

BIJLAGE V BEREKENINGEN OPBARSTEN

Berekening opbarsten en piping/heave

project: Aanvulling Sluitstukkades Cluster E
 projectcode: STD88-2
 datum: 30 september 2013

Witteveen + Bos

gegevens**locatie**

dijkvak 50.320.2 DP 1

waterstanden

zichtperiode 50 jaar
 ontwerpwaterstand 43.72 m+NAP
 verwachte stijghoogte 43.72 m+NAP
 γ_w 10 kN/m³
 polderpeil 41.47 m+NAP

maaiveldniveau

mv (huidig) 41.47 m+NAP

sloot

d 41.47 m+NAP
 b 50 m
 talud 1:n 2 -
 B 50 m

effectieve laagdikte (Bijlage 1 van TR Waterspanningen bij dijken)

H1 1.87 m
 H2 1.87 m
 H3 -14.17 m
H 1.87 m 41.47 m +NAP

grondopbouw achterland

laag	grondsoort	van	tot	$y_{sat,d}$	y_d	d	$y * d$
1	Leem	41.47	39.6	19	19	1.9	35.5
2					0	0.0	0.0
3					0	0.0	0.0
4					0	0.0	0.0
5					0	0.0	0.0
6					0	0.0	0.0
onderkant lagenpakket		39.6 m+NAP					
gewicht bovenliggende lagen		35.5					
waterdruk watervoerend pakket		41.2					

resultaten

grenspotential 3.55 m
 grenspotential 43.15 m+NAP
 opbarstveiligheid 0.86 -

$$h_{z,s} = h_p + d \frac{\gamma_{sat} - \gamma_w}{\gamma_w}$$

Berekening opbarsten en piping/heave

project: Aanvulling Sluitstukkades Cluster E
 projectcode: STD88-2
 datum: 30 september 2013

Witteveen + Bos

gegevens**locatie**

dijkvak 50.320.3 DP 1

waterstanden

zichtperiode 50 jaar
 ontwerpwaterstand 43.82 m+NAP
 verwachte stijghoogte 43.82 m+NAP
 γ_w 10 kN/m³
 polderpeil 41.33 m+NAP

maaiveldniveau

mv (huidig) 41.33 m+NAP

sloot

d 41.33 m+NAP
 b 50 m
 talud 1:n 2 -
 B 50 m

effectieve laagdikte (Bijlage 1 van TR Waterspanningen bij dijken)

H1 1.83 m
 H2 1.83 m
 H3 -14.23 m
H 1.83 m 41.33 m +NAP

grondopbouw achterland

laag	grondsoort	van	tot	$y_{sat,d}$	y_d	d	y * d
1	Leem	41.33	39.5	19	19	1.8	34.8
2					0	0.0	0.0
3					0	0.0	0.0
4					0	0.0	0.0
5					0	0.0	0.0
6					0	0.0	0.0
onderkant lagenpakket		39.5 m+NAP					
gewicht bovenliggende lagen		34.8					
waterdruk watervoerend pakket		43.2					

resultaten

grenspotential 3.48 m
 grenspotential 42.98 m+NAP
 opbarstveiligheid 0.80 -

$$h_{z,s} = h_p + d \frac{\gamma_{sat} - \gamma_w}{\gamma_w}$$

Berekening opbarsten en piping/heave

project: Aanvulling Sluitstukkades Cluster E
 projectcode: STD88-2
 datum: 30 september 2013

Witteveen + Bos

gegevens**locatie**

dijkvak 50.320.4 DP 1

waterstanden

zichtperiode 50 jaar
 ontwerpwaterstand 42.97 m+NAP
 verwachte stijghoogte 42.97 m+NAP
 γ_w 10 kN/m³
 polderpeil 41.4 m+NAP

maaiveldniveau

mv (huidig) 41.4 m+NAP

sloot

d 41.4 m+NAP
 b 50 m
 talud 1:n 2 -
 B 50 m

effectieve laagdikte (Bijlage 1 van TR Waterspanningen bij dijken)

H1 2.00 m
 H2 2.00 m
 H3 -14.00 m
H 2.00 m 41.40 m +NAP

grondopbouw achterland

laag	grondsoort	van	tot	$y_{sat,d}$	y_d	d	y * d
1	Leem	41.4	39.4	19	19	2.0	38.0
2					0	0.0	0.0
3					0	0.0	0.0
4					0	0.0	0.0
5					0	0.0	0.0
6					0	0.0	0.0
onderkant lagenpakket		39.4 m+NAP					
gewicht bovenliggende lagen		38.0					
waterdruk watervoerend pakket		35.7					

resultaten

grenspotential 3.80 m
 grenspotential 43.20 m+NAP
 opbarstveiligheid 1.06 -

$$h_{z,s} = h_p + d \frac{\gamma_{sat} - \gamma_w}{\gamma_w}$$

Berekening opbarsten en piping/heave

project: Aanvulling Sluitstukkades Cluster E
 projectcode: STD88-2
 datum: 30 september 2013

Witteveen + Bos

gegevens**locatie**

dijkvak 50.320.4 DP 2

waterstanden

zichtperiode 50 jaar
 ontwerpwaterstand 42.97 m+NAP
 verwachte stijghoogte 42.97 m+NAP
 γ_w 10 kN/m³
 polderpeil 41 m+NAP

maaiveldniveau

mv (huidig) 41 m+NAP

sloot

d 41 m+NAP
 b 50 m
 talud 1:n 2 -
 B 50 m

effectieve laagdikte (Bijlage 1 van TR Waterspanningen bij dijken)

H1 1.60 m
 H2 1.60 m
 H3 -14.53 m
H 1.60 m 41.00 m +NAP

grondopbouw achterland

laag	grondsoort	van	tot	$y_{sat,d}$	y_d	d	y * d
1	Leem	41	39.4	19	19	1.6	30.4
2					0	0.0	0.0
3					0	0.0	0.0
4					0	0.0	0.0
5					0	0.0	0.0
6					0	0.0	0.0
onderkant lagenpakket		39.4 m+NAP					
gewicht bovenliggende lagen		30.4					
waterdruk watervoerend pakket		35.7					

resultaten

grenspotential 3.04 m
 grenspotential 42.44 m+NAP
 opbarstveiligheid 0.85 -

$$h_{z,s} = h_p + d \frac{\gamma_{sat} - \gamma_w}{\gamma_w}$$

Berekening opbarsten en piping/heave

project: Aanvulling Sluitstukkades Cluster E
 projectcode: STD88-2
 datum: 30 september 2013

Witteveen + Bos

gegevens**locatie**

dijkvak 50.320.4 DP 3

waterstanden

zichtperiode 50 jaar
 ontwerpwaterstand 42.97 m+NAP
 verwachte stijghoogte 42.97 m+NAP
 γ_w 10 kN/m³
 polderpeil 41.39 m+NAP

maaiveldniveau

mv (huidig) 41.39 m+NAP

sloot

d 41.39 m+NAP
 b 50 m
 talud 1:n 2 -
 B 50 m

effectieve laagdikte (Bijlage 1 van TR Waterspanningen bij dijken)

H1 1.99 m
 H2 1.99 m
 H3 -14.01 m
H 1.99 m 41.39 m +NAP

grondopbouw achterland

laag	grondsoort	van	tot	$y_{sat,d}$	y_d	d	y * d
1	Leem	41.39	39.4	19	19	2.0	37.8
2					0	0.0	0.0
3					0	0.0	0.0
4					0	0.0	0.0
5					0	0.0	0.0
6					0	0.0	0.0
onderkant lagenpakket		39.4 m+NAP					
gewicht bovenliggende lagen		37.8					
waterdruk watervoerend pakket		35.7					

resultaten

grenspotential 3.78 m
 grenspotential 43.18 m+NAP
 opbarstveiligheid 1.06 -

$$h_{z,s} = h_p + d \frac{\gamma_{sat} - \gamma_w}{\gamma_w}$$

Berekening opbarsten en piping/heave

project: Aanvulling Sluitstukkades Cluster E
 projectcode: STD88-2
 datum: 30 september 2013

Witteveen + Bos

gegevens**locatie**

dijkvak 50.320.5 DP 1

waterstanden

zichtperiode 50 jaar
 ontwerpwaterstand 42.77 m+NAP
 verwachte stijghoogte 42.77 m+NAP
 γ_w 10 kN/m³
 polderpeil 39.97 m+NAP

maaiveldniveau

mv (huidig) 39.97 m+NAP

sloot

d 39.97 m+NAP
 b 50 m
 talud 1:n 2 -
 B 50 m

effectieve laagdikte (Bijlage 1 van TR Waterspanningen bij dijken)

H1 1.47 m
 H2 1.47 m
 H3 -14.71 m
H 1.47 m 39.97 m +NAP

grondopbouw achterland

laag	grondsoort	van	tot	$y_{sat;d}$	y_d	d	y * d
1	Leem	39.97	38.5	19	19	1.5	27.9
2					0	0.0	0.0
3					0	0.0	0.0
4					0	0.0	0.0
5					0	0.0	0.0
6					0	0.0	0.0
onderkant lagenpakket		38.5 m+NAP					
gewicht bovenliggende lagen		27.9					
waterdruk watervoerend pakket		42.7					

resultaten

grenspotential 2.79 m
 grenspotential 41.29 m+NAP
 opbarstveiligheid 0.65 -

$$h_{z,s} = h_p + d \frac{\gamma_{sat} - \gamma_w}{\gamma_w}$$

Berekening opbarsten en piping/heave

project: Aanvulling Sluitstukkades Cluster E
 projectcode: STD88-2
 datum: 30 september 2013

Witteveen + Bos

gegevens**locatie**

dijkvak 50.320.5 DP 2

waterstanden

zichtperiode 50 jaar
 ontwerpwaterstand 42.77 m+NAP
 verwachte stijghoogte 42.77 m+NAP
 γ_w 10 kN/m³
 polderpeil 40.47 m+NAP

maaiveldniveau

mv (huidig) 40.47 m+NAP

sloot

d 40.47 m+NAP
 b 50 m
 talud 1:n 2 -
 B 50 m

effectieve laagdikte (Bijlage 1 van TR Waterspanningen bij dijken)

H1 1.97 m
 H2 1.97 m
 H3 -14.04 m
H 1.97 m 40.47 m +NAP

grondopbouw achterland

laag	grondsoort	van	tot	$y_{sat,d}$	y_d	d	y * d
1	Leem	40.47	38.5	19	19	2.0	37.4
2					0	0.0	0.0
3					0	0.0	0.0
4					0	0.0	0.0
5					0	0.0	0.0
6					0	0.0	0.0
onderkant lagenpakket		38.5 m+NAP					
gewicht bovenliggende lagen		37.4					
waterdruk watervoerend pakket		42.7					

resultaten

grenspotential 3.74 m
 grenspotential 42.24 m+NAP
 opbarstveiligheid 0.88 -

$$h_{z,s} = h_p + d \frac{\gamma_{sat} - \gamma_w}{\gamma_w}$$

Berekening opbarsten en piping/heave

project: Aanvulling Sluitstukkades Cluster E
 projectcode: STD88-2
 datum: 30 september 2013

Witteveen + Bos

gegevens**locatie**

dijkvak 50.320.6 DP 1

waterstanden

zichtperiode 50 jaar
 ontwerpwaterstand 42.64 m+NAP
 verwachte stijghoogte 42.64 m+NAP
 y_w 10 kN/m³
 polderpeil 41.39 m+NAP

maaiveldniveau

mv (huidig) 41.39 m+NAP

sloot

d 41.39 m+NAP
 b 50 m
 talud 1:n 2 -
 B 50 m

effectieve laagdikte (Bijlage 1 van TR Waterspanningen bij dijken)

H1 3.19 m
 H2 3.19 m
 H3 -12.41 m
H 3.19 m 41.39 m +NAP

grondopbouw achterland

laag	grondsoort	van	tot	$y_{sat,d}$	y_d	d	$y * d$
1	Leem	41.39	38.2	19	19	3.2	60.6
2					0	0.0	0.0
3					0	0.0	0.0
4					0	0.0	0.0
5					0	0.0	0.0
6					0	0.0	0.0
onderkant lagenpakket		38.2 m+NAP					
gewicht bovenliggende lagen		60.6					
waterdruk watervoerend pakket		44.4					

resultaten

grenspotential 6.06 m
 grenspotential 44.26 m+NAP
 opbarstveiligheid 1.37 -

$$h_{z,s} = h_p + d \frac{\gamma_{sat} - \gamma_w}{\gamma_w}$$

Berekening opbarsten en piping/heave

project: Aanvulling Sluitstukkades Cluster E
 projectcode: STD88-2
 datum: 30 september 2013

Witteveen + Bos

gegevens**locatie**

dijkvak 50.320.6 DP 2

waterstanden

zichtperiode 50 jaar
 ontwerpwaterstand 42.64 m+NAP
 verwachte stijghoogte 42.64 m+NAP
 γ_w 10 kN/m³
 polderpeil 41.08 m+NAP

maaiveldniveau

mv (huidig) 41.08 m+NAP

sloot

d 41.08 m+NAP
 b 50 m
 talud 1:n 2 -
 B 50 m

effectieve laagdikte (Bijlage 1 van TR Waterspanningen bij dijken)

H1 2.88 m
 H2 2.88 m
 H3 -12.83 m
H 2.88 m 41.08 m +NAP

grondopbouw achterland

laag	grondsoort	van	tot	$y_{sat,d}$	y_d	d	$y * d$
1	Leem	41.08	38.2	19	19	2.9	54.7
2					0	0.0	0.0
3					0	0.0	0.0
4					0	0.0	0.0
5					0	0.0	0.0
6					0	0.0	0.0
onderkant lagenpakket		38.2 m+NAP					
gewicht bovenliggende lagen		54.7					
waterdruk watervoerend pakket		44.4					

resultaten

grenspotential 5.47 m
 grenspotential 43.67 m+NAP
 opbarstveiligheid 1.23 -

$$h_{z,s} = h_p + d \frac{\gamma_{sat} - \gamma_w}{\gamma_w}$$

Berekening opbarsten en piping/heave

project: Aanvulling Sluitstukkades Cluster E
 projectcode: STD88-2
 datum: 30 september 2013

Witteveen + Bos

gegevens**locatie**

dijkvak 50.320.6 DP 3

waterstanden

zichtperiode 50 jaar
 ontwerpwaterstand 42.64 m+NAP
 verwachte stijghoogte 42.64 m+NAP
 γ_w 10 kN/m³
 polderpeil 41.2 m+NAP

maaiveldniveau

mv (huidig) 41.2 m+NAP

sloot

d 41.2 m+NAP
 b 50 m
 talud 1:n 2 -
 B 50 m

effectieve laagdikte (Bijlage 1 van TR Waterspanningen bij dijken)

H1 3.00 m
 H2 3.00 m
 H3 -12.67 m
H 3.00 m 41.20 m +NAP

grondopbouw achterland

laag	grondsoort	van	tot	$y_{sat,d}$	y_d	d	y * d
1	Leem	41.2	38.2	19	19	3.0	57.0
2					0	0.0	0.0
3					0	0.0	0.0
4					0	0.0	0.0
5					0	0.0	0.0
6					0	0.0	0.0
onderkant lagenpakket		38.2 m+NAP					
gewicht bovenliggende lagen		57.0					
waterdruk watervoerend pakket		44.4					

resultaten

grenspotential 5.70 m
 grenspotential 43.90 m+NAP
 opbarstveiligheid 1.28 -

$$h_{z,s} = h_p + d \frac{\gamma_{sat} - \gamma_w}{\gamma_w}$$

Berekening opbarsten en piping/heave

project: Aanvulling Sluitstukkades Cluster E
 projectcode: STD88-2
 datum: 30 september 2013

Witteveen + Bos

gegevens**locatie**

dijkvak 50.320.6 DP 4

waterstanden

zichtperiode 50 jaar
 ontwerpwaterstand 42.64 m+NAP
 verwachte stijghoogte 42.64 m+NAP
 γ_w 10 kN/m³
 polderpeil 40.51 m+NAP

maaiveldniveau

mv (huidig) 40.51 m+NAP

sloot

d 40.51 m+NAP
 b 50 m
 talud 1:n 2 -
 B 50 m

effectieve laagdikte (Bijlage 1 van TR Waterspanningen bij dijken)

H1 2.31 m
 H2 2.31 m
 H3 -13.59 m
H 2.31 m 40.51 m +NAP

grondopbouw achterland

laag	grondsoort	van	tot	$y_{sat,d}$	y_d	d	y * d
1	Leem	40.51	38.2	19	19	2.3	43.9
2					0	0.0	0.0
3					0	0.0	0.0
4					0	0.0	0.0
5					0	0.0	0.0
6					0	0.0	0.0
onderkant lagenpakket		38.2 m+NAP					
gewicht bovenliggende lagen		43.9					
waterdruk watervoerend pakket		44.4					

resultaten

grenspotential 4.39 m
 grenspotential 42.59 m+NAP
 opbarstveiligheid 0.99 -

$$h_{z,s} = h_p + d \frac{\gamma_{sat} - \gamma_w}{\gamma_w}$$

Berekening opbarsten en piping/heave

project: Aanvulling Sluitstukkades Cluster E
 projectcode: STD88-2
 datum: 30 september 2013

Witteveen + Bos

gegevens**locatie**

dijkvak 50.320.9 DP 1

waterstanden

zichtperiode 50 jaar
 ontwerpwaterstand 42.43 m+NAP
 verwachte stijghoogte 42.43 m+NAP
 γ_w 10 kN/m³
 polderpeil 40.85 m+NAP

maaiveldniveau

mv (huidig) 40.85 m+NAP

sloot

d 40.85 m+NAP
 b 50 m
 talud 1:n 2 -
 B 50 m

effectieve laagdikte (Bijlage 1 van TR Waterspanningen bij dijken)

H1 1.85 m
 H2 1.85 m
 H3 -14.20 m
H 1.85 m 40.85 m +NAP

grondopbouw achterland

laag	grondsoort	van	tot	$y_{sat,d}$	y_d	d	y * d
1	Leem	40.85	39	19	19	1.9	35.2
2					0	0.0	0.0
3					0	0.0	0.0
4					0	0.0	0.0
5					0	0.0	0.0
6					0	0.0	0.0
onderkant lagenpakket		39 m+NAP					
gewicht bovenliggende lagen		35.2					
waterdruk watervoerend pakket		34.3					

resultaten

grenspotential 3.52 m
 grenspotential 42.52 m+NAP
 opbarstveiligheid 1.02 -

$$h_{z,s} = h_p + d \frac{\gamma_{sat} - \gamma_w}{\gamma_w}$$

Berekening opbarsten en piping/heave

project: Aanvulling Sluitstukkades Cluster E
projectcode: STD88-2
datum: 30 september 2013

Witteveen + Bos

gegevens**locatie**

dijkvak 50.320.10 DP 1

waterstanden

zichtperiode 50 jaar
ontwerpwaterstand 42.44 m+NAP
verwachte stijghoogte 42.44 m+NAP
 y_w 10 kN/m³
polderpeil 40.85 m+NAP

maaiveldniveau

mv (huidig) 40.85 m+NAP

sloot

d 40.85 m+NAP
b 50 m
talud 1:n 2 -
B 50 m

effectieve laagdikte (Bijlage 1 van TR Waterspanningen bij dijken)

H1 1.85 m
H2 1.85 m
H3 -14.20 m
H 1.85 m 40.85 m +NAP

grondopbouw achterland

laag	grondsoort	van	tot	$y_{sat,d}$	y_d	d	$y * d$
1	Leem	40.85	39	19	19	1.9	35.2
2					0	0.0	0.0
3					0	0.0	0.0
4					0	0.0	0.0
5					0	0.0	0.0
6					0	0.0	0.0
onderkant lagenpakket		39 m+NAP					
gewicht bovenliggende lagen		35.2					
waterdruk watervoerend pakket		34.4					

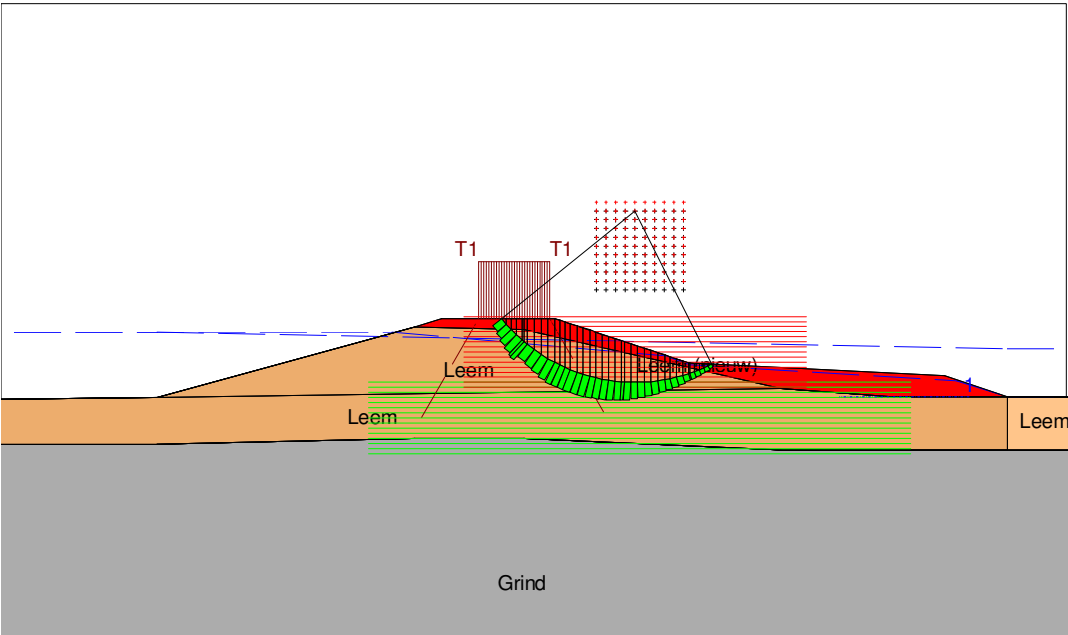
resultaten

grenspotential 3.52 m
grenspotential 42.52 m+NAP
opbarstveiligheid 1.02 -

$$h_{z,s} = h_p + d \frac{\gamma_{sat} - \gamma_w}{\gamma_w}$$

BIJLAGE VI BEREKENINGEN STABILITEIT BINNENWAARTS (STBI)

Shear Stress Bishop



Xm : 7.76 [m]
Ym : 47.99 [m]

Radius : 6.02 [m]
Safety : 1.18

Max. stress : 8.043 [kN/m²]
Min. stress : 1.112 [kN/m²]

Materials

	Leem (nieuw)
	Leem (0)
	Leem
	Grind

Bos Witteveen +

Postbus 233	Phone	0570 697511
7400 AE Deventer	Fax	0570 697123

D-Geo Stability 10.1 : Dijkring 88 Geulle aan de Maas 50.320. 2 Dwarsprofiel 1 - Bishop - zone 1, stl

date
08-10-2013

drv.	
-	
ctr.	

Sluitstukkaden Cluster E

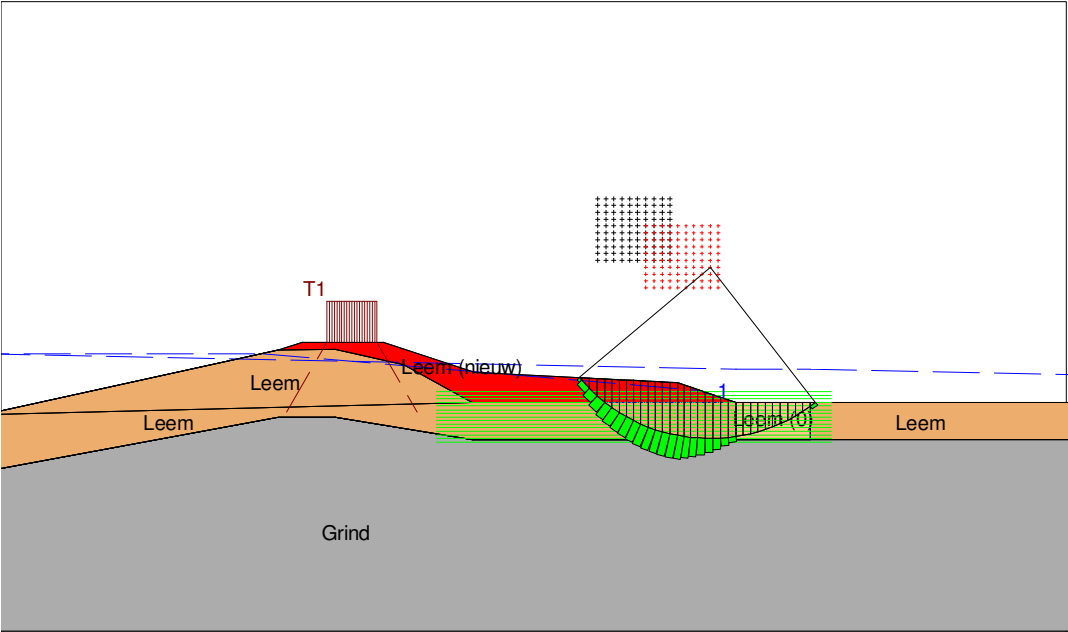
DO Dijkkring 88 - Geulle aan de Maas (50.320.2)

dwp 1 - Bishop (zone 1)

Annex

form.
A4

Shear Stress Bishop



Xm : 21.37 [m]
Ym : 48.02 [m]

Radius : 8.48 [m]
Safety : 1.09

Max. stress : 7.172 [kN/m²]
Min. stress : 0.000 [kN/m²]

Bos  **Witteveen**

Postbus 233	Phone	0570 697511
7400 AE Deventer	Fax	0570 697123

Phone	0570 697511
Fax	0570 697123

D-Geo Stabily 10.1 : Dijkring 88 Geulle aan de Maas 50.320. 3 Dwarsprofiel 1 - Bishop - zone 2,sti

date
08-10-2013

495

Sluitstukkaden Cluster E

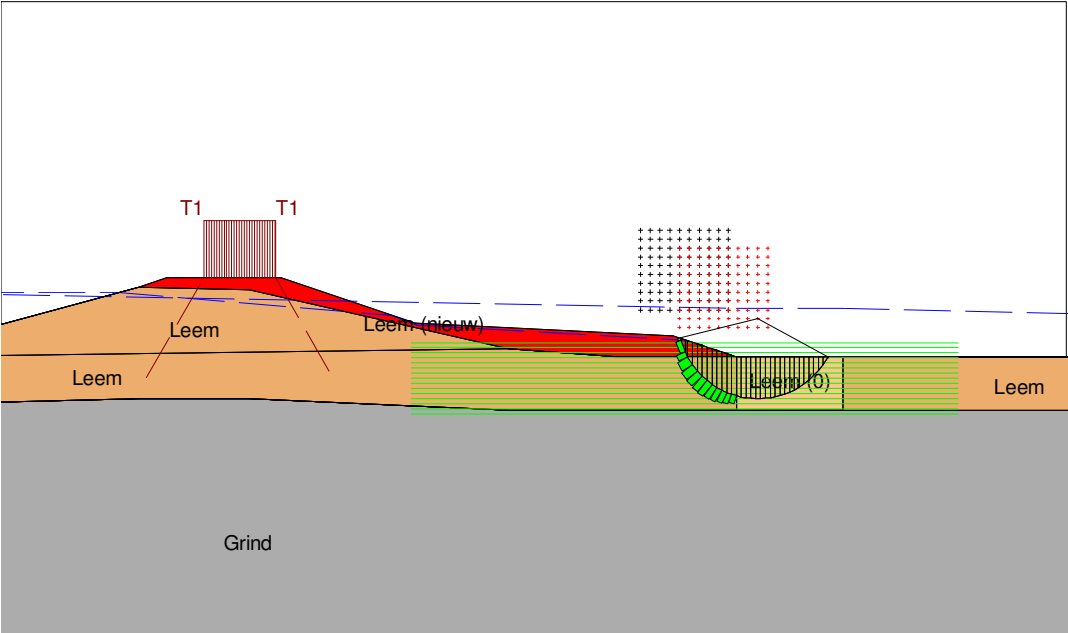
DO Dijkring 88 - Geulle aan de Maas (50.320.3)

dwp 1 - Bishop (zone 2)

Annex

A4

Shear Stress Bishop



Xm : 21.60 [m]
Ym : 42.80 [m]

Radius : 2.79 [m]
Safety : 0.51

Max. stress : 3.416 [kN/m²]
Min. stress : 0.000 [kN/m²]

Bos Witeveen +

Postbus 233	Phone	0570 697511
7400 AE Deventer	Fax	0570 697122

08-10-2013

Sluitstukaden Cluster E

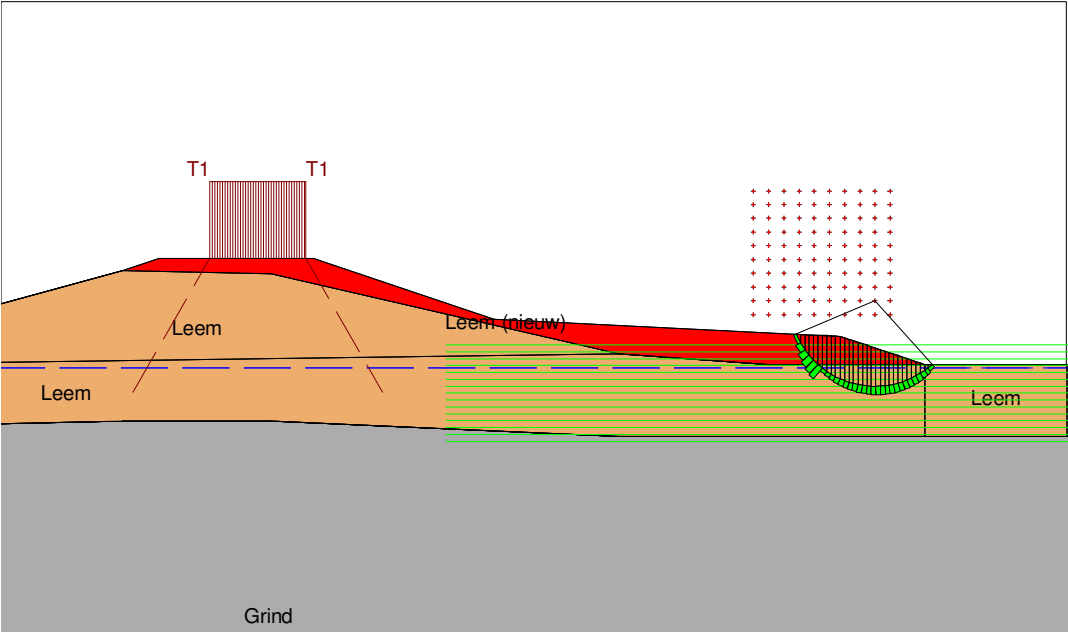
DO Dijkring 88 - Geulle aan de Maas (50.320.2)

dwp 1 - Bishop (zone 3)

Annex

A4

Shear Stress Bishop



Xm : 19.55 [m]
Ym : 43.13 [m]

Radius : 2.23 [m]
Safety : 1.37

Max. stress : 4.292 [kN/m²]
Min. stress : 0.762 [kN/m²]

Bos  **Witteveen +**

Postbus 233	Phone	0570 697511
7400 AE Deventer	Fax	0570 697123

date
08-10-2013

Sluitstukaden Cluster E

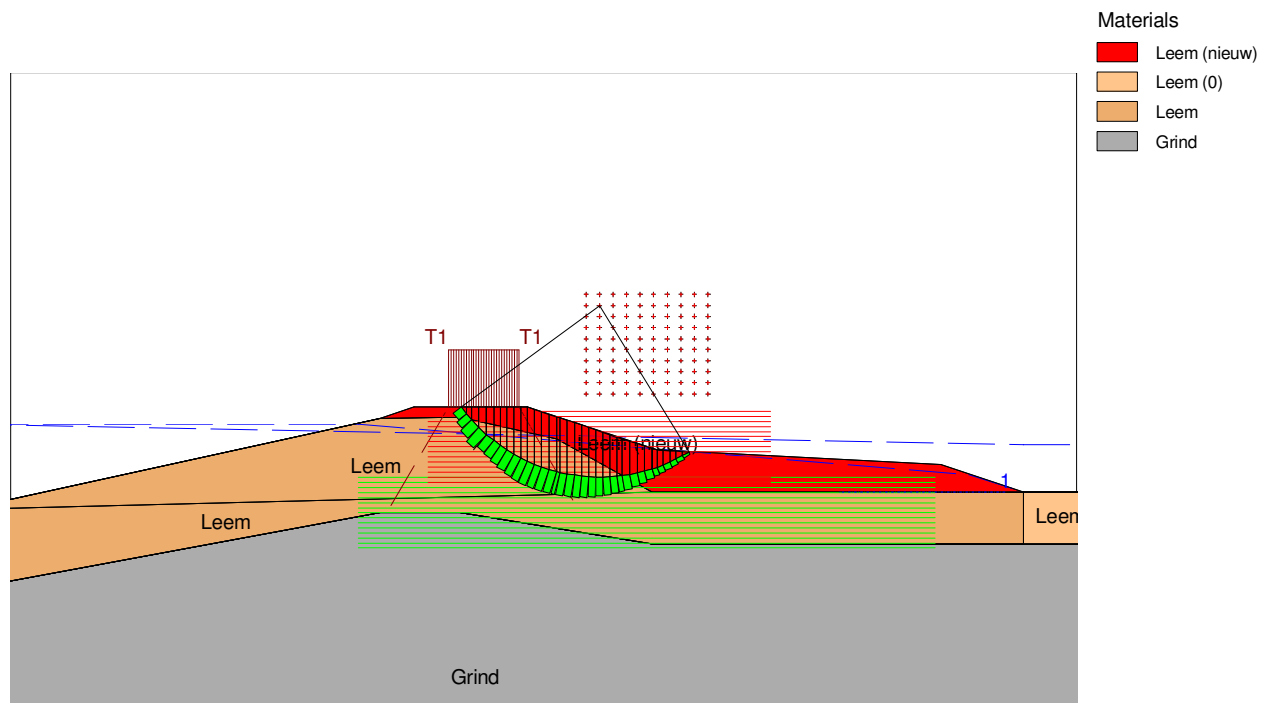
DO Dijkring 88 - Geulle aan de Maas (50.320.2)

dwp 1 - Bishop (uitvoeringstase)

Anne

A4

Shear Stress Bishop



Xm : 7.73 [m]
Ym : 47.89 [m]

Radius : 6.04 [m]
Safety : 1.27

Max. stress : 8.908 [kN/m²]
Min. stress : 1.063 [kN/m²]

Witteveen - Bos

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1

Sluitstukkaden Cluster E

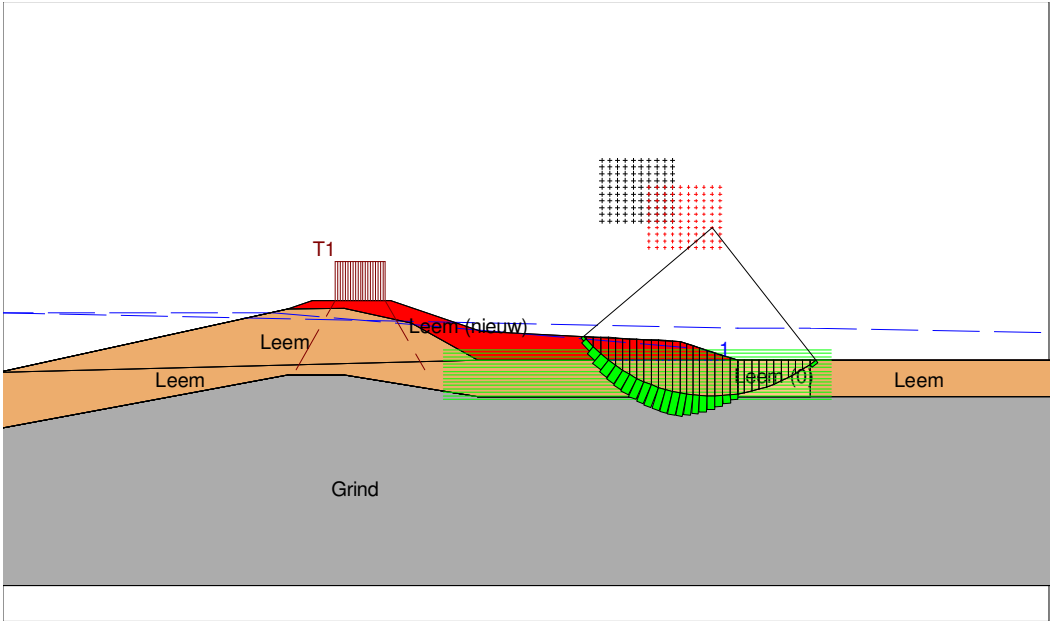
DO Dijkring 88 - Geulle aan de Maas (50.320.3)

dwp 1 - Bishop (zone 1)

Annex

form.
A4

Shear Stress Bishop



Xm : 21.37 [m]
Ym : 48.02 [m]

Radius : 8.48 [m]
Safety : 1.09

Max. stress : 7.172 [kN/m²]
Min. stress : 0.000 [kN/m²]

Witteveen + Bos

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D-Geo Stability 10.1 : Dijkring 88 Geulle aande Maas 50.320.3 Dwaarsprofiel 1 - Bishop - zone 2, st

date
08-10-2013

drw.

Sluitstukken Cluster E

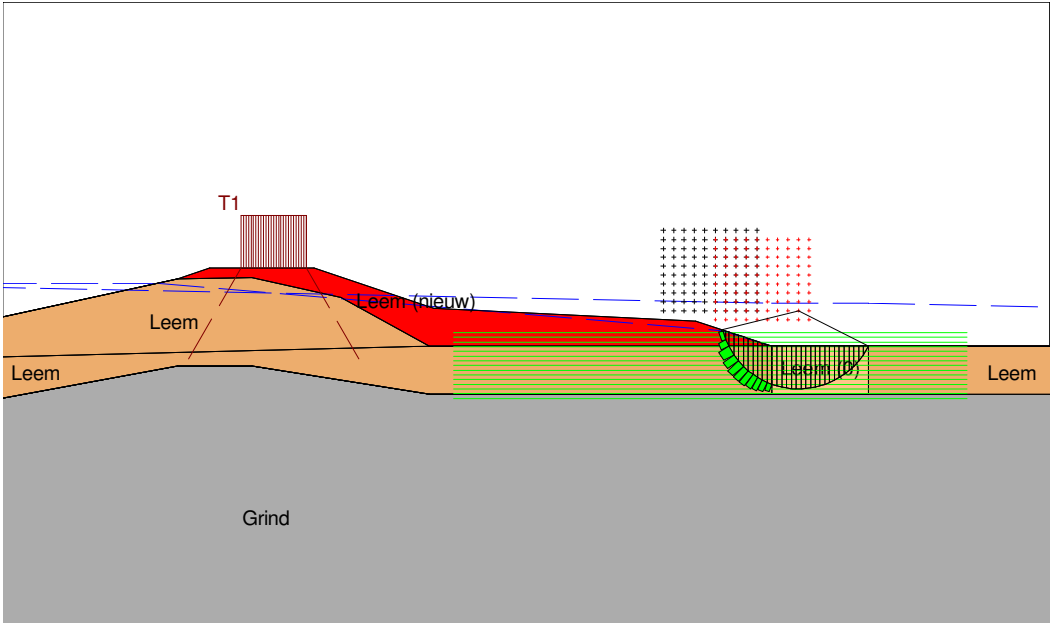
DO Dijkring 88 - Geulle aan de Maas (50.320.3)

dwp 1 - Bishop (zone 2)

Anne

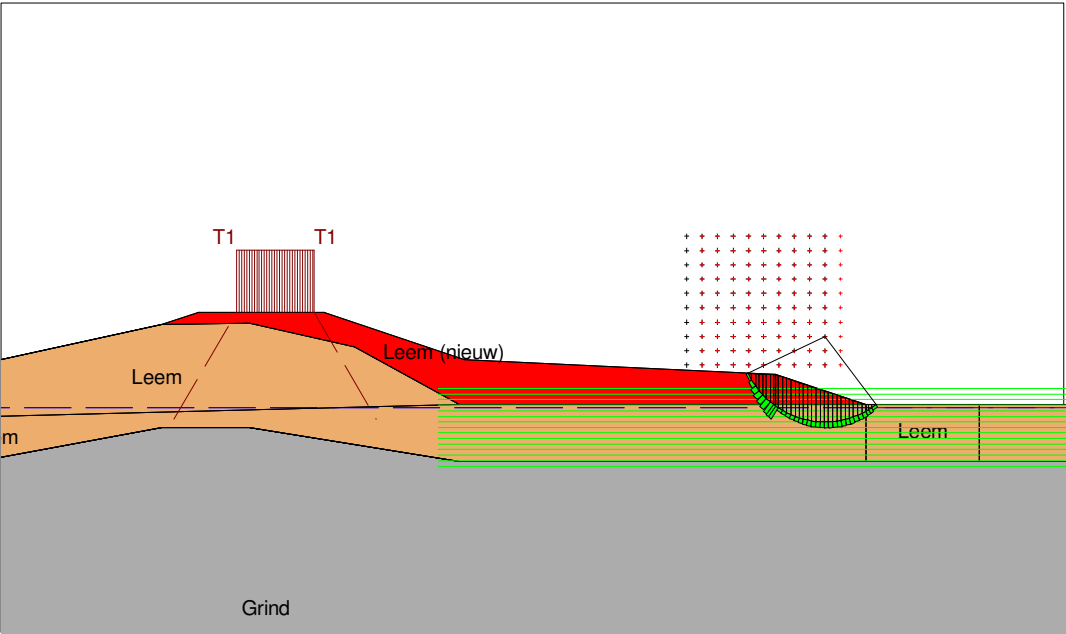
A4

Shear Stress Bishop



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Sluistukkaden Cluster E DO Dijkkring 88 - Geulle aan de Maas (50.320.3) dwp 1 - Bishop (zone 3)		-		df.	term. A4

Shear Stress Bishop


$$\begin{aligned} X_m &: 21.34 \text{ [m]} \\ Y_m &: 43.54 \text{ [m]} \end{aligned}$$

Radius : 2.75 [m]
Safety : 1.19

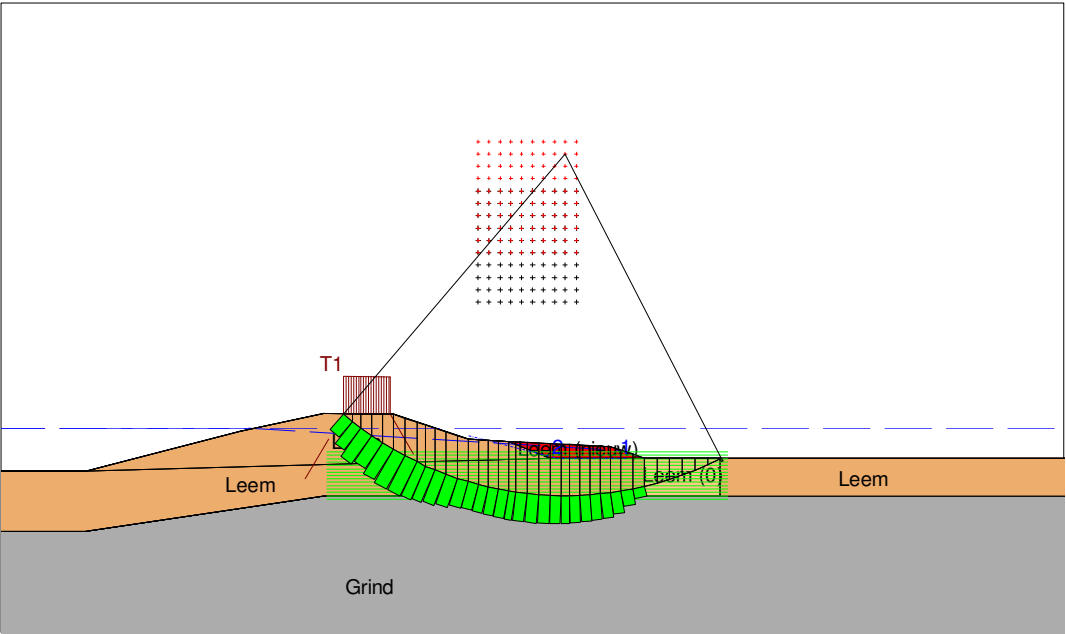
Max. stress : 6.248 [kN/m²]
Min. stress : 0.848 [kN/m²]

Materials

	Leem (nieuw)
	Leem
	Grind

Bos Pastus 233 7400 AE Deventer		Phone 0570 697511 Fax 0570 697123		dtd 08-10-2013		d.w. -	
Sluistukkaden Cluster E DO Dijkring 88 - Geulle aan de Maas (50.320.3) dwp 1 - Bishop (uitvoeringsfase)				-		d.f. -	
				Annex -		A4	

Shear Stress Bishop


$$\begin{aligned} X_m &: 12.81 \text{ [m]} \\ Y_m &: 57.51 \text{ [m]} \end{aligned}$$

Radius : 18.11 [m]
Safety : 1.36

Max. stress : 8.224 [kN/m²]
Min. stress : 0.000 [kN/m²]

Materials

-  Leem (nieuw)
-  Leem (0)
-  Leem
-  Grind

Bos Witteveen +

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Phone	0570 697511
Fax	0570 697123

D-Geo Stabiility 10.1 : Dijkring 88 Geulle aande Maas 50.320.4 Dwarsprofiel 1 - Bishop - zone 1.st

08-10-20

1

Sluitstukkaden Cluster E

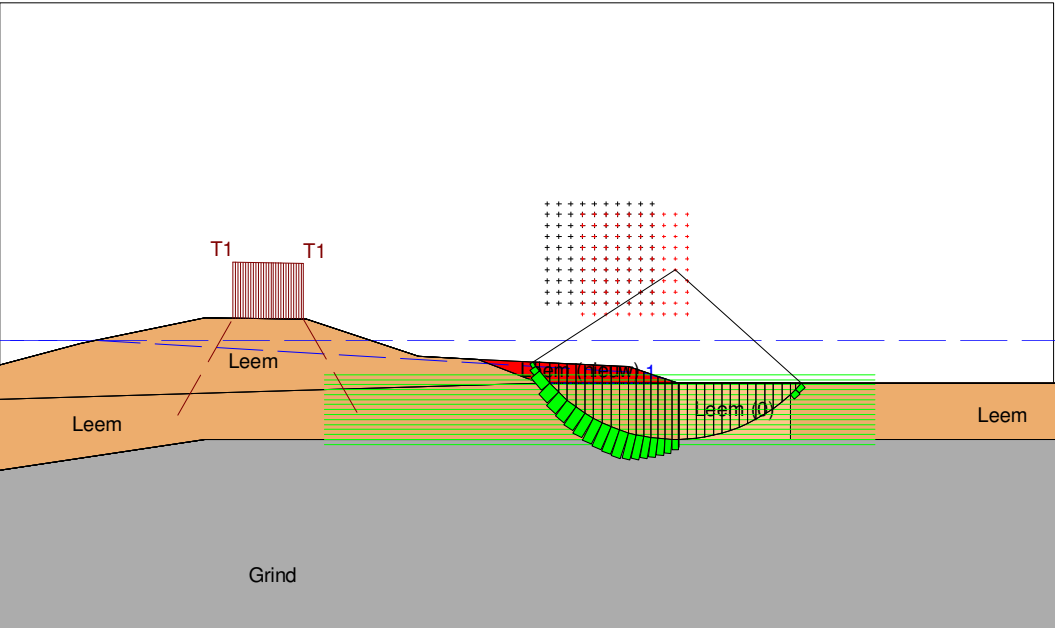
DO Dijkring 88 - Geulle aan de Maas (50.320.4)

dwp 1 - Bishop (zone 1)

Annex

A2

Shear Stress Bishop


$$\begin{aligned} X_m &: 16.89 \text{ [m]} \\ Y_m &: 45.47 \text{ [m]} \end{aligned}$$

Radius : 6.08 [m]
Safety : 1.10

Max. stress : 5.379 [kN/m²]
Min. stress : 0.000 [kN/m²]

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D-Geo Stabily 10.1 : Dijkring 88 Geulle aande Maas 50.320.4 Dwaarsprofiel 1 - Bishop - zone 2.st

date
08-10-2013

draw.

Sluistukkaden Cluster E

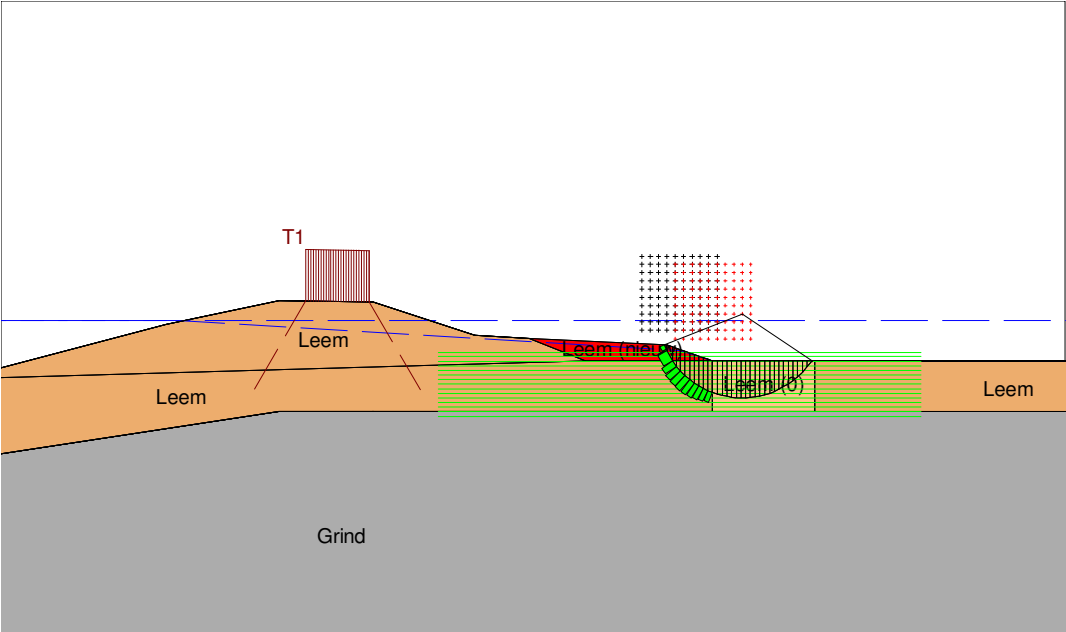
DO Dijkkring 88 - Geulle aan de Maas (50.320.4)

dwp 1 - Bishop (zone 2)

Annex -

form
A4

Shear Stress Bishop



Radius : 3.29 [m]
Safety : 0.65

Max. stress : 3.009 [kN/m²]
Min. stress : 0.000 [kN/m²]

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date
08-10-2013

1

Sluitstukkaden Cluster E

DO Dijkring 88 - Geulle aan de Maas (50.320.4)

dwp 1 - Bishop (zone 3)

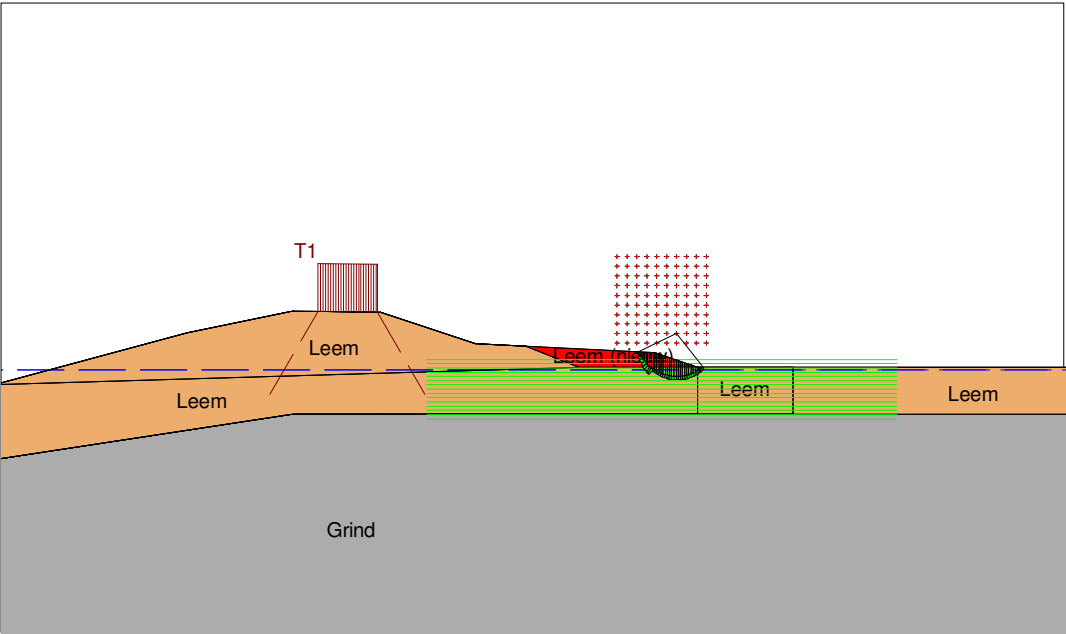
Annex

A4

Shear Stress Bishop

Materials

-  Leem (nieuw)
 Leem
 Grind



Xm : 16.13 [m]
Ym : 42.80 [m]

Radius : 1.80 [m]
Safety : 1.49

Max. stress : 3.597 [kN/m²]
Min. stress : 0.621 [kN/m²]

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Sluitstukkaden Cluster E

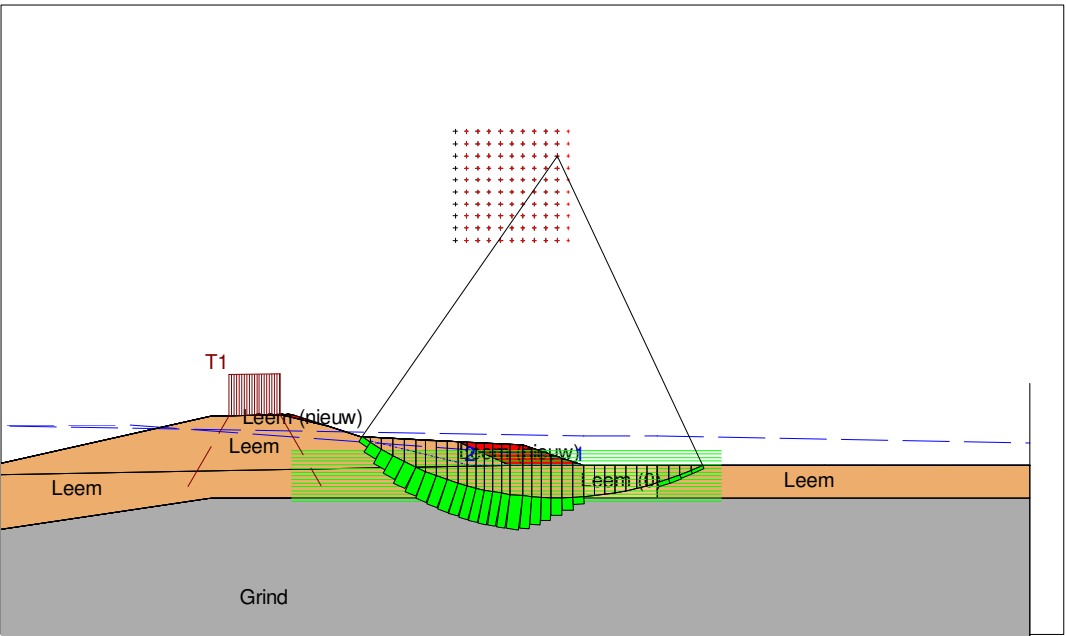
DO Dijkring 88 - Geulle aan de Maas (50.320.4)

dwp 1 - Bishop (uitvoeringsfase)

Annex -

form
Az

Shear Stress Bishop



Xm : 16.90 [m]
Ym : 56.13 [m]

Radius : 16.71 [m]
Safety : 1.54

Max. stress : 5.621 [kN/m²]
Min. stress : 0.000 [kN/m²]

Materials

-  Leem (nieuw)
-  Leem (0)
-  Leem
-  Grind

Bos Witteveen +

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D-Geo Stability 10.1 : Dijkring 88 Geulle aande Maas 50.320.4 Dwarsprofiel 2 - Bishop - zone 1, sit

date
08-10-2013

draw.

Sluitstukkaden Cluster E

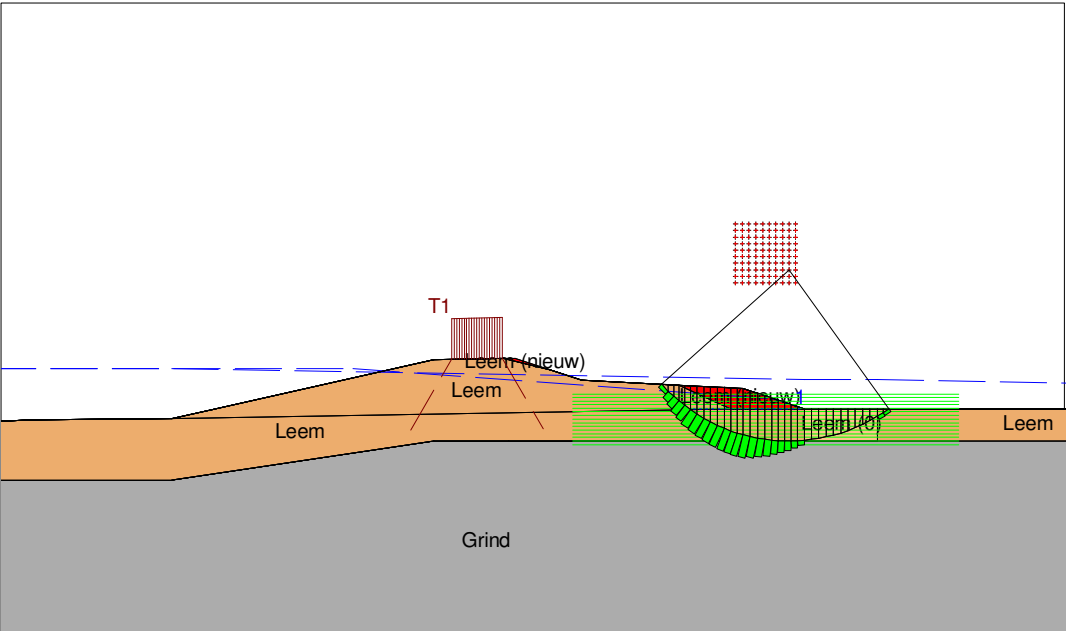
DO Dijkring 88 - Geulle aan de Maas (50.320.4)

dwp 2 - Bishop (zone 1)

Annex

form
A4

Shear Stress Bishop



Xm : 17.46 [m]
Ym : 47.83 [m]

Radius : 8.41 [m]
Safety : 1.10

Max. stress : 6.979 [kN/m²]
Min. stress : 0.000 [kN/m²]

Materials

	Leem (nieuw)
	Leem (0)
	Leem
	Grind

Bos Witteveen +

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1

Sluitstukkaden Cluster E

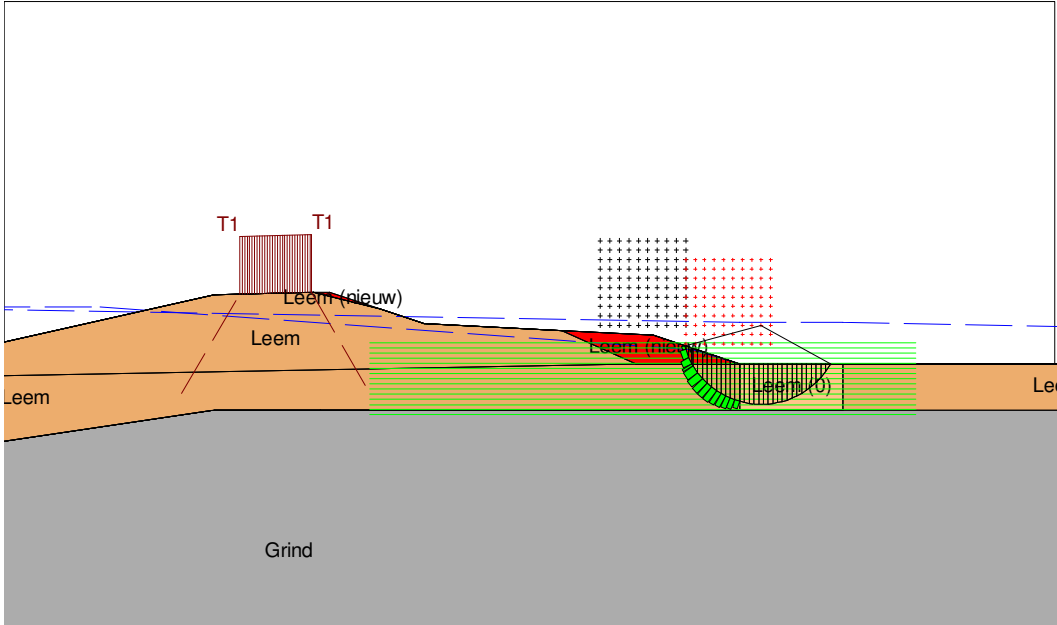
DO Dijkring 88 - Geulle aan de Maas (50.320.4)

dwp 2 - Bishop (zone 2)

Annex

form
A4

Shear Stress Bishop



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	08-10-2013	dw.		
Sluistukkaden Cluster E DO Dijkring 88 - Geulle aan de Maas (50.320.4)		-	cd.	
dwp 2 - Bishop (zone 3)	Annex -	form.		
	A4			

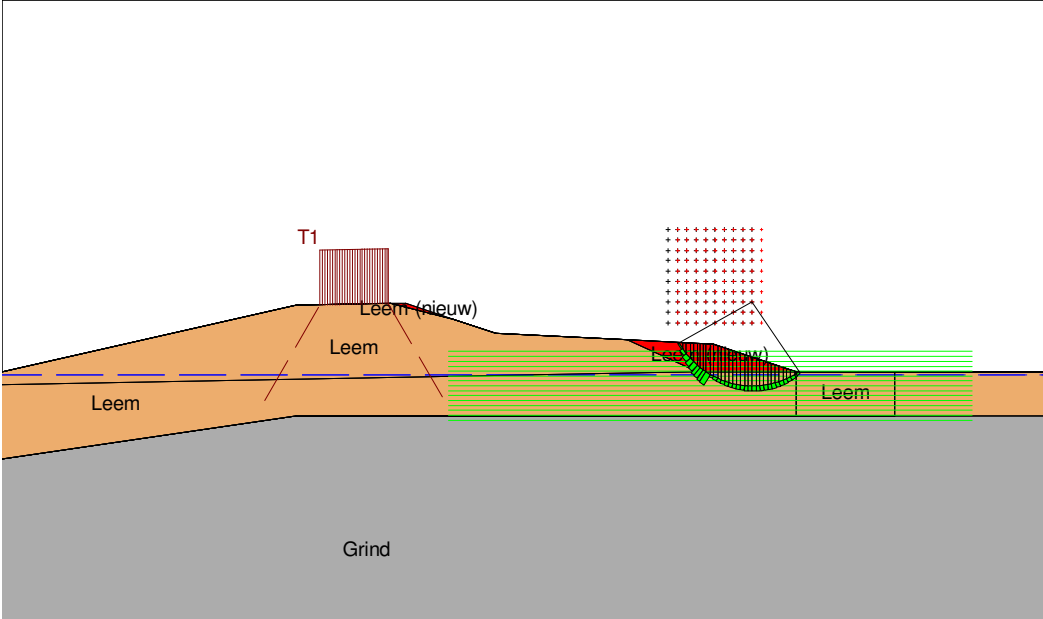
Shear Stress Bishop

Materials

☐ Leem (nieuw)

Leerm

 Grind



Xm : 16.61 [m]
Ym : 43.54 [m]

Radius : 3.05 [m]
Safety : 1.17

Max. stress : 6.634 [kN/m²]
Min. stress : 0.893 [kN/m²]

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Sluitstukkaden Cluster E

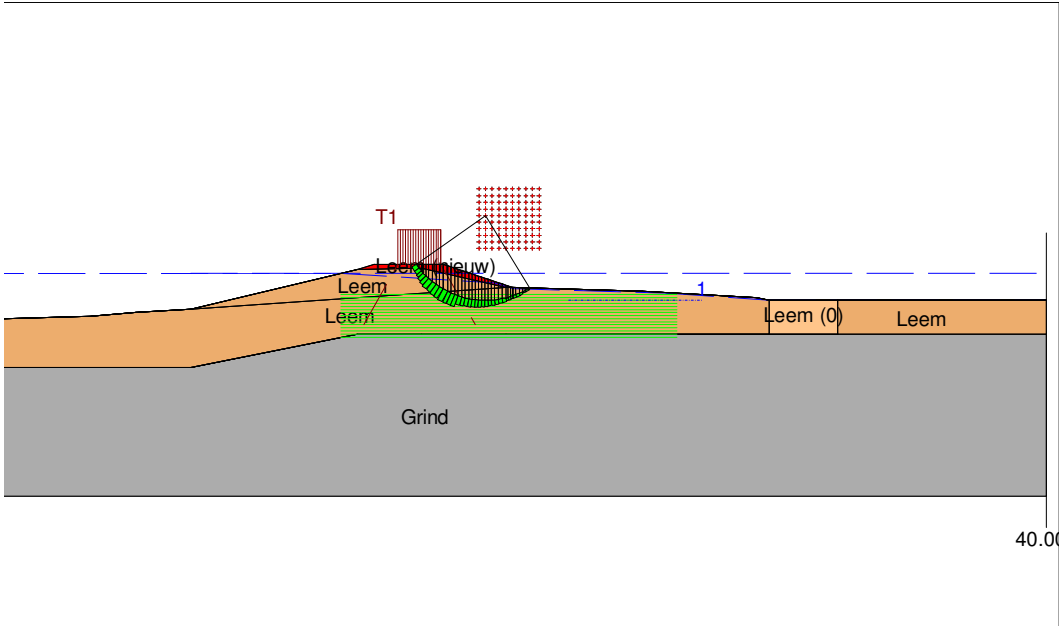
DO Dijkkring 88 - Geulle aan de Maas (50.320.4)

dwp 2 - Bishop (uitvoeringstase)

Annex

A4

Shear Stress Bishop



Xm : 7.42 [m]
Ym : 46.32 [m]

Radius : 4.93 [m]
Safety : 1.27

Max. stress : 9.073 [kN/m²]
Min. stress : 0.962 [kN/m²]

Materials

-  Leem (nieuw)
 Leem (0)
 Leem
 Grind

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D-Geo Stability 10.1 : Dijkring 88 Geulle aan de Maas 50.320.4 Dwarsprofiel 3 - Bishop - zone 1, st

date
08-10-2013

drw.

