

# Tidal marsh and mudflat soils in the inner Scheldt Estuary: Technical Report

Site and soil description, analytical data &  
World Reference Base- classification

Mikkelsen, J.H., Dillen, J., Van Braeckel, A., Genouw, G. &  
Van den Bergh, E.

INBO.R.2011. 46



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Research Institute for Nature and Forest (INBO)

The Research Institute for Nature and Forest (INBO) is the Flemish research and knowledge centre for nature and its sustainable management and use. INBO conducts research and supplies knowledge to all those who prepare or make the policies or are interested in them.

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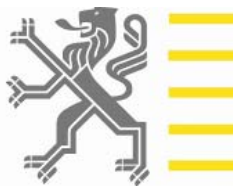
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**Foto cover:** Soil profile in Schor Ouden Doel by Jari Mikkelsen

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# 1. Introduction

## 1.1 General introduction

When the Soil map of Belgium before 1973 was constructed, soils of the estuarine part of the Scheldt were excluded. Since then little attempts have been made to classify soils of the tidal mudflats and tidal marshes of the Belgian part of the river Scheldt. Only one study by Van de Moortel & Deckers, 1997 has provided a series of augerings with the code according to the soil legend handled on the Belgian Soil Map. This study In de framework of the research project 'Inventory and Historical analyses of the Seaschelde environment', describes soil profiles of 4 tidal marshes and adjacent mudflats along the estuarine salinity gradient of this highly dynamic ecosystem. Based on the analytical data of these soils have been classified according to the international classification system for soil (World Reference Base).

## 1.2 World reference base; General comments

General comments that count for all soil profiles classified below:

### **Argic:**

In the WRB classification system the presence of a diagnostic horizon, property or material is based on a set of diagnostic criteria. In addition to this some general information, field identifications additional characteristics and links with other diagnostics are provided. When classifying a soil the diagnostic criteria are in principle determining if an item is present or not. In reality though, some common sense is required and the information provided beside the diagnostic criteria should be consulted as well.

As an example soil profile P2 classified below is located on an estuarine tidal marsh where flooding is occurring bimonthly. The soil is very immature, unripe in depth and contains between 6-14% calcium carbonate including in the present day surface horizon. If testing this soil for the presence of an Argic horizon, it turns out that actually the clay increase between H1 and H3 (pipette texture data are not available from the thin transition horizon H2) fulfils all requirements for an argic. It is specified that clay increase merely the result of a lithologic discontinuity is insufficient, but if we test the soil further then a lithologic discontinuity requires some sort of evidence of a discontinuity such as an example presence/absence of stones, difference in mineralogy or an abrupt textural change. In this case only the abrupt textural change may work. If testing for abrupt textural change it turns out that an increase from with 10.4% to 39% is far too little to fulfil the diagnostic criteria for abrupt textural change and hereby excluding also the presence of a lithologic discontinuity. This implies that if only the diagnostic criteria listed for an Argic horizon are considered, then this Fluvisol located in an active sedimentary environment with more than enough chalk present to prevent any kind of clay migration do have an argic horizon. At this point common sense and expert judgement should take over, and per definition exclude the argic horizon for this particular soil because it is obvious that the clay increase entirely the result is of changes in the sedimentary environment. There are no evidences of any kind of pedogenetic process that potentially could have caused this clay increase. Probably in this case the more clayey horizon was deposited about 50 years ago when the soil was located centrally in the tidal marsh, and the less clayey upper horizon has sedimented afterwards during an erosive phase of the tidal marsh that has resulted in that the soil profile today is positioned at the edge between the tidal marsh and the tidal mud flat.

**Calcic horizon:** requires at least 5%-vol. secondary carbonate, which will not be met in any of the studied tidal soils. Almost the entire fraction of carbonate present has been deposited together with the sediment and is therefore primary carbonate.

**Histic horizon**, which consists of poorly aerated organic material, requires the presence of

at least 20% organic matter, which is not the case in for any of the analysed horizons discussed in the following.

**Sodic:** The qualifier sodic requires that 15% of the cations on the exchange complex compose of sodium and magnesium. Following formula applies (all data based on ammonium extractable cations):

$$\text{Sodic\%} = (\text{Na} + \text{Mg}) * 100 / (\text{Na} + \text{Mg} + \text{Ca} + \text{K})$$

For the specifiers no specifications are given, therefore will following be applied:

Hyper: more than 30% (instead of 15%)

**Calcaric:** requires 2% calcaric material in the upper 20-50 cm.

Hyper: for this report 10% weighted average between 0-50 cm is required for hyper to apply





## 1.3 Materials and methods

### 1.3.1 Field survey

The soil profiles of 4 tidal marshes and adjacent mudflats were described and characterised according to guidelines adapted specifically to this type of soils (Mikkelsen et al. 2009). These guidelines are essentially based on the international field guidelines (FAO, 2006). Afterwards the soil have been classified according to the International World Reference Base for Soil Resources (IUSS Working Group WRB, 2007). The colours were measured using the Munsel colour code system (Munsell, 2000). All topographic measurements are in meters T.A.W. (Tweede Algemene Waterpassing -Belgian reference height)

### 1.3.2 Laboratory analyses

Laboratory analyses executed on soil samples taken in the profile pits dates from the period 2008 to 2009. The analytical methods follow partly the ISO standards and partly the standard methods of the Analytical laboratory of the Research Institute for Nature and Forest. An overview of the analytical methods is presented in Table 1 and Table 2.

Table 1: Overview of the analytical methods conducted on the samples taken from the horizons of the profile pits

Soil variable	Method	Remarks
<i>Particle size distribution</i>	Pipette method: ISO 11277	Following fraction limits are handled: 2, 10, 20, 50 and 2000 $\mu\text{m}$ .
<i>CaCO<sub>3</sub></i>	Acid – Base titration method	
<i>Total N</i>	Modified Kjeldahl method	
<i>Total N</i>	Analyser	
<i>Org. Carbon, TOC</i>	Total Organic Carbon (TOC)	The organic carbon analysed derives from decaying vegetation, bacterial growth, and metabolic activities of living organisms or chemicals.
<i>Basic cations by NH<sub>4</sub>OAc</i>	NH <sub>4</sub> OAc method	
<i>CEC(NH<sub>4</sub>OAc)</i>	Titration	
<i>Exchangeable elements, Free H<sup>+</sup> and exchangeable acidity</i>	ISO 11260 (1994) and ISO 14254 (1994)	Triple BaCl <sub>2</sub> extraction; Free H <sup>+</sup> and exchangeable acidity by titration
<i>CEC(MgSO<sub>4</sub>)</i>	ISO 11260 (1994) 'Compulsive method'	
<i>pH, 1:5, water</i>	Potentiometric	Water soil relation 1:5; weight based
<i>pH, 1:5, CaCl<sub>2</sub></i>	Potentiometric	CaCl <sub>2</sub> solution to soil relation 1:5; weight based
<i>Aqua regia extractable elements</i>		Microwave digestion Extraction with HCl:HNO <sub>3</sub> of 1:3
<i>EC</i>	Potentiometric	Measured concomitantly with pH

Table 1: Overview of the methods of the derived soil variables on the samples taken from the horizons of the profile pits

Derived/calculated soil variables	Description
-----------------------------------	-------------

<i>BS % (Base saturation)</i>	Percent of the basis cations with respect to the measured CEC by NH <sub>4</sub> OAc. Values below detection limit are included for half of the their LOQ value.
<i>CEC (sum)</i>	CEC obtained by the sum of the basic cations and in principle including also the Al <sup>3+</sup> , Fe <sup>3+</sup> , Mn <sup>2+</sup> , Free H <sup>+</sup> cations (but due to the high pH their content is lower than the detection limit) by the BaCl <sub>2</sub> compulsive method
<i>BS by CEC(MgSO<sub>4</sub>) %</i>	The base saturation expressed as the sum of the basic cations with respect to the CEC measured by the MgSO <sub>4</sub> method. Values below detection limit are counted with for half of their LOQ value only.
<i>Acidity (sum)</i>	Sum of Al <sup>3+</sup> , Fe <sup>3+</sup> , Mn <sup>2+</sup> and Free H <sup>+</sup> determined on the triple BaCl <sub>2</sub> extraction
<i>C/N</i>	C/N ratio's discussed in this report are based on either: [(%LOI/2)/%TotalN <sub>modified</sub> ] for the organic layers, or [%TOC/TotalN <sub>modified</sub> ] for the mineral horizons
<i>ESP</i>	A sodic soil, by definition, contains a high level of sodium relative to the other exchangeable cations (i.e. calcium, magnesium and potassium). A soil is considered 'sodic' when the Exchangeable Sodium Percentage (ESP) is 15% or greater. The exchangeable sodium percentage (ESP) is calculated as follows:  ESP = Exchangeable { (Na)/(Ca + Mg + K + Na)} x 100
<i>SAR</i>	Sodium adsorption ratio (SAR) is a measure of the sodicity of soil, as determined from analysis of water extracted from the soil. The formula for calculating sodium adsorption ratio is:  SAR = [Na+] / { ([Ca2+] + [Mg2+]) / 2 } <sup>1/2</sup>

### 1.3.3 Classification

The soils are all classified according to World Reference Base for Soil Resources version 2007 (IUSS Working Group WRB, 2007).

The soils were classified on 2 levels. These are:

1. Full classification name without specifiers, here all prefix and suffix qualifiers present in the soil are listed.
2. Full classification name with specifiers. Due to the arbitrary nature of most specifiers (when is a certain characteristic weak, normal or strong developed?) this level requires some expert judgement.

Although fieldwork and selection of samples for further laboratory analyses were carried out with uppermost care, during the process of classification problem of insufficient data or information was faced. Where possible these data were collected (e.g. asking for additional laboratory data), consulting the digital photographic material etc. If the required data could not be achieved and an expert judgement did not solve the problem a particular qualifier was ignored and the classification continued.

In the profile description the given depths take into account any variation of the horizon boundary. Indicated is the upper and lower limit of the begin and the end of the horizon limit, e.g. H3: 22/25-37/45 cm, means that the upper limit of H3 is found between 22 and 25 cm depth measured from the transition between horizon H2 and horizon H3. The lower limit of H3 is found between 37 and 45 cm.

In the tables of analytical data the indicated depths are simplified. Here the mean upper and lower horizon limits are presented. The mean has been obtained by estimating the

mean from the profile sketches. A horizon boundary that as an example remains at 20 cm over 80% of the boundary and at the end dips to 30 cm will get the mean depth 22 cm

#### 1.3.4 Structure of the report

In the following chapter each soil profile is described in a separate paragraph. Within each salinity zone each paragraph starts with 1) the site and profile description, followed by 2) the analytical laboratory data, and 3) the soil classification according to WRB 2007.



Photo: Soil description in the field at a creek edge in the 'schor of Ouden Doel'



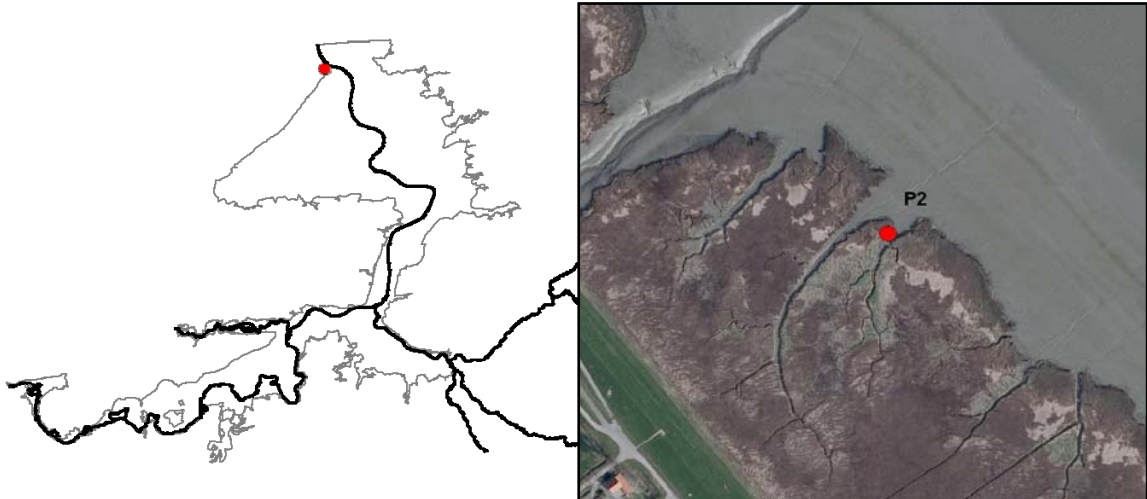
## 2 Soil profile descriptions

### Mesohaline zone: Schor Ouden Doel

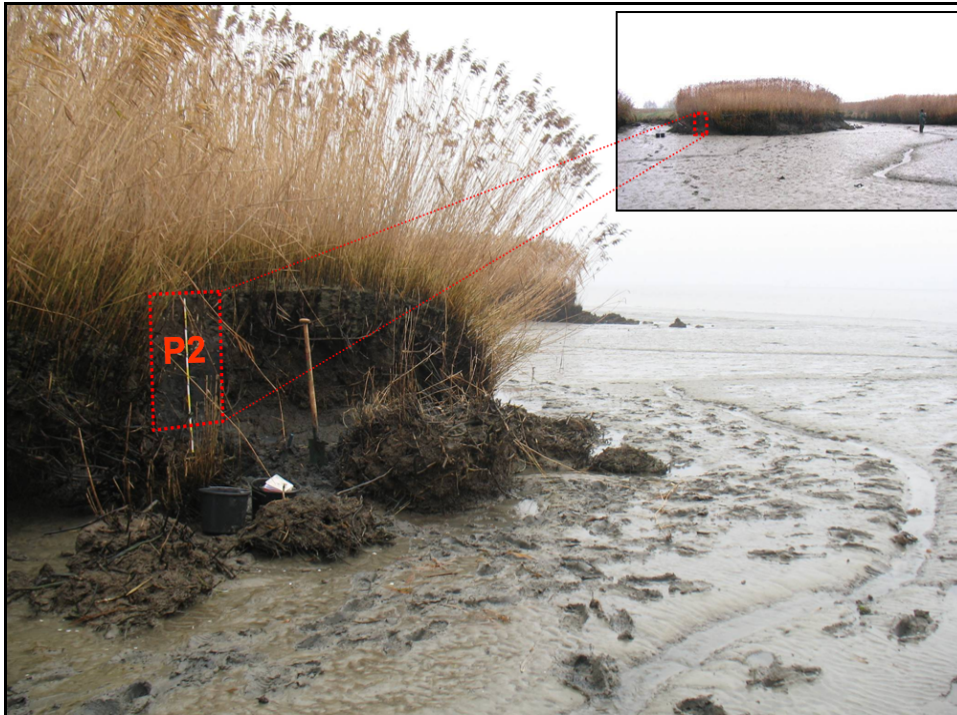
#### 2.1 Profile 'P2': Schor van Ouden Doel

(Derived elevation: 5.20m TAW; La.t: 51.350077, Long.: 4.231032)

##### 2.1.1 Situation



Profile 'P2' is located in 'Schor van Ouden Doel', just over the Dutch border. It is an eroding tidal marsh lacking any artificial protection in the form of riprap. The tidal marsh is covered mainly by reed and grassland (*Elytrigia atherica*). The profile is excavated in the tidal marsh edge at the inflow of an important (1<sup>st</sup> order) creek.

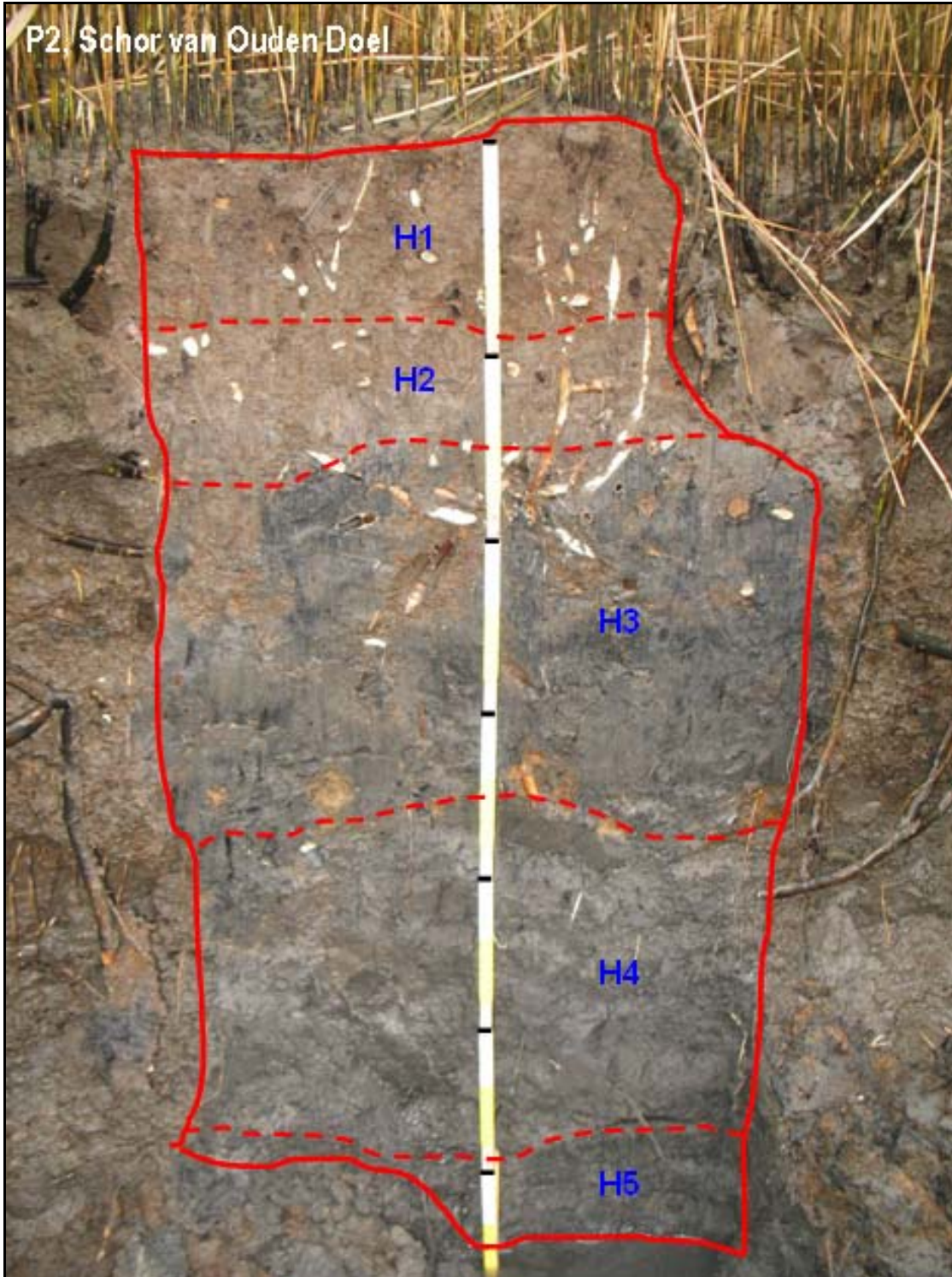


## 2.1.2. Profile description

Profile P2	Schor van Ouden Doel
1.3 Date and time:	14/11/2008. Profile description began at 11:30. Low tide at 10:18.
1.4 Author:	Jari Hinsch Mikkelsen
1.5 Location:	The Netherlands, Province of Zeeland, Hulst Municipality. For a road description check description presented for profile P3. Drive along the dike northwards for about 1.5 km.
1.6 Profile coordinates:	Latitude, longitude: 51° 21' 0.46" N, 04° 14' 4.19" E Lambert-72: 226708.986 N, 140404.329 E
4.1 Elevation:	±5.2 m TAW (interpolated from nearby Trimble measurements)
2.1 Atmospheric climate and weather condition:	Misty during the profile description
Soil climate:	<i>STR</i> : Mesic <i>SMR</i> : Udic
2.2 Topography:	<i>Macrotopography</i> : Estuarium, tidal mouth of the Schelde River <i>Mesotopography</i> : Tidal marsh <i>Landscape position</i> : on the bank where one of the major creeks reaches the tidal mud flat <i>Slope form</i> : complex <i>Slope gradient</i> : - <i>Slope length</i> : - <i>Slope orientation</i> : -
2.4 Tidal marsh cliff:	<i>Tidal marsh cliff height</i> : 95 cm <i>Tidal marsh cliff gradient</i> : >80° (practically vertical) <i>Tidal marsh cliff form</i> : incised 50-80 cm <i>Thickness dense root layer</i> : 60 cm <i>Tidal marsh cliff coarse fragments</i> : none
2.5 Land-use:	Tidal marsh <i>Wildlife</i> : Hunting probably not allowed <i>Grazing</i> : No grazing, except for geese but here no signs
2.6 Human influence:	No evidences of human impact
Vegetation:	Reed vegetation ( <i>Phragmites australis</i> ), with algae on the soil surface
2.7 Parent material:	unconsolidated deposits> marine and estuarine clays and silts> quaternary clay and silt> Holocene Clay (5221)
2.8 Drainage class:	Poorly drained
2.9 External drainage:	Moderately rapid run-off
2.10 Flooding	The horizontal surface of the soil is flooded during spring tides only. The vertical exposed banks are flooded daily.
2.11 Coarse surface frag.	None but at the base of the tidal marsh bank, large lumps of soil material with a dense reed root system have accumulated, which provides some protection from the wave impact. When the soil is undermined with 60-90 cm the root-rich topsoil collapses. On a macro scale the erosion is clearly visible on aerial photos by the retrieving coastline.
2.12 Erosion, sedimentation:	Marginal erosion of the creek walls during tides
2.13 Surface cracks:	Some wide (2-5 cm) cracks observed, which originates from destabilisation of the tidal marsh bank due to wave erosion
2.14 Salts:	None observed

Profile P2		Schor van Ouden Doel
Localisation factors profile:		<p><i>Vegetation:</i> Reed vegetation, which is the most common vegetation type at this location</p> <p><i>Geomorphology/topography:</i> Located on the edge between the tidal mud flat and marsh</p> <p><i>Hydrology:</i> No information from divers is available from the nearby area, but the flooding regime is close to that of the tidal mud flat.</p>
Remarks:		No rock fragments, cementations, compactions and nodules observed through the soil profile. No traces of carbonates.
N o.		Horizon description
H1	Abi	0-20 cm; very dark greyish brown 1.5Y 3/2 (M); olive brown to light olive brown 2.5Y 4.5/3 (D); no reaction to αα-dipyridyl; very fine (2-5mm), weak granular; common very fine to fine, few medium and many coarse roots; large faunal population among others mud shrimps ( <i>Corophium volutator</i> ) and woodlice ( <i>Isopoda</i> ); clear smooth boundary
H2	Bbi	20-32 cm; very dark greyish brown 2.5Y 3/2 (M), dark greyish brown to greyish brown 2.5Y 4.5/2 (D); no reaction to αα-dipyridyl; massive; many very fine to fine, few medium and many coarse roots; gradual wavy boundary
H3	Crbi	32-77 cm; very dark grey 2.5Y 3/1 (M), greyish brown 2.5Y 5/2 (D); positive reaction to αα-dipyridyl, throughout; reductimorphic colour pattern with oxidation along fractures, pedfaces and root galleries; massive; stratification faintly visible; few very fine to fine, very few medium and common coarse roots; gradual smooth boundary
H4	Cr1	77-123 cm; very dark grey 5Y 3/1 (M), grey 2.5Y 5/1 (D); positive reaction to αα-dipyridyl, throughout; reductimorphic colour pattern; massive; stratification faintly visible; few very fine to medium and none coarse roots; diffuse smooth boundary
H5	Cr2	123-140 cm; dark grey 2.5Y 4/1 (M), grey to greyish brown 2.5Y 5/1.5 (D); positive reaction to αα-dipyridyl, throughout; reductimorphic colour pattern, with slight oxidation along biogalleries; massive; stratification faintly visible; very few very fine to fine roots





## 2.1.3 Analytical laboratory data

Table A2: Analytical data for P2, Schor van Ouden Doel									
					Profile studied 14/11/2008 Profile analysed: March-Dec./2009				
P2 Horizon nr.	Horizon symbols	Depth cm	Total N analyser %	Total N Kjeldahl %	Carbon- TOC			C Analyser %	C/N (TOC/Kjel.)
					TC %	IC %	OC %		
H1	A	0-20	0.33	0.27	5.43	1.23	4.20	4.87	15
H2	C	20-32	0.40	0.35	6.35	0.71	5.64	5.70	16
H3	Cr1	32-77	0.39	0.33	7.00	1.64	5.36	6.44	16
H4	Cr2	77-123	0.39	0.25	6.36	2.02	4.34	5.81	17
H5	Cr3	123-140	0.19	0.14	4.12	2.07	2.05	3.57	14
Horizon nr.	Laser diffraction on soil material (fractions in µm)								
	0.4-2	2-6	6-50	50-63	63-100	100-250	250-500	500-1000	1000-2000
	-----%-----								
H1	4.4	7.4	43.5	9.1	16.0	14.7	3.5	1.0	0.3
H2	4.6	8.7	44.3	8.3	15.4	13.4	3.3	1.5	0.5
H3	5.3	10.8	51.2	8.3	13.9	8.4	2.0	0.2	0.0
H4	4.0	7.3	41.9	8.5	16.5	18.5	3.1	0.1	0.0
H5	3.0	4.4	32.8	11.5	26.2	19.3	2.8	0.1	0.0
Horizon nr.	Na <sup>+</sup> -----by MgSO <sub>4</sub> (compulsive method)-----	K <sup>+</sup>	Ca <sup>2+</sup>	Mg <sup>2+</sup>	Particle size distribution (µm; pipette)				
	-----cmol(+)/kg soil-----				0-2	2-10	10-20	20-50	50-2000
	-----%-----								
H1	18.7	2.1	22.6	12.9	28.6	12.1	7.1	35.2	17.0
H2	24.5	2.4	21.5	13.6					
H3	24.0	3.0	24.1	11.0	39.0	23.4	11.6	19.4	6.5
H4	20.4	2.7	17.6	10.2	30.2	16.7	12.0	31.0	10.1
H5	12.9	1.8	11.5	6.0					
Horizon nr.	CEC sum cmol(+)/kg	CEC measured	BS by CEC-m %	Acidity sum cmol(+)/kg	CaCO <sub>3</sub> titration %	pH H <sub>2</sub> O 1:5	pH CaCl <sub>2</sub> 1:5	pH CaCl <sub>2</sub> /H <sub>2</sub> O	EC dS/m 1:5
H1	56.4	36.7	>100	<	10.4	8.2	7.7	0.93	2.68
H2	62.0	38.5	>100	<	6.2	8.1	7.7	0.95	3.91
H3	62.2	31.6	>100	<	11.7	7.8	7.6	0.98	4.96
H4	50.9	27.0	>100	<	14.2	7.9	7.7	0.98	4.28
H5	32.2	16.0	>100	<	14.9	8.5	7.9	0.93	2.77
Horizon nr.	Ca	K	Mg	Na	P	S	Al	As	Cd
	-----Aqua Regia-----								
	-----mg/kg-----								
H1	28726	6945	6416	3711	3472	1484	30230.6	51.6	3.8
H2	21283	7680	8064	5292	2036	1975	30634	62.4	9.7
H3	45998	10909	8323	5437	1857	10858	41813.1	86.8	9.7
H4	54957	10248	8796	4751	685	12785	31513.8	46.8	7.5
H5	56050	6612	6453	2892	524	6608	21024	25.2	1.6
Horizon nr.	Co	Cr	Cu	Fe	Mn	Ni	Pb	Zn	Lab
	-----Aqua Regia-----								
	-----mg/kg-----								
H1	14.3	89.5	151.7	46157	957	36.2	135.4	440	JM350
H2	14.8	97.9	231.0	42706	318	41.0	160.8	556	JM351
H3	17.9	108.6	210.8	45342	842	39.7	199.0	746	JM352
H4	14.9	79.6	105.4	38091	605	30.8	157.7	647	JM353
H5	8.9	39.2	61.6	23740	356	18.1	80.9	339	JM354
Horizon nr.	Na <sup>+</sup>	K <sup>+</sup>	Ca <sup>2+</sup>	Mg <sup>2+</sup>	CEC sum cations	Na+Mg saturation %	ESP %	SAR	
	-----by NH <sub>4</sub> OAc-----								
	-----cmol(+)/kg soil-----								
H1	17.6	1.7	44.4	14.2	78	41	23	3.3	
H2	22.3	1.7	45.4	14.1	84	44	27	4.1	
H3	22.2	2.2	56.9	13.0	94	37	24	3.7	
H4	18.3	1.9	53.4	11.7	85	35	21	3.2	
H5	12.0	1.6	38.7	11.2	63	37	19	2.4	

#### 2.1.4 World reference base (2007) classification

Diagnostic horizon, properties, material:	Present in horizon:	Remarks:
Albic	H5	Dry colours qualify for H5; the moist colours are too dark for the horizons above
Cambic	-	H2 has the chroma 2 and H3 1, therefore is the requirement for alteration present, but H2 is thinner than the required 15 cm
Mollic	-	The granular structure in H1 is described as weak, and below it is massive.
Salic	-	The highest conductivity of 4.96 dS/m was measured in H4, but that is considerable less than the required 8 dS/m to qualify.
Abrupt textural change	-	The changes in clay with depth are insufficient
Gleyic colour pattern	H3-5	More than 90% reductimorphic mottles with in moist conditions a hue of 2.5-5Y
Lithological discontinuity	-	No abrupt textural change, no rock fragments, no abrupt colour change (not pedogenetic) no abrupt change in mineralogy
Reducing conditions	H3-5	Positive reaction to alpha-alpha dipyridyl
Secondary carbonates	-	If secondary carbonate is present it is only in very limited quantities as it remain undiscovered during the fieldwork
Calcaric material	H1-5	Analytical data confirm the presence of more than 2% calcium-carbonate throughout the soil
Fluvic material	H1-5	Due to bioturbation any stratification is gone in H1-2. But the content of organic matter remains rather high and irregular through the soil what is considered an indication for Fluvic material and no other diagnostic horizons has been formed.
Sulphidic material	-	The concentration of S is 10858 mg/kg or 1.09% in H3 and 12785, or 1.28% in H4. The content of calcium carbonate is 11.8 and 14.3% respectively. The content of calcium carbonate is sufficiently high that sulphidic material is not present.

Following the chronological list of Reference Soil Groups the first to come are the Histosols, which concerns organic soils like bogs. Obvious not the case for this soil. The following soils are the Antrosols (man made soil through long term infield-outfield manuring system), Technosols (man made soil like mine waste and old waste dumps), Cryosols (with permafrost), Leptosols (very shallow soils on hard rock), Vertisols (very clayey soils with alternating wet and dry seasons) and finally Fluvisols. To key out in Fluvisols fluvic properties should start within the upper 25 cm and continuing to a depth of at least 50 cm. In this soil fluvic properties are present throughout, so more than fulfilling this requirement. Furthermore should no cambic, natric, petroplinthic or plinthic horizon be present, nor andic or vitric properties, which is not the case. Consequently the profile keys out as a Fluvisol.

#### Full classification name, without specifiers

(except where listed as such for prefix and suffix qualifiers):

**Gleyic Tidalic Fluvisol (Calcaric, Humic, Hypersodic, Eutric, Siltic)**

- Tidalic: flooded by tidewater but not covered by water at mean low tide
- Gleyic: oximorphic and reductimorphic colours and reduced conditions starting from 32 cm
- Calcaric: present throughout the soil profile
- Humic: the weighted average from 0-50 cm is 4.96% (>1% for humic; >5% for hyperhumic)
- Sodic: The required 15% sodium plus manganese cations on the exchange complex is present throughout the soil
- Eutric: The base saturation exceeds 100% throughout.
- Siltic: all 3 analysed horizons have a silty clay loam texture class (USDA)

**Full classification name, with specifiers:**

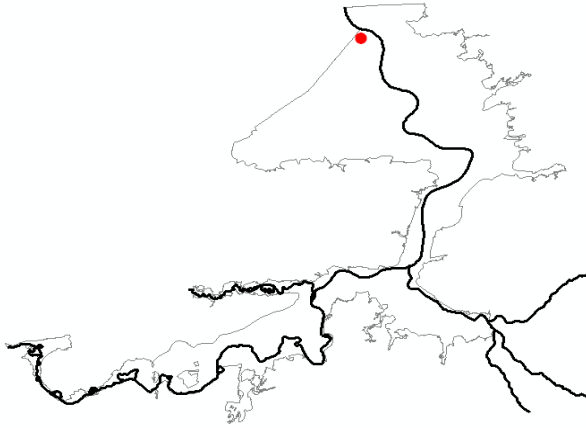
**Gleyic Tidalic Fluvisol (Calcaric, Humic, Hypersodic, Hypereutric, Siltic)**

- Calcaric: the lowest content on calcium carbonate at all analysed soil profiles is found in H2 of this profile. The weighted average for the upper 50 cm is 9.9%.
- Humic: the weighted average from 0-50 cm is 4.96%. The specifier Hyper requires 5%
- Hypersodic: The concentration of sodium plus manganese cations is 35-44%
- Hypereutric: The base saturation exceeds 100% throughout



## .2 Profile 'P3': Schor van Ouden Doel

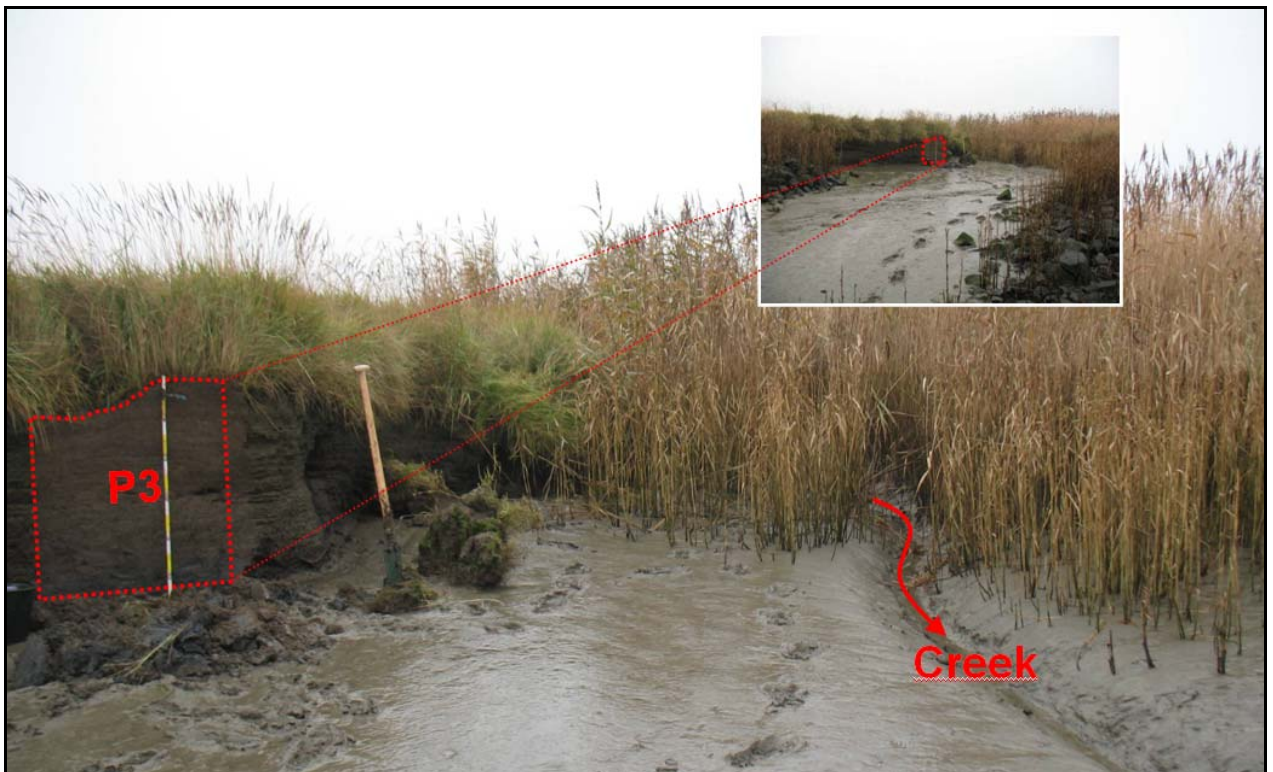
(Derived elevation: 5.50m TAW; Lat.: 51.343688, Long.: 4.241676)



### 2.2.1 Situation

Profile 'P3' is located in 'Schor van Ouden Doel', on Flemish territory. The tidal marsh edge here is defended with riprap. The tidal marsh itself consists of reed vegetation north of the profile, and grassland-vegetation with *Elytrigia atherica* further south.

The profile is excavated in the tidal marsh edge near the inflow of a creek, in grassland vegetation. Due to the inflow of a creek there's a gap in the riprap. Therefore the location itself is rather undefended.



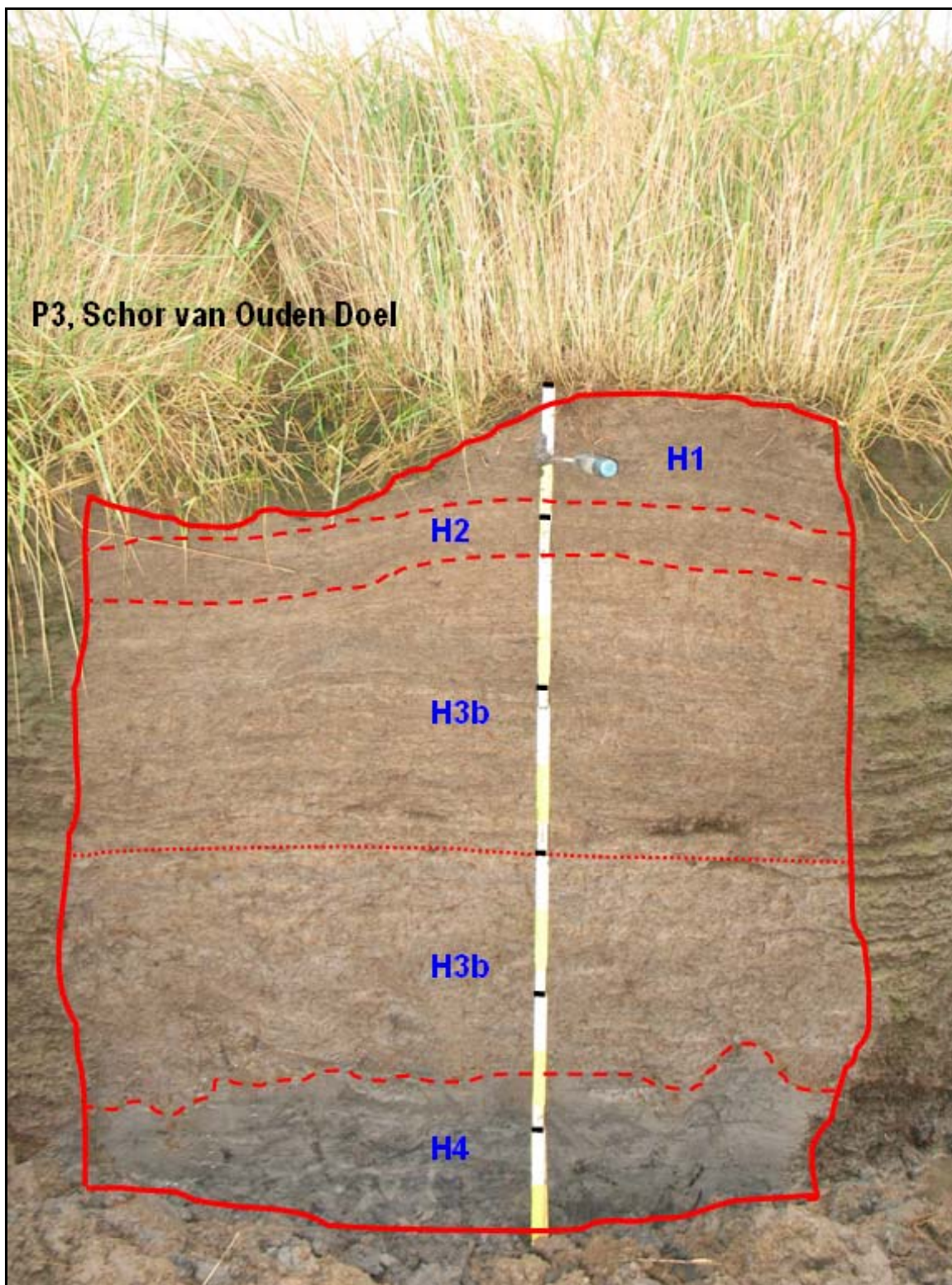


### 2.2.2 Profile description

Profile P3	Schor van Ouden Doel
1.3 Date and time:	14/11/2008. Profile description initiated at 14:20. Low tide at 10:18.
1.4 Author:	Jari Hinsch Mikkelsen
1.5 Location:	Belgium, Province of East Flanders, Beveren Municipality. From Kieldrecht take the road 'Dijk van Nieuw-Arenbergpolder at the first Y junction drive straight following the dike. When the road splits drive over the dike into The Netherlands. After about 500 m at the first junction, take the right road (NE direction). Follow this road passing the village Prosper on the right hand side to the end. Ones on the dike the Schor van Ouden doel is visible from the dike.
1.6 Profile coordinates:	Latitude, longitude: 51° 20' 22.13" N, 04° 14' 50.06" E Lambert-72: 225996.835 N, 141144.733 E
4.1 Elevation:	±5.5 m TAW (deduced from DTM data)
2.1 Atmospheric climate and weather condition:	Misty during the profile description
Soil climate:	<i>STR</i> : Mesic <i>SMR</i> : Udic
2.2 Topography:	<i>Macrotopography</i> : Estuarium, tidal mouth of the Schelde River <i>Mesotopography</i> : Tidal marsh <i>Landscape position</i> : on the wall of the one of the major creeks <i>Slope form</i> : complex <i>Slope gradient</i> : nearly level (0.5-1.0%) <i>Slope length</i> : - <i>Slope orientation</i> : -
2.4 Tidal marsh cliff:	<i>Tidal marsh cliff height</i> : 105 cm <i>Tidal marsh cliff gradient</i> : >80° (practically vertical) <i>Tidal marsh cliff form</i> : straight <i>Thickness dense root layer</i> : 10-20 cm <i>Tidal marsh cliff coarse fragments</i> : none
2.5 Land-use:	Tidal marsh <i>Wildlife</i> : Hunting probably not allowed <i>Grazing</i> : Grazing by cattle is in principle possible during the summer months but in practise the reed vegetation and the deep creeks seems to keep the cattle away from this part of the tidal marsh.
2.6 Human influence:	Ditches has been constructed with regular interval through the complete tidal marsh area. Today these ditches form the backbone in the creek system. Furthermore, the profile is located on about 10 m distance from the transition between the tidal marsh and the tidal mud flat, a transition that is characterised by a solid accumulation of mega boulders to protect the tidal marsh from wave impact and erosion.
Vegetation:	Grass vegetation composing of <i>Elymus athericus</i> , which is typical for brackish tidal marshes
2.7 Parent material:	unconsolidated deposits> marine and estuarine clays and silts> quaternary clay and silt> Holocene Clay (5221)
2.8 Drainage class:	Moderately well drained
2.9 External drainage:	Moderately rapid run-off
2.10 Flooding	Flooded during daily tides
2.11 Coarse surface frag.	None at the level of the soil profile, but at the creek mouth about 10 m from the soil profile boulder stones have been dumped
2.12 Erosion,	Marginal erosion of the creek walls during tides

Profile P3		Schor van Ouden Doel
sedimentation:		
2.13 Surface cracks:		None observed
2.14 Salts:		None observed
Localisation factors profile:		<i>Vegetation:</i> within the units of beach grass vegetation <i>Geomorphology/topography:</i> Representative for the creek mouth soils <i>Hydrology:</i> a diver has been placed in between P3 and P4
Remarks:		No rock fragments through the soil
N o.		Horizon description
H1	A	0-15 cm; very dark greyish brown to dark greyish brown 2.5Y 3.5/2 (M), greyish brown 2.5Y 5/2 (D); no reaction to αα-dipyridyl; weak very fine granular; friable; many very fine roots; mud shrimps ( <i>Corophium volutator</i> ); abrupt smooth boundary
H2	AC	15-23 cm; dark olive brown to olive brown 2.5Y 3.5/3 (M), light olive brown 2.5Y 5/3 (D); common, fine, faint, clear rusty brown oximorphic mottles; no reaction to αα-dipyridyl; massive, discontinuous original lamination faintly visible; very friable; many very fine roots; abrupt smooth boundary
H3	C <sub>Ag</sub>	23-90 cm; very dark greyish brown to dark greyish brown 2.5Y 3.5/2 (M), greyish brown to light olive brown 2.5Y 5/2.5 (D); abundant, medium, distinct rusty brown oximorphic mottles, best visible in OM poor layers than in darker ones; no reaction to αα-dipyridyl; massive, continuous lamination composing of organic poor beige to light greyish layers and organic rich greyish layers; friable; common to very few very fine roots; abrupt wavy boundary
H4	Cr	90-118 cm; dark greyish brown 2.5Y 3/2 (M), grey to greyish brown 2.5Y 5/1.5 (D); rusty brown more or less continuous band on the transition between H3 and H4; positive reaction to αα-dipyridyl; reductimorphic colour pattern; massive; no roots

Colour measurements: M= Moist; MC= Moist-crushed; D= Dry; DC= Dry-crushed; W= Wet.



## 2.2.3 Analytical laboratory data

Table A3: Analytical data for P3, Schor van Ouden Doel									
Profile studied 14/11/2008 Profile analysed: March-Dec./2009									
P3	Horizon	Depth	Total N	Total N	Carbon- TOC			C	C/N
Horizon nr.	symbols	cm	analyser %	Kjeldahl %	TC %	IC %	OC %	Analysers %	(TOC/Kjel.)
H1	A	0-15	0.37	0.19	4.31	1.56	2.75	3.91	14
H2	AC	15-23	0.29	0.14	3.38	1.30	2.08	2.91	15
H3a	CAG	23-60	0.18	0.13	3.48	1.12	2.36	3.29	18
H3b	CAG	60-90	0.25	0.18	4.43	1.33	3.10	4.10	17
H4	Cr	90-118	0.32	0.25	6.45	1.83	4.61	5.86	18
Laser diffraction on soil material (fractions in µm)									
Horizon nr.	0.4-2	2-6	6-50	50-63	63-100	100-250	250-500	500-1000	1000-2000
H1	2.7	3.8	33.0	11.6	24.8	18.9	4.0	0.8	0.4
H2	2.2	2.8	23.5	9.7	27.3	29.2	4.1	0.9	0.3
H3a	3.1	4.5	29.3	9.9	28.1	21.6	3.0	0.4	0.1
H3b	2.8	4.5	25.9	7.5	20.1	28.3	8.5	2.2	0.3
H4	3.3	5.8	30.9	7.4	16.2	23.1	9.4	3.7	0.4
Particle size distribution (µm; pipette)									
Horizon nr.	Na <sup>+</sup>	K <sup>+</sup>	Ca <sup>2+</sup>	Mg <sup>2+</sup>	Particle size distribution (µm; pipette)				
	by MgSO <sub>4</sub> (compulsive method)-----				0-2	2-10	10-20	20-50	50-2000
	-----cmol(+)/kg soil-----				-----%				
H1	9.1	1.3	12.5	5.8	18.9	5.7	5.3	27.0	43.0
H2	10.6	1.3	13.7	6.4					
H3a	9.8	1.2	11.6	5.5	20.1	5.8	4.8	24.9	44.5
H3b	18.3	2.0	17.8	9.8					
H4	16.4	2.8	18.2	7.9	36.1	11.3	5.8	31.0	15.8
EC									
Horizon nr.	CEC sum	CEC measured	BS by CEC-m	Acidity sum	CaCO <sub>3</sub> titration	pH H <sub>2</sub> O	pH CaCl <sub>2</sub>	pH CaCl <sub>2</sub> /H <sub>2</sub> O	EC dS/m
	cmol(+)/kg		%	cmol(+)/kg	%	1:5	1:5		1:5
H1	28.6	23.1	>100	<	10.4	8.2	7.7	0.94	1.23
H2	32.0	21.9	>100	<	9.8	8.6	7.7	0.90	1.48
H3a	28.0	21.1	>100	<	8.8	8.7	7.9	0.91	1.61
H3b	47.9	24.9	>100	<	12.5	8.5	8.0	0.94	2.40
H4	45.2	29.2	>100	<	13.4	8.1	7.9	0.97	3.07
Aqua Regia									
Horizon nr.	Ca	K	Mg	Na	P	S	Al	As	Cd
	-----mg/kg-----								
H1	39891	6618	6273	2465	1917	2116	18641	22.9	1.8
H2	36131	4691	5935	2662	2109	1232	12005	31.8	2.7
H3a	33413	6670	6175	2797	1075	853	20190	40.3	2.4
H3b	48214	7649	7747	3766	1118	1093	22332	42.9	2.9
H4	50081	8432	7968	3555	1081	5931	28641	58.6	11.6
Aqua Regia									
Horizon nr.	Co	Cr	Cu	Fe	Mn	Ni	Pb	Zn	Lab
	-----mg/kg-----								
H1	9.6	42.6	87.6	29253	872	22.8	66.4	263	JM355
H2	9.5	52.7	90.5	28179	702	24.2	87.1	303	JM356
H3a	9.6	48.1	108.1	27300	647	20.7	92.7	337	JM357
H3b	11.7	66.3	91.8	30638	613	24.8	125.1	484	JM358
H4	16.7	86.8	111.1	29687	760	31.3	183.2	755	JM359
by NH <sub>4</sub> OAc									
Horizon nr.	Na <sup>+</sup>	K <sup>+</sup>	Ca <sup>2+</sup>	Mg <sup>2+</sup>	CEC sum	Na+Mg saturation	ESP	SAR	
	-----cmol(+)/kg soil-----				cations	%	%		
H1	8.4	1.0	42.5	7.5	59	27	14	1.7	
H2	8.4	0.9	40.5	6.9	57	27	15	1.7	
H3a	8.1	0.9	42.8	6.1	58	24	14	1.6	
H3b	13.1	1.2	43.7	8.6	67	33	20	2.6	
H4	12.2	1.7	49.1	9.0	72	29	17	2.3	

## 2.2.4 World reference base (2007) classification

Diagnostic horizon, properties, material:	Present in horizon:	Remarks:
Albic		Colours far too dark in moist conditions
Cambic		Stratification is clearly visible through most of the soil and structure is not present, expect a bit of granular structure in the topsoil
Mollic		Colours are not dark enough and the structure is too incomplete
Salic		The highest conductivity is 3.07 dS/m
Abrupt textural change		Data are missing on the clay content for H2 and H4, but based on the data available it seems as the clay decreases towards the surface. Therefor most probably no abrupt change is present
Gleyic colour pattern	H2-3 H4	Oximorphic colour pattern Reductimorphic colour pattern
Lithological discontinuity		No abrupt textural change, no rock fragments, no abrupt colour change (not pedogenetic) no abrupt change in mineralogy
Reducing conditions	H4	Positive reaction to alpha-alpha dipyridyl
Secondary carbonates		No secondary carbonate observed
Calcaric material	H1-4	Analytical data confirm the presence of more than 2% calcium-carbonate throughout the soil
Fluvic material	H2-3 H4	Clearly stratified OC content increases irregular with depth from H1-4
Sulphidic material	-	Alkaline pH

Passing through the diagnostic criteria's the first Reference Soil Group that applies are Fluvisols. P3 have fluvic properties from 15 cm and onwards, and no cambic, natric, petroplinthic or plinthic horizon nor andic or vitric properties are present. Consequently the profile keys out as a Fluvisol.

### Full classification name, without specifiers

(except where listed as such for prefix and suffix qualifiers):

#### Tidalic Fluvisol (Calcaric, Humic, Sodic, Eutric)

- Tidalic: flooded by tidewater but not covered by water at mean low tide
- Gleyic: oximorphic and reductimorphic colours starts from 15 cm depth but the reduced conditions only from 90 cm, which is too deep to qualify
- Calcaric: present throughout the soil profile
- Humic: the content exceeds 1% throughout
- Sodic: The required 15% sodium plus manganese cations on the exchange complex is present throughout the soil
- Eutric: The base saturation exceeds 100% throughout
- Silty: texture is too loamy



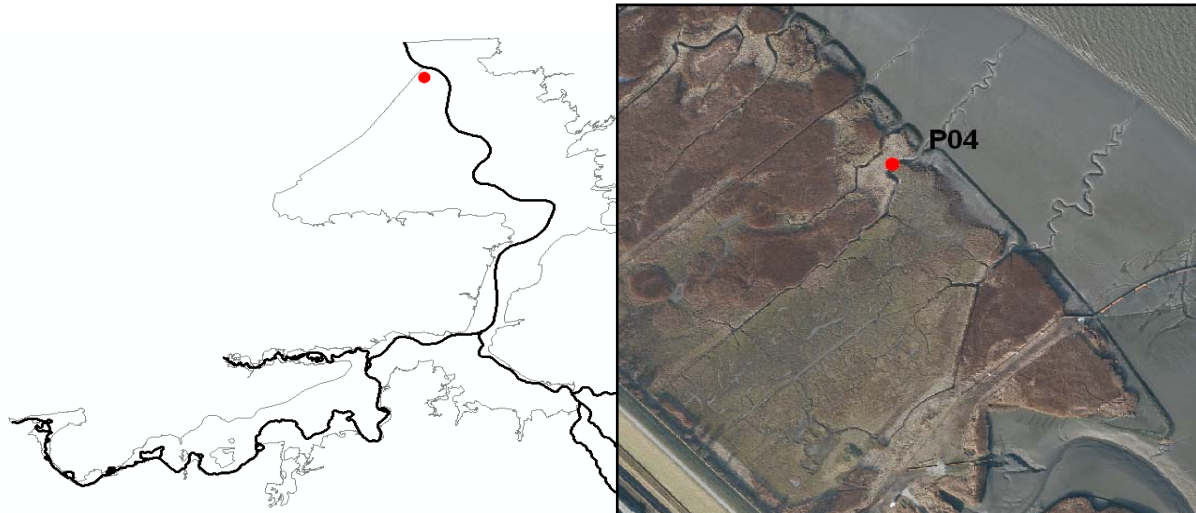
**Full classification name, with specifiers:**

**Tidalic Fluvisol (Calcaric, Humic, Sodic, Hypereutric)**

- Calcaric: a content between 9-13% was found, but the weighted average is 9.4%
- Sodic: The concentration of sodium plus manganese cations is not above 30%
- Hypereutric: The base saturation exceeds 100% throughout

## 2.3 Profile 'P4': Schor van Ouden Doel

(Derived elevation: 5.65m TAW; Lat.: 51.343433, Long.: 4.241926)



### 2.3.1 Situation

Profile 'P4' is located in 'Schor van Ouden Doel', on Flemish territory. The tidal marsh edge here is defended with riprap. The tidal marsh itself consists of reed vegetation north of the profile, and grassland-vegetation further south.

The profile is excavated in a creek-wall, near the inflow of the creek, in grassland vegetation. It's situated in an outer curve of the creek, with erosion near the vegetation and sedimentation on the creek bed.



