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Notitie

1 Inleiding

Door CRUX Engineering is in 2017, in opdracht van toen Gemeente Werkendam, grond- en laboratoriumonderzoek uitgevoerd en een advies uitgebracht naar het bouwrijp maken van het terrein "de Lange Wiep" te Werkendam. De resultaten zijn in RA17513a3 [1] gepresenteerd.

In deze notitie wordt een optimalisatie van de voorbelasting gepresenteerd voor het plangebied fase 1. Deze wordt gedaan aan de hand van de nu beschikbare DO tekeningen en rekening houdend dat voor de ophoging wordt gedeeltelijk gebiedseigen grond gebruikt in plaats van ophoogzand.



Figuur 1 Schetsontwerp fase 1 [4]

Onderwerp

Optimalisatie voorbelasting
Lange Wiep

Projectnummer

20548

Ons kenmerk

NL20548a2

Versie

2

Datum

26 februari 2021

Pagina's

13

Opgesteld

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Bijlagen

Bijlage 1 Kaart
grondonderzoek en
gebieden
Bijlage 2 Metingen
stijghoogte
Bijlage 3 Report D-
Settlement

Formulier

RA-03-v19.1113

2 Uitgangspunten

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2.1 Documenten

Ons kenmerk
NT20548a2

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- [1] CRUX Engineering, Lange Wiep te Werkendam: Advies bouwrijp maken, RA17513a3, 12-04-2018
- [2] ADCIM, Lange Wiep te Werkendam: Situatie te maken werk met schetsontwerp riolering en stedenbouwkundig plan, concept tekening n. C39, 18-11-2020
- [3] ADCIM, Lange Wiep te Werkendam: Situatie te maken. Profiel t.b.v. geotechnisch advies, concept tekening n. C41, 18-11-2020
- [4] SAB, Achter de Schans Werkendam: Model 1b, aangepaste versie 3-12-2020
- [5] Grondslag B.V., Historisch vooronderzoek en aanvullend bodemonderzoek PFOS/PFOA. Project waterkeringen Brabantse Biesbosch, versie 2, 14-11-2019

CRUX staat niet in voor de juistheid en/of volledigheid van de door derden verstrekte informatie en gegevens.

2.2 Programmatuur

Voor de zettingsberekeningen is het programma DSettlement 20.1 (Build 1.29740) gebruikt.

2.3 Grondopbouw en grondparameters

In het algemeen onder de toplaag bevindt zich een laag mineraalarm veen gevolgd door een laag houthoudend veen tot een diepte van maximaal NAP-6,0m. Dit is de maximale diepte die is onderzocht met de boringen. Daarna is klei siltig en klei humeus tot aan de bovenkant van het Pleistocene zand aanwezig, die tussen NAP-8m en NAP-11m ligt. Rond NAP-8,5m is bij de meeste sonderingen een dunne laag basisveen aangetroffen.

Bij sonderingen D8 en D10 is een dikke tussenzandlaag aangetroffen. Bij sonderingen D2 en D15 is geen veen aangetroffen; in plaats daarvan is er klei en kleilig zand aanwezig. Op deze locaties worden minder zettingen verwacht. Bij sonderingen D18 en D29 is een dunne tussenzandlaag aangetroffen. Deze zal een beperkt effect op de zettingen hebben.

In eerdere zettingsberekeningen zijn twee representatieve grondopbouwen doorgerekend, één gemiddeld en één maatgevend, om de bandbreedte van de resultaten in kaart te brengen. Voor de gemiddelde grondopbouw is sondering D7 gebruikt, voor de maatgevende sondering D23.

De omvang van fase 1, die in deze notitie wordt beschouwd, is kleiner dan het gebied die in eerdere rapportage is beschouwd. Sonderingen D1 t/m D8 vallen buiten het gebied van fase 1 en zijn dus minder relevant.

Vanwege de variaties binnen de projectlocatie betreffende de bovenkant van het Pleistocene zand en de aanwezigheid van een tussenzandlaag, zijn drie gebieden gedefinieerd ten behoeve van de installatiediepte van de drains. In gebied 1 is de installatiediepte NAP-9,5m, in gebied 2 is de installatiediepte NAP-7,5m, in gebied 3 NAP-5,5m. De gebieden zijn Bijlage 1 weergegeven.

Sondering D19 is als representatief voor gebied 1 geselecteerd, sondering 17 voor gebied 2 en sondering D10 voor gebied 3. De grondopbouw bij sondering D19 is vergelijkbaar met de grondopbouw bij D23 – gekozen als maatgevend in

het eerdere rapport - behalve dat het Pleistocene zand en de basisveen dieper liggen: D19 is daarom maatgevend t.o.v. D23.

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Tabel 1 Representatieve grondopbouw gebied 1, sondering D19

Grondlaag	Bovenkant [NAP+...m]	Onderkant [NAP+...m]
Toplaag, uitgedroogd	-0,9	-1,7
Veen 1	-1,7	-2,9
Veen, houthoudend	-2,9	-6,0
Klei	-6,0	-7,2
Klei, humeus	-7,2	-8,5
Veen 2	-8,5	-9,0
Klei	-9,0	-9,8
Klei, zandig	-9,8	-10,9
Zand	-10,9	-16,0

Tabel 2 Representatieve grondopbouw gebied 2, sondering D17

Grondlaag	Bovenkant [NAP+...m]	Onderkant [NAP+...m]
Toplaag, uitgedroogd	-0,8	-1,5
Veen 1	-1,5	-2,5
Veen, houthoudend	-2,5	-4,1
Klei, humeus	-4,1	-5,0
Veen, houthoudend	-5,0	-5,5
Klei	-5,5	-6,8
Klei, humeus	-6,8	-7,4
Veen 2	-7,4	-7,6
Klei, zandig	-7,6	-8,6
Zand	-8,6	-16,0

Tabel 3 Representatieve grondopbouw gebied 3, sondering D10

Grondlaag	Bovenkant [NAP+...m]	Onderkant [NAP+...m]
Toplaag, uitgedroogd	-0,8	-1,7
Veen 1	-1,7	-3,0
Veen, houthoudend	-3,0	-3,4
Klei, humeus	-3,4	-4,0
Klei	-4,0	-5,0
Klei, zandig	-5,0	-6,5
(Tussen)zand	-6,5	-8,5
Klei	-8,5	-9,2
Veen 2	-9,2	-9,5
Klei, humeus	-9,5	-10,7
Klei, zandig	-10,7	-11,4
Zand	-11,4	-16,0

In het eerdere advies [1] zijn de NEN Bjerrum parameters uit de resultaten van het laboratoriumonderzoek afgeleid. Dezelfde parameters worden hier gebruikt en worden in Tabel 4 weergegeven.

Tabel 4 Grondparameters zettingsberekeningen

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Grondlaag	qc [MPa]	γ [kN/m ³]	γ_{sat} [kN/m ³]	RR [-]	CR [-]	C α [-]	c _v [m ² /s]	POP [kPa]
Top klei, uitgedroogd	1,0	15,0	15,0	0,0175	0,1127	0,0049	gedraineerd	15
Veen 1	0,15	10,6	10,6	0,0996	0,5140	0,0211	1,06E-7	15
Veen, houthoudend	0,3	11,2	11,2	0,0564	0,3660	0,0165	3,87E-08	15
Klei	0,3	17,0	17,0	0,0219	0,1533	0,0061	1,00E-8	15
Veen 2	0,4	12,0	12,0	0,0613	0,3067	0,0153	1,00E-7	15
klei humeus	0,3	15,0	15,0	0,0383	0,23	0,0115	1,00E-8	15
klei zandig	1,0	18,0	18,0	0,0184	0,0920	0,0037	gedraineerd	15

2.4 Grondwaterstand

De projectlocatie bevindt zich binnen het peilgebied LHA200 van Waterschap Rivierenland. Het hoogste polderpeil (zomer) is NAP-1,60m en het laagste polderpeil (winter) is NAP-1,90m. Het hoogste peil is in dit geval maatgevend.

Uit gegevens van Dinoloket is de gemiddelde stijghoogte in het Pleistocene zand (onder NAP-11m) rond de NAP-0,05m. De gegevens zijn in Bijlage 2 weergegeven.

2.5 Ontwerp

2.5.1 Eisen

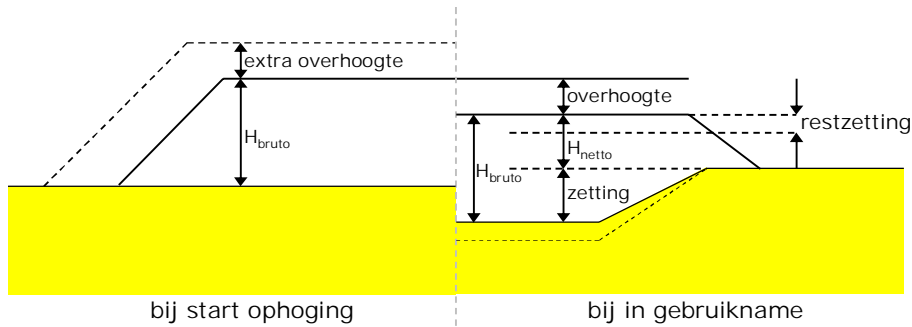
Als uitgangspunt is een restzettingseis van 10cm in 30 jaar aangenomen, zowel bij de kavels als bij de weg.

Er is uitgegaan van een duur van de voorbelasting van 6 maanden.

2.5.2 Versnellingsmaatregelen

Om aan de restzettingseis te voldoen worden de zettingen gedurende een periode van 6 maanden geforceerd met de toepassing van een extra overhoogte (EOH) in combinatie met verticale drains. Uit de eerste rapportage kwam dat aan de zettingseis kon worden voldaan wanneer de verticale drains in combinatie met extra overhoogte werden toegepast. Daarom is in deze notitie alleen de optie met verticale drains verkend.

Bij de kavels wordt de EOH op de bruto ophoging aangebracht; wanneer voldoende zetting is opgetreden om aan de restzettingseis te voldoen kan de extra overhoogte verwijderd worden, terwijl de bruto ophoging (netto ophoging + zettingscompensatie) blijft. De definities zijn in Figuur 2 geïllustreerd.



Figuur 2 Verklaring definities ophoging

Bij de weg wordt de aangebrachte voorbelasting grotendeels weer verwijderd, met uitzondering van het deel dat onder de toekomstige weg is gezakt. Daarna wordt een cunet ontgraven om het riool aan te leggen en tenslotte wordt de wegconstructie aangebracht.

Voor de verticale drains worden de volgende uitgangspunten gehanteerd in de berekeningen:

- h.o.h. afstand strip is 1,0 m in driehoekverband,
- stripbreedte is 0,1m,
- stripdikte is 0,003m.

Vanwege de afwisselende grondopbouw, met variaties betreffend zowel de bovenkant van de Pleistocene zand als de aanwezigheid van een tussenzandlaag, zijn drie gebieden gedefinieerd met verschillende installatiediepte van de drains (zie ook de kaart in Bijlage 1):

- gebied 1: onderkant drains op NAP-9,5m,
- gebied 2: onderkant drains op NAP-7,5m,
- gebied 3: onderkant drains op NAP-5,5m.

2.5.3 Ophoging kavels

Het huidige maaiveld ligt tussen NAP-0,80m en NAP-0,90m. In de berekeningen wordt gehanteerd $m_v = \text{NAP}-0,85\text{m}$. De kavels worden opgehoogd tot NAP-0,2m.

De bruto ophoging, of een deel daarvan, wordt met grond uitgevoerd die in de nabijheid van de projectlocatie is uitgegraven. Op de herkomstlocatie, nabij Dijkgraaf den Dekkerweg te Werkendam, bestaat de bodem vanaf maaiveld tot een diepte van 1,2 m- m_v uit wisselende lagen klei en zand [5]. Door deze wisselende opbouw wordt verwacht dat het niet mogelijk is om de verschillende typen grond gescheiden te ontgraven [5]. Er wordt dus vanuit gegaan dat de grond wordt gemengd tot zandige klei, wat een geschikt en werkbaar materiaal is voor de ophoging. Het wordt aangenomen dat het materiaal niet of nauwelijks wordt verdicht. Als representatieve waarde voor het volume gewicht wordt een veilige waarde van $\gamma_{\text{unsat}} = \gamma_{\text{sat}} = 18,0\text{kN/m}^3$ aangenomen.

De extra overhoogte wordt met zand uitgevoerd. Ook deze wordt niet of nauwelijks verdicht. Als representatieve (lage) waarde voor het volume gewicht wordt aangenomen $\gamma_{\text{unsat}} = 16,0\text{kN/m}^3$, $\gamma_{\text{sat}} = 18,0\text{kN/m}^3$.

2.5.4 Weg

Op de weg wordt eerst een extra overhoogte aangebracht die nadat de gewenste zettingen zijn opgetreden volledig wordt verwijderd om het riool en wegconstructie aan te brengen.

Het wordt aangenomen dat de EOH volledig uit zand bestaat. Als de EOH gedeeltelijk met grond (zwaarder dan zand) zou worden uitgevoerd zullen de restzettingen kleiner worden. Wanneer lichtere grond wordt toegepast moet een dikkere laag worden aangebracht.

De geometrie van de rioolsleuf wordt gehanteerd overeenkomstig tekening [3]: talud 2:1; onderkant zandaanvulling = BOB-0,40. Aanvankelijk zijn twee grenssituaties in de berekeningen gehanteerd:

- BOB min= NAP-1,95m,
- BOB max= NAP-3,81m (NAP-2,70 in gebied 2).

Daarna zijn in overleg met de aannemer twee aanvullende situaties doorgerekend om de overgang tussen de benodigde zettingsversnellende maatregelen te kunnen bepalen:

- BOB = NAP-2,88m in gebied 1,
- BOB = NAP-2,23m in gebied 3.

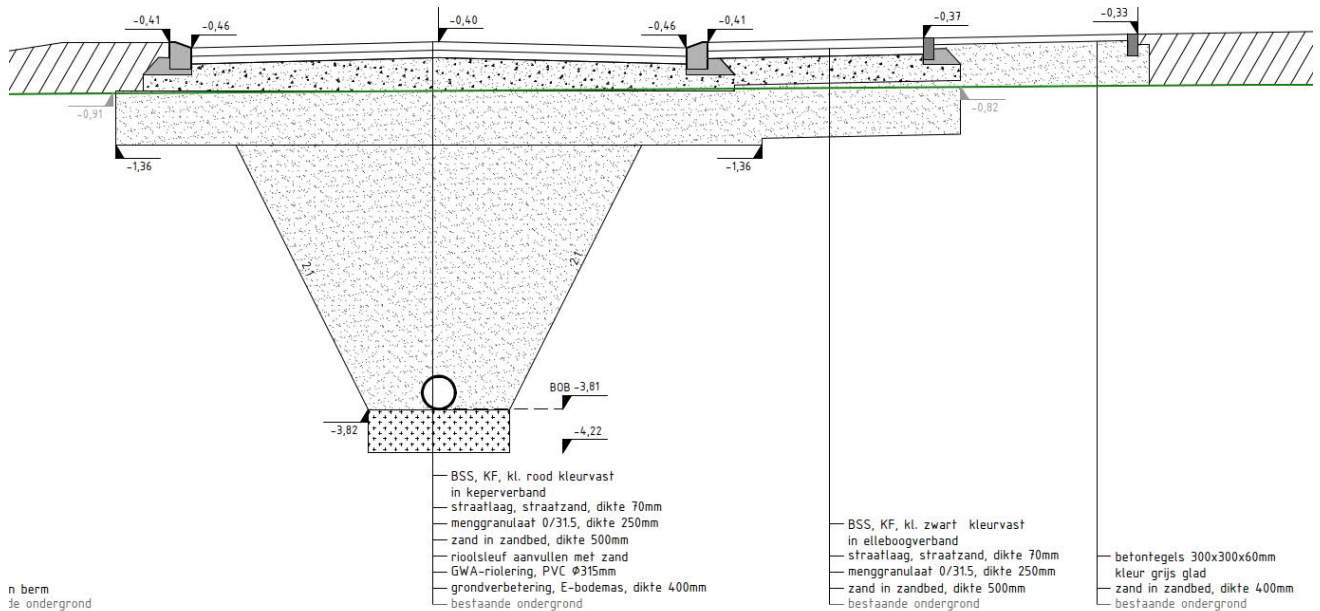
De sleuf wordt met zand aangevuld die verdicht moet worden om zettingen tijdens de levensduur te voorkomen. Het gewicht van het verdichte zand is $\gamma_{\text{unsat}} = 18,0 \text{ kN/m}^3$, $\gamma_{\text{sat}} = 20,0 \text{ kN/m}^3$. Daarboven wordt de weg aangebracht.

De opbouw van de wegconstructie is in Tabel 5 weergegeven. Materialen en diktes zijn overeenkomstig tekening [3] (zie ook Figuur 3). Ontwerphoogte is NAP-0,4m. Voor de soortelijke gewichten zijn bruikbare waarden aangenomen. In de laatste rij is het gewogen gemiddelde van het volume gewicht weergegeven die in de zettingsberekeningen wordt gebruikt.

Het zandbed (0,50m) bevindt zich volledig onder het huidige maaiveld. Het wordt aangeraden het zandbed na het voorbelasten aan te brengen: EOH ontgraven tot onderkant zandbed, daarna zand voor zandbed in lagen aanbrengen en verdichten.

Tabel 5 Opbouw wegconstructie

	Materiaal	Dikte [mm]	Volume gewicht [kN/m ³]
1	Betonstraatsteen	80	22,0
2	Straatzand	70	18,0
3	Menggranulaat	250	21,0
	Wegconstructie (1+2+3)	450	20,7
4	Zand in zandbed	500	18,0/20,0



Figuur 3 Doorsnede weg [3]

3 Berekeningen

3.1 Resultaten

Een overzicht van de belastingen die in de berekeningen zijn toegepast is in Figuur 4 weergegeven:

- bij de kavels worden de eerste 50 cm met grond opgehoogd;
- de rest van de bruto ophoging wordt met zand gedaan;
- daarop word de extra overhoogte (zand) aangebracht;
- de weg wordt volledig met zand voorbelast;
- na 180 dagen wordt de extra overhoogte verwijderd;
- de rioolsleuf en het zandbed worden gegraven en gevuld met verdicht zand; daarna wordt het resterende deel van de wegfundering (menggranulaat en betonstenen) aangebracht.

Er is uitgegaan van een duur van de voorbelastingfase van 6 maanden. De duur van de ophogingsfase is genegeerd.

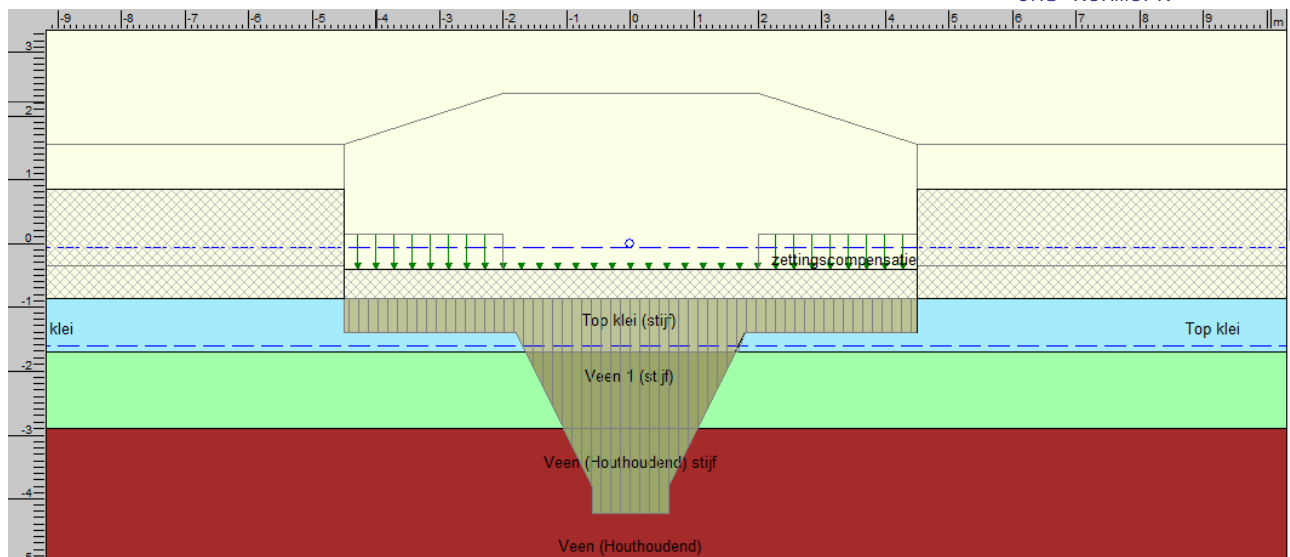
Een controleberekening is uitgevoerd met een asymmetrische belasting die representatief is voor de wegen aan de rand van de projectlocatie (Figuur 5). De helling van de voorbelasting is 1:3. Het wordt ook met deze geometrie aan de zettingseis voldaan.

De resultaten zijn in Tabel 6 en Tabel 8 samengevat. Voor gebied 1 en 2 zijn de resultaten bij de kavels weergegeven en de resultaten bij de weg voor de maximale en de minimale diepte van het riool. Voor gebied 3 is een berekening bij de kavels uitgevoerd waar wordt aangetoond dat aan de eisen wordt voldaan met het ontwerp van gebied 1. Voor zowel de kavels als de weg wordt dus in gebied 3 hetzelfde ontwerp gehanteerd dan in gebied 1. Het wordt opgemerkt dat de verwachte zettingen in gebied 3 kleiner zijn; het wordt dus tot dezelfde niveau voorbelast als in gebied 1 maar de dikte van de benodigde extra overhoogte (grond die wordt hergebruikt) is groter. Dit komt door de samendrukbare lagen onder de tussenzandlaag die langzamer consolideren

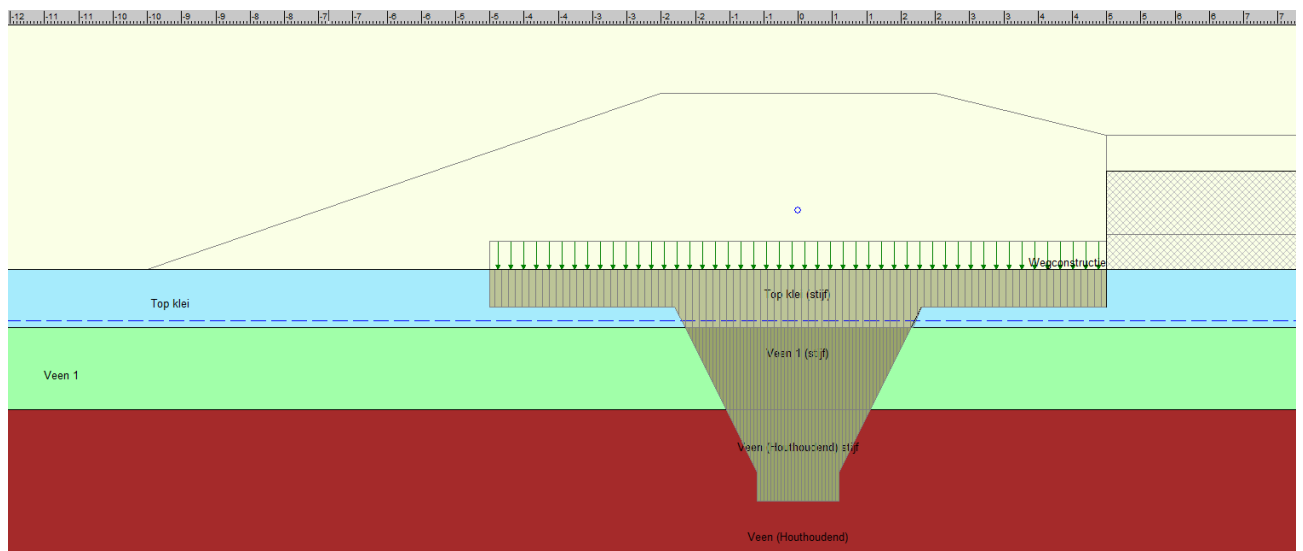
wegens de afwezigheid van verticale drainage (de verticale drainage moet boven de tussenzandlaag blijven).

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Figuur 4 Belastingen ter plaatse van de weg en de kavels



Figuur 5 Asymmetrisch belasting

Het niveau van de minimale benodigde extra overhoogte bij de weg kan hoger of lager zijn dan de EOH bij de kavels, afhankelijk van de diepte van de rioolbuis. De EOH die in de tabel wordt aangegeven is over een breedte van 4 m in de berekeningen toegepast (zie Figuur 4 en Figuur 6).

In de kolom "zettingen" van Tabel 8 worden voor de berekeningen bij de kavels de zettingen na 30 jaar weergegeven. Voor de berekeningen ter plaatse van de weg worden de zettingen na 6 maanden voorbelasten weergegeven en wordt als zettingscompensatie het deel van de EOH bedoeld dat tijdens het voorbelasten beneden de onderkant van het zandbed zakt en dus niet uit het veld wordt ontgraven. Als de verwachte zetting ten gevolge van het voorbelasten kleiner is dan de dikte van het zandbed ($<0,50\text{m}$) is de zettingscompensatie nul beschouwd.

Tabel 6 Samenvatting resultaten: niveaus aan te brengen materiaal

Gebied (zie Bijlage 1)	Sond.	o.k. VD [NAP+m]	Locatie	BOB riool [NAP+m]	Maaiveld [NAP+m]	Ontwerp- hoogte [NAP+m]	Rest- zetting [m]
1	D19	-9,5	kavel	-	-0,85	-0,20	0,085
1	D19	-9,5	weg	-3,81	-0,85	-0,40	0,093
1	D19	-9,5	weg	-1,95	-0,85	-0,40	0,089
2	D17	-7,5	kavel	-	-0,85	-0,20	0,094
2	D17	-7,5	weg	-2,70	-0,85	-0,40	0,090
2	D17	-7,5	weg	-1,95	-0,85	-0,40	0,092
3	D10	-5,5	kavel	-	-0,85	-0,20	0,074

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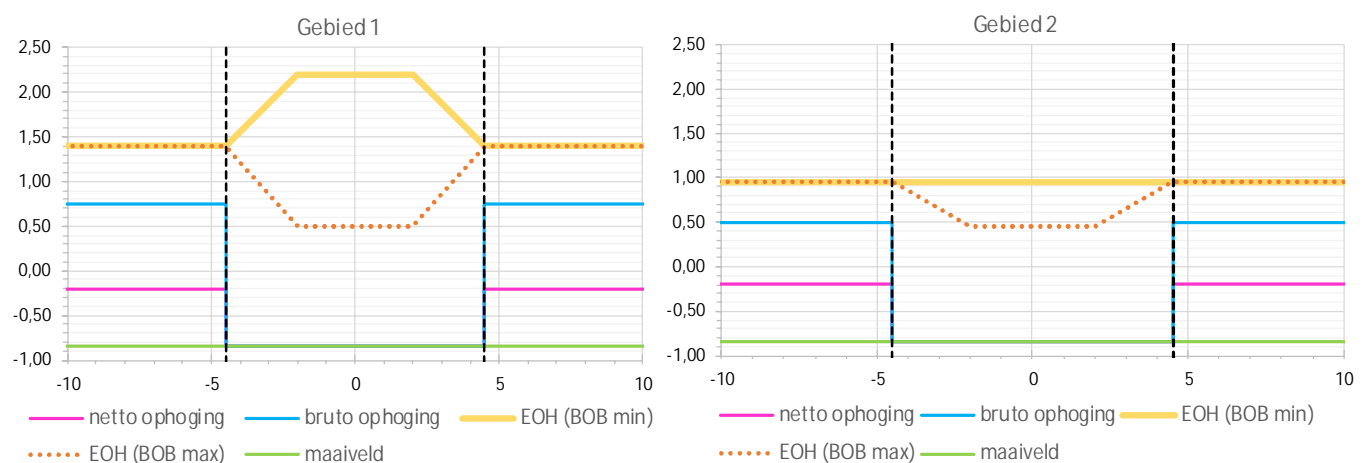
Tabel 7 Samenvatting resultaten: diktes aan te brengen materiaal

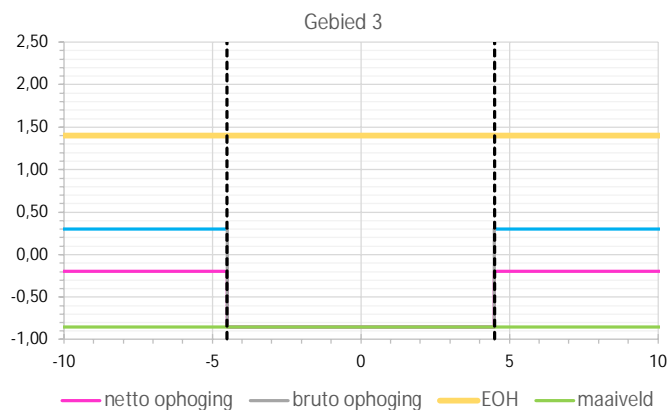
Gebied	Sond.	Locatie	BOB riool [NAP+m]	Maaiveld [NAP+m]	Ontwerp- hoogte [NAP+m]	Netto ophoging [m]	Zettings- compensatie [m]	Bruto ophoging [m]	EOH [m]	Totaal [m]
1	D19	kavel	-	-0,85	-0,2	0,65	0,95	1,60*	0,65	<u>2,25</u>
1	D19	weg	-3,81	-0,85	-0,4	0,45	0,98	1,43	1,62	<u>3,05</u>
1	D19	weg	-1,95	-0,85	-0,4	0,45	0,62	1,07	0,28	<u>1,35**</u>
2	D17	kavel	-	-0,85	-0,2	0,65	0,70	1,35*	0,45	<u>1,80</u>
2	D17	weg	-2,70	-0,85	-0,4	0,45	0,60	1,05	1,80	<u>2,85</u>
2	D17	weg	-1,95	-0,85	-0,4	0,45	0,53	0,98	0,32	<u>1,30**</u>
3	D10	kavel	-	-0,85	-0,2	0,65	0,50	1,15*	1,10	<u>2,25</u>

*waarvan 50 cm gebiedseigen grond

** ophoging loopt af tussen kavel en rand cunet

Tabel 8 Samenvatting resultaten: diktes aan te brengen materiaal





Figuur 6 Grafische weergave resultaten

3.2 Resultaten aanvullende doorsneden (weg)

De resultaten van de twee aanvullende doorsneden zijn in Tabel 9 en Tabel 10 weergegeven. In Tabel 11 is een inschatting van de EOH weergegeven op basis van sondering D19 en directe evenredigheid tussen EOH en diepte van het riool.

De aanvullende sommen bevestigen dat in gebied 1 de benodigde EOH ongeveer recht evenredig is aan de diepteligging van het riool (0,88m EOH per ieder meter diepte van het riool t.o.v. het nieuwe maaiveld). In gebied 3 is meer EOH nodig dan in gebied 1 (per meter diepte van het riool). Dit is trouwens ook in de berekening bij de kavels het geval.

Tabel 9 Resultaten aanvullende doorsneden: niveaus aan te brengen materiaal

Gebied (zie Bijlage 1)	Sond.	o.k. VD [NAP+m]	Locatie	BOB riool [NAP+m]	Maaiveld [NAP+m]	Netto ophoging [NAP+m]	Bruto ophoging [NAP+m]	EOH [NAP+m]	Rest- zetting [m]
1	D19	-9,5	weg	-2,88	-0,85	-0,85	-0,85	<u>1,40</u>	0,074
3	D10	-5,5	weg	-2,23	-0,85	-0,85	-0,85	<u>1,40</u>	0,089

Tabel 10 Resultaten aanvullende doorsneden: diktes aan te brengen materiaal

Gebied	Sond.	Locatie	BOB riool [NAP+m]	Maaiveld [NAP+m]	Ontwerp- hoogte [NAP+m]	Netto ophoging [m]	Zettings- compensatie [m]	Bruto ophoging [m]	EOH [m]	Totaal [m]
1	D19	weg	-2,88	-0,85	-0,4	0,45	0,87	1,32	0,93	<u>2,25</u>
3	D10	weg	-2,23	-0,85	-0,4	0,45	0,37	0,82	1,43	<u>2,25</u>

Gebied	Sond.	BOB max		BOB min		BOB, aanvullend		ns kenmerk
		BOB [NAP+m]	EOH [m]	BOB [NAP+m]	EOH [m]	BOB [NAP+m]	EOH [m], inschatting	
1	D19	-3,81	3,05	-1,95	1,35	-2,88	2,15	T20548a2
3	D19	-3,81	3,05	-1,95	1,35	-2,23	1,61	agi na /13

4 Monitoring

Het doel van de monitoring tijdens de uitvoering is om te controleren of de mate en snelheid van het zettingsproces overeen komen met de verwachtingen. Daarmee kan worden vastgesteld of de voorgestelde duurt van de voorbelasting, 6 maanden in dit geval, voldoende is. Zo nee kunnen maatregelen worden getroffen om de zettingen te versnellen en/of te reduceren.

Voor het monitoren van de zettingen moeten zakbaken worden aangebracht met een onderling afstand van 50m. Bij de weg moeten de zakbaken langs de as worden geplaatst.

De volgende meetfrequentie dient aangehouden te worden.

- 1 voor start werkzaamheden (nulmeting), meting d.m.v. Total Station/ waterpassing.
- Tijdens aanbrengen ophoging 1x per week, meting d.m.v. GPS.
- Hierna afbouwen naar 1x per 2 weken tot aan het eind van de voorbelasting periode, meting d.m.v. GPS.
- Na 3-4 maanden en na 6 maanden, t.b.v. een tussentijdse fit, meting d.m.v. Total Station/ waterpassing.

De volgende items dienen bij de monitoring per zakbaak geregistreerd te worden op het meetformulier.

- Nulmeting:
 - Datum en tijd.
 - Lengte van de zakbaak.
 - X,y coördinaten (t.o.v. RD-stelsel) en hoogteligging (t.o.v. NAP) van origineel maaiveld ter plaatse van zakbaak
 - X,y coördinaten (t.o.v. RD-stelsel) en hoogteligging (t.o.v. NAP) van de voetplaat van de zakbaak.
- Overige metingen:
 - Datum en tijd.
 - X,y coördinaten (t.o.v. RD-stelsel) van zakbaak.
 - Bovenzijde ophoging ten opzichte van NAP.
 - Bovenzijde zakbaak ten opzichte van NAP.
 - Lengte zakbaak en eventuele verlening.
 - Opmerkingen over scheefstand of andere zettingsbeïnvloedende effecten in de nabije omgeving van de monitoringslocatie (bijvoorbeeld versturende activiteiten in de omgeving opslag van materialen etc.).