Sluitstukaden Cluster E

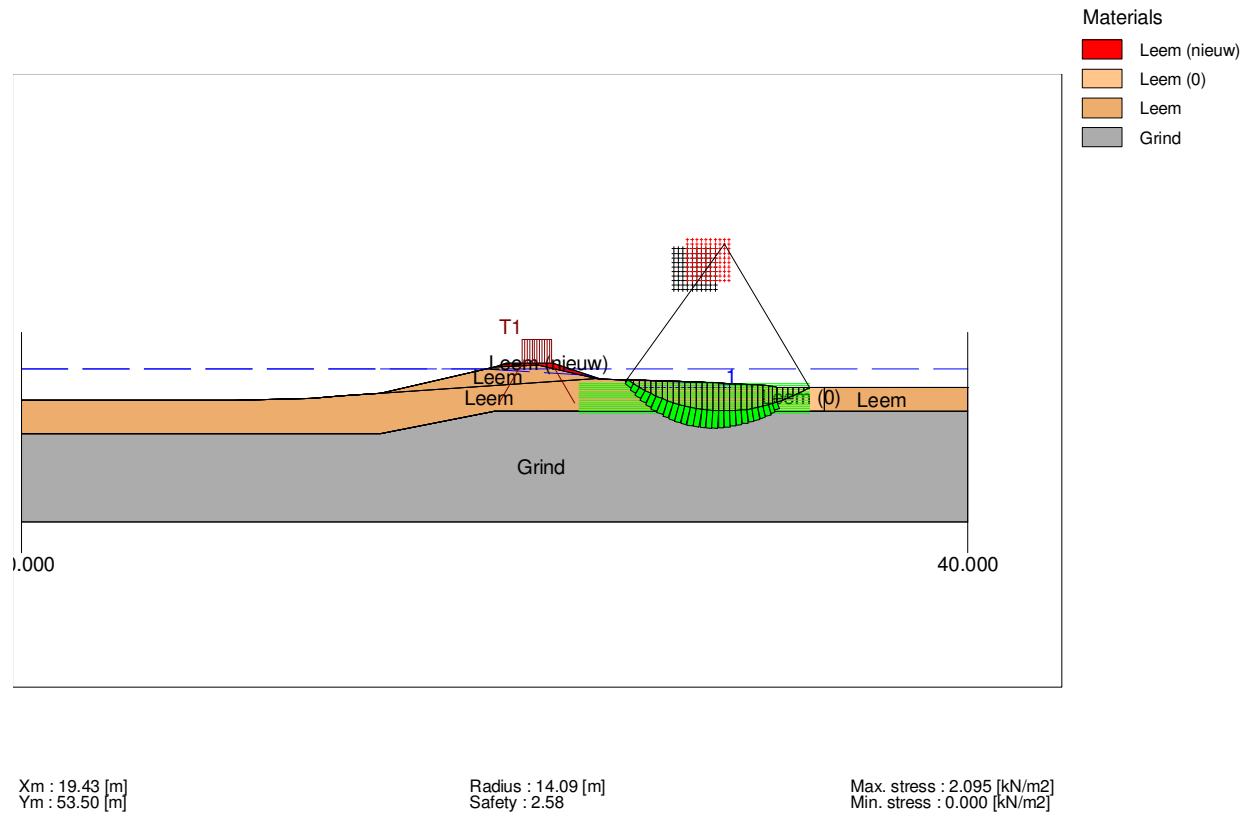
DO Dijkkring 88 - Geulle aan de Maas (50.320.4)

dwp 3 - Bishop (zone 1)

Annex

form.
A4

Shear Stress Bishop



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drw.

Sluitstukkaden Cluster E

DO Dijkring 88 - Geulle aan de Maas (50.320.4)

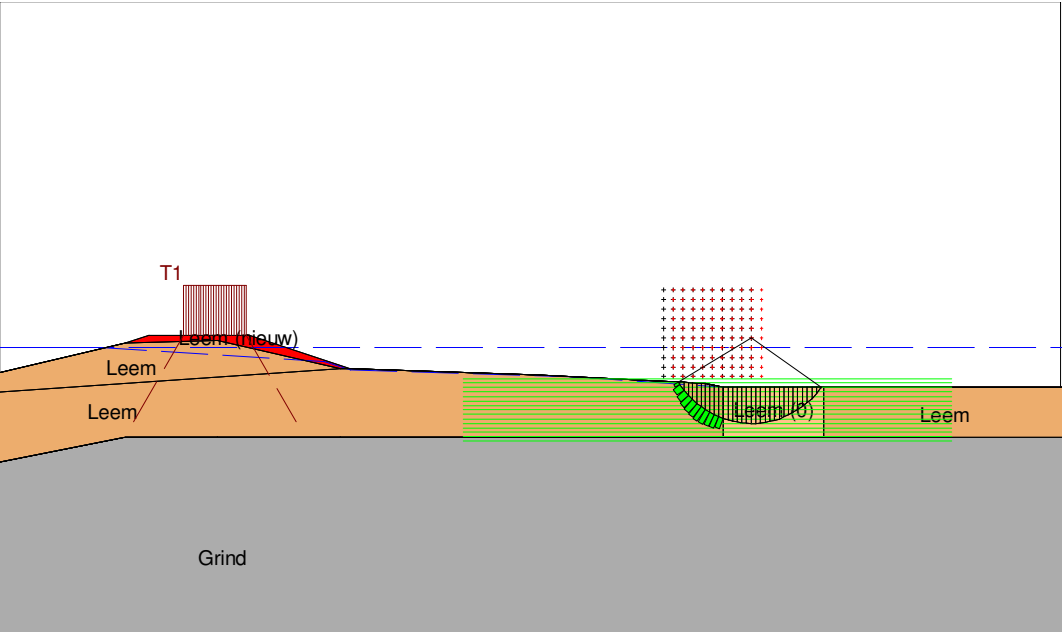
dwp 3 - Bishop (zone 2)

Annex

A4

D-Geo Stability 10.1 : Dijkring 88 Geulle aan de Maas 50.320.4 Dwarsprofiel 3 - Bishop - zone 2.sit

Shear Stress Bishop



Xm : 25.02 [m]
Ym : 43.36 [m]

Radius : 3.41 [m]
Safety : 1.28

Max. stress : 1.488 [kN/m²
Min. stress : 0.000 [kN/m²]

Materials

	Leem (nieuw)
	Leem (0)
	Leem
	Grind

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D-Geo Stability 10.1 : Dijkring 88 Geulle aande Maas 50.320.4 Dwarsprofiel 3 - Bishop - zone 3, sti

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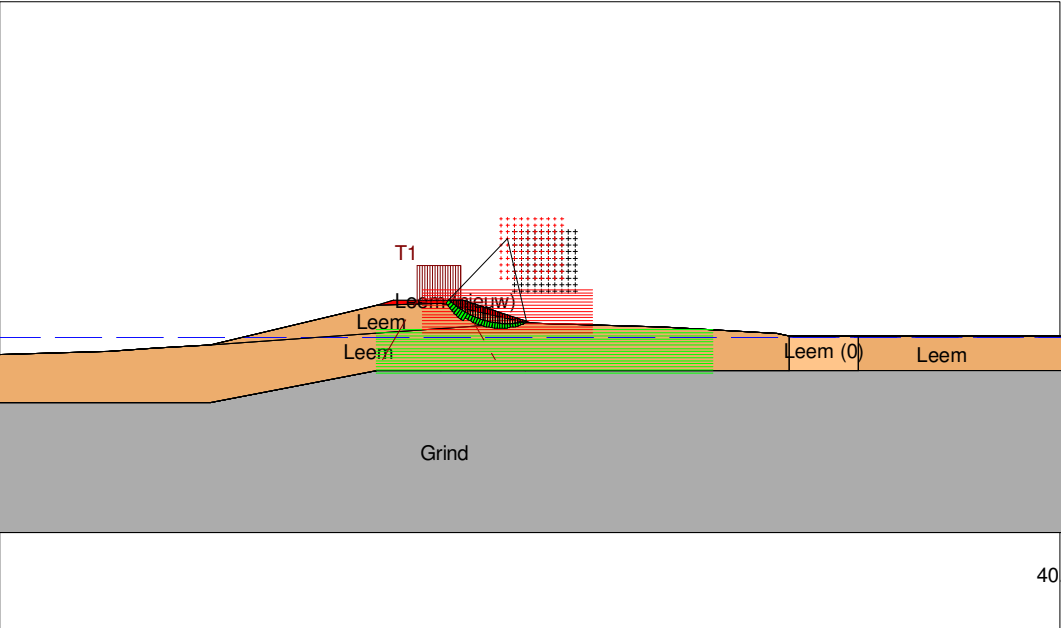
ctr.

Sluistukkaden Cluster E
DO Dijkring 88 - Geulle aan de Maas (50.320.4)
dwp 3 - Bishop (zone 3)

Annex -	A4
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A4

Shear Stress Bishop



Xm : 7.58 [m]
Ym : 47.03 [m]

Radius : 4.94 [m]
Safety : 1.63

Max. stress : 5.696 [kN/m²]
Min. stress : 0.671 [kN/m²]

40

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date
08-10-2013

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ctr.	

Sluitstukken Cluster E

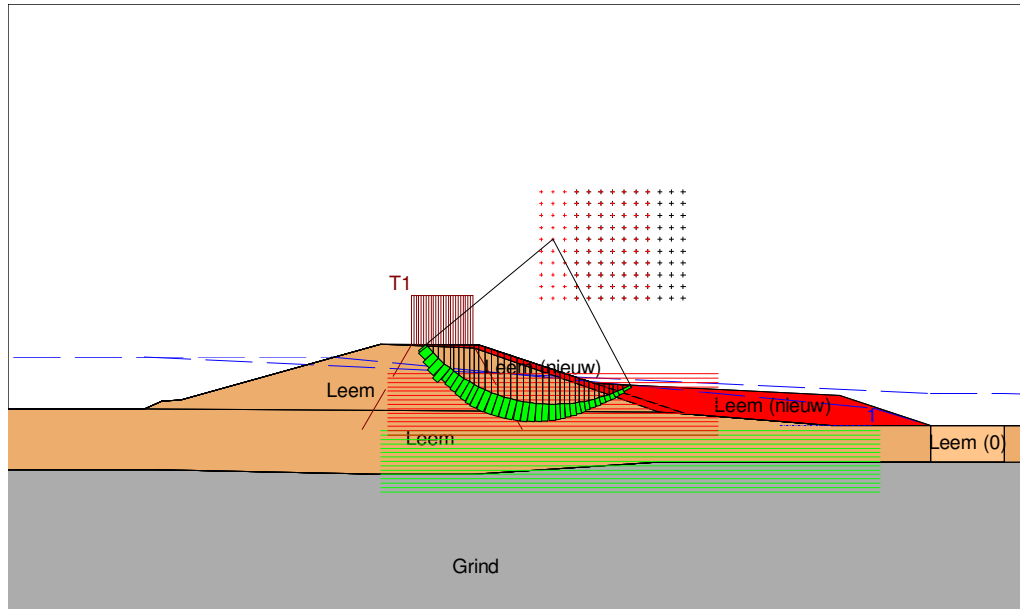
DO Dijkring 88 - Geulle aan de Maas (50.320.4)

dwp 3 - Bishop (uitvoeringsfase)

Annex

form
A2

	Leem (nieuw)
	Leem (0)
	Leem
	Grind



Xm : 7.03 [m]
Ym : 47.57 [m]

Radius : 6.73 [m]
Safety : 1.24

Max. stress : 8.438 [kN/m²]
Min. stress : 0.848 [kN/m²]

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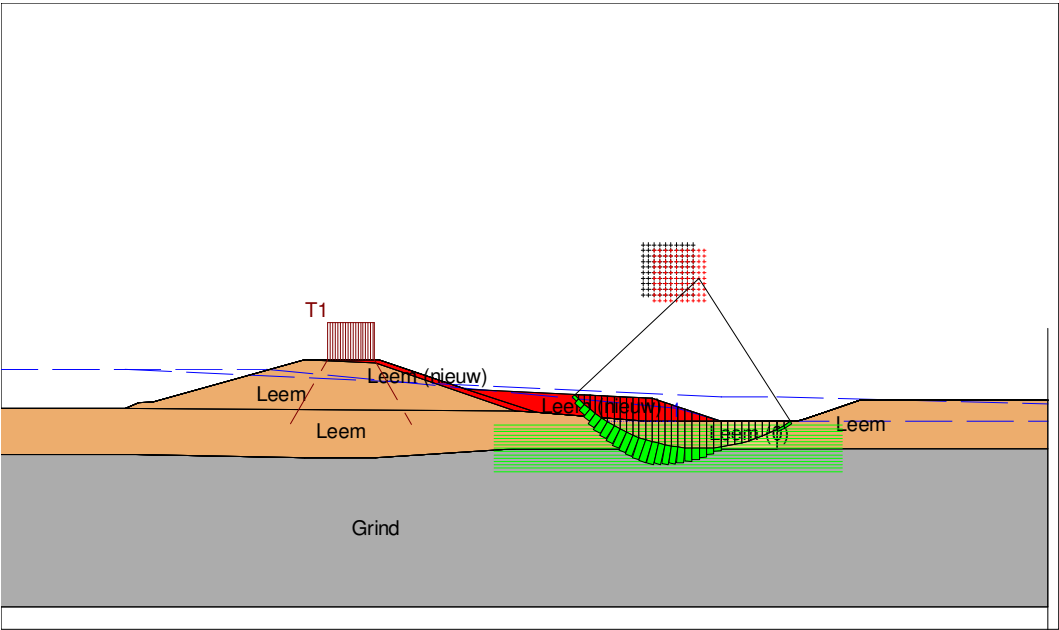
10

DO Dijkring 88 - Geulle aan de Maas (50.320.5)

Annex

A4

Shear Stress Bishop



Xm : 21.21 [m]
Ym : 47.67 [m]

Radius : 9.15 [m]
Safety : 1.08

Max. stress : 7.966 [kN/m²]
Min. stress : 0.000 [kN/m²]

Materials

	Leem (nieuw)
	Leem (0)
	Leem
	Grind

Bos Witteveen +

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date
-2013

ctr.

Sluitstukaden Cluster E

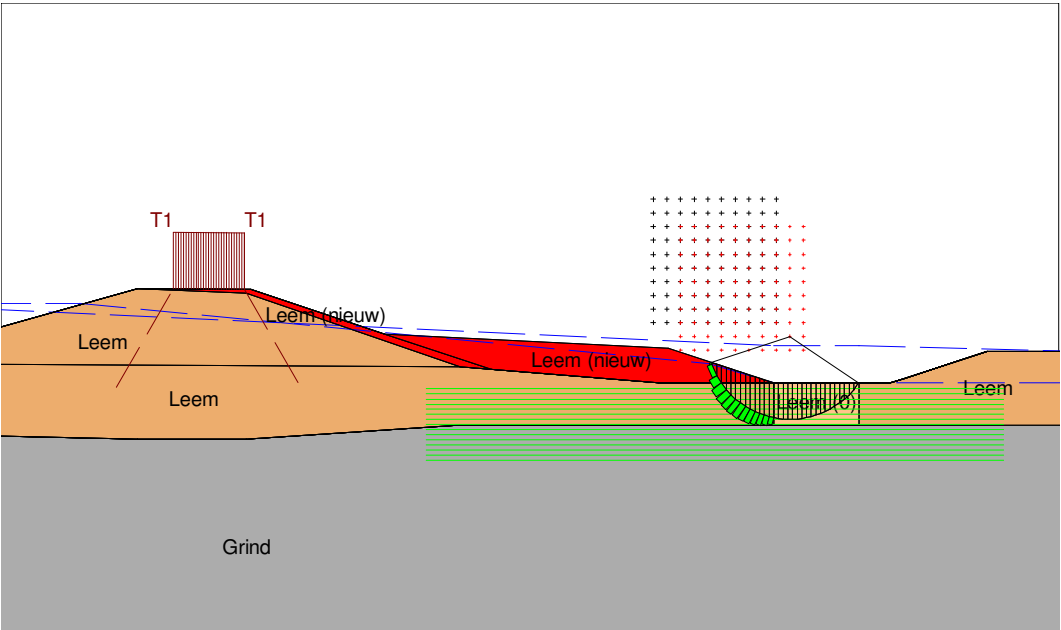
DO Dijkring 88 - Geulle aan de Maas (50.320.5)

dwp 1 - Bishop (zone 2)

Annex

form.
A4

Shear Stress Bishop


$$\begin{aligned} X_m &: 22.97 \text{ [m]} \\ Y_m &: 41.61 \text{ [m]} \end{aligned}$$

Radius : 2.91 [m]
Safety : 0.54

Max. stress : 3.709 [kN/m²]
Min. stress : 0.000 [kN/m²]

Materials

	Leem (nieuw)
	Leem (0)
	Leem
	Grind

Bos
Witteveen +

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D-Geo Stability 10.1 : Dijkring 88 Geulle aan de Maas 50.320.5 Dwarsprofiel 1 - Bishop - zone 3.sii

date
08-10-2013

drw.

Sluitstukken Cluster E

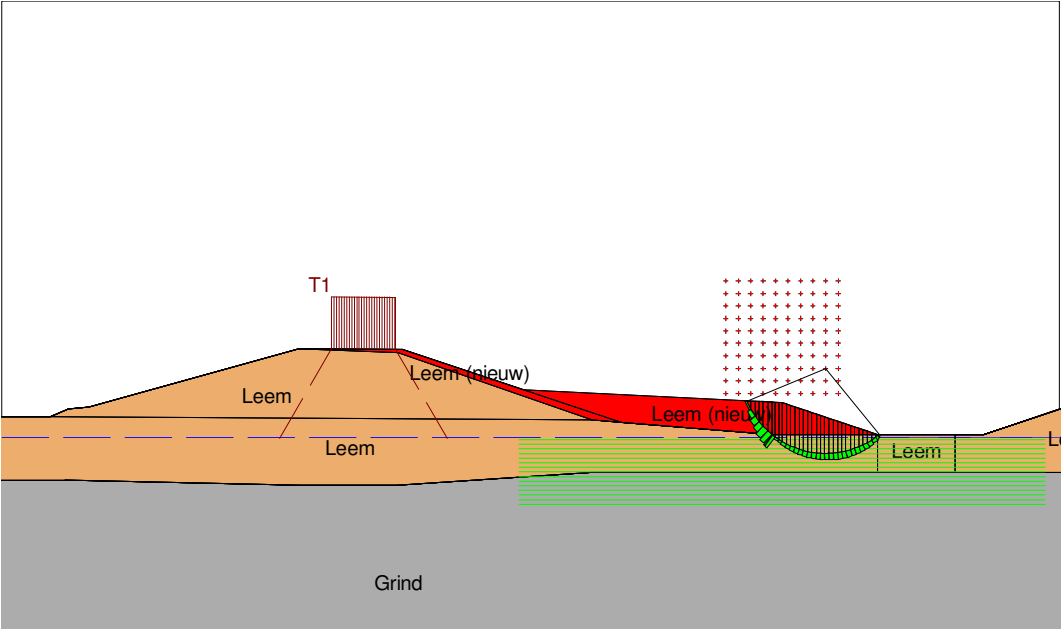
DO Dijkring 88 - Geulle aan de Maas (50.320.5)

dwp 1 - Bishop (zone 3)

Annex

form.
A4

Shear Stress Bishop



Xm : 20.38 [m]
Ym : 42.53 [m]

Radius : 3.29 [m]
Safety : 1.08

Max. stress : 8.301 [kN/m²]
Min. stress : 1.083 [kN/m²]

Materials

	Leem (nieuw)
	Leem
	Grind

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Sluitstukaden Cluster E

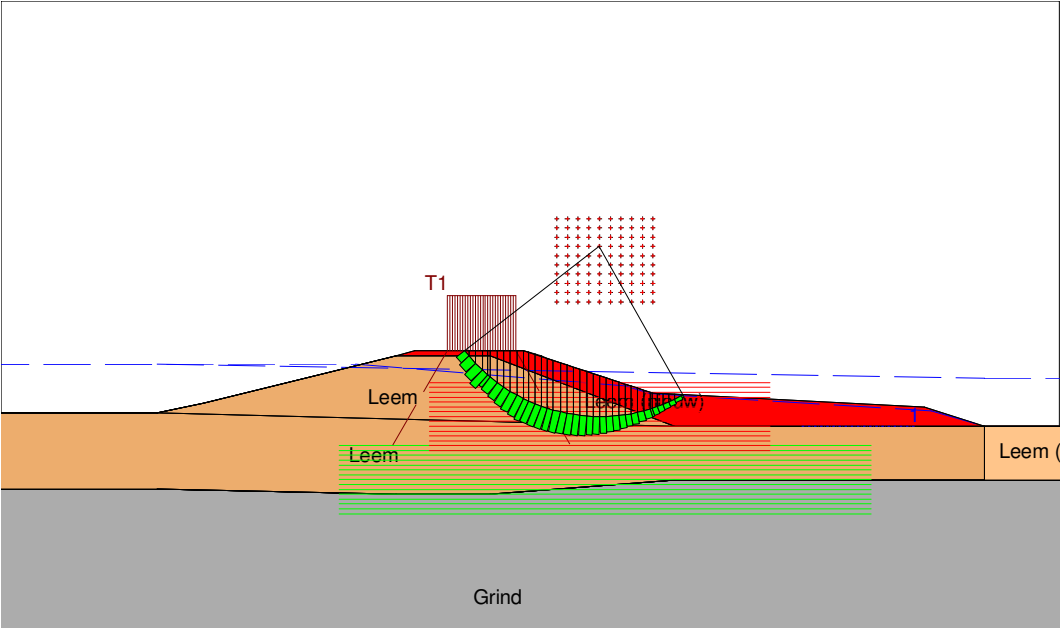
DO Dijkring 88 - Geulle aan de Maas (50.320.5)

dwp 1 - Bishop (uitvoeringsfase)

Annex

form.
A4

Shear Stress Bishop



Xm : 7.45 [m]
Ym : 47.08 [m]

Radius : 6.24 [m]
Safety : 1.20

Max. stress : 8.614 [kN/m²]
Min. stress : 0.996 [kN/m²]

Materials

	Leem (nieuw)
	Leem (0)
	Leem
	Grind

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D-Geo Stability 10.1 : Dijkring 88 Geulle aan de Maas 50.320. 5 Dwarsprofiel 2 - Bishop - zone 1 sti

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08-10-2013

drw.

Sluitstukkaden Cluster E

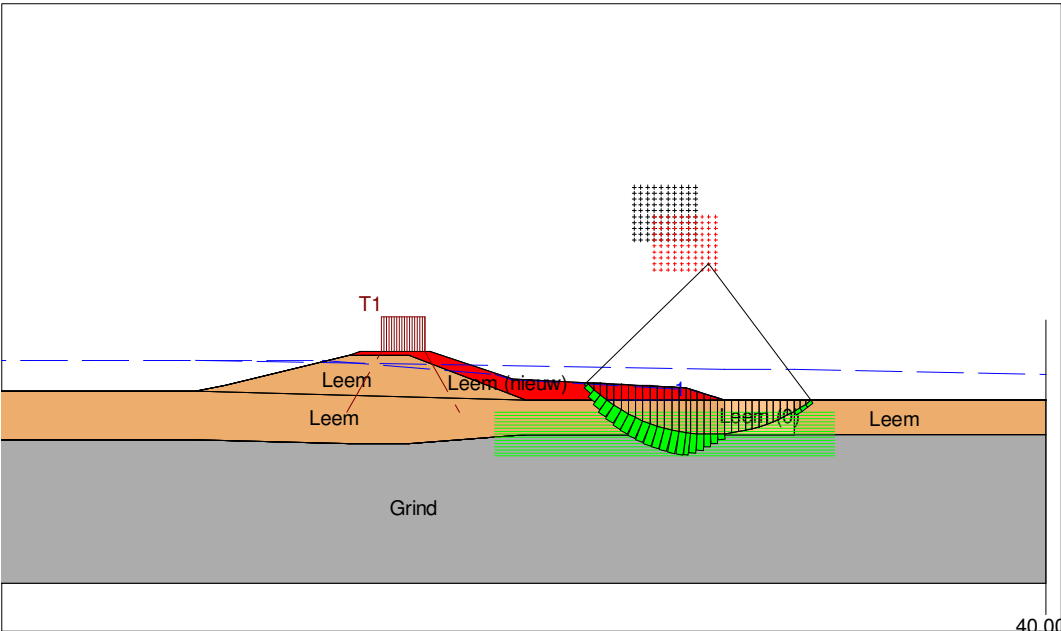
DO Dijkkring 88 - Geulle aan de Maas (50.320.5)

dwp 2 - Bishop (zone 1)

Annex

form.
A4

Shear Stress Bishop


$$\begin{aligned} X_m &: 20.66 \text{ [m]} \\ Y_m &: 48.30 \text{ [m]} \end{aligned}$$

Radius : 9.78 [m]
Safety : 1.16

Max. stress : 5.578 [kN/m²]
Min. stress : 0.000 [kN/m²]

Materials

	Leem (nieuw)
	Leem (0)
	Leem
	Grind

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D-Geo Stability 10.1 : Dijkkring 88 Geulle aande Maas 50.320. 5 Dwaarsprofiel 2 - Bishop - zone 2, sti

08-10-2013

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Sluitstukaden Cluster E

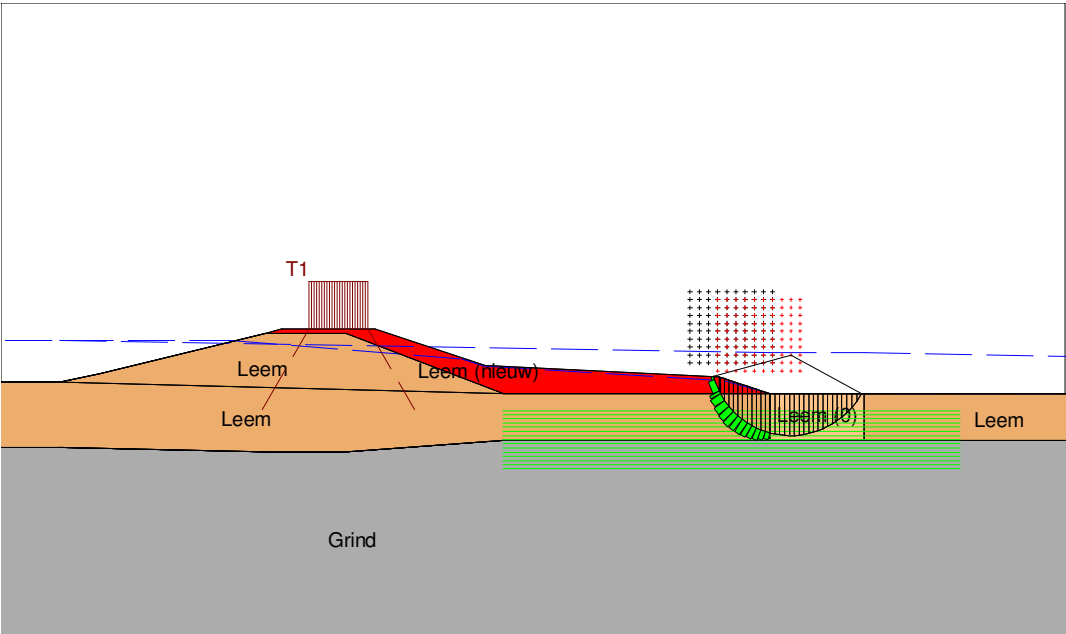
DO Dijkring 88 - Geulle aan de Maas (50.320.5)

dwp 2 - Bishop (zone 2)

Annex

A4

Shear Stress Bishop



Xm : 22.44 [m]
Ym : 42.13 [m]

Radius : 3.44 [m]
Safety : 0.50

Max. stress : 4.295 [kN/m²]
Min. stress : 0.000 [kN/m²]

Materials

	Leem (nieuw)
	Leem (0)
	Leem
	Grind

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D-Geo Stability 10.1 : Dijkring 88 Geulle aan de Maas 50.320. 5 Dwaarsprofiel 2 - Bishop - zone 3.sit

date
08-10-2013

drw.

Sluitstukkaden Cluster E

DO Dijkkring 88 - Geulle aan de Maas (50.320.5)

dwp 1 - Bishop (zone 3)

Annex

form.
A4

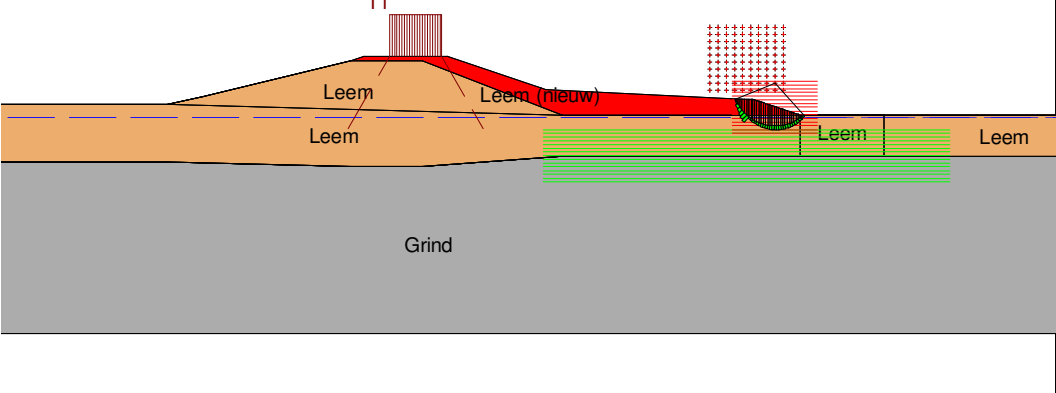
Shear Stress Bishop

Materials

☐ Leem (nieuw)

 Leem

Grind



Xm : 20.35 [m]
Ym : 41.98 [m]

Radius : 2.03 [m]
Safety : 1.36

Max. stress : 4.296 [kN/m²]
Min. stress : 0.756 [kN/m²]

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D-Geo Stability 10.1 : Dijkling 88 Geulle aan de Maas 50.320. 5 Dwarsprofiel 2 - Bishop - uitvoeringsfase: st

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drw.

Sluitstukkaden Cluster E

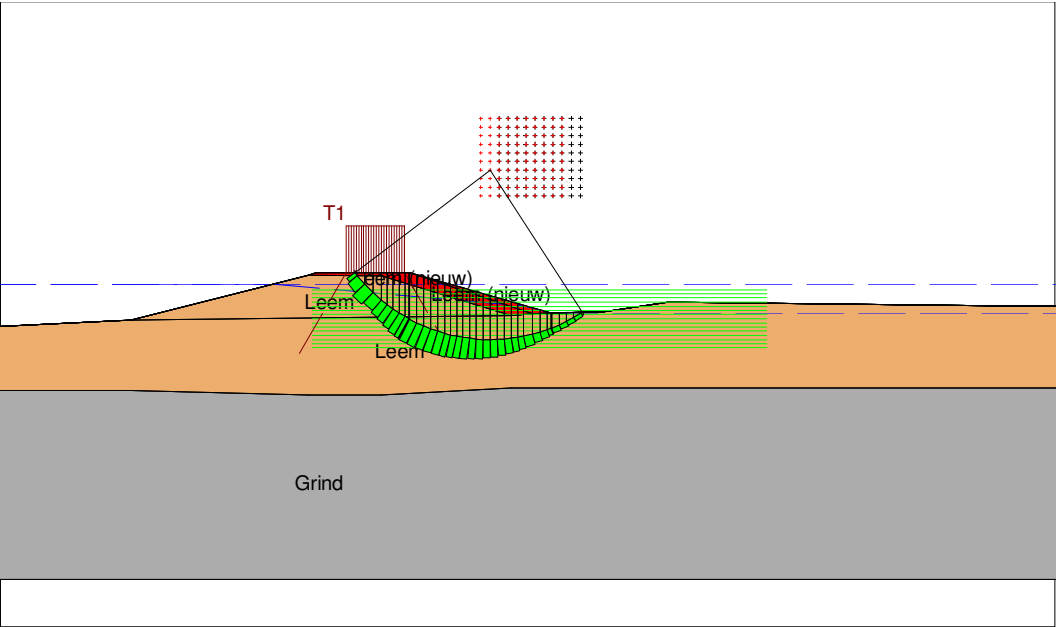
DO Dijkkring 88 - Geulle aan de Maas (50.320.5)

dwp 2 - Bishop (uitvoeringstase)

Annex

A4

Shear Stress Bishop



Xm : 7.77 [m]
Ym : 47.53 [m]

Radius : 7.26 [m]
Safety : 1.19

Max. stress : 9.243 [kN/m²]
Min. stress : 1.033 [kN/m²]

Materials

☐ Leem (nieuw)

 Leem

 Grind

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D-Geo Stability 10.1 : Dijkring 88 Geulle aande Maas 50.320. 6 Dwarsprofiel 1 - Bishop - verflauwd talud, st

08-10-2013

1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18. 19. 20. 21. 22. 23. 24. 25. 26. 27. 28. 29. 30. 31. 32. 33. 34. 35. 36. 37. 38. 39. 40. 41. 42. 43. 44. 45. 46. 47. 48. 49. 50. 51. 52. 53. 54. 55. 56. 57. 58. 59. 60. 61. 62. 63. 64. 65. 66. 67. 68. 69. 70. 71. 72. 73. 74. 75. 76. 77. 78. 79. 80. 81. 82. 83. 84. 85. 86. 87. 88. 89. 90. 91. 92. 93. 94. 95. 96. 97. 98. 99. 100. 101. 102. 103. 104. 105. 106. 107. 108. 109. 110. 111. 112. 113. 114. 115. 116. 117. 118. 119. 120. 121. 122. 123. 124. 125. 126. 127. 128. 129. 130. 131. 132. 133. 134. 135. 136. 137. 138. 139. 140. 141. 142. 143. 144. 145. 146. 147. 148. 149. 150. 151. 152. 153. 154. 155. 156. 157. 158. 159. 160. 161. 162. 163. 164. 165. 166. 167. 168. 169. 170. 171. 172. 173. 174. 175. 176. 177. 178. 179. 180. 181. 182. 183. 184. 185. 186. 187. 188. 189. 190. 191. 192. 193. 194. 195. 196. 197. 198. 199. 200. 201. 202. 203. 204. 205. 206. 207. 208. 209. 210. 211. 212. 213. 214. 215. 216. 217. 218. 219. 220. 221. 222. 223. 224. 225. 226. 227. 228. 229. 230. 231. 232. 233. 234. 235. 236. 237. 238. 239. 240. 241. 242. 243. 244. 245. 246. 247. 248. 249. 250. 251. 252. 253. 254. 255. 256. 257. 258. 259. 260. 261. 262. 263. 264. 265. 266. 267. 268. 269. 270. 271. 272. 273. 274. 275. 276. 277. 278. 279. 280. 281. 282. 283. 284. 285. 286. 287. 288. 289. 290. 291. 292. 293. 294. 295. 296. 297. 298. 299. 300. 301. 302. 303. 304. 305. 306. 307. 308. 309. 310. 311. 312. 313. 314. 315. 316. 317. 318. 319. 320. 321. 322. 323. 324. 325. 326. 327. 328. 329. 330. 331. 332. 333. 334. 335. 336. 337. 338. 339. 340. 341. 342. 343. 344. 345. 346. 347. 348. 349. 350. 351. 352. 353. 354. 355. 356. 357. 358. 359. 360. 361. 362. 363. 364. 365. 366. 367. 368. 369. 370. 371. 372. 373. 374. 375. 376. 377. 378. 379. 380. 381. 382. 383. 384. 385. 386. 387. 388. 389. 390. 391. 392. 393. 394. 395. 396. 397. 398. 399. 400. 401. 402. 403. 404. 405. 406. 407. 408. 409. 410. 411. 412. 413. 414. 415. 416. 417. 418. 419. 420. 421. 422. 423. 424. 425. 426. 427. 428. 429. 430. 431. 432. 433. 434. 435. 436. 437. 438. 439. 440. 441. 442. 443. 444. 445. 446. 447. 448. 449. 450. 451. 452. 453. 454. 455. 456. 457. 458. 459. 460. 461. 462. 463. 464. 465. 466. 467. 468. 469. 470. 471. 472. 473. 474. 475. 476. 477. 478. 479. 480. 481. 482. 483. 484. 485. 486. 487. 488. 489. 490. 491. 492. 493. 494. 495. 496. 497. 498. 499. 500. 501. 502. 503. 504. 505. 506. 507. 508. 509. 510. 511. 512. 513. 514. 515. 516. 517. 518. 519. 520. 521. 522. 523. 524. 525. 526. 527. 528. 529. 530. 531. 532. 533. 534. 535. 536. 537. 538. 539. 540. 541. 542. 543. 544. 545. 546. 547. 548. 549. 550. 551. 552. 553. 554. 555. 556. 557. 558. 559. 560. 561. 562. 563. 564. 565. 566. 567. 568. 569. 570. 571. 572. 573. 574. 575. 576. 577. 578. 579. 580. 581. 582. 583. 584. 585. 586. 587. 588. 589. 590. 591. 592. 593. 594. 595. 596. 597. 598. 599. 600. 601. 602. 603. 604. 605. 606. 607. 608. 609. 610. 611. 612. 613. 614. 615. 616. 617. 618. 619. 620. 621. 622. 623. 624. 625. 626. 627. 628. 629. 630. 631. 632. 633. 634. 635. 636. 637. 638. 639. 640. 641. 642. 643. 644. 645. 646. 647. 648. 649. 650. 651. 652. 653. 654. 655. 656. 657. 658. 659. 660. 661. 662. 663. 664. 665. 666. 667. 668. 669. 670. 671. 672. 673. 674. 675. 676. 677. 678. 679. 680. 681. 682. 683. 684. 685. 686. 687. 688. 689. 690. 691. 692. 693. 694. 695. 696. 697. 698. 699. 700. 701. 702. 703. 704. 705. 706. 707. 708. 709. 710. 711. 712. 713. 714. 715. 716. 717. 718. 719. 720. 721. 722. 723. 724. 725. 726. 727. 728. 729. 730. 731. 732. 733. 734. 735. 736. 737. 738. 739. 740. 741. 742. 743. 744. 745. 746. 747. 748. 749. 750. 751. 752. 753. 754. 755. 756. 757. 758. 759. 760. 761. 762. 763. 764. 765. 766. 767. 768. 769. 770. 771. 772. 773. 774. 775. 776. 777. 778. 779. 780. 781. 782. 783. 784. 785. 786. 787. 788. 789. 790. 791. 792. 793. 794. 795. 796. 797. 798. 799. 800. 801. 802. 803. 804. 805. 806. 807. 808. 809. 810. 811. 812. 813. 814. 815. 816. 817. 818. 819. 820. 821. 822. 823. 824. 825. 826. 827. 828. 829. 830. 831. 832. 833. 834. 835. 836. 837. 838. 839. 840. 84

Sluitstukkaden Cluster E

DO Dijkring 88 - Geulle aan de Maas (50.320.6)

awp 1 - Bisnop

Annex

A4 form

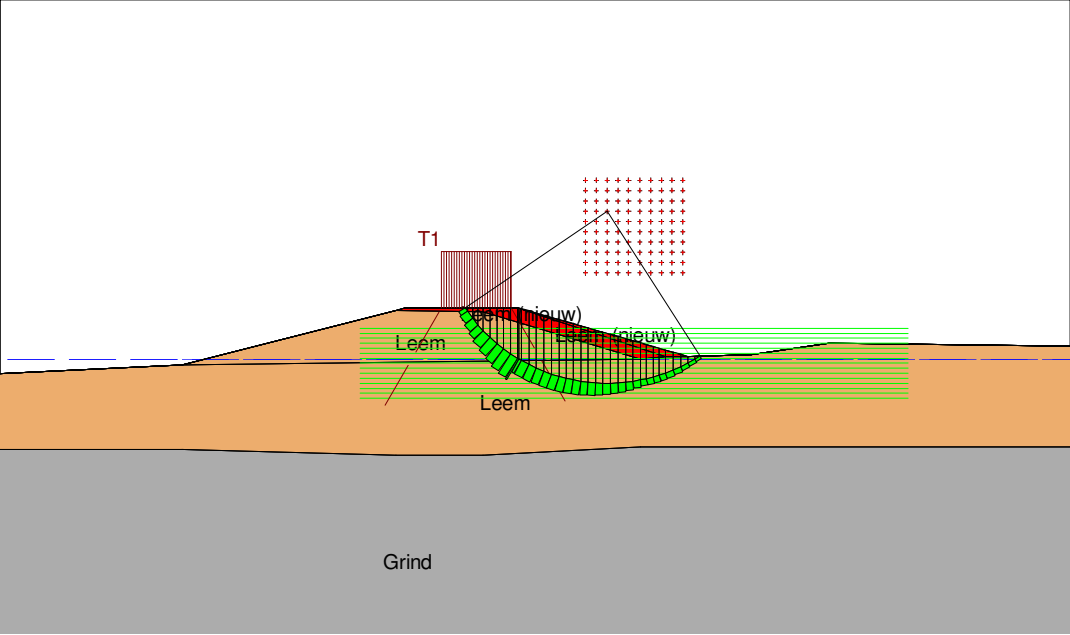
Shear Stress Bishop

Materials

☐ Leem (nieuw)

Leem

 Grind



Xm : 7.51 [m]
Ym : 46.56 [m]

Radius : 6.11 [m]
Safety : 1.24

Max. stress : 12.562 [kN/m²]
Min. stress : 1.277 [kN/m²]

Bos Witteveen +

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Sluitstukkaden Cluster E

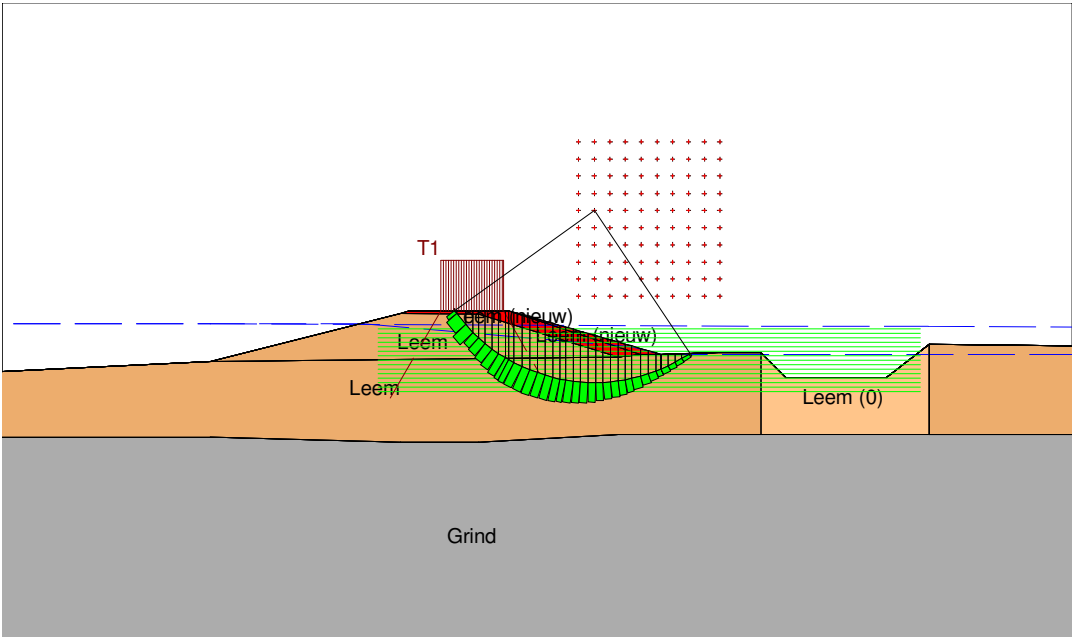
DO Dijkring 88 - Geulle aan de Maas (50.320.6)

dwp 1 - Bishop (uitvoeringsfase)

Annex - A4

A4

Shear Stress Bishop



Xm : 7.73 [m]
Ym : 47.14 [m]

Radius : 6.87 [m]
Safety : 1.20

Max. stress : 9.096 [kN/m²]
Min. stress : 1.011 [kN/m²]

Bos
Witteveen

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| D-Geo Stability 10.1 : Dijkkring 88 Geulle rande Maas 50 | |
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| 7400 AE Deventer | Fax 0570 697123 |

- Bishop - verflawd talun
date
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Sluitstukkaden Cluster E

DO Dijkring 88 - Geulle aan de Maas (50.320.6)

dwp 1 - Bishop (ontgrondingskuil)

- Annex

A4

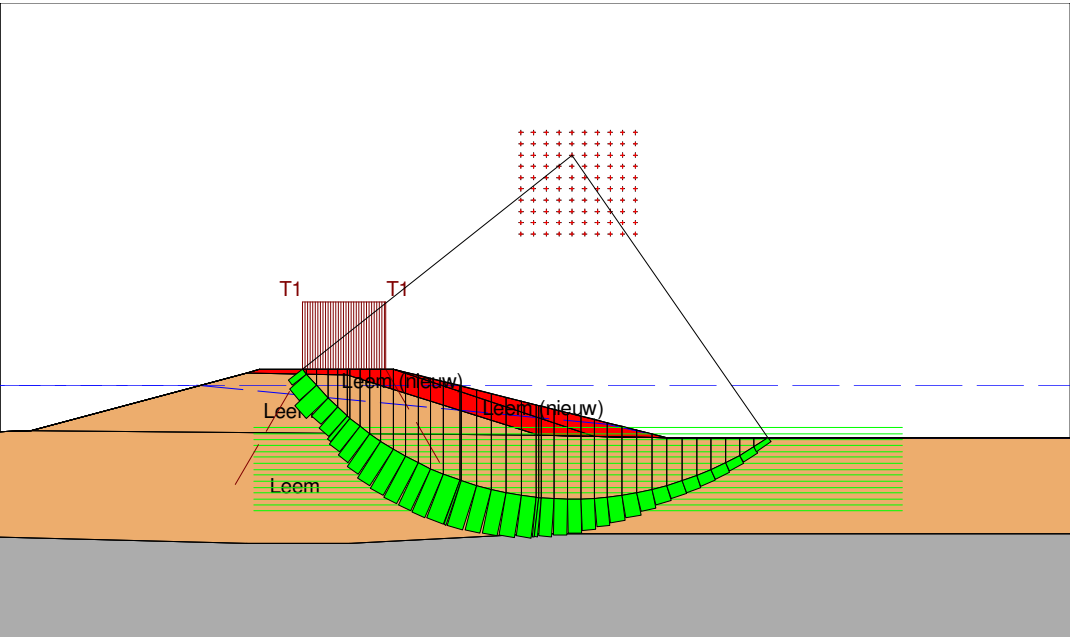
Shear Stress Bishop

Materials

☐ Leem (nieuw)

Leem

 Grind



Xm : 9.75 [m]
Ym : 49.55 [m]

Radius : 10.32 [m]
Safety : 1.17

Max. stress : 10.604 [kN/m²]
Min. stress : 1.174 [kN/m²]

Bos Witteveen +

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date
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Sluitstukkaden Cluster E

DO Dijkring 88 - Geulle aan de Maas (50.320.6)

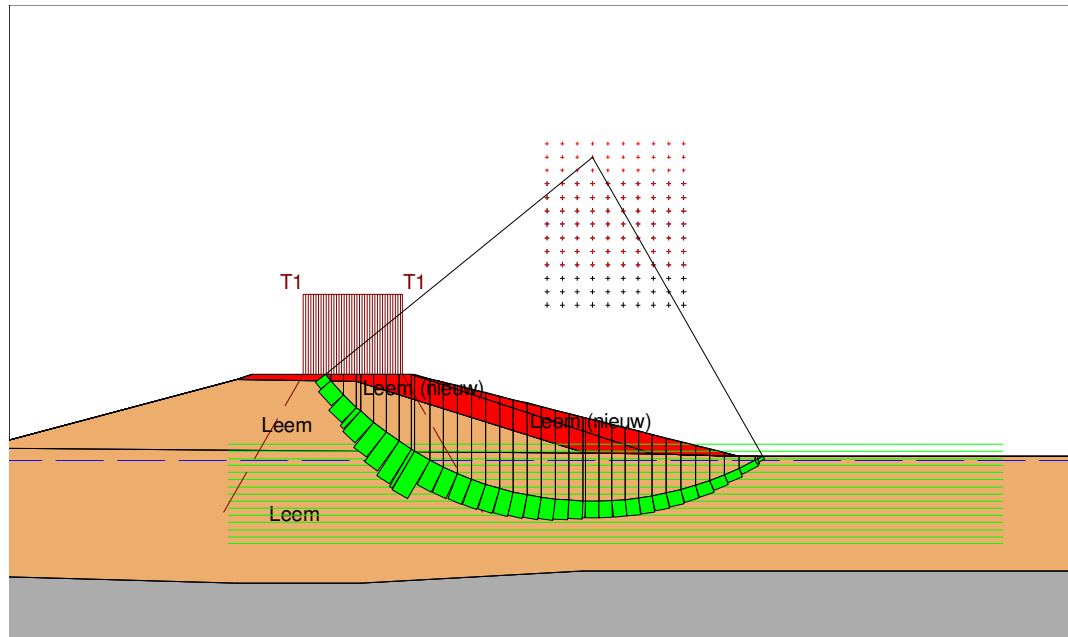
dwp 2 - Bishop

Ann

form.

A4

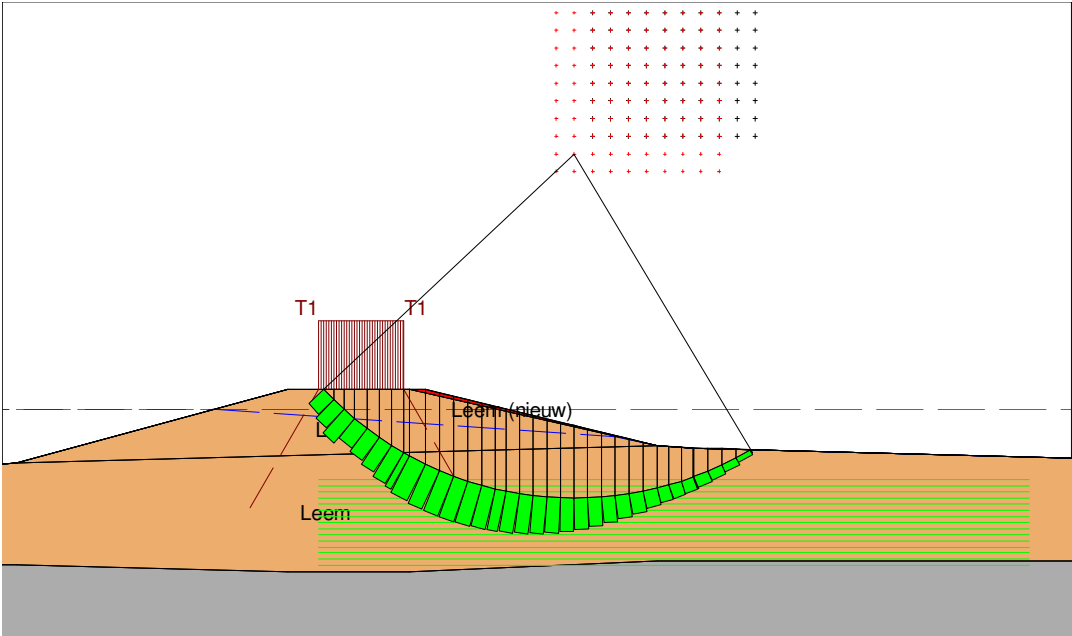
 Leem (nieuw)
 Leem
 Grind



Max. stress : 13.168 [kN/m²]
Min. stress : 1.074 [kN/m²]

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| D-Ges Stachly 10.1 : Dijkweg 88 Geulle aan de Maas 50.320.6 Dwaarsgrael 2 - Bishop - verlaten land - uitvoeringsfase af | |
| Bos | dth
08-10-2013 |
| Postbus 238
7400 AE Deventer | Phone 0570 697514
Fax 0570 697123 |
| Witteveen | dth
- |
| Sluitstukken Cluster E
DO Dijkweg 88 - Geulle aan de Maas (50.320.6) | dth
- |
| dwp 2 - Bishop (uitvoeringsfase) | dth
A4 |

Shear Stress Bishop



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7400 AE Deventer | Phone
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Fax
0570 697723 | date
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DO Dijkring 88 - Geulle aan de Maas (50.320,6)
dwp 3 - Bishop | | Annex - | form.
A4 |

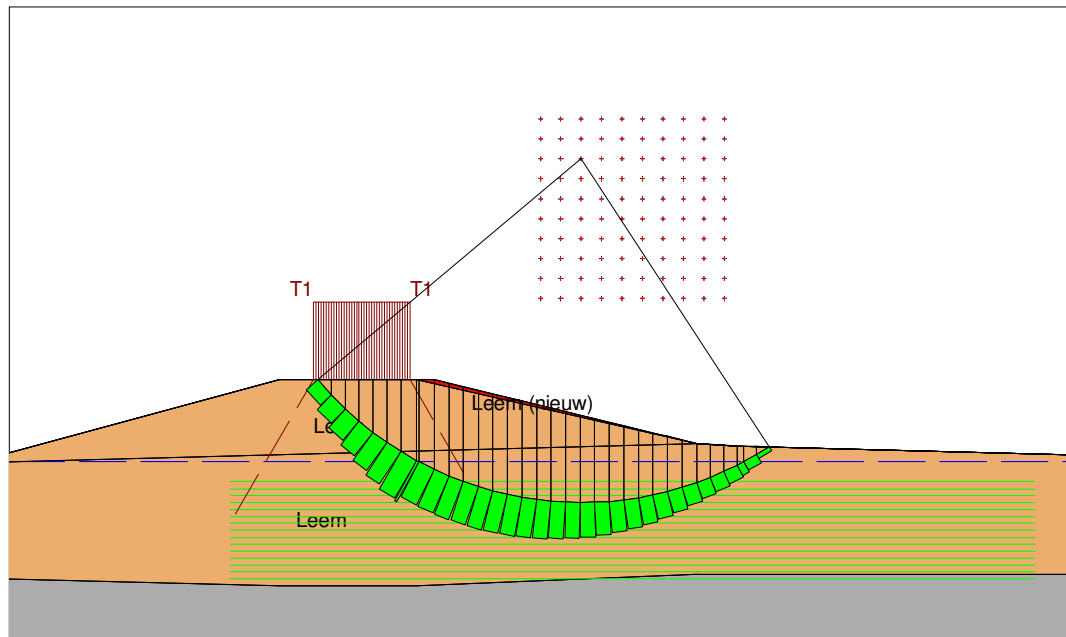
Shear Stress Bishop

Materials

 Leem (nieuw)

Leem

Grind



Xm : 7.79 [m]
Ym : 48.91 [m]

Radius : 8.86 [m]
Safety : 2.03

Max. stress : 9.284 [kN/m²]
Min. stress : 0.952 [kN/m²]

Bos
Witteveen

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date
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Sluitstukkaden Cluster E

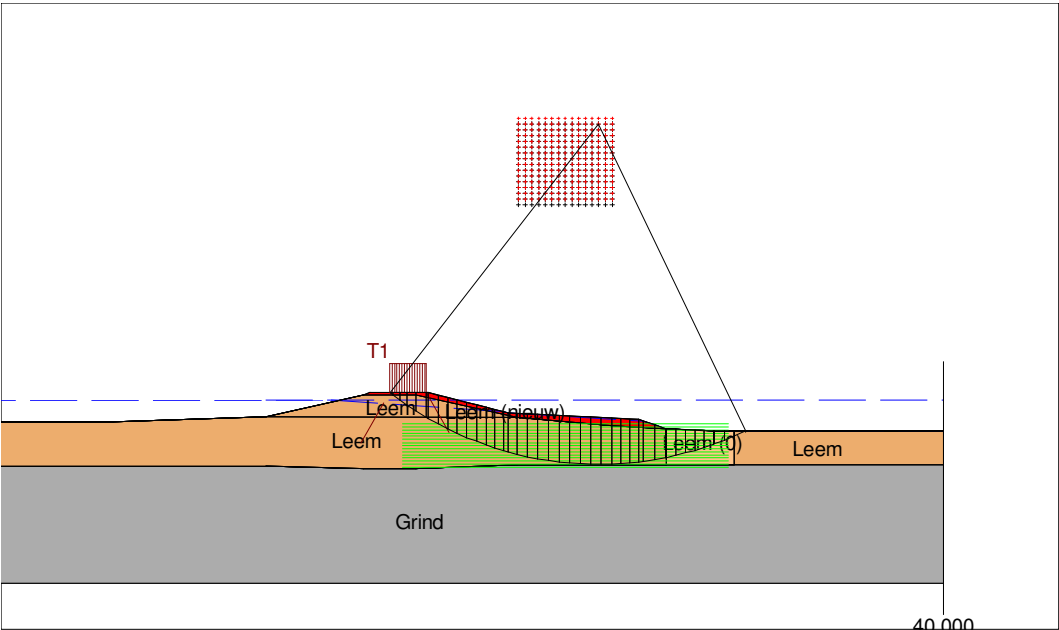
DO Dijkring 88 - Geulle aan de Maas (50.320.6)

dwp 3 - Bishop (uitvoeringsfase)

Annex

form.
A4

Critical Circle Bishop



Xm : 16.24 [m]
Ym : 61.69 [m]

Radius : 23.48 [m]
Safety : 1.32

Materials

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|---|--------------|
|  | Leem (nieuw) |
|  | Leem (0) |
|  | Leem |
|  | Grind |

Bos Witteveen +

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D-Geo Stability 10.1 : Dijkkring 88 Geulle Maas 50.320. 6 Dwarsprofiel 4 - Bishop - zone 1.sti

date
08-10-2013

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Sluitstukaden Cluster E

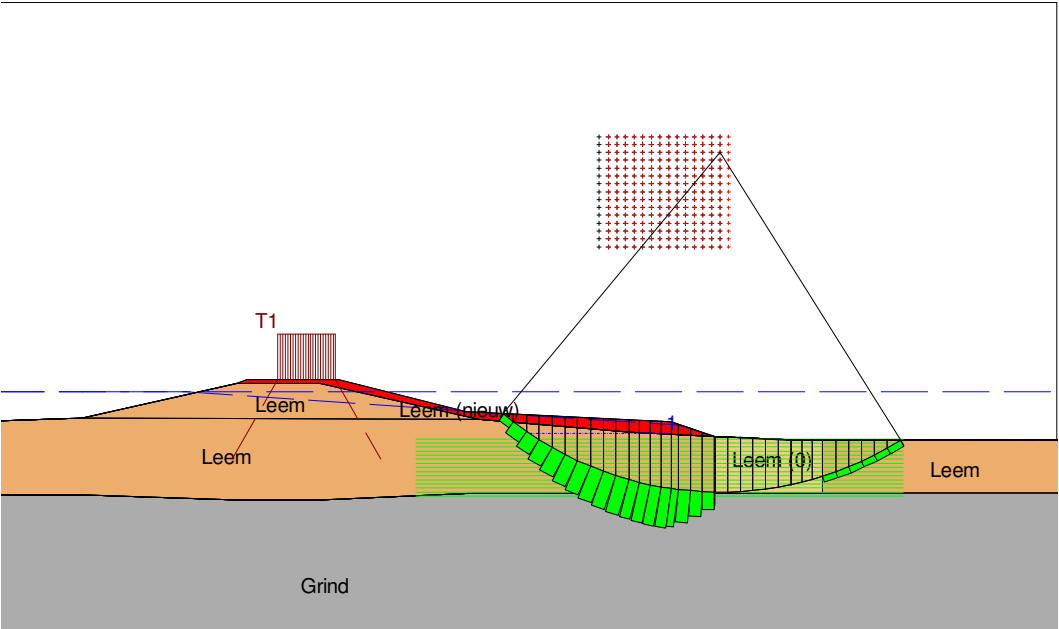
DO Dijkkring 88 - Geulle aan de Maas (50.320.6)

dwpr 4 - Bishop (zone 1)

Annex

form.
A4

Shear Stress Bishop



Xm : 21.12 [m]
Ym : 53.09 [m]

Radius : 14.84 [m]
Safety : 1.12

Max. stress : 6.056 [kN/m²]
Min. stress : 0.000 [kN/m²]

Materials

-  Leem (nieuw)
 Leem (0)
 Leem
 Grind

Bos Witteveen +

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| Fax | 0570 697123 |

D-Geo Stability 10.1 : Dijkkring 88 Geulle aan de Maas 50.320. 6 Dwarsprofiel 4 - Bishop - zone 2, st

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08-10-2013

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Sluitstukaden Cluster E

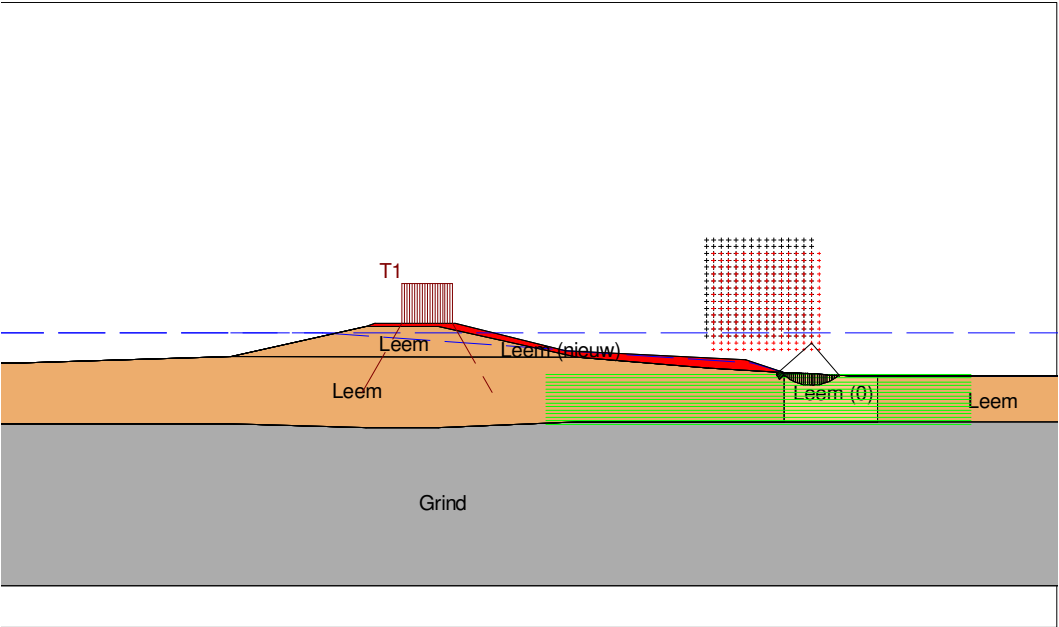
DO Dijkkring 88 - Geulle aan de Maas (50.320.6)

dwp 4 - Bishop (zone 2)