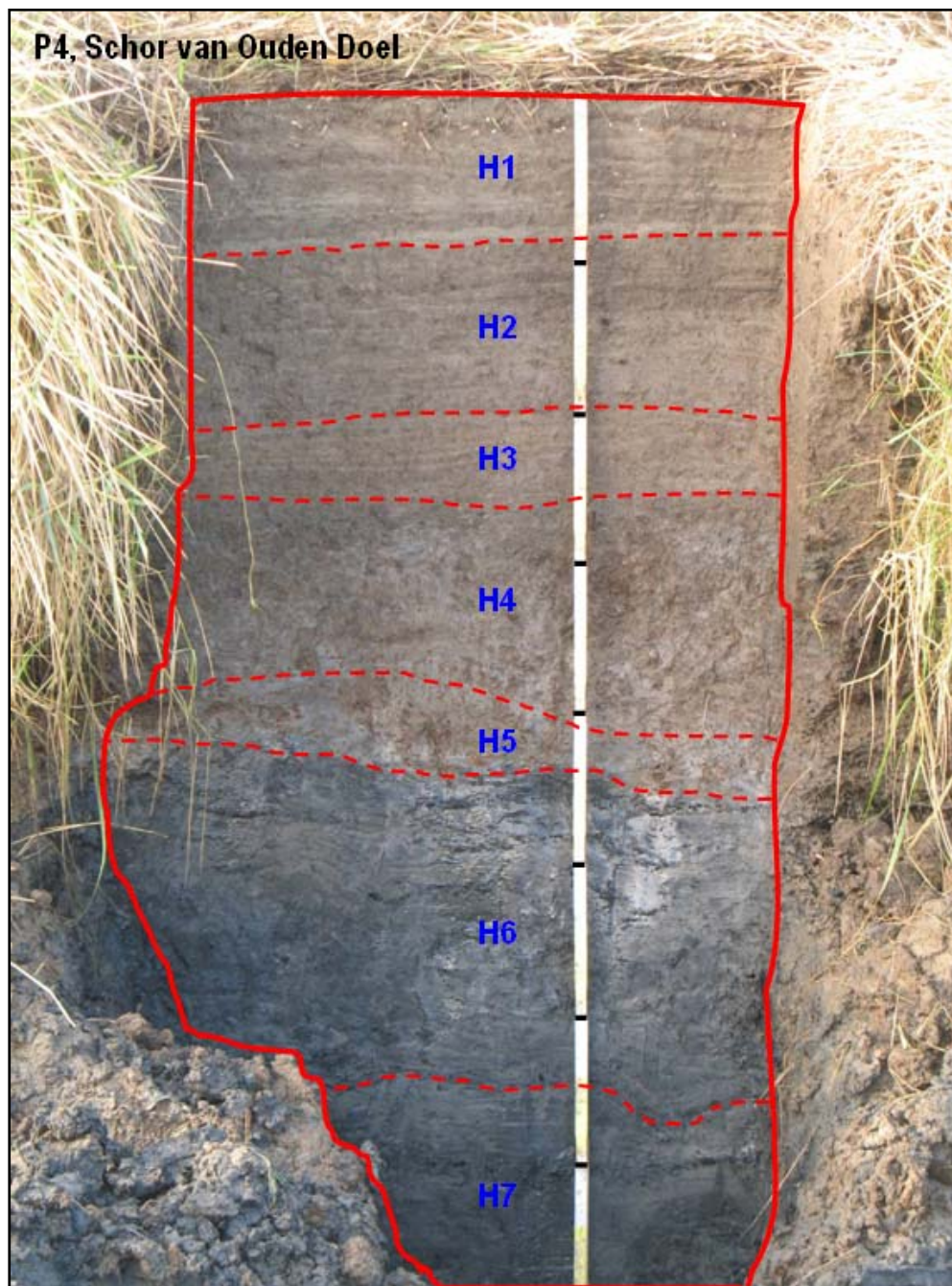
### 2.3.2 Profile description

Profile P4	Schor van Ouden Doel
1.3 Date and time:	17/12/2008. Profile description initiated at 15:00. Low tide at 13:17
1.4 Author:	Jari Hinsch Mikkelsen
1.5 Location:	Belgium, Province of East Flanders, Beveren Municipality. For a road description check description presented for profile P3.
1.6 Profile coordinates:	Latitude, longitude: 51° 20' 20.60" N, 04° 14' 51.56" E Lambert-72: 225968.419 N, 141162.049 E
4.1 Elevation:	±5.65 m TAW (deduced from DTM data)
2.1 Atmospheric climate and weather condition:	In the morning overcast, in the afternoon sunny
Soil climate:	<i>STR</i> : Mesic <i>SMR</i> : Udic
2.2 Topography:	<i>Macrotopography</i> : Estuarium, tidal mouth of the Schelde River <i>Mesotopography</i> : Tidal marsh <i>Landscape position</i> : on the wall of the one of the major creeks <i>Slope form</i> : complex <i>Slope gradient</i> : nearly level (0.5-1.0%) <i>Slope length</i> : - <i>Slope orientation</i> : -
2.4 Tidal marsh cliff:	<i>Tidal marsh cliff height</i> : 200-220 cm <i>Tidal marsh cliff gradient</i> : Upper part >80°, lower part <45° <i>Tidal marsh cliff form</i> : Incised <i>Thickness dense root layer</i> : ±30cm <i>Tidal marsh cliff coarse fragments</i> : None
2.5 Land-use:	Tidal marsh <i>Wildlife</i> : Hunting probably not allowed <i>Grazing</i> : Grazing by cattle is in principle possible during the summer months but in practise, the deep creeks and the reed vegetation on

Profile P4		Schor van Ouden Doel
		some distance seems to keep the cattle away from this part of the tidal marsh.
2.6 Human influence:		The major creeks have developed in former drainage ditches
Vegetation:		Grass vegetation composing of <i>Elymus athericus</i> , which is typical for brackish tidal marshes
2.7 Parent material:		unconsolidated deposits> marine and estuarine clays and silts> quaternary clay and silt> Holocene Clay (5221)
2.8 Drainage class:		Moderately well drained
2.9 External drainage:		Moderately rapid run-off
2.10 Flooding		Flooded during daily tides
2.11 Coarse surface frag.		None at the level of the soil profile
2.12 Erosion, sedimentation:		Marginal erosion of the creek walls during tides
2.13 Surface cracks:		None observed
2.14 Salts:		None observed
Localisation factors profile:		<i>Vegetation</i> : within the units of beach grass vegetation <i>Geomorphology/topography</i> : Representative for the creek mouth soils <i>Hydrology</i> : a diver has been placed inbetween P3 and P4
Remarks:		The profile is morphologically rather similar to P3. No rock fragments through the soil.
N o.		Horizon description
H1	Ae	0-19 cm; dark greyish brown 2.5Y 4/2 (M), greyish brown 2.5Y 5/2 (D); locally very fine, weak granular structure, elsewhere stratified in form of continuous brown and beige sandy bands; friable; common very fine to fine and few medium roots; very abrupt smooth boundary
H2	Be	19-40 cm; very dark greyish brown 2.5Y 3/2 (M), very dark greyish brown 2.5Y 3/2 (M), greyish brown 2.5Y 5/2 (D); massive and stratified composing of continuous brown and beige sandy bands; friable; few very fine roots; very abrupt smooth boundary
H3	Be g	40-53 cm; very dark greyish brown 2.5Y 3/2 (M), greyish brown to light olive brown 2.5Y 5/2.5 (D); common, fine, faint, clear, rusty brown mottles; no reaction to αα-dipyridyl; massive and stratified composing of continuous brown and beige sandy bands; friable; few very fine roots; very abrupt smooth boundary
H4	B g1	53-80 cm; very dark greyish brown to dark greyish brown 2.5Y 3.5/2 (M), light olive brown 2.5Y 5/3 (D); common, fine, faint, clear, rusty brown oximorphic mottles; no reaction to αα-dipyridyl; medium, moderate developed, angular blocky; sticky; very few very fine roots; clear smooth boundary
H5	B g2	80-90 cm; very dark greyish brown 2.5Y 3/2 (M), light olive brown 2.5Y 5/3 (D); many, fine to medium, distinct, diffuse, rusty brown oximorphic mottles; no reaction to αα-dipyridyl; massive; sticky, very plastic; very few very fine roots; effective rooting depth 90cm; abrupt smooth boundary
H6	Cr 1	90-128 cm; very dark greyish brown 2.5Y 3/2 (M), grey to greyish brown 2.5Y 5/1.5 (D); faint positive reaction to αα-dipyridyl; reductimorphic colour pattern; massive, some wavy stratification with organic rich (roots) bands and mineral bands; slightly sticky and slightly plastic; no roots observed; diffuse smooth boundary
H7	Cr 2	128-160 cm; very dark greyish brown 2.5Y 3/2 (M), grey to greyish brown 2.5Y 5/1.5 (D); faint positive reaction to αα-dipyridyl; reductimorphic colour pattern; massive; slightly sticky and slightly plastic; no roots observed



*Extra subordinate symbols: 'bi' biological activity clearly evidences (fauna and flora), and more than what can be expected according to type of soil, position, time of year etc. 'e' original stratification visible. Colour measurements: M= Moist; MC= Moist-crushed; D= Dry; DC= Dry-crushed; W= Wet.*



### 2.3.3 Analytical laboratory data

Table A4: Analytical data for P4, Schor van Ouden Doel									
Profile studied 14/11/2008 Profile analysed: March-Dec./2009									
P4	Horizon	Depth	Total N	Total N	Carbon- TOC			C	C/N
Horizon nr.	symbols	cm	analyser %	Kjeldahl %	TC %	IC %	OC %	Analysed %	(TOC/Kjel.)
H1	Ae	0-19	0.23	0.18	3.40	2.01	1.39	3.60	8
H2	Be	19-40	0.32	0.20	4.35	1.62	2.72	4.95	14
H3	Beg	40-53	0.20	0.15	2.92	1.31	1.61	3.10	11
H4	Bg1	53-80	0.28	0.26	5.44	1.49	3.95	4.93	15
H5	Bg2	80-90	0.33	0.24	5.56	1.83	3.72	4.92	16
H6	Cr1	90-128	0.33	0.20	5.28	1.92	3.36	4.83	17
H7	Cr2	128-160	0.35	0.23	6.15	1.63	4.52	5.88	19
Laser diffraction on soil material (fractions in µm)									
Horizon nr.	0.4-2	2-6	6-50	50-63	63-100	100-250	250-500	500-1000	1000-2000
H1	2.1	2.7	20.9	9.5	29.0	29.4	4.6	1.3	0.6
H2	2.9	4.4	29.6	9.6	24.0	24.3	4.0	0.9	0.2
H3	2.1	2.9	20.5	7.2	23.2	32.9	8.3	2.5	0.4
H4	4.2	7.7	38.1	7.3	14.0	18.0	8.1	2.3	0.3
H5	3.8	6.6	36.5	8.9	19.0	18.6	4.7	1.6	0.5
H6	2.8	4.5	26.9	7.6	20.2	26.0	9.1	2.5	0.3
H7	3.7	6.4	35.9	9.3	21.5	19.3	3.2	0.6	0.2
Particle size distribution (µm; pipette)									
Horizon nr.	Na <sup>+</sup>	K <sup>+</sup>	Ca <sup>2+</sup>	Mg <sup>2+</sup>	Particle size distribution (µm; pipette)				
	by MgSO <sub>4</sub> (compulsive method)				0-2	2-10	10-20	20-50	50-2000
	cmol(+)/kg soil				%				
H1	7.6	1.2	13.0	5.6	16.0	5.4	2.6	28.6	47.4
H2	12.4	1.6	16.5	7.3					
H3	11.1	1.2	12.9	5.9					
H4	19.2	2.2	21.2	10.9	40.3	14.9	23.9	11.4	9.6
H5	17.3	2.0	22.4	9.8					
H6	11.7	2.0	13.7	6.8	24.0	8.8	7.2	24.7	35.3
H7	16.4	2.5	15.6	8.3					
Horizon nr.	CEC sum	CEC measured	BS by CEC-m	Acidity sum	CaCO <sub>3</sub> titration	pH H <sub>2</sub> O	pH CaCl <sub>2</sub>	pH CaCl <sub>2</sub> /H <sub>2</sub> O	EC dS/m
	cmol(+)/kg	cmol(+)/kg	%	cmol(+)/kg	%	1:5	1:5	CaCl <sub>2</sub> /H <sub>2</sub> O	1:5
H1	27.4	22.5	>100	<	12.3	8.8	7.8	0.88	0.98
H2	37.9	24.3	>100	<	10.5	8.5	7.7	0.91	1.57
H3	31.2	23.5	>100	<	9.3	8.6	7.8	0.90	1.46
H4	53.5	37.5	>100	<	10.6	8.3	7.8	0.94	2.54
H5	51.5	34.0	>100	<	11.7	8.2	7.8	0.95	2.68
H6	34.2	22.8	>100	<	13.6	8.1	7.7	0.94	2.15
H7	42.9	26.6	>100	<	14.1	8.2	7.9	0.96	2.75
Horizon nr.	Ca	K	Mg	Na	P	S	Al	As	Cd
	Aqua Regia								
	mg/kg								
H1	46530	2795	4086	1865	1307	1620	7195	15.0	2.0
H2	41667	4736	5836	3194	2600	2671	17344	31.5	3.9
H3	30781	3416	4103	2258	1315	976	11944	29.8	3.7
H4	37638	5037	6273	3797	1407	1174	22545	46.8	5.6
H5	42485	4394	6026	3885	2022	1637	17360	56.3	9.4
H6	50070	4234	5567	3105	1278	7776	14976	44.9	8.0
H7	44560	4442	6043	3740	1281	7473	15595	59.8	6.2
Horizon nr.	Co	Cr	Cu	Fe	Mn	Ni	Pb	Zn	Lab
	Aqua Regia								
	mg/kg								
H1	7.1	29.0	52	19051	621	16.2	48.1	224	JM368
H2	12.6	71.3	123	35045	1095	34.3	106.6	408	JM369
H3	8.1	40.9	101	23218	486	20.4	72.5	287	JM370
H4	14.9	88.6	111	36817	1070	33.6	176.9	611	JM371
H5	11.5	90.8	238	38148	667	28.2	154.1	623	JM372
H6	10.4	68.7	144	29896	973	24.7	119.5	538	JM373
H7	11.8	81.5	125	30794	1179	26.4	153.9	563	JM374
Horizon nr.	Na <sup>+</sup>	K <sup>+</sup>	Ca <sup>2+</sup>	Mg <sup>2+</sup>	CEC sum	Na+Mg saturation	ESP	SAR	
	by NH <sub>4</sub> OAc				sum cations	%	%		
	cmol(+)/kg soil								
H1	5.8	0.8	45.0	6.5	58	21.2	9.9	1.1	
H2	9.3	1.0	43.3	8.3	62	28.4	15.0	1.8	
H3	8.7	0.8	41.9	6.7	58	26.4	14.9	1.8	
H4	15.0	1.4	47.3	10.6	74	34.4	20.1	2.8	
H5	14.3	1.3	45.9	10.4	72	34.4	19.9	2.7	
H6	10.2	1.4	44.8	8.2	65	28.4	15.8	2.0	
H7	13.4	1.7	45.4	10.0	71	33.2	19.0	2.5	



### 2.3.4 World reference base (2007) classification

Diagnostic horizon, properties, material:	Present in horizon:	Remarks:
Albic	H1	The surface horizon qualifies with 4/2 in moist conditions
Cambic		Stratification is clearly visible through most of the soil and structure is not present, expect a bit of granular structure in the topsoil
Mollic		Colours are not dark enough and the structure is too incomplete
Salic		The highest conductivity is 2,68 dS/m
Abrupt textural change	H3 to H4	Data on the texture is missing for H3 but this horizon belongs to the stratified upper group of horizons, where H4 has a structure development and is rather clayey. This might be an old surface horizon and dating from a period of characterised by a more calm sedimentation environment.
Gleyic colour pattern	H3-5 H6-7	Oximorphic colour pattern Reductimorphic colour pattern
Lithological discontinuity	H3 to H4	Abrupt textural change linked with a change in sedimentation environment
Reducing conditions	H6-7	Positive reaction to alpha-alpha dipyridyl
Secondary carbonates		No secondary carbonate observed
Calcaric material	H1-7	Analytical data confirm the presence of more than 2% calcium-carbonate throughout the soil
Fluvic material	H1-3 H1-7	Clearly stratified OC content increases irregular with depth
Sulphidic material	-	Alkaline pH

Passing through the diagnostic criteria's the first Reference Soil Group that applies are Fluvisols. P4 have fluvic properties from the surface on, and no cambic, natric, petroplinthic or plinthic horizon nor andic or vitric properties are present. Consequently the profile keys out as a Fluvisol.

#### Full classification name, without specifiers

(except where listed as such for prefix and suffix qualifiers):

#### **Tidalic Fluvisol (Calcaric, Humic, Sodic, Eutric, Siltic)**

- Tidalic: flooded by tidewater but not covered by water at mean low tide
- Gleyic: oximorphic and reductimorphic colours starts from 15 cm depth but the reduced conditions only from 90 cm, which is too deep to qualify
- Calcaric: present throughout the soil profile
- Humic: the content exceeds 1% throughout
- Sodic: The required 15% sodium plus manganese cations on the exchange complex is present throughout the soil
- Eutric: The base saturation exceeds 100% throughout
- Siltic: H3 qualifies with a silty clay texture but is only 27 cm thick, instead of the required 30 cm. Most probably H5 will contain enough silt that this horizon applies as well. By expert judgement siltic is considered present

**Full classification name, with specifiers:**

**Tidalic Fluvisol (Hypercalcaric, Humic, Sodic, Hypereutric)**

- Hypercalcaric: a content between 9-12% was found, and the weighted average is 10,94%
- Humic: all horizons have less than 5% OC
- Sodic: The concentration of sodium plus manganese cations is less than 30%
- Hypereutric: The base saturation exceeds 100% throughout



Photo Creek edge in the 'schor of Ouden Doel'

## 2.4 Profile 'P5': Schor van Ouden Doel

(Derived elevation: 5.50m TAW; Lat.: 51.343071, Long.: 4.241504)

### 2.4.1 Situation



Profile 'P5' is located in 'Schor van Ouden Doel', on Flemish territory. The tidal marsh edge here is defended with riprap. The tidal marsh itself consists of reed vegetation north of the profile, and grassland-vegetation further south. The profile is excavated in the tidal marsh soil, in reed vegetation.

## 2.4.2 Profile description

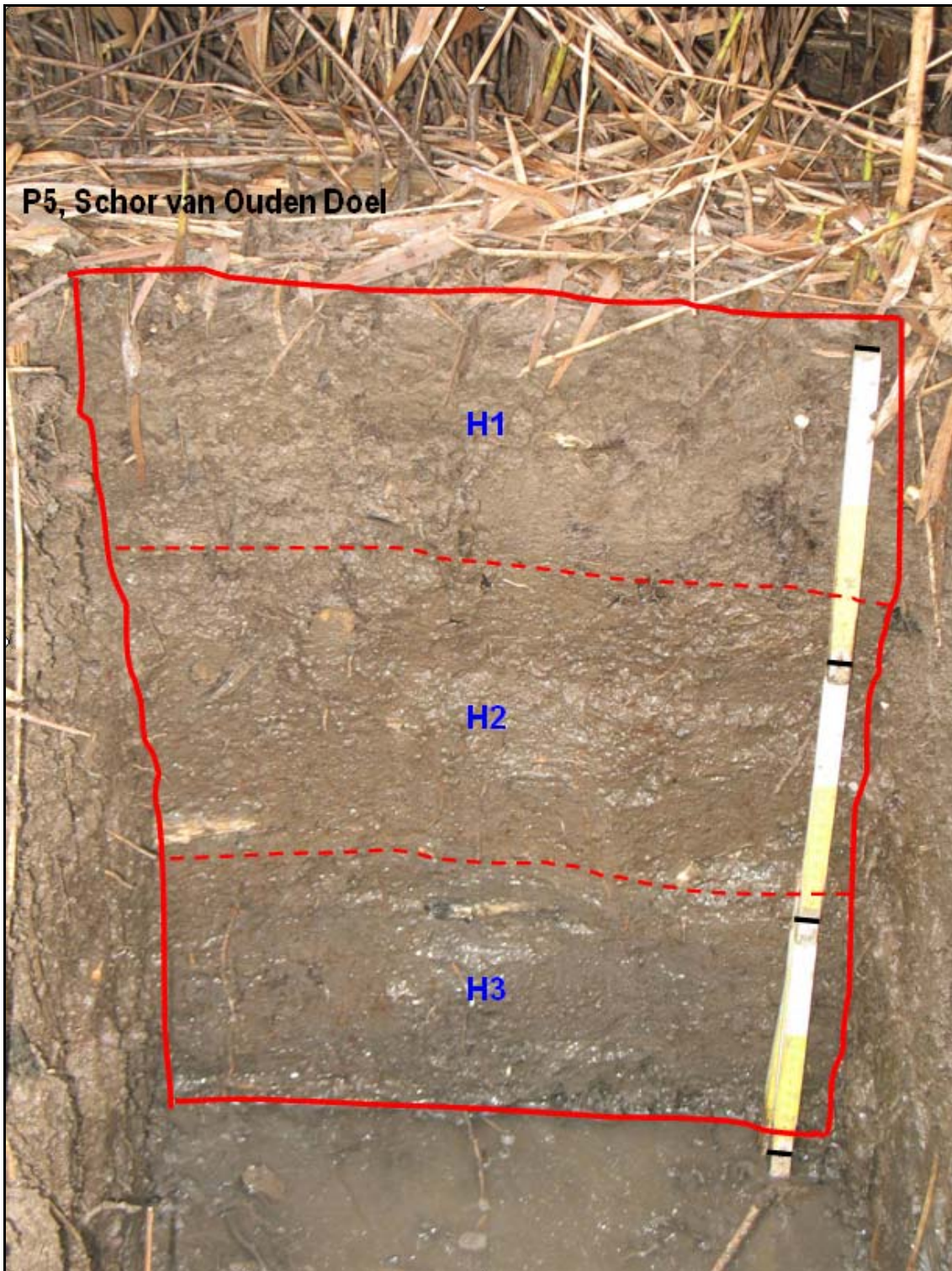
Profile P5		Schor van Ouden Doel
1.3 Date and time:	17/12/2009. Profile description began at 11:45. Low tide at 13:17.	
1.4 Author:	Jari Hinsch Mikkelsen	
1.5 Location:	Belgium, Province of East Flanders, Beveren Municipality. For a road description check description presented for profile P3. The profile is located inbetween two main creeks, in a dense reed vegetated area.	
1.6 Profile coordinates:	Latitude, longitude: 51° 20' 18.43" N, 04° 14' 49.02" E Lambert-72: 225928.200 N, 141132.608 E	
4.1 Elevation:	±5.5 m TAW (interpolation from detailed trimble measurements of the area)	
2.1 Atmospheric climate and weather condition:	Overcast	
Soil climate:	<i>STR</i> : Mesic <i>SMR</i> : Udic	
2.2 Topography:	<i>Macrotopography</i> : Estuarium, tidal mouth of the Schelde River <i>Mesotopography</i> : Tidal marsh <i>Landscape position</i> : Central part of the tidal marsh in a slight depression position. <i>Slope form</i> : - <i>Slope gradient</i> : - <i>Slope length</i> : - <i>Slope orientation</i> : -	
2.5 Land-use:	Tidal marsh <i>Wildlife</i> : Hunting probably not allowed <i>Grazing</i> : Grazing by cattle is possible during the summer period, but to traces found that the cattle effectively access this part of the tidal marsh	
2.6 Human influence:	No human influence traced	
Vegetation:	Dense reed vegetation ( <i>Phragmites australis</i> )	
2.7 Parent material:	unconsolidated deposits> marine and estuarine clays and silts> quaternary clay and silt> Holocene Clay (5221)	
2.8 Drainage class:	Poorly drained	
2.9 External drainage:	Slow run-off	
2.10 Flooding	The location of the soil profile is flooded during spring tides. Between spring tides periods water slowly drains towards the creeks.	
2.11 Coarse surface frag.	None	
2.12 Erosion, sedimentation:	Possible very slow sedimentation related to bimonthly floodings	
2.13 Surface cracks:	None	
2.14 Salts:	None	
Localisation factors profile:	<i>Vegetation</i> : the profile represents the extensive areas covered by reed vegetation. <i>Geomorphology/topography</i> : The profile was located in the central part of the tidal marsh in a somewhat lower landscape position. <i>Hydrology</i> : Diver data are available from a location nearby. The profile was located to assure good link with diver data.	
Remarks:	No rock fragments, cementations, compactions and nodules observed through the soil profile. No traces of secondary carbonates.	
<b>N</b>		<b>Horizon description</b>

Profile P5		Schor van Ouden Doel
o.		
H1	Abi	0-20 cm; very dark greyish brown 2.5Y 3/2 (M), light olive brown 2.5Y 5/3 (D); massive; sticky, very plastic; high porosity; common very fine to fine, very few medium and few coarse roots; clear smooth boundary
H2	Cg	20-42 cm; very dark greyish brown 2.5Y 3/2 (M), olive brown to light olive brown 2.5Y 4.5/3 (D); common, fine to medium, distinct, diffuse, rusty brown, oximorphic mottles; massive; sticky, very plastic; high porosity; many very fine, common fine, very few medium and few coarse roots; abrupt smooth boundary
H3	Cr	42-60 cm; very dark greyish brown 2.5Y 3/2 (M), dark greyish brown to greyish brown 2.5Y 4.5/2 (D); faint reaction to αα-dipyridyl; reductimorphic colour pattern; massive; sticky, very plastic; medium porosity; very few very fine to fine, few medium and very few coarse roots; effective rooting depth is 60 cm (as observed when the profile was dugged out)

*Extra subordinate symbols: 'bi' biological activity clearly evidences (fauna and flora), and more than what can be expected according to type of soil, position, time of year etc.*

*Colour measurements: M= Moist; MC= Moist-crushed; D= Dry; DC= Dry-crushed; W= Wet.*





### 2.4.3 Analytical laboratory data

Table A5: Analytical data for P5, Schor van Ouden Doel									
					Profile studied 14/11/2008				
					Profile analysed: March-Dec./2009				
P5	Horizon	Depth	Total N	Total N	Carbon- TOC			C	C/N
Horizon	symbols		analyser	Kjeldahl	TC	IC	OC	Analysers	
nr.		cm	%	%	%	%	%	%	(TOC/Kjel.)
H1	Abi	0-20	0.45	0.33	6.13	2.14	3.99	5.42	12
H2	Cg	20-42	0.60	0.34	6.37	1.05	5.32	8.22	16
H3	Cr	42-60	0.37	0.29	6.85	1.41	5.44	5.82	19
Laser diffraction on soil material (fractions in µm)									
Horizon									
nr.	0.4-2	2-6	6-50	50-63	63-100	100-250	250-500	500-1000	1000-2000
H1	4.4	7.8	41.0	8.7	17.7	17.9	2.4	0.1	0.0
H2	3.9	7.1	38.1	7.3	14.0	17.2	7.7	4.0	0.8
H3	5.1	9.5	42.8	8.1	17.5	13.8	2.8	0.4	0.0
Horizon	Na <sup>+</sup>	K <sup>+</sup>	Ca <sup>2+</sup>	Mg <sup>2+</sup>	Particle size distribution (µm; pipette)				
nr.	by MgSO <sub>4</sub> (compulsive method)----				0-2	2-10	10-20	20-50	50-2000
	-----cmol(+)/kg soil-----				-----%				
H1	17.8	2.5	23.1	13.1					
H2	23.0	2.6	27.5	13.2	41.0	19.7	9.0	23.1	7.3
H3	19.2	2.6	11.2	12.4					
Horizon	CEC	CEC	BS by	Acidity	CaCO <sub>3</sub>	pH		pH	EC
nr.	sum	measured	CEC-m	sum	titration	H <sub>2</sub> O	CaCl <sub>2</sub>	CaCl <sub>2</sub> /H <sub>2</sub> O	dS/m
	cmol(+)/kg		%	cmol(+)/kg	%	1:5	1:5		1:5
H1	56.5	40.7	>100	<	12.8	8.3	7.8	0.93	2.04
H2	66.2	42.5	>100	<	11.6	8.1	7.7	0.95	3.13
H3	45.4	39.8	>100	<	11.5	8.3	7.9	0.95	2.48
Horizon	Ca	K	Mg	Na	P	S	Al	As	Cd
nr.	Aqua Regia-----								
	-----mg/kg-----								
H1	46962	5226	6819	3554	2490	2495	21037.5	27.6	3.9
H2	35328	10258	8570	5182	3696	1728	36315.7	58.2	10.2
H3	40371	8906	7424	3930	2142	1815	36483.1	60.0	8.6
Horizon	Co	Cr	Cu	Fe	Mn	Ni	Pb	Zn	Lab
nr.	Aqua Regia-----								
	-----mg/kg-----								
H1	14.7	69.9	115.1	40346	1279	34.6	104.1	438	JM375
H2	15.5	117.5	191.1	45471	929	45.5	173.1	602	JM376
H3	15.5	85.0	218.7	42900	670	37.4	149.3	614	JM377
Horizon	Na <sup>+</sup>	K <sup>+</sup>	Ca <sup>2+</sup>	Mg <sup>2+</sup>	CEC	Na+Mg	ESP	SAR	
nr.	by NH <sub>4</sub> OAc-----				sum	saturation			
	-----cmol(+)/kg soil-----				cations	%	%		
H1	14.8	1.7	47.3	14.6	78	38	19	2.7	
H2	20.0	1.8	46.4	13.9	82	41	24	3.6	
H3	17.4	1.9	50.2	12.4	82	36	21	3.1	

#### 2.4.4 World reference base (2007) classification

Diagnostic horizon, properties, material:	Present in horizon:	Remarks:
Albic		Colours are too dark in moist conditions
Cambic		Colour changes insufficient and no structure
Mollic		Structure is too incomplete
Salic		The highest conductivity is 3,13 dS/m
Abrupt textural change		Data on the texture-pipette is partly missing, based on texture-laser; most probably no abrupt changes are present. This soil has for a long time been a depression soil.
	H2 H3	Oximorphic colour pattern Reductimorphic colour pattern
Lithological discontinuity		
Reducing conditions	H3	Positive reaction to alpha-alpha dipyridyl
Secondary carbonates		No secondary carbonate observed
Calcaric material		Analytical data confirm the presence of more than 2% calcium-carbonate throughout the soil
Fluvic material		OC content increases irregular with depth
Sulphidic material	-	Alkaline pH

The profile keys out as a Fluvisol.

##### Full classification name, without specifiers

(except where listed as such for prefix and suffix qualifiers):

##### Gleyic Tidalic Fluvisol (Calcaric, Humic, Sodic, Eutric, Siltic)

- Tidalic: flooded by tidewater but not covered by water at mean low tide
- Gleyic: oximorphic and reductimorphic colours start from 20 cm and 42 cm respectively. The reduced conditions also from 42 cm depth.
- Calcaric: present throughout the soil profile
- Humic: the content exceeds 1% throughout
- Sodic: The required 15% sodium plus manganese cations on the exchange complex is present throughout the soil
- Eutric: The base saturation exceeds 100% throughout
- Siltic: H2 qualifies with a silty clay texture but is only 22 cm thick, instead of the required 30 cm. Most probably H1 or H3 will contain enough silt that this horizon applies as well. By expert judgement siltic is considered present

##### Full classification name, with specifiers:

##### Epigleyic Tidalic Fluvisol (Hypercalcaric, Humic, Hypersodic, Hypereutric, Siltic)

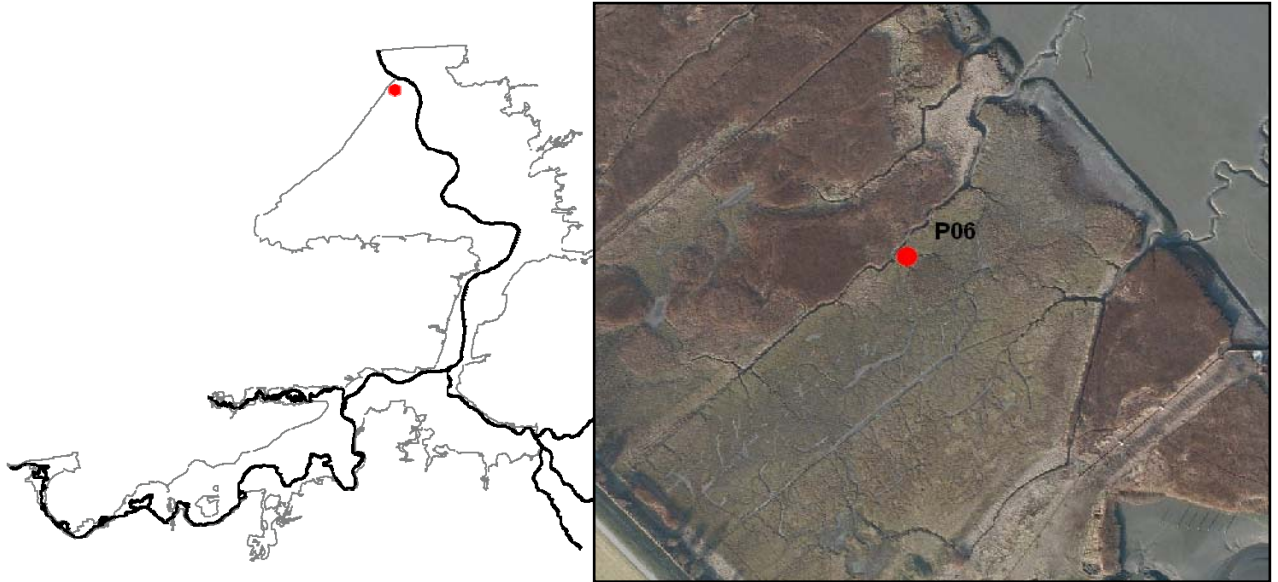
- Epigleyic: the reduced conditions appear already within the upper 50 cm
- Hypercalcaric: a content between 11-12% was found, and the weighted average is above 10%
- Humic: the weighted average is 4,81%
- Hypersodic: The concentration of sodium plus manganese cations exceeds 30% throughout
- Hypereutric: The base saturation exceeds 100% throughout



## 2.5 Profile 'P6': Schor van Ouden Doel

(Derived elevation: 5.60m TAW; Lat.: 51.342653, Long.: 4.241386)

### 2.5.1 Situation



Profile 'P6' is located in 'Schor van Ouden Doel', on Flemish territory. The tidal marsh edge here is defended with riprap.

The tidal marsh itself consists of reed vegetation north of the profile, and grassland-vegetation further south.

The profile is excavated in the creek-wall of a smaller second-order creek, in grassland vegetation.



## 2.5.2 Profile description

Profile P6	Schor van Ouden Doel
1.3 Date and time:	25/2/2009. Profile description began at 12h. Low tide at 10:20.
1.4 Author:	Jari Hinsch Mikkelsen
1.5 Location:	Belgium, Province of East Flanders, Beveren Municipality. For a road description check description presented for profile P3.
1.6 Profile coordinates:	Latitude, longitude: 51° 20' 15.92" N, 04° 14' 48.32" E Lambert72: 225881.698 N, 141124.299 E
4.1 Elevation:	±5.6 m TAW (deduced from DTM data)
2.1 Atmospheric climate and weather condition:	Overcast. In the weeks prior to the fieldwork the weather was extraordinary overcast and rainy. (The month of February was the least sunny February ever recorded in Belgium)
Soil climate:	<i>STR</i> : Mesic <i>SMR</i> : Udic
2.2 Topography:	<i>Macrotopography</i> : Estuarium, tidal mouth of the Scheldt River <i>Mesotopography</i> : Tidal marsh <i>Landscape position</i> : Central part of the tidal marsh in a very gently sloping landscape position. The soil profile was studied in a side-creek. <i>Slope form</i> : straight, convex (SV) <i>Slope gradient</i> : Level (0.2-0.5%) <i>Slope length</i> : <10m <i>Slope orientation</i> : NW
2.5 Land-use:	Tidal marsh <i>Wildlife</i> : Hunting probably not allowed <i>Grazing</i> : Grazing by cattle during the summer months
2.6 Human influence:	Vegetation moderate to strongly disturbed as result of cattle grazing. Partly due to puddling hereby compacting the soil and destroying the vegetation, partly due to a selective eating pattern of the cattle.
Vegetation:	Salt marsh grassland with which is a vegetation type composing of a variety of grasses in a landscape position influenced by (regular) flooding by saline or brackish water
2.7 Parent material:	unconsolidated deposits> marine and estuarine clays and silts> quaternary clay and silt> Holocene Clay (5221)
2.8 Drainage class:	Somewhat poorly drained
2.9 External drainage:	Slow run-off
2.10 Flooding	Where the soil profile was studied the creek is flooded twice daily. The surface of the soil profile is flooded around periods of spring tides
2.11 Coarse surface frag.	None
2.12 Erosion, sedimentation:	In the creek erosion and sedimentation are active process. On top of the soil possible some slow sedimentation takes place. Where the soil is facing puddling and trampling the soil rather faces a phase of erosion.
2.13 Surface cracks:	None
2.14 Salts:	None
Localisation factors profile:	<i>Vegetation</i> : the profile represents the brackish grassland <i>with Puccinellia maritime</i> present in a relatively small area of Schor van Ouden Doel. Within the grassland the profile was located where there were no traces of erosion, like close to the tidal mud flat (wave erosion) or as a result of puddling (cattle grazing). To assure a minimum of disturbance to the environment the soil was studied on the wall of a side creek cutting into the grassland.

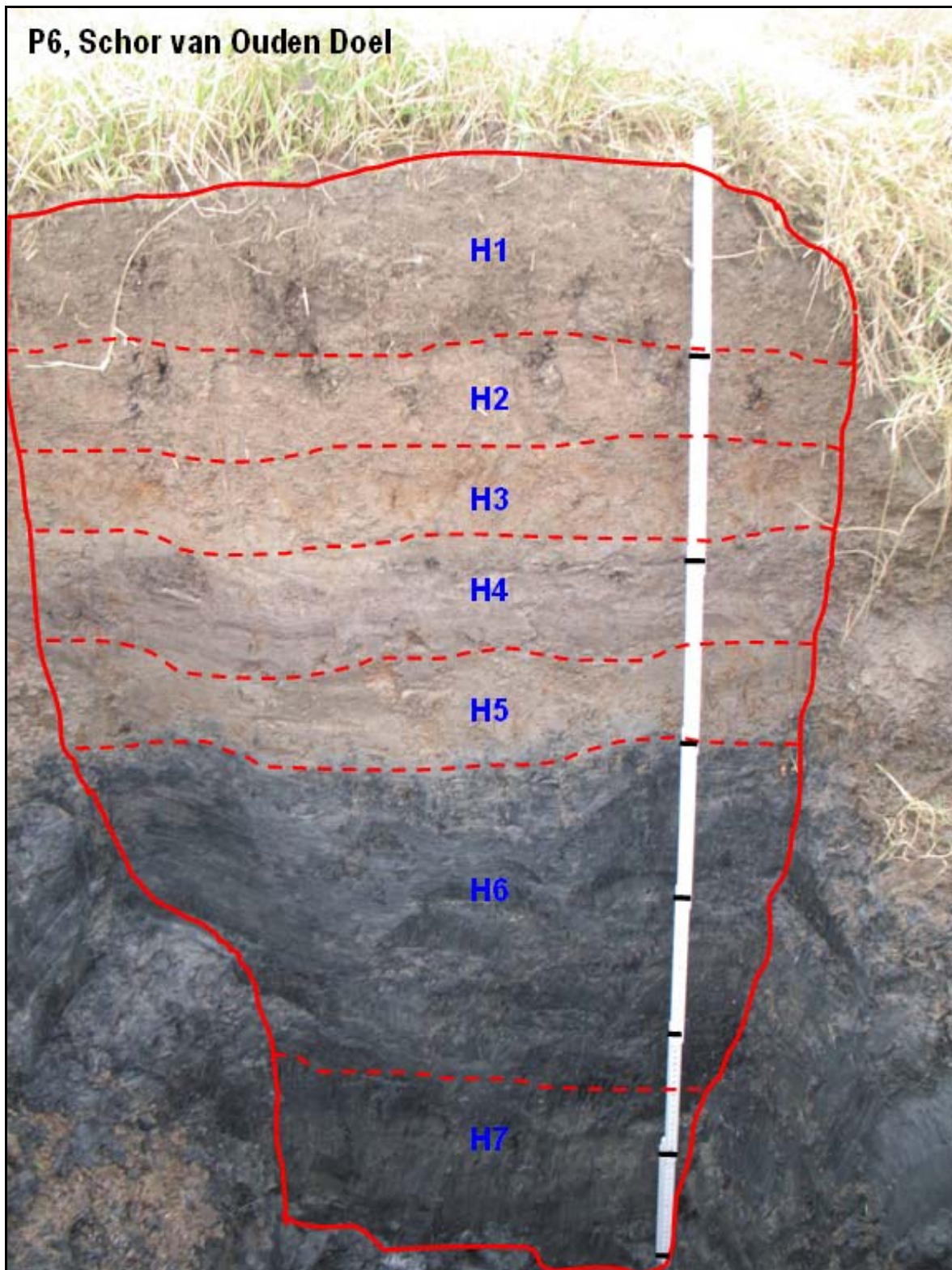


Profile P6		Schor van Ouden Doel
		<p><i>Geomorphology/topography:</i> The profile was located in the central part of the tidal marsh.</p> <p><i>Hydrology:</i> Information are available from one diver that was placed in the grassland about 30-40 meters closer to the Scheldt River</p>
Remarks:		No rock fragments, cementations, compactions and nodules observed through the soil profile. No traces of carbonates.
No.		Horizon description
H1	Abi1	0-15/19 cm; very dark greyish brown 10YR 3/2 (M); no reaction to αα-dipyridyl; very fine, strong granular; very friable; high porosity; many very fine, common fine, very few medium roots; clear smooth boundary
H2	Abi2	15/19-28 cm; dark greyish brown to brown 10YR 4/2.5 (M); no reaction to αα-dipyridyl; very fine, strong granular; friable; high porosity; common very fine and fine, very few medium roots; clear smooth boundary
H3	Bg1	28-37 cm; brown 10YR 4/3 (M); many, medium, distinct, very diffuse, 7.5YR 3/6 (M) mottles; no reaction to αα-dipyridyl; oximorphic colour pattern; very fine, weak granular; sticky, very plastic; medium porosity; few very fine, very few fine roots; gradual smooth boundary
H4	Bg2	37-50/53 cm; very dark greyish brown 10YR 3/2 (M); few, fine, faint, diffuse, 10YR 4/6 mottles; no reaction to αα-dipyridyl; massive, none laminated; sticky, very plastic; medium porosity; very few very fine roots; clear smooth boundary
H5	Bg3	50/53-61 cm; very dark greyish brown to dark greyish brown 10YR 3.5/2 (W); common, medium, faint, very diffuse 10YR 5/8 (W) mottles; no reaction to αα-dipyridyl; oximorphic colour pattern; massive, none laminated; sticky, plastic; medium porosity; very few very fine roots; abrupt smooth boundary
H6	Cr1	61-110 cm; black 5Y 2.5/1 (W); positive reaction to αα-dipyridyl, throughout; reductimorphic colour pattern; massive; sticky, very plastic; medium porosity; no roots observed; blackish colour of the matrix is due to very fine organic matter; gradual smooth boundary
H7	Cr2	110-... cm; very dark greenish grey 3/10Y (W); positive reaction to αα-dipyridyl, throughout; reductimorphic colour pattern; massive, none laminated; very sticky, very plastic; medium porosity; no roots observed; horizon composes of many very fine to fine and medium dead but conserved roots, appears to belong to a period, when the horizon was closer to the surface; all biogalleries are coloured black probably by very fine organic matter

*Extra subordinate symbols: 'bi' biological activity clearly evidences (fauna and flora), and more than what can be expected according to type of soil, position, time of year etc.*

*Colour measurements: M= Moist; MC= Moist-crushed; D= Dry; DC= Dry-crushed; W= Wet.*

## P6, Schor van Ouden Doel



## 2.5.3 Analytical laboratory data

Table A6: Analytical data for P6, Schor van Ouden Doel									
Profile studied 14/11/2008									
Profile analysed: March-Dec./2009									
P6	Horizon	Depth	Total N	Total N	Carbon- TOC			C	C/N
Horizon nr.	symbols	cm	analyser %	Kjeldahl %	TC %	IC %	OC %	Analysier %	(TOC/Kjel.)
H1	Abi1	0-16	0.37	0.29	5.99	2.15	3.84	5.28	13
H2	Abi2	16-29	0.33	0.37	6.42	1.54	4.88	4.73	13
H3	Bg1	29-38	0.36	0.34	5.35	0.97	4.38	4.87	13
H4	Bg2	38-51	0.47	0.42	9.23	0.69	8.54	8.13	20
H5	Bg3	51-61	0.42	0.35	7.52	1.54	5.97	6.36	17
H6	Cr1	61-110	0.43	0.37	7.97	2.01	5.96	7.81	16
H7	Cr2	110-140	0.39	0.32	6.60	2.00	4.59	6.17	14
Horizon nr.	Laser diffraction on soil material (fractions in µm)								
	0.4-2	2-6	6-50	50-63	63-100	100-250	250-500	500-1000	1000-2000
H1	2.9	4.8	31.5	8.3	18.1	22.1	7.6	3.9	0.8
H2	3.3	6.0	30.6	5.2	9.7	17.4	14.4	12.0	1.5
H3	3.7	6.7	35.5	7.6	16.0	20.4	5.3	2.8	2.0
H4	6.3	12.2	46.5	6.4	12.1	13.3	3.0	0.2	0.0
H5	5.5	10.5	46.4	7.4	14.1	13.6	2.4	0.1	0.0
H6	4.0	7.6	39.5	7.1	13.8	19.0	6.0	2.5	0.5
H7	5.8	11.1	44.1	5.8	11.3	16.8	4.1	0.8	0.2
Horizon nr.	Na <sup>+</sup>	K <sup>+</sup>	Ca <sup>2+</sup>	Mg <sup>2+</sup>	Particle size distribution (µm; pipette)				
	by MgSO <sub>4</sub> (compulsive method)----				0-2	2-10	10-20	20-50	50-2000
H1	10.4	2.1	12.1	11.8	31.4	13.8	9.4	27.9	17.4
H2	15.2	2.8	16.5	13.3					
H3	14.9	2.4	13.6	11.7					
H4	20.9	2.5	21.7	11.7	54.2	19.7	12.8	12.0	1.3
H5	19.4	2.6	21.9	11.1					
H6	19.0	3.3	20.7	10.3	42.7	14.8	11.9	23.1	7.5
H7	22.9	1.6	18.9	11.4					
Horizon nr.	CEC sum	CEC measured	BS by CEC-m	Acidity sum	CaCO <sub>3</sub> titration	pH H <sub>2</sub> O	pH CaCl <sub>2</sub>	pH CaCl <sub>2</sub> /H <sub>2</sub> O	EC dS/m
H1	36.4	32.5	>100	<	13.1	8.6	7.9	0.92	1.11
H2	47.7	44.6	>100	<	9.3	8.5	7.8	0.92	1.52
H3	42.7	39.2	>100	<	7.3	8.3	7.8	0.94	1.55
H4	56.7	49.7	>100	<	10.6	8.5	7.9	0.93	2.54
H5	55.0	40.1	>100	<	10.7	8.2	7.8	0.95	2.60
H6	53.3	38.8	>100	<	12.3	8.4	7.9	0.95	3.23
H7	54.8	34.5	>100	<	17.4	8.2	8.0	0.98	3.55
Horizon nr.	Ca	K	Mg	Na	P	S	Al	As	Cd
H1	48857	8670	7535	2682	1904	2611	29317.2	27.8	2.9
H2	31515	5118	6746	3106	3452	2660	16639.6	47.3	3.3
H3	24708	10939	8322	3574	2716	1312	36080.7	61.0	3.2
H4	28083	12951	9873	5101	1599	1920	45531.1	48.0	5.8
H5	28966	11185	8382	4560	2537	1784	41792	62.1	9.3
H6	45775	9898	8215	4203	1134	11395	38936.4	54.6	5.6
H7	58539	7307	7734	4899	1342	5351	23228.7	59.5	3.9
Horizon nr.	Co	Cr	Cu	Fe	Mn	Ni	Pb	Zn	Lab
H1	14.3	57.7	105	39927	1134	29.3	87.4	369	JM378
H2	17.4	115.2	149	45559	1311	38.1	151.2	491	JM379
H3	14.3	101.4	206	41942	683	34.4	161.4	445	JM380
H4	15.7	104.3	205	45054	362	43.9	180.6	640	JM381
H5	15.5	133.3	345	46262	635	39.5	217.6	774	JM382
H6	16.8	91.1	119	39434	1229	34.4	163.7	672	JM383
H7	16.4	93.9	96	41766	1672	32.5	195.2	595	JM384
Horizon nr.	Na <sup>+</sup>	K <sup>+</sup>	Ca <sup>2+</sup>	Mg <sup>2+</sup>	CEC sum	Na+Mg saturation	ESP	SAR	
	by NH <sub>4</sub> OAc-----				sum cations	%	%		
H1	8.5	1.6	47.3	11.8	69	29	12	1.6	
H2	12.0	2.0	42.9	13.3	70	36	17	2.3	
H3	11.9	1.7	41.9	11.7	67	35	18	2.3	
H4	19.1	2.7	38.3	11.7	72	43	27	3.8	
H5	15.4	2.3	42.0	11.3	71	38	22	3.0	
H6	15.3	1.7	37.3	11.5	66	41	23	3.1	
H7	17.6	1.9	40.9	15.3	76	43	23	3.3	

## 2.5.4 World reference base (2007) classification

Diagnostic horizon, properties, material:	Present in horizon:	Remarks:
Albic		Colours are too dark in moist conditions
Cambic	H2-3	H3: Texture fine enough. Granular structure present and no traces of stratification. Calcium carbonate content is lower IN H2-3 than below and structure is present. The chroma is 2.5 in H2 and 3.0 in H3, which is higher than the 2.0 found in H4.
Mollic		H1 fulfil all requirements except the thickness
Salic		The highest conductivity is 3,55 dS/m
Abrupt textural change	H3-4	Data on the texture-pipette is partly missing. In H4 the clay-pipette is 54.2%. Based on morphological characteristics and texture-laser data it is by expert judgement decided that an abrupt change is present between H3 and H4
	H3-5 H6-7	Oximorphic colour pattern Reductimorphic colour pattern
Lithological discontinuity	H3-4	
Reducing conditions	H6-7	Positive reaction to alpha-alpha dipyridyl
Secondary carbonates		No secondary carbonate observed
Calcaric material	H1-7	Analytical data confirm the presence of more than 2% calcium-carbonate throughout the soil
Fluvic material	H4-6	Below the cambic horizon the soil composes of fluvic material. OC content increases irregular with depth
Sulphidic material		Alkaline pH

The profile will not key out in Fluvisol. Fluvic material is present because of an irregular content of organic matter and remaining above 0.2% to a depth of 100 cm. But at the same time H2-3 is sufficiently developed that a Cambic horizon has developed. The soil is therefore no Fluvisol.

The reduced condition starts at 61 cm from the surface, and that is too deep for the Gleysols. Because of the presence of a cambic horizon the soil keys out as a Cambisol.

### Full classification name, without specifiers

(except where listed as such for prefix and suffix qualifiers):

#### Endogleyic Fluvic Cambisol (Calcaric, Sodic, Humic, Eutric, Ruptic, Siltic)

- Fluvic: fluvic material present from 38 cm and onwards
- Endogleyic: oximorphic and reductimorphic colours start from 29 cm and 61 cm respectively. The reduced conditions also from 61 cm depth
- Calcaric: present throughout the soil profile
- Sodic: The required 15% sodium plus manganese cations on the exchange complex is present throughout the soil
- Alcalic: the pH is more than 8.5 in H1-2 but not in H3
- Humic: organic carbon content remains higher than 1%
- Eutric: The base saturation exceeds 100% throughout
- Ruptic: A lithologic discontinuity is present between H3-4 although this is entirely linked to a fluvial sedimentation environment.
- Siltic: H4 and H6 qualify with a silty clay texture.

**Full classification name, with specifiers:**

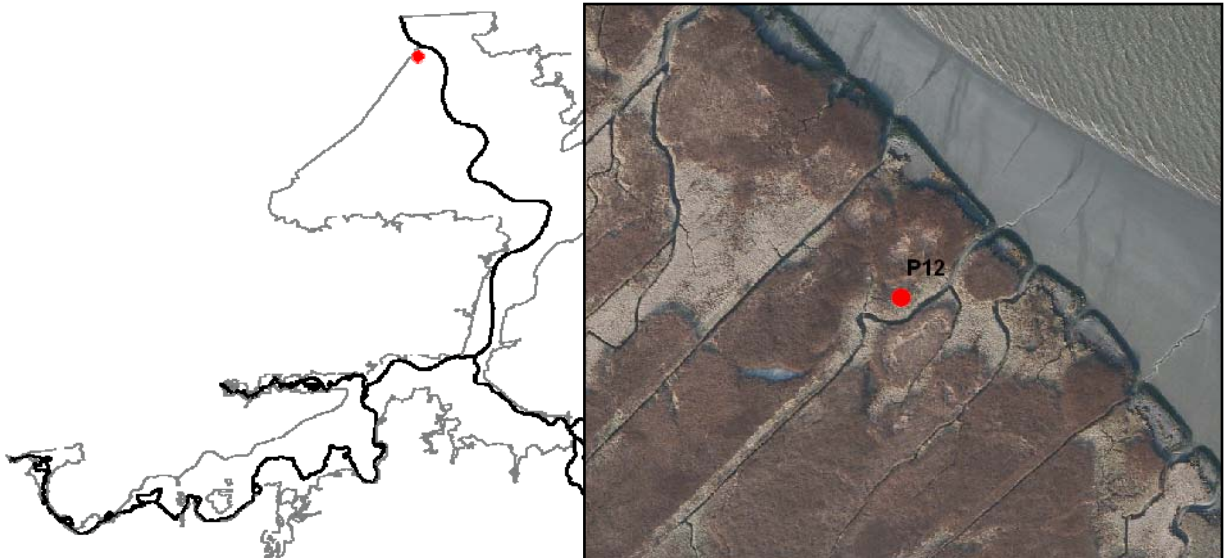
**Endogleyic Fluvic Cambisol (Calcaric, Sodic, Hyperhumic, Hypereutric, Ruptic, Siltic)**

- Calcaric: a content between 7-13% was found, and the weighted average is below 10%
- Sodic: The concentration of sodium plus manganese cations is less than 30%
- Hyperhumic: the weighted average is 5,18%
- Hypereutric: The base saturation exceeds 100% throughout

## 2.6 Profile 'P12': Schor van Ouden Doel

(Derived elevation: 5.80m TAW; Lat.: 51.344558, Long.: 4.239659)

### 2.6.1 Situation



Profile 'P12' is located in 'Schor van Ouden Doel', on Flemish territory. The tidal marsh edge here is defended with riprap. The tidal marsh itself consists of reed vegetation and sea couch (*Scirpus maritimus*).





The profile is excavated in the tidal marsh soil, in a reed and sea couch transition zone.

## 2.6.2 Profile description

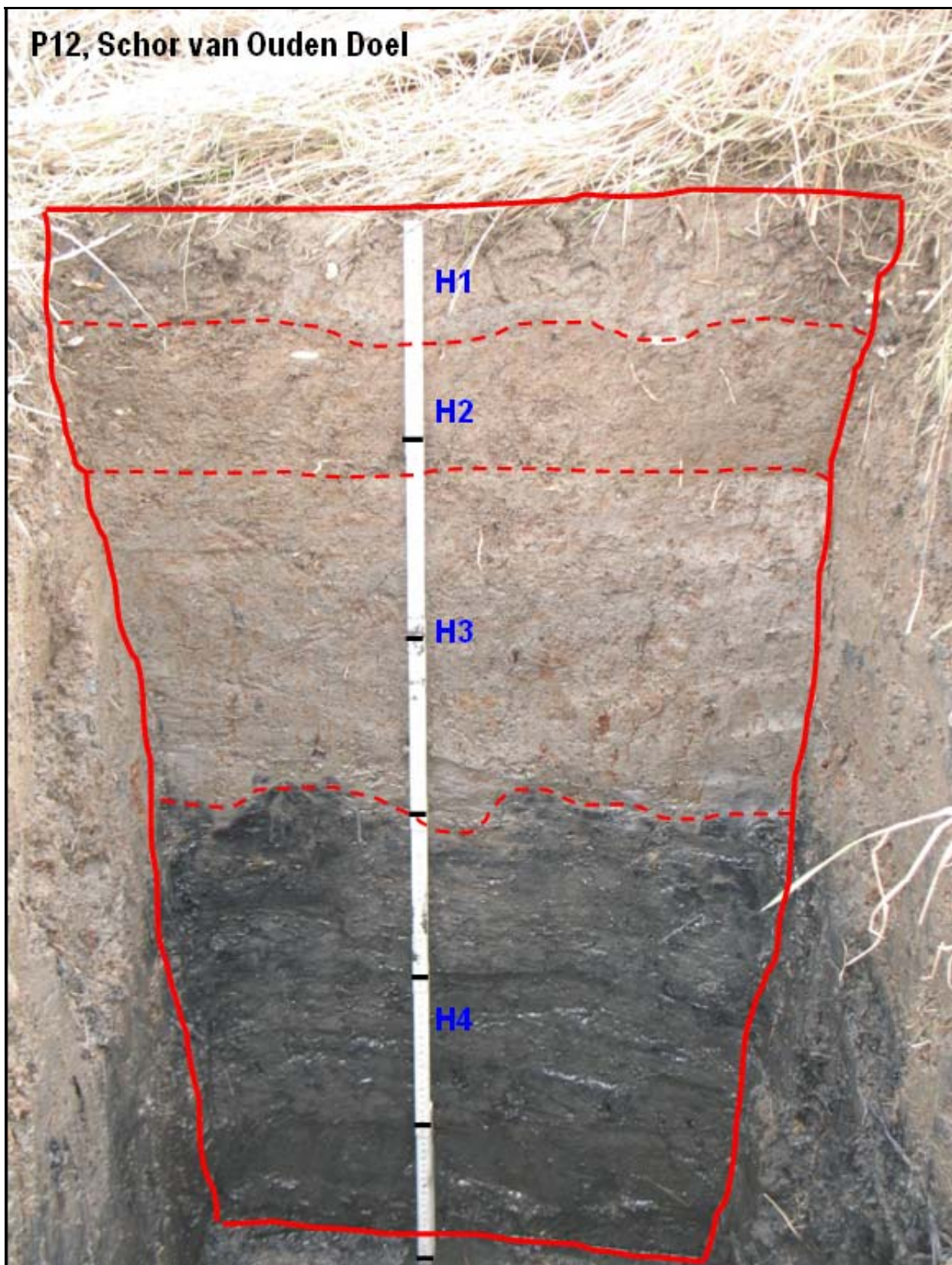
Profile P12	Schor van Ouden Doel
1.3 Date and time:	26/2/2009. Profile description initiated at 14h. Low tide at 10:56.
1.4 Author:	Jari Hinsch Mikkelsen
1.5 Location:	Belgium, Province of East Flanders, Beveren Municipality. For a road description check description presented for profile P3.
1.6 Profile coordinates:	Latitude, longitude: 51° 20' 27.35" N, 04° 14' 37.95" E Lambert-72: 226093.925 N, 141004.323 E
4.1 Elevation:	±5.8 m TAW (deduced from DTM data)
2.1 Atmospheric climate and weather condition:	Overcast during the profile description. In the weeks prior, overcast or rainy weather dominated.
Soil climate:	<i>STR</i> : Mesic <i>SMR</i> : Udic
2.2 Topography:	<i>Macrotopography</i> : Estuarium, tidal mouth of the Schelde River <i>Mesotopography</i> : Tidal marsh <i>Landscape position</i> : bottom (edge of depression) <i>Slope form</i> : straight, straight (SS) <i>Slope gradient</i> : nearly level (0.5-1.0%) <i>Slope length</i> : 7-10m <i>Slope orientation</i> : SE
2.5 Land-use:	Tidal marsh <i>Wildlife</i> : Hunting probably not allowed <i>Grazing</i> : Grazing by cattle is in principle possible during the summer months but in practise, the reed vegetation seems to keep the cattle away.
2.6 Human influence:	No influence observed
Vegetation:	Dominated by <i>Scirpus maritimus</i>

Profile P12		Schor van Ouden Doel
2.7 Parent material:	unconsolidated deposits> marine and estuarine clays and silts> quaternary clay and silt> Holocene Clay (5221)	
2.8 Drainage class:	Poorly drained	
2.9 External drainage:	Ponded	
2.10 Flooding	Flooded during spring tides	
2.11 Coarse surface frag.	None	
2.12 Erosion, sedimentation:	Slight active sheet sedimentation and erosion	
2.13 Surface cracks:	None observed	
2.14 Salts:	None observed	
Localisation factors profile:	<i>Vegetation:</i> On the transition between <i>Scirpus maritimus</i> and <i>Elymus athericus</i> <i>Geomorphology/topography:</i> Profile located at the edge of a shallow landscape depression with free standing water. <i>Hydrology:</i> a diver has been placed close by, providing information about the tidal cycle	
Remarks:	Reed roots grow horizontally only (colonising stage). H4 was sampled in the upper (H4a) and the lower part (H4b) No rock fragments through the soil.	
N o.		Horizon description
H1	A	0-10 cm; very dark greyish brown to dark greyish brown 10YR 3.5/2 (M); horizon composing of relative young sediment with greyish and rusty colours; common, medium, faint, diffuse mottles; no reaction to αα-dipyridyl; oximorphic colour pattern; clay; very fine, weak developed, subangular blocky and granular; sticky, very plastic; medium porosity; few very fine, very few fine to coarse roots; abrupt smooth boundary
H2	bA	10-25 cm; very dark greyish brown 2.5Y 3/2 (W); more soil development than in overlying horizon; abundant, medium, faint, very diffuse mottles; no reaction to αα-dipyridyl; oximorphic colour pattern; clay; very fine, moderate developed granular; sticky, very plastic; high porosity; few very fine, very few fine and few medium to coarse roots; clear smooth boundary
H3	Cg	25-56 cm; very dark grey to dark grey 2.5Y 3.5/1 (W); many, medium, faint, diffuse, 2.5Y 3.5/1 (W) mottles; no reaction to αα-dipyridyl; oximorphic colour pattern; clay; strong, columnar; sticky, very plastic; high porosity; few very fine, very few fine to medium roots; abrupt smooth boundary
H4	Cr	56-120 cm; greenish black 2.5/10Y (W); positive reaction to αα-dipyridyl, throughout; reductimorphic colour pattern; faint petrochemical odour; clay; massive; sticky, very plastic; medium porosity; very few, very fine roots

*Extra subordinate symbols: 'bi' biological activity clearly evidences (fauna and flora), and more than what can be expected according to type of soil, position, time of year etc.*

*Colour measurements: M= Moist; MC= Moist-crushed; D= Dry; DC= Dry-crushed; W= Wet.*

## P12, Schor van Ouden Doel





## 2.6.3 Analytical laboratory data

Table A7: Analytical data for P12, Schor van Ouden Doel									
Profile studied 14/11/2008									
Profile analysed: March-Dec./2009									
P12	Horizon	Depth	Total N	Total N	Carbon- TOC		C		C/N
Horizon nr.	symbols	cm	analyser %	Kjeldahl %	TC %	IC %	OC %	Analysier %	(TOC/Kjel.)
H1	A	0-10	0.54	0.41	7.27	1.82	5.46	6.32	13
H2	bA	10-25	0.43	0.37	6.62	1.60	5.02	6.35	13
H3	Cg	25-56	0.47	0.36	6.83	1.43	5.40	5.94	15
H4a	Cr	56-87	0.43	0.34	7.32	1.79	5.54	6.48	16
H4b	Cr	87-120	0.37	0.27	6.61	1.58	5.03	6.06	18
Laser diffraction on soil material (fractions in µm)									
Horizon nr.	0.4-2	2-6	6-50	50-63	63-100	100-250	250-500	500-1000	1000-2000
----- % -----									
H1	3.0	5.2	30.6	6.9	15.1	22.1	11.6	5.0	0.5
H2	3.3	6.0	29.9	5.4	11.5	20.2	12.8	9.8	1.2
H3	4.4	8.2	36.9	6.6	13.9	20.5	6.3	2.4	0.8
H4a	5.7	11.5	45.3	5.8	10.9	14.9	4.1	1.4	0.4
H4b	4.5	8.6	45.4	7.8	14.9	13.9	3.3	1.3	0.3
Particle size distribution (µm; pipette)									
Horizon nr.	Na <sup>+</sup>	K <sup>+</sup>	Ca <sup>2+</sup>	Mg <sup>2+</sup>	Particle size distribution (µm; pipette)				
-----by MgSO <sub>4</sub> (compulsive method)-----					0-2	2-10	10-20	20-50	50-2000
-----cmol(+)/kg soil-----					----- % -----				
H1	14.6	2.5	23.2	11.3	34.1	12.5	8.8	31.1	13.5
H2	18.1	2.6	23.3	11.1					
H3	19.4	2.6	21.6	9.9	46.8	21.1	10.3	19.0	2.8
H4a	26.2	1.6	20.6	11.2					
H4b	24.5	3.1	19.5	9.8	44.6	22.5	12.2	16.4	4.3
Horizon nr.	CEC sum	CEC measured	BS by CEC-m	Acidity sum	CaCO <sub>3</sub> titration	pH H <sub>2</sub> O	pH CaCl <sub>2</sub>	pH CaCl <sub>2</sub> /H <sub>2</sub> O	EC dS/m
cmol(+)/kg % cmol(+)/kg % % 1:5 1:5									
H1	51.6	39.8	>100	<	11.8	8.4	7.8	0.93	1.63
H2	55.0	45.0	>100	<	11.7	8.3	7.9	0.95	2.20
H3	53.4	38.9	>100	<	9.9	8.4	7.8	0.94	2.29
H4a	59.6	32.9	>100	<	11.6	8.1	7.9	0.98	4.54
H4b	56.9	27.3	>100	<	13.4	7.7	7.5	0.97	4.52
Horizon nr.	Ca	K	Mg	Na	P	S	Al	As	Cd
-----Aqua Regia-----									
-----mg/kg-----									
H1	44478	8009	7417	3330	2298	1686	27584.6	27.6	3.4
H2	26909	9365	7792	4005	3938	1920	35666.6	60.4	9.5
H3	36880	10567	8175	4228	2597	1511	38318.6	79.3	8.9
H4a	45252	10939	8574	5549	995	8950	37441.7	55.9	5.7
H4b	49247	8236	7607	4965	669	15460	28597	71.7	13.3
Horizon nr.	Co	Cr	Cu	Fe	Mn	Ni	Pb	Zn	Lab
-----Aqua Regia-----									
-----mg/kg-----									
H1	14.4	62.9	105	43557	1002	30.9	93.4	403	JM385
H2	19.5	112.1	201	50687	1653	52.6	177.7	659	JM386
H3	15.6	115.6	310	45527	621	40.9	202.9	712	JM387
H4a	19.0	95.2	126	45673	1009	37.9	192.0	710	JM388
H4b	18.2	98.6	111	44710	637	36.4	213.0	857	JM389
Horizon nr.	Na <sup>+</sup>	K <sup>+</sup>	Ca <sup>2+</sup>	Mg <sup>2+</sup>	CEC sum	Na+Mg saturation	ESP	SAR	
-----by NH <sub>4</sub> OAc-----					sum	saturation			
-----cmol(+)/kg soil-----					cations	%	%		
H1	13.6	1.9	43.5	12.6	72	37	19	2.6	
H2	11.4	1.3	40.0	7.8	60	32	19	2.3	
H3	14.5	2.0	36.9	12.8	66	41	22	2.9	
H4a	17.9	2.0	46.0	14.0	80	40	22	3.3	
H4b	20.4	2.3	45.5	10.7	79	39	26	3.8	

## 2.6.4 World reference base (2007) classification

Diagnostic horizon, properties, material:	Present in horizon:	Remarks:
Albic		Colours are too dark in moist conditions
Cambic		Colour changes insufficient
Mollic		Structure is too incomplete
Salic		The highest conductivity is 5,54 dS/m
Abrupt textural change		Data on the texture-pipette is partly missing, based on texture-laser, most probably no abrupt changes are present
	H3 H4	Oximorphic colour pattern Reductimorphic colour pattern
Lithological discontinuity		
Reducing conditions	H4	Positive reaction to alpha-alpha dipyridyl
Secondary carbonates		No secondary carbonate observed
Calcaric material		Analytical data confirm the presence of more than 2% calcium-carbonate throughout the soil
Fluvic material		OC content remains above 5% throughout
Sulphidic material	-	Alkaline pH

The profile keys out as a Fluvisol.

