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5.1.1.d

Notitie

Funderingsadvies
Duivendrechtsekade 50
Amsterdam

23378

NT23378a3

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18 februari 2024

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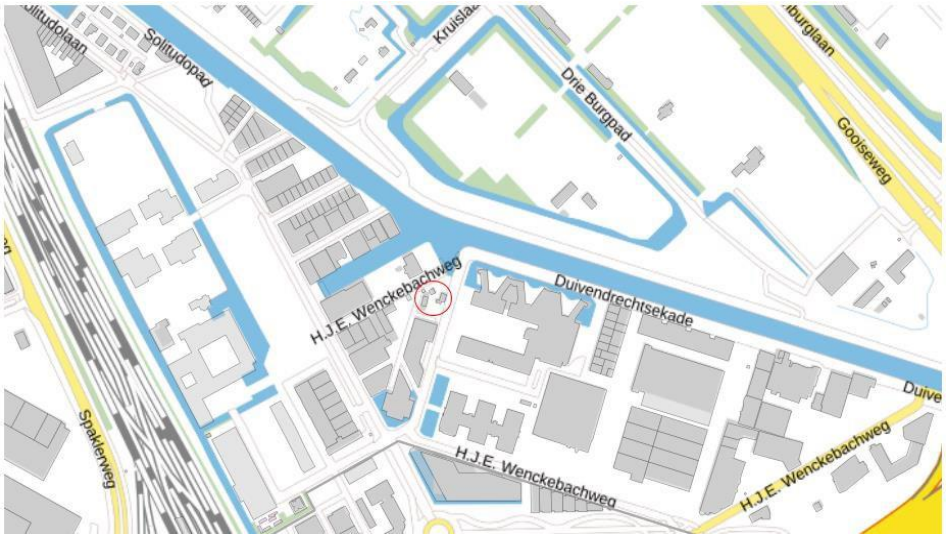
Aantal bijlagen: 4

NT-010

1 Inleiding

In opdracht van BLVG stelt CRUX Engineering BV een funderingsadvies op ten behoeve van de ontwikkeling van de kavel aan de Duivenrechtsekade 50 te Amsterdam. Deze notitie presenteert de uitgangspunten en resultaten van het funderingsadvies.

Figuur 1 illustreert de globale projectlocatie, aangeduid binnen een rode cirkel.



Figuur 1 Projectlocatie, bron: Bag Viewer

2 Uitgangspunten

2.1 Documenten

De volgende documenten zijn gehanteerd bij het opstellen van deze notitie:

[1] BAM Infraconsult BV; Geotechnisch bodemonderzoek Duivendrechtsekade 50 te Amsterdam; d.d. 10-11-2023;

[2] HFB Architectuur + HFB; ontwerptekeningen 2023 10 05 Duivenrechtsekade 50 - HFB A concept tekeningen; d.d. 10-11-2023;

[3] Van Rossum; e-mail *Duivendrechtsekade 50*; van Ewout Bruinsma; verzonden op 16 november 2023.

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

2.2 Programmatuur

De berekeningen van het paaldraagvermogen worden uitgevoerd met PileCore versie 0.19.00 van CEMS. Om tot een optimaal paalpuntniveau te komen zijn de resultaten van de berekeningen verwerkt middels de Grouper Tool waarin op basis van geautomatiseerde berekeningen een voorkeurs paalpuntniveau is bepaald.

De berekening van de zetting uit de diepe zandlaag wordt berekend met behulp van D-Settlement versie 21.2.

2.3 Uitgevoerd grondonderzoek en bodemopbouw

Het bepalen van de bodemopbouw vindt plaats op basis van het op locatie uitgevoerd grondonderzoek, referentie [1], bestaande uit 6 sonderingen. De globale bodemopbouw wordt weergegeven in Tabel 1. Het maaiveldniveau ligt in de huidige situatie op circa NAP -0,65 m.

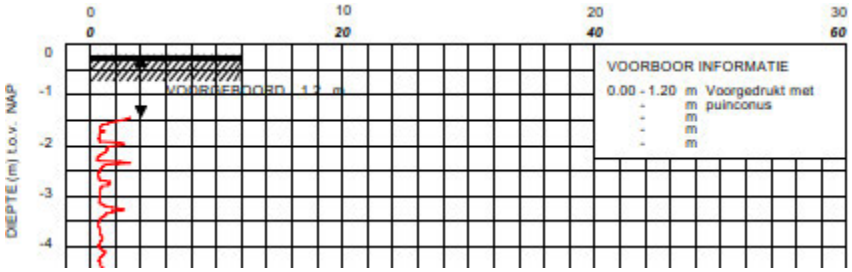
Tabel 1: Globale bodemopbouw

Grondlaag	Bovenkant laag [m NAP]
Zand, Schoon, Los	-0,7
Hollandveen	-4,5
Wadzand	-7,0
Hydrobiaklei	-8,4
Basisveen	-10,3
Eerste Zandlaag	-12,0
Allerød	-20,0
Tweede zandlaag	-24,0

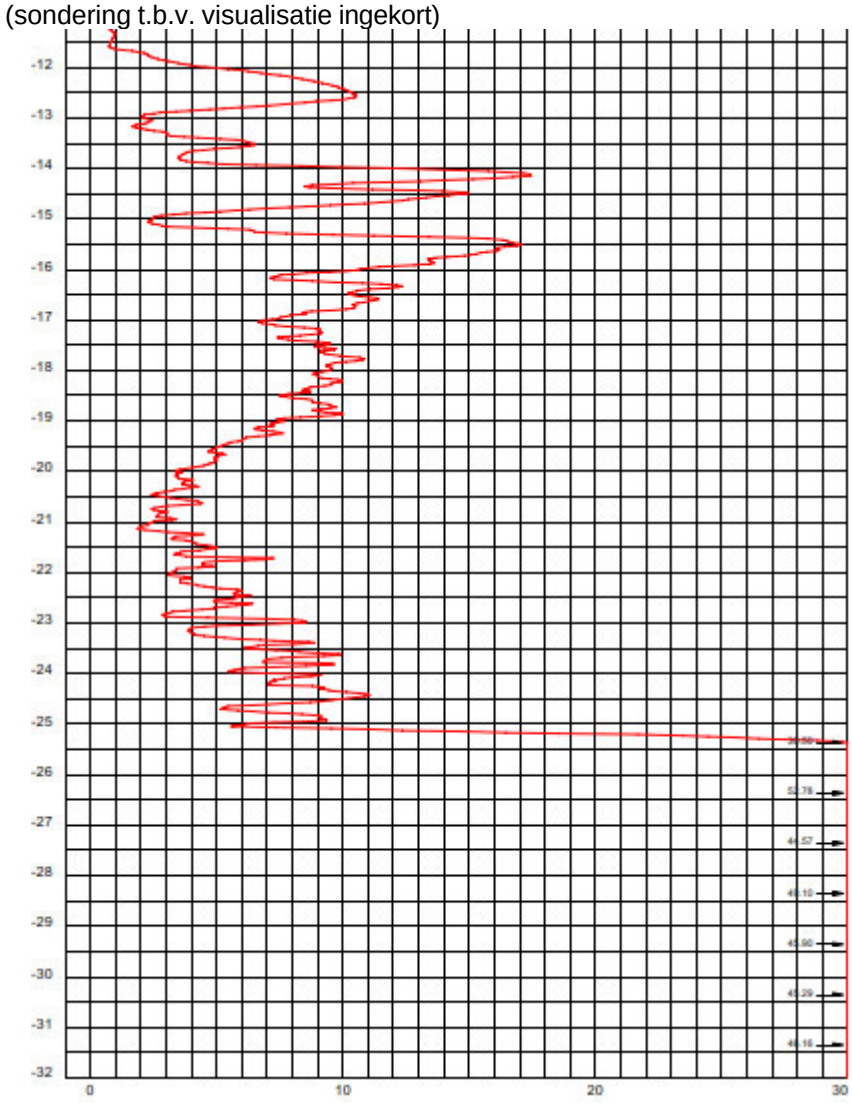
Opmerkingen bij tabel:

1 Grondprofiel is gebaseerd op sondering S03 uit referentie [1].

De pakking van het zand in de Eerste Zandlaag en het eerste deel van de Tweede Zandlaag is matig tot vast. Vanaf ongeveer NAP -25,5 m loopt de conusweerstand over een zeer kleine diepte op naar waarden van 35 MPa en hoger. Dit is een aandachtpunt voor de installeerbaarheid van de paalfundering. Het verloop van de conusweerstand is in de zandlagen is weergegeven in Figuur 2.



(sondering t.b.v. visualisatie ingekort)



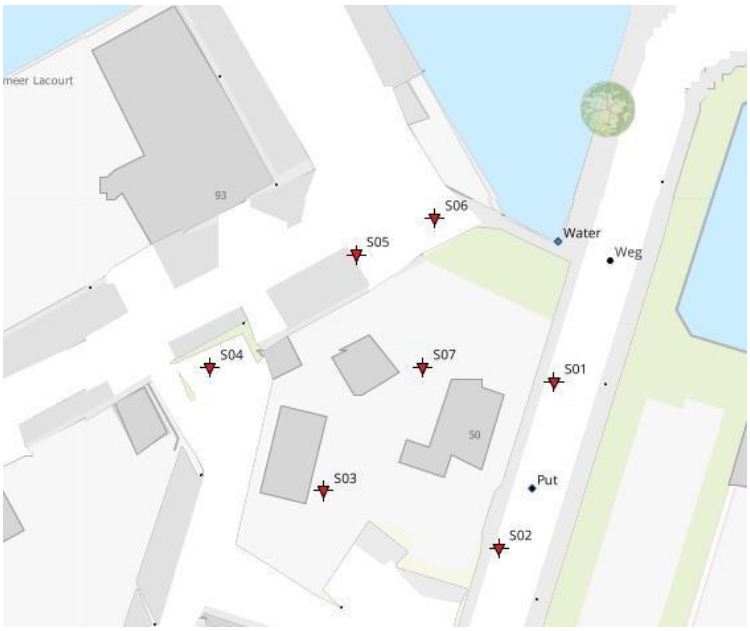
Figuur 2 Verloop conusweerstand in Eerste en Tweede Zandlaag

De grondparameterset ten behoeve van de S2 zettingsberekeningen is gegeven in Tabel 2. Deze is bepaald aan de hand van Tabel 2.b uit NEN9997- 1+C2:2017 en maatgevende sondering S03 en alleen voor relevante grondlagen.

De locatie van de sonderingen wordt weergegeven in Figuur 3. Het grondonderzoek is bijgevoegd in Bijlage 1.

Tabel 2 Parameterset t.b.v. s2 zetting

Grondsoort	γ_{dr}/ γ_{sat}	CR	RR	Cα	OCR
	[kN/m^3]	[-]	[-]	[-]	[-]
Zandlaag	18/20	0,0035	0,0009	0	1,3



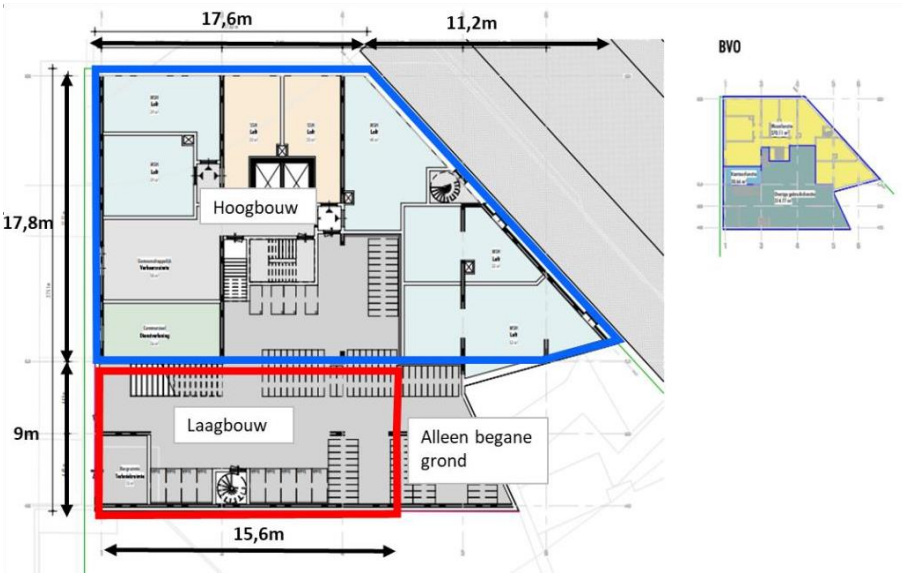
Figuur 3 Sondeerlocaties, bron: referentie [1]

2.4 Belastingen

De paalbelastingen bedragen 1.250 tot 3.000kN/paal. De gebouwbelastingen ten behoeve van de bepaling van de s2 zetting zijn in Tabel 3 gegeven. Alle belastingen zijn opgegeven door de constructeur, ref. [3]. Figuur 4 toont de contour van het gebouw op basis van de plattegrond van de begane grond met daarop de hoogbouw en de laagbouw aangegeven.

Tabel 3 Quasi permanente belasting t.b.v. bepaling s2 zetting, ref. [3]

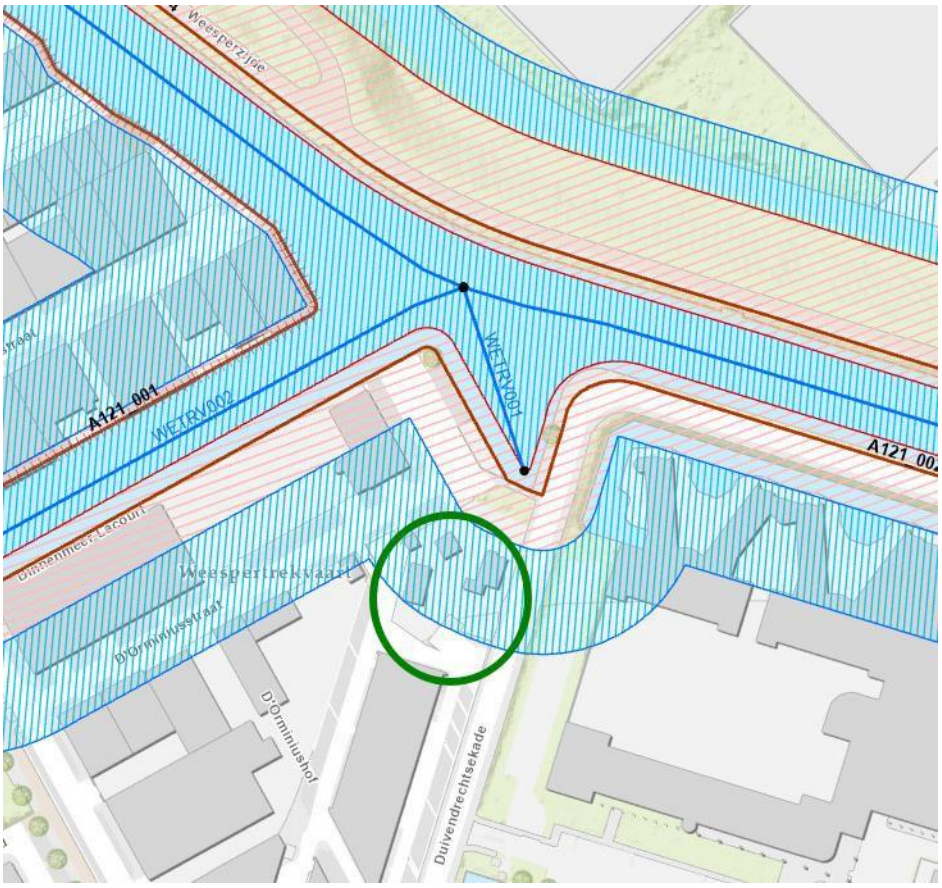
Bouwdeel, zie Figuur 4	Quasi permanente belasting
	[kN/m^2]
Hoogbouw	123
Laagbouw	36
Alleen begane grond	Verwaarloosbaar tbv bepaling s2 zetting



Figuur 4 Plattegrond begane grond

2.5 Overige randvoorwaarden

De projectlocatie ligt gedeeltelijk in de beschermingszone van de waterkering langs de Duivendrechtse vaart. De ligging van de projectlocatie t.o.v. de waterkering is weergegeven in Figuur 5. De beschermingszone van de waterkering is daarin in blauw aangegeven.



Figuur 5: Projectlocatie t.o.v. waterkering

Ten aanzien van het werken in de waterking zijn in de Keur 2019 van Waternet eisen gesteld. Ten aanzien van het maken van palen in de beschermzone zijn anders dan dat er geen lekweg op mag treden of kortsluiting tussen watervoerende paketten mag ontstaan geen eisen gesteld. Met deze eisen is rekening gehouden door in het funderingsadvies uit te gaan van grondverdingende palen. Deze worden vanaf maaiveld en daarmee vanaf boven de geldende stijghoogte aangebracht.

3 Funderingsadvies

3.1 Algemeen

Dit hoofdstuk beschrijft de uitgangspunten en resultaten van de berekeningen van het geotechnisch paaldraagvermogen en -stijfheden.

3.2 Paalsysteem

Om risico op schade aan de belendingen in de nabije omgeving door trillingen te voorkomen wordt gekozen voor in de grondgevormd en geschroefde trillingsvrije paalsysteem met prefab kern. Tabel 4 vat de paalklasse factoren van dit paalsysteem samen.

Tabel 4 Paalspecificaties in de grondgevormd en geschroefde trillingsvrije paalsysteem met prefab kern

Paalsysteem	Afmetingen	Rekenwaarde paalbelasting	Inbreng-methode	LZ-gedrag	Paalfactoren
In de grond gevormde schroefpalen met prefab met behulp van een boorbuis waarbij de punt na het trekken van de paal achterblijft	Ø410/500mm Ø460/560mm Ø540/680mm	**DRUK**: 1.250 – 3.000kN/paal	Geschroefd met groutinjectie en prefab kern	Type 1	α_p = 0,63 α_s = 0,009 s = 1,0 β = 1,0

Gezien de aanwezige bodemgesteldheden raden we aan om van combinatiepalen uit te gaan om kwaliteitsproblemen van de betonnen paalschacht te voorkomen. De noodzaak van al dan niet toepassen van een prefabbeton kern (zgn. combinatiepaal) dient afsluitend door de uitvoerende aannemer te worden beoordeeld. Toepassen van een prefabbeton kern heeft geen invloed op het uitwendige geotechnisch draagvermogen van de paal.

3.3 Uitgangspunten

Voor de berekening van het verticaal draagvermogen van de palen worden de volgende uitgangspunten gehanteerd:

- Berekening volgens NEN9997-1+C2:2017 op basis van de in Bijlage 1 opgenomen sonderingen.
- Het ontgravingsniveau wordt gelijk gesteld aan het maaiveldniveau.
- De positieve schachtwrijving wordt ontleend vanaf de Eerste zandlaag laag op circa NAP -12 m.
- Negatieve kleef wordt in rekening gebracht van paalkopniveau tot NAP -12 m.
- De stijfheid van de constructie van de bovenbouw bepaalt mede de waarde van de factoren ξ (ksi) die de onzekerheid in het grondonderzoek en de mogelijkheid van herverdeling van belasting over meerdere palen in rekening brengt. In het ontwerp van de fundering is voor de hele constructie uitgegaan van een 'niet-stijf' bouwwerk.
- De conform NEN 9997-1 aangehouden factoren ξ (ksi) en veiligheidsfactoren zijn:
  - ξ_3 = 1,27 en ξ_4 = 1,01
  - De factor ξ is mede afhankelijk van het aantal sonderingen dat als groep bij elkaar genomen kan worden. De draagkracht is op twee manieren berekend: het gemiddelde van de sonderingen waarbij de factor ξ_3 van toepassing is, en de slechtste van de groep sonderingen waarbij ξ_4 van toepassing is. De laagste draagkracht is maatgevend. Hierbij moet wel gelden dat de variatiecoëfficiënt ≤ 12% is anders is gerekend met een ξ factor voor een enkele sondering.
  - γ_b, γ_s = 1,2.

3.4 Veerstijfheid paalfundering

3.4.1 Vervormingen paalfundering (druk)

De paalkopzakking (s) van een paalfundering is opgebouwd uit :

$s = s_1 + s_2$, waarbij

s_1 = rekenwaarde van de zakking van de bovenzijde van de paal, opgebouwd uit de zakking van de paalpunt (s_b) en de elastische verkorting van de paal (s_{el}).

s_2 = de zakking door samendrukking van de onder het paalpuntniveau gelegen lagen.

3.4.2 Veerstijfheid statische belasting (s1)

De bepaling van de veerstijfheid bij statische belasting is op basis op het eigen gewicht van het bouwwerk en het permanent aanwezige deel van de veranderlijke belasting (Quasi permanente belasting). De paalkopverplaatsing bestaat uit een gedeelte paalverplaatsing ten gevolge van mobiliseren grondweerstand (s_b) en een gedeelte elastische verkorting (s_{el}) van de paal. Het last-zakkingsgedrag van de palen voor de bruikbaarheidsgrenstoestand (SLS) wordt bepaald met de rekenregels gegeven in NEN 9997-1.

De statische belasting is door CRUX gelijk gesteld aan 70% van het netto draagvermogen.

Aan de hand van de berekende puntverplaatsing onder invloed van de opgelegde karakteristieke paalbelasting is de puntveerstijfheid bepaald volgens vergelijking 1:

$$k_{v;punt}=F_{s;tot;k}/s_b \qquad (1)$$

Wanneer ook de elastische verkorting van de paal meegenomen wordt, dan wordt de veerstijfheid van de paalkop met vergelijking 2 bepaald:

$$k_{v;1}=F_{s;tot;k}/(s_b+s_{el}) \qquad (2)$$

Opgemerkt wordt dat de puntverplaatsing t.g.v. mobilisatie van de grondweerstand niet lineair verloopt. Bij toenemende belasting neemt de zakking meer dan evenredig toe en de veerstijfheid neemt dus af. Op basis van de definitieve paalbelastingen moet een controle van de gehanteerde veerstijfheid worden uitgevoerd.

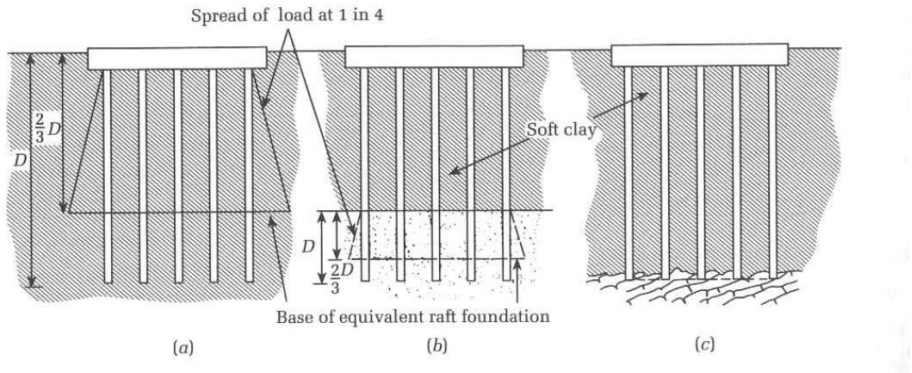
De aangehouden elasticiteitsmodulus van de paal voor de berekening van de elastische verkorting is E_{beton} = 20.000 N/mm^2. Door de constructeur dient de gehanteerde elasticiteitsmodulus gecontroleerd te worden.

De resultaten betreffen representatieve waarden. Voor een boven- en ondergrenswaarde dient de waarde gedeeld of vermenigvuldigd te worden met een factor √2.

3.4.3 Zetting uit diepe ondergrond (S2)

De bepaling van de zetting uit de diep ondergrond vindt op basis van de theorie van Tomlinson plaats. De zetting wordt berekend ten gevolge van de opgegeven belastingen op 4D beneden paalpuntniveau (NAP-28,25m).

De palen zijn niet afzonderlijk gemodelleerd maar als belasting op diepte waarbij het belastingoppervlak en de bijbehorende belasting (na spreiding) zijn bepaald met de methode volgens Tomlinson (b), zie ook Figuur 6.



Figuur 6 Overzicht belastingoverdracht bij paalgroepen, volgens "Foundation Design, Tomlinson"

De samendrukking van de diepe grondlaag wordt berekend tot een korrelspanningstoename van 20%. Dit komt op de maatgevende locatie overeen met NAP-35,5m. De zetting in de zandlaag van 4Deq beneden het paalpuntniveau (NAP-21,3m) tot NAP-35,5m wordt berekend met behulp van D-Settlement.

Bij de beoordeling van de berekende zettingen dient rekening gehouden te worden met onzekerheid op de zettingsparameters, belastingaannames, belasting verdeling en modelleringseffecten. Om deze effecten in rekening te brengen dient een bandbreedte van 30% op de berekende waarden aangehouden te worden.

3.4.4 Veerstijfheid kortdurende belasting

De veerstijfheid bij kortdurende belasting heeft betrekking op het windaandeel van de belasting op de stabiliteitsconstructie met uitzondering van piekbelastingen door zeer korte windvlagen.

Bij de bepaling van de veerstijfheid voor kortdurende belastingen worden de volgende uitgangspunten conform bovengenoemde richtlijnen gehanteerd:

- de stijfheid wordt afgeleid uit het last-zakkingsdiagram in BGT;
- de veerstijfheid wordt met een factor 1,5 vergroot i.v.m. het kortdurende karakter;
- vanwege het kortdurende effect hoeft s_2 niet meegenomen te worden in de bepaling van de veerstijfheid.

Bij de bepaling van deze veerstijfheid bij kortdurende belastingen dient er rekening mee gehouden te worden dat deze kortdurende belasting optreedt aanvullend op de statische belasting. Deze veerstijfheid geldt dus voor de aanvullende kortdurende belasting. De bepaling van de veerstijfheid is in vergelijking 3 weergegeven.

$$k_{v;kort}=1,5*F_{rep;stat}/s_{F;stat} \quad =1,5*k_{v;1} \qquad (3)$$

3.5 Resultaten draagvermogen en veerstijfheid (druk)

Tabel 5 geeft de resultaten van het geotechnisch draagvermogen en de stijfheid voor op druk belaste palen. Geadviseerd wordt om op een niveau van NAP-26m of NAP-26,5m te funderen en daarbij afhankelijk van de belasting voor de volgende paalafmetingen te kiezen:

- Ø410/500mmm voor een paalbelasting 1250 – 1700kN
- Ø460/560mm voor een paalbelasting 1700 - 2150kN
- Ø540/680mm voor een paalbelasting 2150 - 3000kN

Aanbevolen wordt om de haalbaarheid van de installatie inclusief trekken van de boorbuis door een funderingsaannemer te laten beoordelen voor paalpuntniveaus vanaf NAP-27m.

De uitvoer van de berekeningen van het paaldraagvermogen middels PileCore is opgenomen in Bijlage 2 t/m Bijlage 4.

Tabel 5 Rekenkundig draagvermogen/veerwaarden

PPN	Ø410/500mm			Ø460/560mm			Ø540/680mm		
[m NAP]	$R_{c;net;d}$ [kN]	$k_{v;punt}$ [MN/m]	$k_{v;1}$ [MN/m]	$R_{c;net;d}$ [kN]	$k_{v;punt}$ [MN/m]	$k_{v;1}$ [MN/m]	$R_{c;net;d}$ [kN]	$k_{v;punt}$ [MN/m]	$k_{v;1}$ [MN/m]
-25,0	898	253	118	1086	274	137	1631	313	173
-25,5	2592	391	134	3153	158	158	4440	474	207
-26,0	2726	416	135	3303	159	159	4621	502	209
-26,5	2796	439	135	3391	160	159	4739	527	211
-27,0	2866	460	136	3469	161	160	4843	553	213
-27,5	2935	482	136	3547	162	161	4938	579	215
-28,0	3005	504	136	3625	162	162	5032	606	217

3.6 Resultaten S2 zettingen

De berekende S2 zetting uit de diepe zandlaag beneden paalpuntniveau is maximaal 1 à 2cm en derhalve verwaarloosbaar gering.

4 Conclusies

In opdracht van BLVG heeft CRUX Engineering BV een funderingsadvies opgesteld ten behoeve van de ontwikkeling van de kavel aan de Duivenrechtsekade 50 te Amsterdam.

Het funderingsadvies omvat het geotechnische draagvermogen inclusief veerstijfheden voor in de grondgevormd en geschroefde trillingsvrije paalsysteem met prefab kern met de volgende afmetingen:

- Ø410/500mm
- Ø460/560mm
- Ø540/680mm

In het ontwerp van de fundering is voor de hele constructie uitgegaan van een 'niet-stijf' bouwwerk.

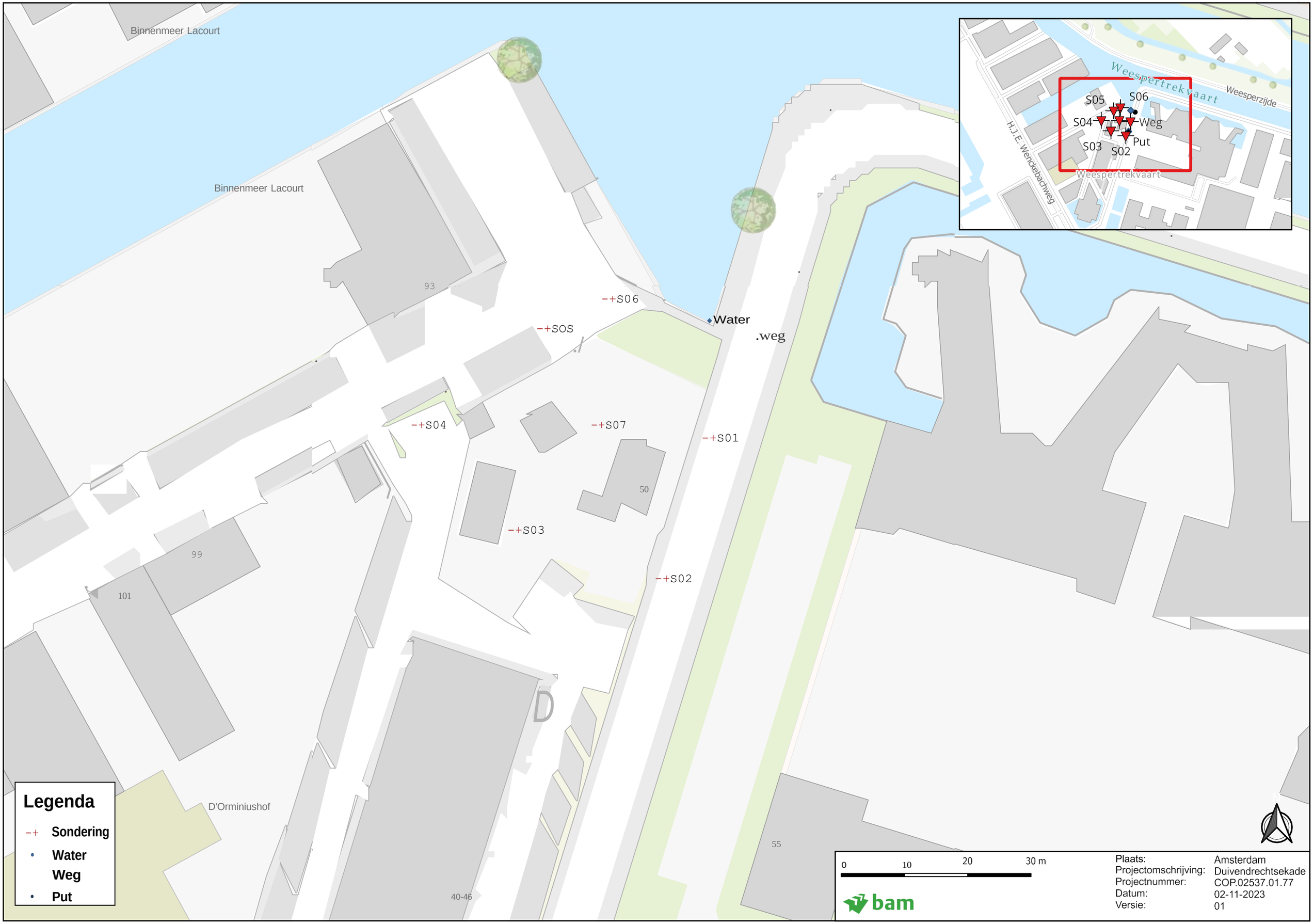
Het berekende paaldraagvermogen per paalafmeting met bijbehorende paalveerstijfheden zijn in Tabel 4 gegeven. De berekende S2 zetting uit de diepe zandlaag beneden paalpuntniveau is verwaarloosbaar klein.

Geadviseerd wordt om op een niveau van NAP-25,5m of NAP-26,0m te funderen en daarbij afhankelijk van de belasting voor de volgende paalafmetingen te kiezen:

- Ø410/500mmm voor een paalbelasting 1250 – 2700kN
- Ø460/560mm voor een paalbelasting 2700 – 3150kN

Vanwege de sterk oplopende conusweerstand (waarden > 35 MPa) vanaf NAP- 25,5m wordt aanbevolen om de haalbaarheid van de installatie inclusief trekken van de boorbuis door een funderingsaannemer te laten beoordelen voor paalpuntniveaus vanaf NAP-27m.

