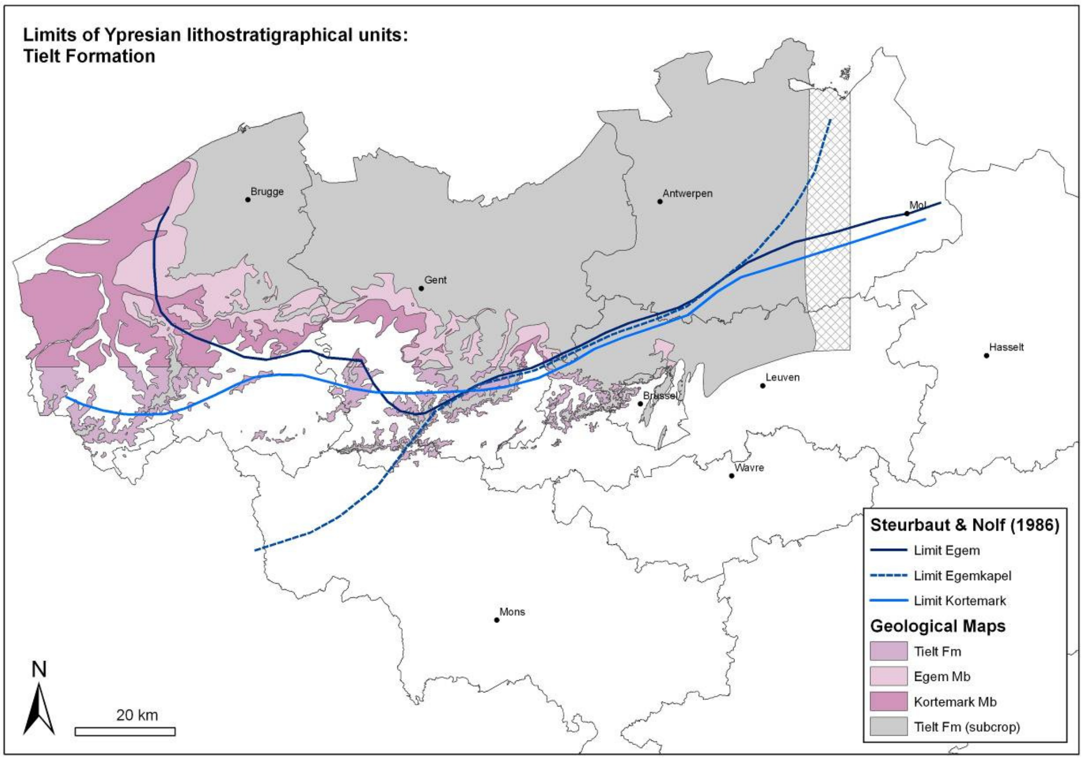


*Figure 6: Comparing the limits of some Ypresian units (Tielt Formation): southern limits after Steurbaut & Nolf (1986: Egem and Kortemark Members) and Van Marcke & Laenen (2005: Egemkapel Member), outcrop areas from the Tertiary map of the Flemish Region, subcrop area from Vancampenhout (2004).*

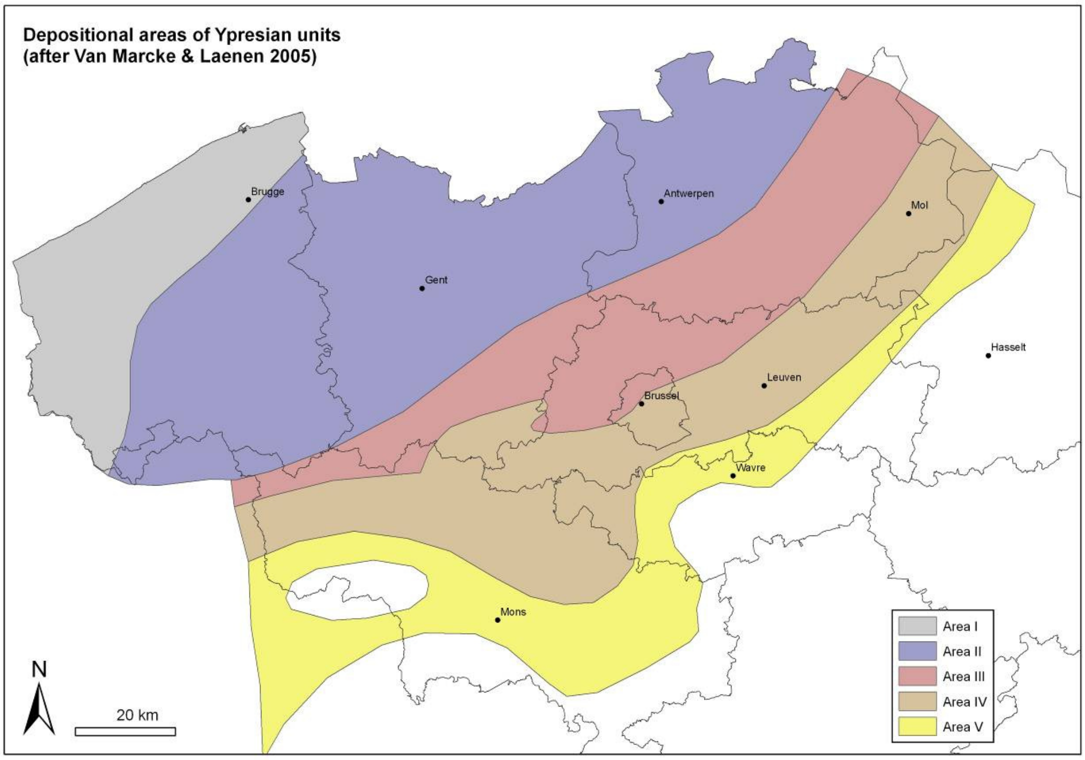


*Figure 7: Geographical zonation of the depositional area of the Ypresian Clay (after Van Marcke & Laenen 2005).*

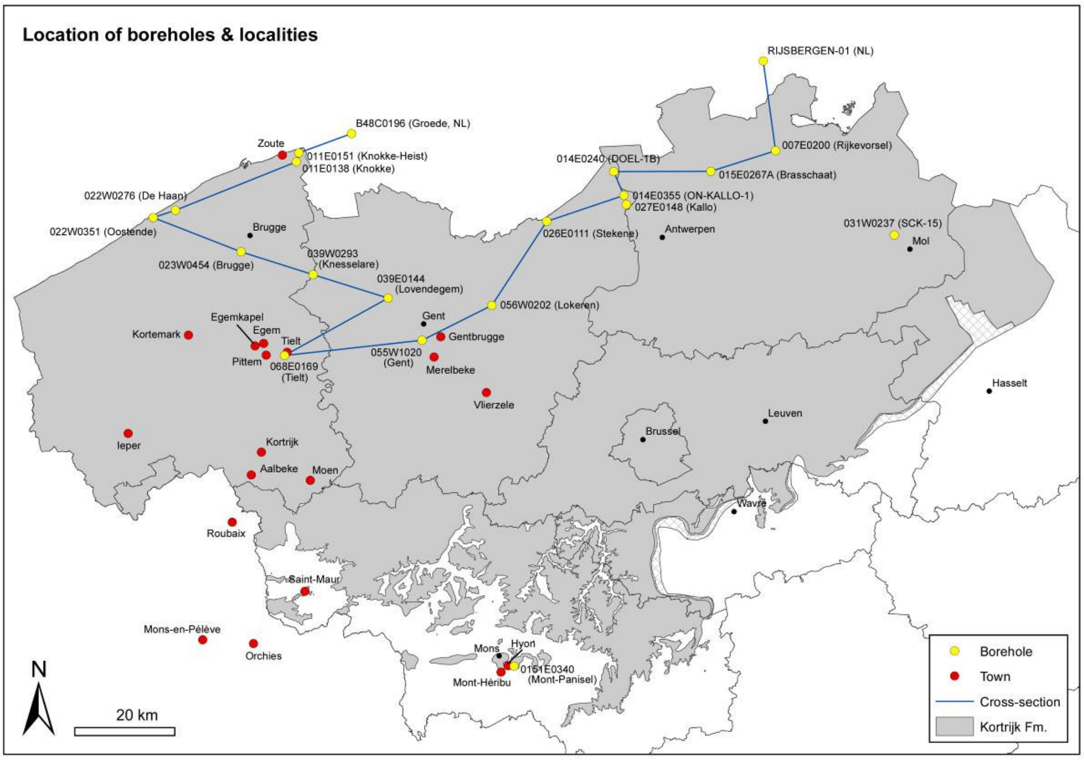


*Figure 8: Locations of key boreholes and localities mentioned in the text.*

## Some concluding remarks

In principle this study follows the stratigraphic framework proposed as the official NCS scheme (Figure 1), but it should be noted that the subdivision of the Ypresian stage is still subject to discussion. The stratigraphic units were initially defined on the basis of lithological (Geets 1988, 1990) and paleontological (Steurbaut & Nolf 1986; Steurbaut 1988) characteristics studied in man-made outcrops. Basin-wide correlations based on the same criteria are hampered by lateral facies changes, which would either result in diachronous boundaries or in meaningless boundaries located in intervals which are hard to differentiate above and below the boundary.

Geophysical well logs show the succession of several fining- and coarsening-upward tracts that can be correlated in the subsurface throughout the entire basin (Vandenberghe et al. 1990, 1998). Although the intra-formational geophysical boundaries are quite consistent, they are not always strongly differentiated in lithological expression, taking into account the overall clay dominance of the sediment, and prone to lateral changes in geophysical signal strength. The lithostratigraphic boundaries of the NCS scheme are not conspicuous among the sequential tracts; the sequences identified correspond to reversals in grain-size trends whereas the traditional lithostratigraphic boundaries are based on breaks in grain size distribution rather than on gradual grain-size trends (Vandenberghe et al. 1998). Moreover, biostratigraphical arguments are needed to distinguish the successive units in a rather monotonous clayey sequence. In spite of common practice (De Ceukelaire & Jacobs 1998; Steurbaut 1998; Welkenhuysen & De Ceukelaire 2009), it is therefore not advisable to use the lithostratigraphic terminology for annotation of sequences based on trends observed in geophysical well logs, until these lithostratigraphic units are precisely defined in terms of geophysical well signature. Indeed, lithostratigraphic units are defined on the basis of properties of the main rock mass as observed in outcrops (with boundaries generally not observed in outcrops and influenced by paleontological reasoning) and less on characteristics of the boundaries. Sequence boundaries on the other hand are identified precisely at the turning points of grain-size trends..This inevitably leads to discrepancies between delimiting the lithostratigraphic succession and their interpretation.

An example of such discrepancy is the Mont-Héribu Member as mapped in the Flemish Region (De Ceukelaire & Jacobs 1998), based on criteria which clearly do not match the definition as a thin basal sandy clay layer (sensu Steurbaut & Nolf 1986) (see Figure 11). Neither does the latter definition correspond to the original description in its type locality, as it has been clearly demonstrated that the biostratigraphic data from the Mont-Héribu hill cover a time span much longer than the first rapid transgressive tract of the Ypresian stage; biostratigraphically these deposits correlate with the interval between 375 and 360 m of the Kallo well (De Coninck et al. 1983), that, based on litho- or sequence-stratigraphic grounds, should be attributed to the Orchies Member (see Figure 10).

To summarize, for the purpose of this study it seems opportune to follow a sequence-stratigraphic subdivision of the Ypresian deposits, based on geophysical boundaries, as these provide the most consistent and objective criteria throughout the basin. In NCS terminology the upper and lower boundaries of the Ypresian Clay are defined at the top of the Egemkapel Member and at the base of Het Zoute (in the NW) or Mont-Héribu Members, respectively.

## Datasets used

From the datasets used for the isohypse mapping project (Vancampenhout 2004) the cored and reverse flush boreholes and all boreholes with geophysical logs were selected.[20] The dataset was further expanded with "new" high-quality borehole data selected from the DOV and GSB archives, based on the following criteria:

- Year of execution or inclusion in the archives after 2003 (i.e. acquired after completion of the isohypse project).
- Depth greater than 20 m.
- At least reaching the top of the Tielt or Kortrijk Formations.
- Reverse flush, cored or with geophysical logs.
- All boreholes carried out on behalf of the Afdeling Geotechniek or VMM, which were described and interpreted by a GSB geologist.[21]
- Some boreholes with geophysical well logs across the border in the Netherlands.[22]

Initially a total of 706 boreholes were selected: 399 from the isohypse dataset and 308 "new" ones. Eventually a total of 585 boreholes were used for modelling the Ypresian Clay: 214 for the top and 528 for the base level (see Table 1 and Figures 15 & 16).

Additional data sources used for the modelling:
- Shapefiles of the outcrop areas from the Tertiary map of the Flemish Region and digitized geological maps of Belgium (GSB archive) for the Walloon Region (for coverage see Figure 17).
- Shapefiles of the subcrop areas from the isohypse project (Vancampenhout 2004).
- Raster file of the base level of Quaternary deposits at 100 m resolution from the G3Dv2 geological model of the Flemish Region (Matthijs 2011).
- Digital terrain model of Belgium at 100 m resolution (extracted from SRTM data files; USGS 2012).
- Digitized data from several publications on geology of the continental shelf (Liu et al. 1992; De Batist & Henriet 1993; Le Bot et al., 2003).

The locations of key boreholes and localities mentioned in the text are displayed in Figure 8.

[20] During successive iterations many of the boreholes without well logs in the Flemish Region where removed from the selection as there appeared discrepancies with nearby well log interpretations; this again confirmed the difficulties of correlating lithological and geophysical-defined boundaries. For the Walloon Region no well logs were available and so the cored and reverse flush boreholes remained the best data source.
[21] The boreholes by Geotechniek usually do not reach further than the top of Tertiary formations and are therefore of limited value, except for characterising the lithofacies of the strata.
[22] The "shallow" boreholes usually do not reach the top of Ypresian Clay (or at least sensu the terminology used in this study – in the Dutch stratigraphic scheme the "Ieper Clay Member" includes the equivalents of the Gentbrugge Formation, with many boreholes ending in what appears to be the equivalent of the Merelbeke Member); only a few deep drillings include the complete Ypresian sequence).

# Methodology

## Interpretation of well log data

In previous mapping projects (Vancampenhout 2004; Vancampenhout et al. 2008) most of the lithostratigraphic interpretations were adopted from the original borehole reports (from the GSB archive or DOV) with no or only minor revisions for the Ypresian sequence. However, because many of the individual interpretations were established ad hoc in the absence of strict guidelines for delimiting the lithostratigraphic units, it was noted that these are often inconsistent and not always in accordance with the current lithostratigraphic division in Belgium (Figure 14). Over time various studies have been carried out aimed at realizing a consistent stratigraphic correlation based on geophysical well logs for the whole of Belgium (for example Vandenberghe et al. 1990), but rarely the results (as revised interpretations) have found their way into the databases.[23]

With the implementation of a drilling campaign in the framework of expansion of the primary groundwater monitoring network (VMM 2005-2006), a systematic dataset covering the whole of Flanders was obtained, based on standard geophysical well logs coupled with a more thorough than usual analysis of borehole samples (Welkenhuysen & De Ceukelaire 2009). However, it should be noted that the lithostratigraphic division used at the time was based on the scheme of the Tertiary mapping of the Flemish Region, which applies a twofold division of the Tielt Formation and does not distinguish the Egemkapel Member, hence of reduced relevance for the objective of this study, to model the top of the Ypresian Clay. Also, the subdivision of the Kortrijk Formation differs significantly from the one proposed by Vandenberghe et al. (1988, 1998), which is biostratigraphically calibrated (Steurbaut 1998). When concerned only with the upper and lower boundaries of the Ypresian Clay sequence (i.e. the top of the Egemkapel Member and the base of the Kortrijk Formation), the differences between the two approaches are not very conspicuous in terms of overall mapping result.

In this study, interpretation of the borehole logs is based on correlations provided by the sequence stratigraphic scheme by Vandenberghe et al. (1998) and calibrated by Steurbaut (1998). Although reference is made to the lithostratigraphic terminology as currently accepted by the NCS (Laga et al. 2001), this is by no means intended to present a definite correlation between the two schemes, as it should be remembered that they are based on very different criteria. In NCS terminology, the boundaries of the Ypresian Clay are defined at the top of the Egemkapel Member and the base of the Zoute (in the NW) or Mont-Héribu Members, respectively. Further subdivision of the sequences was considered beyond the scope of this study, although complete correlations are illustrated with reference to some key boreholes and a cross-section profile through the northern part of the basin.

[23] Stratigraphic interpretation of boreholes is made in two steps, first a premilinary interpretation based on borehole samples which in case of the most common straight flush boreholes do not allow much discrimination between the units, once one enters into a clay sequence, second by picking out appropriate boundaries on geophysical well logs. However, the latter exercice is generally made without consultation of a reference, and is therefore rather indicative for personal preferences in picking the boundary and subject to shifting practices with time.

Correlations between the various litho-, sequence- and biostratigraphic schemes are illustrated by two reference boreholes that were extensively studied in the past: the Knokke well (011E0138; Figure 9) and the Kallo wells (027E0148 and 014E0355; Figure 10). Correlations between the different geophysically-based schemes are illustrated by the Gent well log (055W1020; Figure 11). Correlation problems in the northwestern part of the basin (De Haan/Oostende area) due to the overall less variation in geophysical signal strength were overcome by comparing two recent well logs of Knokke-Heist and Brugge (011E0151 and 023W0454; Figure 12). A cross-section profile between the coast and the Campine area clearly demonstrates that the sequences in the Ypresian Clay can be identified and correlated between well logs through the entire basin (Figure 13).

Note that some slight modifications are displayed in the cross-section profile of Figure 13, which have not yet been included in the point dataset used for modelling: the clay layer marked with ** (De Haan – 022W0276 and Oostende – 022W0351 wells) was initially interpreted as Egemkapel Member. This resulted in an ambiguously thick Ypresian Clay in comparison to the Knokke area to the north. After a careful correlation between the Knokke-Heist (011E0151) and Brugge (023W0254) wells, it rather seems to correspond to a clayey interval within the Egem Member (Figure 12). The same (?) clayey layer can be recognized in the logs of the Antwerp area and maybe it can also be linked to the clayey Egem facies described further south on map sheets 22, 29 and 30 (Jacobs et al. 1996, 1999a, b).

**[The figures below are included as appendices 2-6 at the end of this report.]**

*Figure 9: Correlation between litho- sequence- and biostratigraphic interpretations of the Knokke well (011E0138).*

*Figure 10: Correlation between litho-, sequence- and biostratigraphic interpretations of the Kallo wells (027E0148 and 014E0355).*

*Figure 11: Comparison between different geophysical well log interpretations of a well in Gent (055W1020).*

*Figure 12: Correlation between geophysical well logs of Knokke-Heist (011E0151) and Brugge (023W0454). The Brugge well log was scaled differentially to match the sequence patterns in the other well log.*

*Figure 13: W-E cross-section profile between the coast and the Campine area, showing geophysical well logs penetrating through the entire Ypresian sequence and new consistent interpretations. For the location of boreholes see Figure 8; revised interpretations are included in Appendix 7.*

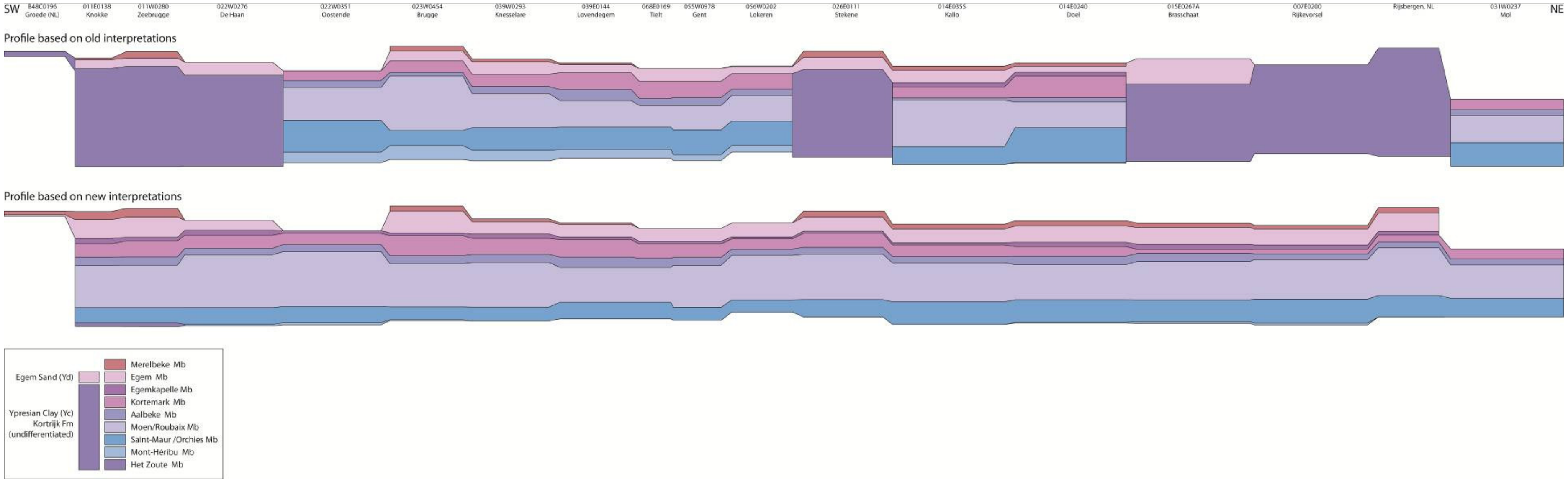


*Figure 14: The same W-E cross-section profile of boreholes penetrating through the Ypresian Clay – comparison between the variable interpretations from archives (top) and revised consistent interpretations (bottom). It is clear that some of the old interpretations do not differentiate beyond the formation level, or when distinction on lower levels has been made, the criteria are inconsistent between boreholes (note that some later modifications displayed in Figure 13 are not included here).*

## Interpolation procedure for the geological model

Based on the point data, the top and base level of the Ypresian Clay were interpolated to raster files at 100 m resolution. The interpolation was performed in ArcGIS – Spatial Analyst, using the natural neighbour method. This algorithm determines the value of a raster cell based on neighbouring points, which are identified and weighted according to Voronoi polygons (comparable to a Delaunay triangulation) (ESRI 2008).

In order to avoid undesirable edge effects, additional support points were introduced along the outcrop boundaries of the formations and outside the model area:

- Point values of the Quaternary base level at regular intervals along the boundaries of the outcrop area (extracted from the G3Dv2 model for the Flemish Region, estimated values for the Walloon Region – see below).
- Estimated point values on the continental shelf, based on published seismic profiles.
- Extrapolated point values in the far NE and SW of the basin, where real data are lacking.

The base level of the Ypresian Clay was interpolated from the point data in the entire area of occurrence (subcrop and outcrop areas). For the top level, the working procedure varied according to the availability of data:

- Zone A (subcrop area): interpolation from point data.
- Zone B (outcrop area Flemish & Brussels Regions): level derived from the Quaternary thickness model of G3Dv2; the level of the top of the Ypresian Clay was calculated by simply subtracting the Quaternary thickness from the DTM of Belgium. As the Quaternary data layer is based on high point density and inferred relations between Quaternary thickness and topography, it provides a more realistic expression of the top of the underlying Ypresian Clay than would otherwise be obtained from interpolation from the dataset of the present study.[24] The outcrop area was delimited by the combined polygons of the Kortemark Member and the Kortrijk Formation from the Tertiary maps, although it is acknowledged an inaccurate assumption. Firstly, on some Tertiary map sheets in the south of Flanders no distinction was made between members of the Tielt Formation; hence in areas where (part of) the Egem Member is present, this has necessarily been included in the outcrop zone. Secondly, the Egemkapel Member is not distinguished on the Tertiary maps (mapped as part of Egem); hence beyond the northern limits, part of the outcrop zone is "missing". Although these assumptions inevitably resulted in systematic offsets in the lateral position of the intersection between the outcrop and subcrop areas, the effects on the vertical position of the modelled surface are considered minimal (in comparison to other uncertainties within the datasets).
- Zone C (outcrop area Walloon Region): the same principles were applied as in Zone B, except no up-to-date geological maps were available. The Quaternary base level was roughly estimated at an average of 5 m below surface, except for the alluvial plains (10 m) and the Scheldt valley (20 m). The location of alluvial valleys was extracted from the old geological maps; the outcrop area was delimited by the combined polygons of the map units Yd and Yc which practically correlate to the Kortrijk Formation. Limited areas of

[24] Evidently this lower point density is sufficient for modelling continuous surfaces such as the base of the Ypresian Clay or its top where it is covered by other Tertiary layers.

the Walloon Region are covered by the Flemish Tertiary maps (zone C2) and these were used instead.

- As the Quaternary base level and the interpolated top of the Ypresian Clay in the subcrop area did not connect seamlessly along the boundaries of the outcrop area, undesirable artefacts had to be removed. Therefore, in the case of raster cells with an interpolated value lower than the Quaternary base level, the former was used. In other words, for each raster cell the lowest value of either the Quaternary base level or the interpolated surface was chosen.
- During the interpolation, the faults mapped in the Campine and related to the Rur Valley Graben shoulder were not taken into account, because too few data were available to model each tectonic block individually.

Finally, a complete model of the top level of the Ypresian Clay was created by merging the raster files from zones A, B and C.

Tables 1 & 2 provide an overview of the datasets used for the interpolations; their locations and coverage are displayed in Figures 15-17. A complete list of all boreholes is included in Appendix 8.