Annex –

form.
A4

Shear Stress Bishop



Xm : 22.29 [m]
Ym : 42.15 [m]

Radius : 2.13 [m]
Safety : 0.00

Max. stress : 2.381 [kN/m²]
Min. stress : 0.000 [kN/m²]

Materials

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|---|--------------|
|  | Leem (nieuw) |
|  | Leem (0) |
|  | Leem |
|  | Grind |

Bos Witteveen

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| Fax | 0570 697122 |

D-Geo Stability 10.1 : Dijkring 88 Geulle aan de Maas 50.320. 6 Dwarsprofiel 4 - Bishop - zone 3, st

date
08-10-2013

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Sluitstukaden Cluster E

DO Dijkkring 88 - Geulle aan de Maas (50.320.6)

dwp 4 - Bishop (zone 3)

Annex

form.
A4

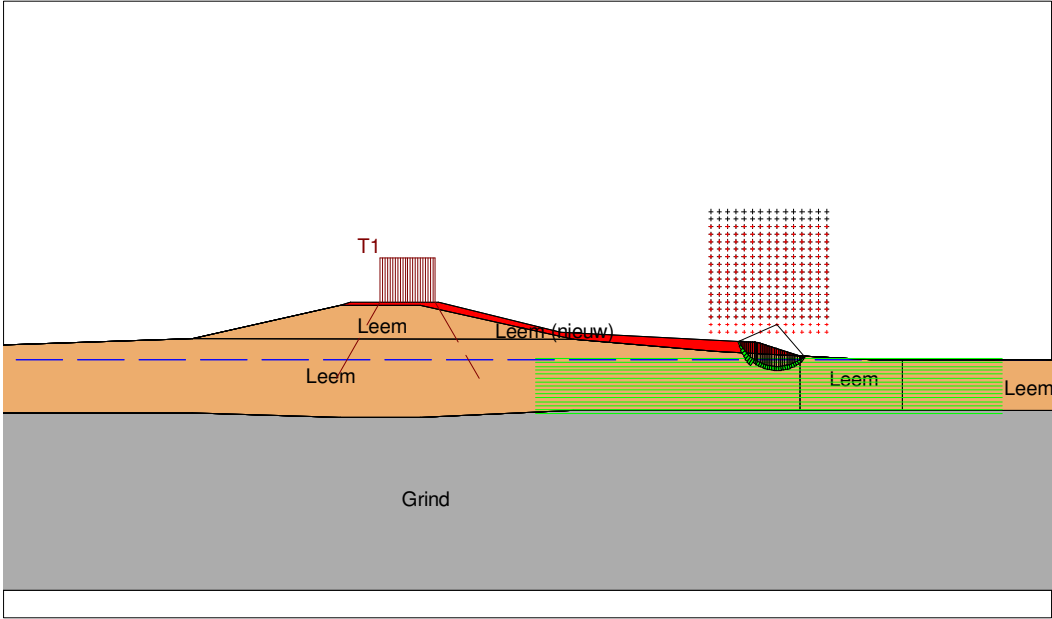
Shear Stress Bishop

Materials

☐ Leem (nieuw)

Leem

 Grind



Xm : 19.89 [m]
Ym : 42.12 [m]

Radius : 1.91 [m]
Safety : 1.79

Max. stress : 3.463 [kN/m²]
Min. stress : 0.574 [kN/m²]

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Sluitstukkaden Cluster E

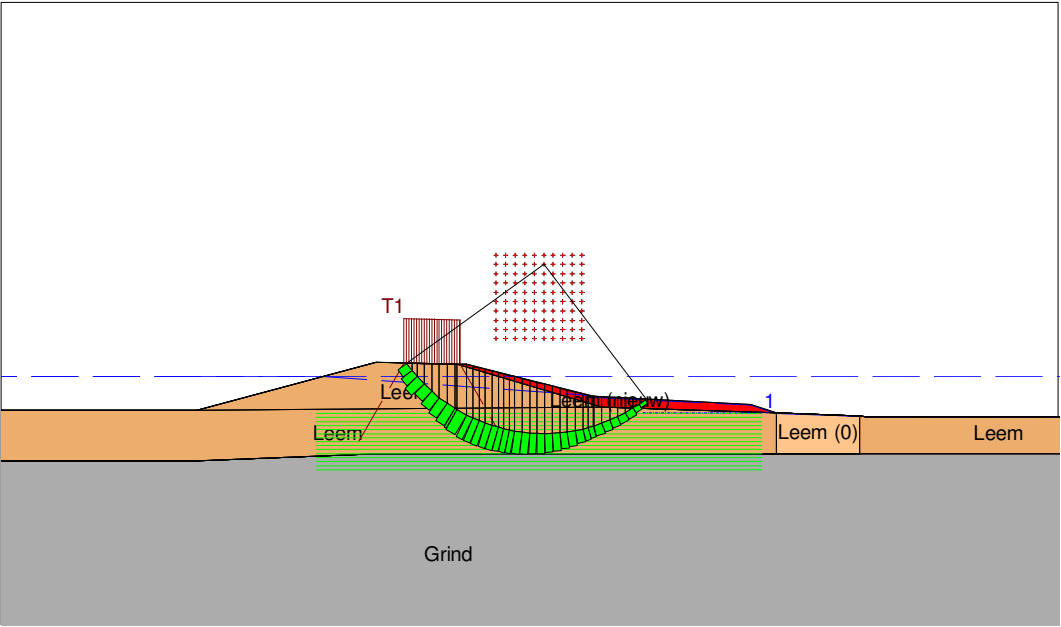
DO Dijkring 88 - Geulle aan de Maas (50.320.6)

dwp 4 - Bishop (uitvoeringsfase)

Anne

A4

Shear Stress Bishop



Xm : 7.45 [m]
Ym : 47.43 [m]

Radius : 7.53 [m]
Safety : 1.35

Max. stress : 8.730 [kN/m²]
Min. stress : 0.883 [kN/m²]

Materials

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|---|--------------|
|  | Leem (nieuw) |
|  | Leem (0) |
|  | Leem |
|  | Grind |

Bos Witteveen +

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D-Geo Stabiliteit 10.1 : Dijkning 88 Geulle aande Maas 50.320. 9 Dwarsprofiel 1 - Bis-hop - zone 1.s

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Sluitstukaden Cluster E

DO Dijkkring 88 - Geulle aan de Maas (50.320.9)

dwp 1 - Bishop (zone 1)

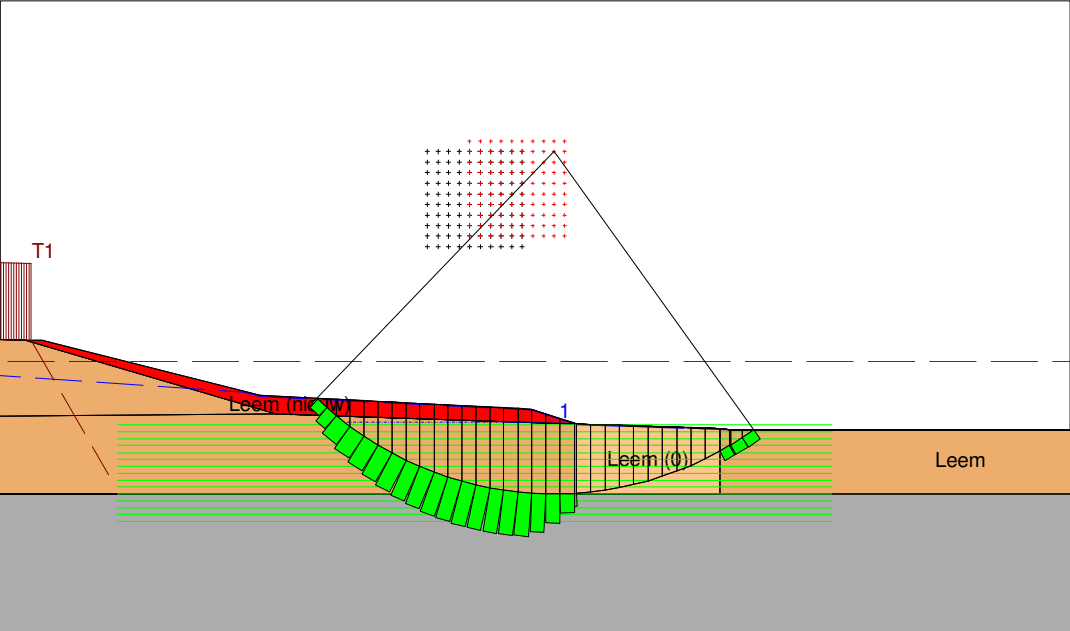
Annex

form.
A4

Shear Stress Bishop

Materials

-  Leem (nieuw)
 Leem (0)
 Leem
 Grind



Xm : 17.22 [m]
Ym : 47.85 [m]

Radius : 8.84 [m]
Safety : 1.13

Max. stress : 3.790 [kN/m²]
Min. stress : 0.000 [kN/m²]

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| Phone | 0570 69751 |
| Fax | 0570 69712 |

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Sluitstukaden Cluster E

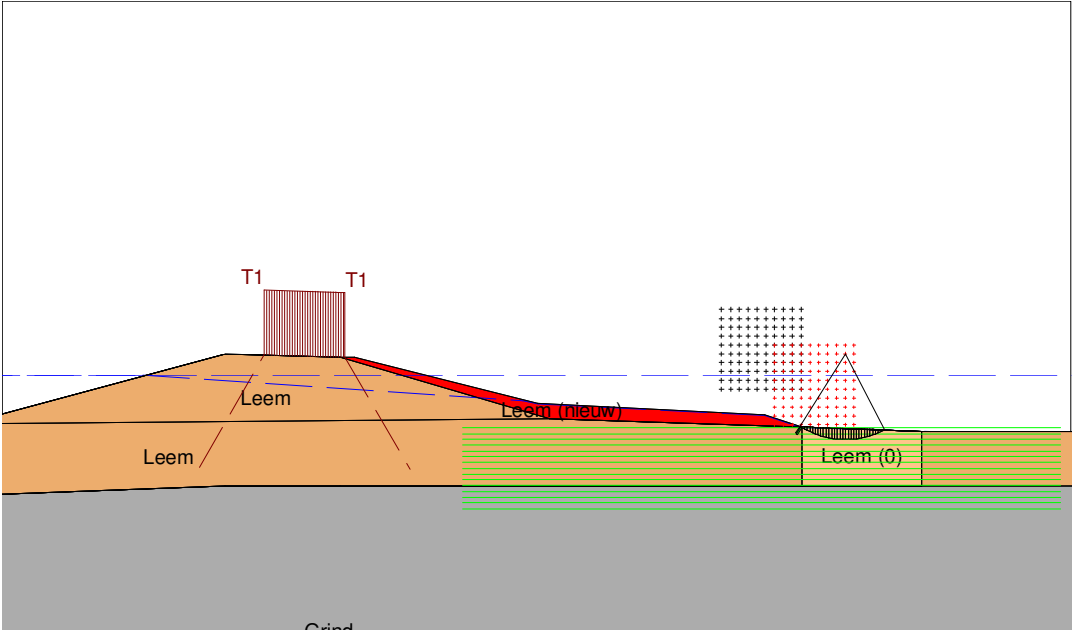
DO Dijkkring 88 - Geulle aan de Maas (50.320.9)

dwp 1 - Bishop (zone 2)

Annex -

A4

Shear Stress Bishop



Xm : 19.15 [m]
Ym : 43.07 [m]

Radius : 2.64 [m]
Safety : 0.00

Max. stress : 3.394 [kN/m²]
Min. stress : 0.000 [kN/m²]

Materials

☐ Leem (nieuw)

Leem (0)

Leem

 Grind

Bos Witteveen +

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| 7400 AE Deventer | Fax | 0570 697123 |

Phone 0570 697 511
Fax 0570 697 123

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Sluitstukaden Cluster E

DO Dijkring 88 - Geulle aan de Maas (50.320.9)

dwp 1 - Bishop (zone 3)

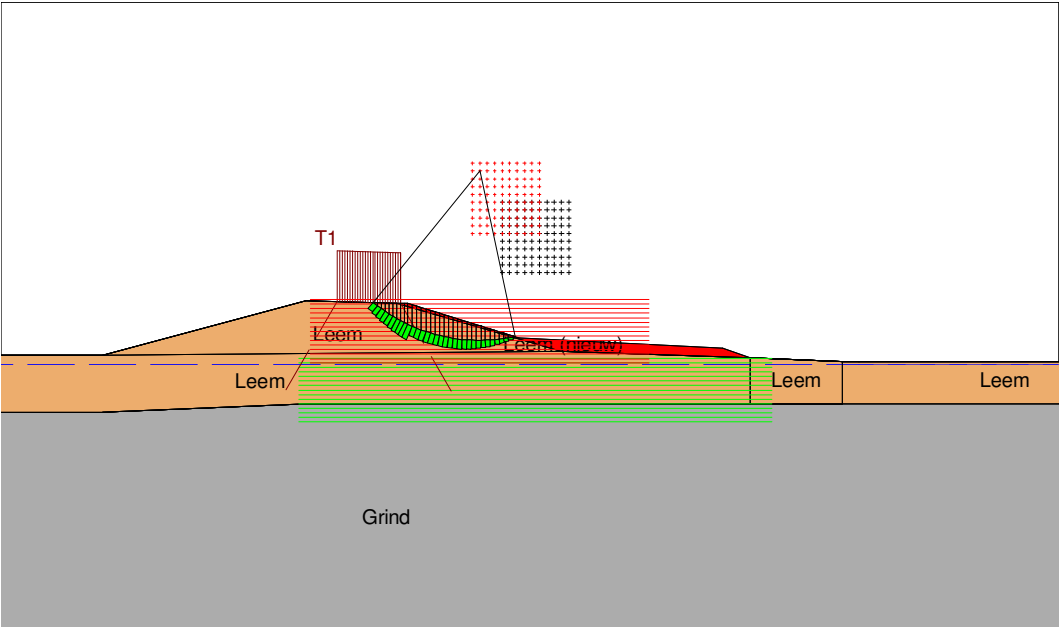
Ann

A4 form

Shear Stress Bishop

Materials

-  Leem (nieuw)
 Leem
 Grind



Xm : 6.84 [m]
Ym : 48.17 [m]

Radius : 6.66 [m]
Safety : 1.71

Max. stress : 6.187 [kN/m²]
Min. stress : 0.605 [kN/m²]

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D-Geo Stability 10.1 : Dijkring 88 Geulle aan de Maas 50.320. 9 Dwarsprofiel 1 - Bishop - uitvoeringstaal: sti

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Sluitstukkaden Cluster E

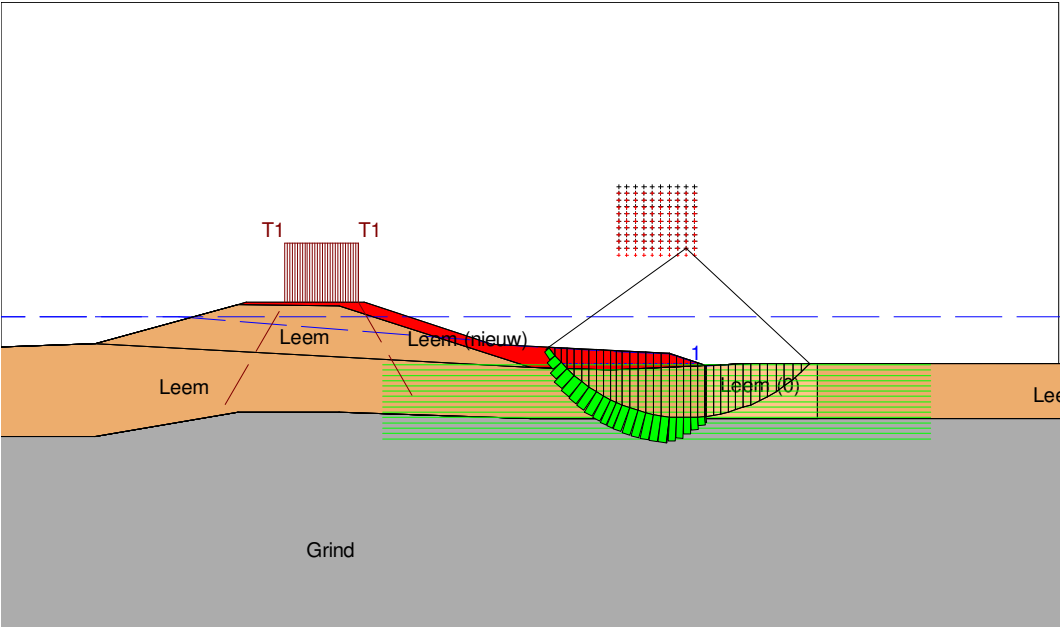
DO Dijkring 88 - Geulle aan de Maas (50.320.9)

dwp 1 - Bishop (uitvoeringsfase)

Annex

form.
A4

Shear Stress Bishop



Xm : 15.17 [m]
Ym : 44.76 [m]

Radius : 5.73 [m]
Safety : 1.25

Max. stress : 3.292 [kN/m²]
Min. stress : 0.000 [kN/m²]

Materials

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|  | Leem (nieuw) |
|  | Leem (0) |
|  | Leem |
|  | Grind |

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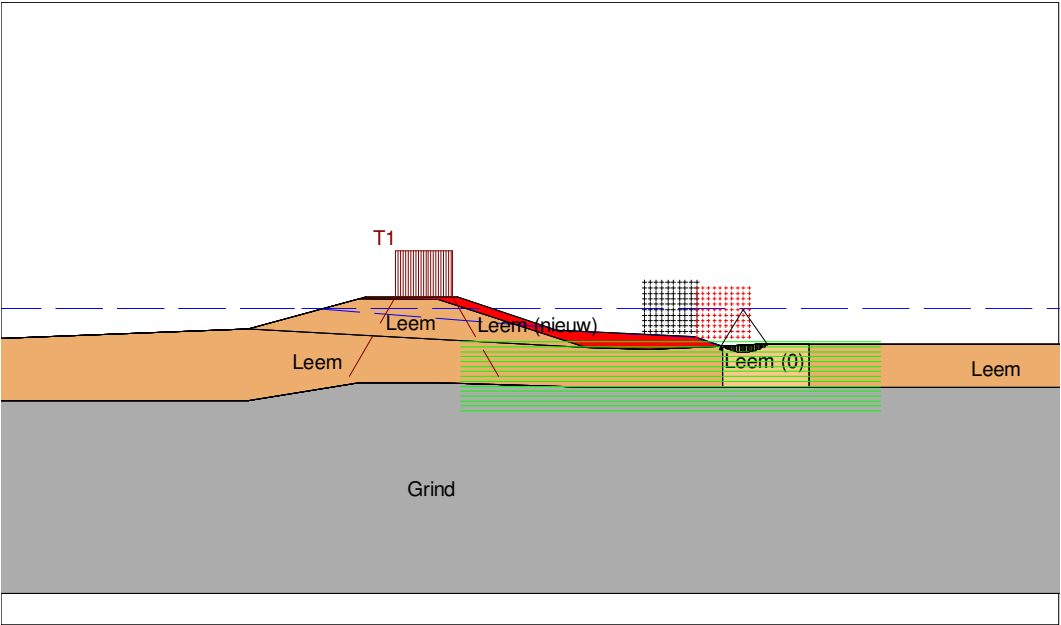
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Sluistukkaden Cluster E
DO Dijkkring 88 - Geulle aan de Maas (50.320.10)
dwp 1 - Bishop (zone 2)

Annex

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A

Shear Stress Bishop


$$\begin{aligned} X_m &: 16.74 \text{ [m]} \\ Y_m &: 42.38 \text{ [m]} \end{aligned}$$

Radius : 1.84 [m]
Safety : 0.37

Max. stress : 4.291 [kN/m²]
Min. stress : 0.000 [kN/m²]

Materials

| | |
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|  | Leem (nieuw) |
|  | Leem (0) |
|  | Leem |
|  | Grind |

Bos Witteveen +

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D-Geo Stabiiliteit 10.1 : Dijkring 88 Geulle aan de Maas 50.320. 10 Dwaarsprofiel 1 - Bishop - zone 3.sti

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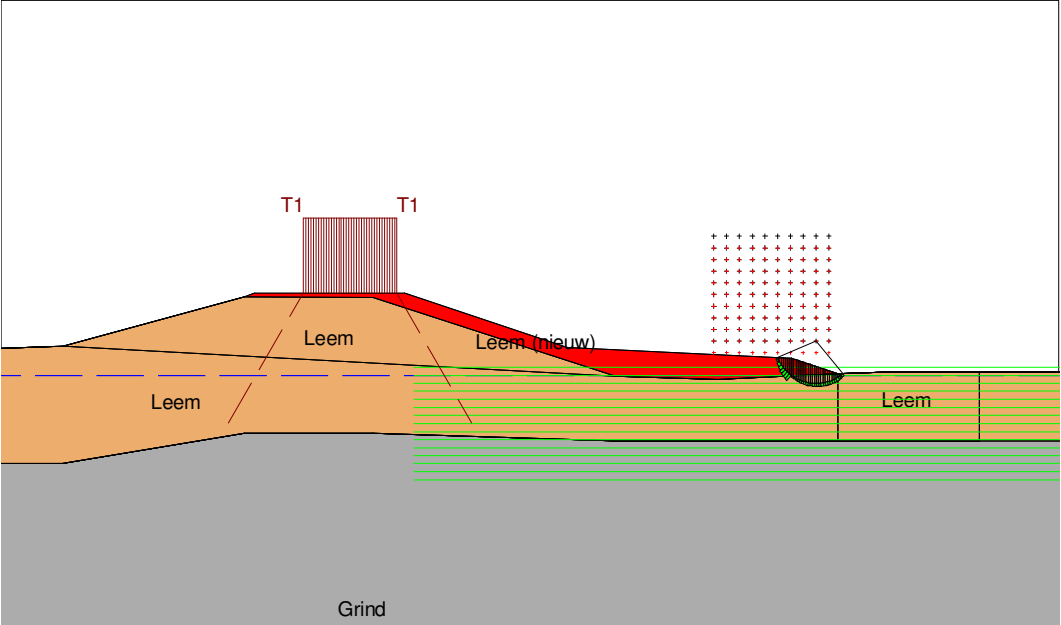
Volume 1

Sluistukkaden Cluster E
DO Dijkkring 88 - Geulle aan de Maas (50.320.10)
dwp 1 - Bishop (zone 3)

Volume 1

...

Shear Stress Bishop



Xm : 15.24 [m]
Ym : 41.66 [m]

Radius : 1.13 [m]
Safety : 1.46

Max. stress : 2.438 [kN/m²]
Min. stress : 0.454 [kN/m²]

Materials

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|  | Leem |
|  | Grind |

Bos Witteveen +

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DATE
08-10-2013

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Sluitstukkaden Cluster E

DO Dijkkring 88 - Geulle aan de Maas (50.320.10)

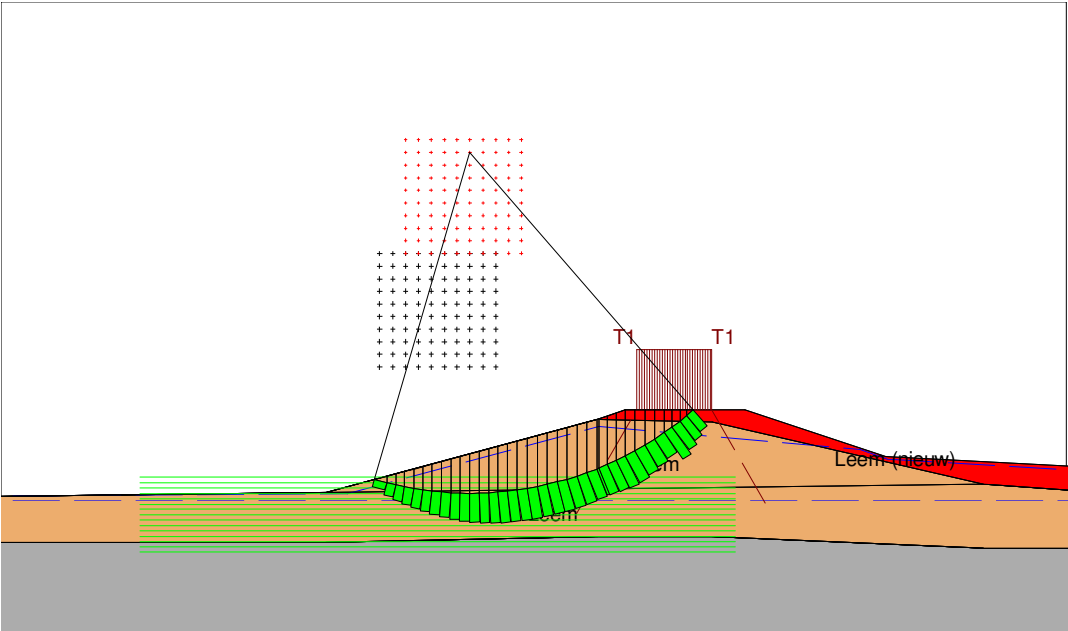
dwp 1 - Bishop (uitvoeringsfase)

Annex

form.
A4

BIJLAGE VII BEREKENINGEN STABILITEIT BUITENWAARTS (STBU)

Shear Stress Bishop



Xm : -4.23 [m]
Ym : 52.81 [m]

Radius : 11.37 [m]
Safety : 1.17

Max. stress : 7.231 [kN/m²]
Min. stress : 1.639 [kN/m²]

Materials

| | |
|---|--------------|
|  | Leem (nieuw) |
|  | Leem (0) |
|  | Leem |
|  | Grind |

Bos  **Witteveen +**

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| Fax | 0570 697123 |

D-Geo Stability 10.1 : Dijkring 88 Geulle aande Maas 50.320. 2 Dwarsprofiel 1 - STBU.

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Sluitstukaden Cluster E

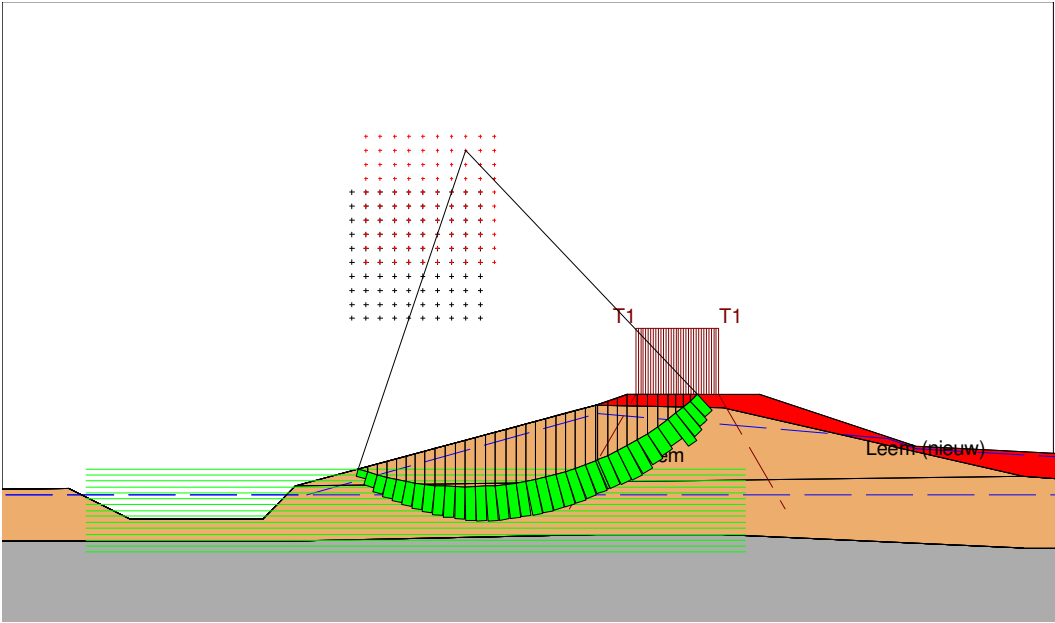
DO Dijkring 88 - Geulle aan de Maas (50.320.2)

dwp 1 - Bishop (STBU)

Annex

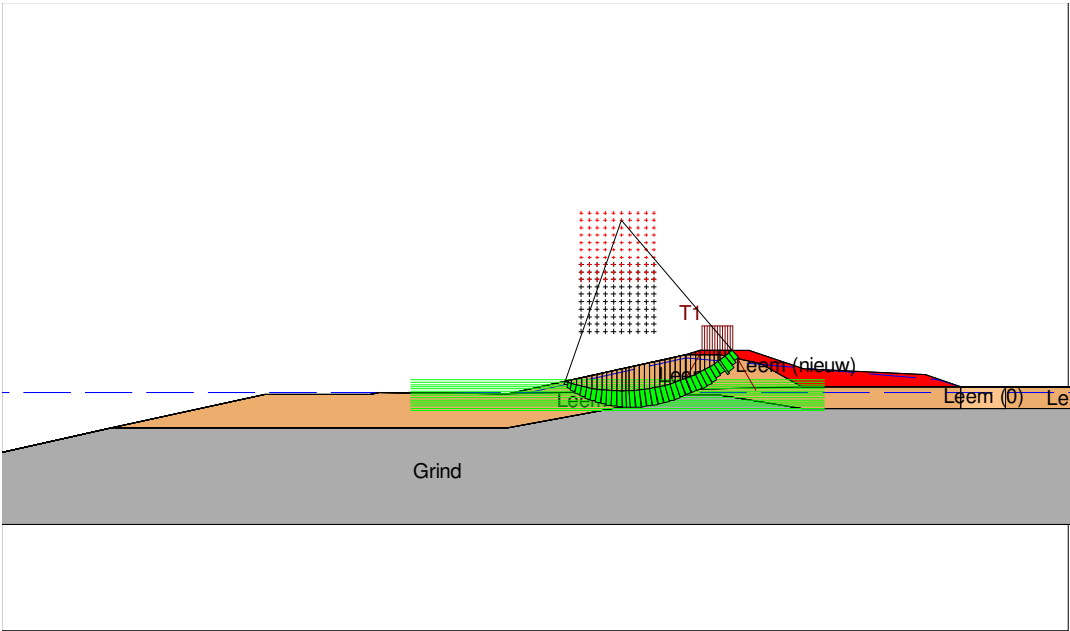
A4

Shear Stress Bishop



| | | | |
|---|--|--|----------|
| Bos
Postbus 293
7400 AE Deventer
Phone 0570 697511
Fax 0570 697123 | | D-Gro Stadhly 10.1 : Dijkweg 88 Geulle ande Maas 50.320.2 Dwaarsdreef 1 - STBU - oirgondingsbuis
08-10-2013
drw. -
cit. | |
| Sluistukkaden Cluster E
DO Dijkweg 88 - Geulle aan de Maas (50.320.2)
dwp 1 - Bishop (STBU) | | - | Term. A4 |

Shear Stress Bishop



Xm : -5.26 [m]
Ym : 55.01 [m]

Radius : 14.04 [m]
Safety : 1.33

Max. stress : 7.478 [kN/m²]
Min. stress : 1.219 [kN/m²]

Bos Witteveen +

| | | |
|------------------|-------|-------------|
| Postbus 233 | Phone | 0570 69751 |
| 7400 AE Deventer | Fax | 0570 697125 |

Phone 0570 697511
Fax 0570 697123

D-Geo Stability 10.1 : Dijkring 88 Geulle aan de Maas 50.320. 3 Dwarsprofiel 1 -STBU.sti

date
08-10-2013

10

Sluitstukaden Cluster E

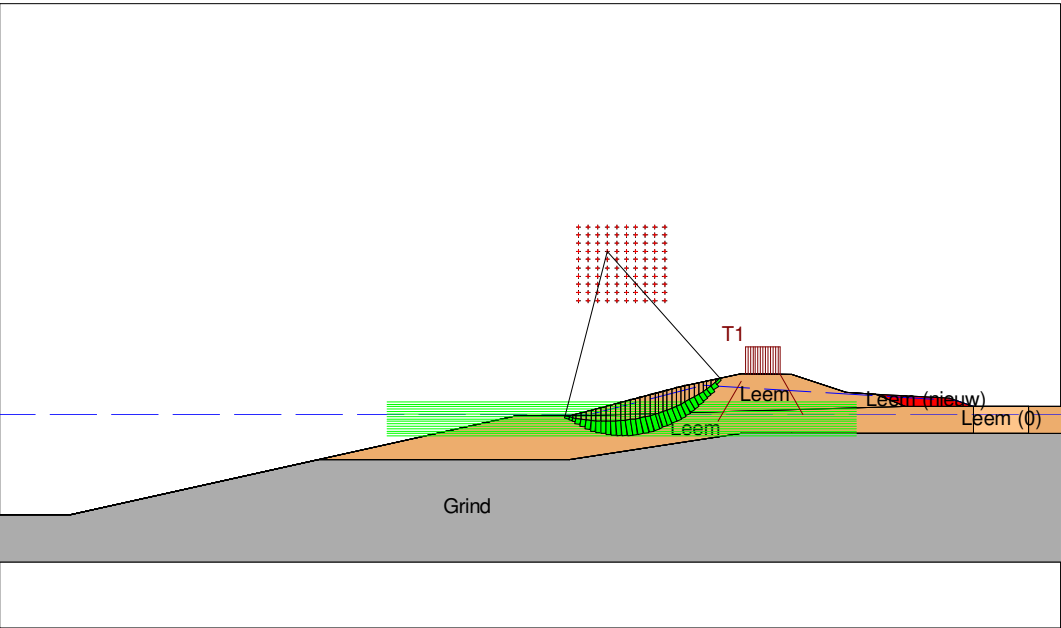
DO Dijkkring 88 - Geulle aan de Maas (50.320.3)

dwp 1 - Bishop (STBU)

Annex

A4

Shear Stress Bishop



Xm : -9.80 [m]
Ym : 52.70 [m]

Radius : 12.41 [m]
Safety : 1.37

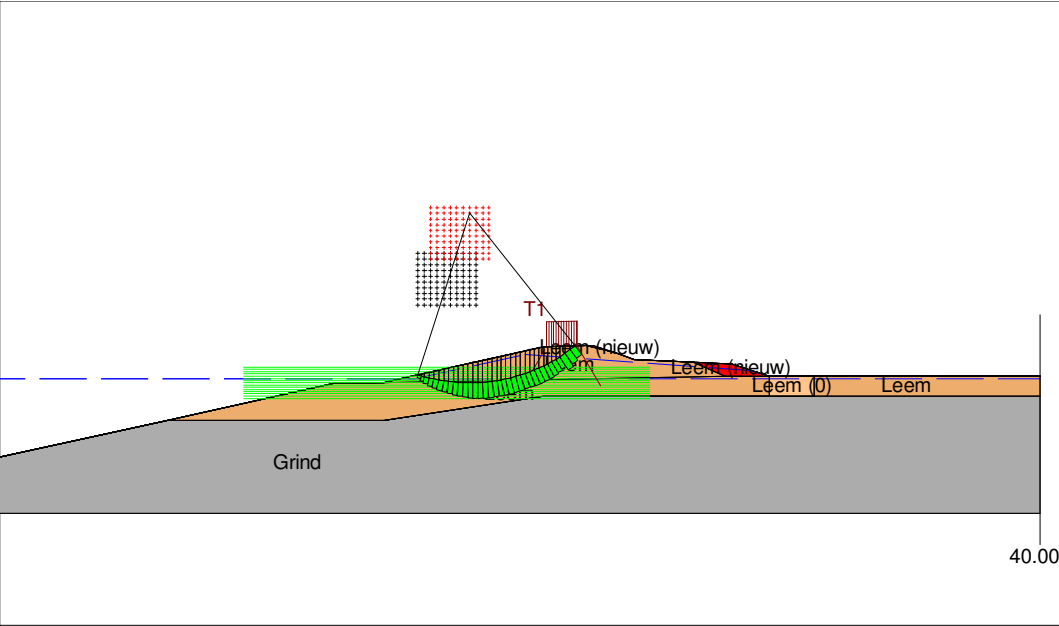
Max. stress : 5.992 [kN/m²]
Min. stress : 0.759 [kN/m²]

Materials

| | |
|---|--------------|
|  | Leem (nieuw) |
|  | Leem (0) |
|  | Leem |
|  | Grind |

| | | | |
|---|------------------------------|--|---------------------------|
| | | D-Geo Society Inc. - Opening de vanes dalam WMS sudah diupdate 1-31-2013 | |
| Bos | Pastus 238
7400 AE Denver | Phone 657.0697511
Fax 657.0697123 | date
08-10-2013 |
| Witteveen | | | dwg.
- |
| Sluistukkaden Cluster E
DO Dijkning 88 - Geulle aan de Maas (50.320.4) | | | dtc.
- |
| dwp 1 - Bishop (STBU) | | Annex - | Term.
A4 |

Shear Stress Bishop



Xm : -5.96 [m]
Ym : 54.15 [m]

Radius : 13.66 [m]
Safety : 1.39

Max. stress : 6.701 [kN/m²]
Min. stress : 1.110 [kN/m²]

Materials

| | |
|---|--------------|
|  | Leem (nieuw) |
|  | Leem (0) |
|  | Leem |
|  | Grind |

Shear Stress Bishop

Witteveen - Bos

Postbus 233
7400 AE Deventer

Phone 0570 697511
Fax 0570 697123

D-Geo Stability 10.1 Dijkring 88 Geulle aan de Maas 50.320.4 Davenport 2 - STBU srl

Materials

- Leem (nieuw)
- Leem (0)
- Leem
- Grind

40.00

Xm : -5.96 [m]
Ym : 54.15 [m]

Radius : 13.66 [m]
Safety : 1.39

Max. stress : 6.701 [kN/m²]
Min. stress : 1.110 [kN/m²]

Shear Stress Bishop



Radius : 9.69 [m]
Safety : 1.47

Max. stress : 6.878 [kN/m²]
Min. stress : 1.035 [kN/m²]

Bos Witteveen +

Postbus 233
7400 AE Deventer

Phone 0570 697511
Fax 0570 697123

D-Geo Stability 10.1 : Diking 88 Geulle aan de Maas 50.320.4 Dwarsprofiel 3 - STBU.st

DATE
08-10-2013

•

Sluistukkaden Cluster E

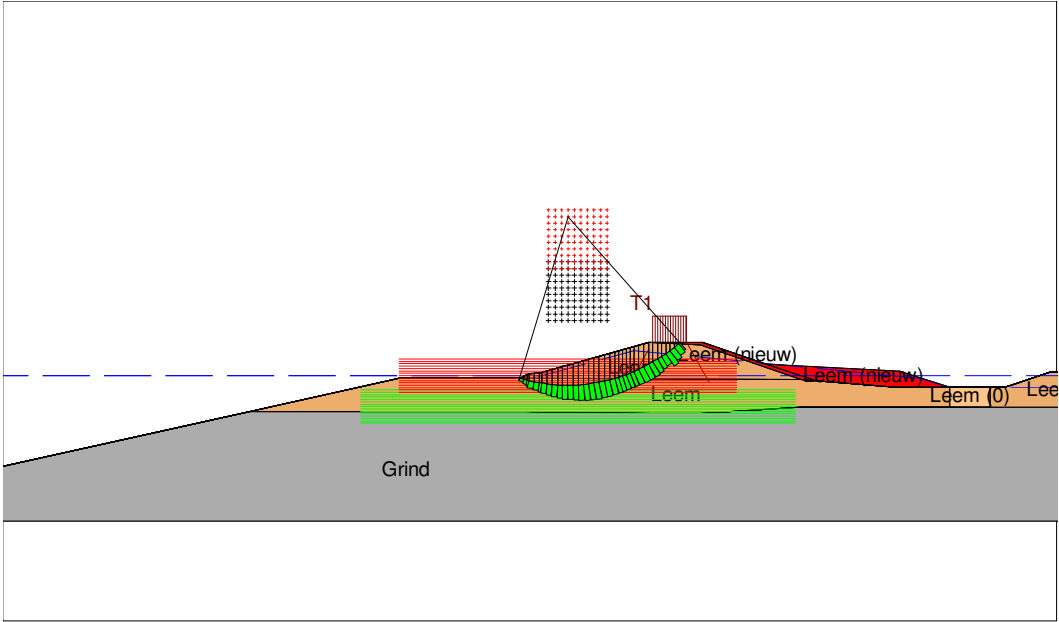
DO Dijkring 88 - Geulle aan de Maas (50.320.4)

awp 3 - Bispnop (SIBU)

Annex

A.

Shear Stress Bishop



Xm : -6.02 [m]
Ym : 52.67 [m]

Radius : 12.54 [m]
Safety : 1.20

Max. stress : 8.039 [kN/m²]
Min. stress : 0.761 [kN/m²]

Materials

Leem (nieuw)

 Leem (0)

Leem

Bos Witteveen +

Postbus 233
7400 AE Deventer

Phone 0570 697511
Fax 0570 697123

D-Geo Stability 10.1 : Dijkring 88 Geulle aande Maas 50.320. 5 Dwarsprofiel 1 - STBU.stl

08-10-2013

—

Sluitstukken Cluster E

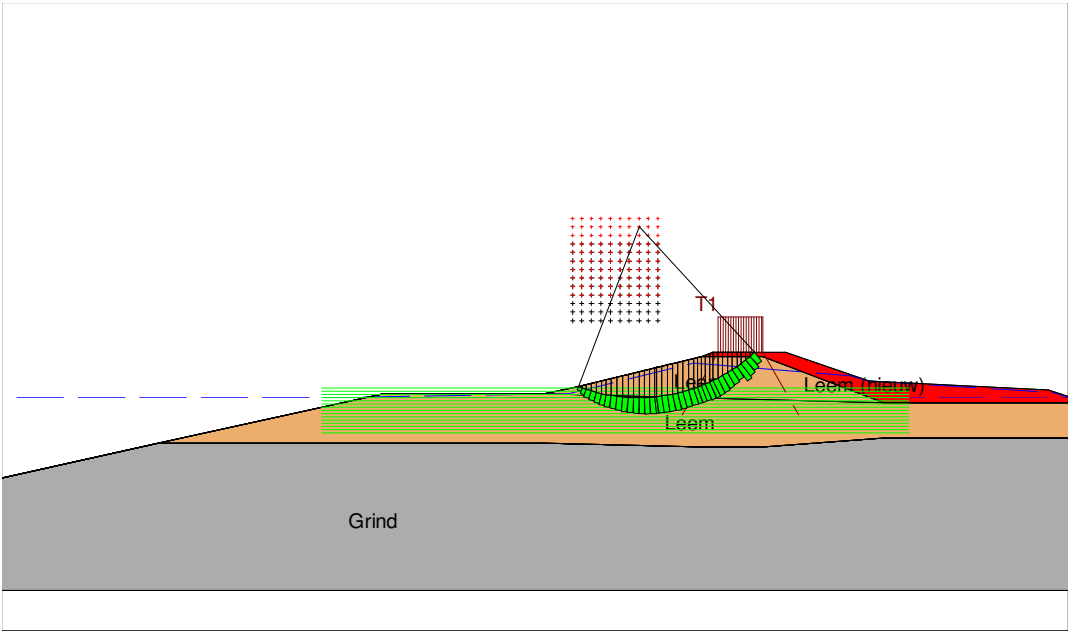
DO Dijkring 88 - Geulle aan de Maas (50.320.5)

dwp 1 - Bishop (STBU)

A1

A4

Shear Stress Bishop



Xm : -3.49 [m]
Ym : 50.28 [m]

Radius : 9.53 [m]
Safety : 1.30

Max. stress : 6.747 [kN/m²]
Min. stress : 1.196 [kN/m²]

Shear Stress Bishop

Witteveen - Bos

Sluistukkaden Cluster E
DO Dijkring 88 - Geulle aan de Maas (50.320.5)
dwp 1 - Bishop (STBU)

Postbus 233
7400 AE Deventer

Phone
0570 697511

Fax
0570 697123

date
08-10-2013

drw.
-

form.
A4

Xm : -3.49 [m]
Ym : 50.28 [m]

Radius : 9.53 [m]
Safety : 1.30

Max. stress : 6.747 [kN/m2]
Min. stress : 1.196 [kN/m2]

Materials

- Leem (nieuw)
- Leem (0)
- Leem
- Grind

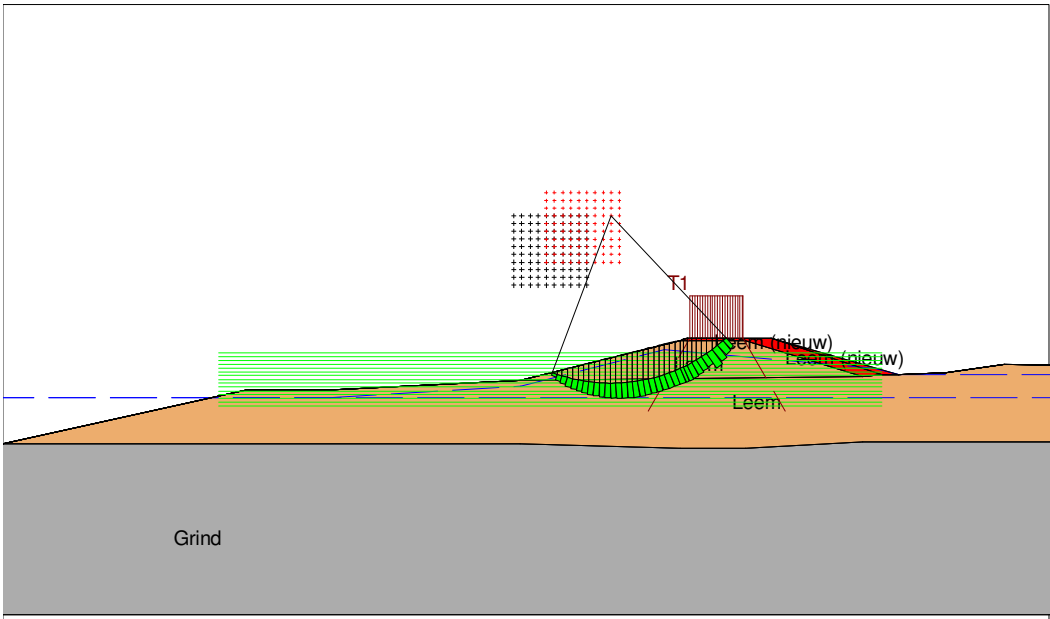
Shear Stress Bishop

Materials

Leem (nieuw)

 Leem

 Grind



Xm : -3.26 [m]
Ym : 48.93 [m]

Radius : 7.95 [m]
Safety : 1.32

Max. stress : 6.494 [kN/m²]
Min. stress : 1.192 [kN/m²]

Witteveen + Bos

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7400 AE Deventer

Phone 0570 697511
Fax 0570 697123

D-Geo Stability 10.1 : Dijkning 88 Geulle aan de Maas 50.320. 6 Dwaarsprofiel 1 - Bishop - STBU, si

date
08-10-2013

—

Sluitstukkaden Cluster E

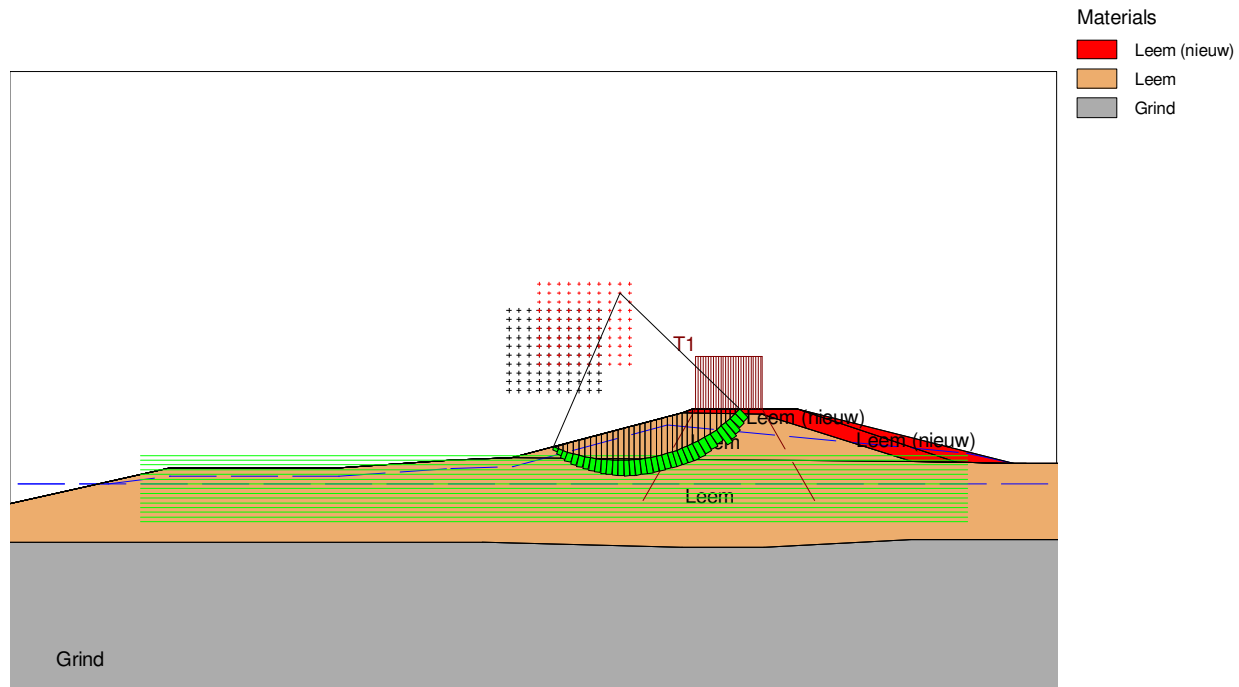
DO Dijkring 88 - Geulle aan de Maas (50.320.6)

dwp 1 - Bishop (STBU)

Annex

form.
A4

Shear Stress Bishop



Xm : -2.38 [m]
Ym : 47.57 [m]

Radius : 6.37 [m]
Safety : 1.30

Max. stress : 6.742 [kN/m²]
Min. stress : 1.137 [kN/m²]

Shear Stress Bishop

Materials

- Leem (nieuw)
- Leem
- Grind

Xm : -2.38 [m]
Ym : 47.57 [m]

Radius : 6.37 [m]
Safety : 1.30

Max. stress : 6.742 [kN/m²]
Min. stress : 1.137 [kN/m²]

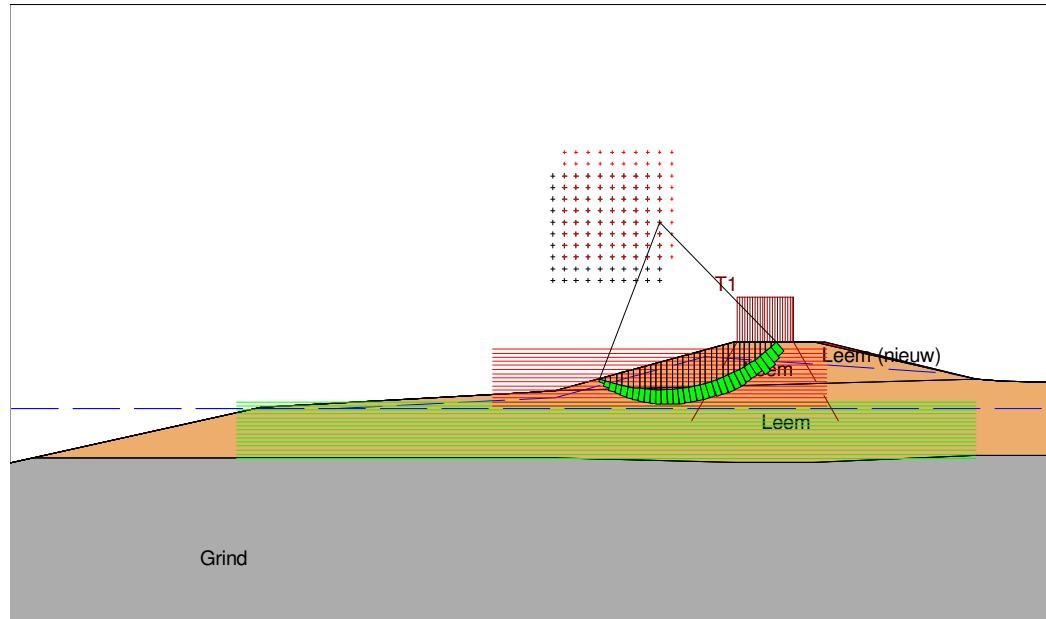
Shear Stress Bishop

Materials

☐ Leem (nieuw)

 Leem

Grind



Xm : -3.29 [m]
Ym : 48.53 [m]

Radius : 7.41 [m]
Safety : 1.29

Max. stress : 6.825 [kN/m²]
Min. stress : 1.274 [kN/m²]

Witteveen - Bos

Postbus 233
7400 AE Deventer

| | |
|-------|-------------|
| Phone | 0570 697511 |
| Fax | 0570 697123 |

D-Geo Stability 10.1 : Dijkring 88 Geulle aande Maas 50.320. 6 Dwarsprofiel 3 - Bishop - STBU.sli

date 08-10-2013

drw.

Sluitstukkaden Cluster E

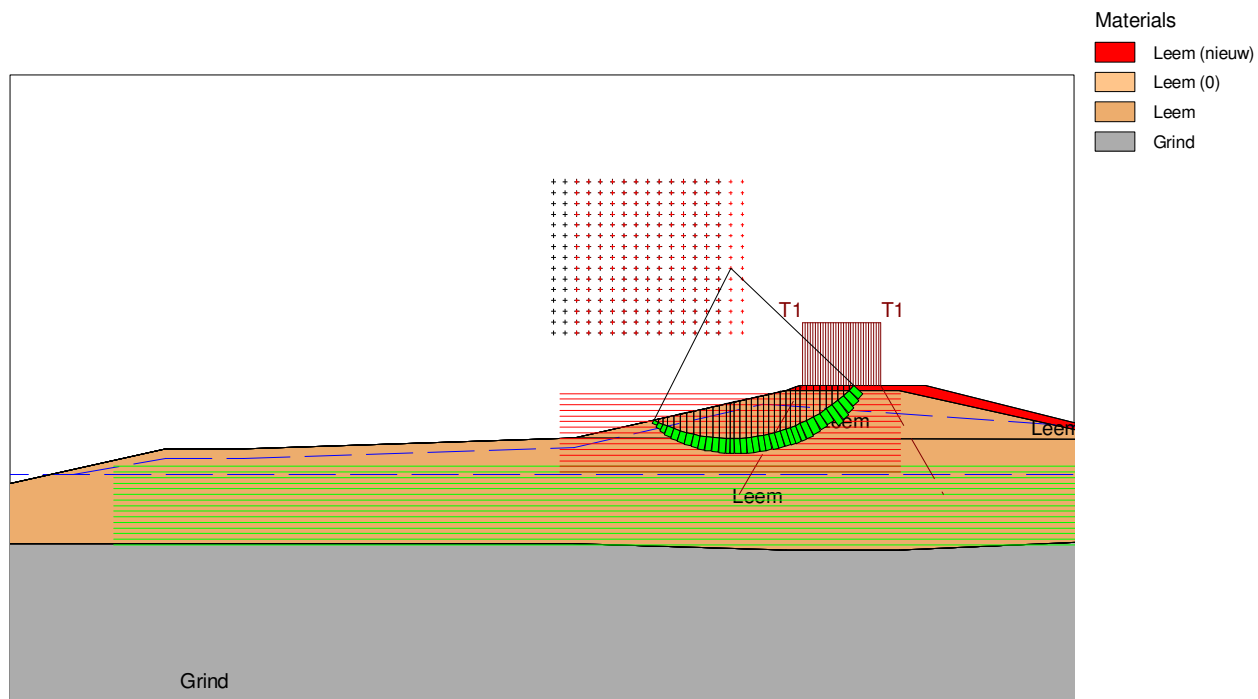
DO Dijkring 88 - Geulle aan de Maas (50.320.6)

dwp 3 - Bishop (STBU)

Annex

form.
A4

Shear Stress Bishop



Xm : -1.76 [m]
Ym : 46.88 [m]

Radius : 5.42 [m]
Safety : 1.44

Max. stress : 6.174 [kN/m²]
Min. stress : 1.006 [kN/m²]

Witteveen - Bos

| | | |
|------------------|-------|-------------|
| Postbus 233 | Phone | 0570 697511 |
| 7400 AE Deventer | Fax | 0570 697123 |

date
08-10-2013

1. W. J.

Sluitstukkaden Cluster E

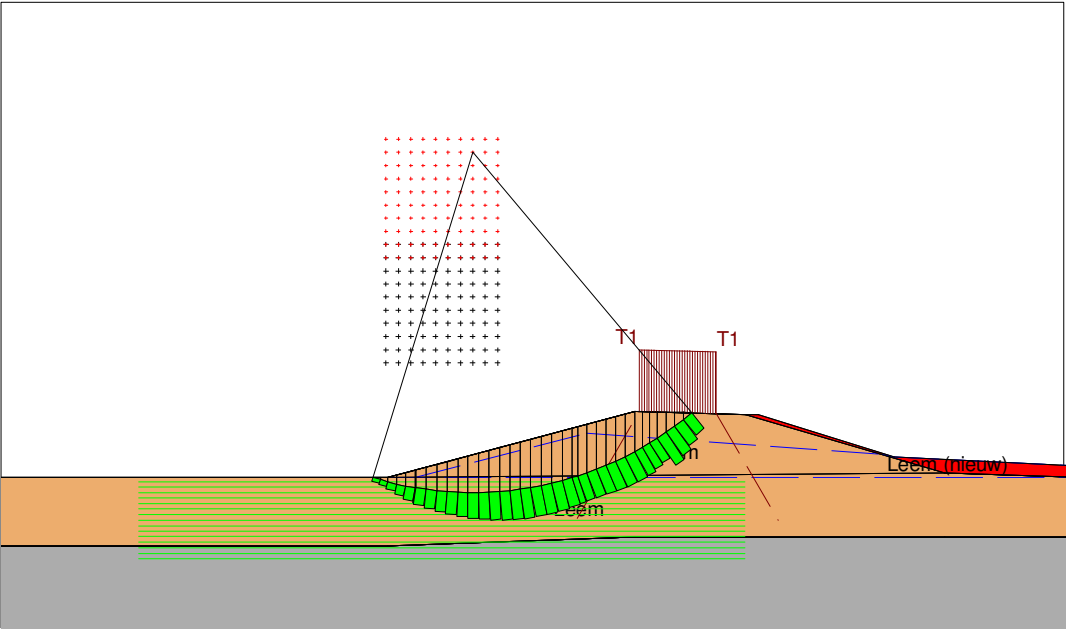
DO Dijkkring 88 - Geulle aan de Maas (50.320.6)

dwp 3 - Bishop (STBU)

Annex

form.
A4

Shear Stress Bishop



Xm : -5.24 [m]
Ym : 51.45 [m]

Radius : 11.01 [m]
Safety : 1.28

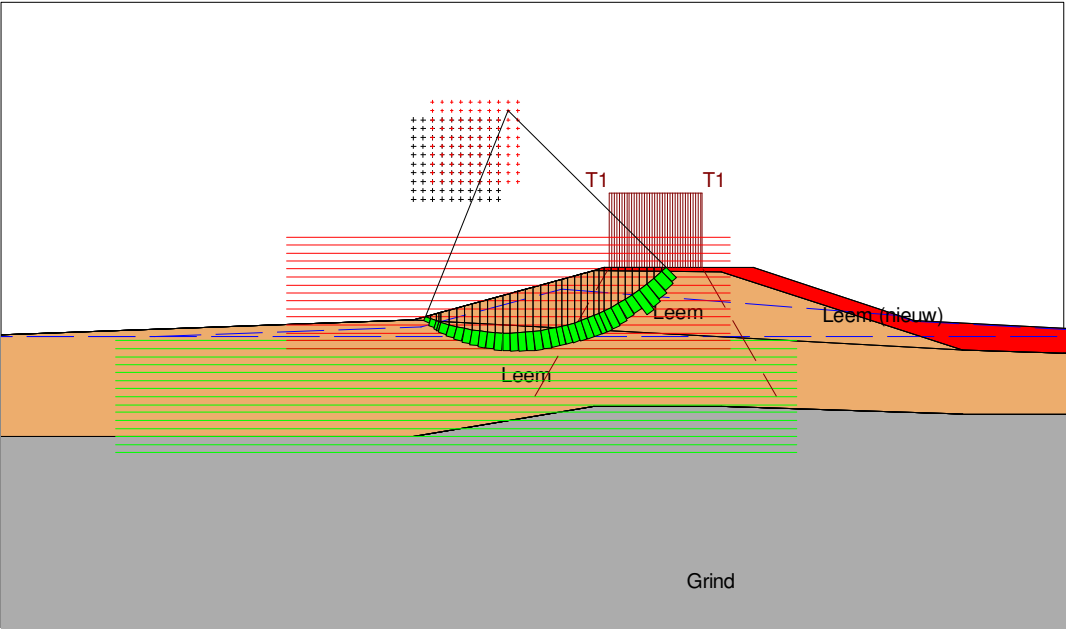
Max. stress : 7.197 [kN/m²]
Min. stress : 0.812 [kN/m²]

Materials

-  Leem (nieuw)
-  Leem (0)
-  Leem
-  Grind

| | | |
|--|------------|------------|
| Witteveen - Bos
Postbus 233
7400 AE Doornik
Phone 0570 697511
Fax 0570 697123 | date | dhw. |
| | 08-10-2013 | - |
| Sluistukkaden Cluster E
DO Dijkring 88 - Geulle aan de Maas (50.320.9)
dwp 1 - Bishop (STBU) | - | dr. |
| | Annex - | brn.
A4 |

Shear Stress Bishop



Xm : -2.30 [m]
Ym : 47.14 [m]

Radius : 5.97 [m]
Safety : 1.30

Max. stress : 6.703 [kN/m²]
Min. stress : 1.085 [kN/m²]

Materials

-  Leem (nieuw)
-  Leem (0)
-  Leem
-  Grind

Bos Witteveen +

| | | |
|------------------|-------|------------|
| Postbus 233 | Phone | 0570 69751 |
| 7400 AE Deventer | Fax | 0570 69712 |

Phone 0570 697511
Fax 0570 697123

D-Geo Stability 10.1 : Dijkring 88 Geulle aan de Maas 50.320. 10 Dwarsprofiel 1 - STBU.st

date
08-10-2013

draw.

Sluitstukkaden Cluster E

DO Dijkring 88 - Geulle aan de Maas (50.320.10)

dwp 1 - Bishop (STBU)

Annex

form.
A4

BIJLAGE VIII HELPDESKWATER VRAAG

Vraag 0907-0170: Creepfactor Bligh

Geachte heer Bouw,

Hierbij berichten wij dat uw vraag genummerd 0907-0170, is afgehandeld.

Ons antwoord luidt:

De geschetste situatie wijkt af van de situatie die voor het toepassen van de regel van Bligh, conform het toetsvoorschrift, voor ogen staat. De vraagsteller geeft aan dat de (onderkant van de) afdekkende leemlaag erosiegevoelig is, waardoor zowel op erosie in de zandlaag als erosie in de leemlaag getoetst moet worden. Met name voor toetsing op erosie van een leemlaag zijn in het VTV geen duidelijke voorschriften voorhanden. Dit zal onder de aandacht gebracht worden van de projectgroep die verantwoordelijk is voor het onderhoud van het wettelijk toetsinstrumentarium (WTI). De hieronder gesuggereerde aanbevolen werkwijze moet dan ook gezien worden als een voorlopige, gebaseerd op raadpleging van deskundigen op dit gebied. Formeel valt de beoordeling onder "beheerdersoordeel".