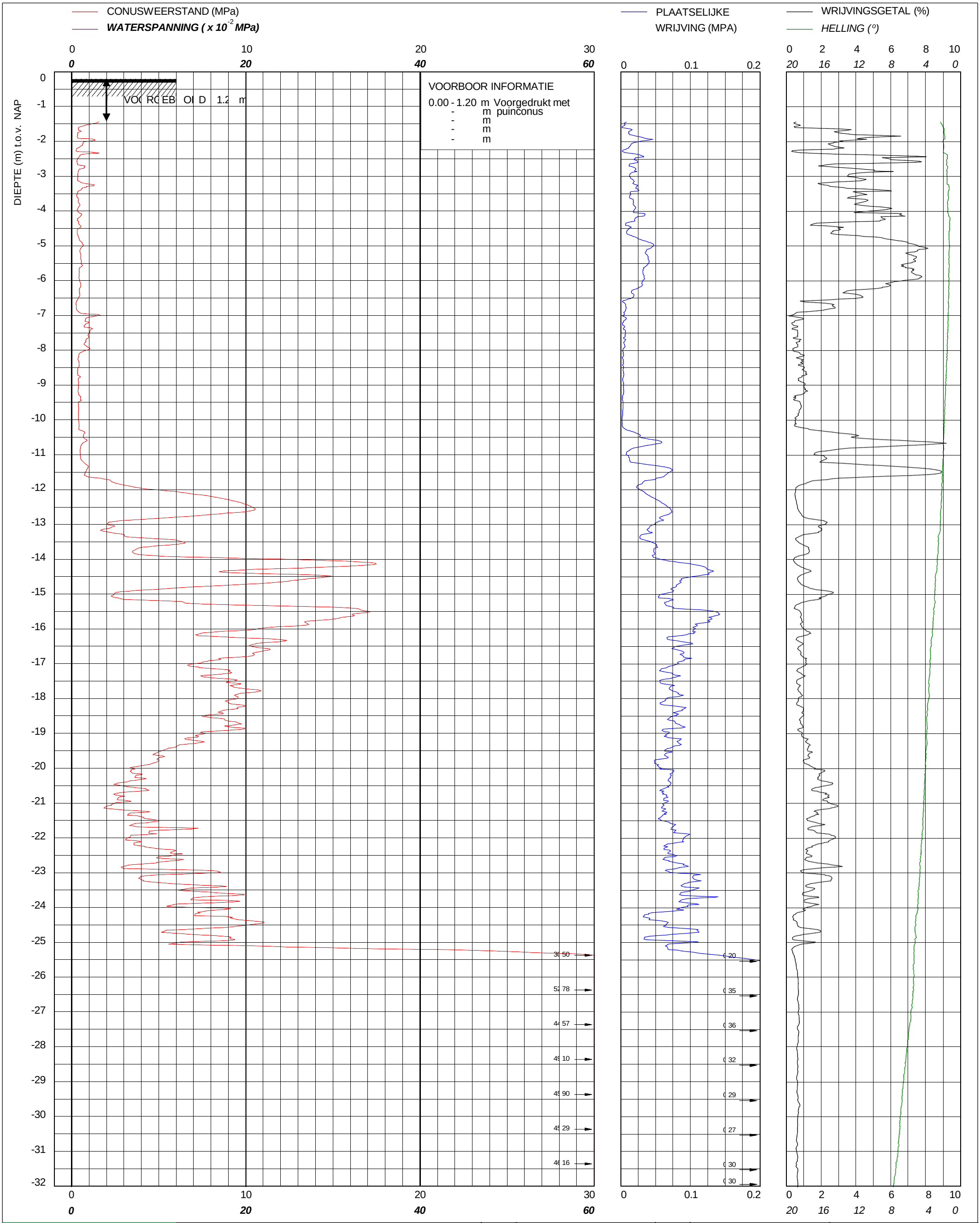
Bijlage 1 Grondonderzoek


Binnenmeer Lacourt
Binnenmeer Lacourt
93
99
101
D'Orminiushof
40-46
50
55
D
.weg
Water
−+S06
−+S05
−+S04
−+S07
−+S01
−+S03
−+S02
Weespertrekvaart
Weesperzijde
H.J.E. Wenckebachweg
S05
S06
S04
Weg
S03
S02
Put
Weespertrekvaart
Legenda
−+ Sondering
Water
Weg
Put
0
10
20
30 m
bam
Plaats: Amsterdam
Projectomschrijving: Duivendrechtsekade
Projectnummer: COP.02537.01.77
Datum: 02-11-2023
Versie: 01

Overzicht sonderingen t.b.v. project "Duivendrechtsekade 50 te Amsterdam" (COP.02537.01.77)

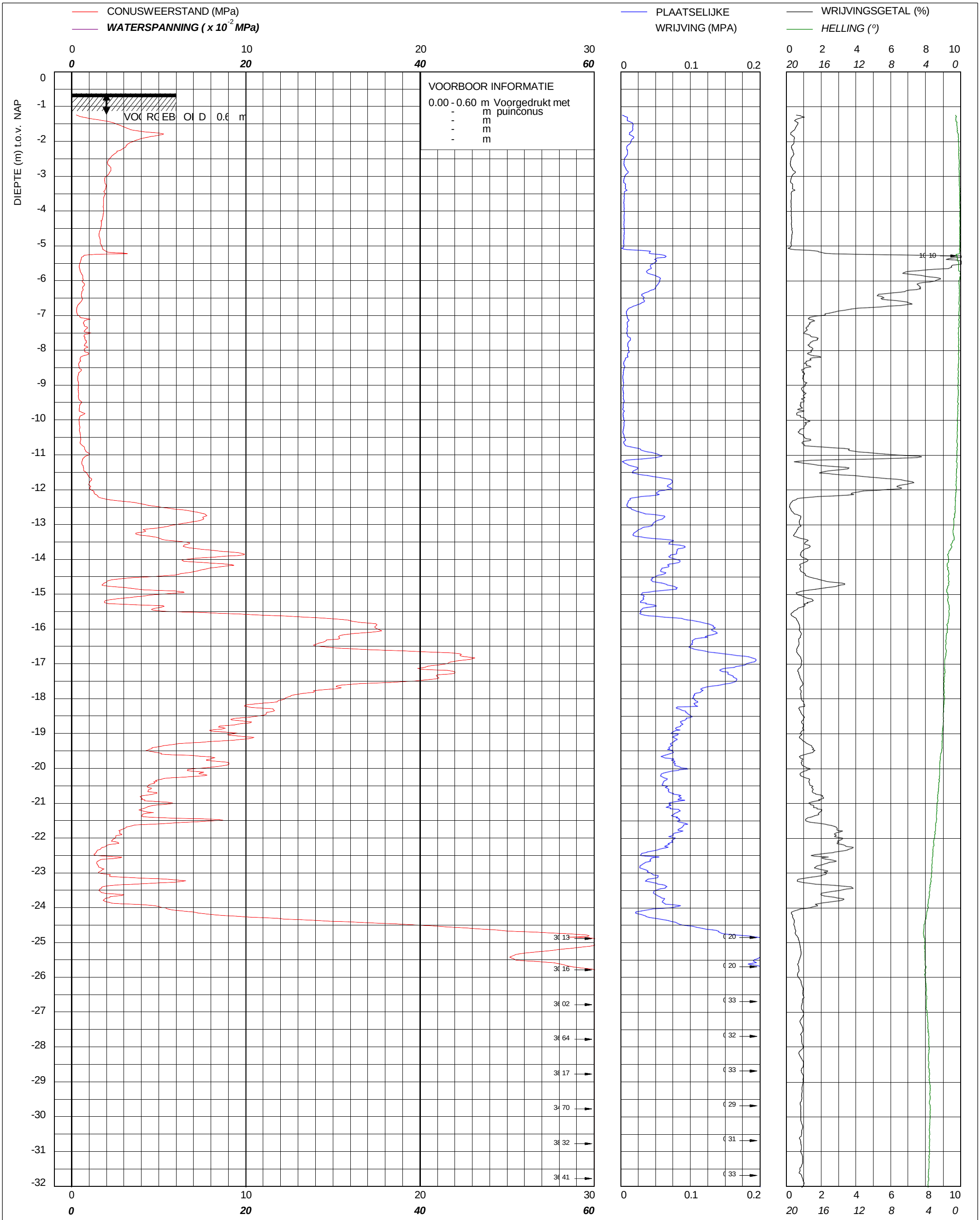
Datum: 3 november 2023

Object	Materieel	Activiteit	Datum uitvoering	Diepte m-/- mv	Maaiveldhoogte t.o.v. N.A.P.	X-coördinaat	Y-coördinaat	GWS t.o.v. maaiveld	Opmerking
Sonderingen									
S01	Sondeerwagen	Sondering TE1	2 november 2023	35.44	-0.22	123804.675	483463.557	n.w.g.	Sondering afgedicht met kleistaven
S02	Sondeerwagen	Sondering TE1	2 november 2023	34.96	-0.63	123797.299	483441.336	n.w.g.	Sondering afgedicht met kleistaven
S03	Sondeerwagen	Sondering TE1	2 november 2023	35.35	-0.25	123773.910	483449.015	n.w.g.	Sondering afgedicht met kleistaven
S04	Sondeerwagen	Sondering TE1	2 november 2023	34.91	-0.15	123758.723	483465.461	n.w.g.	Sondering afgedicht met kleistaven
S05	Sondeerwagen	Sondering TE1	2 november 2023	35.43	+0.20	123778.303	483480.525	n.w.g.	Sondering afgedicht met kleistaven
S06	Sondeerwagen	Sondering TE1	2 november 2023	35.45	+0.18	123788.745	483485.460	n.w.g.	Sondering afgedicht met kleistaven
S07	Sondeerwagen	Sondering TE1	2 november 2023	35.08	+0.12	123787.146	483465.483	n.w.g.	Sondering afgedicht met kleistaven
Overige informatie									
Water	-	-	1 november 2023	-	-0.36	123805.229	483482.503	-	-
Weg	-	-	1 november 2023	-	-.002	123812.163	483479.892	-	-
Put	-	-	1 november 2023	-	-0.41	123801.758	483449.507	-	-



Sondering TE1 volgens NEN-EN-22476, klasse 2 Conus: 171017, Ac: 1.500 mm2	5.1.1.d -0.22 m NAP	X 123805	Opdrachtnummer :
CRUX Engineering BV **Duivendrechtskade te Amsterdam**	Km	Y 483464	02537.01.77
	Uitvoeringsdatum	2-11-2023	Locatiecode :
	Printdatum	2-11-2023	S01

BAM Infraconsult bv
Toetsenbordweg 11
1033 MZ AMSTERDAM
Telefoon (020) 410 85 43
Email info.infra@bam.com



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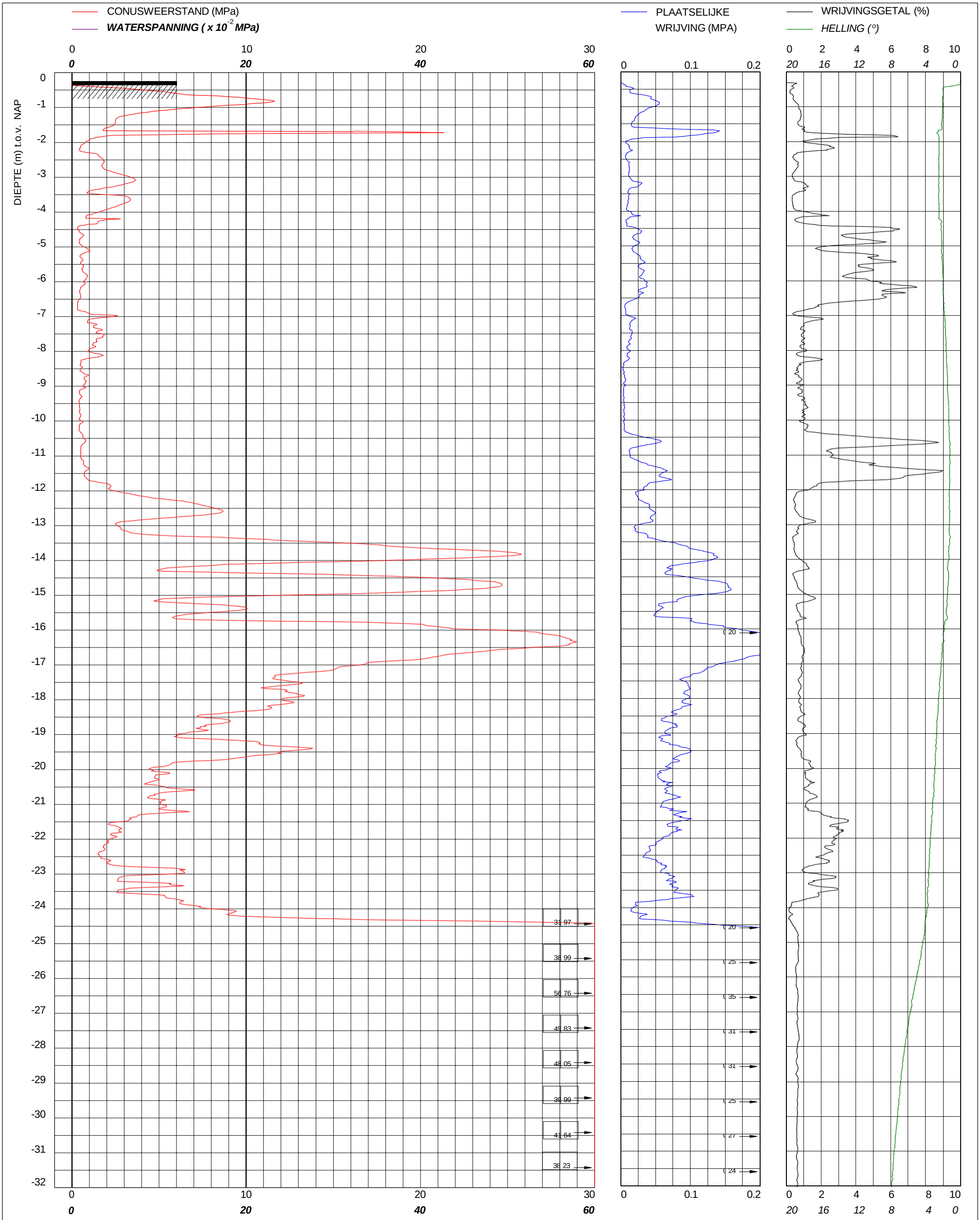
Sondering TE1 volgens NEN-EN-22476, klasse 2
Conus: 221202, Ac: 1.500 mm2

CRUX Engineering BV

Duivendrechtskade te Amsterdam

5.1.1.d	-0.63 m NAP	X	123797	Opdrachtnummer : 02537.01.77
Km		Y	483441	
Uitvoeringsdatum		2-11-2023		Locatiecode : S02
Printdatum		3-11-2023		



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Email info.infra@bam.com

Sondering TE1 volgens NEN-EN-22476, klasse 2
Conus: 171017, Ac: 1.500 mm2

CRUX Engineering BV

Duivendrechtskade te Amsterdam

5.1.1.d	-0.25 m NAP	X	123774	Opdrachtnummer :
Km		Y	483449	02537.01.77
Uitvoeringsdatum		2-11-2023		Locatiecode :
Printdatum		2-11-2023		S03

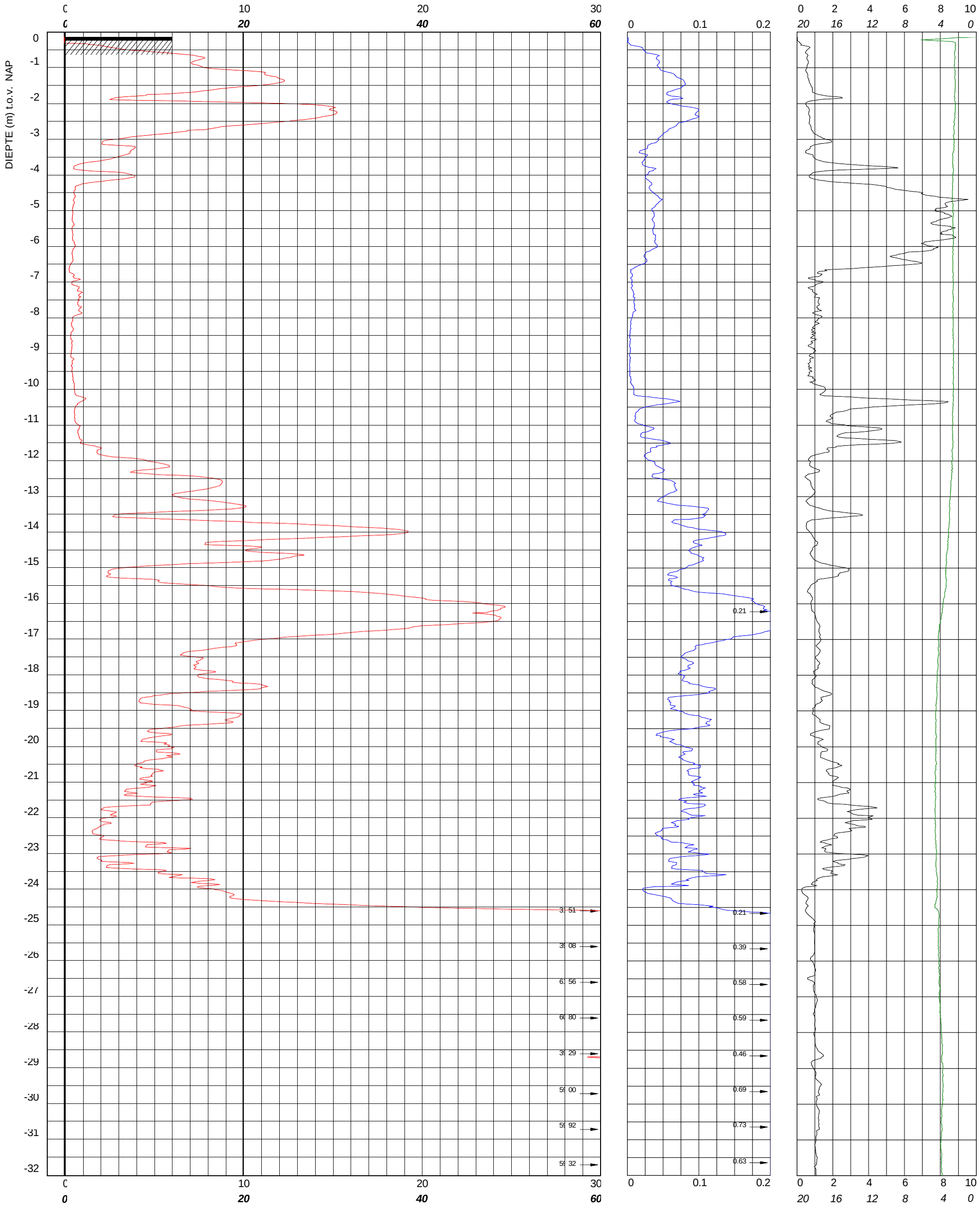
CONUSWEERSTAND (MPa)

WATERSPANNING (x 10^{-2} MPa)

PLAATSELIJKE WRIJVING (MPA)

WRIJVINGSGETAL (%)

HELLING (°)



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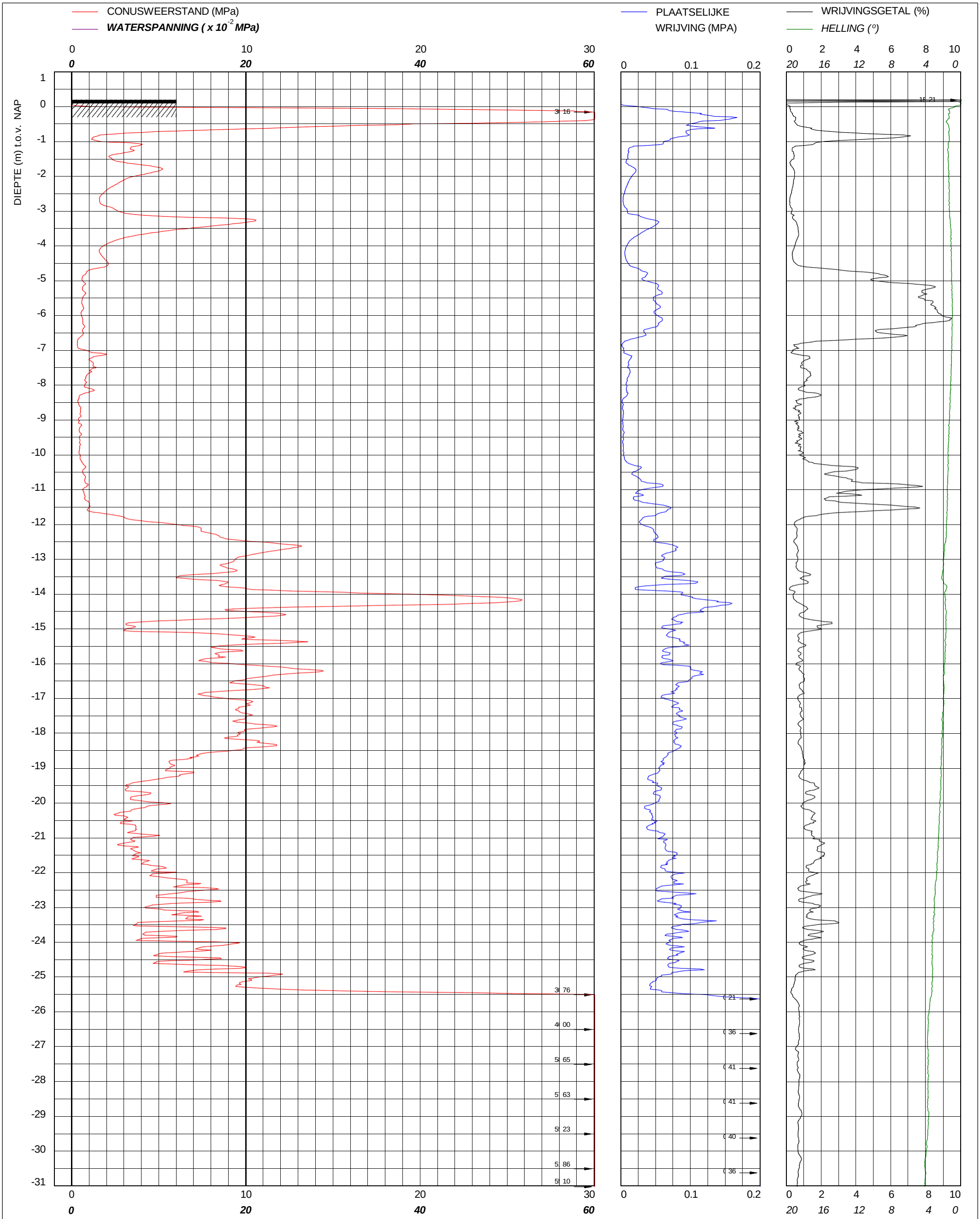
Sondering TE1 volgens NEN-EN-22476, klasse 2
Conus: 221202, Ac: 1.500 mm2

CRUX Engineering BV

Duivendrechtskade te Amsterdam

5.1.1.d	-0.15 m NAP	X	123759	Opdrachtnummer :
Km		Y	483465	02537.01.77
Uitvoeringsdatum		2-11-2023		Locatiecode :
Printdatum		3-11-2023		S04



Sondering TE1 volgens NEN-EN-22476, klasse 2 Conus: 171017, Ac: 1.500 mm2	5.1.1.d	0.2 m NAP	X	123778	Opdrachtnummer :
CRUX Engineering BV **Duivendrechtskade te Amsterdam**	Km		Y	483481	02537.01.77
	Uitvoeringsdatum		2-11-2023		Locatiecode :
	Printdatum		2-11-2023		S05

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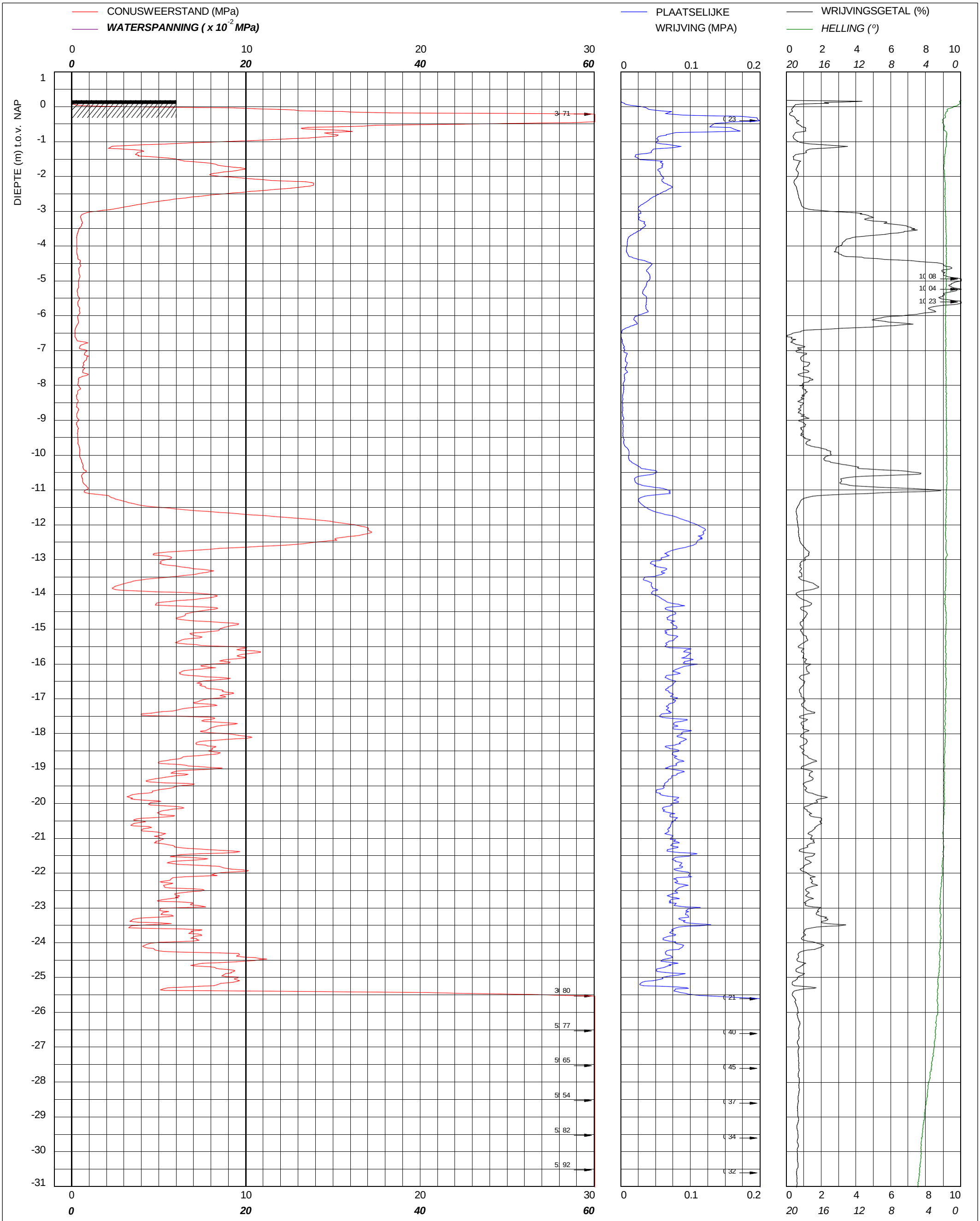

Sondering TE1 volgens NEN-EN-22476, klasse 2 Conus: 171017, Ac: 1.500 mm2	5.1.1.d 0.18 m NAP	X 123789	Opdrachtnummer :
CRUX Engineering BV **Duivendrechtskade te Amsterdam**	Km	Y 483485	02537.01.77
	Uitvoeringsdatum	2-11-2023	Locatiecode :
	Printdatum	2-11-2023	S06

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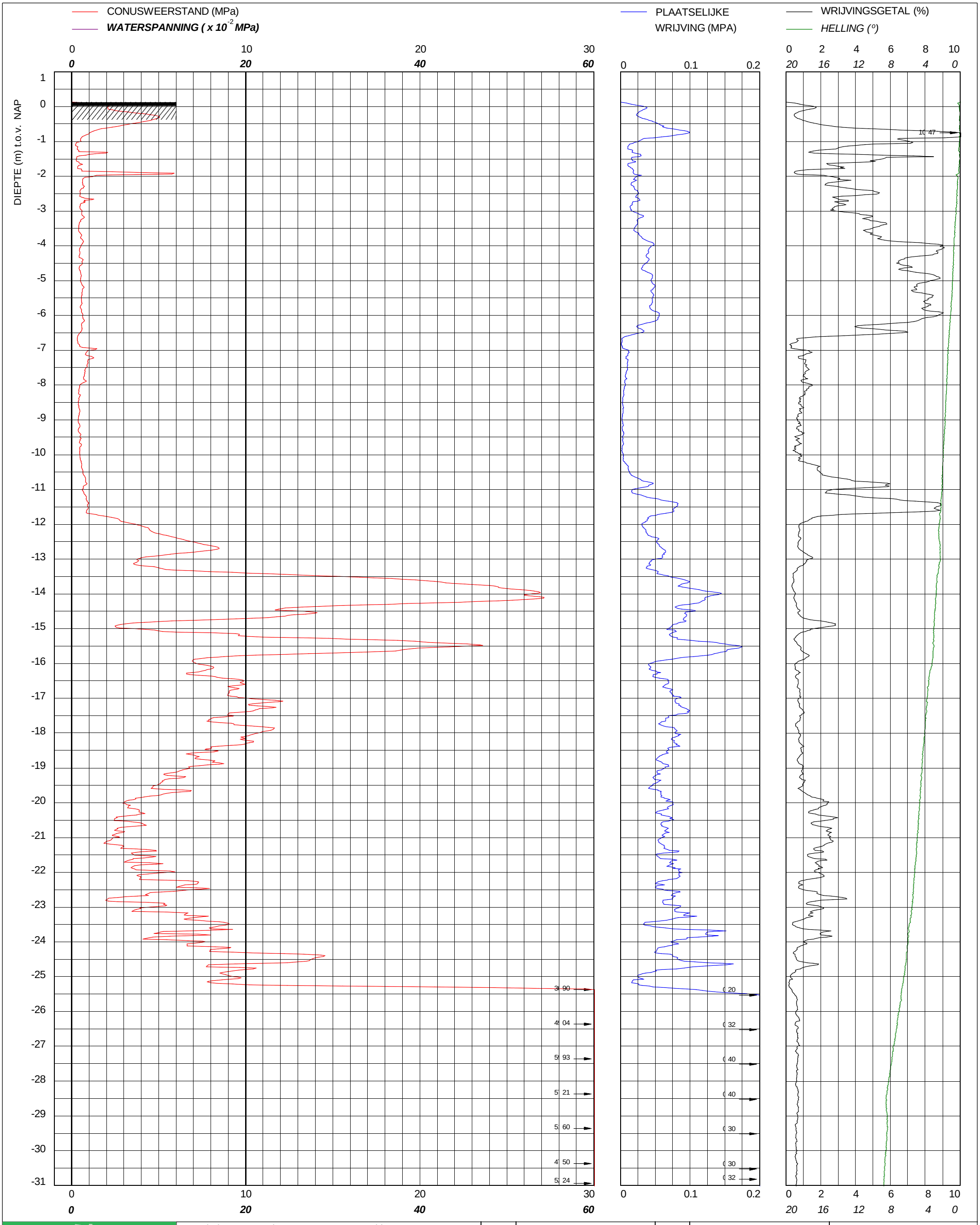

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Sondering TE1 volgens NEN-EN-22476, klasse 2
Conus: 171017, Ac: 1.500 mm2

CRUX Engineering BV

Duivendrechtskade te Amsterdam

5.1.1.d	0.12 m NAP	X	123787	Opdrachtnummer :	
Km		Y	483465	02537.01.77	
Uitvoeringsdatum		2-11-2023		Locatiecode :	
Printdatum		2-11-2023		S07	

Bijlage 2 Uitvoer PileCore Ø410/500mm

PileCore results			CEMS
Project:	Duivendrechtsekade 50	Author:	5.1.1.d
Number:	23378	Date:	16-02-24
PileCore Version:	2.9.4		

Pile properties:

Name:		Reference NEN9997-1
Type:	betonpaal	Table 7.c
Description:	In de grond gevormd met een gladde mantelbuis op een schroefpunt, waarbij het beton direct tegen de grond drukt	Table 7.c
Installation:	Geschroefd; bij het trekken van de mantelbuis blijft de schroefpunt in de grond achter	Table 7.c
Shaft size:	rond 500 mm	
Base size:	rond 500 mm	
Height pile base [mm]:	0.0	Figure 7.h
E GPa:	20.0	

Pile factors:		Reference NEN9997-1	Safety factors:		Reference NEN9997-1
a:	0.63	Table 7.c	γ :	1.0	7.3.2.2(7)(b)
a :	0.009	Table 7.c	γ :	1.2	A.3.3.2
a :	0.009	Table 7.d	γ :	1.2	A.3.3.2
β:	1.0	7.6.2.3. (10)(g)			
Pile factor s:	1.0	7.6.2.3. (10)(h)			
Settlement curve:	1	Table 7.c			
δ :	1.0 φ	7.3.2.2 (7)(d)			

Result Summary

CPT	Pile Tip Level	Bearing capacity		Spring stiffness		
		F	R	F	K	K
[-]	[m NAP]	[kN]	[kN]	[kN]	[kN/mm]	[kN/mm]
S07	-24.0	192	936	847	246	119
S07	-24.5	192	1013	901	262	120
S07	-25.0	192	1271	1081	282	120
S07	-25.5	192	2428	1891	356	121
S07	-26.0	192	2491	1935	375	121
S07	-26.5	192	2556	1980	396	122
S07	-27.0	192	2619	2025	415	122
S07	-27.5	192	2683	2070	435	123
S07	-28.0	192	2746	2114	455	123
S07	-28.5	192	2810	2159	476	123
S07	-29.0	192	2873	2203	497	123
S06	-24.0	242	797	799	227	115
S06	-24.5	242	862	845	239	116
S06	-25.0	242	898	870	253	118
S06	-25.5	242	2326	1870	336	118
S06	-26.0	242	2389	1914	354	119
S06	-26.5	242	2453	1959	374	119
S06	-27.0	242	2516	2003	394	120
S06	-27.5	242	2580	2047	414	121
S06	-28.0	242	2643	2092	434	121
S06	-28.5	242	2707	2136	454	121
S06	-29.0	242	2771	2182	474	121
S02	-24.0	209	888	831	243	121
S02	-24.5	209	1605	1333	283	120
S02	-25.0	209	1801	1470	311	122
S02	-25.5	209	2071	1659	343	124
S02	-26.0	209	2512	1968	385	125
S02	-26.5	209	2576	2012	406	126
S02	-27.0	209	2639	2057	426	126
S02	-27.5	209	2703	2101	446	126
S02	-28.0	209	2766	2146	466	126
S02	-28.5	209	2831	2191	487	126
S02	-29.0	209	2894	2235	508	126
S04	-24.0	249	939	907	247	121
S04	-24.5	249	1961	1622	309	121
S04	-25.0	249	2315	1870	347	123
S04	-25.5	249	2435	1954	370	124
S04	-26.0	249	2498	1998	389	125
S04	-26.5	249	2563	2043	410	125
S04	-27.0	249	2626	2088	430	126
S04	-27.5	249	2690	2132	450	126
S04	-28.0	249	2753	2176	470	126
S04	-28.5	249	2816	2221	491	126
S04	-29.0	249	2880	2265	512	126
S03	-24.0	262	1064	1007	272	126
S03	-24.5	262	2221	1816	343	126
S03	-25.0	262	2426	1960	372	127
S03	-25.5	262	2498	2010	392	128
S03	-26.0	262	2561	2055	412	128
S03	-26.5	262	2624	2099	432	129
S03	-27.0	262	2689	2144	452	129

S03	-27.5	262	2752	2188	473	129
S03	-28.0	262	2815	2233	493	129
S03	-28.5	262	2878	2277	514	129
S03	-29.0	262	2943	2322	536	129
S01	-24.0	186	879	801	239	118
S01	-24.5	186	922	831	253	120
S01	-25.0	186	1379	1152	276	118
S01	-25.5	186	2406	1870	348	120
S01	-26.0	186	2470	1915	367	121
S01	-26.5	186	2534	1960	387	122
S01	-27.0	186	2597	2004	408	122
S01	-27.5	186	2661	2048	427	123
S01	-28.0	186	2724	2093	447	123
S01	-28.5	186	2788	2138	468	123
S01	-29.0	186	2851	2182	489	123
S05	-24.0	326	759	858	236	121
S05	-24.5	326	832	909	247	122
S05	-25.0	326	1019	1040	264	122
S05	-25.5	326	2268	1914	345	122
S05	-26.0	326	2370	1985	366	122
S05	-26.5	326	2433	2030	385	123
S05	-27.0	326	2497	2074	405	123
S05	-27.5	326	2561	2119	426	124
S05	-28.0	326	2625	2164	446	124
S05	-28.5	326	2688	2208	466	124
S05	-29.0	326	2752	2252	486	124

1) Spring stiffness not taking elastic deformation of the pile into account
2) Spring stiffness including elastic deformation of the pile

PileCore CPT results for S07			CEMS
X coordinate* [m]:	123787.0	Excavation level [m NAP]:	N.A.
Y coordinate* [m]:	483465.0	ρ $[kN/m]$	0.0
Groundwater level [m NAP]:	-0.4	ξ [-]	1.39
Surface level [m NAP]:	0.12	qc-reduction:	N.A.

* The x and y coordinates of the CPT need to be in a Cartesian metric coordinate system.