### Full classification name, without specifiers

(except where listed as such for prefix and suffix qualifiers):

#### Tidalic Fluvisol (Calcaric, Humic, Sodic, Eutric, Silty)

- Tidalic: flooded by tidewater but not covered by water at mean low tide
- Gleyic: oximorphic and reductimorphic colours start from 20 cm and 56 cm respectively. The reduced conditions from 56 cm depth only- should start within the upper 50 cm
- Calcaric: present throughout the soil profile
- Humic: the content exceeds 1% throughout
- Sodic: The required 15% sodium plus manganese cations on the exchange complex is present throughout the soil
- Eutric: The base saturation exceeds 100% throughout
- Silty: Both H3-4 have a silty clay texture

### Full classification name, with specifiers:

#### Tidalic Fluvisol (Hypercalcaric, Hyperhumic, Hypersodic, Hypereutric, Silty)

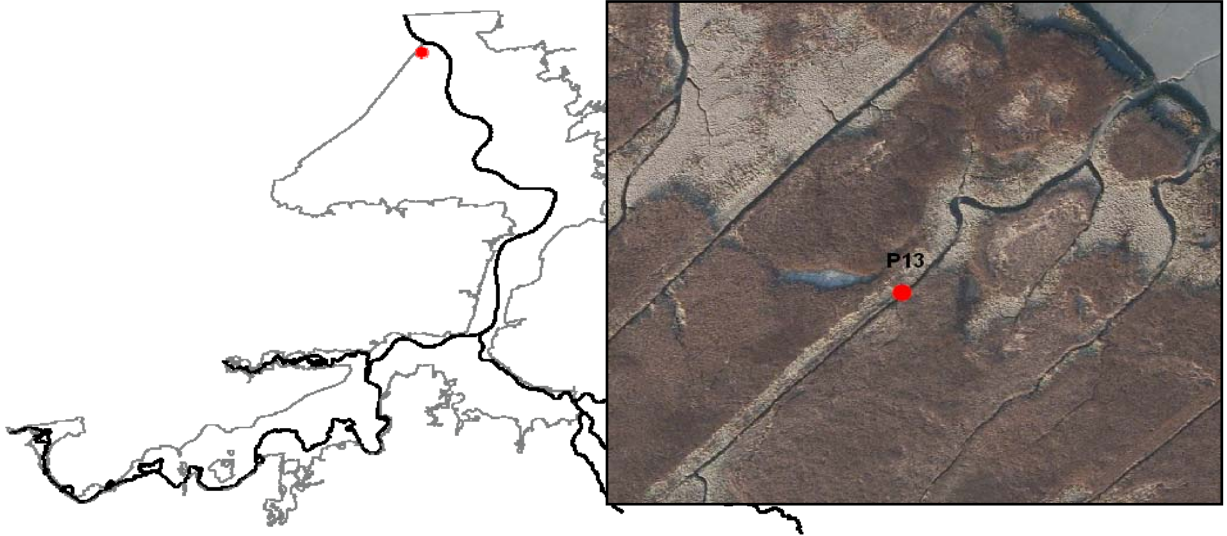
- Epigleyic: the reduced conditions appear already within the upper 50 cm
- Hypercalcaric: lowest content is 9.9%, and the weighted average is above 10%
- Hyperhumic: the content never goes below 5%
- Hypersodic: The concentration of sodium plus manganese cations exceeds 30% throughout
- Hypereutric: The base saturation exceeds 100% throughout



## 2.7 Profile 'P13': Schor van Ouden Doel

(Derived elevation: 6.00m TAW; Lat.: 51.344101, Long.: 4.23904)

### 2.7.1 Situation



Profile 'P13' is located in 'Schor van Ouden Doel', on Flemish territory. The tidal marsh edge here is defended with riprap.

The tidal marsh itself consists of reed vegetation and sea couch (*Scirpus maritimus*).



The profile is excavated in a creek-wall, in reed vegetation.

## 2.7.2 Profile description

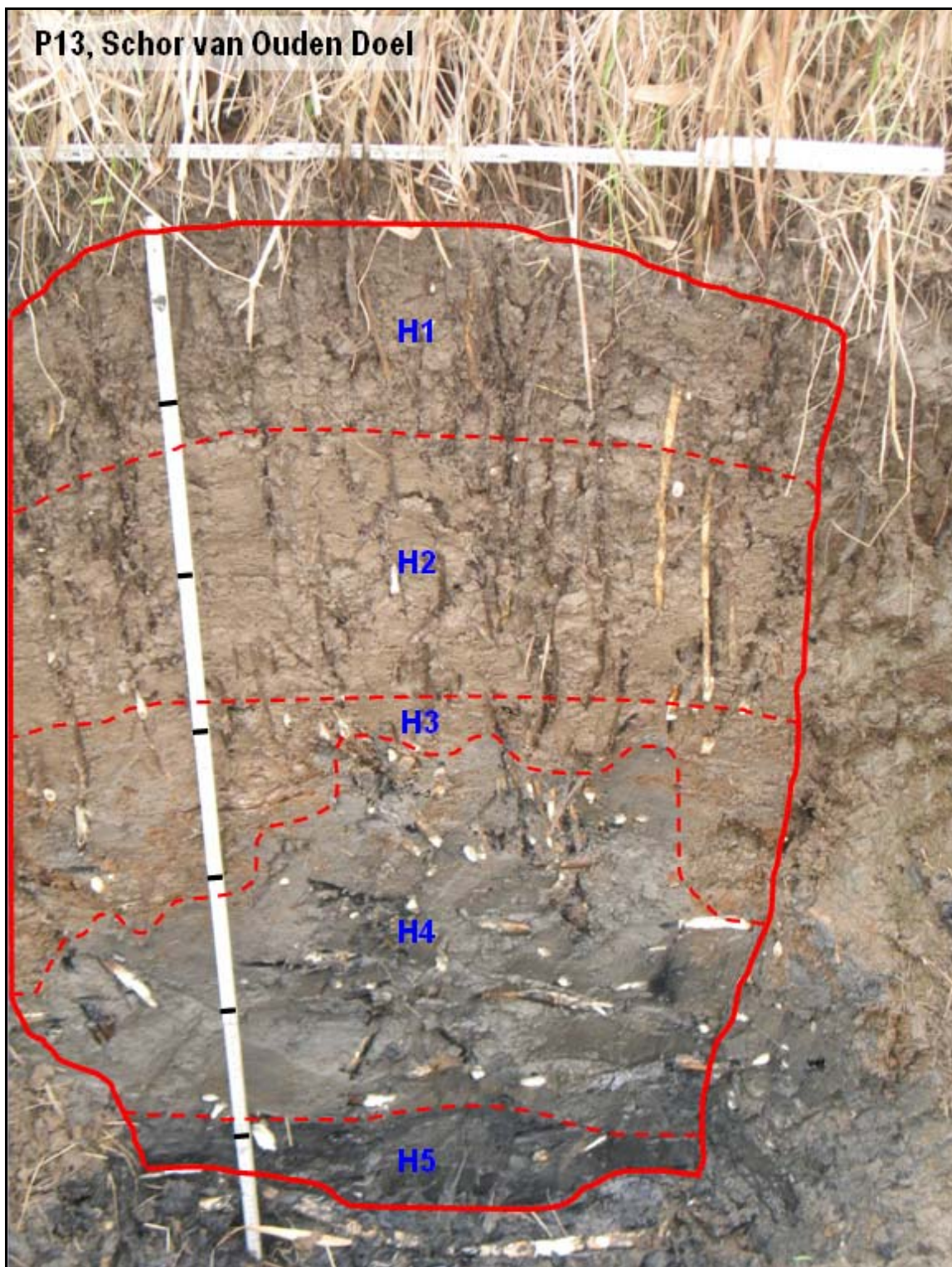
Profile P13		Schor van Ouden Doel
1.3 Date and time:	26/2/2009. Started profile description at 10:20. Low tide at 10:56	
1.4 Author:	Jari Hinsch Mikkelsen	
1.5 Location:	Belgium, Province of East Flanders, Beveren Municipality. For a road description check description for profile P3	
1.6 Profile coordinates:	Latitude, longitude: 51° 20' 24.61" N, 04° 14' 34.24" E Lambert-72: 226043.155 N, 140961.079 E	
4.1 Elevation:	±6.0 m TAW (deduced from DTM data)	
2.1 Atmospheric climate and weather condition:	Overcast, like most other days in the weeks prior to fieldwork.	
Soil climate:	<i>STR</i> : Mesic <i>SMR</i> : Udic	
2.2 Topography:	<i>Macrotopography</i> : Estuarium, tidal mouth of the Schelde River <i>Mesotopography</i> : Tidal marsh <i>Landscape position</i> : Central in the tidal marsh, in a higher landscape position <i>Slope form</i> : - <i>Slope gradient</i> : level (0.2-0.5%) <i>Slope length</i> : - <i>Slope orientation</i> : -	
2.5 Land-use:	Tidal marsh <i>Wildlife</i> : Hunting probably not allowed <i>Grazing</i> : Grazing by cattle is in principle possible during the summer months but in practise, the reed vegetation and the deep creek wherein the profile was made are factors that keep the cattle away.	
2.6 Human influence:	No influence observed	
Vegetation:	Reed	
2.7 Parent material:	unconsolidated deposits> marine and estuarine clays and silts> quaternary clay and silt> Holocene Clay (5221)	
2.8 Drainage class:	Poorly drained	
2.9 External drainage:	Slow run-off	
2.10 Flooding	Twice a day for the creek, and during the spring tides for the surface of the soil profile	
2.11 Coarse surface frag.	None	
2.12 Erosion, sedimentation:	Erosion and sedimentation in the creek and probably slow sedimentation on top of the soil profile related to the bimonthly flooding	
2.13 Surface cracks:	None	
2.14 Salts:	None	
Localisation factors profile:	<i>Vegetation</i> : The profile is located centrally in a large area covered with reed vegetation. <i>Geomorphology/topography</i> : In order to observe to what extend the landscape position has an influence on the soil genesis and development, this profile is located on a slightly higher topographical position	
Remarks:	No rock fragments observed throughout the soil	
N o.		Horizon description
H1	Abi1	0-24 cm; very dark greyish brown 2.5Y 3/2 (W); no reaction to aa-dipyridyl; strong developed very fine granular, locally coarse angular blocky; sticky, very plastic; dirty

Profile P13		Schor van Ouden Doel
		clay coatings along ped faces; common, very fine, few fine to medium and common coarse roots; gradual, smooth boundary
H2	Abi2	24-62 cm; very dark greyish brown to dark greyish brown 2.5Y 3.5/2 (W); no reaction to αα-dipyridyl; silty clay loam (finger test); coarse, moderate developed, angular blocky; sticky, very plastic; dirty clay coatings along fractures and on pedfaces; common very fine, very few fine to medium and common coarse roots; clear, smooth boundary
H3	Bg	62-68/85 cm; dark greenish grey 4/10Y (W); many, medium, distinct, diffuse dark yellowish brown (10YR 4/4, W) mottles; no reaction to αα-dipyridyl; oximorphic colour pattern; massive; sticky, very plastic; high porosity; few very fine, very few fine to medium and common coarse roots; clear, wavy boundary
H4	Cr1	68/85-120 cm; very dark greenish grey to dark greenish grey 3.5/10Y (W); positive reaction to αα-dipyridyl, throughout; reductimorphic colour pattern; massive; sticky, very plastic; medium porosity; few very fine, very few fine to medium and common coarse roots; abrupt, smooth boundary
H5	Cr2	120-... cm; greenish black 2.5/10Y (W); positive reaction to αα-dipyridyl, throughout; reductimorphic colour pattern; petrochemical odour; massive with visible stratification; sticky, very plastic; medium porosity; very few very fine and few coarse roots

*Extra subordinate symbols: 'bi' biological activity clearly evidences (fauna and flora), and more than what can be expected according to type of soil, position, time of year etc.*

*Colour measurements: M= Moist; MC= Moist-crushed; D= Dry; DC= Dry-crushed; W= Wet.*





## 2.7.3 Analytical laboratory data

Table A8: Analytical data for P13, Schor van Ouden Doel									
					Profile studied 14/11/2008				
					Profile analysed: March-Dec./2009				
P13	Horizon	Depth	Total N	Total N	Carbon- TOC			C	C/N
Horizon	symbols		analyser	Kjeldahl	TC	IC	OC	Analysers	
nr.		cm	%	%	%	%	%	%	(TOC/Kjel.)
H1	Abi1	0-24	0.425	0.295	5.82	2.25	3.57	5.26	12
H2	Abi2	24-62	0.219	0.180	4.99	1.80	3.19	3.78	18
H3	Bg	62-68/85	0.277	0.233	4.41	1.88	2.53	4.31	11
H4	Cr1	68/85-120	0.348	0.230	5.03	1.78	3.25	4.77	14
H5	Cr2	120-140	0.306	0.255	5.46	1.88	3.57	5.57	14
Horizon	Laser diffraction on soil material (fractions in µm)								
nr.	0.4-2	2-6	6-50	50-63	63-100	100-250	250-500	500-1000	1000-2000
	-----%								
H1	3.0	4.8	30.1	8.0	17.8	23.1	8.5	4.1	0.6
H2	3.0	4.4	30.8	10.5	26.0	22.2	2.9	0.2	0.0
H3	3.5	5.5	37.5	10.3	20.2	18.4	3.4	0.8	0.3
H4	3.4	5.5	35.9	10.0	22.8	19.6	2.7	0.2	0.0
H5	3.1	5.5	27.7	6.0	13.9	22.6	13.9	6.8	0.5
Horizon	Na <sup>+</sup>	K <sup>+</sup>	Ca <sup>2+</sup>	Mg <sup>2+</sup>	Particle size distribution (µm; pipette)				
nr.	-----by MgSO <sub>4</sub> (compulsive method)-----				0-2	2-10	10-20	20-50	50-2000
	-----cmol(+)/kg soil-----				-----%				
H1	10.7	2.0	14.4	10.4					
H2	8.9	1.5	12.6	7.7	38.8	14.3	6.1	21.2	19.6
H3	14.2	2.4	16.8	8.8					
H4	17.2	2.6	14.6	8.2	29.4	11.4	8.1	29.1	22.0
H5	19.5	2.9	15.8	9.5					
Horizon	CEC	CEC	BS by	Acidity	CaCO <sub>3</sub>	pH		pH	EC
nr.	sum	measured	CEC-m	sum	titration	H <sub>2</sub> O	CaCl <sub>2</sub>	CaCl <sub>2</sub> /H <sub>2</sub> O	dS/m
	cmol(+)/kg		%	cmol(+)/kg	%	1:5	1:5		1:5
H1	37.5	30.4	>100	<	14.4	8.7	8.0	0.91	1.18
H2	30.7	25.6	>100	<	13.5	8.7	7.9	0.91	1.25
H3	42.2	30.5	>100	<	11.7	8.5	7.9	0.93	1.86
H4	42.6	30.8	>100	<	13.0	8.3	7.8	0.94	2.64
H5	47.7	31.0	>100	<	11.7	8.4	8.0	0.96	3.31
Horizon	Ca	K	Mg	Na	P	S	Al	As	Cd
nr.	-----Aqua Regia-----								
	-----mg/kg-----								
H1	52898	8232	7427	2812	1723	2504	23637.2	22.9	2.6
H2	47670	5279	5849	2192	1716	1989	14949.5	23.9	1.9
H3	46332	7779	6787	2968	2104	2644	25844.9	27.1	3.1
H4	47947	8125	7223	3828	2683	3655	27883.5	35.7	5.6
H5	47010	9292	7672	4562	1454	4584	32904.4	62.4	5.9
Horizon	Co	Cr	Cu	Fe	Mn	Ni	Pb	Zn	Lab
nr.	-----Aqua Regia-----								
	-----mg/kg-----								
H1	12.6	47.0	92	32973	1052	25.7	72.3	320	JM390
H2	11.5	44.1	81	29767	815	24.3	73.4	296	JM391
H3	11.4	60.0	113	39686	602	29.0	85.2	349	JM392
H4	14.3	82.7	137	42707	928	38.1	113.7	458	JM393
H5	15.4	92.3	147	39763	672	33.3	194.2	610	JM394
Horizon	Na <sup>+</sup>	K <sup>+</sup>	Ca <sup>2+</sup>	Mg <sup>2+</sup>	CEC	Na+Mg	ESP	SAR	
nr.	-----by NH <sub>4</sub> OAc-----				sum	saturation			
	-----cmol(+)/kg soil-----				cations	%	%		
H1	8.3	1.5	35.6	11.8	57	35	15	1.7	
H2	7.1	1.1	33.6	8.7	51	31	14	1.5	
H3	9.9	1.6	36.2	8.9	56	33	17	2.1	
H4	14.0	1.9	38.0	9.7	64	37	22	2.9	
H5	16.3	2.0	37.8	9.5	66	39	25	3.4	



## 2.7.4 World reference base (2007) classification

Diagnostic horizon, properties, material:	Present in horizon:	Remarks:
Albic	H2	Hue of H2 (2.5Y) is redder than for H3 (10Y)
Cambic	H2	Texture is fine enough. Blocky structure in H2, massive in H3. Colour value slightly higher than for H1 and redder than H3.
Mollic		H1 fulfil all requirements except the thickness. H2 has a too high value
Salic		The highest conductivity is 3,31 dS/m
Abrupt textural change	H3-4	Data on the texture-pipette is partly missing. By expert judgement and based on morphology and texture-laser it is decided that no abrupt change is present
	H3 H4-5	Oximorphic colour pattern Reductimorphic colour pattern
Lithological discontinuity		
Reducing conditions	H4-5	Positive reaction to alpha-alpha dipyridyl
Secondary carbonates		No secondary carbonate observed
Calcaric material	H1-7	Analytical data confirm the presence of more than 2% calcium-carbonate throughout the soil
Fluvic material	H4-6	Below the cambic horizon fluvic material prevails
Sulphidic material		Alkaline pH

The profile will not key out in Fluvisol. Fluvic material is present because of an irregular content of organic matter and remaining above 0.2% to a depth of 100 cm. But from 24-62 cm depth a cambic horizon has developed. This excludes that fluvic material is present starting within the upper 25 cm depth as required for this RSG.

The reduced conditions start at 68 cm from the surface, and that is too deep for the Gleysols. Because of the presence of a cambic horizon the soil keys out as a Cambisol.

### Full classification name, without specifiers

(except where listed as such for prefix and suffix qualifiers):

#### Endogleyic Fluvic Cambisol (Calcaric, Sodic, Humic, Eutric, Siltic)

- Fluvic: fluvic material present from 62 cm and onwards
- Endogleyic: oximorphic and reductimorphic colours start from 62 cm and 68/85 cm respectively. The reduced conditions also from 68/85 cm depth
- Calcaric: present throughout the soil profile
- Sodic: The required 15% sodium plus manganese cations on the exchange complex is present throughout the soil
- Alcalic: the pH remains above 8.5 in H1-3
- Humic: organic carbon content remains higher than 1%
- Eutric: The base saturation exceeds 100% throughout
- Siltic: both H2 qualify with a silty clay texture.

**Full classification name, with specifiers:**

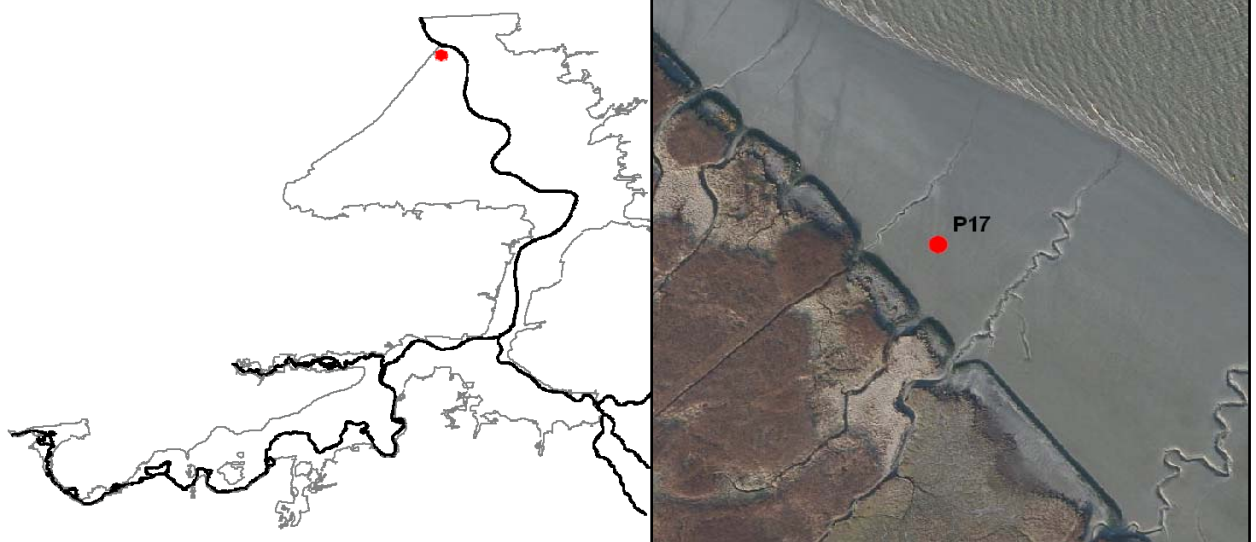
**Endogleyic Endofluvic Cambisol (Hypercalcaric, Hypersodic, Humic, Hypereutric, Siltic)**

- Endofluvic: the fluvic material is only present at 68 cm depth
- Hypercalcaric: a content between 11-14% was found, and the weighted average is above 10%
- Hypersodic: The concentration of sodium plus manganese cations exceeds 30% throughout
- Humic: the weighted average is less than 5%
- Hypereutric: The base saturation exceeds 100% throughout

## 2.8 Profile 'P17': Schor van Ouden Doel

(Derived elevation: 2.40m TAW; Lat.: 51.344152, Long.: 4.242183)

### 2.8.1 Situation



Profile 'P17' is a mudflat-profile, located near 'Schor van Ouden Doel', on Flemish territory.



It is situated at 30 meters from the tidal marsh edge riprap, in the higher zone of the mudflat.

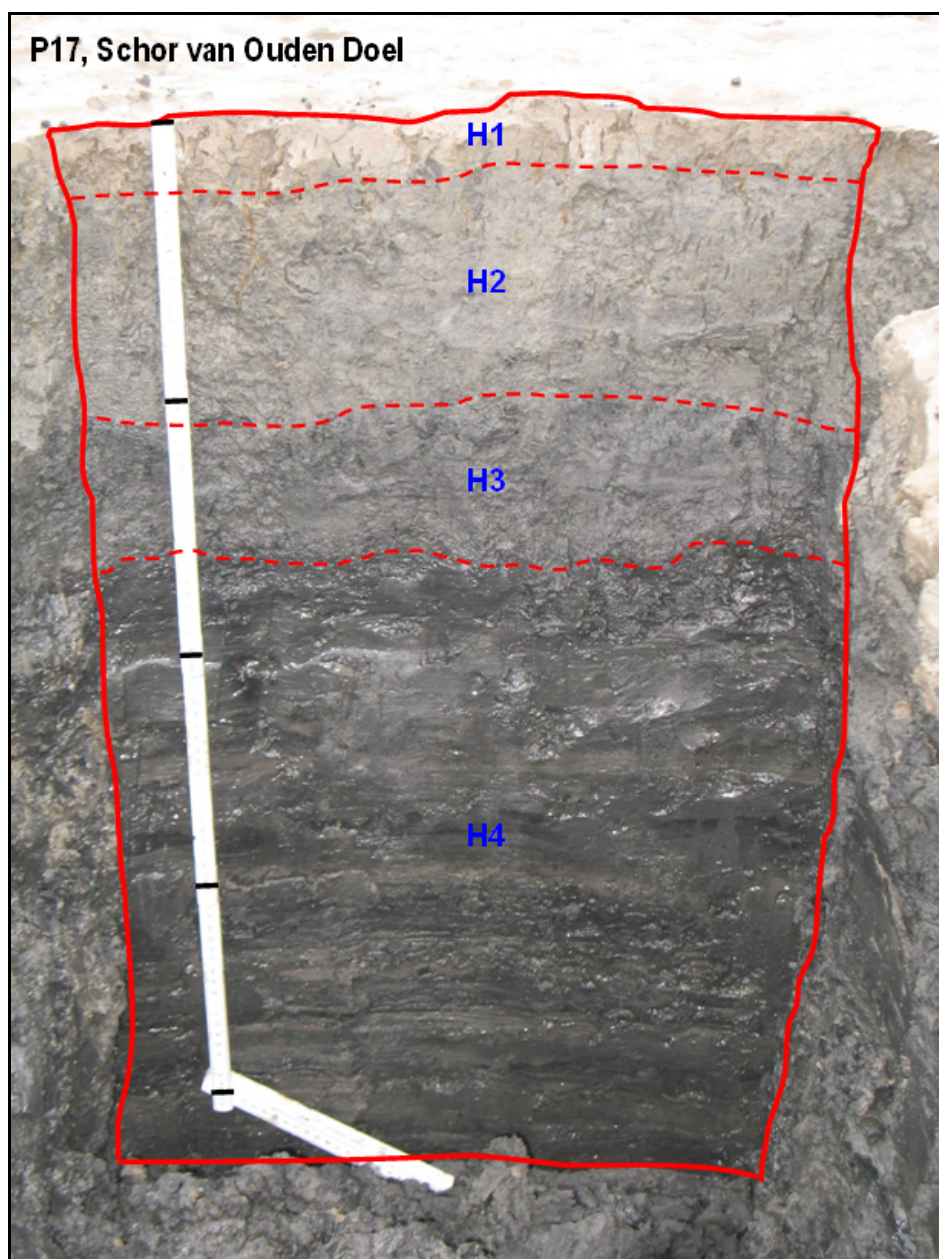
## 2.8.2 Profile description

Profile P17		Schor van Ouden Doel
1.3 Date and time:	27/2/2009. Profile description began at 10:40. Low tide at 11:33	
1.4 Author:	Jari Hinsch Mikkelsen	
1.5 Location:	Belgium, Province of East Flanders, Beveren Municipality. For a road description check description for profile P3.	
1.6 Profile coordinates:	Latitude, longitude: 51° 20' 24.91" N, 04° 14' 53.10" E Lambert-72: 226048.450 N, 141180.133 E	
4.1 Elevation:	±2.4 m TAW (topo-bathymetry data 2001)	
2.1 Atmospheric climate and weather condition:	Overcast, close to light rain.	
Soil climate:	<i>STR</i> : Mesic <i>SMR</i> : Peraquic	
2.2 Topography:	<i>Macrotopography</i> : Estuarium, tidal mouth of the Schelde River <i>Mesotopography</i> : Tidal mud flat <i>Landscape position</i> : Upper part of tidal mud flat, where the surface is characterised by micro ripple formations <i>Slope form</i> : convex, straight (V, S) <i>Slope gradient</i> : gently sloping (2-5%) <i>Slope length</i> : about 300m <i>Slope orientation</i> : SW	
2.3 Tidal mud flat morphology	Heterogeneous rippled covering >80% of the surface. The ripples are 2-5 cm tall, less than 10 cm wide, and 5-10 cm long. No rills observed.	
2.5 Land-use:	Tidal mud flat <i>Wildlife</i> : No hunting <i>Grazing</i> : -	
2.6 Human influence:	No influence	
Vegetation:	No vegetation	
2.7 Parent material:	unconsolidated deposits> marine and estuarine clays and silts> quaternary clay and silt> Holocene Silt (5222)	
2.8 Drainage class:	Very poorly drained	
2.9 External drainage:	Slow run-off	
2.10 Flooding	Twice daily	
2.11 Coarse surface frag.	None	
2.12 Erosion, sedimentation:	Sheet erosion and sedimentation	
2.13 Surface cracks:	None	
2.14 Salts:	None	
Localisation factors profile:	<i>Vegetation</i> : - <i>Geomorphology/topography</i> : Representative for the upper part of the tidal mud flat, where the slope towards the Schelde has a more gentle character.	
N o.		Horizon description
H1	A	0-4 cm; greyish brown 2.5Y 5/2 (M), light greyish brown 2.5Y 6/2 (D); few, very fine, distinct, clear, rusty mottles, present around vertical biogalleries; no reaction to αα-dipyridyl; unripe; high porosity; no roots; calcareous matrix, primary; abrupt smooth boundary
H2	Cr1	4-21 cm; dark greyish brown 2.5Y 4/2 (M), greyish brown 2.5Y 5/2 (D); positive reaction to αα-dipyridyl, throughout; reductimorphic colour pattern; unripe; no roots;

Profile P17		Schor van Ouden Doel
		calcareous matrix, primary; abrupt smooth boundary
H3	Cr2	21-31 cm; olive grey 5Y 4/2 (M) olive grey to light olive grey 5Y 5.5/2; positive reaction to $\alpha\alpha$ -dipyridyl, throughout; reductimorphic colour pattern; unripe; no roots; calcareous matrix, primary; clear smooth boundary
H4	Cr3	31-80 cm; greenish black 2.5/10Y (W); positive reaction to $\alpha\alpha$ -dipyridyl, throughout; reductimorphic colour pattern; unripe; horizon composes of continuous stratified sediment; no roots; calcareous matrix, primary

*Extra subordinate symbols: 'bi' biological activity clearly evidences (fauna and flora), and more than what can be expected according to type of soil, position, time of year etc.*

*Colour measurements: M= Moist; MC= Moist-crushed; D= Dry; DC= Dry-crushed; W= Wet.*



### 2.8.3 Analytical laboratory data

Table A9: Analytical data for P17, Schor van Ouden Doel									
Profile studied 14/11/2008									
Profile analysed: March-Dec./2009									
P17	Horizon	Depth	Total N	Total N	Carbon- TOC			C	C/N
Horizon nr.	symbols	cm	analyser %	Kjeldahl %	TC %	IC %	OC %	Analysed %	(TOC/Kjel.)
H1	C	0-4	0.133	<0.10	2.94	2.41	0.54	2.74	~11
H2	Cr1	4-21	0.152	<0.10	1.92	2.27	<0.10	2.51	~7
H3	Cr2	21-31	0.147	<0.10	2.35	2.00	0.35	2.31	
H4a	Cr3	31-60	0.307	0.185	4.56	1.88	2.68	4.64	14
H4b	Cr3	60-80	0.224	0.144	3.79	2.31	1.48	3.82	10
Laser diffraction on soil material (fractions in µm)									
Horizon nr.	0.4-2	2-6	6-50	50-63	63-100	100-250	250-500	500-1000	1000-2000
-----%-----									
H1	1.6	1.9	19.6	9.0	27.5	31.4	6.1	2.3	0.6
H2	1.7	2.0	17.6	9.1	30.2	34.5	4.8	0.2	0.0
H3	1.7	1.6	17.9	10.1	32.8	33.1	2.6	0.2	0.0
H4a	3.4	5.6	42.0	10.4	19.4	17.4	1.8	0.0	0.0
H4b	2.0	2.7	25.0	8.5	20.3	25.8	10.3	4.8	0.5
Horizon nr.	Na <sup>+</sup>	K <sup>+</sup>	Ca <sup>2+</sup>	Mg <sup>2+</sup>	Particle size distribution (µm; pipette)				
-----by MgSO <sub>4</sub> (compulsive method)-----					0-2	2-10	10-20	20-50	50-2000
-----cmol(+)/kg soil-----					-----%-----				
H1	6.9	0.9	7.5	4.5					
H2	5.8	1.3	5.8	3.2	16.0	0.8	1.0	18.6	63.6
H3	6.7	1.1	5.8	3.5					
H4a	14.9	2.4	12.3	10.0	21.9	9.5	9.0	40.5	19.2
H4b	16.1	2.0	12.3	8.8					
Horizon nr.	CEC sum	CEC measured	BS by CEC-m	Acidity sum	CaCO <sub>3</sub> titration	pH H <sub>2</sub> O	pH CaCl <sub>2</sub>	pH CaCl <sub>2</sub> /H <sub>2</sub> O	EC dS/m
-----cmol(+)/kg-----									
H1	19.9	14.8	>100	<	14.7	8.7	8.1	0.93	1.16
H2	16.1	11.3	>100	<	13.1	8.8	8.2	0.94	1.24
H3	17.1	24.3	70	<	12.9	8.6	8.2	0.95	1.52
H4a	39.8	22.5	>100	<	15.0	8.3	7.9	0.96	2.95
H4b	39.3	18.1	>100	<	13.7	8.2	8.2	1.00	2.68
Horizon nr.	Ca	K	Mg	Na	P	S	Al	As	Cd
-----Aqua Regia-----									
-----mg/kg-----									
H1	50517	4288	4591	1832	953	1756	11760	11.7	1.1
H2	52009	5637	5467	2533	793	1770	9708	9.4	1.1
H3	41779	7865	9175	4542	720	2301	9403	9.2	1.3
H4a	31279	3985	4218	2009	2199	7283	16769	26.6	5.1
H4b	55735	7989	7831	4154	1982	5709	18443	25.4	6.3
Horizon nr.	Co	Cr	Cu	Fe	Mn	Ni	Pb	Zn	Lab
-----Aqua Regia-----									
-----mg/kg-----									
H1	5.9	16.6	45.2	20363	357	11.5	28.3	141	JM395
H2	5.6	15.4	41.0	18104	247	11.1	26.4	128	JM396
H3	4.9	15.9	41.7	15818	249	10.1	26.8	117	JM397
H4a	10.7	59.4	89.7	36040	>	26.8	75.6	333	JM398
H4b	9.3	57.6	98.3	28304	827	25.8	74.9	333	JM399
Horizon nr.	Na <sup>+</sup>	K <sup>+</sup>	Ca <sup>2+</sup>	Mg <sup>2+</sup>	CEC sum	Na+Mg saturation	ESP	SAR	
-----by NH <sub>4</sub> OAc-----					sum	saturation			
-----cmol(+)/kg soil-----					cations	%	%		
H1	5.0	0.6	39.0	5.6	50	21	10	1.1	
H2	5.4	0.9	37.8	5.2	49	21	11	1.2	
H3	6.1	0.8	37.9	5.1	50	23	12	1.3	
H4a	13.2	1.7	38.5	10.9	64	38	21	2.7	
H4b	11.2	1.3	36.6	8.2	57	34	19	2.4	



## 2.8.4 World reference base (2007) classification

Diagnostic horizon, properties, material:	Present in horizon:	Remarks:
Salic		The highest conductivity is 2.95 dS/m
Abrupt textural change		Data on the texture-pipette is partly missing, based on texture-laser, most probably no abrupt change is present
	H1 H2-4	Oximorphic colour pattern Reductimorphic colour pattern
Lithological discontinuity		
Reducing conditions	H2-4	Positive reaction to alpha-alpha dipyridyl
Calcaric material		Analytical data confirm the presence of more than 2% calcium-carbonate throughout the soil
Fluvic material		Stratified and flooded twice a day
Sulphidic material	-	Alkaline pH

The profile keys out as a Fluvisol.

### Full classification name, without specifiers

(except where listed as such for prefix and suffix qualifiers):

#### Gleyic Tidalic Fluvisol (Calcaric, Humic, Sodic, Eutric, Siltic)

- Tidalic: flooded by tidewater but not covered by water at mean low tide
- Gleyic: oximorphic and reductimorphic colours start from 0 cm and 4 cm respectively. The reduced conditions from 4 cm depth.
- Calcaric: present throughout the soil profile
- Humic: the weighted average is 1.15%
- Sodic: The required 15% sodium plus manganese cations on the exchange complex is present throughout the soil
- Eutric: The base saturation exceeds 100% throughout
- Siltic: H4 has a silt loam texture

### Full classification name, with specifiers:

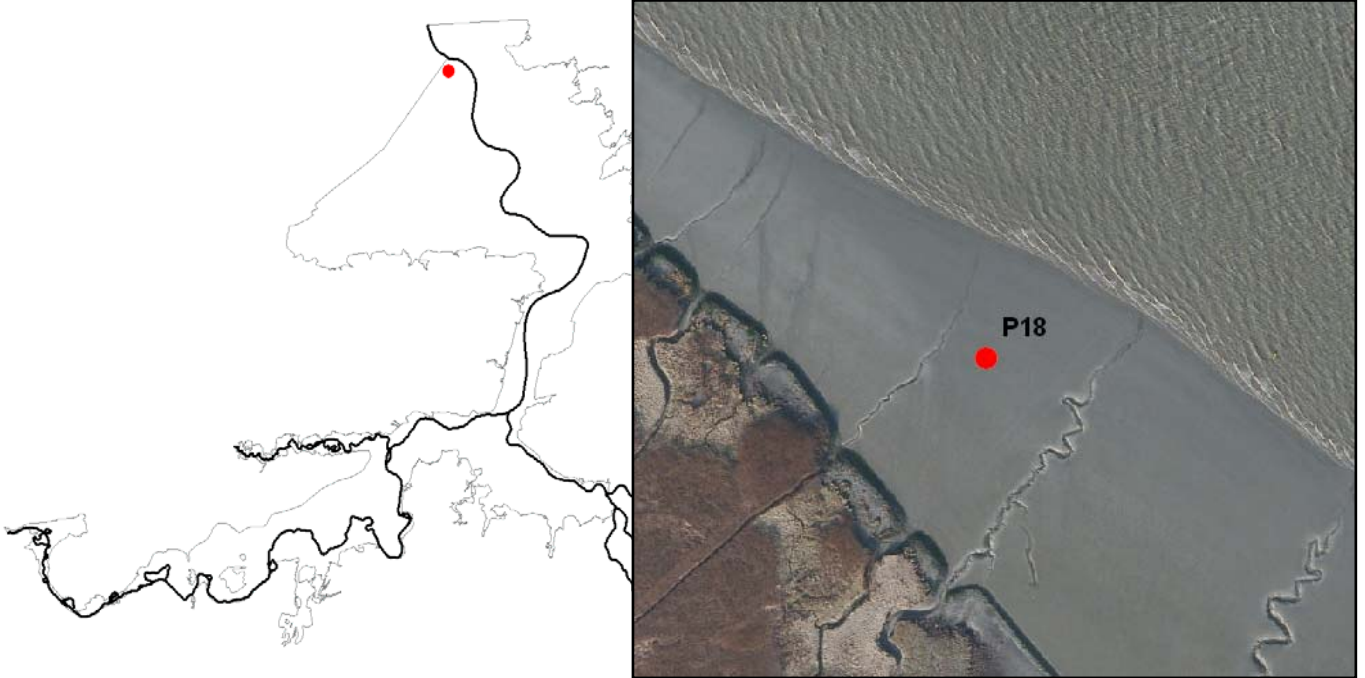
#### Hyperepigleyic Tidalic Fluvisol (Hypercalcaric, Humic, Sodic, Hypereutric, Siltic)

- Hyperepigleyic: the reduced conditions appear from 4 cm only
- Hypercalcaric: lowest content is 12.9%, implying that the weighted average exceeds 10%
- Sodic: The concentration of sodium plus manganese cations is less than 30%
- Hypereutric: The base saturation is less than 100% in H3, but seems rather a lab error

## 2.9 Profile 'P18': Schor van Ouden Doel

(Derived elevation: 1.65m TAW; Lat.: 51.34447, Long.: 4.242538)

### 2.9.1 Situation



Profile 'P18' is a mudflat-profile, located near 'Schor van Ouden Doel', on Flemish territory. It is situated at 70 meters from the tidal marsh edge riprap, in the mid-high zone of the mudflat.

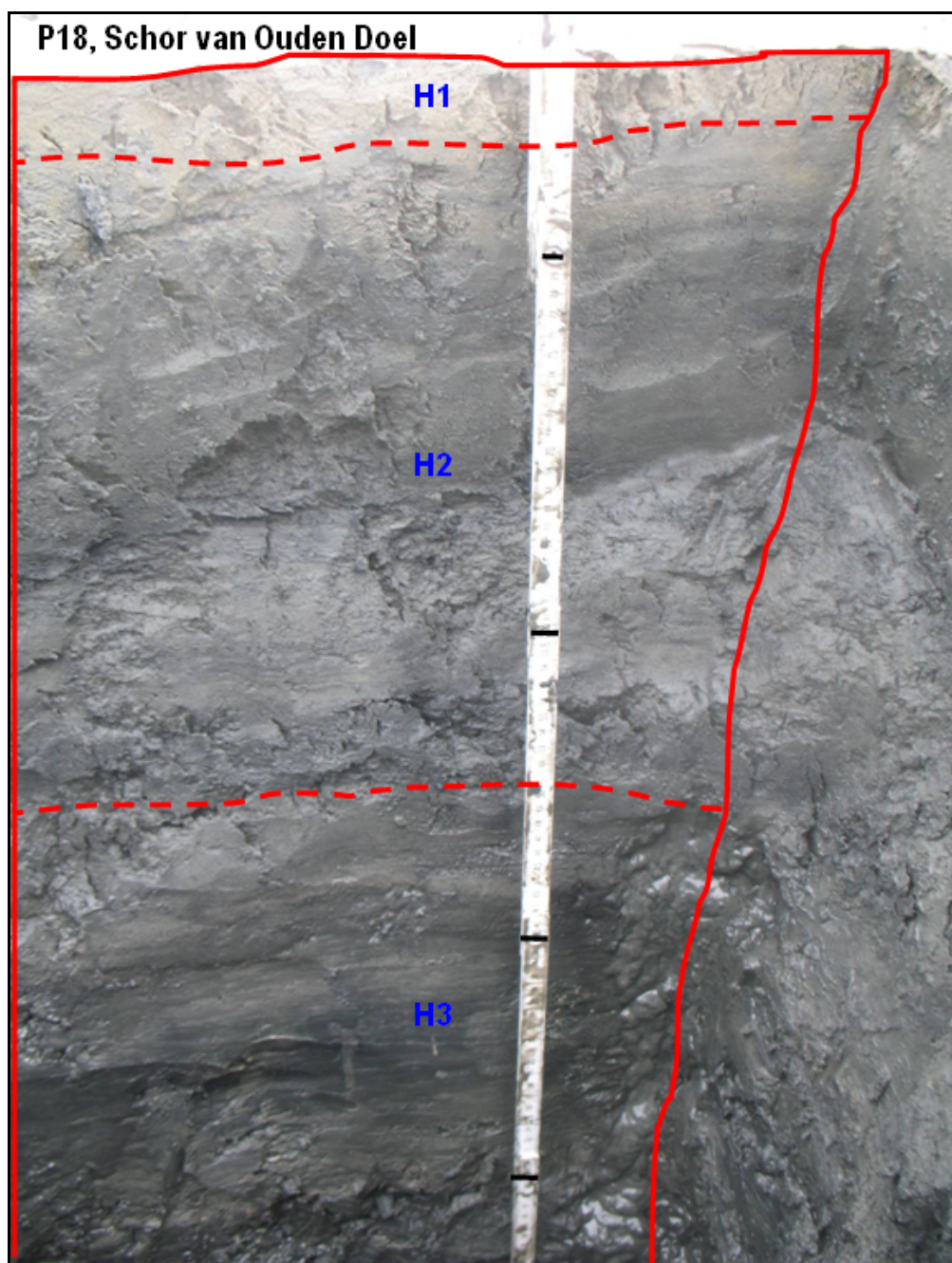


## 2.9.2 Profile description

Profile P18		Schor van Ouden Doel
1.3 Date and time:	27/2/2009. Profile description began at 14h. Low tide at 11:33	
1.4 Author:	Jari Hinsch Mikkelsen	
1.5 Location:	Belgium, Province of East Flanders, Beveren Municipality. For a road description check description for profile P3.	
1.6 Profile coordinates:	Latitude, longitude: 51° 20' 26.82" N, 04° 14' 55.23" E Lambert72: 226083.780 N, 141204.945 E	
4.1 Elevation:	±1.65 m TAW (topo bathymetry data 2001)	
2.1 Atmospheric climate and weather condition:	Overcast, close to light rain.	
Soil climate:	<i>STR</i> : Mesic <i>SMR</i> : Peraquic	
2.2 Topography:	<i>Macrotopography</i> : Estuarium, tidal mouth of the Schelde River <i>Mesotopography</i> : Tidal mud flat <i>Landscape position</i> : Intermediate part of tidal mud flat <i>Slope form</i> : straight, straight (S, S) <i>Slope gradient</i> : gently sloping (2-5%) <i>Slope length</i> : about 300m <i>Slope orientation</i> : SW	
2.3 Tidal mud flat morphology	Heterogeneous surface composing of ripples and small depressions. Depth of depressions <5cm, diameter <20cm. No rills observed.	
2.5 Land-use:	Tidal mud flat <i>Wildlife</i> : No hunting <i>Grazing</i> : -	
2.6 Human influence:	No influence	
Vegetation:	No vegetation	
2.7 Parent material:	unconsolidated deposits> marine and estuarine clays and silts> quaternary clay and silt> Holocene Silt (5222)	
2.8 Drainage class:	Very poorly drained	
2.9 External drainage:	Slow run-off	
2.10 Flooding	Twice daily	
2.11 Coarse surface frag.	None	
2.12 Erosion, sedimentation:	Sheet erosion and sedimentation	
2.13 Surface cracks:	None	
2.14 Salts:	None	
Localisation factors profile:	<i>Vegetation</i> : - <i>Geomorphology/topography</i> : Representative for the intermediate part of the tidal mud flat, where the slope towards the Schelde shows a long straight piece.	
Remarks:	Due to instability of the soil the period for profile description was very short.	
N o.		Horizon description
H1	A	0-4 cm; 2.5Y 4/2 (M), greyish brown 2.5Y 5/2 (D); no reaction to αα-dipyridyl; unripe; no roots; calcareous matrix, primary; clear smooth boundary
H2	Cr1	4-40 cm; 2.5Y 4/2 (M), greyish brown to olive grey 3.5Y 5/2 (D); positive reaction to αα-dipyridyl, throughout; reductimorphic colour pattern; unripe; no roots; calcareous matrix, primary; clear smooth boundary

Profile P18		Schor van Ouden Doel
H3	Cr2	40-80 cm; greyish brown to olive grey 3.5Y 5/2 (D); positive reaction to αα-dipyridyl, throughout; reductimorphic colour pattern; unripe; horizon composes of continuous stratified sediment; no roots; calcareous matrix

*Colour measurements: M= Moist; MC= Moist-crushed; D= Dry; DC= Dry-crushed; W= Wet.*



## 2.9.3 Analytical laboratory data

Table A10: Analytical data for P18, Schor van Ouden Doel									
Profile studied 14/11/2008 Profile analysed: March/2009									
P18	Horizon	Depth	Total N	Total N	Carbon- TOC			C	C/N
Horizon nr.	symbols	cm	analyser %	Kjeldahl %	TC %	IC %	OC %	Analysed %	(TOC/Kjel.)
H1	C	0-4	0.105	<0,10	2.54	2.08	0.46	2.63	>9
H2a	Cr1	4-25	0.132	0.097	2.50	1.78	0.71	3.25	7
H2b		25-40							
H3a	Cr2	40-65	0.341	0.181	4.33	2.35	1.98	6.32	11
H3b		65-80							
Horizon nr.	Laser diffraction on soil material (fractions in µm)								
	0.4-2	2-6	6-50	50-63	63-100	100-250	250-500	500-1000	1000-2000
	----- % -----								
H1	1.5	1.6	16.4	8.0	27.3	37.3	5.6	2.0	0.5
H2a	1.6	1.9	17.7	7.5	24.6	37.5	7.3	1.3	0.5
H2b									
H3a	2.9	4.7	31.5	8.6	16.9	19.3	9.5	5.8	0.8
H3b									
Horizon nr.	Na <sup>+</sup>	K <sup>+</sup>	Ca <sup>2+</sup>	Mg <sup>2+</sup>	Particle size distribution (µm; pipette)				
	-----by MgSO <sub>4</sub> (compulsive method)-----				0-2	2-10	10-20	20-50	50-2000
	-----cmol(+)/kg soil-----				----- % -----				
H1	6.1	0.9	7.2	4.0					
H2a	7.1	1.5	7.5	4.9	13.2	3.6	1.1	16.6	65.5
H2b									
H3a	14.0	2.3	10.7	9.4	27.7	15.3	8.4	32.5	16.2
H3b									
Horizon nr.	CEC sum	CEC measured	BS by CEC-m	Acidity sum	CaCO <sub>3</sub> titration	pH		pH	EC
	cmol(+)/kg		%	cmol(+)/kg	%	H <sub>2</sub> O 1:5	CaCl <sub>2</sub> 1:5	CaCl <sub>2</sub> /H <sub>2</sub> O	dS/m 1:5
H1	18.2	10.5	>100	<	13.5	8.7	8.1	0.93	1.19
H2a	21.0	10.6	>100	<	13.9	8.7	8.0	0.92	1.69
H2b									
H3a	36.4	20.5	>100	<	14.9	8.4	7.9	0.94	2.79
H3b									
Horizon nr.	Ca	K	Mg	Na	P	S	Al	As	Cd
	-----Aqua Regia-----								
	-----mg/kg-----								
H1	37186	4044	3520	1286	794	1529	9272	9.5	1.0
H2a	44482	3950	3843	1639	864	2236	11348	10.7	1.3
H2b									
H3a	42252	3596	3836	1772	2258	8077	26595	27.1	4.6
H3b									
Horizon nr.	Co	Cr	Cu	Fe	Mn	Ni	Pb	Zn	Lab
	-----Aqua Regia-----								
	-----mg/kg-----								
H1	5.3	14.5	38.2	16734	293	10.2	24.1	119	JM400
H2a	6.3	20.1	47.6	17864	302	12.6	31.4	148	JM401
H2b									JM402
H3a	11.5	60.6	102.4	39972	782	25.9	80.4	338	JM403
H3b									JM404
Horizon nr.	Na <sup>+</sup>	K <sup>+</sup>	Ca <sup>2+</sup>	Mg <sup>2+</sup>	CEC sum	Na+Mg saturation	ESP	SAR	
	-----by NH <sub>4</sub> OAc-----				cmol(+)/kg soil	cmol(+)/kg soil	%		
H1	4.7	0.6	37.1	5.1	47	21	10	1.0	
H2a	7.2	1.0	39.1	6.0	53	25	13	1.5	
H2b									
H3a	13.9	1.7	35.2	9.5	60	39	23	3.0	
H3b									



## 2.9.4 World reference base (2007) classification

Diagnostic horizon, properties, material:	Present in horizon:	Remarks:
Salic		The highest conductivity is 2.79 dS/m
Abrupt textural change	H2-3	Clay increase from 13.2-27.7%
	H1 H2-3	Oximorphic colour pattern Reductimorphic colour pattern
Lithological discontinuity	H2-3	
Reducing conditions	H2-3	Positive reaction to alpha-alpha dipyridyl
Calcaric material		Analytical data confirm the presence of more than 2% calcium-carbonate throughout the soil
Fluvic material		Stratified and flooded twice a day
Sulphidic material	-	Alkaline pH

The profile keys out as a Fluvisol.