Om te beginnen moet natuurlijk sprake zijn van stroming in de watervoerende zandlaag naar een uitteerpunt op het binnendijkse maaiveld. Zolang de leemlaag zo dik is dat die niet op kan barsten en overal ononderbroken aanwezig (en afgesloten) is, is daar geen sprake van en hoeft niet op erosie van de zand/grindlaag en de onderkant van de leemlaag te worden getoetst.

Wel kan bij leemlagen van beperkte dikte, die lange tijd droog staan, sprake zijn van spleetvorming en kan bij plotseling stijgende rivierstand spleetstroming ontstaan, waardoor interne erosie optreedt. Dit verschijnsel wordt zeker niet afgedekt door bestaande toetsvoorschriften. Mocht zich die situatie voordoen dan is het zeker aan te bevelen om terzake deskundigen te raadplegen. Echter, wanneer de dikte van de leemlaag, zoals aangegeven door de vraagsteller, overal enige meters is, of wanneer de leemlaag doorgaans verzadigd is speelt dit probleem niet.

Blijft over de erosie van de bovenkant van de zand/grindlaag en van de onderkant van de leemlaag.

Wanneer de zand/grindlaag (aan de bovenkant) overwegend uit zand bestaat dient voor de controle op erosie van de zandlaag met behulp van de regel van Bligh de creepfactor te worden gekozen die bij de zandfractie hoort. Er is dan immers geen grindskelet dat, na wegspoelen van zand, zakkingen verhindert. Bestaat de laag overwegend uit grind, dus een grindskelet waartussen zand zit, dan kan worden getoetst met de creepfactor die bij het grind hoort; deze situatie komt overigens zelden voor in de bovenkant van een zand/grindpakket in Nederland.

De situatie ten aanzien van de onderkant van de leemlaag zou, qua schematisatie, bij benadering het best beschreven kunnen worden met de theorie van Sellmeijer. Een relatief doorlatende watervoerende laag, met bovenin deze laag fijn tot zeer fijn materiaal (van de onderkant van de leemlaag) dat betrekkelijk gemakkelijk door de grondwaterstroming bovenin de zand/grindlaag richting het uitteerpunt wordt meegenomen. Het, gegeven de beperkingen, beste zou daarom zijn de toetsing uit te voeren met de regel van Sellmeijer, waarbij voor de doorlatendheid die van het grind/zandpakket wordt gekozen en voor de d_{70} de diameter van zeer fijn zand.

Als, niettemin, toch gekozen wordt voor een eenvoudige Bligh-achtige toets, dan wordt aanbevolen om voor de creepfactor minimaal uit te gaan van de grootste ($C_{\text{creep}} = 18$), maar, bij voorkeur, een nog groter waarde, bijvoorbeeld $C_{\text{creep}} = 22$ (equivalent aan de creepfactor van Lane voor silt).

Uw vraag luidde:

In Limburg zijn veel kades met succes opgebouwd met leem (kleiig tot zandig met cohesie 3 kPa en hoek van inwendige wrijving 29 graden). Een afdekkende leemlaag van ongeveer 3 m op een

dik pakket grind (zandig) is een veelvoorkomende bodemopbouw. Leem verweekt snel, is erosiegevoelig en slecht waterdoorlatend ten opzichte van grind.

Moet bij deze kades rekeninggehouden worden met piping en zo ja hoe moeten deze dan beoordeeld worden?

Als leem gezien moet worden als klei, dan ontstaan de kanaaltjes in de bovenkant van het grindpakket. De factor Ccreep in Bligh is dan laag en de kans op piping klein.

Als leem beschouwd moet worden als fijn zand, is leem erosiegevoeliger dan grind. In dat geval ontstaan de kanaaltjes aan de onderkant van de leemlaag. Moet dan een Ccreep van 18 worden aangehouden?

Met vriendelijke groet,

Helpdesk Water

Telefoon: 0800-NLWATER (0800 - 659 28 37)

E-mail: contact@helpdeskwater.nl

Internet: www.helpdeskwater.nl

De Helpdesk Water is primair bedoeld voor het beantwoorden van vragen van mensen die beroepsmatig betrokken zijn bij het waterbeleid, het waterbeheer en het watermanagement. De Helpdesk Water is opgezet door rijk, provincies, gemeenten en waterschappen, onder bestuurlijke verantwoordelijkheid van het Nationaal WaterOverleg (voorheen LBOW).

BIJLAGE IX BEREKENINGEN PIPING (STPH)

Witteveen + Bos

invoerparameters

| | | | |
|---|----------|-------|--|
| afstand van teen tot teen | | m | |
| voorlandlengte | | m | |
| lengte horizontale kwelweg | L | m | |
| maaiveldhoogte | | m | |
| onderkant deklaag binnendijks | | m | |
| volumegewicht deklaag | γ | kN/m3 | |
| 70 percentiel waarde van de korrelverdeling | d70 | mm | |
| verticale kwelweg | d | | |
| d factor | fd | - | |
| creepfactor van Bligh | Ccreep | - | |
| buitenwaterstand | MHW | m+NAP | |
| polderpeil | pp | m+NAP | |

opbarstveiligheid

| | | | |
|-------------------|---|--|--|
| neerwaartse druk | | | |
| opwaartse druk | | | |
| opbarstveiligheid | - | | |

pipingscriterium

| | | | |
|------------------------------------|--|---|--|
| kritiek verval | ΔH_c | m | |
| veiligheidsfactor | γ | - | |
| verval | ΔH | m | |
| | $\gamma (\Delta H - f_d \cdot d)$ | m | |
| Voldoet? opbarstveiligheid >1,0 of | $\Delta H_c > \gamma (\Delta H - f_d \cdot d)$ | | |

| 50.320.2
DP1 | 50.320.3
DP1 | 50.320.4
DP1 | 50.320.4
DP2 | 50.320.4
DP3 | 50.320.5
DP1 | 50.320.5
DP2 | 50.320.6
DP1 | 50.320.6
DP2 | 50.320.6
DP3 | 50.320.6
DP4 | 50.320.9
DP1 | 50.320.10
DP1 |
|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|------------------|
| 30 | 37 | 29.5 | 31 | 33.5 | 32 | 30 | 17 | 19 | 19 | 27.5 | 25.5 | 20.5 |
| 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| 40 | 47 | 39.5 | 41 | 43.5 | 42 | 40 | 27 | 29 | 29 | 37.5 | 35.5 | 30.5 |
| 41.47 | 41.33 | 41.4 | 41 | 41.39 | 39.97 | 40.47 | 41.39 | 41.08 | 41.2 | 40.51 | 40.85 | 40.85 |
| 39.6 | 39.5 | 39.4 | 39.4 | 39.2 | 38.5 | 38.5 | 38.2 | 38.2 | 38.2 | 38.2 | 39 | 39 |
| 19 | 19 | 19 | 19 | 19 | 19 | 19 | 19 | 19 | 19 | 19 | 19 | 19 |
| <105 | <105 | <105 | <105 | <105 | <105 | <105 | <105 | <105 | <105 | <105 | <105 | <105 |
| 1.87 | 1.83 | 2 | 1.6 | 2.19 | 1.47 | 1.97 | 3.19 | 2.88 | 3 | 2.31 | 1.85 | 1.85 |
| 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 |
| 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 |
| 43.72 | 43.82 | 42.97 | 42.97 | 42.97 | 42.77 | 42.77 | 42.64 | 42.64 | 42.64 | 42.64 | 42.43 | 42.44 |
| 41.47 | 41.33 | 41.4 | 41 | 41.39 | 39.97 | 40.47 | 41.39 | 41.08 | 41.2 | 40.51 | 40.85 | 40.85 |
| 35.53 | 34.77 | 38 | 30.4 | 41.61 | 27.93 | 37.43 | 60.61 | 54.72 | 57 | 43.89 | 35.15 | 35.15 |
| 41.20 | 43.20 | 35.70 | 35.70 | 37.70 | 42.70 | 42.70 | 44.40 | 44.40 | 44.40 | 44.40 | 34.30 | 34.40 |
| 0.86 | 0.80 | 1.06 | 0.85 | 1.10 | 0.65 | 0.88 | 1.37 | 1.23 | 1.28 | 0.99 | 1.02 | 1.02 |
| 1.82 | 2.14 | 1.80 | 1.86 | 1.98 | 1.91 | 1.82 | 1.23 | 1.32 | 1.32 | 1.70 | 1.61 | 1.39 |
| 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 2.25 | 2.49 | 1.57 | 1.97 | 1.58 | 2.8 | 2.3 | 1.25 | 1.56 | 1.44 | 2.13 | 1.58 | 1.59 |
| 1.69 | 1.94 | 0.97 | 1.49 | 0.92 | 2.36 | 1.71 | 0.29 | 0.70 | 0.54 | 1.44 | 1.03 | 1.04 |
| ja | ja | ja | ja | ja | nee | ja | ja | ja | ja | ja | ja | ja |
| 37.2 | 42.7 | 21.3 | 32.8 | 20.3 | 51.9 | 37.6 | 6.4 | 15.3 | 11.9 | 31.6 | 22.6 | 22.8 |
| - | - | - | - | - | 9.9 | - | - | - | - | - | - | - |

Witteveen + Bos

invoerparameters

| | | |
|---|----------|-------------------|
| afstand van teen tot teen | m | |
| voorlandlengte | m | |
| lengte horizontale kwelweg | L | m |
| maaiveldhoogte | m | |
| onderkant deklaag binnendijks | m | |
| volumegewicht deklaag | γ | kN/m ³ |
| 70 percentiel waarde van de korrelverdeling | d70 | mm |
| verticale kwelweg | d | - |
| d factor | fd | - |
| creepfactor van Bligh | Ccreep | - |
| buitenwaterstand | MHW | m+NAP |
| polderpeil | pp | m+NAP |

opbarstveiligheid

| | | |
|-------------------|---|--|
| neerwaartse druk | | |
| opwaartse druk | | |
| opbarstveiligheid | - | |

pipingscriterium

| | | |
|--|----------------------------------|---|
| kritiek verval | ΔH_c | m |
| veiligheidsfactor | γ | - |
| verval | ΔH | m |
| | $\gamma (\Delta H - fd \cdot d)$ | m |
| Voldoet? opbarstveiligheid >1,0 of $\Delta H_c > \gamma (\Delta H - fd \cdot d)$ | | |

| | | |
|-------------------------|---|--|
| Benodigde kwelweglengte | m | |
| Kwelweglengtetekort | m | |

Bomen

| 50.320.4
DP3 | 50.320.2
DP1 | 50.320.6
DP1 | 50.320.6
DP2 | 50.320.6
DP3 | 50.320.6
DP4 | 50.320.9
westen Kuiperstraat | 50.320.9
oosten Kuiperstraat | 50.320.6
DP1 |
|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|---------------------------------|---------------------------------|-----------------|
| 33.5 | 30 | 19 | 19 | 19 | 27.5 | 37 | 31 | 23 |
| 10 | 0 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| 43.5 | 30 | 29 | 29 | 29 | 37.5 | 47 | 41 | 33 |
| 40.39 | 41.47 | 40.39 | 40.08 | 40.2 | 39.51 | 40 | 40.5 | 40.7 |
| 39.2 | 39.6 | 38.2 | 38.2 | 38.2 | 38.2 | 39 | 39 | 38.2 |
| 19 | 19 | 19 | 19 | 19 | 19 | 19 | 19 | 19 |
| <105 | <105 | <105 | <105 | <105 | <105 | <105 | <105 | <105 |
| 1.19 | 1.87 | 2.19 | 1.88 | 2 | 1.31 | 1 | 1.5 | 2.5 |
| 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 |
| 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 |
| 42.97 | 43.72 | 42.64 | 42.64 | 42.64 | 42.64 | 42.43 | 42.44 | 42.64 |
| 40.39 | 41.47 | 40.39 | 40.08 | 40.2 | 39.51 | 40 | 40.5 | 40.7 |
| 22.61 | 35.53 | 41.61 | 35.72 | 38 | 24.89 | 19 | 28.5 | 47.5 |
| 37.70 | 41.20 | 44.40 | 44.40 | 44.40 | 44.40 | 34.30 | 34.40 | 44.40 |
| 0.60 | 0.86 | 0.94 | 0.80 | 0.86 | 0.56 | 0.55 | 0.83 | 1.07 |
| 1.98 | 1.36 | 1.32 | 1.32 | 1.32 | 1.70 | 2.14 | 1.86 | 1.50 |
| 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 2.58 | 2.25 | 2.25 | 2.56 | 2.44 | 3.13 | 2.43 | 1.94 | 1.94 |
| 2.22 | 1.69 | 1.59 | 2.00 | 1.84 | 2.74 | 2.13 | 1.49 | 1.19 |
| nee | nee | nee | nee | nee | nee | ja | ja | ja |
| 48.9 | 37.2 | 35.0 | 43.9 | 40.5 | 60.2 | 46.9 | 32.8 | 26.2 |
| 5.4 | 7.2 | 6.0 | 14.9 | 11.5 | 22.7 | - | - | - |

BIJLAGE X BEREKENINGEN STABILITEIT VOORLAND (STVL)

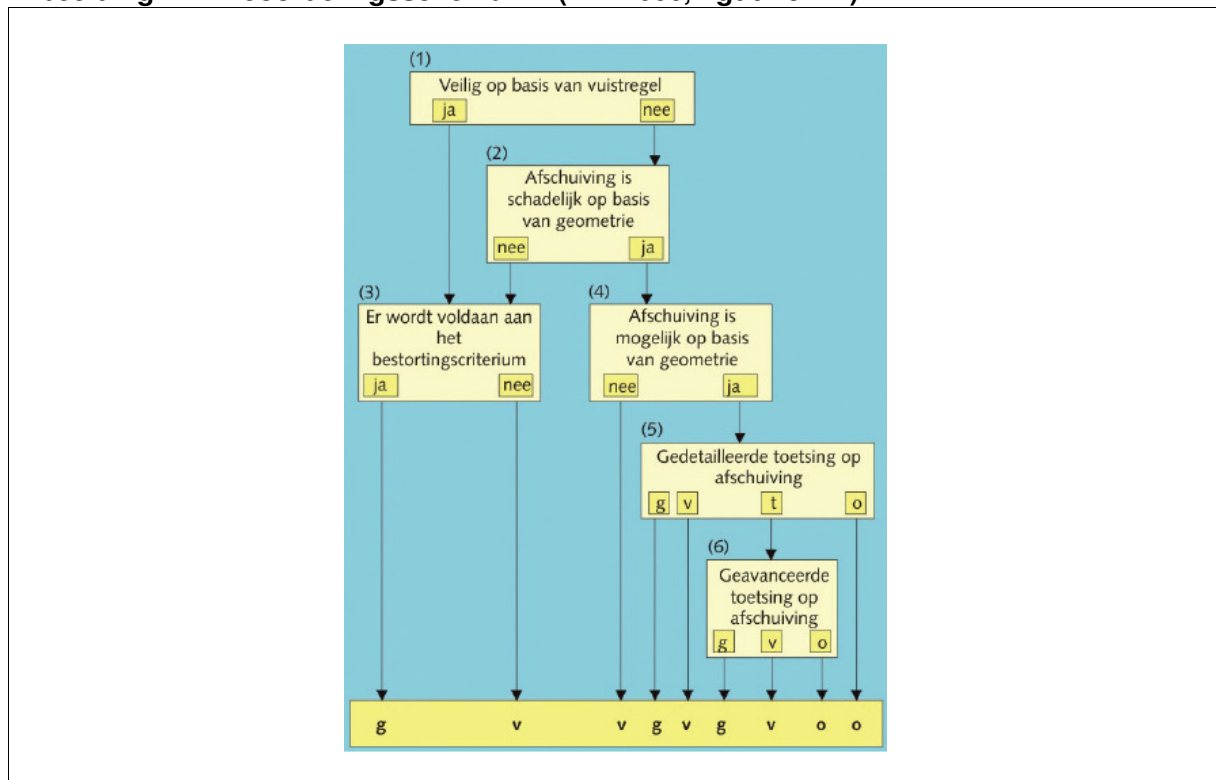
Toetsing stabiliteit voorland (STVL)

Afschuiving (AF)

Het deelspoor AF moet worden getoetst aan de hand van de volgende stappen (Afbeelding 1):

- stap 1: Vuistregel: Controle aanwezigheid geul met diepte > 9 m;
- stap 2: Geometrische toetsing: schadelijkheids criterium Afschuiving;
- stap 3: Bestortingscriterium;
- stap 4: Geometrische toetsing: optredingscriterium Afschuiving;
- stap 5: Gedetailleerde toetsing;
- stap 6: Geavanceerde toetsing.

Afbeelding 1. Beoordelingsschema AF (VTV2006, figuur 9-2.2)



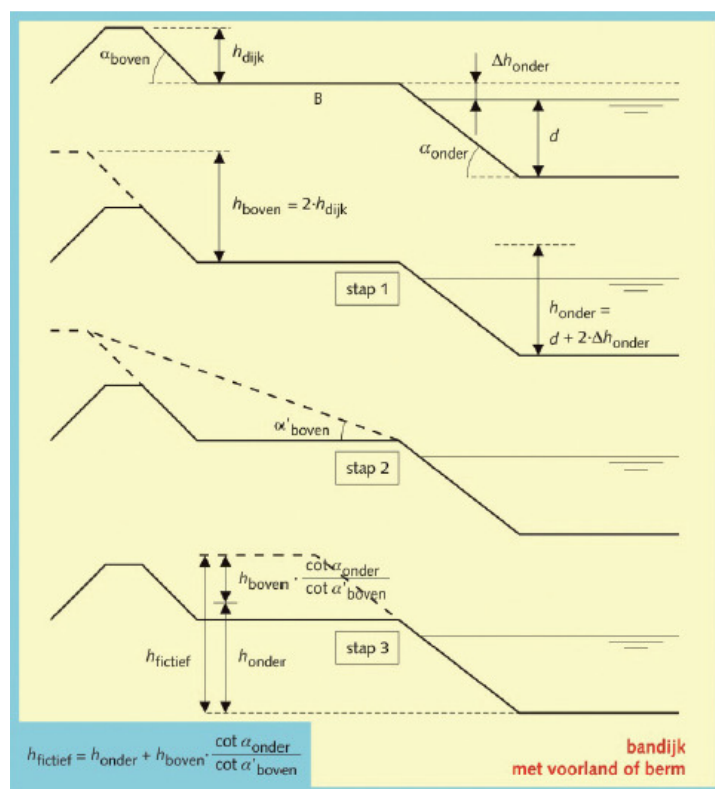
Stap 1: Vuistregel

In stap 1 wordt de fictieve geuldiepte beschouwd. In de VTV2006 worden twee voorwaarden genoemd waaraan voldaan moet worden om naar stap 3 te gaan:

- het voorland is ontstaan door natuurlijke processen;
- de fictieve geuldiepte is kleiner dan 9 meter.

De fictieve geuldiepte is bepaald met behulp van Afbeelding 2. De resultaten van stap 1 zijn gegeven in Tabel 1. In de berekeningen is voor de taludhelling van de geul is een waarde van 1:4,5 aangehouden. Dit is het steilste talud dat is gevonden in de PDF tekeningen van de Grensmaas. De bodem is aangehouden op NAP +33,5 m. Dit is het diepste punt ter plaatse van de ontgraving van het voorland.

Afbeelding 2. Fictieve geuldiepte (VTV2006 figuur 9-B1.1)



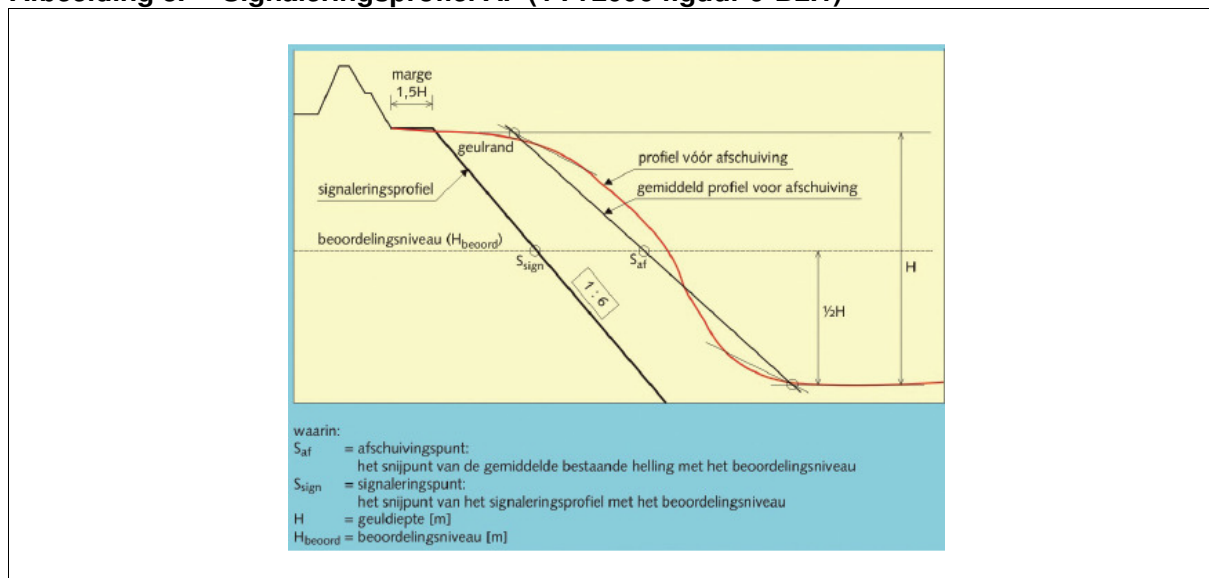
Tabel 1. Beoordeling stap 1: Bepaling fictieve geuldiepte

| dijkvak
[-] | dwarsprofiel
[-] | niveau | | | fictieve geuldiepte
[m] | vervolg
[-] |
|----------------|---------------------|-----------------|---------------------|------------------|----------------------------|----------------|
| | | geul
[m NAP] | voorland
[m NAP] | kruin
[m NAP] | | |
| 50.320.2 | DP1 | 33,5 | 41,21 | 44,22 | 16,10 | stap 2 |
| 50.320.3 | DP1 | 33,5 | 40,70 | 44,32 | 18,85 | stap 2 |
| 50.320.4 | DP1 | 33,5 | 40,68 | 43,75 | 18,45 | stap 2 |
| | DP2 | 33,5 | 40,47 | 43,47 | 17,39 | stap 2 |
| | DP3 | 33,5 | 40,63 | 43,47 | 17,55 | stap 2 |
| 50.320.5 | DP1 | 33,5 | 40,66 | 43,27 | 17,58 | stap 2 |
| | DP2 | 33,5 | 40,98 | 43,27 | 17,24 | stap 2 |
| 50.320.6 | DP1 | 33,5 | 40,67 | 43,14 | 17,03 | stap 2 |
| | DP2 | 33,5 | 40,91 | 43,14 | 17,14 | stap 2 |
| | DP3 | 33,5 | 40,34 | 43,22 | 17,45 | stap 2 |
| | DP4 | 33,5 | 41,12 | 43,14 | 16,88 | stap 2 |
| 50.320.9 | DP1 | 33,5 | 40,92 | 43,07 | 15,65 | stap 2 |
| 50.320.10 | DP1 | 33,5 | 41,08 | 42,94 | 14,76 | stap 2 |

Stap 2: Schadelijkheids criterium Afschuiving

In deze stap is nagegaan of de afschuiving de waterkering bereikt. Hiervoor wordt de methode met een signaleringsprofiel gebruikt volgens Afbeelding 3.

Afbeelding 3. Signaleringsprofiel AF (VTV2006 figuur 9-B2.1)



Tabel 2. Beoordeling stap 2: Schadelijkheidscriterium afschuiving

| dijkvak | dwarsprofiel | signaleringspunt
[m t.o.v. buitenteen dijk] | afschuivingspunt
[m t.o.v. buitenteen dijk] | vervolg |
|-----------|--------------|--|--|---------|
| 50.320.2 | DP1 | 35 | 77 | stap 3 |
| 50.320.3 | DP1 | 32 | 26 | stap 4 |
| 50.320.4 | DP1 | 32 | 26 | stap 4 |
| | DP2 | 31 | 26 | stap 4 |
| | DP3 | 32 | 26 | stap 4 |
| 50.320.5 | DP1 | 32 | 26 | stap 4 |
| | DP2 | 34 | 27 | stap 4 |
| 50.320.6 | DP1 | 32 | 26 | stap 4 |
| | DP2 | 33 | 27 | stap 4 |
| | DP3 | 31 | 25 | stap 4 |
| | DP4 | 34 | 27 | stap 4 |
| 50.320.9 | DP1 | 33 | 47 | stap 4 |
| 50.320.10 | DP1 | 34 | 107 | stap 3 |

De rekensheet voor stappen 1 en 2 is aan het einde van deze bijlage opgenomen.

Stap 3: Bestortingscriterium

Er zijn geen gegevens beschikbaar betreffende de aanwezigheid van een steenbestorting op het voorland. Om deze reden luidt het oordeel voor dijkvakken 50.320.2, 50.320.9 en 50.320.10 'voldoende'.

Stap 4 optredingscriterium afschuiving

Het optreden van een afschuiving is mogelijk als wordt voldaan aan één van de drie onderstaande voorwaarden:

- de gemiddelde helling is steiler dan of gelijk aan 1:2, over een hoogte van minimaal 5 m, tenzij ter plaatse van een kleilaag zonder zand;
- de gemiddelde helling is steiler dan of gelijk aan 1:1, over een hoogte van minimaal 5 m, mits ter plaatse van een kleilaag zonder zand;
- de totale helling (geulrand-geulbodem) is gemiddeld steiler dan of gelijk aan 1:4,5.

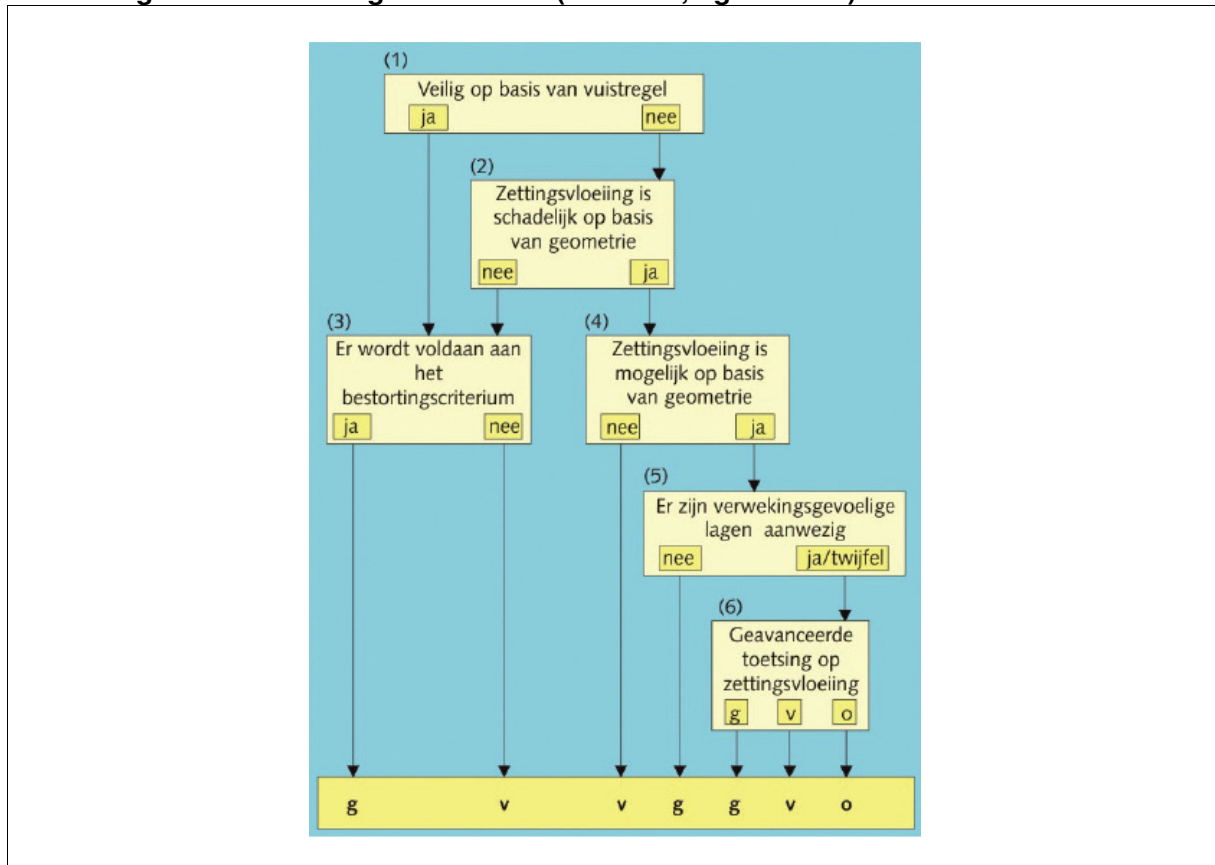
Voor alle profielen geldt dat de taludhelling van de geul maximaal 1:4,5 bedraagt. Afschuiving op basis van de geometrie is daarom niet mogelijk en ook het oordeel voor dijkvakken 50.320.3 t/m 50.320.6 luidt 'voldoende'.

Zettingsvloeiing (ZV)

Het deelspoor ZV moet worden getoetst aan de hand van de volgende stappen (Afbeelding 4):

- stap 1: Vuistregel: Controle aanwezigheid geul met diepte > 9 m;
- stap 2: Geometrische toetsing: schadelijkheidscriterium Zettingsvloeiing;
- stap 3: Bestortingscriterium;
- stap 4: Geometrische toetsing: optredingscriterium Zettingsvloeiing;
- stap 5: Aanwezigheid verwekingsgevoelige lagen+
- stap 6: Geavanceerde toetsing.

Afbeelding 4. Beoordelingsschema ZV (VTV2006, figuur 9-2.4)



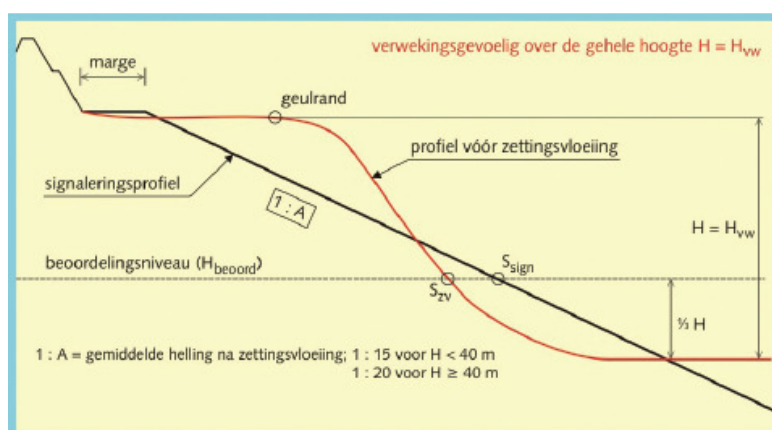
Stap 1: Vuistregel

Stap 1 verloopt voor zettingsvloeiing hetzelfde als de beoordeling op afschuiving.

Stap 2: Schadelijkheidscriterium Zettingsvloeiing

In deze stap is nagegaan of zettingsvloeiing de waterkering bereikt. Hiervoor wordt de methode met een signaleringsprofiel gebruikt volgens Afbeelding 5.

Afbeelding 5. Signaleringsprofiel ZV (VTV2006 figuur 9-B4.1)



Tabel 3. Beoordeling stap 2: Schadelijkheidscriterium zettingstvloeijing

| dijkvak | dwarsprofiel | signaleringspunt
[m t.o.v. buitenteen] | zettingstvloeingspunt
[m t.o.v. buitenteen] | vervolg |
|-----------|--------------|---|--|---------|
| 50.320.2 | DP1 | 93 | 83 | stap 4 |
| 50.320.3 | DP1 | 86 | 32 | stap 4 |
| 50.320.4 | DP1 | 86 | 32 | stap 4 |
| | DP2 | 84 | 31 | stap 4 |
| | DP3 | 86 | 31 | stap 4 |
| 50.320.5 | DP1 | 86 | 31 | stap 4 |
| | DP2 | 90 | 32 | stap 4 |
| 50.320.6 | DP1 | 86 | 32 | stap 4 |
| | DP2 | 89 | 32 | stap 4 |
| | DP3 | 82 | 31 | stap 4 |
| | DP4 | 91 | 33 | stap 4 |
| 50.320.9 | DP1 | 89 | 52 | stap 4 |
| 50.320.10 | DP1 | 91 | 113 | stap 3 |

De rekensheet voor stappen 1 en 2 is aan het einde van deze bijlage opgenomen.

Stap 3: Bestortingscriterium

Er zijn geen gegevens beschikbaar betreffende de aanwezigheid van een steenbestorting op het voorland. Om deze reden luidt het oordeel voor dijkvak 50.320.10 'voldoende'.

Stap 4: Optredingscriterium Zettingstvloeijing

Het optreden van een zettingstvloeijing is mogelijk als wordt voldaan aan één van de twee onderstaande voorwaarden:

- de gemiddelde helling is steiler dan of gelijk aan 1:4, over een hoogte van minimaal 5 m;
- de totale helling (geulrand-geulbodem) is gemiddeld steiler dan of gelijk aan 1:7.

Aan de tweede voorwaarde wordt voldaan. Zettingstvloeijing is op basis van de geometrie niet uit te sluiten en de beoordeling gaat verder in stap 5.

Stap 5: Aanwezigheid verwekingsgevoelige lagen

In bijlage 9-6 van het VTV staat beschreven dat cohesieve lagen en grof materiaal zoals mijnsteen niet verwekingsgevoelig zijn. Ook zandlagen in het rivierengebied, buiten het getijdegebied, zijn niet verwekingsgevoelig. Hierop gelden echter wel twee uitzonderingen: zandopspuitingen op het voorland of onder het dijklichaam en zandwinputten in uiterwaarden. Bij

Geulle aan de Maas is in het voorland een grindpakket aanwezig met een deklaag van cohesieve materialen. Deze materialen zijn niet verwekingsgevoelig en het oordeel luidt 'voldoende'.

project: Sluitstukkaden
code: cluster E
locatie: STD88-1
datum: 50.320.2 DP1
10-okt-13

bepaling fictieve geuldiepte (zie bijlage 9-1 VTV2006)

| | | | |
|------------------------------|------------------|--------------|----------|
| hoogte dijk | h_dijk | 44.22 | m+NAP |
| bodem geul | h_geul | 33.5 | m+NAP |
| hoogte voorland | h_voorland | 41.21 | m+NAP |
| breedte voorland | B | 60 | m |
| waterpeil extreem laag water | h_water | 34.8 | m+NAP |
| talud dijk | t_boven | 3.7 | 1:x |
| | alpha boven | 0.26 | rad |
| talud geul | t_onder | 4.5 | 1:x |
| | alpha onder | 0.22 | rad |
| fictief talud | alpha' boven | 0.07 | rad |
| fictieve geuldiepte | h_fictief | 16.10 | m |

schadelijkheids criterium afschuiving (zie bijlage 9-2 VTV2006)

| | | | |
|------------------------------------|---------|-------|--------------------|
| beoordelingsniveau | H_boord | 37.36 | m+NAP |
| signaleringspunt zonder bestorting | S_sign | 35 | m vanaf buitenteen |
| afschuivingspunt zonder bestorting | S_af | 77 | m vanaf buitenteen |
| voldoet | | | |

schadelijkheids criterium zettingsvloeiing (zie bijlage 9-4 VTV2006)

| | | | |
|---|---------|------|--------------------|
| beoordelingsniveau | H_boord | 36.1 | m+NAP |
| helling signaleringsprofiel | A | 15 | 1:x |
| signaleringspunt zonder bestorting | S_sign | 93 | m vanaf buitenteen |
| zettingsvloeiingspunt zonder bestorting | S_zv | 83 | m vanaf buitenteen |
| voldoet niet | | | |

project: Sluitstukkaden
code: cluster E
locatie: STD88-1
datum: 50.320.3 DP1
10-okt-13

bepaling fictieve geuldiepte (zie bijlage 9-1 VTV2006)

| | | | |
|------------------------------|------------------|--------------|----------|
| hoogte dijk | h_dijk | 44.32 | m+NAP |
| bodem geul | h_geul | 33.5 | m+NAP |
| hoogte voorland | h_voorland | 40.7 | m+NAP |
| breedte voorland | B | 10 | m |
| waterpeil extreem laag water | h_water | 34.5 | m+NAP |
| talud dijk | t_boven | 4.6 | 1:x |
| | alpha boven | 0.21 | rad |
| talud geul | t_onder | 4.5 | 1:x |
| | alpha onder | 0.22 | rad |
| fictief talud | alpha'_boven | 0.17 | rad |
| fictieve geuldiepte | h_fictief | 18.85 | m |

schadelijkheids criterium afschuiving (zie bijlage 9-2 VTV2006)

| | | | |
|------------------------------------|---------|-------|--------------------|
| beoordelingsniveau | H_boord | 37.10 | m+NAP |
| signaleringspunt zonder bestorting | S_sign | 32 | m vanaf buitenteen |
| afschuivingspunt zonder bestorting | S_af | 26 | m vanaf buitenteen |
| voldoet niet | | | |

schadelijkheids criterium zettingsvloeiing (zie bijlage 9-4 VTV2006)

| | | | |
|---|---------|------|--------------------|
| beoordelingsniveau | H_boord | 35.9 | m+NAP |
| helling signaleringsprofiel | A | 15 | 1:x |
| signaleringspunt zonder bestorting | S_sign | 86 | m vanaf buitenteen |
| zettingsvloeiingspunt zonder bestorting | S_zv | 32 | m vanaf buitenteen |
| voldoet niet | | | |

project: Sluitstukkaden
code: cluster E
locatie: STD88-1
datum: 50.320.4 DP1
10-okt-13

bepaling fictieve geuldiepte (zie bijlage 9-1 VTV2006)

| | | | |
|------------------------------|------------------|--------------|----------|
| hoogte dijk | h_dijk | 43.75 | m+NAP |
| bodem geul | h_geul | 33.5 | m+NAP |
| hoogte voorland | h_voorland | 40.68 | m+NAP |
| breedte voorland | B | 10 | m |
| waterpeil extreem laag water | h_water | 34.5 | m+NAP |
| talud dijk | t_boven | 3.8 | 1:x |
| | alpha boven | 0.26 | rad |
| talud geul | t_onder | 4.5 | 1:x |
| | alpha onder | 0.22 | rad |
| fictief talud | alpha'_boven | 0.18 | rad |
| fictieve geuldiepte | h_fictief | 18.45 | m |

schadelijkheidscriterium afschuiving (zie bijlage 9-2 VTV2006)

| | | | |
|------------------------------------|---------|-------|--------------------|
| beoordelingsniveau | H_boord | 37.09 | m+NAP |
| signaleringspunt zonder bestorting | S_sign | 32 | m vanaf buitenteen |
| afschuivingspunt zonder bestorting | S_af | 26 | m vanaf buitenteen |
| voldoet niet | | | |

schadelijkheidscriterium zettingsvloeiing (zie bijlage 9-4 VTV2006)

| | | | |
|---|---------|------|--------------------|
| beoordelingsniveau | H_boord | 35.9 | m+NAP |
| helling signaleringsprofiel | A | 15 | 1:x |
| signaleringspunt zonder bestorting | S_sign | 86 | m vanaf buitenteen |
| zettingsvloeiingspunt zonder bestorting | S_zv | 32 | m vanaf buitenteen |
| voldoet niet | | | |

project: Sluitstukkaden
code: cluster E
locatie: STD88-1
datum: 50.320.4 DP2
10-okt-13

bepaling fictieve geuldiepte (zie bijlage 9-1 VTV2006)

| | | | |
|------------------------------|------------------|--------------|----------|
| hoogte dijk | h_dijk | 43.47 | m+NAP |
| bodem geul | h_geul | 33.5 | m+NAP |
| hoogte voorland | h_voorland | 40.47 | m+NAP |
| breedte voorland | B | 10 | m |
| waterpeil extreem laag water | h_water | 34.5 | m+NAP |
| talud dijk | t_boven | 4.4 | 1:x |
| | alpha boven | 0.22 | rad |
| talud geul | t_onder | 4.5 | 1:x |
| | alpha onder | 0.22 | rad |
| fictief talud | alpha'_boven | 0.16 | rad |
| fictieve geuldiepte | h_fictief | 17.39 | m |

schadelijkheidscriterium afschuiving (zie bijlage 9-2 VTV2006)

| | | | |
|------------------------------------|---------|-------|--------------------|
| beoordelingsniveau | H_boord | 36.99 | m+NAP |
| signaleringspunt zonder bestorting | S_sign | 31 | m vanaf buitenteen |
| afschuivingspunt zonder bestorting | S_af | 26 | m vanaf buitenteen |
| voldoet niet | | | |

schadelijkheidscriterium zettingsvloeiing (zie bijlage 9-4 VTV2006)

| | | | |
|---|---------|------|--------------------|
| beoordelingsniveau | H_boord | 35.8 | m+NAP |
| helling signaleringsprofiel | A | 15 | 1:x |
| signaleringspunt zonder bestorting | S_sign | 84 | m vanaf buitenteen |
| zettingsvloeiingspunt zonder bestorting | S_zv | 31 | m vanaf buitenteen |
| voldoet niet | | | |

project: Sluitstukkaden
code: cluster E
locatie: STD88-1
datum: 50.320.4 DP3
10-okt-13

bepaling fictieve geuldiepte (zie bijlage 9-1 VTV2006)

| | | | |
|------------------------------|------------------|--------------|----------|
| hoogte dijk | h_dijk | 43.47 | m+NAP |
| bodem geul | h_geul | 33.5 | m+NAP |
| hoogte voorland | h_voorland | 40.63 | m+NAP |
| breedte voorland | B | 10 | m |
| waterpeil extreem laag water | h_water | 34.5 | m+NAP |
| talud dijk | t_boven | 4.2 | 1:x |
| | alpha boven | 0.23 | rad |
| talud geul | t_onder | 4.5 | 1:x |
| | alpha onder | 0.22 | rad |
| fictief talud | alpha'_boven | 0.17 | rad |
| fictieve geuldiepte | h_fictief | 17.55 | m |

schadelijkheidscriterium afschuiving (zie bijlage 9-2 VTV2006)

| | | | |
|------------------------------------|---------|-------|--------------------|
| beoordelingsniveau | H_boord | 37.07 | m+NAP |
| signaleringspunt zonder bestorting | S_sign | 32 | m vanaf buitenteen |
| afschuivingspunt zonder bestorting | S_af | 26 | m vanaf buitenteen |
| voldoet niet | | | |

schadelijkheidscriterium zettingsvloeiing (zie bijlage 9-4 VTV2006)

| | | | |
|---|---------|------|--------------------|
| beoordelingsniveau | H_boord | 35.9 | m+NAP |
| helling signaleringsprofiel | A | 15 | 1:x |
| signaleringspunt zonder bestorting | S_sign | 86 | m vanaf buitenteen |
| zettingsvloeiingspunt zonder bestorting | S_zv | 31 | m vanaf buitenteen |
| voldoet niet | | | |

project: Sluitstukkaden
code: cluster E
locatie: STD88-1
datum: 50.320.5 DP1
10-okt-13

bepaling fictieve geuldiepte (zie bijlage 9-1 VTV2006)

| | | | |
|------------------------------|------------------|--------------|----------|
| hoogte dijk | h_dijk | 43.27 | m+NAP |
| bodem geul | h_geul | 33.5 | m+NAP |
| hoogte voorland | h_voorland | 40.66 | m+NAP |
| breedte voorland | B | 10 | m |
| waterpeil extreem laag water | h_water | 34.5 | m+NAP |
| talud dijk | t_boven | 3.6 | 1:x |
| | alpha boven | 0.27 | rad |
| talud geul | t_onder | 4.5 | 1:x |
| | alpha onder | 0.22 | rad |
| fictief talud | alpha' boven | 0.18 | rad |
| fictieve geuldiepte | h_fictief | 17.58 | m |

schadelijkheids criterium afschuiving (zie bijlage 9-2 VTV2006)

| | | | |
|------------------------------------|---------|-------|--------------------|
| beoordelingsniveau | H_boord | 37.08 | m+NAP |
| signaleringspunt zonder bestorting | S_sign | 32 | m vanaf buitenteen |
| afschuivingspunt zonder bestorting | S_af | 26 | m vanaf buitenteen |
| voldoet niet | | | |

schadelijkheids criterium zettingsvloeiing (zie bijlage 9-4 VTV2006)

| | | | |
|---|---------|------|--------------------|
| beoordelingsniveau | H_boord | 35.9 | m+NAP |
| helling signaleringsprofiel | A | 15 | 1:x |
| signaleringspunt zonder bestorting | S_sign | 86 | m vanaf buitenteen |
| zettingsvloeiingspunt zonder bestorting | S_zv | 31 | m vanaf buitenteen |
| voldoet niet | | | |

project: Sluitstukkaden
code: cluster E
locatie: STD88-1
datum: 50.320.5 DP2
10-okt-13

bepaling fictieve geuldiepte (zie bijlage 9-1 VTV2006)

| | | | |
|------------------------------|------------------|--------------|----------|
| hoogte dijk | h_dijk | 43.27 | m+NAP |
| bodem geul | h_geul | 33.5 | m+NAP |
| hoogte voorland | h_voorland | 40.98 | m+NAP |
| breedte voorland | B | 10 | m |
| waterpeil extreem laag water | h_water | 34.5 | m+NAP |
| talud dijk | t_boven | 4.1 | 1:x |
| | alpha boven | 0.24 | rad |
| talud geul | t_onder | 4.5 | 1:x |
| | alpha onder | 0.22 | rad |
| fictief talud | alpha'_boven | 0.16 | rad |
| fictieve geuldiepte | h_fictief | 17.24 | m |

schadelijkheids criterium afschuiving (zie bijlage 9-2 VTV2006)

| | | | |
|------------------------------------|---------|-------|--------------------|
| beoordelingsniveau | H_boord | 37.24 | m+NAP |
| signaleringspunt zonder bestorting | S_sign | 34 | m vanaf buitenteen |
| afschuivingspunt zonder bestorting | S_af | 27 | m vanaf buitenteen |
| voldoet niet | | | |

schadelijkheids criterium zettingsvloeiing (zie bijlage 9-4 VTV2006)

| | | | |
|---|---------|------|--------------------|
| beoordelingsniveau | H_boord | 36.0 | m+NAP |
| helling signaleringsprofiel | A | 15 | 1:x |
| signaleringspunt zonder bestorting | S_sign | 90 | m vanaf buitenteen |
| zettingsvloeiingspunt zonder bestorting | S_zv | 32 | m vanaf buitenteen |
| voldoet niet | | | |

project: Sluitstukkaden
code: cluster E
locatie: STD88-1
datum: 50.320.6 DP1
10-okt-13

bepaling fictieve geuldiepte (zie bijlage 9-1 VTV2006)

| | | | |
|------------------------------|------------------|--------------|----------|
| hoogte dijk | h_dijk | 43.14 | m+NAP |
| bodem geul | h_geul | 33.5 | m+NAP |
| hoogte voorland | h_voorland | 40.67 | m+NAP |
| breedte voorland | B | 10 | m |
| waterpeil extreem laag water | h_water | 34.5 | m+NAP |
| talud dijk | t_boven | 4 | 1:x |
| | alpha boven | 0.24 | rad |
| talud geul | t_onder | 4.5 | 1:x |
| | alpha onder | 0.22 | rad |
| fictief talud | alpha' boven | 0.16 | rad |
| fictieve geuldiepte | h_fictief | 17.03 | m |

schadelijkheids criterium afschuiving (zie bijlage 9-2 VTV2006)

| | | | |
|------------------------------------|---------|-------|--------------------|
| beoordelingsniveau | H_boord | 37.09 | m+NAP |
| signaleringspunt zonder bestorting | S_sign | 32 | m vanaf buitenteen |
| afschuivingspunt zonder bestorting | S_af | 26 | m vanaf buitenteen |
| voldoet niet | | | |

schadelijkheids criterium zettingsvloeiing (zie bijlage 9-4 VTV2006)

| | | | |
|---|---------|------|--------------------|
| beoordelingsniveau | H_boord | 35.9 | m+NAP |
| helling signaleringsprofiel | A | 15 | 1:x |
| signaleringspunt zonder bestorting | S_sign | 86 | m vanaf buitenteen |
| zettingsvloeiingspunt zonder bestorting | S_zv | 32 | m vanaf buitenteen |
| voldoet niet | | | |

project: Sluitstukkaden
code: cluster E
locatie: STD88-1
datum: 50.320.6 DP2
10-okt-13

bepaling fictieve geuldiepte (zie bijlage 9-1 VTV2006)

| | | | |
|------------------------------|------------------|--------------|----------|
| hoogte dijk | h_dijk | 43.14 | m+NAP |
| bodem geul | h_geul | 33.5 | m+NAP |
| hoogte voorland | h_voorland | 40.91 | m+NAP |
| breedte voorland | B | 10 | m |
| waterpeil extreem laag water | h_water | 34.5 | m+NAP |
| talud dijk | t_boven | 3.8 | 1:x |
| | alpha boven | 0.26 | rad |
| talud geul | t_onder | 4.5 | 1:x |
| | alpha onder | 0.22 | rad |
| fictief talud | alpha'_boven | 0.16 | rad |
| fictieve geuldiepte | h_fictief | 17.14 | m |

schadelijkheids criterium afschuiving (zie bijlage 9-2 VTV2006)

| | | | |
|------------------------------------|---------|-------|--------------------|
| beoordelingsniveau | H_boord | 37.21 | m+NAP |
| signaleringspunt zonder bestorting | S_sign | 33 | m vanaf buitenteen |
| afschuivingspunt zonder bestorting | S_af | 27 | m vanaf buitenteen |
| voldoet niet | | | |

schadelijkheids criterium zettingsvloeiing (zie bijlage 9-4 VTV2006)

| | | | |
|---|---------|------|--------------------|
| beoordelingsniveau | H_boord | 36.0 | m+NAP |
| helling signaleringsprofiel | A | 15 | 1:x |
| signaleringspunt zonder bestorting | S_sign | 89 | m vanaf buitenteen |
| zettingsvloeiingspunt zonder bestorting | S_zv | 32 | m vanaf buitenteen |
| voldoet niet | | | |

project: Sluitstukkaden
code: cluster E
locatie: STD88-1
datum: 50.320.6 DP3
10-okt-13

bepaling fictieve geuldiepte (zie bijlage 9-1 VTV2006)

| | | | |
|------------------------------|------------------|--------------|----------|
| hoogte dijk | h_dijk | 43.22 | m+NAP |
| bodem geul | h_geul | 33.5 | m+NAP |
| hoogte voorland | h_voorland | 40.34 | m+NAP |
| breedte voorland | B | 10 | m |
| waterpeil extreem laag water | h_water | 34.5 | m+NAP |
| talud dijk | t_boven | 3.7 | 1:x |
| | alpha boven | 0.26 | rad |
| talud geul | t_onder | 4.5 | 1:x |
| | alpha onder | 0.22 | rad |
| fictief talud | alpha' boven | 0.18 | rad |
| fictieve geuldiepte | h_fictief | 17.45 | m |

schadelijkheidscriterium afschuiving (zie bijlage 9-2 VTV2006)

| | | | |
|------------------------------------|---------|-------|--------------------|
| beoordelingsniveau | H_boord | 36.92 | m+NAP |
| signaleringspunt zonder bestorting | S_sign | 31 | m vanaf buitenteen |
| afschuivingspunt zonder bestorting | S_af | 25 | m vanaf buitenteen |
| voldoet niet | | | |

schadelijkheidscriterium zettingsvloeiing (zie bijlage 9-4 VTV2006)

| | | | |
|---|---------|------|--------------------|
| beoordelingsniveau | H_boord | 35.8 | m+NAP |
| helling signaleringsprofiel | A | 15 | 1:x |
| signaleringspunt zonder bestorting | S_sign | 82 | m vanaf buitenteen |
| zettingsvloeiingspunt zonder bestorting | S_zv | 31 | m vanaf buitenteen |
| voldoet niet | | | |

project: Sluitstukkaden
code: cluster E
locatie: STD88-1
datum: 50.320.6 DP4
10-okt-13

bepaling fictieve geuldiepte (zie bijlage 9-1 VTV2006)

| | | | |
|------------------------------|------------------|--------------|----------|
| hoogte dijk | h_dijk | 43.14 | m+NAP |
| bodem geul | h_geul | 33.5 | m+NAP |
| hoogte voorland | h_voorland | 41.12 | m+NAP |
| breedte voorland | B | 10 | m |
| waterpeil extreem laag water | h_water | 34.5 | m+NAP |
| talud dijk | t_boven | 4.4 | 1:x |
| | alpha boven | 0.22 | rad |
| talud geul | t_onder | 4.5 | 1:x |
| | alpha onder | 0.22 | rad |
| fictief talud | alpha'_boven | 0.14 | rad |
| fictieve geuldiepte | h_fictief | 16.88 | m |

schadelijkheidscriterium afschuiving (zie bijlage 9-2 VTV2006)

| | | | |
|------------------------------------|---------|-------|--------------------|
| beoordelingsniveau | H_boord | 37.31 | m+NAP |
| signaleringspunt zonder bestorting | S_sign | 34 | m vanaf buitenteen |
| afschuivingspunt zonder bestorting | S_af | 27 | m vanaf buitenteen |
| voldoet niet | | | |

schadelijkheidscriterium zettingsvloeiing (zie bijlage 9-4 VTV2006)

| | | | |
|---|---------|------|--------------------|
| beoordelingsniveau | H_boord | 36.0 | m+NAP |
| helling signaleringsprofiel | A | 15 | 1:x |
| signaleringspunt zonder bestorting | S_sign | 91 | m vanaf buitenteen |
| zettingsvloeiingspunt zonder bestorting | S_zv | 33 | m vanaf buitenteen |
| voldoet niet | | | |

project: Sluitstukkaden
code: cluster E
locatie: STD88-1
datum: 50.320.9 DP1
10-okt-13

bepaling fictieve geuldiepte (zie bijlage 9-1 VTV2006)

| | | | |
|------------------------------|------------------|--------------|----------|
| hoogte dijk | h_dijk | 43.07 | m+NAP |
| bodem geul | h_geul | 33.5 | m+NAP |
| hoogte voorland | h_voorland | 40.92 | m+NAP |
| breedte voorland | B | 30 | m |
| waterpeil extreem laag water | h_water | 34.5 | m+NAP |
| talud dijk | t_boven | 3.7 | 1:x |
| | alpha boven | 0.26 | rad |
| talud geul | t_onder | 4.5 | 1:x |
| | alpha onder | 0.22 | rad |
| fictief talud | alpha' boven | 0.09 | rad |
| fictieve geuldiepte | h_fictief | 15.65 | m |

schadelijkheids criterium afschuiving (zie bijlage 9-2 VTV2006)

| | | | |
|------------------------------------|---------|-------|--------------------|
| beoordelingsniveau | H_boord | 37.21 | m+NAP |
| signaleringspunt zonder bestorting | S_sign | 33 | m vanaf buitenteen |
| afschuivingspunt zonder bestorting | S_af | 47 | m vanaf buitenteen |
| voldoet | | | |

schadelijkheids criterium zettingsvloeiing (zie bijlage 9-4 VTV2006)

| | | | |
|---|---------|------|--------------------|
| beoordelingsniveau | H_boord | 36.0 | m+NAP |
| helling signaleringsprofiel | A | 15 | 1:x |
| signaleringspunt zonder bestorting | S_sign | 89 | m vanaf buitenteen |
| zettingsvloeiingspunt zonder bestorting | S_zv | 52 | m vanaf buitenteen |
| voldoet niet | | | |

project: Sluitstukkaden
code: cluster E
locatie: STD88-1
datum: 50.320.10 DP1
10-okt-13

bepaling fictieve geuldiepte (zie bijlage 9-1 VTV2006)

| | | | |
|------------------------------|------------------|--------------|----------|
| hoogte dijk | h_dijk | 42.94 | m+NAP |
| bodem geul | h_geul | 33.5 | m+NAP |
| hoogte voorland | h_voorland | 41.08 | m+NAP |
| breedte voorland | B | 90 | m |
| waterpeil extreem laag water | h_water | 34.5 | m+NAP |
| talud dijk | t_boven | 3.7 | 1:x |
| | alpha boven | 0.26 | rad |
| talud geul | t_onder | 4.5 | 1:x |
| | alpha onder | 0.22 | rad |
| fictief talud | alpha' boven | 0.04 | rad |
| fictieve geuldiepte | h_fictief | 14.76 | m |

schadelijkheids criterium afschuiving (zie bijlage 9-2 VTV2006)

| | | | |
|------------------------------------|---------|-------|--------------------|
| beoordelingsniveau | H_boord | 37.29 | m+NAP |
| signaleringspunt zonder bestorting | S_sign | 34 | m vanaf buitenteen |
| afschuivingspunt zonder bestorting | S_af | 107 | m vanaf buitenteen |
| voldoet | | | |

schadelijkheids criterium zettingsvloeiing (zie bijlage 9-4 VTV2006)

| | | | |
|---|---------|------|--------------------|
| beoordelingsniveau | H_boord | 36.0 | m+NAP |
| helling signaleringsprofiel | A | 15 | 1:x |
| signaleringspunt zonder bestorting | S_sign | 91 | m vanaf buitenteen |
| zettingsvloeiingspunt zonder bestorting | S_zv | 113 | m vanaf buitenteen |
| voldoet | | | |

BIJLAGE XI BEREKENING STABILITEIT BEKLEDING (STBK, GRASTOETS)

| | A | B | C | D | E | F | G | H | I | J | L | M | N | O | P | Q | R | T | U | V | W | X | Y | AA | AB | AC | AE | AF | AG | AI | AJ | AK | | |
|----|---------------------|-------|-------|------|-----------------------------------|-------------------------------|-------|--------|--------|--------|--------|--------|--------|-------------------------------|-------|--------|------|------|--------|---------------------|-------|-------|---------------------|------|------|-------|-------|-------|--------|------|------|------|--|--|
| 2 | Bekleding - Grasmoe | | | | Endzone voor het
gemaal puntel | Zone A | | | | | | | | Zone B | | | | | | Zone C | | | Zone D | | | | | | | | | | | |
| 3 | Bijvoedingsoed | | | | | Ondergrens zone A | | | | | | | | Ondergrens zone B | | | | | | Ondergrens zone C | | | Ondergrens zone D | | | | | | | | | | | |
| 4 | Waterskering | | | | | Bovenbegrens zone A | | | | | | | | Bovenbegrens zone B | | | | | | Bovenbegrens zone C | | | Bovenbegrens zone D | | | | | | | | | | | |
| 5 | Subalgatenen | | | | | Plan maatregelen
beheerder | | | | | | | | Plan maatregelen
beheerder | | | | | | Plan maatregelen | | | Plan maatregelen | | | | | | | | | | | |
| 6 | | | | | Niveaugoed | Gedrag | | | | | | | | Afschuiving | | | | | | Eerste door gatkuip | | | Eerste door gatkuip | | | | | | | | | | | |
| 7 | | | | | | Afschuiving | | | | | | | | Eerste door gatkuip | | | | | | Eerste door gatkuip | | | Eerste door gatkuip | | | | | | | | | | | |
| 8 | Omerkingen | | | Van | Tot | Eerste door gatkuip | | | | | | | | Eerste door gatkuip | | | | | | Eerste door gatkuip | | | Eerste door gatkuip | | | | | | | | | | | |
| 9 | 50.320.2 DP1 | 0.00 | 1.00 | | | Eindzone zone A | | | | | | | | Eindzone zone B | | | | | | Eindzone zone C | | | Eindzone zone D | | | | | | | | | | | |
| 10 | 50.320.3 DP1 | 1.00 | 2.00 | Goed | | 41.46 | 41.70 | n.v.l. | Goed | Goed | n.v.l. | n.v.l. | Goed | 41.70 | 42.20 | n.v.l. | Goed | Goed | n.v.l. | Goed | 43.72 | 44.22 | n.v.l. | Goed | Goed | 44.22 | 44.22 | 41.47 | n.v.l. | Goed | Goed | Goed | | |
| 11 | 50.320.4 DP1 | 2.00 | 3.00 | Goed | | 40.75 | 41.20 | n.v.l. | Goed | Goed | n.v.l. | n.v.l. | Goed | 41.20 | 42.20 | n.v.l. | Goed | Goed | n.v.l. | Goed | 43.83 | 44.33 | n.v.l. | Goed | Goed | 44.33 | 44.33 | 41.33 | n.v.l. | Goed | Goed | Goed | | |
| 12 | 50.320.4 DP2 | 3.00 | 4.00 | Goed | | 40.68 | 41.20 | n.v.l. | Goed | Goed | n.v.l. | n.v.l. | Goed | 41.20 | 42.00 | n.v.l. | Goed | Goed | n.v.l. | Goed | 42.97 | 43.41 | n.v.l. | Goed | Goed | 43.41 | 43.48 | 41.00 | n.v.l. | Goed | Goed | Goed | | |
| 13 | 50.320.4 DP3 | 4.00 | 5.00 | Goed | | 40.50 | 41.20 | n.v.l. | Goed | Goed | n.v.l. | n.v.l. | Goed | 41.20 | 41.54 | n.v.l. | Goed | Goed | n.v.l. | Goed | 42.97 | 43.47 | n.v.l. | Goed | Goed | 43.47 | 43.47 | 41.35 | n.v.l. | Goed | Goed | Goed | | |
| 14 | 50.320.5 DP1 | 5.00 | 6.00 | Goed | | 40.66 | 41.20 | n.v.l. | Goed | Goed | n.v.l. | n.v.l. | Goed | 41.20 | 41.20 | n.v.l. | Goed | Goed | n.v.l. | Goed | 42.77 | 43.29 | n.v.l. | Goed | Goed | 43.29 | 43.27 | 39.97 | n.v.l. | Goed | Goed | Goed | | |
| 15 | 50.320.5 DP2 | 6.00 | 7.00 | Goed | | 40.36 | 41.20 | n.v.l. | Goed | Goed | n.v.l. | n.v.l. | Goed | 41.20 | 41.20 | n.v.l. | Goed | Goed | n.v.l. | Goed | 42.77 | 43.27 | n.v.l. | Goed | Goed | 43.27 | 43.27 | 40.47 | n.v.l. | Goed | Goed | Goed | | |
| 16 | 50.320.6 DP1 | 7.00 | 8.00 | Goed | | 41.11 | 41.11 | n.v.l. | n.v.l. | n.v.l. | n.v.l. | n.v.l. | n.v.l. | 41.11 | 42.64 | n.v.l. | Goed | Goed | n.v.l. | Goed | 42.64 | 43.14 | n.v.l. | Goed | Goed | 43.14 | 43.14 | 41.39 | n.v.l. | Goed | Goed | Goed | | |
| 17 | 50.320.6 DP2 | 8.00 | 9.00 | Goed | | 41.29 | 41.29 | n.v.l. | n.v.l. | n.v.l. | n.v.l. | n.v.l. | n.v.l. | 41.29 | 42.64 | n.v.l. | Goed | Goed | n.v.l. | Goed | 42.64 | 43.14 | n.v.l. | Goed | Goed | 43.14 | 43.14 | 41.13 | n.v.l. | Goed | Goed | Goed | | |
| 18 | 50.320.6 DP3 | 9.00 | 10.00 | Goed | | 41.07 | 41.07 | n.v.l. | n.v.l. | n.v.l. | n.v.l. | n.v.l. | n.v.l. | 41.07 | 42.64 | n.v.l. | Goed | Goed | n.v.l. | Goed | 42.64 | 43.22 | n.v.l. | Goed | Goed | 43.22 | 43.27 | 41.57 | n.v.l. | Goed | Goed | Goed | | |
| 19 | 50.320.6 DP4 | 10.00 | 11.00 | Goed | | 41.47 | 41.47 | n.v.l. | n.v.l. | n.v.l. | n.v.l. | n.v.l. | n.v.l. | 41.47 | 41.50 | n.v.l. | Goed | Goed | n.v.l. | Goed | 42.64 | 43.14 | n.v.l. | Goed | Goed | 43.14 | 43.14 | 40.67 | n.v.l. | Goed | Goed | Goed | | |
| 20 | 50.320.9 DP1 | 11.00 | 12.00 | Goed | | 40.52 | 40.52 | n.v.l. | n.v.l. | n.v.l. | n.v.l. | n.v.l. | n.v.l. | 40.52 | 41.20 | n.v.l. | Goed | Goed | n.v.l. | Goed | 42.43 | 43.07 | n.v.l. | Goed | Goed | 43.07 | 43.14 | 40.82 | n.v.l. | Goed | Goed | Goed | | |
| 21 | 50.320.10 DP1 | 12.00 | 13.00 | Goed | | 41.53 | 41.53 | n.v.l. | n.v.l. | n.v.l. | n.v.l. | n.v.l. | n.v.l. | 41.53 | 41.20 | n.v.l. | Goed | Goed | n.v.l. | Goed | 42.44 | 42.84 | n.v.l. | Goed | Goed | 42.84 | 42.84 | 40.79 | n.v.l. | Goed | Goed | Goed | | |

BIJLAGE XII BOMENINVENTARISATIE

Memo

HASKONINGDHV NEDERLAND B.V.
RIVERS, DELTAS & COASTS

Aan : Roel van de Laar
Van : Celine Roodhart
Datum : 1 oktober 2013
Kopie : Archief
Kwaliteitsborging : Joost Rink
Onze referentie : 9X3223.A0/M0001/901971/JEBR/Nijm

Betreft : Bomeninventarisatie Geulle aan de Maas

Inleiding

Deze memo is de rapportage van een bomeninventarisatie ter hoogte van Geulle aan de Maas, in opdracht van waterschap Roer en Overmaas. Deze memo heeft als doel om in beeld te brengen wat voor bomen er langs de dijk staan. Deze memo wordt vervolgens gebruikt om de sterkte van de dijk in de huidige staat vast te kunnen stellen. Want wanneer bomen onder invloed van water en wind omvallen, kan dit leiden tot de afname van de stabiliteit van de dijk, bijvoorbeeld in de vorm van ontwortelingkuilen.