Soil classification:

Soil code	Bottom	Thickness	γ	γ	
[-]	[m NAP]	[m]	$[kN/m]$	$[kN/m]$	[°]
K	0.1	0.02	18.0	18.0	27.5
K	-0.18	0.28	18.0	18.0	27.5
Z	-0.64	0.46	19.0	21.0	35.0
K	-0.74	0.1	18.0	18.0	27.5
K	-0.92	0.18	15.0	15.0	15.0
V	-1.14	0.22	12.0	12.0	15.0
K	-1.32	0.18	14.0	14.0	17.5
K	-1.42	0.1	18.0	18.0	22.5
K	-1.62	0.2	15.0	15.0	22.5
K	-1.88	0.26	14.0	14.0	17.5
K	-1.98	0.1	19.0	19.0	17.5
K	-2.4	0.42	15.0	15.0	22.5
K	-3.92	1.52	14.0	14.0	17.5
V	-4.36	0.44	12.0	12.0	15.0
K	-4.76	0.4	15.0	15.0	15.0
V	-6.26	1.5	12.0	12.0	15.0
K	-6.6	0.34	14.0	14.0	17.5
K	-10.28	3.68	18.0	18.0	27.5
K	-10.66	0.38	14.0	14.0	17.5
K	-10.96	0.3	17.0	17.0	17.5
K	-11.16	0.2	14.0	14.0	17.5
K	-11.36	0.2	17.0	17.0	17.5
V	-11.8	0.44	12.0	12.0	15.0
K	-12.0	0.2	18.0	18.0	27.5
Z	-14.83	2.84	19.0	21.0	35.0
Z	-15.01	0.18	18.0	20.0	27.0
K	-15.11	0.1	18.0	18.0	27.5
Z	-19.82	4.71	19.0	21.0	35.0
Z	-20.38	0.56	18.0	20.0	25.0
Z	-20.54	0.16	18.0	20.0	27.0
Z	-20.7	0.16	18.0	20.0	25.0
K	-21.32	0.62	18.0	18.0	27.5
Z	-22.21	0.9	18.0	20.0	27.0
Z	-22.69	0.48	19.0	21.0	35.0
Z	-22.99	0.3	18.0	20.0	27.0
Z	-23.84	0.86	19.0	21.0	35.0
Z	-23.94	0.1	18.0	20.0	27.0
Z	-34.89	10.94	19.0	21.0	35.0

Friction range:

Pile tip level	Negative friction range [m NAP]		Positive friction range [m NAP]	
[m NAP]	Top	Bottom	Top	Bottom
-24.0	0.0	-12.02	-12.0	-24.0
-24.5	0.0	-12.02	-12.0	-24.5
-25.0	0.0	-12.02	-12.0	-25.0
-25.5	0.0	-12.02	-12.0	-25.49
-26.0	0.0	-12.02	-12.0	-25.99
-26.5	0.0	-12.02	-12.0	-26.51
-27.0	0.0	-12.02	-12.0	-27.0
-27.5	0.0	-12.02	-12.0	-27.5
-28.0	0.0	-12.02	-12.0	-27.99
-28.5	0.0	-12.02	-12.0	-28.51
-29.0	0.0	-12.02	-12.0	-29.0

Negative skin friction

Soil code	Bottom	Thickness	Average circum.	σ'	δ	K	F
[-]	[m NAP]	[m]	[m]	[kN/m]	[°]	[-]	[kN]
K	-0.18	0.28	1.57	2.9	27.5	0.5	0
Z	-0.64	0.46	1.57	9.2	35.0	0.4	2
K	-0.74	0.1	1.57	12.6	27.5	0.5	1
K	-0.92	0.18	1.57	13.5	15.0	0.7	1
V	-1.14	0.22	1.57	14.3	15.0	0.7	1
K	-1.32	0.18	1.57	14.9	17.5	0.7	1
K	-1.42	0.1	1.57	15.6	22.5	0.6	1
K	-1.62	0.2	1.57	16.6	22.5	0.6	1
K	-1.88	0.26	1.57	17.7	17.5	0.7	2
K	-1.98	0.1	1.57	18.6	17.5	0.7	1
K	-2.4	0.42	1.57	20.2	22.5	0.6	3
K	-3.92	1.52	1.57	24.5	17.5	0.7	15
V	-4.36	0.44	1.57	28.2	15.0	0.7	5
K	-4.76	0.4	1.57	29.7	15.0	0.7	5
V	-6.26	1.5	1.57	32.4	15.0	0.7	19
K	-6.6	0.34	1.57	34.7	17.5	0.7	5
K	-10.28	3.68	1.57	50.4	27.5	0.5	82
K	-10.66	0.38	1.57	66.3	17.5	0.7	10
K	-10.96	0.3	1.57	68.2	17.5	0.7	8
K	-11.16	0.2	1.57	69.7	17.5	0.7	5
K	-11.36	0.2	1.57	70.8	17.5	0.7	6
V	-11.8	0.44	1.57	72.1	15.0	0.7	12
K	-12.0	0.2	1.57	73.3	27.5	0.5	6

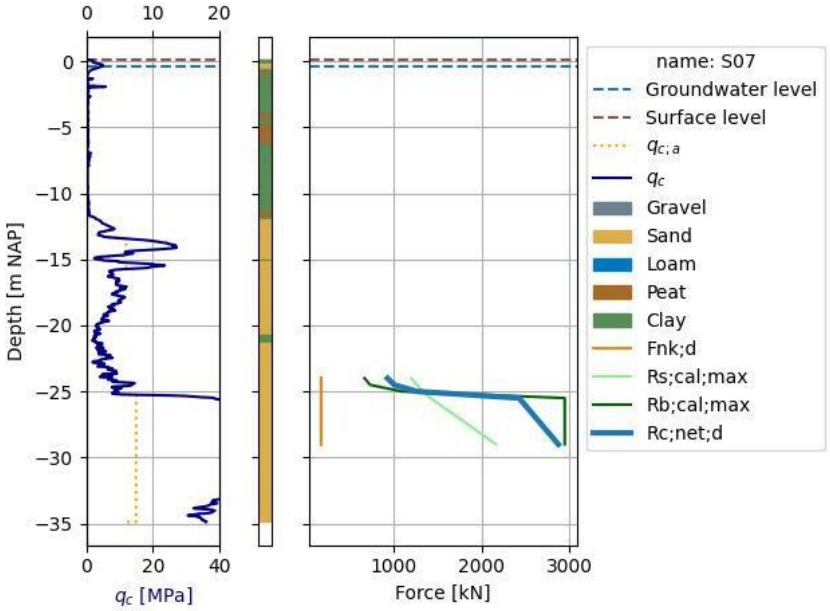
1) The results in this table are presented for the specific case when the pile-tip level is at -29.0 m NAP.
2) The average circumference of the pile per soil layer.
3) A minimum value of 0.25 for the product $K \_\_\_\_ \delta \_\_$ is applied in the calculations (7.3.2.2(7)(d)).

Pile bearing capacity (ULS):

Pile tip level	Base resistance					Shaft resistance		Pile resistance			
	q	q	q	q	R	q	R	R	R	F	R
[m NAP]	[MPa]	[MPa]	[MPa]	[MPa]	[kN]	[kPa]	[kN]	[kN]	[kN]	[kN]	[kN]
-24.0	8.5	8.2	2.6	3.4	676	63.87	1205	1353	1127	192	936
-24.5	9.6	7.8	3.3	3.8	738	64.77	1271	1445	1204	192	1013
-25.0	14.0	13.6	4.0	5.6	1099	65.58	1340	1755	1462	192	1271
-25.5	42.9	42.9	6.2	15.0	2945	67.2	1425	3144	2620	192	2428
-26.0	52.3	48.1	11.5	15.0	2945	69.61	1530	3219	2683	192	2491
-26.5	55.8	55.6	17.3	15.0	2945	71.94	1637	3297	2747	192	2556
-27.0	59.8	53.7	23.7	15.0	2945	74.03	1742	3372	2810	192	2619
-27.5	57.6	49.4	28.8	15.0	2945	75.99	1849	3449	2874	192	2683
-28.0	54.7	49.1	34.3	15.0	2945	77.82	1954	3525	2937	192	2746
-28.5	51.8	45.2	36.9	15.0	2945	79.61	2061	3602	3001	192	2810
-29.0	50.7	45.1	41.5	15.0	2945	81.23	2166	3677	3064	192	2873

4) The average maximum shaft friction in the positive friction zone.

CPT and bearing capacity



Pile settlement (SLS):

Pile tip level	SLS loads			Distributed capacity		Pile settlement/ spring stiffness				
	F	F	F	R	R	S	S	S	K	K
[m NAP]	[kN]	[kN]	[kN]	[kN]	[kN]	[mm]	[mm]	[mm]	[kN/mm]	[kN/mm]
-24.0	655	192	847	486	867	3.7	3.4	7.1	246	119
-24.5	709	192	901	531	914	4.1	3.4	7.5	262	120
-25.0	889	192	1081	791	964	5.2	3.8	9.0	282	120
-25.5	1700	192	1891	2119	1025	10.4	5.3	15.7	356	121
-26.0	1744	192	1935	2119	1101	10.8	5.2	16.0	375	121
-26.5	1789	192	1980	2119	1178	11.2	5.0	16.2	396	122
-27.0	1833	192	2025	2119	1253	11.7	4.9	16.5	415	122
-27.5	1878	192	2070	2119	1330	12.1	4.8	16.9	435	123
-28.0	1922	192	2114	2119	1406	12.6	4.6	17.2	455	123
-28.5	1967	192	2159	2119	1483	13.0	4.5	17.6	476	123

-29.0	2011	192	2203	2119	1558	13.5	4.4	17.9	497	123

PileCore CPT results for S06			CEMS
X coordinate* [m]:	123789.0	Excavation level [m NAP]:	N.A.
Y coordinate* [m]:	483485.0	ρ $[kN/m]$	0.0
Groundwater level [m NAP]:	-0.4	ξ [-]	1.39
Surface level [m NAP]:	0.18	qc-reduction:	N.A.

* The x and y coordinates of the CPT need to be in a Cartesian metric coordinate system.

Soil classification:

Soil code	Bottom	Thickness	γ	γ	
[-]	[m NAP]	[m]	$[kN/m]$	$[kN/m]$	[°]
V	0.16	0.02	10.0	10.0	15.0
V	0.06	0.1	10.0	10.0	15.0
V	-0.04	0.1	12.0	12.0	15.0
Z	-0.22	0.18	18.0	20.0	27.0
Z	-1.22	1.0	19.0	21.0	35.0
Z	-1.46	0.24	18.0	20.0	27.0
Z	-3.02	1.56	19.0	21.0	35.0
Z	-3.12	0.1	18.0	20.0	27.0
K	-4.46	1.34	14.0	14.0	17.5
V	-5.94	1.48	12.0	12.0	15.0
K	-6.3	0.36	15.0	15.0	15.0
K	-6.4	0.1	14.0	14.0	17.5
K	-6.86	0.46	18.0	18.0	27.5
K	-9.78	2.92	15.0	15.0	22.5
K	-10.89	1.12	14.0	14.0	17.5
K	-11.0	0.1	17.0	17.0	17.5
K	-11.12	0.12	15.0	15.0	15.0
V	-11.21	0.1	12.0	12.0	15.0
Z	-11.42	0.2	18.0	20.0	27.0
Z	-19.89	8.48	19.0	21.0	35.0
Z	-20.05	0.16	18.0	20.0	27.0
Z	-20.39	0.34	19.0	21.0	35.0
Z	-20.79	0.4	18.0	20.0	27.0
Z	-23.27	2.48	19.0	21.0	35.0
Z	-23.59	0.32	18.0	20.0	27.0
Z	-35.19	11.6	19.0	21.0	35.0

Friction range:

Pile tip level	Negative friction range [m NAP]		Positive friction range [m NAP]	
[m NAP]	Top	Bottom	Top	Bottom
-24.0	0.0	-12.01	-11.99	-24.01
-24.5	0.0	-12.01	-11.99	-24.51
-25.0	0.0	-12.01	-11.99	-25.01
-25.5	0.0	-12.01	-11.99	-25.51
-26.0	0.0	-12.01	-11.99	-26.0
-26.5	0.0	-12.01	-11.99	-26.5
-27.0	0.0	-12.01	-11.99	-27.0
-27.5	0.0	-12.01	-11.99	-27.5
-28.0	0.0	-12.01	-11.99	-28.0
-28.5	0.0	-12.01	-11.99	-28.5
-29.0	0.0	-12.01	-11.99	-29.0

Negative skin friction

Soil code	Bottom	Thickness	Average circum.	σ'	δ	K	F
[-]	[m NAP]	[m]	[m]	[kN/m]	[°]	[-]	[kN]
V	-0.04	0.1	1.57	1.7	15.0	0.7	0
Z	-0.22	0.18	1.57	3.8	27.0	0.5	0
Z	-1.22	1.0	1.57	12.4	35.0	0.4	6
Z	-1.46	0.24	1.57	19.4	27.0	0.5	2
Z	-3.02	1.56	1.57	29.3	35.0	0.4	21
Z	-3.12	0.1	1.57	38.5	27.0	0.5	2
K	-4.46	1.34	1.57	41.9	17.5	0.7	22
V	-5.94	1.48	1.57	46.3	15.0	0.7	27
K	-6.3	0.36	1.57	48.9	15.0	0.7	7
K	-6.4	0.1	1.57	50.0	17.5	0.7	2
K	-6.86	0.46	1.57	52.1	27.5	0.5	11
K	-9.78	2.92	1.57	61.6	22.5	0.6	72
K	-10.89	1.12	1.57	71.5	17.5	0.7	31
K	-11.0	0.1	1.57	74.2	17.5	0.7	3
K	-11.12	0.12	1.57	74.9	15.0	0.7	4
V	-11.21	0.1	1.57	75.3	15.0	0.7	3
Z	-11.42	0.2	1.57	76.4	27.0	0.5	7
Z	-19.89	8.48	1.57	124.8	35.0	0.4	22

1) The results in this table are presented for the specific case when the pile-tip level is at -29.0 m NAP.
2) The average circumference of the pile per soil layer.
3) A minimum value of 0.25 for the product $K \_\_\_\_ \delta \_\_$ is applied in the calculations (7.3.2.2(7)(d)).

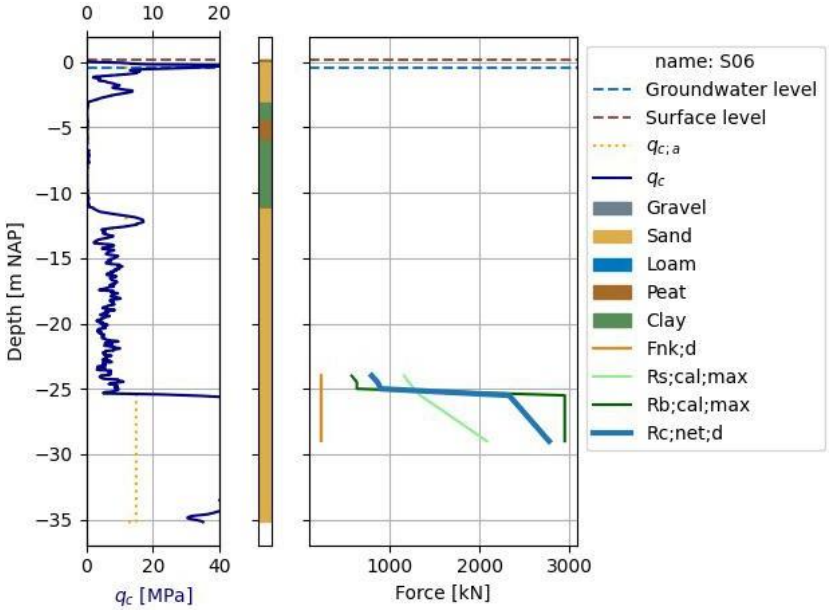
Pile bearing capacity (ULS):

Pile tip level	Base resistance					Shaft resistance		Pile resistance			
	q	q	q	q	R	q	R	R	R	F	R
[m NAP]	[MPa]	[MPa]	[MPa]	[MPa]	[kN]	[kPa]	[kN]	[kN]	[kN]	[kN]	[kN]
-24.0	5.9	5.9	3.4	2.9	574	61.43	1158	1246	1038	242	797
-24.5	8.2	5.1	3.6	3.2	632	61.65	1209	1324	1104	242	862
-25.0	7.8	5.1	3.8	3.2	631	62.23	1270	1368	1140	242	898
-25.5	43.7	43.6	4.7	15.0	2945	63.2	1337	3081	2568	242	2326
-26.0	56.6	52.6	10.1	15.0	2945	65.76	1443	3157	2631	242	2389

-26.5	56.1	55.8	16.2	15.0	2945	68.14	1549	3233	2695	242	2453
-27.0	57.9	54.2	22.5	15.0	2945	70.36	1655	3310	2758	242	2516
-27.5	56.5	52.5	28.4	15.0	2945	72.44	1761	3386	2821	242	2580
-28.0	54.0	49.1	32.6	15.0	2945	74.39	1867	3462	2885	242	2643
-28.5	53.0	49.2	38.1	15.0	2945	76.22	1973	3538	2948	242	2707
-29.0	52.2	49.3	43.6	15.0	2945	77.95	2080	3616	3013	242	2771

4) The average maximum shaft friction in the positive friction zone.

CPT and bearing capacity



Pile settlement (SLS):

Pile tip level	SLS loads			Distributed capacity		Pile settlement/ spring stiffness				
	F	F	F	R	R	S	S	S	K	K
[m NAP]	[kN]	[kN]	[kN]	[kN]	[kN]	[mm]	[mm]	[mm]	[kN/mm]	[kN/mm]
-24.0	558	242	799	413	833	3.4	3.5	6.9	227	115
-24.5	604	242	845	455	870	3.7	3.5	7.3	239	116
-25.0	629	242	870	454	913	3.9	3.4	7.4	253	118
-25.5	1628	242	1870	2119	962	10.3	5.6	15.8	336	118
-26.0	1673	242	1914	2119	1038	10.7	5.4	16.1	354	119
-26.5	1717	242	1959	2119	1115	11.2	5.2	16.4	374	119
-27.0	1762	242	2003	2119	1191	11.6	5.1	16.7	394	120
-27.5	1806	242	2047	2119	1267	12.0	4.9	17.0	414	121
-28.0	1850	242	2092	2119	1343	12.5	4.8	17.3	434	121
-28.5	1895	242	2136	2119	1419	13.0	4.7	17.7	454	121
-29.0	1940	242	2182	2119	1497	13.4	4.6	18.0	474	121

PileCore CPT results for S02			CEMS
X coordinate* [m]:	123797.0	Excavation level [m NAP]:	N.A.
Y coordinate* [m]:	483441.0	ρ $[kN/m]$	0.0
Groundwater level [m NAP]:	-0.4	ξ [-]	1.39
Surface level [m NAP]:	-0.63	qc-reduction:	N.A.

* The x and y coordinates of the CPT need to be in a Cartesian metric coordinate system.

Soil classification:

Soil code	Bottom	Thickness	γ	γ	
[-]	[m NAP]	[m]	$[kN/m]$	$[kN/m]$	[°]
K	-1.25	0.62	15.0	15.0	22.5
K	-1.41	0.16	15.0	15.0	22.5
Z	-1.71	0.3	18.0	20.0	27.0
Z	-5.13	3.42	19.0	21.0	35.0
Z	-5.27	0.14	18.0	20.0	27.0
V	-6.27	1.0	12.0	12.0	15.0
K	-7.01	0.74	14.0	14.0	17.5
K	-10.79	3.78	15.0	15.0	22.5
K	-11.13	0.34	17.0	17.0	17.5
K	-11.31	0.18	15.0	15.0	22.5
K	-11.59	0.28	14.0	14.0	17.5
K	-11.69	0.1	17.0	17.0	17.5
K	-12.19	0.5	15.0	15.0	15.0
K	-12.33	0.14	18.0	18.0	22.5
Z	-12.47	0.14	18.0	20.0	27.0
Z	-14.65	2.18	19.0	21.0	35.0
K	-14.79	0.14	18.0	18.0	27.5
K	-14.89	0.1	20.0	20.0	22.5
Z	-15.01	0.12	18.0	20.0	25.0
Z	-15.33	0.32	19.0	21.0	35.0
Z	-15.53	0.2	18.0	20.0	27.0
Z	-21.64	6.12	19.0	21.0	35.0
K	-22.18	0.54	18.0	18.0	27.5
K	-23.14	0.96	18.0	18.0	22.5
Z	-23.32	0.18	18.0	20.0	27.0
K	-24.0	0.68	20.0	20.0	22.5
Z	-24.12	0.12	18.0	20.0	27.0
Z	-35.51	11.39	19.0	21.0	35.0

Friction range:

Pile tip level	Negative friction range [m NAP]		Positive friction range [m NAP]	
[m NAP]	Top	Bottom	Top	Bottom
-24.0	-0.63	-12.01	-11.99	-24.0
-24.5	-0.63	-12.01	-11.99	-24.5
-25.0	-0.63	-12.01	-11.99	-25.0
-25.5	-0.63	-12.01	-11.99	-25.5
-26.0	-0.63	-12.01	-11.99	-25.99
-26.5	-0.63	-12.01	-11.99	-26.49
-27.0	-0.63	-12.01	-11.99	-26.99
-27.5	-0.63	-12.01	-11.99	-27.49
-28.0	-0.63	-12.01	-11.99	-27.99
-28.5	-0.63	-12.01	-11.99	-28.51
-29.0	-0.63	-12.01	-11.99	-29.01

Negative skin friction

Soil code	Bottom	Thickness	Average circum.	σ'	δ	K	F
[-]	[m NAP]	[m]	[m]	[kN/m]	[°]	[-]	[kN]
K	-1.25	0.62	1.57	1.6	22.5	0.6	0
K	-1.41	0.16	1.57	3.6	22.5	0.6	0
Z	-1.71	0.3	1.57	5.5	27.0	0.5	1
Z	-5.13	3.42	1.57	26.2	35.0	0.4	42
Z	-5.27	0.14	1.57	46.0	27.0	0.5	3
V	-6.27	1.0	1.57	47.9	15.0	0.7	19
K	-7.01	0.74	1.57	50.5	17.5	0.7	15
K	-10.79	3.78	1.57	61.9	22.5	0.6	94
K	-11.13	0.34	1.57	72.9	17.5	0.7	10
K	-11.31	0.18	1.57	74.6	22.5	0.6	5
K	-11.59	0.28	1.57	75.6	17.5	0.7	8
K	-11.69	0.1	1.57	76.6	17.5	0.7	3
K	-12.19	0.5	1.57	78.2	15.0	0.7	9

1) The results in this table are presented for the specific case when the pile-tip level is at -29.0 m NAP.
2) The average circumference of the pile per soil layer.
3) A minimum value of 0.25 for the product K δ is applied in the calculations (7.3.2.2(7)(d)).

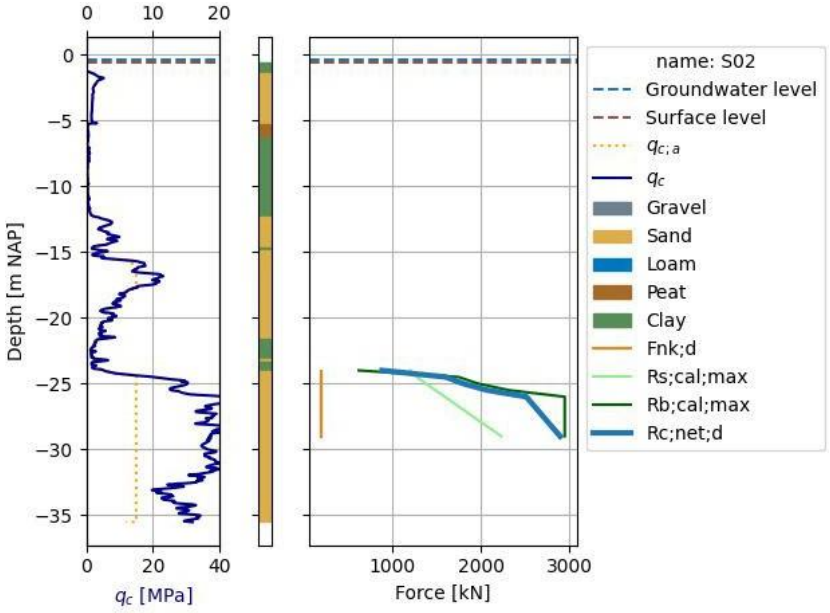
Pile bearing capacity (ULS):

Pile tip level	Base resistance					Shaft resistance		Pile resistance			
	q	q	q	q	R	q	R	R	R	F	R
[m NAP]	[MPa]	[MPa]	[MPa]	[MPa]	[kN]	[kPa]	[kN]	[kN]	[kN]	[kN]	[kN]
-24.0	8.6	8.6	1.5	3.2	625	63.8	1205	1317	1097	209	888
-24.5	25.6	25.4	2.8	8.9	1750	65.02	1277	2178	1815	209	1605
-25.0	27.3	25.2	5.6	10.0	1969	67.7	1383	2412	2010	209	1801
-25.5	28.8	28.8	8.6	11.8	2315	70.19	1489	2737	2281	209	2071
-26.0	38.0	33.2	12.2	15.0	2945	72.5	1595	3266	2722	209	2512
-26.5	36.2	32.9	16.1	15.0	2945	74.65	1701	3342	2785	209	2576
-27.0	36.0	32.7	20.0	15.0	2945	76.65	1806	3418	2849	209	2639
-27.5	36.0	32.8	23.8	15.0	2945	78.53	1912	3495	2912	209	2703
-28.0	37.2	34.5	27.6	15.0	2945	80.29	2018	3571	2976	209	2766
-28.5	36.7	34.6	30.6	15.0	2945	82.01	2126	3648	3040	209	2831

-29.0	36.0	34.6	31.8	15.0	2945	83.56	2232	3724	3104	209	2894

4) The average maximum shaft friction in the positive friction zone.

CPT and bearing capacity



Pile settlement (SLS):

Pile tip level	SLS loads			Distributed capacity		Pile settlement/ spring stiffness				
	F	F	F	R	R	S	S	S	K	K
[m NAP]	[kN]	[kN]	[kN]	[kN]	[kN]	[mm]	[mm]	[mm]	[kN/mm]	[kN/mm]
-24.0	621	209	831	450	867	3.5	3.4	6.9	243	121
-24.5	1124	209	1333	1259	919	6.4	4.7	11.1	283	120
-25.0	1260	209	1470	1417	995	7.3	4.7	12.0	311	122
-25.5	1450	209	1659	1665	1071	8.6	4.8	13.4	343	124
-26.0	1759	209	1968	2119	1147	10.6	5.1	15.8	385	125
-26.5	1803	209	2012	2119	1223	11.1	5.0	16.0	406	126
-27.0	1847	209	2057	2119	1300	11.5	4.8	16.3	426	126
-27.5	1892	209	2101	2119	1376	11.9	4.7	16.7	446	126
-28.0	1936	209	2146	2119	1452	12.4	4.6	17.0	466	126
-28.5	1982	209	2191	2119	1529	12.8	4.5	17.3	487	126
-29.0	2026	209	2235	2119	1606	13.3	4.4	17.7	508	126

PileCore CPT results for S04			CEMS
X coordinate* [m]:	123759.0	Excavation level [m NAP]:	N.A.
Y coordinate* [m]:	483465.0	ρ $[kN/m]$	0.0
Groundwater level [m NAP]:	-0.4	ξ [-]	1.39
Surface level [m NAP]:	-0.15	qc-reduction:	N.A.

* The x and y coordinates of the CPT need to be in a Cartesian metric coordinate system.

Soil classification:

Soil code	Bottom	Thickness	γ	γ	
[-]	[m NAP]	[m]	$[kN/m]$	$[kN/m]$	[°]
V	-0.17	0.02	10.0	10.0	15.0
V	-0.33	0.16	10.0	10.0	15.0
V	-0.43	0.1	12.0	12.0	15.0
K	-0.55	0.12	18.0	18.0	27.5
Z	-1.95	1.4	19.0	21.0	35.0
Z	-2.05	0.1	18.0	20.0	27.0
Z	-3.67	1.62	19.0	21.0	35.0
Z	-3.77	0.1	18.0	20.0	27.0
K	-3.91	0.14	15.0	15.0	22.5
Z	-4.19	0.28	18.0	20.0	27.0
Z	-4.29	0.1	19.0	21.0	35.0
K	-4.47	0.18	15.0	15.0	22.5
K	-4.65	0.18	14.0	14.0	17.5
V	-6.16	1.52	12.0	12.0	15.0
K	-6.54	0.38	15.0	15.0	15.0
K	-6.64	0.1	14.0	14.0	17.5
K	-9.9	3.26	18.0	18.0	27.5
K	-10.22	0.32	14.0	14.0	17.5
K	-10.44	0.22	17.0	17.0	17.5
K	-10.54	0.1	15.0	15.0	15.0
K	-11.06	0.52	14.0	14.0	17.5
K	-11.58	0.52	17.0	17.0	17.5
K	-11.94	0.36	18.0	18.0	22.5
Z	-13.62	1.68	19.0	21.0	35.0
Z	-13.71	0.1	18.0	20.0	25.0
Z	-14.97	1.26	19.0	21.0	35.0
Z	-15.49	0.52	18.0	20.0	27.0
Z	-20.38	4.89	19.0	21.0	35.0
Z	-21.55	1.18	18.0	20.0	27.0
Z	-21.67	0.12	19.0	21.0	35.0
K	-22.27	0.6	18.0	18.0	27.5
K	-22.65	0.38	18.0	18.0	22.5
Z	-22.83	0.18	18.0	20.0	25.0
Z	-23.03	0.2	19.0	21.0	35.0
Z	-23.23	0.2	18.0	20.0	27.0
K	-23.45	0.22	18.0	18.0	27.5
Z	-23.69	0.24	18.0	20.0	27.0
Z	-34.98	11.29	19.0	21.0	35.0

Friction range:

Pile tip level	Negative friction range [m NAP]		Positive friction range [m NAP]	
[m NAP]	Top	Bottom	Top	Bottom
-24.0	-0.15	-12.02	-12.0	-24.01
-24.5	-0.15	-12.02	-12.0	-24.51
-25.0	-0.15	-12.02	-12.0	-25.0
-25.5	-0.15	-12.02	-12.0	-25.5
-26.0	-0.15	-12.02	-12.0	-26.0
-26.5	-0.15	-12.02	-12.0	-26.5
-27.0	-0.15	-12.02	-12.0	-27.0
-27.5	-0.15	-12.02	-12.0	-27.5
-28.0	-0.15	-12.02	-12.0	-28.0
-28.5	-0.15	-12.02	-12.0	-28.49
-29.0	-0.15	-12.02	-12.0	-28.99

Negative skin friction

Soil code	Bottom	Thickness	Average circum.	σ'	δ	K	F
[-]	[m NAP]	[m]	[m]	[kN/m]	[°]	[-]	[kN]
V	-0.17	0.02	1.57	0.0	15.0	0.7	0
V	-0.33	0.16	1.57	0.9	15.0	0.7	0
V	-0.43	0.1	1.57	2.3	15.0	0.7	0
K	-0.55	0.12	1.57	3.1	27.5	0.5	0
Z	-1.95	1.4	1.57	11.4	35.0	0.4	8
Z	-2.05	0.1	1.57	19.7	27.0	0.5	1
Z	-3.67	1.62	1.57	29.3	35.0	0.4	22
Z	-3.77	0.1	1.57	38.9	27.0	0.5	2
K	-3.91	0.14	1.57	39.8	22.5	0.6	2
Z	-4.19	0.28	1.57	41.5	27.0	0.5	5
Z	-4.29	0.1	1.57	43.5	35.0	0.4	2
K	-4.47	0.18	1.57	44.6	22.5	0.6	3
K	-4.65	0.18	1.57	45.4	17.5	0.7	3
V	-6.16	1.52	1.57	47.5	15.0	0.7	28
K	-6.54	0.38	1.57	50.1	15.0	0.7	7
K	-6.64	0.1	1.57	51.3	17.5	0.7	2
K	-9.9	3.26	1.57	64.8	27.5	0.5	93
K	-10.22	0.32	1.57	78.9	17.5	0.7	10
K	-10.44	0.22	1.57	80.3	17.5	0.7	7
K	-10.54	0.1	1.57	81.4	15.0	0.7	3
K	-11.06	0.52	1.57	82.7	17.5	0.7	17
K	-11.58	0.52	1.57	85.7	17.5	0.7	17
K	-11.94	0.36	1.57	89.0	22.5	0.6	13
Z	-13.62	1.68	1.57	99.8	35.0	0.4	2

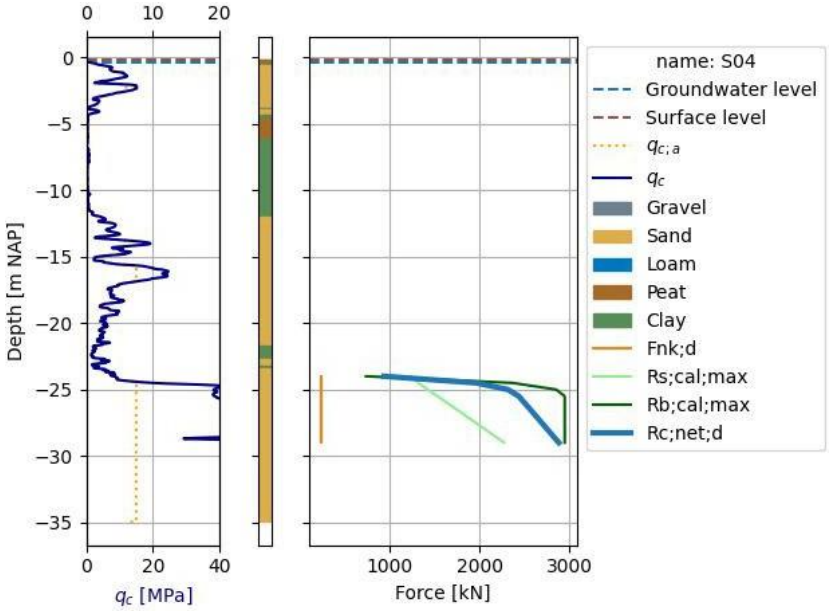
1) The results in this table are presented for the specific case when the pile-tip level is at -29.0 m NAP.
2) The average circumference of the pile per soil layer.
3) A minimum value of 0.25 for the product K δ is applied in the calculations (7.3.2.2(7)(d)).

Pile bearing capacity (ULS):

Pile tip level	Base resistance					Shaft resistance		Pile resistance			
	q	q	q	q	R	q	R	R	R	F	R
[m NAP]	[MPa]	[MPa]	[MPa]	[MPa]	[kN]	[kPa]	[kN]	[kN]	[kN]	[kN]	[kN]
-24.0	9.6	9.6	2.4	3.8	739	65.93	1243	1426	1188	249	939
-24.5	34.7	34.5	3.6	12.1	2366	67.33	1320	2652	2210	249	1961
-25.0	38.5	38.0	7.8	14.5	2851	69.92	1426	3077	2564	249	2315
-25.5	40.3	40.3	12.4	15.0	2945	72.32	1532	3221	2684	249	2435
-26.0	59.4	59.4	17.6	15.0	2945	74.55	1637	3297	2747	249	2498
-26.5	61.8	48.0	23.2	15.0	2945	76.62	1745	3375	2812	249	2563
-27.0	56.8	29.5	20.8	15.0	2945	78.56	1851	3451	2876	249	2626
-27.5	54.0	29.6	24.1	15.0	2945	80.38	1957	3527	2939	249	2690
-28.0	50.1	29.6	26.9	15.0	2945	82.08	2063	3603	3002	249	2753
-28.5	40.0	34.6	29.1	15.0	2945	83.67	2168	3679	3066	249	2816
-29.0	57.5	56.0	30.5	15.0	2945	85.18	2274	3755	3129	249	2880

4) The average maximum shaft friction in the positive friction zone.