*Table 1: Number of data points used for the interpolations of the Ypresian Clay.*

| | Top | Base | Total |
|---|---|---|---|
| Well logs | 149 | 235 | 269 |
| Well logs (NL) | 5 | 5 | 5 |
| Cored boreholes | 60 | 287 | 311 |
| Support points (Quat. base level at outcrop limit) | 1404 | 1430 | 2834 |
| Support points (estimated from seismic profiles) | 6 | 4 | 6 |
| Support points (extrapolated) | 2 | 5 | 7 |

*Table 2: Input data for creating surface models of the top and base of the Ypresian Clay.*

| | Subcrop area | Outcrop area Flemish Region & Brussels | Outcrop area Walloon Region | |
|---|---|---|---|---|
| | A | B | C1 | C2 |
| DTM Belgium | | | x | x |
| Quaternary G3Dv2 | | x | | |
| Tertiary map VLA | | x | | x |
| Geological map BE | | | x | |
| Occurrence map PVC | x | | | |
| Point data – Top | x | | | |
| Point data – Base | x | x | x | x |

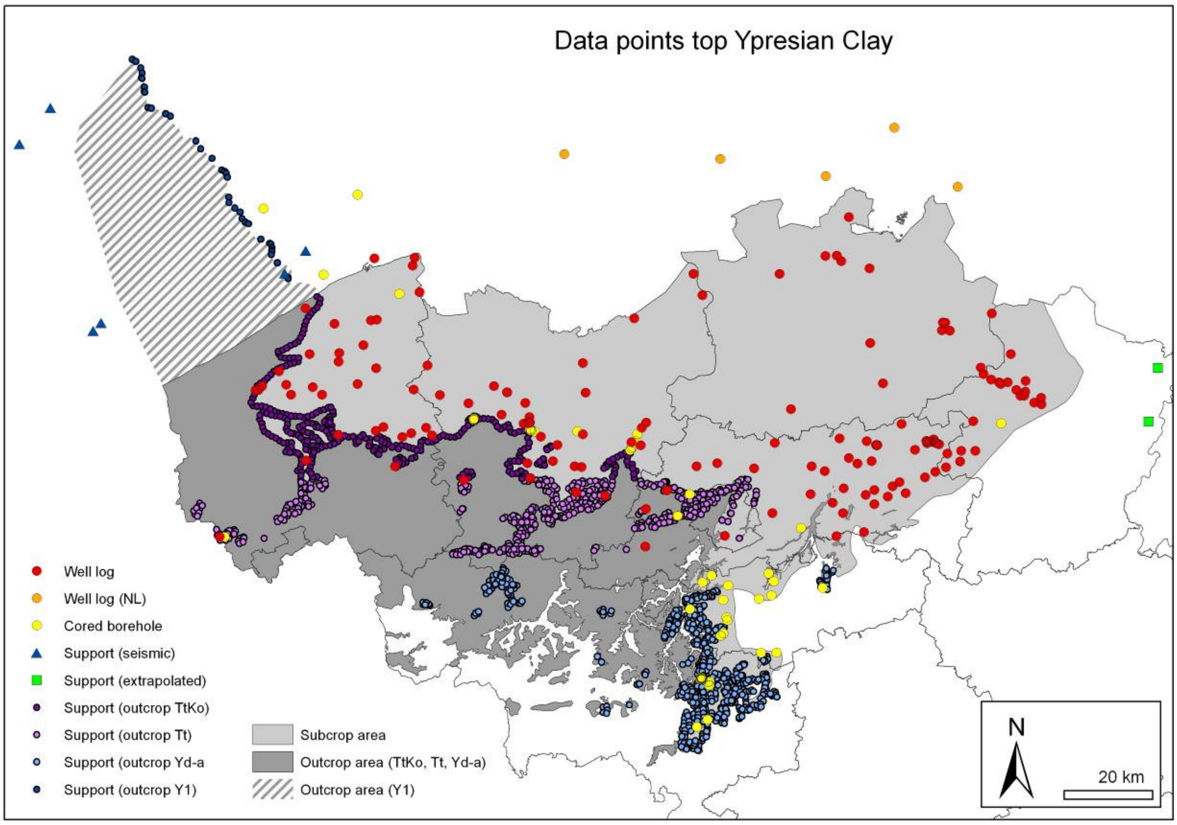


*Figure 15: Map showing the locations of point data (boreholes and support points) used for modelling of the top of the Ypresian Clay.*

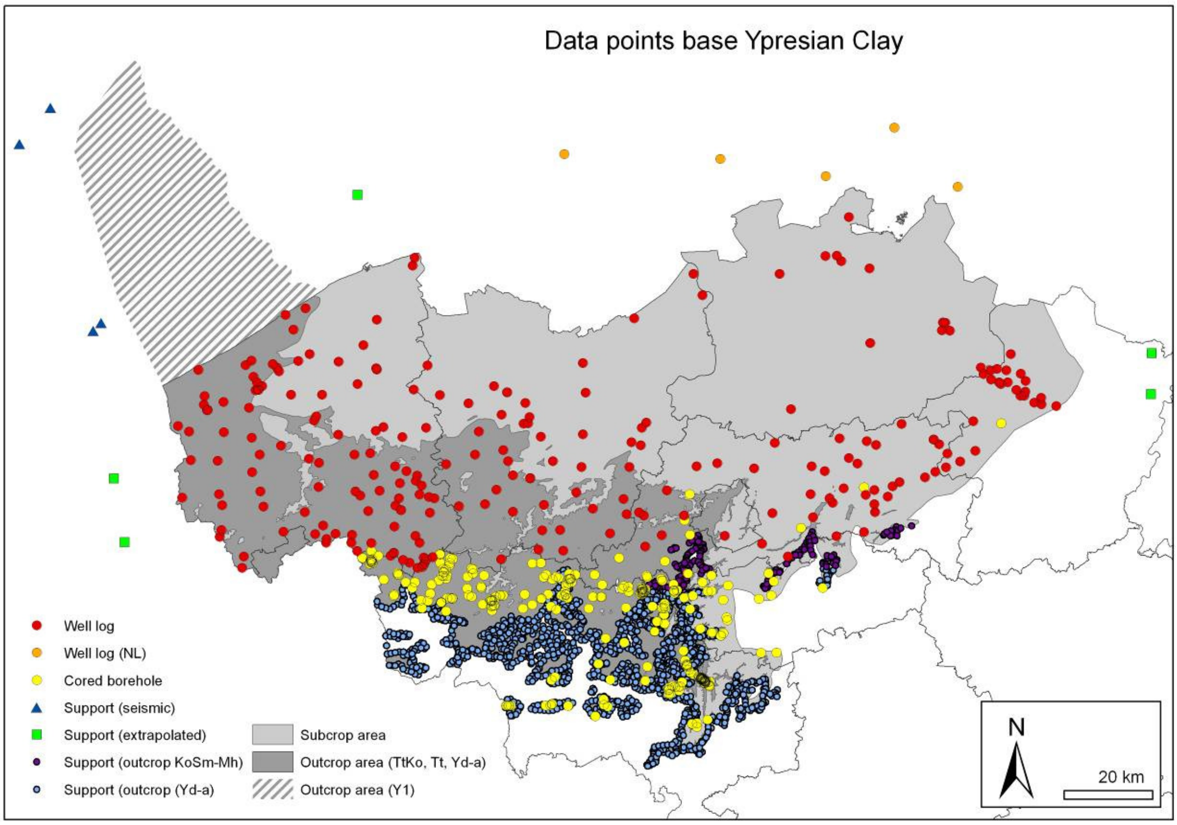


*Figure 16: Map showing the locations of point data (boreholes and support points) used for modelling of the base of Ypresian Clay.*

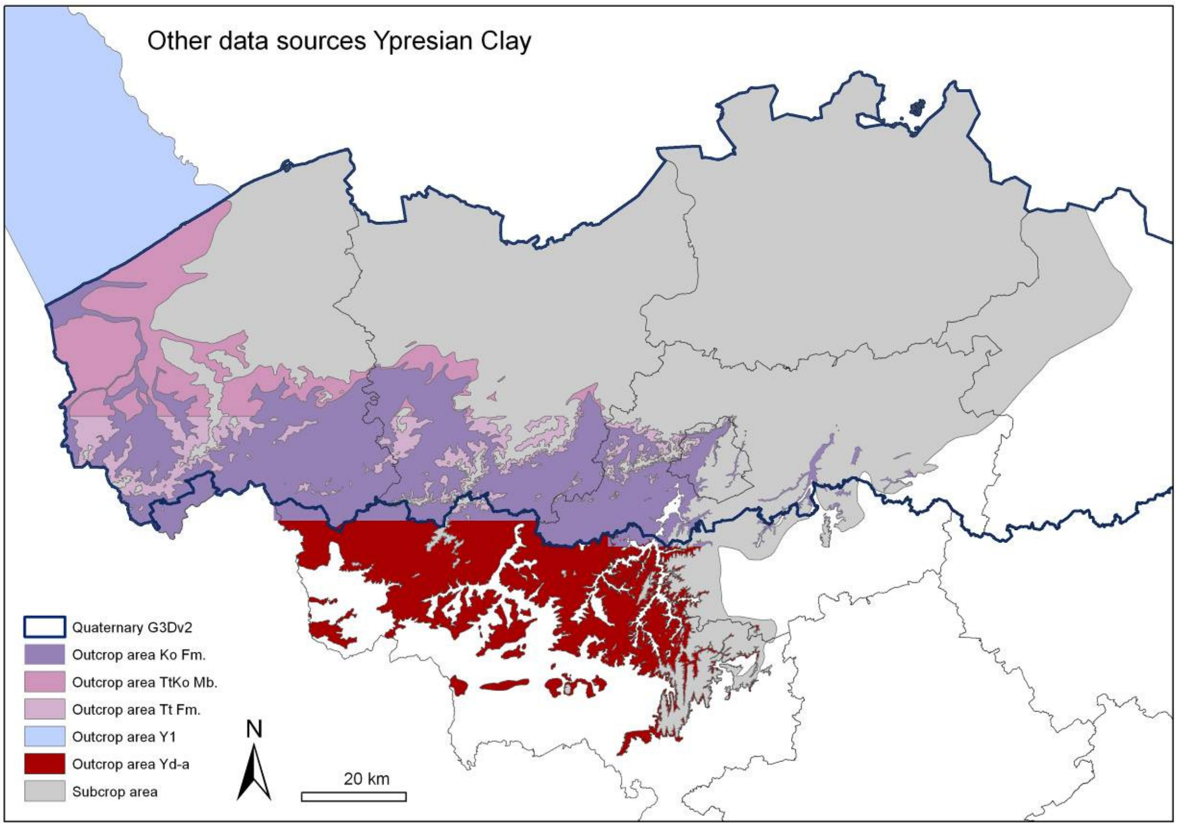


*Figure 17: Map showing the coverage of other data layers used for the modelling of the Ypresian Clay.*

The primary outputs from the interpolation consisted of elevation models relative to a fixed reference level (TAW). In order to derive a model of depth below ground level, for each raster cell the elevation difference was calculated between the interpolated surface and the DTM of Belgium.

Secondary output products included raster maps of the thickness of the Ypresian Clay (calculated by subtracting top and base level maps) and shapefiles with contour lines (isohypse and isopach maps).

## Deliverables

The output of the study comprises the following maps:

- Digital elevation models and isohypse maps of the top and base of the Ypresian Clay relative to TAW (Figures 18-21).
- Model of the thickness of the Ypresian Clay and isopach maps (Figures 22 & 23).
- Depth models and isohypse maps of the top and base of the Ypresian Clay below ground level (Figures 24-27).

The maps clearly show that the layers are generally sloping in NNE direction. Although this is a tectonically sound result in view of the general tilting of Cenozoic to Paleozoic strata towards the Rur Valley Graben it is remarkable because of general thoughts on flat lying strata in the Flemish interior ("built on clay") and the relative depth and thickness increase towards the NNW (culminating in Knokke-Het Zoute).

The maximum depth of Ypresian Clay complex is reached in the north; near the Dutch border in the northern Antwerp Campine area, the top of the unit is present at a depth of more than 600 m below ground level. In the Meer borehole (007E0205) the clay occurs between 578 and 692 m below ground level (or between 565 and 679 below TAW).

In general, the thickness of the complex is quite consistent throughout the basin,  c. 120 m if the complete sequence is present, slightly increasing from east to west. The lower part (Kortrijk Formation) accounts for ca. 100 m, whereas the upper part (Kortemark and Egemkapel Members, with various hiatuses) seem to account for most of the variance.

The thickness of the complete unit possibly reaches a maximum of more than 160 m in the northwest near Oostende. However, based on an alternative correlation of the upper sequences, it may be more likely that the top of the clay should be identified at a lower level (see Figures 12 & 13); in that case the maximum thickness would reached in the Knokke-Heist borehole (144.5 m, between 154 and 298.5 m below ground level).

To the east the thickness rapidly diminishes, possibly due to inversion tectonics of the Rur Valley Graben during the Eocene (meaning that thickness change is fault-related but rather under the form of flexural changes).

Relatively minor irregularities of the interpolated surfaces in the fault zone East of Mol are possibly caused by inadequate interpolation performance across the presumed fault lines, where density of available data is insufficient. Other possible explanations may include errors in elevation or inconsistent interpretations, possibly related to rapid lateral facies change in the inversion zones. The area northeast of Beringen (southeast of a string of coal exploration boreholes lining up on the maps) may be affected by differential mining subsidence. Due to time constraints it was impossible to re-evaluate all data in the eastern Campine.

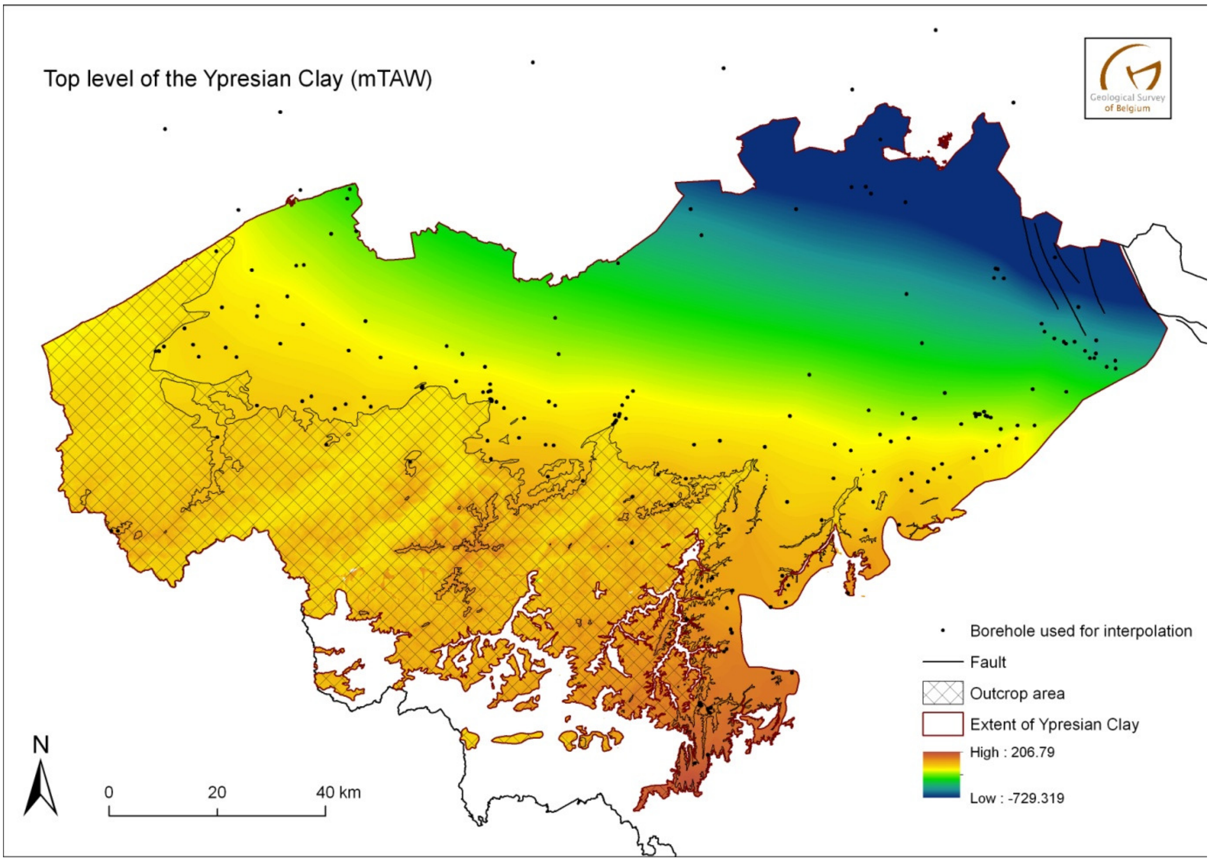


*Figure 18: Digital elevation model of the top of the Ypresian Clay complex (in mTAW).*

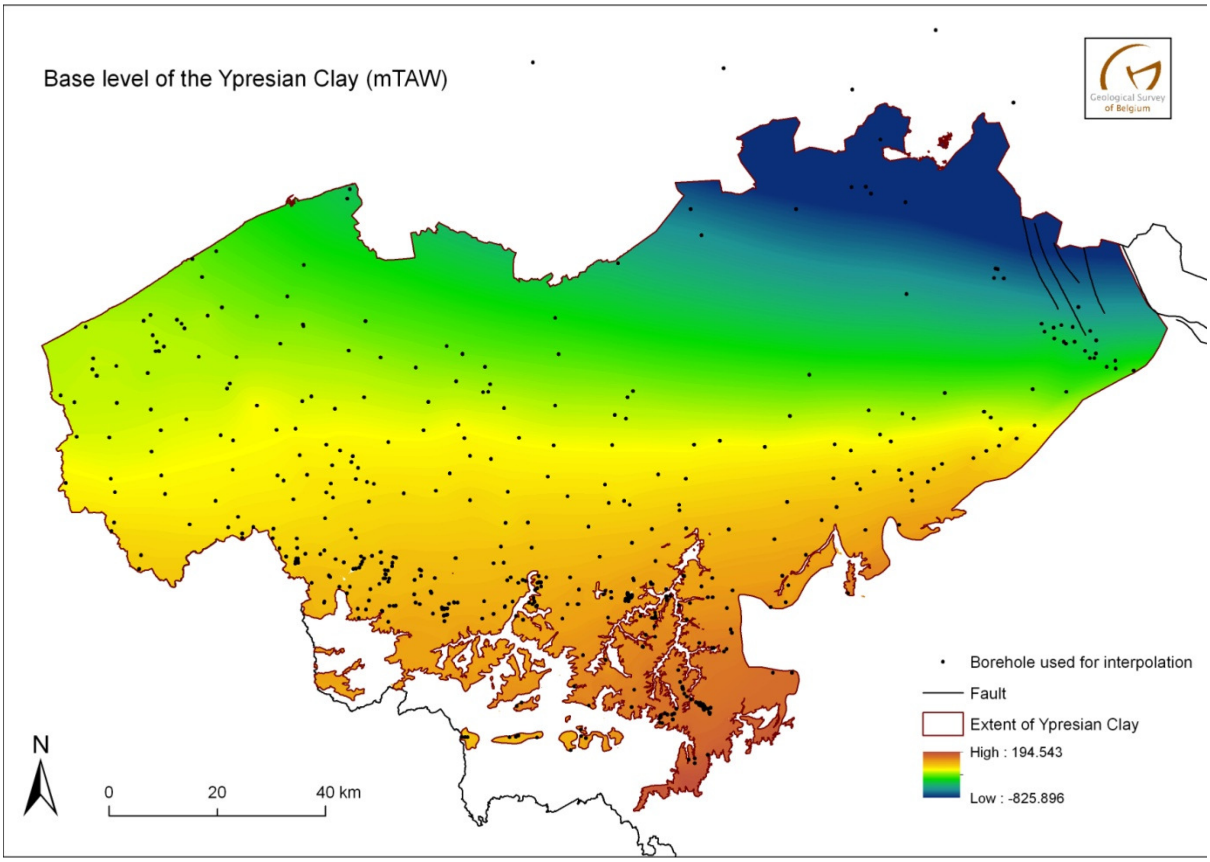


*Figure 19: Digital elevation model of the base of the Ypresian Clay complex (in mTAW).*