5 Conclusies en aanbevelingen

Om aan de restzettingseis te voldoen dient een extra overhoogte in combinatie met verticale drains aangebracht te worden. Er is uitgegaan van een duur van de voorbelastingfase van 6 maanden. De duur van de ophogingsfase is genegeerd aangezien deze beperkt is.

De eerste meter van de ophoging kan zonder beperking worden aangebracht zodat de verticale drains kunnen worden geïnstalleerd. De verticale drains moeten afwateren in een doorlatend zandpakket, dus niet in de ophooglaag grond. De berekende consolidatietijd neemt anders exponentieel toe. Na het aanbrengen van de eerste meter, moet opgehoogd worden met een maximale snelheid van 0,5 m per week.

In de ophoging van de kavels is eruit gegaan van ophoging met gebiedseigen grond voor de onderste 50 cm. Het wordt benadrukt dat voor de volume gewichten van de gebiedseigen grond en ophoogzand ongunstige aannames zijn gedaan op basis van ervaring.

De projectlocatie is in drie gebieden gedeeld met betrekking tot verschillende installatiedieptes van de verticale drains (zie §2.5.2 en Bijlage 1). Er wordt geadviseerd om met de installatie van de verticale drainage in gebied 1, waar de zandlaag het diepste ligt, aan te vangen en richting de andere gebieden toe te werken. Ter plaatse van de transitie tussen de gebieden of waar zand wordt aangetroffen voorprikken met de drainagestelling in een stramien van 10 x 10 m, om de grenzen tussen de gebieden nauwkeuriger te bepalen.

De berekende bruto ophoging en tijdelijke extra overhoogte staan gepresenteerd in Tabel 6 t/m Tabel 11. Wanneer de genoemde maatregelen worden gehanteerd bedraagt de verwachte restzetting minder dan 0,1 m in 30 jaar.

Bij sonderingen D15 is geen veen aangetroffen; in plaats daarvan is er klei en kleiig zand aanwezig. In de nabijheid van deze sondering worden minder zettingen verwacht. Rekening ermee houden met het plaatsen van de zakbakken en de interpretatie van de metingen.

Het zettingsproces dient gemonitord te worden door middel van zakbaken en de resultaten van de monitoring dienen vergeleken te worden met de predicties van de zettingen. Er dienen zogenaamde "fit-berekeningen" uitgevoerd te worden. Indien nodig kan bij geconstateerde afwijkingen van de prognose het advies worden bijgesteld. Aanbevelingen voor het aanbrengen en het lezen van zakbaken zijn in deze notitie gegeven in hoofdstuk 4.

Bijlage 1 Kaart grondonderzoek en gebieden



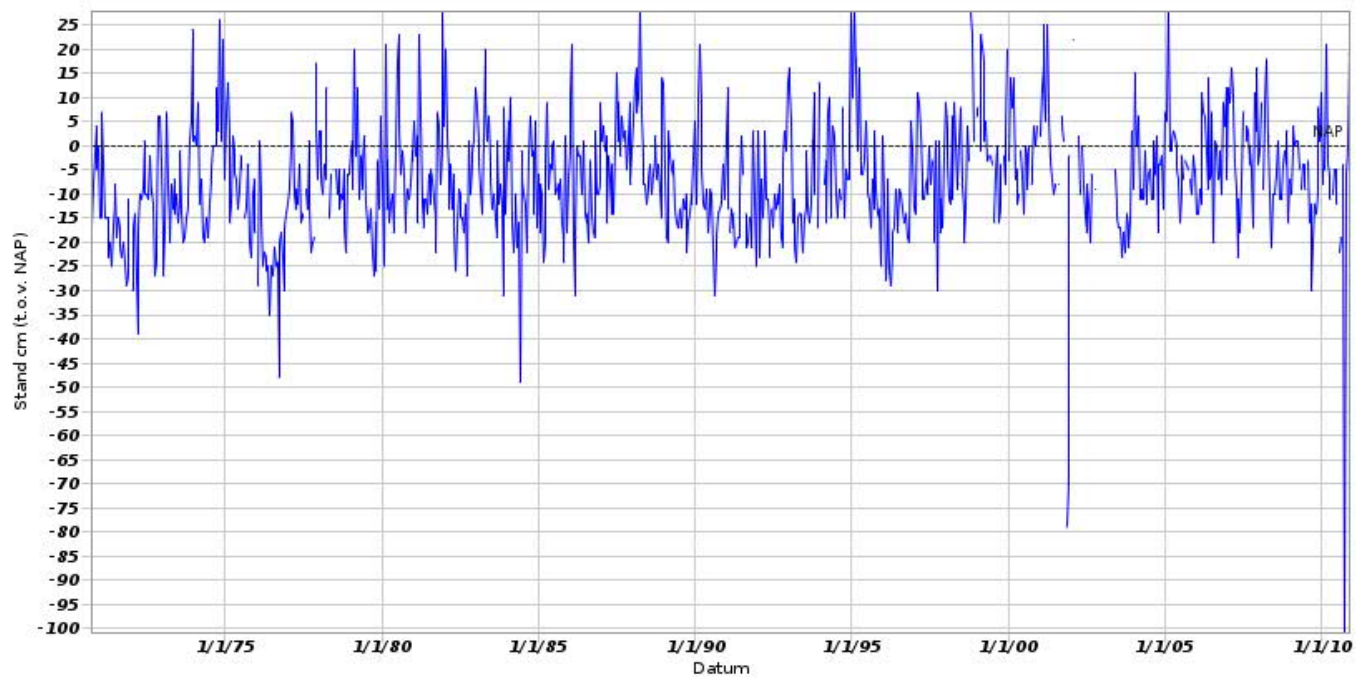
Bijlage 2 Metingen stijghoogte

Put met onderzoeksgegevens DINO

Identificatie B44E0108

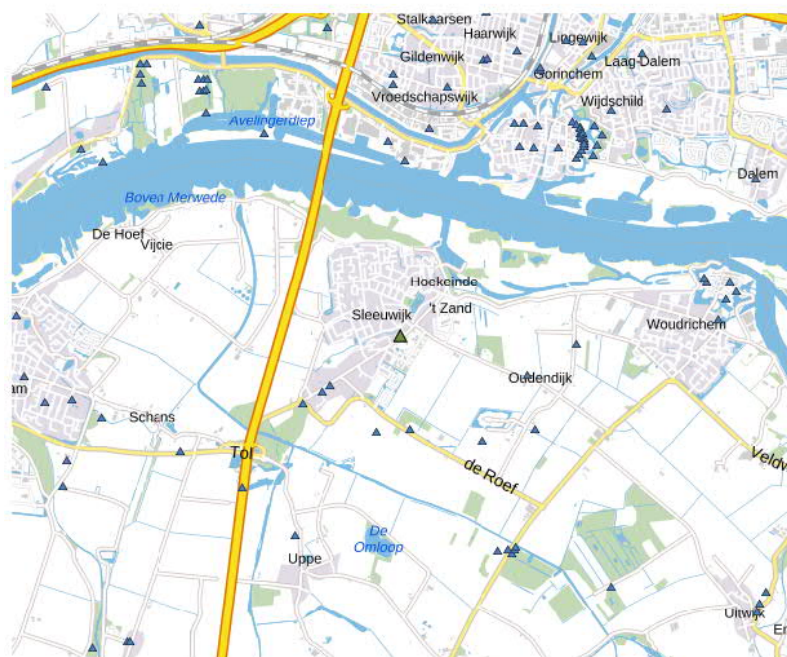


Identificatie buis:	B44E0108-001
Coördinaten:	121438, 424210 (RD)
Maaiveld:	0.16 m t.o.v. NAP
Hoogte bovenkant filter t.o.v. NAP:	-13.94 m
Hoogte onderkant filter t.o.v. NAP:	-28.54 m
Diepte bovenkant filter t.o.v. maaiveld:	14.1 m
Diepte onderkant filter t.o.v. maaiveld:	28.7 m
Drukopnemer aanwezig:	nee
Begindatum:	28-09-1970
Einddatum:	15-11-2010
Aantal metingen:	933

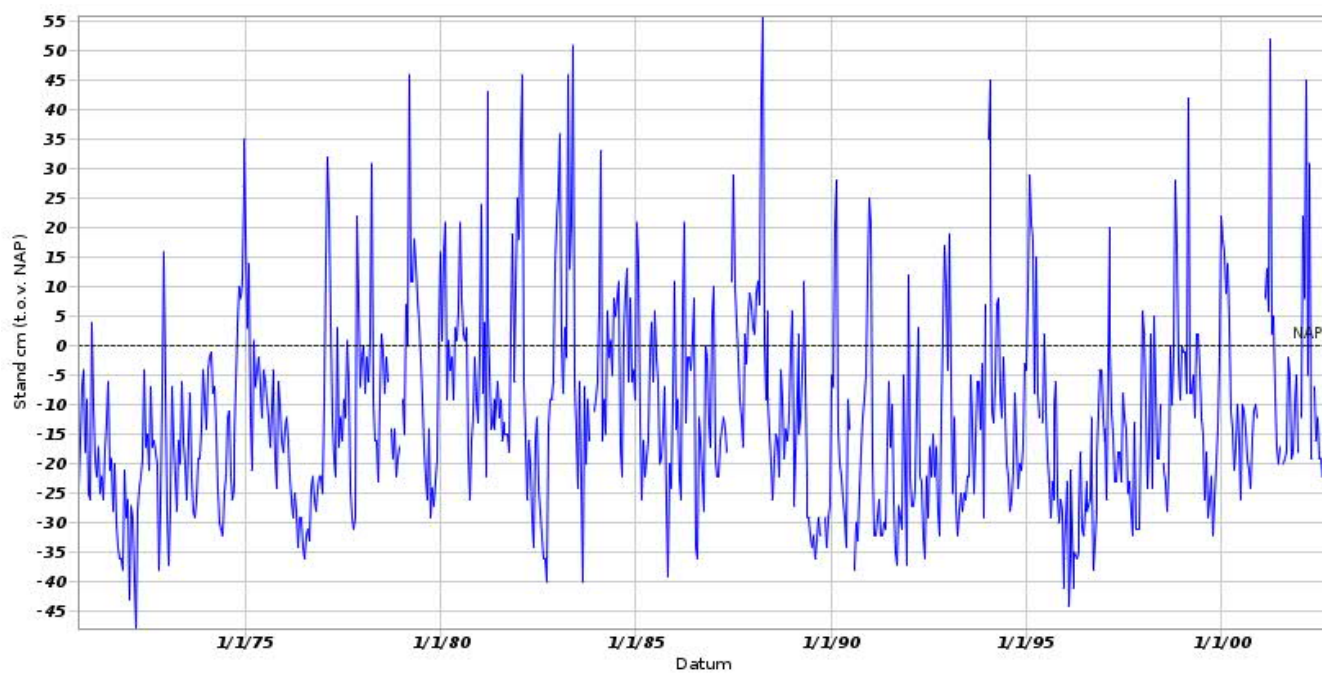


Put met onderzoeksgegevens DINO

Identificatie B44E0109



Identificatie buis:	B44E0109-001
Coördinaten:	125170, 424900 (RD)
Maaiveld:	0.47 m t.o.v. NAP
Hoogte bovenkant filter t.o.v. NAP:	-10.93 m
Hoogte onderkant filter t.o.v. NAP:	-24.53 m
Diepte bovenkant filter t.o.v. maaiveld:	11.4 m
Diepte onderkant filter t.o.v. maaiveld:	25 m
Drukopnemer aanwezig:	nee
Begindatum:	28-09-1970
Einddatum:	27-09-2002
Aantal metingen:	754



Bijlage 3 Report D-Settlement

Codering berekeningen:

SET001: berekening zettingscompensatie kavels (uitgebreider rapport)

SET002: berekening restzetting kavels

SET003: berekening restzetting weg, diepste ligging riool

SET005: berekening zettingscompensatie weg, diepste ligging riool

SET006: berekening restzetting weg, ondiepste ligging riool

SET005: berekening zettingscompensatie weg, ondiepste ligging riool

SET008: berekening restzetting weg, aanvullende diepteligging riool

SET009: berekening zettingscompensatie weg, aanvullende diepteligging riool

Report for D-Settlement 20.1

Settlement Calculations
Developed by Deltares

Company: CRUX Engineering B.V.

Date of report: 21-12-2020

Time of report: 16:30:54

Report with version: 20.1.1.29740

Date of calculation: 18-12-2020

Time of calculation: 19:05:21

Calculated with version: 20.1.1.29740

File name: SET001 CPT17_EOH+drains_MP_zomerpeil

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2 Echo of the Input

2.1 Layer Boundaries

Boundary number	Co-ordinates [m]				
9 - X -	-25,000	25,000			
9 - Y -	-0,850	-0,850			
8 - X -	-25,000	25,000			
8 - Y -	-1,500	-1,500			
7 - X -	-25,000	25,000			
7 - Y -	-2,500	-2,500			
6 - X -	-25,000	25,000			
6 - Y -	-4,100	-4,100			
5 - X -	-25,000	25,000			
5 - Y -	-5,000	-5,000			
4 - X -	-25,000	25,000			
4 - Y -	-5,500	-5,500			
3 - X -	-25,000	25,000			
3 - Y -	-6,800	-6,800			
2 - X -	-25,000	25,000			
2 - Y -	-7,400	-7,400			
1 - X -	-25,000	25,000			
1 - Y -	-7,600	-7,600			
0 - X -	-25,000	25,000			
0 - Y -	-8,600	-8,600			

2.2 PI-lines

PI-line number	Co-ordinates [m]				
1 - X -	-25,000	25,000			
1 - Y -	-1,600	-1,600			
2 - X -	-25,000	25,000			
2 - Y -	-0,050	-0,050			

2.3 General Data

Soil model:	NEN Bjerrum
Consolidation model:	Darcy
Strain model:	Linear
Groundwater level:	Initial determined by PI-line number 1
Unit weight of water:	9,81 [kN/m³]
Stress distribution	
- Soil:	Buisman
- Loads:	None
End of consolidation:	11130,00 [days]
With maintain profile (only for non uniform loads)	
- Material:	Sand
- Time:	0,00 [days]
- Unit weight above phreatic.:	16,00 [kN/m³]
- Unit weight below phreatic:	18,00 [kN/m³]
- Iteration stop criterium:	0,02 [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 :	0,02 [m]
Load column width	
- Non-Uniform Loads :	0,20 [m]
- Trapeziform Loads :	0,05 [m]

2.4 Soil Profiles

Layer number	Material name	PI-line top	PI-line bottom
9	Top klei	1	99
8	Veen 1	99	99
7	Veen (Houthoudend)	99	99
6	Klei humeus	99	99
5	Veen (Houthoudend)	99	99
4	Klei	99	99
3	Klei humeus	99	99
2	Veen 2	99	99
1	Klei zandig	99	2

2.5 Soil Properties

Layer number	Drained	Unit weight	
		Unsaturated [kN/m³]	Saturated [kN/m³]
9	Yes	15,00	15,00
8	No	10,60	10,60
7	No	11,20	11,20
6	No	15,00	15,00
5	No	11,20	11,20
4	No	17,00	17,00
3	No	15,00	15,00
2	No	12,00	12,00
1	No	18,00	18,00

Layer number	Storage type	Vert. consolid. coefficient Cv [m²/s]	Ratio Ch/Cv [-]	Vertical permeability [m/s]	Ratio hor/vert permeability [-]	Permeability strain mod. [-]	Initial vertical permeability [m/s]
9	Vert. cons.	-	1,000	-	-	-	-
8	Vert. cons.	1,06E-07	1,500	-	-	-	-
7	Vert. cons.	3,87E-08	1,500	-	-	-	-
6	Vert. cons.	1,00E-08	1,000	-	-	-	-
5	Vert. cons.	3,87E-08	1,500	-	-	-	-
4	Vert. cons.	1,00E-08	1,000	-	-	-	-
3	Vert. cons.	1,00E-08	1,000	-	-	-	-
2	Vert. cons.	1,00E-07	1,500	-	-	-	-
1	Vert. cons.	1,00E-08	1,000	-	-	-	-

Layer number	POP [kN/m²]	OCR [-]	Equiv. age [days]
9	15,00	-	-
8	15,00	-	-
7	15,00	-	-
6	15,00	-	-
5	15,00	-	-
4	15,00	-	-
3	15,00	-	-
2	15,00	-	-
1	15,00	-	-

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) [-]
9	0,0175000	0,1127000	0,0049000	-	-	-
8	0,0996000	0,5140000	0,0211000	-	-	-
7	0,0564000	0,3660000	0,0165000	-	-	-
6	0,0383000	0,2300000	0,0115000	-	-	-
5	0,0564000	0,3660000	0,0165000	-	-	-
4	0,0219000	0,1533000	0,0061000	-	-	-
3	0,0383000	0,2300000	0,0115000	-	-	-
2	0,0613000	0,3067000	0,0153000	-	-	-

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) [-]
1	0,0184000	0,0920000	0,0037000	-	-	-

2.6 Non-Uniform Loads

Load number	Time [days]	Unit weight	
		Unsaturated [kN/m ³]	Saturated [kN/m ³]
1	0	18,00	18,00
2	0	16,00	18,00

Load number	Co-ordinates [m]					
1 - X -	-25,00	-25,00	25,00	25,00		
1 - Y -	-0,85	-0,35	-0,35	-0,85		
2 - X -	-25,00	-25,00	25,00	25,00		
2 - Y -	-0,35	-0,20	-0,20	-0,35		

2.7 Verticals

Vertical number	X co-ordinates [m]				
1	0,000				

2.8 Vertical Drain

Drain type		Strip
Horizontal range "From"	[m]	-25,000
Horizontal range "To"	[m]	25,000
Bottom position	[m]	-7,500
Center to center distance	[m]	1,000
Width	[m]	0,100
Thickness	[m]	0,003
Grid		Triangular
Drainage schedule		Off
Start of drainage	[days]	0,000

3 Results per Vertical

3.1 Results for Vertical 1 (X = 0,00 m; Z = 0,00 m)

Depth [m]	Effective Stress [kPa]	Hydraulic head [m]	Loading [kPa]	Settlement [m]
-0,850	22,450	-0,850	22,449	0,694
-0,950	23,949	-0,950	22,449	0,688
-1,050	24,532	-1,050	21,532	0,682
-1,150	25,051	-1,150	20,551	0,678
-1,175	25,181	-1,175	20,306	0,677
-1,250	25,570	-1,250	19,570	0,674
-1,350	26,089	-1,350	18,589	0,670
-1,450	26,608	-1,450	17,608	0,666
-1,500	26,868	-1,500	17,118	0,665
-1,500	26,868	-1,500	17,117	0,665
-1,550	26,980	-1,557	16,627	0,658
-1,600	27,093	-1,615	16,137	0,651
-1,650	27,100	-1,612	16,137	0,644
-1,750	27,117	-1,605	16,137	0,630
-1,850	27,138	-1,599	16,137	0,616
-2,000	27,168	-1,590	16,136	0,595
-2,500	27,115	-1,545	16,136	0,521
-2,500	27,115	-1,545	16,136	0,521
-3,300	28,546	-1,577	16,135	0,427
-4,100	29,137	-1,524	16,133	0,323
-4,100	29,137	-1,524	16,133	0,323
-4,550	31,971	-1,576	16,131	0,284
-5,000	34,819	-1,628	16,128	0,243
-5,000	34,819	-1,628	16,128	0,243
-5,250	34,788	-1,590	16,126	0,209
-5,500	34,724	-1,548	16,124	0,174
-5,500	34,724	-1,548	16,124	0,174
-6,150	39,598	-1,569	16,116	0,139
-6,800	44,305	-1,574	16,105	0,104
-6,800	44,305	-1,574	16,105	0,104
-7,100	45,641	-1,552	16,099	0,077
-7,400	46,870	-1,519	16,092	0,050
-7,400	46,870	-1,519	16,092	0,050
-7,500	46,852	-1,495	16,090	0,038
-7,600	46,810	-1,469	16,087	0,026
-7,600	46,810	-1,469	16,087	0,026
-8,100	43,711	-0,737	16,073	0,011
-8,600	41,051	-0,050	16,057	0,000

4 Settlements

4.1 Settlements

Vertical number	X co-ordinate [m]	Z co-ordinate [m]	Surface level [m]	Settlement [m]
1	0,00	0,00	-0,85	0,694

4.2 Residual Times

Vertical number	Time [days]	Settlement [m]	Part of final settlement [%]	Residual settlements [m]
1	180	0,483	69,642	0,211

4.3 Maintain Profile Calculation Results

Load 1 consists of 25,000 m3 per Width

Load 2 consists of 7,500 m3 per Width

The extra amount of soil to be added is 34,530 m3 per Width

This equals the found settlements for non-uniform loads

End of Report

Report for D-Settlement 20.1

Settlement Calculations
Developed by Deltares

Company: CRUX Engineering B.V.

Date of report: 21-12-2020

Time of report: 16:30:28

Report with version: 20.1.1.29740

Date of calculation: 18-12-2020

Time of calculation: 18:47:16

Calculated with version: 20.1.1.29740

File name: SET001 CPT19_EOH+drains_MP_zomerpeil

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2 Echo of the Input

2.1 Layer Boundaries

Boundary number	Co-ordinates [m]				
8 - X -	-25,000	25,000			
8 - Y -	-0,850	-0,850			
7 - X -	-25,000	25,000			
7 - Y -	-1,700	-1,700			
6 - X -	-25,000	25,000			
6 - Y -	-2,900	-2,900			
5 - X -	-25,000	25,000			
5 - Y -	-6,000	-6,000			
4 - X -	-25,000	25,000			
4 - Y -	-7,200	-7,200			
3 - X -	-25,000	25,000			
3 - Y -	-8,500	-8,500			
2 - X -	-25,000	25,000			
2 - Y -	-9,000	-9,000			
1 - X -	-25,000	25,000			
1 - Y -	-9,800	-9,800			
0 - X -	-25,000	25,000			
0 - Y -	-10,900	-10,900			

2.2 PI-lines

PI-line number	Co-ordinates [m]				
1 - X -	-25,000	25,000			
1 - Y -	-1,600	-1,600			
2 - X -	-25,000	25,000			
2 - Y -	-0,050	-0,050			

2.3 General Data

Soil model:	NEN Bjerrum
Consolidation model:	Darcy
Strain model:	Linear
Groundwater level:	Initial determined by PI-line number 1
Unit weight of water:	9,81 [kN/m³]
Stress distribution	
- Soil:	Buisman
- Loads:	None
End of consolidation:	11130,00 [days]
With maintain profile (only for non uniform loads)	
- Material:	Sand
- Time:	0,00 [days]
- Unit weight above phreatic.:	16,00 [kN/m³]
- Unit weight below phreatic:	18,00 [kN/m³]
- Iteration stop criterium:	0,02 [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 :	0,02 [m]
Load column width	
- Non-Uniform Loads :	0,20 [m]
- Trapeziform Loads :	0,05 [m]

2.4 Soil Profiles

Layer number	Material name	PI-line top	PI-line bottom
8	Top klei	1	99
7	Veen 1	99	99
6	Veen (Houthoudend)	99	99
5	Klei	99	99
4	Klei humeus	99	99
3	Veen 2	99	99
2	Klei	99	99
1	Klei zandig	99	2

2.5 Soil Properties

Layer number	Drained	Unit weight	
		Unsaturated [kN/m³]	Saturated [kN/m³]
8	Yes	15,00	15,00
7	No	10,60	10,60
6	No	11,20	11,20
5	No	17,00	17,00
4	No	15,00	15,00
3	No	12,00	12,00
2	No	17,00	17,00
1	No	18,00	18,00

Layer number	Storage type	Vert. consolid. coefficient Cv [m²/s]	Ratio Ch/Cv [-]	Vertical permeability [m/s]	Ratio hor/vert permeability [-]	Permeability strain mod. [-]	Initial vertical permeability [m/s]
8	Vert. cons.	-	1,000	-	-	-	-
7	Vert. cons.	1,06E-07	1,500	-	-	-	-
6	Vert. cons.	3,87E-08	1,500	-	-	-	-
5	Vert. cons.	1,00E-08	1,000	-	-	-	-
4	Vert. cons.	1,00E-08	1,000	-	-	-	-
3	Vert. cons.	1,00E-07	1,500	-	-	-	-
2	Vert. cons.	1,00E-08	1,000	-	-	-	-
1	Vert. cons.	1,00E-08	1,000	-	-	-	-

Layer number	POP [kN/m²]	OCR [-]	Equiv. age [days]
8	15,00	-	-
7	15,00	-	-
6	15,00	-	-
5	15,00	-	-
4	15,00	-	-
3	15,00	-	-
2	15,00	-	-
1	15,00	-	-

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) [-]
8	0,0175000	0,1127000	0,0049000	-	-	-
7	0,0996000	0,5140000	0,0211000	-	-	-
6	0,0564000	0,3660000	0,0165000	-	-	-
5	0,0219000	0,1533000	0,0061000	-	-	-
4	0,0383000	0,2300000	0,0115000	-	-	-
3	0,0613000	0,3067000	0,0153000	-	-	-
2	0,0219000	0,1533000	0,0061000	-	-	-
1	0,0184000	0,0920000	0,0037000	-	-	-

2.6 Non-Uniform Loads

Load number	Time [days]	Unit weight	
		Unsaturated [kN/m ³]	Saturated [kN/m ³]
1	0	18,00	18,00
2	0	16,00	18,00

Load number	Co-ordinates [m]					
1 - X -	-25,00	-25,00	25,00	25,00		
1 - Y -	-0,85	-0,35	-0,35	-0,85		
2 - X -	-25,00	-25,00	25,00	25,00		
2 - Y -	-0,35	-0,20	-0,20	-0,85		

2.7 Verticals

Vertical number	X co-ordinates [m]				
1	0,000				

2.8 Vertical Drain

Drain type		Strip
Horizontal range "From"	[m]	-25,000
Horizontal range "To"	[m]	25,000
Bottom position	[m]	-9,500
Center to center distance	[m]	1,000
Width	[m]	0,100
Thickness	[m]	0,003
Grid		Triangular
Drainage schedule		Off
Start of drainage	[days]	0,000

3 Results per Vertical

3.1 Results for Vertical 1 (X = 0,00 m; Z = 0,00 m)

Depth [m]	Effective Stress [kPa]	Hydraulic head [m]	Loading [kPa]	Settlement [m]
-0,850	24,514	-0,850	24,513	0,934
-0,950	25,032	-0,950	23,532	0,927
-1,050	25,551	-1,050	22,551	0,921
-1,150	26,070	-1,150	21,570	0,917
-1,250	26,589	-1,250	20,589	0,912
-1,275	26,719	-1,275	20,344	0,911
-1,350	27,108	-1,350	19,608	0,908
-1,450	27,627	-1,450	18,627	0,904
-1,550	28,146	-1,550	17,646	0,901
-1,600	28,405	-1,600	17,155	0,900
-1,650	28,583	-1,592	17,155	0,898
-1,700	28,761	-1,583	17,155	0,896
-1,700	28,761	-1,583	17,155	0,896
-1,750	28,811	-1,584	17,155	0,889
-1,850	28,905	-1,586	17,155	0,875
-2,300	29,249	-1,585	17,155	0,808
-2,900	29,420	-1,554	17,155	0,714
-2,900	29,420	-1,554	17,155	0,714
-3,650	30,803	-1,589	17,153	0,625
-4,450	31,966	-1,594	17,149	0,521
-5,200	32,940	-1,588	17,144	0,419
-6,000	33,560	-1,539	17,134	0,305
-6,000	33,560	-1,539	17,134	0,305
-6,600	38,199	-1,573	17,124	0,272
-7,200	42,719	-1,595	17,111	0,241
-7,200	42,719	-1,595	17,111	0,241
-7,850	46,082	-1,596	17,092	0,182
-8,500	49,692	-1,623	17,070	0,124
-8,500	49,692	-1,623	17,070	0,124
-8,750	49,883	-1,587	17,059	0,094
-9,000	50,034	-1,548	17,049	0,064
-9,000	50,034	-1,548	17,049	0,064
-9,400	50,806	-1,335	17,029	0,044
-9,800	51,119	-1,076	17,008	0,026
-9,800	51,119	-1,076	17,008	0,026
-10,350	50,490	-0,556	16,975	0,012
-10,900	49,989	-0,050	16,937	0,000

4 Settlements

4.1 Settlements

Vertical number	X co-ordinate [m]	Z co-ordinate [m]	Surface level [m]	Settlement [m]
1	0,00	0,00	-0,85	0,934

4.2 Maintain Profile Calculation Results

Load 1 consists of 25,000 m³ per Width

Load 2 consists of 7,500 m³ per Width

The extra amount of soil to be added is 46,324 m³ per Width

This equals the found settlements for non-uniform loads

End of Report

Report for D-Settlement 20.1

Settlement Calculations
Developed by Deltares

Company: CRUX Engineering B.V.

Date of report: 21-12-2020

Time of report: 16:33:12

Report with version: 20.1.1.29740

Date of calculation: 18-12-2020

Time of calculation: 23:04:24

Calculated with version: 20.1.1.29740

File name: SET001 CPT10_EOH+drains_MP_zomerpeil

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2 Echo of the Input

2.1 Layer Boundaries

Boundary number	Co-ordinates [m]				
11 - X -	-25,000	25,000			
11 - Y -	-0,850	-0,850			
10 - X -	-25,000	25,000			
10 - Y -	-1,700	-1,700			
9 - X -	-25,000	25,000			
9 - Y -	-3,000	-3,000			
8 - X -	-25,000	25,000			
8 - Y -	-3,400	-3,440			
7 - X -	-25,000	25,000			
7 - Y -	-4,000	-4,000			
6 - X -	-25,000	25,000			
6 - Y -	-5,000	-5,000			
5 - X -	-25,000	25,000			
5 - Y -	-6,500	-6,500			
4 - X -	-25,000	25,000			
4 - Y -	-8,500	-8,500			
3 - X -	-25,000	25,000			
3 - Y -	-9,200	-9,200			
2 - X -	-25,000	25,000			
2 - Y -	-9,500	-9,500			
1 - X -	-25,000	25,000			
1 - Y -	-10,700	-10,700			
0 - X -	-25,000	25,000			
0 - Y -	-11,400	-11,400			

2.2 PI-lines

PI-line number	Co-ordinates [m]				
1 - X -	-25,000	25,000			
1 - Y -	-1,600	-1,600			
2 - X -	-25,000	25,000			
2 - Y -	-0,050	-0,050			

2.3 General Data

Soil model:	NEN Bjerrum
Consolidation model:	Darcy
Strain model:	Linear
Groundwater level:	Initial determined by PI-line number 1
Unit weight of water:	9,81 [kN/m³]
Stress distribution	
- Soil:	Buisman
- Loads:	None
End of consolidation:	11130,00 [days]
With maintain profile (only for non uniform loads)	
- Material:	Sand
- Time:	0,00 [days]
- Unit weight above phreatic.:	16,00 [kN/m³]
- Unit weight below phreatic:	18,00 [kN/m³]
- Iteration stop criterium:	0,02 [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 :	0,02 [m]

Load column width

- Non-Uniform Loads : 0,20 [m]

- Trapeziform Loads : 0,05 [m]

2.4 Soil Profiles

Layer number	Material name	PI-line top	PI-line bottom
11	Top klei	1	99
10	Veen 1	99	99
9	Veen (Houthoudend)	99	99
8	Klei humeus	99	99
7	Klei	99	99
6	Klei zandig	99	2
5	Tussenzand	2	2
4	Klei	2	2
3	Veen 2	2	2
2	Klei humeus	2	2
1	Klei zandig	2	2

2.5 Soil Properties

Layer number	Drained	Unit weight	
		Unsaturated [kN/m³]	Saturated [kN/m³]
11	Yes	15,00	15,00
10	No	10,60	10,60
9	No	11,20	11,20
8	No	15,00	15,00
7	No	17,00	17,00
6	No	18,00	18,00
5	Yes	16,00	18,00
4	No	17,00	17,00
3	No	12,00	12,00
2	No	15,00	15,00
1	No	18,00	18,00

Layer number	Storage type	Vert. consolid. coefficient Cv [m²/s]	Ratio Ch/Cv [-]	Vertical permeability [m/s]	Ratio hor/vert permeability [-]	Permeability strain mod. [-]	Initial vertical permeability [m/s]
11	Vert. cons.	-	1,000	-	-	-	-
10	Vert. cons.	1,06E-07	1,500	-	-	-	-
9	Vert. cons.	3,87E-08	1,500	-	-	-	-
8	Vert. cons.	1,00E-08	1,000	-	-	-	-
7	Vert. cons.	1,00E-08	1,000	-	-	-	-
6	Vert. cons.	1,00E-08	1,000	-	-	-	-
5	Vert. cons.	-	1,000	-	-	-	-
4	Vert. cons.	1,00E-08	1,000	-	-	-	-
3	Vert. cons.	1,00E-07	1,500	-	-	-	-
2	Vert. cons.	1,00E-08	1,000	-	-	-	-
1	Vert. cons.	1,00E-08	1,000	-	-	-	-

Layer number	POP [kN/m²]	OCR [-]	Equiv. age [days]
11	15,00	-	-
10	15,00	-	-
9	15,00	-	-
8	15,00	-	-
7	15,00	-	-
6	15,00	-	-
5	15,00	-	-
4	15,00	-	-
3	15,00	-	-
2	15,00	-	-
1	15,00	-	-

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) [-]
11	0,0175000	0,1127000	0,0049000	-	-	-
10	0,0996000	0,5140000	0,0211000	-	-	-
9	0,0564000	0,3660000	0,0165000	-	-	-
8	0,0383000	0,2300000	0,0115000	-	-	-
7	0,0219000	0,1533000	0,0061000	-	-	-
6	0,0184000	0,0920000	0,0037000	-	-	-
5	0,0001750	0,0011270	0,0000490	-	-	-
4	0,0219000	0,1533000	0,0061000	-	-	-
3	0,0613000	0,3067000	0,0153000	-	-	-
2	0,0383000	0,2300000	0,0115000	-	-	-
1	0,0184000	0,0920000	0,0037000	-	-	-

2.6 Non-Uniform Loads

Load number	Time [days]	Unit weight	
		Unsaturated [kN/m³]	Saturated [kN/m³]
1	0	18,00	18,00
2	0	16,00	18,00

Load number	Co-ordinates [m]					
1 - X -	-25,00	-25,00	25,00	25,00		
1 - Y -	-0,85	-0,35	-0,35	-0,85		
2 - X -	-25,00	-25,00	25,00	25,00		
2 - Y -	-0,35	-0,20	-0,20	-0,35		

2.7 Verticals

Vertical number	X co-ordinates [m]				
1	0,000				

2.8 Vertical Drain

Drain type	Strip
Horizontal range "From"	[m] -25,000
Horizontal range "To"	[m] 25,000
Bottom position	[m] -5,500
Center to center distance	[m] 1,000
Width	[m] 0,100
Thickness	[m] 0,003
Grid	Triangular
Drainage schedule	Off
Start of drainage	[days] 0,000

3 Results per Vertical

3.1 Results for Vertical 1 (X = 0,00 m; Z = 0,00 m)

Depth [m]	Effective Stress [kPa]	Hydraulic head [m]	Loading [kPa]	Settlement [m]
-0,850	19,582	-0,850	19,581	0,513
-0,950	21,081	-0,950	19,581	0,507
-1,050	22,581	-1,050	19,581	0,502
-1,150	23,838	-1,150	19,338	0,498
-1,250	24,357	-1,250	18,357	0,494
-1,275	24,486	-1,275	18,111	0,493
-1,350	24,876	-1,350	17,376	0,491
-1,450	25,395	-1,450	16,395	0,487
-1,550	25,914	-1,550	15,414	0,485
-1,600	26,173	-1,600	14,923	0,483
-1,650	26,278	-1,584	14,923	0,482
-1,700	26,382	-1,568	14,923	0,480
-1,700	26,382	-1,568	14,923	0,480
-1,750	26,441	-1,570	14,923	0,474
-1,850	26,549	-1,573	14,923	0,461
-2,350	26,914	-1,570	14,923	0,392
-3,000	26,703	-1,496	14,922	0,290
-3,000	26,703	-1,496	14,922	0,290
-3,210	26,906	-1,487	14,922	0,265
-3,420	26,847	-1,452	14,922	0,240
-3,420	26,847	-1,452	14,922	0,240
-3,710	28,597	-1,477	14,921	0,216
-4,000	30,048	-1,471	14,920	0,191
-4,000	30,048	-1,471	14,920	0,191
-4,500	33,270	-1,433	14,919	0,166
-5,000	35,030	-1,247	14,916	0,141
-5,000	35,030	-1,247	14,916	0,141
-5,750	35,251	-0,644	14,910	0,121
-6,500	35,560	-0,050	14,901	0,105
-6,500	35,561	-0,050	14,901	0,105
-7,500	43,733	-0,050	14,883	0,104
-8,500	51,897	-0,050	14,858	0,104
-8,500	51,897	-0,050	14,858	0,104
-8,850	53,841	0,007	14,847	0,095
-9,200	55,838	0,059	14,834	0,086
-9,200	55,838	0,059	14,834	0,086
-9,350	56,151	0,060	14,829	0,076
-9,500	56,465	0,061	14,823	0,067
-9,500	56,465	0,061	14,823	0,067
-10,100	59,342	0,082	14,797	0,039
-10,700	62,573	0,067	14,766	0,011
-10,700	62,573	0,067	14,766	0,011
-11,050	65,936	0,015	14,747	0,006
-11,400	69,416	-0,050	14,725	0,000

4 Settlements

4.1 Settlements

Vertical number	X co-ordinate [m]	Z co-ordinate [m]	Surface level [m]	Settlement [m]
1	0,00	0,00	-0,85	0,513

4.2 Residual Times

Vertical number	Time [days]	Settlement [m]	Part of final settlement [%]	Residual settlements [m]
1	180	0,293	57,201	0,219

4.3 Maintain Profile Calculation Results

Load 1 consists of 25,000 m3 per Width

Load 2 consists of 7,500 m3 per Width

The extra amount of soil to be added is 25,565 m3 per Width

This equals the found settlements for non-uniform loads

End of Report

Report for D-Settlement 20.1

Settlement Calculations
Developed by Deltares

Company: CRUX Engineering B.V.