CPT and bearing capacity



Pile settlement (SLS):

Pile tip level	SLS loads			Distributed capacity		Pile settlement/ spring stiffness				
	F	F	F	R	R	S	S	S	K	K
[m NAP]	[kN]	[kN]	[kN]	[kN]	[kN]	[mm]	[mm]	[mm]	[kN/mm]	[kN/mm]
-24.0	657	249	907	532	894	3.8	3.7	7.5	247	121
-24.5	1373	249	1622	1702	950	8.1	5.3	13.4	309	121
-25.0	1620	249	1870	2051	1026	9.8	5.4	15.2	347	123
-25.5	1704	249	1954	2119	1102	10.5	5.3	15.7	370	124
-26.0	1749	249	1998	2119	1178	10.9	5.1	16.0	389	125
-26.5	1794	249	2043	2119	1256	11.3	5.0	16.3	410	125
-27.0	1838	249	2088	2119	1332	11.8	4.9	16.6	430	126
-27.5	1883	249	2132	2119	1408	12.2	4.7	16.9	450	126
-28.0	1927	249	2176	2119	1484	12.7	4.6	17.3	470	126
-28.5	1972	249	2221	2119	1560	13.1	4.5	17.6	491	126

-29.0	2016	249	2265	2119	1636	13.6	4.4	18.0	512	126

PileCore CPT results for S03			CEMS
X coordinate* [m]:	123774.0	Excavation level [m NAP]:	N.A.
Y coordinate* [m]:	483449.0	ρ $[kN/m]$	0.0
Groundwater level [m NAP]:	-0.4	ξ [-]	1.39
Surface level [m NAP]:	-0.25	qc-reduction:	N.A.

* The x and y coordinates of the CPT need to be in a Cartesian metric coordinate system.

Soil classification:

Soil code	Bottom	Thickness	γ	γ	
[-]	[m NAP]	[m]	$[kN/m]$	$[kN/m]$	[°]
Z	-0.27	0.02	18.0	20.0	27.0
Z	-0.57	0.3	18.0	20.0	27.0
Z	-1.69	1.12	19.0	21.0	35.0
Z	-1.79	0.1	18.0	20.0	25.0
Z	-1.89	0.1	18.0	20.0	27.0
K	-2.11	0.22	18.0	18.0	27.5
K	-2.31	0.2	14.0	14.0	17.5
Z	-3.97	1.66	19.0	21.0	35.0
K	-4.45	0.48	18.0	18.0	27.5
K	-4.65	0.2	15.0	15.0	22.5
K	-4.99	0.34	14.0	14.0	17.5
K	-5.23	0.24	17.0	17.0	17.5
K	-5.77	0.54	14.0	14.0	17.5
K	-5.97	0.2	17.0	17.0	17.5
K	-6.86	0.9	14.0	14.0	17.5
Z	-8.22	1.36	18.0	20.0	27.0
K	-10.34	2.12	18.0	18.0	27.5
K	-10.54	0.2	14.0	14.0	17.5
K	-10.76	0.22	15.0	15.0	15.0
K	-11.2	0.44	14.0	14.0	17.5
K	-11.4	0.2	17.0	17.0	17.5
V	-11.74	0.34	12.0	12.0	15.0
K	-11.84	0.1	15.0	15.0	15.0
K	-12.06	0.22	18.0	18.0	27.5
Z	-21.5	9.43	19.0	21.0	35.0
K	-22.03	0.54	20.0	20.0	22.5
K	-22.81	0.78	18.0	18.0	22.5
Z	-23.03	0.22	18.0	20.0	27.0
Z	-23.25	0.22	19.0	21.0	35.0
Z	-23.39	0.14	18.0	20.0	27.0
Z	-23.59	0.2	19.0	21.0	35.0
Z	-23.75	0.16	18.0	20.0	25.0
Z	-35.52	11.77	19.0	21.0	35.0

Friction range:

Pile tip level	Negative friction range [m NAP]		Positive friction range [m NAP]	
[m NAP]	Top	Bottom	Top	Bottom
-24.0	-0.25	-12.02	-12.0	-23.99
-24.5	-0.25	-12.02	-12.0	-24.51
-25.0	-0.25	-12.02	-12.0	-25.01
-25.5	-0.25	-12.02	-12.0	-25.51
-26.0	-0.25	-12.02	-12.0	-26.0
-26.5	-0.25	-12.02	-12.0	-26.5
-27.0	-0.25	-12.02	-12.0	-27.0
-27.5	-0.25	-12.02	-12.0	-27.5
-28.0	-0.25	-12.02	-12.0	-27.99
-28.5	-0.25	-12.02	-12.0	-28.49
-29.0	-0.25	-12.02	-12.0	-29.01

Negative skin friction

Soil code	Bottom	Thickness	Average circum.	σ'	δ	K	F
[-]	[m NAP]	[m]	[m]	[kN/m]	[°]	[-]	[kN]
Z	-0.27	0.02	1.57	0.2	27.0	0.5	0
Z	-0.57	0.3	1.57	2.7	27.0	0.5	0
Z	-1.69	1.12	1.57	10.7	35.0	0.4	6
Z	-1.79	0.1	1.57	17.4	25.0	0.6	1
Z	-1.89	0.1	1.57	18.4	27.0	0.5	1
K	-2.11	0.22	1.57	19.8	27.5	0.5	2
K	-2.31	0.2	1.57	21.2	17.5	0.7	2
Z	-3.97	1.66	1.57	30.8	35.0	0.4	24
K	-4.45	0.48	1.57	42.1	27.5	0.5	9
K	-4.65	0.2	1.57	44.6	22.5	0.6	4
K	-4.99	0.34	1.57	45.8	17.5	0.7	6
K	-5.23	0.24	1.57	47.4	17.5	0.7	4
K	-5.77	0.54	1.57	49.4	17.5	0.7	10
K	-5.97	0.2	1.57	51.2	17.5	0.7	4
K	-6.86	0.9	1.57	53.9	17.5	0.7	19
Z	-8.22	1.36	1.57	62.6	27.0	0.5	37
K	-10.34	2.12	1.57	78.2	27.5	0.5	73
K	-10.54	0.2	1.57	87.4	17.5	0.7	7
K	-10.76	0.22	1.57	88.3	15.0	0.7	8
K	-11.2	0.44	1.57	89.8	17.5	0.7	16
K	-11.4	0.2	1.57	91.5	17.5	0.7	7
V	-11.74	0.34	1.57	92.6	15.0	0.7	12
K	-11.84	0.1	1.57	93.2	15.0	0.7	4
K	-12.06	0.22	1.57	94.3	27.5	0.5	7

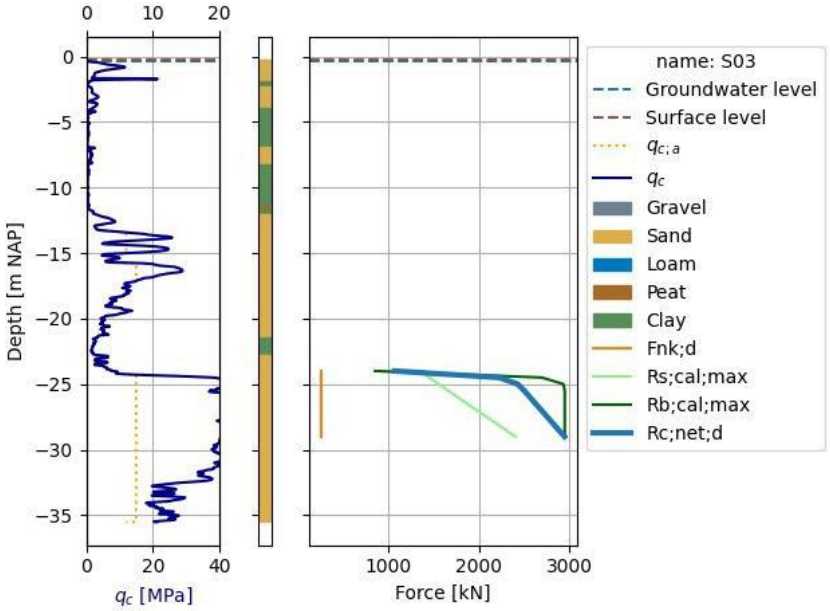
1) The results in this table are presented for the specific case when the pile-tip level is at -29.0 m NAP.
2) The average circumference of the pile per soil layer.
3) A minimum value of 0.25 for the product $K \quad \delta$ is applied in the calculations (7.3.2.2(7)(d)).

Pile bearing capacity (ULS):

Pile tip level	Base resistance					Shaft resistance		Pile resistance			
	q	q	q	q	R	q	R	R	R	F	R
[m NAP]	[MPa]	[MPa]	[MPa]	[MPa]	[kN]	[kPa]	[kN]	[kN]	[kN]	[kN]	[kN]
-24.0	11.5	11.4	2.3	4.3	851	72.19	1360	1591	1326	262	1064
-24.5	41.5	36.9	4.4	13.7	2694	73.74	1446	2979	2483	262	2221
-25.0	40.4	36.9	8.7	14.9	2931	76.09	1552	3225	2688	262	2426
-25.5	43.9	43.8	13.1	15.0	2945	78.27	1658	3312	2760	262	2498
-26.0	52.2	39.4	17.7	15.0	2945	80.29	1763	3388	2823	262	2561
-26.5	49.1	39.5	22.4	15.0	2945	82.17	1869	3464	2886	262	2624
-27.0	47.6	39.5	27.0	15.0	2945	83.92	1977	3541	2951	262	2689
-27.5	42.5	39.2	31.5	15.0	2945	85.57	2082	3617	3014	262	2752
-28.0	42.7	37.6	34.7	15.0	2945	87.11	2188	3693	3077	262	2815
-28.5	41.1	37.7	37.4	15.0	2945	88.56	2293	3768	3140	262	2878
-29.0	39.3	37.7	37.5	15.0	2945	89.97	2400	3846	3205	262	2943

4) The average maximum shaft friction in the positive friction zone.

CPT and bearing capacity



Pile settlement (SLS):

Pile tip level	SLS loads			Distributed capacity		Pile settlement/ spring stiffness				
	F	F	F	R	R	S	S	S	K	K
[m NAP]	[kN]	[kN]	[kN]	[kN]	[kN]	[mm]	[mm]	[mm]	[kN/mm]	[kN/mm]
-24.0	745	262	1007	612	979	4.3	3.7	8.0	272	126
-24.5	1554	262	1816	1938	1041	9.1	5.3	14.4	343	126
-25.0	1698	262	1960	2109	1117	10.2	5.3	15.4	372	127
-25.5	1748	262	2010	2119	1193	10.6	5.1	15.7	392	128
-26.0	1793	262	2055	2119	1269	11.0	5.0	16.0	412	128
-26.5	1837	262	2099	2119	1345	11.5	4.9	16.3	432	129
-27.0	1882	262	2144	2119	1422	11.9	4.7	16.7	452	129
-27.5	1926	262	2188	2119	1498	12.4	4.6	17.0	473	129
-28.0	1971	262	2233	2119	1574	12.8	4.5	17.3	493	129
-28.5	2015	262	2277	2119	1649	13.2	4.4	17.7	514	129

-29.0	2060	262	2322	2119	1727	13.7	4.3	18.0	536	129

PileCore CPT results for S01			CEMS
X coordinate* [m]:	123805.0	Excavation level [m NAP]:	N.A.
Y coordinate* [m]:	483464.0	ρ [kN/m]	0.0
Groundwater level [m NAP]:	-0.4	ξ [-]	1.39
Surface level [m NAP]:	-0.22	qc-reduction:	N.A.

* The x and y coordinates of the CPT need to be in a Cartesian metric coordinate system.

Soil classification:

Soil code	Bottom	Thickness	γ	γ	
[-]	[m NAP]	[m]	[kN/m]	[kN/m]	[°]
Z	-1.44	1.22	19.0	21.0	35.0
Z	-1.62	0.18	19.0	21.0	35.0
K	-1.84	0.22	15.0	15.0	22.5
K	-3.2	1.36	14.0	14.0	17.5
K	-3.34	0.14	17.0	17.0	17.5
K	-4.82	1.48	14.0	14.0	17.5
K	-6.24	1.42	15.0	15.0	15.0
K	-6.9	0.66	14.0	14.0	17.5
Z	-8.06	1.16	18.0	20.0	27.0
K	-10.28	2.22	14.0	14.0	17.5
K	-10.4	0.12	15.0	15.0	22.5
K	-10.52	0.12	14.0	14.0	17.5
K	-10.62	0.1	17.0	17.0	17.5
K	-10.86	0.24	15.0	15.0	15.0
K	-11.26	0.4	14.0	14.0	17.5
K	-11.36	0.1	17.0	17.0	17.5
V	-11.76	0.4	12.0	12.0	15.0
K	-11.92	0.16	20.0	20.0	22.5
Z	-12.89	0.98	19.0	21.0	35.0
K	-13.41	0.52	18.0	18.0	27.5
Z	-14.89	1.48	19.0	21.0	35.0
Z	-15.19	0.3	18.0	20.0	27.0
Z	-15.33	0.14	18.0	20.0	25.0
Z	-19.92	4.59	19.0	21.0	35.0
Z	-20.56	0.64	18.0	20.0	27.0
K	-21.22	0.66	18.0	18.0	27.5
Z	-22.28	1.06	18.0	20.0	27.0
Z	-22.91	0.64	19.0	21.0	35.0
Z	-23.57	0.66	18.0	20.0	27.0
Z	-35.58	12.01	19.0	21.0	35.0

Friction range:

Pile tip level	Negative friction range [m NAP]		Positive friction range [m NAP]	
[m NAP]	Top	Bottom	Top	Bottom
-24.0	-0.22	-12.02	-12.0	-24.01
-24.5	-0.22	-12.02	-12.0	-24.51
-25.0	-0.22	-12.02	-12.0	-25.0
-25.5	-0.22	-12.02	-12.0	-25.5
-26.0	-0.22	-12.02	-12.0	-26.0
-26.5	-0.22	-12.02	-12.0	-26.5
-27.0	-0.22	-12.02	-12.0	-27.0
-27.5	-0.22	-12.02	-12.0	-27.49
-28.0	-0.22	-12.02	-12.0	-27.99
-28.5	-0.22	-12.02	-12.0	-28.51
-29.0	-0.22	-12.02	-12.0	-29.0

Negative skin friction

Soil code	Bottom	Thickness	Average circum.	σ'	δ	K	F
[-]	[m NAP]	[m]	[m]	[kN/m]	[°]	[-]	[kN]
Z	-1.44	1.22	1.57	8.1	35.0	0.4	5
Z	-1.62	0.18	1.57	16.0	35.0	0.4	1
K	-1.84	0.22	1.57	17.6	22.5	0.6	2
K	-3.2	1.36	1.57	21.0	17.5	0.7	11
K	-3.34	0.14	1.57	24.4	17.5	0.7	1
K	-4.82	1.48	1.57	28.0	17.5	0.7	16
K	-6.24	1.42	1.57	34.8	15.0	0.7	19
K	-6.9	0.66	1.57	39.9	17.5	0.7	10
Z	-8.06	1.16	1.57	47.1	27.0	0.5	24
K	-10.28	2.22	1.57	57.7	17.5	0.7	50
K	-10.4	0.12	1.57	62.6	22.5	0.6	3
K	-10.52	0.12	1.57	63.2	17.5	0.7	3
K	-10.62	0.1	1.57	63.8	17.5	0.7	3
K	-10.86	0.24	1.57	64.8	15.0	0.7	6
K	-11.26	0.4	1.57	66.3	17.5	0.7	10
K	-11.36	0.1	1.57	67.4	17.5	0.7	3
V	-11.76	0.4	1.57	68.3	15.0	0.7	11
K	-11.92	0.16	1.57	69.5	22.5	0.6	4
Z	-12.89	0.98	1.57	75.7	35.0	0.4	3

1) The results in this table are presented for the specific case when the pile-tip level is at -29.0 m NAP.
2) The average circumference of the pile per soil layer.
3) A minimum value of 0.25 for the product K δ is applied in the calculations (7.3.2.2(7)(d)).

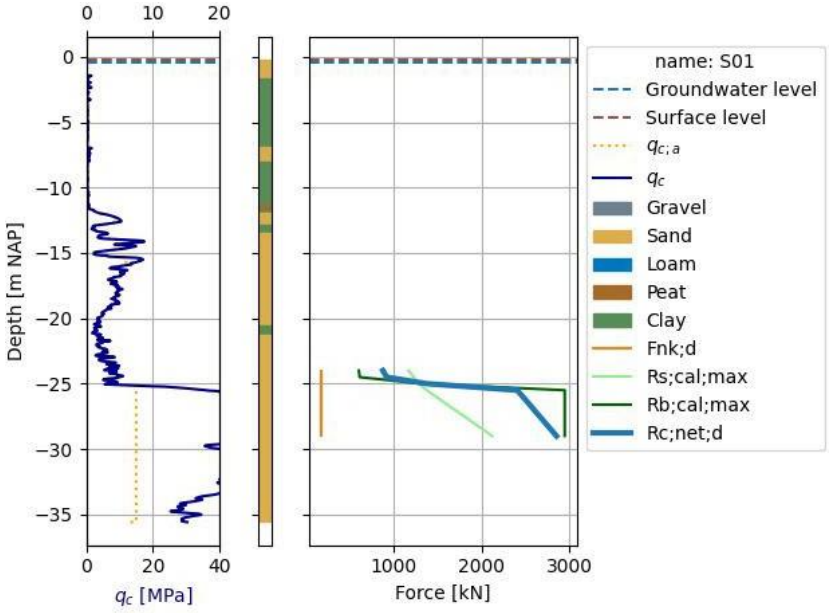
Pile bearing capacity (ULS):

Pile tip level	Base resistance					Shaft resistance		Pile resistance			
	q	q	q	q	R	q	R	R	R	F	R
[m NAP]	[MPa]	[MPa]	[MPa]	[MPa]	[kN]	[kPa]	[kN]	[kN]	[kN]	[kN]	[kN]
-24.0	8.2	5.3	3.1	3.1	607	62.03	1170	1278	1065	186	879
-24.5	7.5	5.4	3.5	3.1	615	62.77	1232	1329	1108	186	922
-25.0	17.5	17.5	3.9	6.7	1324	62.96	1286	1878	1565	186	1379
-25.5	45.8	45.8	6.5	15.0	2945	65.11	1379	3111	2592	186	2406

-26.0	50.9	44.6	11.5	15.0	2945	67.59	1484	3187	2656	186	2470
-26.5	49.0	44.6	16.6	15.0	2945	69.91	1592	3264	2720	186	2534
-27.0	46.4	44.6	21.8	15.0	2945	72.07	1697	3340	2783	186	2597
-27.5	48.7	43.2	26.1	15.0	2945	74.09	1803	3416	2847	186	2661
-28.0	45.7	35.8	26.3	15.0	2945	75.99	1908	3492	2910	186	2724
-28.5	43.9	35.8	30.1	15.0	2945	77.84	2016	3569	2974	186	2788
-29.0	42.3	35.9	33.8	15.0	2945	79.51	2121	3645	3037	186	2851

4) The average maximum shaft friction in the positive friction zone.

CPT and bearing capacity



Pile settlement (SLS):

Pile tip level	SLS loads			Distributed capacity		Pile settlement/ spring stiffness				
	F	F	F	R	R	S	S	S	K	K
[m NAP]	[kN]	[kN]	[kN]	[kN]	[kN]	[mm]	[mm]	[mm]	[kN/mm]	[kN/mm]
-24.0	616	186	801	437	842	3.4	3.4	6.8	239	118
-24.5	645	186	831	443	887	3.7	3.3	6.9	253	120
-25.0	966	186	1152	953	926	5.6	4.2	9.8	276	118
-25.5	1684	186	1870	2119	992	10.2	5.4	15.5	348	120
-26.0	1729	186	1915	2119	1068	10.6	5.2	15.8	367	121
-26.5	1774	186	1960	2119	1145	11.0	5.1	16.1	387	122
-27.0	1818	186	2004	2119	1221	11.5	4.9	16.4	408	122
-27.5	1862	186	2048	2119	1297	11.9	4.8	16.7	427	123
-28.0	1907	186	2093	2119	1373	12.4	4.7	17.0	447	123
-28.5	1952	186	2138	2119	1450	12.8	4.6	17.4	468	123
-29.0	1996	186	2182	2119	1526	13.3	4.5	17.7	489	123

PileCore CPT results for S05			CEMS
X coordinate* [m]:	123778.0	Excavation level [m NAP]:	N.A.
Y coordinate* [m]:	483481.0	ρ $[kN/m]$	0.0
Groundwater level [m NAP]:	-0.4	ξ [-]	1.39
Surface level [m NAP]:	0.2	qc-reduction:	N.A.

* The x and y coordinates of the CPT need to be in a Cartesian metric coordinate system.

Soil classification:

Soil code	Bottom	Thickness	γ	γ	
[-]	[m NAP]	[m]	$[kN/m]$	$[kN/m]$	[°]
Z	0.18	0.02	19.0	21.0	35.0
Z	-0.04	0.22	19.0	21.0	35.0
K	-0.14	0.1	18.0	18.0	27.5
Z	-0.8	0.66	19.0	21.0	35.0
K	-1.02	0.22	18.0	18.0	27.5
K	-1.14	0.12	20.0	20.0	22.5
Z	-4.66	3.52	19.0	21.0	35.0
Z	-4.76	0.1	18.0	20.0	27.0
K	-5.1	0.34	14.0	14.0	17.5
K	-5.9	0.8	15.0	15.0	15.0
V	-6.36	0.46	12.0	12.0	15.0
K	-6.68	0.32	15.0	15.0	15.0
K	-6.78	0.1	14.0	14.0	17.5
Z	-8.36	1.58	18.0	20.0	27.0
Z	-10.26	1.9	18.0	20.0	25.0
K	-10.7	0.44	14.0	14.0	17.5
K	-11.66	0.96	17.0	17.0	17.5
K	-11.76	0.1	15.0	15.0	15.0
K	-11.92	0.16	18.0	18.0	27.5
Z	-14.78	2.86	19.0	21.0	35.0
Z	-15.18	0.4	18.0	20.0	27.0
Z	-19.33	4.16	19.0	21.0	35.0
Z	-19.93	0.6	18.0	20.0	27.0
Z	-20.97	1.04	19.0	21.0	35.0
Z	-21.63	0.66	18.0	20.0	27.0
Z	-23.55	1.92	19.0	21.0	35.0
Z	-23.65	0.1	18.0	20.0	27.0
Z	-35.16	11.51	19.0	21.0	35.0

Friction range:

Pile tip level	Negative friction range [m NAP]		Positive friction range [m NAP]	
[m NAP]	Top	Bottom	Top	Bottom
-24.0	0.0	-12.02	-12.0	-24.01
-24.5	0.0	-12.02	-12.0	-24.51
-25.0	0.0	-12.02	-12.0	-25.0
-25.5	0.0	-12.02	-12.0	-25.5
-26.0	0.0	-12.02	-12.0	-26.0
-26.5	0.0	-12.02	-12.0	-26.5
-27.0	0.0	-12.02	-12.0	-27.0
-27.5	0.0	-12.02	-12.0	-27.5
-28.0	0.0	-12.02	-12.0	-28.0
-28.5	0.0	-12.02	-12.0	-28.5
-29.0	0.0	-12.02	-12.0	-29.0

Negative skin friction

Soil code	Bottom	Thickness	Average circum.	σ'	δ	K	F
[-]	[m NAP]	[m]	[m]	[kN/m]	[°]	[-]	[kN]
Z	-0.04	0.22	1.57	2.3	35.0	0.4	0
K	-0.14	0.1	1.57	5.3	27.5	0.5	0
Z	-0.8	0.66	1.57	11.5	35.0	0.4	4
K	-1.02	0.22	1.57	16.6	27.5	0.5	2
K	-1.14	0.12	1.57	18.1	22.5	0.6	1
Z	-4.66	3.52	1.57	38.4	35.0	0.4	64
Z	-4.76	0.1	1.57	58.6	27.0	0.5	3
K	-5.1	0.34	1.57	59.9	17.5	0.7	8
K	-5.9	0.8	1.57	62.6	15.0	0.7	20
V	-6.36	0.46	1.57	65.3	15.0	0.7	12
K	-6.68	0.32	1.57	66.6	15.0	0.7	8
K	-6.78	0.1	1.57	67.6	17.5	0.7	3
Z	-8.36	1.58	1.57	75.8	27.0	0.5	52
Z	-10.26	1.9	1.57	93.5	25.0	0.6	75
K	-10.7	0.44	1.57	104.3	17.5	0.7	18
K	-11.66	0.96	1.57	108.6	17.5	0.7	41
K	-11.76	0.1	1.57	112.4	15.0	0.7	4
K	-11.92	0.16	1.57	113.3	27.5	0.5	8
Z	-14.78	2.86	1.57	129.9	35.0	0.4	4

1) The results in this table are presented for the specific case when the pile-tip level is at -29.0 m NAP.
2) The average circumference of the pile per soil layer.
3) A minimum value of 0.25 for the product K δ is applied in the calculations (7.3.2.2(7)(d)).

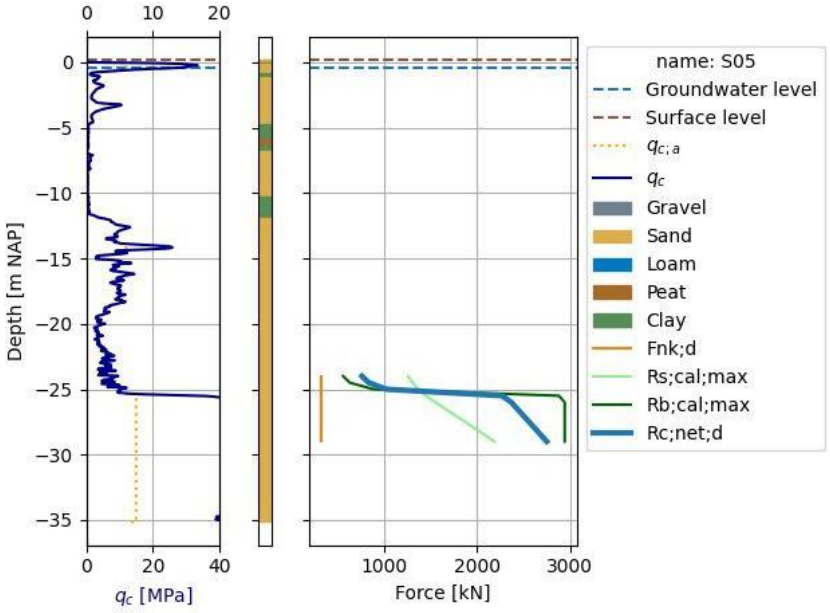
Pile bearing capacity (ULS):

Pile tip level	Base resistance					Shaft resistance		Pile resistance			
	q	q	q	q	R	q	R	R	R	F	R
[m NAP]	[MPa]	[MPa]	[MPa]	[MPa]	[kN]	[kPa]	[kN]	[kN]	[kN]	[kN]	[kN]
-24.0	6.8	4.7	3.3	2.8	556	66.6	1255	1303	1086	326	759
-24.5	7.2	6.0	3.5	3.2	627	66.44	1305	1390	1159	326	832
-25.0	10.3	10.0	4.1	4.5	880	66.85	1364	1615	1345	326	1019
-25.5	41.1	41.0	5.5	14.7	2881	68.29	1446	3113	2594	326	2268

-26.0	43.2	42.5	10.2	15.0	2945	70.67	1552	3235	2696	326	2370
-26.5	48.5	48.5	15.1	15.0	2945	72.88	1658	3311	2759	326	2433
-27.0	60.0	56.2	21.0	15.0	2945	74.94	1763	3387	2823	326	2497
-27.5	58.4	54.9	27.3	15.0	2945	76.88	1871	3465	2888	326	2561
-28.0	57.3	54.9	33.7	15.0	2945	78.69	1977	3541	2951	326	2625
-28.5	56.5	51.3	38.5	15.0	2945	80.39	2083	3617	3014	326	2688
-29.0	55.2	51.5	44.0	15.0	2945	81.99	2189	3694	3078	326	2752

4) The average maximum shaft friction in the positive friction zone.

CPT and bearing capacity



Pile settlement (SLS):

Pile tip level	SLS loads			Distributed capacity		Pile settlement/ spring stiffness				
	F	F	F	R	R	S	S	S	K	K
[m NAP]	[kN]	[kN]	[kN]	[kN]	[kN]	[mm]	[mm]	[mm]	[kN/mm]	[kN/mm]
-24.0	532	326	858	400	903	3.4	3.6	7.1	236	121
-24.5	583	326	909	451	939	3.8	3.7	7.4	247	122
-25.0	713	326	1040	633	981	4.6	3.9	8.5	264	122
-25.5	1588	326	1914	2073	1040	10.2	5.6	15.7	345	122
-26.0	1659	326	1985	2119	1116	10.8	5.4	16.2	366	122
-26.5	1703	326	2030	2119	1192	11.2	5.3	16.5	385	123
-27.0	1748	326	2074	2119	1269	11.7	5.1	16.8	405	123
-27.5	1793	326	2119	2119	1346	12.1	5.0	17.1	426	124
-28.0	1837	326	2164	2119	1422	12.6	4.9	17.4	446	124
-28.5	1882	326	2208	2119	1499	13.1	4.7	17.8	466	124
-29.0	1926	326	2252	2119	1575	13.5	4.6	18.1	486	124

PileCore results for user defined CPT Group

CPT	X coordinate	Y coordinate	Surface level	Groundwater level	Excavation level	ρ
	[m]	[m]	[m NAP]	[m NAP]	[m NAP]	[kN/m]
S07	123787.00	483465.00	0.12	-0.4	0.12	0.0
S06	123789.00	483485.00	0.18	-0.4	0.18	0.0
S02	123797.00	483441.00	-0.63	-0.4	-0.63	0.0
S04	123759.00	483465.00	-0.15	-0.4	-0.15	0.0
S03	123774.00	483449.00	-0.25	-0.4	-0.25	0.0
S01	123805.00	483464.00	-0.22	-0.4	-0.22	0.0
S05	123778.00	483481.00	0.2	-0.4	0.2	0.0

1) Other input parameters that are used to calculate the bearing capacity (e.g. positive skin friction trajectory) can be found in the individual CPT results report.
2) The x and y coordinates of the CPT need to be in a Cartesian metric coordinate system.

Pile Tip Level	R	R	Factor	Var. co-eff	Nominal CPT	R	R	F	R	ξ
[m NAP]	[kN]	[kN]	[-]	[%]	[-]	[kN]	[kN]	[kN]	[kN]	[-]
-24.0	1889	1732	3	8.6	Group av.	1487	1240	238	1002	1.27
-24.5	2641	1841	4	36.8	S06	1324	1104	242	862	1.39
-25.0	3044	1901	4	33.4	S06	1368	1140	242	898	1.39
-25.5	4313	3804	3	5.8	Group av.	3396	2830	238	2592	1.27
-26.0	4517	4388	3	2.4	Group av.	3557	2964	238	2726	1.27
-26.5	4624	4495	3	2.3	Group av.	3641	3034	238	2796	1.27
-27.0	4730	4600	3	2.3	Group av.	3724	3104	238	2866	1.27
-27.5	4836	4706	3	2.2	Group av.	3808	3173	238	2935	1.27
-28.0	4942	4812	3	2.2	Group av.	3891	3243	238	3005	1.27
-28.5	5048	4918	3	2.1	Group av.	3975	3312	238	3074	1.27
-29.0	5154	5026	3	2.1	Group av.	4058	3382	238	3144	1.27

3) The design negative friction force is based on the Nominal CPT. If the 3 factor is applied, the friction force is the group average.
4) The values are related to the net pile bearing capacity (NEN9997-1 7.6.2.3). Based on the lowest outcome of Rc;net;d, this can either be a 3 or 4 value (based on the nominal CPT). In case the variation coefficient is above 12

Pile settlement (SLS):

Pile tip level	SLS loads			Distributed capacity		Pile settlement/ spring stiffness				
	F	F	F	R	R	S	S	S	K	K
[m NAP]	[kN]	[kN]	[kN]	[kN]	[kN]	[mm]	[mm]	[mm]	[kN/mm]	[kN/mm]
-24.0	701	238	939	521	967	3.6	3.5	7.1	271	132
-24.5	604	242	845	455	870	3.7	3.5	7.3	239	116

-25.0	629	242	870	454	913	3.9	3.4	7.4	253	118
-25.5	1814	238	2052	2241	1155	10.1	5.3	15.3	391	134
-26.0	1908	238	2146	2319	1238	10.8	5.2	15.9	416	135
-26.5	1957	238	2195	2319	1322	11.2	5.0	16.2	439	135
-27.0	2006	238	2244	2319	1405	11.7	4.9	16.5	460	136
-27.5	2055	238	2293	2319	1489	12.1	4.8	16.9	482	136
-28.0	2103	238	2341	2319	1572	12.6	4.6	17.2	504	136
-28.5	2152	238	2390	2319	1656	13.0	4.5	17.5	527	136
-29.0	2201	238	2439	2319	1739	13.5	4.4	17.9	550	136

Bijlage 3 Uitvoer PileCore Ø460/556mm

PileCore results			CEMS
Project:	Duivendrechtsekade 50	Author:	5.1.1.d
Number:	23378	Date:	16-02-24
PileCore Version:	2.9.4		

Pile properties:

Name:		Reference NEN9997-1
Type:	betonpaal	Table 7.c
Description:	In de grond gevormd met een gladde mantelbuis op een schroefpunt, waarbij het beton direct tegen de grond drukt	Table 7.c
Installation:	Geschroefd; bij het trekken van de mantelbuis blijft de schroefpunt in de grond achter	Table 7.c
Shaft size:	rond 560 mm	
Base size:	rond 560 mm	
Height pile base [mm]:	0.0	Figure 7.h
E GPa:	20.0	

Pile factors:		Reference NEN9997-1	Safety factors:		Reference NEN9997-1
a:	0.63	Table 7.c	γ :	1.0	7.3.2.2(7)(b)
a :	0.009	Table 7.c	γ :	1.2	A.3.3.2
a :	0.009	Table 7.d	γ :	1.2	A.3.3.2
β:	1.0	7.6.2.3. (10)(g)			
Pile factor s:	1.0	7.6.2.3. (10)(h)			
Settlement curve:	1	Table 7.c			
δ :	1.0 φ	7.3.2.2 (7)(d)			

Result Summary

CPT	Pile Tip Level	Bearing capacity		Spring stiffness		
		F	R	F	K	K
[-]	[m NAP]	[kN]	[kN]	[kN]	[kN/mm]	[kN/mm]
S07	-24.0	215	1115	995	267	138
S07	-24.5	215	1187	1045	283	140
S07	-25.0	215	1582	1322	305	139
S07	-25.5	215	2957	2284	383	142
S07	-26.0	215	3027	2334	403	143
S07	-26.5	215	3100	2384	424	144
S07	-27.0	215	3170	2434	445	145
S07	-27.5	215	3242	2484	467	146
S07	-28.0	215	3313	2533	489	147
S07	-28.5	215	3384	2584	512	147
S07	-29.0	215	3455	2633	535	147
S06	-24.0	271	955	939	247	133
S06	-24.5	271	1015	981	259	135
S06	-25.0	271	1086	1030	274	137
S06	-25.5	271	2842	2260	363	139
S06	-26.0	271	2913	2310	382	140
S06	-26.5	271	2985	2360	402	141
S06	-27.0	271	3056	2410	422	142
S06	-27.5	271	3127	2459	443	143
S06	-28.0	271	3198	2509	465	144
S06	-28.5	271	3269	2559	487	144
S06	-29.0	271	3341	2609	510	145
S02	-24.0	235	1073	986	264	140
S02	-24.5	235	1947	1597	304	140
S02	-25.0	235	2154	1742	333	143
S02	-25.5	235	2500	1985	367	145
S02	-26.0	235	2988	2326	410	148
S02	-26.5	235	3122	2420	434	149
S02	-27.0	235	3193	2470	456	149
S02	-27.5	235	3264	2520	478	150
S02	-28.0	235	3335	2569	500	151
S02	-28.5	235	3408	2620	524	151
S02	-29.0	235	3479	2670	547	151
S04	-24.0	279	1125	1067	268	140
S04	-24.5	279	2390	1952	332	142
S04	-25.0	279	2791	2233	372	145
S04	-25.5	279	2964	2354	398	146
S04	-26.0	279	3035	2404	418	147
S04	-26.5	279	3108	2455	439	148
S04	-27.0	279	3179	2504	461	149
S04	-27.5	279	3250	2554	483	150
S04	-28.0	279	3321	2604	505	150
S04	-28.5	279	3392	2653	528	151
S04	-29.0	279	3463	2703	551	151
S03	-24.0	293	1323	1220	296	147
S03	-24.5	293	2690	2176	368	148
S03	-25.0	293	2917	2336	398	150
S03	-25.5	293	3035	2418	421	151
S03	-26.0	293	3106	2467	441	152
S03	-26.5	293	3177	2517	463	152
S03	-27.0	293	3249	2568	485	153

S03	-27.5	293	3320	2617	508	154
S03	-28.0	293	3390	2667	531	154
S03	-28.5	293	3461	2716	554	154
S03	-29.0	293	3533	2767	577	154
S01	-24.0	208	1028	928	259	137
S01	-24.5	208	1074	960	275	140
S01	-25.0	208	1703	1401	298	137
S01	-25.5	208	2932	2261	375	142
S01	-26.0	208	3003	2311	394	143
S01	-26.5	208	3076	2361	415	144
S01	-27.0	208	3146	2411	436	145
S01	-27.5	208	3217	2460	458	146
S01	-28.0	208	3288	2510	480	146
S01	-28.5	208	3360	2560	503	147
S01	-29.0	208	3431	2610	526	147
S05	-24.0	366	891	989	257	141
S05	-24.5	366	1001	1066	270	142
S05	-25.0	366	1232	1228	286	142
S05	-25.5	366	2772	2306	372	143
S05	-26.0	366	2891	2390	394	145
S05	-26.5	366	2962	2439	414	145
S05	-27.0	366	3033	2489	435	146
S05	-27.5	366	3106	2540	456	147
S05	-28.0	366	3177	2589	478	148
S05	-28.5	366	3248	2639	500	148
S05	-29.0	366	3319	2689	523	148

1) Spring stiffness not taking elastic deformation of the pile into account
2) Spring stiffness including elastic deformation of the pile

PileCore CPT results for S07			CEMS
X coordinate* [m]:	123787.0	Excavation level [m NAP]:	N.A.
Y coordinate* [m]:	483465.0	ρ $[kN/m]$	0.0
Groundwater level [m NAP]:	-0.4	ξ [-]	1.39
Surface level [m NAP]:	0.12	qc-reduction:	N.A.