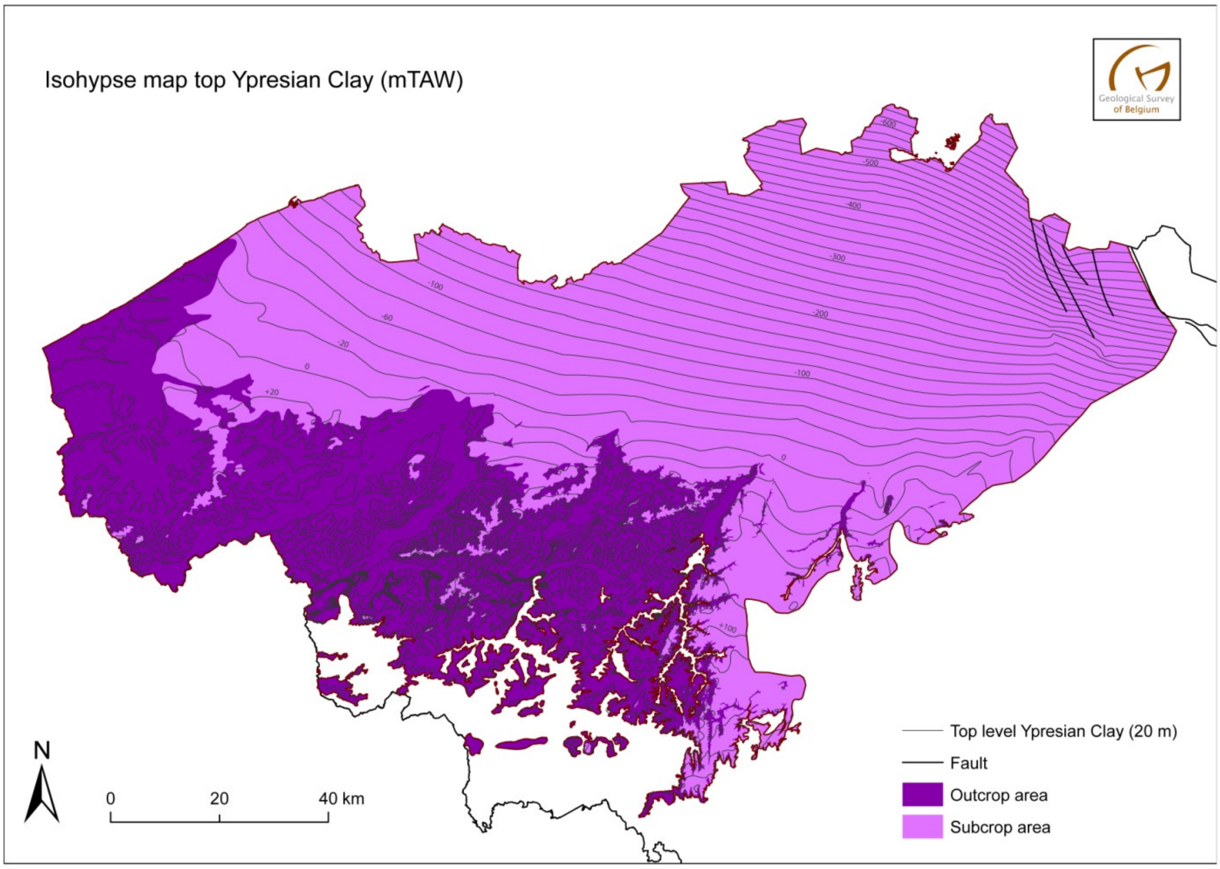


*Figure 20: Isohypse map of the top of the Ypresian Clay complex (in mTAW).*

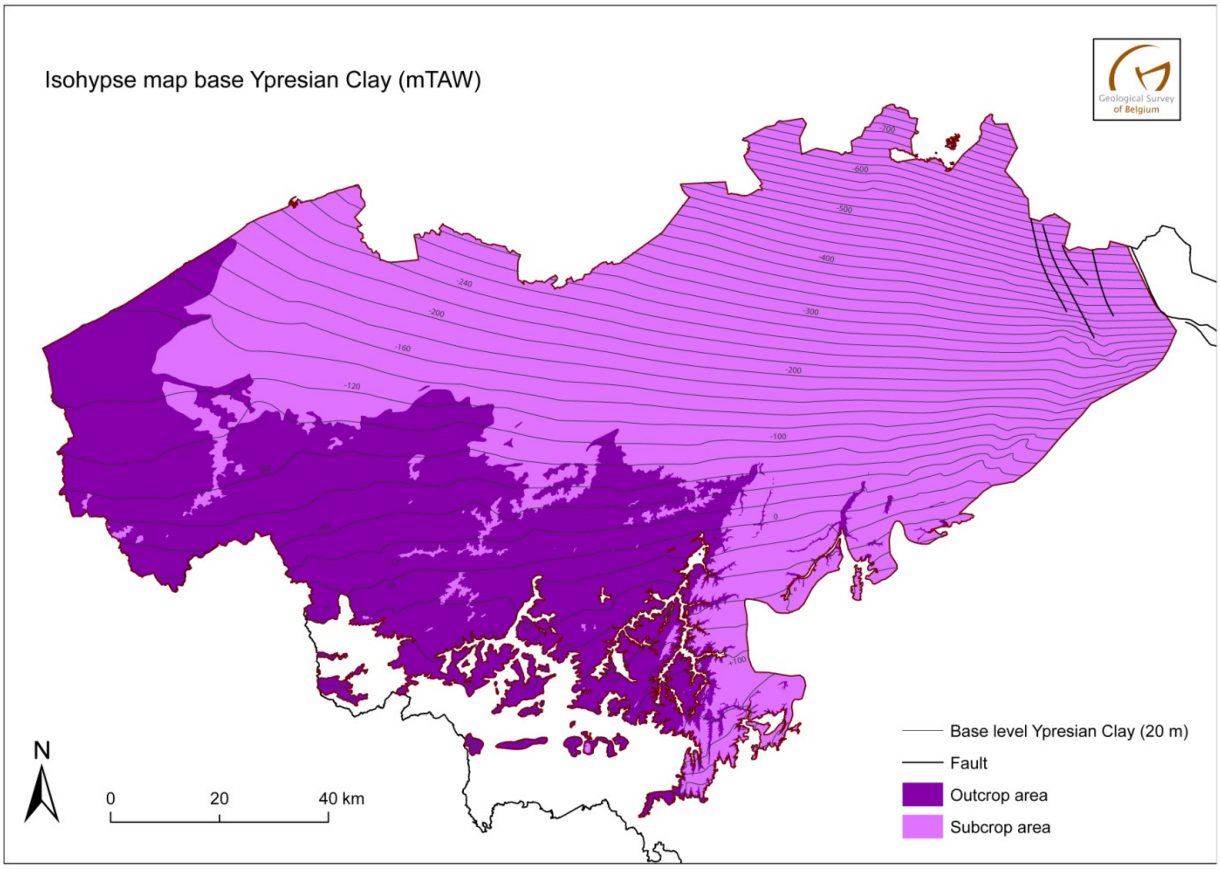


*Figure 21: Isohypse map of the base of the Ypresian Clay complex (in mTAW).*

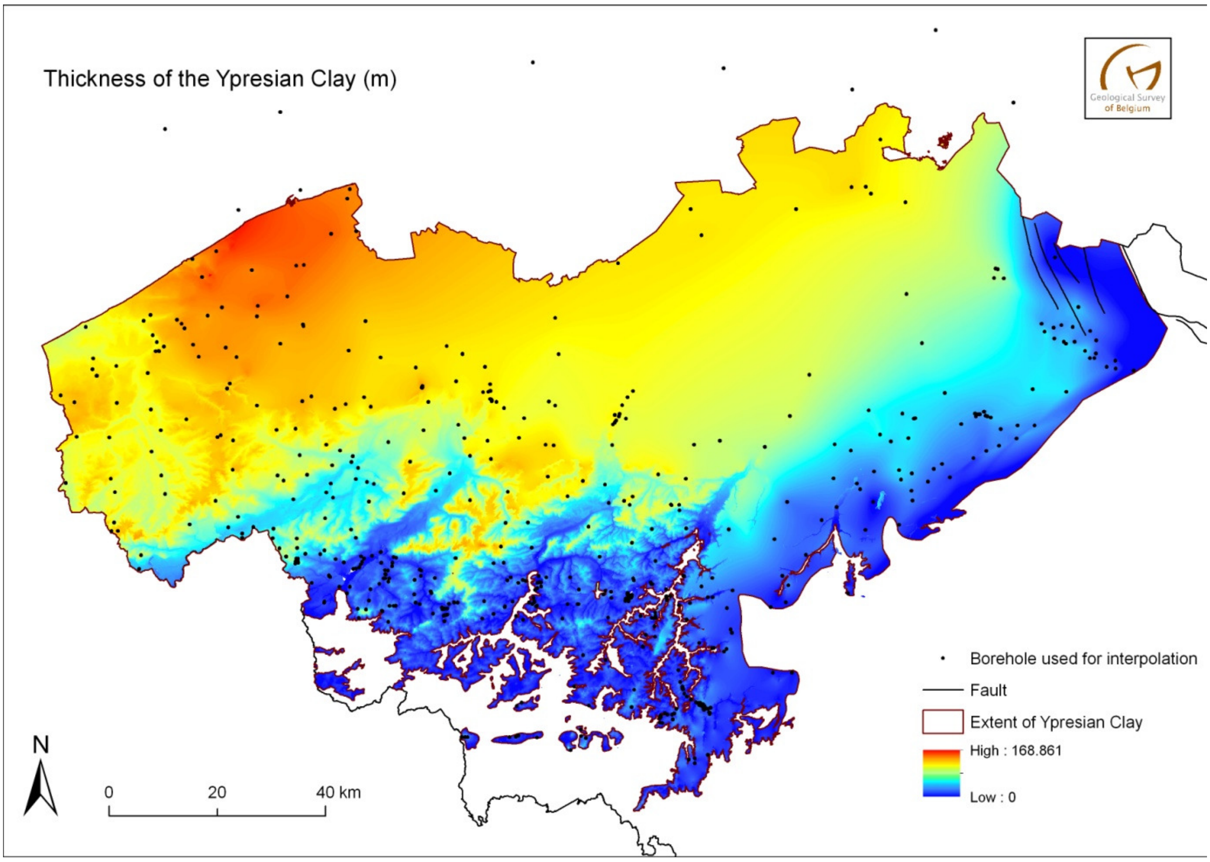


*Figure 22: Thickness of the Ypresian Clay complex.*

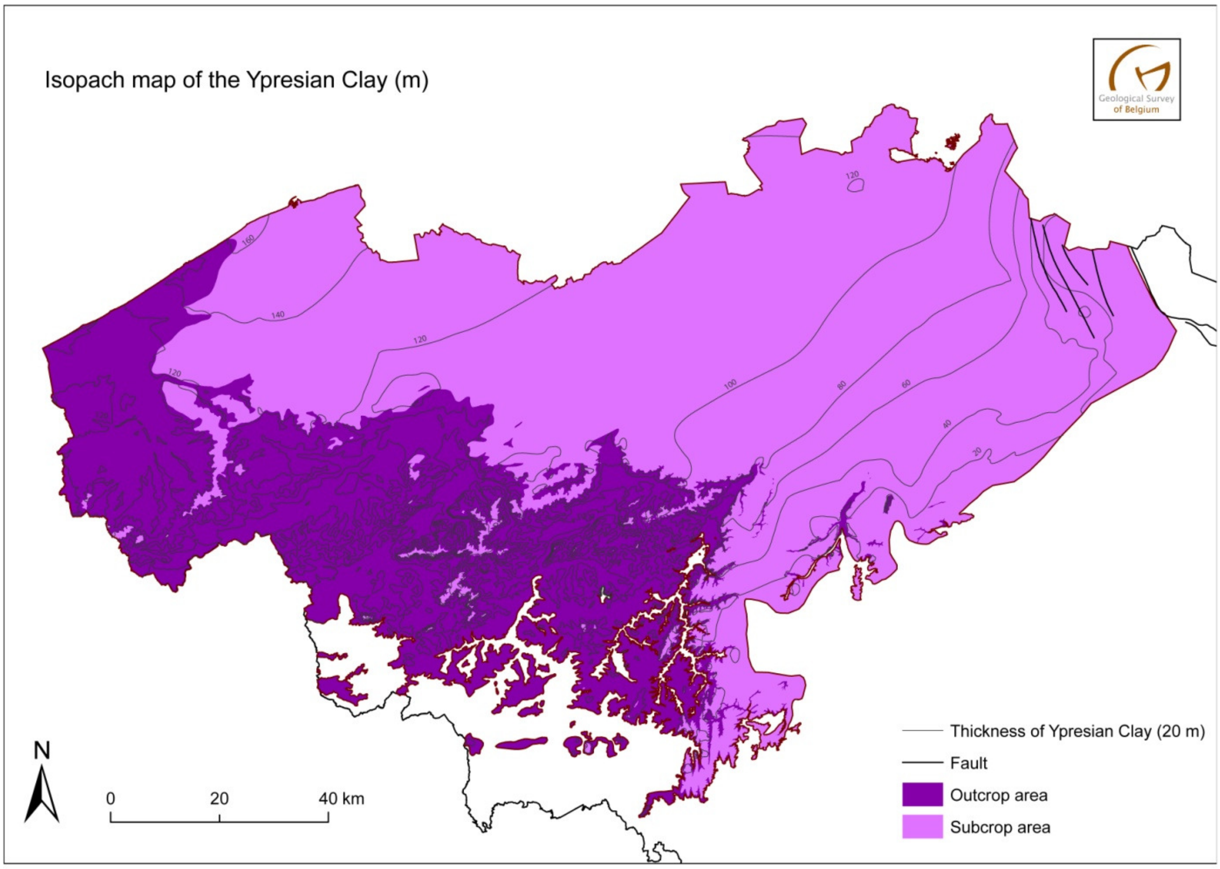


*Figure 23: Isopach map of the Ypresian Clay complex (20 m intervals).*

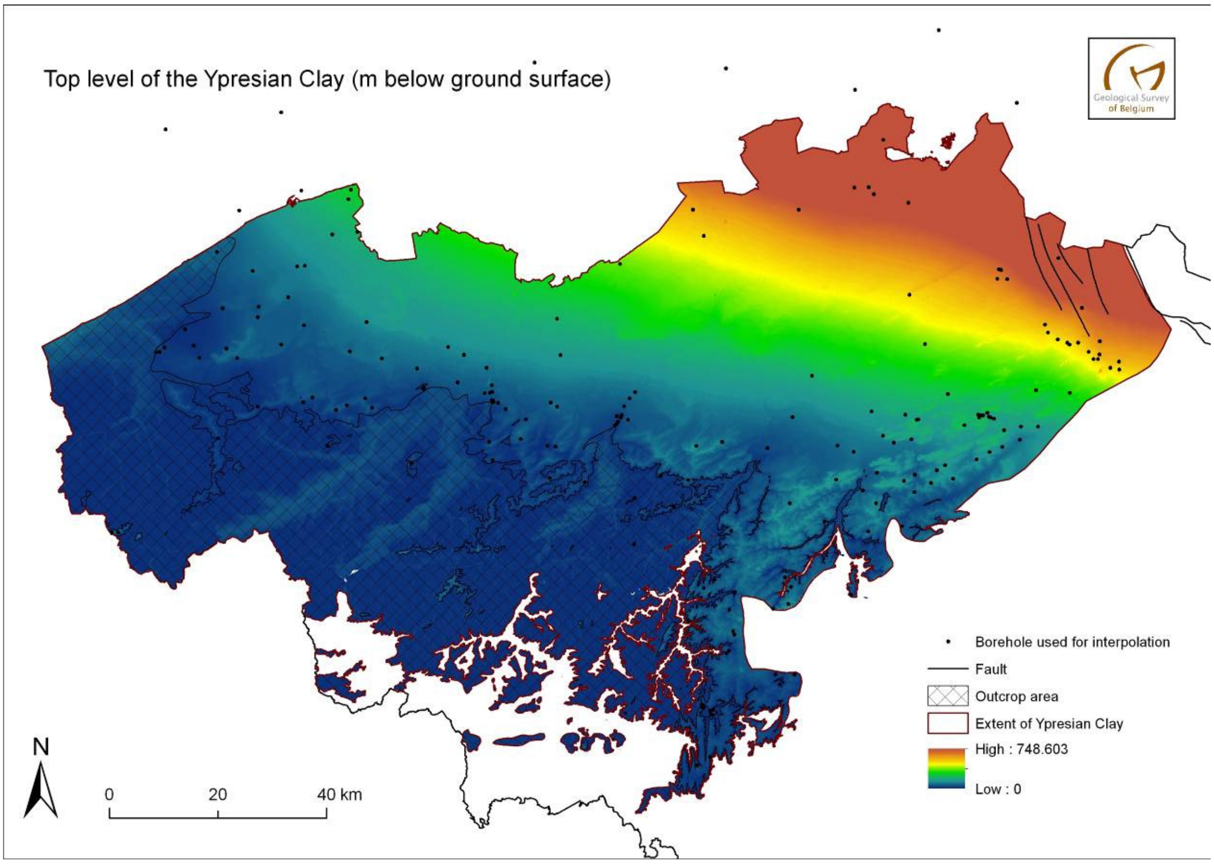


*Figure 24: Depth model of the top of the Ypresian Clay complex (in m below ground level).*

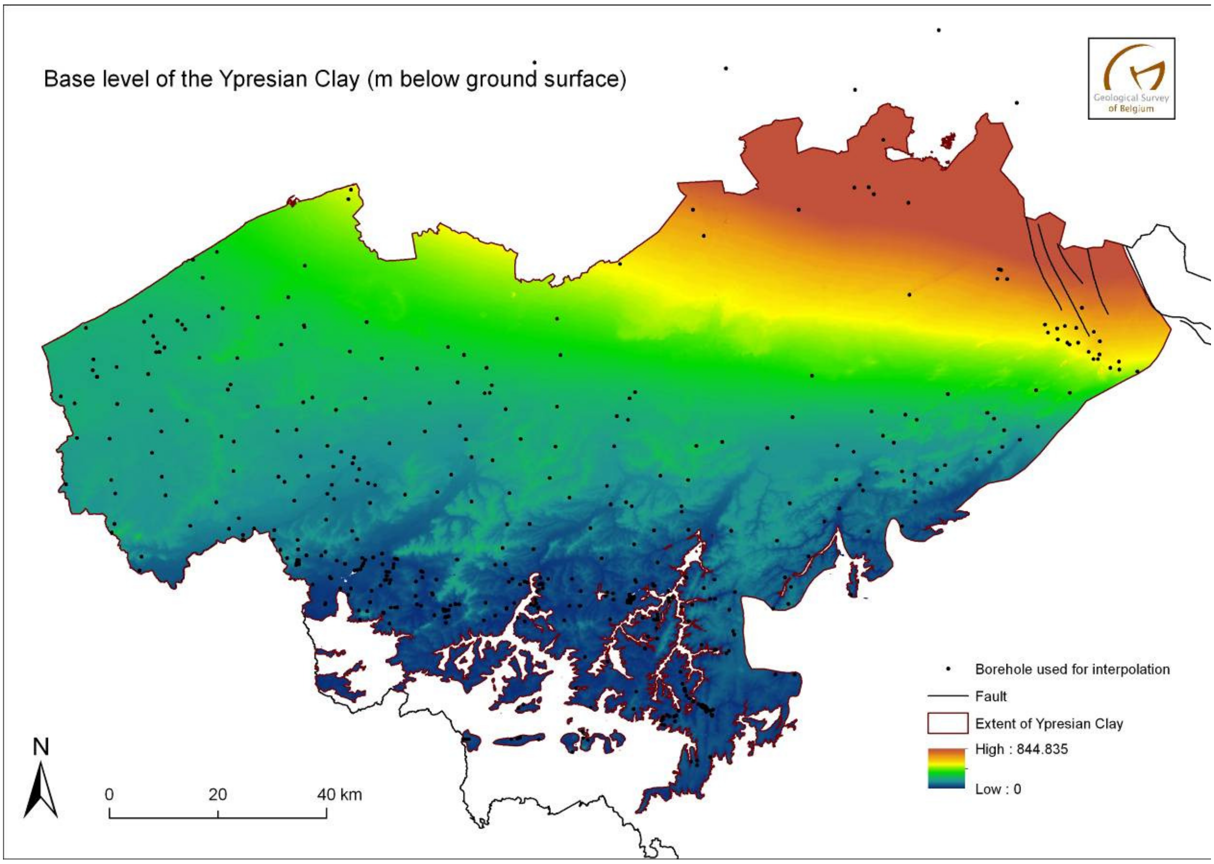


*Figure 25: Depth model of the base of the Ypresian Clay complex (in m below ground level).*

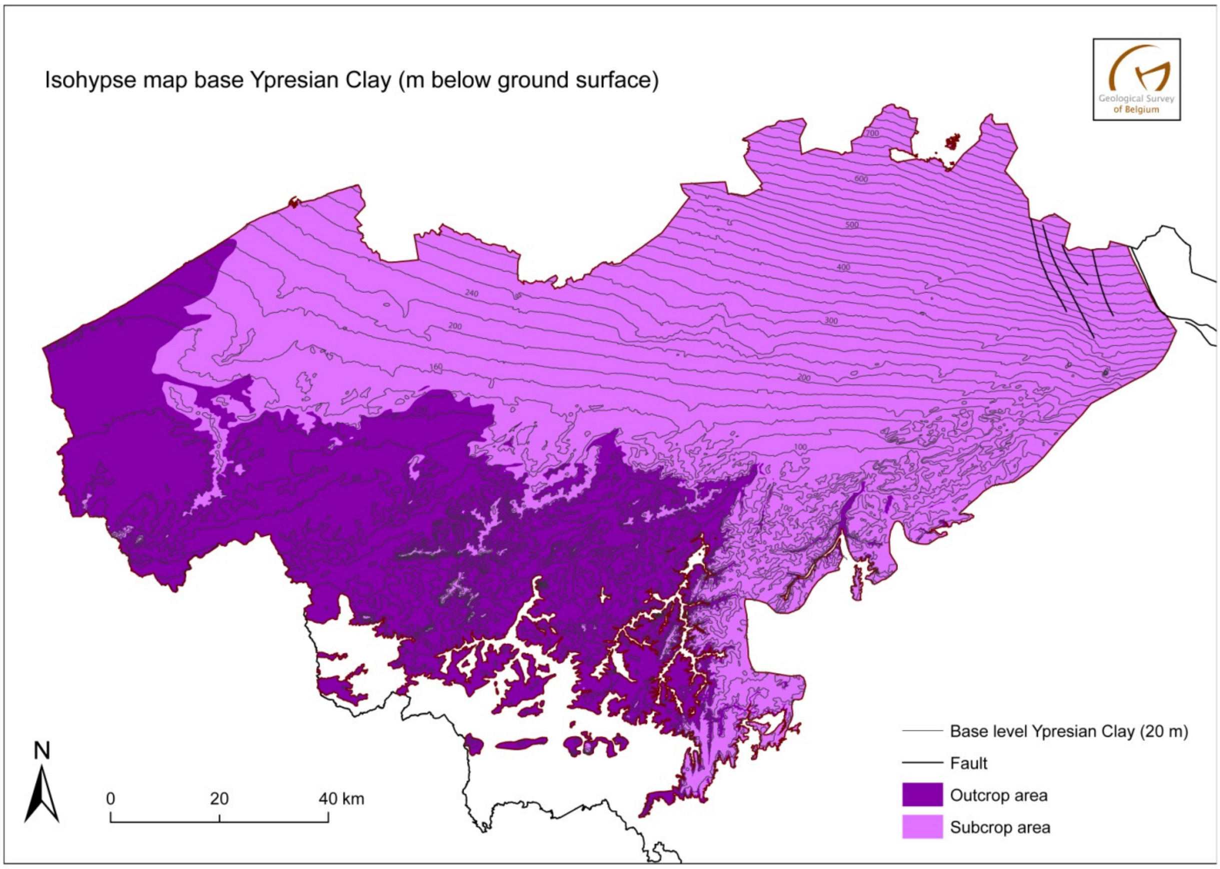

*Figure 26: Isohypse map of the top of the Ypresian Clay complex (in m below ground level).*

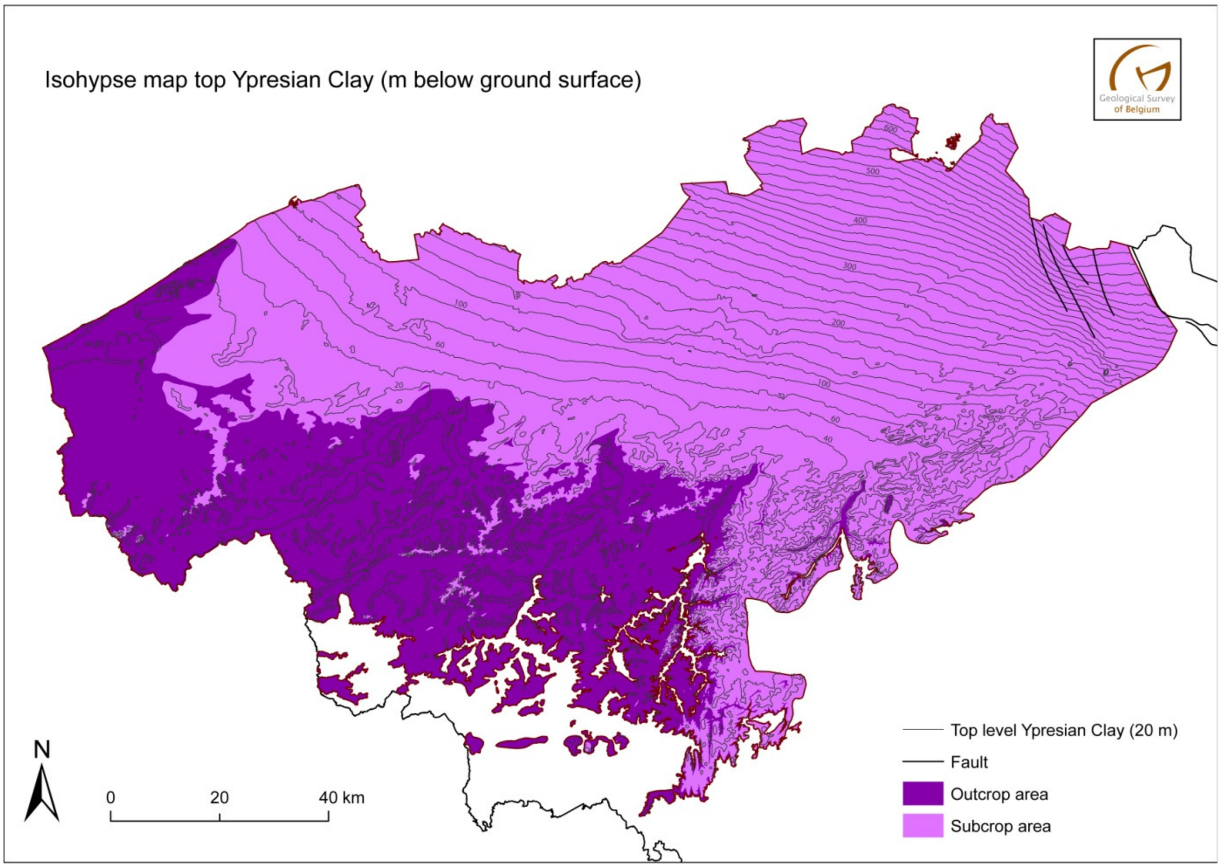

*Figure 27: Isohypse map of the base of the Ypresian Clay complex (in m below ground level).*

# Conclusions

The Lower Eocene Ypresian Clay is an informal but widely used sedimentary unit, composed of a series of stratigraphic sequences, united in an overall regressive trend. The Ypresian Clay may be monotonous but is not homogeneous and consisting of stiff clays, silty clay, clay-silt alternations, fine clayey sand, clean sand and some carbonate- bearing layers; granulometric differences remain rather limited, making it difficult to locate internal boundaries for further lithostratigraphic subdivision. There are few characteristic features which clearly allow to discriminate between the successive stiff clays or the more silty-sandy interlayerings: no marker beds, macrofossils, unique sedimentary structures. Granulometry was the basis for the lithostratigraphic subdivision, granulometric trends derived from geophysical well logs formed the basis for sequence stratigraphy, both constrained by micropaleontological zonation.

The Ypresian Clay constitutes the dominant subcrop rock of East- and West-Flanders, meaning that most stratigraphic units have been defined from quarry sites without much indications on their limits and that few boreholes traverse the entire sequence. This sequence extends south over Hainaut till Mons, east over Brabant till Brussels and Louvain, northeast over Antwerp till Mol and into Limburg till Beringen. In these directions the sedimentary environment becomes more proximal and the sediment more sandy; hiatuses become more frequent. This means that vertical and lateral facies variations are of the same nature, complicating basin-wide correlations between strata which have few characteristics that allow to discriminate between them. The stratigraphical framework is essentially based on two well-studied borehole sites (Knokke and Kallo); large areas were not unequivocally connected to the stratigraphic scheme, making basin-wide maps less reliable.

Altogether the Ypresian Clay is considered as a low permeable hydrostatigraphic unit but its boundaries (particularly its upper boundary) had not been clearly defined in terms of lithostratigraphy or sequence stratigraphy. The first purpose of this study was to define meaningful stratigraphic boundaries for the Ypresian Clay and to verify their consistency and correlation potential. They should be identifiable on geophysical well logs, which in practice constitute the main method for interpretation and correlation. The second objective was to produce depth and thickness maps of the Ypresian Clay, based on these boundaries, using ground level as a variable datum level.

Applying a lithostratigraphic framework on the Ypresian Clay is complicated by the fact that there are two systems in use: “NCS” – formally adopted by the (Belgian) National Commission on Stratigraphy – and “DOV” – in use on the new geological maps of the Flemish Region. As NCS (Laga et al., 2001) has priority and is more complete, it is best to stick to this system. Nevertheless, a double name (Orchies/St Maur and Roubaix/Moen) is used throughout this report, based on the practice in Belgium to make synonymous use of these names. The sequence stratigraphic scheme by Vandenberghe et al. (1998; 2004) is well constrained and useful for selection of reference levels but does not replace the lithostratigraphic scheme. It is mostly based on changes in tendency of granulometric arguments rather than on quantitative granulometric levels. Moreover, boundaries between successive lithostratigraphic units differ in function of the arguments used (lithological or paleontological) and are not formally linked to a geophysical signature from well logs.

## Reflections on further lithostratigraphic revision

The detailed lithostratigraphical subdivision of the Ieper Group does not respond to clear concepts and does not facilitate thematic mapping, e.g. for hydrological barriers. Hierarchy of group, formation, member, bed is not clear, even inconsistent; boundary definitions are lithologically obscure.

The Ypresian Clay ("Ieperklei") is here defined as consisting of the Kortrijk Formation and the Kortemark and Egemkapel Members of the Tielt Formation. The latter unit appears to be sufficiently widespread (west of a line from Turnhout to Brussels) and distinct to be a useful marker level for the top of the Ypresian Clay. This leads to a twofold subdivision of the Ieper Group at a higher level than the formations currently in use, but more meaningful than the considerations which have led to the current split between formations.

The Mons-en-Pévèle Sands are most likely lateral equivalents of the Roubaix/Moen Member of the Kortrijk Formation. Along the eastern margin of the Ypresian subcrop (Mol and Beringen areas) the Orchies/Saint-Maur Member becomes much more silty and is overlain by sand layers. As more hiatuses can be expected it is not always clear whether these sands are laterally equivalent strata of the Roubaix/Moen or Kortemark Members or continue into the younger Egem Member of the Tielt Formation (overlying the Ypresian Clay). Anyway along the eastern border the Ypresian Clay becomes more silty and less complete. These proximal facies of the Mons-en-Pévèle Sands have been included in the Ypresian Clay because of insufficient guidance on how to distinguish it from Roubaix/Moen, using well logs or whatever other data. This position is susceptible to be revised in case of more detailed (hydro)stratigraphical investigations.

The more sandy base of the Ypresian Clay coincides with the base of the Zoute or Mont-Héribu Members. The former is recognised over a very small area. Extending its geographical range might infringe on what is now identified as Mont-Héribu. The top of this unit should be limited to the range of silt-clay interlayerings, but instead paleontological arguments have led to situating the top of the Mont-Héribu Member well into what is typical Orchies/Saint-Maur facies. Consequent application of lithological criteria might reduce the thickness of the Mont-Héribu Member, which might in several cases be restricted to a bed at the base of the Orchies Member.

By following the sequence stratigraphic phase changes to delineate lithostratigraphic units these become bordered by transitional layers. An alternative would be to delineate the stiff clay units in the Kortrijk Formation (Orchies and Aalbeke Members) more strictly on lithological grounds (easily applicable on geophysical well logs) and not where a sequence stratigraphic or granulometric transition is observed.

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# Appendices

Appendix 1: Correlation between different historical lithostratigraphic subdivisions of the Ypresian stage.