Date of report: 21-12-2020

Time of report: 16:31:14

Report with version: 20.1.1.29740

Date of calculation: 18-12-2020

Time of calculation: 19:13:46

Calculated with version: 20.1.1.29740

File name: SET002 CPT17_EOH+drains_6maand_zomerpeil

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2 Echo of the Input

2.1 Layer Boundaries

Boundary number	Co-ordinates [m]				
9 - X -	-25,000	25,000			
9 - Y -	-0,850	-0,850			
8 - X -	-25,000	25,000			
8 - Y -	-1,500	-1,500			
7 - X -	-25,000	25,000			
7 - Y -	-2,500	-2,500			
6 - X -	-25,000	25,000			
6 - Y -	-4,100	-4,100			
5 - X -	-25,000	25,000			
5 - Y -	-5,000	-5,000			
4 - X -	-25,000	25,000			
4 - Y -	-5,500	-5,500			
3 - X -	-25,000	25,000			
3 - Y -	-6,800	-6,800			
2 - X -	-25,000	25,000			
2 - Y -	-7,400	-7,400			
1 - X -	-25,000	25,000			
1 - Y -	-7,600	-7,600			
0 - X -	-25,000	25,000			
0 - Y -	-8,600	-8,600			

2.2 PI-lines

PI-line number	Co-ordinates [m]				
1 - X -	-25,000	25,000			
1 - Y -	-1,600	-1,600			
2 - X -	-25,000	25,000			
2 - Y -	-0,050	-0,050			

2.3 General Data

Soil model:	NEN Bjerrum
Consolidation model:	Darcy
Strain model:	Linear
Groundwater level:	Initial determined by PI-line number 1
Unit weight of water:	9,81 [kN/m³]
Stress distribution	
- Soil:	Buisman
- Loads:	None
End of consolidation:	11130,00 [days]
No maintain profile	
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 :	0,02 [m]
Load column width	
- Non-Uniform Loads :	0,20 [m]
- Trapeziform Loads :	0,05 [m]

2.4 Soil Profiles

Layer number	Material name	PI-line top	PI-line bottom
9	Top klei	1	99
8	Veen 1	99	99

Layer number	Material name	PI-line top	PI-line bottom
7	Veen (Houthoudend)	99	99
6	Klei humeus	99	99
5	Veen (Houthoudend)	99	99
4	Klei	99	99
3	Klei humeus	99	99
2	Veen 2	99	99
1	Klei zandig	99	2

2.5 Soil Properties

Layer number	Drained	Unit weight	
		Unsaturated [kN/m³]	Saturated [kN/m³]
9	Yes	15,00	15,00
8	No	10,60	10,60
7	No	11,20	11,20
6	No	15,00	15,00
5	No	11,20	11,20
4	No	17,00	17,00
3	No	15,00	15,00
2	No	12,00	12,00
1	No	18,00	18,00

Layer number	Storage type	Vert. consolid. coefficient Cv [m²/s]	Ratio Ch/Cv [-]	Vertical permeability [m/s]	Ratio hor/vert permeability [-]	Permeability strain mod. [-]	Initial vertical permeability [m/s]
9	Vert. cons.	-	1,000	-	-	-	-
8	Vert. cons.	1,06E-07	1,500	-	-	-	-
7	Vert. cons.	3,87E-08	1,500	-	-	-	-
6	Vert. cons.	1,00E-08	1,000	-	-	-	-
5	Vert. cons.	3,87E-08	1,500	-	-	-	-
4	Vert. cons.	1,00E-08	1,000	-	-	-	-
3	Vert. cons.	1,00E-08	1,000	-	-	-	-
2	Vert. cons.	1,00E-07	1,500	-	-	-	-
1	Vert. cons.	1,00E-08	1,000	-	-	-	-

Layer number	POP [kN/m²]	OCR [-]	Equiv. age [days]
9	15,00	-	-
8	15,00	-	-
7	15,00	-	-
6	15,00	-	-
5	15,00	-	-
4	15,00	-	-
3	15,00	-	-
2	15,00	-	-
1	15,00	-	-

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) [-]
9	0,0175000	0,1127000	0,0049000	-	-	-
8	0,0996000	0,5140000	0,0211000	-	-	-
7	0,0564000	0,3660000	0,0165000	-	-	-
6	0,0383000	0,2300000	0,0115000	-	-	-
5	0,0564000	0,3660000	0,0165000	-	-	-
4	0,0219000	0,1533000	0,0061000	-	-	-
3	0,0383000	0,2300000	0,0115000	-	-	-
2	0,0613000	0,3067000	0,0153000	-	-	-
1	0,0184000	0,0920000	0,0037000	-	-	-

2.6 Non-Uniform Loads

Load number	Time [days]	Unit weight	
		Unsaturated [kN/m ³]	Saturated [kN/m ³]
1	0	18,00	18,00
2	0	16,00	18,00
3	0	16,00	18,00
4	0	16,00	18,00

Load number	Co-ordinates [m]					
1 - X -	-25,00	-25,00	25,00	25,00		
1 - Y -	-0,85	-0,35	-0,35	-0,85		
2 - X -	-25,00	-25,00	25,00	25,00		
2 - Y -	-0,35	-0,20	-0,20	-0,35		
3 - X -	-25,00	-25,00	25,00	25,00		
3 - Y -	-0,20	0,50	0,50	-0,20		
4 - X -	-25,00	-25,00	25,00	25,00		
4 - Y -	0,50	0,95	0,95	0,50		

2.7 Verticals

Vertical number	X co-ordinates [m]				
1	0,000				

2.8 Vertical Drain

Drain type		Strip
Horizontal range "From"	[m]	-25,000
Horizontal range "To"	[m]	25,000
Bottom position	[m]	-7,500
Center to center distance	[m]	1,000
Width	[m]	0,100
Thickness	[m]	0,003
Grid		Triangular
Drainage schedule		Off
Start of drainage	[days]	0,000

3 Results per Vertical

3.1 Results for Vertical 1 (X = 0,00 m; Z = 0,00 m)

Depth [m]	Effective Stress [kPa]	Hydraulic head [m]	Loading [kPa]	Settlement [m]
-0,850	22,601	-0,850	22,600	0,710
-0,950	24,025	-0,950	22,525	0,704
-1,050	24,544	-1,050	21,544	0,698
-1,150	25,063	-1,150	20,563	0,693
-1,175	25,192	-1,175	20,317	0,692
-1,250	25,582	-1,250	19,582	0,689
-1,350	26,101	-1,350	18,601	0,685
-1,450	26,620	-1,450	17,620	0,681
-1,500	26,879	-1,500	17,129	0,679
-1,500	26,879	-1,500	17,129	0,679
-1,550	26,993	-1,558	16,639	0,671
-1,600	27,108	-1,615	16,148	0,663
-1,650	27,115	-1,612	16,148	0,656
-1,750	27,134	-1,606	16,148	0,641
-1,850	27,156	-1,600	16,148	0,626
-2,000	27,186	-1,591	16,148	0,603
-2,500	27,137	-1,546	16,148	0,524
-2,500	27,137	-1,546	16,148	0,524
-3,300	28,568	-1,578	16,147	0,428
-4,100	29,153	-1,525	16,144	0,323
-4,100	29,153	-1,525	16,144	0,323
-4,550	31,985	-1,576	16,142	0,283
-5,000	34,831	-1,628	16,139	0,243
-5,000	34,831	-1,628	16,139	0,243
-5,250	34,799	-1,590	16,137	0,209
-5,500	34,736	-1,548	16,135	0,174
-5,500	34,736	-1,548	16,135	0,174
-6,150	39,608	-1,569	16,127	0,139
-6,800	44,314	-1,573	16,117	0,104
-6,800	44,314	-1,573	16,117	0,104
-7,100	45,650	-1,552	16,110	0,077
-7,400	46,880	-1,519	16,104	0,050
-7,400	46,880	-1,519	16,104	0,050
-7,500	46,863	-1,495	16,101	0,038
-7,600	46,820	-1,469	16,099	0,026
-7,600	46,820	-1,469	16,099	0,026
-8,100	43,722	-0,737	16,084	0,011
-8,600	41,062	-0,050	16,068	0,000

4 Settlements

4.1 Settlements

Vertical number	X co-ordinate [m]	Z co-ordinate [m]	Surface level [m]	Settlement [m]
1	0,00	0,00	-0,85	0,710

4.2 Residual Times

Vertical number	Time [days]	Settlement [m]	Part of final settlement [%]	Residual settlements [m]
1	180	0,616	86,740	0,094

End of Report

Report for D-Settlement 20.1

Settlement Calculations
Developed by Deltares

Company: CRUX Engineering B.V.

Date of report: 21-12-2020

Time of report: 16:28:22

Report with version: 20.1.1.29740

Date of calculation: 21-12-2020

Time of calculation: 15:34:39

Calculated with version: 20.1.1.29740

File name: SET002 CPT19_EOH+drains_6maand_zomerpeil

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2 Echo of the Input

2.1 Layer Boundaries

Boundary number	Co-ordinates [m]				
8 - X -	-25,000	25,000			
8 - Y -	-0,850	-0,850			
7 - X -	-25,000	25,000			
7 - Y -	-1,700	-1,700			
6 - X -	-25,000	25,000			
6 - Y -	-2,900	-2,900			
5 - X -	-25,000	25,000			
5 - Y -	-6,000	-6,000			
4 - X -	-25,000	25,000			
4 - Y -	-7,200	-7,200			
3 - X -	-25,000	25,000			
3 - Y -	-8,500	-8,500			
2 - X -	-25,000	25,000			
2 - Y -	-9,000	-9,000			
1 - X -	-25,000	25,000			
1 - Y -	-9,800	-9,800			
0 - X -	-25,000	25,000			
0 - Y -	-10,900	-10,900			

2.2 PI-lines

PI-line number	Co-ordinates [m]				
1 - X -	-25,000	25,000			
1 - Y -	-1,600	-1,600			
2 - X -	-25,000	25,000			
2 - Y -	-0,050	-0,050			

2.3 General Data

Soil model:	NEN Bjerrum
Consolidation model:	Darcy
Strain model:	Linear
Groundwater level:	Initial determined by PI-line number 1
Unit weight of water:	9,81 [kN/m³]
Stress distribution	
- Soil:	Buisman
- Loads:	None
End of consolidation:	11130,00 [days]
No maintain profile	
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 :	0,02 [m]
Load column width	
- Non-Uniform Loads :	0,20 [m]
- Trapeziform Loads :	0,05 [m]

2.4 Soil Profiles

Layer number	Material name	PI-line top	PI-line bottom
8	Top klei	1	99
7	Veen 1	99	99
6	Veen (Houthoudend)	99	99
5	Klei	99	99

Layer number	Material name	PI-line top	PI-line bottom
4	Klei humeus	99	99
3	Veen 2	99	99
2	Klei	99	99
1	Klei zandig	99	2

2.5 Non-Uniform Loads

Load number	Time [days]	Unit weight	
		Unsaturated [kN/m³]	Saturated [kN/m³]
1	0	18,00	18,00
2	0	16,00	18,00
3	0	16,00	18,00
4	0	16,00	18,00

Load number	Co-ordinates [m]					
1 - X -	-25,00	-25,00	25,00	25,00		
1 - Y -	-0,85	-0,35	-0,35	-0,85		
2 - X -	-25,00	-25,00	25,00	25,00		
2 - Y -	-0,35	-0,20	-0,20	-0,35		
3 - X -	-25,00	-25,00	25,00	25,00		
3 - Y -	-0,20	0,75	0,75	-0,20		
4 - X -	-25,00	-25,00	25,00	25,00		
4 - Y -	0,75	1,40	1,40	0,75		

2.6 Verticals

Vertical number	X co-ordinates [m]				
1	0,000				

3 Results per Vertical

3.1 Results for Vertical 1 (X = 0,00 m; Z = 0,00 m)

Depth [m]	Effective Stress [kPa]	Hydraulic head [m]	Loading [kPa]	Settlement [m]
-0,850	24,454	-0,850	24,453	0,975
-0,950	24,973	-0,950	23,473	0,967
-1,050	25,491	-1,050	22,491	0,961
-1,150	26,010	-1,150	21,510	0,956
-1,250	26,529	-1,250	20,529	0,950
-1,275	26,659	-1,275	20,284	0,949
-1,350	27,048	-1,350	19,548	0,946
-1,450	27,567	-1,450	18,567	0,941
-1,550	28,086	-1,550	17,586	0,937
-1,600	28,346	-1,600	17,096	0,935
-1,650	28,524	-1,592	17,096	0,933
-1,700	28,701	-1,583	17,096	0,931
-1,700	28,701	-1,583	17,096	0,931
-1,750	28,754	-1,585	17,096	0,923
-1,850	28,851	-1,587	17,096	0,906
-2,300	29,199	-1,586	17,096	0,830
-2,900	29,374	-1,555	17,095	0,725
-2,900	29,374	-1,555	17,095	0,725
-3,650	30,758	-1,590	17,093	0,630
-4,450	31,915	-1,595	17,090	0,524
-5,200	32,888	-1,589	17,084	0,420
-6,000	33,505	-1,539	17,074	0,304
-6,000	33,505	-1,539	17,074	0,304
-6,600	38,137	-1,573	17,064	0,272
-7,200	42,655	-1,595	17,051	0,240
-7,200	42,655	-1,595	17,051	0,240
-7,850	46,018	-1,596	17,033	0,182
-8,500	49,631	-1,622	17,010	0,124
-8,500	49,631	-1,622	17,010	0,124
-8,750	49,823	-1,587	17,000	0,094
-9,000	49,973	-1,548	16,989	0,064
-9,000	49,973	-1,548	16,989	0,064
-9,400	50,741	-1,335	16,970	0,044
-9,800	51,053	-1,076	16,948	0,026
-9,800	51,053	-1,076	16,948	0,026
-10,350	50,425	-0,556	16,915	0,012
-10,900	49,929	-0,050	16,878	0,000

4 Settlements

4.1 Settlements

Vertical number	X co-ordinate [m]	Z co-ordinate [m]	Surface level [m]	Settlement [m]
1	0,00	0,00	-0,85	0,975

4.2 Residual Times

Vertical number	Time [days]	Settlement [m]	Part of final settlement [%]	Residual settlements [m]
1	180	0,890	91,266	0,085

End of Report

Report for D-Settlement 20.1

Settlement Calculations
Developed by Deltares

Company: CRUX Engineering B.V.

Date of report: 22-1-2021

Time of report: 16:38:18

Report with version: 20.1.1.29740

Date of calculation: 22-1-2021

Time of calculation: 16:37:11

Calculated with version: 20.1.1.29740

File name: SET002 CPT10_EOH+drains_6maand_zomerpeil

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4.2 Residual Times	7

2 Echo of the Input

2.1 Layer Boundaries

Boundary number	Co-ordinates [m]				
11 - X -	-25,000	25,000			
11 - Y -	-0,850	-0,850			
10 - X -	-25,000	25,000			
10 - Y -	-1,700	-1,700			
9 - X -	-25,000	25,000			
9 - Y -	-3,000	-3,000			
8 - X -	-25,000	25,000			
8 - Y -	-3,400	-3,440			
7 - X -	-25,000	25,000			
7 - Y -	-4,000	-4,000			
6 - X -	-25,000	25,000			
6 - Y -	-5,000	-5,000			
5 - X -	-25,000	25,000			
5 - Y -	-6,500	-6,500			
4 - X -	-25,000	25,000			
4 - Y -	-8,500	-8,500			
3 - X -	-25,000	25,000			
3 - Y -	-9,200	-9,200			
2 - X -	-25,000	25,000			
2 - Y -	-9,500	-9,500			
1 - X -	-25,000	25,000			
1 - Y -	-10,700	-10,700			
0 - X -	-25,000	25,000			
0 - Y -	-11,400	-11,400			

2.2 PI-lines

PI-line number	Co-ordinates [m]				
1 - X -	-25,000	25,000			
1 - Y -	-1,600	-1,600			
2 - X -	-25,000	25,000			
2 - Y -	-0,050	-0,050			

2.3 General Data

Soil model:	NEN Bjerrum
Consolidation model:	Darcy
Strain model:	Linear
Groundwater level:	Initial determined by PI-line number 1
Unit weight of water:	9,81 [kN/m³]
Stress distribution	
- Soil:	Buisman
- Loads:	None
End of consolidation:	11130,00 [days]
No maintain profile	
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 :	0,02 [m]
Load column width	
- Non-Uniform Loads :	0,20 [m]
- Trapeziform Loads :	0,05 [m]

2.4 Soil Profiles

Layer number	Material name	PI-line top	PI-line bottom
11	Top klei	1	99
10	Veen 1	99	99
9	Veen (Houthoudend)	99	99
8	Klei humeus	99	99
7	Klei	99	99
6	Klei zandig	99	2
5	Tussenwand	2	2
4	Klei	2	2
3	Veen 2	2	2
2	Klei humeus	2	2
1	Klei zandig	2	2

2.5 Soil Properties

Layer number	Drained	Unit weight	
		Unsaturated [kN/m ³]	Saturated [kN/m ³]
11	Yes	15,00	15,00
10	No	10,60	10,60
9	No	11,20	11,20
8	No	15,00	15,00
7	No	17,00	17,00
6	No	18,00	18,00
5	Yes	16,00	18,00
4	No	17,00	17,00
3	No	12,00	12,00
2	No	15,00	15,00
1	No	18,00	18,00

Layer number	Storage type	Vert. consolid. coefficient Cv [m ² /s]	Ratio Ch/Cv [-]	Vertical permeability [m/s]	Ratio hor/vert permeability [-]	Permeability strain mod. [-]	Initial vertical permeability [m/s]
11	Vert. cons.	-	1,000	-	-	-	-
10	Vert. cons.	1,06E-07	1,500	-	-	-	-
9	Vert. cons.	3,87E-08	1,500	-	-	-	-
8	Vert. cons.	1,00E-08	1,000	-	-	-	-
7	Vert. cons.	1,00E-08	1,000	-	-	-	-
6	Vert. cons.	1,00E-08	1,000	-	-	-	-
5	Vert. cons.	-	1,000	-	-	-	-
4	Vert. cons.	1,00E-08	1,000	-	-	-	-
3	Vert. cons.	1,00E-07	1,500	-	-	-	-
2	Vert. cons.	1,00E-08	1,000	-	-	-	-
1	Vert. cons.	1,00E-08	1,000	-	-	-	-

Layer number	POP [kN/m ²]	OCR [-]	Equiv. age [days]
11	15,00	-	-
10	15,00	-	-
9	15,00	-	-
8	15,00	-	-
7	15,00	-	-
6	15,00	-	-
5	15,00	-	-
4	15,00	-	-
3	15,00	-	-
2	15,00	-	-
1	15,00	-	-

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) [-]
11	0,0175000	0,1127000	0,0049000	-	-	-
10	0,0996000	0,5140000	0,0211000	-	-	-
9	0,0564000	0,3660000	0,0165000	-	-	-
8	0,0383000	0,2300000	0,0115000	-	-	-
7	0,0219000	0,1533000	0,0061000	-	-	-
6	0,0184000	0,0920000	0,0037000	-	-	-
5	0,0001750	0,0011270	0,0000490	-	-	-
4	0,0219000	0,1533000	0,0061000	-	-	-
3	0,0613000	0,3067000	0,0153000	-	-	-
2	0,0383000	0,2300000	0,0115000	-	-	-
1	0,0184000	0,0920000	0,0037000	-	-	-

2.6 Non-Uniform Loads

Load number	Time [days]	Unit weight	
		Unsaturated [kN/m³]	Saturated [kN/m³]
1	0	18,00	18,00
2	0	16,00	18,00
3	0	16,00	18,00
4	0	16,00	18,00

Load number	Co-ordinates [m]					
1 - X -	-25,00	-25,00	25,00	25,00		
1 - Y -	-0,85	-0,35	-0,35	-0,85		
2 - X -	-25,00	-25,00	25,00	25,00		
2 - Y -	-0,35	-0,20	-0,20	-0,35		
3 - X -	-25,00	-25,00	25,00	25,00		
3 - Y -	-0,20	0,30	0,30	-0,20		
4 - X -	-25,00	-25,00	25,00	25,00		
4 - Y -	0,30	1,40	1,40	0,30		

2.7 Verticals

Vertical number	X co-ordinates [m]				
1	0,000				

2.8 Vertical Drain

Drain type	Strip
Horizontal range "From"	[m] -25,000
Horizontal range "To"	[m] 25,000
Bottom position	[m] -5,500
Center to center distance	[m] 1,000
Width	[m] 0,100
Thickness	[m] 0,003
Grid	Triangular
Drainage schedule	Off
Start of drainage	[days] 0,000

3 Results per Vertical

3.1 Results for Vertical 1 (X = 0,00 m; Z = 0,00 m)

Depth [m]	Effective Stress [kPa]	Hydraulic head [m]	Loading [kPa]	Settlement [m]
-0,850	19,401	-0,850	19,400	0,586
-0,950	20,900	-0,950	19,400	0,579
-1,050	22,400	-1,050	19,400	0,572
-1,150	23,014	-1,150	18,514	0,567
-1,250	23,533	-1,250	17,533	0,562
-1,275	23,663	-1,275	17,288	0,560
-1,350	24,052	-1,350	16,552	0,557
-1,450	24,571	-1,450	15,571	0,552
-1,550	25,090	-1,550	14,590	0,548
-1,600	25,349	-1,600	14,099	0,546
-1,650	25,454	-1,584	14,099	0,544
-1,700	25,558	-1,568	14,099	0,542
-1,700	25,558	-1,568	14,099	0,542
-1,750	25,622	-1,571	14,099	0,533
-1,850	25,736	-1,574	14,099	0,515
-2,350	26,110	-1,572	14,099	0,423
-3,000	25,904	-1,499	14,099	0,294
-3,000	25,904	-1,499	14,099	0,294
-3,210	26,127	-1,492	14,098	0,264
-3,420	26,081	-1,458	14,098	0,234
-3,420	26,081	-1,458	14,098	0,234
-3,710	27,840	-1,484	14,097	0,209
-4,000	29,271	-1,476	14,097	0,185
-4,000	29,271	-1,476	14,097	0,185
-4,500	32,467	-1,436	14,095	0,161
-5,000	34,222	-1,248	14,092	0,137
-5,000	34,222	-1,248	14,092	0,137
-5,750	34,445	-0,646	14,086	0,118
-6,500	34,737	-0,050	14,077	0,102
-6,500	34,737	-0,050	14,077	0,102
-7,500	42,910	-0,050	14,060	0,102
-8,500	51,074	-0,050	14,035	0,101
-8,500	51,074	-0,050	14,035	0,101
-8,850	53,026	0,006	14,024	0,092
-9,200	55,032	0,057	14,012	0,084
-9,200	55,032	0,057	14,012	0,084
-9,350	55,345	0,058	14,006	0,074
-9,500	55,659	0,059	14,000	0,065
-9,500	55,660	0,059	14,000	0,065
-10,100	58,540	0,080	13,974	0,038
-10,700	61,769	0,065	13,944	0,011
-10,700	61,769	0,065	13,944	0,011
-11,050	65,124	0,014	13,925	0,006
-11,400	68,594	-0,050	13,904	0,000

4 Settlements

4.1 Settlements

Vertical number	X co-ordinate [m]	Z co-ordinate [m]	Surface level [m]	Settlement [m]
1	0,00	0,00	-0,85	0,586

4.2 Residual Times

Vertical number	Time [days]	Settlement [m]	Part of final settlement [%]	Residual settlements [m]
1	180	0,512	87,308	0,074

End of Report

Report for D-Settlement 20.1

Settlement Calculations
Developed by Deltares

Company: CRUX Engineering B.V.

Date of report: 21-12-2020

Time of report: 16:31:44

Report with version: 20.1.1.29740

Date of calculation: 18-12-2020

Time of calculation: 19:30:33

Calculated with version: 20.1.1.29740

File name: SET003 CPT17_riool_zandaanvulling_6maand_zomerpeil

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2 Echo of the Input

2.1 Layer Boundaries

Boundary number	Co-ordinates [m]				
14 - X -	-25,000	-4,500	4,500	25,000	
14 - Y -	-0,850	-0,850	-0,850	-0,850	
13 - X -	-25,000	-4,500	-4,500	-1,245	-1,195
13 - Y -	-0,850	-0,850	-1,400	-1,400	-1,500
13 - X -	1,195	1,245	4,500	4,500	25,000
13 - Y -	-1,500	-1,400	-1,400	-0,850	-0,850
12 - X -	-25,000	-1,195	1,195	1,245	4,500
12 - Y -	-1,500	-1,500	-1,500	-1,400	-1,400
12 - X -	4,500	25,000			
12 - Y -	-0,850	-0,850			
11 - X -	-25,000	-1,195	-0,695	0,695	1,195
11 - Y -	-1,500	-1,500	-2,500	-2,500	-1,500
11 - X -	1,245	4,500	4,500	25,000	
11 - Y -	-1,400	-1,400	-0,850	-0,850	
10 - X -	-25,000	-0,695	0,695	1,195	1,245
10 - Y -	-2,500	-2,500	-2,500	-1,500	-1,400
10 - X -	4,500	4,500	25,000		
10 - Y -	-1,400	-0,850	-0,850		
9 - X -	-25,000	-0,695	-0,595	-0,595	0,595
9 - Y -	-2,500	-2,500	-2,700	-3,100	-3,100
9 - X -	0,595	0,695	1,195	1,245	4,500
9 - Y -	-2,700	-2,500	-1,500	-1,400	-1,400
9 - X -	4,500	25,000			
9 - Y -	-0,850	-0,850			
8 - X -	-25,000	-0,695	-0,595	-0,595	0,595
8 - Y -	-2,500	-2,500	-2,700	-3,100	-3,100
8 - X -	0,595	0,695	1,195	25,000	
8 - Y -	-2,700	-2,500	-1,500	-1,500	
7 - X -	-25,000	-0,695	-0,595	-0,595	0,595
7 - Y -	-2,500	-2,500	-2,700	-3,100	-3,100
7 - X -	0,595	0,695	25,000		
7 - Y -	-2,700	-2,500	-2,500		
6 - X -	-25,000	25,000			
6 - Y -	-4,100	-4,100			
5 - X -	-25,000	25,000			
5 - Y -	-5,000	-5,000			
4 - X -	-25,000	25,000			
4 - Y -	-5,500	-5,500			
3 - X -	-25,000	25,000			
3 - Y -	-6,800	-6,800			
2 - X -	-25,000	25,000			
2 - Y -	-7,400	-7,400			
1 - X -	-25,000	25,000			
1 - Y -	-7,600	-7,600			
0 - X -	-25,000	25,000			
0 - Y -	-8,600	-8,600			

2.2 PI-lines

PI-line number	Co-ordinates [m]				
1 - X -	-25,000	25,000			
1 - Y -	-1,600	-1,600			
2 - X -	-25,000	25,000			
2 - Y -	-0,050	-0,050			

2.3 General Data

Soil model:	NEN Bjerrum
Consolidation model:	Darcy
Strain model:	Linear
Groundwater level:	Initial determined by PI-line number 1
Unit weight of water:	9,81 [kN/m ³]
Stress distribution	
- Soil:	Buisman
- Loads:	None
End of consolidation:	11130,00 [days]
No maintain profile	
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 :	0,02 [m]
Load column width	
- Non-Uniform Loads :	0,20 [m]
- Trapeziform Loads :	0,05 [m]

2.4 Soil Profiles

Layer number	Material name	PI-line top	PI-line bottom
14	Top klei (stijf)	1	99
13	Top klei	1	99
12	Veen 1 (stijf)	99	99
11	Veen 1	99	99
10	Veen (Houthoudend...)	99	99
9	Top klei	99	99
8	Veen 1	99	99
7	Veen (Houthoudend)	99	99
6	Klei humeus	99	99
5	Veen (Houthoudend)	99	99
4	Klei	99	99
3	Klei humeus	99	99
2	Veen 2	99	99
1	Klei zandig	99	2

2.5 Non-Uniform Loads

Load number	Time [days]	Unit weight	
		Unsaturated [kN/m ³]	Saturated [kN/m ³]
1	0	18,00	18,00
2	0	18,00	18,00
3	0	16,00	18,00
4	0	16,00	18,00
5	0	16,00	18,00
6	0	16,00	18,00
7	0	16,00	18,00
8	180	0,00	9,81
9	180	3,00	15,00
10	180	7,40	19,40
11	180	6,80	18,80
12	180	0,00	9,81
13	180	20,70	20,70
14	180	18,00	18,00

Load number	Co-ordinates [m]					
1 - X -	-25,00	-25,00	-4,50	-4,50		
1 - Y -	-0,85	-0,35	-0,35	-0,85		
2 - X -	4,50	4,50	25,00	25,00		
2 - Y -	-0,85	-0,35	-0,35	-0,85		
3 - X -	-25,00	-25,00	-4,50	-4,50		
3 - Y -	-0,35	0,50	0,50	-0,35		
4 - X -	4,50	4,50	25,00	25,00		
4 - Y -	-0,35	0,50	0,50	-0,35		
5 - X -	-25,00	-25,00	-4,50	-4,50		
5 - Y -	0,50	0,95	0,95	0,50		
6 - X -	4,50	4,50	25,00	25,00		
6 - Y -	0,50	0,95	0,95	0,50		
7 - X -	-4,50	-4,50	-2,00	2,00	4,50	4,50
7 - Y -	-0,85	0,95	0,95	0,95	0,95	-0,85
8 - X -	-25,00	-4,50	-4,50	4,50	4,50	25,00
8 - Y -	0,50	0,50	-0,85	-0,85	0,50	0,50
9 - X -	-4,50	-4,50	-1,25	-1,20	1,20	1,25
9 - Y -	-0,85	-1,40	-1,40	-1,50	-1,50	-1,40
9 - X -	4,50	4,50				
9 - Y -	-1,40	-0,85				
10 - X -	-1,20	-0,69	0,69	1,20		
10 - Y -	-1,50	-2,50	-2,50	-1,50		
11 - X -	-0,69	-0,59	-0,59	0,59	0,59	0,69
11 - Y -	-2,50	-2,70	-3,10	-3,10	-2,70	-2,50
12 - X -	-4,50	4,50				
12 - Y -	-0,85	-0,85				
13 - X -	-4,50	-4,50	4,50	4,50		
13 - Y -	-0,85	-0,40	-0,40	-0,85		
14 - X -	-4,50	-4,50	-2,00	-2,00	2,00	2,00
14 - Y -	-0,40	-0,30	-0,30	-0,40	-0,40	-0,30
14 - X -	4,50	4,50				
14 - Y -	-0,30	-0,40				

2.6 Verticals

Vertical number	X co-ordinates [m]				
1 - 5	0,000	0,400	2,400	3,000	4,000
6 - 7	5,000	15,000			