### Full classification name, without specifiers

(except where listed as such for prefix and suffix qualifiers):

#### Gleyic Tidalic Fluvisol (Calcaric, Sodic, Eutric, Siltic)

- Tidalic: flooded by tidewater but not covered by water at mean low tide
- Gleyic: oximorphic and reductimorphic colours start from 0 cm and 4 cm respectively. The reduced conditions from 4 cm depth.
- Calcaric: present throughout the soil profile
- Humic: the weighted average is 0.94%
- Sodic: The required 15% sodium plus manganese cations on the exchange complex is present throughout the soil
- Eutric: The base saturation exceeds 100% throughout
- Siltic: H4 has a silty clay loam texture

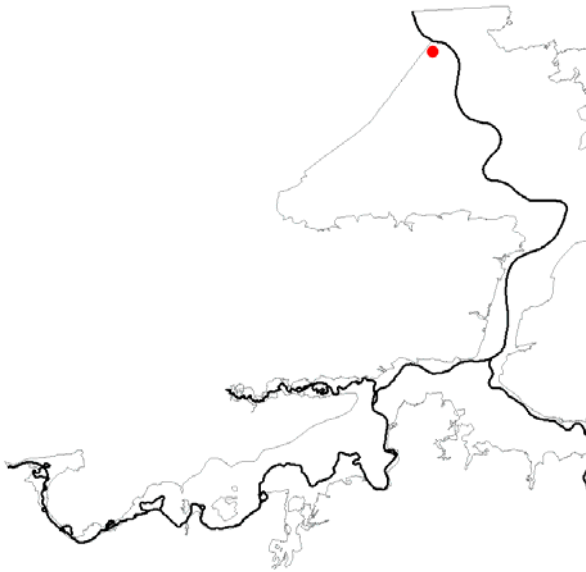
### Full classification name, with specifiers:

#### Hyperepigleyic Tidalic Fluvisol (Hypercalcaric, Sodic, Hypereutric, Siltic)

- Hyperepigleyic: the reduced conditions appear from 4 cm only
- Hypercalcaric: lowest content is 13.5%, implying that the weighted average exceeds 10%
- Sodic: The concentration of sodium plus manganese cations is less than 30%
- Hypereutric: The base saturation is more than 100%

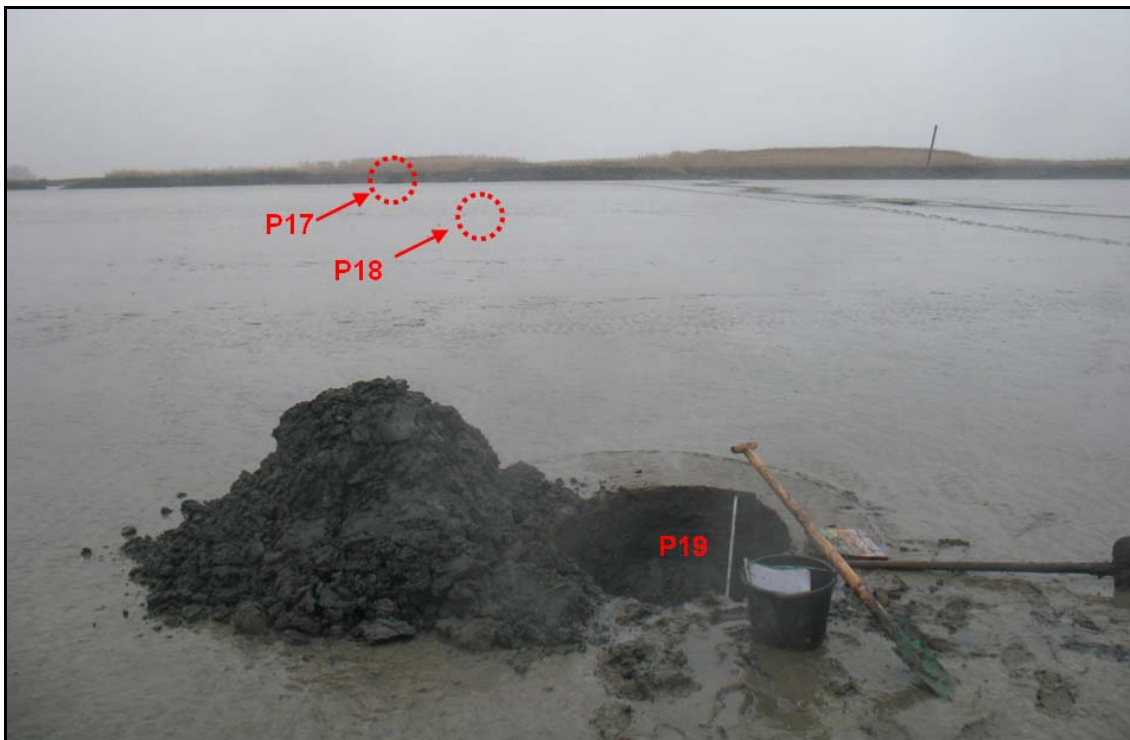
## 2.10 Profile 'P19': Schor van Ouden Doel

(Derived elevation: 1.50m TAW; Lat.: 51.344832, Long.: 4.242871)



### 2.10.1 Situation

Profile 'P19' is a mudflat-profile, located near 'Schor van Ouden Doel', on Flemish territory. It is situated at 115 meters from the tidal marsh edge riprap, in the lower zone of the mudflat.



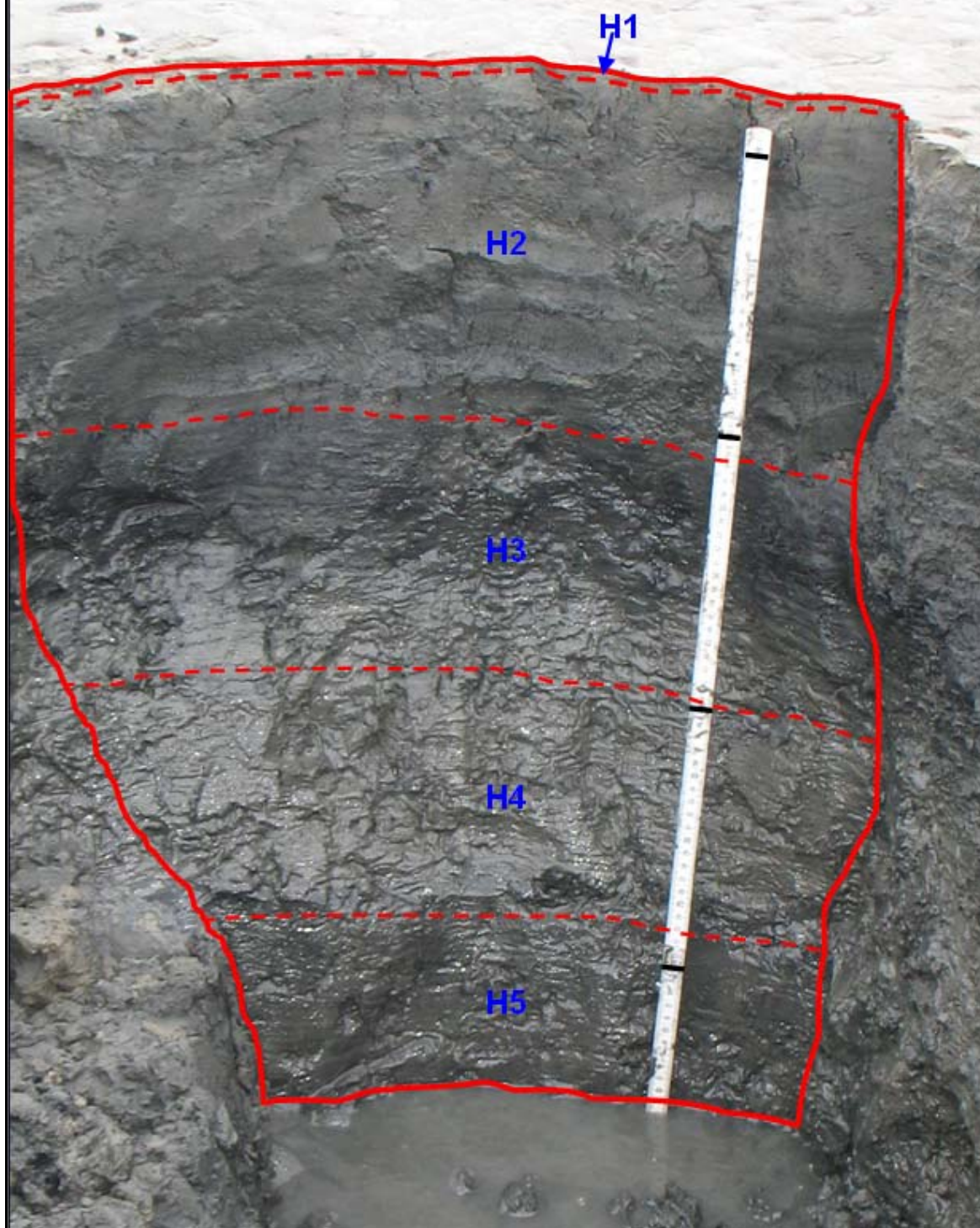
## 2.10.2 Profile description

Profile P19		Schor van Ouden Doel
1.3 Date and time:	27/2/2009. Profile description began at 13h. Low tide at 11:33	
1.4 Author:	Jari Hinsch Mikkelsen	
1.5 Location:	Belgium, Province of East Flanders, Beveren Municipality. For a road description check description for profile P3.	
1.6 Profile coordinates:	Latitude, longitude: 51° 20' 28.99" N, 04° 14' 57.23" E Lambert72: 226124.028 N, 141228.200 E	
4.1 Elevation:	±1.5 m TAW (bathymetry data 2001)	
2.1 Atmospheric climate and weather condition:	Overcast, close to light rain.	
Soil climate:	<i>STR</i> : Mesic <i>SMR</i> : Peraquic	
2.2 Topography:	<i>Macrotopography</i> : Estuarium, tidal mouth of the Schelde River <i>Mesotopography</i> : Tidal mud flat <i>Landscape position</i> : Lower part of tidal mud flat <i>Slope form</i> : straight, straight (S, S) <i>Slope gradient</i> : gently sloping (2-5%) <i>Slope length</i> : about 300m <i>Slope orientation</i> : SW	
2.3 Tidal mud flat morphology	From some distance the tidal mud flat surface appears rather smooth. When closely examined shallow ripple structures are present. The ripples are homogeneous, covering more than 80% of the surface, less than 10 cm wide and more than 20 cm long.	
2.5 Land-use:	Tidal mud flat <i>Wildlife</i> : No hunting <i>Grazing</i> : -	
2.6 Human influence:	No influence	
Vegetation:	No vegetation	
2.7 Parent material:	unconsolidated deposits> marine and estuarine clays and silts> quaternary clay and silt> Holocene Silt (5222)	
2.8 Drainage class:	Very poorly drained	
2.9 External drainage:	Slow run-off	
2.10 Flooding	Twice daily	
2.11 Coarse surface frag.	None	
2.12 Erosion, sedimentation:	Sheet erosion and sedimentation	
2.13 Surface cracks:	None	
2.14 Salts:	None	
Localisation factors profile:	<i>Vegetation</i> : - <i>Geomorphology/topography</i> :. Representative for the lower part of the tidal mud flat, close to the Schelde at low tide, flooded during intermediate and high tide.	
N o.		Horizon description
H1	A	0-1 cm; greyish brown 2.5Y 5/2 (M), light greyish brown 2.5Y 5.5/2 (D); no reaction to aa-dipyridyl; unripe; no roots; calcareous matrix, primary; abrupt smooth boundary
H2	Cr1	1-25 cm; dark greyish brown 2.5Y 4/2 (M); light brownish grey to light olive grey 3.5Y 6/2 (D); positive reaction to aa-dipyridyl, throughout; unripe; no roots; calcareous matrix, primary; abrupt smooth boundary

Profile P19		Schor van Ouden Doel
H3	Cr2	25-42 cm; dark greyish horizon with alternation of organic rich and poor layers; dark greyish brown 2.5Y 4/2 (M); greyish brown 2.5Y 5/2 (D); continuous lateral water flow; positive reaction to $\alpha\alpha$ -dipyridyl, throughout; reductimorphic colour pattern; unripe; no roots; calcareous matrix, primary; diffuse smooth boundary
H4	Cr3	42-56 cm; dark greyish brown to olive grey 3.5Y 4/2 (M); greyish brown to light brownish grey 2.5Y 5.5/2; positive reaction to $\alpha\alpha$ -dipyridyl, throughout; reductimorphic colour pattern; unripe; no roots; calcareous matrix, primary; diffuse smooth boundary
H5	Cr4	56-80 cm; dark grey 5Y 4/1 (M); olive grey 5Y 5/2 (D); positive reaction to $\alpha\alpha$ -dipyridyl, throughout; reductimorphic colour pattern; unripe; no roots; calcareous matrix, primary

*Colour measurements: M= Moist; MC= Moist-crushed; D= Dry; DC= Dry-crushed; W= Wet.*

P19, Schor van Ouden Doel





## 2.10.3 Analytical laboratory data

Table A11: Analytical data for P19, Schor van Ouden Doel									
Profile analysed: March-Dec./2009 Profile studied 14/11/2008									
P19	Horizon	Depth	Total N	Total N	Carbon- TOC			C	C/N
Horizon nr.	symbols	cm	analyser %	Kjeldahl %	TC %	IC %	OC %	Analysier %	(TOC/Kjel.)
H1	C	0-1	0.125	<0,10	1.85	1.72	0.13	2.32	>3
H2	Cr1	1-25	0.128	<0,10	2.00	1.73	0.27	2.16	>5
H3	Cr2	25-42	0.140	0.102	2.54	1.75	0.79	2.36	8
H4a	Cr3	42-56	0.155	0.085	2.74	2.30	0.44	2.72	5
H4b	Cr4	56-80	0.174	0.127	3.87	2.09	1.78	2.98	14
Laser diffraction on soil material (fractions in µm)									
Horizon nr.	0.4-2	2-6	6-50	50-63	63-100	100-250	250-500	500-1000	1000-2000
H1	1.5	1.7	14.7	5.5	19.7	49.1	4.4	2.5	0.9
H2	1.7	1.6	16.3	7.2	22.9	45.5	4.7	0.2	0.0
H3	1.5	1.6	18.3	6.8	18.9	38.8	7.6	4.8	1.6
H4a	2.8	4.0	27.3	7.8	23.3	32.3	2.3	0.1	0.0
H4b	2.1	3.0	22.5	7.7	20.7	33.0	7.0	3.1	0.9
Particle size distribution (µm; pipette)									
Horizon nr.	Na <sup>+</sup>	K <sup>+</sup>	Ca <sup>2+</sup>	Mg <sup>2+</sup>	0-2	2-10	10-20	20-50	50-2000
	by MgSO <sub>4</sub> (compulsive method)-----				-----cmol(+)/kg soil-----				
H1	5.1	0.8	5.2	2.8					
H2	6.6	1.1	4.6	2.5	5.6	1.4	3.5	12.2	77.3
H3	8.5	1.1	7.1	3.8					
H4a	9.4	1.2	7.0	4.1	12.6	4.9	3.5	14.0	65.0
H4b	12.4	1.4	9.6	6.1					
pH									
Horizon nr.	CEC sum	CEC measured	BS by CEC-m	Acidity sum	CaCO <sub>3</sub> titration	H <sub>2</sub> O	CaCl <sub>2</sub>	pH CaCl <sub>2</sub> /H <sub>2</sub> O	EC dS/m
	cmol(+)/kg				%	1:5	1:5		1:5
H1	13.8	8.9	>100	<	11.6	8.9	8.1	0.91	0.81
H2	14.7	8.8	>100	<	10.8	8.8	8.2	0.94	1.34
H3	20.5	7.2	>100	<	12.3	8.5	8.1	0.95	2.08
H4a	21.8	10.4	>100	<	13.0	8.6	8.1	0.94	1.72
H4b	29.5	16.8	>100	<	14.0	8.3	8.0	0.96	2.39
Aqua Regia									
Horizon nr.	Ca	K	Mg	Na	P	S	Al	As	Cd
	-----mg/kg-----								
H1	56911	6824	8299	3964	657	1525	12053.7	9.4	<
H2	43990	5729	5497	2833	775	2938	11125.4	10.1	1.2
H3	43114	4382	4460	2504	1042	2184	15676.8	11.8	1.2
H4a	52697	5162	4756	2554	1632	5616	7970.37	19.7	3.2
H4b	50546	3314	4703	3103	738	1678	10721.3	8.9	<
Aqua Regia									
Horizon nr.	Co	Cr	Cu	Fe	Mn	Ni	Pb	Zn	Lab
	-----mg/kg-----								
H1	5.1	26.2	47.2	18651	288	9.5	30.6	111	JM405
H2	5.3	15.6	41.5	18196	349	10.2	28.5	133	JM406
H3	6.6	18.5	51.8	22579	508	13.0	32.1	154	JM407
H4a	7.7	37.6	58.6	23397	624	17.1	54.9	235	JM408
H4b	4.9	12.5	39.2	17693	233	9.3	23.4	113	JM409
by NH <sub>4</sub> OAc									
Horizon nr.	Na <sup>+</sup>	K <sup>+</sup>	Ca <sup>2+</sup>	Mg <sup>2+</sup>	CEC sum	Na+Mg saturation	ESP	SAR	
	-----cmol(+)/kg soil-----				cations	%	%		
H1	4.1	0.5	36.4	4.4	46	19	9	0.9	
H2	5.7	0.7	36.0	4.3	47	21	12	1.3	
H3	8.4	0.9	39.2	5.7	54	26	16	1.8	
H4a	7.9	0.9	36.4	5.3	50	26	16	1.7	
H4b	11.3	1.1	38.9	7.4	59	32	19	2.4	

#### 2.10.4 World reference base (2007) classification

Diagnostic horizon, properties, material:	Present in horizon:	Remarks:
Salic		The highest conductivity is 2.39 dS/m
Abrupt textural change		Data on the texture-pipette is partly missing, probably no abrupt change is present
	H1 H2-4	Oximorphic colour pattern Reductimorphic colour pattern
Lithological discontinuity		
Reducing conditions	H2-4	Positive reaction to alpha-alpha dipyridyl
Calcaric material		Analytical data confirm the presence of more than 2% calcium-carbonate throughout the soil
Fluvic material		Stratified and flooded twice a day
Sulphidic material	-	Alkaline pH

The profile keys out as a Fluvisol.

#### Full classification name, without specifiers

(except where listed as such for prefix and suffix qualifiers):

#### Gleyic Tidalic Fluvisol (Calcaric, Sodic, Eutric, Arenic)

- Tidalic: flooded by tidewater but not covered by water at mean low tide
- Gleyic: oximorphic and reductimorphic colours start from 0 cm and 4 cm respectively. The reduced conditions from 4 cm depth.
- Calcaric: present throughout the soil profile
- Humic: the OC concentration remains below 1% in the upper 50 cm
- Sodic: The required 15% sodium plus manganese cations on the exchange complex is present throughout the soil
- Eutric: The base saturation exceeds 100% throughout
- Arenic: H2-3 have a loamy sand texture

#### Full classification name, with specifiers:

#### Hyperepigleyic Tidalic Fluvisol (Hypercalcaric, Sodic, Hypereutric, Arenic)

- Hyperepigleyic: the reduced conditions appear from 4 cm only
- Hypercalcaric: lowest content is 10.8%, implying that the weighted average exceeds 10%
- Sodic: The concentration of sodium plus manganese cations is less than 30%
- Hypereutric: The base saturation is more than 100%

## Oligohaline zone: Notelaer

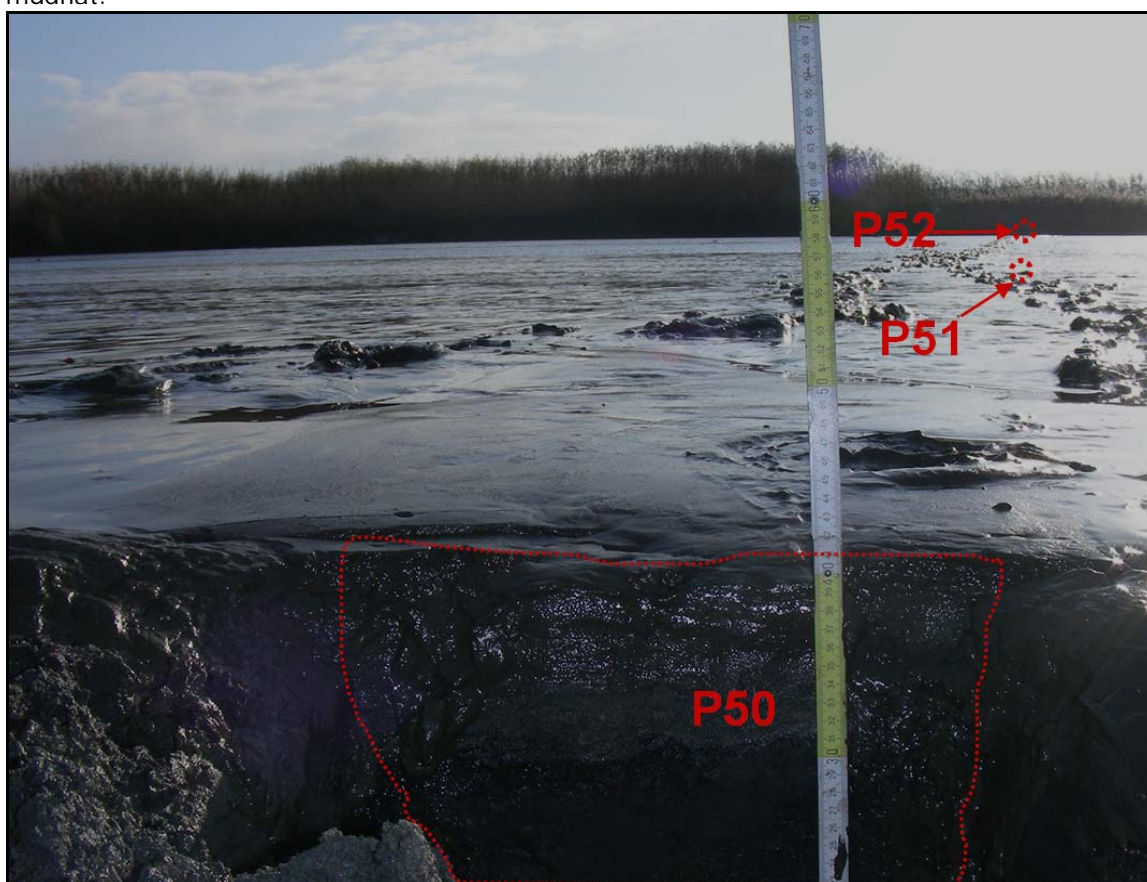
### 2.11 Profile 'P50': Notelaer

(Derived elevation: 0.20m ; Lat.: 51.117298, Long.: 4.265206)

#### 2.11.1 Situation



Profile 'P50' is a mudflat-profile, located near the tidal marsh 'Notelaer'. It is situated at 75 meters from the unprotected tidal marsh-cliff, in the lower zone of the mudflat.

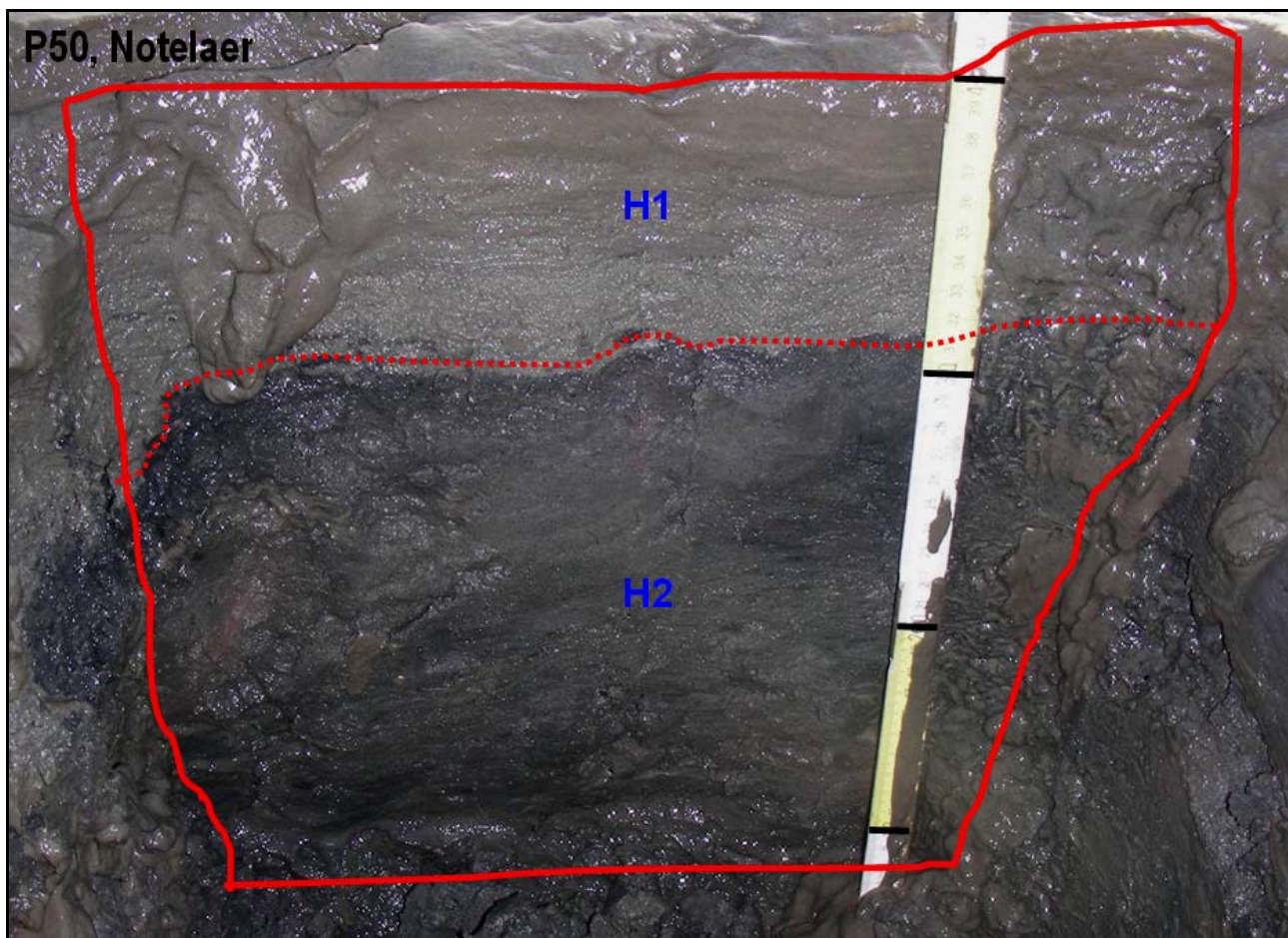


## 2.11.2 Profile description

Profile P50		De Notelaer
1.3 Date and time:	13/11/2008. Profile description initiated at 10:45. Low tide at 10:43	
1.4 Author:	Jari Hinsch Mikkelsen	
1.5 Location:	Belgium, Province of Antwerp, Bornem Municipality For a road description check out P57	
1.6 Profile coordinates:	Latitude, longitude: 51° 07' 02.35" N, 04° 15' 55.80" E Lambert72: 200807.295N, 142749.404263 E	
4.1 Elevation:	±0.2 m TAW (Bathymetry data 2001)	
2.1 Atmospheric climate and weather condition:	Sunny	
Soil climate:	<i>STR</i> : Mesic <i>SMR</i> : Aquic	
2.2 Topography:	<i>Macrotopography</i> : Estuarium, tidal mouth of the Scheldt river <i>Mesotopography</i> : Tidal mud flat <i>Landscape position</i> : Lowest part of the tidal mud flat, on a few meters distance from the Scheldt river at low tide <i>Slope form</i> : straight, straight (SS) <i>Slope gradient</i> : - <i>Slope length</i> : - <i>Slope orientation</i> : -	
2.6 Land-use:	No land use <i>Grazing</i> : No grazing	
2.7 Human influence:	No influence. Anyhow any influence is rapidly erased by the impact of the daily floodings	
Vegetation:	None	
2.8 Parent material:	Unconsolidated deposits> marine and estuarine clays and silts> quaternary clay and silt> Holocene Clay (5221)	
2.9 Drainage class:	Very poorly drained	
2.10 External drainage:	Slow runoff	
2.11 Flooding	Unflooded only for a few hours each day	
2.12 Coarse surface frag.	None	
2.13 Erosion, sedimentation:	Active erosion sedimentation in function of changes of the current regime of the Scheldt	
2.14 Surface cracks:	None observed	
2.15 Salts:	None observed	
Localisation factors profile:	This profile represents the lowest part of the tidal mud flat and is located within the focus zone of this tidal research area	
Remarks:		
N o.		Horizon description
H1	A	0-10 cm; lutum with sand; loose; continuous stratified; no roots; abrupt smooth boundary
H2	C	10-32 cm; reductimorphic colour pattern; positive reaction to αα-dipyridyl; more clayey and denser than horizon above; massive; continuous stratified; no roots;

*Extra subordinate symbols: 'bi' biological activity clearly evidences (fauna and flora), and more than what can be expected according to type of soil, position, time of year etc.*

*Colour measurements: M= Moist; MC= Moist-crushed; D= Dry; DC= Dry-crushed; W= Wet.*





### 2.11.3 Analytical laboratory data

Table A12: Analytical data for P50, 51 en 52, De Notelaer									
						Profile studied 14/11/2008			
						Profile analysed: March-Dec./2009			
P50-52 Horizon nr.	Horizon nr.	Horizon symbols	Depth cm	Total N Kjeldahl %	LOI OM %	TOC OC %	C/N (TOC/Kjel.)	CaCO <sub>3</sub> titration %	EC dS/m 1:5
P50	H1	C	0-9		11.0	6.84		9.1	0.37
	H2	Cr	9-35		10.3	6.42		12.9	0.77
P51	H1	C	0-11						
	H2	Cr1	11-40		9.1	3.28		11.4	0.30
	H3	Cr2	40-50		8.9	4.70		8.7	0.28
P52	H1	C	0-8		10.6	6.53		8.0	0.31
	H2	Cr	8-38		11.4	6.51		6.6	0.89
Horizon nr.	Texture- pipette method (fractions in µm)					Na <sup>+</sup>	K <sup>+</sup>	Ca <sup>2+</sup>	Mg <sup>2+</sup>
	0-2	2-10	10-20	20-50	50-2000	by MgSO <sub>4</sub> (compulsive method)			
	-----%-----					-----cmol(+)/kg soil-----			
P50H1	35.8	20.9	10.9	29.4	3.1	1.2	0.3	43.4	3.5
P50H2						1.2	0.6	34.9	3.0
P51H1									
P51H2	29.7	17.2	6.2	38.2	8.7	0.6	0.8	30.5	3.4
P51H3						0.7	0.8	34.5	3.4
P52H1						0.8	0.9	37.3	3.7
P52H2									
Horizon nr.	Depth cm	CEC sum cmol(+)/kg	CEC measured	BS by CEC-m %	Acidity sum cmol(+)/kg	titrated	pH H <sub>2</sub> O 1:5	pH KCl 1:5	pH KCl/H <sub>2</sub> O
P50H1	0-9	48.4	42.4				7.6	7.2	0.95
P50H2	9-35	39.6	35.2				7.4	7.1	0.96
P51H1	0-11								
P51H2	11-40	35.3	32.4				7.6	7.2	0.94
P51H3	40-50	39.4	35.8				7.6	7.2	0.94
P52H1	0-8	42.8	40.5				7.5	7.1	0.95
P52H2	8-38						7.2	6.9	0.97
Horizon nr.	S	As	Cd	Cr	Cu	Ni	Pb	Zn	Lab
	-----Aqua Regia-----								
	-----mg/kg-----								
P50H1	2431	77	21.5	274	191	69	233	1021	JM330
P50H2	4673	118	37.2	308	206	74	309	1129	JM331
P51H1									JM332
P51H2	2767	29	5.7	110	81	33	103	549	JM333
P51H3	2009	32	6.5	130	95	38	133	634	JM334
P52H1	1951	41	7.4	139	103	41	141	662	JM335
P52H2	9790	38	9.0	167	123	45	173	790	JM336

### 2.11.4 World reference base (2007) classification

Diagnostic horizon, properties, material:	Present in horizon:	Remarks:
--	---------------------------	----------

Abrupt textural change		Data on the texture-pipette is partly missing, based on the soil morphology it is most unlikely that H2 contains 20% less clay
	H1 H2	Oximorphic colour pattern Reductimorphic colour pattern
Lithological discontinuity		
Reducing conditions	H2	Positive reaction to alpha-alpha dipyridyl
Calcaric material		Analytical data confirm the presence of more than 2% calcium-carbonate throughout the soil
Fluvic material		Stratified and flooded twice a day

The profile keys out as a Fluvisol.

**Full classification name, without specifiers**

(except where listed as such for prefix and suffix qualifiers):

**Gleyic Tidalic Fluvisol (Calcaric, Humic, Eutric, Siltic)**

- Tidalic: flooded by tidewater but not covered by water at mean low tide
- Gleyic: oximorphic and reductimorphic colours start from 0 cm and 10 cm respectively. The reduced conditions from 10 cm depth.
- Calcaric: present throughout the soil profile
- Humic: the weighted average is more than 6%, but data is only available to 35 cm depth
- Sodic: Data on ammonium acetate extractable cations are missing, based on magnesium sulphate extractable cations that the concentration of sodium and magnesium is too low to qualify
- Eutric: The base saturation exceeds 100% throughout
- Siltic: H1 has a silty clay loam. Below the data are missing but most probably the texture is more or less similar in H2

**Full classification name, with specifiers:**

**Hyperepigleyic Tidalic Fluvisol (Hypercalcaric, Hyperhumic, Hypereutric, Siltic)**

- Hyperepigleyic: the reduced conditions appear from 10 cm
- Hypercalcaric: The weighted average of the profile going to 35 cm depth is 12%
- Hyperhumic: the concentration exceeds 6%
- Hypereutric: The base saturation exceeds 100%

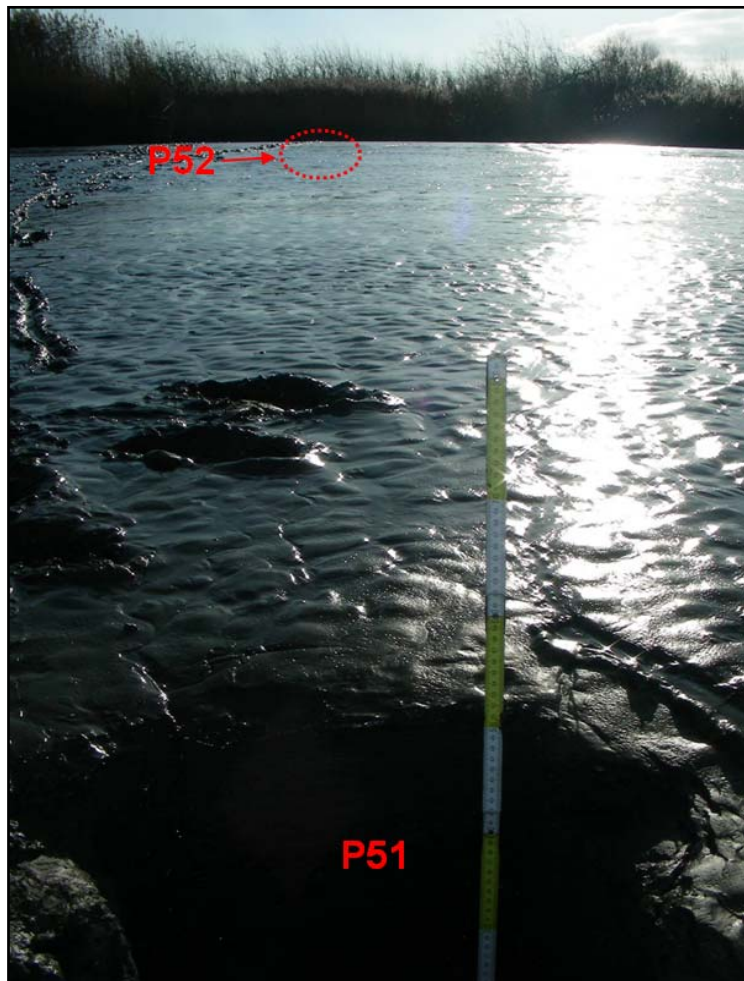
## 2.12 Profile 'P51': Notelaer

(Derived elevation: 1.10m TAW; Lat.: 51.117046, Long.: 4.265486)

### 2.12.1 Situation



Profile 'P51' is a mudflat-profile, located near the tidal marsh 'Notelaer'. It is situated at 40 meters from the unprotected tidal marsh-cliff, in the mid-high zone of the mudflat.



## 2.12.2 Profile description

Profile P51		De Notelaer
1.3 Date and time:	13/11/2008. Profile description initiated at 11:30. Low tide at 10:43	
1.4 Author:	Jari Hinsch Mikkelsen	
1.5 Location:	Belgium, Province of Antwerp, Bornem Municipality For a road description check out P57	
1.6 Profile coordinates:	Latitude, longitude: 51° 20' 27.35" N, 04° 14' 37.95" E Lambert72: 226093.925 N, 141004.323 E	
4.1 Elevation:	±1.1 m TAW (Bathymetry data 2001)	
2.1 Atmospheric climate and weather condition:	Sunny	
Soil climate:	<i>STR</i> : Mesic <i>SMR</i> : Aquic	
2.2 Topography:	<i>Macrotopography</i> : Estuarium, tidal mouth of the Scheldt river <i>Mesotopography</i> : Tidal mud flat <i>Landscape position</i> : Central part of the tidal mud flat <i>Slope form</i> : straight, convex (SV) <i>Slope gradient</i> : - <i>Slope length</i> : - <i>Slope orientation</i> : -	
2.6 Land-use:	No land use <i>Grazing</i> : No grazing	
2.7 Human influence:	No influence. The profile is located in an active estuarine environment, so any human impact is fast erased.	
Vegetation:	None	
2.8 Parent material:	Unconsolidated deposits> marine and estuarine clays and silts> quaternary clay and silt> Holocene Clay (5221)	
2.9 Drainage class:	Very poorly drained	
2.10 External drainage:	Slow runoff	
2.11 Flooding	Unflooded only for some hours each day	
2.12 Coarse surface frag.	None	
2.13 Erosion, sedimentation:	Active erosion sedimentation in function of changes of the current regime of the Scheldt	
2.14 Surface cracks:	None observed	
2.15 Salts:	None observed	
Localisation factors profile:	This profile represents the central part of the tidal mud flat and is located within the focus zone of this tidal research area	
N o.		Horizon description missing colour info
H1	A	0-10 cm; lutum with sand; loose; no roots; abrupt smooth boundary
H2	C1	10-40 cm; reductimorphic colour pattern; positive reaction to αα-dipyridyl; more clayey and denser than horizon above; massive; continuously stratified; no roots; abrupt smooth boundary
H3	C2	40-... cm; reductimorphic colour pattern; positive reaction to αα-dipyridyl; sandy; massive; continuously stratified; no roots

*Extra subordinate symbols: 'bi' biological activity clearly evidences (fauna and flora), and more than what can be expected according to type of soil, position, time of year etc.*  
*Colour measurements: M= Moist; MC= Moist-crushed; D= Dry; DC= Dry-crushed; W= Wet.*

### 2.12.3 Analytical laboratory data

See table 2.11.3

### 2.12.4 World reference base (2007) classification

Diagnostic horizon, properties, material:	Present in horizon:	Remarks:
Abrupt textural change		Data on the texture-pipette is partly missing, based on the soil morphology it is most unlikely that H1 or 3 contains 20% less or more clay than H2
	H1 H2-3	Oximorphic colour pattern Reductimorphic colour pattern
Lithological discontinuity		
Reducing conditions	H2-3	Positive reaction to alpha-alpha dipyridyl
Calcaric material		Analytical data confirm the presence of more than 2% calcium-carbonate throughout the soil
Fluvic material		Stratified and flooded twice a day

The profile keys out as a Fluvisol.

#### Full classification name, without specifiers

(except where listed as such for prefix and suffix qualifiers):

##### Gleyic Tidalic Fluvisol (Calcaric, Humic, Eutric, Siltic)

- Tidalic: flooded by tidewater but not covered by water at mean low tide
- Gleyic: oximorphic and reductimorphic colours start from 0 cm and 11 cm respectively. The reduced conditions from 11 cm depth.
- Calcaric: present throughout the soil profile
- Humic: the weighted average is more than 1%
- Sodic: Data on ammonium acetate extractable cations are missing, based on magnesium sulphate extractable cations that the concentration of sodium and magnesium is too low to qualify
- Eutric: The base saturation exceeds 100% throughout
- Siltic: H2 has a silty clay loam. Below the data are missing but most probably the texture is more or less similar as in H2

#### Full classification name, with specifiers:

##### Hyperepigleyic Tidalic Fluvisol (Hypercalcaric, Humic, Hypereutric, Siltic)

- Hyperepigleyic: the reduced conditions appear from 11 cm
- Hypercalcaric: The weighted average of the profile will probably exceed 10%, but data are missing from H1
- Hypereutric: The base saturation exceeds 100%



## 2.13 Profile 'P52': Notelaer

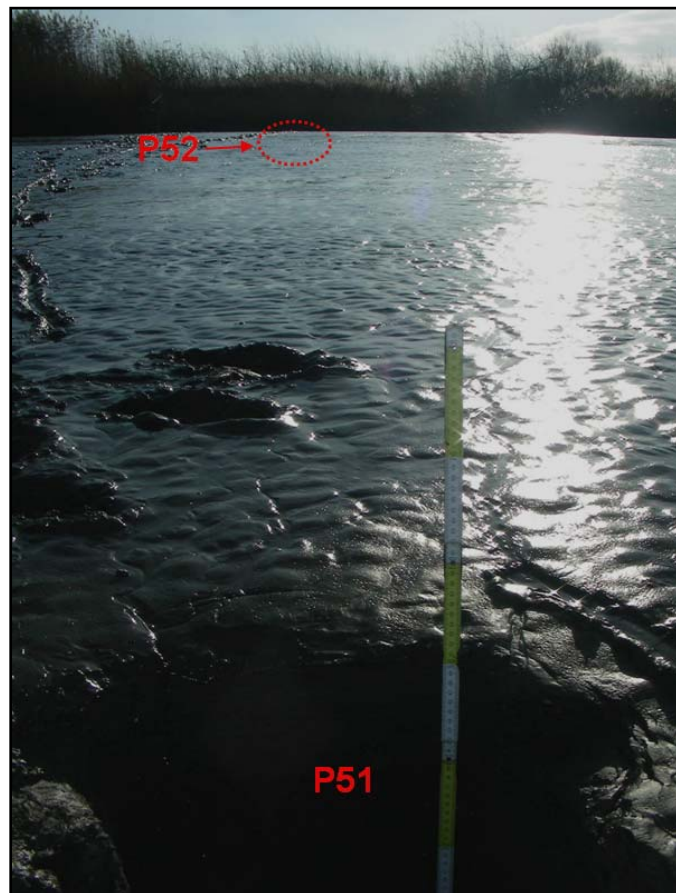
(Derived elevation: 3.40m TAW; Lat.: 51.116761, Long.: 4.26557)

### 2.13.1 Situation



Profile 'P52' is a mudflat-profile, located near the tidal marsh 'Notelaer'.

It is situated near the outlet of an major tidal marsh-creek, in the high zone of the mudflat.

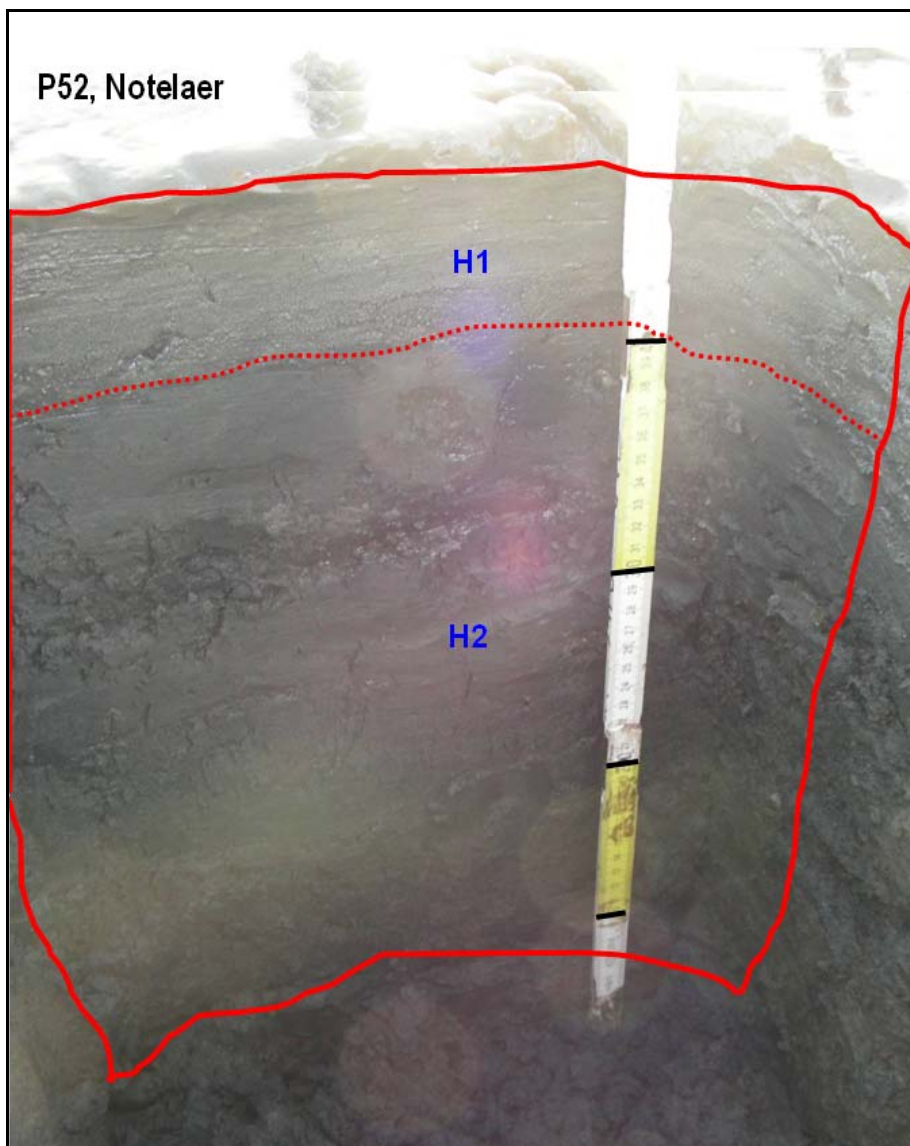


### 2.13.2 Profile description

Profile P52		De Notelaer
1.3 Date and time:	13/11/2008. Profile description initiated at 11:30. Low tide at 10:43	
1.4 Author:	Jari Hinsch Mikkelsen	
1.5 Location:	Belgium, Province of Antwerp, Bornem Municipality For a road description check out P57	
1.6 Profile coordinates:	Latitude, longitude: 51° 07' 00.40" N, 04° 15' 56.66" E Lambert72: 200747.498 N, 142774.822 E	
4.1 Elevation:	±3.4 m TAW (topo-bathymetry data 2001)	
2.1 Atmospheric climate and weather condition:	Sunny	
Soil climate:	<i>STR</i> : Mesic <i>SMR</i> : Aquic	
2.2 Topography:	<i>Macrotopography</i> : Estuarium, tidal mouth of the Scheldt river <i>Mesotopography</i> : Tidal mud flat <i>Landscape position</i> : Highest part of the tidal mud flat, on a few tens of meters distance from the tidal harsh cliff river at low tide <i>Slope form</i> : straight, convex (SV) <i>Slope gradient</i> : - <i>Slope length</i> : - <i>Slope orientation</i> : -	
2.6 Land-use:	No land use <i>Grazing</i> : No grazing	
2.7 Human influence:	No influence. Anyhow any influence is rapidly erased by the impact of the daily floodings	
Vegetation:	None	
2.8 Parent material:	Unconsolidated deposits> marine and estuarine clays and silts> quaternary clay and silt> Holocene Clay (5221)	
2.9 Drainage class:	Very poorly drained	
2.10 External drainage:	Slow runoff	
2.11 Flooding	Daily	
2.12 Coarse surface frag.	None	
2.13 Erosion, sedimentation:	Active erosion sedimentation in function of changes of the current regime of the Scheldt	
2.14 Surface cracks:	None observed	
2.15 Salts:	None observed	
Localisation factors profile:	This profile represents the highest part of the tidal mud flat and is located within the focus zone of this tidal research area	
N o.		Horizon description
H1	A	0-8 cm; lutum and sand; loose; continuous stratified; no roots;
H2	C	8-44 cm; reductimorphic colour pattern; positive reaction to αα-dipyridyl; more clayey and denser than horizon above; massive; continuous stratified; no roots;

*Extra subordinate symbols: 'bi' biological activity clearly evidences (fauna and flora), and more than what can be expected according to type of soil, position, time of year etc.*

*Colour measurements: M= Moist; MC= Moist-crushed; D= Dry; DC= Dry-crushed; W= Wet.*



### 2.13.3 Analytical laboratory data

See table 2.11.3

### 2.13.4 World reference base (2007) classification

Diagnostic horizon, properties, material:	Present in horizon:	Remarks:
Abrupt textural change		No textural data are available
	H1 H2	Oximorphic colour pattern Reductimorphic colour pattern
Lithological discontinuity		
Reducing conditions	H2	Positive reaction to alpha-alpha dipyridyl
Calcaric material		Analytical data confirm the presence of more than 2% calcium-carbonate throughout the soil
Fluvic material		Stratified and flooded twice a day

The profile keys out as a Fluvisol.

**Full classification name, without specifiers**

(except where listed as such for prefix and suffix qualifiers):

#### **Gleyic Tidalic Fluvisol (Calcaric, Humic, Eutric)**

- Tidalic: flooded by tidewater but not covered by water at mean low tide
- Gleyic: oximorphic and reductimorphic colours start from 0 cm and 8 cm respectively. The reduced conditions from 8 cm depth.
- Calcaric: present throughout the soil profile
- Humic: the weighted average is 6.5%
- Sodic: Data on ammonium acetate extractable cations are missing, based on magnesium sulphate extractable cations that the concentration of sodium and magnesium is too low to qualify
- Eutric: The base saturation exceeds 100%

#### **Full classification name, with specifiers:**

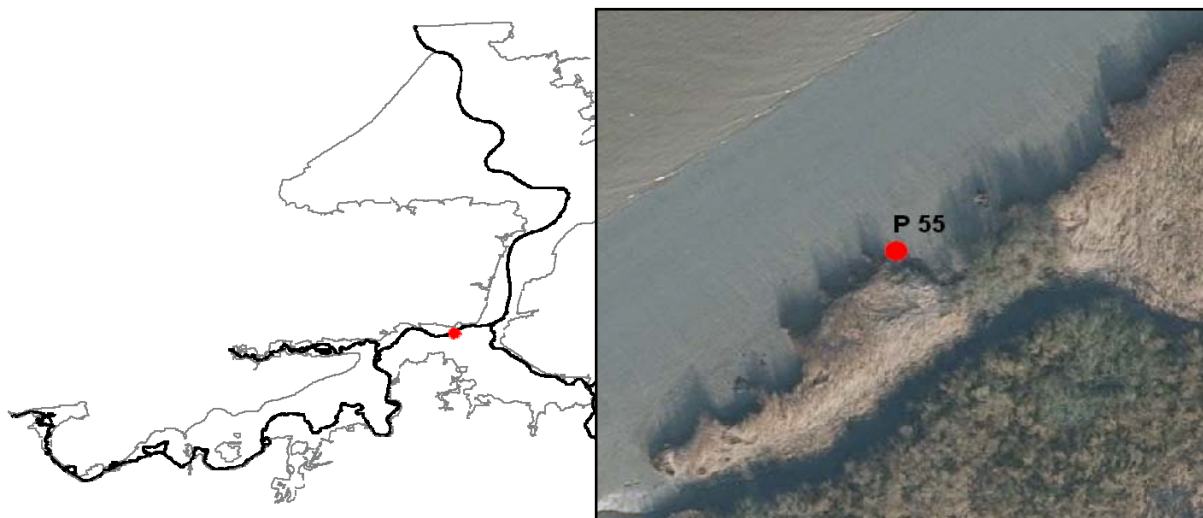
#### **Hyperepigleyic Tidalic Fluvisol (Calcaric, Hyperhumic, Hypereutric)**

- Hyperepigleyic: the reduced conditions appear from 11 cm
- Hypercalcaric: The weighted average of the profile is less than 10%
- Hypereutric: The base saturation exceeds 100%

## **2.14 Profile 'P55': Notelaer**

(Derived elevation: 3.90m TAW; Lat.: 51.070217, Long.: 4.160011)

### **2.14.1 Situation**







Profile 'P55' is excavated in the tidal marsh edge of the tidal marsh 'Notelaer'. Further upstream the tidal marsh consists of reed. At the location itself willow threes and shrubs have colonised the marsh edge.

#### 2.14.2 Profile description

Profile P55	De Notelaer
1.3 Date and time:	16/12/2008. Profile description initiated at 11:45. Low tide at 12:30
1.4 Author:	Jari Hinsch Mikkelsen
1.5 Location:	Belgium, Province of Antwerp, Bornem Municipality. For a road description check out P57
1.6 Profile coordinates:	Latitude, longitude: 51° 07' 02.34" N, 04° 16' 00.09" E Lambert72: 200804.503 N, 142853.079 E
4.1 Elevation:	±3.9 m (Topo -bathymetry data 2001)
2.1 Atmospheric climate and weather condition:	Overcast and slightly misty
Soil climate:	<i>STR</i> : Mesic <i>SMR</i> : Udic
2.2 Topography:	<i>Macrotopography</i> : Estuarium, tidal mouth of the Scheldt river <i>Mesotopography</i> : Tidal marsh <i>Landscape position</i> : Tidal marsh ridge facing the tidal mud flat <i>Slope form</i> : convex, convex (VV) <i>Slope gradient</i> : - <i>Slope length</i> : 3-4m <i>Slope orientation</i> : -
2.6 Land-use:	No land use <i>Grazing</i> : No grazing
2.7 Human influence:	No influence observed in the immediate surroundings of the profile,

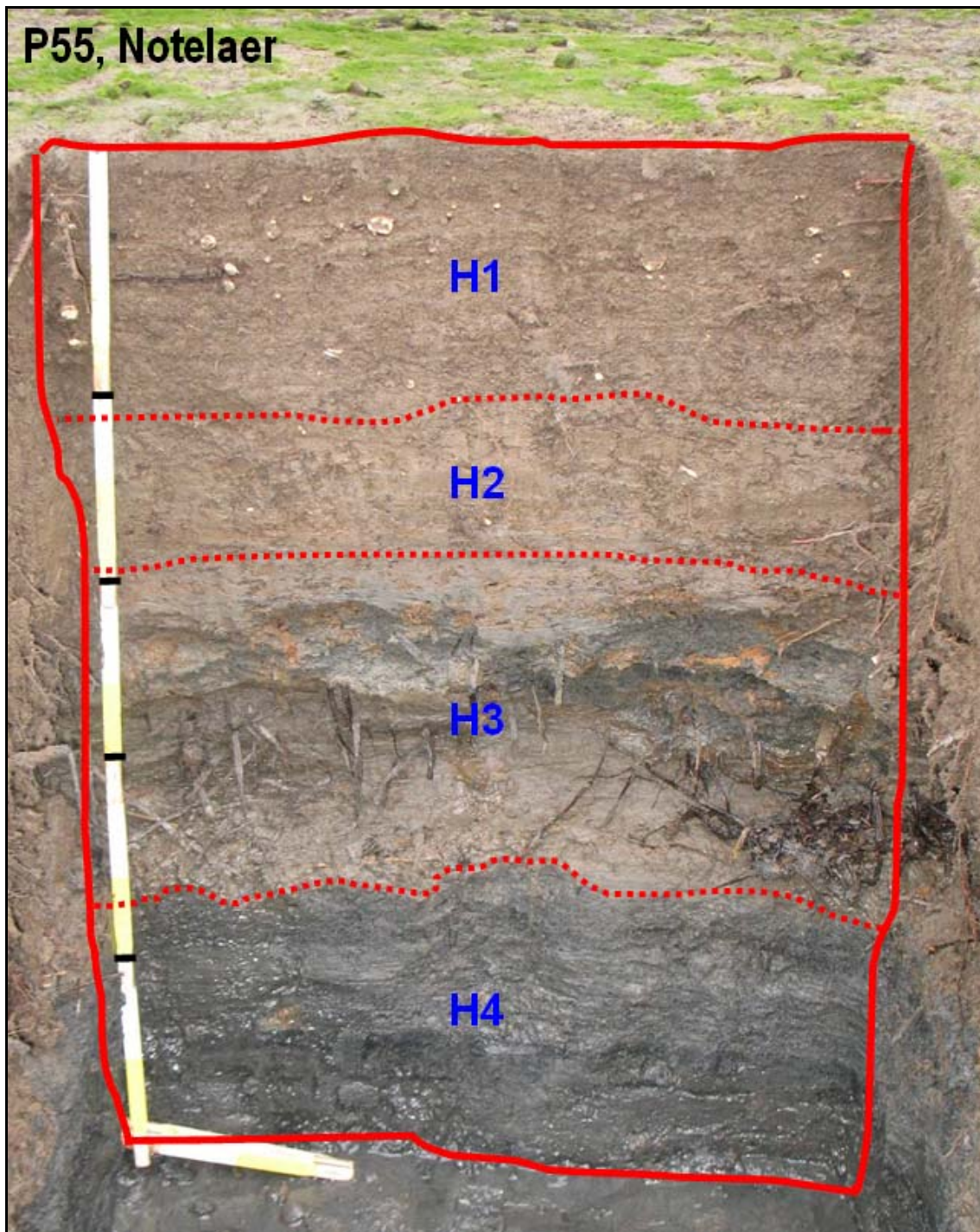


Profile P55		De Notelaer
		although on top and embedded in the soil debris is commonly scattered, mostly of plastic fabric.
Vegetation:		Below willow bushes, with a ground vegetation composing only of some mosses. Next to the willows the tidal marsh is dominated by reed.
2.8 Parent material:		unconsolidated deposits> marine and estuarine clays and silts> quaternary clay and silt> Holocene Clay (5221)
2.9 Drainage class:		Somewhat poorly drained
2.10 External drainage:		Moderately rapid runoff
2.11 Flooding		Flooded daily at least to a certain level of the tidal marsh cliff. Flooding until the top of the soil is restricted to spring tides only.
2.12 Coarse surface frag.		Some larger plastic debris and bottles was found in the immediate surroundings of the profile. Roots and branches (alive and decaying) provide some protection from the wave impact.
2.13 Erosion, sedimentation:		The soil is primarily eroded in a zone of about 20-25 cm just above the tidal mud flat. At this level an incision of more than 50 cm was measured. In fact on the soil photo the incision is still visible. Obviously the erosion is active at present.
2.14 Surface cracks:		None observed
2.15 Salts:		None observed
Localisation factors profile:		This profile together with profile P57 are located in an area dominated by willow. Where profile P57 is situated very close to the dike in on of the oldest parts of the Notelaer tidal marsh, P55 is located on the tidal marsh cliff so on the transition between the tidal marsh and the tidal mud flat. This part of the tidal marsh is furthermore one of the youngest sediments of the Notelaer.
N o.		Horizon description
H1	Abi	0-24 cm; very dark greyish brown 2.5Y 3/2 (M), olive brown to light olive brown 2.5Y 4.5/3 (D); very fine, strong granular; very friable; common very fine, few fine and very few medium to coarse roots; clear smooth boundary
H2	B	24-38 cm; very dark greyish brown 2.5Y 3/2 (M), greyish brown to light olive brown 2.5Y 5/2.5 (D); massive, locally very fine, weak granular; friable; common very fine, few fine and very few medium to coarse roots; clear smooth boundary
H3	BCb	38-73 cm; dark olive grey 5Y 3/2 (M), dark greyish brown to greyish brown 2.5Y 4.5/2 (D); common, medium, distinct, diffuse rusty mottles; oximorphic colours; massive; very friable; very few very fine roots; rooting depth is about 40 cm; abrupt smooth boundary
H4	Cr	73-... cm; very dark grey to dark grey 2.5Y 3.5/1 (M), dark grey to dark greyish brown 2.5Y 4/1.5 (D); reductimorphic colours; positive reaction to aa-dipyridyl; massive; continuous stratification of light and dark greyish material; very friable;

*Extra subordinate symbols: 'bi' biological activity clearly evidences (fauna and flora), and more than what can be expected according to type of soil, position, time of year etc.*

*Colour measurements: M= Moist; MC= Moist-crushed; D= Dry; DC= Dry-crushed; W= Wet.*

**P55, Notelaer**



### 2.14.3 Analytical laboratory data

Table A13: Analytical data for P55, De Notelaer									
Profile analysed: March-Dec./2009									
Profile studied 16/12/2008									
P55	Horizon	Depth	Total N	Total N	Carbon- TOC			C	C/N
Horizon nr.	symbols	cm	analyser %	Kjeldahl %	TC %	IC %	OC %	Analysers %	(TOC/Kjel.)
H1	Abi1	0-24	0.421	0.350	4.95	0.63	4.33	4.63	12
H2	Abi2	24-38	0.465	0.359	5.97	0.43	5.54	5.54	15
H3	Bg	38-73	0.415	0.267	4.65	0.62	4.03	4.44	15
H4	Cr1	73-...	0.390	0.159	4.34	1.55	2.79	4.45	18
Horizon nr.	Laser diffraction on soil material (fractions in µm)								
	0.4-2	2-6	6-50	50-63	63-100	100-250	250-500	500-1000	1000-2000
H1	1.9	2.7	21.6	7.6	19.9	31.3	11.3	3.2	0.5
H2	5.8	11.0	43.7	6.6	12.8	15.9	2.9	1.0	0.4
H3	3.9	7.3	33.6	6.4	13.3	17.1	9.5	7.8	1.1
H4	2.3	3.3	23.4	7.7	24.5	33.2	4.8	0.6	0.2
Horizon nr.	Na <sup>+</sup>	K <sup>+</sup>	Ca <sup>2+</sup>	Mg <sup>2+</sup>	Particle size distribution (µm; pipette)				
	by MgSO <sub>4</sub> (compulsive method)-----				0-2	2-10	10-20	20-50	50-2000
	-----cmol(+)/kg soil-----				-----%				
H1	0.8	0.4	31.5	2.1	25.6	9.2	5.6	34.7	24.9
H2	1.4	1.0	39.7	3.3					
H3	1.2	1.4	32.2	2.8	39.5	13.5	7.8	24.5	14.6
H4	0.8	0.7	24.2	2.1					
Horizon nr.	CEC sum	CEC measured	BS by CEC-m	Acidity sum	CaCO <sub>3</sub> titration	pH H <sub>2</sub> O	pH CaCl <sub>2</sub>	pH CaCl <sub>2</sub> /H <sub>2</sub> O	EC dS/m
	cmol(+)/kg		%	cmol(+)/kg	%	1:5	1:5		1:5
H1	34.7	36.8	94	<	6.9	7.8	7.3	0.93	0.27
H2	45.3	49.6	91	<	4.4	7.8	7.1	0.91	0.34
H3	37.5	36.2	104	<	6.4	7.4	7.3	0.98	1.13
H4	27.8	20.1	138	<	11.4	7.6	7.5	0.98	1.19
Horizon nr.	Ca	K	Mg	Na	P	S	Al	As	Cd
	-----Aqua Regia-----								
	-----mg/kg-----								
H1	25091	6850	5892	446	3469	1443	25902.3	35.1	4.9
H2	18784	10732	8449	753	4772	2089	54915.5	127.4	27.4
H3	24987	9769	7691	644	2574	5378	44117.6	65.3	24.9
H4	47209	4810	4715	456	1460	6496	18668.9	67.3	8.7
Horizon nr.	Co	Cr	Cu	Fe	Mn	Ni	Pb	Zn	Lab
	-----Aqua Regia-----								
	-----mg/kg-----								
H1	14.9	107.9	146.9	39995	957	35.3	151.8	429	JM360
H2	25.7	198.1	341.1	66095	757	68.8	301.4	998	JM361
H3	17.2	147.2	401.7	45501	377	58.0	211.6	1116	JM362
H4	9.9	81.2	118.1	30451	427	23.6	137.9	635	JM363
Horizon nr.	Na <sup>+</sup>	K <sup>+</sup>	Ca <sup>2+</sup>	Mg <sup>2+</sup>	CEC sum	Na+Mg saturation	ESP	SAR	
	by NH <sub>4</sub> OAc-----				sum				
	-----cmol(+)/kg soil-----				cations	%	%		
H1	0.6	0.3	50.0	3.0	54	7	1	0.1	
H2	1.0	0.7	44.6	3.6	50	9	2	0.2	
H3	0.9	1.0	55.6	3.4	61	7	2	0.2	
H4	0.8	0.5	52.8	3.0	57	7	1	0.1	

#### 2.14.4 World reference base (2007) classification

Diagnostic horizon, properties, material:	Present in horizon:	Remarks:
Albic		Colours too dark in moist conditions
Cambic		Structure and colour insufficient
Mollic		H1 qualifies but is too thin, H2 qualifies the colours but is lacking structure
Abrupt textural change		The clay content is decreasing with depth
Gleyic colour pattern	H3 H4	Oximorphic colour pattern Reductimorphic colour pattern
Lithological discontinuity		No abrupt textural change, no rock fragments, no abrupt colour change (not pedogenetic) no abrupt change in mineralogy
Reducing conditions	H4	Positive reaction to alpha-alpha dipyridyl
Secondary carbonates		No secondary carbonate observed
Calcaric material	H1-4	Analytical data confirm the presence of more than 2% calcium-carbonate throughout the soil
Fluvic material	H2-4	A trace of sedimentation is only visible from H3. The content of OC remains high throughout.
Sulphidic material	-	Alkaline pH

Mollic is present in H1 but this horizon is insufficient thick. At the same time fluvic properties can't co-exist with a diagnostic horizon. This implies that fluvic properties start from 24 cm depth and the soil will key out as a Fluvisol. If H1 had been 25 cm thick instead of 24 cm, then a Mollic horizon was present and the soil would have keyed out in the Phaeozems.