Appendix 2: Correlation between litho- sequence- and biostratigraphic interpretations of the Knokke well (011E0138).

Appendix 3: Correlation between litho-, sequence- and biostratigraphic interpretations of the Kallo wells (027E0148 and 014E0355).

Appendix 4: Comparison between different geophysical well log interpretations of a well in Gent (055W1020).

Appendix 5: Correlation between geophysical well logs of Knokke-Heist (011E0151) and Brugge (023W0454). The Brugge well log was scaled differentially to match the sequence patterns in the other well log.

Appendix 6: W-E cross-section profile between the coast and the Campine area, showing geophysical well logs penetrating through the entire Ypresian sequence and new consistent interpretations.

Appendix 7: Revised interpretations of well logs included in the cross-section profile through the northern part of the basin.

Appendix 8: Boreholes used for modelling of the top and base of the Ypresian Clay.

Appendix 9: Isohypses and isopachs of the Ypresian Clay.

**Appendix 1:**

Correlation between different historical lithostratigraphic subdivisions of the Ypresian stage

| Marechal & Laga (1988: voorstel Paleogeen) | | | Laga et al. (2001: Paleogene & Neogene) | | | Tertiair kartering Vlaanderen (versie 2010) | | |
|---|---|---|---|---|---|---|---|---|
| Zenne Groep | Formatie van Lede | | Zenne Group | Lede Formation | | Zenne Groep (ZE) | Formatie van Lede (Ld) | |
| | | | | | | | | |
| | Formatie van Brussel | Lid van Archennes | | Brussel Formation | Archennes Member | | Formatie van Brussel (Br) | Lid van Chaumont-Gistoux (BrCg), Lid van Neerijse (BrNe), Lid van Diegem (BrDi) & Lid van Kraaiberg (BrKr) |
| | | Lid van Bois de la Houssière | | | Bois de la Houssière Member | | | |
| | | Lid van Chaumont-Gistoux | | | Chaumont-Gistoux Member | | | |
| | | Lid van Diegem | | | Diegem Member | | | |
| | | Lid van Neerijse | | | Neerijse Member | | | |
| | Formatie van Knesselare | Lid van Aalter | | Aalter Formation | Oedelem Member | | Formatie van Aalter (Aa) | Lid van Oedelem (AaOe) |
| | | Lid van Oedelem | | | | | | |
| | | Lid van Beernem | | | Beernem Member | | | Lid van Beernem (AaBe) |
| Ieper Groep | Formatie van Gent | Lid van Vlierzele | Ieper Group | Gentbrugge Formation | Vlierzele Member | Ieper Groep (IE) | Formatie van Gentbrugge (Ge) | Lid van Vlierzele (GeVl) |
| | | Lid van Pittem | | | Pittem Member | | | Lid van Pittem (GePi) |
| | | Lid van Merelbeke | | | Merelbeke Member | | | Lid van Merelbeke (GeMe) |
| | Formatie van Tielt | Lid van Egem | | Tielt Formation | Egem Member | | Formatie van Tielt (Tt) | Lid van Egem (TtEg) |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | Egemkapel Member | | | |
| | | Lid van Kortemark | | | | | | Lid van Kortemark (TtKo) |
| | | | | | Kortemark Member | | | |
| | Formatie van Kortrijk | Lid van Aalbeke | | Kortrijk Formation | Aalbeke Member | | Formatie van Kortrijk (Ko) | Lid van Aalbeke (KoAa) |
| | | Lid van Moen | | | Roubaix Member | | | Lid van Moen (KoMo) & Lid van Mons-en-Pévèle (KoMp) |
| | | | | | | | | |
| | | Lid van Saint-Maur | | | Orchies Member | | | Lid van Saint-Maur (KoSm) |
| | | Lid van Mont-Héribu | | | Mont-Héribu Member | | | Lid van Mont-Héribu (KoMh) |
| | | | | | Het Zoute Member | | | |
| | | | | | | | | |

| Dumont 1849 | | | NW > SE* | | De Moor & Geets 1973 | Steurbaut & Nolf 1986 | |
|---|---|---|---|---|---|---|---|
| Brusselien *s.l.* | Lediaan (Le) | | | | | | |
| | Laekeniaan (Lk) | | | | | | |
| | Brusselien *s.s.* , Brusseliaan (B) | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| Yprésien *s.l.* | Boven-Paniseliaan (P2) | | | | Zand van Aalter | | |
| | | | | | | | |
| | | | | | | | |
| | Onder-Paniseliaan (P1) | P1d | P1d | | Zand van Vlierzele** | Vlierzele Formation | Vlierzele Sand |
| | | P1c | P1c | | Klei van Anderlecht | | Pittem Clay |
| | | P1m | P1m | | Klei van Merelbeke | Ieper Formation | Merelbeke Clay |
| | Yprésien *s.s.* , Ieperiaan (Y) | Yd | Yd | P1d | Zand van Ledeberg & Zand-kleicomplex van Kwatrecht | | Egem Sand & Panisel Sand |
| | | | | | | | |
| | | | Yc | | | | |
| | | | | P1c | | | Kortemark Silt |
| | | | | | Klei van Ieper | | |
| | | | | | | | |
| | | Yc | | P1m | | | Aalbeke Clay |
| | | | | Yd | | | Roubaix Clay & Mons-en-Pévèle |
| | | | | | | | |
| | | | | Yc | | | Orchies Clay |
| | | Yb + Ya | | | | | |
| | | | | | | | |
| | | | | | | | |

| Steurbaut 1998 | | NW > SE | | Jacobs et al. | Knokke Well (Laga et al. 1990) |
|---|---|---|---|---|---|
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| | | | | | |
| | | | | | |
| | | | | | |
| Ieper Group | (Not defined) | (Vlierzele Sand) | | | Lower Mont-Panisel Formation |
| | | (Pittem Clay) | | | |
| | | (Merelbeke Clay) | | | |
| | Hyon Formation | | Mont-Panisel Sand & Bois-la-Haut Sand | Mp3 | Egem Formation |
| | | | | | |
| | Tielt Formation | Egem Sand | | | |
| | | Egemkapel Clay | | Mp2 | |
| | | | | | |
| | | Kortemark Silt | | Mp1 | |
| | Kortrijk Formation | Aalbeke Clay | | | Ieper Formation |
| | | Roubaix Clay | Mons-en-Pélève Formation | | |
| | | | Morlanwelz Formation | | |
| | | Orchies Clay | Unnamed clay & sand units | | |
| | | Mont-Héribu Clay | | | |
| | | Zoute Silt | | | |
| | | | | | |

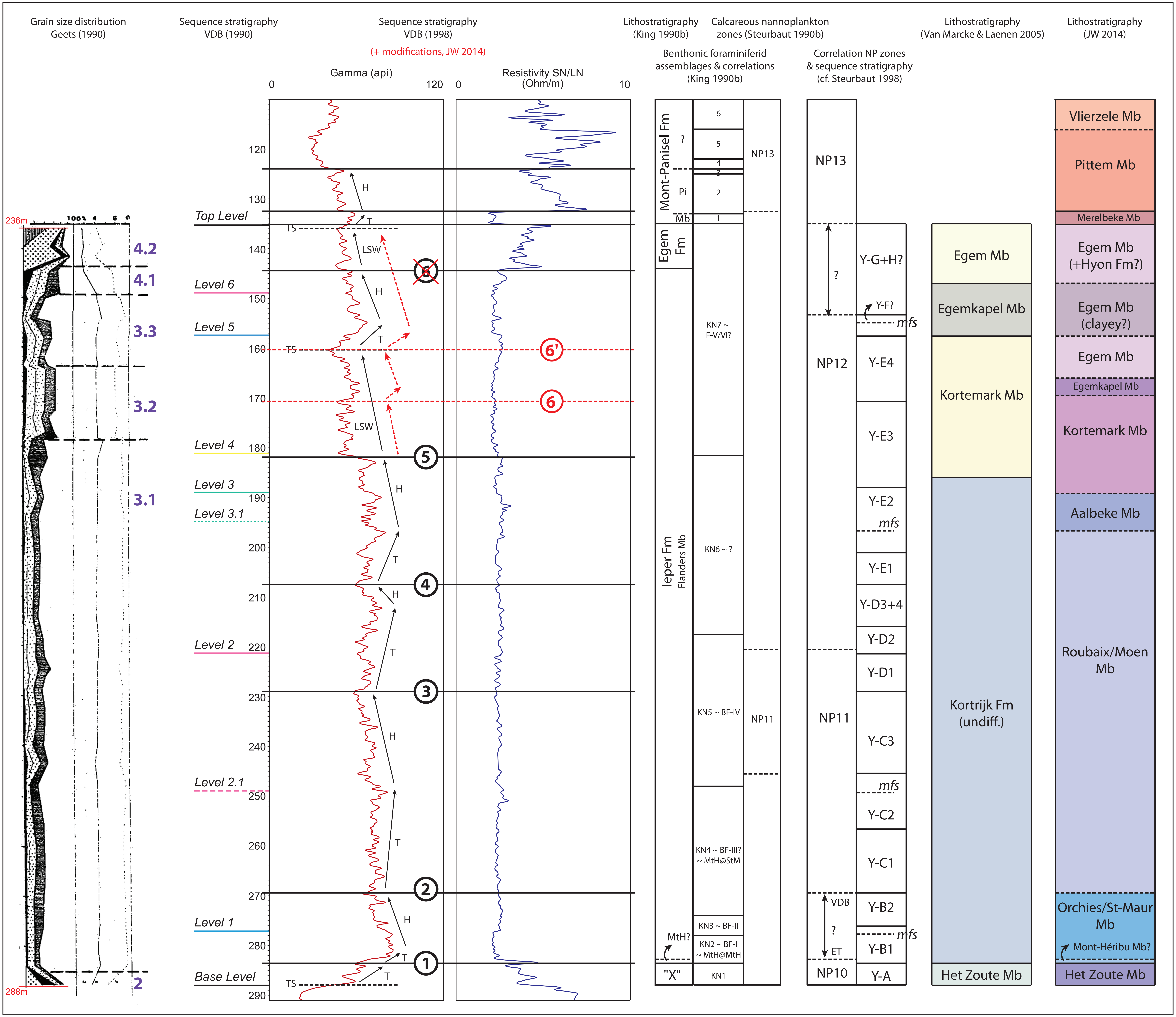
| IGCP - BE (Kockel 1980) | | IGCP - NL (Kockel 1980) | | NL (well logs TNO)* | De Batist & Henriet 1995 (offshore) | Diverse informele benamingen | | Chronostratigrafie |
|---|---|---|---|---|---|---|---|---|
| Lede Formation | | Dongen Formation | Brussel Sand Member | Brussel Sand Member | | | | Midden-Eoceen |
| | | | | | | | | |
| Brussel Formation | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| ?? | | | | | L1 | | | |
| | | | | | | | | |
| | | | | | | | | |
| Mont-Panisel Formation | Vlierzele Member | | Ieper Clay Member | | Y4 + Y5 | Zand van Vlierzele | | Vroeg-Eoceen |
| | Pittem Member | | | | Y2 | Klei van Pittem | | |
| | Merelbeke Member | | | Ieper Clay Member | | Klei van Merelbeke | | |
| Ieper Formation | Egem Member | | | | Y2 | Zand van Ledeberg, Zand van Egem | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | ?? | | | |
| | | | | | | | | |
| | | | | | | Argile d'Ypres, Ieperse Klei, Argile de Flanders, Klei van Vlaanderen | | |
| | Flanders Member | | | | | | | |
| | | | | | Y1 | | Klei van Roubaix & Zanden van Mons-en-Pévèle, Zanden van Vorst | |
| | | | | | | | | |
| | | | | | | | Klei van Orchies | |
| | Mont-Héribu Member | | Basal Dongen Sand Member | | | Zand van Mont-Héribu | | |
| | | | | ?? | | | | |
| | | | | Basal Dongen Sand Member | | | | |

* correlatie in praktijk tussen nieuwe lithostratigrafie en eenheden oude geologische kaart (volgens Steurbaut & Nolf 1986, Bart De Corte 1994)

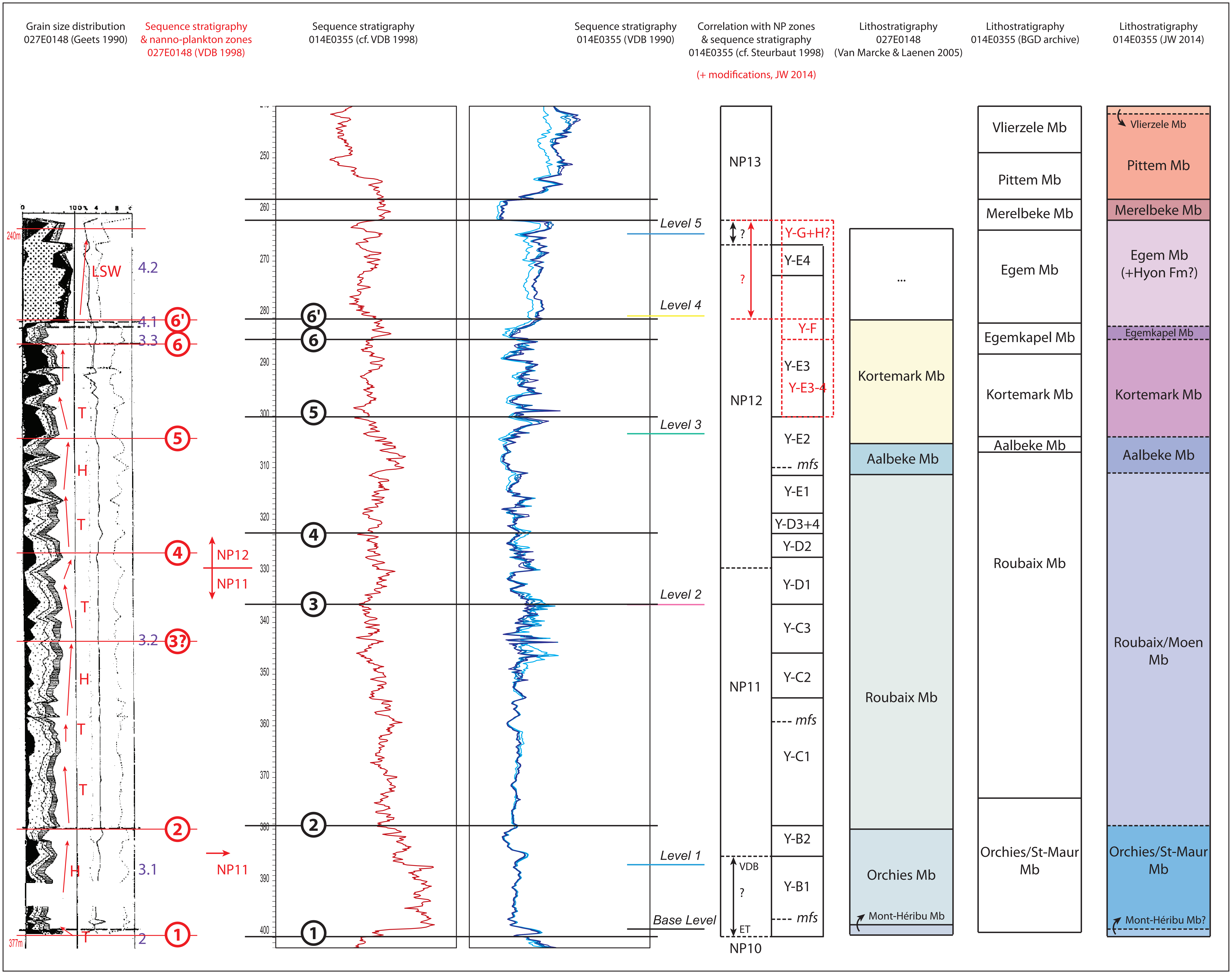
** inclusief Zone van Aalterbrugge

* correlatie in praktijk

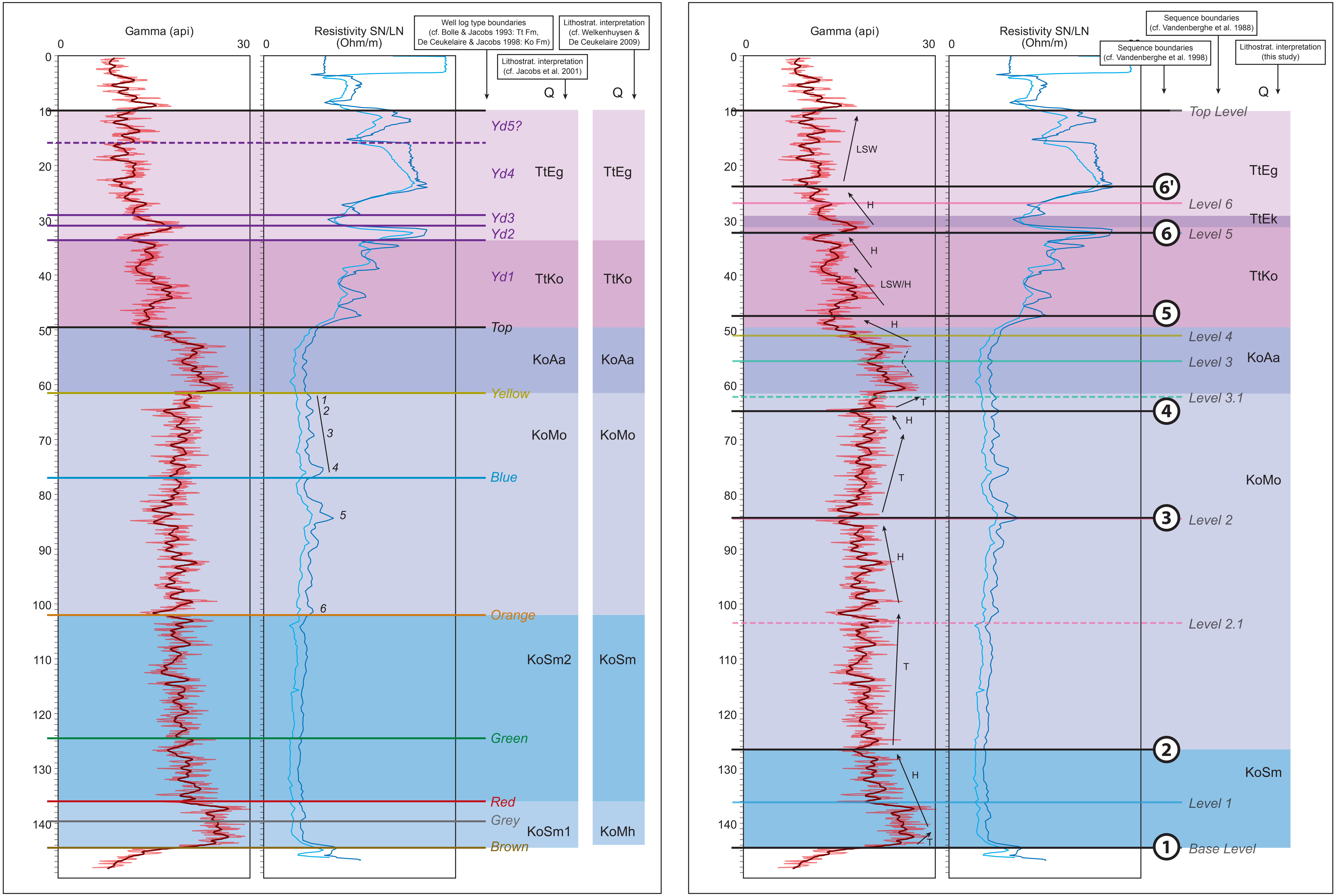
Appendix 2: Correlation between litho- sequence- and biostratigraphic interpretations of the Knokke well (011E0138).



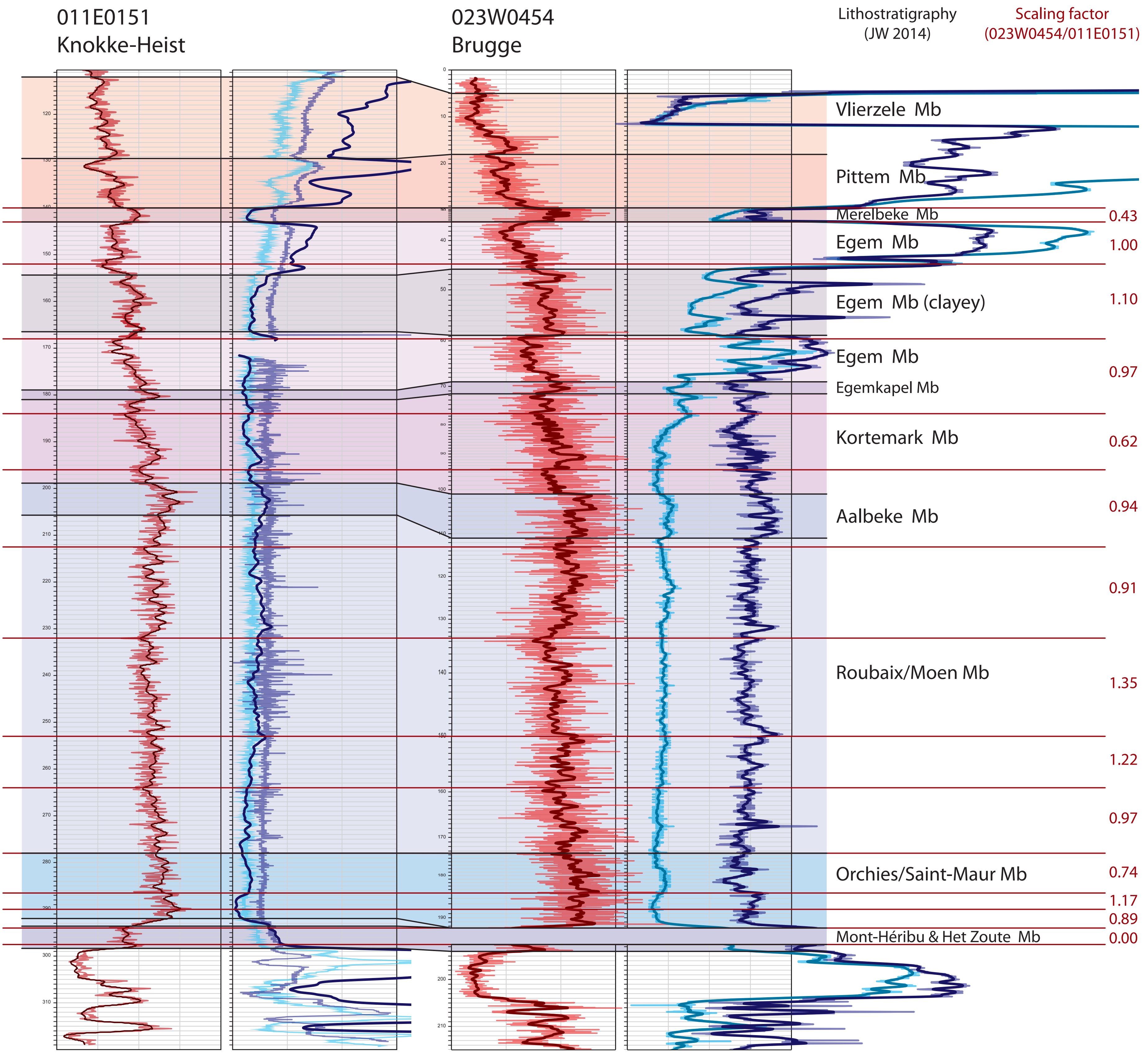
Appendix 3: Correlation between litho-, sequence- and biostratigraphic interpretations of the Kallo wells (027E0148 and 014E0355).



Appendix 4: Comparison between different geophysical well log interpretations of a well in Gent (055W1020).



Appendix 5: Correlation between geophysical well logs of Knokke-Heist (011E0151) and Brugge (023W0454). The Brugge well log was scaled differentially to match the sequence patterns in the other well log.



Appendix 6: W-E cross-section profile between the coast and the Campine area, showing geophysical well logs penetrating through the entire Ypresian sequence and new consistent interpretations.