* The x and y coordinates of the CPT need to be in a Cartesian metric coordinate system.

Soil classification:

Soil code	Bottom	Thickness	γ	γ	
[-]	[m NAP]	[m]	$[kN/m]$	$[kN/m]$	[°]
K	0.1	0.02	18.0	18.0	27.5
K	-0.18	0.28	18.0	18.0	27.5
Z	-0.64	0.46	19.0	21.0	35.0
K	-0.74	0.1	18.0	18.0	27.5
K	-0.92	0.18	15.0	15.0	15.0
V	-1.14	0.22	12.0	12.0	15.0
K	-1.32	0.18	14.0	14.0	17.5
K	-1.42	0.1	18.0	18.0	22.5
K	-1.62	0.2	15.0	15.0	22.5
K	-1.88	0.26	14.0	14.0	17.5
K	-1.98	0.1	19.0	19.0	17.5
K	-2.4	0.42	15.0	15.0	22.5
K	-3.92	1.52	14.0	14.0	17.5
V	-4.36	0.44	12.0	12.0	15.0
K	-4.76	0.4	15.0	15.0	15.0
V	-6.26	1.5	12.0	12.0	15.0
K	-6.6	0.34	14.0	14.0	17.5
K	-10.28	3.68	18.0	18.0	27.5
K	-10.66	0.38	14.0	14.0	17.5
K	-10.96	0.3	17.0	17.0	17.5
K	-11.16	0.2	14.0	14.0	17.5
K	-11.36	0.2	17.0	17.0	17.5
V	-11.8	0.44	12.0	12.0	15.0
K	-12.0	0.2	18.0	18.0	27.5
Z	-14.83	2.84	19.0	21.0	35.0
Z	-15.01	0.18	18.0	20.0	27.0
K	-15.11	0.1	18.0	18.0	27.5
Z	-19.82	4.71	19.0	21.0	35.0
Z	-20.38	0.56	18.0	20.0	25.0
Z	-20.54	0.16	18.0	20.0	27.0
Z	-20.7	0.16	18.0	20.0	25.0
K	-21.32	0.62	18.0	18.0	27.5
Z	-22.21	0.9	18.0	20.0	27.0
Z	-22.69	0.48	19.0	21.0	35.0
Z	-22.99	0.3	18.0	20.0	27.0
Z	-23.84	0.86	19.0	21.0	35.0
Z	-23.94	0.1	18.0	20.0	27.0
Z	-34.89	10.94	19.0	21.0	35.0

Friction range:

Pile tip level	Negative friction range [m NAP]		Positive friction range [m NAP]	
[m NAP]	Top	Bottom	Top	Bottom
-24.0	0.0	-12.02	-12.0	-24.0
-24.5	0.0	-12.02	-12.0	-24.5
-25.0	0.0	-12.02	-12.0	-25.0
-25.5	0.0	-12.02	-12.0	-25.49
-26.0	0.0	-12.02	-12.0	-25.99
-26.5	0.0	-12.02	-12.0	-26.51
-27.0	0.0	-12.02	-12.0	-27.0
-27.5	0.0	-12.02	-12.0	-27.5
-28.0	0.0	-12.02	-12.0	-27.99
-28.5	0.0	-12.02	-12.0	-28.51
-29.0	0.0	-12.02	-12.0	-29.0

Negative skin friction

Soil code	Bottom	Thickness	Average circum.	σ'	δ	K	F
[-]	[m NAP]	[m]	[m]	[kN/m]	[°]	[-]	[kN]
K	-0.18	0.28	1.76	2.9	27.5	0.5	0
Z	-0.64	0.46	1.76	9.2	35.0	0.4	2
K	-0.74	0.1	1.76	12.6	27.5	0.5	1
K	-0.92	0.18	1.76	13.5	15.0	0.7	1
V	-1.14	0.22	1.76	14.3	15.0	0.7	1
K	-1.32	0.18	1.76	14.9	17.5	0.7	1
K	-1.42	0.1	1.76	15.6	22.5	0.6	1
K	-1.62	0.2	1.76	16.6	22.5	0.6	1
K	-1.88	0.26	1.76	17.7	17.5	0.7	2
K	-1.98	0.1	1.76	18.6	17.5	0.7	1
K	-2.4	0.42	1.76	20.2	22.5	0.6	4
K	-3.92	1.52	1.76	24.5	17.5	0.7	16
V	-4.36	0.44	1.76	28.2	15.0	0.7	5
K	-4.76	0.4	1.76	29.7	15.0	0.7	5
V	-6.26	1.5	1.76	32.4	15.0	0.7	21
K	-6.6	0.34	1.76	34.7	17.5	0.7	5
K	-10.28	3.68	1.76	50.4	27.5	0.5	92
K	-10.66	0.38	1.76	66.3	17.5	0.7	11
K	-10.96	0.3	1.76	68.2	17.5	0.7	9
K	-11.16	0.2	1.76	69.7	17.5	0.7	6
K	-11.36	0.2	1.76	70.8	17.5	0.7	6
V	-11.8	0.44	1.76	72.1	15.0	0.7	14
K	-12.0	0.2	1.76	73.3	27.5	0.5	7

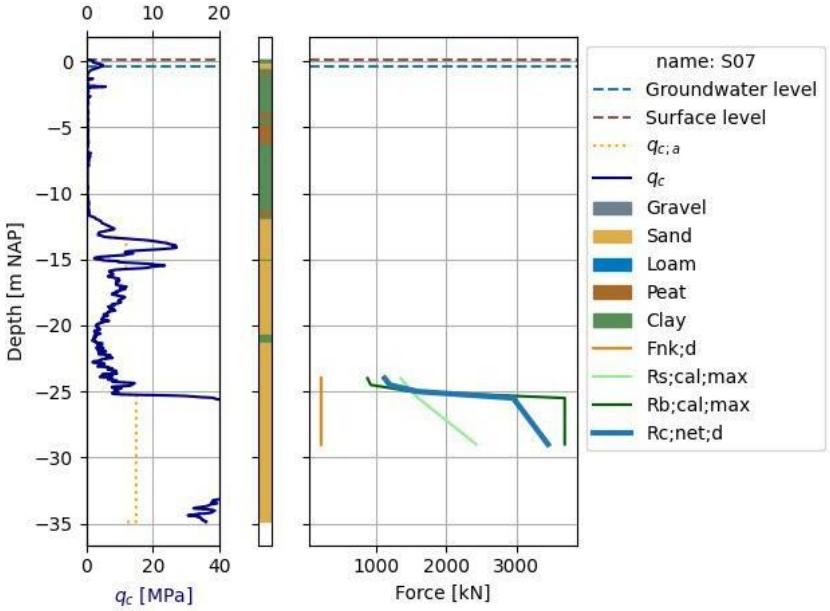
1) The results in this table are presented for the specific case when the pile-tip level is at -29.0 m NAP.
2) The average circumference of the pile per soil layer.
3) A minimum value of 0.25 for the product $K \_ \delta$ is applied in the calculations (7.3.2.2(7)(d)).

Pile bearing capacity (ULS):

Pile tip level	Base resistance					Shaft resistance		Pile resistance			
	q	q	q	q	R	q	R	R	R	F	R
[m NAP]	[MPa]	[MPa]	[MPa]	[MPa]	[kN]	[kPa]	[kN]	[kN]	[kN]	[kN]	[kN]
-24.0	9.8	7.7	2.5	3.5	869	63.87	1349	1596	1330	215	1115
-24.5	9.6	7.8	3.1	3.7	914	64.77	1423	1682	1401	215	1187
-25.0	15.7	15.3	3.8	6.1	1497	65.58	1501	2156	1797	215	1582
-25.5	43.6	43.6	5.8	15.0	3695	67.2	1595	3806	3171	215	2957
-26.0	52.3	48.1	10.4	15.0	3695	69.61	1713	3890	3242	215	3027
-26.5	56.3	56.1	15.7	15.0	3695	71.94	1833	3977	3314	215	3100
-27.0	59.1	49.1	20.9	15.0	3695	74.03	1951	4062	3385	215	3170
-27.5	56.9	49.3	26.1	15.0	3695	75.99	2071	4148	3457	215	3242
-28.0	54.1	48.0	30.7	15.0	3695	77.82	2189	4233	3527	215	3313
-28.5	51.7	45.2	33.8	15.0	3695	79.61	2309	4319	3599	215	3384
-29.0	50.7	45.1	37.9	15.0	3695	81.23	2426	4403	3669	215	3455

4) The average maximum shaft friction in the positive friction zone.

CPT and bearing capacity



Pile settlement (SLS):

Pile tip level	SLS loads			Distributed capacity		Pile settlement/ spring stiffness				
	F	F	F	R	R	S	S	S	K	K
[m NAP]	[kN]	[kN]	[kN]	[kN]	[kN]	[mm]	[mm]	[mm]	[kN/mm]	[kN/mm]
-24.0	781	215	995	625	971	3.5	3.7	7.2	267	138
-24.5	831	215	1045	658	1024	3.8	3.7	7.5	283	140
-25.0	1108	215	1322	1077	1080	5.2	4.3	9.5	305	139
-25.5	2070	215	2284	2658	1148	10.1	6.0	16.0	383	142
-26.0	2119	215	2334	2658	1233	10.5	5.8	16.3	403	143
-26.5	2170	215	2384	2658	1319	10.9	5.6	16.5	424	144
-27.0	2219	215	2434	2658	1404	11.3	5.5	16.8	445	145
-27.5	2269	215	2484	2658	1490	11.7	5.3	17.0	467	146
-28.0	2319	215	2533	2658	1575	12.1	5.2	17.3	489	147
-28.5	2369	215	2584	2658	1661	12.5	5.0	17.6	512	147

-29.0	2418	215	2633	2658	1745	13.0	4.9	17.9	535	147

PileCore CPT results for S06			CEMS
X coordinate* [m]:	123789.0	Excavation level [m NAP]:	N.A.
Y coordinate* [m]:	483485.0	ρ $[kN/m]$	0.0
Groundwater level [m NAP]:	-0.4	ξ [-]	1.39
Surface level [m NAP]:	0.18	qc-reduction:	N.A.

* The x and y coordinates of the CPT need to be in a Cartesian metric coordinate system.

Soil classification:

Soil code	Bottom	Thickness	γ	γ	
[-]	[m NAP]	[m]	$[kN/m]$	$[kN/m]$	[°]
V	0.16	0.02	10.0	10.0	15.0
V	0.06	0.1	10.0	10.0	15.0
V	-0.04	0.1	12.0	12.0	15.0
Z	-0.22	0.18	18.0	20.0	27.0
Z	-1.22	1.0	19.0	21.0	35.0
Z	-1.46	0.24	18.0	20.0	27.0
Z	-3.02	1.56	19.0	21.0	35.0
Z	-3.12	0.1	18.0	20.0	27.0
K	-4.46	1.34	14.0	14.0	17.5
V	-5.94	1.48	12.0	12.0	15.0
K	-6.3	0.36	15.0	15.0	15.0
K	-6.4	0.1	14.0	14.0	17.5
K	-6.86	0.46	18.0	18.0	27.5
K	-9.78	2.92	15.0	15.0	22.5
K	-10.89	1.12	14.0	14.0	17.5
K	-11.0	0.1	17.0	17.0	17.5
K	-11.12	0.12	15.0	15.0	15.0
V	-11.21	0.1	12.0	12.0	15.0
Z	-11.42	0.2	18.0	20.0	27.0
Z	-19.89	8.48	19.0	21.0	35.0
Z	-20.05	0.16	18.0	20.0	27.0
Z	-20.39	0.34	19.0	21.0	35.0
Z	-20.79	0.4	18.0	20.0	27.0
Z	-23.27	2.48	19.0	21.0	35.0
Z	-23.59	0.32	18.0	20.0	27.0
Z	-35.19	11.6	19.0	21.0	35.0

Friction range:

Pile tip level	Negative friction range [m NAP]		Positive friction range [m NAP]	
[m NAP]	Top	Bottom	Top	Bottom
-24.0	0.0	-12.01	-11.99	-24.01
-24.5	0.0	-12.01	-11.99	-24.51
-25.0	0.0	-12.01	-11.99	-25.01
-25.5	0.0	-12.01	-11.99	-25.51
-26.0	0.0	-12.01	-11.99	-26.0
-26.5	0.0	-12.01	-11.99	-26.5
-27.0	0.0	-12.01	-11.99	-27.0
-27.5	0.0	-12.01	-11.99	-27.5
-28.0	0.0	-12.01	-11.99	-28.0
-28.5	0.0	-12.01	-11.99	-28.5
-29.0	0.0	-12.01	-11.99	-29.0

Negative skin friction

Soil code	Bottom	Thickness	Average circum.	σ'	δ	K	F
[-]	[m NAP]	[m]	[m]	[kN/m]	[°]	[-]	[kN]
V	-0.04	0.1	1.76	1.7	15.0	0.7	0
Z	-0.22	0.18	1.76	3.8	27.0	0.5	0
Z	-1.22	1.0	1.76	12.4	35.0	0.4	7
Z	-1.46	0.24	1.76	19.4	27.0	0.5	2
Z	-3.02	1.56	1.76	29.3	35.0	0.4	24
Z	-3.12	0.1	1.76	38.5	27.0	0.5	2
K	-4.46	1.34	1.76	41.9	17.5	0.7	25
V	-5.94	1.48	1.76	46.3	15.0	0.7	30
K	-6.3	0.36	1.76	48.9	15.0	0.7	8
K	-6.4	0.1	1.76	50.0	17.5	0.7	2
K	-6.86	0.46	1.76	52.1	27.5	0.5	12
K	-9.78	2.92	1.76	61.6	22.5	0.6	81
K	-10.89	1.12	1.76	71.5	17.5	0.7	35
K	-11.0	0.1	1.76	74.2	17.5	0.7	3
K	-11.12	0.12	1.76	74.9	15.0	0.7	4
V	-11.21	0.1	1.76	75.3	15.0	0.7	3
Z	-11.42	0.2	1.76	76.4	27.0	0.5	7
Z	-19.89	8.48	1.76	124.8	35.0	0.4	25

1) The results in this table are presented for the specific case when the pile-tip level is at -29.0 m NAP.
2) The average circumference of the pile per soil layer.
3) A minimum value of 0.25 for the product K _ δ _ is applied in the calculations (7.3.2.2(7)(d)).

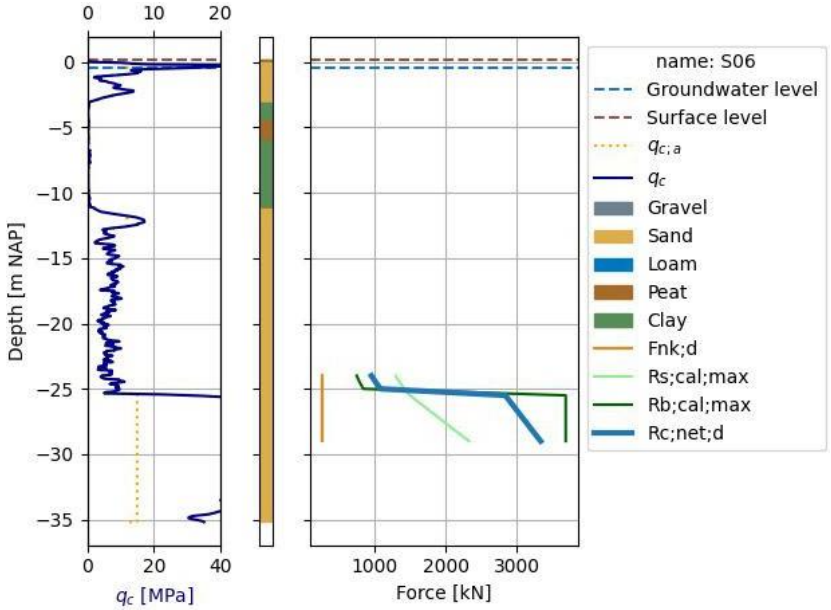
Pile bearing capacity (ULS):

Pile tip level	Base resistance					Shaft resistance		Pile resistance			
	q	q	q	q	R	q	R	R	R	F	R
[m NAP]	[MPa]	[MPa]	[MPa]	[MPa]	[kN]	[kPa]	[kN]	[kN]	[kN]	[kN]	[kN]
-24.0	6.3	6.3	3.3	3.0	747	61.43	1297	1471	1226	271	955
-24.5	8.2	5.1	3.5	3.2	790	61.65	1354	1543	1286	271	1015
-25.0	8.3	5.9	3.7	3.4	840	62.23	1422	1627	1356	271	1086
-25.5	45.3	45.1	4.5	15.0	3695	63.2	1498	3736	3113	271	2842
-26.0	56.6	52.6	9.4	15.0	3695	65.76	1616	3821	3184	271	2913

-26.5	58.1	54.2	14.8	15.0	3695	68.14	1735	3906	3255	271	2985
-27.0	57.4	52.5	20.3	15.0	3695	70.36	1854	3992	3326	271	3056
-27.5	56.0	51.0	25.2	15.0	3695	72.44	1972	4077	3397	271	3127
-28.0	53.7	49.2	29.5	15.0	3695	74.39	2091	4162	3468	271	3198
-28.5	53.0	49.2	34.6	15.0	3695	76.22	2209	4247	3539	271	3269
-29.0	52.2	49.3	39.5	15.0	3695	77.95	2330	4334	3612	271	3341

4) The average maximum shaft friction in the positive friction zone.

CPT and bearing capacity



Pile settlement (SLS):

Pile tip level	SLS loads			Distributed capacity		Pile settlement/ spring stiffness				
	F	F	F	R	R	S	S	S	K	K
[m NAP]	[kN]	[kN]	[kN]	[kN]	[kN]	[mm]	[mm]	[mm]	[kN/mm]	[kN/mm]
-24.0	669	271	939	538	933	3.2	3.8	7.0	247	133
-24.5	711	271	981	569	974	3.5	3.8	7.3	259	135
-25.0	760	271	1030	604	1023	3.8	3.8	7.5	274	137
-25.5	1990	271	2260	2658	1078	10.0	6.2	16.2	363	139
-26.0	2039	271	2310	2658	1163	10.4	6.0	16.5	382	140
-26.5	2089	271	2360	2658	1248	10.8	5.9	16.7	402	141
-27.0	2139	271	2410	2658	1334	11.2	5.7	16.9	422	142
-27.5	2189	271	2459	2658	1419	11.6	5.6	17.2	443	143
-28.0	2238	271	2509	2658	1504	12.1	5.4	17.5	465	144
-28.5	2288	271	2559	2658	1589	12.5	5.3	17.7	487	144
-29.0	2339	271	2609	2658	1676	12.9	5.1	18.0	510	145

PileCore CPT results for S02			CEMS
X coordinate* [m]:	123797.0	Excavation level [m NAP]:	N.A.
Y coordinate* [m]:	483441.0	ρ $[kN/m]$	0.0
Groundwater level [m NAP]:	-0.4	ξ [-]	1.39
Surface level [m NAP]:	-0.63	qc-reduction:	N.A.

* The x and y coordinates of the CPT need to be in a Cartesian metric coordinate system.

Soil classification:

Soil code	Bottom	Thickness	γ	γ	
[-]	[m NAP]	[m]	$[kN/m]$	$[kN/m]$	[°]
K	-1.25	0.62	15.0	15.0	22.5
K	-1.41	0.16	15.0	15.0	22.5
Z	-1.71	0.3	18.0	20.0	27.0
Z	-5.13	3.42	19.0	21.0	35.0
Z	-5.27	0.14	18.0	20.0	27.0
V	-6.27	1.0	12.0	12.0	15.0
K	-7.01	0.74	14.0	14.0	17.5
K	-10.79	3.78	15.0	15.0	22.5
K	-11.13	0.34	17.0	17.0	17.5
K	-11.31	0.18	15.0	15.0	22.5
K	-11.59	0.28	14.0	14.0	17.5
K	-11.69	0.1	17.0	17.0	17.5
K	-12.19	0.5	15.0	15.0	15.0
K	-12.33	0.14	18.0	18.0	22.5
Z	-12.47	0.14	18.0	20.0	27.0
Z	-14.65	2.18	19.0	21.0	35.0
K	-14.79	0.14	18.0	18.0	27.5
K	-14.89	0.1	20.0	20.0	22.5
Z	-15.01	0.12	18.0	20.0	25.0
Z	-15.33	0.32	19.0	21.0	35.0
Z	-15.53	0.2	18.0	20.0	27.0
Z	-21.64	6.12	19.0	21.0	35.0
K	-22.18	0.54	18.0	18.0	27.5
K	-23.14	0.96	18.0	18.0	22.5
Z	-23.32	0.18	18.0	20.0	27.0
K	-24.0	0.68	20.0	20.0	22.5
Z	-24.12	0.12	18.0	20.0	27.0
Z	-35.51	11.39	19.0	21.0	35.0

Friction range:

Pile tip level	Negative friction range [m NAP]		Positive friction range [m NAP]	
[m NAP]	Top	Bottom	Top	Bottom
-24.0	-0.63	-12.01	-11.99	-24.0
-24.5	-0.63	-12.01	-11.99	-24.5
-25.0	-0.63	-12.01	-11.99	-25.0
-25.5	-0.63	-12.01	-11.99	-25.5
-26.0	-0.63	-12.01	-11.99	-25.99
-26.5	-0.63	-12.01	-11.99	-26.49
-27.0	-0.63	-12.01	-11.99	-26.99
-27.5	-0.63	-12.01	-11.99	-27.49
-28.0	-0.63	-12.01	-11.99	-27.99
-28.5	-0.63	-12.01	-11.99	-28.51
-29.0	-0.63	-12.01	-11.99	-29.01

Negative skin friction

Soil code	Bottom	Thickness	Average circum.	σ'	δ	K	F
[-]	[m NAP]	[m]	[m]	[kN/m]	[°]	[-]	[kN]
K	-1.25	0.62	1.76	1.6	22.5	0.6	0
K	-1.41	0.16	1.76	3.6	22.5	0.6	0
Z	-1.71	0.3	1.76	5.5	27.0	0.5	1
Z	-5.13	3.42	1.76	26.2	35.0	0.4	47
Z	-5.27	0.14	1.76	46.0	27.0	0.5	3
V	-6.27	1.0	1.76	47.9	15.0	0.7	21
K	-7.01	0.74	1.76	50.5	17.5	0.7	16
K	-10.79	3.78	1.76	61.9	22.5	0.6	105
K	-11.13	0.34	1.76	72.9	17.5	0.7	11
K	-11.31	0.18	1.76	74.6	22.5	0.6	6
K	-11.59	0.28	1.76	75.6	17.5	0.7	9
K	-11.69	0.1	1.76	76.6	17.5	0.7	3
K	-12.19	0.5	1.76	78.2	15.0	0.7	10

1) The results in this table are presented for the specific case when the pile-tip level is at -29.0 m NAP.
2) The average circumference of the pile per soil layer.
3) A minimum value of 0.25 for the product K δ is applied in the calculations (7.3.2.2(7)(d)).

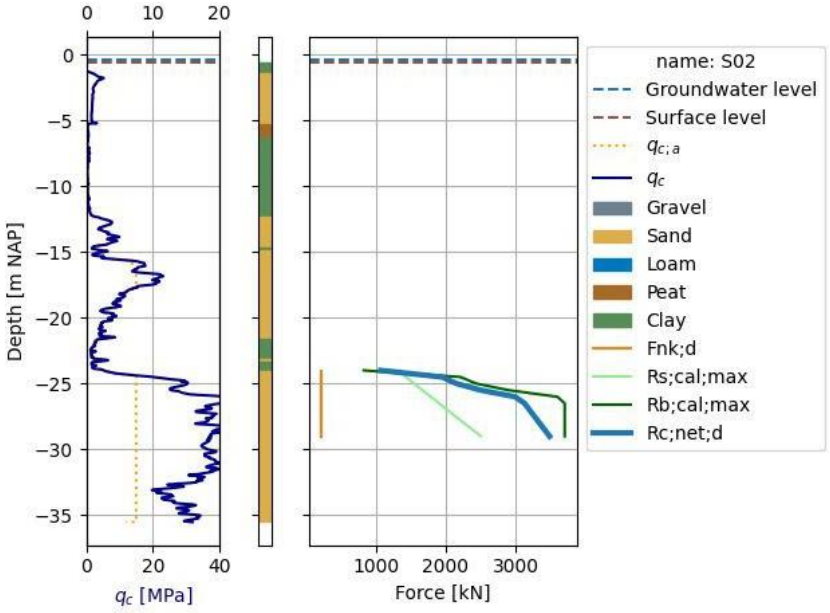
Pile bearing capacity (ULS):

Pile tip level	Base resistance					Shaft resistance		Pile resistance			
	q	q	q	q	R	q	R	R	R	F	R
[m NAP]	[MPa]	[MPa]	[MPa]	[MPa]	[kN]	[kPa]	[kN]	[kN]	[kN]	[kN]	[kN]
-24.0	9.2	9.2	1.5	3.4	832	63.8	1349	1570	1308	235	1073
-24.5	27.1	24.7	2.6	9.0	2208	65.02	1431	2618	2182	235	1947
-25.0	27.3	25.2	5.2	9.9	2435	67.7	1549	2866	2388	235	2154
-25.5	29.5	29.5	7.8	11.7	2894	70.19	1668	3282	2735	235	2500
-26.0	37.8	32.8	11.0	14.6	3590	72.5	1786	3867	3223	235	2988
-26.5	36.2	32.9	14.5	15.0	3695	74.65	1905	4028	3357	235	3122
-27.0	36.0	32.7	18.0	15.0	3695	76.65	2023	4113	3428	235	3193
-27.5	36.0	32.8	21.5	15.0	3695	78.53	2142	4199	3499	235	3264
-28.0	37.2	34.5	24.9	15.0	3695	80.29	2260	4284	3570	235	3335
-28.5	36.7	34.6	28.5	15.0	3695	82.01	2381	4371	3642	235	3408

-29.0	36.0	34.6	31.1	15.0	3695	83.56	2500	4456	3713	235	3479

4) The average maximum shaft friction in the positive friction zone.

CPT and bearing capacity



Pile settlement (SLS):

Pile tip level	SLS loads			Distributed capacity		Pile settlement/ spring stiffness				
	F	F	F	R	R	S	S	S	K	K
[m NAP]	[kN]	[kN]	[kN]	[kN]	[kN]	[mm]	[mm]	[mm]	[kN/mm]	[kN/mm]
-24.0	751	235	986	599	971	3.3	3.7	7.1	264	140
-24.5	1363	235	1597	1589	1029	6.2	5.3	11.4	304	140
-25.0	1508	235	1742	1752	1115	7.0	5.2	12.2	333	143
-25.5	1750	235	1985	2082	1200	8.3	5.4	13.7	367	145
-26.0	2092	235	2326	2583	1285	10.1	5.7	15.8	410	148
-26.5	2186	235	2420	2658	1370	10.7	5.6	16.3	434	149
-27.0	2235	235	2470	2658	1455	11.1	5.4	16.5	456	149
-27.5	2285	235	2520	2658	1541	11.5	5.3	16.8	478	150
-28.0	2335	235	2569	2658	1626	11.9	5.1	17.1	500	151
-28.5	2385	235	2620	2658	1713	12.3	5.0	17.3	524	151
-29.0	2435	235	2670	2658	1798	12.8	4.9	17.6	547	151

PileCore CPT results for S04			CEMS
X coordinate* [m]:	123759.0	Excavation level [m NAP]:	N.A.
Y coordinate* [m]:	483465.0	ρ $[kN/m]$	0.0
Groundwater level [m NAP]:	-0.4	ξ [-]	1.39
Surface level [m NAP]:	-0.15	qc-reduction:	N.A.

* The x and y coordinates of the CPT need to be in a Cartesian metric coordinate system.

Soil classification:

Soil code	Bottom	Thickness	γ	γ	
[-]	[m NAP]	[m]	$[kN/m]$	$[kN/m]$	[°]
V	-0.17	0.02	10.0	10.0	15.0
V	-0.33	0.16	10.0	10.0	15.0
V	-0.43	0.1	12.0	12.0	15.0
K	-0.55	0.12	18.0	18.0	27.5
Z	-1.95	1.4	19.0	21.0	35.0
Z	-2.05	0.1	18.0	20.0	27.0
Z	-3.67	1.62	19.0	21.0	35.0
Z	-3.77	0.1	18.0	20.0	27.0
K	-3.91	0.14	15.0	15.0	22.5
Z	-4.19	0.28	18.0	20.0	27.0
Z	-4.29	0.1	19.0	21.0	35.0
K	-4.47	0.18	15.0	15.0	22.5
K	-4.65	0.18	14.0	14.0	17.5
V	-6.16	1.52	12.0	12.0	15.0
K	-6.54	0.38	15.0	15.0	15.0
K	-6.64	0.1	14.0	14.0	17.5
K	-9.9	3.26	18.0	18.0	27.5
K	-10.22	0.32	14.0	14.0	17.5
K	-10.44	0.22	17.0	17.0	17.5
K	-10.54	0.1	15.0	15.0	15.0
K	-11.06	0.52	14.0	14.0	17.5
K	-11.58	0.52	17.0	17.0	17.5
K	-11.94	0.36	18.0	18.0	22.5
Z	-13.62	1.68	19.0	21.0	35.0
Z	-13.71	0.1	18.0	20.0	25.0
Z	-14.97	1.26	19.0	21.0	35.0
Z	-15.49	0.52	18.0	20.0	27.0
Z	-20.38	4.89	19.0	21.0	35.0
Z	-21.55	1.18	18.0	20.0	27.0
Z	-21.67	0.12	19.0	21.0	35.0
K	-22.27	0.6	18.0	18.0	27.5
K	-22.65	0.38	18.0	18.0	22.5
Z	-22.83	0.18	18.0	20.0	25.0
Z	-23.03	0.2	19.0	21.0	35.0
Z	-23.23	0.2	18.0	20.0	27.0
K	-23.45	0.22	18.0	18.0	27.5
Z	-23.69	0.24	18.0	20.0	27.0
Z	-34.98	11.29	19.0	21.0	35.0

Friction range:

Pile tip level	Negative friction range [m NAP]		Positive friction range [m NAP]	
[m NAP]	Top	Bottom	Top	Bottom
-24.0	-0.15	-12.02	-12.0	-24.01
-24.5	-0.15	-12.02	-12.0	-24.51
-25.0	-0.15	-12.02	-12.0	-25.0
-25.5	-0.15	-12.02	-12.0	-25.5
-26.0	-0.15	-12.02	-12.0	-26.0
-26.5	-0.15	-12.02	-12.0	-26.5
-27.0	-0.15	-12.02	-12.0	-27.0
-27.5	-0.15	-12.02	-12.0	-27.5
-28.0	-0.15	-12.02	-12.0	-28.0
-28.5	-0.15	-12.02	-12.0	-28.49
-29.0	-0.15	-12.02	-12.0	-28.99

Negative skin friction

Soil code	Bottom	Thickness	Average circum.	σ'	δ	K	F
[-]	[m NAP]	[m]	[m]	[kN/m]	[°]	[-]	[kN]
V	-0.17	0.02	1.76	0.0	15.0	0.7	0
V	-0.33	0.16	1.76	0.9	15.0	0.7	0
V	-0.43	0.1	1.76	2.3	15.0	0.7	0
K	-0.55	0.12	1.76	3.1	27.5	0.5	0
Z	-1.95	1.4	1.76	11.4	35.0	0.4	8
Z	-2.05	0.1	1.76	19.7	27.0	0.5	1
Z	-3.67	1.62	1.76	29.3	35.0	0.4	25
Z	-3.77	0.1	1.76	38.9	27.0	0.5	2
K	-3.91	0.14	1.76	39.8	22.5	0.6	3
Z	-4.19	0.28	1.76	41.5	27.0	0.5	6
Z	-4.29	0.1	1.76	43.5	35.0	0.4	2
K	-4.47	0.18	1.76	44.6	22.5	0.6	4
K	-4.65	0.18	1.76	45.4	17.5	0.7	4
V	-6.16	1.52	1.76	47.5	15.0	0.7	32
K	-6.54	0.38	1.76	50.1	15.0	0.7	8
K	-6.64	0.1	1.76	51.3	17.5	0.7	2
K	-9.9	3.26	1.76	64.8	27.5	0.5	104
K	-10.22	0.32	1.76	78.9	17.5	0.7	11
K	-10.44	0.22	1.76	80.3	17.5	0.7	8
K	-10.54	0.1	1.76	81.4	15.0	0.7	4
K	-11.06	0.52	1.76	82.7	17.5	0.7	19
K	-11.58	0.52	1.76	85.7	17.5	0.7	20
K	-11.94	0.36	1.76	89.0	22.5	0.6	14
Z	-13.62	1.68	1.76	99.8	35.0	0.4	3

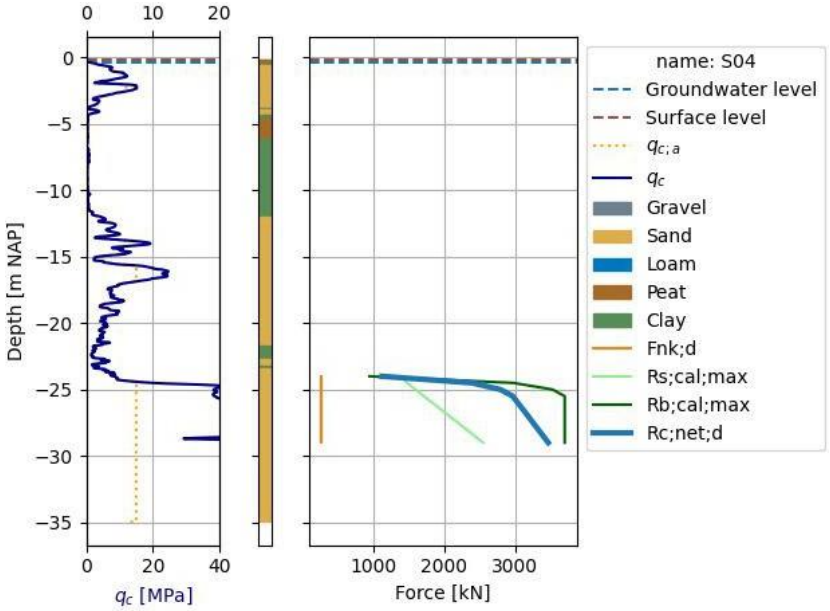
1) The results in this table are presented for the specific case when the pile-tip level is at -29.0 m NAP.
2) The average circumference of the pile per soil layer.
3) A minimum value of 0.25 for the product K δ is applied in the calculations (7.3.2.2(7)(d)).