#### Full classification name, without specifiers

(except where listed as such for prefix and suffix qualifiers):

#### Gleyic Tidalic Fluvisol (Calcaric, Humic, Eutric, Siltic)

- Tidalic: flooded by tidewater but not covered by water at mean low tide
- Gleyic: oximorphic and reductimorphic colours start from 38 cm depth and the reduced conditions from 73 cm
- Calcaric: present throughout the soil profile
- Humic: the content exceeds 1% throughout, with a weighted average of 4.6%
- Sodic: The required 15% sodium plus manganese cations on the exchange complex is not present
- Eutric: The base saturation is at least 91%
- Siltic: H3 qualifies and has a silty clay loam texture

#### Full classification name, with specifiers:

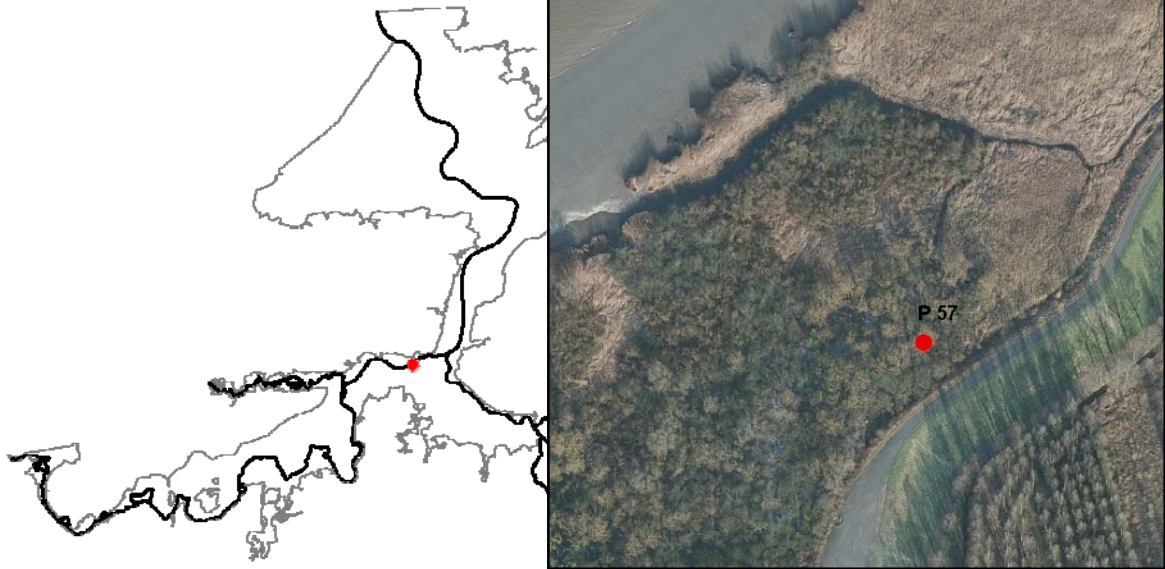
#### Gleyic Tidalic Fluvisol (Calcaric, Humic, Hypereutric, Siltic)

- Calcaric: a content between 4-11% was found, but the weighted average is below 10%
- Hypereutric: The base saturation remains above 91%



## 2.15 Profile 'P57': Notelaer

(Derived elevation: 5.50m TAW; Lat.: 51.065807, Long.: 4.160390)



### 2.15.1 Situation

Profile 'P57' is excavated in the creek-wall of a secondary creek in the tidal marsh 'Notelaer'.



The tidal marsh here consists of open willow forest with little low vegetation dominated by *Poa trivialis*. The location has been tidal marsh at least since 1944, which makes it the oldest tidal marsh-soil in the study area.



## 2.15.2 Profile description

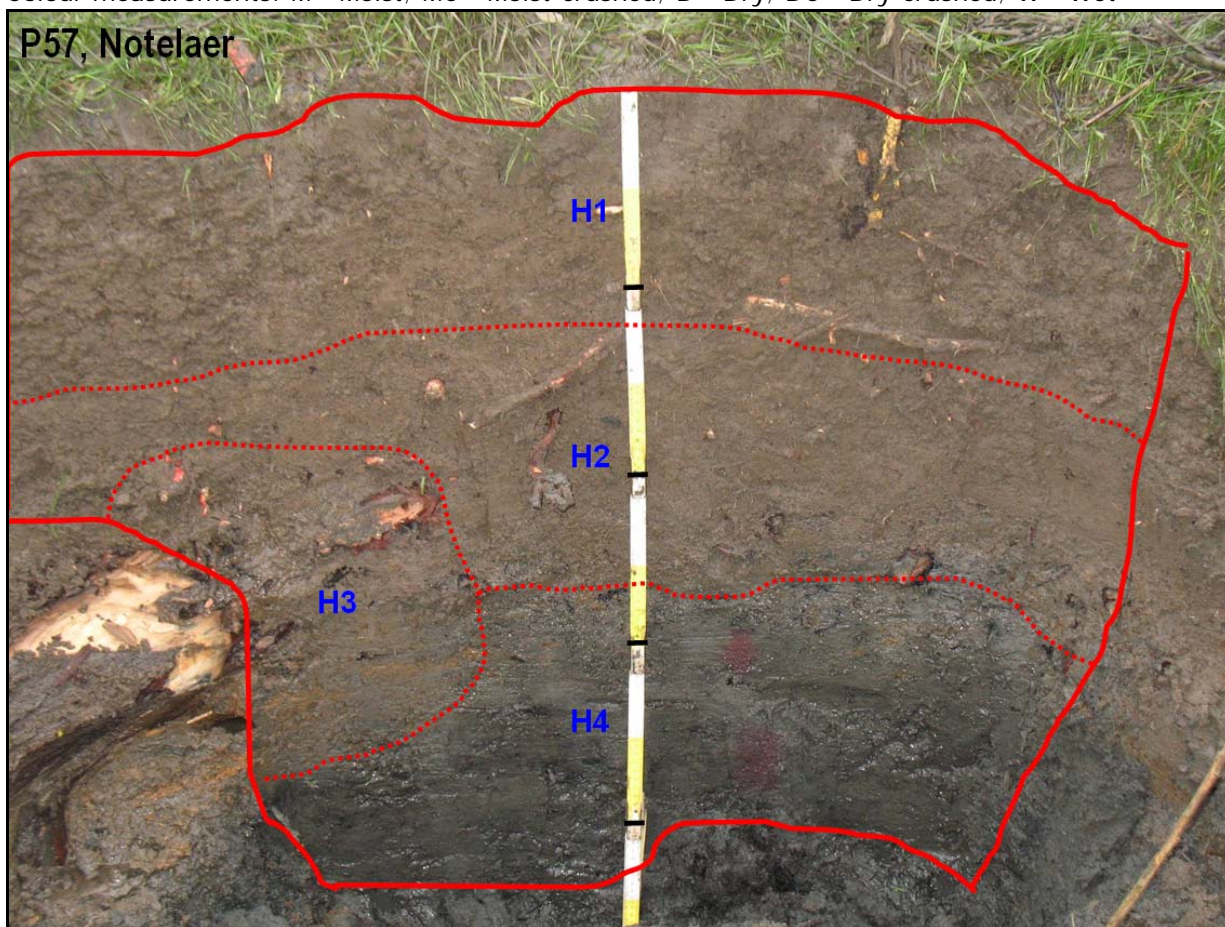
Profile P57	De Notelaer
1.3 Date and time:	16/12/2008. Profile description initiated at 14:30. Low tide at 12:30
1.4 Author:	Jari Hinsch Mikkelsen
1.5 Location:	Belgium, Province of Antwerp, Bornem Municipality. From the express road N16 follow the signs for Hingene along Hingenesteenweg. Within the village border the road change name to Frans van Haelenstraat. At the centre of the village turn in northern direction along Edmond Vleminckxstraat, which after about 500 m in a right turn becomes Louis de Baerdemaekerstraat. In the junction with Pieter Coomansstraat drive in northern direction and follow this cobble stoned road until it ends on the dike road. The Notelaer is located between the Scheldt and the dike.
1.6 Profile coordinates:	Latitude, longitude: 51° 06' 58.33" N, 04° 16' 02.93" E Lambert72: 200667.969 N, 142931.320 E
4.1 Elevation:	±5.5 m TAW (deduced from DTM)
2.1 Atmospheric climate and weather condition:	Overcast
Soil climate:	<i>STR</i> : Mesic <i>SMR</i> : Udic
2.2 Topography:	<i>Macrotopography</i> : Estuarium, tidal mouth of the Scheldt river <i>Mesotopography</i> : Tidal marsh <i>Landscape position</i> : higher part, about 20 m from the dike. The profile is located on the edge of a creek that has a meandering form. The right banc is gently sloping, the left banc more steep. The profile is situated on the left banc. <i>Slope form</i> : convex, straight (VS) <i>Slope gradient</i> : - <i>Slope length</i> : - <i>Slope orientation</i> : -
2.6 Land-use:	No land use <i>Grazing</i> : No grazing
2.7 Human influence:	No influence observed in the immediate surroundings of the profile, closer to the dike the human impact is increasingly more evident
Vegetation:	In a willow forest, with a ground vegetation composing of grasses, nettles, and sporadic presence of reed. The grass vegetation is best developed on the left banc where the profile is located. A slightly higher topography here together with a slight more open canopy may explain why the grass is better developed.
2.8 Parent material:	unconsolidated deposits> marine and estuarine clays and silts> quaternary clay and silt> Holocene Clay (5221)
2.9 Drainage class:	Somewhat poorly drained
2.10 External drainage:	Slow runoff
2.11 Flooding	Flooded daily in the creek
2.12 Coarse surface frag.	No stones, but plenty of woody fragments
2.13 Erosion, sedimentation:	Active erosion sedimentation in the creek
2.14 Surface cracks:	None observed
2.15 Salts:	None observed
Localisation factors profile:	Studying this profile had a dual purpose. Firstly, it is located below some of the oldest and best developed poplar and willow trees. Secondly, this

Profile P57	De Notelaer
	area of the tidal marsh is one of the oldest.
Remarks:	The height difference between the grass cover and the bottom of the creek where the profile was studied is 75 cm.

N o.		Horizon description
H1	Abi1	0-27 cm; very dark greyish brown 2.5Y 3/2 (M), greyish brown to light olive brown 2.5Y 5/2.5 (D); very fine, strong granular; common very fine, very few fine to medium and few coarse roots; smooth gradual boundary
H2	Abi2	27-53 cm; very dark greyish brown 2.5Y 3/2 (M), greyish brown to light olive brown 2.5Y 5/2.5 (D); very fine, strong granular; common very fine and very few fine to coarse roots; smooth clear boundary
H3	Bg	Pocket; light olive brown 2.5Y 5/3.5 (D); very few, medium, distinct, very diffuse rusty mottles; oximorphic colours; few very fine and very few fine to coarse roots;
H4	Cr	53-... cm; very dark grey 2.5Y 3/1 (M), dark greyish brown 2.5Y 4/2 (D); reductimorphic colours; positive reaction to aa-dipyridyl; massive; very few very fine roots; rooting depth until about 75 cm;

Extra subordinate symbols: 'bi' biological activity clearly evidences (fauna and flora), and more than what can be expected according to type of soil, position, time of year etc.

Colour measurements: M= Moist; MC= Moist-crushed; D= Dry; DC= Dry-crushed; W= Wet



### 2.15.3 Analytical laboratory data

Table A14: Analytical data for P57, De Notelaer									
Profile analysed: March-Dec./2009 Profile studied 16/12/2008									
P57	Horizon	Depth	Total N	Total N	Carbon- TOC			C	C/N
Horizon nr.	symbols	cm	analyser %	Kjeldahl %	TC %	IC %	OC %	Analysers %	(TOC/Kjel.)
H1	Abi1	0-27	0.636	0.466	6.96	1.54	5.42	6.75	12
H2	Abi2	27-53	0.588	0.458	7.04	1.16	5.87	7.01	13
H3	Bg	pocket							
H4	Cr1	53-...	0.581	0.426	8.38	1.25	7.13	7.84	17
Laser diffraction on soil material (fractions in µm)									
Horizon nr.	0.4-2	2-6	6-50	50-63	63-100	100-250	250-500	500-1000	1000-2000
	-----%-----								
H1	5.1	9.6	45.1	6.4	12.3	18.0	3.4	0.2	0.0
H2	5.4	9.8	48.1	7.8	14.3	11.8	2.6	0.2	0.0
H3									
H4	5.1	9.8	47.2	7.1	13.4	14.8	2.5	0.2	0.0
Particle size distribution (µm; pipette)									
Horizon nr.	Na <sup>+</sup>	K <sup>+</sup>	Ca <sup>2+</sup>	Mg <sup>2+</sup>	Particle size distribution (µm; pipette)				
	-----by MgSO <sub>4</sub> (compulsive method)-----				0-2	2-10	10-20	20-50	50-2000
	-----cmol(+)/kg soil-----				-----%-----				
H1	1.1	1.3	31.9	3.2	46.1	17.8	14.9	19.9	1.5
H2	1.3	1.0	47.1	3.6					
H3									
H4	1.2	1.4	35.6	2.8					
pH and EC									
Horizon nr.	CEC sum	CEC measured	BS by CEC-m	Acidity sum	CaCO <sub>3</sub> titration	pH H <sub>2</sub> O	pH CaCl <sub>2</sub>	pH CaCl <sub>2</sub> /H <sub>2</sub> O	EC dS/m
	cmol(+)/kg	cmol(+)/kg	%	cmol(+)/kg	%	1:5	1:5		1:5
H1	37.4	49.3	76	<	11.3	7.9	7.4	0.94	0.31
H2	52.9	52.3	101	<	9.8	7.8	7.2	0.93	0.30
H3									
H4	40.9	37.0	111	<	10.1	7.6	7.4	0.97	1.30
Aqua Regia									
Horizon nr.	Ca	K	Mg	Na	P	S	Al	As	Cd
	-----mg/kg-----								
H1	45151	8757	7635	592	4068	3034	39186.6	36.7	7.1
H2	35828	7994	6684	554	6799	2422	35906.9	74.5	24.0
H3									
H4	41534	10649	7102	741	3122	10495	45562.4	180.9	20.1
Aqua Regia									
Horizon nr.	Co	Cr	Cu	Fe	Mn	Ni	Pb	Zn	Lab
	-----mg/kg-----								
H1	21.0	112.3	153.5	53137	1586	44.2	154.3	731	JM364
H2	24.2	226.7	313.2	55545	1916	79.1	316.9	1190	JM365
H3									JM366
H4	21.9	225.9	303.7	50086	890	54.9	386.8	1520	JM367
SAR									
Horizon nr.	Depth	Na <sup>+</sup>	K <sup>+</sup>	Ca <sup>2+</sup>	Mg <sup>2+</sup>	CEC sum	Na+Mg saturation	ESP	SAR
	cm	-----by NH <sub>4</sub> OAc-----				sum	%	%	
		-----cmol(+)/kg soil-----				cations			
H1	0-27	1.0	1.1	57.5	5.4	65	10	2	0.2
H2	27-53	1.2	0.8	59.7	4.7	66	9	2	0.2
H3	pocket								
H4	53-...	1.1	1.1	57.8	3.5	63	7	2	0.2

## 2.15.4 World reference base (2007) classification

Diagnostic horizon, properties, material:	Present in horizon:	Remarks:
Albic		Colours too dark in moist conditions
Cambic	H2	Structure and colour requirements are meet, thickness is enough
Mollic		H1-2 qualifies for the colour, structure and organic material; but the content of the parent material should be at least 0.6% less and instead it is 2% more
Abrupt textural change		Most likely not present
Gleyic colour pattern	pocket H4	Oximorphic colour pattern Reductimorphic colour pattern
Lithological discontinuity		
Reducing conditions	H4	Positive reaction to alpha-alpha dipyridyl
Secondary carbonates		No secondary carbonate observed
Calcaric material	H1-4	Analytical data confirm the presence of more than 2% calcium-carbonate throughout the soil
Fluvic material	H3-4	Traces of sedimentation are only visible from H3. The content of OC remains high throughout.

A cambic horizon is present between 27-53 cm. This implies that the fluvic material only is present from 53 cm depth. Also the reduced conditions are only present below half a meter. The soil therefore keys out as a Cambisol.

### Full classification name, without specifiers

(except where listed as such for prefix and suffix qualifiers):

#### Endogleyic Fluvic Cambisol (Calcaric, Humic, Eutric, Siltic)

- Fluvic: fluvic material present from 53 cm and onwards
- Endogleyic: reductimorphic and reduced conditions starts at 53 cm
- Calcaric: present throughout the soil profile
- Humic: organic carbon content remains higher than 1%
- Eutric: The base saturation exceeds 76% throughout
- Siltic: H1 has a silty clay texture probably the texture is similar silty below

### Full classification name, with specifiers:

#### Endogleyic Endofluvic Cambisol (Hypercalcaric, Hyperhumic, Hypereutric, Siltic)

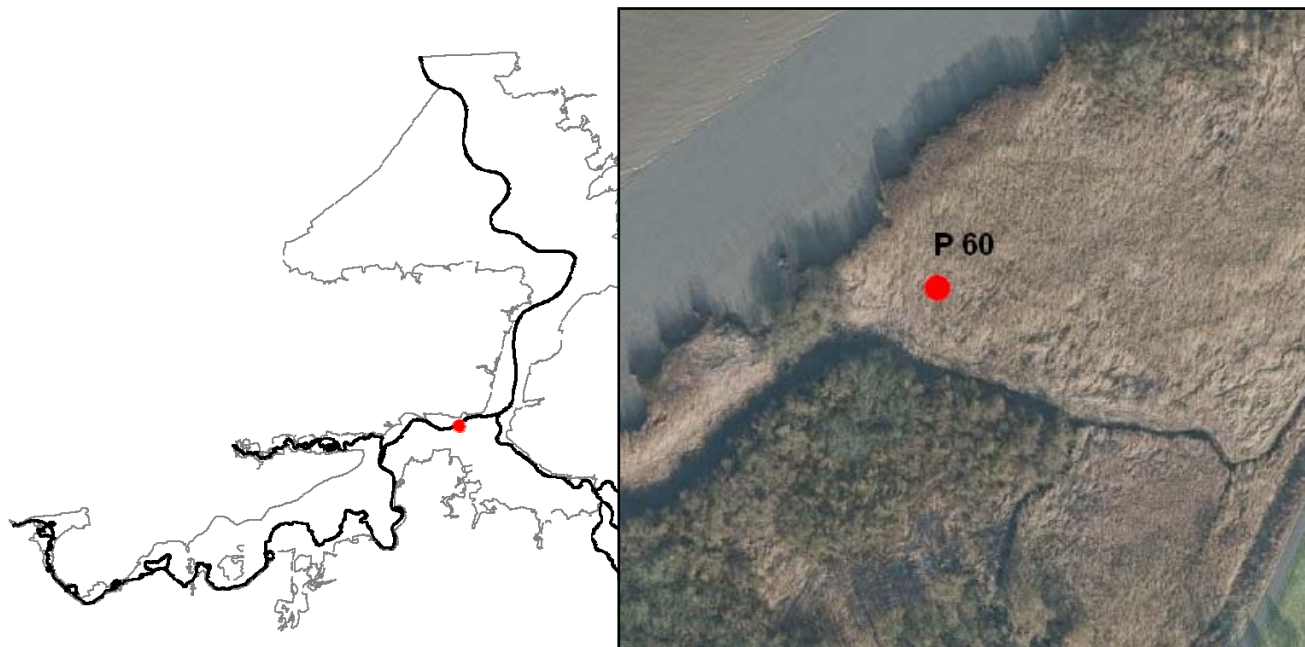
- Endofluvic: the fluvic material is only present at 68 cm depth
- Hypercalcaric: a content between 10-11% was found, and the weighted average is above 10%
- Hyperhumic: the weighted average is more than 5%
- Hypereutric: The base saturation exceeds 100% in H2-4 and 76% in H1



## 2.16 Profile 'P60': Notelaer

(Derived elevation: 5.60m TAW; Lat.: 51.070240, Long.: 4.160333)

### 2.16.1 Situation



Profile 'P60' is excavated in the tidal marsh-soil of the area 'Notelaer'.

The tidal marsh consists of reed. The location has been tidal marsh since 1965, and would be encroached by willow shrubs and forest if chopping didn't occurred.





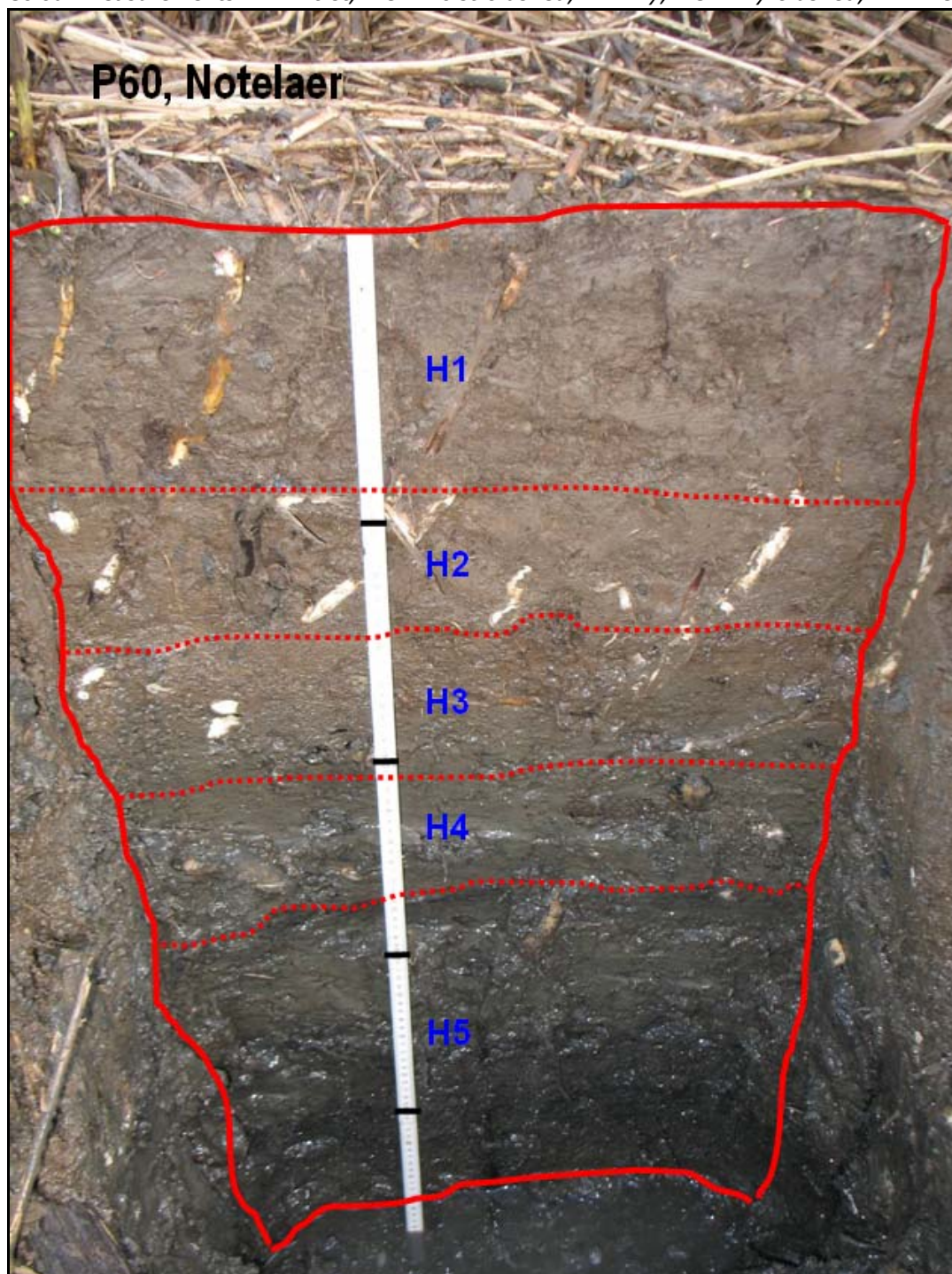
## 2.16.2 Profile description

Profile P60		De Notelaer
1.3 Date and time:	11/3/2009. Profile description initiated at 9:30. Low tide at 11:30	
1.4 Author:	Jari Hinsch Mikkelsen	
1.5 Location:	Belgium, Province of Antwerp, Bornem Municipality. For a road description check out description for P57	
1.6 Profile coordinates:	Latitude, longitude: 51° 07' 02.24" N, 04° 16' 03.23" E Lambert72: 200810.526699 N, 142918.040 E	
4.1 Elevation:	±5.6 m TAW (deduced from DTM)	
2.1 Atmospheric climate and weather condition:	Sunny	
Soil climate:	<i>STR</i> : Mesic <i>SMR</i> : Udic	
2.2 Topography:	<i>Macrotopography</i> : Estuarium, tidal mouth of the Scheldt river <i>Mesotopography</i> : Tidal marsh <i>Landscape position</i> : Within the tidal marsh in a intermediate position <i>Slope form</i> : - <i>Slope gradient</i> : - <i>Slope length</i> : - <i>Slope orientation</i> : -	
2.6 Land-use:	No land use <i>Grazing</i> : No grazing	
2.7 Human influence:	No influence observed in the immediate surroundings of the profile	
Vegetation:	Reed vegetation with nettles imbedded	
2.8 Parent material:	unconsolidated deposits> marine and estuarine clays and silts> quaternary clay and silt> Holocene Clay (5221)	
2.9 Drainage class:	Poorly drained	
2.10 External drainage:	Neither receiving nor shedding water	
2.11 Flooding	Flooded montly during spring tide periods	
2.12 Coarse surface frag.	None	
2.13 Erosion, sedimentation:	No traces of erosion	
2.14 Surface cracks:	None observed	
2.15 Salts:	None observed	
Localisation factors profile:	The profile is located on about 6-7m distance from diver 43 towards the Scheldt, and on about 10-15m distance from the mega creek. The profile is situated between two subcreeks, which are faintly visible as the height difference is <50cm and this over a wideness of 1.5-2m.	
N o.		Horizon description
H1	A1	0-18 cm; very dark greyish brown 10YR 3/2 (M); incomplete subangular blocky, locally granular; friable; common very fine to fine, very few medium and common coarse roots; small earthworms; gradual smooth boundary
H2	A2	18-31 cm; dark greyish brown 2.5Y 4/2 (M); massive; sticky and plastic; common very fine to fine, few medium and common coarse roots; snail 5-5 mm in dia.; clear smooth boundary
H3	AC	31-44 cm; very dark greyish brown 2.5Y 3/2 (W); horizon forms the transition between oxidised and reduced parts of the soil; high content of organic matter; massive; sticky; common very fine to fine, few medium and common large roots; clear smooth boundary

Profile P60		De Notelaer
H4	CAr	44-54 cm; dark grey 2.5Y 4/1 (W); reductimorphic colour pattern; positive reaction to $\alpha\alpha$ -dipyridyl; massive; sticky; common dead roots; smooth gradual boundary
H5	Cr	54-100 cm; very dark greenish grey 3/10Y (W); reductimorphic colour pattern; positive reaction to $\alpha\alpha$ -dipyridyl; massive; stratified, where not disturbed by roots; sticky; common large roots; common dead roots; very high content of organic matter, partly in form of debris and fragments

*Extra subordinate symbols: 'bi' biological activity clearly evidences (fauna and flora), and more than what can be expected according to type of soil, position, time of year etc.*

*Colour measurements: M= Moist; MC= Moist-crushed; D= Dry; DC= Dry-crushed; W= Wet.*



### 2.16.3 Analytical laboratory data

**Table A15: Analytical data for P60, De Notelaer**

<b>P60</b>	<b>Horizon</b>	<b>Depth</b>	<b>LOI</b>	<b>TOC</b>	<b>EC</b>	<b>CaCO<sub>3</sub></b>	<b>Lab</b>
<b>Horizon nr.</b>	<b>symbols</b>	<b>cm</b>	<b>OM %</b>	<b>OC %</b>	<b>dS/m 1:5</b>	<b>titration %</b>	
H1	A1	0-18	5,70	2,08	1,20	8,9	JM410
H2	A2	18-31	2,67	1,21	0,76	7,7	JM411
H3	AC	31-44	6,53	3,02	3,43	12,7	JM412
H4	CAr	44-54	2,20	0,90	1,93	10,9	JM413
H5	Cr	54-100	5,24	2,18	2,56	11,7	JM414
<b>Texture- pipette method (fractions in µm)</b>					<b>pH</b>		<b>pH</b>
<b>0-2</b>	<b>2-10</b>	<b>10-20</b>	<b>20-50</b>	<b>50-2000</b>	<b>H<sub>2</sub>O</b>	<b>KCl</b>	<b>KCl/H<sub>2</sub>O</b>
-----%-----					<b>1:5</b>	<b>1:5</b>	
					7,3	7,2	0,99
6,5	2,1	2,0	11,7	77,8	7,4	7,3	0,99
26,0	13,3	7,2	19,3	34,2	8,1	7,9	0,97
					8,6	8,4	0,98
19,7	7,1	2,5	11,0	59,6	8,2	7,9	0,97
<b>Horizon nr.</b>	<b>Depth</b>	<b>Na<sup>+</sup></b>	<b>K<sup>+</sup></b>	<b>Ca<sup>2+</sup></b>	<b>Mg<sup>2+</sup></b>	<b>CEC</b>	<b>CEC</b>
	<b>cm</b>	-----by MgSO <sub>4</sub> (compulsive method)-----				<b>sum</b>	<b>measured</b>
		-----cmol(+)/kg soil-----				cmol(+)/kg	
H1	0-18	0,6	0,2	21,8	1,0	23,6	17,3
H2	18-31	0,2	0,2	11,6	1,1	13,0	11,8
H3	31-44						
H4	44-54						
H5	54-100						
<b>S</b>	<b>As</b>	<b>Cd</b>	<b>Cr</b>	<b>Cu</b>	<b>Ni</b>	<b>Pb</b>	<b>Zn</b>
<b>Aqua Regia</b>							
-----mg/kg-----							
4489	19,8	5,5	164	121	26	104	638
2472	13,3	3,5	125	73	18	82	538
3080	21,8	2,1	81	37	21	70	506
2569	14,1	1,1	51	23	15	44	350

#### 2.16.4 World reference base (2007) classification

Diagnostic horizon, properties, material:	Present in horizon:	Remarks:
Albic		Colours too dark in moist conditions
Cambic		Structure requirement is not meet
Mollic		Lack of structure
Abrupt textural change	H2-3	Change from 6.5 to 26% clay
Gleyic colour pattern	- H4	Oximorphic colour pattern Reductimorphic colour pattern
Lithological discontinuity		
Reducing conditions	H4	Positive reaction to alpha-alpha dipyridyl
Calcaric material	H1-4	Analytical data confirm the presence of more than 2% calcium-carbonate throughout the soil
Fluvic material	H1-5	No traces of sedimentation was found, but irregular content of organic carbon remaining above 0.2% is found through the soil

The soil keys out in Fluvisols.

#### Full classification name, without specifiers

(except where listed as such for prefix and suffix qualifiers):

#### Gleyic Tidalic Fluvisol (Calcaric, Humic, Eutric, Siltic)

- Tidalic: flooded by tidewater but not covered by water at mean low tide
- Gleyic: reductimorphic colours and reduced conditions starts from 44 cm depth
- Calcaric: present throughout the soil profile
- Humic: the content exceeds 1% throughout, with a weighted average of 1.96%
- Eutric: The base saturation exceeds 100% in de analysed horizons
- Arenic: H3 has a silty clay loam texture and qualifies for Arenic, but the horizon is too thin.

#### Full classification name, with specifiers:

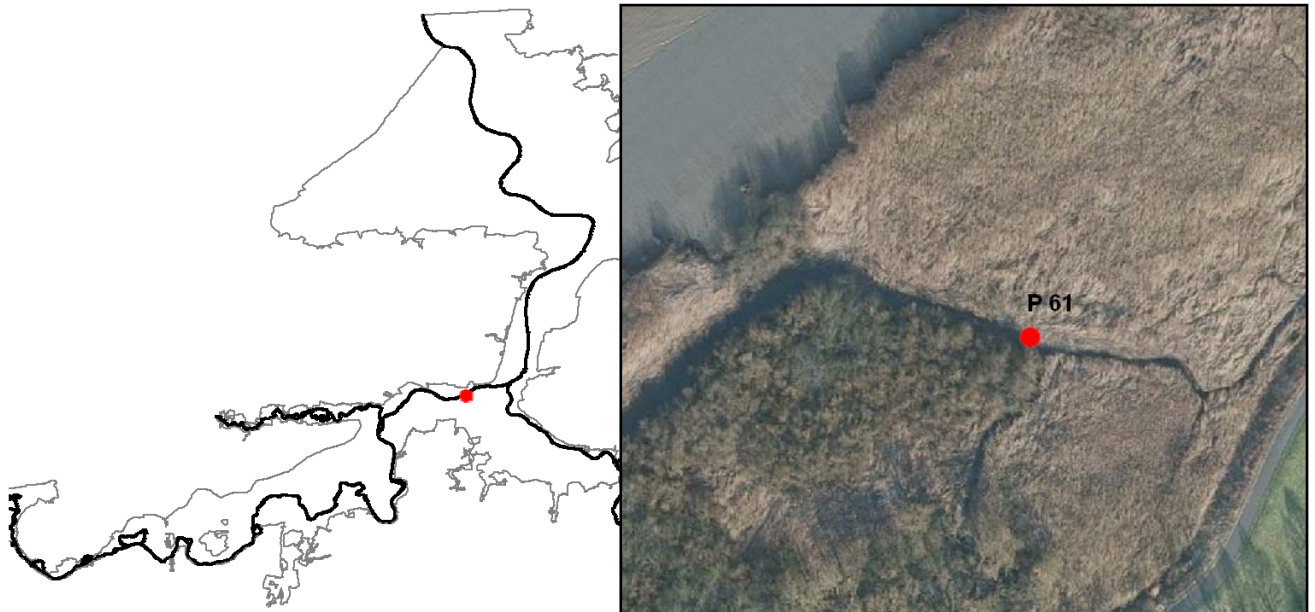
#### Epigleyic Tidalic Fluvisol (Calcaric, Humic, Hypereutric, Siltic)

- Calcaric: a content between 8-13% was found, but the weighted average does not exceeds 10%
- Hypereutric: The base saturation remains above 100% for the analysed horizons



## 2.17 Profile 'P61': Notelaer

(Derived elevation: 5.00m TAW; Lat.: 51.070122, Long.: 4.160529)



### 2.17.1 Situation

Profile 'P61' is excavated in the wall of a major creek in the area 'Notelaer'.

The tidal marsh consists of reed on the north side of the creek, and willow forest further south. The profile is excavated in the creek-wall grown with reed.





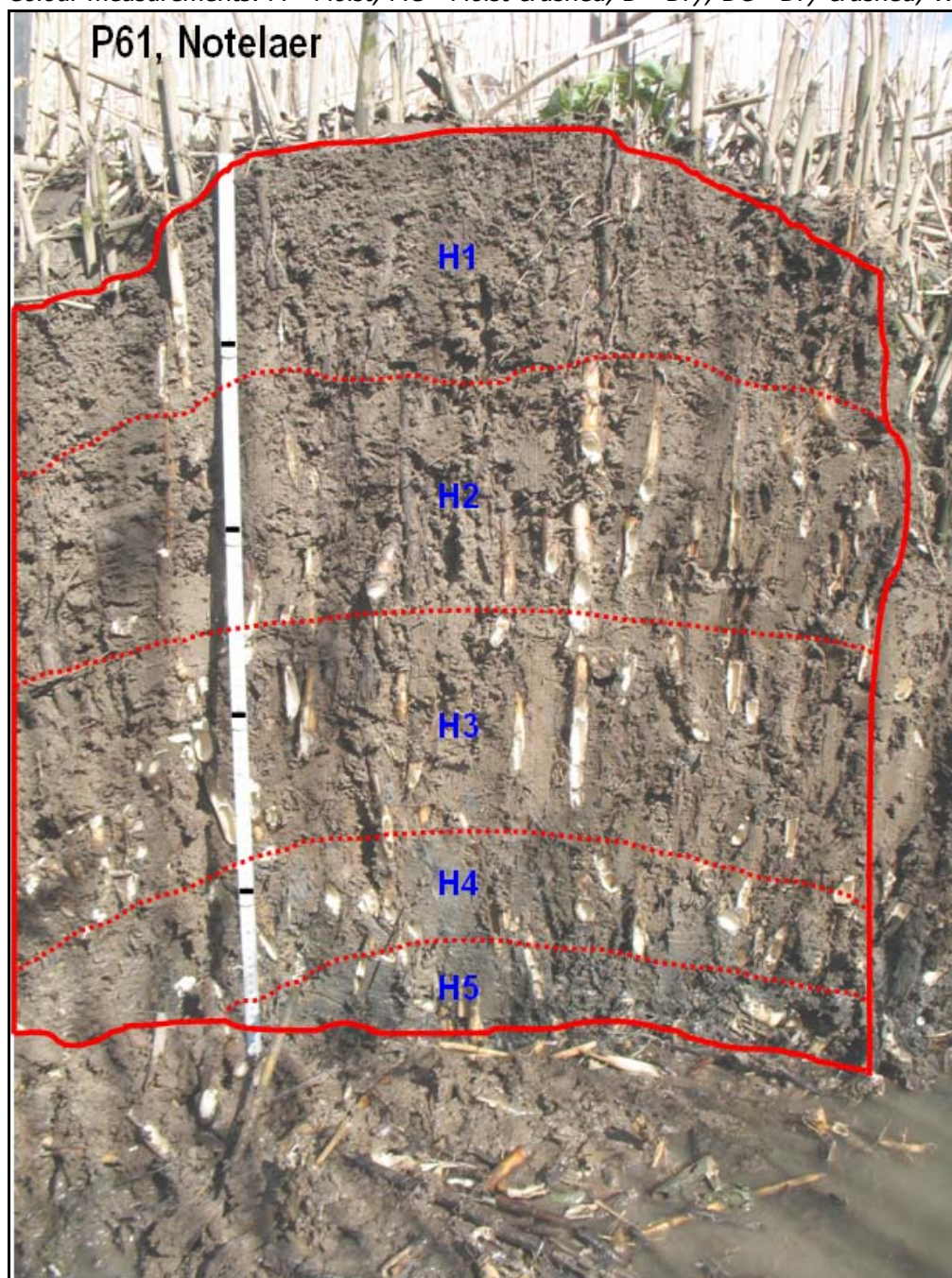
## 2.17.2 Profile description

Profile P61		De Notelaer
1.3 Date and time:	11/3/2009. Profile description initiated at 11:45. Low tide at 11:30	
1.4 Author:	Jari Hinsch Mikkelsen	
1.5 Location:	Belgium, Province of Antwerp, Bornem Municipality. For a road description check out description for P57	
1.6 Profile coordinates:	Latitude, longitude: 51° 07' 01.21" N, 04° 16' 05.17" E Lambert72: 200774.401 N, 142954.833 E	
4.1 Elevation:	±5.0 m TAW (deduced from trimble measurements from the area)	
2.1 Atmospheric climate and weather condition:	Sunny	
Soil climate:	<i>STR</i> : Mesic <i>SMR</i> : Udic	
2.2 Topography:	<i>Macrotopography</i> : Estuarium, tidal mouth of the Scheldt river <i>Mesotopography</i> : Tidal marsh <i>Landscape position</i> : Centrally within the tidal marsh along the bank of the mega creek <i>Slope form</i> : - <i>Slope gradient</i> : - <i>Slope length</i> : - <i>Slope orientation</i> : -	
2.6 Land-use:	No land use <i>Grazing</i> : No grazing	
2.7 Human influence:	No influence observed in the immediate surroundings of the profile	
Vegetation:	Reed vegetation	
2.8 Parent material:	unconsolidated deposits> marine and estuarine clays and silts> quaternary clay and silt> Holocene Clay (5221)	
2.9 Drainage class:	Somewhat poorly drained	
2.10 External drainage:	Moderately rapid run-off	
2.11 Flooding	Creek flooded daily; top of soil flooded during spring tides only	
2.12 Coarse surface frag.	None	
2.13 Erosion, sedimentation:	No traces of erosion	
2.14 Surface cracks:	None observed	
2.15 Salts:	None observed	
Localisation factors profile:	The profile is part of the profile sequence P60-P63, which were studied to provide with a better insight in the lateral variation along the mega creek.	
N o.		Horizon description
H1	Abi	0-20 cm; dark grey 10YR 4/1 (M); weak blocky; friable; very few very fine, common fine to medium and few coarse roots; many plant fragments embedded in the soil, locally enhancing platy structure; smooth gradual boundary
H2	A2	20-53 cm; very dark greyish brown to dark brown 10YR 3/2.5 (M); massive; slightly sticky; very few very fine, common fine and few medium to coarse roots; common plant tissues embedded; smooth diffuse boundary
H3	Bg	53-80 cm; dark greyish brown to brown 10YR 4/2.5 (W); massive; slightly sticky; very few very fine, common fine and few medium to coarse roots; smooth clear boundary
H4	Cg	80-95 cm; very dark grey to very dark greyish brown 2.5Y 3/1.5 (W); positive reaction to aa-dipyridyl; faint petrochemical odour; massive; sticky; no very fine, common fine

Profile P61		De Notelaer
		and few medium to coarse roots; many plant fragments embedded; clear smooth boundary
H5	Cr	95-100 cm; greenish black 2.5/10Y (W); positive reaction to aa-dipyridyl; no very fine, common fine, few medium and common coarse roots;

*Extra subordinate symbols: 'bi' biological activity clearly evidences (fauna and flora), and more than what can be expected according to type of soil, position, time of year etc.*

*Colour measurements: M= Moist; MC= Moist-crushed; D= Dry; DC= Dry-crushed; W= Wet.*



### 2.17.3 Analytical laboratory data

**Table A16: Analytical data for P61, De Notelaer**

<b>P61</b>	<b>Horizon</b>	<b>Depth</b>	<b>LOI</b>	<b>TOC</b>	<b>EC</b>	<b>CaCO<sub>3</sub></b>	<b>Lab</b>
<b>Horizon nr.</b>	<b>symbols</b>	<b>cm</b>	<b>OM %</b>	<b>OC %</b>	<b>dS/m 1:5</b>	<b>titration %</b>	
H1	Abi	0-20	5,5	2,77	2,55	14,7	JM415
H2	A	20-53	6,4	2,92	2,68	12,5	JM416
H3	Bg	53-80	10,3	6,26	0,28	9,5	JM417
H4	Cg	80-95	10,1	5,97	0,29	10,2	JM418
<b>Texture- pipette method (fractions in µm)</b>					<b>pH</b>		<b>pH</b>
<b>0-2</b>	<b>2-10</b>	<b>10-20</b>	<b>20-50</b>	<b>50-2000</b>	<b>H<sub>2</sub>O</b>	<b>KCl</b>	<b>KCl/H<sub>2</sub>O</b>
-----%-----					<b>1:5</b>	<b>1:5</b>	
					8,3	8,0	0,96
29,2	8,3	5,3	13,9	43,3	8,2	7,9	0,97
42,5	17,2	11,3	26,6	2,4	7,6	7,1	0,94
					7,6	7,1	0,93
<b>Horizon nr.</b>	<b>Depth cm</b>	<b>Na<sup>+</sup></b>	<b>K<sup>+</sup></b>	<b>Ca<sup>2+</sup></b>	<b>Mg<sup>2+</sup></b>	<b>CEC sum</b>	<b>CEC measured</b>
		-----by MgSO <sub>4</sub> (compulsive method)-----				<b>cmol(+)/kg</b>	<b>cmol(+)/kg</b>
H1	0-20						
H2	20-53						
H3	53-80	0,8	0,8	35,1	4,3	41,0	37,4
H4	80-95	1,1	0,6	39,2	4,1	45,0	41,5
<b>S</b>	<b>As</b>	<b>Cd</b>	<b>Cr</b>	<b>Cu</b>	<b>Ni</b>	<b>Pb</b>	<b>Zn</b>
<b>Aqua Regia</b>							
-----mg/kg-----							
3133	17,4	1,4	59	29	17	51	421
2562	25,9	5,6	126	85	35	111	607
2777	36,9	8,2	178	125	49	164	793

#### 2.17.4 World reference base (2007) classification

Diagnostic horizon, properties, material:	Present in horizon:	Remarks:
Albic		Dry colours missing but probably no albic present
Cambic		Structure requirement is not meet
Mollic		Lack of structure
Abrupt textural change		Data partly missing; though based on the available information the absence of an abrupt textural change seems evident
Gleyic colour pattern	- H4-5	Oximorphic colour pattern Reductimorphic colour pattern
Lithological discontinuity		
Reducing conditions	H4-5	Positive reaction to alpha-alpha dipyridyl
Calcaric material	H1-5	Analytical data confirm the presence of more than 2% calcium-carbonate throughout the soil
Fluvic material	H1-5	No traces of sedimentation was found due to the bioturbation caused by the reed roots, but irregular content of organic carbon remaining above 0.2% is found through the soil

The soil keys out in Fluvisols.

#### Full classification name, without specifiers

(except where listed as such for prefix and suffix qualifiers):

#### Tidalic Fluvisol (Calcaric, Humic, Eutric, Siltic)

- Tidalic: flooded by tidewater but not covered by water at mean low tide
- Gleyic: reductimorphic colours and reduced conditions starts from 80 cm depth, which is too deep as a reduced layer, at least 25 cm thick, should be present within the upper 100 cm
- Calcaric: present throughout the soil profile
- Humic: the content exceeds 1% throughout, with a weighted average of 2.86% (0-50 cm)
- Eutric: The base saturation exceeds 100% in de analysed horizons
- Siltic: H3 has a silty clay texture

#### Full classification name, with specifiers:

#### Tidalic Fluvisol (Hypercalcaric, Humic, Hypereutric, Siltic)

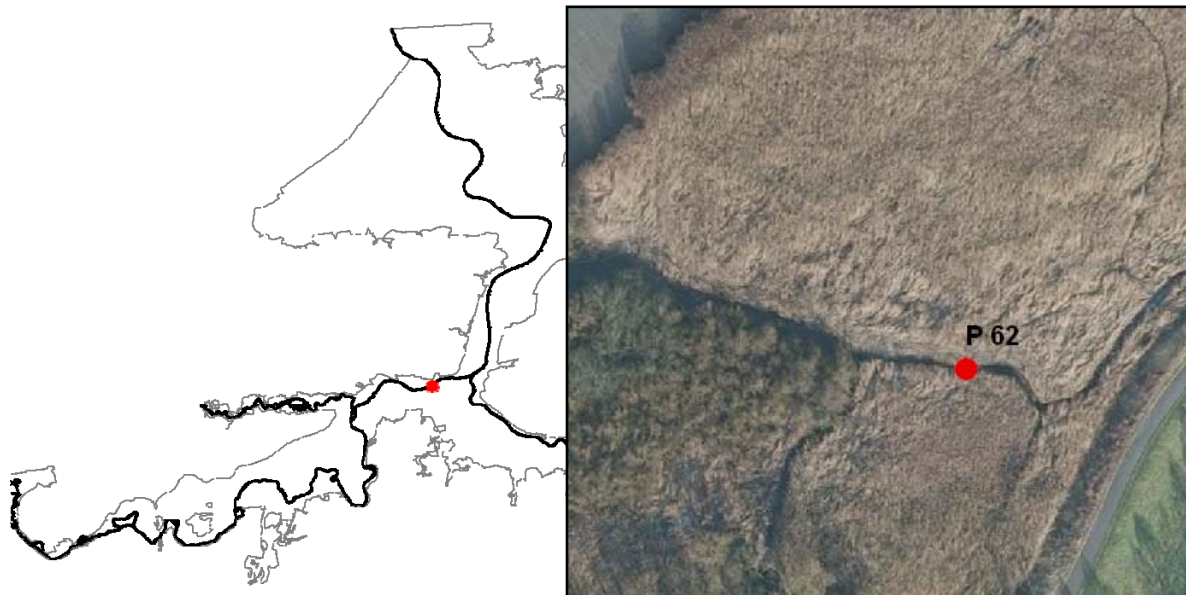
- Hypercalcaric: a content in the upper 50 cm between 12.5-14.7% was found, so the weighted average exceeds 10%
- Hypereutric: The base saturation remains above 100% for the analysed horizons



## 2.18 Profile 'P62': Notelaer

(Derived elevation: 5.00m TAW; Lat.: 51.070097, Long.: 4.160677)

### 2.18.1 Situation



Profile 'P62' is excavated in the wall of a major creek in the area 'Notelaer'. The creek is embedded in tidal marsh with reed vegetation.



## 2.18.2 Profile description

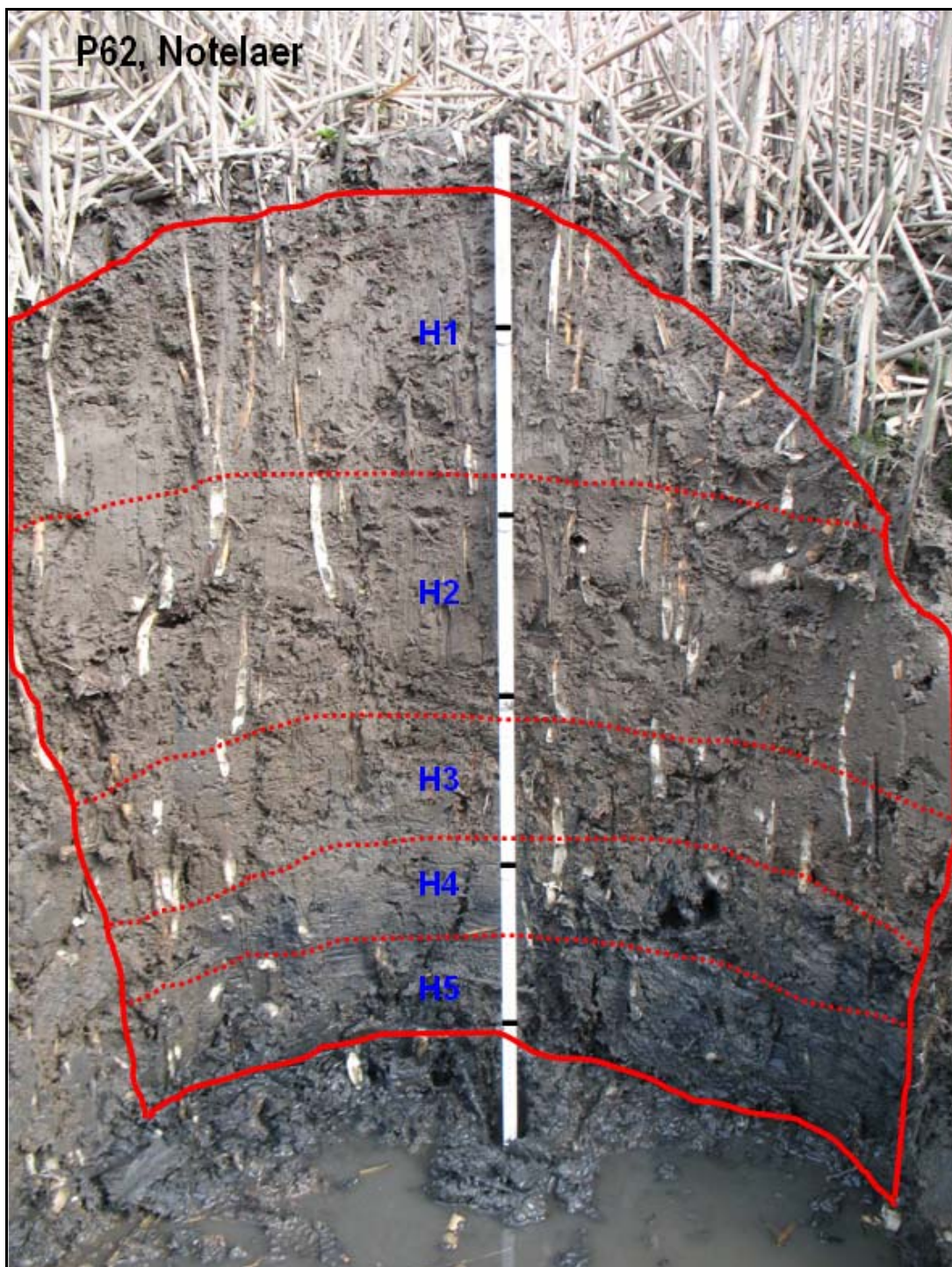
Profile P62		De Notelaer
1.3 Date and time:	11/3/2009. Profile description initiated at 13:30. Low tide at 11:30	
1.4 Author:	Jari Hinsch Mikkelsen	
1.5 Location:	Belgium, Province of Antwerp, Bornem Municipality. For a road description check out description for P57	
1.6 Profile coordinates:	Latitude, longitude: 51° 07' 00.97" N, 04° 16' 06.81" E Lambert72: 200767.225 N, 142986.350 E	
4.1 Elevation:	±5.0 m TAW (deduced from trimble measurements from the area)	
2.1 Atmospheric climate and weather condition:	Partly cloudy	
Soil climate:	<i>STR</i> : Mesic <i>SMR</i> : Udic	
2.2 Topography:	<i>Macrotopography</i> : Estuarium, tidal mouth of the Scheldt river <i>Mesotopography</i> : Tidal marsh <i>Landscape position</i> : Centrally within the tidal marsh along the bank of the mega creek, about 75 meter further upstream than P61 <i>Slope form</i> : convex, convex (VV) <i>Slope gradient</i> : - <i>Slope length</i> : - <i>Slope orientation</i> : -	
2.6 Land-use:	No land use <i>Grazing</i> : No grazing	
2.7 Human influence:	No influence observed in the immediate surroundings of the profile	
Vegetation:	Reed vegetation, some ground vegetation starts to grow (similar as for P61)	
2.8 Parent material:	unconsolidated deposits> marine and estuarine clays and silts> quaternary clay and silt> Holocene Clay (5221)	
2.9 Drainage class:	Somewhat poorly drained	
2.10 External drainage:	Moderately rapid run-off	
2.11 Flooding	Creek flooded daily; top of soil flooded during spring tides only	
2.12 Coarse surface frag.	None	
2.13 Erosion, sedimentation:	No traces of erosion	
2.14 Surface cracks:	None observed	
2.15 Salts:	None observed	
Localisation factors profile:	The profile is part of the profile sequence P60-P63, which were studied to provide with a better insight in the lateral variation along the mega creek.	
N o.		Horizon description
H1	A1	0-32 cm; dark greyish brown 2.5Y 4/2 (W); locally faint oxido reduction along biogalleries; massive, unripe; sticky, very plastic; very few very fine to fine, no medium and common coarse roots; few small earthworms observed; plenty of organic matter embedded; smooth diffuse boundary
H2	A2	32-64 cm; dark greyish brown 2.5Y 4/2 (W); locally faint oxido reduction along biogalleries; massive; sticky; few very fine to fine, very few medium and common coarse roots; smooth clear boundary
H3	BCg	64-77 cm; olive grey 5Y 4/2 (W); common, medium, distinct, clear, rusty brown (strong brown 7.5YR 4/6 [w]), oximorphic mottles; Fe precipitation around macro

Profile P62		De Notelaer
		pores; massive; sticky; many very fine to fine, very few medium and common coarse roots; smooth clear boundary
H4	CBg	77-86 cm; olive grey 5Y 4/2 (W); reductimorphic colour pattern; positive reaction to αα-dipyridyl; massive; sticky; no very fine and medium, very few fine and common coarse roots, many very fine and fine decomposing roots; plastic piece found at 86 cm depth; smooth clear boundary
H5	Cr	86-114 cm; very dark grey 5Y 3/1 (W); reductimorphic colour pattern; positive reaction to αα-dipyridyl; massive; sticky; no very fine to medium and common coarse roots; plastic piece at 110 cm depth

*Extra subordinate symbols: 'bi' biological activity clearly evidences (fauna and flora), and more than what can be expected according to type of soil, position, time of year etc.*

*Colour measurements: M= Moist; MC= Moist-crushed; D= Dry; DC= Dry-crushed; W= Wet.*





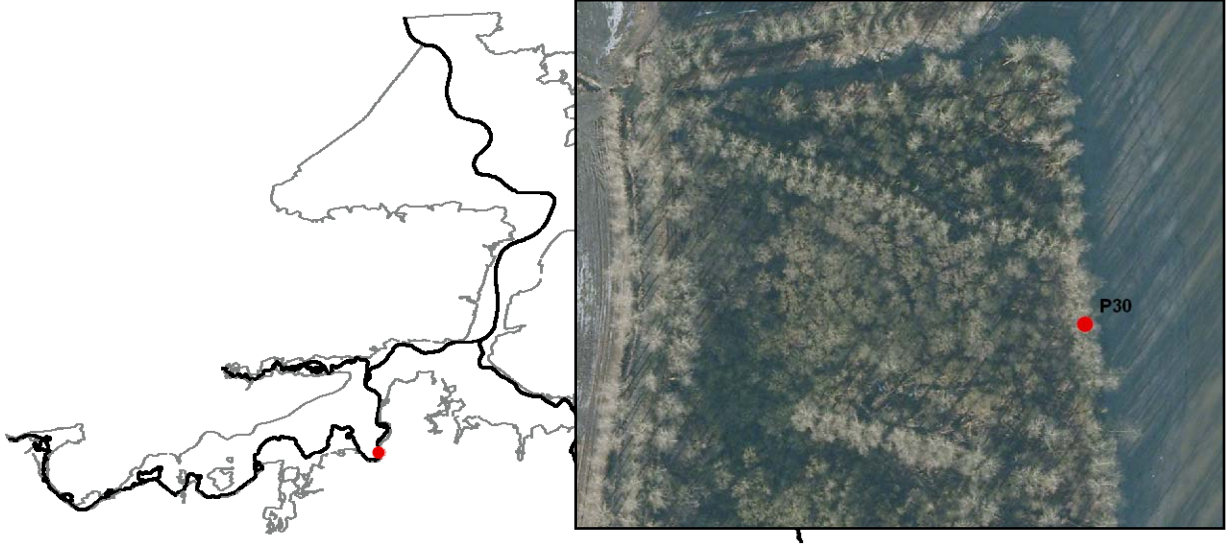


## Fresh water zone: Groot schoor van Hamme

### 2.19 Profile 'P30': Groot schor van Hamme

(Derived elevation: 5.50m TAW; Lat.: 51.021672, Long.: 4.111985)

#### 2.19.1 Situation



Profile P30 is excavated in the north-eastern edge of the tidal marsh 'Groot schor van Hamme'.