**Appendix 7:**

Revised interpretations of well logs included in the cross-section profile through the northern part of the basin

| ** | ** | ** | ** | ** | ** |
|---|---|---|---|---|---|
| **B48C0196** | **Groede (NL)** | | | | |
| X | 89790.31 | | | | |
| Y | 232028.98 | | | | |
| Z | 0.12 | | | | |
| JW 2014 | | | TNO/DINO | | |
| GeVl | 152.6 | 167.5 | | | |
| GePi | 167.5 | 188 | DOBR | 114 | 188 |
| GeMe | 188 | 192.6 | | | |
| TtEg | 192.6 | 195 | DOIE | 188 | 195 |
| **011E0151** | **Knokke-Heist** | | | | |
| X | 79248.00 | | | | |
| Y | 228159.00 | | | | |
| Z | 5.24 | | | | |
| JW 2014 | | | KW&MDC 2009 | | |
| GeVl | 112 | 129.3 | GeVl | 112 | 130 |
| GePi | 129.3 | 140 | GePi | 130 | 140 |
| GeMe | 140 | 143.2 | GeMe | 140 | 144 |
| TtEg | 143.2 | 154.2 | TtEg | 144 | 154 |
| TtEg-k | 154.2 | 166.5 | | | |
| TtEg | 166.5 | 178.5 | TtKo | 154 | 171 |
| TtEk | 178.5 | 180.7 | KoAa | 171 | 182 |
| TtKo | 180.7 | 198.7 | | | |
| KoAa | 198.7 | 205.7 | | | |
| KoRo/Mo | 205.7 | 277.9 | KoMo | 182 | 244 |
| KoOr/Sm | 277.9 | 291.8 | KoSm | 244 | 280 |
| KoMh | 291.8 | 293.1 | | | |
| KoZo | 293.1 | 298 | KoMh | 280 | 298 |
| **011E0138** | **Knokke** | | | | |
| X | 78776.00 | | | | |
| Y | 226370.00 | | | | |
| Z | 4.90 | | | | |
| JW 2014 | | | King 1990 | | |
| GeVl | 100.6 | 116 | Mt-Panisel Fm | 104.5 | 133 |
| GePi | 116 | 132.6 | (undiff.) | | |
| GeMe | 132.6 | 135 | Merelbeke Mb | 133 | 135 |
| TtEg | 135 | 147 | Egem Mb | 135 | 144 |
| TtEg-k | 147 | 157 | Flanders Mb | 144 | 282.6 |
| TtEg | 157 | 166 | | | |
| TtEk | 166 | 169.3 | | | |
| TtKo | 169.3 | 189 | | | |
| KoAa | 189 | 196 | | | |
| KoRo/Mo | 196 | 269.5 | | | |
| KoOr/Sm | 269.5 | 282.6 | | | |

| | | | | | |
|---|---|---|---|---|---|
| KoMh | 282.6 | 283.4 | Mt-Heribu Mb | 282.6 | 283.4 |
| KoZo | 283.4 | 288 | "Unit X" | 283.4 | 288 |

| **022W0276** | **De Haan** | | | | |
|---|---|---|---|---|---|
| X | 54582.00 | | | | |
| Y | 216649.00 | | | | |
| Z | 5.02 | | | | |
| JW 2014 | | | Laga et al. 1990 | | |
| TtEg | 41 | 53 | Ieper Fm | 41 | 193 |
| TtEg-k | 53 | 59 | (Yc + Yd) | | |
| TtEg | 59 | 69 | | | |
| TtEk | 69 | 72 | | | |
| TtKo | 72 | 95 | | | |
| KoAa | 95 | 102 | | | |
| KoRo/Mo | 102 | 172 | | | |
| KoOr/Sm | 172 | 187.4 | | | |
| KoMh | 187.4 | 188.4 | | | |
| KoZo | 188.4 | 191 | | | |

| **022W0351** | **Oostende** | | | | |
|---|---|---|---|---|---|
| X | 50100.00 | | | | |
| Y | 215210.00 | | | | |
| Z | 7.50 | | | | |
| JW 2014 | | | BGD: MDC et al. 2008 | | |
| TtEg-k | 41 | 46 | TtKo | 41 | 56 |
| TtEg | 46 | 52 | | | |
| TtEk | 52 | 54.7 | | | |
| TtKo | 54.7 | 72.7 | KoAa | 56 | 66 |
| KoAa | 72.7 | 83 | | | |
| KoRo/Mo | 83 | 154 | KoMo | 66 | 113 |
| KoOr/Sm | 154 | 174.4 | KoSm | 113 | 159 |
| KoMh | 174.4 | 177.4 | KoMh | 159 | 174 |

| **023W0454** | **Brugge** | | | | |
|---|---|---|---|---|---|
| X | 67699.00 | | | | |
| Y | 208344.00 | | | | |
| Z | 11.00 | | | | |
| JW 2014 | | | KW&MDC 2009 | | |
| GeVl | 5 | 18 | GeVl | 5 | 18 |
| GePi | 18 | 29.6 | GePi | 18 | 29 |
| GeMe | 29.6 | 35.7 | GeMe | 29 | 36 |
| TtEg | 35.7 | 46 | TtEg | 36 | 49 |
| TtEg-k | 46 | 58.5 | | | |
| TtEg | 58.5 | 69 | TtKo | 49 | 67 |
| TtEk | 69 | 71.8 | KoAa | 67 | 76 |
| TtKo | 71.8 | 101 | | | |
| KoAa | 101 | 110.9 | | | |
| KoRo/Mo | 110.9 | 173.7 | KoMo | 76 | 131 |
| KoOr/Sm | 173.7 | 192.6 | KoSm | 131 | 178 |
| KoMh | 192.6 | 194 | KoMh | 178 | 192 |

| **039W0293** | **Knesselare** | | | | |
|---|---|---|---|---|---|

| | | | | | |
|---|---|---|---|---|---|
| X | 82118.00 | | | | |
| Y | 203791.00 | | | | |
| Z | 11.97 | | | | |
| JW 2014 | | | KW&MDC 2009 | | |
| | | | | | |
| GeVl | 21 | 35 | GeVl | 21 | 35 |
| GePi | 35 | 46 | GePi | 35 | 46 |
| GeMe | 46 | 49.2 | GeMe | 46 | 50 |
| TtEg | 49.2 | 70 | TtEg | 50 | 70 |
| TtEk | 70 | 75 | | | |
| TtKo | 75 | 98 | TtKo | 70 | 86 |
| KoAa | 98 | 106.8 | KoAa | 86 | 97 |
| KoRo/Mo | 106.8 | 173.2 | KoMo | 97 | 145 |
| KoOr/Sm | 173.2 | 192 | KoSm | 145 | 180 |
| KoMh | 192 | 193 | KoMh | 180 | 193 |

| **039E0144** | **Lovendegem** | | | | |
|---|---|---|---|---|---|
| X | 97149.00 | | | | |
| Y | 199107.00 | | | | |
| Z | 8.03 | | | | |
| JW 2014 | | | KW&MDC 2009 | | |
| | | | | | |
| GeVl | 21 | 32 | GeVl | 21 | 32 |
| GePi | 32 | 46.2 | GePi | 32 | 46 |
| GeMe | 46.2 | 47.7 | GeMe | 46 | 48 |
| TtEg | 47.7 | 67 | TtEg | 48 | 73 |
| TtEk | 67 | 70.5 | | | |
| TtKo | 70.5 | 93.4 | TtKo | 73 | 90 |
| KoAa | 93.4 | 101 | KoAa | 90 | 105 |
| KoRo/Mo | 101 | 162.9 | KoMo | 105 | 138 |
| KoOr/Sm | 162.9 | 183.7 | KoSm | 138 | 173 |
| | | | KoMh | 173 | 183 |

| **068E0169** | **Tielt** | | | | |
|---|---|---|---|---|---|
| X | 76439.00 | | | | |
| Y | 187576.00 | | | | |
| Z | 49.00 | | | | |
| JW 2014 | | | KB21/DOV | | |
| | | | | | |
| GePi | 2.8 | 11.8 | Paniseliaan | 0 | 11.8 |
| TtEg | 11.8 | 27.6 | TtEg (Yd2-Yd6) | 11.8 | 32 |
| TtEk | 27.6 | 30 | | | |
| TtKo | 30 | 51 | TtKo (Yd1) | 32 | 49.5 |
| KoAa | 51 | 56 | KoAa | 49.5 | 56 |

| **055W1020** | **Gent** | | | | |
|---|---|---|---|---|---|
| X | 103904.00 | | | | |
| Y | 190630.00 | | | | |
| Z | 10.59 | | | | |
| JW 2014 | | | KB22/DOV | | |
| | | | | | |
| TtEg | 10 | 29.4 | TtEg (Yd2-Yd6) | 10 | 34 |
| TtEk | 29.4 | 31.5 | | | |
| TtKo | 31.5 | 52.2 | TtKo (Yd1) | 34 | 49.5 |
| KoAa | 52.2 | 61.5 | KoAa | 49.5 | 61.5 |

| | | | | | |
|---|---|---|---|---|---|
| KoRo/Mo | 61.5 | 126.8 | KoMo | 61.5 | 102 |
| KoOr/Sm | 126.8 | 144.2 | KoSm | 102 | 136 |
| | | | KoMh | 136 | 145 |

| **056W0202** | **Lokeren** | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| X | 117867.00 | | | | | | | |
| Y | 197644.00 | | | | | | | |
| Z | 6.06 | | | | | | | |
| JW 2014 | | | KW&MDC 2009 | | | BGD: KW 2007 | | |
| | | | | | | | | |
| GeVl | 32 | 47.2 | GeVl | 37 | 48 | GeVl | 32 | 48 |
| GePi | 47.2 | 66.8 | GePi | 48 | 64 | GePi | 48 | 69 |
| | | | GeMe | 64 | 67 | GeMe | 69 | 70 |
| TtEg | 66.8 | 83.7 | TtEg | 67 | 88 | TtEg | 70 | 79 |
| TtEk | 83.7 | 86.4 | | | | | | |
| TtKo | 86.4 | 103.3 | TtKo | 88 | 101 | TtKo | 79 | 101 |
| KoAa | 103.3 | 109.6 | KoAa | 101 | 110 | KoAa | 101 | 110 |
| KoRo/Mo | 109.6 | 173.8 | KoMo | 110 | 148 | KoMo | 110 | 147 |
| KoOr/Sm | 173.8 | 191.1 | KoSm | 148 | 183 | KoSm | 147 | 182 |
| | | | KoMh | 183 | 192 | KoMh | 182 | 192 |

| **026E0111** | **Stekene** | | | | |
|---|---|---|---|---|---|
| X | 128880.00 | | | | |
| Y | 214425.00 | | | | |
| Z | 3.00 | | | | |
| JW 2014 | | | BGD: EG et al. 1999 | | |
| | | | | | |
| GeVl | 132.5 | 154.2 | GeVl | ? | 166 |
| GePi | 154.2 | 171.3 | | | |
| GeMe | 171.3 | 174.8 | GePi & GeMe | 166 | 174 |
| TtEg | 174.8 | 200.1 | Tt | 174 | 193 |
| TtEk | 200.1 | 203.6 | Ko | 193 | 314 |
| TtKo | 203.6 | 219.6 | | | |
| KoAa | 219.6 | 227.7 | | | |
| KoRo/Mo | 227.7 | 301.4 | | | |
| KoOr/Sm | 301.4 | 318.9 | | | |

| **014E0355** | **Kallo (ON-KALLO-1)** | | | | |
|---|---|---|---|---|---|
| X | 144287.00 | | | | |
| Y | 219656.00 | | | | |
| Z | 8.54 | | | | |
| JW 2014 | | | NIRAS: ? | | |
| | | | | | |
| GeVl | 213 | 241.6 | GeVl | ? | 249 |
| GePi | 241.6 | 258 | GePi | 249 | 258 |
| GeMe | 258 | 262.4 | GeMe | 258 | 264 |
| TtEg | 262.4 | 282.6 | TtEg | 264 | 282 |
| TtEk | 282.6 | 284.9 | TtEk | 282 | 288 |
| TtKo | 284.9 | 304 | TtKo | 288 | 304 |
| KoAa | 304 | 310.7 | KoAa | 304 | 307 |
| KoRo/Mo | 310.7 | 379.2 | KoMo | 307 | 374 |
| KoOr/Sm | 379.2 | 399.3 | KoOr /KoSm | 374 | 400 |
| KoMh | 399.3 | 401 | | | |

| **014E0240** | **Doel (Doel-1b)** | | | | |
|---|---|---|---|---|---|

| | | | | | |
|---|---|---|---|---|---|
| X | 142240.00 | | | | |
| Y | 224444.00 | | | | |
| Z | 8.03 | | | | |
| JW 2014 | | | NIRAS: Helsen & Lie 1998 | | |
| GeVl | 243 | 279.8 | GeVl | 263.5 | 278.5 |
| GePi | 279.8 | 297.2 | GePi | 278.5 | 297 |
| GeMe | 297.2 | 302 | GeMe | 297 | 301.5 |
| TtEg | 302 | 313 | TtEg | 301.5 | 310.5 |
| TtEg-k | 313 | 316 | TtEk | 310.5 | 316 |
| TtEg | 316 | 324.4 | | | |
| TtEk | 324.4 | 330.5 | | | |
| TtKo | 330.5 | 347.3 | TtKo | 316 | 347 |
| KoAa | 347.3 | 356.3 | KoAa | 347 | 353 |
| KoRo/Mo | 356.3 | 416.9 | KoMo | 353 | 390 |
| KoOr/Sm | 416.9 | 440 | KoSm | 390 | 440 |
| KoMh | 440 | 441 | KoMh | 440 | 441 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **015E0267A** | **Brasschaat** | | | | | | | |
| X | 161725.00 | | | | | | | |
| Y | 224500.00 | | | | | | | |
| Z | 25.56 | | | | | | | |
| JW 2014 | | | BGD: Laga 1983 | | | DOV: MVG - Water | | |
| GeVl | 321.7 | 357.9 | Ld & Br | 310 | 363 | Ld & Br | 310 | 363 |
| GePi | 357.9 | 370 | Yd | 363 | 400 | TtEg | 363 | 374 |
| GeMe | 370 | 375.6 | | | | | | |
| TtEg | 375.6 | 384 | | | | TtKo | 374 | 400 |
| TtEg-k | 384 | 387.6 | | | | | | |
| TtEg | 387.6 | 400 | | | | | | |
| TtEk | 400 | 406.6 | Yc | 400 | 511 | Ko | 400 | 511 |
| TtKo | 406.6 | 418.6 | | | | | | |
| KoAa | 418.6 | 424.3 | | | | | | |
| KoRo/Mo | 424.3 | 485.7 | | | | | | |
| KoOr/Sm | 485.7 | 511.4 | | | | | | |
| KoMh | 511.4 | 514 | | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| **007E0200** | **Rijkevorsel** | | | | |
| X | 174629.00 | | | | |
| Y | 228594.00 | | | | |
| Z | 26.00 | | | | |
| JW 2014 | | | DOV: Buffel 1998 | | |
| GeVl | 400.6 | 430 | Br | ? | 425 |
| GePi | 430 | 441 | Ieper Groep | 425 | 590 |
| GeMe | 441 | 446 | | | |
| TtEg | 446 | 454 | | | |
| TtEg-k | 454 | 458 | | | |
| TtEg | 458 | 469.8 | | | |
| TtEk | 469.8 | 474.7 | | | |
| TtKo | 474.7 | 482.8 | | | |
| KoAa | 482.8 | 489.2 | | | |
| KoRo/Mo | 489.2 | 559.3 | | | |
| KoOr/Sm | 559.3 | 581.4 | | | |

| | | |
|---|---|---|
| KoMh | 581.4 | 584 |

| **Rijsbergen-01** | **(NL)** | | | | |
|---|---|---|---|---|---|
| X | 172161.09 | | | | |
| Y | 246564.43 | | | | |
| Z | 16.43 | | | | |
| JW 2014 | | | TNO/NLOG | | |
| | | | | | |
| GeVl | ? | 634 | | | |
| GePi | 634 | 654.6 | DOBR | 526 | 654 |
| GeMe | 654.6 | 661.3 | | | |
| TtEg | 661.3 | 671 | | | |
| TtEg-k | 671 | 674.6 | | | |
| TtEg | 674.6 | 688.2 | | | |
| TtEk | 688.2 | 692.2 | | | |
| TtKo | 692.2 | 702.7 | | | |
| KoAa | 702.7 | 710 | | | |
| KoRo/Mo | 710 | 790 | | | |
| KoOr/Sm | 790 | 808.6 | | | |
| KoMh | 808.6 | 810.9 | DOIE | 654 | 810 |

| **031W0237** | **Mol SCK-15** | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| X | 198400.00 | | | | | | | |
| Y | 211725.00 | | | | | | | |
| Z | 24.50 | | | | | | | |
| JW 2014 | | | BGD: Gulinck & Laga 1975 | | | NIRAS: VM&L 2005 | | |
| | | | | | | | | |
| TtKo | 345.6 | 359.8 | Ieper Fm | 346 | 442.75 | TtEg & TtKo | ? | 359 |
| KoAa | 359.8 | 368.1 | | | | KoAa | 359 | 368 |
| KoRo/Mo | 368.1 | 422 | | | | KoRo | 368 | 408 |
| KoOr/Sm | 422 | 443 | | | | KoOr | 408 | 443 |
| ** | ** | ** | ** | ** | ** | ** | ** | ** |

** In green: agreement between old and new interpretation (more or less)

**Appendix 8:**

Boreholes used for modelling of the top and base of the Ypresian Clay
(type: wl = well log, nl = well log NL, cb = cored borehole)