3 Results per Vertical

3.1 Results for Vertical 1 (X = 0,00 m; Z = 0,00 m)

Depth [m]	Effective Stress [kPa]	Hydraulic head [m]	Loading [kPa]	Settlement [m]
-0,850	9,318	-0,850	9,317	0,465
-0,950	10,820	-0,950	9,320	0,465
-1,050	12,324	-1,050	9,324	0,465
-1,150	13,736	-1,150	9,236	0,465
-1,175	13,868	-1,175	8,993	0,465
-1,250	14,263	-1,250	8,263	0,465
-1,350	14,794	-1,350	7,294	0,465
-1,450	15,327	-1,450	6,327	0,465
-1,500	18,330	-1,500	8,580	0,465
-1,500	18,330	-1,500	8,580	0,465
-1,550	18,379	-1,550	8,099	0,465
-1,600	18,428	-1,600	7,618	0,465
-1,650	18,371	-1,589	7,630	0,465
-1,750	18,258	-1,567	7,656	0,465
-1,850	18,151	-1,545	7,687	0,465
-2,000	18,000	-1,511	7,743	0,464
-2,500	27,213	-1,401	17,647	0,464
-2,500	27,213	-1,401	17,647	0,464
-2,800	27,326	-1,334	17,995	0,464
-3,100	32,382	-1,268	23,285	0,464
-3,100	32,382	-1,268	23,285	0,464
-3,600	33,006	-1,424	21,683	0,393
-4,100	31,153	-1,409	19,284	0,321
-4,100	31,153	-1,409	19,283	0,321
-4,550	33,139	-1,537	17,678	0,279
-5,000	35,385	-1,637	16,604	0,237
-5,000	35,385	-1,637	16,604	0,237
-5,250	34,851	-1,591	16,173	0,202
-5,500	34,386	-1,543	15,830	0,168
-5,500	34,386	-1,543	15,830	0,168
-6,150	38,675	-1,566	15,228	0,133
-6,800	42,990	-1,563	14,898	0,099
-6,800	42,990	-1,563	14,898	0,099
-7,100	44,170	-1,534	14,803	0,073
-7,400	45,210	-1,488	14,735	0,048
-7,400	45,210	-1,488	14,735	0,048
-7,500	45,175	-1,464	14,717	0,036
-7,600	45,120	-1,438	14,701	0,025
-7,600	45,120	-1,438	14,701	0,025
-8,100	42,146	-0,723	14,648	0,011
-8,600	39,622	-0,050	14,627	0,000

3.2 Results for Vertical 2 (X = 0,40 m; Z = 0,00 m)

Depth [m]	Effective Stress [kPa]	Hydraulic head [m]	Loading [kPa]	Settlement [m]
-0,850	9,319	-0,850	9,318	0,457
-0,950	10,821	-0,950	9,321	0,457
-1,050	12,327	-1,050	9,327	0,457
-1,150	13,809	-1,150	9,309	0,457
-1,175	13,941	-1,175	9,066	0,457
-1,250	14,338	-1,250	8,338	0,457
-1,350	14,871	-1,350	7,371	0,457

Depth [m]	Effective Stress [kPa]	Hydraulic head [m]	Loading [kPa]	Settlement [m]
-1,450	15,406	-1,450	6,406	0,457
-1,500	18,407	-1,500	8,657	0,457
-1,500	18,407	-1,500	8,657	0,457
-1,550	18,457	-1,550	8,177	0,457
-1,600	18,509	-1,600	7,699	0,457
-1,650	18,454	-1,589	7,714	0,457
-1,750	18,351	-1,567	7,748	0,457
-1,850	18,253	-1,545	7,789	0,457
-2,000	18,115	-1,511	7,857	0,457
-2,500	27,568	-1,401	18,002	0,457
-2,500	27,568	-1,401	18,002	0,457
-2,800	27,626	-1,334	18,295	0,457
-3,100	31,868	-1,268	22,771	0,457
-3,100	31,868	-1,268	22,771	0,457
-3,600	31,430	-1,424	20,103	0,388
-4,100	30,138	-1,409	18,267	0,319
-4,100	30,138	-1,409	18,267	0,319
-4,550	32,580	-1,536	17,128	0,278
-5,000	35,093	-1,637	16,315	0,237
-5,000	35,093	-1,637	16,315	0,237
-5,250	34,650	-1,591	15,974	0,202
-5,500	34,249	-1,543	15,695	0,168
-5,500	34,249	-1,543	15,695	0,168
-6,150	38,639	-1,565	15,194	0,133
-6,800	43,005	-1,563	14,913	0,099
-6,800	43,005	-1,563	14,913	0,099
-7,100	44,199	-1,534	14,833	0,073
-7,400	45,250	-1,488	14,775	0,048
-7,400	45,250	-1,488	14,775	0,048
-7,500	45,218	-1,464	14,759	0,036
-7,600	45,165	-1,438	14,746	0,025
-7,600	45,165	-1,438	14,746	0,025
-8,100	42,202	-0,723	14,703	0,011
-8,600	39,683	-0,050	14,689	0,000

3.3 Results for Vertical 3 (X = 2,40 m; Z = 0,00 m)

Depth [m]	Effective Stress [kPa]	Hydraulic head [m]	Loading [kPa]	Settlement [m]
-0,850	10,988	-0,850	10,987	0,598
-0,950	12,431	-0,950	10,931	0,598
-1,050	13,603	-1,050	10,603	0,598
-1,125	13,962	-1,125	9,837	0,598
-1,150	14,082	-1,150	9,582	0,598
-1,250	14,573	-1,250	8,573	0,598
-1,350	15,075	-1,350	7,575	0,598
-1,400	17,839	-1,400	9,589	0,598
-1,400	17,839	-1,400	9,589	0,598
-1,450	18,097	-1,450	9,097	0,596
-1,500	18,357	-1,500	8,607	0,595
-1,500	18,357	-1,500	8,607	0,595
-1,550	18,481	-1,558	8,119	0,588
-1,600	18,608	-1,617	7,633	0,581
-1,650	18,630	-1,614	7,640	0,575
-1,750	18,681	-1,610	7,658	0,562
-1,850	18,742	-1,605	7,684	0,549
-2,000	18,850	-1,599	7,736	0,529
-2,500	19,273	-1,574	8,007	0,461
-2,500	19,273	-1,574	8,007	0,461
-3,300	21,073	-1,572	8,717	0,374

Depth [m]	Effective Stress [kPa]	Hydraulic head [m]	Loading [kPa]	Settlement [m]
-4,100	22,506	-1,495	9,788	0,281
-4,100	22,506	-1,495	9,788	0,281
-4,550	26,218	-1,568	10,451	0,249
-5,000	29,858	-1,639	11,063	0,216
-5,000	29,859	-1,639	11,063	0,216
-5,250	30,054	-1,592	11,365	0,186
-5,500	30,201	-1,544	11,636	0,155
-5,500	30,202	-1,544	11,636	0,155
-6,150	35,634	-1,564	12,201	0,125
-6,800	40,687	-1,562	12,602	0,094
-6,800	40,687	-1,562	12,602	0,094
-7,100	42,109	-1,534	12,745	0,069
-7,400	43,345	-1,488	12,869	0,045
-7,400	43,345	-1,488	12,869	0,045
-7,500	43,366	-1,464	12,906	0,034
-7,600	43,362	-1,438	12,941	0,023
-7,600	43,362	-1,438	12,941	0,023
-8,100	40,602	-0,723	13,097	0,010
-8,600	38,217	-0,050	13,223	0,000

3.4 Results for Vertical 4 (X = 3,00 m; Z = 0,00 m)

Depth [m]	Effective Stress [kPa]	Hydraulic head [m]	Loading [kPa]	Settlement [m]
-0,850	11,130	-0,850	11,129	0,604
-0,950	12,641	-0,950	11,141	0,604
-1,050	13,828	-1,050	10,828	0,604
-1,125	14,236	-1,125	10,111	0,604
-1,150	14,373	-1,150	9,873	0,604
-1,250	14,926	-1,250	8,926	0,604
-1,350	15,488	-1,350	7,988	0,604
-1,400	18,301	-1,400	10,051	0,604
-1,400	18,301	-1,400	10,051	0,604
-1,450	18,588	-1,450	9,588	0,602
-1,500	18,876	-1,500	9,126	0,601
-1,500	18,876	-1,500	9,126	0,601
-1,550	19,029	-1,558	8,666	0,593
-1,600	19,183	-1,617	8,208	0,587
-1,650	19,232	-1,614	8,242	0,580
-1,750	19,336	-1,610	8,313	0,567
-1,850	19,447	-1,605	8,388	0,553
-2,000	19,619	-1,599	8,503	0,533
-2,500	20,150	-1,574	8,880	0,462
-2,500	20,150	-1,574	8,880	0,462
-3,300	21,798	-1,572	9,438	0,374
-4,100	22,833	-1,496	10,113	0,281
-4,100	22,833	-1,496	10,113	0,281
-4,550	26,330	-1,568	10,560	0,248
-5,000	29,813	-1,639	11,016	0,215
-5,000	29,813	-1,639	11,016	0,215
-5,250	29,951	-1,592	11,261	0,185
-5,500	30,061	-1,544	11,494	0,154
-5,500	30,061	-1,544	11,494	0,154
-6,150	35,460	-1,564	12,026	0,124
-6,800	40,531	-1,562	12,445	0,093
-6,800	40,531	-1,562	12,445	0,093
-7,100	41,968	-1,534	12,604	0,069
-7,400	43,221	-1,488	12,744	0,045
-7,400	43,221	-1,488	12,744	0,045
-7,500	43,247	-1,464	12,787	0,034

Depth [m]	Effective Stress [kPa]	Hydraulic head [m]	Loading [kPa]	Settlement [m]
-7,600	43,250	-1,438	12,828	0,023
-7,600	43,250	-1,438	12,828	0,023
-8,100	40,516	-0,724	13,009	0,010
-8,600	38,152	-0,050	13,157	0,000

3.5 Results for Vertical 5 (X = 4,00 m; Z = 0,00 m)

Depth [m]	Effective Stress [kPa]	Hydraulic head [m]	Loading [kPa]	Settlement [m]
-0,850	11,824	-0,850	11,823	0,619
-0,950	13,647	-0,950	12,147	0,619
-1,050	15,015	-1,050	12,015	0,619
-1,125	15,637	-1,125	11,512	0,619
-1,150	15,841	-1,150	11,341	0,619
-1,250	16,641	-1,250	10,641	0,619
-1,350	17,412	-1,350	9,912	0,619
-1,400	20,349	-1,400	12,099	0,619
-1,400	20,349	-1,400	12,099	0,619
-1,450	20,718	-1,450	11,718	0,617
-1,500	21,080	-1,500	11,330	0,615
-1,500	21,080	-1,500	11,330	0,615
-1,550	21,300	-1,559	10,935	0,607
-1,600	21,510	-1,617	10,530	0,600
-1,650	21,603	-1,615	10,606	0,592
-1,750	21,760	-1,611	10,728	0,578
-1,850	21,883	-1,606	10,813	0,563
-2,000	22,024	-1,600	10,896	0,541
-2,500	22,311	-1,576	11,027	0,467
-2,500	22,311	-1,576	11,027	0,467
-3,300	23,534	-1,573	11,168	0,378
-4,100	24,083	-1,495	11,364	0,284
-4,100	24,083	-1,495	11,364	0,284
-4,550	27,291	-1,568	11,523	0,251
-5,000	30,513	-1,639	11,716	0,216
-5,000	30,513	-1,639	11,716	0,216
-5,250	30,523	-1,593	11,833	0,186
-5,500	30,521	-1,545	11,954	0,155
-5,500	30,521	-1,545	11,954	0,155
-6,150	35,707	-1,565	12,270	0,124
-6,800	40,652	-1,562	12,565	0,093
-6,800	40,652	-1,562	12,565	0,093
-7,100	42,054	-1,534	12,689	0,069
-7,400	43,281	-1,488	12,803	0,045
-7,400	43,281	-1,488	12,803	0,045
-7,500	43,300	-1,464	12,839	0,034
-7,600	43,296	-1,438	12,874	0,023
-7,600	43,296	-1,438	12,874	0,023
-8,100	40,540	-0,723	13,034	0,010
-8,600	38,165	-0,050	13,170	0,000

3.6 Results for Vertical 6 (X = 5,00 m; Z = 0,00 m)

Depth [m]	Effective Stress [kPa]	Hydraulic head [m]	Loading [kPa]	Settlement [m]
-0,850	21,893	-0,850	21,892	0,643
-0,950	23,066	-0,950	21,566	0,636
-1,050	23,787	-1,050	20,787	0,631

Depth [m]	Effective Stress [kPa]	Hydraulic head [m]	Loading [kPa]	Settlement [m]
-1,150	23,997	-1,150	19,497	0,627
-1,175	24,053	-1,175	19,178	0,626
-1,250	24,232	-1,250	18,232	0,623
-1,350	24,493	-1,350	16,993	0,619
-1,450	24,781	-1,450	15,781	0,616
-1,500	24,934	-1,500	15,184	0,614
-1,500	24,934	-1,500	15,184	0,614
-1,550	24,957	-1,558	14,595	0,607
-1,600	24,989	-1,617	14,015	0,600
-1,650	24,923	-1,614	13,935	0,594
-1,750	24,825	-1,609	13,804	0,581
-1,850	24,764	-1,605	13,708	0,567
-2,000	24,719	-1,599	13,608	0,547
-2,500	24,670	-1,574	13,402	0,476
-2,500	24,670	-1,574	13,402	0,476
-3,300	25,504	-1,571	13,151	0,388
-4,100	25,694	-1,494	12,984	0,292
-4,100	25,694	-1,494	12,984	0,292
-4,550	28,703	-1,568	12,940	0,257
-5,000	31,732	-1,639	12,934	0,221
-5,000	31,732	-1,639	12,934	0,221
-5,250	31,636	-1,593	12,945	0,190
-5,500	31,532	-1,545	12,965	0,159
-5,500	31,532	-1,545	12,965	0,159
-6,150	36,492	-1,565	13,051	0,127
-6,800	41,256	-1,562	13,167	0,095
-6,800	41,256	-1,562	13,167	0,095
-7,100	42,590	-1,534	13,224	0,070
-7,400	43,758	-1,488	13,281	0,046
-7,400	43,758	-1,488	13,281	0,046
-7,500	43,760	-1,464	13,300	0,034
-7,600	43,740	-1,438	13,319	0,023
-7,600	43,740	-1,438	13,319	0,023
-8,100	40,912	-0,723	13,410	0,010
-8,600	38,487	-0,050	13,492	0,000

4 Settlements

4.1 Settlements

Vertical number	X co-ordinate [m]	Z co-ordinate [m]	Surface level [m]	Settlement [m]
1	0,00	0,00	-0,85	0,465
2	0,40	0,00	-0,85	0,457
3	2,40	0,00	-0,85	0,598
4	3,00	0,00	-0,85	0,604
5	4,00	0,00	-0,85	0,619
6	5,00	0,00	-0,85	0,643
7	15,00	0,00	-0,85	0,706

4.2 Residual Times

Vertical number	Time [days]	Settlement [m]	Part of final settlement [%]	Residual settlements [m]
1	180	0,375	80,638	0,090
2	180	0,375	81,921	0,083
3	180	0,599	100,196	-0,001
4	180	0,603	99,875	0,001
5	180	0,605	97,868	0,013
6	180	0,602	93,701	0,040
7	180	0,624	88,421	0,082

End of Report

Report for D-Settlement 20.1

Settlement Calculations
Developed by Deltares

Company: CRUX Engineering B.V.

Date of report: 21-12-2020

Time of report: 16:28:56

Report with version: 20.1.1.29740

Date of calculation: 18-12-2020

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2 Echo of the Input

2.1 Layer Boundaries

Boundary number	Co-ordinates [m]				
13 - X -	-25,000	-4,500	4,500	25,000	
13 - Y -	-0,850	-0,850	-0,850	-0,850	
12 - X -	-25,000	-4,500	-4,500	-1,800	-1,650
12 - Y -	-0,850	-0,850	-1,400	-1,400	-1,700
12 - X -	1,650	1,800	4,500	4,500	25,000
12 - Y -	-1,700	-1,400	-1,400	-0,850	-0,850
11 - X -	-25,000	-1,650	1,650	1,800	4,500
11 - Y -	-1,700	-1,700	-1,700	-1,400	-1,400
11 - X -	4,500	25,000			
11 - Y -	-0,850	-0,850			
10 - X -	-25,000	-1,650	-1,050	1,050	1,650
10 - Y -	-1,700	-1,700	-2,900	-2,900	-1,700
10 - X -	1,800	4,500	4,500	25,000	
10 - Y -	-1,400	-1,400	-0,850	-0,850	
9 - X -	-25,000	-1,050	1,050	1,650	1,800
9 - Y -	-2,900	-2,900	-2,900	-1,700	-1,400
9 - X -	4,500	4,500	25,000		
9 - Y -	-1,400	-0,850	-0,850		
8 - X -	-25,000	-1,050	-0,595	-0,595	0,595
8 - Y -	-2,900	-2,900	-3,810	-4,220	-4,220
8 - X -	0,595	1,050	1,650	1,800	4,500
8 - Y -	-3,810	-2,900	-1,700	-1,400	-1,400
8 - X -	4,500	25,000			
8 - Y -	-0,850	-0,850			
7 - X -	-25,000	-1,050	-0,595	-0,595	0,595
7 - Y -	-2,900	-2,900	-3,810	-4,220	-4,220
7 - X -	0,595	1,050	1,650	25,000	
7 - Y -	-3,810	-2,900	-1,700	-1,700	
6 - X -	-25,000	-1,050	-0,595	-0,595	0,595
6 - Y -	-2,900	-2,900	-3,810	-4,220	-4,220
6 - X -	0,595	1,050	25,000		
6 - Y -	-3,810	-2,900	-2,900		
5 - X -	-25,000	25,000			
5 - Y -	-6,000	-6,000			
4 - X -	-25,000	25,000			
4 - Y -	-7,200	-7,200			
3 - X -	-25,000	25,000			
3 - Y -	-8,500	-8,500			
2 - X -	-25,000	25,000			
2 - Y -	-9,000	-9,000			
1 - X -	-25,000	25,000			
1 - Y -	-9,800	-9,800			
0 - X -	-25,000	25,000			
0 - Y -	-10,900	-10,900			

2.2 PI-lines

PI-line number	Co-ordinates [m]				
1 - X -	-25,000	25,000			
1 - Y -	-1,600	-1,600			
2 - X -	-25,000	25,000			
2 - Y -	-0,050	-0,050			

2.3 General Data

Soil model:	NEN Bjerrum
Consolidation model:	Darcy
Strain model:	Linear

Groundwater level:	Initial determined by PI-line number 1
Unit weight of water:	9,81 [kN/m ³]
Stress distribution	
- Soil:	Buisman
- Loads:	None
End of consolidation:	11130,00 [days]
No maintain profile	
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 :	0,02 [m]
Load column width	
- Non-Uniform Loads :	0,20 [m]
- Trapeziform Loads :	0,05 [m]

2.4 Soil Profiles

Layer number	Material name	PI-line top	PI-line bottom
13	Top klei (stijf)	1	99
12	Top klei	1	99
11	Veen 1 (stijf)	99	99
10	Veen 1	99	99
9	Veen (Houthoudend...	99	99
8	Top klei	99	99
7	Veen 1	99	99
6	Veen (Houthoudend)	99	99
5	Klei	99	99
4	Klei humeus	99	99
3	Veen 2	99	99
2	Klei	99	99
1	Klei zandig	99	2

2.5 Non-Uniform Loads

Load number	Time [days]	Unit weight	
		Unsaturated [kN/m ³]	Saturated [kN/m ³]
1	0	18,00	18,00
2	0	18,00	18,00
3	0	16,00	18,00
4	0	16,00	18,00
5	0	16,00	18,00
6	0	16,00	18,00
7	0	16,00	18,00
8	180	0,00	9,81
9	180	3,00	15,00
10	180	7,40	19,40
11	180	6,80	18,80
12	180	0,00	9,81
13	180	20,70	20,70
14	180	16,00	18,00

Load number	Co-ordinates [m]					
1 - X -	-25,00	-25,00	-4,50	-4,50		
1 - Y -	-0,85	-0,35	-0,35	-0,85		
2 - X -	4,50	4,50	25,00	25,00		
2 - Y -	-0,85	-0,35	-0,35	-0,85		
3 - X -	-25,00	-25,00	-4,50	-4,50		
3 - Y -	-0,35	0,75	0,75	-0,35		
4 - X -	4,50	4,50	25,00	25,00		
4 - Y -	-0,35	0,75	0,75	-0,35		
5 - X -	-25,00	-25,00	-4,50	-4,50		

Load number	Co-ordinates [m]					
5 - Y -	0,75	1,40	1,40	0,75		
6 - X -	4,50	4,50	25,00	25,00		
6 - Y -	0,75	1,40	1,40	0,75		
7 - X -	-4,50	-4,50	-2,00	2,00	4,50	4,50
7 - Y -	-0,85	1,40	2,20	2,20	1,40	-0,85
8 - X -	-25,00	-4,50	-4,50	4,50	4,50	25,00
8 - Y -	0,75	0,75	-0,85	-0,85	0,75	0,75
9 - X -	-4,50	-4,50	-1,80	-1,65	1,68	1,80
9 - Y -	-0,85	-1,40	-1,40	-1,70	-1,70	-1,40
9 - X -	4,50	4,50				
9 - Y -	-1,40	-0,85				
10 - X -	-1,65	-1,05	1,05	1,65		
10 - Y -	-1,70	-2,90	-2,90	-1,70		
11 - X -	-1,05	-0,59	-0,59	0,59	0,59	1,05
11 - Y -	-2,90	-3,81	-4,22	-4,22	-3,81	-2,90
12 - X -	-4,50	4,50				
12 - Y -	-0,85	-0,85				
13 - X -	-4,50	-4,50	4,50	4,50		
13 - Y -	-0,85	-0,40	-0,40	-0,85		
14 - X -	-4,50	-4,50	-2,00	-2,00	2,00	2,00
14 - Y -	-0,40	0,10	0,10	-0,40	-0,40	0,10
14 - X -	4,50	4,50				
14 - Y -	0,10	-0,40				

2.6 Verticals

Vertical number	X co-ordinates [m]				
1 - 5	0,000	0,400	2,400	3,000	4,000
6 - 7	5,000	15,000			

3 Results per Vertical

3.1 Results for Vertical 1 (X = 0,00 m; Z = 0,00 m)

Depth [m]	Effective Stress [kPa]	Hydraulic head [m]	Loading [kPa]	Settlement [m]
-0,850	9,324	-0,850	9,323	0,657
-0,950	10,807	-0,950	9,307	0,657
-1,050	11,340	-1,050	8,340	0,657
-1,150	11,879	-1,150	7,379	0,657
-1,250	12,425	-1,250	6,425	0,657
-1,275	12,563	-1,275	6,188	0,657
-1,350	12,979	-1,350	5,479	0,657
-1,450	13,539	-1,450	4,539	0,657
-1,550	14,108	-1,550	3,608	0,657
-1,600	14,395	-1,600	3,145	0,657
-1,650	14,603	-1,592	3,175	0,657
-1,700	19,009	-1,583	7,403	0,657
-1,700	19,009	-1,583	7,403	0,657
-1,750	19,001	-1,575	7,437	0,657
-1,850	18,990	-1,558	7,511	0,657
-2,300	19,050	-1,483	7,951	0,657
-2,900	30,808	-1,383	20,216	0,657
-2,900	30,808	-1,383	20,216	0,657
-3,560	31,463	-1,273	21,033	0,657
-4,220	43,121	-1,163	32,853	0,657
-4,220	43,121	-1,163	32,853	0,657
-5,110	43,667	-1,502	28,835	0,494
-6,000	40,195	-1,491	24,243	0,331
-6,000	40,195	-1,491	24,243	0,331
-6,600	43,417	-1,559	22,483	0,293
-7,200	46,883	-1,591	21,315	0,257
-7,200	46,883	-1,591	21,315	0,257
-7,850	49,416	-1,594	20,449	0,193
-8,500	52,415	-1,618	19,841	0,131
-8,500	52,415	-1,618	19,841	0,131
-8,750	52,418	-1,581	19,655	0,099
-9,000	52,401	-1,540	19,489	0,068
-9,000	52,401	-1,540	19,489	0,068
-9,400	52,971	-1,329	19,260	0,046
-9,800	53,113	-1,070	19,065	0,027
-9,800	53,113	-1,070	19,065	0,027
-10,350	52,320	-0,553	18,842	0,013
-10,900	51,708	-0,050	18,657	0,000

3.2 Results for Vertical 2 (X = 0,40 m; Z = 0,00 m)

Depth [m]	Effective Stress [kPa]	Hydraulic head [m]	Loading [kPa]	Settlement [m]
-0,850	9,327	-0,850	9,326	0,652
-0,950	10,838	-0,950	9,338	0,652
-1,050	11,398	-1,050	8,398	0,652
-1,150	11,941	-1,150	7,441	0,652
-1,250	12,490	-1,250	6,490	0,652
-1,275	12,628	-1,275	6,253	0,652
-1,350	13,044	-1,350	5,544	0,652
-1,450	13,605	-1,450	4,605	0,652
-1,550	14,173	-1,550	3,673	0,652
-1,600	14,459	-1,600	3,209	0,652

Depth [m]	Effective Stress [kPa]	Hydraulic head [m]	Loading [kPa]	Settlement [m]
-1,650	14,666	-1,592	3,238	0,652
-1,700	19,083	-1,583	7,478	0,652
-1,700	19,083	-1,583	7,478	0,652
-1,750	19,074	-1,575	7,511	0,652
-1,850	19,065	-1,558	7,587	0,652
-2,300	19,145	-1,483	8,047	0,652
-2,900	30,925	-1,383	20,333	0,652
-2,900	30,925	-1,383	20,333	0,652
-3,560	31,452	-1,273	21,022	0,652
-4,220	43,342	-1,163	33,074	0,652
-4,220	43,342	-1,163	33,074	0,652
-5,110	41,779	-1,503	26,944	0,490
-6,000	39,506	-1,491	23,553	0,330
-6,000	39,506	-1,491	23,552	0,330
-6,600	43,031	-1,558	22,099	0,292
-7,200	46,648	-1,591	21,081	0,256
-7,200	46,648	-1,591	21,081	0,256
-7,850	49,268	-1,594	20,301	0,193
-8,500	52,318	-1,618	19,743	0,131
-8,500	52,318	-1,618	19,743	0,131
-8,750	52,334	-1,581	19,570	0,099
-9,000	52,328	-1,540	19,416	0,067
-9,000	52,328	-1,540	19,416	0,067
-9,400	52,913	-1,329	19,201	0,046
-9,800	53,066	-1,070	19,018	0,027
-9,800	53,066	-1,070	19,018	0,027
-10,350	52,286	-0,553	18,807	0,013
-10,900	51,682	-0,050	18,631	0,000

3.3 Results for Vertical 3 (X = 2,40 m; Z = 0,00 m)

Depth [m]	Effective Stress [kPa]	Hydraulic head [m]	Loading [kPa]	Settlement [m]
-0,850	14,258	-0,850	14,257	1,015
-0,950	14,509	-0,950	13,009	1,015
-1,050	14,798	-1,050	11,798	1,015
-1,125	15,043	-1,125	10,918	1,015
-1,150	15,130	-1,150	10,630	1,015
-1,250	15,500	-1,250	9,500	1,015
-1,350	15,901	-1,350	8,401	1,015
-1,400	18,968	-1,400	10,718	1,015
-1,400	18,968	-1,400	10,717	1,015
-1,450	19,186	-1,450	10,186	1,013
-1,550	19,639	-1,550	9,139	1,008
-1,600	19,871	-1,600	8,621	1,006
-1,650	20,023	-1,592	8,595	1,004
-1,700	20,177	-1,583	8,571	1,002
-1,700	20,177	-1,583	8,571	1,002
-1,750	20,206	-1,585	8,548	0,992
-1,850	20,264	-1,586	8,509	0,973
-2,300	20,715	-1,589	8,583	0,889
-2,900	21,691	-1,578	9,193	0,772
-2,900	21,691	-1,578	9,193	0,772
-3,650	23,937	-1,592	10,252	0,663
-4,450	26,614	-1,593	11,808	0,542
-5,200	28,966	-1,581	13,235	0,425
-6,000	30,843	-1,519	14,610	0,299
-6,000	30,843	-1,519	14,610	0,299
-6,600	36,432	-1,567	15,414	0,267
-7,200	41,557	-1,592	15,982	0,237

Depth [m]	Effective Stress [kPa]	Hydraulic head [m]	Loading [kPa]	Settlement [m]
-7,200	41,557	-1,592	15,982	0,237
-7,850	45,336	-1,593	16,376	0,180
-8,500	49,181	-1,618	16,607	0,123
-8,500	49,181	-1,618	16,607	0,123
-8,750	49,428	-1,581	16,665	0,093
-9,000	49,623	-1,541	16,711	0,063
-9,000	49,623	-1,541	16,711	0,063
-9,400	50,486	-1,330	16,762	0,043
-9,800	50,858	-1,072	16,791	0,025
-9,800	50,858	-1,072	16,791	0,025
-10,350	50,301	-0,554	16,807	0,012
-10,900	49,853	-0,050	16,801	0,000

3.4 Results for Vertical 4 (X = 3,00 m; Z = 0,00 m)

Depth [m]	Effective Stress [kPa]	Hydraulic head [m]	Loading [kPa]	Settlement [m]
-0,850	14,916	-0,850	14,915	0,996
-0,950	15,412	-0,950	13,912	0,996
-1,050	15,902	-1,050	12,902	0,996
-1,125	16,266	-1,125	12,141	0,996
-1,150	16,387	-1,150	11,887	0,996
-1,250	16,872	-1,250	10,872	0,996
-1,350	17,360	-1,350	9,860	0,996
-1,400	20,461	-1,400	12,211	0,996
-1,400	20,461	-1,400	12,211	0,996
-1,450	20,709	-1,450	11,709	0,994
-1,550	21,209	-1,550	10,709	0,989
-1,600	21,462	-1,600	10,212	0,987
-1,650	21,635	-1,592	10,207	0,985
-1,700	21,809	-1,583	10,203	0,983
-1,700	21,809	-1,583	10,203	0,983
-1,750	21,858	-1,585	10,201	0,973
-1,850	21,953	-1,586	10,198	0,955
-2,300	22,360	-1,589	10,226	0,871
-2,900	22,900	-1,578	10,400	0,757
-2,900	22,900	-1,578	10,400	0,757
-3,650	24,545	-1,593	10,859	0,650
-4,450	26,524	-1,593	11,717	0,532
-5,200	28,450	-1,581	12,719	0,418
-6,000	30,047	-1,519	13,814	0,294
-6,000	30,047	-1,519	13,814	0,294
-6,600	35,574	-1,567	14,553	0,263
-7,200	40,735	-1,592	15,159	0,233
-7,200	40,735	-1,592	15,159	0,233
-7,850	44,614	-1,593	15,653	0,178
-8,500	48,574	-1,618	16,000	0,121
-8,500	48,574	-1,618	16,000	0,121
-8,750	48,865	-1,581	16,101	0,092
-9,000	49,101	-1,541	16,188	0,062
-9,000	49,101	-1,541	16,188	0,062
-9,400	50,028	-1,331	16,299	0,043
-9,800	50,457	-1,073	16,382	0,025
-9,800	50,457	-1,073	16,382	0,025
-10,350	49,961	-0,555	16,461	0,012
-10,900	49,558	-0,050	16,507	0,000

3.5 Results for Vertical 5 (X = 4,00 m; Z = 0,00 m)

Depth [m]	Effective Stress [kPa]	Hydraulic head [m]	Loading [kPa]	Settlement [m]
-0,850	15,935	-0,850	15,934	0,961
-0,950	16,719	-0,950	15,219	0,961
-1,050	17,495	-1,050	14,495	0,961
-1,125	18,062	-1,125	13,937	0,961
-1,150	18,248	-1,150	13,748	0,961
-1,250	18,974	-1,250	12,974	0,961
-1,350	19,674	-1,350	12,174	0,961
-1,400	22,869	-1,400	14,619	0,961
-1,400	22,869	-1,400	14,619	0,961
-1,450	23,204	-1,450	14,204	0,958
-1,550	23,853	-1,550	13,353	0,954
-1,600	24,164	-1,600	12,914	0,952
-1,650	24,384	-1,592	12,956	0,950
-1,700	24,594	-1,583	12,988	0,947
-1,700	24,594	-1,583	12,988	0,947
-1,750	24,669	-1,585	13,010	0,938
-1,850	24,786	-1,587	13,027	0,920
-2,300	25,047	-1,589	12,908	0,840
-2,900	25,212	-1,578	12,707	0,731
-2,900	25,212	-1,578	12,707	0,731
-3,650	26,283	-1,592	12,598	0,630
-4,450	27,537	-1,593	12,733	0,518
-5,200	28,822	-1,581	13,094	0,408
-6,000	29,879	-1,519	13,648	0,289
-6,000	29,879	-1,519	13,648	0,289
-6,600	35,128	-1,567	14,112	0,259
-7,200	40,139	-1,592	14,562	0,230
-7,200	40,139	-1,592	14,562	0,230
-7,850	43,960	-1,593	14,998	0,175
-8,500	47,934	-1,618	15,359	0,119
-8,500	47,934	-1,618	15,359	0,119
-8,750	48,241	-1,581	15,477	0,090
-9,000	48,498	-1,541	15,584	0,061
-9,000	48,498	-1,541	15,584	0,061
-9,400	49,467	-1,331	15,733	0,042
-9,800	49,938	-1,073	15,856	0,025
-9,800	49,938	-1,073	15,856	0,025
-10,350	49,497	-0,556	15,989	0,011
-10,900	49,138	-0,050	16,086	0,000

3.6 Results for Vertical 6 (X = 5,00 m; Z = 0,00 m)

Depth [m]	Effective Stress [kPa]	Hydraulic head [m]	Loading [kPa]	Settlement [m]
-0,850	24,126	-0,850	24,125	0,938
-0,950	24,371	-0,950	22,871	0,931
-1,050	24,618	-1,050	21,618	0,925
-1,150	24,883	-1,150	20,383	0,920
-1,250	25,170	-1,250	19,170	0,916
-1,275	25,246	-1,275	18,871	0,915
-1,350	25,479	-1,350	17,979	0,912
-1,450	25,808	-1,450	16,808	0,908
-1,550	26,158	-1,550	15,658	0,904
-1,600	26,343	-1,600	15,093	0,903
-1,650	26,456	-1,592	15,028	0,901

Depth [m]	Effective Stress [kPa]	Hydraulic head [m]	Loading [kPa]	Settlement [m]
-1,700	26,578	-1,583	14,973	0,899
-1,700	26,578	-1,583	14,973	0,899
-1,750	26,582	-1,584	14,926	0,892
-1,850	26,605	-1,586	14,856	0,877
-2,300	26,813	-1,587	14,694	0,808
-2,900	26,978	-1,577	14,490	0,710
-2,900	26,978	-1,577	14,490	0,710
-3,650	27,898	-1,591	14,226	0,617
-4,450	28,844	-1,592	14,048	0,509
-5,200	29,760	-1,581	14,037	0,404
-6,000	30,416	-1,519	14,189	0,287
-6,000	30,416	-1,519	14,189	0,287
-6,600	35,396	-1,566	14,387	0,258
-7,200	40,202	-1,592	14,625	0,229
-7,200	40,202	-1,592	14,625	0,229
-7,850	43,860	-1,593	14,896	0,174
-8,500	47,729	-1,618	15,154	0,119
-8,500	47,730	-1,618	15,154	0,119
-8,750	48,011	-1,581	15,246	0,090
-9,000	48,247	-1,541	15,333	0,061
-9,000	48,247	-1,541	15,333	0,061
-9,400	49,196	-1,331	15,460	0,042
-9,800	49,656	-1,073	15,573	0,024
-9,800	49,656	-1,073	15,573	0,024
-10,350	49,211	-0,556	15,702	0,011
-10,900	48,856	-0,050	15,805	0,000

4 Settlements

4.1 Settlements

Vertical number	X co-ordinate [m]	Z co-ordinate [m]	Surface level [m]	Settlement [m]
1	0,00	0,00	-0,85	0,657
2	0,40	0,00	-0,85	0,652
3	2,40	0,00	-0,85	1,015
4	3,00	0,00	-0,85	0,996
5	4,00	0,00	-0,85	0,961
6	5,00	0,00	-0,85	0,938
7	15,00	0,00	-0,85	0,968

4.2 Residual Times

Vertical number	Time [days]	Settlement [m]	Part of final settlement [%]	Residual settlements [m]
1	180	0,565	85,894	0,093
2	180	0,564	86,468	0,088
3	180	1,035	101,942	-0,020
4	180	1,010	101,393	-0,014
5	180	0,957	99,581	0,004
6	180	0,909	96,929	0,029
7	180	0,891	92,000	0,077

End of Report

Report for D-Settlement 20.1

Settlement Calculations
Developed by Deltares

Company: CRUX Engineering B.V.