The location used to be a summer dike. Later it was planted with poplar trees.

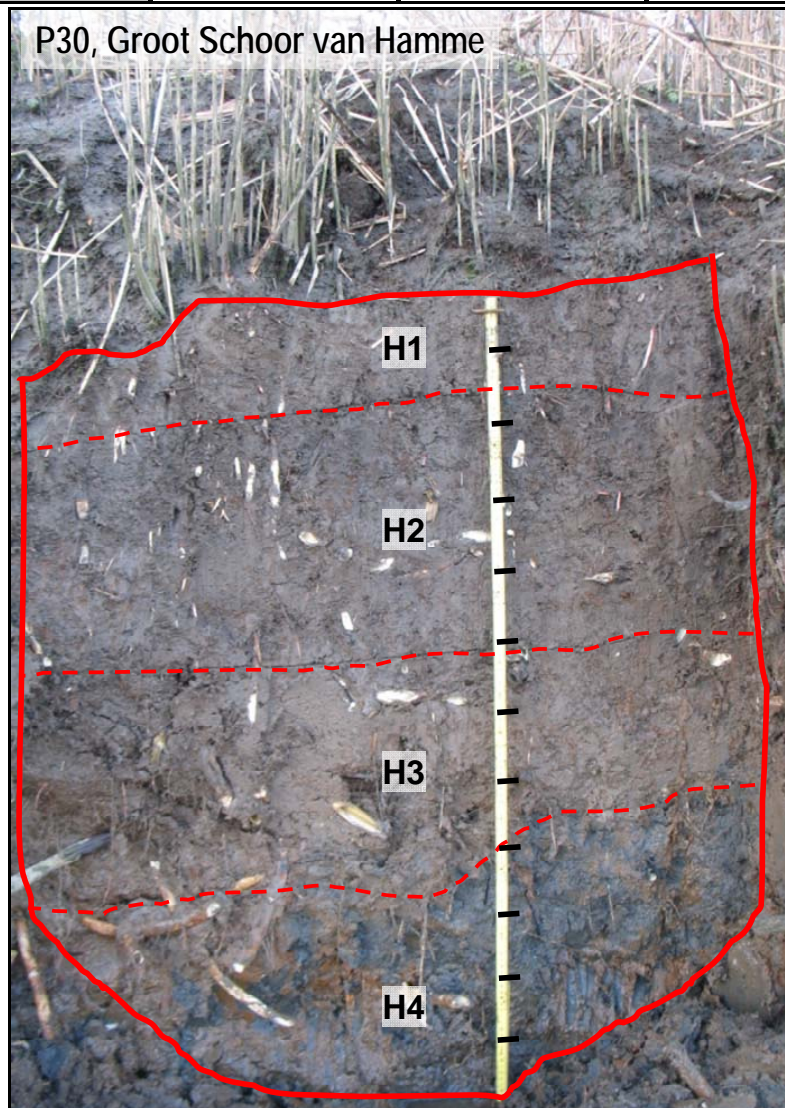
Because of erosion, starting in the fifties, it now has become the tidal marsh edge.





## 2.19.2 Profile description

		H1	H2	H3	H4
	Horizon symbol	A1	A2	Cg	Cr
	depth	0-15	15-51	51-78	78-120
Colour	Colour Wet				
	Colour Moist	2.5Y 3/2	5Y 2.5/2	5Y 2.5/1	2.5/10Y
Mottles	Mottles abundance				
	colour		rusty brown	rusty brown	rusty brown
	size		pedfaces	pedfaces	pedfaces
	contrast		faint	faint	prominent
	boundary				
	Reducing conditions	αα no	αα no	αα no	αα yes
	Odour				faint sulphurous
	Structure	granular, weak developed	granular, weak developed		pressure faces
	Stratification				
Consistence	ConsistenceMoist				
	Sticky				
	Plastic				
	Ripening			medium	
	Porosity			many very fine	common coarse
	Roots	many very fine	many very fine	snails; small earthworms	snails
	Other bio				



### 2.19.3 Analytical laboratory data

<b>Table A17: Analytical data for P30, Groot Schoor van Hamme</b>								
nr.	P30 Horizon symbols	Depth cm	LOI OM %	Carbon- TOC			Nitrogen Kjeldahl %	C/N (TOC/Kjel.)
				TC %	IC %	OC %		
H1	A1	0-15	9.0			4.04		
H2	A2	15-51	13.2			7.16		
H3	Cg	51-78	7.9			1.86		
H4	Cr	78-120	8.0			2.08		
Horizon nr.	Depth cm	Texture- pipette method (fractions in µm)					CaCO <sub>3</sub> calculated %	Lab
		0-2	2-10	10-20	20-50	50-2000		
		-----%-----						
H1	0-15						5.3	JM535
H2	15-51						4.3	JM536
H3	51-78						3.9	JM537a
H4	78-120						5.3	JM537b
Horizon nr.	Texture- laser Coulter (fractions in µm)				pH		pH	EC
	0.4-2	2-6	6-50	50-2000	H <sub>2</sub> O 1:5	KCl 1:5	KCl/H <sub>2</sub> O	dS/m 1:5
	-----%-----							
H1					7.9	7.4	0.93	0.20
H2					7.9	7.3	0.92	0.26
H3					8.1	7.5	0.92	0.22
H4					8.0	7.4	0.93	0.44

### 2.19.4 World reference base (2007) classification

<b>Diagnostic horizon, properties, material:</b>	<b>Present in horizon:</b>	<b>Remarks:</b>
Albic		Moist colours are too dark
Cambic		Structure requirement is not meet
Mollic		Lack of structure
Abrupt textural change		No data, but the soil composes of heavy clay throughout
Gleyic colour pattern	H3 H4	Oximorphic colour pattern Reductimorphic colour pattern
Lithological discontinuity		
Reducing conditions	H4	Positive reaction to alpha-alpha dipyridyl
Calcaric material	H1-4	Analytical data confirm the presence of more than 2% calcium-carbonate throughout the soil
Fluvic material	H1-4	No traces of sedimentation was found due to the bioturbation caused by the reed roots, but irregular content of organic carbon remaining above 0.2% is found through the soil

The soil keys out in Fluvisols.

**Full classification name, without specifiers**

(except where listed as such for prefix and suffix qualifiers):

**Tidalic Fluvisol (Calcaric, Humic, Eutric)**

- Tidalic: flooded by tidewater but not covered by water at mean low tide
- Gleyic: reductimorphic colours and reduced conditions starts from 78 cm depth, which is too deep as a reduced layer, at least 25 cm thick, should be present within the upper 100 cm
- Calcaric: present throughout the soil profile
- Humic: the content exceeds 1% throughout, with a weighted average of 6.24% (0-50 cm)
- Eutric: No data available on the base saturation, but considering the high content of calcium carbonate present through the soil the content must exceed 100%
- Siltic: Not data available

**Full classification name, with specifiers:****Tidalic Fluvisol (Calcaric, Hyperhumic, Hypereutric)**

- Calcaric: All measurements are lower than 6%
- Hyperhumic: the weighted average exceeds 5%
- Hypereutric: The base saturation will considering the free carbonate exceed 100%

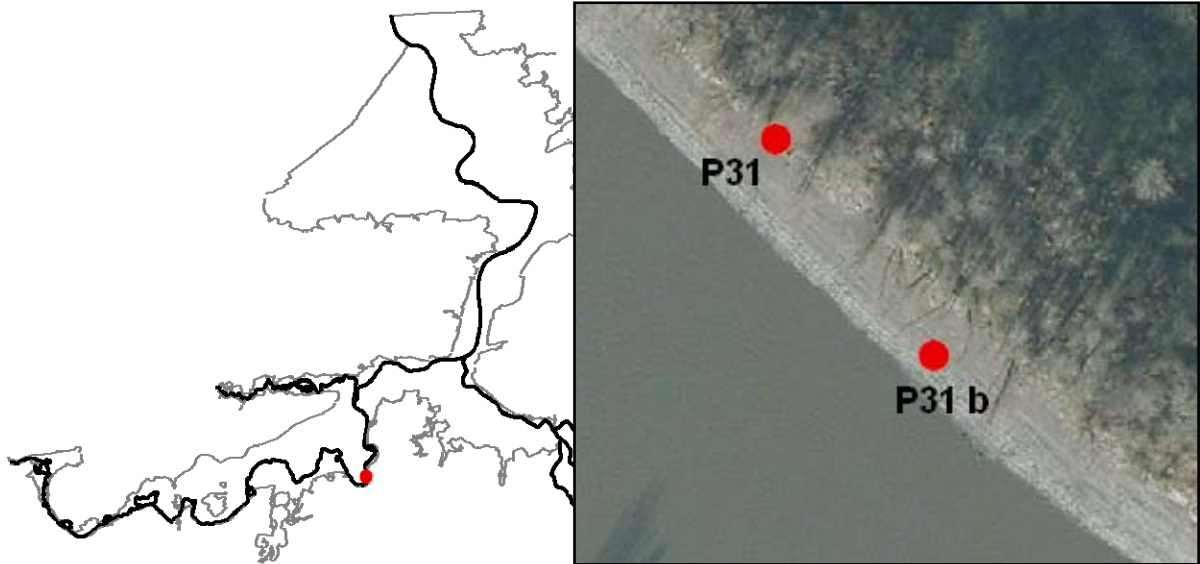


## 2.20 Profile 'P31 and P31b': Groot schor van Hamme

*(Derived elevation: 5.00m TAW; Lat.: 51.020291, Long.: 4.102643) P31*

*(Derived elevation: 1.70m TAW; Lat.: 51.020176, Long.: 4.102801) P31b*

### 2.20.1 Situation



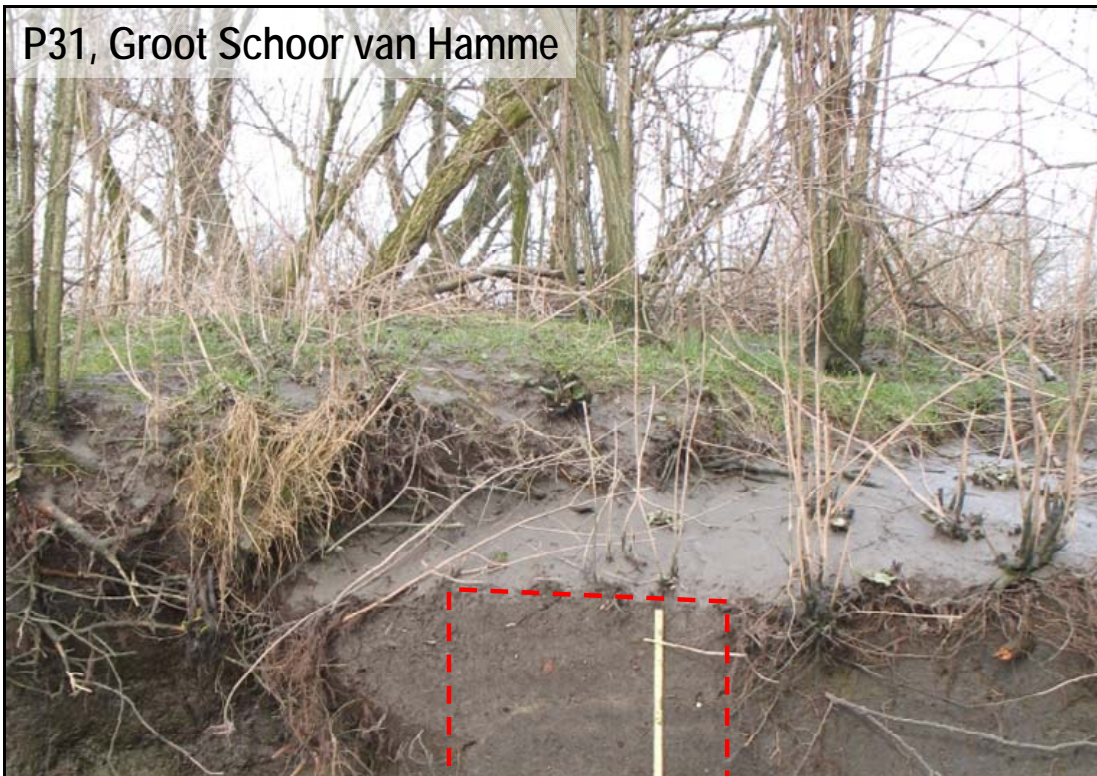
P31 is excavated in the tidal marsh edge. P31b is located in the mudflat, at about 50 meters stream down from P31.

In 1944 P31 used to be on the inner side of a summer dike, which now has disappeared because of erosion. Poplar trees have been planted upon the tidal marsh.

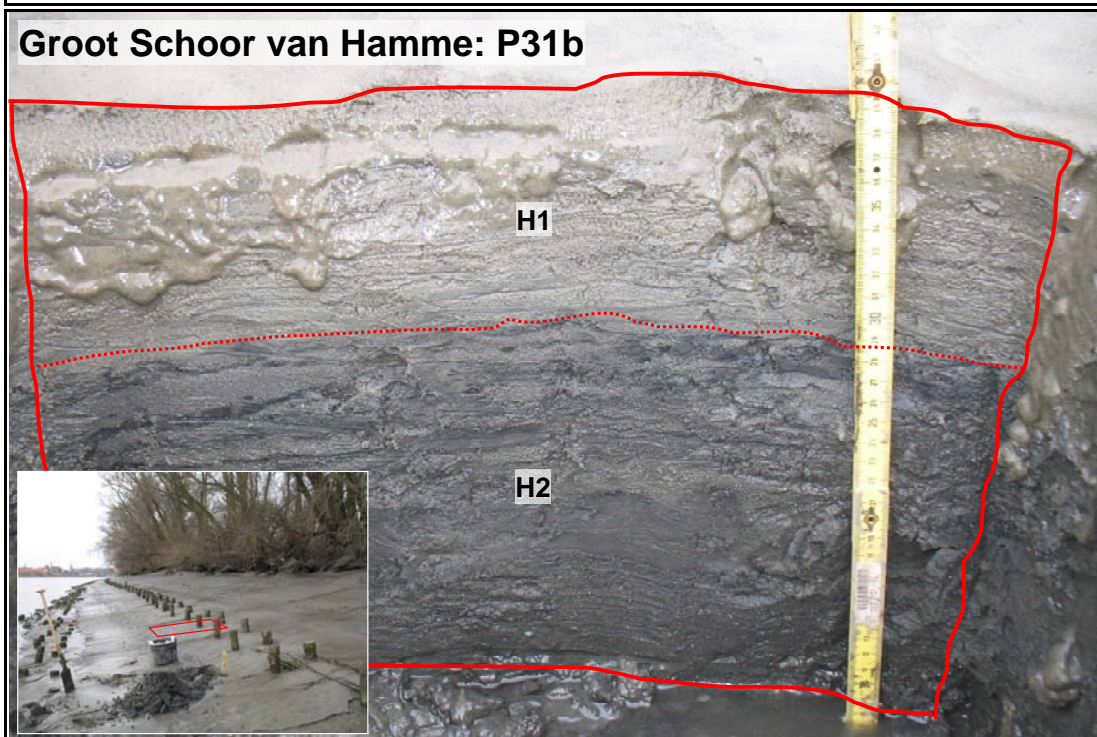
In 1944 P31b also used to be tidal marsh, planted with poplar trees. Because of erosion it has now turned into a mudflat.



P31, Groot Schoor van Hamme



Groot Schoor van Hamme: P31b

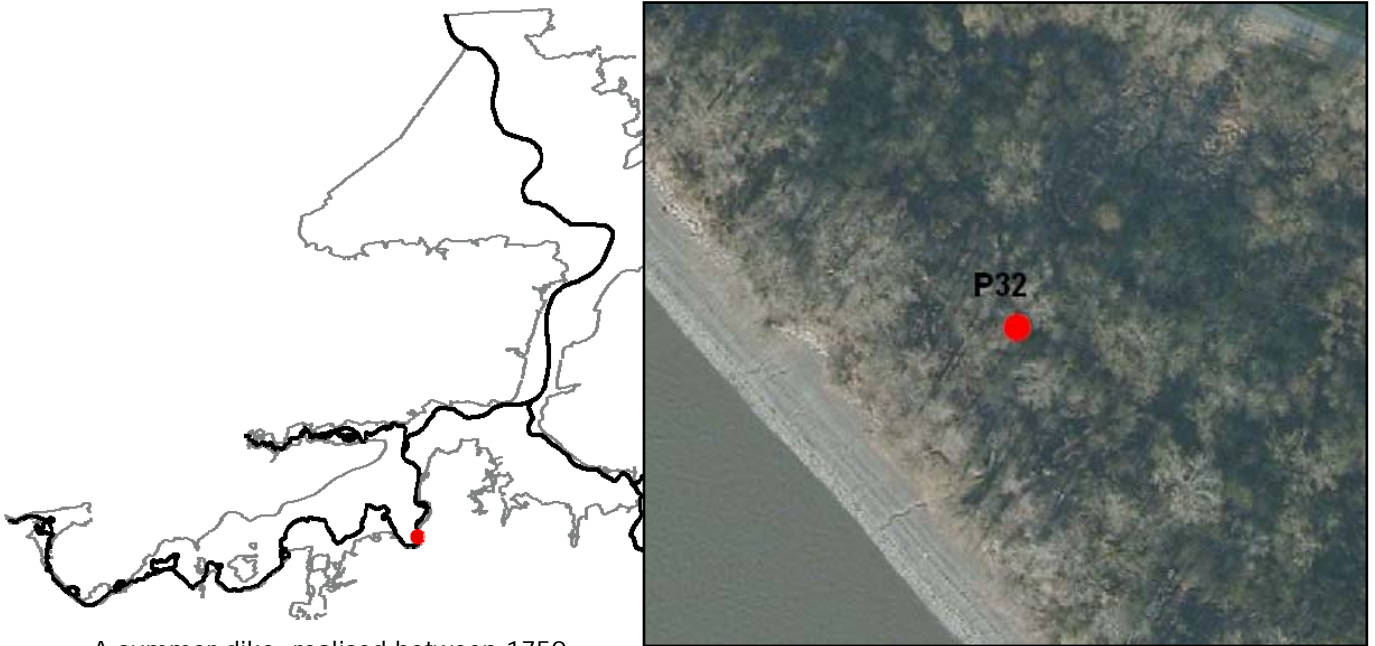


## 2.21 Profile 'P32': Groot schor van Hamme

(Derived elevation: 5.40m TAW; Lat.: 51.020640, Long.: 4.102417)



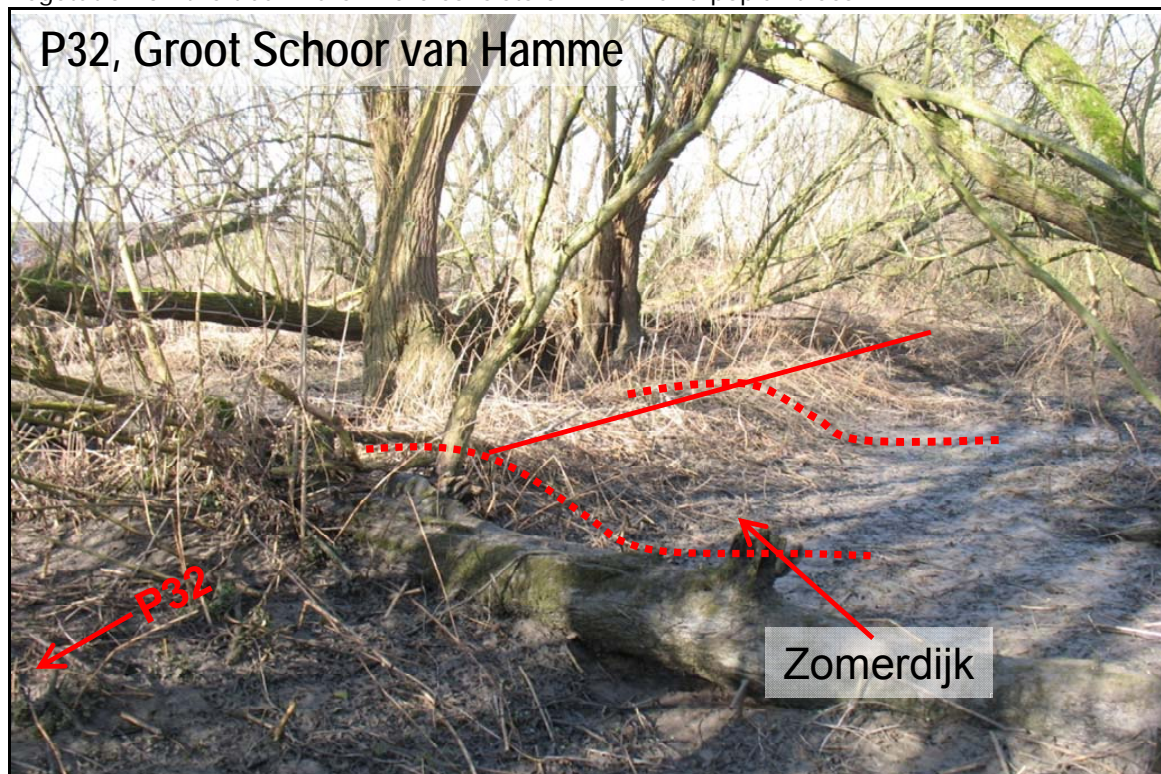
### 2.21.1 Situation



A summer dike, realised between 1750 and 1850, got broken through. A creek started to develop. Thus, a transect through the summer dike got exposed.

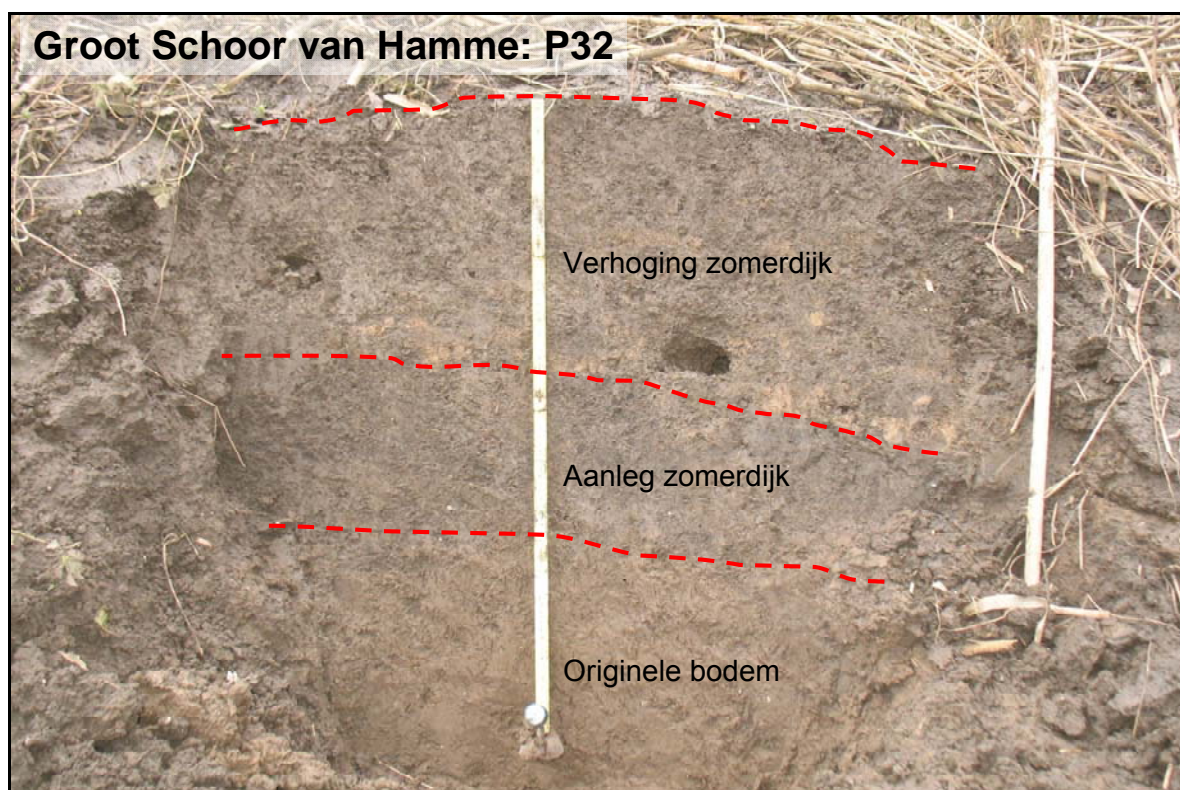
On this location, P32 was excavated. At least for now, the summer dike is not more than 60 cm higher than the tidal marsh itself.

Vegetation on the tidal marsh here consists of willow and poplar trees.





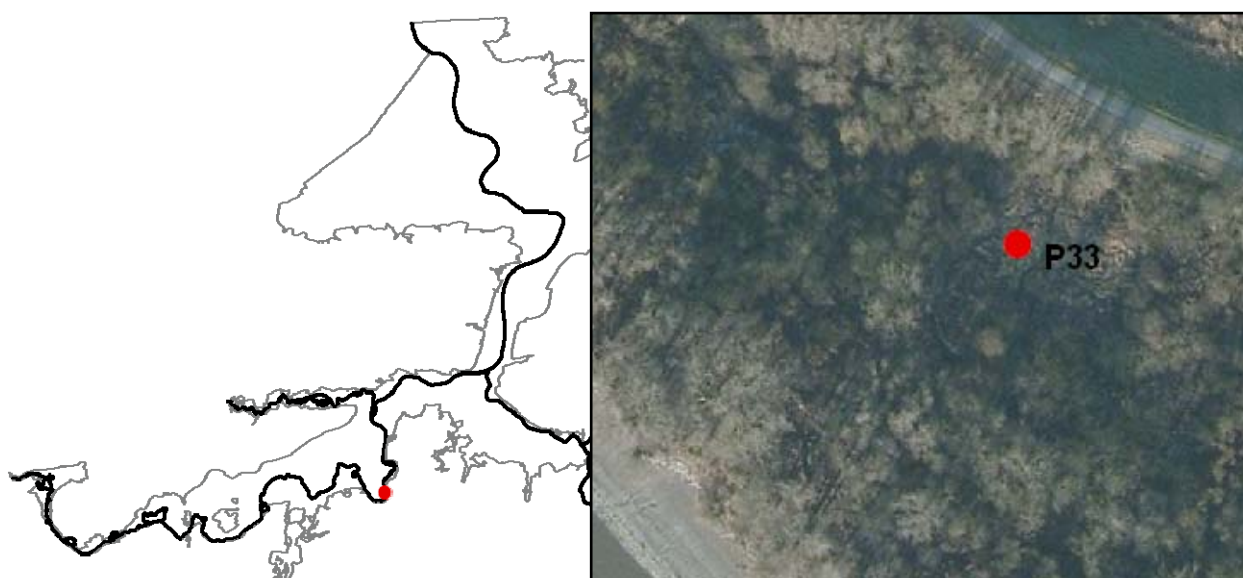
### 2.21.2 Profile description



## 2.22 Profile 'P33': Groot schor van Hamme

(Elevation: 5.72m; Lat.: 51.036108, Long.: 4.172492)

### 2.22.1 Situation



P33 is located in tidal marsh, near a winter dike which is already present since at least 1750.

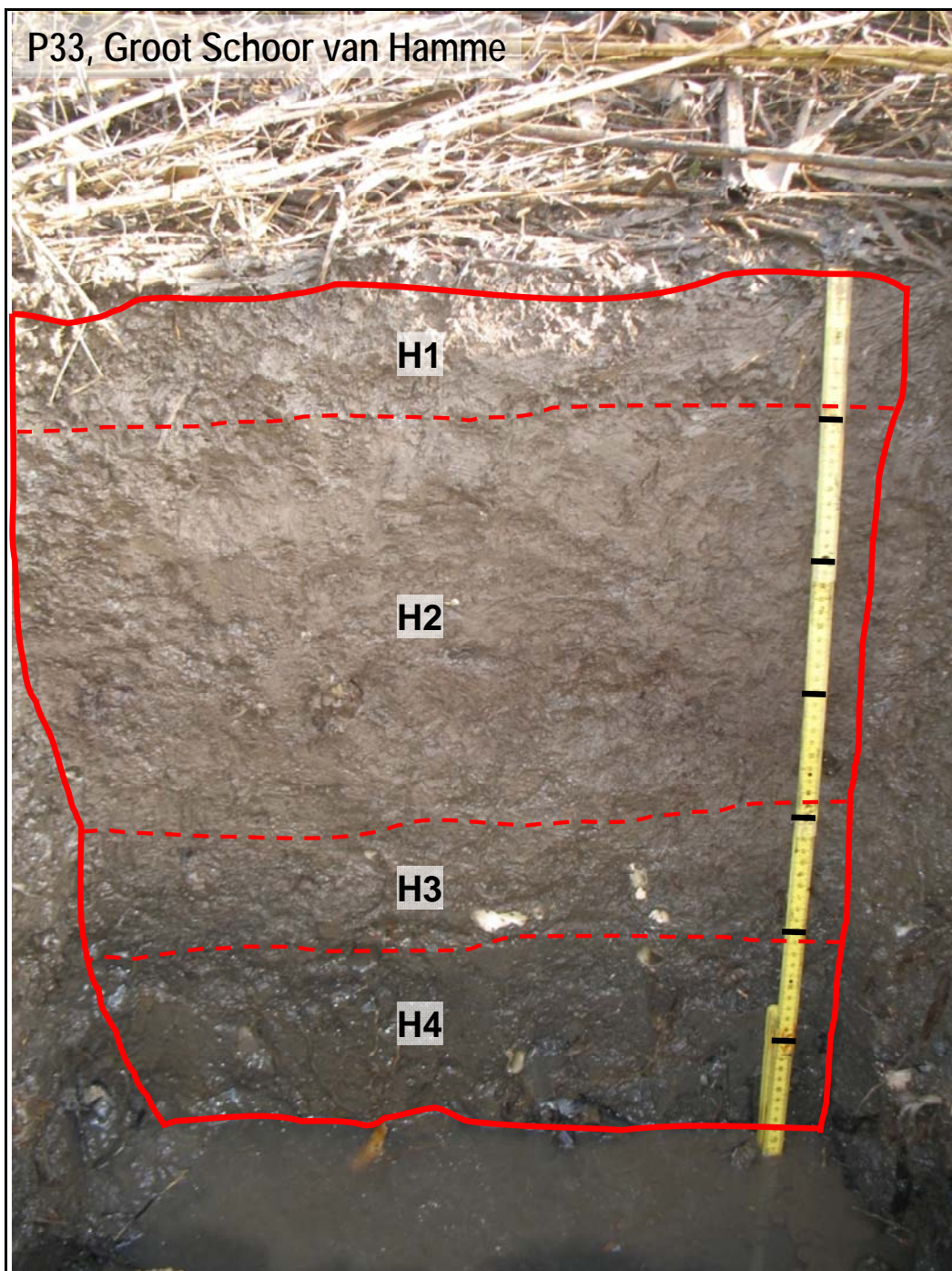
The location used to be cultivated as a summerpolder, until is turned into tidal marsh in the sixties. Due to succession it turned over into reed land, and in the vicinity willow shrubs and trees are encroaching the tidal marsh.



## 2.22.2 Profile description

		H1	H2	H3	H4
symbol		A1	A2	Ag	2Agb
depth		0-9	9-38	38-51	51-69
Colour	Wet				
	Moist	2.5Y 3/2	2.5Y 3/2	2.5Y 3/2	
Mottles	abundance				many
	colour				rusty brown
	size				pedfaces
	contrast				
	boundary				
Reducing conditions		αα no	αα no	αα no	αα faint
Odour					
Structure		weak granular	weak angular blocky	granular	granular
Stratification		-	-	-	-
Con- sistence	Moist	not possible	not possible	not possible	friable
	Sticky	very sticky	sticky	sticky	sticky
	Plastic	not possible	plastic	very plastic	very plastic
	Ripening	ripe	ripe	nearly ripe	half ripe
Porosity		to wet	medium	medium	medium
Roots		none	none	many very fine	many very fine
bio		none	snails; common earthworms; many OM frag.	many OM frag.	many OM frag.





### 2.22.3 Analytical laboratory data

**Table A18: Analytical data for P33, Groot Schoor van Hamme**

P33		Depth	LOI	Carbon- TOC			Nitrogen	C/N
Horizon			OM	TC	IC	OC	Kjeldahl	
nr.	symbols	cm	%	%	%	%	%	(TOC/Kjel.)
H1	A1	0-9	17.7			7.1		
H2	A2	9-38	16.0			6.9		
H3	Ag	38-51	16.2			6.9		
H4	2Ar	51-69	13.8			6.4		
Horizon	Depth	Texture- pipette method (fractions in µm)					CaCO <sub>3</sub>	Lab
nr.		0-2	2-10	10-20	20-50	50-2000	calculated	
	cm	-----%-----					%	
H1	0-9	42.5	22.7	11.7	22.1	1.0	6.8	JM538
H2	9-38	52.5	17.3	15.8	13.9	0.4	2.4	JM539
H3	38-51	49.2	22.4	7.1	20.5	0.7	3.0	JM540
H4	51-69	25.0	8.0	27.0	31.7	8.3	7.8	JM541
Horizon	Texture- laser Coulter (fractions in µm)				pH		pH	EC
nr.	0.4-2	2-6	6-50	50-2000	H <sub>2</sub> O	KCl	KCl/H <sub>2</sub> O	dS/m
	-----%-----				1:5	1:5		1:5
H1	21.6	26.9	49.5	2.0	7.7	7.1	0.92	0.40
H2	23.7	29.8	45.6	1.0	7.6	7.0	0.92	0.37
H3	24.7	30.3	42.8	2.2	7.5	6.9	0.93	0.33
H4	19.0	25.7	44.3	11.0	7.6	7.2	0.94	0.31
Horizon	Na <sup>+</sup>	K <sup>+</sup>	Ca <sup>2+</sup>	Mg <sup>2+</sup>	CEC	CEC	CEC/clay	BS by
nr.	-----by MgSO <sub>4</sub> (compulsive method)-----				sum	measured		CEC-m
	-----cmol(+)/kg-----							%
H1								
H2								
H3								
H4								
P	S	As	Cd	Cr	Cu	Ni	Pb	Zn
-----Aqua Regia-----								
-----mg/kg-----								
3559	3271	19.9	6.2	125	87	36	115	638
4682	2974	28.0	10.1	220	143	46	168	954
6819	3542	69.0	31.6	1002	233	62	325	2360
5889	2455	92.2	28.5	959	208	42	347	2324

## 2.22.4 World reference base (2007) classification

Diagnostic horizon, properties, material:	Present in horizon:	Remarks:
Albic		Moist colours are too dark
Cambic		Colour requirements are not meet
Mollic		Lack of structure
Abrupt textural change		A very sharp decrease in clay content is found between H3 and H4, buy abrupt textural change concerns an increase only
Gleyic colour pattern	H3 H4	Oximorphic colour pattern Reductimorphic colour pattern
Lithological discontinuity	H3-4	Abrupt change in texture not due to pedogenesis
Reducing conditions	H4	Positive reaction to alpha-alpha dipyridyl
Calcaric material	H1-4	Analytical data confirm the presence of more than 2% calcium-carbonate throughout the soil
Fluvic material	H1-4	In H3 the structure is best developed, but since then the soil has been buried with new fluvatile material. In de new material the soil development is insufficient so that it has fluvic material to the surface. The organic carbon remains above 0.2% i through the soil

The soil keys out in Fluvisols. The buried soil present in H3 is not expressed in the classification name.

### Full classification name, without specifiers

(except where listed as such for prefix and suffix qualifiers):

#### Gleyic Tidalic Fluvisol (Calcaric, Humic, Eutric, Siltic)

- Tidalic: flooded by tidewater but not covered by water at mean low tide
- Gleyic: reductimorphic colours and reduced conditions starts from 51 cm depth
- Calcaric: present throughout the soil profile
- Humic: the content exceeds 1% throughout, with a weighted average of 6.95% (0-50 cm)
- Eutric: No data available on the base saturation, but considering the high content of calcium carbonate present through the soil the content must exceed 100%
- Siltic: texture class for H1-3 is silty clay

### Full classification name, with specifiers:

#### Endogleyic Tidalic Fluvisol (Calcaric, Hyperhumic, Hypereutric, Siltic)

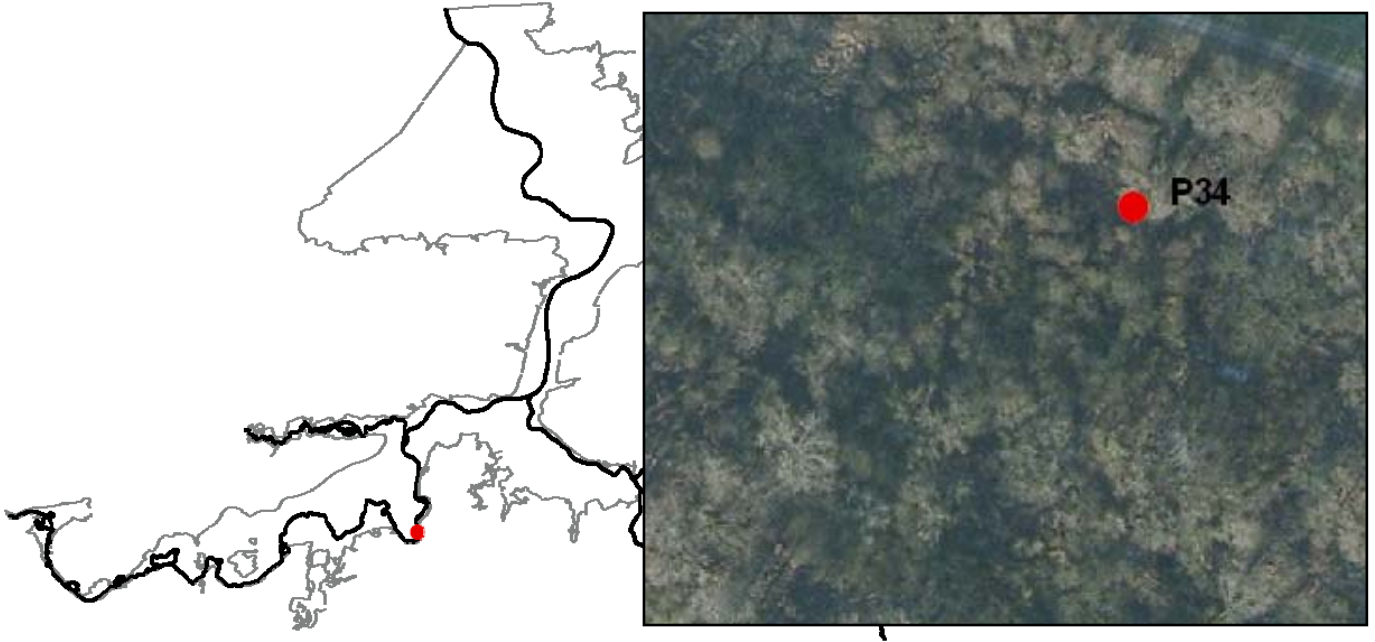
- Calcaric: measurements are partly below partly above 6%; weighted average is less than 6%
- Hyperhumic: the weighted average exceeds 5%
- Hypereutric: The base saturation will considering the free carbonate exceed 100%



## 2.23 Profile 'P34': Groot schor van Hamme

(Elevation: 5.60m TAW; Lat.: 51.035811, Long.: 4.173639)

### 2.23.1 Situation



The situation of profile P34 is very comparable with P33.

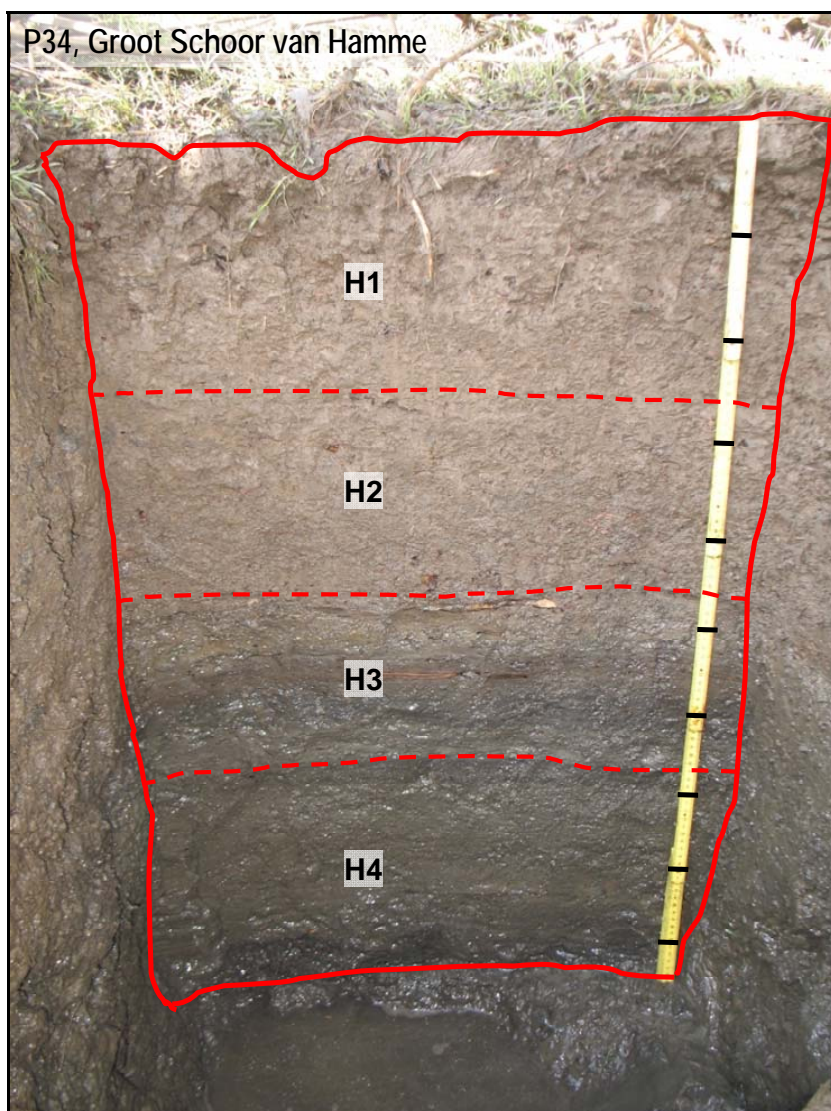
It differs in dryer, better drained soil. Willow trees have overgrown this location of the tidal marsh.





## 2.23.2 Profile description

		H1	H2	H3	H4
	symbol	A1	A2	Ag	2Cr
	depth	0-26	26-48	48-67	67-95
Colour	Wet			5Y 2.5/2	5Y 2.5/1
	Moist	2.5Y 3/2	2.5Y 3/2	2.5Y 2.5/1	5Y 2.5/1
Mottles	abundance				
	colour				
	size				
	contrast				
	boundary				
	Reducing conditions	αα no	αα no	αα yes	αα yes
	Odour			faint petrochemical	
	Structure	angular blocky, 4-5 cm	massive, locally granular	granular, well developed	
Con- sistance	Stratification	-	-	OM and clay stratification	stratified
	Moist	friable	very friable	friable	very friable
	Sticky	slightly	sticky	sticky	slightly
	Plastic	plastic	very plastic	very plastic	none plastic
	Ripening	ripe	nearly ripe	half ripe	half ripe
	Porosity	low	high	medium	high
	Roots	few very fine and fine	none	very few very fine	none
	bio	snails; large earthworm	-	-	-



### 2.23.3 Analytical laboratory data

**Table A19: Analytical data for P34, Groot Schoor van Hamme**

P34		Depth	LOI	Carbon- TOC			Nitrogen	C/N
nr.	Horizon symbols	cm	OM %	TC %	IC %	OC %	Kjeldahl %	(TOC/Kjel.)
H1	A1	0-26	14.0			4.74		
H2	A2	26-48	14.5			5.49		
H3	Ag	48-67	21.7			10.40		
H4	2Cr	67-95	7.5			2.55		
Horizon nr.	Depth cm	Texture- pipette method (fractions in µm)					CaCO <sub>3</sub> calculated	Lab
		0-2	2-10	10-20	20-50	50-2000	%	
		-----%-----						
H1	0-26	40.1	25.6	2.8	27.9	3.7	5.1	JM542
H2	26-48	38.4	16.6	14.8	24.6	5.5	4.9	JM543
H3	48-67	52.4	28.6	1.4	15.8	1.8	2.0	JM544
H4	67-95	16.7	1.3	7.1	16.3	58.6	7.9	JM545
Horizon nr.	Texture- laser Coulter	(fractions in µm)			pH		pH	EC
	0.4-2	2-6	6-50	50-2000	H <sub>2</sub> O	KCl	KCl/H <sub>2</sub> O	dS/m
	-----%-----				1:5	1:5		1:5
H1	19.9	22.9	50.7	6.6	7.6	7.0	0.92	0.29
H2	20.4	24.0	46.7	8.9	7.5	7.0	0.93	0.29
H3	25.1	39.2	35.8	0.0	7.4	7.0	0.95	0.80
H4	8.6	12.2	20.2	59.0	7.8	7.4	0.95	0.26
Horizon nr.	Na <sup>+</sup>	K <sup>+</sup>	Ca <sup>2+</sup>	Mg <sup>2+</sup>	CEC	CEC	CEC/clay	BS by
	-----by MgSO <sub>4</sub> (compulsive method)-----				sum	measured		CEC-m
	-----cmol(+)/kg-----							%
H1	0.9	0.7	38.4	4.0	44.0	47.2	77	93
H2	1.1	0.7	42.1	3.3	47.2	47.6	75	99
H3	1.0	1.2	49.9	3.2	55.2	48.8	25	>100
H4	0.3	0.5	23.4	1.5	25.8	25.4	99	>100
P	S	As	Cd	Cr	Cu	Ni	Pb	Zn
-----Aqua Regia-----								
-----mg/kg-----								
3771	2199	21.3	7.3	153	97	34	124	711
6210	2440	43.5	22.6	534	199	63	255	1735
7603	4635	87.9	38.5	939	269	76	352	2726
1796	1557	35.1	11.7	272	88	23	158	1009

## 2.23.4 World reference base (2007) classification

Diagnostic horizon, properties, material:	Present in horizon:	Remarks:
Albic		Moist colours are too dark
Cambic		Colour and/or structure requirements are not meet
Mollic		Lack of structure
Abrupt textural change		A very sharp decrease in clay content is found between H3 and H4 (drop from 52% to 17%), buy abrupt textural change concerns an increase with depth only
Gleyic colour pattern	H3 H4	Oximorphic colour pattern Reductimorphic colour pattern
Lithological discontinuity	H3-4	Abrupt change in texture not due to pedogenesis
Reducing conditions	H3	Positive reaction to alpha-alpha dipyridyl
Calcaric material	H1-4	Analytical data confirm the presence of more than 2% calcium-carbonate throughout the soil
Fluvic material	H1-4	No traces of sedimentation was found due to the bioturbation, but irregular content of organic carbon remaining above 0.2% is found through the soil

The soil keys out in Fluvisols.

### Full classification name, without specifiers

(except where listed as such for prefix and suffix qualifiers):

#### Gleyic Tidalic Fluvisol (Calcaric, Humic, Eutric, Siltic)

- Tidalic: flooded by tidewater but not covered by water at mean low tide
- Gleyic: reductimorphic colours and reduced conditions starts from 67 cm depth
- Calcaric: present throughout the soil profile
- Humic: the content exceeds 1% throughout, with a weighted average of 5.10% (0-50 cm)
- Eutric: The lowest base saturation is 93%
- Siltic: H1 and H3 have a silty clay texture and H2 a silty clay loam.

### Full classification name, with specifiers:

#### Endogleyic Tidalic Fluvisol (Calcaric, Hyperhumic, Hypereutric, Siltic)

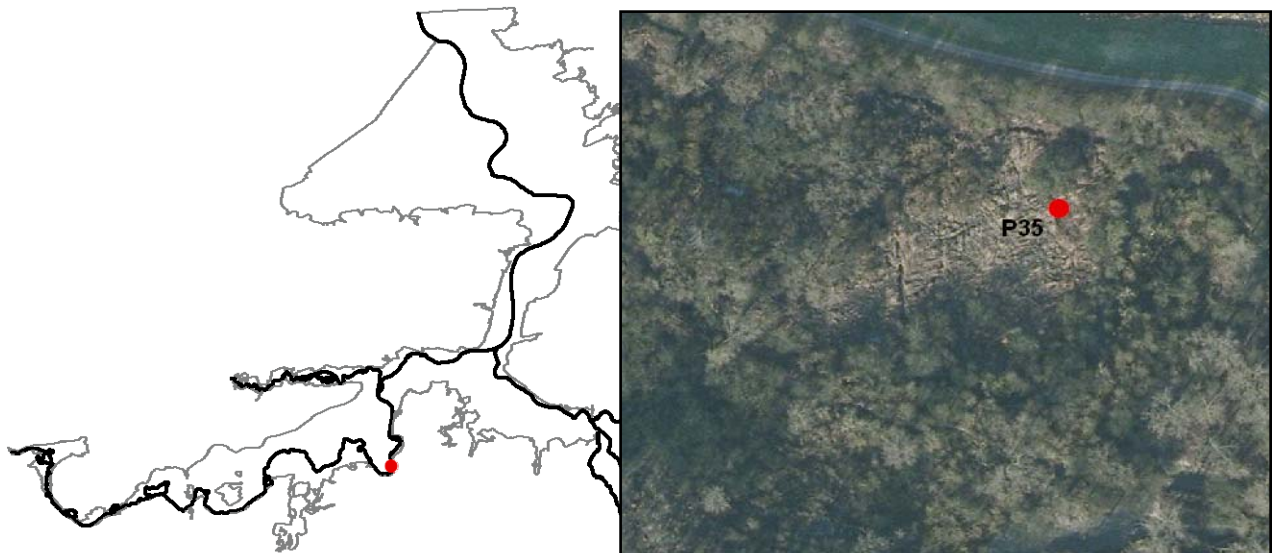
- Calcaric: measurements remains lower than 6%
- Hyperhumic: the weighted average exceeds 5%
- Hypereutric: The base saturation exceeds throughout the profile 80%



## 2.24 Profile 'P35': Groot schor van Hamme

(Elevation: 5.66m TAW; Lat.: 51.035472, Long.: 4.175295)

### 2.24.1 Situation



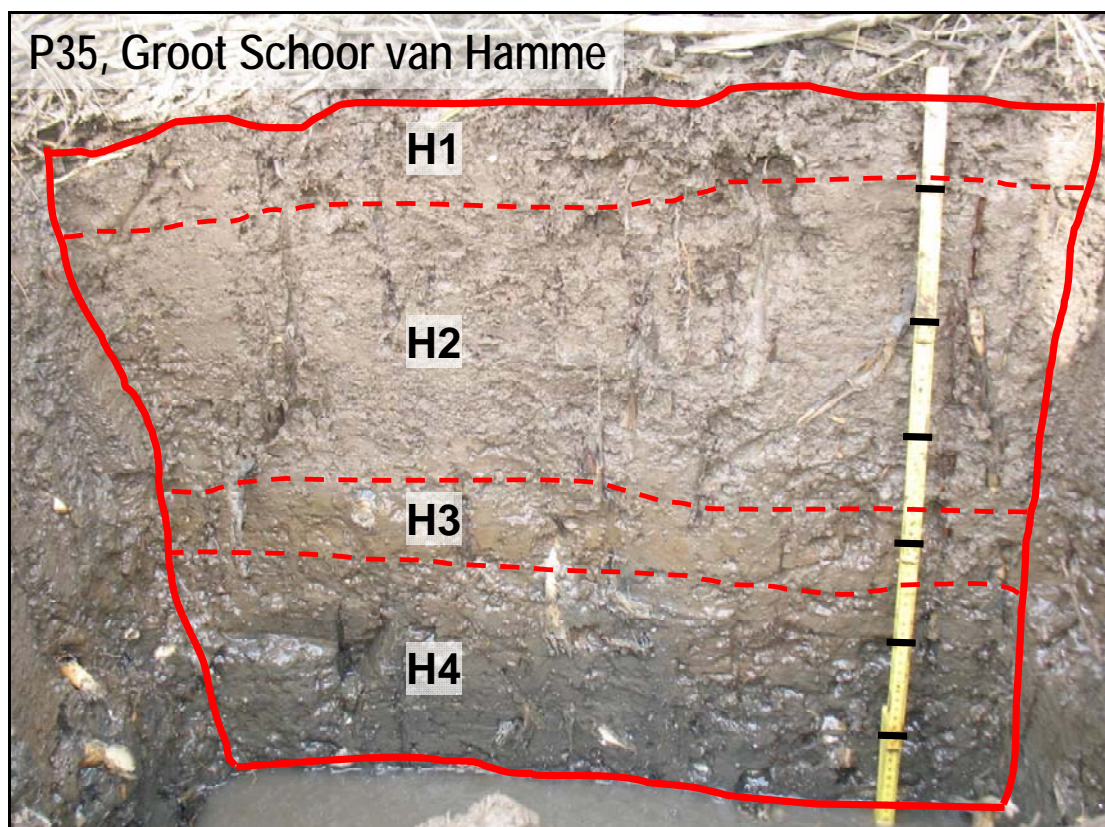
The situation of P35 is very much comparable with P34 and P33. Yet, it is the most wet and least accessible site of the three.

Therefore, this location has never been cultivated. The knotting of trees may have had place on the location until the early sixties.