Pile bearing capacity (ULS):

Pile tip level	Base resistance					Shaft resistance		Pile resistance			
	q	q	q	q	R	q	R	R	R	F	R
[m NAP]	[MPa]	[MPa]	[MPa]	[MPa]	[kN]	[kPa]	[kN]	[kN]	[kN]	[kN]	[kN]
-24.0	10.0	9.9	2.3	3.9	950	65.93	1392	1685	1404	279	1125
-24.5	35.2	34.6	3.4	12.1	2973	67.33	1479	3203	2669	279	2390
-25.0	38.5	38.0	7.2	14.3	3524	69.92	1597	3684	3070	279	2791
-25.5	41.5	41.5	11.2	15.0	3695	72.32	1716	3892	3244	279	2964
-26.0	60.5	58.6	15.9	15.0	3695	74.55	1834	3977	3314	279	3035
-26.5	59.1	29.3	15.6	15.0	3695	76.62	1955	4064	3387	279	3108
-27.0	56.8	29.5	18.7	15.0	3695	78.56	2073	4150	3458	279	3179
-27.5	54.0	29.6	21.8	15.0	3695	80.38	2192	4235	3529	279	3250
-28.0	50.1	29.6	24.7	15.0	3695	82.08	2310	4320	3600	279	3321
-28.5	41.1	36.2	27.2	15.0	3695	83.67	2429	4405	3671	279	3392
-29.0	57.5	56.0	30.3	15.0	3695	85.18	2547	4490	3742	279	3463

4) The average maximum shaft friction in the positive friction zone.

CPT and bearing capacity



Pile settlement (SLS):

Pile tip level	SLS loads			Distributed capacity		Pile settlement/ spring stiffness				
	F	F	F	R	R	S	S	S	K	K
[m NAP]	[kN]	[kN]	[kN]	[kN]	[kN]	[mm]	[mm]	[mm]	[kN/mm]	[kN/mm]
-24.0	787	279	1067	683	1002	3.6	4.0	7.6	268	140
-24.5	1673	279	1952	2139	1064	7.9	5.9	13.8	332	142
-25.0	1954	279	2233	2535	1149	9.4	6.0	15.4	372	145
-25.5	2075	279	2354	2658	1234	10.2	5.9	16.1	398	146
-26.0	2125	279	2404	2658	1319	10.5	5.8	16.3	418	147
-26.5	2175	279	2455	2658	1406	11.0	5.6	16.5	439	148
-27.0	2225	279	2504	2658	1492	11.4	5.4	16.8	461	149
-27.5	2275	279	2554	2658	1577	11.8	5.3	17.1	483	150
-28.0	2325	279	2604	2658	1662	12.2	5.2	17.3	505	150
-28.5	2374	279	2653	2658	1747	12.6	5.0	17.6	528	151

-29.0	2424	279	2703	2658	1833	13.0	4.9	17.9	551	151

PileCore CPT results for S03			CEMS
X coordinate* [m]:	123774.0	Excavation level [m NAP]:	N.A.
Y coordinate* [m]:	483449.0	ρ $[kN/m]$	0.0
Groundwater level [m NAP]:	-0.4	ξ [-]	1.39
Surface level [m NAP]:	-0.25	qc-reduction:	N.A.

* The x and y coordinates of the CPT need to be in a Cartesian metric coordinate system.

Soil classification:

Soil code	Bottom	Thickness	γ	γ	
[-]	[m NAP]	[m]	$[kN/m]$	$[kN/m]$	[°]
Z	-0.27	0.02	18.0	20.0	27.0
Z	-0.57	0.3	18.0	20.0	27.0
Z	-1.69	1.12	19.0	21.0	35.0
Z	-1.79	0.1	18.0	20.0	25.0
Z	-1.89	0.1	18.0	20.0	27.0
K	-2.11	0.22	18.0	18.0	27.5
K	-2.31	0.2	14.0	14.0	17.5
Z	-3.97	1.66	19.0	21.0	35.0
K	-4.45	0.48	18.0	18.0	27.5
K	-4.65	0.2	15.0	15.0	22.5
K	-4.99	0.34	14.0	14.0	17.5
K	-5.23	0.24	17.0	17.0	17.5
K	-5.77	0.54	14.0	14.0	17.5
K	-5.97	0.2	17.0	17.0	17.5
K	-6.86	0.9	14.0	14.0	17.5
Z	-8.22	1.36	18.0	20.0	27.0
K	-10.34	2.12	18.0	18.0	27.5
K	-10.54	0.2	14.0	14.0	17.5
K	-10.76	0.22	15.0	15.0	15.0
K	-11.2	0.44	14.0	14.0	17.5
K	-11.4	0.2	17.0	17.0	17.5
V	-11.74	0.34	12.0	12.0	15.0
K	-11.84	0.1	15.0	15.0	15.0
K	-12.06	0.22	18.0	18.0	27.5
Z	-21.5	9.43	19.0	21.0	35.0
K	-22.03	0.54	20.0	20.0	22.5
K	-22.81	0.78	18.0	18.0	22.5
Z	-23.03	0.22	18.0	20.0	27.0
Z	-23.25	0.22	19.0	21.0	35.0
Z	-23.39	0.14	18.0	20.0	27.0
Z	-23.59	0.2	19.0	21.0	35.0
Z	-23.75	0.16	18.0	20.0	25.0
Z	-35.52	11.77	19.0	21.0	35.0

Friction range:

Pile tip level	Negative friction range [m NAP]		Positive friction range [m NAP]	
[m NAP]	Top	Bottom	Top	Bottom
-24.0	-0.25	-12.02	-12.0	-23.99
-24.5	-0.25	-12.02	-12.0	-24.51
-25.0	-0.25	-12.02	-12.0	-25.01
-25.5	-0.25	-12.02	-12.0	-25.51
-26.0	-0.25	-12.02	-12.0	-26.0
-26.5	-0.25	-12.02	-12.0	-26.5
-27.0	-0.25	-12.02	-12.0	-27.0
-27.5	-0.25	-12.02	-12.0	-27.5
-28.0	-0.25	-12.02	-12.0	-27.99
-28.5	-0.25	-12.02	-12.0	-28.49
-29.0	-0.25	-12.02	-12.0	-29.01

Negative skin friction

Soil code	Bottom	Thickness	Average circum.	σ'	δ	K	F
[-]	[m NAP]	[m]	[m]	[kN/m]	[°]	[-]	[kN]
Z	-0.27	0.02	1.76	0.2	27.0	0.5	0
Z	-0.57	0.3	1.76	2.7	27.0	0.5	0
Z	-1.69	1.12	1.76	10.7	35.0	0.4	6
Z	-1.79	0.1	1.76	17.4	25.0	0.6	1
Z	-1.89	0.1	1.76	18.4	27.0	0.5	1
K	-2.11	0.22	1.76	19.8	27.5	0.5	2
K	-2.31	0.2	1.76	21.2	17.5	0.7	2
Z	-3.97	1.66	1.76	30.8	35.0	0.4	27
K	-4.45	0.48	1.76	42.1	27.5	0.5	10
K	-4.65	0.2	1.76	44.6	22.5	0.6	4
K	-4.99	0.34	1.76	45.8	17.5	0.7	7
K	-5.23	0.24	1.76	47.4	17.5	0.7	5
K	-5.77	0.54	1.76	49.4	17.5	0.7	12
K	-5.97	0.2	1.76	51.2	17.5	0.7	5
K	-6.86	0.9	1.76	53.9	17.5	0.7	21
Z	-8.22	1.36	1.76	62.6	27.0	0.5	42
K	-10.34	2.12	1.76	78.2	27.5	0.5	82
K	-10.54	0.2	1.76	87.4	17.5	0.7	8
K	-10.76	0.22	1.76	88.3	15.0	0.7	9
K	-11.2	0.44	1.76	89.8	17.5	0.7	17
K	-11.4	0.2	1.76	91.5	17.5	0.7	8
V	-11.74	0.34	1.76	92.6	15.0	0.7	14
K	-11.84	0.1	1.76	93.2	15.0	0.7	4
K	-12.06	0.22	1.76	94.3	27.5	0.5	7

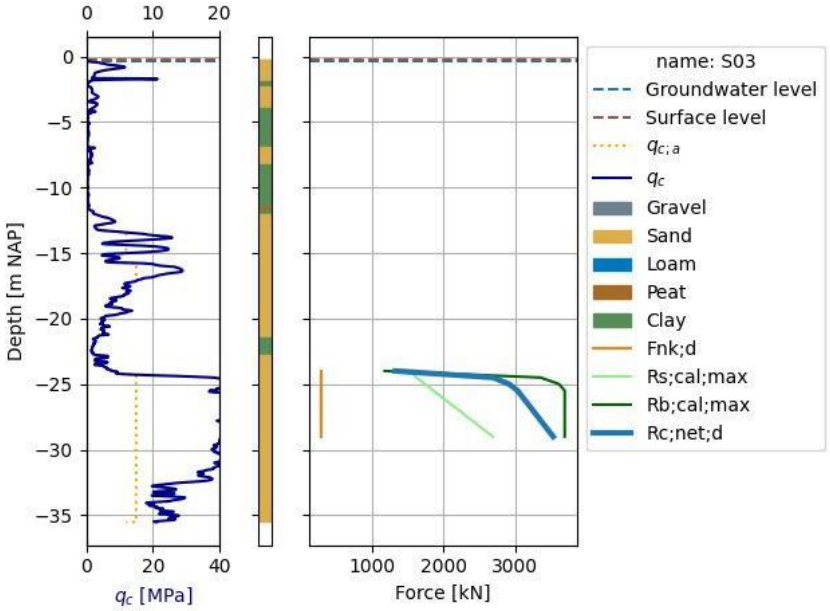
1) The results in this table are presented for the specific case when the pile-tip level is at -29.0 m NAP.
2) The average circumference of the pile per soil layer.
3) A minimum value of 0.25 for the product K δ is applied in the calculations (7.3.2.2(7)(d)).

Pile bearing capacity (ULS):

Pile tip level	Base resistance					Shaft resistance		Pile resistance			
	q	q	q	q	R	q	R	R	R	F	R
[m NAP]	[MPa]	[MPa]	[MPa]	[MPa]	[kN]	[kPa]	[kN]	[kN]	[kN]	[kN]	[kN]
-24.0	13.0	12.9	2.2	4.8	1173	72.19	1523	1940	1617	293	1323
-24.5	41.5	36.9	4.1	13.6	3356	73.74	1620	3580	2983	293	2690
-25.0	40.4	36.9	8.0	14.7	3617	76.09	1739	3853	3211	293	2917
-25.5	45.5	45.4	11.9	15.0	3695	78.27	1857	3994	3328	293	3035
-26.0	51.5	40.0	16.0	15.0	3695	80.29	1975	4079	3399	293	3106
-26.5	49.1	39.5	20.2	15.0	3695	82.17	2093	4164	3470	293	3177
-27.0	45.9	39.7	24.3	15.0	3695	83.92	2214	4251	3542	293	3249
-27.5	43.1	38.3	28.0	15.0	3695	85.57	2332	4336	3613	293	3320
-28.0	42.2	37.7	31.6	15.0	3695	87.11	2450	4421	3684	293	3390
-28.5	41.1	37.7	35.2	15.0	3695	88.56	2568	4505	3754	293	3461
-29.0	39.3	37.7	37.4	15.0	3695	89.97	2688	4592	3827	293	3533

4) The average maximum shaft friction in the positive friction zone.

CPT and bearing capacity



Pile settlement (SLS):

Pile tip level	SLS loads			Distributed capacity		Pile settlement/ spring stiffness				
	F	F	F	R	R	S	S	S	K	K
[m NAP]	[kN]	[kN]	[kN]	[kN]	[kN]	[mm]	[mm]	[mm]	[kN/mm]	[kN/mm]
-24.0	926	293	1220	844	1096	4.2	4.1	8.3	296	147
-24.5	1883	293	2176	2415	1165	8.8	5.9	14.7	368	148
-25.0	2042	293	2336	2602	1251	9.7	5.9	15.6	398	150
-25.5	2124	293	2418	2658	1336	10.3	5.7	16.0	421	151
-26.0	2174	293	2467	2658	1421	10.7	5.6	16.3	441	152
-26.5	2224	293	2517	2658	1506	11.1	5.4	16.5	463	152
-27.0	2274	293	2568	2658	1593	11.5	5.3	16.8	485	153
-27.5	2324	293	2617	2658	1678	11.9	5.2	17.0	508	154
-28.0	2373	293	2667	2658	1763	12.3	5.0	17.3	531	154
-28.5	2423	293	2716	2658	1847	12.7	4.9	17.6	554	154

-29.0	2473	293	2767	2658	1934	13.1	4.8	17.9	577	154

PileCore CPT results for S01			CEMS
X coordinate* [m]:	123805.0	Excavation level [m NAP]:	N.A.
Y coordinate* [m]:	483464.0	ρ [kN/m]	0.0
Groundwater level [m NAP]:	-0.4	ξ [-]	1.39
Surface level [m NAP]:	-0.22	qc-reduction:	N.A.

* The x and y coordinates of the CPT need to be in a Cartesian metric coordinate system.

Soil classification:

Soil code	Bottom	Thickness	γ	γ	
[-]	[m NAP]	[m]	[kN/m]	[kN/m]	[°]
Z	-1.44	1.22	19.0	21.0	35.0
Z	-1.62	0.18	19.0	21.0	35.0
K	-1.84	0.22	15.0	15.0	22.5
K	-3.2	1.36	14.0	14.0	17.5
K	-3.34	0.14	17.0	17.0	17.5
K	-4.82	1.48	14.0	14.0	17.5
K	-6.24	1.42	15.0	15.0	15.0
K	-6.9	0.66	14.0	14.0	17.5
Z	-8.06	1.16	18.0	20.0	27.0
K	-10.28	2.22	14.0	14.0	17.5
K	-10.4	0.12	15.0	15.0	22.5
K	-10.52	0.12	14.0	14.0	17.5
K	-10.62	0.1	17.0	17.0	17.5
K	-10.86	0.24	15.0	15.0	15.0
K	-11.26	0.4	14.0	14.0	17.5
K	-11.36	0.1	17.0	17.0	17.5
V	-11.76	0.4	12.0	12.0	15.0
K	-11.92	0.16	20.0	20.0	22.5
Z	-12.89	0.98	19.0	21.0	35.0
K	-13.41	0.52	18.0	18.0	27.5
Z	-14.89	1.48	19.0	21.0	35.0
Z	-15.19	0.3	18.0	20.0	27.0
Z	-15.33	0.14	18.0	20.0	25.0
Z	-19.92	4.59	19.0	21.0	35.0
Z	-20.56	0.64	18.0	20.0	27.0
K	-21.22	0.66	18.0	18.0	27.5
Z	-22.28	1.06	18.0	20.0	27.0
Z	-22.91	0.64	19.0	21.0	35.0
Z	-23.57	0.66	18.0	20.0	27.0
Z	-35.58	12.01	19.0	21.0	35.0

Friction range:

Pile tip level	Negative friction range [m NAP]		Positive friction range [m NAP]	
[m NAP]	Top	Bottom	Top	Bottom
-24.0	-0.22	-12.02	-12.0	-24.01
-24.5	-0.22	-12.02	-12.0	-24.51
-25.0	-0.22	-12.02	-12.0	-25.0
-25.5	-0.22	-12.02	-12.0	-25.5
-26.0	-0.22	-12.02	-12.0	-26.0
-26.5	-0.22	-12.02	-12.0	-26.5
-27.0	-0.22	-12.02	-12.0	-27.0
-27.5	-0.22	-12.02	-12.0	-27.49
-28.0	-0.22	-12.02	-12.0	-27.99
-28.5	-0.22	-12.02	-12.0	-28.51
-29.0	-0.22	-12.02	-12.0	-29.0

Negative skin friction

Soil code	Bottom	Thickness	Average circum.	σ'	δ	K	F
[-]	[m NAP]	[m]	[m]	[kN/m]	[°]	[-]	[kN]
Z	-1.44	1.22	1.76	8.1	35.0	0.4	5
Z	-1.62	0.18	1.76	16.0	35.0	0.4	2
K	-1.84	0.22	1.76	17.6	22.5	0.6	2
K	-3.2	1.36	1.76	21.0	17.5	0.7	13
K	-3.34	0.14	1.76	24.4	17.5	0.7	2
K	-4.82	1.48	1.76	28.0	17.5	0.7	18
K	-6.24	1.42	1.76	34.8	15.0	0.7	22
K	-6.9	0.66	1.76	39.9	17.5	0.7	12
Z	-8.06	1.16	1.76	47.1	27.0	0.5	27
K	-10.28	2.22	1.76	57.7	17.5	0.7	56
K	-10.4	0.12	1.76	62.6	22.5	0.6	3
K	-10.52	0.12	1.76	63.2	17.5	0.7	3
K	-10.62	0.1	1.76	63.8	17.5	0.7	3
K	-10.86	0.24	1.76	64.8	15.0	0.7	7
K	-11.26	0.4	1.76	66.3	17.5	0.7	12
K	-11.36	0.1	1.76	67.4	17.5	0.7	3
V	-11.76	0.4	1.76	68.3	15.0	0.7	12
K	-11.92	0.16	1.76	69.5	22.5	0.6	5
Z	-12.89	0.98	1.76	75.7	35.0	0.4	3

1) The results in this table are presented for the specific case when the pile-tip level is at -29.0 m NAP.
2) The average circumference of the pile per soil layer.
3) A minimum value of 0.25 for the product K δ is applied in the calculations (7.3.2.2(7)(d)).

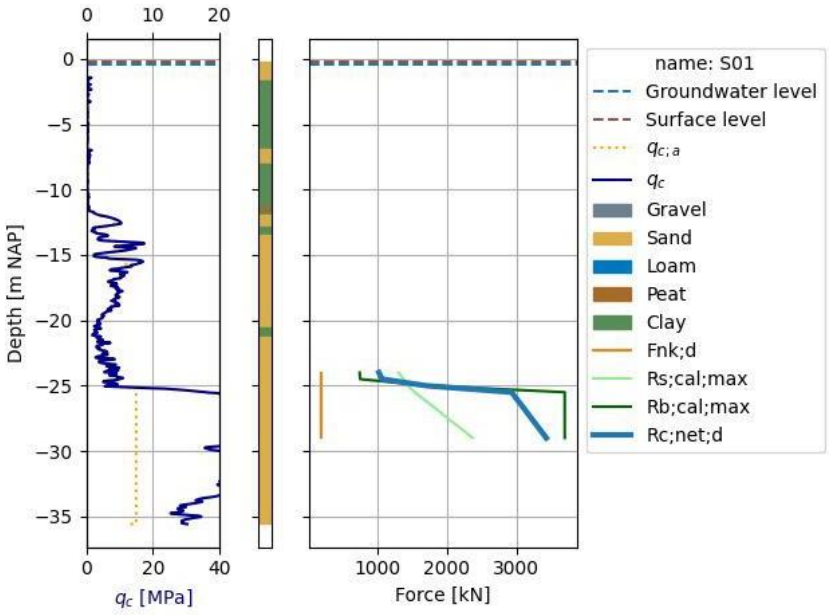
Pile bearing capacity (ULS):

Pile tip level	Base resistance					Shaft resistance		Pile resistance			
	q	q	q	q	R	q	R	R	R	F	R
[m NAP]	[MPa]	[MPa]	[MPa]	[MPa]	[kN]	[kPa]	[kN]	[kN]	[kN]	[kN]	[kN]
-24.0	8.2	5.3	3.0	3.0	751	62.03	1310	1483	1236	208	1028
-24.5	7.5	5.4	3.3	3.1	758	62.77	1380	1539	1282	208	1074
-25.0	18.8	18.8	3.7	7.1	1748	62.96	1441	2294	1912	208	1703
-25.5	50.4	44.1	6.1	15.0	3695	65.11	1544	3769	3141	208	2932

-26.0	50.9	44.6	10.5	15.0	3695	67.59	1662	3854	3212	208	3003
-26.5	49.0	44.6	15.2	15.0	3695	69.91	1783	3941	3284	208	3076
-27.0	46.4	44.6	19.8	15.0	3695	72.07	1901	4026	3355	208	3146
-27.5	47.8	35.6	20.6	15.0	3695	74.09	2019	4111	3426	208	3217
-28.0	45.7	35.8	24.0	15.0	3695	75.99	2137	4196	3496	208	3288
-28.5	43.9	35.8	27.4	15.0	3695	77.84	2258	4282	3568	208	3360
-29.0	42.3	35.9	30.8	15.0	3695	79.51	2376	4367	3639	208	3431

4) The average maximum shaft friction in the positive friction zone.

CPT and bearing capacity



Pile settlement (SLS):

Pile tip level	SLS loads			Distributed capacity		Pile settlement/ spring stiffness				
	F	F	F	R	R	S	S	S	K	K
[m NAP]	[kN]	[kN]	[kN]	[kN]	[kN]	[mm]	[mm]	[mm]	[kN/mm]	[kN/mm]
-24.0	719	208	928	540	943	3.2	3.6	6.8	259	137
-24.5	752	208	960	546	993	3.4	3.5	6.9	275	140
-25.0	1192	208	1401	1257	1037	5.5	4.7	10.2	298	137
-25.5	2053	208	2261	2658	1111	9.9	6.0	15.9	375	142
-26.0	2102	208	2311	2658	1196	10.3	5.9	16.1	394	143
-26.5	2153	208	2361	2658	1283	10.7	5.7	16.4	415	144
-27.0	2202	208	2411	2658	1368	11.1	5.5	16.6	436	145
-27.5	2252	208	2460	2658	1453	11.5	5.4	16.9	458	146
-28.0	2302	208	2510	2658	1538	11.9	5.2	17.1	480	146
-28.5	2352	208	2560	2658	1624	12.3	5.1	17.4	503	147
-29.0	2402	208	2610	2658	1709	12.8	5.0	17.7	526	147

PileCore CPT results for S05			CEMS
X coordinate* [m]:	123778.0	Excavation level [m NAP]:	N.A.
Y coordinate* [m]:	483481.0	ρ $[kN/m]$	0.0
Groundwater level [m NAP]:	-0.4	ξ [-]	1.39
Surface level [m NAP]:	0.2	qc-reduction:	N.A.

* The x and y coordinates of the CPT need to be in a Cartesian metric coordinate system.

Soil classification:

Soil code	Bottom	Thickness	γ	γ	
[-]	[m NAP]	[m]	$[kN/m]$	$[kN/m]$	[°]
Z	0.18	0.02	19.0	21.0	35.0
Z	-0.04	0.22	19.0	21.0	35.0
K	-0.14	0.1	18.0	18.0	27.5
Z	-0.8	0.66	19.0	21.0	35.0
K	-1.02	0.22	18.0	18.0	27.5
K	-1.14	0.12	20.0	20.0	22.5
Z	-4.66	3.52	19.0	21.0	35.0
Z	-4.76	0.1	18.0	20.0	27.0
K	-5.1	0.34	14.0	14.0	17.5
K	-5.9	0.8	15.0	15.0	15.0
V	-6.36	0.46	12.0	12.0	15.0
K	-6.68	0.32	15.0	15.0	15.0
K	-6.78	0.1	14.0	14.0	17.5
Z	-8.36	1.58	18.0	20.0	27.0
Z	-10.26	1.9	18.0	20.0	25.0
K	-10.7	0.44	14.0	14.0	17.5
K	-11.66	0.96	17.0	17.0	17.5
K	-11.76	0.1	15.0	15.0	15.0
K	-11.92	0.16	18.0	18.0	27.5
Z	-14.78	2.86	19.0	21.0	35.0
Z	-15.18	0.4	18.0	20.0	27.0
Z	-19.33	4.16	19.0	21.0	35.0
Z	-19.93	0.6	18.0	20.0	27.0
Z	-20.97	1.04	19.0	21.0	35.0
Z	-21.63	0.66	18.0	20.0	27.0
Z	-23.55	1.92	19.0	21.0	35.0
Z	-23.65	0.1	18.0	20.0	27.0
Z	-35.16	11.51	19.0	21.0	35.0

Friction range:

Pile tip level	Negative friction range [m NAP]		Positive friction range [m NAP]	
[m NAP]	Top	Bottom	Top	Bottom
-24.0	0.0	-12.02	-12.0	-24.01
-24.5	0.0	-12.02	-12.0	-24.51
-25.0	0.0	-12.02	-12.0	-25.0
-25.5	0.0	-12.02	-12.0	-25.5
-26.0	0.0	-12.02	-12.0	-26.0
-26.5	0.0	-12.02	-12.0	-26.5
-27.0	0.0	-12.02	-12.0	-27.0
-27.5	0.0	-12.02	-12.0	-27.5
-28.0	0.0	-12.02	-12.0	-28.0
-28.5	0.0	-12.02	-12.0	-28.5
-29.0	0.0	-12.02	-12.0	-29.0

Negative skin friction

Soil code	Bottom	Thickness	Average circum.	σ'	δ	K	F
[-]	[m NAP]	[m]	[m]	[kN/m]	[°]	[-]	[kN]
Z	-0.04	0.22	1.76	2.3	35.0	0.4	0
K	-0.14	0.1	1.76	5.3	27.5	0.5	0
Z	-0.8	0.66	1.76	11.5	35.0	0.4	4
K	-1.02	0.22	1.76	16.6	27.5	0.5	2
K	-1.14	0.12	1.76	18.1	22.5	0.6	1
Z	-4.66	3.52	1.76	38.4	35.0	0.4	71
Z	-4.76	0.1	1.76	58.6	27.0	0.5	3
K	-5.1	0.34	1.76	59.9	17.5	0.7	9
K	-5.9	0.8	1.76	62.6	15.0	0.7	22
V	-6.36	0.46	1.76	65.3	15.0	0.7	13
K	-6.68	0.32	1.76	66.6	15.0	0.7	9
K	-6.78	0.1	1.76	67.6	17.5	0.7	3
Z	-8.36	1.58	1.76	75.8	27.0	0.5	59
Z	-10.26	1.9	1.76	93.5	25.0	0.6	84
K	-10.7	0.44	1.76	104.3	17.5	0.7	20
K	-11.66	0.96	1.76	108.6	17.5	0.7	46
K	-11.76	0.1	1.76	112.4	15.0	0.7	5
K	-11.92	0.16	1.76	113.3	27.5	0.5	9
Z	-14.78	2.86	1.76	129.9	35.0	0.4	5

1) The results in this table are presented for the specific case when the pile-tip level is at -29.0 m NAP.
2) The average circumference of the pile per soil layer.
3) A minimum value of 0.25 for the product $K \_ \delta$ is applied in the calculations (7.3.2.2(7)(d)).

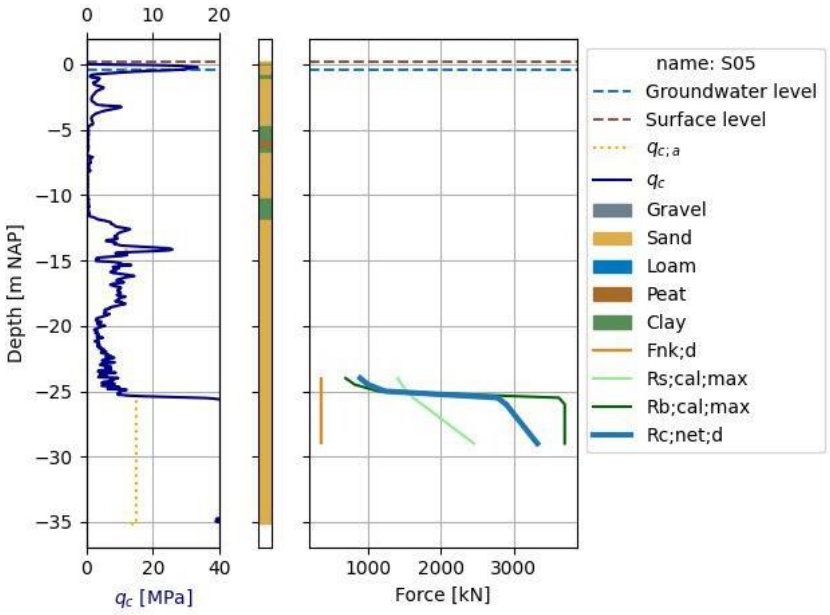
Pile bearing capacity (ULS):

Pile tip level	Base resistance					Shaft resistance		Pile resistance			
	q	q	q	q	R	q	R	R	R	F	R
[m NAP]	[MPa]	[MPa]	[MPa]	[MPa]	[kN]	[kPa]	[kN]	[kN]	[kN]	[kN]	[kN]
-24.0	6.8	4.7	3.2	2.8	690	66.6	1406	1508	1257	366	891
-24.5	7.6	6.6	3.4	3.3	818	66.44	1462	1640	1367	366	1001
-25.0	10.8	10.6	4.0	4.6	1137	66.85	1528	1917	1598	366	1232
-25.5	41.5	41.1	5.3	14.7	3614	68.29	1619	3765	3137	366	2772

-26.0	43.2	42.6	9.5	15.0	3695	70.67	1738	3908	3257	366	2891
-26.5	49.1	49.1	13.9	15.0	3695	72.88	1856	3993	3328	366	2962
-27.0	59.6	54.9	19.1	15.0	3695	74.94	1975	4079	3399	366	3033
-27.5	58.1	54.8	24.8	15.0	3695	76.88	2096	4166	3471	366	3106
-28.0	57.3	54.9	30.5	15.0	3695	78.69	2214	4251	3542	366	3177
-28.5	56.1	51.4	34.9	15.0	3695	80.39	2333	4336	3614	366	3248
-29.0	55.2	51.5	40.1	15.0	3695	81.99	2451	4422	3685	366	3319

4) The average maximum shaft friction in the positive friction zone.

CPT and bearing capacity



Pile settlement (SLS):

Pile tip level	SLS loads			Distributed capacity		Pile settlement/ spring stiffness				
	F	F	F	R	R	S	S	S	K	K
[m NAP]	[kN]	[kN]	[kN]	[kN]	[kN]	[mm]	[mm]	[mm]	[kN/mm]	[kN/mm]
-24.0	624	366	989	497	1011	3.2	3.9	7.0	257	141
-24.5	701	366	1066	588	1052	3.6	4.0	7.5	270	142
-25.0	863	366	1228	818	1099	4.4	4.3	8.7	286	142
-25.5	1940	366	2306	2600	1165	9.9	6.2	16.1	372	143
-26.0	2024	366	2390	2658	1250	10.5	6.1	16.5	394	145
-26.5	2074	366	2439	2658	1336	10.9	5.9	16.8	414	145
-27.0	2123	366	2489	2658	1421	11.3	5.7	17.0	435	146
-27.5	2174	366	2540	2658	1508	11.7	5.6	17.3	456	147
-28.0	2224	366	2589	2658	1593	12.1	5.4	17.6	478	148
-28.5	2274	366	2639	2658	1678	12.6	5.3	17.8	500	148
-29.0	2323	366	2689	2658	1764	13.0	5.1	18.1	523	148

PileCore results for user defined CPT Group

CPT	X coordinate	Y coordinate	Surface level	Groundwater level	Excavation level	ρ
	[m]	[m]	[m NAP]	[m NAP]	[m NAP]	[kN/m]
S07	123787.00	483465.00	0.12	-0.4	0.12	0.0
S06	123789.00	483485.00	0.18	-0.4	0.18	0.0
S02	123797.00	483441.00	-0.63	-0.4	-0.63	0.0
S04	123759.00	483465.00	-0.15	-0.4	-0.15	0.0
S03	123774.00	483449.00	-0.25	-0.4	-0.25	0.0
S01	123805.00	483464.00	-0.22	-0.4	-0.22	0.0
S05	123778.00	483481.00	0.2	-0.4	0.2	0.0

1) Other input parameters that are used to calculate the bearing capacity (e.g. positive skin friction trajectory) can be found in the individual CPT results report.
2) The x and y coordinates of the CPT need to be in a Cartesian metric coordinate system.