Date of report: 21-12-2020

Time of report: 16:32:07

Report with version: 20.1.1.29740

Date of calculation: 18-12-2020

Time of calculation: 19:24:12

Calculated with version: 20.1.1.29740

File name: SET005 CPT17_voorbelasting+drains_6maand_zomerpeil_zand

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2 Echo of the Input

2.1 Layer Boundaries

Boundary number	Co-ordinates [m]				
9 - X -	-25,000	25,000			
9 - Y -	-0,850	-0,850			
8 - X -	-25,000	25,000			
8 - Y -	-1,500	-1,500			
7 - X -	-25,000	25,000			
7 - Y -	-2,500	-2,500			
6 - X -	-25,000	25,000			
6 - Y -	-4,100	-4,100			
5 - X -	-25,000	25,000			
5 - Y -	-5,000	-5,000			
4 - X -	-25,000	25,000			
4 - Y -	-5,500	-5,500			
3 - X -	-25,000	25,000			
3 - Y -	-6,800	-6,800			
2 - X -	-25,000	25,000			
2 - Y -	-7,400	-7,400			
1 - X -	-25,000	25,000			
1 - Y -	-7,600	-7,600			
0 - X -	-25,000	25,000			
0 - Y -	-8,600	-8,600			

2.2 PI-lines

PI-line number	Co-ordinates [m]				
1 - X -	-25,000	25,000			
1 - Y -	-1,600	-1,600			
2 - X -	-25,000	25,000			
2 - Y -	-0,050	-0,050			

2.3 General Data

Soil model:	NEN Bjerrum
Consolidation model:	Darcy
Strain model:	Linear
Groundwater level:	Initial determined by PI-line number 1
Unit weight of water:	9,81 [kN/m³]
Stress distribution	
- Soil:	Buisman
- Loads:	None
End of consolidation:	11130,00 [days]
No maintain profile	
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 :	0,02 [m]
Load column width	
- Non-Uniform Loads :	0,20 [m]
- Trapeziform Loads :	0,05 [m]

2.4 Soil Profiles

Layer number	Material name	PI-line top	PI-line bottom
9	Top klei	1	99
8	Veen 1	99	99

Layer number	Material name	PI-line top	PI-line bottom
7	Veen (Houthoudend)	99	99
6	Klei humeus	99	99
5	Veen (Houthoudend)	99	99
4	Klei	99	99
3	Klei humeus	99	99
2	Veen 2	99	99
1	Klei zandig	99	2

2.5 Soil Properties

Layer number	Drained	Unit weight	
		Unsaturated [kN/m³]	Saturated [kN/m³]
9	Yes	15,00	15,00
8	No	10,60	10,60
7	No	11,20	11,20
6	No	15,00	15,00
5	No	11,20	11,20
4	No	17,00	17,00
3	No	15,00	15,00
2	No	12,00	12,00
1	No	18,00	18,00

Layer number	Storage type	Vert. consolid. coefficient Cv [m²/s]	Ratio Ch/Cv [-]	Vertical permeability [m/s]	Ratio hor/vert permeability [-]	Permeability strain mod. [-]	Initial vertical permeability [m/s]
9	Vert. cons.	-	1,000	-	-	-	-
8	Vert. cons.	1,06E-07	1,500	-	-	-	-
7	Vert. cons.	3,87E-08	1,500	-	-	-	-
6	Vert. cons.	1,00E-08	1,000	-	-	-	-
5	Vert. cons.	3,87E-08	1,500	-	-	-	-
4	Vert. cons.	1,00E-08	1,000	-	-	-	-
3	Vert. cons.	1,00E-08	1,000	-	-	-	-
2	Vert. cons.	1,00E-07	1,500	-	-	-	-
1	Vert. cons.	1,00E-08	1,000	-	-	-	-

Layer number	POP [kN/m²]	OCR [-]	Equiv. age [days]
9	15,00	-	-
8	15,00	-	-
7	15,00	-	-
6	15,00	-	-
5	15,00	-	-
4	15,00	-	-
3	15,00	-	-
2	15,00	-	-
1	15,00	-	-

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) [-]
9	0,0175000	0,1127000	0,0049000	-	-	-
8	0,0996000	0,5140000	0,0211000	-	-	-
7	0,0564000	0,3660000	0,0165000	-	-	-
6	0,0383000	0,2300000	0,0115000	-	-	-
5	0,0564000	0,3660000	0,0165000	-	-	-
4	0,0219000	0,1533000	0,0061000	-	-	-
3	0,0383000	0,2300000	0,0115000	-	-	-
2	0,0613000	0,3067000	0,0153000	-	-	-
1	0,0184000	0,0920000	0,0037000	-	-	-

2.6 Non-Uniform Loads

Load number	Time [days]	Unit weight	
		Unsaturated [kN/m ³]	Saturated [kN/m ³]
1	0	16,00	18,00

Load number	Co-ordinates [m]					
1 - X -	-25,00	-25,00	25,00	25,00		
1 - Y -	-0,85	0,95	0,95	-0,85		

2.7 Verticals

Vertical number	X co-ordinates [m]				
1	0,000				

2.8 Vertical Drain

Drain type		Strip
Horizontal range "From"	[m]	-25,000
Horizontal range "To"	[m]	25,000
Bottom position	[m]	-7,500
Center to center distance	[m]	1,000
Width	[m]	0,100
Thickness	[m]	0,003
Grid		Triangular
Drainage schedule		Off
Start of drainage	[days]	0,000

3 Results per Vertical

3.1 Results for Vertical 1 (X = 0,00 m; Z = 0,00 m)

Depth [m]	Effective Stress [kPa]	Hydraulic head [m]	Loading [kPa]	Settlement [m]
-0,850	28,302	-0,850	28,301	0,821
-0,950	28,820	-0,950	27,320	0,814
-1,050	29,339	-1,050	26,339	0,808
-1,150	29,858	-1,150	25,358	0,802
-1,175	29,988	-1,175	25,113	0,801
-1,250	30,377	-1,250	24,377	0,797
-1,350	30,896	-1,350	23,396	0,793
-1,450	31,415	-1,450	22,415	0,788
-1,500	31,674	-1,500	21,924	0,786
-1,500	31,674	-1,500	21,924	0,786
-1,550	31,787	-1,557	21,434	0,777
-1,600	31,900	-1,615	20,943	0,768
-1,650	31,907	-1,612	20,943	0,760
-1,750	31,925	-1,605	20,943	0,742
-1,850	31,945	-1,599	20,943	0,725
-2,000	31,975	-1,590	20,943	0,698
-2,500	31,923	-1,545	20,943	0,605
-2,500	31,923	-1,545	20,943	0,605
-3,300	33,356	-1,578	20,942	0,492
-4,100	33,945	-1,525	20,940	0,369
-4,100	33,945	-1,525	20,940	0,369
-4,550	36,784	-1,576	20,939	0,323
-5,000	39,628	-1,628	20,936	0,276
-5,000	39,628	-1,628	20,936	0,276
-5,250	39,596	-1,590	20,934	0,237
-5,500	39,533	-1,548	20,931	0,197
-5,500	39,533	-1,548	20,931	0,197
-6,150	44,409	-1,570	20,924	0,156
-6,800	49,112	-1,574	20,912	0,117
-6,800	49,112	-1,574	20,912	0,117
-7,100	50,447	-1,552	20,906	0,087
-7,400	51,678	-1,519	20,899	0,057
-7,400	51,678	-1,519	20,899	0,057
-7,500	51,660	-1,495	20,896	0,044
-7,600	51,617	-1,469	20,893	0,030
-7,600	51,617	-1,469	20,893	0,030
-8,100	48,532	-0,739	20,878	0,014
-8,600	45,854	-0,050	20,859	0,000

4 Settlements

4.1 Settlements

Vertical number	X co-ordinate [m]	Z co-ordinate [m]	Surface level [m]	Settlement [m]
1	0,00	0,00	-0,85	0,821

4.2 Residual Times

Vertical number	Time [days]	Settlement [m]	Part of final settlement [%]	Residual settlements [m]
1	180	0,599	72,957	0,222

End of Report

Report for D-Settlement 20.1

Settlement Calculations
Developed by Deltares

Company: CRUX Engineering B.V.

Date of report: 21-12-2020

Time of report: 16:29:16

Report with version: 20.1.1.29740

Date of calculation: 18-12-2020

Time of calculation: 18:55:47

Calculated with version: 20.1.1.29740

File name: SET005 CPT19_voorbelasting+drains_6maand_zand_zomerpeil

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2 Echo of the Input

2.1 Layer Boundaries

Boundary number	Co-ordinates [m]				
8 - X -	-25,000	25,000			
8 - Y -	-0,850	-0,850			
7 - X -	-25,000	25,000			
7 - Y -	-1,700	-1,700			
6 - X -	-25,000	25,000			
6 - Y -	-2,900	-2,900			
5 - X -	-25,000	25,000			
5 - Y -	-6,000	-6,000			
4 - X -	-25,000	25,000			
4 - Y -	-7,200	-7,200			
3 - X -	-25,000	25,000			
3 - Y -	-8,500	-8,500			
2 - X -	-25,000	25,000			
2 - Y -	-9,000	-9,000			
1 - X -	-25,000	25,000			
1 - Y -	-9,800	-9,800			
0 - X -	-25,000	25,000			
0 - Y -	-10,900	-10,900			

2.2 PI-lines

PI-line number	Co-ordinates [m]				
1 - X -	-25,000	25,000			
1 - Y -	-1,600	-1,600			
2 - X -	-25,000	25,000			
2 - Y -	-0,050	-0,050			

2.3 General Data

Soil model:	NEN Bjerrum
Consolidation model:	Darcy
Strain model:	Linear
Groundwater level:	Initial determined by PI-line number 1
Unit weight of water:	9,81 [kN/m³]
Stress distribution	
- Soil:	Buisman
- Loads:	None
End of consolidation:	11130,00 [days]
No maintain profile	
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 :	0,02 [m]
Load column width	
- Non-Uniform Loads :	0,20 [m]
- Trapeziform Loads :	0,05 [m]

2.4 Soil Profiles

Layer number	Material name	PI-line top	PI-line bottom
8	Top klei	1	99
7	Veen 1	99	99
6	Veen (Houthoudend)	99	99
5	Klei	99	99

Layer number	Material name	PI-line top	PI-line bottom
4	Klei humeus	99	99
3	Veen 2	99	99
2	Klei	99	99
1	Klei zandig	99	2

2.5 Non-Uniform Loads

Load number	Time [days]	Unit weight	
		Unsaturated [kN/m³]	Saturated [kN/m³]
1	0	16,00	18,00

Load number	Co-ordinates [m]						
1 - X -	-25,00	-25,00	-4,50	-2,00	2,00	4,50	
1 - Y -	-0,85	1,40	1,40	2,20	2,20	1,40	
1 - X -	25,00	25,00					
1 - Y -	1,40	-0,85					

2.6 Verticals

Vertical number	X co-ordinates [m]				
1	-3,250				

3 Results per Vertical

3.1 Results for Vertical 1 (X = -3,25 m; Z = 0,00 m)

Depth [m]	Effective Stress [kPa]	Hydraulic head [m]	Loading [kPa]	Settlement [m]
-0,850	38,328	-0,850	38,327	1,307
-0,950	38,731	-0,950	37,231	1,298
-1,050	39,188	-1,050	36,188	1,290
-1,150	39,695	-1,150	35,195	1,283
-1,250	40,212	-1,250	34,212	1,277
-1,275	40,341	-1,275	33,966	1,275
-1,350	40,730	-1,350	33,230	1,271
-1,450	41,249	-1,450	32,249	1,265
-1,550	41,767	-1,550	31,267	1,260
-1,600	42,027	-1,600	30,777	1,258
-1,650	42,204	-1,592	30,777	1,255
-1,700	42,382	-1,583	30,776	1,253
-1,700	42,382	-1,583	30,776	1,253
-1,750	42,432	-1,584	30,776	1,241
-1,850	42,526	-1,586	30,776	1,218
-2,300	42,865	-1,585	30,771	1,114
-2,900	43,021	-1,554	30,754	0,970
-2,900	43,021	-1,554	30,754	0,970
-3,650	44,359	-1,589	30,707	0,837
-4,450	45,433	-1,594	30,616	0,691
-5,200	46,286	-1,588	30,490	0,549
-6,000	46,739	-1,539	30,316	0,394
-6,000	46,739	-1,539	30,316	0,394
-6,600	51,235	-1,573	30,163	0,349
-7,200	55,592	-1,594	29,995	0,306
-7,200	55,592	-1,594	29,995	0,306
-7,850	58,774	-1,595	29,799	0,232
-8,500	62,211	-1,622	29,594	0,159
-8,500	62,211	-1,622	29,594	0,159
-8,750	62,331	-1,587	29,512	0,122
-9,000	62,409	-1,547	29,430	0,084
-9,000	62,409	-1,547	29,430	0,084
-9,400	63,035	-1,332	29,296	0,059
-9,800	63,217	-1,071	29,161	0,035
-9,800	63,217	-1,071	29,161	0,035
-10,350	62,442	-0,552	28,972	0,016
-10,900	61,832	-0,050	28,780	0,000

4 Settlements

4.1 Settlements

Vertical number	X co-ordinate [m]	Z co-ordinate [m]	Surface level [m]	Settlement [m]
1	-3,25	0,00	-0,85	1,307

4.2 Residual Times

Vertical number	Time [days]	Settlement [m]	Part of final settlement [%]	Residual settlements [m]
1	180	0,983	75,239	0,324

End of Report

Report for D-Settlement 20.1

Settlement Calculations
Developed by Deltares

Company: CRUX Engineering B.V.

Date of report: 21-12-2020

Time of report: 16:32:24

Report with version: 20.1.1.29740

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Calculated with version: 20.1.1.29740

File name: SET006 CPT17_riool_zandaanvulling_ondiep_6maand_zomerpeil

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2 Echo of the Input

2.1 Layer Boundaries

Boundary number	Co-ordinates [m]				
12 - X -	-25,000	-4,500	4,500	25,000	
12 - Y -	-0,850	-0,850	-0,850	-0,850	
11 - X -	-25,000	-4,500	-4,500	-0,900	-0,850
11 - Y -	-0,850	-0,850	-1,400	-1,400	-1,500
11 - X -	0,850	0,900	4,500	4,500	25,000
11 - Y -	-1,500	-1,400	-1,400	-0,850	-0,850
10 - X -	-25,000	-0,850	0,850	0,900	4,500
10 - Y -	-1,500	-1,500	-1,500	-1,400	-1,400
10 - X -	4,500	25,000			
10 - Y -	-0,850	-0,850			
9 - X -	-25,000	-0,850	-0,625	-0,625	0,625
9 - Y -	-1,500	-1,500	-1,950	-2,350	-2,350
9 - X -	0,625	0,850	0,900	4,500	4,500
9 - Y -	-1,950	-1,500	-1,400	-1,400	-0,850
9 - X -	25,000				
9 - Y -	-0,850				
8 - X -	-25,000	-0,850	-0,625	-0,625	0,625
8 - Y -	-1,500	-1,500	-1,950	-2,350	-2,350
8 - X -	0,625	0,850	25,000		
8 - Y -	-1,950	-1,500	-1,500		
7 - X -	-25,000	25,000			
7 - Y -	-2,500	-2,500			
6 - X -	-25,000	25,000			
6 - Y -	-4,100	-4,100			
5 - X -	-25,000	25,000			
5 - Y -	-5,000	-5,000			
4 - X -	-25,000	25,000			
4 - Y -	-5,500	-5,500			
3 - X -	-25,000	25,000			
3 - Y -	-6,800	-6,800			
2 - X -	-25,000	25,000			
2 - Y -	-7,400	-7,400			
1 - X -	-25,000	25,000			
1 - Y -	-7,600	-7,600			
0 - X -	-25,000	25,000			
0 - Y -	-8,600	-8,600			

2.2 PI-lines

PI-line number	Co-ordinates [m]				
1 - X -	-25,000	25,000			
1 - Y -	-1,600	-1,600			
2 - X -	-25,000	25,000			
2 - Y -	-0,050	-0,050			

2.3 General Data

Soil model:	NEN Bjerrum
Consolidation model:	Darcy
Strain model:	Linear
Groundwater level:	Initial determined by PI-line number 1
Unit weight of water:	9,81 [kN/m³]
Stress distribution	
- Soil:	Buisman
- Loads:	None
End of consolidation:	11130,00 [days]
No maintain profile	
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 :	0,02 [m]
Load column width	
- Non-Uniform Loads :	0,20 [m]
- Trapeziform Loads :	0,05 [m]

2.4 Soil Profiles

Layer number	Material name	PI-line top	PI-line bottom
12	Top klei (stijf)	1	99
11	Top klei	1	99
10	Veen 1 (stijf)	99	99
9	Top klei	99	99
8	Veen 1	99	99
7	Veen (Houthoudend)	99	99
6	Klei humeus	99	99
5	Veen (Houthoudend)	99	99
4	Klei	99	99
3	Klei humeus	99	99
2	Veen 2	99	99
1	Klei zandig	99	2

2.5 Non-Uniform Loads

Load number	Time [days]	Unit weight	
		Unsaturated [kN/m³]	Saturated [kN/m³]
1	0	18,00	18,00
2	0	18,00	18,00
3	0	16,00	18,00
4	0	16,00	18,00
5	0	16,00	18,00
6	0	16,00	18,00
7	0	16,00	18,00
8	180	0,00	9,81
9	180	3,00	15,00
10	180	7,40	19,40
11	180	0,00	9,81
12	180	20,70	20,70

Load number	Co-ordinates [m]					
1 - X -	-25,00	-25,00	-4,50	-4,50		
1 - Y -	-0,85	-0,35	-0,35	-0,85		
2 - X -	4,50	4,50	25,00	25,00		
2 - Y -	-0,85	-0,35	-0,35	-0,85		
3 - X -	-25,00	-25,00	-4,50	-4,50		
3 - Y -	-0,35	0,50	0,50	-0,35		
4 - X -	4,50	4,50	25,00	25,00		
4 - Y -	-0,35	0,50	0,50	-0,35		
5 - X -	-25,00	-25,00	-4,50	-4,50		
5 - Y -	0,50	0,95	0,95	0,50		
6 - X -	4,50	4,50	25,00	25,00		
6 - Y -	0,50	0,95	0,95	0,50		
7 - X -	-4,50	-4,50	-2,00	2,00	4,50	4,50
7 - Y -	-0,85	0,95	0,45	0,45	0,95	-0,85
8 - X -	-25,00	-4,50	-4,50	4,50	4,50	25,00
8 - Y -	0,50	0,50	-0,85	-0,85	0,50	0,50
9 - X -	-4,50	-4,50	-0,90	-0,85	0,85	0,90
9 - Y -	-0,85	-1,40	-1,40	-1,50	-1,50	-1,40
9 - X -	4,50	4,50				
9 - Y -	-1,40	-0,85				

Load number	Co-ordinates [m]					
10 - X -	-0,85	-0,63	-0,63	0,63	0,63	0,85
10 - Y -	-1,50	-1,95	-2,35	-2,35	-1,95	-1,50
11 - X -	-4,50	4,50				
11 - Y -	-0,85	-0,85				
12 - X -	-4,50	-4,50	4,50	4,50		
12 - Y -	-0,85	-0,40	-0,40	-0,85		

2.6 Verticals

Vertical number	X co-ordinates [m]				
1 - 5	0,000	0,400	1,000	1,500	2,000
6 - 10	2,500	3,000	4,000	5,000	15,000

3 Results per Vertical

3.1 Results for Vertical 1 (X = 0,00 m; Z = 0,00 m)

Depth [m]	Effective Stress [kPa]	Hydraulic head [m]	Loading [kPa]	Settlement [m]
-0,850	9,317	-0,850	9,316	0,472
-0,950	10,817	-0,950	9,317	0,472
-1,050	12,318	-1,050	9,318	0,472
-1,150	13,660	-1,150	9,160	0,472
-1,175	13,791	-1,175	8,916	0,472
-1,250	14,182	-1,250	8,182	0,472
-1,350	14,705	-1,350	7,205	0,472
-1,450	15,229	-1,450	6,229	0,472
-1,500	18,243	-1,500	8,493	0,472
-1,500	18,243	-1,500	8,492	0,472
-1,550	18,286	-1,550	8,006	0,472
-1,600	18,331	-1,600	7,521	0,472
-1,650	18,268	-1,589	7,527	0,472
-1,750	18,146	-1,567	7,544	0,472
-1,850	18,029	-1,545	7,565	0,472
-1,925	17,946	-1,528	7,585	0,472
-2,350	25,712	-1,434	15,939	0,472
-2,350	25,712	-1,434	15,939	0,472
-2,425	25,916	-1,445	15,979	0,462
-2,500	26,079	-1,452	16,009	0,451
-2,500	26,079	-1,452	16,009	0,451
-3,300	26,272	-1,544	14,186	0,366
-4,100	25,008	-1,483	12,408	0,277
-4,100	25,008	-1,483	12,408	0,277
-4,550	27,655	-1,563	11,934	0,244
-5,000	30,481	-1,639	11,685	0,209
-5,000	30,481	-1,639	11,685	0,209
-5,250	30,301	-1,592	11,612	0,180
-5,500	30,139	-1,544	11,574	0,151
-5,500	30,139	-1,544	11,574	0,151
-6,150	35,028	-1,565	11,588	0,121
-6,800	39,794	-1,563	11,702	0,091
-6,800	39,794	-1,563	11,702	0,091
-7,100	41,143	-1,534	11,774	0,067
-7,400	42,333	-1,489	11,854	0,043
-7,400	42,333	-1,489	11,854	0,043
-7,500	42,344	-1,465	11,882	0,033
-7,600	42,334	-1,438	11,911	0,022
-7,600	42,334	-1,438	11,911	0,022
-8,100	39,561	-0,723	12,058	0,009
-8,600	37,203	-0,050	12,209	0,000

3.2 Results for Vertical 2 (X = 0,40 m; Z = 0,00 m)

Depth [m]	Effective Stress [kPa]	Hydraulic head [m]	Loading [kPa]	Settlement [m]
-0,850	9,317	-0,850	9,316	0,467
-0,950	10,817	-0,950	9,317	0,467
-1,050	12,318	-1,050	9,318	0,467
-1,150	13,704	-1,150	9,204	0,467
-1,175	13,835	-1,175	8,960	0,467
-1,250	14,226	-1,250	8,226	0,467
-1,350	14,750	-1,350	7,250	0,467

Depth [m]	Effective Stress [kPa]	Hydraulic head [m]	Loading [kPa]	Settlement [m]
-1,450	15,274	-1,450	6,274	0,467
-1,500	18,289	-1,500	8,539	0,467
-1,500	18,289	-1,500	8,539	0,467
-1,550	18,335	-1,550	8,055	0,467
-1,600	18,384	-1,600	7,574	0,467
-1,650	18,329	-1,589	7,588	0,467
-1,750	18,223	-1,567	7,620	0,467
-1,850	18,123	-1,545	7,659	0,467
-1,925	18,085	-1,528	7,725	0,467
-2,350	25,947	-1,434	16,174	0,467
-2,350	25,947	-1,434	16,174	0,467
-2,425	26,110	-1,445	16,170	0,457
-2,500	26,109	-1,453	16,031	0,446
-2,500	26,109	-1,453	16,031	0,446
-3,300	25,347	-1,545	13,258	0,363
-4,100	24,714	-1,483	12,114	0,277
-4,100	24,714	-1,483	12,114	0,277
-4,550	27,510	-1,563	11,792	0,244
-5,000	30,420	-1,639	11,625	0,209
-5,000	30,420	-1,639	11,625	0,209
-5,250	30,269	-1,592	11,582	0,180
-5,500	30,129	-1,544	11,565	0,151
-5,500	30,129	-1,544	11,565	0,151
-6,150	35,051	-1,565	11,612	0,121
-6,800	39,834	-1,563	11,743	0,091
-6,800	39,834	-1,563	11,743	0,091
-7,100	41,188	-1,534	11,820	0,067
-7,400	42,382	-1,489	11,903	0,043
-7,400	42,382	-1,489	11,903	0,043
-7,500	42,393	-1,465	11,932	0,033
-7,600	42,384	-1,438	11,961	0,022
-7,600	42,384	-1,438	11,961	0,022
-8,100	39,614	-0,723	12,110	0,009
-8,600	37,257	-0,050	12,263	0,000

3.3 Results for Vertical 3 (X = 1,00 m; Z = 0,00 m)

Depth [m]	Effective Stress [kPa]	Hydraulic head [m]	Loading [kPa]	Settlement [m]
-0,850	9,317	-0,850	9,316	0,509
-0,950	10,817	-0,950	9,317	0,509
-1,050	12,319	-1,050	9,319	0,509
-1,125	13,264	-1,125	9,139	0,509
-1,150	13,395	-1,150	8,895	0,509
-1,250	13,918	-1,250	7,918	0,509
-1,350	14,443	-1,350	6,943	0,509
-1,400	17,020	-1,400	8,770	0,509
-1,400	17,020	-1,400	8,770	0,509
-1,450	17,265	-1,450	8,265	0,508
-1,500	17,429	-1,500	7,679	0,507
-1,500	17,429	-1,500	7,679	0,507
-1,550	17,483	-1,558	7,122	0,502
-1,600	17,600	-1,617	6,627	0,498
-1,650	17,656	-1,614	6,669	0,493
-1,750	17,809	-1,609	6,791	0,485
-1,850	17,969	-1,605	6,918	0,476
-2,000	18,329	-1,598	7,224	0,462
-2,500	18,853	-1,573	7,602	0,414
-2,500	18,853	-1,573	7,602	0,414
-3,300	22,001	-1,569	9,671	0,348

Depth [m]	Effective Stress [kPa]	Hydraulic head [m]	Loading [kPa]	Settlement [m]
-4,100	23,219	-1,493	10,525	0,269
-4,100	23,219	-1,493	10,525	0,269
-4,550	26,467	-1,566	10,723	0,239
-5,000	29,661	-1,639	10,866	0,206
-5,000	29,661	-1,639	10,866	0,206
-5,250	29,626	-1,592	10,938	0,177
-5,500	29,573	-1,544	11,010	0,149
-5,500	29,573	-1,544	11,010	0,149
-6,150	34,638	-1,564	11,203	0,120
-6,800	39,496	-1,562	11,408	0,090
-6,800	39,496	-1,562	11,408	0,090
-7,100	40,872	-1,534	11,506	0,066
-7,400	42,082	-1,488	11,605	0,043
-7,400	42,082	-1,488	11,605	0,043
-7,500	42,098	-1,464	11,638	0,032
-7,600	42,092	-1,438	11,670	0,022
-7,600	42,092	-1,438	11,670	0,022
-8,100	39,335	-0,723	11,834	0,009
-8,600	36,988	-0,050	11,993	0,000

3.4 Results for Vertical 4 (X = 1,50 m; Z = 0,00 m)

Depth [m]	Effective Stress [kPa]	Hydraulic head [m]	Loading [kPa]	Settlement [m]
-0,850	9,318	-0,850	9,317	0,507
-0,950	10,819	-0,950	9,319	0,507
-1,050	12,322	-1,050	9,322	0,507
-1,125	13,285	-1,125	9,160	0,507
-1,150	13,416	-1,150	8,916	0,507
-1,250	13,942	-1,250	7,942	0,507
-1,350	14,470	-1,350	6,970	0,507
-1,400	17,052	-1,400	8,802	0,507
-1,400	17,052	-1,400	8,802	0,507
-1,450	17,317	-1,450	8,317	0,506
-1,500	17,584	-1,500	7,834	0,505
-1,500	17,584	-1,500	7,833	0,505
-1,550	17,711	-1,558	7,350	0,500
-1,600	17,839	-1,617	6,866	0,495
-1,650	17,859	-1,614	6,872	0,491
-1,750	17,903	-1,609	6,884	0,482
-1,850	17,954	-1,605	6,902	0,473
-2,000	18,053	-1,598	6,947	0,460
-2,500	18,532	-1,573	7,278	0,411
-2,500	18,532	-1,573	7,278	0,411
-3,300	20,727	-1,570	8,392	0,344
-4,100	22,354	-1,493	9,655	0,267
-4,100	22,354	-1,493	9,655	0,267
-4,550	25,878	-1,565	10,136	0,237
-5,000	29,291	-1,639	10,497	0,205
-5,000	29,291	-1,639	10,497	0,205
-5,250	29,349	-1,592	10,662	0,177
-5,500	29,373	-1,544	10,810	0,149
-5,500	29,373	-1,544	10,810	0,149
-6,150	34,572	-1,564	11,139	0,120
-6,800	39,508	-1,562	11,421	0,090
-6,800	39,508	-1,562	11,421	0,090
-7,100	40,907	-1,534	11,541	0,066
-7,400	42,133	-1,488	11,656	0,043
-7,400	42,133	-1,488	11,656	0,043
-7,500	42,154	-1,464	11,693	0,032

Depth [m]	Effective Stress [kPa]	Hydraulic head [m]	Loading [kPa]	Settlement [m]
-7,600	42,152	-1,438	11,730	0,022
-7,600	42,152	-1,438	11,730	0,022
-8,100	39,409	-0,723	11,908	0,009
-8,600	37,070	-0,050	12,075	0,000

3.5 Results for Vertical 5 (X = 2,00 m; Z = 0,00 m)

Depth [m]	Effective Stress [kPa]	Hydraulic head [m]	Loading [kPa]	Settlement [m]
-0,850	9,320	-0,850	9,319	0,513
-0,950	10,823	-0,950	9,323	0,513
-1,050	12,329	-1,050	9,329	0,513
-1,125	13,238	-1,125	9,113	0,513
-1,150	13,370	-1,150	8,870	0,513
-1,250	13,902	-1,250	7,902	0,513
-1,350	14,437	-1,350	6,937	0,513
-1,400	17,037	-1,400	8,787	0,513
-1,400	17,037	-1,400	8,787	0,513
-1,450	17,307	-1,450	8,307	0,512
-1,500	17,579	-1,500	7,829	0,511
-1,500	17,579	-1,500	7,829	0,511
-1,550	17,712	-1,558	7,351	0,506
-1,600	17,848	-1,617	6,875	0,501
-1,650	17,877	-1,614	6,890	0,497
-1,750	17,942	-1,609	6,924	0,487
-1,850	18,014	-1,604	6,963	0,478
-2,000	18,135	-1,598	7,029	0,464
-2,500	18,596	-1,573	7,341	0,413
-2,500	18,596	-1,573	7,341	0,413
-3,300	20,501	-1,570	8,162	0,344
-4,100	21,959	-1,494	9,256	0,266
-4,100	21,959	-1,494	9,256	0,266
-4,550	25,542	-1,566	9,797	0,237
-5,000	29,040	-1,638	10,247	0,205
-5,000	29,040	-1,638	10,247	0,205
-5,250	29,147	-1,592	10,461	0,177
-5,500	29,215	-1,544	10,653	0,149
-5,500	29,215	-1,544	10,653	0,149
-6,150	34,504	-1,564	11,072	0,120
-6,800	39,497	-1,562	11,411	0,090
-6,800	39,497	-1,562	11,411	0,090
-7,100	40,913	-1,534	11,548	0,067
-7,400	42,153	-1,488	11,676	0,043
-7,400	42,153	-1,488	11,676	0,043
-7,500	42,177	-1,464	11,717	0,032
-7,600	42,178	-1,438	11,757	0,022
-7,600	42,178	-1,438	11,757	0,022
-8,100	39,447	-0,723	11,945	0,009
-8,600	37,112	-0,050	12,117	0,000

3.6 Results for Vertical 6 (X = 2,50 m; Z = 0,00 m)

Depth [m]	Effective Stress [kPa]	Hydraulic head [m]	Loading [kPa]	Settlement [m]
-0,850	9,325	-0,850	9,324	0,526
-0,950	10,833	-0,950	9,333	0,526
-1,050	12,347	-1,050	9,347	0,526

Depth [m]	Effective Stress [kPa]	Hydraulic head [m]	Loading [kPa]	Settlement [m]
-1,125	13,142	-1,125	9,017	0,526
-1,150	13,277	-1,150	8,777	0,526
-1,250	13,822	-1,250	7,822	0,526
-1,350	14,374	-1,350	6,874	0,526
-1,400	17,013	-1,400	8,763	0,526
-1,400	17,013	-1,400	8,763	0,526
-1,450	17,293	-1,450	8,293	0,525
-1,500	17,576	-1,500	7,826	0,524
-1,500	17,576	-1,500	7,826	0,524
-1,550	17,721	-1,558	7,360	0,518
-1,600	17,869	-1,617	6,895	0,513
-1,650	17,911	-1,614	6,924	0,508
-1,750	18,004	-1,609	6,985	0,499
-1,850	18,105	-1,605	7,053	0,489
-2,000	18,270	-1,598	7,163	0,473
-2,500	18,845	-1,573	7,586	0,419
-2,500	18,845	-1,573	7,586	0,419
-3,300	20,713	-1,571	8,368	0,347
-4,100	21,975	-1,494	9,268	0,266
-4,100	21,975	-1,494	9,268	0,266
-4,550	25,506	-1,566	9,757	0,237
-5,000	28,988	-1,639	10,194	0,205
-5,000	28,988	-1,639	10,194	0,205
-5,250	29,098	-1,592	10,412	0,177
-5,500	29,174	-1,544	10,611	0,149
-5,500	29,175	-1,544	10,611	0,149
-6,150	34,487	-1,564	11,056	0,120
-6,800	39,501	-1,562	11,415	0,090
-6,800	39,501	-1,562	11,415	0,090
-7,100	40,923	-1,534	11,559	0,067
-7,400	42,168	-1,488	11,691	0,043
-7,400	42,168	-1,488	11,691	0,043
-7,500	42,193	-1,464	11,733	0,032
-7,600	42,195	-1,438	11,774	0,022
-7,600	42,195	-1,438	11,774	0,022
-8,100	39,466	-0,723	11,964	0,009
-8,600	37,129	-0,050	12,134	0,000

4 Settlements

4.1 Settlements

Vertical number	X co-ordinate [m]	Z co-ordinate [m]	Surface level [m]	Settlement [m]
1	0,00	0,00	-0,85	0,472
2	0,40	0,00	-0,85	0,467
3	1,00	0,00	-0,85	0,509
4	1,50	0,00	-0,85	0,507
5	2,00	0,00	-0,85	0,513
6	2,50	0,00	-0,85	0,526
7	3,00	0,00	-0,85	0,545
8	4,00	0,00	-0,85	0,586
9	5,00	0,00	-0,85	0,628
10	15,00	0,00	-0,85	0,706

4.2 Residual Times

Vertical number	Time [days]	Settlement [m]	Part of final settlement [%]	Residual settlements [m]
1	180	0,380	80,465	0,092
2	180	0,380	81,392	0,087
3	180	0,472	92,685	0,037
4	180	0,479	94,382	0,028
5	180	0,490	95,536	0,023
6	180	0,508	96,440	0,019
7	180	0,528	97,005	0,016
8	180	0,565	96,309	0,022
9	180	0,583	92,812	0,045
10	180	0,624	88,406	0,082

End of Report

Report for D-Settlement 20.1

Settlement Calculations
Developed by Deltares

Company: CRUX Engineering B.V.