## 2.24.2 Profile description

		H1	H2	H3	H4
	symbol	Abi	A	Cg	Cr
	depth	0-9	9-35	35-46	46-80
Colour	Wet	10YR 3/2	3.5Y 3/2	2.5Y 3/2	5Y 3/1
	Moist	10YR 3/2	2.5Y 3.5/2	1.5Y 4/2	3.5Y 3/1
Mottles	abundance				
	colour			rusty brown	
	size			pedfaces	
	contrast				
	boundary				
	Reducing conditions	aa no	aa no	aa faint	aa yes
	Odour				distinct petrochemical
	Structure	granular	locally granular		massive
	Stratification	-	-	stratified	stratified OM & clay
Con-sistence	Moist	not possible	not possible	not possible	not possible
	Sticky		slightly	Sticky	very sticky
	Plastic	very plastic	very plastic	not possible	not possible
	Ripening	ripe	ripe	nearly ripe	half ripe
	Porosity	high	medium	medium	medium
	Roots	common very fine and fine; many coarse	common very fine; many coarse	few very fine; many coarse	common very fine; many coarse
	bio	-	snails; decaying reed roots	snails	-



### 2.24.3 Analytical laboratory data

Table A20: Analytical data for P35, Groot Schoor van Hamme								
P35		Depth	LOI	Carbon- TOC			Nitrogen	C/N
Horizon			OM	TC	IC	OC	Kjeldahl	
nr.	symbols	cm	%	%	%	%	%	(TOC/Kjel.)
H1	Abi	0-9	21.2			9.86		
H2	A	9-35	15.2			6.20		
H3	Cg	35-46	14.3			5.69		
H4	Cr	46-80	12.7			4.88		
Horizon nr.	Depth	Texture- pipette method (fractions in µm)					CaCO <sub>3</sub>	Lab
		0-2	2-10	10-20	20-50	50-2000	calculated	
	cm	-----%-----					%	
H1	0-9	41.6	20.1	0.9	36.7	0.7	5.9	JM546
H2	9-35	39.5	20.0	17.3	20.9	2.2	4.9	JM547
H3	35-46	45.9	22.7	12.0	18.1	1.3	3.1	JM548
H4	46-80	38.0	19.1	2.9	33.1	6.9	4.4	JM549
Horizon nr.	Texture- laser Coulter (fractions in µm)				pH		pH	EC
	0.4-2	2-6	6-50	50-2000	H <sub>2</sub> O	KCl	KCl/H <sub>2</sub> O	dS/m
	-----%-----				1:5	1:5		1:5
H1	19.4	23.2	56.0	1.4	7.7	7.1	0.93	0.45
H2	19.3	24.3	49.4	7.1	7.7	7.1	0.93	0.27
H3	21.0	33.6	42.4	3.0	7.5	7.0	0.94	0.33
H4	19.3	29.0	43.1	8.6	7.6	7.3	0.96	0.54
Horizon nr.	Na <sup>+</sup>	K <sup>+</sup>	Ca <sup>2+</sup>	Mg <sup>2+</sup>	CEC	CEC	CEC/clay	BS by
	-----by MgSO <sub>4</sub> (compulsive method)-----				sum	measured		CEC-m
	-----cmol(+)/kg-----							%
H1								
H2								
H3								
H4								
P	S	As	Cd	Cr	Cu	Ni	Pb	Zn
-----Aqua Regia-----								
-----mg/kg-----								
3565	3090	20.1	7.8	153	102	39	125	753
5471	2781	34.1	16.8	287	201	58	213	1180
5443	3034	100.8	35.1	437	246	62	317	1513
5443	2653	44.4	24.4	891	181	47	274	1929



## 2.24.4 World reference base (2007) classification

Diagnostic horizon, properties, material:	Present in horizon:	Remarks:
Albic		Moist colours are too dark
Cambic		In principle H1 could qualify for the colours and structure, but the horizon is a surface horizon and it is too thin
Mollic		H1 qualifies for structure and moist colour- dry colours are missing. Again the horizon is too thin.
Abrupt textural change		Clay content remains rather uniform between 38-46%
Gleyic colour pattern	H3 H4	Oximorphic colour pattern Reductimorphic colour pattern
Lithological discontinuity		
Reducing conditions	H3	Faint reaction to alpha-alpha dipyridyl in H3 and clear reaction in H4
Calcaric material	H1-4	Analytical data confirm the presence of more than 2% calcium-carbonate throughout the soil
Fluvic material	H1-4	No traces of sedimentation was found due to the bioturbation caused by roots and the fauna, but irregular content of organic carbon remaining above 0.2% is found through the soil

The soil keys out in Fluvisols.

### Full classification name, without specifiers

(except where listed as such for prefix and suffix qualifiers):

#### Gleyic Tidalic Fluvisol (Calcaric, Humic, Eutric, Siltic)

- Tidalic: flooded by tidewater but not covered by water at mean low tide
- Gleyic: reductimorphic colours and reduced conditions starts from 46 cm depth
- Calcaric: present throughout the soil profile
- Humic: the content exceeds 1% throughout, with a weighted average of 6.64% (0-50 cm)
- Eutric: No data are available, but considering the presence of carbonate in the matrix, most likely the base saturation is close to 100%
- Siltic: H1 and H3 have a silty clay texture and H2 and H4 a silty clay loam.

### Full classification name, with specifiers:

#### Epigleyic Tidalic Fluvisol (Calcaric, Hyperhumic, Hypereutric, Siltic)

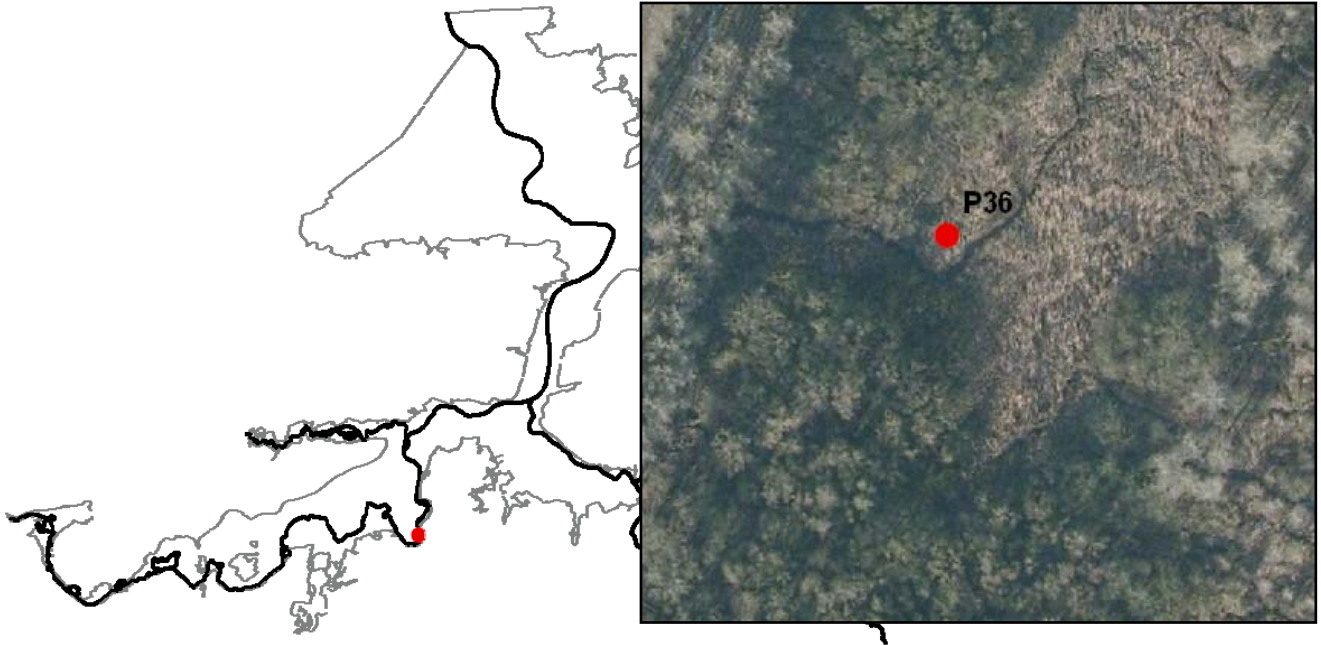
- Calcaric: measurements remains lower than 6%
- Hyperhumic: the weighted average exceeds 5%
- Hypereutric: The base saturation probably exceeds throughout the profile 80%



## 2.25 Profile 'P36': Groot schor van Hamme

(Elevation: 5.54m TAW; Lat.: 51.036615, Long.: 4.185575)

### 2.25.1 Situation



Profile 'P36' is located in the eastern part of the tidal marsh 'Groot schor van Hamme'. Until the second world war, the tidal marsh used to be cultivated. Since then, it has been left aside.

Reed has colonised the tidal marsh, and willow trees are encroaching in the proximity.



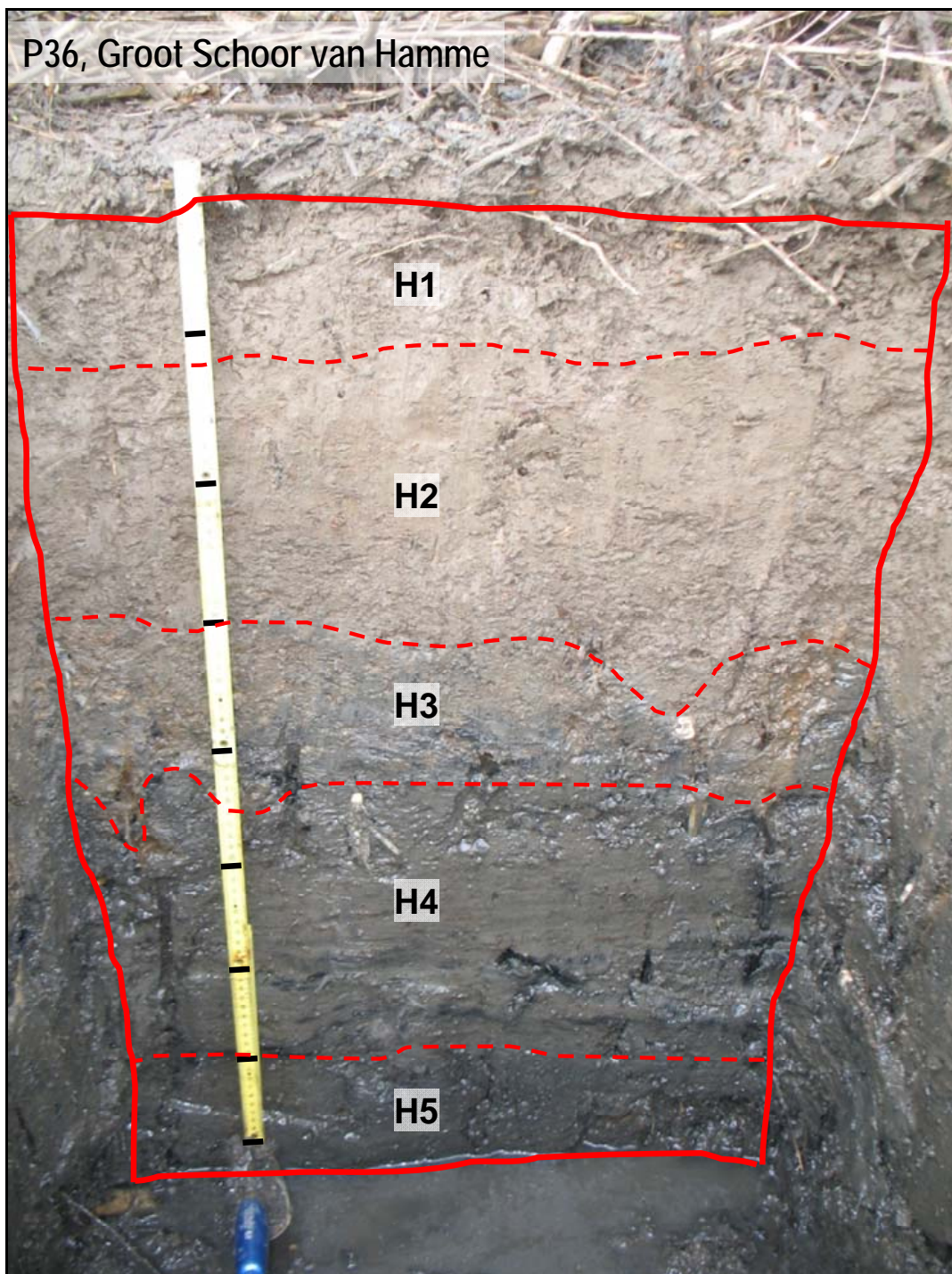
## 2.25.2 Profile description

		H1	H2	H3
	symbol	A	Abi	Ag
	depth	0-11	11-30	30-45
Colour	Wet			5Y 3/1
	Moist	2.5Y 3/2	2.5Y 3/2	5Y 2.5/2
Mottles	abundance			common
	colour			rusty brown
	size			irregular
	contrast			distinct
	boundary			diffuse
Con-sistence	Reducing conditions	αα no	αα no	αα no
	Odour			
	Structure	granular, weak developed	granular	granular
	Stratification	-	-	-
	Moist	very friable	very friable	very friable
Con-sistence	Sticky	slightly	sticky	sticky
	Plastic	plastic	very plastic	plastic
	Ripening	ripe	nearly ripe	half ripe
	Porosity		high	high
	Roots	common very fine, fine and coarse	few very fine; common coarse	common very fine, few fine and many coarse
	bio	snails; small earthworms	small earthworms	-

		H4	H5
	symbol	Cr1	Cr2
	depth	45-71	71-85
Colour	Wet	5Y 2.5/1	5Y 2/1
	Moist	5Y 3/2	2.5/10Y
Mottles	abundance		
	colour		
	size		
	contrast		
	boundary		
Con-sistence	Reducing conditions	αα yes	αα yes
	Odour		petrochemical
	Structure	massive	massive
	Stratification	possible?	-
	Moist	not possible	not possible
Con-sistence	Sticky	sticky	very sticky
	Plastic	very plastic	plastic
	Ripening	half ripe	half ripe
	Porosity	medium	low
	Roots	few very fine; common coarse	very few very fine; common coars
	bio	-	-

P36, Groot Schoor van Hamme





### 2.25.3 Analytical laboratory data

**Table A21: Analytical data for P36, Groot Schoor van Hamme**

Table A21: Analytical data for P36, Groot Schoor van Hamme								
P36		Depth	LOI	Carbon- TOC			Nitrogen	C/N
Horizon			OM	TC	IC	OC	Kjeldahl	
nr.	symbols	cm	%	%	%	%	%	(TOC/Kjel.)
H1	A	0-11	15.5			5.63		
H2	Abi	11-30	15.7			5.84		
H3	Ag	30-45	15.8			6.32		
H4	Cr1	45-71	14.2			6.01		
H5	Cr2	71-85	15.9			8.22		
Horizon	Depth	Texture- pipette method (fractions in µm)					CaCO <sub>3</sub>	Lab
nr.		0-2	2-10	10-20	20-50	50-2000	calculated	
	cm	-----%-----					%	
H1	0-11	38.6	27.1	2.1	29.5	2.8	5.7	JM550
H2	11-30	46.2	15.3	28.0	9.2	1.3	3.9	JM551
H3	30-45	42.7	12.2	13.8	28.1	3.3	4.3	JM552
H4	45-71	46.7	19.3	12.8	18.0	3.1	3.0	JM553
H5	71-85						2.9	JM554
Horizon	Texture- laser Coulter (fractions in µm)				pH		pH	EC
nr.	0.4-2	2-6	6-50	50-2000	H <sub>2</sub> O	KCl	KCl/H <sub>2</sub> O	dS/m
	-----%-----				1:5	1:5		1:5
H1	17.3	24.4	51.9	6.4	7.6	7.1	0.93	0.35
H2	20.3	27.8	47.8	4.1	7.5	7.0	0.93	0.33
H3	19.6	27.0	46.6	6.8	7.3	7.0	0.96	0.64
H4	21.3	34.6	40.0	4.1	7.4	7.1	0.96	0.73
H5					7.3	7.1	0.97	1.19
Horizon	Na <sup>+</sup>	K <sup>+</sup>	Ca <sup>2+</sup>	Mg <sup>2+</sup>	CEC	CEC	CEC/clay	BS by
nr.	-----by MgSO <sub>4</sub> (compulsive method)-----				sum	measured		CEC-m
	-----cmol(+)/kg-----							%
H1	0.8	1.0	35.9	3.9	41.6	44.6	65.5	93
H2	1.2	0.7	40.3	3.3	45.5	47.7	59.9	95
H3	1.0	0.8	37.7	2.8	42.3	42.0	47.5	>100
H4	0.7	1.2	32.3	2.2	36.5	38.4	38.0	95
H5								
P	S	As	Cd	Cr	Cu	Ni	Pb	Zn
-----Aqua Regia-----								
-----mg/kg-----								
3349	2599	21.7	6.4	130	89	35	114	638
5243	2074	26.9	8.9	204	135	43	160	849
6209	3372	32.1	12.8	314	222	48	207	1087
6869	6235	77.5	30.5	551	223	61	293	1973



#### 2.25.4 World reference base (2007) classification

Diagnostic horizon, properties, material:	Present in horizon:	Remarks:
Albic		Moist colours are too dark
Cambic		Evidences of alteration not sufficiently clear
Mollic		The structure in H1 is insufficient developed and for H2 the dry colours are missing
Abrupt textural change		Clay content remains rather uniform between 39-47%
Gleyic colour pattern	H3 H4	Oximorphic colour pattern Reductimorphic colour pattern
Lithological discontinuity		
Reducing conditions	H4-5	Clear reaction to alpha-alpha dipyridyl
Calcaric material	H1-5	Analytical data confirm the presence of more than 2% calcium-carbonate throughout the soil
Fluvic material	H1-5	No traces of sedimentation was found due to the bioturbation caused by reed roots and the fauna, but irregular content of organic carbon remaining above 0.2% is found through the soil

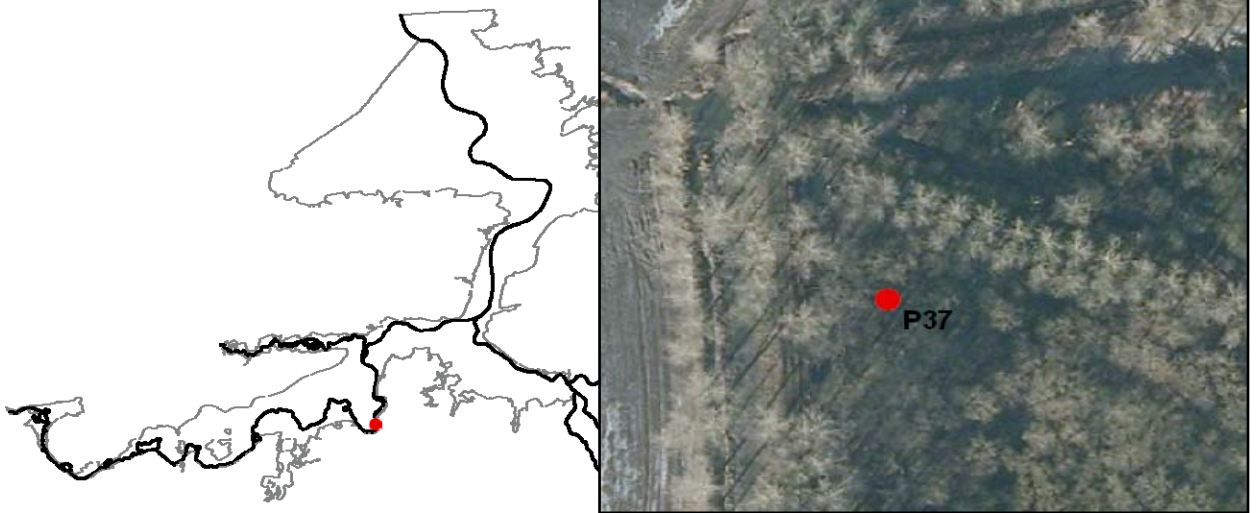
The soil keys out in Fluvisols.

Full classification name, without specifiers (except where listed as such for prefix and suffix qualifiers):
<p><b>Gleyic Tidalic Fluvisol (Calcaric, Humic, Eutric, Siltic)</b></p> <ul style="list-style-type: none"> <li>• Tidalic: flooded by tidewater but not covered by water at mean low tide</li> <li>• Gleyic: reductimorphic colours and reduced conditions starts from 45 cm depth</li> <li>• Calcaric: present throughout the soil profile</li> <li>• Humic: the content exceeds 1% throughout, with a weighted average of 5.95% (0-50 cm)</li> <li>• Eutric: The base saturation is 95% or more</li> <li>• Siltic: H1 has a silty clay loam texture, H2-5 are silty clayey</li> </ul>
Full classification name, with specifiers:
<p><b>Epigleyic Tidalic Fluvisol (Calcaric, Hyperhumic, Hypereutric, Siltic)</b></p> <ul style="list-style-type: none"> <li>• Calcaric: measurements remains lower than 6%</li> <li>• Hyperhumic: the weighted average exceeds 5%</li> <li>• Hypereutric: The base saturation exceeds throughout the profile 80%</li> </ul>

## 2.26 Profile 'P37': Groot schor van Hamme

(Derived elevation: 5.70m TAW; Lat.: 51.021826, Long.: 4.111231)

### 2.26.1 Situation



Profile 'P37' is located in the eastern part of the tidal marsh 'Groot schor van Hamme', near the winter dike.

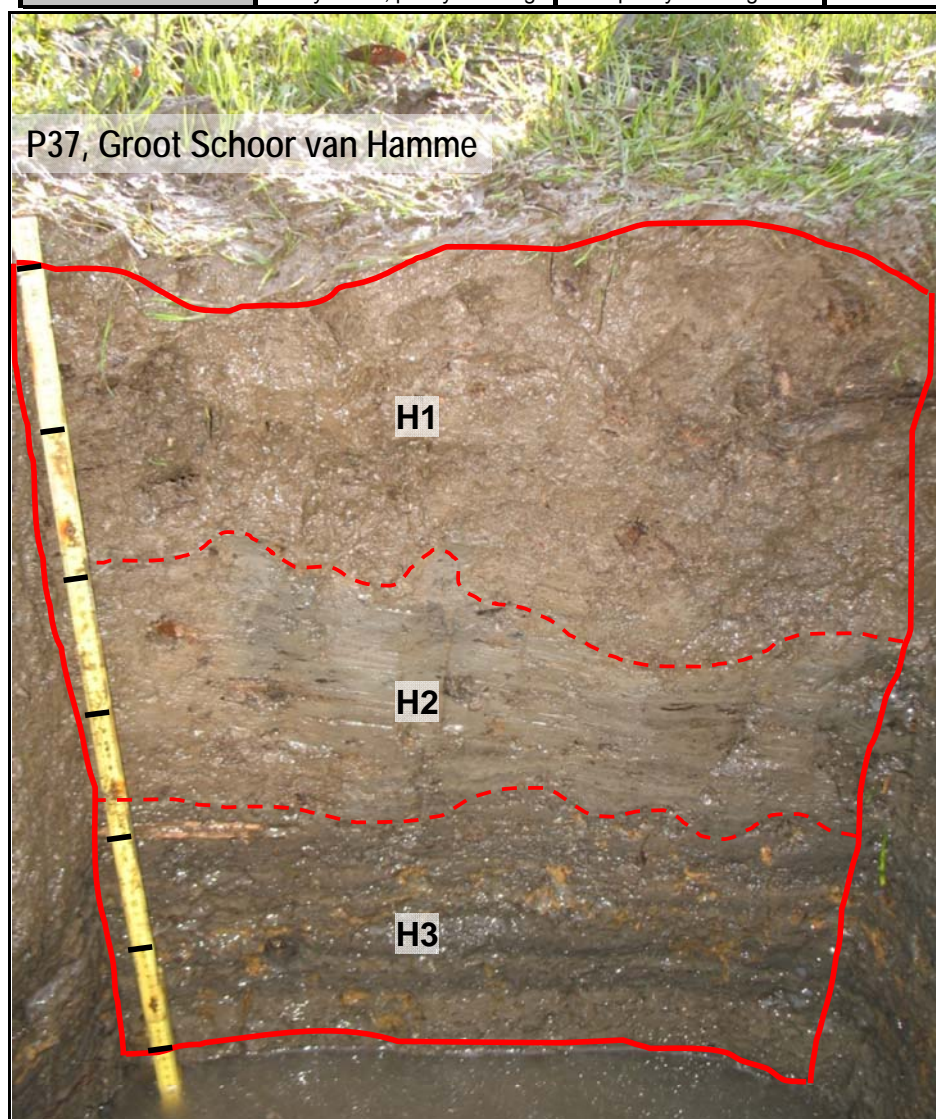
The profile is excavated centrally in a poplar forest, where grass (*Poa trivialis*) and bush vegetation cover the tidal marsh soil.

Lack of developed creek system and high presence of humus and clay in the soil result in poorly drained, wet conditions.



## 2.26.2 Profile description

		H1	H2	H3
	symbol	Abi	Cg	Cr
	depth	0-23	23-44	44-65
Colour	Wet	5Y 2.5/2	2.5/10Y	2.5/10Y
	Moist	10YR 3/2	5Y 2.5/2	5Y 2.5/1
Mottles	abundance		common	
	colour		rusty brown	10YR 5/8
	size			coatings
	contrast		prominent	
	boundary			
	Reducing conditions	aa no	aa yes	aa yes
	Odour			
	Structure	granular	massive	
	Stratification	OM is horizontal stratified	OM is horizontal stratified	Stratified
Con-sistence	Moist			
	Sticky	slightly	very sticky	sticky
	Plastic	slightly plastic	plastic	plastic
	Ripening			
	Porosity		high	
	Roots	common very fine		
	bio	many snails; plenty OM frag.	plenty OM frag.	few OM frag.





### 2.26.3 Analytical laboratory data

Table A22: Analytical data for P37, Groot Schoor van Hamme								
P37		Depth	LOI	Carbon- TOC		Nitrogen	C/N	
Horizon			OM	TC	IC	OC	Kjeldahl	(TOC/Kjel.)
nr.	symbols	cm	%	%	%	%	%	
H1	Abi	0-23	19.6			8.41	0.64	13
H2	Cg	23-44	16.0			6.67	0.42	16
H3	Cr	44-65	14.6			7.06	0.40	17
Horizon nr.	Depth	Texture- pipette method (fractions in µm)					CaCO <sub>3</sub>	Lab
	cm	0-2	2-10	10-20	20-50	50-2000	calculated	
		-----%-----					%	
H1	0-23	44.6	19.5	13.6	20.6	1.8	4.4	JM516
H2	23-44	48.0	16.9	8.7	23.1	3.3	3.1	JM517
H3	44-65	35.8	18.9	19.9	21.8	3.6	5.9	JM518
Horizon nr.	Texture- laser Coulter (fractions in µm)				pH		pH	EC
	0.4-2	2-6	6-50	50-2000	H <sub>2</sub> O	KCl	KCl/H <sub>2</sub> O	dS/m
	-----%-----				1:5	1:5		1:5
H1	22.0	33.4	43.4	1.1	7.6	7.08	0.93	0.34
H2	21.3	31.8	41.3	5.7	7.54	7.12	0.94	0.48
H3	19.3	27.1	45.7	7.9	7.71	7.26	0.94	0.43
Horizon nr.	Na <sup>+</sup>	K <sup>+</sup>	Ca <sup>2+</sup>	Mg <sup>2+</sup>	CEC	CEC	CEC/clay	BS by
	-----by MgSO <sub>4</sub> (compulsive method)-----				sum	measured		CEC-m
	-----cmol(+)/kg-----							%
H1	1.0	1.0	45.8	4.5	52.3	50.7	48.9	>100
H2	1.0	1.5	41.0	3.0	46.4	49.0	54.2	95
H3	<	1.2	32.6	2.5	36.3	40.2	44.5	90
P	S	As	Cd	Cr	Cu	Ni	Pb	Zn
-----Aqua Regia-----								
-----mg/kg-----								
4252	2739	28.1	13.7	218	142	52	166	997
6500	4171	70.7	30.4	746	248	57	316	2137
5300	2574	91.1	24.2	827	197	41	353	1948



#### 2.26.4 World reference base (2007) classification

Diagnostic horizon, properties, material:	Present in horizon:	Remarks:
Albic		Moist colours are too dark
Cambic		Evidences of alteration not sufficiently clear
Mollic		The structure in H1 is insufficient developed and H2 is massive
Abrupt textural change		Clay content remains relatively uniform between 36-48%
Gleyic colour pattern	H2 H3	Oximorphic colour pattern Reductimorphic colour pattern
Lithological discontinuity		
Reducing conditions	H2-3	Clear reaction to alpha-alpha dipyridyl
Calcaric material	H1-3	Analytical data confirm the presence of more than 2% calcium-carbonate throughout the soil
Fluvic material	H1-3	Stratification visible almost to the surface. The content of organic carbon is irregular and remains above 0.2% through the soil

The soil keys out in Fluvisols.

#### Full classification name, without specifiers

(except where listed as such for prefix and suffix qualifiers):

#### Gleyic Tidalic Fluvisol (Calcaric, Humic, Eutric, Siltic)

- Tidalic: flooded by tidewater but not covered by water at mean low tide
- Gleyic: reductimorphic colours and reduced conditions starts from 23 cm depth
- Calcaric: present throughout the soil profile
- Humic: the content exceeds 1% throughout, with a weighted average of 7.52% (0-50 cm)
- Eutric: The base saturation is 90% or more
- Siltic: H1-2 have a silty clay texture and H3 a silty clay loam

#### Full classification name, with specifiers:

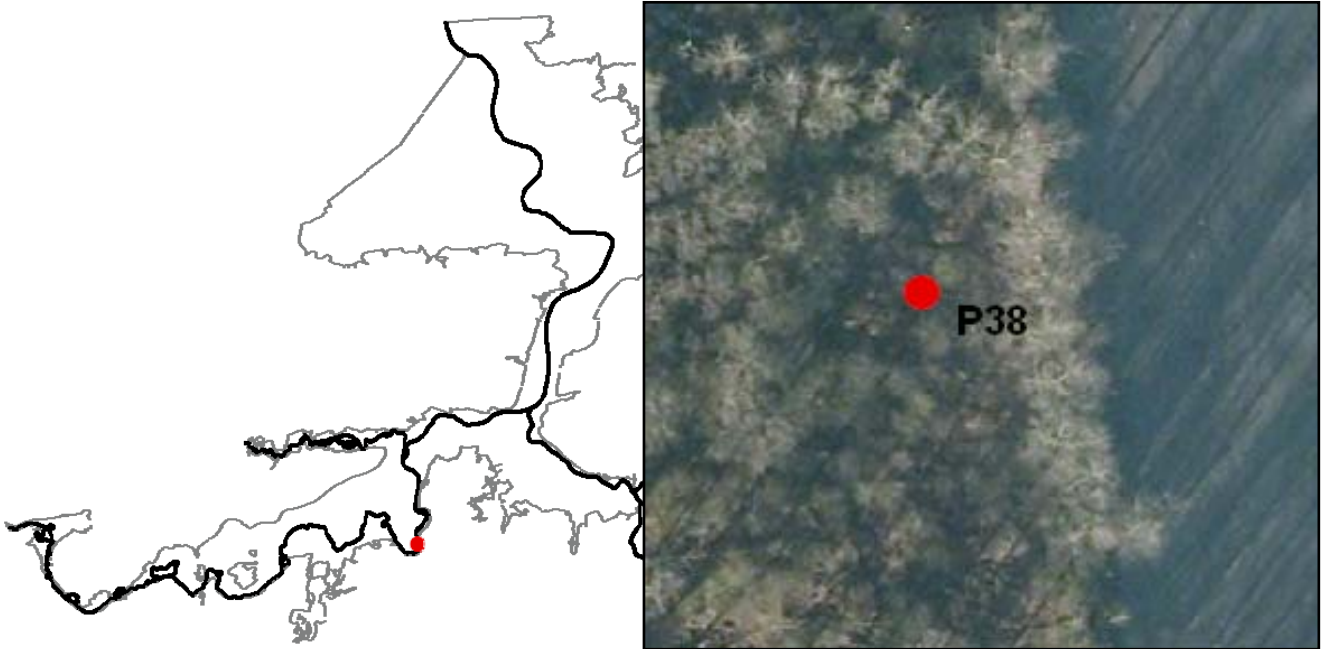
#### Epigleyic Tidalic Fluvisol (Calcaric, Hyperhumic, Hypereutric, Siltic)

- Calcaric: measurements remains lower than 6%
- Hyperhumic: the weighted average exceeds 5%
- Hypereutric: The base saturation exceeds throughout the profile 80%

## 2.27 Profile 'P38': Groot schor van Hamme

(Derived elevation: 5.90m TAW; Lat.: 51.021713, Long.: 4.111880)

### 2.27.1 Situation



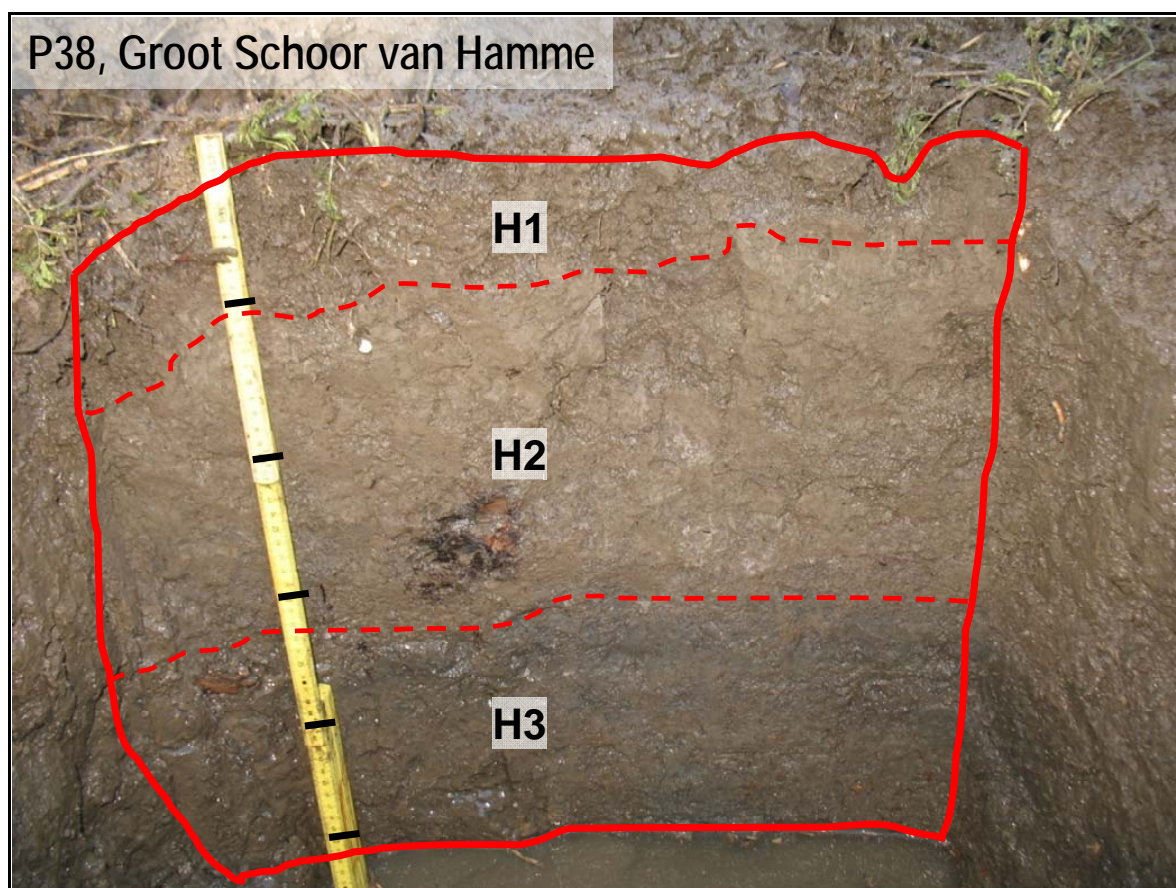
Profile 'P38' is located at about 100 m from profile 'P37', in comparable, somewhat less wet conditions.

Until world war 2, the tidal marsh was cultivated, and protected by a summer dike. Since then it was planted with poplar trees, and left aside.



## 2.27.2 Profile description

		H1	H2	H3
	symbol	Abi	A	Cg
	depth	0-7	7-32	32-60
Colour	Wet	2.5Y 3/2	2.5Y 3.5/2	5Y 2.5/1
	Moist	10YR 3/1	1.5Y 3.5/2	2.5Y 3/2
Mottles	abundance			
	colour			
	size			
	contrast			
	boundary			
	Reducing conditions	αα no	αα no	αα yes
	Odour			
	Structure	granular, well developed	granular, weak developed	massive
Con-sistence	Stratification	-	-	-
	Moist	very friable	very friable	firm
	Sticky	sticky		
	Plastic	plastic		
	Ripening	ripe	ripe	ripe
	Porosity	high	high	medium
	Roots	few very fine	none	none
	bio	snails	-	-



### 2.27.3 Analytical laboratory data

Table A23: Analytical data for P38, Groot Schoor van Hamme								
P38		Depth	LOI	Carbon- TOC			Nitrogen	C/N
Horizon			OM	TC	IC	OC	Kjeldahl	
nr.	symbols	cm	%	%	%	%	%	(TOC/Kjel.)
H1	Abi	0-7	16.19			7.31	0.56	13
H2	A	7-32	12.50			3.93	0.38	10
H3	Cr	32-60	10.59			4.80	0.26	18
Horizon nr.	Depth	Texture- pipette method (fractions in µm)					CaCO <sub>3</sub>	Lab
	cm	0-2	2-10	10-20	20-50	50-2000	calculated	
		-----%-----					%	
H1	0-7	34.1	14.8	18.7	24.0	8.4	4.7	JM558
H2	7-32	32.5	11.6	5.1	39.8	11.1	5.4	JM559
H3	32-60	28.7	12.1	11.0	29.5	18.6	5.9	JM560
Horizon nr.	Texture- laser Coulter (fractions in µm)				pH		pH	EC
	0.4-2	2-6	6-50	50-2000	H <sub>2</sub> O	KCl	KCl/H <sub>2</sub> O	dS/m
	-----%-----				1:5	1:5		1:5
H1	18.5	24.8	44.6	12.1	7.59	7.08	0.93	0.29
H2	18.0	22.0	44.8	15.2	7.47	6.92	0.93	0.19
H3	16.0	21.6	39.5	22.9	7.68	7.14	0.93	0.19
Horizon nr.	Na <sup>+</sup>	K <sup>+</sup>	Ca <sup>2+</sup>	Mg <sup>2+</sup>	CEC	CEC	CEC/clay	BS by
	-----by MgSO <sub>4</sub> (compulsive method)-----				sum	measured		CEC-m
	-----cmol(+)/kg-----							%
H1	1.0	1.3	36.0	4.2	42.5	46.6	63.0	91
H2	1.0	0.7	35.2	3.1	40.0	43.1	91.0	93
H3	0.5	0.6	27.3	2.4	30.8	34.0	60.7	91
P	S	As	Cd	Cr	Cu	Ni	Pb	Zn
-----Aqua Regia-----								
-----mg/kg-----								
3713	2663	19.2	7.2	118	83	31	103	685
5143	2492	34.6	14.4	246	167	47	188	1047
5038	2426	33.0	13.8	238	165	46	185	1027



#### 2.27.4 World reference base (2007) classification

Diagnostic horizon, properties, material:	Present in horizon:	Remarks:
Albic		Moist colours are too dark
Cambic		Evidences of alteration not sufficiently clear
Mollic		Possible H1 will qualify but the dry colours are missing and the horizon is too thin
Abrupt textural change		Clay content remains relatively uniform between 29-34%
Gleyic colour pattern	H3	Oximorphic colour pattern
Lithological discontinuity		
Reducing conditions	H3	Clear reaction to alpha-alpha dipyridyl
Calcaric material	H1-3	Analytical data confirm the presence of more than 2% calcium-carbonate throughout the soil
Fluvic material	H2-3	The content of organic carbon is irregular and remains above 0.2% through the soil. Stratification visible in H3

The soil keys out Fluvisols.

#### Full classification name, without specifiers

(except where listed as such for prefix and suffix qualifiers):

##### **Gleyic Tidalic Fluvisol (Calcaric, Humic, Eutric, Siltic)**

- Tidalic: flooded by tidewater but not covered by water at mean low tide
- Gleyic: oximorphic colours and reduced conditions starts from 32 cm depth
- Calcaric: present throughout the soil profile
- Humic: the content exceeds 1% throughout, with a weighted average of 4.72% (0-50 cm)
- Eutric: The base saturation is 91-93%
- Siltic: silty clay loam throughout the soil

#### Full classification name, with specifiers:

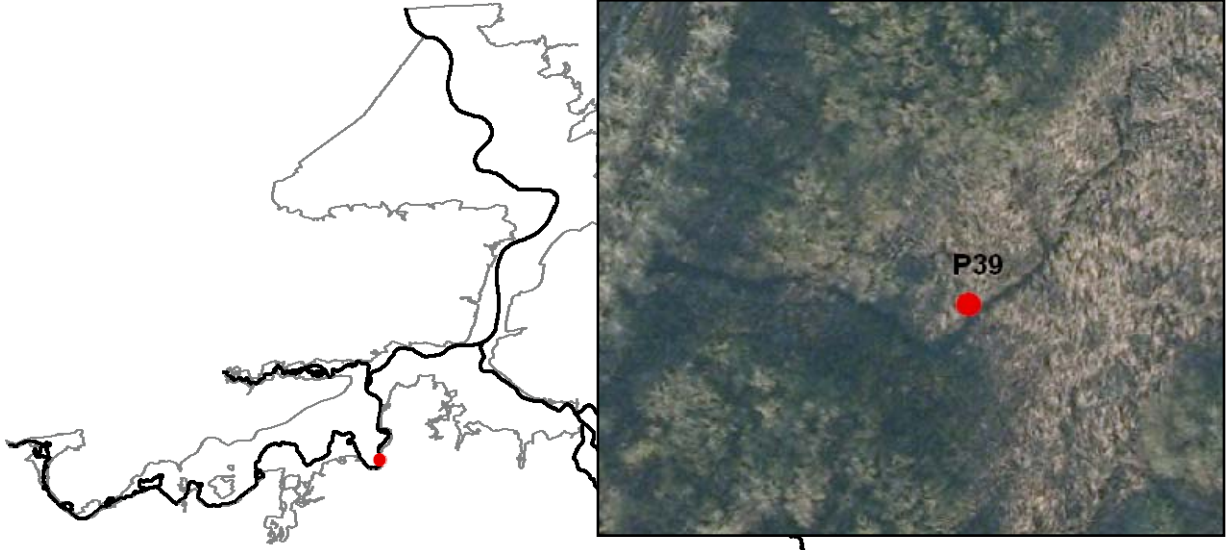
##### **Epigleyic Tidalic Fluvisol (Calcaric, Humic, Hypereutric, Siltic)**

- Calcaric: measurements remains lower than 6%
- Hyperhumic: the weighted average is slightly less than 5%
- Hypereutric: The base saturation exceeds throughout the profile 80%

## 2.28 Profile 'P39': Groot schor van Hamme

(Elevation: 5.40m TAW; Lat.: 51.036601, Long.: 4.185648)

### 2.28.1 Situation



Profile 'P39' is located in the eastern part of the tidal marsh 'Groot schor van Hamme'. Until the second world war, the tidal marsh used to be cultivated. Since then, it has been left aside.

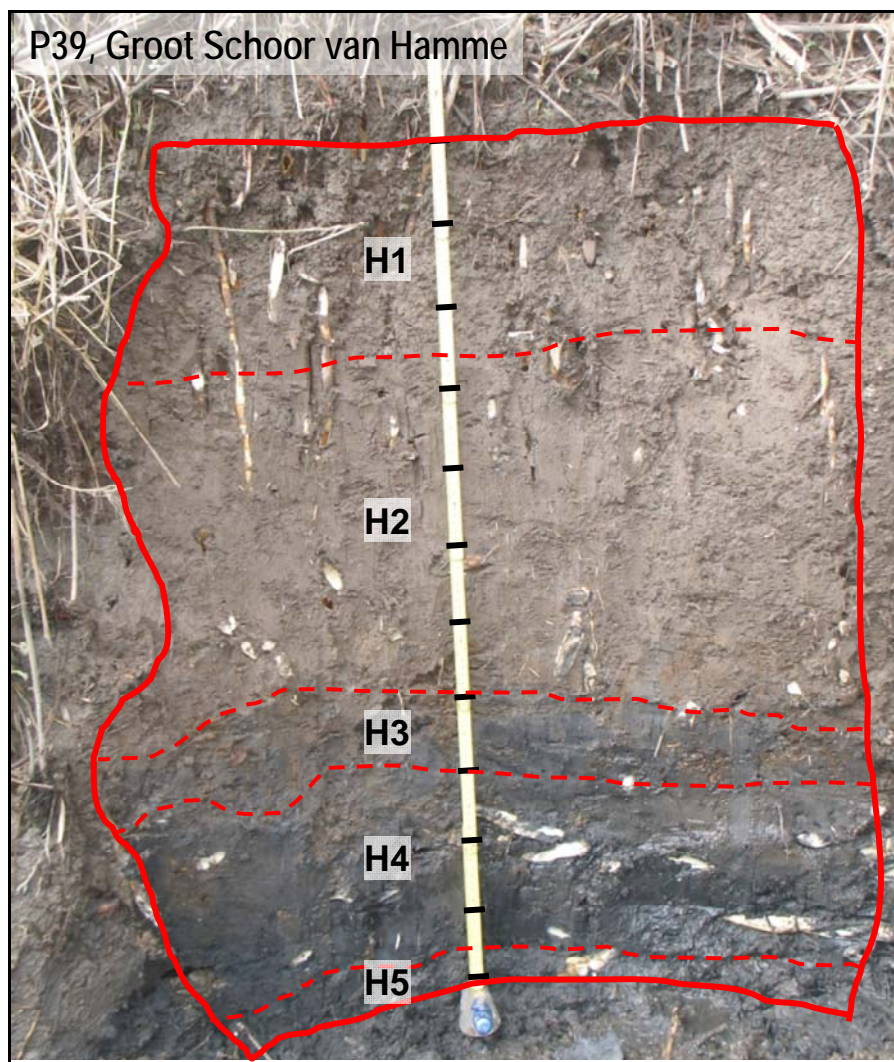
Reed has colonised the tidal marsh, and willow trees are encroaching in the proximity.

It is situated in the direct proximity of profile 'P36', excavated in a second order creek wall.



## 2.28.2 Profile description

		H1	H2	H3	H4	H5
	symbol	Abi	A	Cg	Cr1	Cr2
	depth	0-27	27-70	70-81	81-105	105-125
Colour	Wet					
	Moist	2.5Y 3/2	2.5Y 3.5/2	2.5Y 3/2	5Y 2.5/1	2.5/N
Mottles	abundance				rusty brown	
	colour				on pedfaces	
	size				prominent	
	contrast				irregular	
	boundary					
	Reducing conditions	aa no	aa faint	aa yes	aa yes	aa yes
	Odour					
	Structure	granular			massive	massive
Con-	Stratification					
	Moist					
	Sticky					
	Plastic					
	Ripening	nearly ripe	nearly ripe	nearly ripe	half ripe	half ripe
	Porosity	high		high		
	Roots	common very fine, fine and coarse	many very fine and fine, common coarse	common coarse	few very fine to medium, common coarse	very few very fine to fine, common coarse



### 2.28.3 Analytical laboratory data

Table A24: Analytical data for P39, Groot Schoor van Hamme								
P39		Depth	LOI	Carbon- TOC		Nitrogen	C/N	
Horizon			OM	TC	IC	OC	Kjeldahl	(TOC/Kjel.)
nr.	symbols	cm	%	%	%	%	%	
H1	Abi	0-27	13.98			5.73		
H2	A	27-70	13.37			5.40		
H3	Cg	70-81	16.44			6.53		
H4	Cr1	81-105	17.77			9.20		
H5	Cr2	105-125	11.38			5.72		
Horizon nr.	Depth cm	Texture- pipette method (fractions in µm)					CaCO <sub>3</sub> calculated %	Lab
		0-2	2-10	10-20	20-50	50-2000		
		-----%-----						
H1	0-27						6.7	JM561
H2	27-70						4.8	JM562
H3	70-81	37.4	25.2	5.5	25.5	6.3	4.0	JM563
H4	81-105	38.0	29.1	12.6	18.1	2.1	3.8	JM564
H5	105-125	31.2	23.8	3.4	33.5	8.1	5.3	JM565
Horizon nr.	Texture- laser Coulter	(fractions in µm)			pH		pH	EC
	0.4-2	2-6	6-50	50-2000	H <sub>2</sub> O	KCl	KCl/H <sub>2</sub> O	dS/m
	-----%-----				1:5	1:5		1:5
H1					7.87	7.25	0.92	0.28
H2					7.73	7.18	0.93	0.32
H3	20.4	27.6	42.0	9.9	7.65	7.1	0.93	0.31
H4	20.2	36.8	42.5	0.4	7.42	7.09	0.96	0.78
H5	16.6	28.6	44.7	10.2	7.42	7.07	0.95	1.01
Horizon nr.	Na <sup>+</sup>	K <sup>+</sup>	Ca <sup>2+</sup>	Mg <sup>2+</sup>	CEC	CEC	CEC/clay	BS by
	-----by MgSO <sub>4</sub> (compulsive method)-----				sum	measured		CEC-m
	-----cmol(+)/kg-----							%
H1								
H2								
H3	1.2	0.6	46.2	3.5	51.4	53.0	81.7	97
H4	1.0	0.9	37.1	3.1	42.1	45.9	37.4	92
H5	0.6	0.9	27.2	2.5	31.2	30.0	33.1	>100
P	S	As	Cd	Cr	Cu	Ni	Pb	Zn
-----Aqua Regia-----								
-----mg/kg-----								
7914	1905	92.8	21.1	647	193	58	258	1801
6673	9568	108.7	36.8	956	231	55	405	2732
1895	11247	77.2	8.5	221	130	33	236	1086



#### 2.28.4 World reference base (2007) classification

Diagnostic horizon, properties, material:	Present in horizon:	Remarks:
Albic		Moist colours are too dark
Cambic		Insufficient evidences of alteration
Mollic	(H1)	Possible H1 will qualify but the dry colours are missing, and often that is the parameter that turns down the presence of Mollic horizons
Abrupt textural change		Clay content remains relatively uniform between 31-38%
Gleyic colour pattern	H3 H4-5	Oximorphic colour pattern Reductimorphic colour pattern
Lithological discontinuity		
Reducing conditions	H3	Clear reaction to alpha-alpha dipyridyl
Calcaric material	H1-3	Analytical data confirm the presence of more than 2% calcium-carbonate throughout the soil
Fluvic material	H2-3	The content of organic carbon is irregular and remains above 0.2% through the soil. Stratification is not visible due to the impact of the reed roots.

H1 may qualify for Mollic (5/10 odds) and the horizon has the structure, content of organic matter etc. If anyhow the presence of a Mollic horizon is accepted, then fluvic material will anyhow prevail through the soil as irregular presence of organic matter is sufficient to qualify in absence of any SUBSURFACE diagnostic horizon. The result is that the soil keys out in Fluvisols.

#### Full classification name, without specifiers

(except where listed as such for prefix and suffix qualifiers):

#### (Mollic), Gleyic Tidalic Fluvisol (Calcaric, Humic, Eutric, Siltic)

- Tidalic: flooded by tidewater but not covered by water at mean low tide
- Gleyic: oximorphic colours and reduced conditions starts from 70 cm depth
- Mollic: if the dry colour values does not exceed 5, then H1 qualifies for Mollic
- Calcaric: present throughout the soil profile
- Humic: the content exceeds 1% throughout, with a weighted average of 5.58% (0-50 cm)
- Eutric: The lowest base saturation is 92%
- Siltic: silty clay loam throughout the soil

#### Full classification name, with specifiers:

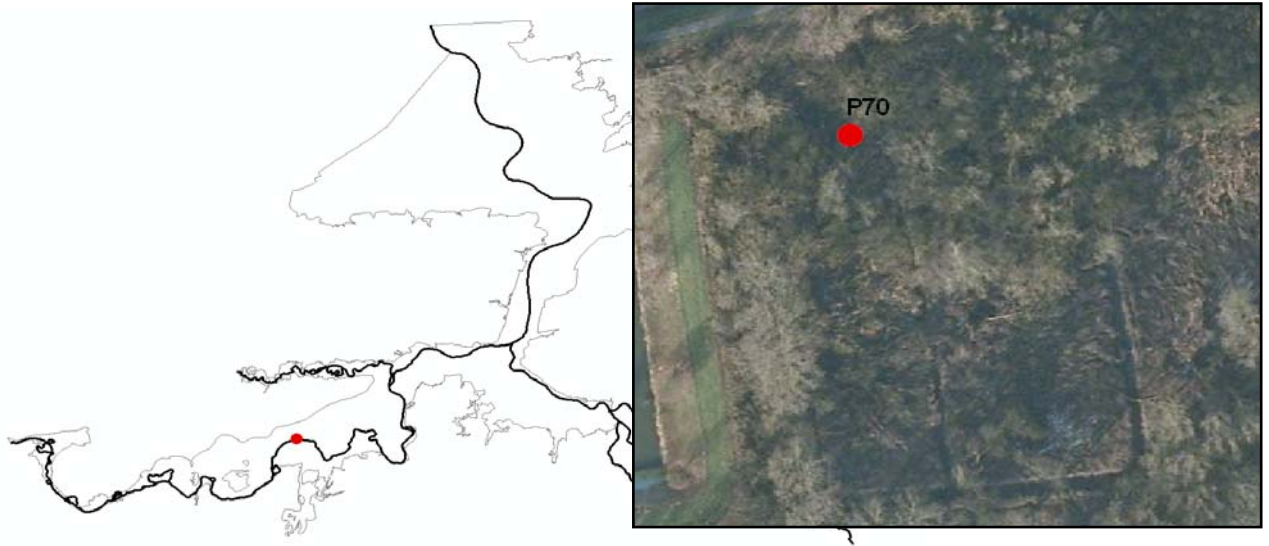
#### (Mollic) Endogleyic Tidalic Fluvisol (Calcaric, Hyperhumic, Hypereutric, Siltic)

- Calcaric: measurements remains lower than 6%
- Hyperhumic: the weighted average is slightly less than 5%
- Hypereutric: The base saturation exceeds throughout the profile 80%

## Fresh water zone: Schor van Zele & Appels

### 2.29 Profile 'P70': Schor van Zele

(Elevation: 5.16m TAW; Lat.: 51.051444, Long.: 4.067787)



#### 2.29.1 Situation

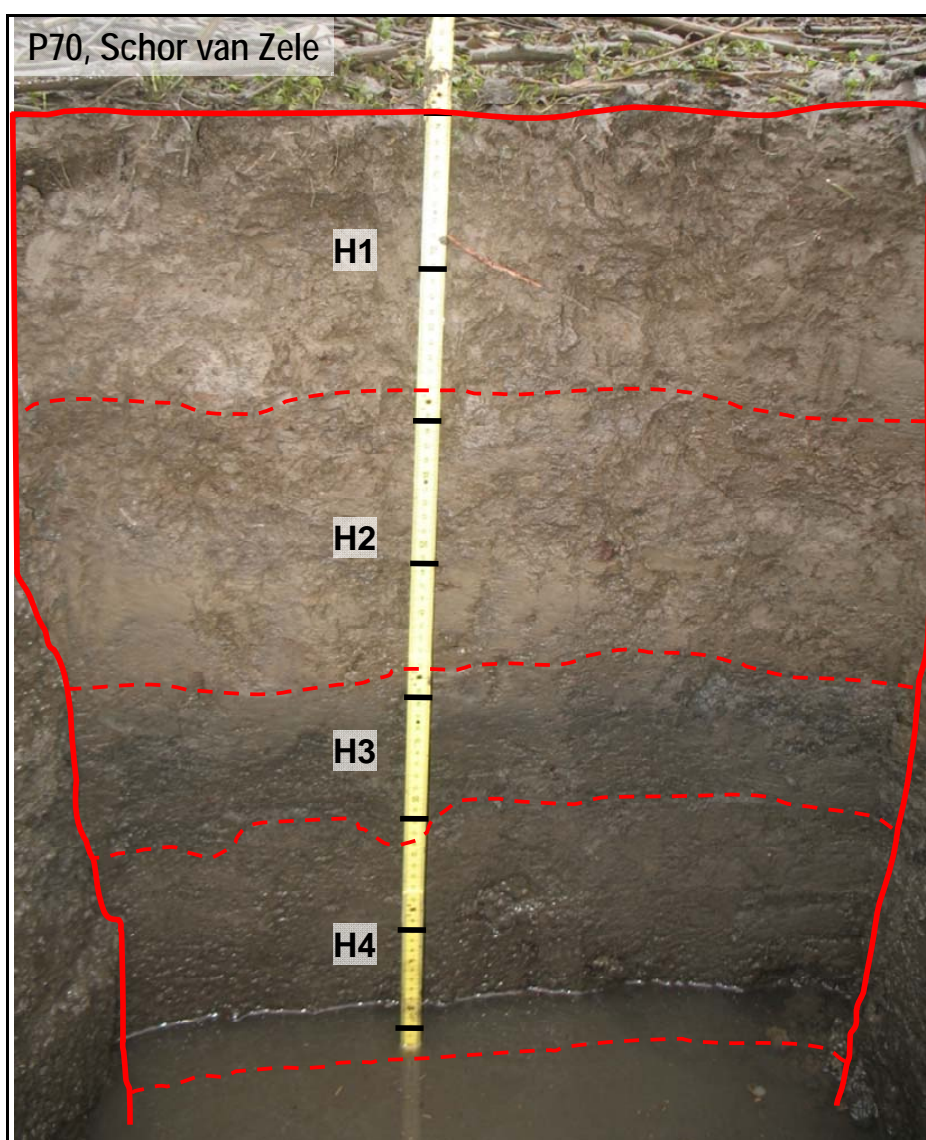
Profile 'P70' is located in the tidalmarsh 'Schor van Zele', near the winter dike. The profile is situated in a poorly drained depression.

Vegetation consists of grass and bush, but willow trees are colonising the direct proximity.