| BGDNR | PROEFNUMMER | Type | Top | Base | X | Y | Z | Y_top | Y_bas | Y_topTAW | Y_basTAW |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 007E0200 | kb8d7e-B42 | wl | x | x | 174629.0 | 228594.0 | 26.0 | 469.5 | 584.0 | -444.0 | -559.0 |
| 007E0205 | kb8d7e-B224 | wl | x | x | 177378.0 | 237304.0 | 13.2 | 578.0 | 692.0 | -565.0 | -678.8 |
| 007E0223 | kb8d7e-B239 | wl | x | x | 172064.0 | 228539.0 | 22.8 | 467.0 | 589.0 | -444.0 | -566.2 |
| 010E0081 | | cb | x | | 58619.0 | 224313.0 | -5.9 | 44.0 | | -50.0 | |
| 011E0138 | kb5d11e-B287 | wl | x | x | 78776.0 | 226370.0 | 4.9 | 144.0 | 288.0 | -139.0 | -283.1 |
| 011E0149 | B/3-0517 | wl | x | | 80402.0 | 220335.0 | 4.5 | 118.0 | | -113.0 | |
| 011E0150 | B/3-0523 | cb | x | | 75765.0 | 219929.0 | 3.4 | 98.0 | | -95.0 | |
| 011E0151 | B/3-0525a | wl | x | x | 79248.0 | 228159.0 | 5.2 | 154.0 | 298.5 | -149.0 | -293.3 |
| 011W0280 | kb5d11w-B268 | wl | x | | 70144.0 | 227979.0 | 7.7 | 121.0 | | -113.0 | |
| 014E0240 | subcropBM-014E0240 | wl | x | x | 142240.0 | 224444.0 | 8.0 | 325.0 | 441.0 | -317.0 | -433.0 |
| 014E0355 | | wl | x | x | 144287.0 | 219656.0 | 8.5 | 282.0 | 400.0 | -273.0 | -391.5 |
| 015E0267A | B/1-0441 | wl | x | x | 161725.0 | 224500.0 | 25.6 | 400.0 | 514.0 | -374.0 | -488.4 |
| 016E0176 | kb8d16e-B166 | wl | x | x | 175609.0 | 227355.0 | 27.8 | 462.0 | 576.0 | -434.0 | -548.2 |
| 017W0280 | kb8d17w-B315 | wl | x | x | 182012.0 | 225742.0 | 30.0 | 460.0 | 570.0 | -430.0 | -540.0 |
| 022E0227 | kb12d22e-B541 | wl | x | | 61124.0 | 213170.0 | 1.3 | 45.5 | | -44.0 | |
| 022W0276 | kb12d22w-B1 | wl | x | x | 54582.0 | 216649.0 | 5.0 | 47.0 | 191.0 | -42.0 | -186.0 |
| 022W0279 | kb12d22w-B279 | wl | | x | 51900.0 | 211891.0 | 2.5 | 27.0 | 171.0 | | -168.5 |
| 022W0351 | VLA07-4.1-B1 | wl | | x | 50100.0 | 215210.0 | 7.5 | 41.0 | 177.0 | | -169.5 |
| 023W0375 | kb13d23w-B239 | wl | x | | 69351.0 | 213983.0 | 5.0 | 61.0 | | -56.0 | |
| 023W0427 | subcropBM-023W0427 | wl | x | x | 70717.0 | 214113.0 | 4.0 | 64.0 | 215.0 | -60.0 | -211.0 |
| 023W0454 | B/3-0524a | wl | x | x | 67699.0 | 208344.0 | 11.0 | 45.5 | 194.0 | -34.0 | -183.0 |
| 026E0111 | subcropBM-026E0111 | wl | x | x | 128880.0 | 214425.0 | 3.0 | 200.8 | 318.5 | -198.0 | -315.5 |
| 030W0372 | kb16d30w-B401 | wl | x | x | 182179.0 | 208801.0 | 16.0 | 279.0 | 368.0 | -263.0 | -352.0 |
| 031E0341 | kb17d31e-B323 | wl | x | | 209640.0 | 215490.0 | 42.9 | 561.5 | | -519.0 | |
| 031W0237 | kb17d31w-B224 | wl | x | x | 198400.0 | 211725.0 | 24.5 | 360.5 | 443.0 | -336.0 | -418.5 |
| 031W0300 | "Dessel-1" | wl | x | x | 199117.0 | 213382.0 | 24.8 | 386.5 | 468.0 | -362.0 | -443.2 |
| 031W0310 | BGD031W0310 | wl | x | x | 198625.0 | 213475.0 | 23.5 | 384.0 | 466.0 | -360.0 | -442.5 |
| 031W0314 | "Mol-1" | wl | x | x | 200191.0 | 211652.0 | 24.9 | 377.0 | 457.0 | -352.0 | -432.1 |
| 035E0142 | kb11d35e-B146 | wl | | x | 30409.0 | 202711.0 | 6.6 | 26.0 | 136.0 | | -129.5 |
| 036E0129 | kb12d36e-B128 | wl | x | x | 43334.0 | 198182.0 | 3.0 | 12.0 | 135.0 | -9.0 | -132.0 |
| 036E0130 | kb12d36e-B129 | wl | x | x | 43918.0 | 198198.0 | 3.0 | 8.0 | 133.0 | -5.0 | -130.0 |
| 036E0131 | kb12d36e-B130 | wl | x | x | 43879.0 | 198233.0 | 3.0 | 5.0 | 132.0 | -2.0 | -129.0 |
| 036E0135 | kb12d36e-B134 | wl | x | x | 44815.0 | 199093.0 | 3.0 | 12.0 | 132.0 | -9.0 | -129.0 |
| 036E0136 | kb12d36e-B135 | wl | x | x | 48627.0 | 202442.0 | 4.0 | 4.0 | 139.5 | 0.0 | -135.5 |
| 036E0137 | kb12d36e-B136 | wl | | x | 42815.0 | 201195.0 | 3.0 | 15.0 | 133.0 | | -130.0 |
| 036E0138 | kb12d36e-B137 | wl | | x | 43597.0 | 199908.0 | 3.0 | 29.0 | 134.0 | | -131.0 |
| 036E0139 | kb12d36e-B138 | wl | | x | 47229.0 | 204037.0 | 3.0 | 25.0 | 141.5 | | -138.5 |
| 036E0160 | | wl | | x | 42351.0 | 204884.0 | 1.0 | 25.0 | 137.0 | | -136.0 |
| 036E0161 | B/3-0515a | wl | | x | 48164.0 | 203275.0 | 2.8 | 24.0 | 145.0 | | -142.2 |
| 036W0204 | B/3-0519a | wl | | x | 41083.0 | 203807.0 | 3.7 | 25.0 | 137.0 | | -133.3 |
| 037E0199 | kb12d37e-B234 | wl | x | | 62220.0 | 206565.0 | 8.8 | 24.0 | | -15.0 | |
| 037E0215 | B/3-0522a | wl | x | x | 62069.0 | 204638.0 | 14.0 | 35.0 | 174.0 | -21.0 | -160.0 |
| 037W0199 | kb12d37w-B199 | wl | | x | 52976.0 | 204805.0 | 2.5 | 20.0 | 141.0 | | -138.5 |
| 037W0204 | subcropBM-037W0204 | wl | x | x | 55540.0 | 206300.0 | 7.0 | 22.0 | 164.0 | -15.0 | -157.0 |
| 037W0225 | geobib-B111 | wl | x | | 50241.0 | 199364.0 | 8.0 | 2.8 | | 5.0 | |
| 037W0226 | geobib-B112 | wl | x | | 56238.0 | 198893.0 | 19.3 | 16.0 | | 3.0 | |
| 038E0206 | B/4-0275a | wl | x | x | 79027.0 | 198332.0 | 21.5 | 40.5 | 168.0 | -19.0 | -146.5 |
| 038W0227 | kb13d38w-B149 | wl | | x | 70715.0 | 202790.0 | 12.3 | | 169.0 | | -156.8 |
| 038W0243 | subcropBM-038W0243 | wl | x | x | 70552.0 | 203148.0 | 17.1 | 38.5 | 173.0 | -21.0 | -156.0 |
| 038W0264 | B/3-0509a | wl | x | x | 66379.0 | 199570.0 | 20.7 | 34.0 | 165.0 | -13.0 | -144.3 |
| 039E0144 | B/4-0271a | wl | x | x | 97149.0 | 199107.0 | 8.0 | 66.0 | 184.0 | -58.0 | -176.0 |
| 039W0293 | B/4-0274a | wl | x | x | 82118.0 | 203791.0 | 12.0 | 68.0 | 193.0 | -56.0 | -181.0 |
| 041W0179 | kb14d41w-B183 | wl | x | x | 117251.0 | 204309.0 | 4.7 | 116.5 | 232.5 | -112.0 | -227.8 |
| 045W0348 | kb16d45w-B361 | wl | x | | 185040.0 | 199720.0 | 13.5 | 205.0 | | -192.0 | |
| 046E0278 | kb17d46e-B269 | wl | | x | 209383.0 | 202580.0 | 43.0 | | 343.5 | | -300.5 |
| 046E0279 | kb17d46e-B270 | wl | x | x | 207160.0 | 203283.0 | 36.0 | 320.0 | 354.0 | -284.0 | -318.0 |
| 046E0280 | kb17d46e-B271 | wl | x | x | 207756.0 | 201813.0 | 41.0 | 275.0 | 332.0 | -234.0 | -291.0 |
| 046E0281 | kb17d46e-B272 | wl | x | x | 209528.0 | 200554.0 | 48.0 | 275.0 | 312.4 | -227.0 | -264.4 |
| 047W0260 | kb17d47w-B258 | wl | x | x | 215223.0 | 198267.0 | 59.0 | 290.0 | 342.0 | -231.0 | -283.0 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 047W0261 | kb17d47w-B259 | wl | x | x | 217288.0 | 200235.0 | 69.0 | 355.0 | 375.0 | -286.0 | -306.0 |
| 047W0262 | kb17d47w-B260 | wl | | x | 216163.0 | 201898.0 | 61.0 | | 384.5 | | -323.5 |
| 047W0264 | kb17d47w-B262 | wl | x | x | 213939.0 | 206366.0 | 46.0 | 392.0 | 437.0 | -346.0 | -391.0 |
| 047W0265 | kb17d47w-B263 | wl | x | x | 213235.0 | 199937.0 | 53.0 | 295.0 | 324.8 | -242.0 | -271.8 |
| 047W0266 | kb17d47w-B264 | wl | | x | 210829.0 | 202989.0 | 44.0 | | 355.2 | | -311.2 |
| 047W0267 | kb17d47w-B265 | wl | x | x | 211271.0 | 199933.0 | 46.0 | 275.0 | 320.6 | -229.0 | -274.6 |
| 047W0268 | kb17d47w-B266 | wl | x | x | 211676.0 | 199549.0 | 46.0 | 275.0 | 324.4 | -229.0 | -278.4 |
| 047W0269 | kb17d47w-B267 | wl | | x | 212935.0 | 202699.0 | 54.0 | | 375.2 | | -321.2 |
| 050E0134 | kb19d50e-B214 | wl | | x | 32469.0 | 193699.0 | 4.1 | 15.0 | 129.0 | | -124.9 |
| 050E0214 | kb19d50e-B224 | wl | | x | 28301.0 | 188809.0 | 10.0 | 9.0 | 131.0 | | -121.0 |
| 050E0217 | kb19d50e-B226 | wl | | x | 31766.0 | 196824.0 | 2.5 | 16.0 | 124.0 | | -121.5 |
| 050E0234 | kb19d50e-B243 | wl | | x | 32365.0 | 193675.0 | 3.4 | 20.5 | 123.5 | | -120.1 |
| 050E0235 | subcropBM-050E0235 | wl | | x | 31635.0 | 194905.0 | 4.7 | 12.0 | 125.5 | | -120.8 |
| 050W0055 | B/3-0514 | wl | | x | 25786.0 | 190028.0 | 3.9 | 7.0 | 126.0 | | -122.1 |
| 051W0144 | kb20d51w-B209 | wl | | x | 41855.0 | 194180.0 | 3.5 | 15.0 | 132.0 | | -128.5 |
| 051W0156 | B/3-0518a | wl | | x | 36061.0 | 195471.0 | 3.1 | 19.0 | 125.0 | | -121.9 |
| 051W0157 | B/3-0506a | wl | | x | 36136.0 | 188658.0 | 2.7 | 4.0 | 122.0 | | -119.3 |
| 052E0195 | kb20d52e-B208 | wl | x | x | 58332.0 | 197127.0 | 26.7 | 26.0 | 161.0 | 1.0 | -134.3 |
| 052W0154 | kb20d52w-B164 | wl | | x | 56535.0 | 191340.0 | 7.0 | 17.0 | 129.0 | | -122.0 |
| 052W0255 | B/3-0510a | wl | x | x | 51330.0 | 197169.0 | 18.0 | 10.0 | 148.0 | 8.0 | -130.0 |
| 052W0256 | B/3-0520a | wl | | x | 57008.0 | 192209.0 | 13.9 | 22.0 | 136.0 | | -122.1 |
| 053E0058 | kb21d53e-B107 | wl | x | x | 81840.0 | 189700.0 | 28.8 | 26.5 | 144.0 | 2.0 | -115.3 |
| 053E0061 | kb21d53e-B103 | wl | x | | 78490.0 | 188422.0 | 42.5 | 26.0 | | 16.0 | |
| 053W0073 | kb21d53w-B71 | wl | x | x | 70440.0 | 188940.0 | 35.5 | 13.5 | 146.5 | 22.0 | -111.0 |
| 053W0077 | kb21d53w-B115 | wl | x | x | 72176.0 | 189840.0 | 37.4 | 22.5 | 150.0 | 15.0 | -112.6 |
| 054E0196 | kb21d54e-B164 | wl | x | x | 91440.0 | 195165.0 | 10.0 | 41.0 | 159.0 | -31.0 | -149.0 |
| 054E0246 | B/4-0258a | wl | | x | 93734.0 | 188820.0 | 11.3 | 28.0 | 133.0 | | -121.7 |
| 054W0084 | kb21d54w-B137 | wl | x | x | 84918.0 | 197042.0 | 18.0 | 49.0 | 167.0 | -31.0 | -149.0 |
| 055E1023 | GEO-08/43-B37 | cb | x | | 106387.2 | 188829.6 | 8.2 | 17.2 | | -9.0 | |
| 055E1138 | GEO-08/43-B29 | cb | x | | 105572.1 | 189100.0 | 7.9 | 16.0 | | -8.0 | |
| 055E1139 | GEO-08/43-B33 | cb | x | | 105497.8 | 188942.5 | 8.0 | 16.8 | | -9.0 | |
| 055W0033 | kb22d55w-B33 | wl | x | x | 105171.0 | 192059.0 | 9.0 | 35.0 | 152.0 | -26.0 | -143.0 |
| 055W0978 | kb22d55w-B978 | wl | x | x | 104230.0 | 195300.0 | 8.0 | 53.0 | 168.0 | -45.0 | -160.0 |
| 055W0990 | kb22d55w-B990 | wl | x | | 105232.0 | 190891.0 | 10.0 | 29.5 | | -20.0 | |
| 055W0991 | kb22d55w-B1241 | wl | x | | 105263.0 | 190807.0 | 9.0 | 31.0 | | -22.0 | |
| 055W1020 | kb22d55w-B1020 | wl | x | x | 103904.0 | 190630.0 | 10.6 | 29.0 | 145.0 | -18.0 | -134.4 |
| 055W1021 | kb22d55w-B1021 | wl | x | x | 104867.0 | 190696.0 | 11.0 | 29.0 | 144.0 | -18.0 | -133.0 |
| 055W1090 | subcropBM-055W1090 | wl | x | x | 100115.0 | 197715.0 | 5.0 | 62.5 | 177.0 | -58.0 | -172.0 |
| 055W1091 | B/4-0111 | wl | x | x | 100119.0 | 197689.0 | 5.0 | 62.5 | 177.0 | -58.0 | -172.0 |
| 055W1112 | B/4-0273a | wl | x | x | 98905.0 | 192666.0 | 9.2 | 35.0 | 149.0 | -26.0 | -139.8 |
| 055W1129 | GEO-08/99-B19 | cb | x | | 105187.1 | 189329.4 | 11.1 | 22.4 | | -11.0 | |
| 055W1133 | GEO-08/99-B3 | cb | x | | 105408.6 | 189315.8 | 7.4 | 17.2 | | -10.0 | |
| 056W0202 | B/4-0270a | wl | x | x | 117867.0 | 197644.0 | 6.1 | 84.0 | 192.0 | -78.0 | -185.9 |
| 056W0261 | geo wetteren | cb | x | | 116036.0 | 188894.0 | | 30.0 | | -30.0 | |
| 057W0151 | kb23d57w-B161 | wl | x | x | 130548.0 | 189689.0 | 5.0 | 40.0 | 148.0 | -35.0 | -143.0 |
| 057W0154 | kb23d57w-B162 | wl | x | x | 131606.0 | 190824.0 | 4.6 | 47.0 | 156.0 | -42.0 | -151.4 |
| 059W0180 | kb24d59w-B187 | wl | x | x | 164262.0 | 193846.0 | 11.0 | 113.0 | 210.0 | -102.0 | -199.0 |
| 060E0292 | B/2-0436a | wl | x | x | 189271.0 | 190520.0 | 17.9 | 137.0 | 189.0 | -119.0 | -171.2 |
| 061E0362 | B/7-0557a | wl | x | x | 205486.0 | 191169.0 | 49.6 | 169.0 | 223.0 | -119.0 | -173.4 |
| 062E0272 | kb25d62e-B276 | wl | x | x | 220808.0 | 196446.0 | 74.0 | 315.0 | 323.0 | -241.0 | -249.0 |
| 062E0280 | kb25d62e-B284 | wl | | x | 224190.0 | 194595.0 | 80.0 | | 274.0 | | -194.0 |
| 062E0281 | kb25d62e-B285 | wl | x | x | 220905.0 | 194997.0 | 74.0 | 282.0 | 298.0 | -208.0 | -224.0 |
| 062E0282 | kb25d62e-B286 | wl | x | x | 219240.0 | 195331.0 | 72.0 | 285.0 | 304.0 | -213.0 | -232.0 |
| 062W0302 | kb25d62w-B305 | wl | x | x | 217193.0 | 197814.0 | 63.9 | 328.0 | 346.0 | -264.0 | -282.1 |
| 062W0304 | kb25d62w-B307 | wl | x | x | 216108.0 | 196932.0 | 56.0 | 275.0 | 305.0 | -219.0 | -249.0 |
| 062W0305 | kb25d62w-B308 | wl | x | x | 216943.0 | 196922.0 | 67.0 | 290.0 | 311.6 | -223.0 | -244.6 |
| 062W0414 | B/7-0559a | cb | x | x | 211746.0 | 190688.0 | 35.5 | 172.5 | 224.5 | -137.0 | -189.0 |
| 065E0097 | B/3-0513a | wl | | x | 28710.0 | 182364.0 | 6.7 | 4.0 | 117.0 | | -110.3 |
| 066E0099 | kb20d66e-B133 | wl | | x | 44246.0 | 183587.0 | 7.0 | | 113.0 | | -106.0 |
| 066E0114 | kb20d66e-B149 | wl | | x | 42445.0 | 187420.0 | 3.9 | 13.0 | 120.0 | | -116.1 |
| 066E0135 | B/3-0511a | wl | | x | 49046.0 | 185587.0 | 15.3 | 4.0 | 123.0 | | -107.7 |
| 066E0136 | B/3-0521a | wl | | x | 42522.0 | 179666.0 | 7.2 | 5.0 | 110.0 | | -102.8 |
| 066W0148 | | wl | | x | 34755.0 | 182230.0 | 6.1 | 14.0 | 116.0 | | -109.9 |
| 067E0178 | kb20d67e-B181 | wl | x | x | 62023.0 | 188126.0 | 30.0 | 3.0 | 122.0 | 27.0 | -92.0 |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| 067E0214 | B/3-0505a | wl | | x | 65643.0 | 183636.0 | 23.0 | 8.0 | 118.0 | | -95.0 |
| 067W0229 | kb20d67w-B239 | wl | | x | 57652.0 | 181724.0 | 25.0 | 16.0 | 120.5 | | -95.5 |
| 067W0232 | | wl | x | | 54735.0 | 182300.0 | 44.0 | 12.0 | | 32.0 | |
| 067W0237 | subcropBM-067W0237 | wl | | x | 55390.0 | 182655.0 | 32.0 | | 131.0 | | -99.0 |
| 068E0169 | BGD068E0169 | wl | x | x | 76439.0 | 187576.0 | 49.0 | 27.5 | 153.8 | 22.0 | -104.8 |
| 068E0189 | BGD068E0189 | wl | | x | 79782.0 | 178838.0 | 15.0 | 26.0 | 90.0 | | -75.0 |
| 068E0198 | 68e198 | wl | | x | 77385.0 | 179830.0 | 13.8 | 8.0 | 92.0 | | -78.2 |
| 068E0200 | subcropBM-068E0200 | wl | x | x | 74845.0 | 180920.0 | 33.0 | 18.0 | 119.0 | 15.0 | -86.0 |
| 068W0526 | kb21d68w-B538 | wl | | x | 69991.0 | 178989.0 | 17.5 | 13.0 | 92.0 | | -74.5 |
| 068W0534 | kb21d68w-B548 | wl | | x | 69210.0 | 183872.0 | 22.5 | 8.5 | 117.0 | | -94.5 |
| 069E0450 | B/4-0257a | wl | | x | 92868.0 | 183585.0 | 12.4 | 23.0 | 110.0 | | -97.6 |
| 069W0457 | kb21d69w-B457 | wl | | x | 86383.0 | 181411.0 | 11.0 | 20.0 | 99.0 | | -88.0 |
| 069W0460 | kb21d69w-B559 | wl | x | | 83135.0 | 187930.0 | 36.9 | 24.0 | | 13.0 | |
| 070E0200 | kb22d70e-B200 | wl | x | | 111472.0 | 185769.0 | 10.0 | 17.0 | | -7.0 | |
| 070E0236 | kb22d70e-B260 | wl | x | x | 107750.0 | 187675.0 | 10.0 | 18.5 | 126.0 | -8.0 | -116.0 |
| 070E0237 | kb22d70e-B237 | wl | x | x | 110512.0 | 182146.0 | 52.4 | 34.0 | 147.0 | 18.0 | -94.6 |
| 070W0738 | kb22d70w-B738 | wl | | x | 101495.0 | 178903.0 | 24.1 | 12.0 | 99.0 | | -74.9 |
| 070W0752 | kb22d70w-B752 | wl | | x | 99311.0 | 184597.0 | 12.0 | 15.0 | 105.0 | | -93.0 |
| 070W0759 | geobib-B103 | wl | x | | 104750.0 | 181650.0 | 53.0 | 31.5 | | 21.0 | |
| 070W0770 | subcropBM-070W0770 | wl | | x | 100405.0 | 182125.0 | 14.0 | 6.0 | 98.0 | | -84.0 |
| 070W0784 | B/4-0256b | wl | x | x | 105339.0 | 178263.0 | 60.8 | 27.0 | 136.0 | 34.0 | -75.2 |
| 070W0785 | B/4-0256a | wl | x | x | 105333.0 | 178281.0 | 60.9 | 18.0 | 135.0 | 43.0 | -74.1 |
| 071E0256 | kb22d71e-B256 | wl | x | x | 128207.0 | 186408.0 | 5.0 | | 128.0 | | -123.0 |
| 071E0261 | kb22d71e-B296 | wl | | x | 127749.0 | 180821.0 | 10.0 | 9.5 | 105.0 | | -95.0 |
| 071E0335 | GEO-11/082-B24 | cb | x | | 127897.0 | 184641.0 | 6.8 | 13.2 | | -6.0 | |
| 071E0340 | GEO-11/082-B50 | cb | x | | 129139.0 | 186611.0 | 7.0 | 22.0 | | -15.0 | |
| 071W0251 | kb22d71w-B251 | wl | x | x | 116915.0 | 180765.0 | 38.4 | 9.5 | 131.0 | 29.0 | -92.7 |
| 071W0270 | kb22d71w-B461 | wl | x | | 115430.0 | 180931.0 | 30.2 | 2.0 | | 28.0 | |
| 071W0325 | B/4-0272a | wl | x | x | 117253.0 | 188164.0 | 14.7 | 42.0 | 146.0 | -27.0 | -131.3 |
| 072E0229 | B/2-0427a | wl | x | x | 142914.0 | 180915.0 | 67.7 | 71.0 | 165.0 | -3.0 | -97.3 |
| 072W0159 | kb23d72w-B121 | wl | x | x | 130325.0 | 185708.0 | 10.8 | 31.0 | 131.5 | -20.0 | -120.7 |