Date of report: 21-12-2020

Time of report: 16:29:40

Report with version: 20.1.1.29740

Date of calculation: 21-12-2020

Time of calculation: 15:54:11

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File name: SET006 CPT19_riool_zandaanvulling_ondiep_6maand_zomerpeil

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2 Echo of the Input

2.1 Layer Boundaries

Boundary number	Co-ordinates [m]				
11 - X -	-25,000	-4,500	4,500	25,000	
11 - Y -	-0,850	-0,850	-0,850	-0,850	
10 - X -	-25,000	-4,500	-4,500	-0,900	-0,750
10 - Y -	-0,850	-0,850	-1,400	-1,400	-1,700
10 - X -	0,750	0,900	4,500	4,500	25,000
10 - Y -	-1,700	-1,400	-1,400	-0,850	-0,850
9 - X -	-25,000	-0,750	0,750	0,900	4,500
9 - Y -	-1,700	-1,700	-1,700	-1,400	-1,400
9 - X -	4,500	25,000			
9 - Y -	-0,850	-0,850			
8 - X -	-25,000	-0,750	-0,625	-0,625	0,625
8 - Y -	-1,700	-1,700	-1,950	-2,350	-2,350
8 - X -	0,625	0,750	0,900	4,500	4,500
8 - Y -	-1,950	-1,700	-1,400	-1,400	-0,850
8 - X -	25,000				
8 - Y -	-0,850				
7 - X -	-25,000	-0,750	-0,625	-0,625	0,625
7 - Y -	-1,700	-1,700	-1,950	-2,350	-2,350
7 - X -	0,625	0,750	25,000		
7 - Y -	-1,950	-1,700	-1,700		
6 - X -	-25,000	25,000			
6 - Y -	-2,900	-2,900			
5 - X -	-25,000	25,000			
5 - Y -	-6,000	-6,000			
4 - X -	-25,000	25,000			
4 - Y -	-7,200	-7,200			
3 - X -	-25,000	25,000			
3 - Y -	-8,500	-8,500			
2 - X -	-25,000	25,000			
2 - Y -	-9,000	-9,000			
1 - X -	-25,000	25,000			
1 - Y -	-9,800	-9,800			
0 - X -	-25,000	25,000			
0 - Y -	-10,900	-10,900			

2.2 PI-lines

PI-line number	Co-ordinates [m]				
1 - X -	-25,000	25,000			
1 - Y -	-1,600	-1,600			
2 - X -	-25,000	25,000			
2 - Y -	-0,050	-0,050			

2.3 General Data

Soil model:	NEN Bjerrum
Consolidation model:	Darcy
Strain model:	Linear
Groundwater level:	Initial determined by PI-line number 1
Unit weight of water:	9,81 [kN/m³]
Stress distribution	
- Soil:	Buisman
- Loads:	None
End of consolidation:	11130,00 [days]
No maintain profile	
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 : 0,02 [m]
Load column width
- Non-Uniform Loads : 0,20 [m]
- Trapeziform Loads : 0,05 [m]

2.4 Soil Profiles

Layer number	Material name	PI-line top	PI-line bottom
11	Top klei (stijf)	1	99
10	Top klei	1	99
9	Veen 1 (stijf)	99	99
8	Top klei	99	99
7	Veen 1	99	99
6	Veen (Houthoudend)	99	99
5	Klei	99	99
4	Klei humeus	99	99
3	Veen 2	99	99
2	Klei	99	99
1	Klei zandig	99	2

2.5 Non-Uniform Loads

Load number	Time [days]	Unit weight	
		Unsaturated [kN/m³]	Saturated [kN/m³]
1	0	18,00	18,00
2	0	18,00	18,00
3	0	16,00	18,00
4	0	16,00	18,00
5	0	16,00	18,00
6	0	16,00	18,00
7	0	16,00	18,00
8	180	0,00	9,81
9	180	3,00	15,00
10	180	7,40	19,40
11	180	0,00	9,81
12	180	20,70	20,70
13	180	16,00	18,00

Load number	Co-ordinates [m]					
1 - X -	-25,00	-25,00	-4,50	-4,50		
1 - Y -	-0,85	-0,35	-0,35	-0,85		
2 - X -	4,50	4,50	25,00	25,00		
2 - Y -	-0,85	-0,35	-0,35	-0,85		
3 - X -	-25,00	-25,00	-4,50	-4,50		
3 - Y -	-0,35	0,75	0,75	-0,35		
4 - X -	4,50	4,50	25,00	25,00		
4 - Y -	-0,35	0,75	0,75	-0,35		
5 - X -	-25,00	-25,00	-4,50	-4,50		
5 - Y -	0,75	1,40	1,40	0,75		
6 - X -	-4,50	-4,50	-2,00	2,00	4,50	4,50
6 - Y -	-0,85	1,40	0,50	0,50	1,40	-0,85
7 - X -	4,50	4,50	25,00	25,00		
7 - Y -	0,75	1,40	1,40	0,75		
8 - X -	-25,00	-4,50	-4,50	4,50	4,50	25,00
8 - Y -	0,75	0,75	-0,85	-0,85	0,75	0,75
9 - X -	-4,50	-4,50	-0,90	-0,75	0,75	0,90
9 - Y -	-0,85	-1,40	-1,40	-1,70	-1,70	-1,40
9 - X -	4,50	4,50				
9 - Y -	-1,40	-0,85				
10 - X -	-0,75	-0,63	-0,63	0,63	0,63	0,75
10 - Y -	-1,70	-1,95	-2,35	-2,35	-1,95	-1,70

Load number	Co-ordinates [m]					
11 - X -	-4,50	4,50				
11 - Y -	-0,85	-0,85				
12 - X -	-4,50	-4,50	4,50	4,50		
12 - Y -	-0,85	-0,40	-0,40	-0,85		
13 - X -	-4,50	-4,50	-2,00	-2,00	2,00	2,00
13 - Y -	-0,40	-0,25	-0,25	-0,40	-0,40	-0,25
13 - X -	4,50	4,50				
13 - Y -	-0,25	-0,40				

2.6 Verticals

Vertical number	X co-ordinates [m]				
1 - 5	0,000	0,400	1,000	1,500	2,000
6 - 10	2,500	3,000	4,000	5,000	15,000

3 Results per Vertical

3.1 Results for Vertical 1 (X = 0,00 m; Z = 0,00 m)

Depth [m]	Effective Stress [kPa]	Hydraulic head [m]	Loading [kPa]	Settlement [m]
-0,850	9,319	-0,850	9,318	0,658
-0,950	10,804	-0,950	9,304	0,658
-1,050	11,329	-1,050	8,329	0,658
-1,150	11,856	-1,150	7,356	0,658
-1,250	12,386	-1,250	6,386	0,658
-1,275	12,519	-1,275	6,144	0,658
-1,350	12,920	-1,350	5,420	0,658
-1,450	13,457	-1,450	4,457	0,658
-1,550	14,000	-1,550	3,500	0,658
-1,600	14,274	-1,600	3,024	0,658
-1,650	14,469	-1,592	3,041	0,658
-1,700	18,862	-1,583	7,257	0,658
-1,700	18,862	-1,583	7,257	0,658
-1,750	18,846	-1,575	7,283	0,658
-1,850	18,829	-1,558	7,351	0,658
-2,025	18,833	-1,529	7,502	0,658
-2,350	25,030	-1,475	13,974	0,658
-2,350	25,030	-1,475	13,974	0,658
-2,625	25,653	-1,514	13,999	0,625
-2,900	25,604	-1,530	13,578	0,590
-2,900	25,604	-1,530	13,578	0,590
-3,650	25,449	-1,580	11,889	0,519
-4,450	25,900	-1,589	11,137	0,438
-5,200	26,753	-1,579	11,047	0,356
-6,000	27,452	-1,517	11,238	0,262
-6,000	27,452	-1,517	11,238	0,262
-6,600	32,461	-1,565	11,469	0,237
-7,200	37,305	-1,592	11,730	0,211
-7,200	37,305	-1,592	11,730	0,211
-7,850	40,990	-1,594	12,023	0,160
-8,500	44,889	-1,618	12,311	0,109
-8,500	44,889	-1,618	12,311	0,109
-8,750	45,185	-1,581	12,418	0,082
-9,000	45,440	-1,541	12,523	0,055
-9,000	45,440	-1,541	12,523	0,055
-9,400	46,436	-1,333	12,685	0,038
-9,800	46,945	-1,076	12,839	0,022
-9,800	46,945	-1,076	12,839	0,022
-10,350	46,564	-0,558	13,037	0,010
-10,900	46,270	-0,050	13,219	0,000

3.2 Results for Vertical 2 (X = 0,40 m; Z = 0,00 m)

Depth [m]	Effective Stress [kPa]	Hydraulic head [m]	Loading [kPa]	Settlement [m]
-0,850	9,320	-0,850	9,319	0,653
-0,950	10,823	-0,950	9,323	0,653
-1,050	11,375	-1,050	8,375	0,653
-1,150	11,904	-1,150	7,404	0,653
-1,250	12,437	-1,250	6,437	0,653
-1,275	12,570	-1,275	6,195	0,653
-1,350	12,973	-1,350	5,473	0,653
-1,450	13,514	-1,450	4,514	0,653

Depth [m]	Effective Stress [kPa]	Hydraulic head [m]	Loading [kPa]	Settlement [m]
-1,550	14,063	-1,550	3,563	0,653
-1,600	14,344	-1,600	3,094	0,653
-1,650	14,552	-1,592	3,124	0,653
-1,700	18,968	-1,583	7,362	0,653
-1,700	18,968	-1,583	7,362	0,653
-1,750	18,986	-1,575	7,422	0,653
-1,850	19,043	-1,558	7,564	0,653
-2,025	19,074	-1,529	7,743	0,653
-2,350	25,092	-1,475	14,036	0,653
-2,350	25,092	-1,475	14,036	0,653
-2,625	25,131	-1,514	13,471	0,620
-2,900	24,597	-1,530	12,568	0,587
-2,900	24,597	-1,530	12,568	0,587
-3,650	24,973	-1,579	11,420	0,519
-4,450	25,766	-1,589	11,006	0,439
-5,200	26,725	-1,579	11,020	0,356
-6,000	27,463	-1,517	11,250	0,263
-6,000	27,463	-1,517	11,250	0,263
-6,600	32,483	-1,564	11,492	0,237
-7,200	37,332	-1,592	11,758	0,211
-7,200	37,332	-1,592	11,758	0,211
-7,850	41,019	-1,594	12,052	0,160
-8,500	44,917	-1,618	12,340	0,109
-8,500	44,917	-1,618	12,340	0,109
-8,750	45,213	-1,581	12,447	0,082
-9,000	45,468	-1,541	12,551	0,056
-9,000	45,468	-1,541	12,551	0,056
-9,400	46,463	-1,333	12,712	0,038
-9,800	46,971	-1,076	12,865	0,022
-9,800	46,971	-1,076	12,865	0,022
-10,350	46,589	-0,558	13,063	0,010
-10,900	46,295	-0,050	13,244	0,000

3.3 Results for Vertical 3 (X = 1,00 m; Z = 0,00 m)

Depth [m]	Effective Stress [kPa]	Hydraulic head [m]	Loading [kPa]	Settlement [m]
-0,850	9,331	-0,850	9,330	0,686
-0,950	10,574	-0,950	9,074	0,686
-1,050	11,114	-1,050	8,114	0,686
-1,125	11,523	-1,125	7,398	0,686
-1,150	11,660	-1,150	7,160	0,686
-1,250	12,211	-1,250	6,211	0,686
-1,350	12,767	-1,350	5,267	0,686
-1,400	15,751	-1,400	7,501	0,686
-1,400	15,751	-1,400	7,501	0,686
-1,450	16,010	-1,450	7,010	0,685
-1,550	16,254	-1,550	5,754	0,683
-1,600	16,402	-1,600	5,152	0,682
-1,650	16,639	-1,592	5,211	0,681
-1,700	16,944	-1,583	5,339	0,680
-1,700	16,944	-1,583	5,339	0,680
-1,750	17,088	-1,584	5,433	0,676
-1,850	17,296	-1,586	5,549	0,668
-2,300	18,537	-1,587	6,425	0,630
-2,900	20,327	-1,575	7,856	0,572
-2,900	20,327	-1,575	7,856	0,572
-3,650	23,040	-1,589	9,389	0,510
-4,450	24,848	-1,591	10,069	0,433
-5,200	26,191	-1,579	10,482	0,352

Depth [m]	Effective Stress [kPa]	Hydraulic head [m]	Loading [kPa]	Settlement [m]
-6,000	27,100	-1,517	10,885	0,260
-6,000	27,100	-1,517	10,885	0,260
-6,600	32,173	-1,564	11,183	0,234
-7,200	37,048	-1,592	11,476	0,209
-7,200	37,048	-1,592	11,476	0,209
-7,850	40,747	-1,594	11,782	0,159
-8,500	44,649	-1,618	12,072	0,108
-8,500	44,649	-1,618	12,072	0,108
-8,750	44,944	-1,581	12,178	0,081
-9,000	45,198	-1,541	12,281	0,055
-9,000	45,198	-1,541	12,281	0,055
-9,400	46,190	-1,333	12,440	0,038
-9,800	46,694	-1,076	12,590	0,022
-9,800	46,694	-1,076	12,590	0,022
-10,350	46,308	-0,557	12,783	0,010
-10,900	46,011	-0,050	12,960	0,000

3.4 Results for Vertical 4 (X = 1,50 m; Z = 0,00 m)

Depth [m]	Effective Stress [kPa]	Hydraulic head [m]	Loading [kPa]	Settlement [m]
-0,850	9,427	-0,850	9,426	0,693
-0,950	10,655	-0,950	9,155	0,693
-1,050	11,245	-1,050	8,245	0,693
-1,125	11,688	-1,125	7,563	0,693
-1,150	11,835	-1,150	7,335	0,693
-1,250	12,424	-1,250	6,424	0,693
-1,350	13,011	-1,350	5,511	0,693
-1,400	16,026	-1,400	7,776	0,693
-1,400	16,026	-1,400	7,776	0,693
-1,450	16,317	-1,450	7,317	0,691
-1,550	16,898	-1,550	6,398	0,689
-1,600	17,185	-1,600	5,935	0,688
-1,650	17,388	-1,592	5,960	0,687
-1,700	17,588	-1,583	5,983	0,686
-1,700	17,588	-1,583	5,983	0,686
-1,750	17,657	-1,584	6,002	0,682
-1,850	17,785	-1,586	6,038	0,674
-2,300	18,434	-1,587	6,321	0,635
-2,900	19,568	-1,575	7,095	0,575
-2,900	19,568	-1,575	7,095	0,575
-3,650	22,124	-1,589	8,470	0,512
-4,450	24,350	-1,591	9,570	0,434
-5,200	25,963	-1,579	10,252	0,353
-6,000	27,018	-1,517	10,802	0,260
-6,000	27,018	-1,517	10,802	0,260
-6,600	32,144	-1,564	11,153	0,234
-7,200	37,044	-1,592	11,471	0,209
-7,200	37,044	-1,592	11,471	0,209
-7,850	40,753	-1,594	11,788	0,159
-8,500	44,655	-1,618	12,078	0,108
-8,500	44,655	-1,618	12,078	0,108
-8,750	44,950	-1,581	12,183	0,081
-9,000	45,201	-1,541	12,285	0,055
-9,000	45,201	-1,541	12,285	0,055
-9,400	46,189	-1,333	12,439	0,038
-9,800	46,688	-1,076	12,585	0,022
-9,800	46,688	-1,075	12,585	0,022
-10,350	46,295	-0,557	12,771	0,010
-10,900	45,992	-0,050	12,940	0,000

3.5 Results for Vertical 5 (X = 2,00 m; Z = 0,00 m)

Depth [m]	Effective Stress [kPa]	Hydraulic head [m]	Loading [kPa]	Settlement [m]
-0,850	10,521	-0,850	10,520	0,709
-0,950	11,529	-0,950	10,029	0,709
-1,050	12,055	-1,050	9,055	0,709
-1,125	12,452	-1,125	8,327	0,709
-1,150	12,584	-1,150	8,084	0,709
-1,250	13,117	-1,250	7,117	0,709
-1,350	13,654	-1,350	6,154	0,709
-1,400	16,683	-1,400	8,433	0,709
-1,400	16,683	-1,400	8,433	0,709
-1,450	16,954	-1,450	7,954	0,708
-1,550	17,499	-1,550	6,999	0,705
-1,600	17,772	-1,600	6,522	0,704
-1,650	17,966	-1,592	6,538	0,703
-1,700	18,160	-1,583	6,554	0,702
-1,700	18,160	-1,583	6,554	0,702
-1,750	18,226	-1,584	6,571	0,698
-1,850	18,355	-1,586	6,607	0,689
-2,300	18,931	-1,587	6,817	0,646
-2,900	19,787	-1,576	7,310	0,582
-2,900	19,787	-1,576	7,310	0,582
-3,650	21,939	-1,590	8,280	0,516
-4,450	24,117	-1,591	9,332	0,436
-5,200	25,813	-1,580	10,100	0,353
-6,000	26,941	-1,518	10,723	0,259
-6,000	26,941	-1,518	10,723	0,259
-6,600	32,096	-1,565	11,104	0,234
-7,200	37,009	-1,592	11,436	0,209
-7,200	37,009	-1,592	11,436	0,209
-7,850	40,720	-1,594	11,754	0,159
-8,500	44,616	-1,618	12,039	0,108
-8,500	44,616	-1,618	12,039	0,108
-8,750	44,907	-1,581	12,140	0,081
-9,000	45,155	-1,541	12,238	0,055
-9,000	45,155	-1,541	12,238	0,055
-9,400	46,135	-1,333	12,386	0,037
-9,800	46,627	-1,075	12,525	0,022
-9,800	46,627	-1,075	12,525	0,022
-10,350	46,223	-0,557	12,700	0,010
-10,900	45,911	-0,050	12,859	0,000

3.6 Results for Vertical 6 (X = 2,50 m; Z = 0,00 m)

Depth [m]	Effective Stress [kPa]	Hydraulic head [m]	Loading [kPa]	Settlement [m]
-0,850	11,618	-0,850	11,617	0,733
-0,950	12,333	-0,950	10,833	0,733
-1,050	12,800	-1,050	9,800	0,733
-1,125	13,154	-1,125	9,029	0,733
-1,150	13,273	-1,150	8,773	0,733
-1,250	13,755	-1,250	7,755	0,733
-1,350	14,248	-1,350	6,748	0,733
-1,400	17,313	-1,400	9,063	0,733
-1,400	17,313	-1,400	9,063	0,733
-1,450	17,567	-1,450	8,567	0,732
-1,550	18,083	-1,550	7,583	0,729

Depth [m]	Effective Stress [kPa]	Hydraulic head [m]	Loading [kPa]	Settlement [m]
-1,600	18,345	-1,600	7,095	0,728
-1,650	18,529	-1,592	7,101	0,727
-1,700	18,715	-1,583	7,110	0,726
-1,700	18,715	-1,583	7,110	0,726
-1,750	18,776	-1,584	7,121	0,721
-1,850	18,899	-1,586	7,150	0,710
-2,300	19,485	-1,587	7,366	0,662
-2,900	20,284	-1,576	7,800	0,591
-2,900	20,284	-1,576	7,800	0,591
-3,650	22,193	-1,591	8,526	0,521
-4,450	24,173	-1,592	9,382	0,438
-5,200	25,807	-1,580	10,090	0,354
-6,000	26,919	-1,518	10,699	0,259
-6,000	26,919	-1,518	10,699	0,259
-6,600	32,069	-1,565	11,075	0,234
-7,200	36,973	-1,592	11,398	0,208
-7,200	36,973	-1,592	11,398	0,208
-7,850	40,671	-1,594	11,704	0,158
-8,500	44,551	-1,618	11,973	0,108
-8,500	44,551	-1,618	11,973	0,107
-8,750	44,835	-1,581	12,069	0,081
-9,000	45,077	-1,541	12,160	0,055
-9,000	45,077	-1,541	12,160	0,055
-9,400	46,046	-1,333	12,297	0,037
-9,800	46,527	-1,075	12,425	0,022
-9,800	46,527	-1,075	12,425	0,022
-10,350	46,109	-0,557	12,587	0,010
-10,900	45,784	-0,050	12,732	0,000

4 Settlements

4.1 Settlements

Vertical number	X co-ordinate [m]	Z co-ordinate [m]	Surface level [m]	Settlement [m]
1	0,00	0,00	-0,85	0,658
2	0,40	0,00	-0,85	0,653
3	1,00	0,00	-0,85	0,686
4	1,50	0,00	-0,85	0,693
5	2,00	0,00	-0,85	0,709
6	2,50	0,00	-0,85	0,733
7	3,00	0,00	-0,85	0,763
8	4,00	0,00	-0,85	0,824
9	5,00	0,00	-0,85	0,875
10	15,00	0,00	-0,85	0,969

4.2 Residual Times

Vertical number	Time [days]	Settlement [m]	Part of final settlement [%]	Residual settlements [m]
1	180	0,569	86,438	0,089
2	180	0,570	87,253	0,083
3	180	0,641	93,490	0,045
4	180	0,654	94,499	0,038
5	180	0,675	95,270	0,034
6	180	0,705	96,072	0,029
7	180	0,738	96,776	0,025
8	180	0,794	96,293	0,031
9	180	0,826	94,434	0,049
10	180	0,890	91,868	0,079

End of Report

Report for D-Settlement 20.1

Settlement Calculations
Developed by Deltares

Company: CRUX Engineering B.V.

Date of report: 21-12-2020

Time of report: 16:32:49

Report with version: 20.1.1.29740

Date of calculation: 18-12-2020

Time of calculation: 19:43:49

Calculated with version: 20.1.1.29740

File name: SET007 CPT17_voorbelasting+drains_6maand_zomerpeil_zand_ondiepe riool

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2 Echo of the Input

2.1 Layer Boundaries

Boundary number	Co-ordinates [m]				
9 - X -	-25,000	25,000			
9 - Y -	-0,850	-0,850			
8 - X -	-25,000	25,000			
8 - Y -	-1,500	-1,500			
7 - X -	-25,000	25,000			
7 - Y -	-2,500	-2,500			
6 - X -	-25,000	25,000			
6 - Y -	-4,100	-4,100			
5 - X -	-25,000	25,000			
5 - Y -	-5,000	-5,000			
4 - X -	-25,000	25,000			
4 - Y -	-5,500	-5,500			
3 - X -	-25,000	25,000			
3 - Y -	-6,800	-6,800			
2 - X -	-25,000	25,000			
2 - Y -	-7,400	-7,400			
1 - X -	-25,000	25,000			
1 - Y -	-7,600	-7,600			
0 - X -	-25,000	25,000			
0 - Y -	-8,600	-8,600			

2.2 PI-lines

PI-line number	Co-ordinates [m]				
1 - X -	-25,000	25,000			
1 - Y -	-1,600	-1,600			
2 - X -	-25,000	25,000			
2 - Y -	-0,050	-0,050			

2.3 General Data

Soil model:	NEN Bjerrum
Consolidation model:	Darcy
Strain model:	Linear
Groundwater level:	Initial determined by PI-line number 1
Unit weight of water:	9,81 [kN/m³]
Stress distribution	
- Soil:	Buisman
- Loads:	None
End of consolidation:	11130,00 [days]
No maintain profile	
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 :	0,02 [m]
Load column width	
- Non-Uniform Loads :	0,20 [m]
- Trapeziform Loads :	0,05 [m]

2.4 Soil Profiles

Layer number	Material name	PI-line top	PI-line bottom
9	Top klei	1	99
8	Veen 1	99	99

Layer number	Material name	PI-line top	PI-line bottom
7	Veen (Houthoudend)	99	99
6	Klei humeus	99	99
5	Veen (Houthoudend)	99	99
4	Klei	99	99
3	Klei humeus	99	99
2	Veen 2	99	99
1	Klei zandig	99	2

2.5 Soil Properties

Layer number	Drained	Unit weight	
		Unsaturated [kN/m³]	Saturated [kN/m³]
9	Yes	15,00	15,00
8	No	10,60	10,60
7	No	11,20	11,20
6	No	15,00	15,00
5	No	11,20	11,20
4	No	17,00	17,00
3	No	15,00	15,00
2	No	12,00	12,00
1	No	18,00	18,00

Layer number	Storage type	Vert. consolid. coefficient Cv [m²/s]	Ratio Ch/Cv [-]	Vertical permeability [m/s]	Ratio hor/vert permeability [-]	Permeability strain mod. [-]	Initial vertical permeability [m/s]
9	Vert. cons.	-	1,000	-	-	-	-
8	Vert. cons.	1,06E-07	1,500	-	-	-	-
7	Vert. cons.	3,87E-08	1,500	-	-	-	-
6	Vert. cons.	1,00E-08	1,000	-	-	-	-
5	Vert. cons.	3,87E-08	1,500	-	-	-	-
4	Vert. cons.	1,00E-08	1,000	-	-	-	-
3	Vert. cons.	1,00E-08	1,000	-	-	-	-
2	Vert. cons.	1,00E-07	1,500	-	-	-	-
1	Vert. cons.	1,00E-08	1,000	-	-	-	-

Layer number	POP [kN/m²]	OCR [-]	Equiv. age [days]
9	15,00	-	-
8	15,00	-	-
7	15,00	-	-
6	15,00	-	-
5	15,00	-	-
4	15,00	-	-
3	15,00	-	-
2	15,00	-	-
1	15,00	-	-

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) [-]
9	0,0175000	0,1127000	0,0049000	-	-	-
8	0,0996000	0,5140000	0,0211000	-	-	-
7	0,0564000	0,3660000	0,0165000	-	-	-
6	0,0383000	0,2300000	0,0115000	-	-	-
5	0,0564000	0,3660000	0,0165000	-	-	-
4	0,0219000	0,1533000	0,0061000	-	-	-
3	0,0383000	0,2300000	0,0115000	-	-	-
2	0,0613000	0,3067000	0,0153000	-	-	-
1	0,0184000	0,0920000	0,0037000	-	-	-

2.6 Non-Uniform Loads

Load number	Time [days]	Unit weight	
		Unsaturated [kN/m ³]	Saturated [kN/m ³]
1	0	16,00	18,00

Load number	Co-ordinates [m]						
1 - X -	-25,00	-25,00	-4,50	-2,00	2,00	4,50	
1 - Y -	-0,85	0,95	0,95	0,45	0,45	0,95	
1 - X -	25,00	25,00					
1 - Y -	0,95	-0,85					

2.7 Verticals

Vertical number	X co-ordinates [m]				
1	-3,250				

2.8 Vertical Drain

Drain type		Strip
Horizontal range "From"	[m]	-25,000
Horizontal range "To"	[m]	25,000
Bottom position	[m]	-7,500
Center to center distance	[m]	1,000
Width	[m]	0,100
Thickness	[m]	0,003
Grid		Triangular
Drainage schedule		Off
Start of drainage	[days]	0,000

3 Results per Vertical

3.1 Results for Vertical 1 (X = -3,25 m; Z = 0,00 m)

Depth [m]	Effective Stress [kPa]	Hydraulic head [m]	Loading [kPa]	Settlement [m]
-0,850	24,681	-0,850	24,680	0,747
-0,950	25,828	-0,950	24,328	0,741
-1,050	26,386	-1,050	23,386	0,735
-1,150	26,912	-1,150	22,412	0,730
-1,175	27,043	-1,175	22,168	0,729
-1,250	27,433	-1,250	21,433	0,726
-1,350	27,952	-1,350	20,452	0,722
-1,450	28,472	-1,450	19,472	0,718
-1,500	28,731	-1,500	18,981	0,716
-1,500	28,731	-1,500	18,981	0,716
-1,550	28,843	-1,557	18,491	0,708
-1,600	28,957	-1,615	18,000	0,700
-1,650	28,964	-1,612	18,000	0,693
-1,750	28,982	-1,605	18,001	0,677
-1,850	29,003	-1,599	18,001	0,662
-2,000	29,033	-1,590	18,002	0,638
-2,500	28,985	-1,545	18,006	0,557
-2,500	28,985	-1,545	18,006	0,557
-3,300	30,437	-1,577	18,026	0,455
-4,100	31,070	-1,524	18,067	0,344
-4,100	31,070	-1,524	18,067	0,344
-4,550	33,941	-1,576	18,100	0,301
-5,000	36,832	-1,628	18,141	0,258
-5,000	36,832	-1,628	18,141	0,258
-5,250	36,828	-1,590	18,167	0,222
-5,500	36,794	-1,548	18,194	0,185
-5,500	36,794	-1,548	18,194	0,185
-6,150	41,753	-1,569	18,272	0,147
-6,800	46,554	-1,573	18,356	0,110
-6,800	46,554	-1,573	18,356	0,110
-7,100	47,937	-1,552	18,396	0,082
-7,400	49,216	-1,519	18,437	0,054
-7,400	49,216	-1,519	18,437	0,054
-7,500	49,214	-1,495	18,450	0,041
-7,600	49,188	-1,469	18,464	0,028
-7,600	49,188	-1,469	18,464	0,028
-8,100	46,181	-0,738	18,530	0,013
-8,600	43,588	-0,050	18,594	0,000

4 Settlements

4.1 Settlements

Vertical number	X co-ordinate [m]	Z co-ordinate [m]	Surface level [m]	Settlement [m]
1	-3,25	0,00	-0,85	0,747

4.2 Residual Times

Vertical number	Time [days]	Settlement [m]	Part of final settlement [%]	Residual settlements [m]
1	180	0,529	70,847	0,218

End of Report

Report for D-Settlement 20.1

Settlement Calculations
Developed by Deltares

Company: CRUX Engineering B.V.

Date of report: 21-12-2020

Time of report: 16:29:59

Report with version: 20.1.1.29740

Date of calculation: 18-12-2020

Time of calculation: 19:02:06

Calculated with version: 20.1.1.29740

File name: SET007 CPT19_voorbelasting+drains_6maand_zand_ondiepe riool_zomerpeil

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2 Echo of the Input

2.1 Layer Boundaries

Boundary number	Co-ordinates [m]				
8 - X -	-25,000	25,000			
8 - Y -	-0,850	-0,850			
7 - X -	-25,000	25,000			
7 - Y -	-1,700	-1,700			
6 - X -	-25,000	25,000			
6 - Y -	-2,900	-2,900			
5 - X -	-25,000	25,000			
5 - Y -	-6,000	-6,000			
4 - X -	-25,000	25,000			
4 - Y -	-7,200	-7,200			
3 - X -	-25,000	25,000			
3 - Y -	-8,500	-8,500			
2 - X -	-25,000	25,000			
2 - Y -	-9,000	-9,000			
1 - X -	-25,000	25,000			
1 - Y -	-9,800	-9,800			
0 - X -	-25,000	25,000			
0 - Y -	-10,900	-10,900			

2.2 PI-lines

PI-line number	Co-ordinates [m]				
1 - X -	-25,000	25,000			
1 - Y -	-1,600	-1,600			

2.3 General Data

Soil model:	NEN Bjerrum
Consolidation model:	Darcy
Strain model:	Linear
Groundwater level:	Initial determined by PI-line number 1
Unit weight of water:	9,81 [kN/m³]
Stress distribution	
- Soil:	Buisman
- Loads:	Simulate
End of consolidation:	11130,00 [days]
No maintain profile	
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 :	0,02 [m]
Load column width	
- Non-Uniform Loads :	0,20 [m]
- Trapeziform Loads :	0,05 [m]

2.4 Soil Profiles

Layer number	Material name	PI-line top	PI-line bottom
8	Top klei	1	1
7	Veen 1	1	1
6	Veen (Houthoudend)	1	1
5	Klei	1	1
4	Klei humeus	1	1
3	Veen 2	1	1

Layer number	Material name	PI-line top	PI-line bottom
2	Klei	1	1
1	Klei zandig	1	1

2.5 Non-Uniform Loads

Load number	Time [days]	Unit weight	
		Unsaturated [kN/m ³]	Saturated [kN/m ³]
1	0	16,00	18,00

Load number	Co-ordinates [m]						
1 - X -	-25,00	-25,00	-4,50	-2,00	2,00	4,50	
1 - Y -	-0,85	1,40	1,40	0,50	0,50	1,40	
1 - X -	25,00	25,00					
1 - Y -	1,40	-0,85					

2.6 Verticals

Vertical number	X co-ordinates [m]				
1	-3,000				

3 Results per Vertical

3.1 Results for Vertical 1 (X = -3,00 m; Z = 0,00 m)

Depth [m]	Effective Stress [kPa]	Hydraulic head [m]	Loading [kPa]	Settlement [m]
-0,850	0,001	-0,850	0,000	0,437
-0,950	1,500	-0,950	0,000	0,434
-1,050	3,000	-1,050	0,000	0,431
-1,150	4,500	-1,150	0,000	0,428
-1,250	5,342	-1,250	-0,658	0,425
-1,275	5,472	-1,275	-0,903	0,424
-1,350	5,861	-1,350	-1,639	0,422
-1,450	6,380	-1,450	-2,620	0,420
-1,550	6,899	-1,550	-3,601	0,418
-1,600	7,158	-1,600	-4,092	0,417
-1,650	7,418	-1,600	-4,092	0,416
-1,700	7,677	-1,600	-4,092	0,415
-1,700	7,677	-1,600	-4,092	0,415
-1,750	7,978	-1,627	-4,092	0,412
-1,850	8,533	-1,675	-4,092	0,404
-2,300	10,234	-1,812	-4,092	0,366
-2,900	11,234	-1,866	-4,092	0,309
-2,900	11,234	-1,866	-4,092	0,309
-3,650	12,551	-1,894	-4,092	0,254
-4,450	13,713	-1,899	-4,092	0,198
-5,200	14,764	-1,900	-4,092	0,146
-6,000	15,877	-1,900	-4,092	0,092
-6,000	15,877	-1,900	-4,092	0,092
-6,600	20,190	-1,900	-4,092	0,081
-7,200	24,502	-1,900	-4,092	0,074
-7,200	24,502	-1,900	-4,092	0,074
-7,850	27,873	-1,899	-4,092	0,061
-8,500	31,239	-1,899	-4,092	0,042
-8,500	31,239	-1,899	-4,092	0,042
-8,750	31,784	-1,898	-4,092	0,029
-9,000	32,323	-1,898	-4,092	0,016
-9,000	32,324	-1,898	-4,092	0,016
-9,400	34,816	-1,859	-4,092	0,009
-9,800	37,275	-1,816	-4,092	0,006
-9,800	37,275	-1,816	-4,092	0,006
-10,350	40,807	-1,717	-4,092	0,004
-10,900	44,165	-1,600	-4,092	0,000

4 Settlements

4.1 Settlements

Vertical number	X co-ordinate [m]	Z co-ordinate [m]	Surface level [m]	Settlement [m]
1	-3,00	0,00	-0,85	0,437

4.2 Residual Times

Vertical number	Time [days]	Settlement [m]	Part of final settlement [%]	Residual settlements [m]
1	180	0,623	142,398	-0,185

End of Report

Report for D-Settlement 20.1

Settlement Calculations
Developed by Deltares

Company: CRUX Engineering B.V.