Werkwijze

Op 10 september heeft de bomeninventarisatie plaatsgevonden op het gehele dijktraject langs Geulle aan de Maas (dijkvak 50.320.001 t/m dijkvak 50.320.009). Zowel binnendijs als buitendijs zijn alle bomen binnen 20 meter van de teen van de dijk geïnventariseerd. De verschillende boomsoorten zijn op naam gebracht en de aantallen zijn geteld. Met behulp van een meetlint is de omtrek van de bomen bepaald, waarbij iedere boom is gemeten op borsthoogte 1.30m (AVIH, 2013). De hoogtes zijn geschat. Daarnaast is de ouderdom van de bomen geschat en is de vitaliteit van de bomen beoordeeld.

Bomen op percelen van particulieren (zoals de boomgaarden) zijn niet met een meetlint gemeten omdat er geen toestemming is gevraagd aan de grondeigenaren om de percelen te betreden. Desondanks kan vanaf het aangrenzende terrein een goede schatting gemaakt worden van de soort, aantal, omvang en hoogte van de bomen.

Resultaten

Hieronder zijn de resultaten weergegeven in een tabel en ter verduidelijking zijn er foto's toegevoegd van enkele bijzonderheden die zijn aangetroffen in het veld.

De looproute van de inventarisatie was van noord naar zuid, waarbij er in het begin van de inventarisatie voor gekozen is om per boom of per bomengroep de boom in te meten. Tijdens het eerste deel van de inventarisatie is er ook een coniferenhaag ingemeten, zie figuur 1 en kaart 1. Later is er in sommige gevallen voor gekozen om een groot deel van het dijktraject in een keer in te meten, bijvoorbeeld in het geval van de boomgaard (50,92-50,68 (y-coördinaten van de uiterlijke noord – en zuidgrens van de boomgaard) en 5.88-5.26 (x-coördinaten van de uiterlijke noord – en zuidgrens van de boomgaard, zie tabel deel 1 (50 bomen). Zie figuur 2 voor een afbeelding van de betreffende boomgaard.

In het tweede deel van de tabel is er vanaf dijktraject 50.320.004 tot en met dijktraject 50.320.001 voor gekozen om per dijktraject te inventariseren. Dit houdt in dat de coördinaten 50,14-50,28 (y) en 5,28-5,91 (x) horen bij het traject tussen punaise 'dijkvak 50.320.004...' en punaise 'es, haagbeuk, hazelaar...' enzovoort.

Figuur 3 geeft een beeld van de grootte van de 8 haagbeuken en figuur 4 toont dat er veel jonge bomen (iepen) zijn afgestorven in het laatste dijktraject (50.320.001).

A company of Royal HaskoningDHV

Tabel 1: Resultaten boominventarisatie

| Y-coördinaat | x- coördinaat | Aantal | Soort | Omtrek (cm) | Geschatte hoogte (M) | Vitaliteit | Geschatte ouderdom |
|--------------|---------------|--------|------------------------|-------------|-----------------------|--|--------------------|
| 50,82 | 5,6 | 2 | zomereik | 88, 65 | 11m | vitaal | 25 jaar |
| 50,82 | 5,6 | 1 | spaanse aak | 12.0 | 2.5 m | vitaal (struik) | 2 jaar |
| 50,53 | 5,89 | 3 | peer | 128, 60, 20 | 9, 7.5 en 2.5 m | 1 vitaal, 1 met een scheve kroon, 1 dood op 1 tak na | 60 jaar |
| 50,53 | 5,89 | 1 | okkernoot | 50.0 | 4.5 | vitaal | 3 jaar |
| 50,93 | 5,73 | 6 | zwarte populier | 130-190 | 15 - 22 m | vitaal, alle exemplaren met maretakken | 30 jaar |
| 50,93 | 5,73 | 1 | vlier | 40.0 | 8 m | struik met hедера | 20 jaar |
| 50,93 | 5,73 | 2 | meidoorn | 35.0 | 8m | struik met hедера | 20 jaar |
| 50,54 | 5,9 | 10 | conifeer | 45.0 | 13 m | vitale haag met een dode struik | 40 jaar |
| 50,54 | 5,9 | 3 | es | 40.0 | 12.5 m | vitaal met een beschadiging hoog op de stam | 10 jaar |
| 50,32 | 5,83 | 1 | kers | 60.0 | 18 m | vitaal | 40 jaar |
| 50,32 | 5,83 | 1 | peer | 40.0 | 9 m | vitaal | 40 jaar |
| 50,32 | 5,83 | 2 | appel | 70.0 | 11 m | vitaal met snoeiwonden | 40 jaar |
| 50,32 | 5,83 | 1 | appel | 30.0 | 4.5 m | vitaal | 20 jaar |
| 50,32 | 5,83 | 1 | okkernoot | 70.0 | 15 m | vitaal | 40 jaar |
| 50,3 | 5,22 | 1 | es | 250.0 | 18 m | vitaal, vrijstaande met meerdere opgaande spullen | 50 jaar |
| 50,46 | 5,59 | 1 | kers | 112.0 | 11 m | vitaal vrijstaand, buitendijks | 40 jaar |
| 50.92-50.68 | 5.88- 5.26 | 50 | appel, okkernoot, kers | gem: 50 cm | gem: 10 m | vitaal, enkele exemplaren met dode takken | 50 jaar |
| 50,4 | 5,42 | 1 | meidoorn | 35.0 | 6 m | vitaal | 40 jaar |
| 50,4 | 5,42 | 2 | okkernoot | 70.0 | 15 m | vitaal | 40 jaar |
| 50,97 | 5,74 | 1 | vlier | 35.0 | 5 m | vitaal | 15 jaar |
| 50,97 | 5,74 | 6 | schietwilg | 80.0 | 6-15 m (deels geknot) | vitaal | 30 jaar |
| 50,97 | 5,74 | 1 | appel | 40.0 | 6 m | vitaal | 30 jaar |
| 50,97 | 5,74 | 1 | rode esdoorn | 50.0 | 14 m | vitaal | 30 jaar |
| 50,97 | 5,74 | 2 | okkernoot | 55.0 | 14 m | vitaal | 30 jaar |
| 50,77 | 5,74 | 1 | haagbeuk | 220.0 | 7 m | vitaal, 1 arm vergroeid met prikkeldraad | 75 jaar |
| 50,67 | 5,9 | 1 | haagbeuk | 260.0 | 11 m | vitaal, beschadigingen op stam door vee | 75 jaar |
| 50,07 | 5,34 | 1 | haagbeuk | 250.0 | 11 m | vitaal met enkele rotte plekken | 75 jaar |
| 50,63 | 5,1 | 1 | haagbeuk | 230.0 | 11 m | vitaal met enkele dode plekken in het hart | 75 jaar |
| 50,1 | 5,65 | 1 | haagbeuk | 150.0 | 5.5 m | niet vitaal, volledig rot, 1 arm nog in leven | 75 jaar |
| 50,79 | 5,4 | 1 | haagbeuk | 190.0 | 11 m | Vitaal. Mierennest en rotplekken | 75 jaar |
| 50,57 | 5,19 | 1 | haagbeuk | 190.0 | 11 m | niet vitaal, tonderzwammen (1 verse) | 75 jaar |
| 50,28 | 5,04 | 1 | haagbeuk | 170.0 | 11 m | vitaal, er groeit een vlier in het hart | 75 jaar |
| 50,96 | 5,35 | 1 | zomereik | 96.0 | 9 m | vitaal met veel waterlot | 25 jaar |
| 50,96 | 5,35 | 2 | okkernoot | 22.0- 95.0 | 2.5 m - 10.5 m | vitaal (een binnendijks een buitendijks) | 5 jaar |

| y-coördinaat | x-coördinaat | Aantal | Soort | Omtrek (cm) | Geschatte hoogte (M) | Vitaliteit | Geschatte ouderdom |
|--------------|--------------|--------|----------------------|-------------|----------------------|--|--------------------|
| 50,61 | 5,28 | 1 | es | 225.0 | 11 m | vitaal met snoeiwonden | 45 jaar |
| 50,62 | 5,29 | 1 | rode esdoorn | 40.0 | 6 m | vitaal | 25 jaar |
| 50,14-50,28 | 5.28-5.91 | 2 | es | 35.0 | 4.5 m | vitaal | 5 jaar |
| 50,14-50,28 | 5.28-5.91 | 3 | haagbeuk | 40.0 | 5 m | vitaal | 5 jaar |
| 50,14-50,28 | 5.28-5.91 | 5 | spaanse aak | 40.0 | 5 m | niet vitaal, dood hout en scheefgroei | 5 jaar |
| 50,14-50,28 | 5.28-5.91 | 4 | meidoorn | 25.0 | 3.5 m | vitaal met 1 slecht groeiende struik met stresslot | 5 jaar |
| 50,14-50,28 | 5.28-5.91 | 4 | zwarte els | 25.0 | 4.5 m | kwarrende staat: dood hout in kroon en iel | 5 jaar |
| 50.28-50.34 | 5.91-5.83 | 4 | iep | 30.0 | 5.5 m | vitaal met hедера | 10 jaar |
| 50.28-50.34 | 5.91-5.83 | 3 | hazelaar | 30.0 | 6.5 m | vitaal met hедера | 10 jaar |
| 50.28-50.34 | 5.91-5.83 | 5 | es | 35.0 | 8.0 m | vitaal met hедера | 10 jaar |
| 50.28-50.34 | 5.91-5.83 | 1 | es | 55.0 | 13 m | niet vitaal, verstiks door hедера, geen kroon meer | 20 jaar |
| 50.28-50.34 | 5.91-5.83 | 5 | es | 40.0 | 12 m | vitaal | 20 jaar |
| 50.28-50.34 | 5.91-5.83 | 7 | iep | 35.0 | 7.5 m | vitaal, 1 dood exemplaar, veel ondergroei | 20 jaar |
| 50.34-50.44 | 5.83-5.19 | 1 | spaanse aak | 40.0 | 9 m | vitaal | 20 jaar |
| 50.34-50.44 | 5.83-5.19 | 21 | es | 40.0 | 9 m | vitaal | 20 jaar |
| 50.34-50.44 | 5.83-5.19 | 5 | zomereik | 40.0 | 9 m | vitaal | 20 jaar |
| 50.34-50.44 | 5.83-5.19 | 4 | iep | 30.0 | 7.5 m | vitaal | 20 jaar |
| 50.34-50.44 | 5.83-5.19 | 3 | meidoorn | 22.0 | 7.5 m | vitaal | 20 jaar |
| 50.34-50.44 | 5.83-5.19 | 6 | hazelaar | 25.0 | 7.5 m | vitaal | 20 jaar |
| 50.34-50.44 | 5.83-5.19 | 1 | wilde kardinaalsmuts | 15.0 | 3 m | vitaal | 20 jaar |
| 50.34-50.44 | 5.83-5.19 | 1 | wintereik | 45.0 | 12.5 m | vitaal | 20 jaar |
| 50.34-50.44 | 5.83-5.19 | 1 | hazelaar | 35.0 | 7.5 m | dood | 20 jaar |
| 50.34-50.44 | 5.83-5.19 | 1 | es | 40.0 | 6.5 m | niet vitaal, kwarrend met veel dood hout | 15 jaar |
| 50.44-50.99 | 5.19-5.40 | 2 | boswilg | 25.0 | 7 m | niet vitaal, verdroging en twee dooie exemplaren | 20 jaar |
| 50.44-50.99 | 5.19-5.40 | 21 | iep | 25.0 | 8 m | vitaal met 1 dood exemplaar | 15 jaar |
| 50.44-50.99 | 5.19-5.40 | 1 | spaanse aak | 30.0 | 7.5 m | vitaal | 15 jaar |
| 50.44-50.99 | 5.19-5.40 | 3 | es | 40.0 | 8 m | vitaal met verdrogingsverschijnselen | 15 jaar |
| 50.44-50.99 | 5.19-5.40 | 3 | iep | 40.0 | 6 m | vitaal | 5 jaar |
| 50.44-50.99 | 5.19-5.40 | 2 | zomereik | 55.0 | 6.5 m | vitaal | 5 jaar |
| 50.44-50.99 | 5.19-5.40 | 5 | spaanse aak | 50.0 | 6.5 m | vitaal | 5 jaar |
| 50.44-50.99 | 5.19-5.40 | 16 | boswilg | 45.0 | 6.5 m | vitaal | 5 jaar |
| 50.44-50.99 | 5.19-5.40 | 1 | iep | 50.0 | 6.5 m | vitaal | 5 jaar |
| 50.44-50.99 | 5.19-5.40 | 2 | haagbeuk | 100.0 | 7 m | vitaal | 5 jaar |
| 50.44-50.99 | 5.19-5.40 | 2 | es | 40.0 | 5.5 m | vitaal | 5 jaar |
| 50.99-50.26 | 5.40-5.05 | 3 | boswilg | 40.0 | 6.5 m | vitaal | 5 jaar |
| 50.99-50.26 | 5.40-5.05 | 2 | spaanse aak | 40.0 | 6.5 m | kwarrend, binnen een jaar dood | 10 jaar |
| 50.99-50.26 | 5.40-5.05 | 2 | es | 25.0 | 4.5 m | vitaal | 10 jaar |
| 50.99-50.26 | 5.40-5.05 | 2 | meidoorn | 25.0 | 4.5 m | vitaal | 10 jaar |
| 50.99-50.26 | 5.40-5.05 | 2 | zomereik | 50.0 | 6.5 m | vitaal | 10 jaar |
| 50.99-50.26 | 5.40-5.05 | 2 | zwarte populier | 160.0 | 16 m | vitaal met onderaan waterlot | 30 jaar |



Figuur 1: Dijktraject 50.320.008: Coniferenhaag bij een houtzagerij



Figuur 2: Dijktraject 50.320.006 Boomgaard met ongeveer 50 bomen



Figuur 3: Dijktraject 50.320.005 met 8 grote haagbeuken



Figuur 4: Dijktraject 50.320.001 met dode iepen

Kaart I: Noordelijk deel traject



Kaart II: Midden traject



Kaart III: Midden deel traject



Kaart IV: Zuidelijk deel traject



Bronnen

http://www.avih.nl/pdf/richtlijnen_inlandshout.pdf bezocht op 11 september 2013

BIJLAGE XIII ZETTINGSBEREKENINGEN

Report for D-Settlement 9.2

Settlement Calculations
Developed by Deltares



| | |
|----------------------|---|
| Company: | Witteveen+Bos |
| Date of report: | 09-10-2013 |
| Time of report: | 15:59:57 |
| Date of calculation: | 09-10-2013 |
| Time of calculation: | 9:14:58 |
| Filename: | F:\..50.320.10 dwp 1 - 01 Zettingen versterkingsopgave 2020 |

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2 Echo of the Input

2.1 Layer Boundaries

| Boundary number | Co-ordinates [m] | | | | |
|-----------------|------------------|---------|--------|--------|--------|
| 3 - X - | -40,000 | -17,220 | -4,840 | 0,000 | 3,430 |
| 3 - Y - | 41,080 | 41,080 | 41,530 | 42,850 | 42,820 |
| 3 - X - | 9,900 | 12,620 | 15,830 | 17,360 | 40,000 |
| 3 - Y - | 40,720 | 40,640 | 40,790 | 40,850 | 40,850 |
| 2 - X - | -40,000 | -17,220 | -4,840 | 9,900 | 12,620 |
| 2 - Y - | 41,080 | 41,080 | 41,530 | 40,720 | 40,640 |
| 2 - X - | 15,830 | 17,360 | 40,000 | | |
| 2 - Y - | 40,790 | 40,850 | 40,850 | | |
| 1 - X - | -40,000 | -4,840 | 0,000 | 3,430 | 9,900 |
| 1 - Y - | 38,400 | 38,400 | 39,200 | 39,200 | 39,000 |
| 1 - X - | 40,000 | | | | |
| 1 - Y - | 39,000 | | | | |
| 0 - X - | -40,000 | 40,000 | | | |
| 0 - Y - | 30,000 | 30,000 | | | |

2.2 PL Lines

| PL line number | Co-ordinates [m] | | | | |
|----------------|------------------|--------|--------|--------|--|
| 1 - X - | -40,000 | -4,840 | 9,900 | 40,000 | |
| 1 - Y - | 41,080 | 41,080 | 40,640 | 40,640 | |

2.3 General Data

| | |
|---|---|
| Soil model: | NEN Bjerrum |
| Consolidation model: | Darcy |
| Strain model: | Linear |
| Groundwater level: | Initial determined by PL-line number 1 |
| Unit weight of water: | 9,81 [kN/m³] |
| Stress distribution | |
| - Soil: | Buisman |
| - Loads: | Simulate |
| End of consolidation: | 13140,00 [days] |
| With maintain profile
(only for non uniform loads) | |
| - Material: | Superelevation |
| - Time: | 1,00 [days] |
| - Unit weight above phreatic.: | 19,00 [kN/m³] |
| - Unit weight below phreatic: | 19,00 [kN/m³] |
| - Iteration stop criterium: | 0,10 [m] |
| Pc (initial): | Variable parallel to the initial effective stress |
| Pc (per step): | Automatic increased to the final effective stresses |
| Creep rate reference time: | 1,000 [days] |
| No imaginary surface | |
| With submerging
(only for non uniform loads) | |
| - Iteration stop criterium : | 0,10 [m] |
| Load column width | |
| - Non-Uniform Loads : | 1,00 [m] |
| - Trapezoidal Loads : | 1,00 [m] |

2.4 Soil Profiles

| Layer number | Material name | PL-line top | PL-line bottom |
|--------------|------------------|-------------|----------------|
| 3 | leem, zz, slap | 1 | 1 |
| 2 | leem, zz, slap | 1 | 1 |
| 1 | grind, zs, matig | 1 | 1 |

2.5 Soil Properties

| Layer number | Drained | Unit weight | |
|--------------|---------|---------------------|-------------------|
| | | Unsaturated [kN/m³] | Saturated [kN/m³] |
| 3 | No | 19,00 | 19,00 |
| 2 | No | 19,00 | 19,00 |
| 1 | Yes | 18,00 | 20,00 |

| Layer number | Storage type | Vert. consolid. coefficient Cv [m²/s] | Vertical permeability [m/s] | Permeability strain mod. [m/s] | Initial vertical permeability [m/s] |
|--------------|--------------|---------------------------------------|-----------------------------|--------------------------------|-------------------------------------|
| 3 | Vert. cons. | 1,00E-07 | - | - | - |
| 2 | Vert. cons. | 1,00E-07 | - | - | - |
| 1 | Vert. cons. | - | - | - | - |

| Layer number | POP [kN/m²] | OCR [-] | Equiv. age [days] |
|--------------|-------------|---------|-------------------|
| 3 | 10,00 | - | - |
| 2 | 10,00 | - | - |
| 1 | 10,00 | - | - |

| Layer number | Secondary swelling type | Secondary swelling factor [-] | Unloading stress ratio [-] |
|--------------|-------------------------|-------------------------------|----------------------------|
| 3 | Full | - | - |
| 2 | Full | - | - |
| 1 | Full | - | - |

| Layer number | Reloading/ swelling ratio RR [-] | Compression ratio CR [-] | Coeff. of sec. compression Ca [-] | Reloading/ swelling index Cr [-] | Compression index Cc [-] | Initial void ratio (e0) [-] |
|--------------|----------------------------------|--------------------------|-----------------------------------|----------------------------------|--------------------------|-----------------------------|
| 3 | 0,0307000 | 0,0920000 | 0,0037000 | - | - | - |
| 2 | 0,0307000 | 0,0920000 | 0,0037000 | - | - | - |
| 1 | 0,0008000 | 0,0023000 | 0,0000000 | - | - | - |

2.6 Non-Uniform Loads

| Load number | Time [days] | Unit weight | |
|-------------|-------------|---------------------|-------------------|
| | | Unsaturated [kN/m³] | Saturated [kN/m³] |
| 1 | 1 | 19,00 | 19,00 |

| Load number | Co-ordinates [m] | | | | | |
|-------------|------------------|-------|-------|-------|-------|--|
| 1 - X - | 3,43 | 4,63 | 8,60 | 14,60 | 15,83 | |
| 1 - Y - | 42,82 | 42,82 | 41,50 | 41,20 | 40,79 | |

2.7 Verticals

| Vertical number | X co-ordinates [m] | | | | |
|-----------------|--------------------|---------|--------|--------|--------|
| 1 - 5 | -40,000 | -17,220 | -4,840 | 0,000 | 0,270 |
| 6 - 10 | 2,000 | 3,430 | 4,270 | 4,631 | 6,500 |
| 11 - 15 | 8,600 | 9,900 | 11,500 | 12,620 | 14,600 |
| 16 - 19 | 15,830 | 17,360 | 25,000 | 40,000 | |

Calculation of cross section at Z = 0,000 m
Discretisation = 100

3 Settlements

3.1 Settlements

| Vertical number | X co-ordinate [m] | Surface level [m] | Settlement [m] |
|-----------------|-------------------|-------------------|----------------|
| 1 | -40,00 | 41,08 | 0,005 |
| 2 | -17,22 | 41,08 | 0,005 |
| 3 | -4,84 | 41,53 | 0,012 |
| 4 | 0,00 | 42,85 | 0,024 |
| 5 | 0,27 | 42,85 | 0,024 |
| 6 | 2,00 | 42,83 | 0,025 |
| 7 | 3,43 | 42,82 | 0,034 |
| 8 | 4,27 | 42,55 | 0,045 |
| 9 | 4,63 | 42,43 | 0,052 |
| 10 | 6,50 | 41,82 | 0,051 |
| 11 | 8,60 | 41,14 | 0,050 |
| 12 | 9,90 | 40,72 | 0,061 |
| 13 | 11,50 | 40,67 | 0,062 |
| 14 | 12,62 | 40,64 | 0,061 |
| 15 | 14,60 | 40,73 | 0,038 |
| 16 | 15,83 | 40,79 | 0,010 |
| 17 | 17,36 | 40,85 | 0,003 |
| 18 | 25,00 | 40,85 | 0,002 |
| 19 | 40,00 | 40,85 | 0,002 |

3.2 Maintain Profile Calculation Results

Load 1 consists of 5,687 m3 per Width

The extra amount of soil to be added is 0,618 m3 per Width

This equals the found settlements for non-uniform loads

End of Report

Report for D-Settlement 9.2

Settlement Calculations
Developed by Deltares



| | |
|----------------------|---|
| Company: | Witteveen+Bos |
| Date of report: | 09-10-2013 |
| Time of report: | 16:00:13 |
| Date of calculation: | 09-10-2013 |
| Time of calculation: | 9:13:24 |
| Filename: | F:\..50.320.10 dwp 1 - 02 Zettingen uitbreidbaarheidsprofiel 2050 |

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| 2.7 Verticals | 4 |
| 3 Settlements | 5 |
| 3.1 Settlements | 5 |
| 3.2 Maintain Profile Calculation Results | 5 |

2 Echo of the Input

2.1 Layer Boundaries

| Boundary number | Co-ordinates [m] | | | | |
|-----------------|------------------|---------|--------|--------|--------|
| 3 - X - | -40,000 | -17,220 | -4,840 | 0,000 | 3,430 |
| 3 - Y - | 41,080 | 41,080 | 41,530 | 42,850 | 42,820 |
| 3 - X - | 9,900 | 12,620 | 15,830 | 17,360 | 40,000 |
| 3 - Y - | 40,720 | 40,640 | 40,790 | 40,850 | 40,850 |
| 2 - X - | -40,000 | -17,220 | -4,840 | 9,900 | 12,620 |
| 2 - Y - | 41,080 | 41,080 | 41,530 | 40,720 | 40,640 |
| 2 - X - | 15,830 | 17,360 | 40,000 | | |
| 2 - Y - | 40,790 | 40,850 | 40,850 | | |
| 1 - X - | -40,000 | -4,840 | 0,000 | 3,430 | 9,900 |
| 1 - Y - | 38,400 | 38,400 | 39,200 | 39,200 | 39,000 |
| 1 - X - | 40,000 | | | | |
| 1 - Y - | 39,000 | | | | |
| 0 - X - | -40,000 | 40,000 | | | |
| 0 - Y - | 30,000 | 30,000 | | | |

2.2 PL Lines

| PL line number | Co-ordinates [m] | | | | |
|----------------|------------------|--------|--------|--------|--|
| 1 - X - | -40,000 | -4,840 | 9,900 | 40,000 | |
| 1 - Y - | 41,080 | 41,080 | 40,640 | 40,640 | |

2.3 General Data

| | |
|---|---|
| Soil model: | NEN Bjerrum |
| Consolidation model: | Darcy |
| Strain model: | Linear |
| Groundwater level: | Initial determined by PL-line number 1 |
| Unit weight of water: | 9,81 [kN/m³] |
| Stress distribution | |
| - Soil: | Buisman |
| - Loads: | Simulate |
| End of consolidation: | 13140,00 [days] |
| With maintain profile
(only for non uniform loads) | |
| - Material: | Superelevation |
| - Time: | 1,00 [days] |
| - Unit weight above phreatic.: | 19,00 [kN/m³] |
| - Unit weight below phreatic: | 19,00 [kN/m³] |
| - Iteration stop criterium: | 0,10 [m] |
| Pc (initial): | Variable parallel to the initial effective stress |
| Pc (per step): | Automatic increased to the final effective stresses |
| Creep rate reference time: | 1,000 [days] |
| No imaginary surface | |
| With submerging
(only for non uniform loads) | |
| - Iteration stop criterium : | 0,10 [m] |
| Load column width | |
| - Non-Uniform Loads : | 1,00 [m] |
| - Trapezoidal Loads : | 1,00 [m] |

2.4 Soil Profiles

| Layer number | Material name | PL-line top | PL-line bottom |
|--------------|------------------|-------------|----------------|
| 3 | leem, zz, slap | 1 | 1 |
| 2 | leem, zz, slap | 1 | 1 |
| 1 | grind, zs, matig | 1 | 1 |

2.5 Soil Properties

| Layer number | Drained | Unit weight | |
|--------------|---------|---------------------|-------------------|
| | | Unsaturated [kN/m³] | Saturated [kN/m³] |
| 3 | No | 19,00 | 19,00 |
| 2 | No | 19,00 | 19,00 |
| 1 | Yes | 18,00 | 20,00 |

| Layer number | Storage type | Vert. consolid. coefficient Cv [m²/s] | Vertical permeability [m/s] | Permeability strain mod. [m/s] | Initial vertical permeability [m/s] |
|--------------|--------------|---------------------------------------|-----------------------------|--------------------------------|-------------------------------------|
| 3 | Vert. cons. | 1,00E-07 | - | - | - |
| 2 | Vert. cons. | 1,00E-07 | - | - | - |
| 1 | Vert. cons. | - | - | - | - |

| Layer number | POP [kN/m²] | OCR [-] | Equiv. age [days] |
|--------------|-------------|---------|-------------------|
| 3 | 10,00 | - | - |
| 2 | 10,00 | - | - |
| 1 | 10,00 | - | - |

| Layer number | Secondary swelling type | Secondary swelling factor[-] | Unloading stress ratio[-] |
|--------------|-------------------------|------------------------------|---------------------------|
| 3 | Full | - | - |
| 2 | Full | - | - |
| 1 | Full | - | - |

| Layer number | Reloading/ swelling ratio RR [-] | Compression ratio CR [-] | Coeff. of sec. compression Ca [-] | Reloading/ swelling index Cr [-] | Compression index Cc [-] | Initial void ratio (e0) [-] |
|--------------|----------------------------------|--------------------------|-----------------------------------|----------------------------------|--------------------------|-----------------------------|
| 3 | 0,0307000 | 0,0920000 | 0,0037000 | - | - | - |
| 2 | 0,0307000 | 0,0920000 | 0,0037000 | - | - | - |
| 1 | 0,0008000 | 0,0023000 | 0,0000000 | - | - | - |

2.6 Non-Uniform Loads

| Load number | Time [days] | Unit weight | |
|-------------|-------------|---------------------|-------------------|
| | | Unsaturated [kN/m³] | Saturated [kN/m³] |
| 1 | 1 | 19,00 | 19,00 |
| 2 | 1 | 19,00 | 19,00 |

| Load number | Co-ordinates [m] | | | | | |
|-------------|------------------|-------|-------|-------|-------|--|
| 1 - X - | 3,43 | 4,63 | 8,60 | 14,60 | 15,83 | |
| 1 - Y - | 42,82 | 42,82 | 41,50 | 41,20 | 40,79 | |
| 2 - X - | 0,00 | 0,27 | 4,27 | 4,63 | | |
| 2 - Y - | 42,85 | 42,94 | 42,94 | 42,82 | | |

2.7 Verticals

| Vertical number | X co-ordinates [m] | | | | |
|-----------------|--------------------|---------|--------|--------|--------|
| 1 - 5 | -40,000 | -17,220 | -4,840 | 0,000 | 0,270 |
| 6 - 10 | 2,000 | 3,430 | 4,270 | 4,631 | 6,500 |
| 11 - 15 | 8,600 | 9,900 | 11,500 | 12,620 | 14,600 |
| 16 - 19 | 15,830 | 17,360 | 25,000 | 40,000 | |

Calculation of cross section at Z = 0,000 m
Discretisation = 100

3 Settlements

3.1 Settlements

| Vertical number | X co-ordinate [m] | Surface level [m] | Settlement [m] |
|-----------------|-------------------|-------------------|----------------|
| 1 | -40,00 | 41,08 | 0,005 |
| 2 | -17,22 | 41,08 | 0,005 |
| 3 | -4,84 | 41,53 | 0,012 |
| 4 | 0,00 | 42,85 | 0,030 |
| 5 | 0,27 | 42,85 | 0,033 |
| 6 | 2,00 | 42,83 | 0,039 |
| 7 | 3,43 | 42,82 | 0,047 |
| 8 | 4,27 | 42,55 | 0,053 |
| 9 | 4,63 | 42,43 | 0,057 |
| 10 | 6,50 | 41,82 | 0,052 |
| 11 | 8,60 | 41,14 | 0,050 |
| 12 | 9,90 | 40,72 | 0,061 |
| 13 | 11,50 | 40,67 | 0,062 |
| 14 | 12,62 | 40,64 | 0,061 |
| 15 | 14,60 | 40,73 | 0,039 |
| 16 | 15,83 | 40,79 | 0,010 |
| 17 | 17,36 | 40,85 | 0,003 |
| 18 | 25,00 | 40,85 | 0,002 |
| 19 | 40,00 | 40,85 | 0,002 |

3.2 Maintain Profile Calculation Results

Load 1 consists of 5,687 m3 per Width

Load 2 consists of 0,470 m3 per Width

The extra amount of soil to be added is 0,768 m3 per Width

This equals the found settlements for non-uniform loads

End of Report

Report for D-Settlement 9.2

Settlement Calculations
Developed by Deltares



Company: Witteveen+Bos

Date of report: 09-10-2013

Time of report: 15:43:10

Date of calculation: 08-10-2013

Time of calculation: 15:47:37

Filename: F:\..50.320.2 dwp 1 - 01 Zettingen versterkingsopgave 2020

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| 2.7 Verticals | 4 |
| 3 Settlements | 5 |
| 3.1 Settlements | 5 |
| 3.2 Maintain Profile Calculation Results | 5 |

2 Echo of the Input

2.1 Layer Boundaries

| Boundary number | Co-ordinates [m] | | | | |
|-----------------|------------------|---------|--------|--------|--------|
| 3 - X - | -40,000 | -30,020 | -9,030 | 0,000 | 3,850 |
| 3 - Y - | 41,210 | 41,210 | 41,460 | 43,900 | 43,820 |
| 3 - X - | 12,890 | 16,820 | 20,850 | 40,000 | |
| 3 - Y - | 41,750 | 41,470 | 41,470 | 41,470 | |
| 2 - X - | -40,000 | -30,020 | -9,030 | 12,890 | 16,820 |
| 2 - Y - | 41,210 | 41,210 | 41,460 | 41,750 | 41,470 |
| 2 - X - | 20,850 | 40,000 | | | |
| 2 - Y - | 41,470 | 41,470 | | | |
| 1 - X - | -40,000 | -9,030 | 0,000 | 3,850 | 12,890 |
| 1 - Y - | 39,800 | 39,800 | 40,000 | 40,000 | 39,600 |
| 1 - X - | 40,000 | | | | |
| 1 - Y - | 39,600 | | | | |
| 0 - X - | -40,000 | 40,000 | | | |
| 0 - Y - | 30,000 | 30,000 | | | |

2.2 PL Lines

| PL line number | Co-ordinates [m] | | | | |
|----------------|------------------|--------|--|--|--|
| 1 - X - | -40,000 | 40,000 | | | |
| 1 - Y - | 41,470 | 41,470 | | | |

2.3 General Data

| | |
|---|---|
| Soil model: | NEN Bjerrum |
| Consolidation model: | Darcy |
| Strain model: | Linear |
| Groundwater level: | Initial determined by PL-line number 1 |
| Unit weight of water: | 9,81 [kN/m³] |
| Stress distribution | |
| - Soil: | Buisman |
| - Loads: | Simulate |
| End of consolidation: | 13140,00 [days] |
| With maintain profile
(only for non uniform loads) | |
| - Material: | Superelevation |
| - Time: | 1,00 [days] |
| - Unit weight above phreatic.: | 19,00 [kN/m³] |
| - Unit weight below phreatic: | 19,00 [kN/m³] |
| - Iteration stop criterium: | 0,10 [m] |
| Pc (initial): | Variable parallel to the initial effective stress |
| Pc (per step): | Automatic increased to the final effective stresses |
| Creep rate reference time: | 1,000 [days] |
| No imaginary surface | |
| With submerging
(only for non uniform loads) | |
| - Iteration stop criterium : | 0,10 [m] |
| Load column width | |
| - Non-Uniform Loads : | 1,00 [m] |
| - Trapezoidal Loads : | 1,00 [m] |

2.4 Soil Profiles

| Layer number | Material name | PL-line top | PL-line bottom |
|--------------|------------------|-------------|----------------|
| 3 | leem, zz, slap | 1 | 1 |
| 2 | leem, zz, slap | 1 | 1 |
| 1 | grind, zs, matig | 1 | 1 |

2.5 Soil Properties

| Layer number | Drained | Unit weight | |
|--------------|---------|---------------------|-------------------|
| | | Unsaturated [kN/m³] | Saturated [kN/m³] |
| 3 | No | 19,00 | 19,00 |
| 2 | No | 19,00 | 19,00 |
| 1 | Yes | 18,00 | 20,00 |

| Layer number | Storage type | Vert. consolid. coefficient Cv [m²/s] | Vertical permeability [m/s] | Permeability strain mod. [m/s] | Initial vertical permeability [m/s] |
|--------------|--------------|---------------------------------------|-----------------------------|--------------------------------|-------------------------------------|
| 3 | Vert. cons. | 1,00E-07 | - | - | - |
| 2 | Vert. cons. | 1,00E-07 | - | - | - |
| 1 | Vert. cons. | - | - | - | - |

| Layer number | POP [kN/m²] | OCR [-] | Equiv. age [days] |
|--------------|-------------|---------|-------------------|
| 3 | 10,00 | - | - |
| 2 | 10,00 | - | - |
| 1 | 10,00 | - | - |

| Layer number | Secondary swelling type | Secondary swelling factor [-] | Unloading stress ratio [-] |
|--------------|-------------------------|-------------------------------|----------------------------|
| 3 | Full | - | - |
| 2 | Full | - | - |
| 1 | Full | - | - |

| Layer number | Reloading/ swelling ratio RR [-] | Compression ratio CR [-] | Coeff. of sec. compression Ca [-] | Reloading/ swelling index Cr [-] | Compression index Cc [-] | Initial void ratio (e0) [-] |
|--------------|----------------------------------|--------------------------|-----------------------------------|----------------------------------|--------------------------|-----------------------------|
| 3 | 0,0307000 | 0,0920000 | 0,0037000 | - | - | - |
| 2 | 0,0307000 | 0,0920000 | 0,0037000 | - | - | - |
| 1 | 0,0008000 | 0,0023000 | 0,0000000 | - | - | - |

2.6 Non-Uniform Loads

| Load number | Time [days] | Unit weight | |
|-------------|-------------|---------------------|-------------------|
| | | Unsaturated [kN/m³] | Saturated [kN/m³] |
| 1 | 1 | 19,00 | 19,00 |

| Load number | Co-ordinates [m] | | | | | | |
|-------------|------------------|-------|-------|-------|-------|--|--|
| 1 - X - | 3,85 | 6,15 | 9,65 | 18,65 | 20,85 | | |
| 1 - Y - | 43,82 | 43,82 | 42,65 | 42,20 | 41,47 | | |

2.7 Verticals

| Vertical number | X co-ordinates [m] | | | | |
|-----------------|--------------------|---------|--------|--------|--------|
| 1 - 5 | -40,000 | -30,020 | -9,030 | 0,000 | 0,950 |
| 6 - 10 | 2,500 | 3,850 | 4,950 | 9,650 | 12,890 |
| 11 - 15 | 16,820 | 18,650 | 20,850 | 30,000 | 40,000 |

Calculation of cross section at Z = 0,000 m
Discretisation = 100

3 Settlements

3.1 Settlements

| Vertical number | X co-ordinate [m] | Surface level [m] | Settlement [m] |
|-----------------|-------------------|-------------------|----------------|
| 1 | -40,00 | 41,21 | 0,000 |
| 2 | -30,02 | 41,21 | 0,000 |
| 3 | -9,03 | 41,46 | 0,001 |
| 4 | 0,00 | 43,90 | 0,027 |
| 5 | 0,95 | 43,88 | 0,027 |
| 6 | 2,50 | 43,85 | 0,028 |
| 7 | 3,85 | 43,82 | 0,036 |
| 8 | 4,95 | 43,57 | 0,053 |
| 9 | 9,65 | 42,49 | 0,042 |
| 10 | 12,89 | 41,75 | 0,071 |
| 11 | 16,82 | 41,47 | 0,078 |
| 12 | 18,65 | 41,47 | 0,066 |
| 13 | 20,85 | 41,47 | 0,012 |
| 14 | 30,00 | 41,47 | 0,001 |
| 15 | 40,00 | 41,47 | 0,001 |

3.2 Maintain Profile Calculation Results

Load 1 consists of 8,541 m3 per Width

The extra amount of soil to be added is 0,957 m3 per Width

This equals the found settlements for non-uniform loads

End of Report

Report for D-Settlement 9.2

Settlement Calculations
Developed by Deltares



Company: Witteveen+Bos

Date of report: 09-10-2013

Time of report: 15:43:29

Date of calculation: 08-10-2013

Time of calculation: 15:47:14

Filename: F:\..150.320.2 dwp 1 - 02 Zettingen uitbreidbaarheidsprofiel 2050

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| 3.1 Settlements | 5 |
| 3.2 Maintain Profile Calculation Results | 5 |

2 Echo of the Input

2.1 Layer Boundaries

| Boundary number | Co-ordinates [m] | | | | |
|-----------------|------------------|---------|--------|--------|--------|
| 3 - X - | -40,000 | -30,020 | -9,030 | 0,000 | 3,850 |
| 3 - Y - | 41,210 | 41,210 | 41,460 | 43,900 | 43,820 |
| 3 - X - | 12,890 | 16,820 | 20,850 | 40,000 | |
| 3 - Y - | 41,750 | 41,470 | 41,470 | 41,470 | |
| 2 - X - | -40,000 | -30,020 | -9,030 | 12,890 | 16,820 |
| 2 - Y - | 41,210 | 41,210 | 41,460 | 41,750 | 41,470 |
| 2 - X - | 20,850 | 40,000 | | | |
| 2 - Y - | 41,470 | 41,470 | | | |
| 1 - X - | -40,000 | -9,030 | 0,000 | 3,850 | 12,890 |
| 1 - Y - | 39,800 | 39,800 | 40,000 | 40,000 | 39,600 |
| 1 - X - | 40,000 | | | | |
| 1 - Y - | 39,600 | | | | |
| 0 - X - | -40,000 | 40,000 | | | |
| 0 - Y - | 30,000 | 30,000 | | | |

2.2 PL Lines

| PL line number | Co-ordinates [m] | | | | |
|----------------|------------------|--------|--|--|--|
| 1 - X - | -40,000 | 40,000 | | | |
| 1 - Y - | 41,470 | 41,470 | | | |

2.3 General Data

| | |
|---|---|
| Soil model: | NEN Bjerrum |
| Consolidation model: | Darcy |
| Strain model: | Linear |
| Groundwater level: | Initial determined by PL-line number 1 |
| Unit weight of water: | 9,81 [kN/m³] |
| Stress distribution | |
| - Soil: | Buisman |
| - Loads: | Simulate |
| End of consolidation: | 13140,00 [days] |
| With maintain profile
(only for non uniform loads) | |
| - Material: | Superelevation |
| - Time: | 1,00 [days] |
| - Unit weight above phreatic.: | 19,00 [kN/m³] |
| - Unit weight below phreatic: | 19,00 [kN/m³] |
| - Iteration stop criterium: | 0,10 [m] |
| Pc (initial): | Variable parallel to the initial effective stress |
| Pc (per step): | Automatic increased to the final effective stresses |
| Creep rate reference time: | 1,000 [days] |
| No imaginary surface | |
| With submerging
(only for non uniform loads) | |
| - Iteration stop criterium : | 0,10 [m] |
| Load column width | |
| - Non-Uniform Loads : | 1,00 [m] |
| - Trapezoidal Loads : | 1,00 [m] |

2.4 Soil Profiles

| Layer number | Material name | PL-line top | PL-line bottom |
|--------------|------------------|-------------|----------------|
| 3 | leem, zz, slap | 1 | 1 |
| 2 | leem, zz, slap | 1 | 1 |
| 1 | grind, zs, matig | 1 | 1 |

2.5 Soil Properties

| Layer number | Drained | Unit weight | |
|--------------|---------|---------------------|-------------------|
| | | Unsaturated [kN/m³] | Saturated [kN/m³] |
| 3 | No | 19,00 | 19,00 |
| 2 | No | 19,00 | 19,00 |
| 1 | Yes | 18,00 | 20,00 |

| Layer number | Storage type | Vert. consolid. coefficient Cv [m²/s] | Vertical permeability [m/s] | Permeability strain mod. [m/s] | Initial vertical permeability [m/s] |
|--------------|--------------|---------------------------------------|-----------------------------|--------------------------------|-------------------------------------|
| 3 | Vert. cons. | 1,00E-07 | - | - | - |
| 2 | Vert. cons. | 1,00E-07 | - | - | - |
| 1 | Vert. cons. | - | - | - | - |

| Layer number | POP [kN/m²] | OCR [-] | Equiv. age [days] |
|--------------|-------------|---------|-------------------|
| 3 | 10,00 | - | - |
| 2 | 10,00 | - | - |
| 1 | 10,00 | - | - |

| Layer number | Secondary swelling type | Secondary swelling factor[-] | Unloading stress ratio[-] |
|--------------|-------------------------|------------------------------|---------------------------|
| 3 | Full | - | - |
| 2 | Full | - | - |
| 1 | Full | - | - |

| Layer number | Reloading/ swelling ratio RR [-] | Compression ratio CR [-] | Coeff. of sec. compression Ca [-] | Reloading/ swelling index Cr [-] | Compression index Cc [-] | Initial void ratio (e0) [-] |
|--------------|----------------------------------|--------------------------|-----------------------------------|----------------------------------|--------------------------|-----------------------------|
| 3 | 0,0307000 | 0,0920000 | 0,0037000 | - | - | - |
| 2 | 0,0307000 | 0,0920000 | 0,0037000 | - | - | - |
| 1 | 0,0008000 | 0,0023000 | 0,0000000 | - | - | - |

2.6 Non-Uniform Loads

| Load number | Time [days] | Unit weight | |
|-------------|-------------|---------------------|-------------------|
| | | Unsaturated [kN/m³] | Saturated [kN/m³] |
| 1 | 1 | 19,00 | 19,00 |
| 2 | 1 | 19,00 | 19,00 |

| Load number | Co-ordinates [m] | | | | | |
|-------------|------------------|-------|-------|-------|-------|--|
| 1 - X - | 3,85 | 6,15 | 9,65 | 18,65 | 20,85 | |
| 1 - Y - | 43,82 | 43,82 | 42,65 | 42,20 | 41,47 | |
| 2 - X - | 0,00 | 0,95 | 4,95 | 6,15 | | |
| 2 - Y - | 43,90 | 44,22 | 44,22 | 43,82 | | |

2.7 Verticals

| Vertical number | X co-ordinates [m] | | | | |
|-----------------|--------------------|---------|--------|--------|--------|
| 1 - 5 | -40,000 | -30,020 | -9,030 | 0,000 | 0,950 |
| 6 - 10 | 2,500 | 3,850 | 4,950 | 9,650 | 12,890 |
| 11 - 15 | 16,820 | 18,650 | 20,850 | 30,000 | 40,000 |

Calculation of cross section at Z = 0,000 m
Discretisation = 100

3 Settlements

3.1 Settlements

| Vertical number | X co-ordinate [m] | Surface level [m] | Settlement [m] |
|-----------------|-------------------|-------------------|----------------|
| 1 | -40,00 | 41,21 | 0,000 |
| 2 | -30,02 | 41,21 | 0,000 |
| 3 | -9,03 | 41,46 | 0,001 |
| 4 | 0,00 | 43,90 | 0,041 |
| 5 | 0,95 | 43,88 | 0,058 |
| 6 | 2,50 | 43,85 | 0,070 |
| 7 | 3,85 | 43,82 | 0,077 |
| 8 | 4,95 | 43,57 | 0,081 |
| 9 | 9,65 | 42,49 | 0,043 |
| 10 | 12,89 | 41,75 | 0,071 |
| 11 | 16,82 | 41,47 | 0,078 |
| 12 | 18,65 | 41,47 | 0,066 |
| 13 | 20,85 | 41,47 | 0,012 |
| 14 | 30,00 | 41,47 | 0,001 |
| 15 | 40,00 | 41,47 | 0,001 |

3.2 Maintain Profile Calculation Results

Load 1 consists of 8,541 m3 per Width

Load 2 consists of 1,913 m3 per Width

The extra amount of soil to be added is 1,309 m3 per Width

This equals the found settlements for non-uniform loads

End of Report

Report for D-Settlement 9.2

Settlement Calculations
Developed by Deltares



| | |
|----------------------|---|
| Company: | Witteveen+Bos |
| Date of report: | 09-10-2013 |
| Time of report: | 15:43:44 |
| Date of calculation: | 08-10-2013 |
| Time of calculation: | 16:01:53 |
| Filename: | F:\..150.320.3 dwp 1 - 01 Zettingen versterkingsopgave 2020 |

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| 2.7 Verticals | 4 |
| 3 Settlements | 5 |
| 3.1 Settlements | 5 |
| 3.2 Maintain Profile Calculation Results | 5 |

2 Echo of the Input

2.1 Layer Boundaries

| Boundary number | Co-ordinates [m] | | | | |
|-----------------|------------------|---------|---------|---------|--------|
| 3 - X - | -40,000 | -25,950 | -25,280 | -14,620 | 0,000 |
| 3 - Y - | 40,700 | 40,700 | 40,800 | 40,730 | 43,920 |
| 3 - X - | 2,820 | 6,210 | 9,580 | 40,000 | |
| 3 - Y - | 43,960 | 43,200 | 41,330 | 41,330 | |
| 2 - X - | -40,000 | -25,950 | -25,280 | -14,620 | 9,580 |
| 2 - Y - | 40,700 | 40,700 | 40,800 | 40,730 | 41,330 |
| 2 - X - | 40,000 | | | | |
| 2 - Y - | 41,330 | | | | |
| 1 - X - | -40,000 | -14,620 | 0,000 | 2,820 | 9,580 |
| 1 - Y - | 37,900 | 37,900 | 40,600 | 40,600 | 39,500 |
| 1 - X - | 40,000 | | | | |
| 1 - Y - | 39,500 | | | | |
| 0 - X - | -40,000 | 40,000 | | | |
| 0 - Y - | 30,000 | 30,000 | | | |

2.2 PL Lines

| PL line number | Co-ordinates [m] | | | | |
|----------------|------------------|---------|--------|--------|--|
| 1 - X - | -40,000 | -14,620 | 9,580 | 40,000 | |
| 1 - Y - | 40,700 | 40,700 | 41,330 | 41,330 | |

2.3 General Data

| | |
|---|---|
| Soil model: | NEN Bjerrum |
| Consolidation model: | Darcy |
| Strain model: | Linear |
| Groundwater level: | Initial determined by PL-line number 1 |
| Unit weight of water: | 9,81 [kN/m³] |
| Stress distribution | |
| - Soil: | Buisman |
| - Loads: | Simulate |
| End of consolidation: | 13140,00 [days] |
| With maintain profile
(only for non uniform loads) | |
| - Material: | Superelevation |
| - Time: | 1,00 [days] |
| - Unit weight above phreatic.: | 19,00 [kN/m³] |
| - Unit weight below phreatic: | 19,00 [kN/m³] |
| - Iteration stop criterium: | 0,10 [m] |
| Pc (initial): | Variable parallel to the initial effective stress |
| Pc (per step): | Automatic increased to the final effective stresses |
| Creep rate reference time: | 1,000 [days] |
| No imaginary surface | |
| With submerging
(only for non uniform loads) | |
| - Iteration stop criterium : | 0,10 [m] |
| Load column width | |
| - Non-Uniform Loads : | 1,00 [m] |
| - Trapezoidal Loads : | 1,00 [m] |

2.4 Soil Profiles

| Layer number | Material name | PL-line top | PL-line bottom |
|--------------|------------------|-------------|----------------|
| 3 | leem, zz, slap | 1 | 1 |
| 2 | leem, zz, slap | 1 | 1 |
| 1 | grind, zs, matig | 1 | 1 |

2.5 Soil Properties

| Layer number | Drained | Unit weight | |
|--------------|---------|---------------------|-------------------|
| | | Unsaturated [kN/m³] | Saturated [kN/m³] |
| 3 | No | 19,00 | 19,00 |
| 2 | No | 19,00 | 19,00 |
| 1 | Yes | 18,00 | 20,00 |

| Layer number | Storage type | Vert. consolid. coefficient Cv [m²/s] | Vertical permeability [m/s] | Permeability strain mod. [m/s] | Initial vertical permeability [m/s] |
|--------------|--------------|---------------------------------------|-----------------------------|--------------------------------|-------------------------------------|
| 3 | Vert. cons. | 1,00E-07 | - | - | - |
| 2 | Vert. cons. | 1,00E-07 | - | - | - |
| 1 | Vert. cons. | - | - | - | - |

| Layer number | POP [kN/m²] | OCR [-] | Equiv. age [days] |
|--------------|-------------|---------|-------------------|
| 3 | 10,00 | - | - |
| 2 | 10,00 | - | - |
| 1 | 10,00 | - | - |

| Layer number | Secondary swelling type | Secondary swelling factor [-] | Unloading stress ratio [-] |
|--------------|-------------------------|-------------------------------|----------------------------|
| 3 | Full | - | - |
| 2 | Full | - | - |
| 1 | Full | - | - |

| Layer number | Reloading/ swelling ratio RR [-] | Compression ratio CR [-] | Coeff. of sec. compression Ca [-] | Reloading/ swelling index Cr [-] | Compression index Cc [-] | Initial void ratio (e0) [-] |
|--------------|----------------------------------|--------------------------|-----------------------------------|----------------------------------|--------------------------|-----------------------------|
| 3 | 0,0307000 | 0,0920000 | 0,0037000 | - | - | - |
| 2 | 0,0307000 | 0,0920000 | 0,0037000 | - | - | - |
| 1 | 0,0008000 | 0,0023000 | 0,0000000 | - | - | - |

2.6 Non-Uniform Loads

| Load number | Time [days] | Unit weight | |
|-------------|-------------|---------------------|-------------------|
| | | Unsaturated [kN/m³] | Saturated [kN/m³] |
| 1 | 1 | 19,00 | 19,00 |

| Load number | Co-ordinates [m] | | | | | |
|-------------|------------------|-------|-------|-------|-------|--|
| 1 - X - | 2,82 | 6,28 | 9,75 | 19,75 | 22,66 | |
| 1 - Y - | 43,96 | 43,96 | 42,80 | 42,30 | 41,33 | |

2.7 Verticals

| Vertical number | X co-ordinates [m] | | | | |
|-----------------|--------------------|---------|---------|---------|--------|
| 1 - 5 | -40,000 | -25,950 | -25,280 | -14,620 | 0,000 |
| 6 - 10 | 1,200 | 2,820 | 5,200 | 6,210 | 6,278 |
| 11 - 15 | 9,580 | 9,750 | 19,750 | 22,660 | 40,000 |

Calculation of cross section at Z = 0,000 m
Discretisation = 100

3 Settlements

3.1 Settlements

| Vertical number | X co-ordinate [m] | Surface level [m] | Settlement [m] |
|-----------------|-------------------|-------------------|----------------|
| 1 | -40,00 | 40,70 | 0,006 |
| 2 | -25,95 | 40,70 | 0,006 |
| 3 | -25,28 | 40,80 | 0,007 |
| 4 | -14,62 | 40,73 | 0,006 |
| 5 | 0,00 | 43,92 | 0,022 |
| 6 | 1,20 | 43,94 | 0,023 |
| 7 | 2,82 | 43,96 | 0,031 |
| 8 | 5,20 | 43,43 | 0,073 |
| 9 | 6,21 | 43,20 | 0,083 |
| 10 | 6,28 | 43,16 | 0,088 |
| 11 | 9,58 | 41,33 | 0,115 |
| 12 | 9,75 | 41,33 | 0,115 |
| 13 | 19,75 | 41,33 | 0,080 |
| 14 | 22,66 | 41,33 | 0,014 |
| 15 | 40,00 | 41,33 | 0,001 |

3.2 Maintain Profile Calculation Results

Load 1 consists of 19,045 m3 per Width

The extra amount of soil to be added is 1,670 m3 per Width

This equals the found settlements for non-uniform loads

End of Report

Report for D-Settlement 9.2

Settlement Calculations
Developed by Deltares



| | |
|----------------------|---|
| Company: | Witteveen+Bos |
| Date of report: | 09-10-2013 |
| Time of report: | 15:44:21 |
| Date of calculation: | 08-10-2013 |
| Time of calculation: | 16:00:49 |
| Filename: | F:\..150.320.3 dwp 1 - 02 Zettingen uitbreidbaarheidsprofiel 2050 |

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| 2.7 Verticals | 4 |
| 3 Settlements | 5 |
| 3.1 Settlements | 5 |
| 3.2 Maintain Profile Calculation Results | 5 |

2 Echo of the Input

2.1 Layer Boundaries

| Boundary number | Co-ordinates [m] | | | | |
|-----------------|------------------|---------|---------|---------|--------|
| 3 - X - | -40,000 | -25,950 | -25,280 | -14,620 | 0,000 |
| 3 - Y - | 40,700 | 40,700 | 40,800 | 40,730 | 43,920 |
| 3 - X - | 2,820 | 6,210 | 9,580 | 40,000 | |
| 3 - Y - | 43,960 | 43,200 | 41,330 | 41,330 | |
| 2 - X - | -40,000 | -25,950 | -25,280 | -14,620 | 9,580 |
| 2 - Y - | 40,700 | 40,700 | 40,800 | 40,730 | 41,330 |
| 2 - X - | 40,000 | | | | |
| 2 - Y - | 41,330 | | | | |
| 1 - X - | -40,000 | -14,620 | 0,000 | 2,820 | 9,580 |
| 1 - Y - | 37,900 | 37,900 | 40,600 | 40,600 | 39,500 |
| 1 - X - | 40,000 | | | | |
| 1 - Y - | 39,500 | | | | |
| 0 - X - | -40,000 | 40,000 | | | |
| 0 - Y - | 30,000 | 30,000 | | | |

2.2 PL Lines

| PL line number | Co-ordinates [m] | | | | |
|----------------|------------------|---------|--------|--------|--|
| 1 - X - | -40,000 | -14,620 | 9,580 | 40,000 | |
| 1 - Y - | 40,700 | 40,700 | 41,330 | 41,330 | |

2.3 General Data

| | |
|---|---|
| Soil model: | NEN Bjerrum |
| Consolidation model: | Darcy |
| Strain model: | Linear |
| Groundwater level: | Initial determined by PL-line number 1 |
| Unit weight of water: | 9,81 [kN/m³] |
| Stress distribution | |
| - Soil: | Buisman |
| - Loads: | Simulate |
| End of consolidation: | 13140,00 [days] |
| With maintain profile
(only for non uniform loads) | |
| - Material: | Superelevation |
| - Time: | 1,00 [days] |
| - Unit weight above phreatic.: | 19,00 [kN/m³] |
| - Unit weight below phreatic: | 19,00 [kN/m³] |
| - Iteration stop criterium: | 0,10 [m] |
| Pc (initial): | Variable parallel to the initial effective stress |
| Pc (per step): | Automatic increased to the final effective stresses |
| Creep rate reference time: | 1,000 [days] |
| No imaginary surface | |
| With submerging
(only for non uniform loads) | |
| - Iteration stop criterium : | 0,10 [m] |
| Load column width | |
| - Non-Uniform Loads : | 1,00 [m] |
| - Trapezoidal Loads : | 1,00 [m] |

2.4 Soil Profiles

| Layer number | Material name | PL-line top | PL-line bottom |
|--------------|------------------|-------------|----------------|
| 3 | leem, zz, slap | 1 | 1 |
| 2 | leem, zz, slap | 1 | 1 |
| 1 | grind, zs, matig | 1 | 1 |

2.5 Soil Properties

| Layer number | Drained | Unit weight | |
|--------------|---------|---------------------|-------------------|
| | | Unsaturated [kN/m³] | Saturated [kN/m³] |
| 3 | No | 19,00 | 19,00 |
| 2 | No | 19,00 | 19,00 |
| 1 | Yes | 18,00 | 20,00 |

| Layer number | Storage type | Vert. consolid. coefficient Cv [m²/s] | Vertical permeability [m/s] | Permeability strain mod. [m/s] | Initial vertical permeability [m/s] |
|--------------|--------------|---------------------------------------|-----------------------------|--------------------------------|-------------------------------------|
| 3 | Vert. cons. | 1,00E-07 | - | - | - |
| 2 | Vert. cons. | 1,00E-07 | - | - | - |
| 1 | Vert. cons. | - | - | - | - |

| Layer number | POP [kN/m²] | OCR [-] | Equiv. age [days] |
|--------------|-------------|---------|-------------------|
| 3 | 10,00 | - | - |
| 2 | 10,00 | - | - |
| 1 | 10,00 | - | - |

| Layer number | Secondary swelling type | Secondary swelling factor[-] | Unloading stress ratio[-] |
|--------------|-------------------------|------------------------------|---------------------------|
| 3 | Full | - | - |
| 2 | Full | - | - |
| 1 | Full | - | - |

| Layer number | Reloading/ swelling ratio RR [-] | Compression ratio CR [-] | Coeff. of sec. compression Ca [-] | Reloading/ swelling index Cr [-] | Compression index Cc [-] | Initial void ratio (e0) [-] |
|--------------|----------------------------------|--------------------------|-----------------------------------|----------------------------------|--------------------------|-----------------------------|
| 3 | 0,0307000 | 0,0920000 | 0,0037000 | - | - | - |
| 2 | 0,0307000 | 0,0920000 | 0,0037000 | - | - | - |
| 1 | 0,0008000 | 0,0023000 | 0,0000000 | - | - | - |

2.6 Non-Uniform Loads

| Load number | Time [days] | Unit weight | |
|-------------|-------------|---------------------|-------------------|
| | | Unsaturated [kN/m³] | Saturated [kN/m³] |
| 1 | 1 | 19,00 | 19,00 |
| 2 | 1 | 19,00 | 19,00 |

| Load number | Co-ordinates [m] | | | | | |
|-------------|------------------|-------|-------|-------|-------|--|
| 1 - X - | 2,82 | 6,28 | 9,75 | 19,75 | 22,66 | |
| 1 - Y - | 43,96 | 43,96 | 42,80 | 42,30 | 41,33 | |
| 2 - X - | 0,00 | 1,20 | 5,20 | 6,28 | | |
| 2 - Y - | 43,92 | 44,32 | 44,32 | 43,96 | | |

2.7 Verticals

| Vertical number | X co-ordinates [m] | | | | |
|-----------------|--------------------|---------|---------|---------|--------|
| 1 - 5 | -40,000 | -25,950 | -25,280 | -14,620 | 0,000 |
| 6 - 10 | 1,200 | 2,820 | 5,200 | 6,210 | 6,278 |
| 11 - 15 | 9,580 | 9,750 | 19,750 | 22,660 | 40,000 |

Calculation of cross section at Z = 0,000 m
Discretisation = 100

3 Settlements

3.1 Settlements

| Vertical number | X co-ordinate [m] | Surface level [m] | Settlement [m] |
|-----------------|-------------------|-------------------|----------------|
| 1 | -40,00 | 40,70 | 0,006 |
| 2 | -25,95 | 40,70 | 0,006 |
| 3 | -25,28 | 40,80 | 0,007 |
| 4 | -14,62 | 40,73 | 0,006 |
| 5 | 0,00 | 43,92 | 0,034 |
| 6 | 1,20 | 43,94 | 0,056 |
| 7 | 2,82 | 43,96 | 0,067 |
| 8 | 5,20 | 43,43 | 0,091 |
| 9 | 6,21 | 43,20 | 0,092 |
| 10 | 6,28 | 43,16 | 0,096 |
| 11 | 9,58 | 41,33 | 0,115 |
| 12 | 9,75 | 41,33 | 0,116 |
| 13 | 19,75 | 41,33 | 0,080 |
| 14 | 22,66 | 41,33 | 0,014 |
| 15 | 40,00 | 41,33 | 0,001 |

3.2 Maintain Profile Calculation Results

Load 1 consists of 19,045 m3 per Width

Load 2 consists of 1,882 m3 per Width

The extra amount of soil to be added is 1,920 m3 per Width

This equals the found settlements for non-uniform loads

End of Report

Report for D-Settlement 9.2

Settlement Calculations
Developed by Deltares



| | |
|----------------------|---|
| Company: | Witteveen+Bos |
| Date of report: | 09-10-2013 |
| Time of report: | 15:44:42 |
| Date of calculation: | 08-10-2013 |
| Time of calculation: | 16:12:20 |
| Filename: | F:\..150.320.4 dwp 1 - 01 Zettingen versterkingsopgave 2020 |