| 073E0377 | B/2-0419a | wl | x | x | 155951.0 | 180524.0 | 18.6 | 24.0 | 107.0 | -5.0 | -88.4 |
| 073E0397 | B/2-0424a | wl | x | x | 160635.0 | 186224.0 | 10.0 | 49.0 | 143.0 | -39.0 | -133.0 |
| 073W0394 | B/2-0418a | wl | x | x | 147656.0 | 181650.0 | 52.4 | 55.0 | 146.0 | -3.0 | -93.6 |
| 074E0128 | kb24d74e-B136 | wl | x | x | 175237.0 | 187238.0 | 15.0 | 92.0 | 150.0 | -77.0 | -135.0 |
| 074E0163 | BGD074e0163 | wl | x | x | 171940.0 | 179855.0 | 17.0 | 50.0 | 95.0 | -33.0 | -78.0 |
| 074E0184 | B/2-0441a | wl | x | x | 177333.0 | 182788.0 | 20.1 | 68.0 | 126.0 | -48.0 | -105.9 |
| 074W0152 | kb24d74w-B187 | wl | x | x | 168928.0 | 180974.0 | 17.0 | 42.5 | 97.0 | -26.0 | -80.0 |
| 075E0340 | kb24d75e-B344 | wl | x | | 192295.0 | 184705.0 | 75.0 | 138.0 | | -63.0 | |
| 075W0320 | | wl | x | x | 181415.0 | 186655.0 | 11.0 | 94.0 | 144.0 | -83.0 | -133.0 |
| 075W0321 | kb24d75w-B357 | wl | x | | 182524.0 | 182092.0 | 26.0 | 59.0 | | -33.0 | |
| 075W0324 | kb24d75w-B360 | wl | x | x | 179270.0 | 181545.0 | 25.0 | 64.0 | 110.0 | -39.0 | -85.0 |
| 075W0345 | | wl | x | | 183650.0 | 185710.0 | 13.4 | 86.0 | | -73.0 | |
| 075W0381 | B/2-91957 | wl | x | | 183774.0 | 185791.0 | 13.7 | 88.0 | | -74.0 | |
| 075W0393 | "3001-108" | wl | x | x | 183511.0 | 185746.0 | 13.8 | 86.5 | 137.0 | -73.0 | -123.2 |
| 076E0295 | kb25d76e-B298 | wl | x | | 202697.0 | 184482.0 | 23.5 | 86.0 | | -62.0 | |
| 076E0303 | B/7-0344 | wl | x | x | 205920.0 | 184473.7 | 23.6 | 95.0 | 124.0 | -71.0 | -100.4 |
| 076E0304 | B/7-0368 | wl | x | x | 202500.0 | 182050.0 | 43.0 | 67.1 | 91.0 | -24.0 | -48.0 |
| 076W0273 | kb25d76w-B285 | wl | x | x | 199289.0 | 180714.0 | 43.4 | 71.5 | 101.0 | -28.0 | -57.6 |
| 076W0285 | kb25d76w-B311 | wl | x | x | 197758.0 | 185946.0 | 35.0 | 104.0 | 147.0 | -69.0 | -112.0 |
| 076W0287 | kb25d76w-B313 | wl | x | x | 196913.0 | 179745.0 | 57.5 | 86.0 | 109.0 | -28.0 | -51.5 |
| 076W0289 | kb25d76w-B315 | wl | x | x | 199606.0 | 183851.0 | 40.0 | 107.0 | 138.0 | -67.0 | -98.0 |
| 076W0297 | kb25d76w-B323 | wl | x | | 195117.0 | 186535.0 | 20.0 | 100.0 | | -80.0 | |
| 076W0305 | kb25d76w-B336 | wl | x | | 194853.0 | 186700.0 | 18.6 | 97.0 | | -78.0 | |
| 076W0306 | kb25d76w-B337 | wl | x | | 195494.0 | 186576.0 | 18.4 | 98.0 | | -80.0 | |
| 076W0307 | kb25d76w-B338 | wl | x | | 195760.0 | 186566.0 | 19.0 | 98.0 | | -79.0 | |
| 076W0319 | B/2-0106 | wl | x | x | 194594.8 | 178441.2 | 57.9 | 56.0 | 73.0 | 2.0 | -15.1 |
| 076W0327 | BGD076w0327 | wl | x | x | 196524.0 | 187034.0 | 20.0 | 102.5 | 138.0 | -82.0 | -118.0 |
| 076W0328 | BGD076w0328 | wl | x | x | 196537.0 | 186988.0 | 21.0 | 102.7 | 135.0 | -82.0 | -114.0 |
| 076W0329 | BGD076w0329 | wl | x | | 195027.0 | 186206.0 | 59.0 | 138.2 | | -79.0 | |
| 076W0362 | | wl | x | | 196810.0 | 186315.0 | 42.0 | 117.0 | | -75.0 | |
| 076W0363 | | wl | x | | 197129.0 | 186183.0 | 41.0 | 112.0 | | -71.0 | |
| 076W0364 | | cb | x | | 196809.0 | 186334.0 | 42.0 | 115.0 | | -73.0 | |
| 080E0083 | kb27d80e-B97 | wl | | x | 26769.0 | 173879.0 | 15.5 | 6.0 | 98.0 | | -82.5 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 081E0141 | kb28d81e-B209 | wl | | x | 45103.0 | 171822.0 | 25.0 | 5.0 | 106.0 | | -81.0 |
| 081E0143 | kb28d81e-B211 | wl | | x | 44420.0 | 175250.0 | 13.4 | 6.0 | 102.0 | | -88.6 |
| 081W0067 | kb28d81w-B115 | wl | | x | 35798.0 | 172147.0 | 29.0 | 14.5 | 112.0 | | -83.0 |
| 081W0095 | B/3-0512a | wl | | x | 35076.0 | 174644.0 | 31.2 | 6.0 | 124.0 | | -92.8 |
| 082E0103 | B/3-0508a | wl | | x | 65878.0 | 175277.0 | 22.9 | 6.0 | 100.0 | | -77.1 |
| 082W0148 | kb28d82w-B110 | wl | | x | 54412.0 | 170562.0 | 29.1 | 4.0 | 103.0 | | -73.9 |
| 082W0179 | B/3-0504a | wl | | x | 57586.0 | 176243.0 | 35.6 | 18.0 | 120.0 | | -84.4 |
| 083E0407 | kb29d83e-B53 | wl | | x | 75940.0 | 177117.0 | 19.0 | 0.0 | 90.0 | | -71.0 |
| 083E0417A | kb29d83e-B63 | wl | | x | 74884.0 | 172058.0 | 12.5 | 23.0 | 71.0 | | -58.5 |
| 083E0440 | kb29d83e-B461 | wl | | x | 75729.0 | 173740.0 | 16.0 | 23.0 | 77.0 | | -61.0 |
| 083E0442 | kb29d83e-B86 | wl | | x | 80810.0 | 176630.0 | 12.5 | 19.0 | 83.5 | | -71.0 |
| 083E0443 | kb29d83e-B487 | wl | | x | 79530.0 | 177710.0 | 15.1 | 23.0 | 88.0 | | -72.9 |
| 083E0446 | kb29d83e-B485 | wl | | x | 76145.0 | 171100.0 | 14.5 | 20.0 | 69.0 | | -54.6 |
| 083E0447 | kb29d83e-B486 | wl | | x | 80360.0 | 174560.0 | 16.0 | 27.0 | 80.0 | | -64.0 |
| 083W0446 | kb29d83w-B120 | wl | | x | 76145.0 | 171100.0 | 14.5 | 20.0 | 69.0 | | -54.6 |
| 083W0471 | kb29d83w-B149 | wl | | x | 66975.0 | 174328.0 | 26.0 | 5.0 | 98.0 | | -72.0 |
| 083W0472 | kb29d83w-B150 | wl | | x | 68796.0 | 170806.0 | 17.5 | 18.5 | 81.5 | | -64.0 |
| 083W0487 | kb29d83w-B165 | wl | | x | 71298.0 | 175405.0 | 27.5 | 23.5 | 92.5 | | -65.0 |
| 084E1387 | kb29d84e-B199 | wl | | x | 95124.0 | 172422.0 | 22.5 | 36.0 | 79.0 | | -56.5 |
| 084E1412 | geobib-B101 | wl | x | | 90370.0 | 177820.0 | 58.2 | 22.0 | | 36.0 | |
| 084E1441 | B/4-0255b | wl | | x | 97729.0 | 175645.0 | 24.0 | 37.0 | 88.0 | | -64.0 |
| 084W1471 | kb29d84w-B168 | wl | | x | 82728.0 | 170413.0 | 29.5 | 9.0 | 77.0 | | -47.5 |
| 084W1475 | kb29d84w-B171 | wl | | x | 89216.0 | 171951.0 | 63.9 | 6.0 | 113.0 | | -49.1 |
| 084W1476 | kb29d84w-B1526 | wl | | x | 83680.0 | 173680.0 | 17.0 | 5.0 | 72.5 | | -55.5 |
| 084W1478 | kb29d84w-B1539 | wl | | x | 82460.0 | 174030.0 | 17.5 | 23.0 | 77.0 | | -59.5 |
| 085E0963 | kb30d85e-B963 | wl | | x | 108479.0 | 172199.0 | 35.8 | 9.0 | 90.5 | | -54.7 |
| 085W0797 | kb30d85w-B797 | wl | | x | 101487.0 | 170679.0 | 81.3 | 7.0 | 119.0 | | -37.7 |
| 086E0201 | kb30d86e-B201 | wl | | x | 129960.0 | 170560.0 | 50.0 | 6.0 | 104.5 | | -54.5 |
| 086E0250 | kb30d86e-B250 | wl | | x | 127160.0 | 170150.0 | 12.0 | 7.5 | 51.0 | | -39.0 |
| 086E0267 | kb30d86e-B267 | wl | | x | 126425.0 | 173524.0 | 24.0 | 27.0 | 84.0 | | -60.0 |
| 086E0340 | kerksken | wl | x | | 122309.0 | 174247.0 | 72.1 | 24.0 | | 48.0 | |
| 086W0183 | subcropBM-086W0183 | wl | x | x | 115820.0 | 175015.0 | 65.0 | 17.0 | 132.0 | 48.0 | -67.0 |
| 086W0213 | B/4-0253a | wl | | x | 119505.0 | 171401.0 | 56.3 | 7.5 | 103.0 | | -46.7 |
| 087E0794 | GEO-03/124-B8.8/2 | cb | | x | 140220.2 | 168748.4 | 33.5 | 8.0 | 51.5 | | -18.0 |
| 087E0797 | GEO-03/124-B10.8/1 | cb | x | | 138627.3 | 169857.0 | 68.6 | 22.0 | | 47.0 | |
| 087E0803 | B/2-0434a | wl | | x | 140132.0 | 169814.0 | 61.8 | 4.0 | 91.0 | | -29.2 |
| 087E0822 | GEO-07/15-B10.6/1 | cb | x | | 138760.0 | 169708.0 | 74.4 | 25.0 | | 49.0 | |
| 087W0415 | kb31d87w-B415 | wl | x | x | 136285.0 | 175475.0 | 46.0 | 9.0 | 112.0 | 37.0 | -66.0 |
| 087W0479 | strijtem | wl | x | | 131516.1 | 171301.0 | 68.8 | 7.8 | | 61.0 | |
| 087W0492 | B/2-0432a | wl | | x | 131015.0 | 169794.0 | 50.1 | 9.0 | 86.0 | | -35.9 |
| 088E0836 | B/2-0420a | wl | x | x | 160078.0 | 170389.0 | 74.7 | 62.0 | 87.0 | 13.0 | -12.3 |
| 089E0379 | kb32d89e-B319 | wl | x | | 176054.0 | 170352.0 | 60.7 | 65.0 | | -4.0 | |
| 089E0390 | kb32d89e-B330 | wl | | x | 173027.0 | 173733.0 | 25.0 | 12.0 | 44.0 | | -19.0 |
| 089E0491 | kb32d89e-B396 | wl | x | x | 173660.0 | 172735.0 | 23.1 | 17.0 | 43.0 | 6.0 | -19.9 |
| 089E0492 | kb32d89e-B397 | wl | x | x | 176179.0 | 175953.0 | 25.4 | 35.0 | 63.0 | -10.0 | -37.6 |
| 089W0326 | kb32d89w-B313 | wl | | x | 169270.0 | 169420.0 | 27.0 | 13.5 | 28.0 | | -1.0 |
| 089W0335 | kb32d89w-B320 | wl | x | x | 168700.0 | 174675.0 | 92.5 | 90.0 | 129.0 | 2.0 | -36.5 |
| 090E0748 | kb32d90e-B765 | wl | x | x | 187235.0 | 176456.0 | 67.0 | 64.5 | 87.5 | 2.0 | -20.5 |
| 090E0749 | kb32d90e-B766 | wl | x | | 190208.0 | 174886.0 | 66.0 | 63.0 | | 3.0 | |
| 090E0755 | kb32d90e-B772 | wl | x | x | 186140.0 | 174082.0 | 88.0 | 74.0 | 95.0 | 14.0 | -7.0 |
| 090E0794 | B/2-0422a | wl | x | x | 188763.0 | 177376.0 | 72.6 | 81.0 | 107.0 | -8.0 | -34.4 |
| 090W1158 | kb32d90w-B1190 | wl | x | x | 183154.0 | 175619.0 | 50.0 | 32.0 | 72.5 | 18.0 | -22.5 |
| 090W1169 | kb32d90w-B1201 | wl | x | x | 181202.0 | 174518.0 | 94.0 | 68.5 | 113.5 | 26.0 | -19.5 |
| 090W1205 | B/2-0111 | wl | | x | 183254.1 | 170590.1 | 61.0 | | 50.0 | | 11.0 |
| 090W1263 | B/2-0421 | cb | | x | 180790.0 | 176231.0 | 74.9 | | 120.0 | | -45.1 |
| 090W1267 | B/2-0440a | wl | x | x | 183106.0 | 172384.0 | 76.2 | 46.0 | 74.0 | 30.0 | 2.2 |
| 095E0190 | kb28d95e-B148 | wl | | x | 49620.0 | 166191.0 | 24.8 | 10.5 | 83.0 | | -58.2 |
| 095W0150 | kb28d95w-B14 | cb | x | | 36335.0 | 164985.0 | 143.0 | 68.0 | | 75.0 | |
| 095W0152 | kb28d95w-B19 | wl | | x | 40660.0 | 160540.0 | 75.0 | 5.0 | 103.0 | | -28.0 |
| 095W0154 | kb28d95w-B21 | wl | x | x | 35185.0 | 164987.0 | 102.5 | 32.0 | 146.0 | 70.0 | -43.5 |
| 095W0157 | kb28d95w-B23 | wl | | x | 35615.0 | 166575.0 | 42.0 | 6.0 | 98.0 | | -56.0 |
| 096E0074 | kb28d96e-B284 | wl | | x | 59295.0 | 163695.0 | 13.1 | 15.0 | 61.0 | | -47.9 |
| 096E0075 | kb28d96e-B90 | wl | | x | 59339.0 | 164552.0 | 17.5 | 22.0 | 64.0 | | -46.5 |
| 096E0076 | kb28d96e-B91 | wl | | x | 64950.0 | 163649.0 | 23.0 | 5.0 | 67.0 | | -44.0 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 096E0077 | kb28d96e-B92 | wl | | x | 65073.0 | 165438.0 | 13.0 | 10.0 | 63.0 | | -50.0 |
| 096E0080 | kb28d96e-B94 | wl | | x | 58560.0 | 167585.0 | 20.0 | 16.0 | 78.0 | | -58.0 |
| 096E0082 | kb28d96e-B96 | wl | | x | 61391.0 | 165721.0 | 16.6 | 23.0 | 67.0 | | -50.4 |
| 096W0081 | kb28d96w-B82 | wl | | x | 56768.0 | 165646.0 | 18.0 | 25.0 | 74.0 | | -56.0 |
| 097E0806 | kb29d97e-B158 | wl | | x | 80980.0 | 158222.0 | 14.0 | 18.0 | 23.0 | | -9.0 |
| 097E0817 | kb29d97e-B170 | wl | | x | 81849.0 | 159910.0 | 15.0 | 20.0 | 23.0 | | -8.0 |
| 097E0863 | kb29d97e-B225 | wl | | x | 78135.0 | 159194.0 | 17.6 | 21.0 | 30.0 | | -12.4 |
| 097E0864 | kb29d97e-B226 | wl | | x | 76606.0 | 159760.0 | 26.0 | 11.0 | 41.0 | | -15.0 |
| 097E0865 | kb29d97e-B227 | wl | | x | 74535.0 | 161410.0 | 28.0 | 5.0 | 56.0 | | -28.0 |
| 097E0866 | kb29d97e-B228 | wl | | x | 81262.0 | 160296.0 | 16.0 | 17.0 | 28.0 | | -12.0 |
| 097E0872 | kb29d97e-B234 | wl | | x | 79428.0 | 165200.0 | 37.5 | 14.5 | 70.5 | | -33.0 |
| 097E0874 | kb29d97e-B985 | wl | | x | 74540.0 | 161365.0 | 30.9 | 8.0 | 56.0 | | -25.1 |
| 097E0924 | BGD097e0924 | wl | | x | 81575.0 | 159298.0 | 13.0 | 19.0 | 25.0 | | -12.0 |
| 097E0927 | BGD097e0927 | wl | | x | 81320.0 | 158780.0 | 13.6 | 20.0 | 22.0 | | -8.4 |
| 097E0928 | BGD097E0928 | cb | | x | 80974.0 | 158205.0 | 13.0 | | 32.0 | | -19.0 |
| 097E0941 | B/3-0527a | wl | | x | 80364.0 | 163686.0 | 31.0 | 6.0 | 59.0 | | -28.0 |
| 097E0942 | B/3-0502a | wl | | x | 74671.0 | 167334.0 | 25.6 | 5.0 | 73.0 | | -47.5 |
| 097W0008 | kb29d97w-B9 | cb | | x | 69234.0 | 159392.0 | 47.0 | 10.5 | 67.0 | | -20.0 |
| 097W0009 | kb29d97w-B10 | cb | | x | 69413.0 | 159734.0 | 43.0 | 2.0 | 64.5 | | -21.5 |
| 097W0010 | kb29d97w-B11 | cb | | x | 69142.0 | 158912.0 | 41.0 | 10.0 | 55.6 | | -14.6 |
| 097W0012 | kb29d97w-B13 | cb | | x | 69608.0 | 159380.0 | 40.0 | 15.0 | 62.0 | | -22.0 |
| 097W0014 | kb29d97w-B17 | cb | | x | 69337.0 | 159881.0 | 43.0 | 16.0 | 69.0 | | -26.0 |
| 097W0019 | kb29d97w-B24 | cb | | x | 69484.0 | 159552.0 | 40.0 | 6.8 | 65.0 | | -25.0 |
| 097W0020 | kb29d97w-B25 | cb | | x | 69461.0 | 159508.0 | 40.0 | 6.2 | 59.5 | | -19.5 |
| 097W0022 | kb29d97w-B28 | cb | | x | 69607.0 | 159906.0 | 36.0 | 11.0 | 65.0 | | -29.0 |
| 097W0061 | kb29d97w-B67 | cb | | x | 67468.0 | 160215.0 | 70.0 | 30.0 | 105.0 | | -35.0 |
| 097W0597 | kb29d97w-B75 | cb | | x | 67440.0 | 160274.0 | 70.0 | 4.0 | 98.0 | | -28.0 |
| 097W0616 | kb29d97w-B95 | cb | | x | 69467.0 | 159261.0 | 39.0 | 12.0 | 66.0 | | -27.0 |
| 097W0617 | kb29d97w-B96 | cb | | x | 69669.0 | 159117.0 | 47.0 | 0.0 | 65.0 | | -18.0 |
| 097W0622 | kb29d97w-B103 | cb | | x | 69477.0 | 161837.0 | 41.0 | 4.0 | 80.0 | | -39.0 |
| 097W0625 | kb29d97w-B189 | cb | | x | 70990.0 | 160751.0 | 40.0 | 3.0 | 55.0 | | -15.0 |
| 097W0648 | kb29d97w-B766 | wl | | x | 66246.0 | 161810.0 | 37.0 | 9.0 | 74.0 | | -37.0 |
| 097W0649 | kb29d97w-B213 | wl | | x | 73798.0 | 160709.0 | 21.0 | 5.0 | 41.0 | | -20.0 |
| 097W0774 | B/3-0526a | wl | | x | 69433.0 | 163599.0 | 37.9 | 5.0 | 74.0 | | -36.1 |
| 098W0015 | kb29d98w-B12 | cb | | x | 84995.0 | 161086.0 | 13.5 | 20.6 | 32.0 | | -18.5 |
| 098W0038 | kb29d98w-B34 | cb | | x | 87066.0 | 158510.0 | 20.0 | 2.8 | 23.2 | | -3.2 |
| 098W0041 | kb29d98w-B37 | cb | | x | 84930.0 | 161047.0 | 13.5 | 20.0 | 31.0 | | -17.5 |
| 098W0062 | kb29d98w-B55 | cb | | x | 87331.0 | 160133.0 | 25.0 | 0.0 | 13.0 | | 12.0 |
| 098W0063 | kb29d98w-B56 | cb | | x | 85046.0 | 159143.0 | 18.0 | 13.0 | 24.0 | | -6.0 |
| 098W0898 | kb29d98w-B59 | cb | | x | 87828.0 | 159992.0 | 27.5 | 24.0 | 35.0 | | -7.5 |
| 098W0899 | kb29d98w-B60 | cb | | x | 87144.0 | 159117.0 | 15.0 | 4.0 | 19.0 | | -4.0 |
| 098W0956 | kb29d98w-B1050 | wl | | x | 83320.0 | 160390.0 | 13.0 | 18.0 | 23.0 | | -10.0 |
| 099E0007 | kb30d99e-B7 | cb | | x | 107732.0 | 159117.0 | 47.5 | 8.5 | 48.5 | | -1.0 |
| 099E0968 | kb30d99e-B968 | wl | | x | 108039.0 | 166508.0 | 34.0 | 7.0 | 72.0 | | -38.0 |
| 099E0973 | kb30d99e-B973 | wl | | x | 112156.0 | 166527.0 | 35.1 | 5.0 | 56.0 | | -20.9 |
| 099E0974 | kb30d99e-B974 | wl | | x | 112829.0 | 161914.0 | 35.5 | 8.0 | 42.5 | | -7.0 |
| 099E1017 | B/4-0251a | wl | | x | 107206.0 | 162083.0 | 103.0 | 24.0 | 114.0 | | -11.0 |
| 099W0001 | kb30d99w-B1 | cb | | x | 105781.0 | 159013.0 | 37.5 | 11.9 | 38.4 | | -0.9 |
| 099W1514 | subcropBM-099W1514 | wl | | x | 98785.0 | 159970.0 | 65.0 | 6.0 | 72.5 | | -7.5 |
| 099W1535 | B/4-0250 | cb | | x | 98789.0 | 159969.0 | 66.6 | 5.0 | 72.0 | | -5.4 |
| 100E0072 | B/2-0433 | cb | | x | 125436.0 | 160215.0 | 58.9 | 9.0 | 49.0 | | 9.9 |
| 100E0073 | B/4-0252 | wl | | x | 123405.0 | 165780.0 | 64.1 | 8.0 | 85.0 | | -20.9 |
| 101E0728 | B/2-0416a | cb | | x | 141435.0 | 165457.0 | 56.2 | | 58.0 | | -1.8 |
| 101W0079 | kb31d101w-B108 | wl | x | x | 131377.0 | 162781.0 | 110.0 | 39.0 | 111.0 | 71.0 | -1.0 |
| 101W0094 | kb31d101w-B94 | wl | | x | 135102.0 | 165362.0 | 41.5 | 10.0 | 53.0 | | -11.5 |
| 101W0126 | B/2-0426 | cb | | x | 135773.0 | 159470.0 | 70.0 | | 40.0 | | 30.0 |
| 102E0355 | B/2-0431 | wl | | x | 157749.0 | 163462.0 | 114.2 | | 93.0 | | 21.2 |
| 102W0847 | kb31d102w-B840 | wl | x | x | 149336.0 | 165264.0 | 102.0 | 49.0 | 93.5 | 53.0 | 8.5 |
| 103E0250 | B/2-0429a | wl | x | x | 174586.0 | 165125.0 | 90.6 | 52.0 | 59.0 | 39.0 | 31.6 |
| 103W0227 | B/2-002548 | wl | | x | 163600.0 | 160572.0 | 50.0 | 5.2 | 13.0 | | 37.0 |
| 103W0353 | B/2-0430 | cb | x | x | 166516.0 | 167019.0 | 72.2 | 37.0 | 52.0 | 35.0 | 20.2 |
| 104W0524 | B/2-0438a | wl | x | x | 180804.0 | 166112.0 | 95.1 | 31.0 | 47.0 | 64.0 | 48.1 |
| 110W0007 | kb36d110w-B5 | wl | | x | 40278.0 | 157985.0 | 19.5 | 2.0 | 42.0 | | -22.5 |
| 111E0044 | | cb | | x | 75580.0 | 156470.0 | 19.2 | 21.0 | 29.0 | | -9.8 |