Pile Tip Level	R	R	Factor	Var. co-eff	Nominal CPT	R	R	F	R	ξ
[m NAP]	[kN]	[kN]	[-]	[%]	[-]	[kN]	[kN]	[kN]	[kN]	[-]
-24.0	2234	2045	3	10.2	Group av.	1759	1466	267	1200	1.27
-24.5	3138	2139	4	38.4	S01	1539	1282	208	1074	1.39
-25.0	3653	2262	4	33.0	S06	1627	1356	271	1086	1.39
-25.5	5211	4561	3	6.0	Group av.	4103	3419	267	3153	1.27
-26.0	5440	5311	3	2.2	Group av.	4284	3570	267	3303	1.27
-26.5	5575	5430	3	2.1	Group av.	4389	3658	267	3391	1.27
-27.0	5693	5548	3	2.1	Group av.	4483	3736	267	3469	1.27
-27.5	5812	5667	3	2.1	Group av.	4577	3814	267	3547	1.27
-28.0	5930	5785	3	2.0	Group av.	4670	3891	267	3625	1.27
-28.5	6050	5904	3	2.0	Group av.	4764	3970	267	3703	1.27
-29.0	6169	6025	3	1.9	Group av.	4857	4048	267	3781	1.27

3) The design negative friction force is based on the Nominal CPT. If the 3 factor is applied, the friction force is the group average.
4) The values are related to the net pile bearing capacity (NEN9997-1 7.6.2.3). Based on the lowest outcome of Rc;net;d, this can either be a 3 or 4 value (based on the nominal CPT). In case the variation coefficient is above 12

Pile settlement (SLS):

Pile tip level	SLS loads			Distributed capacity		Pile settlement/ spring stiffness				
	F	F	F	R	R	S	S	S	K	K
[m NAP]	[kN]	[kN]	[kN]	[kN]	[kN]	[mm]	[mm]	[mm]	[kN/mm]	[kN/mm]
-24.0	840	267	1106	676	1083	3.5	3.8	7.2	294	153
-24.5	752	208	960	546	993	3.4	3.5	6.9	275	140

-25.0	760	271	1030	604	1023	3.8	3.8	7.5	274	137
-25.5	2207	267	2473	2810	1293	9.8	5.9	15.7	420	158
-26.0	2312	267	2579	2897	1386	10.4	5.8	16.2	446	159
-26.5	2374	267	2640	2909	1480	10.9	5.6	16.5	470	160
-27.0	2428	267	2695	2909	1574	11.3	5.5	16.7	493	161
-27.5	2483	267	2750	2909	1667	11.7	5.3	17.0	517	162
-28.0	2537	267	2804	2909	1761	12.1	5.2	17.3	542	162
-28.5	2592	267	2859	2909	1854	12.5	5.0	17.5	567	163
-29.0	2647	267	2913	2909	1948	12.9	4.9	17.8	592	163

Bijlage 4 Uitvoer PileCore Ø540/680mm

PileCore results			CEMS
Project:	Duivendrechtsekade 50	Author:	5.1.1.d
Number:	23378	Date:	16-02-24
PileCore Version:	2.9.4		

Pile properties:

Name:		Reference NEN9997-1
Type:	betonpaal	Table 7.c
Description:	In de grond gevormd met een gladde mantelbuis op een schroefpunt, waarbij het beton direct tegen de grond drukt	Table 7.c
Installation:	Geschroefd; bij het trekken van de mantelbuis blijft de schroefpunt in de grond achter	Table 7.c
Shaft size:	rond 680 mm	
Base size:	rond 680 mm	
Height pile base [mm]:	0.0	Figure 7.h
E GPa:	20.0	

Pile factors:		Reference NEN9997-1	Safety factors:		Reference NEN9997-1
a:	0.63	Table 7.c	γ :	1.0	7.3.2.2(7)(b)
a :	0.009	Table 7.c	γ :	1.2	A.3.3.2
a :	0.009	Table 7.d	γ :	1.2	A.3.3.2
β:	1.0	7.6.2.3. (10)(g)			
Pile factor s:	1.0	7.6.2.3. (10)(h)			
Settlement curve:	1	Table 7.c			
δ :	1.0 φ	7.3.2.2 (7)(d)			

Result Summary

CPT	Pile Tip Level	Bearing capacity		Spring stiffness		
		F	R	F	K	K
[-]	[m NAP]	[kN]	[kN]	[kN]	[kN/mm]	[kN/mm]
S07	-24.0	261	1482	1298	303	175
S07	-24.5	261	1569	1359	322	179
S07	-25.0	261	2351	1906	345	178
S07	-25.5	261	4167	3177	432	187
S07	-26.0	261	4253	3237	453	189
S07	-26.5	261	4340	3299	476	191
S07	-27.0	261	4426	3359	499	192
S07	-27.5	261	4513	3420	523	194
S07	-28.0	261	4599	3480	547	195
S07	-28.5	261	4686	3541	572	197
S07	-29.0	261	4771	3601	596	198
S06	-24.0	328	1283	1227	281	168
S06	-24.5	328	1352	1275	296	172
S06	-25.0	328	1631	1470	313	173
S06	-25.5	328	4028	3148	411	182
S06	-26.0	328	4114	3208	432	184
S06	-26.5	328	4201	3269	453	186
S06	-27.0	328	4287	3329	475	188
S06	-27.5	328	4373	3390	497	190
S06	-28.0	328	4459	3450	521	191
S06	-28.5	328	4546	3510	545	193
S06	-29.0	328	4634	3572	571	194
S02	-24.0	285	1529	1355	300	176
S02	-24.5	285	2693	2170	340	178
S02	-25.0	285	2949	2349	371	183
S02	-25.5	285	3517	2747	413	189
S02	-26.0	285	4071	3135	456	193
S02	-26.5	285	4308	3300	485	196
S02	-27.0	285	4454	3403	511	198
S02	-27.5	285	4540	3463	535	199
S02	-28.0	285	4626	3523	560	201
S02	-28.5	285	4714	3585	585	202
S02	-29.0	285	4801	3645	609	203
S04	-24.0	339	1599	1458	305	176
S04	-24.5	339	3377	2703	375	183
S04	-25.0	339	3872	3049	416	189
S04	-25.5	339	4176	3262	449	192
S04	-26.0	339	4262	3322	470	194
S04	-26.5	339	4350	3384	493	196
S04	-27.0	339	4436	3444	517	198
S04	-27.5	339	4522	3505	541	199
S04	-28.0	339	4609	3565	565	200
S04	-28.5	339	4695	3625	590	201
S04	-29.0	339	4781	3686	615	202
S03	-24.0	356	1998	1755	337	185
S03	-24.5	356	3759	2988	414	192
S03	-25.0	356	4029	3177	444	195
S03	-25.5	356	4261	3339	473	198
S03	-26.0	356	4347	3400	496	200
S03	-26.5	356	4434	3460	519	202
S03	-27.0	356	4521	3521	544	203

S03	-27.5	356	4607	3581	568	205
S03	-28.0	356	4693	3642	593	206
S03	-28.5	356	4779	3702	617	207
S03	-29.0	356	4867	3763	643	207
S01	-24.0	253	1352	1199	296	174
S01	-24.5	253	1404	1236	314	179
S01	-25.0	253	2522	2018	338	175
S01	-25.5	253	4137	3149	424	186
S01	-26.0	253	4223	3209	445	188
S01	-26.5	253	4311	3271	467	190
S01	-27.0	253	4397	3331	490	192
S01	-27.5	253	4483	3391	513	194
S01	-28.0	253	4569	3451	537	195
S01	-28.5	253	4657	3512	562	196
S01	-29.0	253	4743	3573	586	197
S05	-24.0	444	1181	1270	294	178
S05	-24.5	444	1381	1410	308	179
S05	-25.0	444	1857	1744	326	178
S05	-25.5	444	3914	3184	420	187
S05	-26.0	444	4087	3305	446	190
S05	-26.5	444	4174	3365	467	191
S05	-27.0	444	4260	3426	489	193
S05	-27.5	444	4348	3487	512	195
S05	-28.0	444	4434	3548	536	196
S05	-28.5	444	4520	3608	561	197
S05	-29.0	444	4607	3668	585	199

1) Spring stiffness not taking elastic deformation of the pile into account
2) Spring stiffness including elastic deformation of the pile

PileCore CPT results for S07			CEMS
X coordinate* [m]:	123787.0	Excavation level [m NAP]:	N.A.
Y coordinate* [m]:	483465.0	ρ $[kN/m]$	0.0
Groundwater level [m NAP]:	-0.4	ξ [-]	1.39
Surface level [m NAP]:	0.12	qc-reduction:	N.A.

* The x and y coordinates of the CPT need to be in a Cartesian metric coordinate system.

Soil classification:

Soil code	Bottom	Thickness	γ	γ	
[-]	[m NAP]	[m]	$[kN/m]$	$[kN/m]$	[°]
K	0.1	0.02	18.0	18.0	27.5
K	-0.18	0.28	18.0	18.0	27.5
Z	-0.64	0.46	19.0	21.0	35.0
K	-0.74	0.1	18.0	18.0	27.5
K	-0.92	0.18	15.0	15.0	15.0
V	-1.14	0.22	12.0	12.0	15.0
K	-1.32	0.18	14.0	14.0	17.5
K	-1.42	0.1	18.0	18.0	22.5
K	-1.62	0.2	15.0	15.0	22.5
K	-1.88	0.26	14.0	14.0	17.5
K	-1.98	0.1	19.0	19.0	17.5
K	-2.4	0.42	15.0	15.0	22.5
K	-3.92	1.52	14.0	14.0	17.5
V	-4.36	0.44	12.0	12.0	15.0
K	-4.76	0.4	15.0	15.0	15.0
V	-6.26	1.5	12.0	12.0	15.0
K	-6.6	0.34	14.0	14.0	17.5
K	-10.28	3.68	18.0	18.0	27.5
K	-10.66	0.38	14.0	14.0	17.5
K	-10.96	0.3	17.0	17.0	17.5
K	-11.16	0.2	14.0	14.0	17.5
K	-11.36	0.2	17.0	17.0	17.5
V	-11.8	0.44	12.0	12.0	15.0
K	-12.0	0.2	18.0	18.0	27.5
Z	-14.83	2.84	19.0	21.0	35.0
Z	-15.01	0.18	18.0	20.0	27.0
K	-15.11	0.1	18.0	18.0	27.5
Z	-19.82	4.71	19.0	21.0	35.0
Z	-20.38	0.56	18.0	20.0	25.0
Z	-20.54	0.16	18.0	20.0	27.0
Z	-20.7	0.16	18.0	20.0	25.0
K	-21.32	0.62	18.0	18.0	27.5
Z	-22.21	0.9	18.0	20.0	27.0
Z	-22.69	0.48	19.0	21.0	35.0
Z	-22.99	0.3	18.0	20.0	27.0
Z	-23.84	0.86	19.0	21.0	35.0
Z	-23.94	0.1	18.0	20.0	27.0
Z	-34.89	10.94	19.0	21.0	35.0

Friction range:

Pile tip level	Negative friction range [m NAP]		Positive friction range [m NAP]	
[m NAP]	Top	Bottom	Top	Bottom
-24.0	0.0	-12.02	-12.0	-24.0
-24.5	0.0	-12.02	-12.0	-24.5
-25.0	0.0	-12.02	-12.0	-25.0
-25.5	0.0	-12.02	-12.0	-25.49
-26.0	0.0	-12.02	-12.0	-25.99
-26.5	0.0	-12.02	-12.0	-26.51
-27.0	0.0	-12.02	-12.0	-27.0
-27.5	0.0	-12.02	-12.0	-27.5
-28.0	0.0	-12.02	-12.0	-27.99
-28.5	0.0	-12.02	-12.0	-28.51
-29.0	0.0	-12.02	-12.0	-29.0

Negative skin friction

Soil code	Bottom	Thickness	Average circum.	σ'	δ	K	F
[-]	[m NAP]	[m]	[m]	[kN/m]	[°]	[-]	[kN]
K	-0.18	0.28	2.14	2.9	27.5	0.5	0
Z	-0.64	0.46	2.14	9.2	35.0	0.4	3
K	-0.74	0.1	2.14	12.6	27.5	0.5	1
K	-0.92	0.18	2.14	13.5	15.0	0.7	1
V	-1.14	0.22	2.14	14.3	15.0	0.7	2
K	-1.32	0.18	2.14	14.9	17.5	0.7	1
K	-1.42	0.1	2.14	15.6	22.5	0.6	1
K	-1.62	0.2	2.14	16.6	22.5	0.6	2
K	-1.88	0.26	2.14	17.7	17.5	0.7	2
K	-1.98	0.1	2.14	18.6	17.5	0.7	1
K	-2.4	0.42	2.14	20.2	22.5	0.6	5
K	-3.92	1.52	2.14	24.5	17.5	0.7	20
V	-4.36	0.44	2.14	28.2	15.0	0.7	7
K	-4.76	0.4	2.14	29.7	15.0	0.7	6
V	-6.26	1.5	2.14	32.4	15.0	0.7	26
K	-6.6	0.34	2.14	34.7	17.5	0.7	6
K	-10.28	3.68	2.14	50.4	27.5	0.5	111
K	-10.66	0.38	2.14	66.3	17.5	0.7	14
K	-10.96	0.3	2.14	68.2	17.5	0.7	11
K	-11.16	0.2	2.14	69.7	17.5	0.7	7
K	-11.36	0.2	2.14	70.8	17.5	0.7	8
V	-11.8	0.44	2.14	72.1	15.0	0.7	17
K	-12.0	0.2	2.14	73.3	27.5	0.5	9

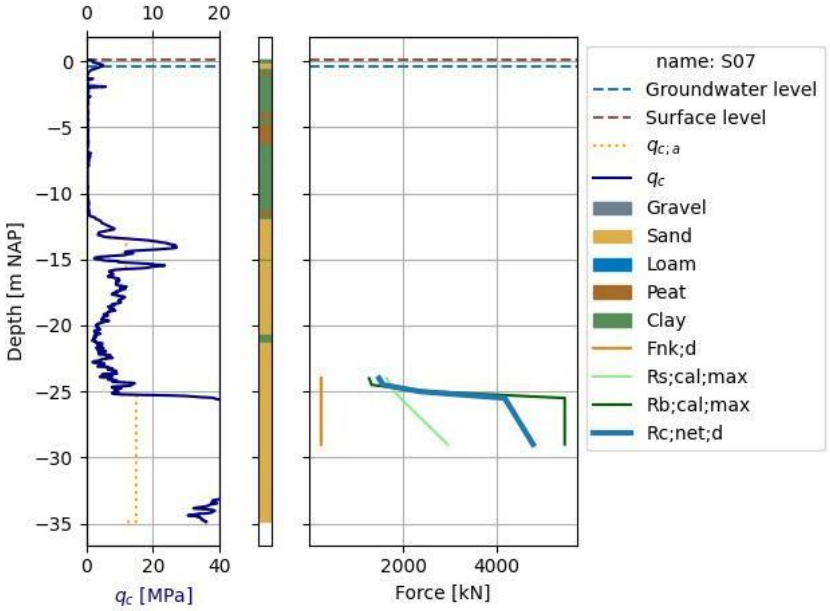
1) The results in this table are presented for the specific case when the pile-tip level is at -29.0 m NAP.
2) The average circumference of the pile per soil layer.
3) A minimum value of 0.25 for the product $K \_ \delta$ is applied in the calculations (7.3.2.2(7)(d)).

Pile bearing capacity (ULS):

Pile tip level	Base resistance					Shaft resistance		Pile resistance			
	q	q	q	q	R	q	R	R	R	F	R
[m NAP]	[MPa]	[MPa]	[MPa]	[MPa]	[kN]	[kPa]	[kN]	[kN]	[kN]	[kN]	[kN]
-24.0	9.8	7.7	2.4	3.5	1269	63.87	1638	2091	1743	261	1482
-24.5	9.6	7.8	2.9	3.6	1323	64.77	1728	2195	1829	261	1569
-25.0	18.9	18.6	3.4	7.0	2534	65.58	1822	3134	2612	261	2351
-25.5	45.1	45.1	5.1	15.0	5448	67.2	1937	5313	4427	261	4167
-26.0	52.3	48.1	8.9	15.0	5448	69.61	2080	5416	4513	261	4253
-26.5	58.8	51.3	13.3	15.0	5448	71.94	2226	5521	4601	261	4340
-27.0	57.8	49.3	17.6	15.0	5448	74.03	2369	5624	4686	261	4426
-27.5	55.6	48.0	21.6	15.0	5448	75.99	2515	5728	4774	261	4513
-28.0	53.3	45.3	24.6	15.0	5448	77.82	2658	5831	4859	261	4599
-28.5	51.7	45.2	28.7	15.0	5448	79.61	2803	5936	4947	261	4686
-29.0	50.7	45.1	32.4	15.0	5448	81.23	2946	6038	5032	261	4771

4) The average maximum shaft friction in the positive friction zone.

CPT and bearing capacity



Pile settlement (SLS):

Pile tip level	SLS loads			Distributed capacity		Pile settlement/ spring stiffness				
	F	F	F	R	R	S	S	S	K	K
[m NAP]	[kN]	[kN]	[kN]	[kN]	[kN]	[mm]	[mm]	[mm]	[kN/mm]	[kN/mm]
-24.0	1038	261	1298	913	1179	3.1	4.3	7.4	303	175
-24.5	1098	261	1359	952	1243	3.4	4.2	7.6	322	179
-25.0	1646	261	1906	1823	1311	5.2	5.5	10.7	345	178
-25.5	2917	261	3177	3919	1394	9.7	7.4	17.0	432	187
-26.0	2977	261	3237	3919	1497	10.0	7.1	17.1	453	189
-26.5	3038	261	3299	3919	1602	10.4	6.9	17.3	476	191
-27.0	3098	261	3359	3919	1705	10.7	6.7	17.5	499	192
-27.5	3159	261	3420	3919	1809	11.1	6.5	17.6	523	194
-28.0	3219	261	3480	3919	1912	11.4	6.4	17.8	547	195
-28.5	3280	261	3541	3919	2017	11.8	6.2	18.0	572	197

-29.0	3340	261	3601	3919	2119	12.2	6.0	18.2	596	198

PileCore CPT results for S06			CEMS
X coordinate* [m]:	123789.0	Excavation level [m NAP]:	N.A.
Y coordinate* [m]:	483485.0	ρ $[kN/m]$	0.0
Groundwater level [m NAP]:	-0.4	ξ [-]	1.39
Surface level [m NAP]:	0.18	qc-reduction:	N.A.

* The x and y coordinates of the CPT need to be in a Cartesian metric coordinate system.

Soil classification:

Soil code	Bottom	Thickness	γ	γ	
[-]	[m NAP]	[m]	$[kN/m]$	$[kN/m]$	[°]
V	0.16	0.02	10.0	10.0	15.0
V	0.06	0.1	10.0	10.0	15.0
V	-0.04	0.1	12.0	12.0	15.0
Z	-0.22	0.18	18.0	20.0	27.0
Z	-1.22	1.0	19.0	21.0	35.0
Z	-1.46	0.24	18.0	20.0	27.0
Z	-3.02	1.56	19.0	21.0	35.0
Z	-3.12	0.1	18.0	20.0	27.0
K	-4.46	1.34	14.0	14.0	17.5
V	-5.94	1.48	12.0	12.0	15.0
K	-6.3	0.36	15.0	15.0	15.0
K	-6.4	0.1	14.0	14.0	17.5
K	-6.86	0.46	18.0	18.0	27.5
K	-9.78	2.92	15.0	15.0	22.5
K	-10.89	1.12	14.0	14.0	17.5
K	-11.0	0.1	17.0	17.0	17.5
K	-11.12	0.12	15.0	15.0	15.0
V	-11.21	0.1	12.0	12.0	15.0
Z	-11.42	0.2	18.0	20.0	27.0
Z	-19.89	8.48	19.0	21.0	35.0
Z	-20.05	0.16	18.0	20.0	27.0
Z	-20.39	0.34	19.0	21.0	35.0
Z	-20.79	0.4	18.0	20.0	27.0
Z	-23.27	2.48	19.0	21.0	35.0
Z	-23.59	0.32	18.0	20.0	27.0
Z	-35.19	11.6	19.0	21.0	35.0

Friction range:

Pile tip level	Negative friction range [m NAP]		Positive friction range [m NAP]	
[m NAP]	Top	Bottom	Top	Bottom
-24.0	0.0	-12.01	-11.99	-24.01
-24.5	0.0	-12.01	-11.99	-24.51
-25.0	0.0	-12.01	-11.99	-25.01
-25.5	0.0	-12.01	-11.99	-25.51
-26.0	0.0	-12.01	-11.99	-26.0
-26.5	0.0	-12.01	-11.99	-26.5
-27.0	0.0	-12.01	-11.99	-27.0
-27.5	0.0	-12.01	-11.99	-27.5
-28.0	0.0	-12.01	-11.99	-28.0
-28.5	0.0	-12.01	-11.99	-28.5
-29.0	0.0	-12.01	-11.99	-29.0

Negative skin friction

Soil code	Bottom	Thickness	Average circum.	σ'	δ	K	F
[-]	[m NAP]	[m]	[m]	[kN/m]	[°]	[-]	[kN]
V	-0.04	0.1	2.14	1.7	15.0	0.7	0
Z	-0.22	0.18	2.14	3.8	27.0	0.5	0
Z	-1.22	1.0	2.14	12.4	35.0	0.4	8
Z	-1.46	0.24	2.14	19.4	27.0	0.5	3
Z	-3.02	1.56	2.14	29.3	35.0	0.4	29
Z	-3.12	0.1	2.14	38.5	27.0	0.5	2
K	-4.46	1.34	2.14	41.9	17.5	0.7	30
V	-5.94	1.48	2.14	46.3	15.0	0.7	37
K	-6.3	0.36	2.14	48.9	15.0	0.7	9
K	-6.4	0.1	2.14	50.0	17.5	0.7	3
K	-6.86	0.46	2.14	52.1	27.5	0.5	14
K	-9.78	2.92	2.14	61.6	22.5	0.6	98
K	-10.89	1.12	2.14	71.5	17.5	0.7	43
K	-11.0	0.1	2.14	74.2	17.5	0.7	4
K	-11.12	0.12	2.14	74.9	15.0	0.7	5
V	-11.21	0.1	2.14	75.3	15.0	0.7	4
Z	-11.42	0.2	2.14	76.4	27.0	0.5	9
Z	-19.89	8.48	2.14	124.8	35.0	0.4	30

1) The results in this table are presented for the specific case when the pile-tip level is at -29.0 m NAP.
2) The average circumference of the pile per soil layer.
3) A minimum value of 0.25 for the product $K \_\_\_\_ \delta \_\_$ is applied in the calculations (7.3.2.2(7)(d)).

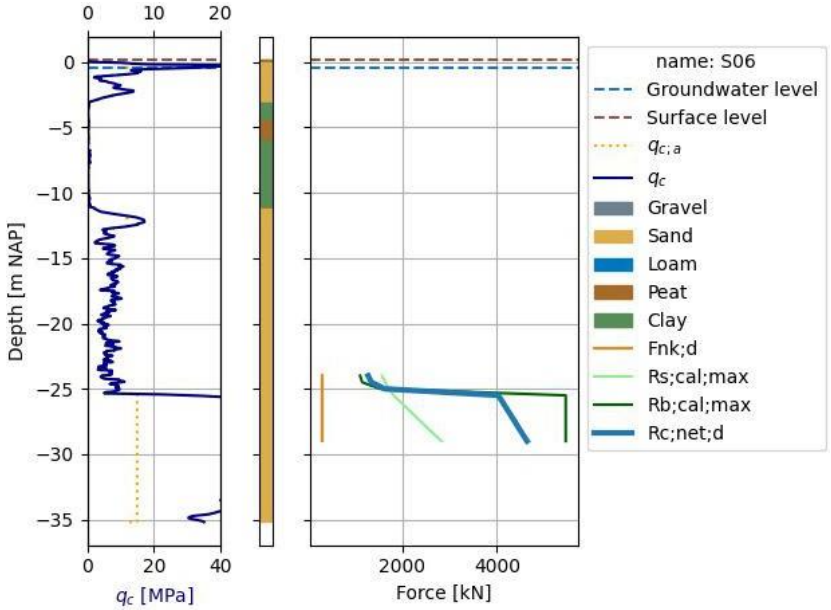
Pile bearing capacity (ULS):

Pile tip level	Base resistance					Shaft resistance		Pile resistance			
	q	q	q	q	R	q	R	R	R	F	R
[m NAP]	[MPa]	[MPa]	[MPa]	[MPa]	[kN]	[kPa]	[kN]	[kN]	[kN]	[kN]	[kN]
-24.0	7.9	5.0	3.3	3.1	1113	61.43	1575	1934	1612	328	1283
-24.5	8.2	5.1	3.5	3.2	1159	61.65	1644	2017	1681	328	1352
-25.0	10.8	8.8	3.6	4.2	1541	62.23	1727	2351	1959	328	1631
-25.5	48.6	48.5	4.3	15.0	5448	63.2	1819	5228	4356	328	4028
-26.0	56.6	52.6	8.3	15.0	5448	65.76	1963	5331	4443	328	4114

-26.5	57.4	52.5	12.7	15.0	5448	68.14	2107	5435	4529	328	4201
-27.0	56.6	50.9	17.0	15.0	5448	70.36	2251	5538	4615	328	4287
-27.5	55.0	49.2	20.7	15.0	5448	72.44	2395	5642	4702	328	4373
-28.0	53.7	49.2	24.9	15.0	5448	74.39	2539	5746	4788	328	4459
-28.5	53.0	49.2	29.1	15.0	5448	76.22	2683	5849	4874	328	4546
-29.0	52.1	46.5	31.8	15.0	5448	77.95	2829	5955	4962	328	4634

4) The average maximum shaft friction in the positive friction zone.

CPT and bearing capacity



Pile settlement (SLS):

Pile tip level	SLS loads			Distributed capacity		Pile settlement/ spring stiffness				
	F	F	F	R	R	S	S	S	K	K
[m NAP]	[kN]	[kN]	[kN]	[kN]	[kN]	[mm]	[mm]	[mm]	[kN/mm]	[kN/mm]
-24.0	898	328	1227	801	1133	2.9	4.4	7.3	281	168
-24.5	947	328	1275	834	1183	3.1	4.3	7.4	296	172
-25.0	1141	328	1470	1109	1242	3.8	4.7	8.5	313	173
-25.5	2820	328	3148	3919	1309	9.6	7.7	17.3	411	182
-26.0	2880	328	3208	3919	1412	10.0	7.4	17.4	432	184
-26.5	2940	328	3269	3919	1516	10.3	7.2	17.5	453	186
-27.0	3001	328	3329	3919	1619	10.7	7.0	17.7	475	188
-27.5	3061	328	3390	3919	1723	11.0	6.8	17.9	497	190
-28.0	3122	328	3450	3919	1826	11.4	6.6	18.0	521	191
-28.5	3182	328	3510	3919	1930	11.8	6.4	18.2	545	193
-29.0	3244	328	3572	3919	2036	12.2	6.3	18.4	571	194

PileCore CPT results for S02			CEMS
X coordinate* [m]:	123797.0	Excavation level [m NAP]:	N.A.
Y coordinate* [m]:	483441.0	ρ $[kN/m]$	0.0
Groundwater level [m NAP]:	-0.4	ξ [-]	1.39
Surface level [m NAP]:	-0.63	qc-reduction:	N.A.

* The x and y coordinates of the CPT need to be in a Cartesian metric coordinate system.

Soil classification:

Soil code	Bottom	Thickness	γ	γ	
[-]	[m NAP]	[m]	$[kN/m]$	$[kN/m]$	[°]
K	-1.25	0.62	15.0	15.0	22.5
K	-1.41	0.16	15.0	15.0	22.5
Z	-1.71	0.3	18.0	20.0	27.0
Z	-5.13	3.42	19.0	21.0	35.0
Z	-5.27	0.14	18.0	20.0	27.0
V	-6.27	1.0	12.0	12.0	15.0
K	-7.01	0.74	14.0	14.0	17.5
K	-10.79	3.78	15.0	15.0	22.5
K	-11.13	0.34	17.0	17.0	17.5
K	-11.31	0.18	15.0	15.0	22.5
K	-11.59	0.28	14.0	14.0	17.5
K	-11.69	0.1	17.0	17.0	17.5
K	-12.19	0.5	15.0	15.0	15.0
K	-12.33	0.14	18.0	18.0	22.5
Z	-12.47	0.14	18.0	20.0	27.0
Z	-14.65	2.18	19.0	21.0	35.0
K	-14.79	0.14	18.0	18.0	27.5
K	-14.89	0.1	20.0	20.0	22.5
Z	-15.01	0.12	18.0	20.0	25.0
Z	-15.33	0.32	19.0	21.0	35.0
Z	-15.53	0.2	18.0	20.0	27.0
Z	-21.64	6.12	19.0	21.0	35.0
K	-22.18	0.54	18.0	18.0	27.5
K	-23.14	0.96	18.0	18.0	22.5
Z	-23.32	0.18	18.0	20.0	27.0
K	-24.0	0.68	20.0	20.0	22.5
Z	-24.12	0.12	18.0	20.0	27.0
Z	-35.51	11.39	19.0	21.0	35.0

Friction range:

Pile tip level	Negative friction range [m NAP]		Positive friction range [m NAP]	
[m NAP]	Top	Bottom	Top	Bottom
-24.0	-0.63	-12.01	-11.99	-24.0
-24.5	-0.63	-12.01	-11.99	-24.5
-25.0	-0.63	-12.01	-11.99	-25.0
-25.5	-0.63	-12.01	-11.99	-25.5
-26.0	-0.63	-12.01	-11.99	-25.99
-26.5	-0.63	-12.01	-11.99	-26.49
-27.0	-0.63	-12.01	-11.99	-26.99
-27.5	-0.63	-12.01	-11.99	-27.49
-28.0	-0.63	-12.01	-11.99	-27.99
-28.5	-0.63	-12.01	-11.99	-28.51
-29.0	-0.63	-12.01	-11.99	-29.01

Negative skin friction

Soil code	Bottom	Thickness	Average circum.	σ'	δ	K	F
[-]	[m NAP]	[m]	[m]	[kN/m]	[°]	[-]	[kN]
K	-1.25	0.62	2.14	1.6	22.5	0.6	1
K	-1.41	0.16	2.14	3.6	22.5	0.6	0
Z	-1.71	0.3	2.14	5.5	27.0	0.5	1
Z	-5.13	3.42	2.14	26.2	35.0	0.4	57
Z	-5.27	0.14	2.14	46.0	27.0	0.5	4
V	-6.27	1.0	2.14	47.9	15.0	0.7	26
K	-7.01	0.74	2.14	50.5	17.5	0.7	20
K	-10.79	3.78	2.14	61.9	22.5	0.6	128
K	-11.13	0.34	2.14	72.9	17.5	0.7	13
K	-11.31	0.18	2.14	74.6	22.5	0.6	7
K	-11.59	0.28	2.14	75.6	17.5	0.7	11
K	-11.69	0.1	2.14	76.6	17.5	0.7	4
K	-12.19	0.5	2.14	78.2	15.0	0.7	12

1) The results in this table are presented for the specific case when the pile-tip level is at -29.0 m NAP.
2) The average circumference of the pile per soil layer.
3) A minimum value of 0.25 for the product K δ is applied in the calculations (7.3.2.2(7)(d)).

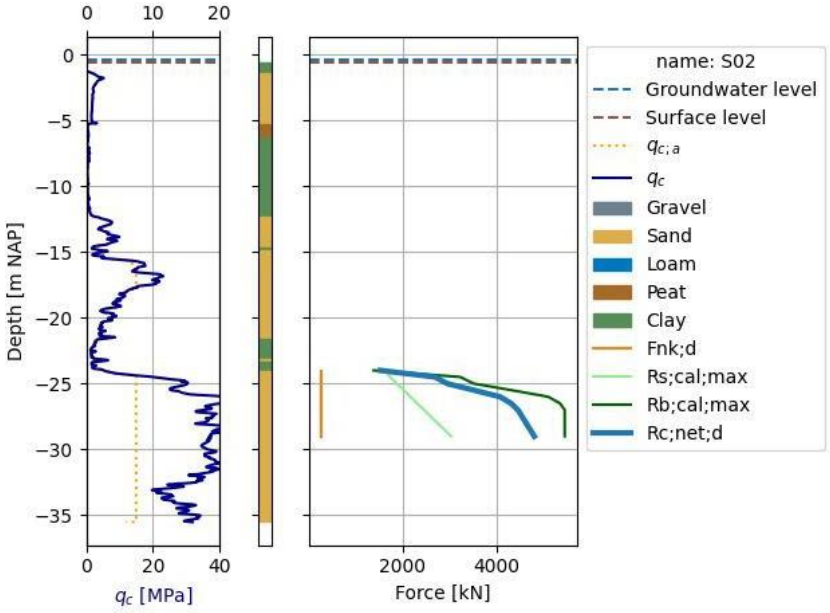
Pile bearing capacity (ULS):

Pile tip level	Base resistance					Shaft resistance		Pile resistance			
	q	q	q	q	R	q	R	R	R	F	R
[m NAP]	[MPa]	[MPa]	[MPa]	[MPa]	[kN]	[kPa]	[kN]	[kN]	[kN]	[kN]	[kN]
-24.0	10.7	10.7	1.5	3.8	1386	63.8	1639	2176	1813	285	1529
-24.5	27.1	24.7	2.4	8.9	3230	65.02	1737	3573	2978	285	2693
-25.0	27.3	25.2	4.5	9.7	3512	67.7	1881	3880	3233	285	2949
-25.5	31.1	31.1	6.7	11.9	4316	70.19	2025	4562	3802	285	3517
-26.0	37.8	32.8	9.3	14.0	5098	72.5	2169	5228	4356	285	4071
-26.5	36.2	32.9	12.2	14.7	5347	74.65	2313	5511	4592	285	4308
-27.0	36.0	32.7	15.1	15.0	5448	76.65	2457	5686	4739	285	4454
-27.5	36.0	32.8	17.9	15.0	5448	78.53	2601	5790	4825	285	4540
-28.0	37.2	34.5	20.8	15.0	5448	80.29	2744	5893	4911	285	4626
-28.5	36.7	34.6	23.9	15.0	5448	82.01	2891	5999	4999	285	4714

-29.0	36.0	34.6	26.9	15.0	5448	83.56	3035	6103	5086	285	4801

4) The average maximum shaft friction in the positive friction zone.

CPT and bearing capacity



Pile settlement (SLS):

Pile tip level	SLS loads			Distributed capacity		Pile settlement/ spring stiffness				
	F	F	F	R	R	S	S	S	K	K
[m NAP]	[kN]	[kN]	[kN]	[kN]	[kN]	[mm]	[mm]	[mm]	[kN/mm]	[kN/mm]
-24.0	1070	285	1355	997	1179	3.2	4.5	7.7	300	176
-24.5	1885	285	2170	2323	1250	5.8	6.4	12.2	340	178
-25.0	2064	285	2349	2527	1353	6.5	6.3	12.8	371	183
-25.5	2462	285	2747	3105	1457	7.9	6.7	14.5	413	189
-26.0	2850	285	3135	3667	1560	9.3	6.9	16.2	456	193
-26.5	3015	285	3300	3847	1664	10.0	6.8	16.8	485	196
-27.0	3118	285	3403	3919	1767	10.5	6.7	17.2	511	198
-27.5	3178	285	3463	3919	1871	10.9	6.5	17.4	535	199
-28.0	3238	285	3523	3919	1974	11.2	6.3	17.5	560	201
-28.5	3300	285	3585	3919	2080	11.6	6.1	17.7	585	202
-29.0	3360	285	3645	3919	2184	12.0	6.0	18.0	609	203

PileCore CPT results for S04			CEMS
X coordinate* [m]:	123759.0	Excavation level [m NAP]:	N.A.
Y coordinate* [m]:	483465.0	ρ $[kN/m]$	0.0
Groundwater level [m NAP]:	-0.4	ξ [-]	1.39
Surface level [m NAP]:	-0.15	qc-reduction:	N.A.

* The x and y coordinates of the CPT need to be in a Cartesian metric coordinate system.