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| 2.7 Verticals | 4 |
| 3 Settlements | 5 |
| 3.1 Settlements | 5 |
| 3.2 Maintain Profile Calculation Results | 5 |

2 Echo of the Input

2.1 Layer Boundaries

| Boundary number | Co-ordinates [m] | | | | |
|-----------------|------------------|---------|--------|--------|--------|
| 3 - X - | -40,000 | -12,550 | -4,430 | 0,000 | 3,680 |
| 3 - Y - | 40,680 | 40,680 | 42,830 | 43,750 | 43,710 |
| 3 - X - | 7,680 | 9,800 | 12,020 | 40,000 | |
| 3 - Y - | 42,380 | 42,275 | 41,400 | 41,400 | |
| 2 - X - | -40,000 | -12,550 | 12,020 | 40,000 | |
| 2 - Y - | 40,680 | 40,680 | 41,400 | 41,400 | |
| 1 - X - | -40,000 | -12,550 | 0,000 | 3,680 | 40,000 |
| 1 - Y - | 37,500 | 37,500 | 39,400 | 39,400 | 39,400 |
| 0 - X - | -40,000 | 40,000 | | | |
| 0 - Y - | 30,000 | 30,000 | | | |

2.2 PL Lines

| PL line number | Co-ordinates [m] | | | | |
|----------------|------------------|---------|--------|--------|--|
| 1 - X - | -40,000 | -12,550 | 12,020 | 40,000 | |
| 1 - Y - | 40,680 | 40,680 | 41,400 | 41,400 | |

2.3 General Data

| | |
|---|---|
| Soil model: | NEN Bjerrum |
| Consolidation model: | Darcy |
| Strain model: | Linear |
| Groundwater level: | Initial determined by PL-line number 1 |
| Unit weight of water: | 9,81 [kN/m³] |
| Stress distribution | |
| - Soil: | Buisman |
| - Loads: | Simulate |
| End of consolidation: | 13140,00 [days] |
| With maintain profile
(only for non uniform loads) | |
| - Material: | Superelevation |
| - Time: | 1,00 [days] |
| - Unit weight above phreatic.: | 19,00 [kN/m³] |
| - Unit weight below phreatic: | 19,00 [kN/m³] |
| - Iteration stop criterium: | 0,10 [m] |
| Pc (initial): | Variable parallel to the initial effective stress |
| Pc (per step): | Automatic increased to the final effective stresses |
| Creep rate reference time: | 1,000 [days] |
| No imaginary surface | |
| With submerging
(only for non uniform loads) | |
| - Iteration stop criterium : | 0,10 [m] |
| Load column width | |
| - Non-Uniform Loads : | 1,00 [m] |
| - Trapezoidal Loads : | 1,00 [m] |

2.4 Soil Profiles

| Layer number | Material name | PL-line top | PL-line bottom |
|--------------|------------------|-------------|----------------|
| 3 | leem, zz, slap | 1 | 1 |
| 2 | leem, zz, slap | 1 | 1 |
| 1 | grind, zs, matig | 1 | 1 |

2.5 Soil Properties

| Layer number | Drained | Unit weight | |
|--------------|---------|---------------------|-------------------|
| | | Unsaturated [kN/m³] | Saturated [kN/m³] |
| 3 | No | 19,00 | 19,00 |
| 2 | No | 19,00 | 19,00 |
| 1 | Yes | 18,00 | 20,00 |

| Layer number | Storage type | Vert. consolid. coefficient Cv [m²/s] | Vertical permeability [m/s] | Permeability strain mod. [m/s] | Initial vertical permeability [m/s] |
|--------------|--------------|---------------------------------------|-----------------------------|--------------------------------|-------------------------------------|
| 3 | Vert. cons. | 1,00E-07 | - | - | - |
| 2 | Vert. cons. | 1,00E-07 | - | - | - |
| 1 | Vert. cons. | - | - | - | - |

| Layer number | POP [kN/m²] | OCR [-] | Equiv. age [days] |
|--------------|-------------|---------|-------------------|
| 3 | 10,00 | - | - |
| 2 | 10,00 | - | - |
| 1 | 10,00 | - | - |

| Layer number | Secondary swelling type | Secondary swelling factor[-] | Unloading stress ratio[-] |
|--------------|-------------------------|------------------------------|---------------------------|
| 3 | Full | - | - |
| 2 | Full | - | - |
| 1 | Full | - | - |

| Layer number | Reloading/ swelling ratio RR [-] | Compression ratio CR [-] | Coeff. of sec. compression Ca [-] | Reloading/ swelling index Cr [-] | Compression index Cc [-] | Initial void ratio (e0) [-] |
|--------------|----------------------------------|--------------------------|-----------------------------------|----------------------------------|--------------------------|-----------------------------|
| 3 | 0,0307000 | 0,0920000 | 0,0037000 | - | - | - |
| 2 | 0,0307000 | 0,0920000 | 0,0037000 | - | - | - |
| 1 | 0,0008000 | 0,0023000 | 0,0000000 | - | - | - |

2.6 Non-Uniform Loads

| Load number | Time [days] | Unit weight | |
|-------------|-------------|---------------------|-------------------|
| | | Unsaturated [kN/m³] | Saturated [kN/m³] |
| 1 | 1 | 19,00 | 19,00 |

| Load number | Co-ordinates [m] | | | | | |
|-------------|------------------|-------|-------|--|--|--|
| 1 - X - | 9,80 | 15,20 | 17,00 | | | |
| 1 - Y - | 42,28 | 42,00 | 41,40 | | | |

2.7 Verticals

| Vertical number | X co-ordinates [m] | | | | |
|-----------------|--------------------|---------|--------|--------|--------|
| 1 - 5 | -40,000 | -12,550 | -4,430 | 0,000 | 2,000 |
| 6 - 10 | 3,680 | 7,680 | 9,800 | 12,020 | 15,200 |
| 11 - 13 | 17,000 | 28,500 | 40,000 | | |

Calculation of cross section at Z = 0,000 m
Discretisation = 100

3 Settlements

3.1 Settlements

| Vertical number | X co-ordinate [m] | Surface level [m] | Settlement [m] |
|-----------------|-------------------|-------------------|----------------|
| 1 | -40,00 | 40,68 | 0,009 |
| 2 | -12,55 | 40,68 | 0,009 |
| 3 | -4,43 | 42,83 | 0,028 |
| 4 | 0,00 | 43,75 | 0,032 |
| 5 | 2,00 | 43,73 | 0,032 |
| 6 | 3,68 | 43,71 | 0,032 |
| 7 | 7,68 | 42,38 | 0,015 |
| 8 | 9,80 | 42,28 | 0,024 |
| 9 | 12,02 | 41,40 | 0,072 |
| 10 | 15,20 | 41,40 | 0,058 |
| 11 | 17,00 | 41,40 | 0,015 |
| 12 | 28,50 | 41,40 | 0,002 |
| 13 | 40,00 | 41,40 | 0,002 |

3.2 Maintain Profile Calculation Results

Load 1 consists of 3,551 m3 per Width

The extra amount of soil to be added is 0,377 m3 per Width

This equals the found settlements for non-uniform loads

End of Report

Report for D-Settlement 9.2

Settlement Calculations
Developed by Deltares



| | |
|----------------------|---|
| Company: | Witteveen+Bos |
| Date of report: | 09-10-2013 |
| Time of report: | 15:47:51 |
| Date of calculation: | 08-10-2013 |
| Time of calculation: | 16:41:43 |
| Filename: | F:\..150.320.4 dwp 2 - 01 Zettingen versterkingsopgave 2020 |

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| 3 Settlements | 5 |
| 3.1 Settlements | 5 |
| 3.2 Maintain Profile Calculation Results | 5 |

2 Echo of the Input

2.1 Layer Boundaries

| Boundary number | Co-ordinates [m] | | | | |
|-----------------|------------------|---------|---------|---------|---------|
| 3 - X - | -40,000 | -25,990 | -19,780 | -12,880 | -10,890 |
| 3 - Y - | 40,170 | 40,170 | 40,450 | 40,500 | 40,960 |
| 3 - X - | 0,000 | 3,430 | 5,732 | 7,272 | 12,043 |
| 3 - Y - | 43,410 | 43,480 | 42,906 | 42,393 | 42,155 |
| 3 - X - | 14,610 | 18,200 | 40,000 | | |
| 3 - Y - | 41,000 | 41,000 | 41,000 | | |
| 2 - X - | -40,000 | -25,990 | -19,780 | -12,880 | 14,610 |
| 2 - Y - | 40,170 | 40,170 | 40,450 | 40,500 | 41,000 |
| 2 - X - | 18,200 | 40,000 | | | |
| 2 - Y - | 41,000 | 41,000 | | | |
| 1 - X - | -40,000 | -12,880 | 0,000 | 3,680 | 40,000 |
| 1 - Y - | 37,500 | 37,500 | 39,400 | 39,400 | 39,400 |
| 0 - X - | -40,000 | 40,000 | | | |
| 0 - Y - | 30,000 | 30,000 | | | |

2.2 PL Lines

| PL line number | Co-ordinates [m] | | | | |
|----------------|------------------|---------|--------|--------|--|
| 1 - X - | -40,000 | -12,880 | 14,610 | 40,000 | |
| 1 - Y - | 40,170 | 40,170 | 41,000 | 41,000 | |

2.3 General Data

| | |
|---|---|
| Soil model: | NEN Bjerrum |
| Consolidation model: | Darcy |
| Strain model: | Linear |
| Groundwater level: | Initial determined by PL-line number 1 |
| Unit weight of water: | 9,81 [kN/m³] |
| Stress distribution | |
| - Soil: | Buisman |
| - Loads: | Simulate |
| End of consolidation: | 13140,00 [days] |
| With maintain profile
(only for non uniform loads) | |
| - Material: | Superelevation |
| - Time: | 1,00 [days] |
| - Unit weight above phreatic.: | 19,00 [kN/m³] |
| - Unit weight below phreatic: | 19,00 [kN/m³] |
| - Iteration stop criterium: | 0,10 [m] |
| Pc (initial): | Variable parallel to the initial effective stress |
| Pc (per step): | Automatic increased to the final effective stresses |
| Creep rate reference time: | 1,000 [days] |
| No imaginary surface | |
| With submerging
(only for non uniform loads) | |
| - Iteration stop criterium : | 0,10 [m] |
| Load column width | |
| - Non-Uniform Loads : | 1,00 [m] |
| - Trapezoidal Loads : | 1,00 [m] |

2.4 Soil Profiles

| Layer number | Material name | PL-line top | PL-line bottom |
|--------------|------------------|-------------|----------------|
| 3 | leem, zz, slap | 1 | 1 |
| 2 | leem, zz, slap | 1 | 1 |
| 1 | grind, zs, matig | 1 | 1 |

2.5 Soil Properties

| Layer number | Drained | Unit weight | |
|--------------|---------|---------------------|-------------------|
| | | Unsaturated [kN/m³] | Saturated [kN/m³] |
| 3 | No | 19,00 | 19,00 |
| 2 | No | 19,00 | 19,00 |
| 1 | Yes | 18,00 | 20,00 |

| Layer number | Storage type | Vert. consolid. coefficient Cv [m²/s] | Vertical permeability [m/s] | Permeability strain mod. [m/s] | Initial vertical permeability [m/s] |
|--------------|--------------|---------------------------------------|-----------------------------|--------------------------------|-------------------------------------|
| 3 | Vert. cons. | 1,00E-07 | - | - | - |
| 2 | Vert. cons. | 1,00E-07 | - | - | - |
| 1 | Vert. cons. | - | - | - | - |

| Layer number | POP [kN/m²] | OCR [-] | Equiv. age [days] |
|--------------|-------------|---------|-------------------|
| 3 | 10,00 | - | - |
| 2 | 10,00 | - | - |
| 1 | 10,00 | - | - |

| Layer number | Secondary swelling type | Secondary swelling factor [-] | Unloading stress ratio [-] |
|--------------|-------------------------|-------------------------------|----------------------------|
| 3 | Full | - | - |
| 2 | Full | - | - |
| 1 | Full | - | - |

| Layer number | Reloading/ swelling ratio RR [-] | Compression ratio CR [-] | Coeff. of sec. compression Ca [-] | Reloading/ swelling index Cr [-] | Compression index Cc [-] | Initial void ratio (e0) [-] |
|--------------|----------------------------------|--------------------------|-----------------------------------|----------------------------------|--------------------------|-----------------------------|
| 3 | 0,0307000 | 0,0920000 | 0,0037000 | - | - | - |
| 2 | 0,0307000 | 0,0920000 | 0,0037000 | - | - | - |
| 1 | 0,0008000 | 0,0023000 | 0,0000000 | - | - | - |

2.6 Non-Uniform Loads

| Load number | Time [days] | Unit weight | |
|-------------|-------------|---------------------|-------------------|
| | | Unsaturated [kN/m³] | Saturated [kN/m³] |
| 1 | 1 | 19,00 | 19,00 |
| 2 | 1 | 19,00 | 19,00 |

| Load number | Co-ordinates [m] | | | | | |
|-------------|------------------|-------|-------|--|--|--|
| 1 - X - | 3,43 | 4,00 | 5,73 | | | |
| 1 - Y - | 43,48 | 43,48 | 42,91 | | | |
| 2 - X - | 12,04 | 15,20 | 18,20 | | | |
| 2 - Y - | 42,16 | 42,00 | 41,00 | | | |

2.7 Verticals

| Vertical number | X co-ordinates [m] | | | | |
|-----------------|--------------------|---------|---------|---------|---------|
| 1 - 5 | -40,000 | -25,990 | -19,780 | -12,880 | -10,890 |
| 6 - 10 | 0,000 | 2,000 | 3,430 | 3,680 | 4,000 |
| 11 - 15 | 5,732 | 7,272 | 12,043 | 14,610 | 15,200 |
| 16 - 18 | 18,200 | 30,000 | 40,000 | | |

Calculation of cross section at Z = 0,000 m
Discretisation = 100

3 Settlements

3.1 Settlements

| Vertical number | X co-ordinate [m] | Surface level [m] | Settlement [m] |
|-----------------|-------------------|-------------------|----------------|
| 1 | -40,00 | 40,17 | 0,005 |
| 2 | -25,99 | 40,17 | 0,005 |
| 3 | -19,78 | 40,45 | 0,009 |
| 4 | -12,88 | 40,50 | 0,010 |
| 5 | -10,89 | 40,96 | 0,014 |
| 6 | 0,00 | 43,41 | 0,029 |
| 7 | 2,00 | 43,45 | 0,030 |
| 8 | 3,43 | 43,48 | 0,034 |
| 9 | 3,68 | 43,42 | 0,037 |
| 10 | 4,00 | 43,34 | 0,038 |
| 11 | 5,73 | 42,91 | 0,027 |
| 12 | 7,27 | 42,39 | 0,017 |
| 13 | 12,04 | 42,16 | 0,025 |
| 14 | 14,61 | 41,00 | 0,075 |
| 15 | 15,20 | 41,00 | 0,074 |
| 16 | 18,20 | 41,00 | 0,012 |
| 17 | 30,00 | 41,00 | 0,000 |
| 18 | 40,00 | 41,00 | 0,000 |

3.2 Maintain Profile Calculation Results

Load 1 consists of 0,164 m3 per Width

Load 2 consists of 3,419 m3 per Width

The extra amount of soil to be added is 0,377 m3 per Width

This equals the found settlements for non-uniform loads

End of Report

Report for D-Settlement 9.2

Settlement Calculations
Developed by Deltares



Company: Witteveen+Bos

Date of report: 09-10-2013

Time of report: 15:48:15

Date of calculation: 08-10-2013

Time of calculation: 16:50:33

Filename: F:\..150.320.4 dwp 3 - 01 Zettingen versterkingsopgave 2020

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| 2.6 Non-Uniform Loads | 4 |
| 2.7 Verticals | 4 |
| 3 Settlements | 5 |
| 3.1 Settlements | 5 |
| 3.2 Maintain Profile Calculation Results | 5 |

2 Echo of the Input

2.1 Layer Boundaries

| Boundary number | Co-ordinates [m] | | | | |
|-----------------|------------------|---------|---------|---------|--------|
| 3 - X - | -40,000 | -21,850 | -15,490 | -12,910 | -9,660 |
| 3 - Y - | 40,290 | 40,290 | 40,470 | 40,690 | 40,870 |
| 3 - X - | 0,000 | 3,680 | 8,600 | 8,986 | 16,560 |
| 3 - Y - | 43,150 | 43,260 | 42,140 | 42,128 | 41,900 |
| 3 - X - | 23,180 | 23,890 | 40,000 | | |
| 3 - Y - | 41,540 | 41,390 | 41,390 | | |
| 2 - X - | -40,000 | -21,850 | -15,490 | -12,910 | -9,660 |
| 2 - Y - | 40,290 | 40,290 | 40,470 | 40,690 | 40,870 |
| 2 - X - | 8,600 | 8,986 | 16,560 | 23,180 | 23,890 |
| 2 - Y - | 42,140 | 42,128 | 41,900 | 41,540 | 41,390 |
| 2 - X - | 40,000 | | | | |
| 2 - Y - | 41,390 | | | | |
| 1 - X - | -40,000 | -9,660 | 0,000 | 3,680 | 8,600 |
| 1 - Y - | 37,500 | 37,500 | 39,400 | 39,400 | 39,400 |
| 1 - X - | 40,000 | | | | |
| 1 - Y - | 39,400 | | | | |
| 0 - X - | -40,000 | 40,000 | | | |
| 0 - Y - | 30,000 | 30,000 | | | |

2.2 PL Lines

| PL line number | Co-ordinates [m] | | | | |
|----------------|------------------|--------|--------|--------|--|
| 1 - X - | -40,000 | -9,660 | 8,600 | 40,000 | |
| 1 - Y - | 40,290 | 40,290 | 41,390 | 41,390 | |

2.3 General Data

| | |
|---|---|
| Soil model: | NEN Bjerrum |
| Consolidation model: | Darcy |
| Strain model: | Linear |
| Groundwater level: | Initial determined by PL-line number 1 |
| Unit weight of water: | 9,81 [kN/m³] |
| Stress distribution | |
| - Soil: | Buisman |
| - Loads: | Simulate |
| End of consolidation: | 13140,00 [days] |
| With maintain profile
(only for non uniform loads) | |
| - Material: | Superelevation |
| - Time: | 1,00 [days] |
| - Unit weight above phreatic.: | 19,00 [kN/m³] |
| - Unit weight below phreatic: | 19,00 [kN/m³] |
| - Iteration stop criterium: | 0,10 [m] |
| Pc (initial): | Variable parallel to the initial effective stress |
| Pc (per step): | Automatic increased to the final effective stresses |
| Creep rate reference time: | 1,000 [days] |
| No imaginary surface | |
| With submerging
(only for non uniform loads) | |
| - Iteration stop criterium : | 0,10 [m] |
| Load column width | |
| - Non-Uniform Loads : | 1,00 [m] |
| - Trapezoidal Loads : | 1,00 [m] |

2.4 Soil Profiles

| Layer number | Material name | PL-line top | PL-line bottom |
|--------------|----------------|-------------|----------------|
| 3 | leem, zz, slap | 1 | 1 |

| Layer number | Material name | PL-line top | PL-line bottom |
|--------------|------------------|-------------|----------------|
| 2 | leem, zz, slap | 1 | 1 |
| 1 | grind, zs, matig | 1 | 1 |

2.5 Soil Properties

| Layer number | Drained | Unit weight | |
|--------------|---------|---------------------|-------------------|
| | | Unsaturated [kN/m³] | Saturated [kN/m³] |
| 3 | No | 19,00 | 19,00 |
| 2 | No | 19,00 | 19,00 |
| 1 | Yes | 18,00 | 20,00 |

| Layer number | Storage type | Vert. consolid. coefficient Cv [m²/s] | Vertical permeability [m/s] | Permeability strain mod. [m/s] | Initial vertical permeability [m/s] |
|--------------|--------------|---------------------------------------|-----------------------------|--------------------------------|-------------------------------------|
| 3 | Vert. cons. | 1,00E-07 | - | - | - |
| 2 | Vert. cons. | 1,00E-07 | - | - | - |
| 1 | Vert. cons. | - | - | - | - |

| Layer number | POP [kN/m²] | OCR [-] | Equiv. age [days] |
|--------------|-------------|---------|-------------------|
| 3 | 10,00 | - | - |
| 2 | 10,00 | - | - |
| 1 | 10,00 | - | - |

| Layer number | Secondary swelling type | Secondary swelling factor [-] | Unloading stress ratio [-] |
|--------------|-------------------------|-------------------------------|----------------------------|
| 3 | Full | - | - |
| 2 | Full | - | - |
| 1 | Full | - | - |

| Layer number | Reloading/ swelling ratio RR [-] | Compression ratio CR [-] | Coeff. of sec. compression Ca [-] | Reloading/ swelling index Cr [-] | Compression index Cc [-] | Initial void ratio (e0) [-] |
|--------------|----------------------------------|--------------------------|-----------------------------------|----------------------------------|--------------------------|-----------------------------|
| 3 | 0,0307000 | 0,0920000 | 0,0037000 | - | - | - |
| 2 | 0,0307000 | 0,0920000 | 0,0037000 | - | - | - |
| 1 | 0,0008000 | 0,0023000 | 0,0000000 | - | - | - |

2.6 Non-Uniform Loads

| Load number | Time [days] | Unit weight | |
|-------------|-------------|---------------------|-------------------|
| | | Unsaturated [kN/m³] | Saturated [kN/m³] |
| 1 | 1 | 19,00 | 19,00 |

| Load number | Co-ordinates [m] | | | | | |
|-------------|------------------|-------|-------|--|--|--|
| 1 - X - | 3,68 | 5,59 | 8,99 | | | |
| 1 - Y - | 43,26 | 43,26 | 42,13 | | | |

2.7 Verticals

| Vertical number | X co-ordinates [m] | | | | |
|-----------------|--------------------|---------|---------|---------|--------|
| 1 - 5 | -40,000 | -21,850 | -15,490 | -12,910 | -9,660 |
| 6 - 10 | 0,000 | 0,960 | 3,680 | 4,960 | 5,590 |
| 11 - 15 | 8,600 | 8,986 | 16,560 | 23,180 | 23,890 |
| 16 | 40,000 | | | | |

Calculation of cross section at Z = 0,000 m
Discretisation = 100

3 Settlements

3.1 Settlements

| Vertical number | X co-ordinate [m] | Surface level [m] | Settlement [m] |
|-----------------|-------------------|-------------------|----------------|
| 1 | -40,00 | 40,29 | 0,006 |
| 2 | -21,85 | 40,29 | 0,006 |
| 3 | -15,49 | 40,47 | 0,008 |
| 4 | -12,91 | 40,69 | 0,012 |
| 5 | -9,66 | 40,87 | 0,015 |
| 6 | 0,00 | 43,15 | 0,026 |
| 7 | 0,96 | 43,18 | 0,026 |
| 8 | 3,68 | 43,26 | 0,036 |
| 9 | 4,96 | 42,97 | 0,053 |
| 10 | 5,59 | 42,83 | 0,057 |
| 11 | 8,60 | 42,14 | 0,026 |
| 12 | 8,99 | 42,13 | 0,020 |
| 13 | 16,56 | 41,90 | 0,007 |
| 14 | 23,18 | 41,54 | 0,003 |
| 15 | 23,89 | 41,39 | 0,001 |
| 16 | 40,00 | 41,39 | 0,001 |

3.2 Maintain Profile Calculation Results

Load 1 consists of 1,268 m3 per Width
The extra amount of soil to be added is 0,225 m3 per Width
This equals the found settlements for non-uniform loads

End of Report

Report for D-Settlement 9.2

Settlement Calculations
Developed by Deltares



Company: Witteveen+Bos

Date of report: 09-10-2013

Time of report: 15:48:26

Date of calculation: 08-10-2013

Time of calculation: 16:49:45

Filename: F:\..150.320.4 dwp 3 - 02 Zettingen uitbreidbaarheidsprofiel 2050

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| 2.7 Verticals | 4 |
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| 3.1 Settlements | 6 |
| 3.2 Maintain Profile Calculation Results | 6 |

2 Echo of the Input

2.1 Layer Boundaries

| Boundary number | Co-ordinates [m] | | | | |
|-----------------|------------------|---------|---------|---------|--------|
| 3 - X - | -40,000 | -21,850 | -15,490 | -12,910 | -9,660 |
| 3 - Y - | 40,290 | 40,290 | 40,470 | 40,690 | 40,870 |
| 3 - X - | 0,000 | 3,680 | 8,600 | 8,986 | 16,560 |
| 3 - Y - | 43,150 | 43,260 | 42,140 | 42,128 | 41,900 |
| 3 - X - | 23,180 | 23,890 | 40,000 | | |
| 3 - Y - | 41,540 | 41,390 | 41,390 | | |
| 2 - X - | -40,000 | -21,850 | -15,490 | -12,910 | -9,660 |
| 2 - Y - | 40,290 | 40,290 | 40,470 | 40,690 | 40,870 |
| 2 - X - | 8,600 | 8,986 | 16,560 | 23,180 | 23,890 |
| 2 - Y - | 42,140 | 42,128 | 41,900 | 41,540 | 41,390 |
| 2 - X - | 40,000 | | | | |
| 2 - Y - | 41,390 | | | | |
| 1 - X - | -40,000 | -9,660 | 0,000 | 3,680 | 8,600 |
| 1 - Y - | 37,500 | 37,500 | 39,400 | 39,400 | 39,400 |
| 1 - X - | 40,000 | | | | |
| 1 - Y - | 39,400 | | | | |
| 0 - X - | -40,000 | 40,000 | | | |
| 0 - Y - | 30,000 | 30,000 | | | |

2.2 PL Lines

| PL line number | Co-ordinates [m] | | | | |
|----------------|------------------|--------|--------|--------|--|
| 1 - X - | -40,000 | -9,660 | 8,600 | 40,000 | |
| 1 - Y - | 40,290 | 40,290 | 41,390 | 41,390 | |

2.3 General Data

| | |
|---|---|
| Soil model: | NEN Bjerrum |
| Consolidation model: | Darcy |
| Strain model: | Linear |
| Groundwater level: | Initial determined by PL-line number 1 |
| Unit weight of water: | 9,81 [kN/m³] |
| Stress distribution | |
| - Soil: | Buisman |
| - Loads: | Simulate |
| End of consolidation: | 13140,00 [days] |
| With maintain profile
(only for non uniform loads) | |
| - Material: | Superelevation |
| - Time: | 1,00 [days] |
| - Unit weight above phreatic.: | 19,00 [kN/m³] |
| - Unit weight below phreatic: | 19,00 [kN/m³] |
| - Iteration stop criterium: | 0,10 [m] |
| Pc (initial): | Variable parallel to the initial effective stress |
| Pc (per step): | Automatic increased to the final effective stresses |
| Creep rate reference time: | 1,000 [days] |
| No imaginary surface | |
| With submerging
(only for non uniform loads) | |
| - Iteration stop criterium : | 0,10 [m] |
| Load column width | |
| - Non-Uniform Loads : | 1,00 [m] |
| - Trapezoidal Loads : | 1,00 [m] |

2.4 Soil Profiles

| Layer number | Material name | PL-line top | PL-line bottom |
|--------------|----------------|-------------|----------------|
| 3 | leem, zz, slap | 1 | 1 |

| Layer number | Material name | PL-line top | PL-line bottom |
|--------------|------------------|-------------|----------------|
| 2 | leem, zz, slap | 1 | 1 |
| 1 | grind, zs, matig | 1 | 1 |

2.5 Soil Properties

| Layer number | Drained | Unit weight | |
|--------------|---------|---------------------|-------------------|
| | | Unsaturated [kN/m³] | Saturated [kN/m³] |
| 3 | No | 19,00 | 19,00 |
| 2 | No | 19,00 | 19,00 |
| 1 | Yes | 18,00 | 20,00 |

| Layer number | Storage type | Vert. consolid. coefficient Cv [m²/s] | Vertical permeability [m/s] | Permeability strain mod. [m/s] | Initial vertical permeability [m/s] |
|--------------|--------------|---------------------------------------|-----------------------------|--------------------------------|-------------------------------------|
| 3 | Vert. cons. | 1,00E-07 | - | - | - |
| 2 | Vert. cons. | 1,00E-07 | - | - | - |
| 1 | Vert. cons. | - | - | - | - |

| Layer number | POP [kN/m²] | OCR [-] | Equiv. age [days] |
|--------------|-------------|---------|-------------------|
| 3 | 10,00 | - | - |
| 2 | 10,00 | - | - |
| 1 | 10,00 | - | - |

| Layer number | Secondary swelling type | Secondary swelling factor [-] | Unloading stress ratio [-] |
|--------------|-------------------------|-------------------------------|----------------------------|
| 3 | Full | - | - |
| 2 | Full | - | - |
| 1 | Full | - | - |

| Layer number | Reloading/ swelling ratio RR [-] | Compression ratio CR [-] | Coeff. of sec. compression Ca [-] | Reloading/ swelling index Cr [-] | Compression index Cc [-] | Initial void ratio (e0) [-] |
|--------------|----------------------------------|--------------------------|-----------------------------------|----------------------------------|--------------------------|-----------------------------|
| 3 | 0,0307000 | 0,0920000 | 0,0037000 | - | - | - |
| 2 | 0,0307000 | 0,0920000 | 0,0037000 | - | - | - |
| 1 | 0,0008000 | 0,0023000 | 0,0000000 | - | - | - |

2.6 Non-Uniform Loads

| Load number | Time [days] | Unit weight | |
|-------------|-------------|---------------------|-------------------|
| | | Unsaturated [kN/m³] | Saturated [kN/m³] |
| 1 | 1 | 19,00 | 19,00 |
| 2 | 1 | 19,00 | 19,00 |

| Load number | Co-ordinates [m] | | | | | |
|-------------|------------------|-------|-------|-------|--|--|
| 1 - X - | 3,68 | 5,59 | 8,99 | | | |
| 1 - Y - | 43,26 | 43,26 | 42,13 | | | |
| 2 - X - | 0,00 | 0,96 | 4,96 | 5,59 | | |
| 2 - Y - | 43,15 | 43,47 | 43,47 | 43,26 | | |

2.7 Verticals

| Vertical number | X co-ordinates [m] | | | | |
|-----------------|--------------------|---------|---------|---------|--------|
| 1 - 5 | -40,000 | -21,850 | -15,490 | -12,910 | -9,660 |
| 6 - 10 | 0,000 | 0,960 | 3,680 | 4,960 | 5,590 |
| 11 - 15 | 8,600 | 8,986 | 16,560 | 23,180 | 23,890 |
| 16 | 40,000 | | | | |

Calculation of cross section at $Z = 0,000$ m
Discretisation = 100

3 Settlements

3.1 Settlements

| Vertical number | X co-ordinate [m] | Surface level [m] | Settlement [m] |
|-----------------|-------------------|-------------------|----------------|
| 1 | -40,00 | 40,29 | 0,006 |
| 2 | -21,85 | 40,29 | 0,006 |
| 3 | -15,49 | 40,47 | 0,008 |
| 4 | -12,91 | 40,69 | 0,012 |
| 5 | -9,66 | 40,87 | 0,015 |
| 6 | 0,00 | 43,15 | 0,037 |
| 7 | 0,96 | 43,18 | 0,050 |
| 8 | 3,68 | 43,26 | 0,060 |
| 9 | 4,96 | 42,97 | 0,067 |
| 10 | 5,59 | 42,83 | 0,065 |
| 11 | 8,60 | 42,14 | 0,027 |
| 12 | 8,99 | 42,13 | 0,020 |
| 13 | 16,56 | 41,90 | 0,007 |
| 14 | 23,18 | 41,54 | 0,003 |
| 15 | 23,89 | 41,39 | 0,001 |
| 16 | 40,00 | 41,39 | 0,001 |

3.2 Maintain Profile Calculation Results

Load 1 consists of 1,268 m3 per Width

Load 2 consists of 1,157 m3 per Width

The extra amount of soil to be added is 0,460 m3 per Width

This equals the found settlements for non-uniform loads

End of Report

Report for D-Settlement 9.2

Settlement Calculations
Developed by Deltares



| | |
|----------------------|---|
| Company: | Witteveen+Bos |
| Date of report: | 09-10-2013 |
| Time of report: | 15:48:38 |
| Date of calculation: | 09-10-2013 |
| Time of calculation: | 8:44:07 |
| Filename: | F:\..150.320.5 dwp 1 - 01 Zettingen versterkingsopgave 2020 |

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| 2.7 Verticals | 4 |
| 3 Settlements | 5 |
| 3.1 Settlements | 5 |
| 3.2 Maintain Profile Calculation Results | 5 |

2 Echo of the Input

2.1 Layer Boundaries

| Boundary number | Co-ordinates [m] | | | | |
|-----------------|------------------|--------|--------|--------|--------|
| 3 - X - | -40,000 | -9,620 | -8,910 | -8,130 | 0,000 |
| 3 - Y - | 40,660 | 40,660 | 40,970 | 41,030 | 43,290 |
| 3 - X - | 3,830 | 11,350 | 12,478 | 18,350 | 26,500 |
| 3 - Y - | 43,130 | 40,540 | 40,448 | 39,970 | 39,970 |
| 3 - X - | 29,900 | 40,000 | | | |
| 3 - Y - | 41,100 | 41,100 | | | |
| 2 - X - | -40,000 | -9,620 | 11,350 | 12,478 | 18,350 |
| 2 - Y - | 40,660 | 40,660 | 40,540 | 40,448 | 39,970 |
| 2 - X - | 26,500 | 29,900 | 40,000 | | |
| 2 - Y - | 39,970 | 41,100 | 41,100 | | |
| 1 - X - | -40,000 | -9,030 | 0,000 | 3,830 | 11,350 |
| 1 - Y - | 38,200 | 38,200 | 38,000 | 38,000 | 38,500 |
| 1 - X - | 40,000 | | | | |
| 1 - Y - | 38,500 | | | | |
| 0 - X - | -40,000 | 40,000 | | | |
| 0 - Y - | 30,000 | 30,000 | | | |

2.2 PL Lines

| PL line number | Co-ordinates [m] | | | | |
|----------------|------------------|--------|--------|--------|--|
| 1 - X - | -40,000 | -9,030 | 11,350 | 40,000 | |
| 1 - Y - | 40,660 | 40,660 | 39,970 | 39,970 | |

2.3 General Data

| | |
|---|---|
| Soil model: | NEN Bjerrum |
| Consolidation model: | Darcy |
| Strain model: | Linear |
| Groundwater level: | Initial determined by PL-line number 1 |
| Unit weight of water: | 9,81 [kN/m³] |
| Stress distribution | |
| - Soil: | Buisman |
| - Loads: | Simulate |
| End of consolidation: | 13140,00 [days] |
| With maintain profile
(only for non uniform loads) | |
| - Material: | Superelevation |
| - Time: | 1,00 [days] |
| - Unit weight above phreatic.: | 19,00 [kN/m³] |
| - Unit weight below phreatic: | 19,00 [kN/m³] |
| - Iteration stop criterium: | 0,10 [m] |
| Pc (initial): | Variable parallel to the initial effective stress |
| Pc (per step): | Automatic increased to the final effective stresses |
| Creep rate reference time: | 1,000 [days] |
| No imaginary surface | |
| With submerging
(only for non uniform loads) | |
| - Iteration stop criterium : | 0,10 [m] |
| Load column width | |
| - Non-Uniform Loads : | 1,00 [m] |
| - Trapezoidal Loads : | 1,00 [m] |

2.4 Soil Profiles

| Layer number | Material name | PL-line top | PL-line bottom |
|--------------|------------------|-------------|----------------|
| 3 | leem, zz, slap | 1 | 1 |
| 2 | leem, zz, slap | 1 | 1 |
| 1 | grind, zs, matig | 1 | 1 |

2.5 Soil Properties

| Layer number | Drained | Unit weight | |
|--------------|---------|---------------------|-------------------|
| | | Unsaturated [kN/m³] | Saturated [kN/m³] |
| 3 | No | 19,00 | 19,00 |
| 2 | No | 19,00 | 19,00 |
| 1 | Yes | 18,00 | 20,00 |

| Layer number | Storage type | Vert. consolid. coefficient Cv [m²/s] | Vertical permeability [m/s] | Permeability strain mod. [m/s] | Initial vertical permeability [m/s] |
|--------------|--------------|---------------------------------------|-----------------------------|--------------------------------|-------------------------------------|
| 3 | Vert. cons. | 1,00E-07 | - | - | - |
| 2 | Vert. cons. | 1,00E-07 | - | - | - |
| 1 | Vert. cons. | - | - | - | - |

| Layer number | POP [kN/m²] | OCR [-] | Equiv. age [days] |
|--------------|-------------|---------|-------------------|
| 3 | 10,00 | - | - |
| 2 | 10,00 | - | - |
| 1 | 10,00 | - | - |

| Layer number | Secondary swelling type | Secondary swelling factor [-] | Unloading stress ratio [-] |
|--------------|-------------------------|-------------------------------|----------------------------|
| 3 | Full | - | - |
| 2 | Full | - | - |
| 1 | Full | - | - |

| Layer number | Reloading/ swelling ratio RR [-] | Compression ratio CR [-] | Coeff. of sec. compression Ca [-] | Reloading/ swelling index Cr [-] | Compression index Cc [-] | Initial void ratio (e0) [-] |
|--------------|----------------------------------|--------------------------|-----------------------------------|----------------------------------|--------------------------|-----------------------------|
| 3 | 0,0307000 | 0,0920000 | 0,0037000 | - | - | - |
| 2 | 0,0307000 | 0,0920000 | 0,0037000 | - | - | - |
| 1 | 0,0008000 | 0,0023000 | 0,0000000 | - | - | - |

2.6 Non-Uniform Loads

| Load number | Time [days] | Unit weight | |
|-------------|-------------|---------------------|-------------------|
| | | Unsaturated [kN/m³] | Saturated [kN/m³] |
| 1 | 1 | 19,00 | 19,00 |

| Load number | Co-ordinates [m] | | | | | |
|-------------|------------------|-------|-------|-------|-------|--|
| 1 - X - | 3,83 | 4,42 | 8,70 | 18,70 | 22,40 | |
| 1 - Y - | 43,13 | 43,13 | 41,70 | 41,20 | 39,97 | |

2.7 Verticals

| Vertical number | X co-ordinates [m] | | | | |
|-----------------|--------------------|---------|--------|--------|--------|
| 1 - 5 | -40,000 | -25,000 | -9,620 | -9,030 | -8,910 |
| 6 - 10 | -8,130 | 0,000 | 2,000 | 3,830 | 4,000 |
| 11 - 15 | 4,419 | 8,700 | 11,350 | 12,478 | 15,500 |
| 16 - 20 | 18,350 | 18,700 | 22,400 | 26,500 | 29,900 |
| 21 | 40,000 | | | | |

Calculation of cross section at Z = 0,000 m
Discretisation = 100

3 Settlements

3.1 Settlements

| Vertical number | X co-ordinate [m] | Surface level [m] | Settlement [m] |
|-----------------|-------------------|-------------------|----------------|
| 1 | -40,00 | 40,66 | 0,004 |
| 2 | -25,00 | 40,66 | 0,004 |
| 3 | -9,62 | 40,66 | 0,004 |
| 4 | -9,03 | 40,92 | 0,007 |
| 5 | -8,91 | 40,97 | 0,008 |
| 6 | -8,13 | 41,03 | 0,009 |
| 7 | 0,00 | 43,29 | 0,044 |
| 8 | 2,00 | 43,21 | 0,044 |
| 9 | 3,83 | 43,13 | 0,051 |
| 10 | 4,00 | 43,07 | 0,054 |
| 11 | 4,42 | 42,93 | 0,058 |
| 12 | 8,70 | 41,45 | 0,056 |
| 13 | 11,35 | 40,54 | 0,080 |
| 14 | 12,48 | 40,45 | 0,083 |
| 15 | 15,50 | 40,20 | 0,083 |
| 16 | 18,35 | 39,97 | 0,084 |
| 17 | 18,70 | 39,97 | 0,081 |
| 18 | 22,40 | 39,97 | 0,009 |
| 19 | 26,50 | 39,97 | 0,000 |
| 20 | 29,90 | 41,10 | 0,012 |
| 21 | 40,00 | 41,10 | 0,012 |

3.2 Maintain Profile Calculation Results

Load 1 consists of 13,385 m3 per Width

The extra amount of soil to be added is 1,229 m3 per Width

This equals the found settlements for non-uniform loads

End of Report

Report for D-Settlement 9.2

Settlement Calculations
Developed by Deltares



Company: Witteveen+Bos

Date of report: 09-10-2013

Time of report: 15:49:05

Date of calculation: 09-10-2013

Time of calculation: 8:43:24

Filename: F:\..150.320.5 dwp 1 - 02 Zettingen uitbreidbaarheidsprofiel 2050

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| 2.7 Verticals | 4 |
| 3 Settlements | 5 |
| 3.1 Settlements | 5 |
| 3.2 Maintain Profile Calculation Results | 5 |

2 Echo of the Input

2.1 Layer Boundaries

| Boundary number | Co-ordinates [m] | | | | |
|-----------------|------------------|--------|--------|--------|--------|
| 3 - X - | -40,000 | -9,620 | -8,910 | -8,130 | 0,000 |
| 3 - Y - | 40,660 | 40,660 | 40,970 | 41,030 | 43,290 |
| 3 - X - | 3,830 | 11,350 | 12,478 | 18,350 | 26,500 |
| 3 - Y - | 43,130 | 40,540 | 40,448 | 39,970 | 39,970 |
| 3 - X - | 29,900 | 40,000 | | | |
| 3 - Y - | 41,100 | 41,100 | | | |
| 2 - X - | -40,000 | -9,620 | 11,350 | 12,478 | 18,350 |
| 2 - Y - | 40,660 | 40,660 | 40,540 | 40,448 | 39,970 |
| 2 - X - | 26,500 | 29,900 | 40,000 | | |
| 2 - Y - | 39,970 | 41,100 | 41,100 | | |
| 1 - X - | -40,000 | -9,030 | 0,000 | 3,830 | 11,350 |
| 1 - Y - | 38,200 | 38,200 | 38,000 | 38,000 | 38,500 |
| 1 - X - | 40,000 | | | | |
| 1 - Y - | 38,500 | | | | |
| 0 - X - | -40,000 | 40,000 | | | |
| 0 - Y - | 30,000 | 30,000 | | | |

2.2 PL Lines

| PL line number | Co-ordinates [m] | | | | |
|----------------|------------------|--------|--------|--------|--|
| 1 - X - | -40,000 | -9,030 | 11,350 | 40,000 | |
| 1 - Y - | 40,660 | 40,660 | 39,970 | 39,970 | |

2.3 General Data

| | |
|---|---|
| Soil model: | NEN Bjerrum |
| Consolidation model: | Darcy |
| Strain model: | Linear |
| Groundwater level: | Initial determined by PL-line number 1 |
| Unit weight of water: | 9,81 [kN/m³] |
| Stress distribution | |
| - Soil: | Buisman |
| - Loads: | Simulate |
| End of consolidation: | 13140,00 [days] |
| With maintain profile
(only for non uniform loads) | |
| - Material: | Superelevation |
| - Time: | 1,00 [days] |
| - Unit weight above phreatic.: | 19,00 [kN/m³] |
| - Unit weight below phreatic: | 19,00 [kN/m³] |
| - Iteration stop criterium: | 0,10 [m] |
| Pc (initial): | Variable parallel to the initial effective stress |
| Pc (per step): | Automatic increased to the final effective stresses |
| Creep rate reference time: | 1,000 [days] |
| No imaginary surface | |
| With submerging
(only for non uniform loads) | |
| - Iteration stop criterium : | 0,10 [m] |
| Load column width | |
| - Non-Uniform Loads : | 1,00 [m] |
| - Trapezoidal Loads : | 1,00 [m] |

2.4 Soil Profiles

| Layer number | Material name | PL-line top | PL-line bottom |
|--------------|------------------|-------------|----------------|
| 3 | leem, zz, slap | 1 | 1 |
| 2 | leem, zz, slap | 1 | 1 |
| 1 | grind, zs, matig | 1 | 1 |

2.5 Soil Properties

| Layer number | Drained | Unit weight | |
|--------------|---------|---------------------|-------------------|
| | | Unsaturated [kN/m³] | Saturated [kN/m³] |
| 3 | No | 19,00 | 19,00 |
| 2 | No | 19,00 | 19,00 |
| 1 | Yes | 18,00 | 20,00 |

| Layer number | Storage type | Vert. consolid. coefficient Cv [m²/s] | Vertical permeability [m/s] | Permeability strain mod. [m/s] | Initial vertical permeability [m/s] |
|--------------|--------------|---------------------------------------|-----------------------------|--------------------------------|-------------------------------------|
| 3 | Vert. cons. | 1,00E-07 | - | - | - |
| 2 | Vert. cons. | 1,00E-07 | - | - | - |
| 1 | Vert. cons. | - | - | - | - |

| Layer number | POP [kN/m²] | OCR [-] | Equiv. age [days] |
|--------------|-------------|---------|-------------------|
| 3 | 10,00 | - | - |
| 2 | 10,00 | - | - |
| 1 | 10,00 | - | - |

| Layer number | Secondary swelling type | Secondary swelling factor[-] | Unloading stress ratio[-] |
|--------------|-------------------------|------------------------------|---------------------------|
| 3 | Full | - | - |
| 2 | Full | - | - |
| 1 | Full | - | - |

| Layer number | Reloading/ swelling ratio RR [-] | Compression ratio CR [-] | Coeff. of sec. compression Ca [-] | Reloading/ swelling index Cr [-] | Compression index Cc [-] | Initial void ratio (e0) [-] |
|--------------|----------------------------------|--------------------------|-----------------------------------|----------------------------------|--------------------------|-----------------------------|
| 3 | 0,0307000 | 0,0920000 | 0,0037000 | - | - | - |
| 2 | 0,0307000 | 0,0920000 | 0,0037000 | - | - | - |
| 1 | 0,0008000 | 0,0023000 | 0,0000000 | - | - | - |

2.6 Non-Uniform Loads

| Load number | Time [days] | Unit weight | |
|-------------|-------------|---------------------|-------------------|
| | | Unsaturated [kN/m³] | Saturated [kN/m³] |
| 1 | 1 | 19,00 | 19,00 |
| 2 | 1 | 19,00 | 19,00 |

| Load number | Co-ordinates [m] | | | | | |
|-------------|------------------|-------|-------|-------|-------|--|
| 1 - X - | 3,83 | 4,42 | 8,70 | 18,70 | 22,40 | |
| 1 - Y - | 43,13 | 43,13 | 41,70 | 41,20 | 39,97 | |
| 2 - X - | 0,00 | 4,00 | 4,42 | | | |
| 2 - Y - | 43,29 | 43,27 | 43,13 | | | |

2.7 Verticals

| Vertical number | X co-ordinates [m] | | | | |
|-----------------|--------------------|---------|--------|--------|--------|
| 1 - 5 | -40,000 | -25,000 | -9,620 | -9,030 | -8,910 |
| 6 - 10 | -8,130 | 0,000 | 2,000 | 3,830 | 4,000 |
| 11 - 15 | 4,419 | 8,700 | 11,350 | 12,478 | 15,500 |
| 16 - 20 | 18,350 | 18,700 | 22,400 | 26,500 | 29,900 |
| 21 | 40,000 | | | | |

Calculation of cross section at Z = 0,000 m
Discretisation = 100

3 Settlements

3.1 Settlements

| Vertical number | X co-ordinate [m] | Surface level [m] | Settlement [m] |
|-----------------|-------------------|-------------------|----------------|
| 1 | -40,00 | 40,66 | 0,004 |
| 2 | -25,00 | 40,66 | 0,004 |
| 3 | -9,62 | 40,66 | 0,004 |
| 4 | -9,03 | 40,92 | 0,007 |
| 5 | -8,91 | 40,97 | 0,008 |
| 6 | -8,13 | 41,03 | 0,009 |
| 7 | 0,00 | 43,29 | 0,049 |
| 8 | 2,00 | 43,21 | 0,057 |
| 9 | 3,83 | 43,13 | 0,064 |
| 10 | 4,00 | 43,07 | 0,065 |
| 11 | 4,42 | 42,93 | 0,065 |
| 12 | 8,70 | 41,45 | 0,057 |
| 13 | 11,35 | 40,54 | 0,080 |
| 14 | 12,48 | 40,45 | 0,083 |
| 15 | 15,50 | 40,20 | 0,083 |
| 16 | 18,35 | 39,97 | 0,084 |
| 17 | 18,70 | 39,97 | 0,081 |
| 18 | 22,40 | 39,97 | 0,009 |
| 19 | 26,50 | 39,97 | 0,000 |
| 20 | 29,90 | 41,10 | 0,012 |
| 21 | 40,00 | 41,10 | 0,012 |

3.2 Maintain Profile Calculation Results

Load 1 consists of 13,385 m3 per Width

Load 2 consists of 0,323 m3 per Width

The extra amount of soil to be added is 1,465 m3 per Width

This equals the found settlements for non-uniform loads

End of Report

Report for D-Settlement 9.2

Settlement Calculations
Developed by Deltares



Company: Witteveen+Bos

Date of report: 09-10-2013

Time of report: 15:49:19

Date of calculation: 09-10-2013

Time of calculation: 8:55:38

Filename: F:\..150.320.5 dwp 2 - 01 Zettingen versterkingsopgave 2020

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2 Echo of the Input

2.1 Layer Boundaries

| Boundary number | Co-ordinates [m] | | | | |
|-----------------|------------------|--------|--------|--------|--------|
| 3 - X - | -40,000 | -8,770 | -7,080 | 0,000 | 3,450 |
| 3 - Y - | 40,980 | 40,980 | 41,330 | 43,050 | 43,070 |
| 3 - X - | 10,180 | 40,000 | | | |
| 3 - Y - | 40,470 | 40,470 | | | |
| 2 - X - | -40,000 | -8,770 | 10,180 | 40,000 | |
| 2 - Y - | 40,980 | 40,980 | 40,470 | 40,470 | |
| 1 - X - | -40,000 | -8,770 | 0,000 | 3,450 | 10,180 |
| 1 - Y - | 38,200 | 38,200 | 38,000 | 38,000 | 38,500 |
| 1 - X - | 40,000 | | | | |
| 1 - Y - | 38,500 | | | | |
| 0 - X - | -40,000 | 40,000 | | | |
| 0 - Y - | 30,000 | 30,000 | | | |

2.2 PL Lines

| PL line number | Co-ordinates [m] | | | | |
|----------------|------------------|--------|--------|--------|--|
| 1 - X - | -40,000 | -8,770 | 10,180 | 40,000 | |
| 1 - Y - | 40,980 | 40,980 | 40,470 | 40,470 | |

2.3 General Data

| | |
|---|---|
| Soil model: | NEN Bjerrum |
| Consolidation model: | Darcy |
| Strain model: | Linear |
| Groundwater level: | Initial determined by PL-line number 1 |
| Unit weight of water: | 9,81 [kN/m³] |
| Stress distribution | |
| - Soil: | Buisman |
| - Loads: | Simulate |
| End of consolidation: | 13140,00 [days] |
| With maintain profile
(only for non uniform loads) | |
| - Material: | Superelevation |
| - Time: | 1,00 [days] |
| - Unit weight above phreatic.: | 19,00 [kN/m³] |
| - Unit weight below phreatic.: | 19,00 [kN/m³] |
| - Iteration stop criterium: | 0,10 [m] |
| Pc (initial): | Variable parallel to the initial effective stress |
| Pc (per step): | Automatic increased to the final effective stresses |
| Creep rate reference time: | 1,000 [days] |
| No imaginary surface | |
| With submerging
(only for non uniform loads) | |
| - Iteration stop criterium : | 0,10 [m] |
| Load column width | |
| - Non-Uniform Loads : | 1,00 [m] |
| - Trapezoidal Loads : | 1,00 [m] |

2.4 Soil Profiles

| Layer number | Material name | PL-line top | PL-line bottom |
|--------------|------------------|-------------|----------------|
| 3 | leem, zz, slap | 1 | 1 |
| 2 | leem, zz, slap | 1 | 1 |
| 1 | grind, zs, matig | 1 | 1 |

2.5 Soil Properties

| Layer number | Drained | Unit weight | |
|--------------|---------|---------------------|-------------------|
| | | Unsaturated [kN/m³] | Saturated [kN/m³] |
| 3 | No | 19,00 | 19,00 |
| 2 | No | 19,00 | 19,00 |
| 1 | Yes | 18,00 | 20,00 |

| Layer number | Storage type | Vert. consolid. coefficient Cv [m²/s] | Vertical permeability [m/s] | Permeability strain mod. [m/s] | Initial vertical permeability [m/s] |
|--------------|--------------|---------------------------------------|-----------------------------|--------------------------------|-------------------------------------|
| 3 | Vert. cons. | 1,00E-07 | - | - | - |
| 2 | Vert. cons. | 1,00E-07 | - | - | - |
| 1 | Vert. cons. | - | - | - | - |

| Layer number | POP [kN/m²] | OCR [-] | Equiv. age [days] |
|--------------|-------------|---------|-------------------|
| 3 | 10,00 | - | - |
| 2 | 10,00 | - | - |
| 1 | 10,00 | - | - |

| Layer number | Secondary swelling type | Secondary swelling factor [-] | Unloading stress ratio [-] |
|--------------|-------------------------|-------------------------------|----------------------------|
| 3 | Full | - | - |
| 2 | Full | - | - |
| 1 | Full | - | - |

| Layer number | Reloading/ swelling ratio RR [-] | Compression ratio CR [-] | Coeff. of sec. compression Ca [-] | Reloading/ swelling index Cr [-] | Compression index Cc [-] | Initial void ratio (e0) [-] |
|--------------|----------------------------------|--------------------------|-----------------------------------|----------------------------------|--------------------------|-----------------------------|
| 3 | 0,0307000 | 0,0920000 | 0,0037000 | - | - | - |
| 2 | 0,0307000 | 0,0920000 | 0,0037000 | - | - | - |
| 1 | 0,0008000 | 0,0023000 | 0,0000000 | - | - | - |

2.6 Non-Uniform Loads

| Load number | Time [days] | Unit weight | |
|-------------|-------------|---------------------|-------------------|
| | | Unsaturated [kN/m³] | Saturated [kN/m³] |
| 1 | 1 | 19,00 | 19,00 |

| Load number | Co-ordinates [m] | | | | | |
|-------------|------------------|-------|-------|-------|-------|--|
| 1 - X - | 3,45 | 5,26 | 9,37 | 19,37 | 21,56 | |
| 1 - Y - | 43,07 | 43,07 | 41,70 | 41,20 | 40,47 | |

2.7 Verticals

| Vertical number | X co-ordinates [m] | | | | |
|-----------------|--------------------|---------|--------|--------|--------|
| 1 - 5 | -40,000 | -25,000 | -8,770 | -7,080 | 0,000 |
| 6 - 10 | 0,660 | 2,000 | 3,450 | 4,660 | 5,260 |
| 11 - 15 | 9,370 | 10,180 | 15,000 | 19,370 | 21,560 |
| 16 - 17 | 30,000 | 40,000 | | | |

Calculation of cross section at Z = 0,000 m
Discretisation = 100

3 Settlements

3.1 Settlements

| Vertical number | X co-ordinate [m] | Surface level [m] | Settlement [m] |
|-----------------|-------------------|-------------------|----------------|
| 1 | -40,00 | 40,98 | 0,006 |
| 2 | -25,00 | 40,98 | 0,006 |
| 3 | -8,77 | 40,98 | 0,006 |
| 4 | -7,08 | 41,33 | 0,011 |
| 5 | 0,00 | 43,05 | 0,040 |
| 6 | 0,66 | 43,05 | 0,041 |
| 7 | 2,00 | 43,06 | 0,043 |
| 8 | 3,45 | 43,07 | 0,058 |
| 9 | 4,66 | 42,60 | 0,085 |
| 10 | 5,26 | 42,37 | 0,094 |
| 11 | 9,37 | 40,78 | 0,097 |
| 12 | 10,18 | 40,47 | 0,101 |
| 13 | 15,00 | 40,47 | 0,089 |
| 14 | 19,37 | 40,47 | 0,068 |
| 15 | 21,56 | 40,47 | 0,013 |
| 16 | 30,00 | 40,47 | 0,001 |
| 17 | 40,00 | 40,47 | 0,001 |

3.2 Maintain Profile Calculation Results

Load 1 consists of 14,427 m³ per Width

The extra amount of soil to be added is 1,497 m³ per Width

This equals the found settlements for non-uniform loads

End of Report

Report for D-Settlement 9.2

Settlement Calculations
Developed by Deltares



| | |
|----------------------|---|
| Company: | Witteveen+Bos |
| Date of report: | 09-10-2013 |
| Time of report: | 15:49:41 |
| Date of calculation: | 09-10-2013 |
| Time of calculation: | 8:55:03 |
| Filename: | F:\..\50.320.5 dwp 2 - 02 Zettingen uitbreidbaarheidsprofiel 2050 |

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| 3 Settlements | 5 |
| 3.1 Settlements | 5 |
| 3.2 Maintain Profile Calculation Results | 5 |

2 Echo of the Input

2.1 Layer Boundaries

| Boundary number | Co-ordinates [m] | | | | |
|-----------------|------------------|--------|--------|--------|--------|
| 3 - X - | -40,000 | -8,770 | -7,080 | 0,000 | 3,450 |
| 3 - Y - | 40,980 | 40,980 | 41,330 | 43,050 | 43,070 |
| 3 - X - | 10,180 | 40,000 | | | |
| 3 - Y - | 40,470 | 40,470 | | | |
| 2 - X - | -40,000 | -8,770 | 10,180 | 40,000 | |
| 2 - Y - | 40,980 | 40,980 | 40,470 | 40,470 | |
| 1 - X - | -40,000 | -8,770 | 0,000 | 3,450 | 10,180 |
| 1 - Y - | 38,200 | 38,200 | 38,000 | 38,000 | 38,500 |
| 1 - X - | 40,000 | | | | |
| 1 - Y - | 38,500 | | | | |
| 0 - X - | -40,000 | 40,000 | | | |
| 0 - Y - | 30,000 | 30,000 | | | |

2.2 PL Lines

| PL line number | Co-ordinates [m] | | | | |
|----------------|------------------|--------|--------|--------|--|
| 1 - X - | -40,000 | -8,770 | 10,180 | 40,000 | |
| 1 - Y - | 40,980 | 40,980 | 40,470 | 40,470 | |

2.3 General Data

| | |
|---|---|
| Soil model: | NEN Bjerrum |
| Consolidation model: | Darcy |
| Strain model: | Linear |
| Groundwater level: | Initial determined by PL-line number 1 |
| Unit weight of water: | 9,81 [kN/m³] |
| Stress distribution | |
| - Soil: | Buisman |
| - Loads: | Simulate |
| End of consolidation: | 13140,00 [days] |
| With maintain profile
(only for non uniform loads) | |
| - Material: | Superelevation |
| - Time: | 1,00 [days] |
| - Unit weight above phreatic.: | 19,00 [kN/m³] |
| - Unit weight below phreatic.: | 19,00 [kN/m³] |
| - Iteration stop criterium: | 0,10 [m] |
| Pc (initial): | Variable parallel to the initial effective stress |
| Pc (per step): | Automatic increased to the final effective stresses |
| Creep rate reference time: | 1,000 [days] |
| No imaginary surface | |
| With submerging
(only for non uniform loads) | |
| - Iteration stop criterium : | 0,10 [m] |
| Load column width | |
| - Non-Uniform Loads : | 1,00 [m] |
| - Trapezoidal Loads : | 1,00 [m] |

2.4 Soil Profiles

| Layer number | Material name | PL-line top | PL-line bottom |
|--------------|------------------|-------------|----------------|
| 3 | leem, zz, slap | 1 | 1 |
| 2 | leem, zz, slap | 1 | 1 |
| 1 | grind, zs, matig | 1 | 1 |

2.5 Soil Properties

| Layer number | Drained | Unit weight | |
|--------------|---------|---------------------|-------------------|
| | | Unsaturated [kN/m³] | Saturated [kN/m³] |
| 3 | No | 19,00 | 19,00 |
| 2 | No | 19,00 | 19,00 |
| 1 | Yes | 18,00 | 20,00 |

| Layer number | Storage type | Vert. consolid. coefficient Cv [m²/s] | Vertical permeability [m/s] | Permeability strain mod. [m/s] | Initial vertical permeability [m/s] |
|--------------|--------------|---------------------------------------|-----------------------------|--------------------------------|-------------------------------------|
| 3 | Vert. cons. | 1,00E-07 | - | - | - |
| 2 | Vert. cons. | 1,00E-07 | - | - | - |
| 1 | Vert. cons. | - | - | - | - |

| Layer number | POP [kN/m²] | OCR [-] | Equiv. age [days] |
|--------------|-------------|---------|-------------------|
| 3 | 10,00 | - | - |
| 2 | 10,00 | - | - |
| 1 | 10,00 | - | - |

| Layer number | Secondary swelling type | Secondary swelling factor[-] | Unloading stress ratio[-] |
|--------------|-------------------------|------------------------------|---------------------------|
| 3 | Full | - | - |
| 2 | Full | - | - |
| 1 | Full | - | - |

| Layer number | Reloading/ swelling ratio RR [-] | Compression ratio CR [-] | Coeff. of sec. compression Ca [-] | Reloading/ swelling index Cr [-] | Compression index Cc [-] | Initial void ratio (e0) [-] |
|--------------|----------------------------------|--------------------------|-----------------------------------|----------------------------------|--------------------------|-----------------------------|
| 3 | 0,0307000 | 0,0920000 | 0,0037000 | - | - | - |
| 2 | 0,0307000 | 0,0920000 | 0,0037000 | - | - | - |
| 1 | 0,0008000 | 0,0023000 | 0,0000000 | - | - | - |

2.6 Non-Uniform Loads

| Load number | Time [days] | Unit weight | |
|-------------|-------------|---------------------|-------------------|
| | | Unsaturated [kN/m³] | Saturated [kN/m³] |
| 1 | 1 | 19,00 | 19,00 |
| 2 | 1 | 19,00 | 19,00 |

| Load number | Co-ordinates [m] | | | | | |
|-------------|------------------|-------|-------|-------|-------|--|
| 1 - X - | 3,45 | 5,26 | 9,37 | 19,37 | 21,56 | |
| 1 - Y - | 43,07 | 43,07 | 41,70 | 41,20 | 40,47 | |
| 2 - X - | 0,00 | 0,66 | 4,66 | 5,26 | | |
| 2 - Y - | 43,05 | 43,27 | 43,27 | 43,07 | | |

2.7 Verticals

| Vertical number | X co-ordinates [m] | | | | |
|-----------------|--------------------|---------|--------|--------|--------|
| 1 - 5 | -40,000 | -25,000 | -8,770 | -7,080 | 0,000 |
| 6 - 10 | 0,660 | 2,000 | 3,450 | 4,660 | 5,260 |
| 11 - 15 | 9,370 | 10,180 | 15,000 | 19,370 | 21,560 |
| 16 - 17 | 30,000 | 40,000 | | | |

Calculation of cross section at Z = 0,000 m
Discretisation = 100

3 Settlements

3.1 Settlements

| Vertical number | X co-ordinate [m] | Surface level [m] | Settlement [m] |
|-----------------|-------------------|-------------------|----------------|
| 1 | -40,00 | 40,98 | 0,006 |
| 2 | -25,00 | 40,98 | 0,006 |
| 3 | -8,77 | 40,98 | 0,006 |
| 4 | -7,08 | 41,33 | 0,012 |
| 5 | 0,00 | 43,05 | 0,052 |
| 6 | 0,66 | 43,05 | 0,063 |
| 7 | 2,00 | 43,06 | 0,072 |
| 8 | 3,45 | 43,07 | 0,083 |
| 9 | 4,66 | 42,60 | 0,097 |
| 10 | 5,26 | 42,37 | 0,101 |
| 11 | 9,37 | 40,78 | 0,097 |
| 12 | 10,18 | 40,47 | 0,102 |
| 13 | 15,00 | 40,47 | 0,089 |
| 14 | 19,37 | 40,47 | 0,068 |
| 15 | 21,56 | 40,47 | 0,013 |
| 16 | 30,00 | 40,47 | 0,001 |
| 17 | 40,00 | 40,47 | 0,001 |