#### 2.29.2 Profile description

		H1	H2	H3	H4	H5
	symbol	A1	A2	Abr1	Abr2	Cr
	depth	0-18	18-38	38-52	52-75	75-85
Colour	Wet		5Y 3.5/2	5Y 2.5/1	5Y 2.5/2	2.5/N
	Moist	2.5Y 3/2	2.5Y 3.5/2	5Y 2.5/1	5Y 2.5/1.5	5Y 2.5/1
Mottles	abundance				few	very few
	colour				rusty brown	rusty brown
	size				fine	irregular
	contrast				prominent	prominent
	boundary				sharp	along biogalleries
	Reducing conditions	aa no	aa no	aa no	aa no	aa yes
	Odour					
	Structure	locally granular; elsewhere massive	massive	massive	granular?	granular?
Consistence	Stratification	-	-	-	-	-
	Moist	friable	friable	very friable	friable	friable
	Sticky	slightly	slightly	slightly	slightly	sticky
	Plastic	plastic	plastic	plastic	slightly plastic	plastic
	Ripening	ripe	ripe	ripe	nearly ripe	nearly ripe
	Porosity	medium	medium	high	high	medium
	Roots	common very fine	very few very fine	none	none	none
	bio	snails		More OM fragments than in H4	many decomposing roots	snails



## 2.29.3 Analytical laboratory data

Table A25 Analytical data for P70, Schor van Zele								
P70		Depth	LOI	Carbon- TOC			Nitrogen	C/N
Horizon			OM	TC	IC	OC	Kjeldahl	
nr.	symbols	cm	%	%	%	%	%	(TOC/Kjel.)
H1	A1	0-18	14.6	5.73	0.49	5.24	0.49	11
H2	A2	18-38	14.0	5.71	0.62	5.10	0.40	13
H3	Abr1	38-52	16.3	8.77	0.32	8.45	0.47	18
H4	Abr2	52-75	12.1	7.69	0.48	7.21	0.36	20
H5	Cr	75-85	12.9	8.30	1.89	6.41	0.40	16
Horizon nr.	Depth cm	Texture- pipette method (fractions in µm)					CaCO <sub>3</sub> calculated	Lab
		0-2	2-10	10-20	20-50	50-2000	%	
H1	0-18	45.0	18.8	4.1	30.9	1.1	4.1	JM516
H2	18-38	46.7	16.7	16.6	18.9	1.1	6.0	JM517
H3	38-52	47.7	16.1	15.3	18.8	2.1	2.7	JM518
H4	52-75	34.8	13.5	9.4	15.0	27.3	4.0	JM519
H5	75-85	37.4	15.3	10.5	34.6	2.2	3.9	JM520
Horizon nr.	Texture- laser Coulter	(fractions in µm)				pH	pH	EC
	0.4-2	2-6	6-50	50-2000	H <sub>2</sub> O	KCl	KCl/H <sub>2</sub> O	dS/m
	-----%-----				1:5	1:5		1:5
H1	22.1	23.1	46.5	8.4	7.6	6.9	0.91	0.29
H2	25.2	28.4	43.6	2.9	7.5	6.9	0.92	0.25
H3	23.5	27.6	43.3	5.6	7.6	7.1	0.92	0.27
H4	17.9	19.0	44.5	18.6	7.8	7.1	0.91	0.23
H5	18.6	20.4	47.0	14.0	7.8	7.2	0.93	0.38
Horizon nr.	Na <sup>+</sup>	K <sup>+</sup>	Ca <sup>2+</sup>	Mg <sup>2+</sup>	CEC sum	CEC measured	CEC/clay	BS by CEC-m
	-----by MgSO <sub>4</sub> (compulsive method)-----							
	-----cmol(+)/kg-----							%
H1	0.9	0.8	38.0	3.5	43.2	49.6	70.0	87
H2	0.9	0.8	42.6	3.4	47.6	49.9	69.3	95
H3	0.8	0.8	42.6	3.1	47.2	47.8	39.2	99
H4	0.5	0.8	28.4	2.4	32.0	38.2	38.5	84
H5	0.5	1.0	28.1	2.3	31.8	39.0	45.4	81
P	S	As	Cd	Cr	Cu	Ni	Pb	Zn
-----Aqua Regia-----								
-----mg/kg-----								
3827	2097	17.6	7.6	222	117	39.3	142	846
7759	3087	45.8	25.9	738	221	57.1	314	2248
7153	2035	81.8	31.5	428	40	53.3	414	2632
2495	1346	81.0	10.1	351	146	33.2	296	1262
2184	2114	84.4	10.6	343	155	34.7	308	1304



## 2.29.4 World reference base (2007) classification

Diagnostic horizon, properties, material:	Present in horizon:	Remarks:
Albic		Moist colours are too dark
Cambic		Evidences of alteration not sufficiently clear
Mollic		Structure insufficient developed
Abrupt textural change		Clay content remains relatively uniform between 35-48%
Gleyic colour pattern	H3	Reductimorphic colour pattern
Lithological discontinuity		
Reducing conditions	H3	Reaction to alpha-alpha dipyridyl
Calcaric material	H1-2; H4-5	Analytical data confirm the presence of more than 2% calcium-carbonate in all horizons but H3
Fluvisic material	H2-3	The content of organic carbon is irregular and remains above 0.2% through the soil

The soil keys out in Fluvisols.

### Full classification name, without specifiers

(except where listed as such for prefix and suffix qualifiers):

#### Gleyic Tidalic Fluvisol (Humic, Eutric, Siltic)

- Tidalic: flooded by tidewater but not covered by water at mean low tide
- Gleyic: reductimorphic colours and reduced conditions starts from 38 cm depth
- Calcaric: should contain at least 2% between 20-50 cm. Considering that the analyser method measure about 40% to little carbonate, H3 with 2.7% has less than 2% and as this horizon is present between 38-52 cm depth Calcaric is not present
- Humic: the content exceeds 1% throughout, with a weighted average of 5.95% (0-50 cm)
- Eutric: The base saturation ranges between 81% and 99%
- Siltic: H1-3 have a silty clay and H5 a silty clay loam

### Full classification name, with specifiers:

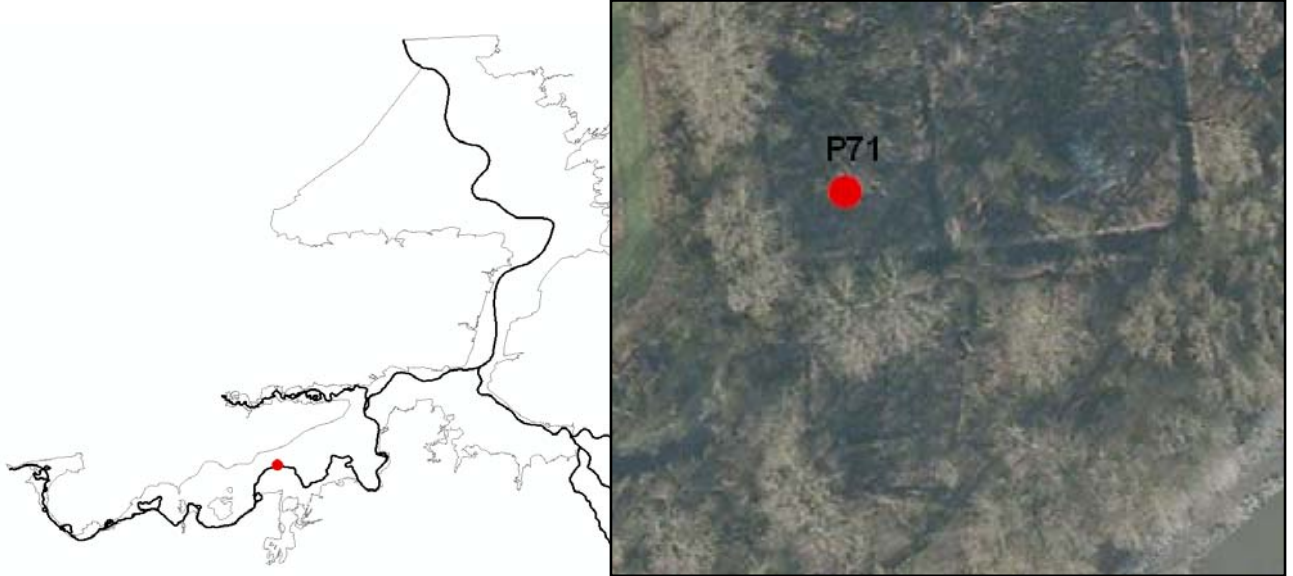
#### Epigleyic Tidalic Fluvisol (Hyperhumic, Hypereutric, Siltic)

- Hyperhumic: the weighted average is more than 5%
- Hypereutric: The base saturation exceeds throughout the profile 80%

## 2.30 Profile 'P71': Schor van Zele

(Elevation: 5.39m TAW; Lat.: 51.05071, Long.: 4.067873)

### 2.30.1 Situation



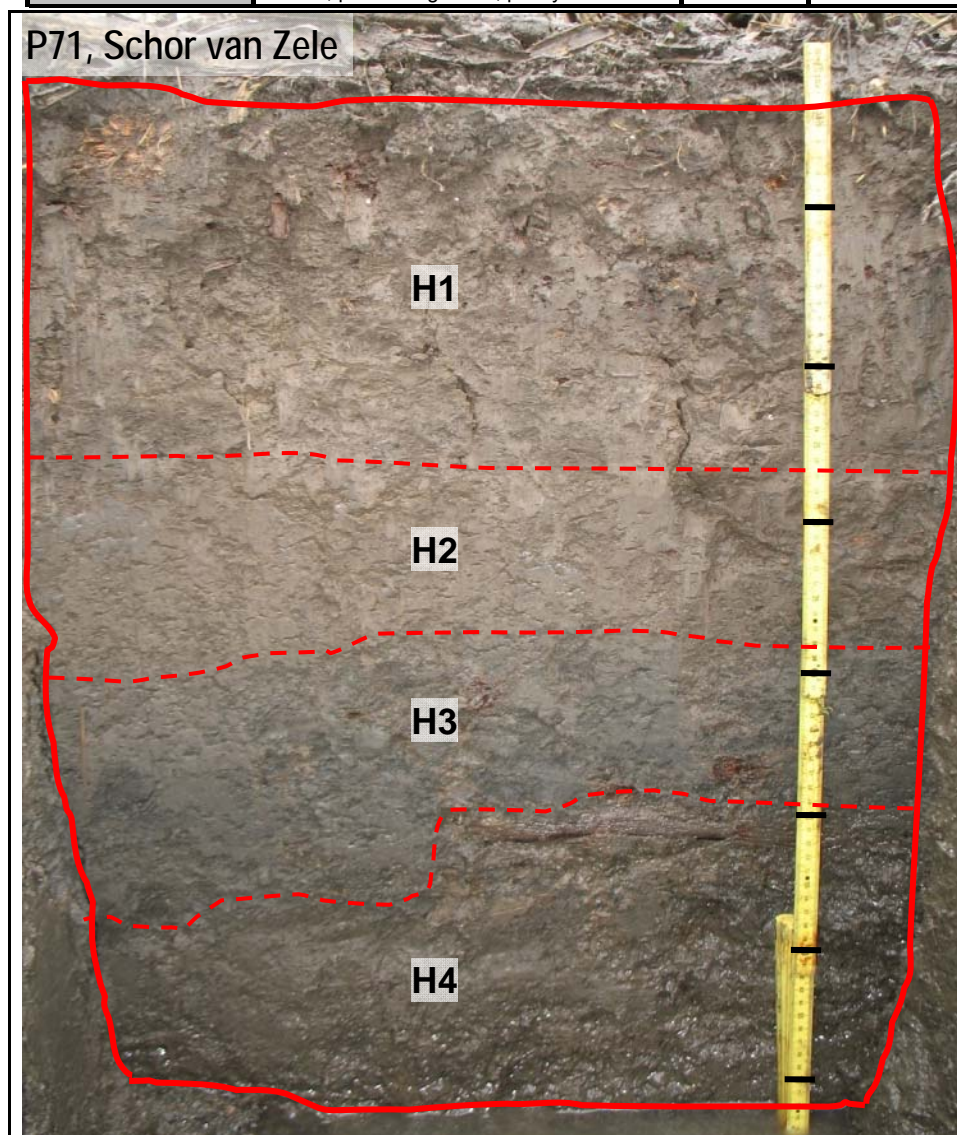
Profile 'P71' is located in comparable conditions as profile P70.

The relative proximity of 2 second order creeks result in a slightly better drainage.



## 2.30.2 Profile description

		H1	H2	H3	H4
	symbol	A1	A2	Abr1	Abr2
	depth	0-23	23-36	36-47	47-69
Colour	Wet	2.5Y 3/2	2.5Y 3.5/2	5Y 2.5/1	5Y 2.5/2
	Moist	2.5Y 3/2	2.5Y 3/2	2.5Y 3/1	2.5Y 3/1
Mottles	abundance				
	colour				
	size				
	contrast				
	boundary				
Con- sistance	Reducing conditions	αα no	αα no	αα no	αα no
	Odour				
	Structure	granular, weak developed	massive	granular+ massive	granular
	Stratification	possible?	-	-	-
	Moist	friable	friable	very friable	very friable
	Sticky	slightly	sticky	sticky	sticky
	Plastic	plastic	very plastic	very plastic	very plastic
	Ripening	ripe	nearly ripe	nearly ripe	nearly ripe
	Porosity	medium	high	high	high
	Roots	few very fine	few very fine	none	none
	bio	snails; plastic fragments; plenty OM debris	-	common OM tissues	-



### 2.30.3 Analytical laboratory data

Table A26: Analytical data for P71, Schor van Zele								
P71		Depth	LOI	Carbon- TOC			Nitrogen	C/N
nr.	Horizon symbols	cm	OM %	TC %	IC %	OC %	Kjeldahl %	(TOC/Kjel.)
H1	A1	0-23	15.3			5.49	0.48	
H2	A2	23-36	13.4			4.99	0.34	
H3	Abr1	36-47	10.7			4.83	0.25	
H4	Abr2	47-69	13.1			6.15	0.32	
Horizon nr.	Depth cm	Texture- pipette method (fractions in µm)					CaCO <sub>3</sub> calculated %	Lab
		0-2	2-10	10-20	20-50	50-2000		
		-----%-----					%	
H1	0-23	40.1	22.2	13.0	22.4	2.3	4.0	JM521
H2	23-36	41.0	17.5	5.3	32.5	3.8	3.6	JM522
H3	36-47	31.1	12.1	0.7	36.6	19.5	4.3	JM523
H4	47-69	28.9	21.7	0.0	35.2	14.3	5.4	JM524
Horizon nr.	Texture- laser Coulter (fractions in µm)				pH		pH	EC
	0.4-2	2-6	6-50	50-2000	H <sub>2</sub> O	KCl	KCl/H <sub>2</sub> O	dS/m
	-----%-----				1:5	1:5		1:5
H1	21.4	23.5	49.5	5.6	7.6	7.0	0.92	0.26
H2	23.7	24.7	48.7	2.9	7.6	7.0	0.92	0.23
H3	16.9	18.5	41.1	23.5	7.7	7.1	0.93	0.18
H4	18.4	18.6	43.2	19.8	7.7	7.1	0.93	0.20
Horizon nr.	Na <sup>+</sup>	K <sup>+</sup>	Ca <sup>2+</sup>	Mg <sup>2+</sup>	CEC sum	CEC measured	CEC/clay	BS by CEC-m %
	-----by MgSO <sub>4</sub> (compulsive method)-----							
	-----cmol(+)/kg-----							%
H1								
H2								
H3								
H4								
P	S	As	Cd	Cr	Cu	Ni	Pb	Zn
-----Aqua Regia-----								
-----mg/kg-----								
3653	2084	17.1	7.9	185	107	36	133	800
5876	2520	27.2	18.6	468	173	54	224	1467
5342	1649	54.4	23.3	997	151	39	289	2051
3942	1542	79.9	14.3	559	152	34	315	1404



#### 2.30.4 World reference base (2007) classification

Diagnostic horizon, properties, material:	Present in horizon:	Remarks:
Albic		Moist colours are too dark
Cambic		Evidences of alteration not sufficiently clear
Mollic		Structure insufficient developed
Abrupt textural change		Clay content remains relatively uniform between 35-48%
Gleyic colour pattern	H3	Reductimorphic colour pattern
Lithological discontinuity		
Reducing conditions	H3	Reaction to alpha-alpha dipyridyl
Calcaric material	H1-2; H4-5	Analytical data confirm the presence of more than 2% calcium-carbonate in all horizons but H3
Fluvic material	H2-3	The content of organic carbon is irregular and remains above 0.2% through the soil

Probably in the past a soil like this one had a Mollic epipedon, but after the burial by new sediment and the drainage of the soil stopped the soil has become wet and this prevents a good structure from developing. The soil remains a Fluvisols.

#### Full classification name, without specifiers

(except where listed as such for prefix and suffix qualifiers):

#### Gleyic Tidalic Fluvisol (Calcaric, Humic, Eutric, Siltic)

- Tidalic: flooded by tidewater but not covered by water at mean low tide
- Gleyic: reductimorphic colours and reduced conditions starts from 36 cm depth
- Calcaric: should contain at least 2% between 20-50 cm. considering that the analyser method measure about 40% to little carbonate, all horizons qualify.
- Humic: the content exceeds 1% throughout, with a weighted average of 5.18% (0-50 cm)
- Eutric: The base saturation has not been measured but as free carbonate is present through the soil most probably the saturation exceeds 80%
- Siltic: H1-2 have a silty clay and H3-4 have a silty clay loam

#### Full classification name, with specifiers:

#### Epigleyic Tidalic Fluvisol (Calcaric, Hyperhumic, Hypereutric, Siltic)

- Hyperhumic: the weighted average is more than 5%
- Hypereutric: The base saturation probably exceeds 80% throughout the profile

## 2.31 Profile 'P72': Schor van Zele

(Elevation: 5.24m TAW; Lat.: 51.05008, Long.: 4.067799)

### 2.31.1 Situation



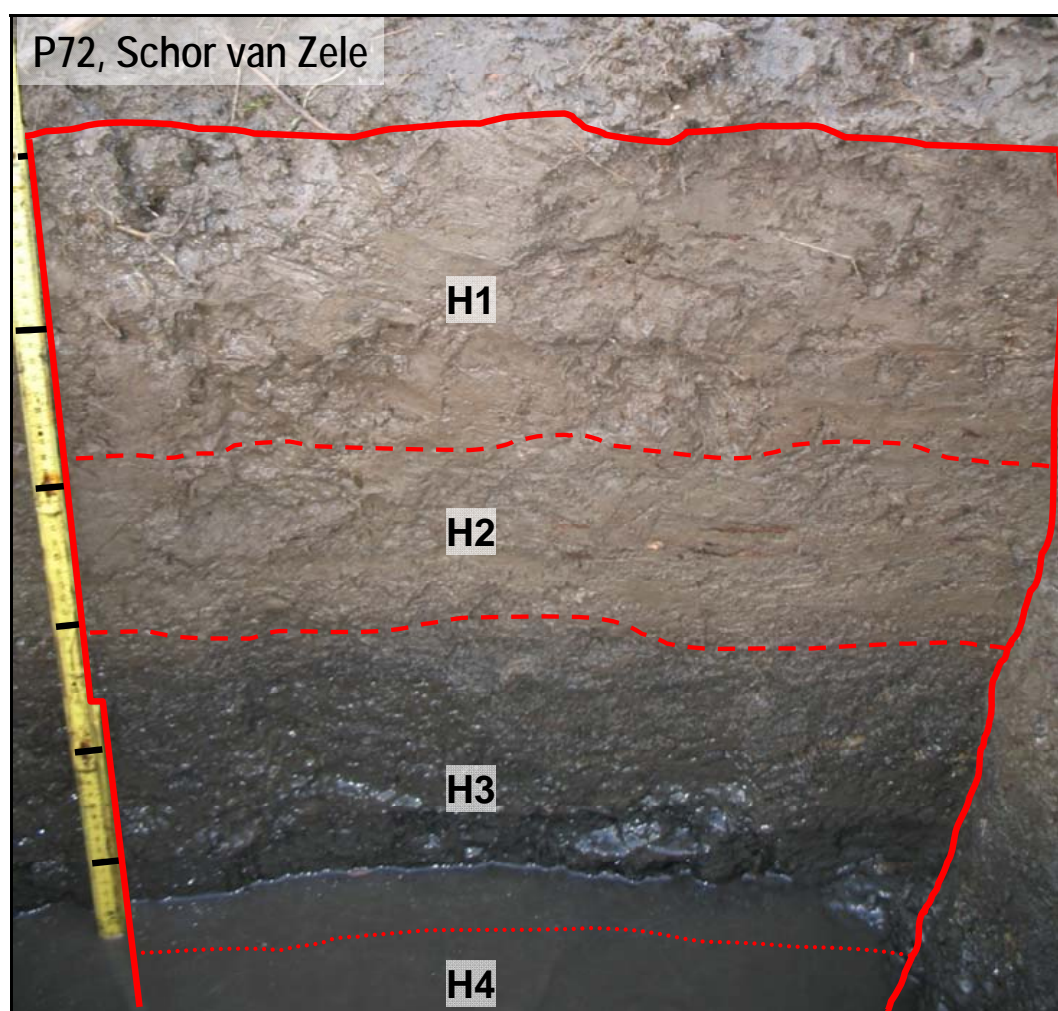
Profile 'P72' is located further south, towards the river Scheldt on the tidal marsh 'Schor van Zele'.

After a period as meadowland, the tidal marsh got planted with poplar trees. The old ditch network has disappeared, but a spontaneous development of a creek network has not occurred.



## 2.31.2 Profile description

		H1	H2	H3	H4
	symbol	A1	A2	Abr	Cr
	depth	0-20	20-40	40-75	70-80
Colour	Wet	10YR 3.5/2	2.5Y 3.5/2	5Y 2.5/1	2.5/N
	Moist	1.5Y 3/2	2.5Y 3/2	5Y 2.5/1	5Y 2.5/1
Mottles	abundance				
	colour				
	size				
	contrast boundary				
	Reducing conditions	aa no	aa no	aa yes	aa yes
	Odour			faint petrochemical	
	Structure	granular+ massive	massive, locally granular	granular	massive
	Stratification	-	yes, more sandy layers	possible?	-
Con-sistence	Moist	friable	very friable	very friable	very friable
		sticky	sticky	sticky	sticky
		plastic	plastic	none plastic	slightly plastic
	Ripening	ripe	nearly ripe	half ripe	half ripe
		medium	medium	high	medium
		few very fine	few very fine	none	common decaying roots
		snails; common OM debris	snails; plenty OM debris	plenty OM debris e.g. decaying roots	snails



### 2.31.3 Analytical laboratory data

**Table A27: Analytical data for P72, Schor van Zele**

Table A27: Analytical data for P72, Schor van Zele								
P72		Depth	LOI	Carbon- TOC			Nitrogen	C/N
Horizon			OM	TC	IC	OC	Kjeldahl	
nr.	symbols	cm	%	%	%	%	%	(TOC/Kjel.)
H1	A1	0-20	14.7			5.61	0.50	
H2	A2	20-40	12.3			5.40	0.34	
H3	Abr	40-75	10.4			5.15	0.30	
H4	Cr	70-80	11.5			7.05	0.33	
Horizon	Depth	Texture- pipette method (fractions in µm)					CaCO <sub>3</sub>	Lab
nr.		0-2	2-10	10-20	20-50	50-2000	calculated	
	cm	-----%-----					%	
H1	0-20	44.8	13.0	15.7	25.4	1.1	0.8	JM525
H2	20-40	34.6	8.6	12.2	22.6	22.0	4.1	JM526
H3	40-75	22.6	11.6	7.3	19.3	39.2	6.4	JM527
H4	70-80	23.9	12.2	13.9	22.1	28.0	4.6	JM528
Horizon	Texture- laser Coulter (fractions in µm)				pH		pH	EC
nr.	0.4-2	2-6	6-50	50-2000	H <sub>2</sub> O	KCl	KCl/H <sub>2</sub> O	dS/m
	-----%-----				1:5	1:5		1:5
H1	20.6	21.5	50.7	7.2	7.7	7.1	0.92	0.26
H2	18.2	19.0	38.9	24.1	7.7	7.1	0.92	0.21
H3	15.4	20.4	33.8	30.5	7.7	7.0	0.92	0.65
H4	12.5	19.1	40.7	27.7	7.8	7.4	0.95	0.54
Horizon	Na <sup>+</sup>	K <sup>+</sup>	Ca <sup>2+</sup>	Mg <sup>2+</sup>	CEC	CEC	CEC/clay	BS by
nr.	-----by MgSO <sub>4</sub> (compulsive method)-----				sum	measured		CEC-m
	-----cmol(+)/kg-----							%
H1	0.8	0.8	37.7	3.7	43.1	46.1	60	93
H2	0.7	0.7	33.5	2.8	37.8	42.9	70	88
H3	0.5	0.8	25.6	2.0	28.9	29.7	53	97
H4	0.4	0.7	26.7	1.5	29.3	23.8		>100
P	S	As	Cd	Cr	Cu	Ni	Pb	Zn
-----Aqua Regia-----								
-----mg/kg-----								
3739	1921	17.8	7.7	220	119	40	140	864
4960	2300	34.4	20.2	518	146	44	226	1937
3326	3738	56.0	13.1	545	120	28	241	1244
2127	2662	69.6	7.6	317	127	27	246	1252



#### 2.31.4 World reference base (2007) classification

Diagnostic horizon, properties, material:	Present in horizon:	Remarks:
Albic		Moist colours are too dark
Cambic		Evidences of alteration not sufficiently clear
Mollic		Structure insufficient developed
Abrupt textural change		Clay content decreases with depth
Gleyic colour pattern	H3-4	Reductimorphic colour pattern
Lithological discontinuity		Decrease in clay is not abrupt (H1: 45%; H2: 35%; H3: 23%)
Reducing conditions	H3-4	Reaction to alpha-alpha dipyridyl
Calcaric material	H2-4	Analytical data confirm the presence of more than 2% calcium-carbonate in all horizons but H1
Fluvic material	H2-3	The content of organic carbon is irregular and remains above 0.2% through the soil

The soil keys out in the Fluvisols.

#### Full classification name, without specifiers

(except where listed as such for prefix and suffix qualifiers):

#### Gleyic Tidalic Fluvisol (Calcaric, Humic, Eutric)

- Tidalic: flooded by tidewater but not covered by water at mean low tide
- Gleyic: reductimorphic colours and reduced conditions starts from 40 cm depth
- Calcaric: should contain at least 2% between 20-50 cm. Considering that the analyser method measure about 40% to little carbonate, all horizons except H1 qualify. H1 is found between 0-20 cm depth.
- Humic: the content exceeds 1% throughout, with a weighted average of 5.43% (0-50 cm)
- Eutric: The base saturation is 87% or more
- Silty: H1 has a silty clay texture but is only 20 cm thick

#### Full classification name, with specifiers:

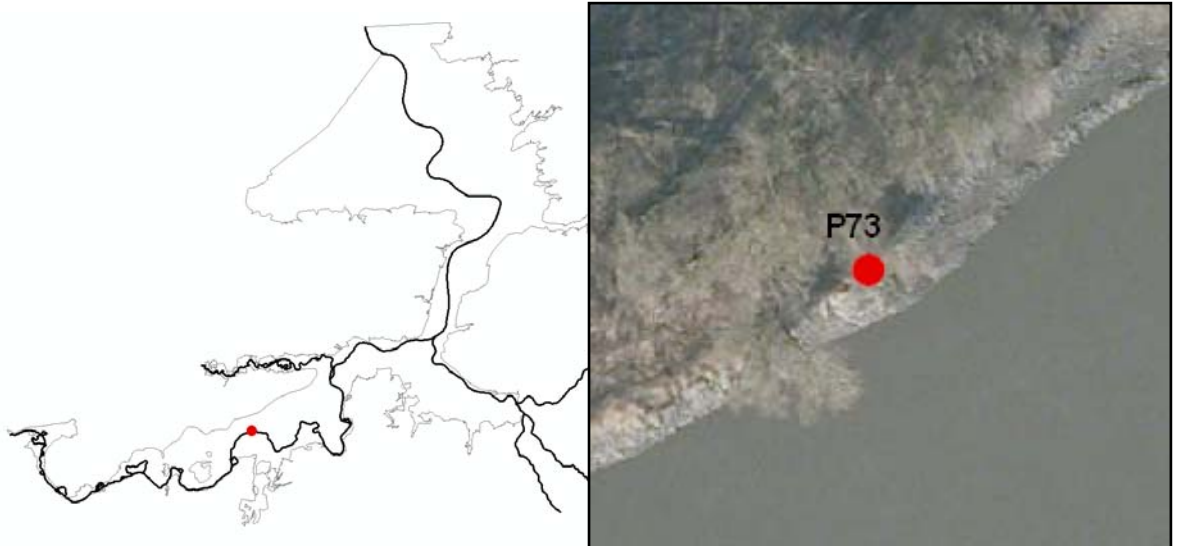
#### Epigleyic Tidalic Fluvisol (Calcaric, Hyperhumic, Hypereutric)

- Hyperhumic: the weighted average is more than 5%
- Hypereutric: The base saturation probably exceeds 80% throughout the profile

## 2.32 Profile 'P73': Schor van Zele

(Elevation: 3.70m TAW; Lat.: 51.050023, Long.: 4.068494)

### 2.32.1 Situation



Profile 'P73'

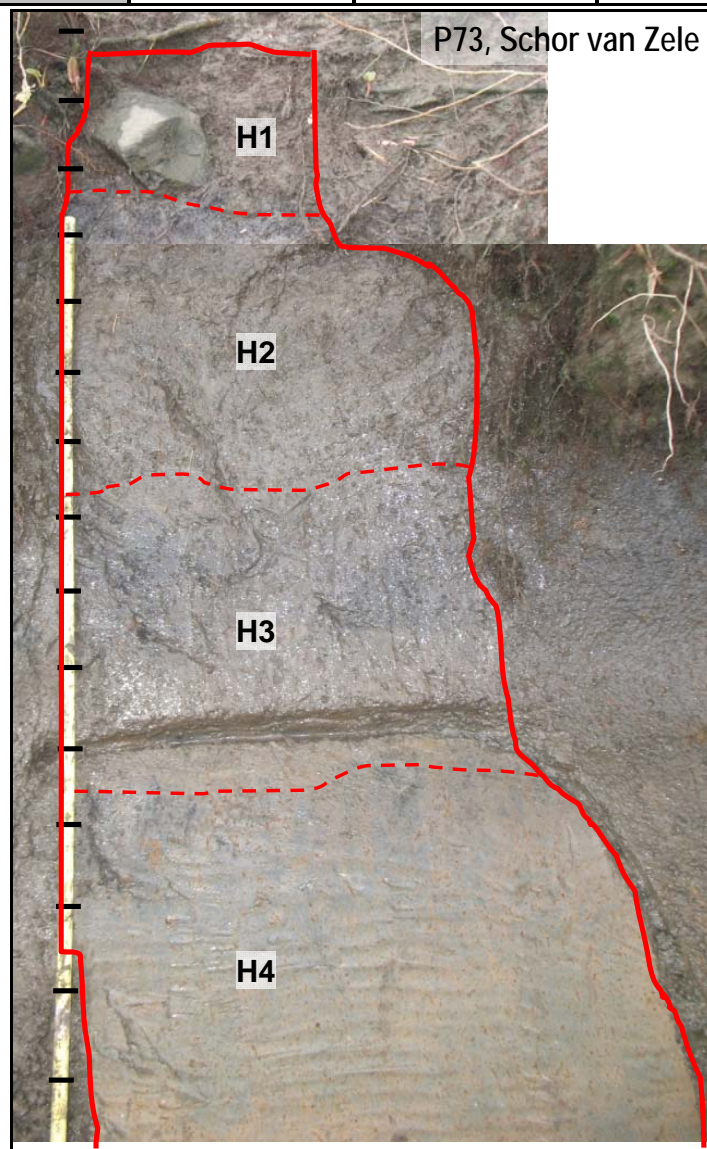
initially used to be in the same tidal marsh as P72 and P74. It has been a meadowland that later got planted with poplar trees.

Because of continuous erosion, the location turned into the tidal marsh edge somewhere between 1976 and 1987.



## 2.32.2 Profile description

		H1	H2	H3	H4
	symbol	Abi	A	Ar	Br
	depth	0-24	24-67	67-106	106-150
Colour	Wet	2.5Y 3/2	5Y 2.5/1	2.5/N	2.5/10Y
	Moist	2.5Y 3/2	5Y 2.5/2	5Y 2.5/1	2.5Y 3.5/2
Mottles	abundance				
	colour			rusty brown	rusty brown
	size			in pores	in pores
	contrast			prominent	prominent
	boundary				
	Reducing conditions	aa no	aa no	aa yes	aa yes
	Odour				
	Structure	granular	massive, locally granular	granular	fine angular blocky, well developed
	Stratification	-	Stratified	Stratified	-
Con-sistence	Moist	very friable	friable	very friable	friable
	Sticky	slightly	slightly	slightly	slightly
	Plastic	plastic	none plastic	plastic	plastic
	Ripening	ripe	ripe	nearly ripe	ripe
	Porosity	high	medium	medium	high
	Roots	many very fine and fine	many very fine and fine	very few very fine	none
	bio	-	snails	-	snails



### 2.32.3 Analytical laboratory data

**Table A28: Analytical data for P73, Schor van Zele**

P73		Depth	LOI	Carbon- TOC			Nitrogen	C/N
Horizon			OM	TC	IC	OC	Kjeldahl	
nr.	symbols	cm	%	%	%	%	%	(TOC/Kjel.)
H1	Abi	0-24	9.5			2.33		
H2	A	24-67	6.8			3.68		
H3	Ar	67-106	13.1			7.98		
H4	Br	106-150	6.7			1.18		
Horizon nr.	Depth cm	Texture- pipette method (fractions in µm)					CaCO <sub>3</sub> calculated	Lab
		0-2	2-10	10-20	20-50	50-2000	%	
		-----%-----						
H1	0-24						4.5	JM529
H2	24-67						5.0	JM530
H3	67-106	31.3	12.8	11.7	30.8	13.4	3.6	JM531
H4	106-150	35.4	19.1	0.4	30.3	14.7	1.9	JM532
Horizon nr.	Texture- laser Coulter (fractions in µm)				pH		pH	EC
	0.4-2	2-6	6-50	50-2000	H <sub>2</sub> O	KCl	KCl/H <sub>2</sub> O	dS/m
	-----%-----				1:5	1:5		1:5
H1					7.8	7.3	0.94	0.24
H2					8.0	7.4	0.93	0.21
H3	16.4	20.3	46.8	16.5	7.8	7.3	0.93	0.42
H4	13.9	17.5	50.2	18.4	8.1	7.4	0.91	0.29
Horizon nr.	Na <sup>+</sup>	K <sup>+</sup>	Ca <sup>2+</sup>	Mg <sup>2+</sup>	CEC sum	CEC measured	CEC/clay	BS by CEC-m
	-----by MgSO <sub>4</sub> (compulsive method)-----							%
	-----cmol(+)/kg-----							
H1	0.3	0.8	29.1	2.1	32.3	26.7		
H2								
H3								
H4								
-----Aqua Regia-----								
-----mg/kg-----								
571	745	10.1	1.1	56	26	25	46	95



#### 2.32.4 World reference base (2007) classification

Diagnostic horizon, properties, material:	Present in horizon:	Remarks:
Albic		Moist colours are too dark
Cambic		Evidences of alteration not sufficiently clear
Mollic		Structure insufficient developed
Abrupt textural change		Clay content only available from H3-4 but for an abrupt change to be present that implies that in H2 the clay content should be at most 15.65%, which is most unlikely
Gleyic colour pattern	H3-4	Reductimorphic colour pattern
Lithological discontinuity		
Reducing conditions	H3-4	Reaction to alpha-alpha dipyridyl
Calcaric material	H1-3	Analytical data confirm the presence of more than 2% calcium-carbonate in all horizons but H4
Fluvic material	H1-4	The content of organic carbon is irregular and remains above 0.2% through the soil

The soil keys out as a Fluvisols.

#### Full classification name, without specifiers

(except where listed as such for prefix and suffix qualifiers):

#### Gleyic Tidalic Fluvisol (Calcaric, Humic, Eutric, Siltic)

- Tidalic: flooded by tidewater but not covered by water at mean low tide
- Gleyic: reductimorphic colours and reduced conditions starts from 67 cm depth
- Calcaric: should contain at least 2% between 20-50 cm. Considering that the analyser method measure about 40% to little carbonate, all horizons qualify.
- Humic: the content exceeds 1% throughout, with a weighted average of 3.03% (0-50 cm)
- Eutric: The base saturation has only been measured for H1 where the saturation is more than 100%. Most probably and considering the free carbonate present through the soil all horizons have a saturation of at least 80%
- Siltic: H3-4 have a silty clay loam texture class

#### Full classification name, with specifiers:

#### Endogleyic Tidalic Fluvisol (Calcaric, Humic, Hypereutric, Siltic)

- Hyperhumic: the weighted average is more than 5%
- Hypereutric: The base saturation probably exceeds 80% throughout the profile

## 2.33 Profile 'P74': Schor van Zele

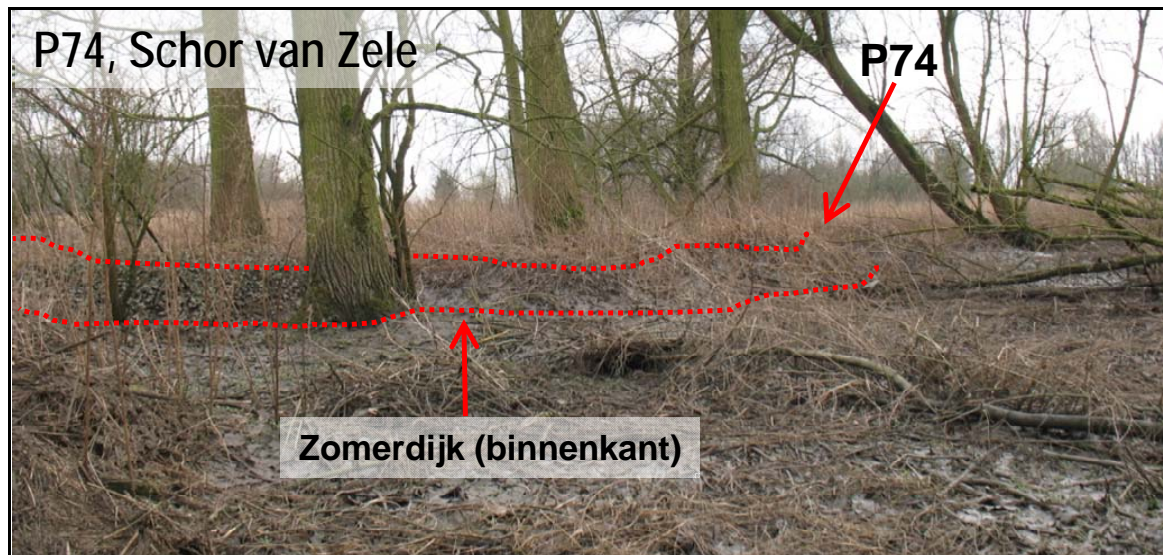
(Derived elevation: 5.74m TAW; Lat.: 51.025811, Long.: 4.041108)

### 2.33.1 Situation



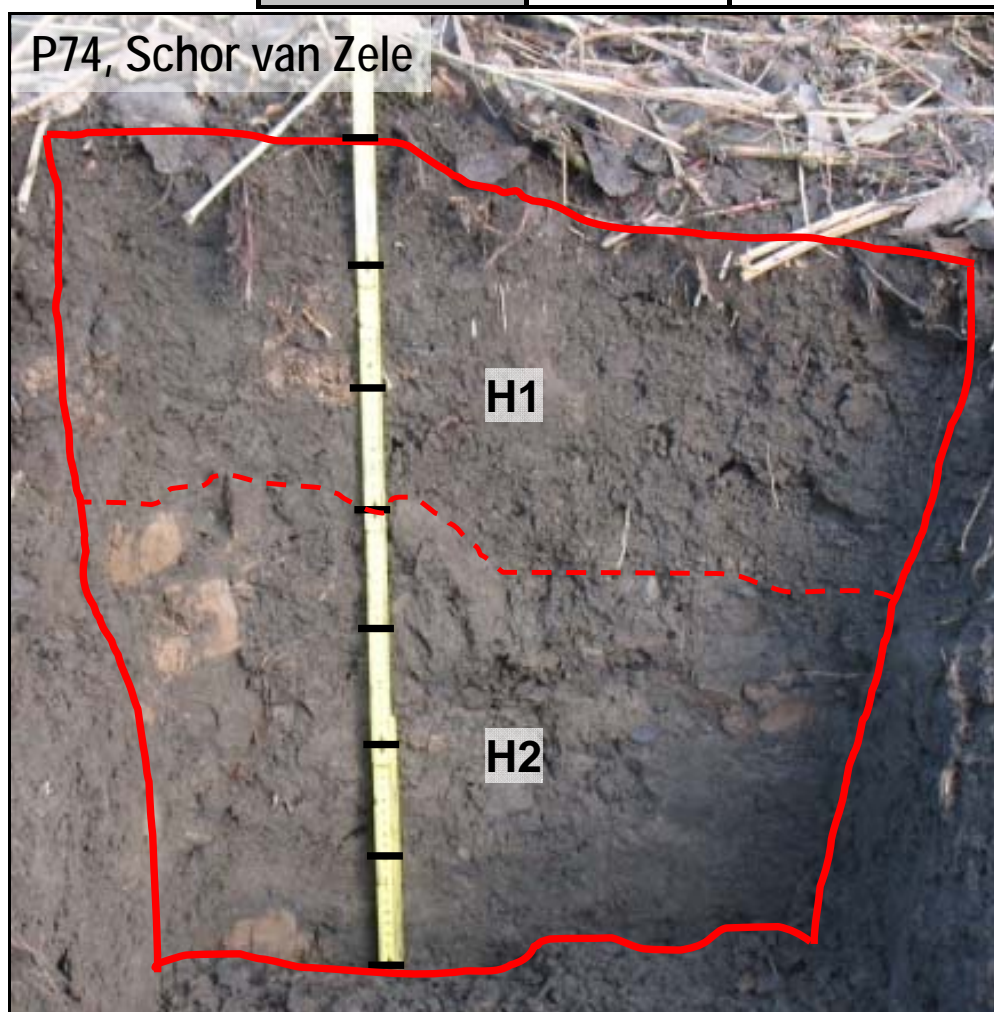
Profile 'P74' has a comparable history to P73, but is still situated on tidal marsh, in an old summer dike.

After the planted poplar trees have been cut down, spontaneous willow shrub and forest encroached the tidal marsh.



### 2.33.2 Profile description

		H1	H2
symbol depth		Abi1	Abi2
		0-30	30-70
Colour	Wet		
	Moist	2.5Y 3/2	2.5Y 3/2
Mottles	abundance		
	colour		
	size		
	contrast		
	boundary		
Reducing conditions		αα no	αα no
Odour			
Structure		strong granular	granular, locally massive
Stratification		-	-
Consistence	Moist	very friable	friable
	Sticky	slightly	not possible
	Plastic	plastic	not possible
	Ripening	ripe	ripe
	Porosity	high	medium
Roots		very few very fine	very few very fine
bio		no OM debris	snails



### 2.33.3 Analytical laboratory data

**Table A29: Analytical data for P74, Schor van Zele**

<b>P74</b>								
<b>Horizon</b>		<b>Depth</b>	<b>LOI</b>	<b>Carbon- TOC</b>			<b>Nitrogen</b>	<b>C/N</b>
nr.	symbols	cm	OM %	TC %	IC %	OC %	Kjeldahl %	(TOC/Kjel.)
H1	Abi1	0-30	9.0			3.18	0.29	
H2	Abi2	30-70	6.5			2.47	0.17	
<b>Horizon nr.</b>	<b>Depth</b>	<b>Texture- pipette method (fractions in µm)</b>					<b>CaCO<sub>3</sub></b>	<b>Lab</b>
	cm	<b>0-2</b>	<b>2-10</b>	<b>10-20</b>	<b>20-50</b>	<b>50-2000</b>	calculated	
		-----%-----					%	
H1		23.6	8.3	6.6	23.0	38.4	3.4	JM533
H2		18.0	6.8	3.3	17.1	54.9	4.8	JM534
<b>Horizon nr.</b>	<b>Texture- laser Coulter</b>	<b>(fractions in µm)</b>			<b>pH</b>		<b>pH</b>	<b>EC</b>
	<b>0.4-2</b>	<b>2-6</b>	<b>6-50</b>	<b>50-2000</b>	<b>H<sub>2</sub>O</b>	<b>KCl</b>	<b>KCl/H<sub>2</sub>O</b>	<b>dS/m</b>
	-----%-----				1:5	1:5		1:5
H1	12.1	13.4	35.6	38.9	7.9	7.3	0.92	0.16
H2	10.5	11.7	27.0	50.8	8.1	7.5	0.92	0.13
<b>Horizon nr.</b>	<b>Na<sup>+</sup></b>	<b>K<sup>+</sup></b>	<b>Ca<sup>2+</sup></b>	<b>Mg<sup>2+</sup></b>	<b>CEC</b>	<b>CEC</b>	<b>CEC/clay</b>	<b>BS by</b>
	<b>-----by MgSO<sub>4</sub> (compulsive method)-----</b>				<b>sum</b>	<b>measured</b>		<b>CEC-m</b>
	-----cmol(+)/kg-----							%
H1	0.3	0.9	27.7	2.5	31.4	32.1		
H2	0.3	0.4	23.3	1.9	25.9	27.0		
<b>P</b>	<b>S</b>	<b>As</b>	<b>Cd</b>	<b>Cr</b>	<b>Cu</b>	<b>Ni</b>	<b>Pb</b>	<b>Zn</b>
<b>Aqua Regia</b>								
-----mg/kg-----								
1876	915	32.3	6.6	241	71	26	135	785
1703	791	39.8	6.7	298	74	23	155	856



#### 2.33.4 World reference base (2007) classification

Diagnostic horizon, properties, material:	Present in horizon:	Remarks:
Albic		Moist colours are too dark
Cambic		Evidences of alteration not sufficiently clear
Mollic	H1	At least H1 has sufficient structure and possible H2 as well. Dry colours are missing but probably they will have a value of no more than 5
Abrupt textural change		
Gleyic colour pattern		
Lithological discontinuity		
Reducing conditions		
Calcaric material	H1-2	Analytical data confirm the presence of more than 2% calcium-carbonate in both horizons
Fluvic material		

The soil will probably key out as a Phaeozem although the dry colours are missing.

#### Full classification name, without specifiers

(except where listed as such for prefix and suffix qualifiers):

#### Haplic Phaeozem (Calcaric)

- Gleyic: the soil was only studied until a depth of 70 cm; probably no gley colours and reduced conditions will be present above 100 cm depth.
- Pachic: Considering the blocks of endogenic material present in the horizon the structure and biological mixing is consider insufficient for H2 to qualify for Mollic. If H2 is not a Mollic then Pachic will not apply

#### Full classification name, with specifiers:

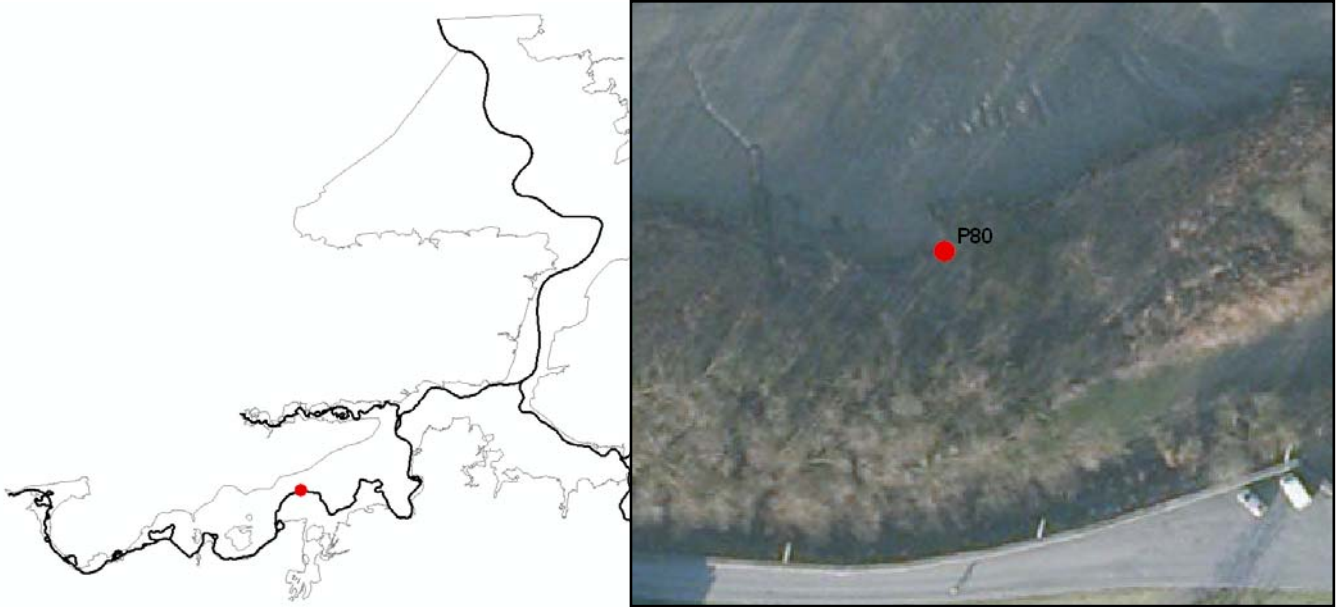
#### Haplic Phaeozem (Calcaric)

- The carbonate content is 3.4-4.8% (analyser method)

## 2.34 Profile 'P80': Nieuw schor van Appels

(Derived elevation: 4.00m TAW; Lat.: 51.025370, Long.: 4.041059)

### 2.34.1 Situation



Profile 'P80' was excavated in the tidal marsh edge of the tidal marsh 'Nieuw schor van Appels', situated opposite from 'Schor van Zele'. It's a young tidal marsh that recently developed. Because of the erosion of 'Schor van Zele', the water stream declined on the opposite side of the river. Thus, 'Nieuw schor van Appels' was able to develop in the outer curve of the river.



## 2.34.2 Profile description

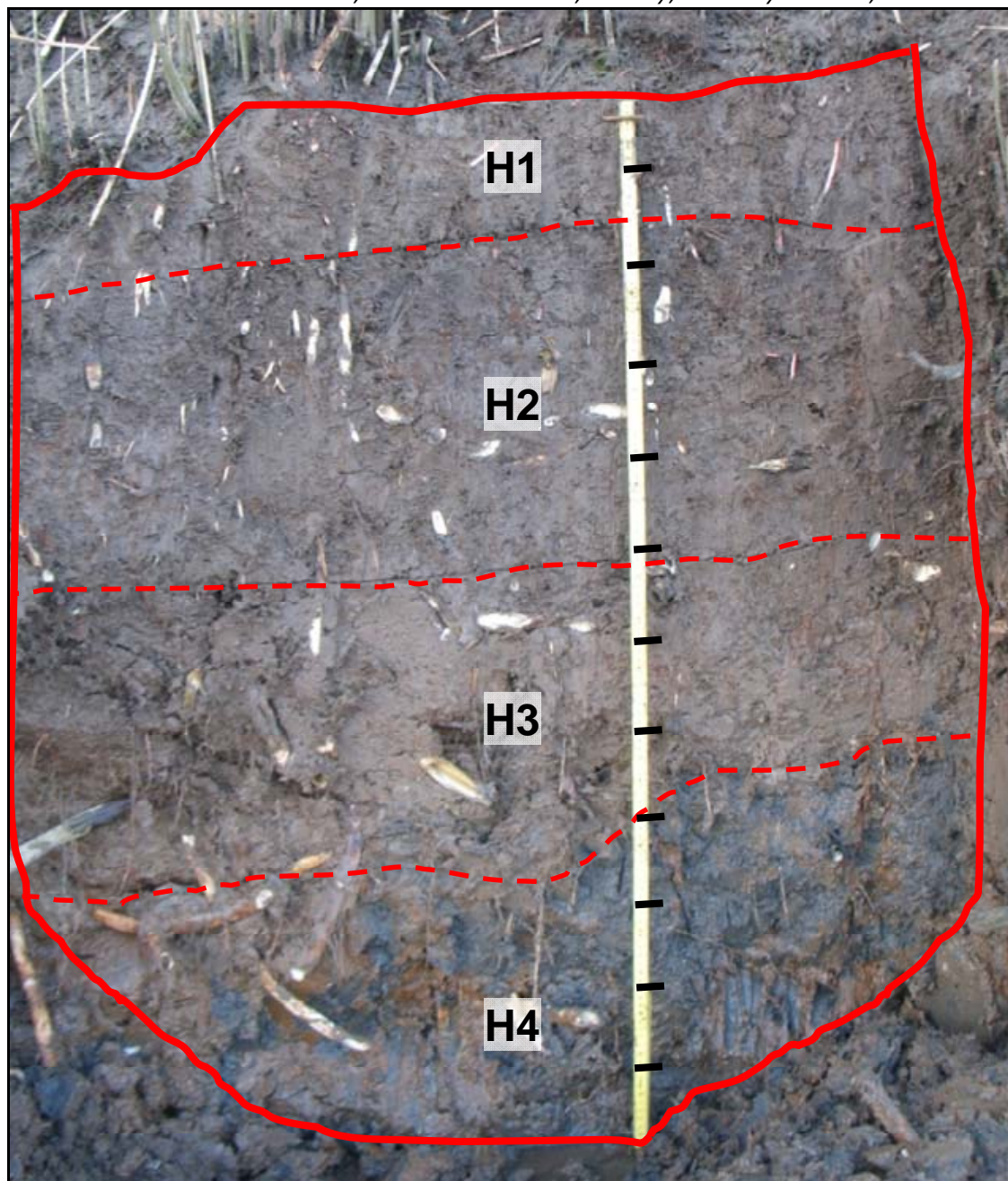
Profile P80		Nieuw Schor van Appels
1.3 Date and time:	13/11/2008. Profile description initiated at 15:00. Low tide at 10:43	
1.4 Author:	Jari Hinsch Mikkelsen	
1.5 Location:	Belgium, Province of East Flanders, Dendermonde Municipality Coming from Dendermonde along the N406, 400m after having passed the bridge over the Dender follow the Zandstraat straight ahead for about 800m. On the righthand side (northern direction) turn into the Koebosstraat. After 400m the road divides follow the Maaistraat. At the junction with Rijckelstraat turn right. At the next road junction turn 90° in northern direction along the Achtentwintig Roeden. At the end of the road turn right along the Sint Onolfsdijk. After about 600m on the dike the road turns right, tidal marsh and mud flat Nieuwe Schor van Appels is located at the foot of the dike.	
1.6 Profile coordinates:	Latitude, longitude: 51° 02' 53.71" N, 04° 04' 10.59" E Lambert72: 193163.465 N, 129028.229 E	
4.1 Elevation:	±4 m TAW (interpolation measurements in surroundings)	
2.1 Atmospheric climate and weather condition:	Sunny	
Soil climate:	<i>STR</i> : Mesic <i>SMR</i> : Udic	
2.2 Topography:	<i>Macrotopography</i> : Estuarium, tidal mouth of the Scheldt river <i>Mesotopography</i> : Tidal marsh cliff <i>Landscape position</i> : <i>Slope form</i> : complex <i>Slope gradient</i> : - <i>Slope length</i> : - <i>Slope orientation</i> : -	
2.6 Land-use:	No land use <i>Grazing</i> : No grazing	
2.7 Human influence:	No influence observed	
Vegetation:	Reed and fresh water bulrush ( <i>Scirpus x kuekenthalianus</i> )	
2.8 Parent material:	Unconsolidated deposits> marine and estuarine clays and silts> quaternary clay and silt> Holocene Clay (5221)	
2.9 Drainage class:	Poorly drained	
2.10 External drainage:	Moderately rapid runoff	
2.11 Flooding	The cliff is flooded to a certain extent each day. Flooding exceeding the high of the cliff is happening around spring tides.	
2.12 Coarse surface frag.	None	
2.13 Erosion, sedimentation:	Active erosion sedimentation on the tidal marsh cliff in function of changes of the current regime of the Scheldt	
2.14 Surface cracks:	None observed	
2.15 Salts:	None observed	
Localisation factors profile:	The profile is located centrally in this relatively small tidal marsh	
Remarks:	The tidal marsh cliff has a high at the location of the soil profile of 60 cm, an almost vertical straight slope profile and inclination	
N o.	Horizon description	
H1	A	0-20 cm; granular; common very fine to fine and none coarser roots; clear smooth boundary



Profile P80		Nieuw Schor van Appels
H2	AC	20-37 cm; massive; few very fine to fine and none coarser roots; discontinuous stratification disturbed by roots; clear smooth boundary
H3	Cr1	37-69 cm; very dark greyish colours; reductimorphic colour pattern; positive reaction to $\alpha\alpha$ -dipyridyl; massive; gradual smooth boundary
H4	Cr2	69-93 cm; reductimorphic colour pattern; positive reaction to $\alpha\alpha$ -dipyridyl; massive

*Extra subordinate symbols: 'bi' biological activity clearly evidences (fauna and flora), and more than what can be expected according to type of soil, position, time of year etc.*

*Colour measurements: M= Moist; MC= Moist-crushed; D= Dry; DC= Dry-crushed; W= Wet.*





### 2.34.3 Analytical laboratory data

Table A30: Analytical data for P80, Nieuw schor van Appels								
Appels	Horizon	Depth	EC	CaCO <sub>3</sub>	pH		pH	Lab
Horizon nr.	symbols	cm	dS/m 1:5	titration %	H <sub>2</sub> O 1:5	KCl 1:5	KCl/H <sub>2</sub> O	
H1	A	0-20	0.55	11.5	7.7	7.5	0.98	JM340
H2	AC	20-37	0.72	11.7	7.7	7.5	0.98	JM341
H3	Cr1	37-60	0.28	12.0	8.0	7.8	0.98	JM342
H3b	Cr1	60-69	0.70	13.2	7.5	7.3	0.98	JM343
H4	Cr2	69-93	0.36	9.9	7.8	7.7	0.99	JM344
Horizon nr.	Depth cm	Texture- pipette method (fractions in µm)					TOC OC %	LOI OM %
		0-2	2-10	10-20	20-50	50-2000		
H1	0-20	12.8	5.2	3.1	18.9	59.9	1.16	3.7
H2	20-37						2.60	3.8
H3	37-60	5.6	0.7	1.5	14.9	77.3	0.79	1.8
H3b	60-69						4.87	7.1
H4	69-93	8.6	2.8	1.2	10.5	77.0	1.72	2.5
Horizon nr.	S	As	Cd	Cr	Cu	Ni	Pb	Zn
	Aqua Regia mg/kg							
H1	2014	14	2.0	49	26	15	51	250
H2	2970	48	8.3	59	49	15	102	438
H3	1363	10	1.3	34	14	8	29	171
H3b	4864	113	12.5	142	121	29	240	926
H4	1737	31	3.6	51	36	12	76	362

### 2.34.4 World reference base (2007) classification

Diagnostic horizon, properties, material:	Present in horizon:	Remarks:
Albic		Colour data not available
Cambic		Soil is subject to active fluvial erosion and sedimentation
Mollic		
Abrupt textural change		Probably not but only 3 horizons have been analysed for texture
Gleyic colour pattern	H3-4	Reductimorphic colour pattern
Lithological discontinuity		
Reducing conditions	H3-4	Reaction to alpha-alpha dipyrindyl
Calcaric material	H1-4	Analytical data confirm the presence of more than 2% calcium-carbonate in all horizons
Fluvic material	H1-4	The content of organic carbon is irregular and remains above 0.2% through the soil

The soil keys out as a Fluvisols.

**Full classification name, without specifiers**

(except where listed as such for prefix and suffix qualifiers):

**Gleyic Tidalic Fluvisol (Calcaric, Humic, Eutric)**

- Tidalic: flooded by tidewater but not covered by water at mean low tide
- Gleyic: reductimorphic colours and reduced conditions starts from 37 cm depth
- Calcaric: should contain at least 2% between 20-50 cm. Titration carbonate shows values exceeding 10%.
- Humic: the content is less than 1% in H3. The weighted average is 1.55% (0-50 cm)
- Eutric: The base saturation has not been measured. Most probably and considering the free carbonate present through the soil all horizons have a saturation of at least 80%
- Arenic: H3 has a loamy sand texture but is too thin to qualify

**Full classification name, with specifiers:****Epigleyic Tidalic Fluvisol (Hypercalcaric, Humic, Hypereutric)**

- Hyperhumic: the weighted average is more than 5%
- Hypereutric: The base saturation probably exceeds 80% throughout the profile

## List of references

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