Date of report: 22-1-2021

Time of report: 16:29:40

Report with version: 20.1.1.29740

Date of calculation: 21-1-2021

Time of calculation: 16:11:34

Calculated with version: 20.1.1.29740

File name: SET008 CPT19_riool_zandaanvulling_gemiddelde_6maand_zomerpeil

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4.1 Settlements	12
4.2 Residual Times	12

2 Echo of the Input

2.1 Layer Boundaries

Boundary number	Co-ordinates [m]				
13 - X -	-25,000	-4,500	4,500	25,000	
13 - Y -	-0,850	-0,850	-0,850	-0,850	
12 - X -	-25,000	-4,500	-4,500	-1,375	-1,225
12 - Y -	-0,850	-0,850	-1,400	-1,400	-1,700
12 - X -	1,225	1,375	4,500	4,500	25,000
12 - Y -	-1,700	-1,400	-1,400	-0,850	-0,850
11 - X -	-25,000	-1,225	1,225	1,375	4,500
11 - Y -	-1,700	-1,700	-1,700	-1,400	-1,400
11 - X -	4,500	25,000			
11 - Y -	-0,850	-0,850			
10 - X -	-25,000	-1,225	-0,625	0,625	1,225
10 - Y -	-1,700	-1,700	-2,900	-2,900	-1,700
10 - X -	1,375	4,500	4,500	25,000	
10 - Y -	-1,400	-1,400	-0,850	-0,850	
9 - X -	-25,000	-0,625	0,625	1,225	1,375
9 - Y -	-2,900	-2,900	-2,900	-1,700	-1,400
9 - X -	4,500	4,500	25,000		
9 - Y -	-1,400	-0,850	-0,850		
8 - X -	-25,000	-0,625	-0,625	0,625	0,625
8 - Y -	-2,900	-2,900	-3,300	-3,300	-2,900
8 - X -	1,225	1,375	4,500	4,500	25,000
8 - Y -	-1,700	-1,400	-1,400	-0,850	-0,850
7 - X -	-25,000	-0,625	-0,625	0,625	0,625
7 - Y -	-2,900	-2,900	-3,300	-3,300	-2,900
7 - X -	1,225	25,000			
7 - Y -	-1,700	-1,700			
6 - X -	-25,000	-0,625	-0,625	0,625	0,625
6 - Y -	-2,900	-2,900	-3,300	-3,300	-2,900
6 - X -	25,000				
6 - Y -	-2,900				
5 - X -	-25,000	25,000			
5 - Y -	-6,000	-6,000			
4 - X -	-25,000	25,000			
4 - Y -	-7,200	-7,200			
3 - X -	-25,000	25,000			
3 - Y -	-8,500	-8,500			
2 - X -	-25,000	25,000			
2 - Y -	-9,000	-9,000			
1 - X -	-25,000	25,000			
1 - Y -	-9,800	-9,800			
0 - X -	-25,000	25,000			
0 - Y -	-10,900	-10,900			

2.2 PI-lines

PI-line number	Co-ordinates [m]				
1 - X -	-25,000	25,000			
1 - Y -	-1,600	-1,600			
2 - X -	-25,000	25,000			
2 - Y -	-0,050	-0,050			

2.3 General Data

Soil model:	NEN Bjerrum
Consolidation model:	Darcy
Strain model:	Linear
Groundwater level:	Initial determined by PI-line number 1
Unit weight of water:	9,81 [kN/m³]

Stress distribution	
- Soil:	Buisman
- Loads:	None
End of consolidation:	11130,00 [days]
No maintain profile	
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 :	0,02 [m]
Load column width	
- Non-Uniform Loads :	0,20 [m]
- Trapeziform Loads :	0,05 [m]

2.4 Soil Profiles

Layer number	Material name	PI-line top	PI-line bottom
13	Top klei (stijf)	1	99
12	Top klei	1	99
11	Veen 1 (stijf)	99	99
10	Veen 1	99	99
9	Veen (Houthoudend...	99	99
8	Top klei	99	99
7	Veen 1	99	99
6	Veen (Houthoudend)	99	99
5	Klei	99	99
4	Klei humeus	99	99
3	Veen 2	99	99
2	Klei	99	99
1	Klei zandig	99	2

2.5 Soil Properties

Layer number	Drained	Unit weight	
		Unsaturated [kN/m³]	Saturated [kN/m³]
13	Yes	15,00	15,00
12	Yes	15,00	15,00
11	Yes	10,60	10,60
10	No	10,60	10,60
9	Yes	11,20	11,20
8	Yes	15,00	15,00
7	No	10,60	10,60
6	No	11,20	11,20
5	No	17,00	17,00
4	No	15,00	15,00
3	No	12,00	12,00
2	No	17,00	17,00
1	No	18,00	18,00

Layer number	Storage type	Vert. consolid. coefficient Cv [m²/s]	Ratio Ch/Cv [-]	Vertical permeability [m/s]	Ratio hor/vert permeability [-]	Permeability strain mod. [-]	Initial vertical permeability [m/s]
13	Vert. cons.	-	1,000	-	-	-	-
12	Vert. cons.	-	1,000	-	-	-	-
11	Vert. cons.	-	1,000	-	-	-	-
10	Vert. cons.	1,06E-07	1,000	-	-	-	-
9	Vert. cons.	-	1,000	-	-	-	-
8	Vert. cons.	-	1,000	-	-	-	-
7	Vert. cons.	1,06E-07	1,000	-	-	-	-
6	Vert. cons.	1,00E-07	1,000	-	-	-	-
5	Vert. cons.	1,00E-08	1,000	-	-	-	-
4	Vert. cons.	1,00E-08	1,000	-	-	-	-

Layer number	Storage type	Vert. consolid. coefficient C_v [m ² /s]	Ratio C_h/C_v [-]	Vertical permeability [m/s]	Ratio hor/vert permeability [-]	Permeability strain mod. [-]	Initial vertical permeability [m/s]
3	Vert. cons.	1,00E-07	1,000	-	-	-	-
2	Vert. cons.	1,00E-08	1,000	-	-	-	-
1	Vert. cons.	1,00E-08	1,000	-	-	-	-

Layer number	POP [kN/m ²]	OCR [-]	Equiv. age [days]
13	15,00	-	-
12	15,00	-	-
11	15,00	-	-
10	15,00	-	-
9	15,00	-	-
8	15,00	-	-
7	15,00	-	-
6	15,00	-	-
5	15,00	-	-
4	15,00	-	-
3	15,00	-	-
2	15,00	-	-
1	15,00	-	-

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) [-]
13	0,0000100	0,0000100	0,0000100	-	-	-
12	0,0175000	0,1127000	0,0049000	-	-	-
11	0,0000100	0,0000100	0,0000100	-	-	-
10	0,0996000	0,5140000	0,0211000	-	-	-
9	0,0000100	0,0000100	0,0000100	-	-	-
8	0,0175000	0,1127000	0,0049000	-	-	-
7	0,0996000	0,5140000	0,0211000	-	-	-
6	0,0564000	0,3660000	0,0165000	-	-	-
5	0,0219000	0,1533000	0,0061000	-	-	-
4	0,0383000	0,2300000	0,0115000	-	-	-
3	0,0613000	0,3067000	0,0153000	-	-	-
2	0,0219000	0,1533000	0,0061000	-	-	-
1	0,0184000	0,0920000	0,0037000	-	-	-

2.6 Non-Uniform Loads

Load number	Time [days]	Unit weight	
		Unsaturated [kN/m ³]	Saturated [kN/m ³]
1	0	18,00	18,00
2	0	18,00	18,00
3	0	16,00	18,00
4	0	16,00	18,00
5	0	16,00	18,00
6	0	16,00	18,00
7	0	16,00	18,00
8	180	0,00	9,81
9	180	3,00	15,00
10	180	7,40	19,40
11	180	6,80	18,80
12	180	0,00	9,81
13	180	20,70	20,70
14	180	16,00	18,00

Load number	Co-ordinates [m]					
1 - X -	-25,00	-25,00	-4,50	-4,50		
1 - Y -	-0,85	-0,35	-0,35	-0,85		
2 - X -	4,50	4,50	25,00	25,00		
2 - Y -	-0,85	-0,35	-0,35	-0,85		
3 - X -	-25,00	-25,00	-4,50	-4,50		

Load number	Co-ordinates [m]					
3 - Y -	-0,35	0,75	0,75	-0,35		
4 - X -	4,50	4,50	25,00	25,00		
4 - Y -	-0,35	0,75	0,75	-0,35		
5 - X -	-25,00	-25,00	-4,50	-4,50		
5 - Y -	0,75	1,40	1,40	0,75		
6 - X -	-4,50	-4,50	-2,00	2,00	4,50	4,50
6 - Y -	-0,85	1,40	1,40	1,40	1,40	-0,85
7 - X -	4,50	4,50	25,00	25,00		
7 - Y -	0,75	1,40	1,40	0,75		
8 - X -	-25,00	-4,50	-4,50	4,50	4,50	25,00
8 - Y -	0,75	0,75	-0,85	-0,85	0,75	0,75
9 - X -	-4,50	-4,50	-1,38	-1,23	1,23	1,38
9 - Y -	-0,85	-1,40	-1,40	-1,70	-1,70	-1,40
9 - X -	4,50	4,50				
9 - Y -	-1,40	-0,85				
10 - X -	-1,23	-0,63	0,63	1,23		
10 - Y -	-1,70	-2,90	-2,90	-1,70		
11 - X -	-0,63	-0,63	0,63	0,63		
11 - Y -	-2,90	-3,30	-3,30	-2,90		
12 - X -	-4,50	4,50				
12 - Y -	-0,85	-0,85				
13 - X -	-4,50	-4,50	4,50	4,50		
13 - Y -	-0,85	-0,40	-0,40	-0,85		
14 - X -	-4,50	-4,50	-2,00	-2,00	2,00	2,00
14 - Y -	-0,40	-0,05	-0,05	-0,40	-0,40	-0,05
14 - X -	4,50	4,50				
14 - Y -	-0,05	-0,40				

2.7 Verticals

Vertical number	X co-ordinates [m]					
1 - 5	0,000	0,400	1,000	1,500	2,000	
6 - 10	2,500	3,000	4,000	5,000	15,000	

2.8 Vertical Drain

Drain type		Strip
Horizontal range "From"	[m]	-25,000
Horizontal range "To"	[m]	25,000
Bottom position	[m]	-9,500
Center to center distance	[m]	1,000
Width	[m]	0,100
Thickness	[m]	0,003
Grid		Triangular
Drainage schedule		Off
Start of drainage	[days]	0,000

3 Results per Vertical

3.1 Results for Vertical 1 (X = 0,00 m; Z = 0,00 m)

Depth [m]	Effective Stress [kPa]	Hydraulic head [m]	Loading [kPa]	Settlement [m]
-0,850	9,322	-0,850	9,321	0,690
-0,950	10,484	-0,950	8,984	0,690
-1,050	11,013	-1,050	8,013	0,690
-1,150	11,546	-1,150	7,046	0,690
-1,250	12,082	-1,250	6,082	0,690
-1,275	12,217	-1,275	5,842	0,690
-1,350	12,623	-1,350	5,123	0,690
-1,450	13,168	-1,450	4,168	0,690
-1,550	13,718	-1,550	3,218	0,690
-1,600	13,996	-1,600	2,746	0,690
-1,650	14,193	-1,592	2,765	0,690
-1,700	18,660	-1,583	7,055	0,690
-1,700	18,660	-1,583	7,055	0,690
-1,750	18,642	-1,575	7,079	0,690
-1,850	18,613	-1,558	7,134	0,690
-2,300	18,601	-1,483	7,503	0,690
-2,900	30,337	-1,383	19,746	0,690
-2,900	30,337	-1,383	19,746	0,690
-3,100	30,722	-1,350	20,180	0,690
-3,300	34,493	-1,317	24,000	0,690
-3,300	34,493	-1,317	24,000	0,690
-3,950	35,091	-1,514	21,755	0,596
-4,650	33,605	-1,571	18,739	0,493
-5,300	32,901	-1,571	17,129	0,396
-6,000	32,388	-1,516	16,190	0,292
-6,000	32,388	-1,516	16,190	0,292
-6,600	36,752	-1,566	15,749	0,260
-7,200	41,083	-1,593	15,500	0,230
-7,200	41,083	-1,593	15,500	0,230
-7,850	44,331	-1,594	15,360	0,174
-8,500	47,879	-1,618	15,303	0,118
-8,500	47,879	-1,618	15,303	0,118
-8,750	48,060	-1,581	15,294	0,089
-9,000	48,207	-1,541	15,292	0,060
-9,000	48,207	-1,541	15,292	0,060
-9,400	49,031	-1,331	15,296	0,041
-9,800	49,390	-1,073	15,308	0,024
-9,800	49,390	-1,073	15,308	0,024
-10,350	48,840	-0,556	15,333	0,011
-10,900	48,413	-0,050	15,362	0,000

3.2 Results for Vertical 2 (X = 0,40 m; Z = 0,00 m)

Depth [m]	Effective Stress [kPa]	Hydraulic head [m]	Loading [kPa]	Settlement [m]
-0,850	9,324	-0,850	9,323	0,685
-0,950	10,533	-0,950	9,033	0,685
-1,050	11,060	-1,050	8,060	0,685
-1,150	11,587	-1,150	7,087	0,685
-1,250	12,114	-1,250	6,114	0,685
-1,275	12,246	-1,275	5,871	0,685
-1,350	12,643	-1,350	5,143	0,685
-1,450	13,178	-1,450	4,178	0,685

Depth [m]	Effective Stress [kPa]	Hydraulic head [m]	Loading [kPa]	Settlement [m]
-1,550	13,721	-1,550	3,221	0,685
-1,600	13,995	-1,600	2,745	0,685
-1,650	14,191	-1,592	2,763	0,685
-1,700	18,675	-1,583	7,069	0,685
-1,700	18,675	-1,583	7,069	0,685
-1,750	18,657	-1,575	7,094	0,685
-1,850	18,636	-1,558	7,157	0,685
-2,300	18,675	-1,483	7,577	0,685
-2,900	30,942	-1,383	20,351	0,685
-2,900	30,942	-1,383	20,351	0,685
-3,100	31,380	-1,350	20,838	0,685
-3,300	33,984	-1,317	23,491	0,685
-3,300	33,984	-1,317	23,491	0,685
-3,950	33,453	-1,514	20,119	0,593
-4,650	32,816	-1,571	17,955	0,491
-5,300	32,518	-1,571	16,748	0,395
-6,000	32,195	-1,516	15,998	0,291
-6,000	32,195	-1,516	15,998	0,291
-6,600	36,637	-1,566	15,635	0,260
-7,200	41,012	-1,593	15,429	0,230
-7,200	41,012	-1,593	15,429	0,230
-7,850	44,288	-1,594	15,318	0,174
-8,500	47,853	-1,618	15,276	0,118
-8,500	47,853	-1,618	15,276	0,118
-8,750	48,038	-1,581	15,273	0,089
-9,000	48,189	-1,541	15,274	0,060
-9,000	48,190	-1,541	15,274	0,060
-9,400	49,019	-1,331	15,284	0,041
-9,800	49,382	-1,073	15,300	0,024
-9,800	49,382	-1,073	15,300	0,024
-10,350	48,837	-0,556	15,329	0,011
-10,900	48,413	-0,050	15,361	0,000

3.3 Results for Vertical 3 (X = 1,00 m; Z = 0,00 m)

Depth [m]	Effective Stress [kPa]	Hydraulic head [m]	Loading [kPa]	Settlement [m]
-0,850	8,737	-0,850	8,736	0,820
-0,950	9,291	-0,950	7,791	0,820
-1,050	9,870	-1,050	6,870	0,820
-1,150	10,460	-1,150	5,960	0,820
-1,250	11,055	-1,250	5,055	0,820
-1,275	11,204	-1,275	4,829	0,820
-1,350	11,654	-1,350	4,154	0,820
-1,450	12,258	-1,450	3,258	0,820
-1,550	12,876	-1,550	2,376	0,820
-1,600	13,200	-1,600	1,950	0,820
-1,650	13,469	-1,592	2,041	0,820
-1,700	18,186	-1,583	6,581	0,820
-1,700	18,186	-1,583	6,581	0,820
-1,750	18,300	-1,575	6,736	0,820
-1,850	18,464	-1,558	6,985	0,820
-1,925	18,459	-1,546	7,043	0,820
-2,150	19,258	-1,508	8,033	0,820
-2,150	21,165	-1,508	9,940	0,820
-2,525	21,985	-1,545	10,103	0,761
-2,900	21,766	-1,553	9,508	0,700
-2,900	21,767	-1,553	9,508	0,700
-3,650	25,819	-1,585	12,204	0,608
-4,450	28,916	-1,591	14,131	0,501

Depth [m]	Effective Stress [kPa]	Hydraulic head [m]	Loading [kPa]	Settlement [m]
-5,200	30,204	-1,580	14,481	0,397
-6,000	30,686	-1,518	14,461	0,282
-6,000	30,686	-1,518	14,461	0,282
-6,600	35,422	-1,566	14,417	0,253
-7,200	39,971	-1,592	14,394	0,224
-7,200	39,971	-1,592	14,394	0,224
-7,850	43,363	-1,594	14,398	0,170
-8,500	47,002	-1,618	14,426	0,115
-8,500	47,002	-1,618	14,426	0,115
-8,750	47,206	-1,581	14,442	0,087
-9,000	47,373	-1,541	14,459	0,059
-9,000	47,373	-1,541	14,459	0,059
-9,400	48,219	-1,331	14,488	0,040
-9,800	48,595	-1,073	14,520	0,023
-9,800	48,595	-1,073	14,520	0,023
-10,350	48,066	-0,555	14,564	0,011
-10,900	47,659	-0,050	14,607	0,000

3.4 Results for Vertical 4 (X = 1,50 m; Z = 0,00 m)

Depth [m]	Effective Stress [kPa]	Hydraulic head [m]	Loading [kPa]	Settlement [m]
-0,850	8,385	-0,850	8,384	0,878
-0,950	9,059	-0,950	7,559	0,878
-1,050	9,761	-1,050	6,761	0,878
-1,125	10,290	-1,125	6,165	0,878
-1,150	10,466	-1,150	5,966	0,878
-1,250	11,165	-1,250	5,165	0,878
-1,350	11,856	-1,350	4,356	0,878
-1,400	15,052	-1,400	6,802	0,878
-1,400	15,052	-1,400	6,802	0,878
-1,450	15,380	-1,450	6,380	0,876
-1,550	15,817	-1,550	5,317	0,873
-1,600	16,007	-1,600	4,757	0,871
-1,650	16,219	-1,592	4,791	0,869
-1,700	16,514	-1,583	4,908	0,868
-1,700	16,514	-1,583	4,908	0,868
-1,750	16,684	-1,584	5,028	0,861
-1,850	16,970	-1,586	5,219	0,846
-2,300	18,484	-1,588	6,363	0,781
-2,900	20,104	-1,576	7,619	0,689
-2,900	20,104	-1,576	7,619	0,689
-3,650	23,097	-1,591	9,426	0,598
-4,450	26,490	-1,592	11,694	0,495
-5,200	28,689	-1,581	12,965	0,393
-6,000	29,831	-1,518	13,605	0,280
-6,000	29,831	-1,518	13,605	0,280
-6,600	34,860	-1,566	13,856	0,251
-7,200	39,595	-1,592	14,019	0,223
-7,200	39,595	-1,592	14,019	0,223
-7,850	43,113	-1,593	14,150	0,169
-8,500	46,831	-1,618	14,256	0,115
-8,500	46,831	-1,618	14,256	0,115
-8,750	47,057	-1,581	14,293	0,087
-9,000	47,242	-1,541	14,328	0,058
-9,000	47,242	-1,541	14,328	0,058
-9,400	48,113	-1,331	14,381	0,040
-9,800	48,508	-1,073	14,431	0,023
-9,800	48,508	-1,073	14,431	0,023
-10,350	47,996	-0,555	14,493	0,011

Depth [m]	Effective Stress [kPa]	Hydraulic head [m]	Loading [kPa]	Settlement [m]
-10,900	47,600	-0,050	14,549	0,000

3.5 Results for Vertical 5 (X = 2,00 m; Z = 0,00 m)

Depth [m]	Effective Stress [kPa]	Hydraulic head [m]	Loading [kPa]	Settlement [m]
-0,850	10,897	-0,850	10,896	0,878
-0,950	11,419	-0,950	9,919	0,878
-1,050	11,944	-1,050	8,944	0,878
-1,125	12,340	-1,125	8,215	0,878
-1,150	12,473	-1,150	7,973	0,878
-1,250	13,008	-1,250	7,008	0,878
-1,350	13,549	-1,350	6,049	0,878
-1,400	16,677	-1,400	8,427	0,878
-1,400	16,677	-1,400	8,427	0,878
-1,450	16,952	-1,450	7,952	0,876
-1,550	17,506	-1,550	7,006	0,872
-1,600	17,783	-1,600	6,533	0,870
-1,650	17,977	-1,592	6,549	0,869
-1,700	18,170	-1,583	6,564	0,867
-1,700	18,170	-1,583	6,564	0,867
-1,750	18,235	-1,585	6,578	0,860
-1,850	18,358	-1,586	6,605	0,845
-2,300	18,999	-1,588	6,874	0,778
-2,900	20,129	-1,577	7,640	0,685
-2,900	20,129	-1,577	7,640	0,685
-3,650	22,541	-1,591	8,866	0,594
-4,450	25,365	-1,592	10,568	0,491
-5,200	27,673	-1,581	11,948	0,390
-6,000	29,129	-1,519	12,902	0,278
-6,000	29,129	-1,519	12,902	0,278
-6,600	34,359	-1,566	13,354	0,249
-7,200	39,241	-1,592	13,667	0,221
-7,200	39,241	-1,592	13,667	0,221
-7,850	42,872	-1,593	13,909	0,168
-8,500	46,666	-1,618	14,090	0,114
-8,500	46,666	-1,618	14,090	0,114
-8,750	46,913	-1,581	14,149	0,086
-9,000	47,116	-1,541	14,202	0,058
-9,000	47,116	-1,541	14,202	0,058
-9,400	48,013	-1,331	14,279	0,040
-9,800	48,427	-1,073	14,347	0,023
-9,800	48,427	-1,073	14,347	0,023
-10,350	47,932	-0,555	14,427	0,011
-10,900	47,547	-0,050	14,496	0,000

3.6 Results for Vertical 6 (X = 2,50 m; Z = 0,00 m)

Depth [m]	Effective Stress [kPa]	Hydraulic head [m]	Loading [kPa]	Settlement [m]
-0,850	13,406	-0,850	13,405	0,882
-0,950	13,786	-0,950	12,286	0,882
-1,050	14,163	-1,050	11,163	0,882
-1,125	14,451	-1,125	10,326	0,882
-1,150	14,548	-1,150	10,048	0,882
-1,250	14,948	-1,250	8,948	0,882
-1,350	15,367	-1,350	7,867	0,882

Depth [m]	Effective Stress [kPa]	Hydraulic head [m]	Loading [kPa]	Settlement [m]
-1,400	18,438	-1,400	10,188	0,882
-1,400	18,438	-1,400	10,188	0,882
-1,450	18,660	-1,450	9,660	0,880
-1,550	19,117	-1,550	8,617	0,876
-1,600	19,353	-1,600	8,103	0,875
-1,650	19,511	-1,592	8,083	0,873
-1,700	19,672	-1,583	8,067	0,871
-1,700	19,672	-1,583	8,067	0,871
-1,750	19,711	-1,585	8,054	0,863
-1,850	19,792	-1,586	8,038	0,848
-2,300	20,224	-1,588	8,096	0,779
-2,900	20,958	-1,577	8,464	0,684
-2,900	20,958	-1,577	8,464	0,684
-3,650	22,906	-1,592	9,227	0,592
-4,450	25,175	-1,593	10,374	0,489
-5,200	27,241	-1,581	11,515	0,388
-6,000	28,713	-1,519	12,486	0,276
-6,000	28,714	-1,519	12,486	0,276
-6,600	34,021	-1,566	13,014	0,248
-7,200	38,981	-1,592	13,407	0,221
-7,200	38,981	-1,592	13,407	0,221
-7,850	42,685	-1,593	13,722	0,168
-8,500	46,533	-1,618	13,957	0,114
-8,500	46,533	-1,618	13,957	0,114
-8,750	46,797	-1,581	14,032	0,086
-9,000	47,015	-1,541	14,100	0,058
-9,000	47,015	-1,541	14,100	0,058
-9,400	47,932	-1,331	14,196	0,040
-9,800	48,362	-1,073	14,279	0,023
-9,800	48,362	-1,073	14,279	0,023
-10,350	47,882	-0,556	14,376	0,011
-10,900	47,506	-0,050	14,455	0,000

4 Settlements

4.1 Settlements

Vertical number	X co-ordinate [m]	Z co-ordinate [m]	Surface level [m]	Settlement [m]
1	0,00	0,00	-0,85	0,690
2	0,40	0,00	-0,85	0,685
3	1,00	0,00	-0,85	0,820
4	1,50	0,00	-0,85	0,878
5	2,00	0,00	-0,85	0,878
6	2,50	0,00	-0,85	0,882
7	3,00	0,00	-0,85	0,889
8	4,00	0,00	-0,85	0,898
9	5,00	0,00	-0,85	0,908
10	15,00	0,00	-0,85	0,969

4.2 Residual Times

Vertical number	Time [days]	Settlement [m]	Part of final settlement [%]	Residual settlements [m]
1	180	0,615	89,211	0,074
2	180	0,615	89,825	0,070
3	180	0,792	96,545	0,028
4	180	0,880	100,143	-0,001
5	180	0,881	100,383	-0,003
6	180	0,884	100,167	-0,001
7	180	0,886	99,771	0,002
8	180	0,882	98,289	0,015
9	180	0,871	95,865	0,038
10	180	0,891	91,937	0,078

End of Report

Report for D-Settlement 20.1

Settlement Calculations
Developed by Deltares

Company: CRUX Engineering B.V.

Date of report: 22-1-2021

Time of report: 16:26:30

Report with version: 20.1.1.29740

Date of calculation: 22-1-2021

Time of calculation: 11:23:06

Calculated with version: 20.1.1.29740

File name: SET008 CPT10_riool_zandaanvulling_ondiep_6maand_zomerpeil

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2 Echo of the Input

2.1 Layer Boundaries

Boundary number	Co-ordinates [m]				
14 - X -	-25,000	-4,500	4,500	25,000	
14 - Y -	-0,850	-0,850	-0,850	-0,850	
13 - X -	-25,000	-4,500	-4,500	-1,040	-0,890
13 - Y -	-0,850	-0,850	-1,400	-1,400	-1,700
13 - X -	0,890	1,040	4,500	4,500	25,000
13 - Y -	-1,700	-1,400	-1,400	-0,850	-0,850
12 - X -	-25,000	-0,890	0,890	1,040	4,500
12 - Y -	-1,700	-1,700	-1,700	-1,400	-1,400
12 - X -	4,500	25,000			
12 - Y -	-0,850	-0,850			
11 - X -	-25,000	-0,890	-0,625	-0,625	0,625
11 - Y -	-1,700	-1,700	-2,230	-2,630	-2,630
11 - X -	0,625	0,890	1,040	4,500	4,500
11 - Y -	-2,230	-1,700	-1,400	-1,400	-0,850
11 - X -	25,000				
11 - Y -	-0,850				
10 - X -	-25,000	-0,890	-0,625	-0,625	0,625
10 - Y -	-1,700	-1,700	-2,230	-2,630	-2,630
10 - X -	0,625	0,890	25,000		
10 - Y -	-2,230	-1,700	-1,700		
9 - X -	-25,000	25,000			
9 - Y -	-3,000	-3,000			
8 - X -	-25,000	25,000			
8 - Y -	-3,400	-3,400			
7 - X -	-25,000	25,000			
7 - Y -	-4,000	-4,000			
6 - X -	-25,000	25,000			
6 - Y -	-5,000	-5,000			
5 - X -	-25,000	25,000			
5 - Y -	-6,500	-6,500			
4 - X -	-25,000	25,000			
4 - Y -	-8,500	-8,500			
3 - X -	-25,000	25,000			
3 - Y -	-9,200	-9,200			
2 - X -	-25,000	25,000			
2 - Y -	-9,500	-9,500			
1 - X -	-25,000	25,000			
1 - Y -	-10,700	-10,700			
0 - X -	-25,000	25,000			
0 - Y -	-11,400	-11,400			

2.2 PI-lines

PI-line number	Co-ordinates [m]				
1 - X -	-25,000	25,000			
1 - Y -	-1,600	-1,600			
2 - X -	-25,000	25,000			
2 - Y -	-0,050	-0,050			

2.3 General Data

Soil model:	NEN Bjerrum
Consolidation model:	Darcy
Strain model:	Linear
Groundwater level:	Initial determined by PI-line number 1
Unit weight of water:	9,81 [kN/m³]
Stress distribution	
- Soil:	Buisman

- Loads:	None
End of consolidation:	11130,00 [days]
No maintain profile	
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 :	0,02 [m]
Load column width	
- Non-Uniform Loads :	0,20 [m]
- Trapeziform Loads :	0,05 [m]

2.4 Soil Profiles

Layer number	Material name	PI-line top	PI-line bottom
14	Top klei (stijf)	1	99
13	Top klei	1	99
12	Veen 1 (stijf)	99	99
11	Top klei	99	99
10	Veen 1	99	99
9	Veen (Houthoudend)	99	99
8	Klei humeus	99	99
7	Klei	99	99
6	Klei zandig	99	2
5	Tussenzand	2	2
4	Klei	2	2
3	Veen 2	2	2
2	Klei humeus	2	2
1	Klei zandig	2	2

2.5 Non-Uniform Loads

Load number	Time [days]	Unit weight	
		Unsaturated [kN/m³]	Saturated [kN/m³]
1	0	18,00	18,00
2	0	18,00	18,00
3	0	16,00	18,00
4	0	16,00	18,00
5	0	16,00	18,00
6	0	16,00	18,00
7	0	16,00	18,00
8	180	0,00	9,81
9	180	3,00	15,00
10	180	7,40	19,40
11	180	0,00	9,81
12	180	20,70	20,70

Load number	Co-ordinates [m]					
1 - X -	-25,00	-25,00	-4,50	-4,50		
1 - Y -	-0,85	-0,35	-0,35	-0,85		
2 - X -	4,50	4,50	25,00	25,00		
2 - Y -	-0,85	-0,35	-0,35	-0,85		
3 - X -	-25,00	-25,00	-4,50	-4,50		
3 - Y -	-0,35	0,30	0,30	-0,35		
4 - X -	4,50	4,50	25,00	25,00		
4 - Y -	-0,35	0,30	0,30	-0,35		
5 - X -	-25,00	-25,00	-4,50	-4,50		
5 - Y -	0,30	1,40	1,40	0,30		
6 - X -	-4,50	-4,50	-2,00	2,00	4,50	4,50
6 - Y -	-0,85	1,40	1,40	1,40	1,40	-0,85
7 - X -	4,50	4,50	25,00	25,00		
7 - Y -	0,75	1,40	1,40	0,30		

Load number	Co-ordinates [m]					
8 - X -	-25,00	-4,50	-4,50	4,50	4,50	25,00
8 - Y -	0,75	0,75	-0,85	-0,85	0,75	0,75
9 - X -	-4,50	-4,50	-1,04	-0,89	0,89	1,04
9 - Y -	-0,85	-1,40	-1,40	-1,70	-1,70	-1,40
9 - X -	4,50	4,50				
9 - Y -	-1,40	-0,85				
10 - X -	-0,89	-0,63	-0,63	0,63	0,63	0,89
10 - Y -	-1,70	-2,23	-2,63	-2,63	-2,23	-1,70
11 - X -	-4,50	4,50				
11 - Y -	-0,85	-0,85				
12 - X -	-4,50	-4,50	4,50	4,50		
12 - Y -	-0,85	-0,40	-0,40	-0,85		

2.6 Verticals

Vertical number	X co-ordinates [m]				
1 - 5	0,000	0,400	1,000	1,500	2,000
6 - 10	2,500	3,000	4,000	5,000	15,000