3.2 Maintain Profile Calculation Results

Load 1 consists of 14,427 m3 per Width

Load 2 consists of 0,954 m3 per Width

The extra amount of soil to be added is 1,780 m3 per Width

This equals the found settlements for non-uniform loads

End of Report

Report for D-Settlement 9.2

Settlement Calculations
Developed by Deltares



Company: Witteveen+Bos

Date of report: 09-10-2013

Time of report: 15:49:53

Date of calculation: 09-10-2013

Time of calculation: 9:43:03

Filename: F:\..150.320.6 dwp 1 - 01 Zettingen versterkingsopgave 2020

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| 2.7 Verticals | 4 |
| 3 Settlements | 5 |
| 3.1 Settlements | 5 |
| 3.2 Maintain Profile Calculation Results | 5 |

2 Echo of the Input

2.1 Layer Boundaries

| Boundary number | Co-ordinates [m] | | | | |
|-----------------|------------------|---------|--------|--------|--------|
| 3 - X - | -40,000 | -16,630 | -7,590 | 0,000 | 3,110 |
| 3 - Y - | 40,670 | 40,670 | 41,110 | 43,030 | 43,000 |
| 3 - X - | 8,690 | 9,590 | 10,390 | 12,640 | 15,400 |
| 3 - Y - | 41,310 | 41,390 | 41,410 | 41,470 | 41,890 |
| 3 - X - | 29,960 | 40,000 | | | |
| 3 - Y - | 41,710 | 41,710 | | | |
| 2 - X - | -40,000 | -16,630 | -7,590 | 8,690 | 9,590 |
| 2 - Y - | 40,670 | 40,670 | 41,110 | 41,310 | 41,390 |
| 2 - X - | 10,390 | 12,640 | 15,400 | 29,960 | 40,000 |
| 2 - Y - | 41,410 | 41,470 | 41,890 | 41,710 | 41,710 |
| 1 - X - | -40,000 | -7,590 | 0,000 | 3,110 | 8,690 |
| 1 - Y - | 38,100 | 38,100 | 37,900 | 37,900 | 38,200 |
| 1 - X - | 40,000 | | | | |
| 1 - Y - | 38,200 | | | | |
| 0 - X - | -40,000 | 40,000 | | | |
| 0 - Y - | 30,000 | 30,000 | | | |

2.2 PL Lines

| PL line number | Co-ordinates [m] | | | | |
|----------------|------------------|--------|--------|--------|--|
| 1 - X - | -40,000 | -7,590 | 8,690 | 40,000 | |
| 1 - Y - | 40,670 | 40,670 | 41,310 | 41,310 | |

2.3 General Data

| | |
|---|---|
| Soil model: | NEN Bjerrum |
| Consolidation model: | Darcy |
| Strain model: | Linear |
| Groundwater level: | Initial determined by PL-line number 1 |
| Unit weight of water: | 9,81 [kN/m³] |
| Stress distribution | |
| - Soil: | Buisman |
| - Loads: | Simulate |
| End of consolidation: | 13140,00 [days] |
| With maintain profile
(only for non uniform loads) | |
| - Material: | Superelevation |
| - Time: | 1,00 [days] |
| - Unit weight above phreatic.: | 19,00 [kN/m³] |
| - Unit weight below phreatic: | 19,00 [kN/m³] |
| - Iteration stop criterium: | 0,10 [m] |
| Pc (initial): | Variable parallel to the initial effective stress |
| Pc (per step): | Automatic increased to the final effective stresses |
| Creep rate reference time: | 1,000 [days] |
| No imaginary surface | |
| With submerging
(only for non uniform loads) | |
| - Iteration stop criterium : | 0,10 [m] |
| Load column width | |
| - Non-Uniform Loads : | 1,00 [m] |
| - Trapezoidal Loads : | 1,00 [m] |

2.4 Soil Profiles

| Layer number | Material name | PL-line top | PL-line bottom |
|--------------|------------------|-------------|----------------|
| 3 | leem, zz, slap | 1 | 1 |
| 2 | leem, zz, slap | 1 | 1 |
| 1 | grind, zs, matig | 1 | 1 |

2.5 Soil Properties

| Layer number | Drained | Unit weight | |
|--------------|---------|---------------------|-------------------|
| | | Unsaturated [kN/m³] | Saturated [kN/m³] |
| 3 | No | 19,00 | 19,00 |
| 2 | No | 19,00 | 19,00 |
| 1 | Yes | 18,00 | 20,00 |

| Layer number | Storage type | Vert. consolid. coefficient C_v [m²/s] | Vertical permeability [m/s] | Permeability strain mod. [m/s] | Initial vertical permeability [m/s] |
|--------------|--------------|--|-----------------------------|--------------------------------|-------------------------------------|
| 3 | Vert. cons. | 1,00E-07 | - | - | - |
| 2 | Vert. cons. | 1,00E-07 | - | - | - |
| 1 | Vert. cons. | - | - | - | - |

| Layer number | POP [kN/m²] | OCR [-] | Equiv. age [days] |
|--------------|-------------|---------|-------------------|
| 3 | 10,00 | - | - |
| 2 | 10,00 | - | - |
| 1 | 10,00 | - | - |

| Layer number | Secondary swelling type | Secondary swelling factor [-] | Unloading stress ratio [-] |
|--------------|-------------------------|-------------------------------|----------------------------|
| 3 | Full | - | - |
| 2 | Full | - | - |
| 1 | Full | - | - |

| Layer number | Reloading/ swelling ratio RR [-] | Compression ratio CR [-] | Coeff. of sec. compression C_a [-] | Reloading/ swelling index C_r [-] | Compression index C_c [-] | Initial void ratio (e_0) [-] |
|--------------|----------------------------------|--------------------------|--------------------------------------|-------------------------------------|-----------------------------|----------------------------------|
| 3 | 0,0307000 | 0,0920000 | 0,0037000 | - | - | - |
| 2 | 0,0307000 | 0,0920000 | 0,0037000 | - | - | - |
| 1 | 0,0008000 | 0,0023000 | 0,0000000 | - | - | - |

2.6 Non-Uniform Loads

| Load number | Time [days] | Unit weight | |
|-------------|-------------|---------------------|-------------------|
| | | Unsaturated [kN/m³] | Saturated [kN/m³] |
| 1 | 1 | 19,00 | 19,00 |

| Load number | Co-ordinates [m] | | | | | |
|-------------|------------------|-------|-------|--|--|--|
| 1 - X - | 3,11 | 4,82 | 10,39 | | | |
| 1 - Y - | 43,00 | 43,00 | 41,41 | | | |

2.7 Verticals

| Vertical number | X co-ordinates [m] | | | | |
|-----------------|--------------------|---------|--------|--------|--------|
| 1 - 5 | -40,000 | -16,630 | -7,590 | 0,000 | 0,330 |
| 6 - 10 | 2,000 | 3,110 | 4,330 | 4,820 | 7,000 |
| 11 - 15 | 8,690 | 9,590 | 10,390 | 12,640 | 15,400 |
| 16 - 18 | 22,000 | 29,960 | 40,000 | | |

Calculation of cross section at $Z = 0,000$ m
Discretisation = 100

3 Settlements

3.1 Settlements

| Vertical number | X co-ordinate [m] | Surface level [m] | Settlement [m] |
|-----------------|-------------------|-------------------|----------------|
| 1 | -40,00 | 40,67 | 0,004 |
| 2 | -16,63 | 40,67 | 0,004 |
| 3 | -7,59 | 41,11 | 0,011 |
| 4 | 0,00 | 43,03 | 0,041 |
| 5 | 0,33 | 43,03 | 0,041 |
| 6 | 2,00 | 43,01 | 0,043 |
| 7 | 3,11 | 43,00 | 0,055 |
| 8 | 4,33 | 42,63 | 0,077 |
| 9 | 4,82 | 42,48 | 0,084 |
| 10 | 7,00 | 41,82 | 0,088 |
| 11 | 8,69 | 41,31 | 0,082 |
| 12 | 9,59 | 41,39 | 0,052 |
| 13 | 10,39 | 41,41 | 0,027 |
| 14 | 12,64 | 41,47 | 0,012 |
| 15 | 15,40 | 41,89 | 0,018 |
| 16 | 22,00 | 41,81 | 0,016 |
| 17 | 29,96 | 41,71 | 0,014 |
| 18 | 40,00 | 41,71 | 0,014 |

3.2 Maintain Profile Calculation Results

Load 1 consists of 3,052 m3 per Width
The extra amount of soil to be added is 0,538 m3 per Width
This equals the found settlements for non-uniform loads

End of Report

Report for D-Settlement 9.2

Settlement Calculations
Developed by Deltares



Company: Witteveen+Bos

Date of report: 09-10-2013

Time of report: 15:50:05

Date of calculation: 09-10-2013

Time of calculation: 9:41:32

Filename: F:\..50.320.6 dwp 1 - 02 Zettingen uitbreidbaarheidsprofiel 2050

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2 Echo of the Input

2.1 Layer Boundaries

| Boundary number | Co-ordinates [m] | | | | |
|-----------------|------------------|---------|--------|--------|--------|
| 3 - X - | -40,000 | -16,630 | -7,590 | 0,000 | 3,110 |
| 3 - Y - | 40,670 | 40,670 | 41,110 | 43,030 | 43,000 |
| 3 - X - | 8,690 | 9,590 | 10,390 | 12,640 | 15,400 |
| 3 - Y - | 41,310 | 41,390 | 41,410 | 41,470 | 41,890 |
| 3 - X - | 29,960 | 40,000 | | | |
| 3 - Y - | 41,710 | 41,710 | | | |
| 2 - X - | -40,000 | -16,630 | -7,590 | 8,690 | 9,590 |
| 2 - Y - | 40,670 | 40,670 | 41,110 | 41,310 | 41,390 |
| 2 - X - | 10,390 | 12,640 | 15,400 | 29,960 | 40,000 |
| 2 - Y - | 41,410 | 41,470 | 41,890 | 41,710 | 41,710 |
| 1 - X - | -40,000 | -7,590 | 0,000 | 3,110 | 8,690 |
| 1 - Y - | 38,100 | 38,100 | 37,900 | 37,900 | 38,200 |
| 1 - X - | 40,000 | | | | |
| 1 - Y - | 38,200 | | | | |
| 0 - X - | -40,000 | 40,000 | | | |
| 0 - Y - | 30,000 | 30,000 | | | |

2.2 PL Lines

| PL line number | Co-ordinates [m] | | | | |
|----------------|------------------|--------|--------|--------|--|
| 1 - X - | -40,000 | -7,590 | 8,690 | 40,000 | |
| 1 - Y - | 40,670 | 40,670 | 41,310 | 41,310 | |

2.3 General Data

| | |
|---|---|
| Soil model: | NEN Bjerrum |
| Consolidation model: | Darcy |
| Strain model: | Linear |
| Groundwater level: | Initial determined by PL-line number 1 |
| Unit weight of water: | 9,81 [kN/m³] |
| Stress distribution | |
| - Soil: | Buisman |
| - Loads: | Simulate |
| End of consolidation: | 13140,00 [days] |
| With maintain profile
(only for non uniform loads) | |
| - Material: | Superelevation |
| - Time: | 1,00 [days] |
| - Unit weight above phreatic.: | 19,00 [kN/m³] |
| - Unit weight below phreatic: | 19,00 [kN/m³] |
| - Iteration stop criterium: | 0,10 [m] |
| Pc (initial): | Variable parallel to the initial effective stress |
| Pc (per step): | Automatic increased to the final effective stresses |
| Creep rate reference time: | 1,000 [days] |
| No imaginary surface | |
| With submerging
(only for non uniform loads) | |
| - Iteration stop criterium : | 0,10 [m] |
| Load column width | |
| - Non-Uniform Loads : | 1,00 [m] |
| - Trapezoidal Loads : | 1,00 [m] |

2.4 Soil Profiles

| Layer number | Material name | PL-line top | PL-line bottom |
|--------------|------------------|-------------|----------------|
| 3 | leem, zz, slap | 1 | 1 |
| 2 | leem, zz, slap | 1 | 1 |
| 1 | grind, zs, matig | 1 | 1 |

2.5 Soil Properties

| Layer number | Drained | Unit weight | |
|--------------|---------|---------------------|-------------------|
| | | Unsaturated [kN/m³] | Saturated [kN/m³] |
| 3 | No | 19,00 | 19,00 |
| 2 | No | 19,00 | 19,00 |
| 1 | Yes | 18,00 | 20,00 |

| Layer number | Storage type | Vert. consolid. coefficient Cv [m²/s] | Vertical permeability [m/s] | Permeability strain mod. [m/s] | Initial vertical permeability [m/s] |
|--------------|--------------|---------------------------------------|-----------------------------|--------------------------------|-------------------------------------|
| 3 | Vert. cons. | 1,00E-07 | - | - | - |
| 2 | Vert. cons. | 1,00E-07 | - | - | - |
| 1 | Vert. cons. | - | - | - | - |

| Layer number | POP [kN/m²] | OCR [-] | Equiv. age [days] |
|--------------|-------------|---------|-------------------|
| 3 | 10,00 | - | - |
| 2 | 10,00 | - | - |
| 1 | 10,00 | - | - |

| Layer number | Secondary swelling type | Secondary swelling factor[-] | Unloading stress ratio[-] |
|--------------|-------------------------|------------------------------|---------------------------|
| 3 | Full | - | - |
| 2 | Full | - | - |
| 1 | Full | - | - |

| Layer number | Reloading/ swelling ratio RR [-] | Compression ratio CR [-] | Coeff. of sec. compression Ca [-] | Reloading/ swelling index Cr [-] | Compression index Cc [-] | Initial void ratio (e0) [-] |
|--------------|----------------------------------|--------------------------|-----------------------------------|----------------------------------|--------------------------|-----------------------------|
| 3 | 0,0307000 | 0,0920000 | 0,0037000 | - | - | - |
| 2 | 0,0307000 | 0,0920000 | 0,0037000 | - | - | - |
| 1 | 0,0008000 | 0,0023000 | 0,0000000 | - | - | - |

2.6 Non-Uniform Loads

| Load number | Time [days] | Unit weight | |
|-------------|-------------|---------------------|-------------------|
| | | Unsaturated [kN/m³] | Saturated [kN/m³] |
| 1 | 1 | 19,00 | 19,00 |
| 2 | 1 | 19,00 | 19,00 |

| Load number | Co-ordinates [m] | | | | | |
|-------------|------------------|-------|-------|-------|--|--|
| 1 - X - | 3,11 | 4,82 | 10,39 | | | |
| 1 - Y - | 43,00 | 43,00 | 41,41 | | | |
| 2 - X - | 0,00 | 0,33 | 4,33 | 4,82 | | |
| 2 - Y - | 43,03 | 43,14 | 43,14 | 43,00 | | |

2.7 Verticals

| Vertical number | X co-ordinates [m] | | | | |
|-----------------|--------------------|---------|--------|--------|--------|
| 1 - 5 | -40,000 | -16,630 | -7,590 | 0,000 | 0,330 |
| 6 - 10 | 2,000 | 3,110 | 4,330 | 4,820 | 7,000 |
| 11 - 15 | 8,690 | 9,590 | 10,390 | 12,640 | 15,400 |
| 16 - 18 | 22,000 | 29,960 | 40,000 | | |

Calculation of cross section at Z = 0,000 m
Discretisation = 100

3 Settlements

3.1 Settlements

| Vertical number | X co-ordinate [m] | Surface level [m] | Settlement [m] |
|-----------------|-------------------|-------------------|----------------|
| 1 | -40,00 | 40,67 | 0,004 |
| 2 | -16,63 | 40,67 | 0,004 |
| 3 | -7,59 | 41,11 | 0,011 |
| 4 | 0,00 | 43,03 | 0,050 |
| 5 | 0,33 | 43,03 | 0,054 |
| 6 | 2,00 | 43,01 | 0,063 |
| 7 | 3,11 | 43,00 | 0,073 |
| 8 | 4,33 | 42,63 | 0,087 |
| 9 | 4,82 | 42,48 | 0,090 |
| 10 | 7,00 | 41,82 | 0,089 |
| 11 | 8,69 | 41,31 | 0,083 |
| 12 | 9,59 | 41,39 | 0,052 |
| 13 | 10,39 | 41,41 | 0,028 |
| 14 | 12,64 | 41,47 | 0,012 |
| 15 | 15,40 | 41,89 | 0,018 |
| 16 | 22,00 | 41,81 | 0,016 |
| 17 | 29,96 | 41,71 | 0,014 |
| 18 | 40,00 | 41,71 | 0,014 |

3.2 Maintain Profile Calculation Results

Load 1 consists of 3,052 m3 per Width

Load 2 consists of 0,576 m3 per Width

The extra amount of soil to be added is 0,758 m3 per Width

This equals the found settlements for non-uniform loads

End of Report

Report for D-Settlement 9.2

Settlement Calculations
Developed by Deltares



Company: Witteveen+Bos

Date of report: 09-10-2013

Time of report: 15:50:18

Date of calculation: 09-10-2013

Time of calculation: 9:59:50

Filename: F:\..150.320.6 dwp 2 - 01 Zettingen versterkingsopgave 2020

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| 2.7 Verticals | 4 |
| 3 Settlements | 5 |
| 3.1 Settlements | 5 |
| 3.2 Maintain Profile Calculation Results | 5 |

2 Echo of the Input

2.1 Layer Boundaries

| Boundary number | Co-ordinates [m] | | | | |
|-----------------|------------------|---------|--------|--------|--------|
| 3 - X - | -40,000 | -13,050 | -8,830 | -6,460 | 0,000 |
| 3 - Y - | 40,910 | 40,910 | 41,210 | 41,290 | 43,010 |
| 3 - X - | 3,010 | 8,750 | 10,421 | 12,600 | 13,060 |
| 3 - Y - | 42,960 | 41,160 | 41,129 | 41,080 | 41,080 |
| 3 - X - | 40,000 | | | | |
| 3 - Y - | 41,080 | | | | |
| 2 - X - | -40,000 | -13,050 | -8,830 | -6,460 | 8,750 |
| 2 - Y - | 40,910 | 40,910 | 41,210 | 41,290 | 41,160 |
| 2 - X - | 10,421 | 12,600 | 13,060 | 40,000 | |
| 2 - Y - | 41,129 | 41,080 | 41,080 | 41,080 | |
| 1 - X - | -40,000 | -7,590 | 0,000 | 3,110 | 8,690 |
| 1 - Y - | 38,100 | 38,100 | 37,900 | 37,900 | 38,200 |
| 1 - X - | 40,000 | | | | |
| 1 - Y - | 38,200 | | | | |
| 0 - X - | -40,000 | 40,000 | | | |
| 0 - Y - | 30,000 | 30,000 | | | |

2.2 PL Lines

| PL line number | Co-ordinates [m] | | | | |
|----------------|------------------|--------|--------|--------|--|
| 1 - X - | -40,000 | -7,590 | 8,690 | 40,000 | |
| 1 - Y - | 40,910 | 40,910 | 41,080 | 41,080 | |

2.3 General Data

| | |
|---|---|
| Soil model: | NEN Bjerrum |
| Consolidation model: | Darcy |
| Strain model: | Linear |
| Groundwater level: | Initial determined by PL-line number 1 |
| Unit weight of water: | 9,81 [kN/m³] |
| Stress distribution | |
| - Soil: | Buisman |
| - Loads: | Simulate |
| End of consolidation: | 13140,00 [days] |
| With maintain profile
(only for non uniform loads) | |
| - Material: | Superelevation |
| - Time: | 1,00 [days] |
| - Unit weight above phreatic.: | 19,00 [kN/m³] |
| - Unit weight below phreatic: | 19,00 [kN/m³] |
| - Iteration stop criterium: | 0,10 [m] |
| Pc (initial): | Variable parallel to the initial effective stress |
| Pc (per step): | Automatic increased to the final effective stresses |
| Creep rate reference time: | 1,000 [days] |
| No imaginary surface | |
| With submerging
(only for non uniform loads) | |
| - Iteration stop criterium : | 0,10 [m] |
| Load column width | |
| - Non-Uniform Loads : | 1,00 [m] |
| - Trapezoidal Loads : | 1,00 [m] |

2.4 Soil Profiles

| Layer number | Material name | PL-line top | PL-line bottom |
|--------------|------------------|-------------|----------------|
| 3 | leem, zz, slap | 1 | 1 |
| 2 | leem, zz, slap | 1 | 1 |
| 1 | grind, zs, matig | 1 | 1 |

2.5 Soil Properties

| Layer number | Drained | Unit weight | |
|--------------|---------|---------------------|-------------------|
| | | Unsaturated [kN/m³] | Saturated [kN/m³] |
| 3 | No | 19,00 | 19,00 |
| 2 | No | 19,00 | 19,00 |
| 1 | Yes | 18,00 | 20,00 |

| Layer number | Storage type | Vert. consolid. coefficient Cv [m²/s] | Vertical permeability [m/s] | Permeability strain mod. [m/s] | Initial vertical permeability [m/s] |
|--------------|--------------|---------------------------------------|-----------------------------|--------------------------------|-------------------------------------|
| 3 | Vert. cons. | 1,00E-07 | - | - | - |
| 2 | Vert. cons. | 1,00E-07 | - | - | - |
| 1 | Vert. cons. | - | - | - | - |

| Layer number | POP [kN/m²] | OCR [-] | Equiv. age [days] |
|--------------|-------------|---------|-------------------|
| 3 | 10,00 | - | - |
| 2 | 10,00 | - | - |
| 1 | 10,00 | - | - |

| Layer number | Secondary swelling type | Secondary swelling factor[-] | Unloading stress ratio[-] |
|--------------|-------------------------|------------------------------|---------------------------|
| 3 | Full | - | - |
| 2 | Full | - | - |
| 1 | Full | - | - |

| Layer number | Reloading/ swelling ratio RR [-] | Compression ratio CR [-] | Coeff. of sec. compression Ca [-] | Reloading/ swelling index Cr [-] | Compression index Cc [-] | Initial void ratio (e0) [-] |
|--------------|----------------------------------|--------------------------|-----------------------------------|----------------------------------|--------------------------|-----------------------------|
| 3 | 0,0307000 | 0,0920000 | 0,0037000 | - | - | - |
| 2 | 0,0307000 | 0,0920000 | 0,0037000 | - | - | - |
| 1 | 0,0008000 | 0,0023000 | 0,0000000 | - | - | - |

2.6 Non-Uniform Loads

| Load number | Time [days] | Unit weight | |
|-------------|-------------|---------------------|-------------------|
| | | Unsaturated [kN/m³] | Saturated [kN/m³] |
| 1 | 1 | 19,00 | 19,00 |

| Load number | Co-ordinates [m] | | | | | |
|-------------|------------------|-------|-------|--|--|--|
| 1 - X - | 3,01 | 5,11 | 12,60 | | | |
| 1 - Y - | 42,96 | 42,96 | 41,08 | | | |

2.7 Verticals

| Vertical number | X co-ordinates [m] | | | | | |
|-----------------|--------------------|---------|---------|--------|--------|--|
| 1 - 5 | -40,000 | -25,000 | -13,050 | -8,830 | -7,590 | |
| 6 - 10 | -6,460 | 0,000 | 0,390 | 1,750 | 3,010 | |
| 11 - 15 | 3,110 | 4,390 | 5,107 | 6,800 | 8,690 | |
| 16 - 20 | 8,750 | 10,421 | 12,600 | 13,060 | 27,000 | |
| 21 | 40,000 | | | | | |

Calculation of cross section at Z = 0,000 m
Discretisation = 100

3 Settlements

3.1 Settlements

| Vertical number | X co-ordinate [m] | Surface level [m] | Settlement [m] |
|-----------------|-------------------|-------------------|----------------|
| 1 | -40,00 | 40,91 | 0,006 |
| 2 | -25,00 | 40,91 | 0,006 |
| 3 | -13,05 | 40,91 | 0,006 |
| 4 | -8,83 | 41,21 | 0,010 |
| 5 | -7,59 | 41,25 | 0,011 |
| 6 | -6,46 | 41,29 | 0,012 |
| 7 | 0,00 | 43,01 | 0,041 |
| 8 | 0,39 | 43,00 | 0,041 |
| 9 | 1,75 | 42,98 | 0,043 |
| 10 | 3,01 | 42,96 | 0,054 |
| 11 | 3,11 | 42,93 | 0,058 |
| 12 | 4,39 | 42,53 | 0,084 |
| 13 | 5,11 | 42,30 | 0,095 |
| 14 | 6,80 | 41,77 | 0,103 |
| 15 | 8,69 | 41,18 | 0,103 |
| 16 | 8,75 | 41,16 | 0,105 |
| 17 | 10,42 | 41,13 | 0,075 |
| 18 | 12,60 | 41,08 | 0,021 |
| 19 | 13,06 | 41,08 | 0,014 |
| 20 | 27,00 | 41,08 | 0,006 |
| 21 | 40,00 | 41,08 | 0,006 |

3.2 Maintain Profile Calculation Results

Load 1 consists of 5,199 m³ per Width

The extra amount of soil to be added is 0,780 m³ per Width

This equals the found settlements for non-uniform loads

End of Report

Report for D-Settlement 9.2

Settlement Calculations
Developed by Deltares



Company: Witteveen+Bos

Date of report: 09-10-2013

Time of report: 15:58:44

Date of calculation: 09-10-2013

Time of calculation: 9:59:18

Filename: F:\..150.320.6 dwp 2 - 02 Zettingen uitbreidbaarheidsprofiel 2050

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| 2.7 Verticals | 4 |
| 3 Settlements | 5 |
| 3.1 Settlements | 5 |
| 3.2 Maintain Profile Calculation Results | 5 |

2 Echo of the Input

2.1 Layer Boundaries

| Boundary number | Co-ordinates [m] | | | | |
|-----------------|------------------|---------|--------|--------|--------|
| 3 - X - | -40,000 | -13,050 | -8,830 | -6,460 | 0,000 |
| 3 - Y - | 40,910 | 40,910 | 41,210 | 41,290 | 43,010 |
| 3 - X - | 3,010 | 8,750 | 10,421 | 12,600 | 13,060 |
| 3 - Y - | 42,960 | 41,160 | 41,129 | 41,080 | 41,080 |
| 3 - X - | 40,000 | | | | |
| 3 - Y - | 41,080 | | | | |
| 2 - X - | -40,000 | -13,050 | -8,830 | -6,460 | 8,750 |
| 2 - Y - | 40,910 | 40,910 | 41,210 | 41,290 | 41,160 |
| 2 - X - | 10,421 | 12,600 | 13,060 | 40,000 | |
| 2 - Y - | 41,129 | 41,080 | 41,080 | 41,080 | |
| 1 - X - | -40,000 | -7,590 | 0,000 | 3,110 | 8,690 |
| 1 - Y - | 38,100 | 38,100 | 37,900 | 37,900 | 38,200 |
| 1 - X - | 40,000 | | | | |
| 1 - Y - | 38,200 | | | | |
| 0 - X - | -40,000 | 40,000 | | | |
| 0 - Y - | 30,000 | 30,000 | | | |

2.2 PL Lines

| PL line number | Co-ordinates [m] | | | | |
|----------------|------------------|--------|--------|--------|--|
| 1 - X - | -40,000 | -7,590 | 8,690 | 40,000 | |
| 1 - Y - | 40,910 | 40,910 | 41,080 | 41,080 | |

2.3 General Data

| | |
|---|---|
| Soil model: | NEN Bjerrum |
| Consolidation model: | Darcy |
| Strain model: | Linear |
| Groundwater level: | Initial determined by PL-line number 1 |
| Unit weight of water: | 9,81 [kN/m³] |
| Stress distribution | |
| - Soil: | Buisman |
| - Loads: | Simulate |
| End of consolidation: | 13140,00 [days] |
| With maintain profile
(only for non uniform loads) | |
| - Material: | Superelevation |
| - Time: | 1,00 [days] |
| - Unit weight above phreatic.: | 19,00 [kN/m³] |
| - Unit weight below phreatic: | 19,00 [kN/m³] |
| - Iteration stop criterium: | 0,10 [m] |
| Pc (initial): | Variable parallel to the initial effective stress |
| Pc (per step): | Automatic increased to the final effective stresses |
| Creep rate reference time: | 1,000 [days] |
| No imaginary surface | |
| With submerging
(only for non uniform loads) | |
| - Iteration stop criterium : | 0,10 [m] |
| Load column width | |
| - Non-Uniform Loads : | 1,00 [m] |
| - Trapezoidal Loads : | 1,00 [m] |

2.4 Soil Profiles

| Layer number | Material name | PL-line top | PL-line bottom |
|--------------|------------------|-------------|----------------|
| 3 | leem, zz, slap | 1 | 1 |
| 2 | leem, zz, slap | 1 | 1 |
| 1 | grind, zs, matig | 1 | 1 |

2.5 Soil Properties

| Layer number | Drained | Unit weight | |
|--------------|---------|---------------------|-------------------|
| | | Unsaturated [kN/m³] | Saturated [kN/m³] |
| 3 | No | 19,00 | 19,00 |
| 2 | No | 19,00 | 19,00 |
| 1 | Yes | 18,00 | 20,00 |

| Layer number | Storage type | Vert. consolid. coefficient Cv [m²/s] | Vertical permeability [m/s] | Permeability strain mod. [m/s] | Initial vertical permeability [m/s] |
|--------------|--------------|---------------------------------------|-----------------------------|--------------------------------|-------------------------------------|
| 3 | Vert. cons. | 1,00E-07 | - | - | - |
| 2 | Vert. cons. | 1,00E-07 | - | - | - |
| 1 | Vert. cons. | - | - | - | - |

| Layer number | POP [kN/m²] | OCR [-] | Equiv. age [days] |
|--------------|-------------|---------|-------------------|
| 3 | 10,00 | - | - |
| 2 | 10,00 | - | - |
| 1 | 10,00 | - | - |

| Layer number | Secondary swelling type | Secondary swelling factor[-] | Unloading stress ratio[-] |
|--------------|-------------------------|------------------------------|---------------------------|
| 3 | Full | - | - |
| 2 | Full | - | - |
| 1 | Full | - | - |

| Layer number | Reloading/ swelling ratio RR [-] | Compression ratio CR [-] | Coeff. of sec. compression Ca [-] | Reloading/ swelling index Cr [-] | Compression index Cc [-] | Initial void ratio (e0) [-] |
|--------------|----------------------------------|--------------------------|-----------------------------------|----------------------------------|--------------------------|-----------------------------|
| 3 | 0,0307000 | 0,0920000 | 0,0037000 | - | - | - |
| 2 | 0,0307000 | 0,0920000 | 0,0037000 | - | - | - |
| 1 | 0,0008000 | 0,0023000 | 0,0000000 | - | - | - |

2.6 Non-Uniform Loads

| Load number | Time [days] | Unit weight | |
|-------------|-------------|---------------------|-------------------|
| | | Unsaturated [kN/m³] | Saturated [kN/m³] |
| 1 | 1 | 19,00 | 19,00 |
| 2 | 1 | 19,00 | 19,00 |

| Load number | Co-ordinates [m] | | | | | |
|-------------|------------------|-------|-------|-------|--|--|
| 1 - X - | 3,01 | 5,11 | 12,60 | | | |
| 1 - Y - | 42,96 | 42,96 | 41,08 | | | |
| 2 - X - | 0,00 | 0,39 | 4,39 | 5,11 | | |
| 2 - Y - | 43,01 | 43,14 | 43,14 | 42,96 | | |

2.7 Verticals

| Vertical number | X co-ordinates [m] | | | | |
|-----------------|--------------------|---------|---------|--------|--------|
| 1 - 5 | -40,000 | -25,000 | -13,050 | -8,830 | -7,590 |
| 6 - 10 | -6,460 | 0,000 | 0,390 | 1,750 | 3,010 |
| 11 - 15 | 3,110 | 4,390 | 5,107 | 6,800 | 8,690 |
| 16 - 20 | 8,750 | 10,421 | 12,600 | 13,060 | 27,000 |
| 21 | 40,000 | | | | |

Calculation of cross section at Z = 0,000 m
Discretisation = 100

3 Settlements

3.1 Settlements

| Vertical number | X co-ordinate [m] | Surface level [m] | Settlement [m] |
|-----------------|-------------------|-------------------|----------------|
| 1 | -40,00 | 40,91 | 0,006 |
| 2 | -25,00 | 40,91 | 0,006 |
| 3 | -13,05 | 40,91 | 0,006 |
| 4 | -8,83 | 41,21 | 0,010 |
| 5 | -7,59 | 41,25 | 0,011 |
| 6 | -6,46 | 41,29 | 0,012 |
| 7 | 0,00 | 43,01 | 0,051 |
| 8 | 0,39 | 43,00 | 0,057 |
| 9 | 1,75 | 42,98 | 0,066 |
| 10 | 3,01 | 42,96 | 0,076 |
| 11 | 3,11 | 42,93 | 0,079 |
| 12 | 4,39 | 42,53 | 0,096 |
| 13 | 5,11 | 42,30 | 0,101 |
| 14 | 6,80 | 41,77 | 0,105 |
| 15 | 8,69 | 41,18 | 0,103 |
| 16 | 8,75 | 41,16 | 0,105 |
| 17 | 10,42 | 41,13 | 0,076 |
| 18 | 12,60 | 41,08 | 0,021 |
| 19 | 13,06 | 41,08 | 0,014 |
| 20 | 27,00 | 41,08 | 0,006 |
| 21 | 40,00 | 41,08 | 0,006 |

3.2 Maintain Profile Calculation Results

Load 1 consists of 5,199 m3 per Width

Load 2 consists of 0,754 m3 per Width

The extra amount of soil to be added is 1,012 m3 per Width

This equals the found settlements for non-uniform loads

End of Report

Report for D-Settlement 9.2

Settlement Calculations
Developed by Deltares



Company: Witteveen+Bos

Date of report: 09-10-2013

Time of report: 15:59:10

Date of calculation: 09-10-2013

Time of calculation: 10:10:20

Filename: F:\..50.320.6 dwp 3 - 01 Zettingen versterkingsopgave 2020

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2 Echo of the Input

2.1 Layer Boundaries

| Boundary number | Co-ordinates [m] | | | | |
|-----------------|------------------|---------|--------|--------|--------|
| 3 - X - | -40,000 | -22,460 | -9,110 | -7,930 | 0,000 |
| 3 - Y - | 40,260 | 40,260 | 40,980 | 41,070 | 43,220 |
| 3 - X - | 3,540 | 10,760 | 11,809 | 23,190 | 40,000 |
| 3 - Y - | 43,210 | 41,570 | 41,510 | 41,200 | 41,200 |
| 2 - X - | -40,000 | -22,460 | -9,110 | -7,930 | 10,760 |
| 2 - Y - | 40,260 | 40,260 | 40,980 | 41,070 | 41,570 |
| 2 - X - | 11,809 | 23,190 | 40,000 | | |
| 2 - Y - | 41,510 | 41,200 | 41,200 | | |
| 1 - X - | -40,000 | -7,930 | 0,000 | 3,540 | 10,760 |
| 1 - Y - | 38,100 | 38,100 | 37,900 | 37,900 | 38,200 |
| 1 - X - | 40,000 | | | | |
| 1 - Y - | 38,200 | | | | |
| 0 - X - | -40,000 | 40,000 | | | |
| 0 - Y - | 30,000 | 30,000 | | | |

2.2 PL Lines

| PL line number | Co-ordinates [m] | | | | |
|----------------|------------------|--------|--------|--------|--|
| 1 - X - | -40,000 | -7,930 | 10,760 | 40,000 | |
| 1 - Y - | 40,260 | 40,260 | 41,200 | 41,200 | |

2.3 General Data

| | |
|---|---|
| Soil model: | NEN Bjerrum |
| Consolidation model: | Darcy |
| Strain model: | Linear |
| Groundwater level: | Initial determined by PL-line number 1 |
| Unit weight of water: | 9,81 [kN/m³] |
| Stress distribution | |
| - Soil: | Buisman |
| - Loads: | Simulate |
| End of consolidation: | 13140,00 [days] |
| With maintain profile
(only for non uniform loads) | |
| - Material: | Superelevation |
| - Time: | 1,00 [days] |
| - Unit weight above phreatic.: | 19,00 [kN/m³] |
| - Unit weight below phreatic: | 19,00 [kN/m³] |
| - Iteration stop criterium: | 0,10 [m] |
| Pc (initial): | Variable parallel to the initial effective stress |
| Pc (per step): | Automatic increased to the final effective stresses |
| Creep rate reference time: | 1,000 [days] |
| No imaginary surface | |
| With submerging
(only for non uniform loads) | |
| - Iteration stop criterium : | 0,10 [m] |
| Load column width | |
| - Non-Uniform Loads : | 1,00 [m] |
| - Trapezoidal Loads : | 1,00 [m] |

2.4 Soil Profiles

| Layer number | Material name | PL-line top | PL-line bottom |
|--------------|------------------|-------------|----------------|
| 3 | leem, zz, slap | 1 | 1 |
| 2 | leem, zz, slap | 1 | 1 |
| 1 | grind, zs, matig | 1 | 1 |

2.5 Soil Properties

| Layer number | Drained | Unit weight | |
|--------------|---------|---------------------|-------------------|
| | | Unsaturated [kN/m³] | Saturated [kN/m³] |
| 3 | No | 19,00 | 19,00 |
| 2 | No | 19,00 | 19,00 |
| 1 | Yes | 18,00 | 20,00 |

| Layer number | Storage type | Vert. consolid. coefficient Cv [m²/s] | Vertical permeability [m/s] | Permeability strain mod. [m/s] | Initial vertical permeability [m/s] |
|--------------|--------------|---------------------------------------|-----------------------------|--------------------------------|-------------------------------------|
| 3 | Vert. cons. | 1,00E-07 | - | - | - |
| 2 | Vert. cons. | 1,00E-07 | - | - | - |
| 1 | Vert. cons. | - | - | - | - |

| Layer number | POP [kN/m²] | OCR [-] | Equiv. age [days] |
|--------------|-------------|---------|-------------------|
| 3 | 10,00 | - | - |
| 2 | 10,00 | - | - |
| 1 | 10,00 | - | - |

| Layer number | Secondary swelling type | Secondary swelling factor [-] | Unloading stress ratio [-] |
|--------------|-------------------------|-------------------------------|----------------------------|
| 3 | Full | - | - |
| 2 | Full | - | - |
| 1 | Full | - | - |

| Layer number | Reloading/ swelling ratio RR [-] | Compression ratio CR [-] | Coeff. of sec. compression Ca [-] | Reloading/ swelling index Cr [-] | Compression index Cc [-] | Initial void ratio (e0) [-] |
|--------------|----------------------------------|--------------------------|-----------------------------------|----------------------------------|--------------------------|-----------------------------|
| 3 | 0,0307000 | 0,0920000 | 0,0037000 | - | - | - |
| 2 | 0,0307000 | 0,0920000 | 0,0037000 | - | - | - |
| 1 | 0,0008000 | 0,0023000 | 0,0000000 | - | - | - |

2.6 Non-Uniform Loads

| Load number | Time [days] | Unit weight | |
|-------------|-------------|---------------------|-------------------|
| | | Unsaturated [kN/m³] | Saturated [kN/m³] |
| 1 | 1 | 19,00 | 19,00 |

| Load number | Co-ordinates [m] | | | | | |
|-------------|------------------|-------|-------|--|--|--|
| 1 - X - | 3,54 | 4,00 | 10,76 | | | |
| 1 - Y - | 43,21 | 43,21 | 41,57 | | | |

2.7 Verticals

| Vertical number | X co-ordinates [m] | | | | |
|-----------------|--------------------|---------|--------|--------|--------|
| 1 - 5 | -40,000 | -22,460 | -9,110 | -7,930 | 0,000 |
| 6 - 10 | 2,000 | 3,540 | 4,000 | 5,500 | 10,760 |
| 11 - 13 | 11,809 | 23,190 | 40,000 | | |

Calculation of cross section at Z = 0,000 m
Discretisation = 100

3 Settlements

3.1 Settlements

| Vertical number | X co-ordinate [m] | Surface level [m] | Settlement [m] |
|-----------------|-------------------|-------------------|----------------|
| 1 | -40,00 | 40,26 | 0,002 |
| 2 | -22,46 | 40,26 | 0,002 |
| 3 | -9,11 | 40,98 | 0,012 |
| 4 | -7,93 | 41,07 | 0,013 |
| 5 | 0,00 | 43,22 | 0,043 |
| 6 | 2,00 | 43,21 | 0,044 |
| 7 | 3,54 | 43,21 | 0,049 |
| 8 | 4,00 | 43,11 | 0,052 |
| 9 | 5,50 | 42,76 | 0,049 |
| 10 | 10,76 | 41,57 | 0,015 |
| 11 | 11,81 | 41,51 | 0,012 |
| 12 | 23,19 | 41,20 | 0,007 |
| 13 | 40,00 | 41,20 | 0,007 |

3.2 Maintain Profile Calculation Results

Load 1 consists of 0,377 m3 per Width

The extra amount of soil to be added is 0,264 m3 per Width

This equals the found settlements for non-uniform loads

End of Report

Report for D-Settlement 9.2

Settlement Calculations
Developed by Deltares



Company: Witteveen+Bos

Date of report: 09-10-2013

Time of report: 15:59:23

Date of calculation: 09-10-2013

Time of calculation: 10:25:19

Filename: F:\..150.320.6 dwp 4 - 01 Zettingen versterkingsopgave 2020

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| 2.7 Verticals | 4 |
| 3 Settlements | 5 |
| 3.1 Settlements | 5 |
| 3.2 Maintain Profile Calculation Results | 5 |

2 Echo of the Input

2.1 Layer Boundaries

| Boundary number | Co-ordinates [m] | | | | |
|-----------------|------------------|---------|--------|--------|--------|
| 3 - X - | -40,000 | -17,270 | -6,740 | 0,000 | 3,620 |
| 3 - Y - | 41,120 | 41,120 | 41,470 | 42,990 | 42,990 |
| 3 - X - | 10,590 | 17,138 | 20,900 | 24,200 | 25,600 |
| 3 - Y - | 41,430 | 40,875 | 40,670 | 40,510 | 40,510 |
| 3 - X - | 40,000 | | | | |
| 3 - Y - | 40,510 | | | | |
| 2 - X - | -40,000 | -17,270 | -6,740 | 10,590 | 17,138 |
| 2 - Y - | 41,120 | 41,120 | 41,470 | 41,430 | 40,875 |
| 2 - X - | 20,900 | 24,200 | 25,600 | 40,000 | |
| 2 - Y - | 40,670 | 40,510 | 40,510 | 40,510 | |
| 1 - X - | -40,000 | -6,740 | 0,000 | 3,620 | 10,590 |
| 1 - Y - | 38,100 | 38,100 | 37,900 | 37,900 | 38,200 |
| 1 - X - | 40,000 | | | | |
| 1 - Y - | 38,200 | | | | |
| 0 - X - | -40,000 | 40,000 | | | |
| 0 - Y - | 30,000 | 30,000 | | | |

2.2 PL Lines

| PL line number | Co-ordinates [m] | | | | |
|----------------|------------------|--------|--------|--------|--|
| 1 - X - | -40,000 | -6,740 | 10,590 | 40,000 | |
| 1 - Y - | 41,120 | 41,120 | 40,510 | 40,510 | |

2.3 General Data

| | |
|---|---|
| Soil model: | NEN Bjerrum |
| Consolidation model: | Darcy |
| Strain model: | Linear |
| Groundwater level: | Initial determined by PL-line number 1 |
| Unit weight of water: | 9,81 [kN/m³] |
| Stress distribution | |
| - Soil: | Buisman |
| - Loads: | Simulate |
| End of consolidation: | 13140,00 [days] |
| With maintain profile
(only for non uniform loads) | |
| - Material: | Superelevation |
| - Time: | 1,00 [days] |
| - Unit weight above phreatic.: | 19,00 [kN/m³] |
| - Unit weight below phreatic: | 19,00 [kN/m³] |
| - Iteration stop criterium: | 0,10 [m] |
| Pc (initial): | Variable parallel to the initial effective stress |
| Pc (per step): | Automatic increased to the final effective stresses |
| Creep rate reference time: | 1,000 [days] |
| No imaginary surface | |
| With submerging
(only for non uniform loads) | |
| - Iteration stop criterium : | 0,10 [m] |
| Load column width | |
| - Non-Uniform Loads : | 1,00 [m] |
| - Trapezoidal Loads : | 1,00 [m] |

2.4 Soil Profiles

| Layer number | Material name | PL-line top | PL-line bottom |
|--------------|------------------|-------------|----------------|
| 3 | leem, zz, slap | 1 | 1 |
| 2 | leem, zz, slap | 1 | 1 |
| 1 | grind, zs, matig | 1 | 1 |

2.5 Soil Properties

| Layer number | Drained | Unit weight | |
|--------------|---------|---------------------|-------------------|
| | | Unsaturated [kN/m³] | Saturated [kN/m³] |
| 3 | No | 19,00 | 19,00 |
| 2 | No | 19,00 | 19,00 |
| 1 | Yes | 18,00 | 20,00 |

| Layer number | Storage type | Vert. consolid. coefficient C_v [m²/s] | Vertical permeability [m/s] | Permeability strain mod. [m/s] | Initial vertical permeability [m/s] |
|--------------|--------------|--|-----------------------------|--------------------------------|-------------------------------------|
| 3 | Vert. cons. | 1,00E-07 | - | - | - |
| 2 | Vert. cons. | 1,00E-07 | - | - | - |
| 1 | Vert. cons. | - | - | - | - |

| Layer number | POP [kN/m²] | OCR [-] | Equiv. age [days] |
|--------------|-------------|---------|-------------------|
| 3 | 10,00 | - | - |
| 2 | 10,00 | - | - |
| 1 | 10,00 | - | - |

| Layer number | Secondary swelling type | Secondary swelling factor [-] | Unloading stress ratio [-] |
|--------------|-------------------------|-------------------------------|----------------------------|
| 3 | Full | - | - |
| 2 | Full | - | - |
| 1 | Full | - | - |

| Layer number | Reloading/ swelling ratio RR [-] | Compression ratio CR [-] | Coeff. of sec. compression C_a [-] | Reloading/ swelling index C_r [-] | Compression index C_c [-] | Initial void ratio (e_0) [-] |
|--------------|----------------------------------|--------------------------|--------------------------------------|-------------------------------------|-----------------------------|----------------------------------|
| 3 | 0,0307000 | 0,0920000 | 0,0037000 | - | - | - |
| 2 | 0,0307000 | 0,0920000 | 0,0037000 | - | - | - |
| 1 | 0,0008000 | 0,0023000 | 0,0000000 | - | - | - |

2.6 Non-Uniform Loads

| Load number | Time [days] | Unit weight | |
|-------------|-------------|---------------------|-------------------|
| | | Unsaturated [kN/m³] | Saturated [kN/m³] |
| 1 | 1 | 19,00 | 19,00 |

| Load number | Co-ordinates [m] | | | | | |
|-------------|------------------|-------|-------|-------|-------|--|
| 1 - X - | 3,62 | 5,05 | 10,00 | 19,00 | 20,90 | |
| 1 - Y - | 42,99 | 42,99 | 41,75 | 41,30 | 40,67 | |

2.7 Verticals

| Vertical number | X co-ordinates [m] | | | | |
|-----------------|--------------------|---------|--------|--------|--------|
| 1 - 5 | -40,000 | -17,270 | -6,740 | 0,000 | 0,450 |
| 6 - 10 | 2,000 | 3,620 | 4,450 | 5,049 | 7,500 |
| 11 - 15 | 10,000 | 10,590 | 14,000 | 17,138 | 19,000 |
| 16 - 20 | 20,900 | 24,200 | 25,600 | 32,000 | 40,000 |

Calculation of cross section at $Z = 0,000$ m
Discretisation = 100

3 Settlements

3.1 Settlements

| Vertical number | X co-ordinate [m] | Surface level [m] | Settlement [m] |
|-----------------|-------------------|-------------------|----------------|
| 1 | -40,00 | 41,12 | 0,007 |
| 2 | -17,27 | 41,12 | 0,007 |
| 3 | -6,74 | 41,47 | 0,013 |
| 4 | 0,00 | 42,99 | 0,040 |
| 5 | 0,45 | 42,99 | 0,040 |
| 6 | 2,00 | 42,99 | 0,041 |
| 7 | 3,62 | 42,99 | 0,051 |
| 8 | 4,45 | 42,80 | 0,060 |
| 9 | 5,05 | 42,67 | 0,067 |
| 10 | 7,50 | 42,12 | 0,061 |
| 11 | 10,00 | 41,56 | 0,050 |
| 12 | 10,59 | 41,43 | 0,051 |
| 13 | 14,00 | 41,14 | 0,060 |
| 14 | 17,14 | 40,88 | 0,065 |
| 15 | 19,00 | 40,77 | 0,057 |
| 16 | 20,90 | 40,67 | 0,017 |
| 17 | 24,20 | 40,51 | 0,003 |
| 18 | 25,60 | 40,51 | 0,003 |
| 19 | 32,00 | 40,51 | 0,003 |
| 20 | 40,00 | 40,51 | 0,003 |

3.2 Maintain Profile Calculation Results

Load 1 consists of 5,747 m3 per Width

The extra amount of soil to be added is 0,973 m3 per Width

This equals the found settlements for non-uniform loads

End of Report

Report for D-Settlement 9.2

Settlement Calculations
Developed by Deltares



| | |
|----------------------|---|
| Company: | Witteveen+Bos |
| Date of report: | 09-10-2013 |
| Time of report: | 15:59:36 |
| Date of calculation: | 09-10-2013 |
| Time of calculation: | 10:24:41 |
| Filename: | F:\..150.320.6 dwp 4 - 02 Zettingen uitbreidbaarheidsprofiel 2050 |

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| 2.7 Verticals | 4 |
| 3 Settlements | 5 |
| 3.1 Settlements | 5 |
| 3.2 Maintain Profile Calculation Results | 5 |

2 Echo of the Input

2.1 Layer Boundaries

| Boundary number | Co-ordinates [m] | | | | |
|-----------------|------------------|---------|--------|--------|--------|
| 3 - X - | -40,000 | -17,270 | -6,740 | 0,000 | 3,620 |
| 3 - Y - | 41,120 | 41,120 | 41,470 | 42,990 | 42,990 |
| 3 - X - | 10,590 | 17,138 | 20,900 | 24,200 | 25,600 |
| 3 - Y - | 41,430 | 40,875 | 40,670 | 40,510 | 40,510 |
| 3 - X - | 40,000 | | | | |
| 3 - Y - | 40,510 | | | | |
| 2 - X - | -40,000 | -17,270 | -6,740 | 10,590 | 17,138 |
| 2 - Y - | 41,120 | 41,120 | 41,470 | 41,430 | 40,875 |
| 2 - X - | 20,900 | 24,200 | 25,600 | 40,000 | |
| 2 - Y - | 40,670 | 40,510 | 40,510 | 40,510 | |
| 1 - X - | -40,000 | -6,740 | 0,000 | 3,620 | 10,590 |
| 1 - Y - | 38,100 | 38,100 | 37,900 | 37,900 | 38,200 |
| 1 - X - | 40,000 | | | | |
| 1 - Y - | 38,200 | | | | |
| 0 - X - | -40,000 | 40,000 | | | |
| 0 - Y - | 30,000 | 30,000 | | | |

2.2 PL Lines

| PL line number | Co-ordinates [m] | | | | |
|----------------|------------------|--------|--------|--------|--|
| 1 - X - | -40,000 | -6,740 | 10,590 | 40,000 | |
| 1 - Y - | 41,120 | 41,120 | 40,510 | 40,510 | |

2.3 General Data

| | |
|---|---|
| Soil model: | NEN Bjerrum |
| Consolidation model: | Darcy |
| Strain model: | Linear |
| Groundwater level: | Initial determined by PL-line number 1 |
| Unit weight of water: | 9,81 [kN/m³] |
| Stress distribution | |
| - Soil: | Buisman |
| - Loads: | Simulate |
| End of consolidation: | 13140,00 [days] |
| With maintain profile
(only for non uniform loads) | |
| - Material: | Superelevation |
| - Time: | 1,00 [days] |
| - Unit weight above phreatic.: | 19,00 [kN/m³] |
| - Unit weight below phreatic: | 19,00 [kN/m³] |
| - Iteration stop criterium: | 0,10 [m] |
| Pc (initial): | Variable parallel to the initial effective stress |
| Pc (per step): | Automatic increased to the final effective stresses |
| Creep rate reference time: | 1,000 [days] |
| No imaginary surface | |
| With submerging
(only for non uniform loads) | |
| - Iteration stop criterium : | 0,10 [m] |
| Load column width | |
| - Non-Uniform Loads : | 1,00 [m] |
| - Trapezoidal Loads : | 1,00 [m] |

2.4 Soil Profiles

| Layer number | Material name | PL-line top | PL-line bottom |
|--------------|------------------|-------------|----------------|
| 3 | leem, zz, slap | 1 | 1 |
| 2 | leem, zz, slap | 1 | 1 |
| 1 | grind, zs, matig | 1 | 1 |

2.5 Soil Properties

| Layer number | Drained | Unit weight | |
|--------------|---------|---------------------|-------------------|
| | | Unsaturated [kN/m³] | Saturated [kN/m³] |
| 3 | No | 19,00 | 19,00 |
| 2 | No | 19,00 | 19,00 |
| 1 | Yes | 18,00 | 20,00 |

| Layer number | Storage type | Vert. consolid. coefficient Cv [m²/s] | Vertical permeability [m/s] | Permeability strain mod. [m/s] | Initial vertical permeability [m/s] |
|--------------|--------------|---------------------------------------|-----------------------------|--------------------------------|-------------------------------------|
| 3 | Vert. cons. | 1,00E-07 | - | - | - |
| 2 | Vert. cons. | 1,00E-07 | - | - | - |
| 1 | Vert. cons. | - | - | - | - |

| Layer number | POP [kN/m²] | OCR [-] | Equiv. age [days] |
|--------------|-------------|---------|-------------------|
| 3 | 10,00 | - | - |
| 2 | 10,00 | - | - |
| 1 | 10,00 | - | - |

| Layer number | Secondary swelling type | Secondary swelling factor[-] | Unloading stress ratio[-] |
|--------------|-------------------------|------------------------------|---------------------------|
| 3 | Full | - | - |
| 2 | Full | - | - |
| 1 | Full | - | - |

| Layer number | Reloading/ swelling ratio RR [-] | Compression ratio CR [-] | Coeff. of sec. compression Ca [-] | Reloading/ swelling index Cr [-] | Compression index Cc [-] | Initial void ratio (e0) [-] |
|--------------|----------------------------------|--------------------------|-----------------------------------|----------------------------------|--------------------------|-----------------------------|
| 3 | 0,0307000 | 0,0920000 | 0,0037000 | - | - | - |
| 2 | 0,0307000 | 0,0920000 | 0,0037000 | - | - | - |
| 1 | 0,0008000 | 0,0023000 | 0,0000000 | - | - | - |

2.6 Non-Uniform Loads

| Load number | Time [days] | Unit weight | |
|-------------|-------------|---------------------|-------------------|
| | | Unsaturated [kN/m³] | Saturated [kN/m³] |
| 1 | 1 | 19,00 | 19,00 |
| 2 | 1 | 19,00 | 19,00 |

| Load number | Co-ordinates [m] | | | | | |
|-------------|------------------|-------|-------|-------|-------|--|
| 1 - X - | 3,62 | 5,05 | 10,00 | 19,00 | 20,90 | |
| 1 - Y - | 42,99 | 42,99 | 41,75 | 41,30 | 40,67 | |
| 2 - X - | 0,00 | 0,45 | 4,45 | 5,05 | | |
| 2 - Y - | 42,99 | 43,14 | 43,14 | 42,99 | | |

2.7 Verticals

| Vertical number | X co-ordinates [m] | | | | |
|-----------------|--------------------|---------|--------|--------|--------|
| 1 - 5 | -40,000 | -17,270 | -6,740 | 0,000 | 0,450 |
| 6 - 10 | 2,000 | 3,620 | 4,450 | 5,049 | 7,500 |
| 11 - 15 | 10,000 | 10,590 | 14,000 | 17,138 | 19,000 |
| 16 - 20 | 20,900 | 24,200 | 25,600 | 32,000 | 40,000 |

Calculation of cross section at Z = 0,000 m
Discretisation = 100

3 Settlements

3.1 Settlements

| Vertical number | X co-ordinate [m] | Surface level [m] | Settlement [m] |
|-----------------|-------------------|-------------------|----------------|
| 1 | -40,00 | 41,12 | 0,007 |
| 2 | -17,27 | 41,12 | 0,007 |
| 3 | -6,74 | 41,47 | 0,013 |
| 4 | 0,00 | 42,99 | 0,050 |
| 5 | 0,45 | 42,99 | 0,056 |
| 6 | 2,00 | 42,99 | 0,063 |
| 7 | 3,62 | 42,99 | 0,070 |
| 8 | 4,45 | 42,80 | 0,073 |
| 9 | 5,05 | 42,67 | 0,075 |
| 10 | 7,50 | 42,12 | 0,062 |
| 11 | 10,00 | 41,56 | 0,050 |
| 12 | 10,59 | 41,43 | 0,052 |
| 13 | 14,00 | 41,14 | 0,060 |
| 14 | 17,14 | 40,88 | 0,065 |
| 15 | 19,00 | 40,77 | 0,057 |
| 16 | 20,90 | 40,67 | 0,017 |
| 17 | 24,20 | 40,51 | 0,003 |
| 18 | 25,60 | 40,51 | 0,003 |
| 19 | 32,00 | 40,51 | 0,003 |
| 20 | 40,00 | 40,51 | 0,003 |

3.2 Maintain Profile Calculation Results

Load 1 consists of 5,747 m3 per Width

Load 2 consists of 0,679 m3 per Width

The extra amount of soil to be added is 1,227 m3 per Width

This equals the found settlements for non-uniform loads

End of Report

Report for D-Settlement 9.2

Settlement Calculations
Developed by Deltares



Company: Witteveen+Bos

Date of report: 09-10-2013

Time of report: 15:59:47

Date of calculation: 09-10-2013

Time of calculation: 14:59:00

Filename: F:\..150.320.9 dwp 1 - 01 Zettingen versterkingsopgave 2020

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| 2.7 Verticals | 4 |
| 3 Settlements | 5 |
| 3.1 Settlements | 5 |
| 3.2 Maintain Profile Calculation Results | 5 |

2 Echo of the Input

2.1 Layer Boundaries

| Boundary number | Co-ordinates [m] | | | | |
|-----------------|------------------|--------|--------|--------|--------|
| 3 - X - | -40,000 | -8,000 | 0,000 | 3,580 | 10,030 |
| 3 - Y - | 40,920 | 40,920 | 43,070 | 42,970 | 41,080 |
| 3 - X - | 17,800 | 21,500 | 21,780 | 40,000 | |
| 3 - Y - | 40,820 | 40,693 | 40,670 | 40,670 | |
| 2 - X - | -40,000 | -8,000 | 10,030 | 17,800 | 21,500 |
| 2 - Y - | 40,920 | 40,920 | 41,080 | 40,820 | 40,693 |
| 2 - X - | 21,780 | 40,000 | | | |
| 2 - Y - | 40,670 | 40,670 | | | |
| 1 - X - | -40,000 | -8,000 | 0,000 | 3,580 | 10,030 |
| 1 - Y - | 38,700 | 38,700 | 39,000 | 39,000 | 39,000 |
| 1 - X - | 40,000 | | | | |
| 1 - Y - | 39,000 | | | | |
| 0 - X - | -40,000 | 40,000 | | | |
| 0 - Y - | 30,000 | 30,000 | | | |

2.2 PL Lines

| PL line number | Co-ordinates [m] | | | | |
|----------------|------------------|--------|--------|--------|--|
| 1 - X - | -40,000 | -8,000 | 10,030 | 40,000 | |
| 1 - Y - | 40,920 | 40,920 | 40,670 | 40,670 | |

2.3 General Data

| | |
|---|---|
| Soil model: | NEN Bjerrum |
| Consolidation model: | Darcy |
| Strain model: | Linear |
| Groundwater level: | Initial determined by PL-line number 1 |
| Unit weight of water: | 9,81 [kN/m³] |
| Stress distribution | |
| - Soil: | Buisman |
| - Loads: | Simulate |
| End of consolidation: | 13140,00 [days] |
| With maintain profile
(only for non uniform loads) | |
| - Material: | Superelevation |
| - Time: | 1,00 [days] |
| - Unit weight above phreatic.: | 19,00 [kN/m³] |
| - Unit weight below phreatic: | 19,00 [kN/m³] |
| - Iteration stop criterium: | 0,10 [m] |
| Pc (initial): | Variable parallel to the initial effective stress |
| Pc (per step): | Automatic increased to the final effective stresses |
| Creep rate reference time: | 1,000 [days] |
| No imaginary surface | |
| With submerging
(only for non uniform loads) | |
| - Iteration stop criterium : | 0,10 [m] |
| Load column width | |
| - Non-Uniform Loads : | 1,00 [m] |
| - Trapezoidal Loads : | 1,00 [m] |

2.4 Soil Profiles

| Layer number | Material name | PL-line top | PL-line bottom |
|--------------|------------------|-------------|----------------|
| 3 | leem, zz, slap | 1 | 1 |
| 2 | leem, zz, slap | 1 | 1 |
| 1 | grind, zs, matig | 1 | 1 |

2.5 Soil Properties

| Layer number | Drained | Unit weight | |
|--------------|---------|---------------------|-------------------|
| | | Unsaturated [kN/m³] | Saturated [kN/m³] |
| 3 | No | 19,00 | 19,00 |
| 2 | No | 19,00 | 19,00 |
| 1 | Yes | 18,00 | 20,00 |

| Layer number | Storage type | Vert. consolid. coefficient Cv [m²/s] | Vertical permeability [m/s] | Permeability strain mod. [m/s] | Initial vertical permeability [m/s] |
|--------------|--------------|---------------------------------------|-----------------------------|--------------------------------|-------------------------------------|
| 3 | Vert. cons. | 1,00E-07 | - | - | - |
| 2 | Vert. cons. | 1,00E-07 | - | - | - |
| 1 | Vert. cons. | - | - | - | - |

| Layer number | POP [kN/m²] | OCR [-] | Equiv. age [days] |
|--------------|-------------|---------|-------------------|
| 3 | 10,00 | - | - |
| 2 | 10,00 | - | - |
| 1 | 10,00 | - | - |

| Layer number | Secondary swelling type | Secondary swelling factor [-] | Unloading stress ratio [-] |
|--------------|-------------------------|-------------------------------|----------------------------|
| 3 | Full | - | - |
| 2 | Full | - | - |
| 1 | Full | - | - |

| Layer number | Reloading/ swelling ratio RR [-] | Compression ratio CR [-] | Coeff. of sec. compression Ca [-] | Reloading/ swelling index Cr [-] | Compression index Cc [-] | Initial void ratio (e0) [-] |
|--------------|----------------------------------|--------------------------|-----------------------------------|----------------------------------|--------------------------|-----------------------------|
| 3 | 0,0307000 | 0,0920000 | 0,0037000 | - | - | - |
| 2 | 0,0307000 | 0,0920000 | 0,0037000 | - | - | - |
| 1 | 0,0008000 | 0,0023000 | 0,0000000 | - | - | - |

2.6 Non-Uniform Loads

| Load number | Time [days] | Unit weight | |
|-------------|-------------|---------------------|-------------------|
| | | Unsaturated [kN/m³] | Saturated [kN/m³] |
| 1 | 1 | 19,00 | 19,00 |

| Load number | Co-ordinates [m] | | | | | |
|-------------|------------------|-------|-------|-------|-------|--|
| 1 - X - | 3,58 | 4,00 | 9,65 | 16,65 | 17,80 | |
| 1 - Y - | 42,97 | 42,97 | 41,55 | 41,20 | 40,82 | |

2.7 Verticals

| Vertical number | X co-ordinates [m] | | | | |
|-----------------|--------------------|---------|--------|--------|--------|
| 1 - 5 | -40,000 | -25,000 | -8,000 | 0,000 | 2,000 |
| 6 - 10 | 3,580 | 4,000 | 9,650 | 10,030 | 13,000 |
| 11 - 15 | 16,650 | 17,800 | 21,500 | 21,780 | 30,000 |
| 16 | 40,000 | | | | |