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|---|---|---|---|---|---|---|---|---|---|---|
| 111E0045 | | cb | x | 75380.0 | 156800.0 | 19.4 | 18.0 | 27.0 | | -7.6 |
| 111E0046 | vgmperceel8-B1775 | cb | x | 75470.0 | 156620.0 | 19.1 | 16.0 | 25.0 | | -5.9 |
| 111E0074 | vgmperceel8-B1772 | cb | x | 78710.0 | 153480.0 | 16.0 | 9.0 | 10.0 | | 6.0 |
| 111E0079 | | cb | x | 77270.0 | 154700.0 | 21.0 | 24.0 | 27.0 | | -6.0 |
| 111E0088 | | cb | x | 80900.0 | 148910.0 | 55.0 | 0.0 | 23.0 | | 32.0 |
| 111E0552 | | cb | x | 79270.0 | 154690.0 | 25.0 | 1.0 | 23.0 | | 2.0 |
| 111E0568 | | cb | x | 74490.0 | 151700.0 | 19.0 | 15.0 | 24.0 | | -5.0 |
| 111E0569 | | cb | x | 74590.0 | 151950.0 | 19.0 | 6.0 | 15.0 | | 4.0 |
| 111E0571 | vgmperceel8-B1769 | cb | x | 80710.0 | 150640.0 | 76.0 | 5.0 | 50.0 | | 26.0 |
| 111E0626 | kb37d111e-B4 | wl | x | 79921.3 | 158009.1 | 12.0 | 20.0 | 25.0 | | -13.0 |
| 111E0637 | | cb | x | 80319.0 | 158044.0 | 14.1 | 17.0 | 24.0 | | -9.9 |
| 111W0031 | | cb | x | 72230.0 | 155360.0 | 25.0 | 8.0 | 19.0 | | 6.0 |
| 112E0001 | vgmperceel8-B1788 | cb | x | 91220.0 | 155930.0 | 45.5 | 4.0 | 39.0 | | 6.5 |
| 112E0002 | vgmperceel8-B1809 | cb | x | 94610.0 | 149720.0 | 49.0 | 16.0 | 22.0 | | 27.0 |
| 112E0004 | subcropBM-112E0004 | cb | x | 96440.0 | 150660.0 | 44.0 | 16.5 | 23.0 | | 21.0 |
| 112E0008 | subcropBM-112E0008 | cb | x | 94210.0 | 153760.0 | 43.0 | | 29.5 | | 13.5 |
| 112E0009 | subcropBM-112E0009 | cb | x | 96300.0 | 150860.0 | 39.0 | 11.3 | 16.8 | | 22.2 |
| 112E0024 | subcropBM-112E0024 | cb | x | 97260.0 | 149510.0 | 51.0 | 12.6 | 21.8 | | 29.2 |
| 112E0027 | vgmperceel8-B1810 | cb | x | 97130.0 | 149450.0 | 51.0 | 14.0 | 22.0 | | 29.0 |
| 112E0048 | subcropBM-112E0048 | cb | x | 96320.0 | 150530.0 | 51.0 | 13.0 | 27.0 | | 24.0 |
| 112E0053 | vgmperceel8-B1793 | cb | x | 92140.0 | 151450.0 | 33.0 | 1.0 | 7.0 | | 26.0 |
| 112E0067 | | cb | x | 94930.0 | 156240.0 | 38.0 | 3.0 | 29.0 | | 9.0 |
| 112E0069 | vgmperceel8-B1792 | cb | x | 91140.0 | 153310.0 | 32.0 | 12.0 | 19.0 | | 13.0 |
| 112E0075 | | cb | x | 92140.0 | 157850.0 | 21.5 | 6.0 | 17.0 | | 4.5 |
| 112E0077 | subcropBM-112E0077 | cb | x | 96720.0 | 148310.0 | 56.0 | 9.0 | 24.0 | | 32.0 |
| 112E0078 | subcropBM-112E0078 | cb | x | 96710.0 | 150670.0 | 40.0 | 15.0 | 22.0 | | 18.0 |
| 112E0084 | | cb | x | 91420.0 | 151740.0 | 46.0 | 10.0 | 16.0 | | 30.0 |
| 112E0090 | | cb | x | 96640.0 | 150550.0 | 44.0 | 11.0 | 25.0 | | 19.0 |
| 112E0094 | | cb | x | 94290.0 | 153530.0 | 43.0 | 1.0 | 23.0 | | 20.0 |
| 112E0106 | | cb | x | 96710.0 | 149390.0 | 38.0 | 2.0 | 11.0 | | 27.0 |
| 112E0146 | kb37d112e-B185 | cb | x | 92460.0 | 157690.0 | 21.0 | 10.0 | 16.0 | | 5.0 |
| 112E0149 | subcropBM-112E0149 | cb | x | 96590.0 | 149360.0 | 37.5 | 5.3 | 7.3 | | 30.3 |
| 112E0790 | vgmperceel8-B1790 | cb | x | 92420.0 | 156720.0 | 23.0 | 11.0 | 15.0 | | 8.0 |
| 112E0791 | vgmperceel8-B1805 | cb | x | 97570.0 | 151480.0 | 45.0 | 14.0 | 25.0 | | 20.0 |
| 112E0799 | subcropBM-112E0799 | cb | x | 97240.0 | 150670.0 | 35.0 | 3.0 | 9.0 | | 26.0 |
| 112W0005 | subcropBM-112W0005 | cb | x | 87690.0 | 151090.0 | 45.5 | 3.2 | 23.6 | | 21.9 |
| 112W0006 | vgmperceel8-B1776 | cb | x | 87740.0 | 151160.0 | 45.0 | 6.0 | 26.0 | | 19.0 |
| 112W0007 | | cb | x | 86520.0 | 156220.0 | 18.0 | 8.0 | 16.4 | | 1.6 |
| 112W0009 | | cb | x | 85460.0 | 156170.0 | 20.0 | 7.8 | 16.0 | | 4.0 |
| 112W0016 | | cb | x | 84700.0 | 155210.0 | 27.0 | 5.0 | 23.0 | | 4.0 |
| 112W0018 | | cb | x | 85720.0 | 157740.0 | 21.0 | 8.0 | 23.0 | | -2.0 |
| 112W0024 | | cb | x | 86350.0 | 155600.0 | 30.0 | 7.0 | 33.0 | | -3.0 |
| 112W0035 | vgmperceel8-B1755 | cb | x | 86560.0 | 151140.0 | 52.0 | 4.0 | 29.0 | | 23.0 |
| 112W0039 | | cb | x | 85760.0 | 156230.0 | 19.0 | 8.0 | 15.0 | | 4.0 |
| 112W0399 | | cb | x | 82760.0 | 152140.0 | 31.0 | 0.0 | 17.0 | | 14.0 |
| 112W0400 | | cb | x | 86300.0 | 157640.0 | 16.0 | 1.0 | 19.0 | | -3.0 |
| 112W0401 | | cb | x | 83080.0 | 154230.0 | 26.0 | 0.0 | 19.0 | | 7.0 |
| 112W0402 | vgmperceel8-B1754 | cb | x | 82250.0 | 150500.0 | 62.0 | 5.0 | 46.0 | | 16.0 |
| 112W0407 | vgmperceel8-B1750 | cb | x | 87320.0 | 151120.0 | 53.0 | 12.0 | 42.0 | | 11.0 |
| 112W0408 | vgmperceel8-B1749 | cb | x | 86360.0 | 148190.0 | 57.0 | 1.0 | 30.0 | | 27.0 |
| 112W0410 | subcropBM-112W0410 | cb | x | 85840.0 | 156990.0 | 17.0 | 6.0 | 19.0 | | -2.0 |
| 112W0411 | vgmperceel8-B1747 | cb | x | 85830.0 | 157040.0 | 17.0 | 14.0 | 22.0 | | -5.0 |
| 112W0418 | subcropBM-112W0418 | cb | x | 85245.0 | 150155.0 | 41.3 | 1.0 | 18.0 | | 23.3 |
| 112W0419 | subcropBM-112W0419 | cb | x | 85258.0 | 150134.0 | 41.0 | 4.0 | 21.0 | | 20.0 |
| 112W0420 | vgmperceel8-B1740 | cb | x | 85258.0 | 150169.0 | 41.5 | 5.0 | 15.0 | | 26.5 |
| 112W0421 | subcropBM-112W0421 | cb | x | 85227.0 | 150191.0 | 42.0 | 4.0 | 18.0 | | 24.0 |
| 112W0422 | subcropBM-112W0422 | cb | x | 85193.0 | 150234.0 | 43.0 | 5.0 | 18.0 | | 25.0 |
| 113E0024 | subcropBM-113E0024 | cb | x | 113480.0 | 154060.0 | 25.0 | 9.0 | 14.0 | | 11.0 |
| 113E0030 | | cb | x | 113400.0 | 151910.0 | 44.0 | 1.2 | 15.0 | | 29.0 |
| 113E0031 | subcropBM-113E0031 | cb | x | 113380.0 | 152030.0 | 39.0 | 3.0 | 4.5 | | 34.5 |
| 113E0032 | vgmperceel7-B234 | cb | x | 113250.0 | 152620.0 | 36.0 | 1.5 | 9.5 | | 26.5 |
| 113E0037 | subcropBM-113E0037 | cb | x | 113940.0 | 155400.0 | 43.0 | 4.0 | 20.9 | | 22.1 |
| 113E0039 | subcropBM-113E0039 | cb | x | 113950.0 | 154400.0 | 35.0 | 9.5 | 10.1 | | 24.9 |
| 113E0168 | subcropBM-113E0168 | cb | x | 110000.0 | 149250.0 | 36.0 | 7.0 | 14.0 | | 22.0 |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| 113E0970 | subcropBM-113E0970 | cb | | x | 108960.0 | 156420.0 | 32.0 | 15.0 | 21.0 | | 11.0 |
| 113E0971 | vgmperceel7-B1004 | cb | | x | 108360.0 | 155860.0 | 36.0 | 17.0 | 20.0 | | 16.0 |
| 113E0972 | vgmperceel7-B1005 | cb | | x | 111280.0 | 148600.0 | 61.0 | 3.0 | 12.0 | | 49.0 |
| 113E0985 | vgmperceel7-B1080 | cb | | x | 111780.0 | 155760.0 | 37.0 | 17.5 | 20.0 | | 17.0 |
| 113E1004 | vgmperceel7-B252 | cb | | x | 110360.0 | 155390.0 | 62.0 | 5.8 | 42.7 | | 19.3 |
| 113E1005 | vgmperceel7-B248 | cb | | x | 111220.0 | 155970.0 | 29.0 | 14.7 | 26.5 | | 2.5 |
| 113E1016 | vgmperceel7-B242 | cb | | x | 107880.0 | 150960.0 | 46.0 | 10.5 | 17.5 | | 28.5 |
| 113E1017 | subcropBM-113E1017 | cb | | x | 107950.0 | 151030.0 | 43.7 | 12.0 | 14.5 | | 29.2 |
| 113E1023 | vgmperceel7-B244 | cb | | x | 109390.0 | 151960.0 | 37.1 | 17.0 | 22.8 | | 14.3 |
| 113E1027 | subcropBM-113E1027 | cb | | x | 112423.0 | 151764.0 | 39.4 | 7.5 | 10.7 | | 28.7 |
| 113E1029 | subcropBM-113E1029 | cb | | x | 112987.0 | 151460.0 | 48.9 | 4.0 | 19.5 | | 29.4 |
| 113E1031 | vgmperceel7-B247 | cb | | x | 113656.0 | 151062.0 | 47.6 | 7.5 | 14.3 | | 33.3 |
| 113E1032 | subcropBM-113E1032 | cb | | x | 113860.0 | 151190.0 | 46.7 | 1.5 | 14.4 | | 32.3 |
| 113W0015 | | cb | | x | 99180.0 | 151760.0 | 39.0 | 9.0 | 17.0 | | 22.0 |
| 113W0016 | vgmperceel7-B135 | cb | | x | 105810.0 | 149640.0 | 50.0 | 10.0 | 17.0 | | 33.0 |
| 113W1030 | vgmperceel7-B134 | cb | | x | 103730.0 | 148800.0 | 55.0 | 14.0 | 24.0 | | 31.0 |
| 113W1031 | vgmperceel8-B1780 | cb | | x | 98530.0 | 151800.0 | 37.0 | 9.0 | 15.0 | | 22.0 |
| 113W1032 | | cb | | x | 98550.0 | 151760.0 | 39.0 | 11.0 | 18.0 | | 21.0 |
| 113W1033 | vgmperceel7-B133 | cb | | x | 104100.0 | 151980.0 | 56.0 | 13.0 | 33.0 | | 23.0 |
| 114E0002 | kb38d114e-B2 | cb | | x | 127586.0 | 152591.0 | 58.0 | 5.5 | 9.5 | | 48.5 |
| 114E0022 | | cb | | x | 126134.0 | 153291.0 | 37.0 | 5.1 | 19.5 | | 17.6 |
| 114E0026 | kb38d114e-B26 | cb | | x | 127502.0 | 153722.0 | 64.0 | 16.4 | 23.2 | | 40.8 |
| 114E0056 | vgmperceel7-B128 | cb | | x | 126990.0 | 148937.0 | 85.0 | 7.2 | 26.9 | | 58.1 |
| 114E0064 | kb38d114e-B64 | cb | | x | 126487.0 | 153898.0 | 45.0 | 5.0 | 12.0 | | 33.0 |
| 114W0007 | | cb | | x | 121493.0 | 151442.0 | 62.0 | 9.5 | 22.0 | | 40.0 |
| 114W0008 | kb38d114w-B8 | cb | | x | 119495.0 | 151412.0 | 47.0 | 8.0 | 10.0 | | 37.0 |
| 114W0011 | kb38d114w-B11 | cb | | x | 121342.0 | 151416.0 | 59.0 | 8.5 | 20.9 | | 38.1 |
| 114W0013 | | cb | | x | 114267.0 | 155489.0 | 40.0 | 5.3 | 11.2 | | 28.8 |
| 114W0015 | subcropBM-114W0015 | cb | | x | 114179.0 | 155523.0 | 39.0 | 7.0 | 11.5 | | 27.5 |
| 114W0016 | | cb | | x | 114355.0 | 155488.0 | 40.0 | 6.4 | 11.5 | | 28.5 |
| 114W0018 | kb38d114w-B18 | cb | | x | 114553.0 | 155529.0 | 35.0 | 5.5 | 7.7 | | 27.3 |
| 114W0051 | kb38d114w-B51 | cb | | x | 118565.0 | 148784.0 | 59.0 | 13.0 | 15.0 | | 44.0 |
| 114W0058 | kb38d114w-B58 | cb | | x | 114664.0 | 154710.0 | 57.4 | 0.0 | 32.8 | | 24.7 |
| 114W0059 | vgmperceel7-B1088 | cb | | x | 115577.0 | 156410.0 | 53.3 | 0.0 | 33.2 | | 20.1 |
| 114W0060 | kb38d114w-B60 | cb | | x | 114185.0 | 156659.0 | 36.8 | 0.0 | 15.1 | | 21.7 |
| 114W0093 | geobib-B107 | cb | | x | 119940.0 | 156410.0 | 31.0 | 8.0 | 12.0 | | 19.0 |
| 114W0097 | B/2-0428 | cb | | x | 121594.0 | 154145.0 | 58.6 | 9.0 | 18.0 | | 40.6 |
| 115E0284 | vgmperceel6-B9 | cb | | x | 142120.0 | 151660.0 | 70.0 | 6.8 | 17.3 | | 52.7 |
| 115E0387 | vgmperceel6-B21 | cb | x | x | 141490.0 | 148640.0 | 122.0 | 17.0 | 48.5 | 105.0 | 73.5 |
| 115E0395 | | cb | | x | 140120.0 | 151240.0 | 65.0 | 0.0 | 4.0 | | 61.0 |
| 115E0441 | vgmperceel6-B24 | cb | | x | 138490.0 | 152940.0 | 62.0 | 3.1 | 5.5 | | 56.5 |
| 115E0512 | | cb | | x | 145420.0 | 152710.0 | 68.9 | 8.8 | 9.5 | | 59.4 |
| 115E0913 | B/2-0435a | cb | x | x | 144289.0 | 154712.0 | 122.0 | 40.0 | 72.0 | 82.0 | 50.0 |
| 115E0918 | | cb | | x | 141095.0 | 156659.0 | 62.0 | 2.0 | 21.5 | | 40.5 |
| 115E0919 | | cb | | x | 140923.0 | 156739.0 | 55.0 | 7.5 | 16.5 | | 38.5 |
| 115W0100 | vgmperceel7-B186 | cb | | x | 130590.0 | 153550.0 | 63.0 | 11.0 | 15.0 | | 48.0 |
| 115W0104 | kb39d115w-B2 | cb | | x | 134920.0 | 155480.0 | 63.0 | 10.3 | 17.7 | | 45.4 |
| 115W0112 | kb39d115w-B4 | cb | | x | 135220.0 | 155090.0 | 68.0 | 10.2 | 22.3 | | 45.7 |
| 115W0115 | | cb | | x | 137740.0 | 152870.0 | 52.0 | 1.3 | 3.0 | | 49.0 |
| 115W0117 | | cb | | x | 137810.0 | 152850.0 | 54.0 | 1.9 | 7.2 | | 46.8 |
| 115W0118 | | cb | | x | 137820.0 | 152880.0 | 52.0 | 1.5 | 5.3 | | 46.8 |
| 115W0127 | kb39d115w-B5 | cb | | x | 135050.0 | 155090.0 | 73.0 | 10.5 | 24.9 | | 48.2 |
| 115W0130 | | cb | | x | 137850.0 | 152600.0 | 65.0 | 5.5 | 14.5 | | 50.5 |
| 115W0141 | | cb | | x | 137860.0 | 152220.0 | 60.0 | 2.5 | 7.5 | | 52.6 |
| 115W0143 | vgmperceel7-B180 | cb | | x | 137740.0 | 154240.0 | 56.0 | 3.0 | 7.0 | | 49.0 |
| 115W0169 | subcropBM-115W0169 | cb | | x | 132970.0 | 149290.0 | 84.0 | 6.0 | 14.0 | | 70.0 |
| 115W0180 | subcropBM-115W0180 | cb | | x | 135770.0 | 149330.0 | 97.6 | 7.1 | 29.1 | | 68.5 |
| 115W0181 | subcropBM-115W0181 | cb | | x | 135410.0 | 148860.0 | 104.6 | 1.3 | 37.8 | | 66.8 |
| 115W0185 | subcropBM-115W0185 | cb | | x | 131390.0 | 152870.0 | 70.0 | 10.0 | 20.0 | | 50.0 |
| 115W0186 | vgmperceel7-B1107 | cb | | x | 131410.0 | 153180.0 | 60.0 | 10.0 | 15.0 | | 45.0 |
| 115W0187 | vgmperceel7-B175 | cb | | x | 131240.0 | 152650.0 | 65.0 | 9.0 | 14.0 | | 51.0 |
| 115W0188 | subcropBM-115W0188 | cb | | x | 130550.0 | 153230.0 | 65.0 | 10.5 | 16.5 | | 48.5 |
| 115W0190 | subcropBM-115W0190 | cb | | x | 130680.0 | 153030.0 | 60.0 | | 8.0 | | 52.0 |
| 115W0191 | vgmperceel7-B1108 | cb | | x | 130720.0 | 153130.0 | 60.0 | | 4.0 | | 56.0 |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| 115W0192 | subcropBM-115W0192 | cb | | x | 130720.0 | 153320.0 | 60.0 | | 11.0 | | 49.0 |
| 115W0193 | subcropBM-115W0193 | cb | | x | 130800.0 | 152600.0 | 60.0 | | 6.0 | | 54.0 |
| 115W0194 | subcropBM-115W0194 | cb | | x | 130630.0 | 152580.0 | 60.0 | | 15.0 | | 45.0 |
| 115W0195 | subcropBM-115W0195 | cb | | x | 130950.0 | 152500.0 | 60.0 | | 20.0 | | 40.0 |
| 115W0196 | subcropBM-115W0196 | cb | | x | 131040.0 | 152530.0 | 60.0 | | 20.0 | | 40.0 |
| 115W0198 | subcropBM-115W0198 | cb | | x | 130470.0 | 152450.0 | 69.0 | 3.0 | 25.0 | | 44.0 |
| 115W0199 | subcropBM-115W0199 | cb | | x | 130170.0 | 152080.0 | 68.0 | 4.0 | 18.0 | | 50.0 |
| 115W0200 | vgmperceel7-B172 | cb | | x | 130750.0 | 152040.0 | 71.0 | 4.0 | 12.0 | | 59.0 |
| 115W0201 | subcropBM-115W0201 | cb | | x | 130720.0 | 152310.0 | 67.0 | 3.0 | 16.0 | | 51.0 |
| 115W0202 | vgmperceel7-B173 | cb | | x | 130270.0 | 152330.0 | 66.0 | 3.0 | 16.0 | | 50.0 |
| 115W0203 | subcropBM-115W0203 | cb | | x | 130240.0 | 152480.0 | 65.0 | 4.0 | 15.0 | | 50.0 |
| 115W0206 | subcropBM-115W0206 | cb | | x | 135870.0 | 148880.0 | 82.6 | 4.0 | 15.2 | | 67.4 |
| 115W0209 | vgmperceel7-B169 | cb | | x | 135700.0 | 149900.0 | 90.4 | 2.0 | 21.0 | | 69.5 |
| 115W0210 | subcropBM-115W0210 | cb | | x | 135100.0 | 148920.0 | 104.4 | 1.0 | 27.6 | | 76.8 |
| 115W0220 | kb39d115w-B19 | cb | | x | 131810.0 | 155880.0 | 72.5 | 2.8 | 33.4 | | 39.1 |
| 115W0361 | B/2-0415 | cb | | x | 131650.0 | 156174.0 | 74.0 | 13.0 | 36.0 | | 38.0 |
| 116E0136 | kb39d116e-B47 | cb | x | x | 160373.0 | 154945.0 | 111.0 | 42.0 | 75.0 | 69.0 | 36.0 |
| 116E0139 | kb39d116e-B50 | cb | x | x | 159235.0 | 156717.0 | 104.0 | 39.0 | 57.6 | 65.0 | 46.4 |
| 116E0149 | vgmperceel6-B86 | cb | x | x | 157061.0 | 150952.0 | 79.0 | 6.0 | 9.8 | 73.0 | 69.2 |
| 116W0138 | vgmperceel6-B49 | cb | x | x | 148981.0 | 150712.0 | 96.2 | 12.0 | 27.1 | 84.0 | 69.1 |
| 116W0148 | kb39d116w-B34 | cb | x | x | 150018.0 | 154000.0 | 81.3 | 5.4 | 25.8 | 76.0 | 55.5 |
| 116W0185 | vgmperceel6-B57 | cb | | x | 146305.0 | 152739.0 | 71.0 | 7.0 | 12.2 | | 58.8 |
| 116W0243 | kb39d116w-B72 | cb | x | x | 146287.0 | 156265.0 | 104.0 | 21.0 | 55.0 | 83.0 | 49.0 |
| 117E0147 | vgmperceel6-B147 | cb | x | x | 171420.0 | 153440.0 | 129.0 | 27.0 | 34.0 | 102.0 | 95.0 |
| 117W0168 | | cb | x | x | 159832.0 | 151795.0 | 60.0 | 4.3 | 7.0 | 56.0 | 53.0 |
| 127E0041 | vgmperceel7-B226 | cb | | x | 126590.0 | 141120.0 | 96.0 | 8.2 | 14.5 | | 81.5 |
| 127E0042 | vgmperceel7-B225 | cb | | x | 122390.0 | 142060.0 | 89.0 | 11.0 | 21.0 | | 68.0 |
| 128E0405 | | cb | | x | 139990.0 | 139240.0 | 116.0 | 3.9 | 11.4 | | 104.7 |
| 128E0651 | subcropBM-128e0651 | cb | | x | 143820.0 | 144230.0 | 114.0 | 5.0 | 22.0 | | 92.0 |
| 128W0202 | | cb | | x | 133360.0 | 143600.0 | 103.0 | 7.0 | 18.3 | | 84.7 |
| 128W0203 | | cb | | x | 133420.0 | 143640.0 | 104.0 | 8.0 | 15.5 | | 88.5 |
| 128W0205 | | cb | | x | 133500.0 | 143560.0 | 98.0 | 3.9 | 14.4 | | 83.6 |
| 128W0220 | vgmperceel7-B12 | cb | | x | 134020.0 | 145810.0 | 105.0 | 6.0 | 30.2 | | 74.8 |
| 128W0222 | | cb | | x | 135620.0 | 147400.0 | 80.0 | 3.7 | 6.4 | | 73.6 |
| 128W0230 | vgmperceel7-B7 | cb | | x | 135740.0 | 145410.0 | 90.0 | 8.0 | 15.0 | | 75.0 |
| 129E0183 | | cb | x | x | 157470.0 | 138790.0 | 135.0 | 9.5 | 11.0 | 126.0 | 124.0 |
| 129E0208 | vgmperceel6-B233 | cb | x | x | 160980.0 | 138830.0 | 137.0 | 10.7 | 12.1 | 126.0 | 124.9 |
| 129W0120 | | cb | | x | 146560.0 | 143380.0 | 115.0 | 0.3 | 24.6 | | 90.4 |
| 129W0133 | vgmperceel6-B209 | cb | x | x | 148390.0 | 142680.0 | 122.0 | 4.0 | 21.0 | 118.0 | 101.0 |
| 129W0141 | | cb | x | x | 148404.0 | 142660.0 | 124.0 | 6.0 | 23.0 | 118.0 | 101.0 |
| 129W0145 | | cb | | x | 146290.0 | 143320.0 | 99.0 | 2.0 | 3.0 | | 96.0 |
| 129W0157 | vgmperceel6-B214 | cb | x | x | 148920.0 | 143170.0 | 144.0 | 16.0 | 48.0 | 128.0 | 96.0 |
| 129W0225 | | cb | x | x | 149693.0 | 146786.0 | 137.6 | 43.0 | 52.0 | 95.0 | 85.6 |
| 129W0228 | | cb | x | x | 149879.0 | 146189.0 | 147.0 | 42.0 | 52.0 | 105.0 | 95.0 |
| 139E0173 | | cb | | x | 110144.0 | 132625.0 | 85.0 | 2.0 | 6.0 | | 79.0 |
| 139E0279 | | cb | | x | 110988.0 | 133278.0 | 83.0 | 1.0 | 6.0 | | 77.0 |
| 140E0203 | | cb | | x | 123464.0 | 132711.0 | 91.0 | 3.0 | 15.0 | | 76.0 |
| 140W0168 | | cb | | x | 120758.0 | 136266.0 | 87.0 | 0.0 | 9.0 | | 78.0 |
| 140W0253 | | cb | | x | 121910.0 | 128245.0 | 59.0 | 1.0 | 9.0 | | 50.0 |
| 141E0199 | | cb | | x | 139670.0 | 132160.0 | 136.0 | 3.0 | 24.7 | | 111.3 |
| 141E0233 | | cb | | x | 138860.0 | 131080.0 | 133.0 | 6.0 | 20.5 | | 112.5 |
| 141E0245 | | cb | | x | 138030.0 | 131020.0 | 125.5 | 9.5 | 10.4 | | 115.2 |
| 141E0257 | | cb | | x | 144680.0 | 132000.0 | 141.2 | 9.6 | 14.6 | | 126.6 |
| 141E0275 | | cb | x | x | 145680.0 | 131410.0 | 146.5 | 0.7 | 31.3 | 146.0 | 115.2 |
| 141E0278 | | cb | x | x | 145890.0 | 131400.0 | 146.2 | 4.4 | 33.3 | 142.0 | 113.0 |
| 141E0279 | | cb | | x | 145810.0 | 131200.0 | 124.2 | 3.1 | 3.9 | | 120.4 |
| 141E0284 | | cb | x | x | 145940.0 | 132330.0 | 137.1 | 5.6 | 21.0 | 132.0 | 116.1 |
| 141E0286 | | cb | x | x | 145420.0 | 132110.0 | 155.2 | 7.3 | 43.8 | 148.0 | 111.4 |
| 141E0288 | | cb | | x | 144750.0 | 131880.0 | 140.8 | 10.5 | 31.5 | | 109.3 |
| 141E0289 | | cb | | x | 143300.0 | 133330.0 | 127.6 | 2.0 | 15.2 | | 112.4 |
| 141E0290 | | cb | | x | 143610.0 | 133120.0 | 135.7 | 3.5 | 23.0 | | 112.7 |
| 141E0291 | | cb | x | x | 143820.0 | 132790.0 | 155.8 | 4.5 | 43.0 | 151.0 | 112.8 |
| 141E0292 | | cb | | x | 143860.0 | 132860.0 | 146.3 | 0.5 | 33.0 | | 113.3 |
| 141E0293 | | cb | | x | 143880.0 | 132990.0 | 139.3 | 5.0 | 30.0 | | 109.3 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 141E0294 | | cb | x | x | 143940.0 | 133090.0 | 149.9 | 0.0 | 37.0 | 150.0 | 112.9 |
| 141E0295 | | cb | x | x | 144050.0 | 132730.0 | 160.6 | 7.5 | 47.0 | 153.0 | 113.6 |
| 141E0296 | | cb | x | x | 144070.0 | 132910.0 | 159.2 | 9.0 | 48.5 | 150.0 | 110.7 |
| 141E0297 | | cb | x | x | 144090.0 | 132950.0 | 158.1 | 7.0 | 45.5 | 151.0 | 112.6 |
| 141E0298 | | cb | x | x | 144060.0 | 132990.0 | 156.3 | 3.0 | 43.5 | 153.0 | 112.8 |
| 141E0299 | | cb | x | x | 144100.0 | 133140.0 | 158.3 | 6.5 | 46.0 | 152.0 | 112.3 |
| 141E0300 | | cb | x | x | 144080.0 | 133200.0 | 159.6 | 8.5 | 51.0 | 151.0 | 108.6 |
| 141E0301 | | cb | x | x | 144260.0 | 132780.0 | 152.8 | 0.5 | 42.0 | 152.0 | 110.8 |
| 141E0302 | | cb | | x | 144300.0 | 132930.0 | 143.8 | 4.5 | 33.5 | | 110.3 |
| 141E0304 | | cb | | x | 144370.0 | 132620.0 | 145.9 | 4.0 | 35.0 | | 110.9 |
| 141E0305 | | cb | | x | 144400.0 | 132780.0 | 146.6 | 5.0 | 32.5 | | 114.1 |
| 141E0306 | | cb | | x | 144400.0 | 132820.0 | 149.4 | 3.5 | 35.0 | | 114.4 |
| 141E0307 | | cb | | x | 144540.0 | 132970.0 | 140.1 | 4.0 | 31.0 | | 109.1 |
| 141E0308 | | cb | | x | 144570.0 | 132490.0 | 142.2 | 7.0 | 28.5 | | 113.7 |
| 141E0309 | | cb | | x | 144560.0 | 132570.0 | 141.0 | 10.0 | 26.0 | | 115.0 |
| 141E0310 | | cb | | x | 144870.0 | 132650.0 | 136.4 | 5.0 | 24.0 | | 112.4 |
| 141E0311 | | cb | | x | 144610.0 | 132340.0 | 135.8 | 4.5 | 19.5 | | 116.3 |
| 141E0312 | | cb | | x | 144770.0 | 132430.0 | 135.8 | 7.0 | 20.5 | | 115.3 |
| 141E0313 | | cb | | x | 144910.0 | 132480.0 | 138.2 | 3.5 | 24.0 | | 114.2 |
| 141E0314 | | cb | | x | 144720.0 | 132190.0 | 132.1 | 4.5 | 24.0 | | 108.1 |
| 141E0315 | | cb | | x | 144790.0 | 132340.0 | 124.8 | 2.0 | 9.5 | | 115.3 |
| 141E0316 | | cb | | x | 144980.0 | 132340.0 | 141.1 | 2.5 | 25.5 | | 115.6 |
| 141E0317 | | cb | | x | 144730.0 | 131950.0 | 139.9 | 9.5 | 26.0 | | 113.9 |
| 141E0319 | | cb | | x | 145050.0 | 132190.0 | 143.0 | 3.0 | 26.0 | | 117.0 |
| 141E0320 | | cb | x | x | 143930.0 | 133220.0 | 154.7 | 1.0 | 46.1 | 154.0 | 108.6 |
| 141E0321 | | cb | | x | 143660.0 | 133210.0 | 150.2 | 0.5 | 44.0 | | 106.2 |
| 141E0322 | | cb | | x | 138950.0 | 130180.0 | 135.0 | 3.0 | 24.0 | | 111.0 |
| 141E0323 | | cb | | x | 142300.0 | 133820.0 | 123.5 | 10.0 | 11.0 | | 112.5 |
| 141E0325 | | cb | | x | 141570.0 | 134330.0 | 126.6 | 16.0 | 18.5 | | 108.1 |
| 141E0326 | | cb | | x | 141130.0 | 134930.0 | 122.3 | 15.0 | 20.0 | | 102.3 |
| 141E0327 | | cb | | x | 140880.0 | 135680.0 | 125.6 | 4.5 | 16.5 | | 109.1 |
| 141E0328 | | cb | | x | 140800.0 | 135790.0 | 128.0 | 2.0 | 20.0 | | 108.0 |
| 141E0329 | | cb | | x | 140780.0 | 135940.0 | 129.9 | 5.5 | 20.5 | | 109.4 |
| 141E0330 | | cb | | x | 140750.0 | 136030.0 | 134.2 | 2.5 | 26.0 | | 108.2 |
| 141E0331 | | cb | | x | 140710.0 | 136200.0 | 131.2 | 4.5 | 22.5 | | 108.7 |
| 141E0332 | | cb | | x | 140370.0 | 137070.0 | 125.1 | 4.0 | 19.5 | | 105.6 |
| 141E0343 | | cb | | x | 139180.0 | 131240.0 | 155.0 | 0.0 | 42.0 | | 113.0 |
| 141W0251 | | cb | | x | 136710.0 | 130520.0 | 124.0 | 9.0 | 11.0 | | 113.0 |
| 141W0252 | | cb | | x | 136730.0 | 130900.0 | 124.0 | 4.0 | 10.0 | | 114.0 |
| 141W0254 | | cb | | x | 131330.0 | 132440.0 | 114.0 | 6.5 | 28.0 | | 86.0 |
| 141W0258 | | cb | | x | 137020.0 | 129490.0 | 133.0 | 15.3 | 18.8 | | 114.3 |
| 141W0278 | | cb | | x | 136630.0 | 129510.0 | 118.5 | 4.0 | 7.0 | | 111.5 |
| 141W0327 | | cb | | x | 136540.0 | 130350.0 | 125.0 | 5.0 | 11.0 | | 114.0 |
| 141W0330 | | cb | | x | 137490.0 | 131290.0 | 118.0 | 4.0 | 5.0 | | 113.0 |
| 141W0331 | | cb | | x | 131850.0 | 135640.0 | 129.0 | 8.0 | 33.0 | | 96.0 |
| 150E0322 | | cb | | x | 113893.0 | 126778.0 | 26.0 | 11.5 | 31.0 | | -5.0 |
| 150E0349 | | cb | | x | 109917.0 | 126949.0 | 25.9 | 12.0 | 38.0 | | -12.1 |
| 150E0354 | | cb | | x | 108817.0 | 126880.0 | 23.0 | 6.0 | 18.0 | | 5.0 |
| 150E0365 | | cb | | x | 110239.0 | 127154.0 | 24.1 | 8.0 | 27.0 | | -3.0 |
| 150E0368 | | cb | | x | 110357.0 | 127208.0 | 23.6 | 8.0 | 25.0 | | -1.4 |
| 150W0195 | | cb | | x | 99867.0 | 126867.0 | 21.7 | 10.0 | 49.0 | | -27.3 |
| 150W0196 | | cb | | x | 100055.0 | 126869.0 | 21.9 | 10.0 | 50.0 | | -28.1 |
| 150W0198 | | cb | | x | 100454.0 | 126878.0 | 21.7 | 12.0 | 59.0 | | -37.3 |
| 150W0199 | | cb | | x | 100624.0 | 126885.0 | 21.6 | 11.0 | 49.0 | | -27.4 |
| 150W0201 | | cb | | x | 101030.0 | 126889.0 | 22.0 | 10.0 | 52.0 | | -30.0 |
| 151E0295 | | cb | | x | 122861.0 | 126651.0 | 70.0 | 0.0 | 29.0 | | 41.0 |
| 151W0467 | | cb | | x | 120075.0 | 124425.0 | 54.0 | 0.0 | 3.0 | | 51.0 |
| 151W0573 | | cb | | x | 121985.0 | 127028.0 | 52.0 | 5.0 | 34.0 | | 18.0 |
| 152E0217 | | cb | x | x | 145420.0 | 123650.0 | 180.0 | 10.1 | 28.2 | 170.0 | 151.8 |
| 152E0219 | | cb | x | x | 142990.0 | 122050.0 | 170.0 | 7.0 | 16.9 | 163.0 | 153.1 |
| 152E0235 | | cb | | x | 141970.0 | 122740.0 | 160.1 | 4.0 | 16.0 | | 144.1 |
| 152E0236 | | cb | | x | 143020.0 | 122900.0 | 147.2 | 1.0 | 2.0 | | 145.2 |
| 999A0013 | | cb | x | | 45074.0 | 239293.0 | -19.3 | 34.6 | | -54.0 | |
| 999A0015 | "VR1" | cb | x | | 66388.0 | 242398.0 | -12.7 | 134.4 | | -147.0 | |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| DONGEN-01 | | nl | x | x | 187631.7 | 257556.0 | 12.6 | 867.0 | 985.0 | -854.0 | -972.4 |
| HILVARENBEEK-01 | | nl | x | x | 201939.7 | 244155.3 | 22.8 | 811.0 | 902.0 | -788.0 | -879.2 |
| KORTGENE-01 | | nl | x | x | 113081.2 | 251578.7 | 10.3 | 460.0 | 603.0 | -450.0 | -592.7 |
| RIJSBERGEN-01 | | nl | x | x | 172161.1 | 246564.4 | 16.4 | 688.0 | 811.0 | -672.0 | -794.6 |
| STEENBERGEN-01 | | nl | x | x | 148334.5 | 250490.1 | 5.2 | 660.0 | 785.0 | -655.0 | -779.9 |
| | B/2-0417a | cb | x | x | 141375.0 | 174618.0 | 79.3 | 42.0 | 138.1 | 37.0 | -58.8 |
| | GEO-11/31-B10 | cb | x | | 92646.7 | 191774.5 | 9.3 | 20.5 | | -11.0 | |
| | GEO-11/31-B15 | cb | x | | 92530.3 | 191520.6 | 9.2 | 19.0 | | -10.0 | |
| | GEO-11/31-B25 | cb | x | | 92586.0 | 191469.3 | 9.1 | 16.5 | | -7.0 | |
| | GEO-11/31-B28 | cb | x | | 92641.3 | 191606.4 | 9.4 | 17.8 | | -8.0 | |
| | GEO-11/81-S135 | cb | x | | 128505.4 | 185392.5 | 7.2 | 18.6 | | -11.0 | |
| | GEO-11/81-S187 | cb | x | | 129009.4 | 186150.0 | 6.6 | 23.4 | | -17.0 | |
| | GEO-11/81-S31 | cb | x | | 128204.7 | 185063.2 | 6.9 | 10.6 | | -4.0 | |
| | GEO-84/243-SV | cb | x | | 129592.0 | 188235.0 | 5.2 | 32.5 | | -27.0 | |

Appendix 9: Isohypse and isopach maps of the Ypresian Clay