2.7 Vertical Drain

Drain type		Strip
Horizontal range "From"	[m]	-25,000
Horizontal range "To"	[m]	25,000
Bottom position	[m]	-5,500
Center to center distance	[m]	1,000
Width	[m]	0,100
Thickness	[m]	0,003
Grid		Triangular
Drainage schedule		Off
Start of drainage	[days]	0,000

3 Results per Vertical

3.1 Results for Vertical 1 (X = 0,00 m; Z = 0,00 m)

Depth [m]	Effective Stress [kPa]	Hydraulic head [m]	Loading [kPa]	Settlement [m]
-0,850	9,317	-0,850	9,316	0,367
-0,950	10,816	-0,950	9,316	0,367
-1,050	12,317	-1,050	9,317	0,367
-1,150	13,819	-1,150	9,319	0,367
-1,250	15,208	-1,250	9,208	0,367
-1,275	15,339	-1,275	8,964	0,367
-1,350	15,730	-1,350	8,230	0,367
-1,450	16,253	-1,450	7,253	0,367
-1,550	16,777	-1,550	6,277	0,367
-1,600	17,040	-1,600	5,790	0,367
-1,650	17,149	-1,584	5,795	0,367
-1,700	20,820	-1,568	9,361	0,367
-1,700	20,820	-1,568	9,361	0,367
-1,750	20,713	-1,553	9,370	0,367
-1,850	20,506	-1,521	9,394	0,367
-2,165	19,897	-1,421	9,514	0,367
-2,630	27,961	-1,274	18,654	0,367
-2,630	27,961	-1,274	18,654	0,367
-2,815	28,603	-1,320	18,703	0,329
-3,000	28,667	-1,331	18,514	0,291
-3,000	28,667	-1,331	18,514	0,291
-3,200	28,427	-1,336	17,939	0,261
-3,400	27,606	-1,303	17,164	0,230
-3,400	27,606	-1,303	17,164	0,230
-3,700	28,926	-1,396	16,015	0,203
-4,000	29,792	-1,422	15,077	0,178
-4,000	29,792	-1,422	15,077	0,178
-4,500	32,211	-1,412	13,991	0,153
-5,000	33,390	-1,234	13,328	0,130
-5,000	33,390	-1,234	13,328	0,130
-5,750	33,166	-0,639	12,792	0,112
-6,500	33,292	-0,050	12,557	0,097
-6,500	33,292	-0,050	12,557	0,097
-7,500	41,396	-0,050	12,471	0,097
-8,500	49,622	-0,050	12,506	0,096
-8,500	49,622	-0,050	12,506	0,096
-8,850	51,627	0,005	12,532	0,087
-9,200	53,694	0,054	12,562	0,079
-9,200	53,694	0,054	12,562	0,079
-9,350	54,026	0,055	12,575	0,071
-9,500	54,361	0,055	12,589	0,062
-9,500	54,361	0,055	12,589	0,062
-10,100	57,331	0,076	12,646	0,036
-10,700	60,642	0,062	12,703	0,010
-10,700	60,642	0,062	12,703	0,010
-11,050	64,031	0,012	12,735	0,005
-11,400	67,532	-0,050	12,765	0,000

3.2 Results for Vertical 2 (X = 0,40 m; Z = 0,00 m)

Depth [m]	Effective Stress [kPa]	Hydraulic head [m]	Loading [kPa]	Settlement [m]
-0,850	9,317	-0,850	9,316	0,365

Depth [m]	Effective Stress [kPa]	Hydraulic head [m]	Loading [kPa]	Settlement [m]
-0,950	10,816	-0,950	9,316	0,365
-1,050	12,317	-1,050	9,317	0,365
-1,150	13,819	-1,150	9,319	0,365
-1,250	15,232	-1,250	9,232	0,365
-1,275	15,363	-1,275	8,988	0,365
-1,350	15,754	-1,350	8,254	0,365
-1,450	16,277	-1,450	7,277	0,365
-1,550	16,803	-1,550	6,303	0,365
-1,600	17,068	-1,600	5,818	0,365
-1,650	17,181	-1,584	5,827	0,365
-1,700	20,880	-1,568	9,422	0,365
-1,700	20,880	-1,568	9,422	0,365
-1,750	20,784	-1,553	9,441	0,365
-1,850	20,608	-1,521	9,496	0,365
-2,165	20,058	-1,421	9,675	0,365
-2,630	28,228	-1,274	18,921	0,365
-2,630	28,228	-1,274	18,921	0,365
-2,815	28,471	-1,320	18,565	0,327
-3,000	27,684	-1,331	17,525	0,288
-3,000	27,684	-1,331	17,525	0,288
-3,200	27,085	-1,337	16,592	0,259
-3,400	26,347	-1,304	15,898	0,229
-3,400	26,347	-1,304	15,898	0,229
-3,700	28,015	-1,397	15,094	0,202
-4,000	29,176	-1,422	14,459	0,177
-4,000	29,176	-1,422	14,459	0,177
-4,500	31,903	-1,412	13,683	0,153
-5,000	33,241	-1,234	13,174	0,130
-5,000	33,241	-1,234	13,174	0,130
-5,750	33,123	-0,640	12,743	0,112
-6,500	33,286	-0,050	12,550	0,097
-6,500	33,286	-0,050	12,550	0,097
-7,500	41,413	-0,050	12,488	0,097
-8,500	49,647	-0,050	12,531	0,097
-8,500	49,647	-0,050	12,531	0,097
-8,850	51,653	0,005	12,559	0,087
-9,200	53,720	0,054	12,590	0,080
-9,200	53,720	0,054	12,590	0,080
-9,350	54,053	0,055	12,603	0,071
-9,500	54,388	0,056	12,618	0,062
-9,500	54,388	0,056	12,618	0,062
-10,100	57,359	0,076	12,675	0,036
-10,700	60,669	0,062	12,732	0,011
-10,700	60,669	0,062	12,732	0,011
-11,050	64,059	0,012	12,764	0,005
-11,400	67,561	-0,050	12,794	0,000

3.3 Results for Vertical 3 (X = 1,00 m; Z = 0,00 m)

Depth [m]	Effective Stress [kPa]	Hydraulic head [m]	Loading [kPa]	Settlement [m]
-0,850	9,317	-0,850	9,316	0,503
-0,950	10,817	-0,950	9,317	0,503
-1,050	12,318	-1,050	9,318	0,503
-1,150	13,397	-1,150	8,897	0,503
-1,165	13,475	-1,165	8,750	0,503
-1,250	13,919	-1,250	7,919	0,503
-1,350	14,443	-1,350	6,943	0,503
-1,450	16,433	-1,450	7,433	0,503
-1,480	16,664	-1,480	7,214	0,503

Depth [m]	Effective Stress [kPa]	Hydraulic head [m]	Loading [kPa]	Settlement [m]
-1,480	17,891	-1,480	8,441	0,503
-1,550	18,369	-1,550	7,869	0,500
-1,590	18,609	-1,590	7,509	0,499
-1,600	18,651	-1,600	7,401	0,498
-1,650	18,690	-1,584	7,335	0,496
-1,700	18,624	-1,568	7,166	0,495
-1,700	18,624	-1,568	7,166	0,495
-1,750	18,489	-1,570	6,977	0,487
-1,850	18,650	-1,572	7,042	0,471
-2,350	19,919	-1,565	7,980	0,387
-3,000	20,545	-1,503	8,698	0,266
-3,000	20,545	-1,503	8,698	0,266
-3,200	21,217	-1,476	9,357	0,239
-3,400	21,613	-1,431	9,917	0,210
-3,400	21,613	-1,431	9,917	0,210
-3,700	24,172	-1,476	10,483	0,186
-4,000	26,008	-1,472	10,799	0,164
-4,000	26,008	-1,472	10,799	0,164
-4,500	29,456	-1,435	11,017	0,143
-5,000	31,283	-1,250	11,063	0,122
-5,000	31,283	-1,250	11,063	0,122
-5,750	31,545	-0,651	11,054	0,105
-6,500	31,793	-0,050	11,057	0,092
-6,500	31,793	-0,050	11,057	0,092
-7,500	40,036	-0,050	11,111	0,092
-8,500	48,318	-0,050	11,202	0,092
-8,500	48,318	-0,050	11,202	0,092
-8,850	50,356	0,002	11,239	0,083
-9,200	52,450	0,049	11,276	0,076
-9,200	52,450	0,049	11,276	0,076
-9,350	52,786	0,050	11,292	0,067
-9,500	53,123	0,051	11,308	0,059
-9,500	53,123	0,051	11,308	0,059
-10,100	56,107	0,071	11,371	0,034
-10,700	59,414	0,057	11,431	0,010
-10,700	59,414	0,057	11,431	0,010
-11,050	62,784	0,009	11,464	0,005
-11,400	66,261	-0,050	11,494	0,000

3.4 Results for Vertical 4 (X = 1,50 m; Z = 0,00 m)

Depth [m]	Effective Stress [kPa]	Hydraulic head [m]	Loading [kPa]	Settlement [m]
-0,850	9,318	-0,850	9,317	0,501
-0,950	10,818	-0,950	9,318	0,501
-1,050	12,321	-1,050	9,321	0,501
-1,125	13,320	-1,125	9,195	0,501
-1,150	13,451	-1,150	8,951	0,501
-1,250	13,975	-1,250	7,975	0,501
-1,350	14,501	-1,350	7,001	0,501
-1,400	17,063	-1,400	8,813	0,501
-1,400	17,063	-1,400	8,813	0,501
-1,450	17,327	-1,450	8,327	0,499
-1,550	17,854	-1,550	7,354	0,495
-1,600	18,114	-1,600	6,864	0,493
-1,650	18,215	-1,584	6,860	0,491
-1,700	18,312	-1,568	6,854	0,489
-1,700	18,312	-1,568	6,854	0,489
-1,750	18,357	-1,570	6,845	0,481
-1,850	18,437	-1,572	6,828	0,465

Depth [m]	Effective Stress [kPa]	Hydraulic head [m]	Loading [kPa]	Settlement [m]
-2,350	18,982	-1,565	7,039	0,382
-3,000	19,569	-1,503	7,720	0,262
-3,000	19,569	-1,503	7,720	0,262
-3,200	19,864	-1,477	8,001	0,235
-3,400	20,041	-1,432	8,342	0,207
-3,400	20,041	-1,432	8,342	0,207
-3,700	22,599	-1,478	8,888	0,182
-4,000	24,611	-1,474	9,382	0,161
-4,000	24,612	-1,474	9,382	0,161
-4,500	28,451	-1,436	9,996	0,142
-5,000	30,630	-1,252	10,383	0,122
-5,000	30,630	-1,252	10,383	0,122
-5,750	31,239	-0,655	10,715	0,106
-6,500	31,643	-0,050	10,908	0,092
-6,500	31,644	-0,050	10,908	0,092
-7,500	40,014	-0,050	11,088	0,092
-8,500	48,352	-0,050	11,237	0,092
-8,500	48,352	-0,050	11,237	0,092
-8,850	50,400	0,003	11,284	0,083
-9,200	52,501	0,050	11,330	0,076
-9,200	52,501	0,050	11,330	0,076
-9,350	52,840	0,051	11,349	0,067
-9,500	53,179	0,051	11,367	0,059
-9,500	53,179	0,051	11,367	0,059
-10,100	56,170	0,071	11,438	0,035
-10,700	59,481	0,057	11,501	0,010
-10,700	59,481	0,057	11,501	0,010
-11,050	62,853	0,009	11,535	0,005
-11,400	66,333	-0,050	11,566	0,000

3.5 Results for Vertical 5 (X = 2,00 m; Z = 0,00 m)

Depth [m]	Effective Stress [kPa]	Hydraulic head [m]	Loading [kPa]	Settlement [m]
-0,850	9,319	-0,850	9,318	0,501
-0,950	10,821	-0,950	9,321	0,501
-1,050	12,326	-1,050	9,326	0,501
-1,125	13,326	-1,125	9,201	0,501
-1,150	13,458	-1,150	8,958	0,501
-1,250	13,987	-1,250	7,987	0,501
-1,350	14,518	-1,350	7,018	0,501
-1,400	17,084	-1,400	8,834	0,501
-1,400	17,084	-1,400	8,834	0,501
-1,450	17,352	-1,450	8,352	0,499
-1,550	17,890	-1,550	7,390	0,495
-1,600	18,160	-1,600	6,910	0,493
-1,650	18,276	-1,584	6,921	0,491
-1,700	18,391	-1,568	6,933	0,489
-1,700	18,391	-1,568	6,933	0,489
-1,750	18,457	-1,570	6,944	0,481
-1,850	18,578	-1,572	6,968	0,465
-2,350	19,081	-1,565	7,137	0,381
-3,000	19,452	-1,504	7,601	0,261
-3,000	19,452	-1,504	7,601	0,261
-3,200	19,657	-1,477	7,792	0,233
-3,400	19,713	-1,432	8,011	0,205
-3,400	19,713	-1,432	8,011	0,205
-3,700	22,106	-1,479	8,384	0,180
-4,000	24,023	-1,475	8,780	0,160
-4,000	24,023	-1,475	8,780	0,160

Depth [m]	Effective Stress [kPa]	Hydraulic head [m]	Loading [kPa]	Settlement [m]
-4,500	27,862	-1,438	9,395	0,141
-5,000	30,151	-1,254	9,888	0,121
-5,000	30,151	-1,254	9,888	0,121
-5,750	30,951	-0,657	10,404	0,105
-6,500	31,471	-0,050	10,735	0,092
-6,500	31,471	-0,050	10,735	0,092
-7,500	39,951	-0,050	11,025	0,092
-8,500	48,344	-0,050	11,228	0,092
-8,500	48,344	-0,050	11,228	0,092
-8,850	50,403	0,003	11,287	0,083
-9,200	52,512	0,050	11,341	0,076
-9,200	52,512	0,050	11,341	0,076
-9,350	52,853	0,051	11,363	0,067
-9,500	53,195	0,051	11,384	0,059
-9,500	53,195	0,051	11,384	0,059
-10,100	56,193	0,071	11,461	0,035
-10,700	59,507	0,057	11,528	0,010
-10,700	59,507	0,057	11,528	0,010
-11,050	62,881	0,009	11,563	0,005
-11,400	66,361	-0,050	11,595	0,000

3.6 Results for Vertical 6 (X = 2,50 m; Z = 0,00 m)

Depth [m]	Effective Stress [kPa]	Hydraulic head [m]	Loading [kPa]	Settlement [m]
-0,850	9,323	-0,850	9,322	0,504
-0,950	10,829	-0,950	9,329	0,504
-1,050	12,339	-1,050	9,339	0,504
-1,125	13,317	-1,125	9,192	0,504
-1,150	13,451	-1,150	8,951	0,504
-1,250	13,990	-1,250	7,990	0,504
-1,350	14,534	-1,350	7,034	0,504
-1,400	17,114	-1,400	8,864	0,504
-1,400	17,114	-1,400	8,864	0,504
-1,450	17,390	-1,450	8,390	0,502
-1,550	17,945	-1,550	7,445	0,498
-1,600	18,225	-1,600	6,975	0,496
-1,650	18,351	-1,584	6,996	0,494
-1,700	18,478	-1,568	7,019	0,492
-1,700	18,478	-1,568	7,019	0,492
-1,750	18,555	-1,570	7,042	0,484
-1,850	18,702	-1,572	7,092	0,468
-2,350	19,322	-1,566	7,378	0,382
-3,000	19,678	-1,504	7,824	0,261
-3,000	19,678	-1,504	7,824	0,261
-3,200	19,847	-1,477	7,979	0,233
-3,400	19,850	-1,432	8,146	0,204
-3,400	19,850	-1,432	8,146	0,204
-3,700	22,146	-1,479	8,419	0,180
-4,000	23,963	-1,476	8,714	0,159
-4,000	23,963	-1,476	8,714	0,159
-4,500	27,687	-1,438	9,215	0,140
-5,000	29,942	-1,255	9,674	0,121
-5,000	29,942	-1,255	9,674	0,121
-5,750	30,779	-0,658	10,224	0,105
-6,500	31,353	-0,050	10,617	0,092
-6,500	31,353	-0,050	10,617	0,092
-7,500	39,898	-0,050	10,973	0,092
-8,500	48,330	-0,050	11,214	0,092
-8,500	48,330	-0,050	11,214	0,092

Depth [m]	Effective Stress [kPa]	Hydraulic head [m]	Loading [kPa]	Settlement [m]
-8,850	50,397	0,003	11,281	0,083
-9,200	52,512	0,050	11,341	0,076
-9,200	52,512	0,050	11,341	0,076
-9,350	52,856	0,051	11,365	0,067
-9,500	53,200	0,051	11,388	0,059
-9,500	53,200	0,051	11,388	0,059
-10,100	56,202	0,071	11,471	0,035
-10,700	59,519	0,057	11,540	0,010
-10,700	59,519	0,057	11,540	0,010
-11,050	62,893	0,009	11,575	0,005
-11,400	66,373	-0,050	11,606	0,000

4 Settlements

4.1 Settlements

Vertical number	X co-ordinate [m]	Z co-ordinate [m]	Surface level [m]	Settlement [m]
1	0,00	0,00	-0,85	0,367
2	0,40	0,00	-0,85	0,365
3	1,00	0,00	-0,85	0,503
4	1,50	0,00	-0,85	0,501
5	2,00	0,00	-0,85	0,501
6	2,50	0,00	-0,85	0,504
7	3,00	0,00	-0,85	0,509
8	4,00	0,00	-0,85	0,520
9	5,00	0,00	-0,85	0,536
10	15,00	0,00	-0,85	0,579

4.2 Residual Times

Vertical number	Time [days]	Settlement [m]	Part of final settlement [%]	Residual settlements [m]
1	180	0,278	75,682	0,089
2	180	0,278	76,221	0,087
3	180	0,471	93,659	0,032
4	180	0,476	95,114	0,024
5	180	0,479	95,576	0,022
6	180	0,482	95,684	0,022
7	180	0,486	95,506	0,023
8	180	0,487	93,788	0,032
9	180	0,485	90,575	0,050
10	180	0,508	87,745	0,071

End of Report

Report for D-Settlement 20.1

Settlement Calculations
Developed by Deltares

Company: CRUX Engineering B.V.

Date of report: 22-1-2021

Time of report: 16:30:24

Report with version: 20.1.1.29740

Date of calculation: 21-1-2021

Time of calculation: 16:07:48

Calculated with version: 20.1.1.29740

File name: SET009 CPT19_voorbelasting+drains_gemiddelde_6maand_zomerpeil

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2 Echo of the Input

2.1 Layer Boundaries

Boundary number	Co-ordinates [m]				
8 - X -	-25,000	25,000			
8 - Y -	-0,850	-0,850			
7 - X -	-25,000	25,000			
7 - Y -	-1,700	-1,700			
6 - X -	-25,000	25,000			
6 - Y -	-2,900	-2,900			
5 - X -	-25,000	25,000			
5 - Y -	-6,000	-6,000			
4 - X -	-25,000	25,000			
4 - Y -	-7,200	-7,200			
3 - X -	-25,000	25,000			
3 - Y -	-8,500	-8,500			
2 - X -	-25,000	25,000			
2 - Y -	-9,000	-9,000			
1 - X -	-25,000	25,000			
1 - Y -	-9,800	-9,800			
0 - X -	-25,000	25,000			
0 - Y -	-10,900	-10,900			

2.2 PI-lines

PI-line number	Co-ordinates [m]				
1 - X -	-25,000	25,000			
1 - Y -	-1,600	-1,600			
2 - X -	-25,000	25,000			
2 - Y -	-0,050	-0,050			

2.3 General Data

Soil model:	NEN Bjerrum
Consolidation model:	Darcy
Strain model:	Linear
Groundwater level:	Initial determined by PI-line number 1
Unit weight of water:	9,81 [kN/m³]
Stress distribution	
- Soil:	Buisman
- Loads:	None
End of consolidation:	11130,00 [days]
No maintain profile	
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 :	0,02 [m]
Load column width	
- Non-Uniform Loads :	0,20 [m]
- Trapeziform Loads :	0,05 [m]

2.4 Soil Profiles

Layer number	Material name	PI-line top	PI-line bottom
8	Top klei	1	99
7	Veen 1	99	99
6	Veen (Houthoudend)	99	99
5	Klei	99	99

Layer number	Material name	PI-line top	PI-line bottom
4	Klei humeus	99	99
3	Veen 2	99	99
2	Klei	99	99
1	Klei zandig	99	2

2.5 Soil Properties

Layer number	Drained	Unit weight	
		Unsaturated [kN/m³]	Saturated [kN/m³]
8	Yes	15,00	15,00
7	No	10,60	10,60
6	No	11,20	11,20
5	No	17,00	17,00
4	No	15,00	15,00
3	No	12,00	12,00
2	No	17,00	17,00
1	No	18,00	18,00

Layer number	Storage type	Vert. consolid. coefficient Cv [m²/s]	Ratio Ch/Cv [-]	Vertical permeability [m/s]	Ratio hor/vert permeability [-]	Permeability strain mod. [-]	Initial vertical permeability [m/s]
8	Vert. cons.	-	1,000	-	-	-	-
7	Vert. cons.	1,06E-07	1,500	-	-	-	-
6	Vert. cons.	3,87E-08	1,500	-	-	-	-
5	Vert. cons.	1,00E-08	1,000	-	-	-	-
4	Vert. cons.	1,00E-08	1,000	-	-	-	-
3	Vert. cons.	1,00E-07	1,500	-	-	-	-
2	Vert. cons.	1,00E-08	1,000	-	-	-	-
1	Vert. cons.	1,00E-08	1,000	-	-	-	-

Layer number	POP [kN/m²]	OCR [-]	Equiv. age [days]
8	15,00	-	-
7	15,00	-	-
6	15,00	-	-
5	15,00	-	-
4	15,00	-	-
3	15,00	-	-
2	15,00	-	-
1	15,00	-	-

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) [-]
8	0,0175000	0,1127000	0,0049000	-	-	-
7	0,0996000	0,5140000	0,0211000	-	-	-
6	0,0564000	0,3660000	0,0165000	-	-	-
5	0,0219000	0,1533000	0,0061000	-	-	-
4	0,0383000	0,2300000	0,0115000	-	-	-
3	0,0613000	0,3067000	0,0153000	-	-	-
2	0,0219000	0,1533000	0,0061000	-	-	-
1	0,0184000	0,0920000	0,0037000	-	-	-

2.6 Non-Uniform Loads

Load number	Time [days]	Unit weight	
		Unsaturated [kN/m³]	Saturated [kN/m³]
1	0	16,00	18,00

Load number	Co-ordinates [m]					
1 - X -	-25,00	-25,00	-4,50	-2,00	2,00	4,50
1 - Y -	-0,85	1,40	1,40	1,40	1,40	1,40
1 - X -	25,00	25,00				
1 - Y -	1,40	-0,85				

2.7 Verticals

Vertical number	X co-ordinates [m]				
1	-3,250				

2.8 Vertical Drain

Drain type		Strip
Horizontal range "From"	[m]	-25,000
Horizontal range "To"	[m]	25,000
Bottom position	[m]	-9,500
Center to center distance	[m]	1,000
Width	[m]	0,100
Thickness	[m]	0,003
Grid		Triangular
Drainage schedule		Off
Start of drainage	[days]	0,000

3 Results per Vertical

3.1 Results for Vertical 1 (X = -3,25 m; Z = 0,00 m)

Depth [m]	Effective Stress [kPa]	Hydraulic head [m]	Loading [kPa]	Settlement [m]
-0,850	32,741	-0,850	32,740	1,178
-0,950	33,259	-0,950	31,759	1,170
-1,050	33,778	-1,050	30,778	1,163
-1,150	34,297	-1,150	29,797	1,157
-1,250	34,816	-1,250	28,816	1,151
-1,275	34,946	-1,275	28,571	1,150
-1,350	35,335	-1,350	27,835	1,146
-1,450	35,854	-1,450	26,854	1,141
-1,550	36,373	-1,550	25,873	1,136
-1,600	36,632	-1,600	25,382	1,134
-1,650	36,810	-1,592	25,382	1,132
-1,700	36,988	-1,583	25,382	1,130
-1,700	36,988	-1,583	25,382	1,130
-1,750	37,038	-1,584	25,382	1,120
-1,850	37,132	-1,586	25,382	1,100
-2,300	37,476	-1,585	25,382	1,009
-2,900	37,648	-1,554	25,382	0,883
-2,900	37,648	-1,554	25,382	0,883
-3,650	39,031	-1,589	25,380	0,765
-4,450	40,192	-1,594	25,376	0,634
-5,200	41,166	-1,588	25,370	0,506
-6,000	41,782	-1,539	25,358	0,365
-6,000	41,782	-1,539	25,358	0,365
-6,600	46,418	-1,573	25,346	0,324
-7,200	50,928	-1,594	25,329	0,285
-7,200	50,928	-1,594	25,329	0,285
-7,850	54,284	-1,595	25,305	0,216
-8,500	57,894	-1,622	25,276	0,148
-8,500	57,894	-1,622	25,276	0,148
-8,750	58,083	-1,587	25,262	0,113
-9,000	58,229	-1,548	25,248	0,078
-9,000	58,229	-1,548	25,248	0,078
-9,400	58,977	-1,333	25,222	0,054
-9,800	59,274	-1,073	25,194	0,032
-9,800	59,274	-1,073	25,194	0,032
-10,350	58,640	-0,554	25,150	0,015
-10,900	58,151	-0,050	25,099	0,000

4 Settlements

4.1 Settlements

Vertical number	X co-ordinate [m]	Z co-ordinate [m]	Surface level [m]	Settlement [m]
1	-3,25	0,00	-0,85	1,178

4.2 Residual Times

Vertical number	Time [days]	Settlement [m]	Part of final settlement [%]	Residual settlements [m]
1	180	0,873	74,133	0,305

End of Report

Report for D-Settlement 20.1

Settlement Calculations
Developed by Deltares

Company: CRUX Engineering B.V.

Date of report: 22-1-2021

Time of report: 16:27:29

Report with version: 20.1.1.29740

Date of calculation: 22-1-2021

Time of calculation: 11:38:03

Calculated with version: 20.1.1.29740

File name: SET009 CPT10_voorbelasting+drains_gemiddelde_6maand_zomerpeil

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2 Echo of the Input

2.1 Layer Boundaries

Boundary number	Co-ordinates [m]				
11 - X -	-25,000	25,000			
11 - Y -	-0,850	-0,850			
10 - X -	-25,000	25,000			
10 - Y -	-1,700	-1,700			
9 - X -	-25,000	25,000			
9 - Y -	-3,000	-3,000			
8 - X -	-25,000	25,000			
8 - Y -	-3,400	-3,440			
7 - X -	-25,000	25,000			
7 - Y -	-4,000	-4,000			
6 - X -	-25,000	25,000			
6 - Y -	-5,000	-5,000			
5 - X -	-25,000	25,000			
5 - Y -	-6,500	-6,500			
4 - X -	-25,000	25,000			
4 - Y -	-8,500	-8,500			
3 - X -	-25,000	25,000			
3 - Y -	-9,200	-9,200			
2 - X -	-25,000	25,000			
2 - Y -	-9,500	-9,500			
1 - X -	-25,000	25,000			
1 - Y -	-10,700	-10,700			
0 - X -	-25,000	25,000			
0 - Y -	-11,400	-11,400			

2.2 PI-lines

PI-line number	Co-ordinates [m]				
1 - X -	-25,000	25,000			
1 - Y -	-1,600	-1,600			
2 - X -	-25,000	25,000			
2 - Y -	-0,050	-0,050			

2.3 General Data

Soil model:	NEN Bjerrum
Consolidation model:	Darcy
Strain model:	Linear
Groundwater level:	Initial determined by PI-line number 1
Unit weight of water:	9,81 [kN/m³]
Stress distribution	
- Soil:	Buisman
- Loads:	None
End of consolidation:	11130,00 [days]
No maintain profile	
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 :	0,02 [m]
Load column width	
- Non-Uniform Loads :	0,20 [m]
- Trapeziform Loads :	0,05 [m]

2.4 Soil Profiles

Layer number	Material name	PI-line top	PI-line bottom
11	Top klei	1	99
10	Veen 1	99	99
9	Veen (Houthoudend)	99	99
8	Klei humeus	99	99
7	Klei	99	99
6	Klei zandig	99	2
5	Tussenwand	2	2
4	Klei	2	2
3	Veen 2	2	2
2	Klei humeus	2	2
1	Klei zandig	2	2

2.5 Soil Properties

Layer number	Drained	Unit weight	
		Unsaturated [kN/m ³]	Saturated [kN/m ³]
11	Yes	15,00	15,00
10	No	10,60	10,60
9	No	11,20	11,20
8	No	15,00	15,00
7	No	17,00	17,00
6	No	18,00	18,00
5	Yes	16,00	18,00
4	No	17,00	17,00
3	No	12,00	12,00
2	No	15,00	15,00
1	No	18,00	18,00

Layer number	Storage type	Vert. consolid. coefficient Cv [m ² /s]	Ratio Ch/Cv [-]	Vertical permeability [m/s]	Ratio hor/vert permeability [-]	Permeability strain mod. [-]	Initial vertical permeability [m/s]
11	Vert. cons.	-	1,000	-	-	-	-
10	Vert. cons.	1,06E-07	1,500	-	-	-	-
9	Vert. cons.	3,87E-08	1,500	-	-	-	-
8	Vert. cons.	1,00E-08	1,000	-	-	-	-
7	Vert. cons.	1,00E-08	1,000	-	-	-	-
6	Vert. cons.	1,00E-08	1,000	-	-	-	-
5	Vert. cons.	-	1,000	-	-	-	-
4	Vert. cons.	1,00E-08	1,000	-	-	-	-
3	Vert. cons.	1,00E-07	1,500	-	-	-	-
2	Vert. cons.	1,00E-08	1,000	-	-	-	-
1	Vert. cons.	1,00E-08	1,000	-	-	-	-

Layer number	POP [kN/m ²]	OCR [-]	Equiv. age [days]
11	15,00	-	-
10	15,00	-	-
9	15,00	-	-
8	15,00	-	-
7	15,00	-	-
6	15,00	-	-
5	15,00	-	-
4	15,00	-	-
3	15,00	-	-
2	15,00	-	-
1	15,00	-	-

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) [-]
11	0,0175000	0,1127000	0,0049000	-	-	-
10	0,0996000	0,5140000	0,0211000	-	-	-
9	0,0564000	0,3660000	0,0165000	-	-	-
8	0,0383000	0,2300000	0,0115000	-	-	-
7	0,0219000	0,1533000	0,0061000	-	-	-
6	0,0184000	0,0920000	0,0037000	-	-	-
5	0,0001750	0,0011270	0,0000490	-	-	-
4	0,0219000	0,1533000	0,0061000	-	-	-
3	0,0613000	0,3067000	0,0153000	-	-	-
2	0,0383000	0,2300000	0,0115000	-	-	-
1	0,0184000	0,0920000	0,0037000	-	-	-

2.6 Non-Uniform Loads

Load number	Time [days]	Unit weight	
		Unsaturated [kN/m³]	Saturated [kN/m³]
1	0	16,00	18,00

Load number	Co-ordinates [m]					
1 - X -	-25,00	-25,00	25,00	25,00		
1 - Y -	-0,85	1,40	1,40	-0,85		

2.7 Verticals

Vertical number	X co-ordinates [m]				
1	0,000				

2.8 Vertical Drain

Drain type		Strip
Horizontal range "From"	[m]	-25,000
Horizontal range "To"	[m]	25,000
Bottom position	[m]	-5,500
Center to center distance	[m]	1,000
Width	[m]	0,100
Thickness	[m]	0,003
Grid		Triangular
Drainage schedule		Off
Start of drainage	[days]	0,000

3 Results per Vertical

3.1 Results for Vertical 1 (X = 0,00 m; Z = 0,00 m)

Depth [m]	Effective Stress [kPa]	Hydraulic head [m]	Loading [kPa]	Settlement [m]
-0,850	0,001	-0,850	0,000	0,369
-0,950	1,500	-0,950	0,000	0,364
-1,050	3,000	-1,050	0,000	0,360
-1,150	4,500	-1,150	0,000	0,355
-1,250	6,000	-1,250	0,000	0,351
-1,275	6,251	-1,275	-0,124	0,350
-1,350	6,640	-1,350	-0,860	0,348
-1,450	7,159	-1,450	-1,841	0,344
-1,550	7,678	-1,550	-2,822	0,341
-1,600	7,938	-1,600	-3,312	0,339
-1,650	8,042	-1,584	-3,312	0,338
-1,700	8,147	-1,568	-3,312	0,337
-1,700	8,147	-1,568	-3,312	0,337
-1,750	8,209	-1,571	-3,312	0,330
-1,850	8,321	-1,574	-3,312	0,318
-2,350	8,693	-1,572	-3,312	0,251
-3,000	8,484	-1,498	-3,312	0,155
-3,000	8,484	-1,498	-3,312	0,155
-3,210	8,719	-1,492	-3,312	0,131
-3,420	8,686	-1,459	-3,312	0,107
-3,420	8,686	-1,459	-3,312	0,107
-3,710	10,524	-1,493	-3,312	0,089
-4,000	11,953	-1,485	-3,312	0,073
-4,000	11,953	-1,485	-3,312	0,073
-4,500	15,173	-1,447	-3,312	0,059
-5,000	16,955	-1,262	-3,312	0,048
-5,000	16,955	-1,262	-3,312	0,048
-5,750	17,644	-0,706	-3,312	0,044
-6,500	17,347	-0,050	-3,312	0,036
-6,500	17,348	-0,050	-3,312	0,036
-7,500	25,537	-0,050	-3,312	0,036
-8,500	33,727	-0,050	-3,312	0,035
-8,500	33,728	-0,050	-3,312	0,035
-8,850	36,005	-0,026	-3,312	0,029
-9,200	38,326	-0,006	-3,312	0,027
-9,200	38,326	-0,006	-3,312	0,027
-9,350	38,651	-0,005	-3,312	0,025
-9,500	38,976	-0,005	-3,312	0,022
-9,500	38,976	-0,005	-3,312	0,022
-10,100	42,001	0,004	-3,312	0,014
-10,700	45,169	-0,001	-3,312	0,005
-10,700	45,170	-0,001	-3,312	0,005
-11,050	48,242	-0,022	-3,312	0,004
-11,400	51,378	-0,050	-3,312	0,000

4 Settlements

4.1 Settlements

Vertical number	X co-ordinate [m]	Z co-ordinate [m]	Surface level [m]	Settlement [m]
1	0,00	0,00	-0,85	0,369

4.2 Residual Times

Vertical number	Time [days]	Settlement [m]	Part of final settlement [%]	Residual settlements [m]
1	180	0,501	135,882	-0,132

End of Report