Calculation of cross section at Z = 0,000 m
Discretisation = 100

3 Settlements

3.1 Settlements

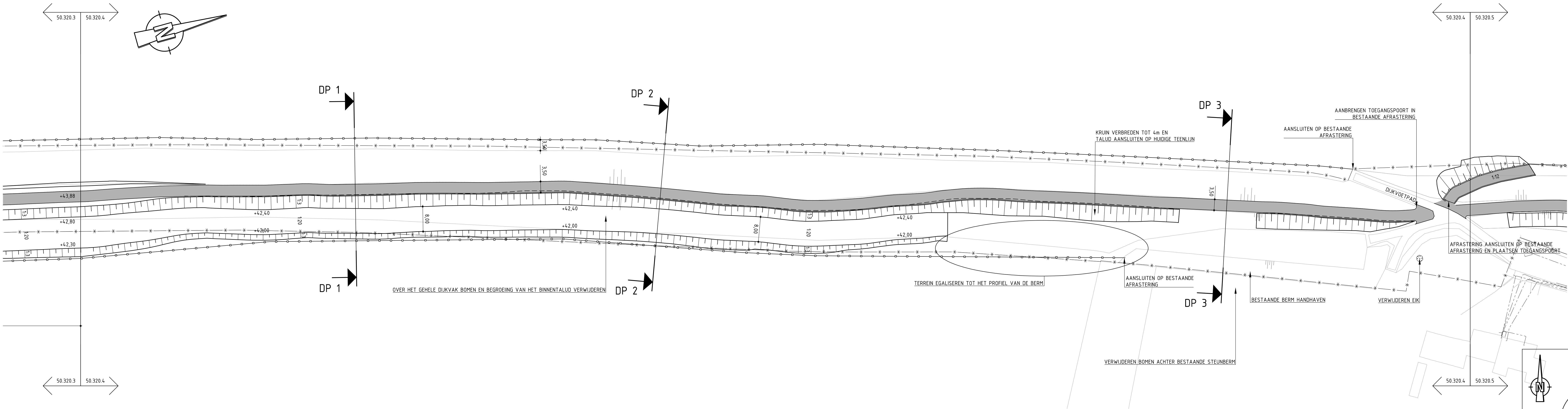
| Vertical number | X co-ordinate [m] | Surface level [m] | Settlement [m] |
|-----------------|-------------------|-------------------|----------------|
| 1 | -40,00 | 40,92 | 0,003 |
| 2 | -25,00 | 40,92 | 0,003 |
| 3 | -8,00 | 40,92 | 0,003 |
| 4 | 0,00 | 43,07 | 0,029 |
| 5 | 2,00 | 43,01 | 0,029 |
| 6 | 3,58 | 42,97 | 0,034 |
| 7 | 4,00 | 42,85 | 0,038 |
| 8 | 9,65 | 41,19 | 0,045 |
| 9 | 10,03 | 41,08 | 0,047 |
| 10 | 13,00 | 40,98 | 0,043 |
| 11 | 16,65 | 40,86 | 0,028 |
| 12 | 17,80 | 40,82 | 0,009 |
| 13 | 21,50 | 40,69 | 0,001 |
| 14 | 21,78 | 40,67 | 0,001 |
| 15 | 30,00 | 40,67 | 0,001 |
| 16 | 40,00 | 40,67 | 0,001 |

3.2 Maintain Profile Calculation Results

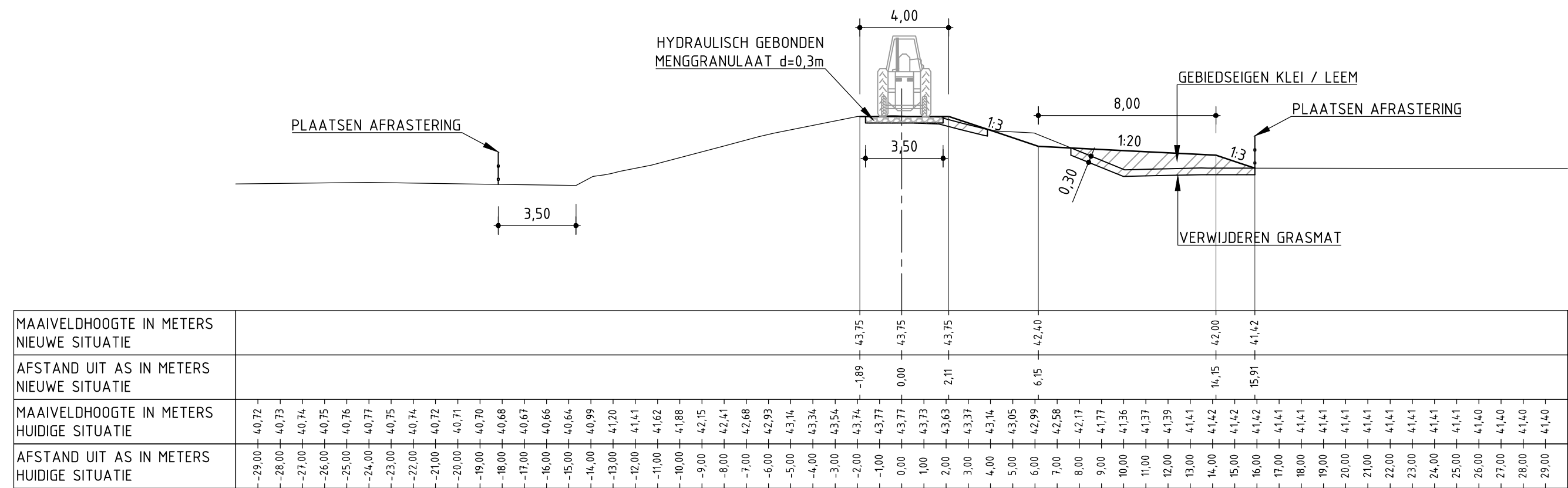
Load 1 consists of 4,360 m3 per Width
The extra amount of soil to be added is 0,546 m3 per Width
This equals the found settlements for non-uniform loads

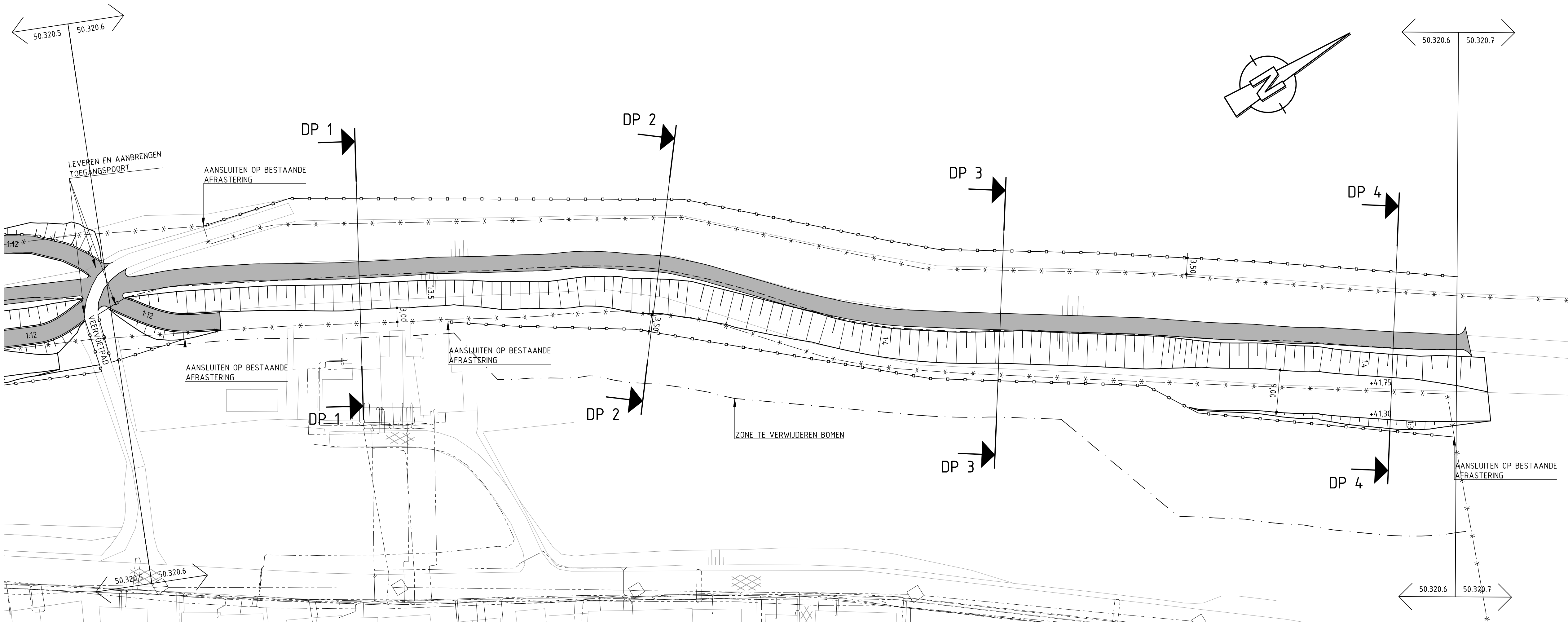
End of Report

BIJLAGE XIV ONTWERPTEKENINGEN

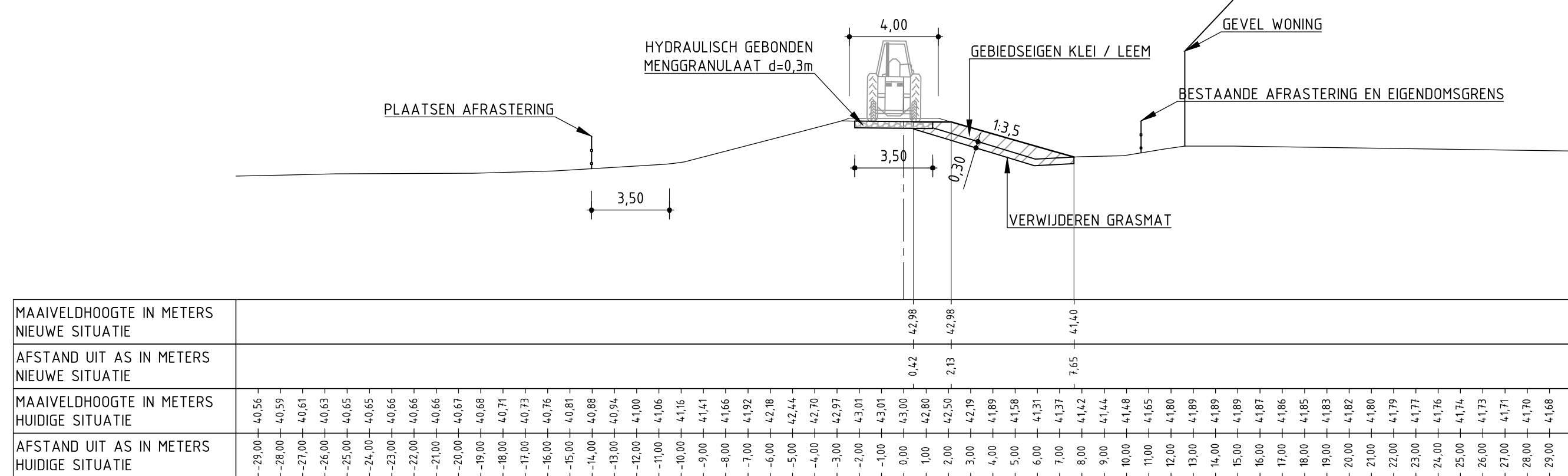


BOVENAANZICHT 50.320.4
SCHAAL: 1500

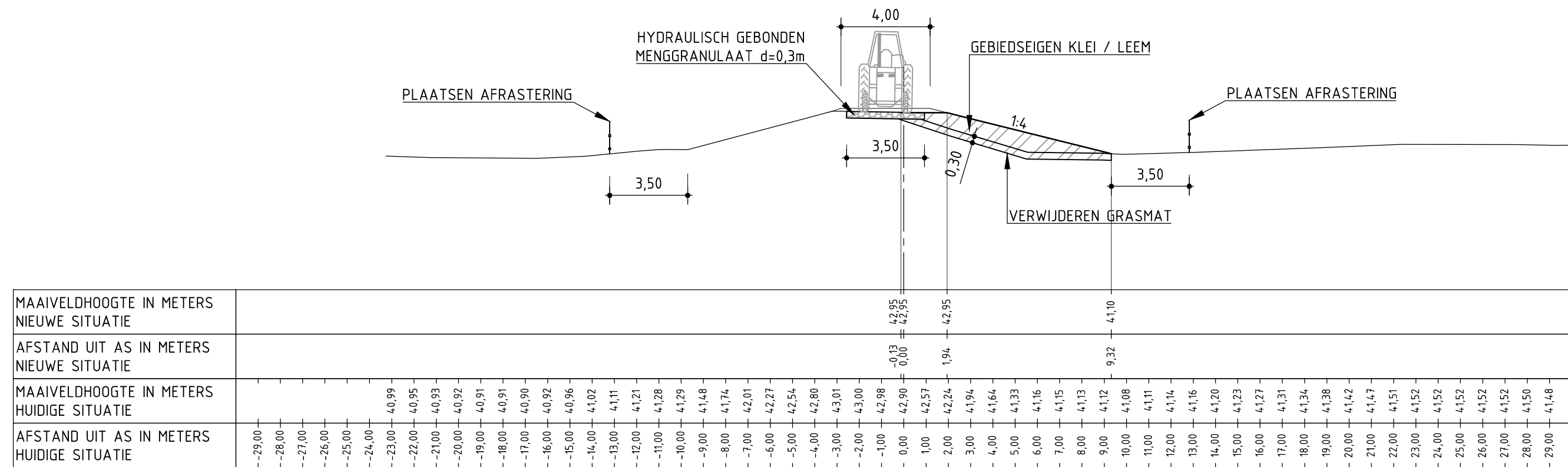




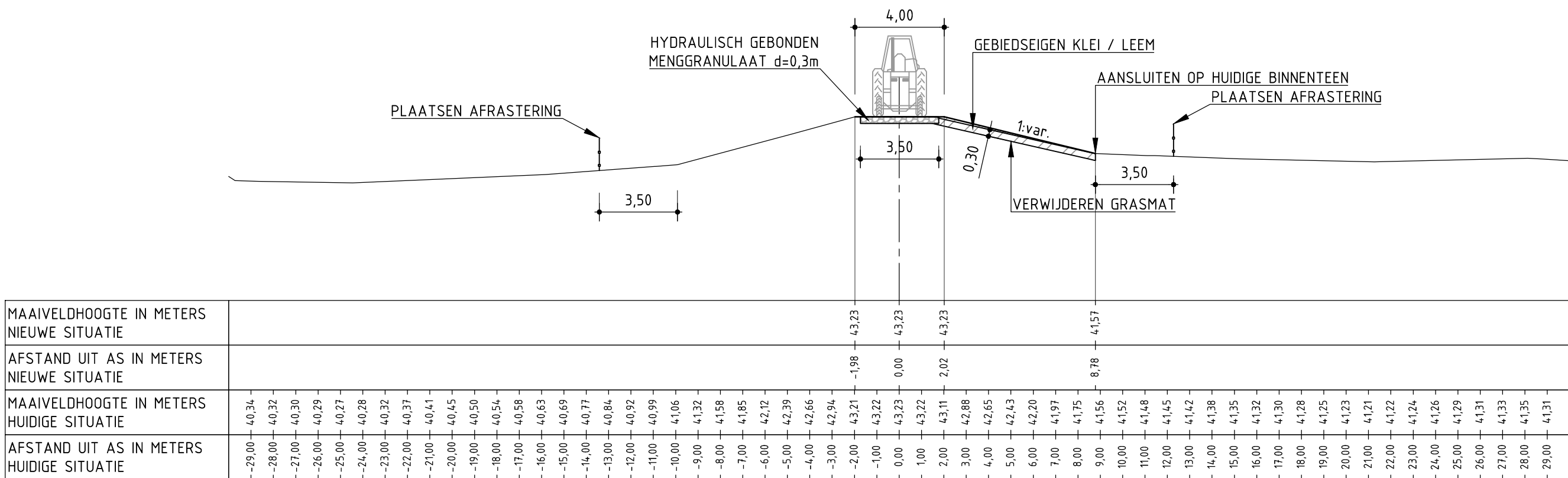
BOVENAANZICHT 50.320.6
SCHAAL: 1:500



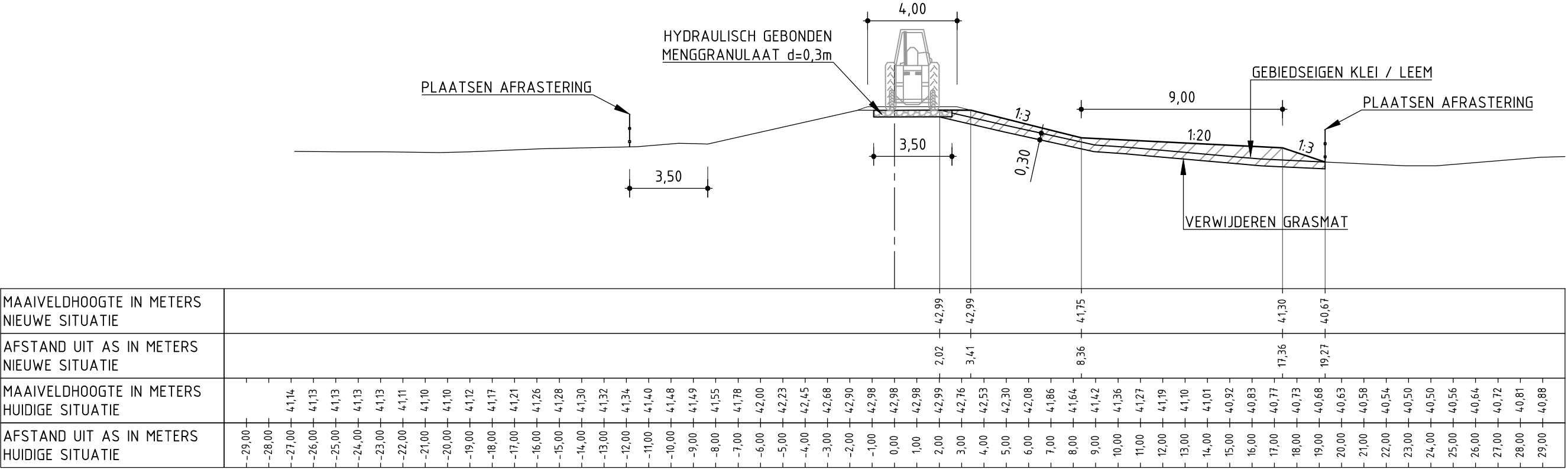
50.320.6 DP 1: KRUINVERBREDING I.V.M. UITBREIDBAARHEIDSPROFIEL
schaal 1:200



50.320.6 DP 2: KRUINVERBREDING I.V.M. UITBREIDBAARHEIDSPROFIEL
schaal 1:200



50.320.6 DP 3: KRUINVERBREDING I.V.M. TE SMALLE KRUIN
schaal 1:200



50.320.6 DP 4: KRUINVERBREDING I.V.M. UITBREIDBAARHEIDSPROFIEL
schaal 1:200



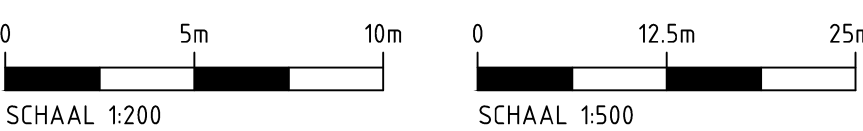
LOCATIE DIJKVAK 50.320.6
SCHAAL 1:10000

LEGENDA:

- DWARSPROFIEL:
- ONTWERPPROFIEL
 - AANLEGPROFIEL
 - UITBREIDBAARHEIDSPROFIEL 2050
 - GEBIEDSEIGEN KLEI OF LEEM
 - KLEI CAT. 1
 - KLEI CAT. 2
 - ONDERHOUDSPAD HYDRAULISCH GEBONDEN MENGGRANULAAT
- BOVENAANZICHT:
- HOOGTEMATEN IN METERS TEN OPZICHTE VAN NAP
 - DUIKVAK AFGEGEKEURD OP STBI
 - TE VERWIJDEREN BOOM (LOCATIE INDICATIEF WEERGEGEVEN)
 - ONDERHOUDSPAD HYDRAULISCH GEBONDEN MENGGRANULAAT
 - EIGENDOMSGRENS WRO
 - AANBRENGEN AFRASTERING

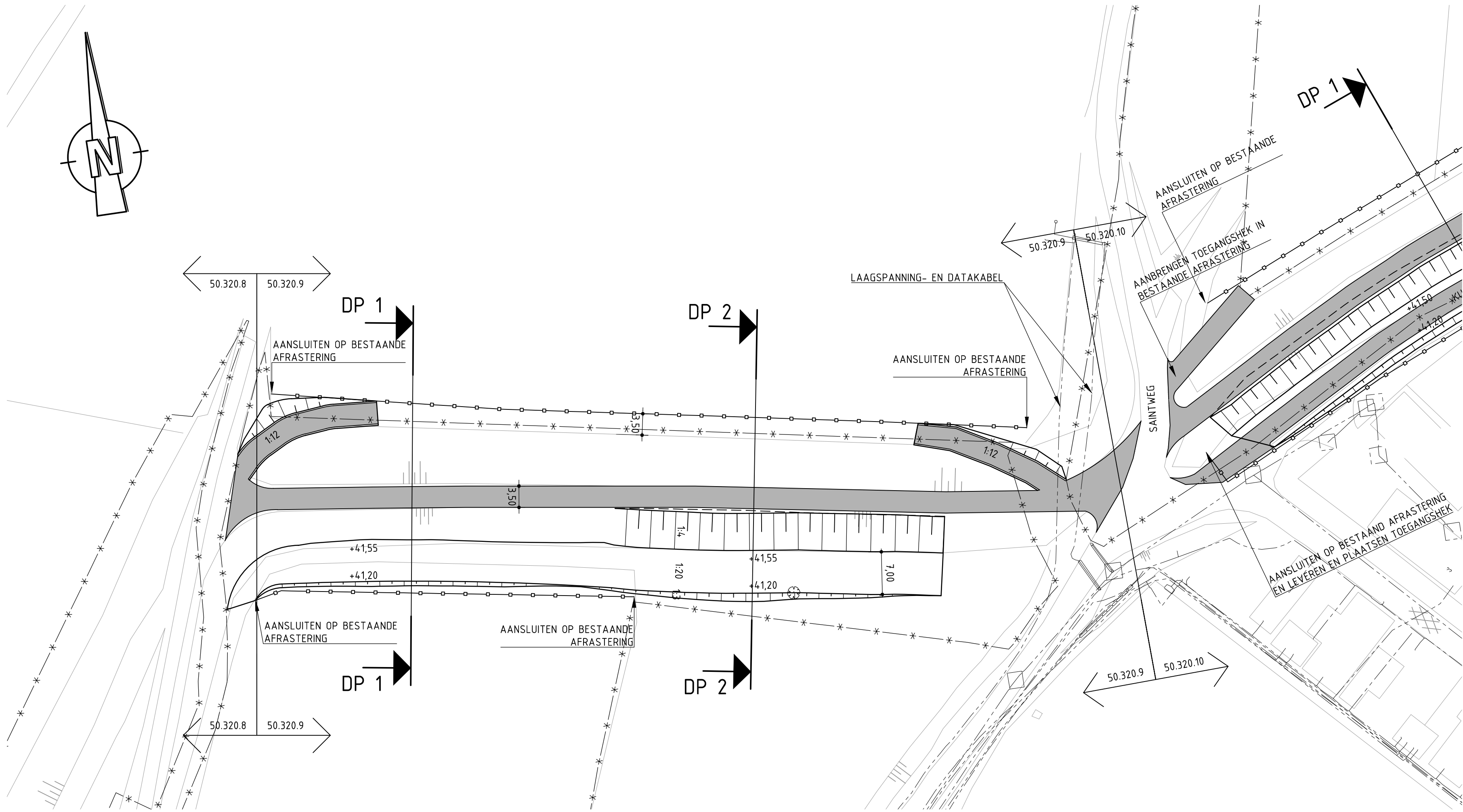
OPMERKINGEN:

- HOOGTEMATEN IN METERS TEN OPZICHTE VAN NAP
- DUIKVAK AFGEGEKEURD OP STBI

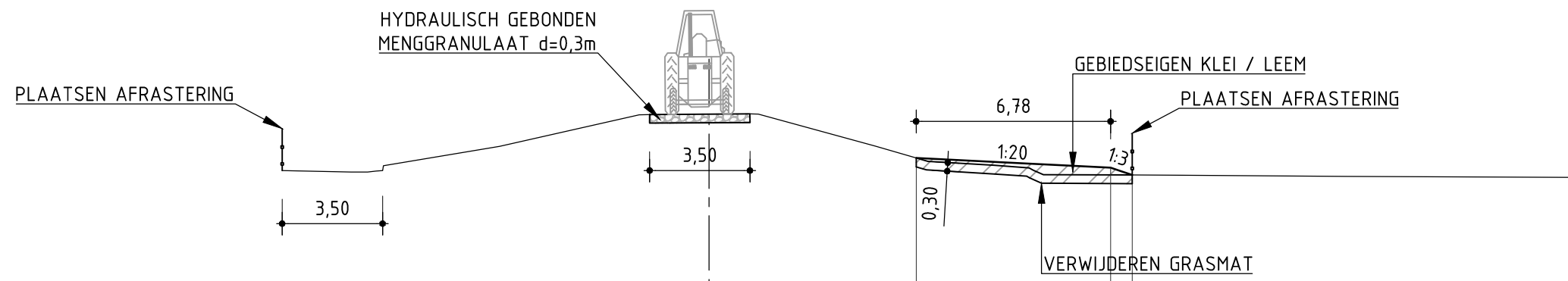


WATERSCHAP ROER EN OVERMAAS AANVULLING SLUITSTUKKADEN MAAS

Definitief Ontwerp
Geulle aan de Maas
Dijkvak 50.320.6

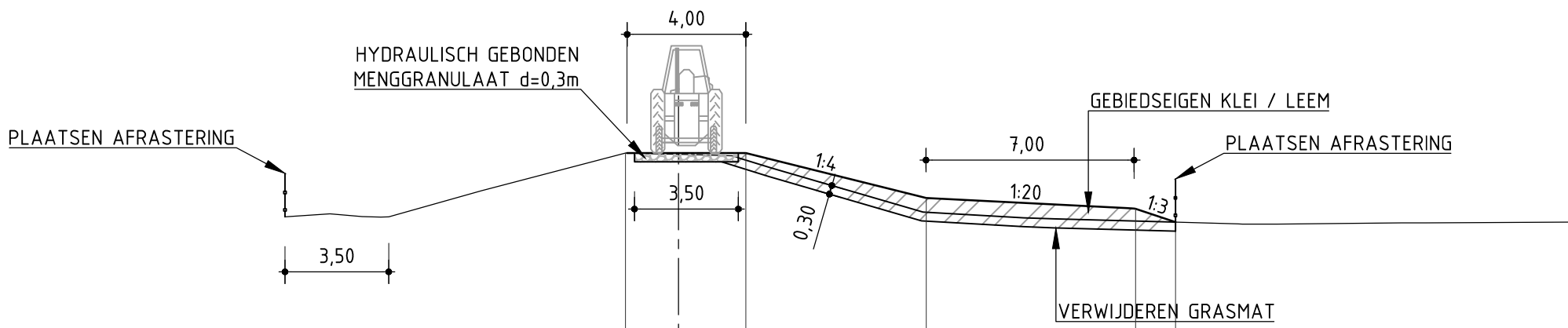


BOVENAANZICHT 50.320.9
SCHAAL: 1:500



| | |
|--|--|
| MAAIVELDHOOGTE IN METERS
NIEUWE SITUATIE | |
| AFSTAND UIT AS IN METERS
NIEUWE SITUATIE | |
| MAAIVELDHOOGTE IN METERS
HUIDIGE SITUATIE | |
| AFSTAND UIT AS IN METERS
HUIDIGE SITUATIE | |

50.320.9 DP 1
schaal 1:200



| | |
|--|--|
| MAAIVELDHOOGTE IN METERS
NIEUWE SITUATIE | |
| AFSTAND UIT AS IN METERS
NIEUWE SITUATIE | |
| MAAIVELDHOOGTE IN METERS
HUIDIGE SITUATIE | |
| AFSTAND UIT AS IN METERS
HUIDIGE SITUATIE | |

50.320.9 DP 2: KRUINVERBREIDING I.V.M. TE SMALLE KRUIN
schaal 1:200



LOCATIE DIJKVAK 50.320.9
SCHAAL 1:10000

LEGENDA:

- DWARSPROFIEL:
- ONTWERPPROFIEL
 - AANLEGPROFIEL
 - UITBREIDBAARHEIDSPROFIEL 2050
 - GEBIEDSEIGEN KLEI OF LEEM
 - KLEI CAT. 1
 - KLEI CAT. 2
 - ONDERHOUDSPAD HYDRAULISCH GEBONDEN MENGGRANULAAT
- BOVENAANZICHT:
- TE VERWIJDEREN BOOM (LOCATIE INDICATIEF WEERGEGEVEN)
 - ONDERHOUDSPAD HYDRAULISCH GEBONDEN MENGGRANULAAT
 - EIGENDOMSGRENS WRO
 - AANBRENGEN AFRASTERING

OPMERKINGEN:

- HOOGTEMATEN IN METERS TEN OPZICHT VAN NAP
- DIJKVAK AFGEKEURD OP STBI



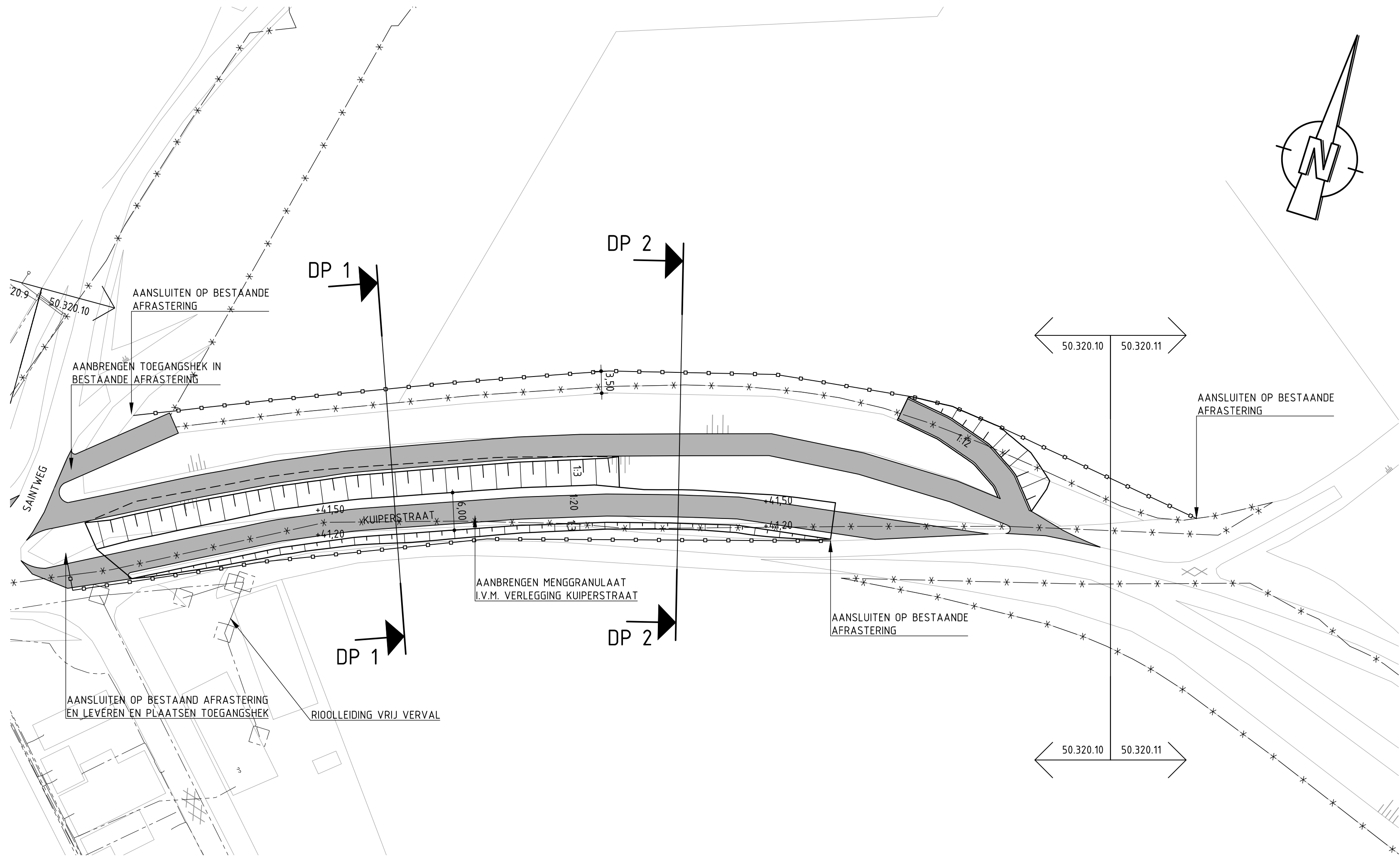
WATERSCHAP ROER EN OVERMAAS
AANVULLING SLUITSTUKKADEN MAAS

Definitief Ontwerp
Geulle aan de Maas
Dijkvak 50.320.9

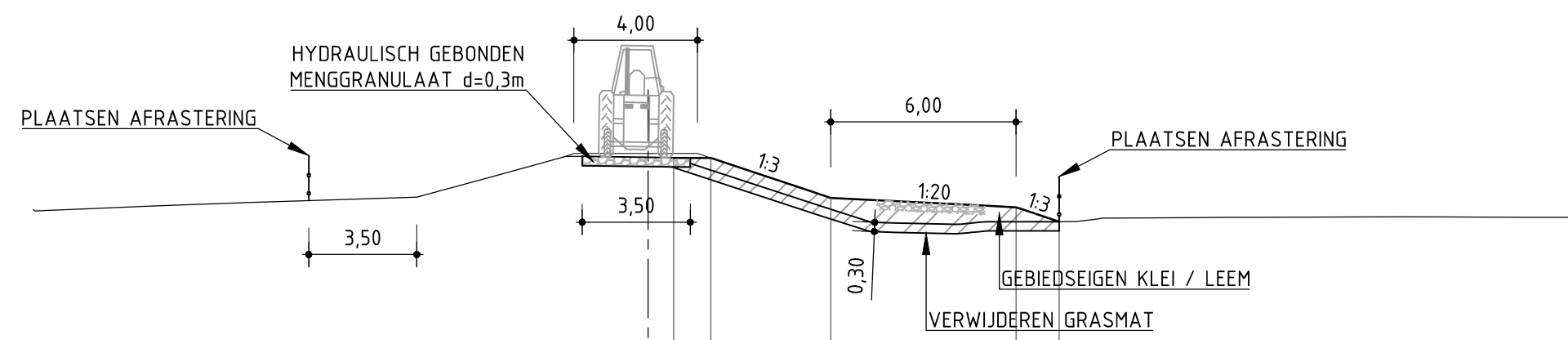
| | | | | | |
|-----------|----|---------------|-----------------|---------|-------------|
| Witteveen | Bo | Gefekend | ing. L. de Gier | Schaal | 1:200 1:500 |
| | | Gecontroleerd | ir. J. Lansink | | |
| | | Goedgekeurd | ir. S.T. Pwa | | |
| | | Datum | 31-10-2013 | Formaat | A1 |

| | |
|-------------|--|
| G | |
| F | |
| E | |
| D | |
| C | |
| B | |
| A | |
| Wijzigingen | |

STD88-2-2006

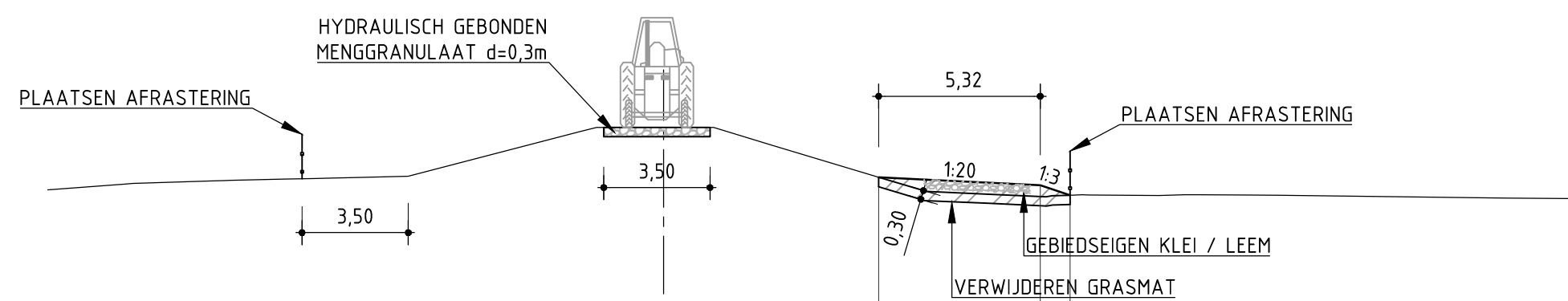


BOVENAANZICHT 50.320.10
SCHAAL: 1:500



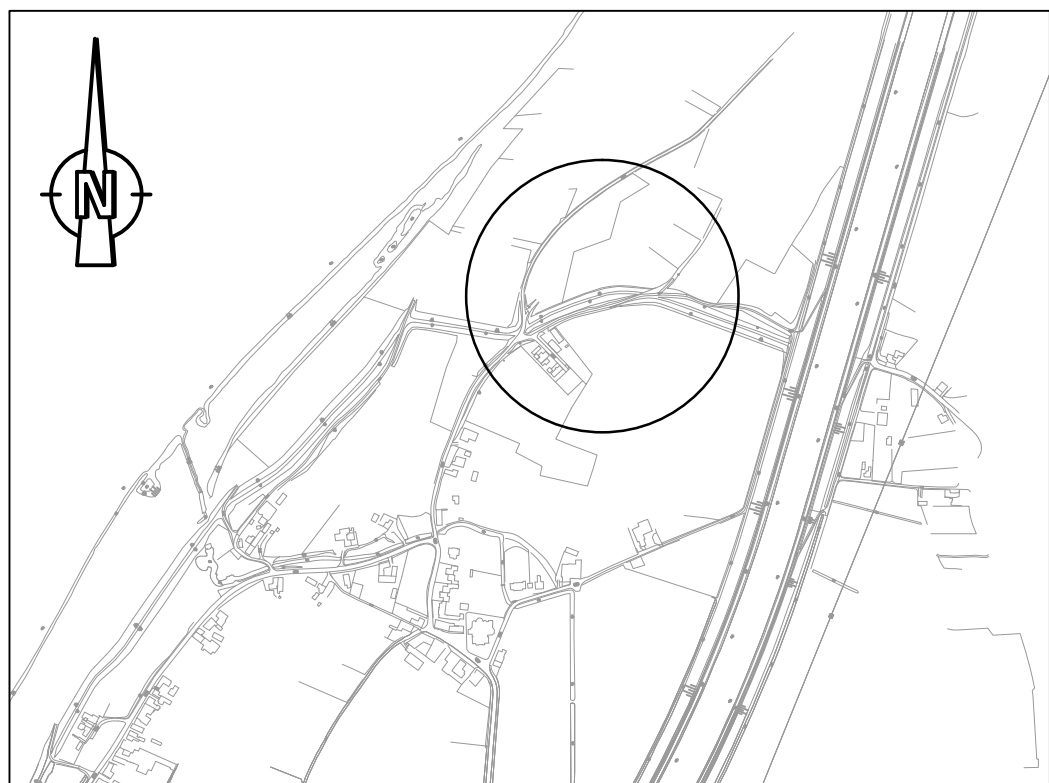
| MAAIVELDHOOGTEN IN METERS NIEUWE SITUATIE | 42.80 | 41.50 | 41.20 | 40.73 |
|--|--------|--------|--------|--------|
| AFSTAND UIT AS IN METERS NIEUWE SITUATIE | 0.80 | 2.03 | 5.90 | 11.90 |
| MAAIVELDHOOGTEN IN METERS HUIDIGE SITUATIE | -29.00 | -28.00 | -27.00 | -26.00 |
| AFSTAND UIT AS IN METERS HUIDIGE SITUATIE | -29.00 | -28.00 | -27.00 | -26.00 |

50.320.10 DP 1: KRUINVERBREIDING I.V.M. UITBREIDBAARHEIDSPROFIEL
schaal 1:200



| MAAIVELDHOOGTEN IN METERS NIEUWE SITUATIE | 41.47 | 41.20 | 40.87 |
|--|--------|--------|--------|
| AFSTAND UIT AS IN METERS NIEUWE SITUATIE | 7.08 | 12.41 | 19.39 |
| MAAIVELDHOOGTEN IN METERS HUIDIGE SITUATIE | -29.00 | -28.00 | -27.00 |
| AFSTAND UIT AS IN METERS HUIDIGE SITUATIE | -29.00 | -28.00 | -27.00 |

50.320.10 DP 2: AANBRENGEN BERM
schaal 1:200



LOCATIE DIJKVAK 50.320.10
SCHAAL 1:10000

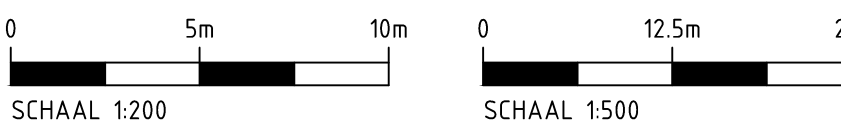
LEGENDA:

- DWARSPROFIEL:
- ONTWERPPROFIEL
 - AANLEGPROFIEL
 - UITBREIDBAARHEIDSPROFIEL 2050
 - GEBIEDSEIGEN KLEI OF LEEM
 - KLEI CAT. 1
 - KLEI CAT. 2
 - ONDERHOUDSPAD HYDRAULISCH GEBONDEN MENGGRANULAAT

- BOVENAANZICHT:
- TE VERWIJDEREN BOOM (LOCATIE INDICATIEF WEERGEGEVEN)
 - ONDERHOUDSPAD HYDRAULISCH GEBONDEN MENGGRANULAAT
 - EIGENDOMSGRENS WRO
 - AANBRENGEN AFRASTERING

OPMERKINGEN:

- HOOGTEMATEN IN METERS TEN OPZICHT VAN NAP
- DIJKVAK AFGEKEURD OP STBI

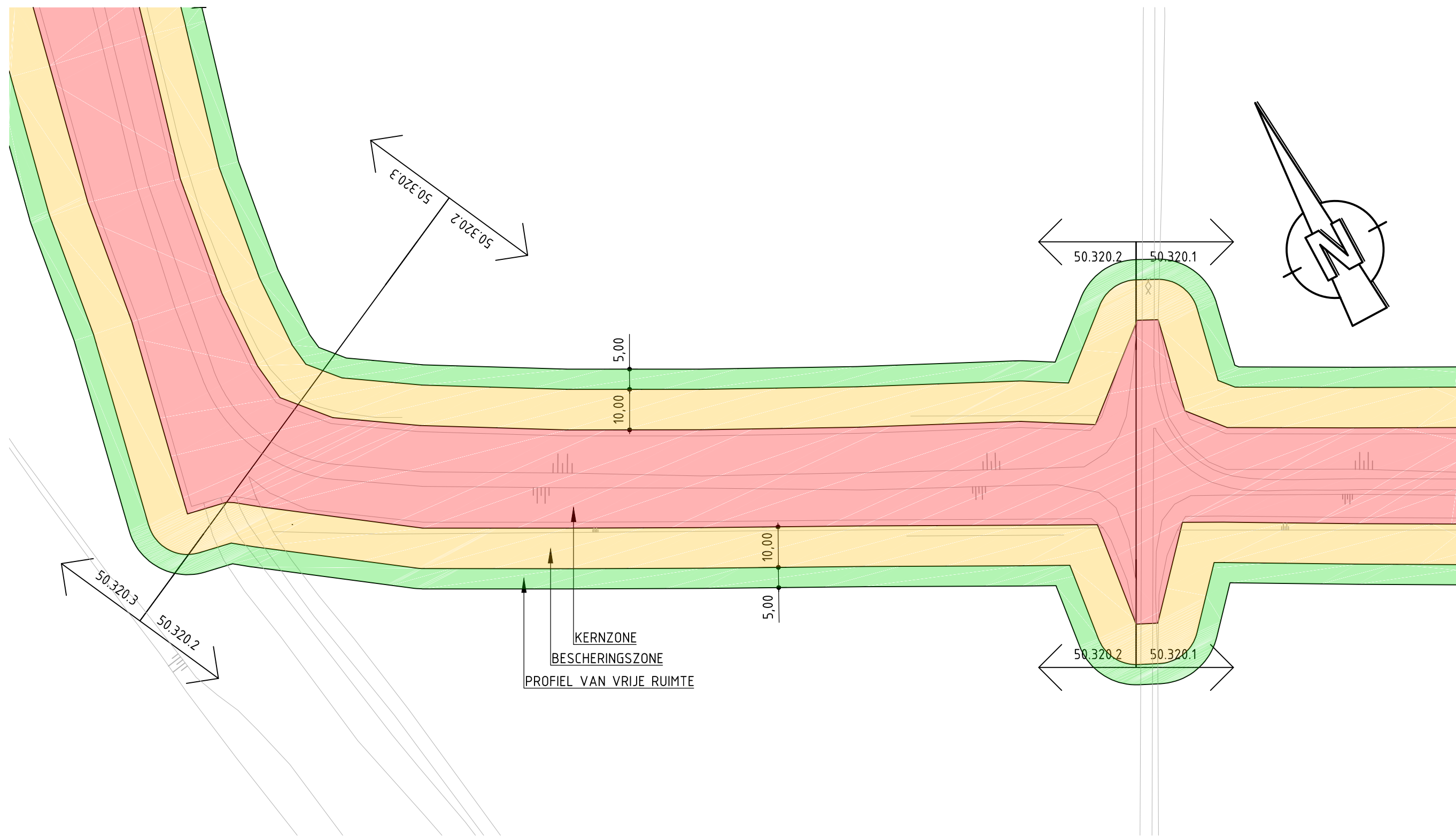


WATERSCHAP ROER EN OVERMAAS AANVULLING SLUITSTUKKADEN MAAS

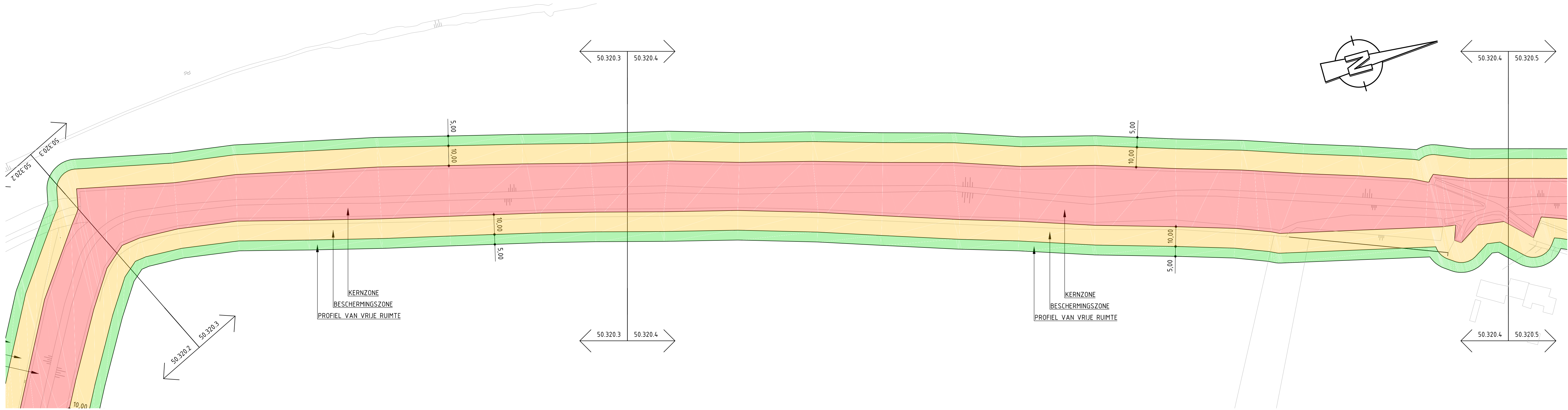
Definitief Ontwerp
Geulle aan de Maas
Dijkvak 50.320.10

| | | | | | |
|-----------|----|---------------|-----------------|---------|-------------|
| Witteveen | Bo | Getekend | ing. L. de Gier | Schaal | 1:200 1:500 |
| | | Gecontroleerd | ir. J. Lansink | | |
| | | Goedgekeurd | ir. S.T. Pwa | | |
| | | Datum | 31-10-2013 | Formaat | A1 |

BIJLAGE XV TEKENING LEGGERZONERING



DIJKVAK 50.320.2
SCHAAL 1:1000



DIJKVAKKEN 50.320.3 EN 4
SCHAAL 1:1000



DIJKVAKKEN 50.320.5 EN 6
SCHAAL 1:1000



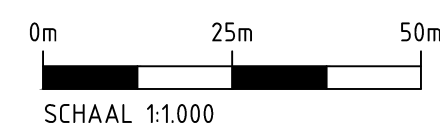
DIJKVAKKEN 50.320.9 EN 10
SCHAAL 1:1000

LEGENDA:

- KERNZONE
- BESCHERMINGSZONE
- PROFIEL VAN VRIJE RUIMTE

OPMERKINGEN:

MATEN IN METERS

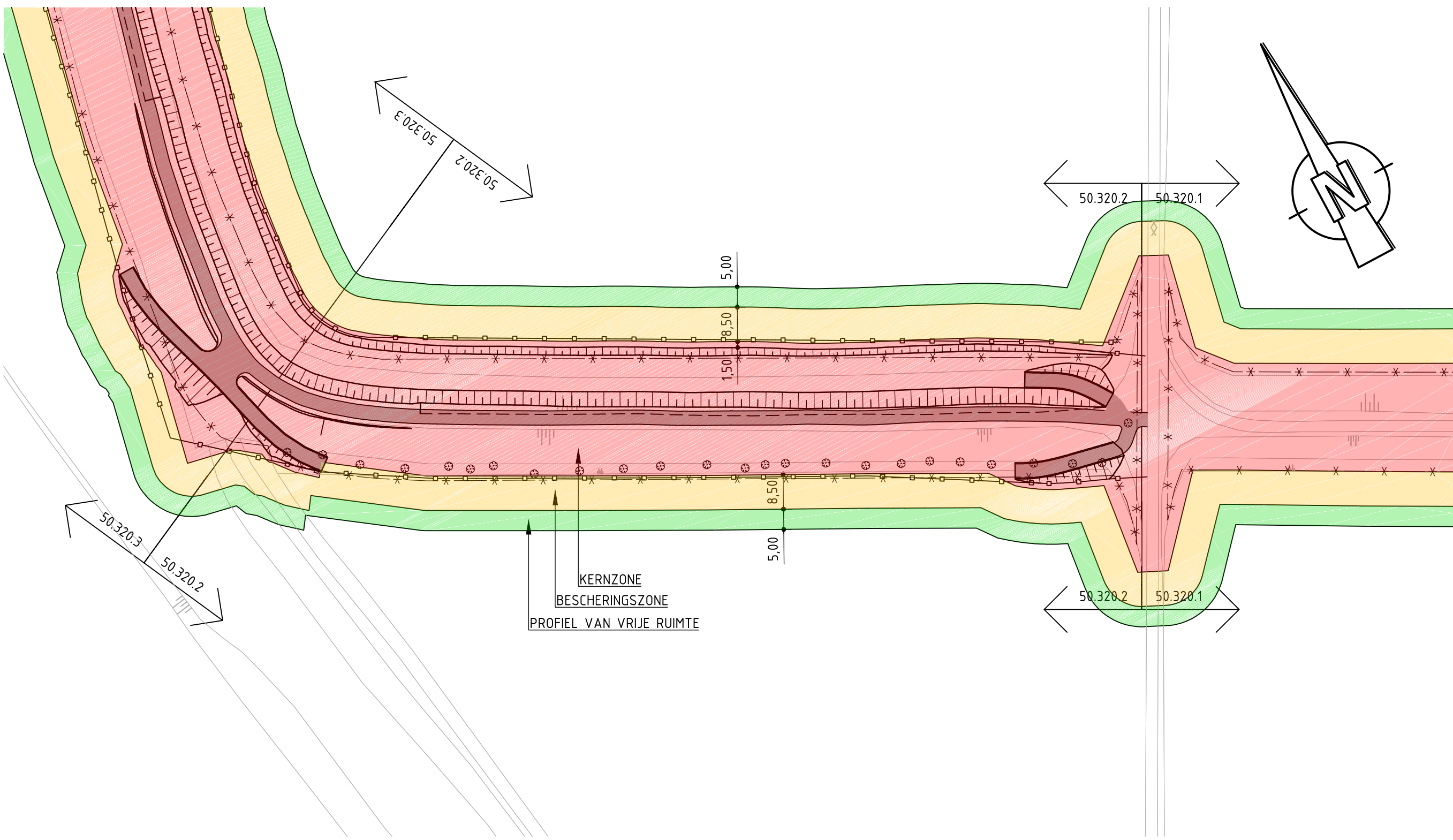


SCHAAL 1:1000

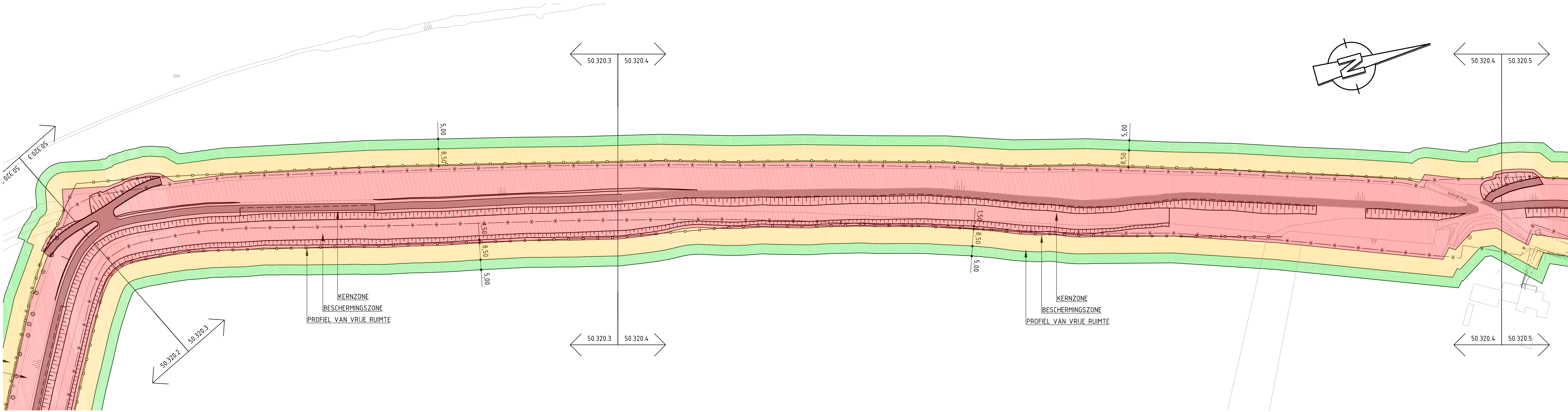
WATERSCHAP ROER EN OVERMAAS
AANVULLING SLUITSTUKKADEN MAAS

Dijkkring 88: Geulle aan de Maas
Definitief ontwerp
Zonering legger: huidige situatie

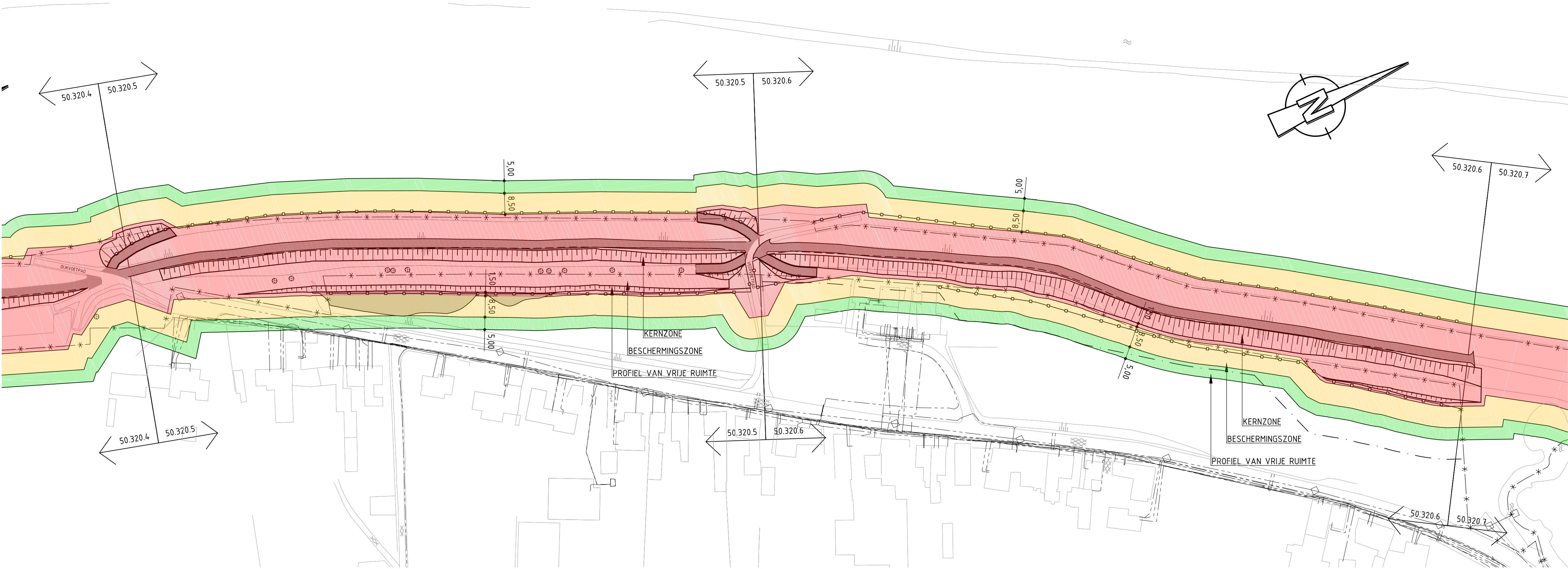
| | | | |
|-----------------|---|--|---|
| Witteveen
Bo | Gerekeerd
2400 AK, Overmaas
Telefoon 0578 69 10 11
Telefax 0578 69 10 44 | Gerekeerd
Ing. A.R. Eikelboom
Gecontroleerd
Ing. E. Kaspers
Goedgekeurd
Ing. S.T. Piva
Datum
31-10-2013 | Schale
1:1000
STD88-2-2021
Formaat
A0 |
| | | | |



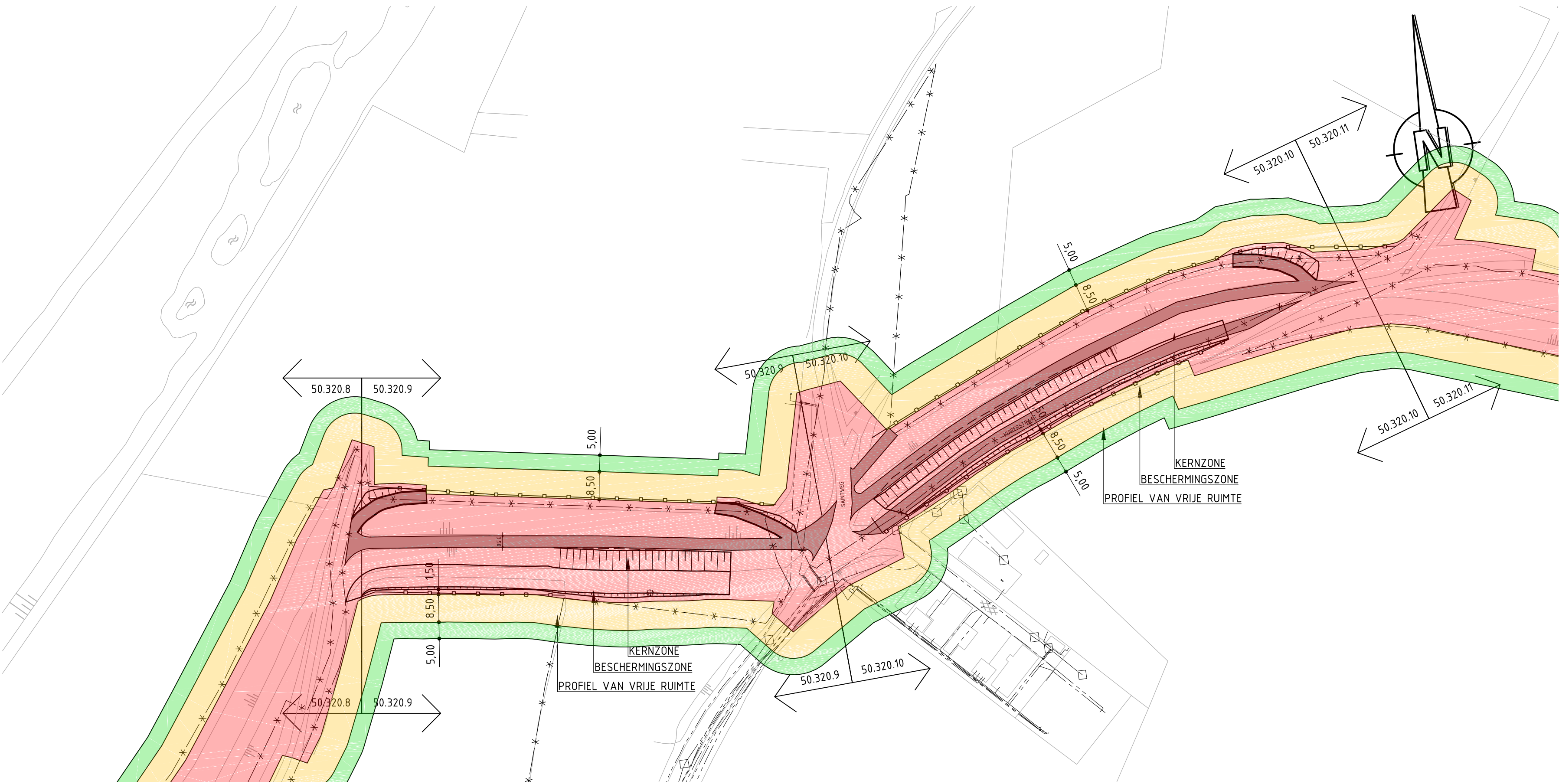
DIJKVAK 50.320.2
SCHAAL 1:1000



DIJKVAKKEN 50.320.3 EN 4
SCHAAL 1:1000



DIJKVAKKEN 50.320.5 EN 6
SCHAAL 1:1000



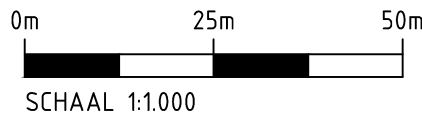
DIJKVAKKEN 50.320.9 EN 10
SCHAAL 1:1000

LEGENDA:

- KERNZONE
- BESCHERMINGSZONE
- PROFIEL VAN VRIJE RUIMTE

OPMERKINGEN:

MATEN IN METERS



SCHAAL 1:1000

WATERSCHAP ROER EN OVERMAAS
AANVULLING SLUITSTUKKADEN MAAS

Dijkkring 88: Geulle aan de Maas
Definitief ontwerp
Zonering legger: nieuwe situatie

| | | | |
|---|--|---|--|
| Witteveen
Bo
Postbus 233
7420 MK, Deventer
Telefoon 0570 69 10 11
Telefax 0570 69 12 44 | Getekend
Gecorrigeerd
Goedgekeurd
Datum | Ing. A.R. Eikelboom
P. E. Kaspers
P. S.T. Pwa
31-10-2013 | Schaal
1:1000
STD88-2-2022
Formaat
A0 |
| | | | |
| | | | |
| | | | |

BIJLAGE XVI TEKENINGEN PERCEELGRENZEN / GRONDVERWERVING