Soil classification:

Soil code	Bottom	Thickness	γ	γ	
[-]	[m NAP]	[m]	$[kN/m]$	$[kN/m]$	[°]
V	-0.17	0.02	10.0	10.0	15.0
V	-0.33	0.16	10.0	10.0	15.0
V	-0.43	0.1	12.0	12.0	15.0
K	-0.55	0.12	18.0	18.0	27.5
Z	-1.95	1.4	19.0	21.0	35.0
Z	-2.05	0.1	18.0	20.0	27.0
Z	-3.67	1.62	19.0	21.0	35.0
Z	-3.77	0.1	18.0	20.0	27.0
K	-3.91	0.14	15.0	15.0	22.5
Z	-4.19	0.28	18.0	20.0	27.0
Z	-4.29	0.1	19.0	21.0	35.0
K	-4.47	0.18	15.0	15.0	22.5
K	-4.65	0.18	14.0	14.0	17.5
V	-6.16	1.52	12.0	12.0	15.0
K	-6.54	0.38	15.0	15.0	15.0
K	-6.64	0.1	14.0	14.0	17.5
K	-9.9	3.26	18.0	18.0	27.5
K	-10.22	0.32	14.0	14.0	17.5
K	-10.44	0.22	17.0	17.0	17.5
K	-10.54	0.1	15.0	15.0	15.0
K	-11.06	0.52	14.0	14.0	17.5
K	-11.58	0.52	17.0	17.0	17.5
K	-11.94	0.36	18.0	18.0	22.5
Z	-13.62	1.68	19.0	21.0	35.0
Z	-13.71	0.1	18.0	20.0	25.0
Z	-14.97	1.26	19.0	21.0	35.0
Z	-15.49	0.52	18.0	20.0	27.0
Z	-20.38	4.89	19.0	21.0	35.0
Z	-21.55	1.18	18.0	20.0	27.0
Z	-21.67	0.12	19.0	21.0	35.0
K	-22.27	0.6	18.0	18.0	27.5
K	-22.65	0.38	18.0	18.0	22.5
Z	-22.83	0.18	18.0	20.0	25.0
Z	-23.03	0.2	19.0	21.0	35.0
Z	-23.23	0.2	18.0	20.0	27.0
K	-23.45	0.22	18.0	18.0	27.5
Z	-23.69	0.24	18.0	20.0	27.0
Z	-34.98	11.29	19.0	21.0	35.0

Friction range:

Pile tip level	Negative friction range [m NAP]		Positive friction range [m NAP]	
[m NAP]	Top	Bottom	Top	Bottom
-24.0	-0.15	-12.02	-12.0	-24.01
-24.5	-0.15	-12.02	-12.0	-24.51
-25.0	-0.15	-12.02	-12.0	-25.0
-25.5	-0.15	-12.02	-12.0	-25.5
-26.0	-0.15	-12.02	-12.0	-26.0
-26.5	-0.15	-12.02	-12.0	-26.5
-27.0	-0.15	-12.02	-12.0	-27.0
-27.5	-0.15	-12.02	-12.0	-27.5
-28.0	-0.15	-12.02	-12.0	-28.0
-28.5	-0.15	-12.02	-12.0	-28.49
-29.0	-0.15	-12.02	-12.0	-28.99

Negative skin friction

Soil code	Bottom	Thickness	Average circum.	σ'	δ	K	F
[-]	[m NAP]	[m]	[m]	[kN/m]	[°]	[-]	[kN]
V	-0.17	0.02	2.14	0.0	15.0	0.7	0
V	-0.33	0.16	2.14	0.9	15.0	0.7	0
V	-0.43	0.1	2.14	2.3	15.0	0.7	0
K	-0.55	0.12	2.14	3.1	27.5	0.5	0
Z	-1.95	1.4	2.14	11.4	35.0	0.4	10
Z	-2.05	0.1	2.14	19.7	27.0	0.5	1
Z	-3.67	1.62	2.14	29.3	35.0	0.4	30
Z	-3.77	0.1	2.14	38.9	27.0	0.5	2
K	-3.91	0.14	2.14	39.8	22.5	0.6	3
Z	-4.19	0.28	2.14	41.5	27.0	0.5	7
Z	-4.29	0.1	2.14	43.5	35.0	0.4	3
K	-4.47	0.18	2.14	44.6	22.5	0.6	4
K	-4.65	0.18	2.14	45.4	17.5	0.7	4
V	-6.16	1.52	2.14	47.5	15.0	0.7	39
K	-6.54	0.38	2.14	50.1	15.0	0.7	10
K	-6.64	0.1	2.14	51.3	17.5	0.7	3
K	-9.9	3.26	2.14	64.8	27.5	0.5	127
K	-10.22	0.32	2.14	78.9	17.5	0.7	14
K	-10.44	0.22	2.14	80.3	17.5	0.7	9
K	-10.54	0.1	2.14	81.4	15.0	0.7	4
K	-11.06	0.52	2.14	82.7	17.5	0.7	23
K	-11.58	0.52	2.14	85.7	17.5	0.7	24
K	-11.94	0.36	2.14	89.0	22.5	0.6	18
Z	-13.62	1.68	2.14	99.8	35.0	0.4	3

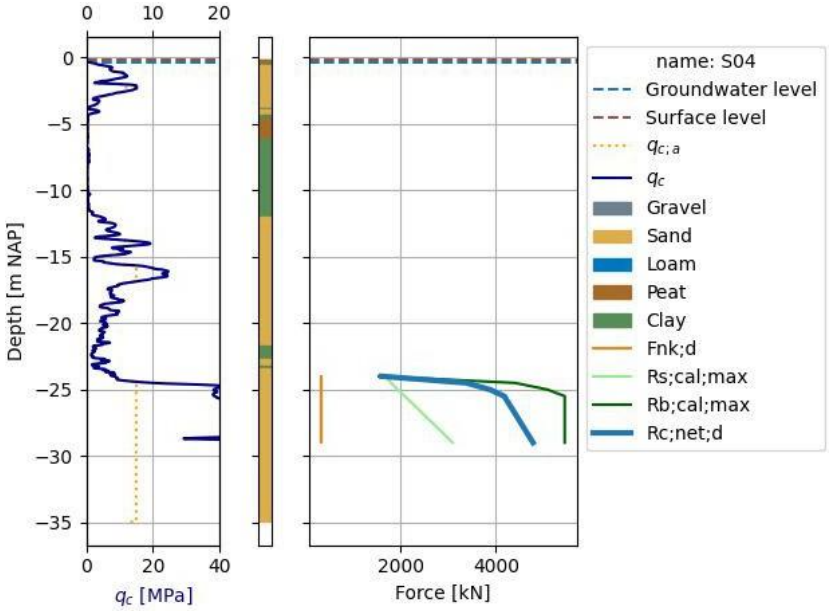
1) The results in this table are presented for the specific case when the pile-tip level is at -29.0 m NAP.
2) The average circumference of the pile per soil layer.
3) A minimum value of 0.25 for the product K δ is applied in the calculations (7.3.2.2(7)(d)).

Pile bearing capacity (ULS):

Pile tip level	Base resistance					Shaft resistance		Pile resistance			
	q	q	q	q	R	q	R	R	R	F	R
[m NAP]	[MPa]	[MPa]	[MPa]	[MPa]	[kN]	[kPa]	[kN]	[kN]	[kN]	[kN]	[kN]
-24.0	11.3	11.3	2.2	4.2	1541	65.93	1691	2325	1938	339	1599
-24.5	35.9	34.9	3.1	12.1	4402	67.33	1796	4459	3716	339	3377
-25.0	38.5	38.0	6.2	14.0	5084	69.92	1939	5053	4211	339	3872
-25.5	43.4	43.4	9.5	15.0	5448	72.32	2083	5418	4515	339	4176
-26.0	59.6	29.2	10.6	15.0	5448	74.55	2227	5521	4601	339	4262
-26.5	58.8	29.5	13.1	15.0	5448	76.62	2374	5627	4689	339	4350
-27.0	56.8	29.5	15.7	15.0	5448	78.56	2518	5730	4775	339	4436
-27.5	54.0	29.6	18.2	15.0	5448	80.38	2661	5834	4861	339	4522
-28.0	50.1	29.6	20.7	15.0	5448	82.08	2805	5937	4948	339	4609
-28.5	42.9	38.7	23.2	15.0	5448	83.67	2949	6041	5034	339	4695
-29.0	57.5	56.0	26.7	15.0	5448	85.18	3093	6144	5120	339	4781

4) The average maximum shaft friction in the positive friction zone.

CPT and bearing capacity



Pile settlement (SLS):

Pile tip level	SLS loads			Distributed capacity		Pile settlement/ spring stiffness				
	F	F	F	R	R	S	S	S	K	K
[m NAP]	[kN]	[kN]	[kN]	[kN]	[kN]	[mm]	[mm]	[mm]	[kN/mm]	[kN/mm]
-24.0	1119	339	1458	1109	1216	3.5	4.8	8.3	305	176
-24.5	2364	339	2703	3167	1292	7.6	7.2	14.8	375	183
-25.0	2710	339	3049	3657	1395	8.8	7.3	16.2	416	189
-25.5	2923	339	3262	3919	1499	9.7	7.3	17.0	449	192
-26.0	2983	339	3322	3919	1602	10.1	7.1	17.1	470	194
-26.5	3045	339	3384	3919	1708	10.4	6.9	17.3	493	196
-27.0	3105	339	3444	3919	1811	10.8	6.7	17.4	517	198
-27.5	3166	339	3505	3919	1915	11.1	6.5	17.6	541	199
-28.0	3226	339	3565	3919	2018	11.5	6.3	17.8	565	200
-28.5	3286	339	3625	3919	2122	11.8	6.1	18.0	590	201

-29.0	3347	339	3686	3919	2225	12.2	6.0	18.2	615	202

PileCore CPT results for S03			CEMS
X coordinate* [m]:	123774.0	Excavation level [m NAP]:	N.A.
Y coordinate* [m]:	483449.0	ρ $[kN/m]$	0.0
Groundwater level [m NAP]:	-0.4	ξ [-]	1.39
Surface level [m NAP]:	-0.25	qc-reduction:	N.A.

* The x and y coordinates of the CPT need to be in a Cartesian metric coordinate system.

Soil classification:

Soil code	Bottom	Thickness	γ	γ	
[-]	[m NAP]	[m]	$[kN/m]$	$[kN/m]$	[°]
Z	-0.27	0.02	18.0	20.0	27.0
Z	-0.57	0.3	18.0	20.0	27.0
Z	-1.69	1.12	19.0	21.0	35.0
Z	-1.79	0.1	18.0	20.0	25.0
Z	-1.89	0.1	18.0	20.0	27.0
K	-2.11	0.22	18.0	18.0	27.5
K	-2.31	0.2	14.0	14.0	17.5
Z	-3.97	1.66	19.0	21.0	35.0
K	-4.45	0.48	18.0	18.0	27.5
K	-4.65	0.2	15.0	15.0	22.5
K	-4.99	0.34	14.0	14.0	17.5
K	-5.23	0.24	17.0	17.0	17.5
K	-5.77	0.54	14.0	14.0	17.5
K	-5.97	0.2	17.0	17.0	17.5
K	-6.86	0.9	14.0	14.0	17.5
Z	-8.22	1.36	18.0	20.0	27.0
K	-10.34	2.12	18.0	18.0	27.5
K	-10.54	0.2	14.0	14.0	17.5
K	-10.76	0.22	15.0	15.0	15.0
K	-11.2	0.44	14.0	14.0	17.5
K	-11.4	0.2	17.0	17.0	17.5
V	-11.74	0.34	12.0	12.0	15.0
K	-11.84	0.1	15.0	15.0	15.0
K	-12.06	0.22	18.0	18.0	27.5
Z	-21.5	9.43	19.0	21.0	35.0
K	-22.03	0.54	20.0	20.0	22.5
K	-22.81	0.78	18.0	18.0	22.5
Z	-23.03	0.22	18.0	20.0	27.0
Z	-23.25	0.22	19.0	21.0	35.0
Z	-23.39	0.14	18.0	20.0	27.0
Z	-23.59	0.2	19.0	21.0	35.0
Z	-23.75	0.16	18.0	20.0	25.0
Z	-35.52	11.77	19.0	21.0	35.0

Friction range:

Pile tip level	Negative friction range [m NAP]		Positive friction range [m NAP]	
[m NAP]	Top	Bottom	Top	Bottom
-24.0	-0.25	-12.02	-12.0	-23.99
-24.5	-0.25	-12.02	-12.0	-24.51
-25.0	-0.25	-12.02	-12.0	-25.01
-25.5	-0.25	-12.02	-12.0	-25.51
-26.0	-0.25	-12.02	-12.0	-26.0
-26.5	-0.25	-12.02	-12.0	-26.5
-27.0	-0.25	-12.02	-12.0	-27.0
-27.5	-0.25	-12.02	-12.0	-27.5
-28.0	-0.25	-12.02	-12.0	-27.99
-28.5	-0.25	-12.02	-12.0	-28.49
-29.0	-0.25	-12.02	-12.0	-29.01

Negative skin friction

Soil code	Bottom	Thickness	Average circum.	σ'	δ	K	F
[-]	[m NAP]	[m]	[m]	[kN/m]	[°]	[-]	[kN]
Z	-0.27	0.02	2.14	0.2	27.0	0.5	0
Z	-0.57	0.3	2.14	2.7	27.0	0.5	0
Z	-1.69	1.12	2.14	10.7	35.0	0.4	8
Z	-1.79	0.1	2.14	17.4	25.0	0.6	1
Z	-1.89	0.1	2.14	18.4	27.0	0.5	1
K	-2.11	0.22	2.14	19.8	27.5	0.5	3
K	-2.31	0.2	2.14	21.2	17.5	0.7	2
Z	-3.97	1.66	2.14	30.8	35.0	0.4	33
K	-4.45	0.48	2.14	42.1	27.5	0.5	12
K	-4.65	0.2	2.14	44.6	22.5	0.6	5
K	-4.99	0.34	2.14	45.8	17.5	0.7	8
K	-5.23	0.24	2.14	47.4	17.5	0.7	6
K	-5.77	0.54	2.14	49.4	17.5	0.7	14
K	-5.97	0.2	2.14	51.2	17.5	0.7	5
K	-6.86	0.9	2.14	53.9	17.5	0.7	26
Z	-8.22	1.36	2.14	62.6	27.0	0.5	51
K	-10.34	2.12	2.14	78.2	27.5	0.5	99
K	-10.54	0.2	2.14	87.4	17.5	0.7	9
K	-10.76	0.22	2.14	88.3	15.0	0.7	10
K	-11.2	0.44	2.14	89.8	17.5	0.7	21
K	-11.4	0.2	2.14	91.5	17.5	0.7	10
V	-11.74	0.34	2.14	92.6	15.0	0.7	17
K	-11.84	0.1	2.14	93.2	15.0	0.7	5
K	-12.06	0.22	2.14	94.3	27.5	0.5	9

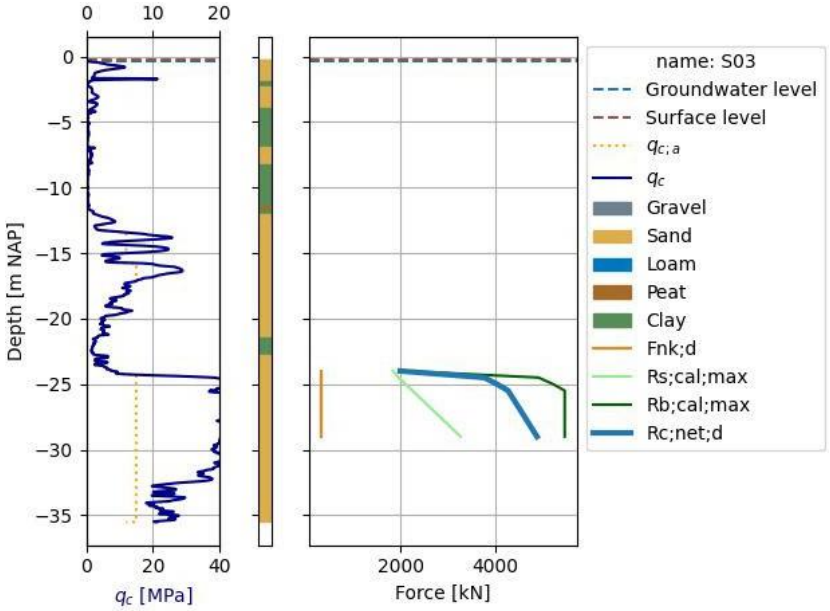
1) The results in this table are presented for the specific case when the pile-tip level is at -29.0 m NAP.
2) The average circumference of the pile per soil layer.
3) A minimum value of 0.25 for the product $K \quad \delta$ is applied in the calculations (7.3.2.2(7)(d)).

Pile bearing capacity (ULS):

Pile tip level	Base resistance					Shaft resistance		Pile resistance			
	q	q	q	q	R	q	R	R	R	F	R
[m NAP]	[MPa]	[MPa]	[MPa]	[MPa]	[kN]	[kPa]	[kN]	[kN]	[kN]	[kN]	[kN]
-24.0	16.1	16.1	2.1	5.7	2077	72.19	1850	2825	2355	356	1998
-24.5	41.5	36.9	3.6	13.5	4898	73.74	1967	4939	4116	356	3759
-25.0	40.4	36.9	6.8	14.3	5204	76.09	2111	5262	4385	356	4029
-25.5	51.4	39.4	10.1	15.0	5448	78.27	2255	5541	4618	356	4261
-26.0	50.6	40.8	13.5	15.0	5448	80.29	2398	5645	4704	356	4347
-26.5	47.2	39.6	16.9	15.0	5448	82.17	2542	5748	4790	356	4434
-27.0	44.8	38.3	20.1	15.0	5448	83.92	2688	5853	4878	356	4521
-27.5	42.3	37.7	23.2	15.0	5448	85.57	2832	5956	4964	356	4607
-28.0	42.2	37.8	26.5	15.0	5448	87.11	2975	6059	5050	356	4693
-28.5	41.1	37.7	29.8	15.0	5448	88.56	3118	6162	5135	356	4779
-29.0	39.7	33.4	29.6	15.0	5448	89.97	3264	6268	5223	356	4867

4) The average maximum shaft friction in the positive friction zone.

CPT and bearing capacity



Pile settlement (SLS):

Pile tip level	SLS loads			Distributed capacity		Pile settlement/ spring stiffness				
	F	F	F	R	R	S	S	S	K	K
[m NAP]	[kN]	[kN]	[kN]	[kN]	[kN]	[mm]	[mm]	[mm]	[kN/mm]	[kN/mm]
-24.0	1399	356	1755	1495	1331	4.3	5.2	9.5	337	185
-24.5	2632	356	2988	3523	1415	8.4	7.2	15.6	414	192
-25.0	2820	356	3177	3744	1519	9.1	7.1	16.3	444	195
-25.5	2983	356	3339	3919	1622	9.8	7.1	16.9	473	198
-26.0	3043	356	3400	3919	1725	10.1	6.9	17.0	496	200
-26.5	3104	356	3460	3919	1829	10.5	6.7	17.2	519	202
-27.0	3165	356	3521	3919	1934	10.9	6.5	17.3	544	203
-27.5	3225	356	3581	3919	2037	11.2	6.3	17.5	568	205
-28.0	3285	356	3642	3919	2140	11.6	6.1	17.7	593	206
-28.5	3345	356	3702	3919	2243	11.9	6.0	17.9	617	207

-29.0	3407	356	3763	3919	2348	12.3	5.9	18.2	643	207

PileCore CPT results for S01			CEMS
X coordinate* [m]:	123805.0	Excavation level [m NAP]:	N.A.
Y coordinate* [m]:	483464.0	ρ [kN/m]	0.0
Groundwater level [m NAP]:	-0.4	ξ [-]	1.39
Surface level [m NAP]:	-0.22	qc-reduction:	N.A.

* The x and y coordinates of the CPT need to be in a Cartesian metric coordinate system.

Soil classification:

Soil code	Bottom	Thickness	γ	γ	
[-]	[m NAP]	[m]	[kN/m]	[kN/m]	[°]
Z	-1.44	1.22	19.0	21.0	35.0
Z	-1.62	0.18	19.0	21.0	35.0
K	-1.84	0.22	15.0	15.0	22.5
K	-3.2	1.36	14.0	14.0	17.5
K	-3.34	0.14	17.0	17.0	17.5
K	-4.82	1.48	14.0	14.0	17.5
K	-6.24	1.42	15.0	15.0	15.0
K	-6.9	0.66	14.0	14.0	17.5
Z	-8.06	1.16	18.0	20.0	27.0
K	-10.28	2.22	14.0	14.0	17.5
K	-10.4	0.12	15.0	15.0	22.5
K	-10.52	0.12	14.0	14.0	17.5
K	-10.62	0.1	17.0	17.0	17.5
K	-10.86	0.24	15.0	15.0	15.0
K	-11.26	0.4	14.0	14.0	17.5
K	-11.36	0.1	17.0	17.0	17.5
V	-11.76	0.4	12.0	12.0	15.0
K	-11.92	0.16	20.0	20.0	22.5
Z	-12.89	0.98	19.0	21.0	35.0
K	-13.41	0.52	18.0	18.0	27.5
Z	-14.89	1.48	19.0	21.0	35.0
Z	-15.19	0.3	18.0	20.0	27.0
Z	-15.33	0.14	18.0	20.0	25.0
Z	-19.92	4.59	19.0	21.0	35.0
Z	-20.56	0.64	18.0	20.0	27.0
K	-21.22	0.66	18.0	18.0	27.5
Z	-22.28	1.06	18.0	20.0	27.0
Z	-22.91	0.64	19.0	21.0	35.0
Z	-23.57	0.66	18.0	20.0	27.0
Z	-35.58	12.01	19.0	21.0	35.0

Friction range:

Pile tip level	Negative friction range [m NAP]		Positive friction range [m NAP]	
[m NAP]	Top	Bottom	Top	Bottom
-24.0	-0.22	-12.02	-12.0	-24.01
-24.5	-0.22	-12.02	-12.0	-24.51
-25.0	-0.22	-12.02	-12.0	-25.0
-25.5	-0.22	-12.02	-12.0	-25.5
-26.0	-0.22	-12.02	-12.0	-26.0
-26.5	-0.22	-12.02	-12.0	-26.5
-27.0	-0.22	-12.02	-12.0	-27.0
-27.5	-0.22	-12.02	-12.0	-27.49
-28.0	-0.22	-12.02	-12.0	-27.99
-28.5	-0.22	-12.02	-12.0	-28.51
-29.0	-0.22	-12.02	-12.0	-29.0

Negative skin friction

Soil code	Bottom	Thickness	Average circum.	σ'	δ	K	F
[-]	[m NAP]	[m]	[m]	[kN/m]	[°]	[-]	[kN]
Z	-1.44	1.22	2.14	8.1	35.0	0.4	6
Z	-1.62	0.18	2.14	16.0	35.0	0.4	2
K	-1.84	0.22	2.14	17.6	22.5	0.6	2
K	-3.2	1.36	2.14	21.0	17.5	0.7	15
K	-3.34	0.14	2.14	24.4	17.5	0.7	2
K	-4.82	1.48	2.14	28.0	17.5	0.7	22
K	-6.24	1.42	2.14	34.8	15.0	0.7	26
K	-6.9	0.66	2.14	39.9	17.5	0.7	14
Z	-8.06	1.16	2.14	47.1	27.0	0.5	32
K	-10.28	2.22	2.14	57.7	17.5	0.7	68
K	-10.4	0.12	2.14	62.6	22.5	0.6	4
K	-10.52	0.12	2.14	63.2	17.5	0.7	4
K	-10.62	0.1	2.14	63.8	17.5	0.7	3
K	-10.86	0.24	2.14	64.8	15.0	0.7	8
K	-11.26	0.4	2.14	66.3	17.5	0.7	14
K	-11.36	0.1	2.14	67.4	17.5	0.7	4
V	-11.76	0.4	2.14	68.3	15.0	0.7	15
K	-11.92	0.16	2.14	69.5	22.5	0.6	6
Z	-12.89	0.98	2.14	75.7	35.0	0.4	4

1) The results in this table are presented for the specific case when the pile-tip level is at -29.0 m NAP.
2) The average circumference of the pile per soil layer.
3) A minimum value of 0.25 for the product K δ is applied in the calculations (7.3.2.2(7)(d)).

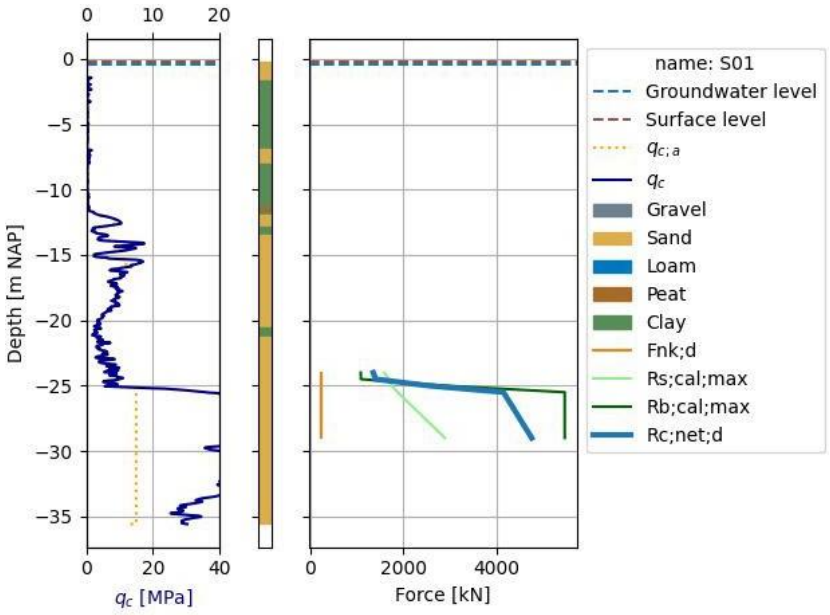
Pile bearing capacity (ULS):

Pile tip level	Base resistance					Shaft resistance		Pile resistance			
	q	q	q	q	R	q	R	R	R	F	R
[m NAP]	[MPa]	[MPa]	[MPa]	[MPa]	[kN]	[kPa]	[kN]	[kN]	[kN]	[kN]	[kN]
-24.0	8.2	5.3	2.8	3.0	1085	62.03	1591	1925	1604	253	1352
-24.5	7.5	5.4	3.1	3.0	1088	62.77	1676	1989	1657	253	1404
-25.0	21.8	21.8	3.4	7.9	2879	62.96	1750	3330	2775	253	2522
-25.5	50.4	44.1	5.3	15.0	5448	65.11	1875	5268	4390	253	4137

-26.0	50.9	44.6	9.1	15.0	5448	67.59	2018	5371	4476	253	4223
-26.5	49.0	44.6	13.0	15.0	5448	69.91	2165	5477	4564	253	4311
-27.0	47.7	35.8	14.5	15.0	5448	72.07	2308	5580	4650	253	4397
-27.5	46.7	35.8	17.4	15.0	5448	74.09	2452	5683	4736	253	4483
-28.0	45.7	35.8	20.4	15.0	5448	75.99	2595	5786	4822	253	4569
-28.5	43.9	35.8	23.4	15.0	5448	77.84	2741	5891	4909	253	4657
-29.0	42.3	35.9	26.2	15.0	5448	79.51	2885	5994	4995	253	4743

4) The average maximum shaft friction in the positive friction zone.

CPT and bearing capacity



Pile settlement (SLS):

Pile tip level	SLS loads			Distributed capacity		Pile settlement/ spring stiffness				
	F	F	F	R	R	S	S	S	K	K
[m NAP]	[kN]	[kN]	[kN]	[kN]	[kN]	[mm]	[mm]	[mm]	[kN/mm]	[kN/mm]
-24.0	946	253	1199	781	1145	2.8	4.0	6.9	296	174
-24.5	983	253	1236	783	1206	3.0	3.9	6.9	314	179
-25.0	1765	253	2018	2071	1259	5.6	6.0	11.5	338	175
-25.5	2896	253	3149	3919	1349	9.5	7.4	16.9	424	186
-26.0	2956	253	3209	3919	1452	9.8	7.2	17.1	445	188
-26.5	3018	253	3271	3919	1558	10.2	7.0	17.2	467	190
-27.0	3078	253	3331	3919	1661	10.6	6.8	17.4	490	192
-27.5	3138	253	3391	3919	1764	10.9	6.6	17.5	513	194
-28.0	3198	253	3451	3919	1867	11.3	6.4	17.7	537	195
-28.5	3260	253	3512	3919	1972	11.6	6.2	17.9	562	196
-29.0	3320	253	3573	3919	2075	12.0	6.1	18.1	586	197

PileCore CPT results for S05			CEMS
X coordinate* [m]:	123778.0	Excavation level [m NAP]:	N.A.
Y coordinate* [m]:	483481.0	ρ $[kN/m]$	0.0
Groundwater level [m NAP]:	-0.4	ξ [-]	1.39
Surface level [m NAP]:	0.2	qc-reduction:	N.A.

* The x and y coordinates of the CPT need to be in a Cartesian metric coordinate system.

Soil classification:

Soil code	Bottom	Thickness	γ	γ	
[-]	[m NAP]	[m]	$[kN/m]$	$[kN/m]$	[°]
Z	0.18	0.02	19.0	21.0	35.0
Z	-0.04	0.22	19.0	21.0	35.0
K	-0.14	0.1	18.0	18.0	27.5
Z	-0.8	0.66	19.0	21.0	35.0
K	-1.02	0.22	18.0	18.0	27.5
K	-1.14	0.12	20.0	20.0	22.5
Z	-4.66	3.52	19.0	21.0	35.0
Z	-4.76	0.1	18.0	20.0	27.0
K	-5.1	0.34	14.0	14.0	17.5
K	-5.9	0.8	15.0	15.0	15.0
V	-6.36	0.46	12.0	12.0	15.0
K	-6.68	0.32	15.0	15.0	15.0
K	-6.78	0.1	14.0	14.0	17.5
Z	-8.36	1.58	18.0	20.0	27.0
Z	-10.26	1.9	18.0	20.0	25.0
K	-10.7	0.44	14.0	14.0	17.5
K	-11.66	0.96	17.0	17.0	17.5
K	-11.76	0.1	15.0	15.0	15.0
K	-11.92	0.16	18.0	18.0	27.5
Z	-14.78	2.86	19.0	21.0	35.0
Z	-15.18	0.4	18.0	20.0	27.0
Z	-19.33	4.16	19.0	21.0	35.0
Z	-19.93	0.6	18.0	20.0	27.0
Z	-20.97	1.04	19.0	21.0	35.0
Z	-21.63	0.66	18.0	20.0	27.0
Z	-23.55	1.92	19.0	21.0	35.0
Z	-23.65	0.1	18.0	20.0	27.0
Z	-35.16	11.51	19.0	21.0	35.0

Friction range:

Pile tip level	Negative friction range [m NAP]		Positive friction range [m NAP]	
[m NAP]	Top	Bottom	Top	Bottom
-24.0	0.0	-12.02	-12.0	-24.01
-24.5	0.0	-12.02	-12.0	-24.51
-25.0	0.0	-12.02	-12.0	-25.0
-25.5	0.0	-12.02	-12.0	-25.5
-26.0	0.0	-12.02	-12.0	-26.0
-26.5	0.0	-12.02	-12.0	-26.5
-27.0	0.0	-12.02	-12.0	-27.0
-27.5	0.0	-12.02	-12.0	-27.5
-28.0	0.0	-12.02	-12.0	-28.0
-28.5	0.0	-12.02	-12.0	-28.5
-29.0	0.0	-12.02	-12.0	-29.0

Negative skin friction

Soil code	Bottom	Thickness	Average circum.	σ'	δ	K	F
[-]	[m NAP]	[m]	[m]	[kN/m]	[°]	[-]	[kN]
Z	-0.04	0.22	2.14	2.3	35.0	0.4	0
K	-0.14	0.1	2.14	5.3	27.5	0.5	0
Z	-0.8	0.66	2.14	11.5	35.0	0.4	5
K	-1.02	0.22	2.14	16.6	27.5	0.5	2
K	-1.14	0.12	2.14	18.1	22.5	0.6	1
Z	-4.66	3.52	2.14	38.4	35.0	0.4	86
Z	-4.76	0.1	2.14	58.6	27.0	0.5	4
K	-5.1	0.34	2.14	59.9	17.5	0.7	11
K	-5.9	0.8	2.14	62.6	15.0	0.7	27
V	-6.36	0.46	2.14	65.3	15.0	0.7	16
K	-6.68	0.32	2.14	66.6	15.0	0.7	11
K	-6.78	0.1	2.14	67.6	17.5	0.7	4
Z	-8.36	1.58	2.14	75.8	27.0	0.5	71
Z	-10.26	1.9	2.14	93.5	25.0	0.6	102
K	-10.7	0.44	2.14	104.3	17.5	0.7	25
K	-11.66	0.96	2.14	108.6	17.5	0.7	56
K	-11.76	0.1	2.14	112.4	15.0	0.7	6
K	-11.92	0.16	2.14	113.3	27.5	0.5	11
Z	-14.78	2.86	2.14	129.9	35.0	0.4	6

1) The results in this table are presented for the specific case when the pile-tip level is at -29.0 m NAP.
2) The average circumference of the pile per soil layer.
3) A minimum value of 0.25 for the product $K\_\_\_\_\delta\_\_$ is applied in the calculations (7.3.2.2(7)(d)).

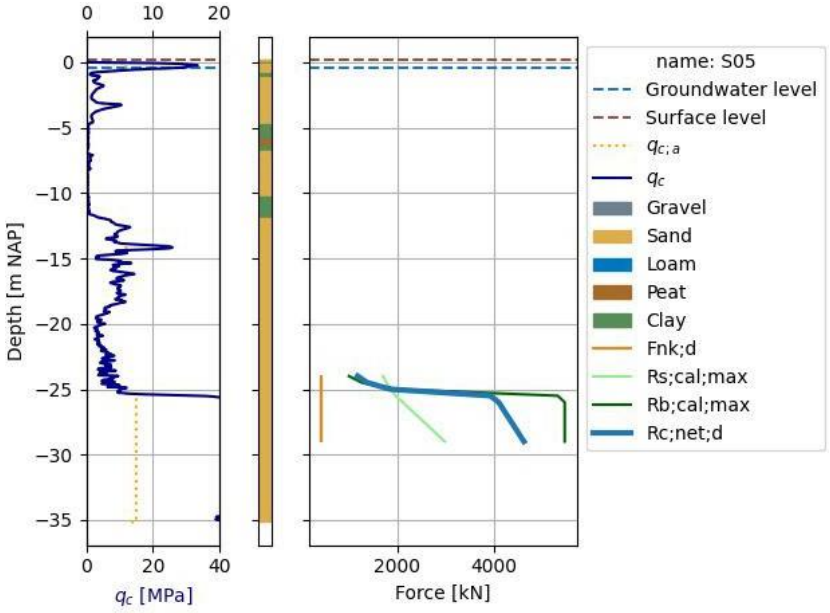
Pile bearing capacity (ULS):

Pile tip level	Base resistance					Shaft resistance		Pile resistance			
	q	q	q	q	R	q	R	R	R	F	R
[m NAP]	[MPa]	[MPa]	[MPa]	[MPa]	[kN]	[kPa]	[kN]	[kN]	[kN]	[kN]	[kN]
-24.0	6.8	4.7	3.1	2.8	1003	66.6	1707	1949	1625	444	1181
-24.5	8.4	7.3	3.3	3.5	1268	66.44	1775	2190	1825	444	1381
-25.0	13.8	13.5	3.7	5.5	1982	66.85	1855	2761	2301	444	1857
-25.5	41.8	41.4	4.8	14.6	5303	68.29	1966	5230	4358	444	3914

-26.0	43.5	43.0	8.3	15.0	5448	70.67	2110	5437	4531	444	4087
-26.5	50.2	50.2	12.0	15.0	5448	72.88	2254	5541	4617	444	4174
-27.0	58.9	54.9	16.3	15.0	5448	74.94	2398	5644	4704	444	4260
-27.5	58.0	54.9	21.0	15.0	5448	76.88	2545	5750	4792	444	4348
-28.0	56.5	51.4	25.0	15.0	5448	78.69	2689	5854	4878	444	4434
-28.5	55.8	51.5	29.4	15.0	5448	80.39	2833	5957	4964	444	4520
-29.0	54.4	48.6	32.7	15.0	5448	81.99	2977	6061	5050	444	4607

4) The average maximum shaft friction in the positive friction zone.

CPT and bearing capacity



Pile settlement (SLS):

Pile tip level	SLS loads			Distributed capacity		Pile settlement/ spring stiffness				
	F	F	F	R	R	S	S	S	K	K
[m NAP]	[kN]	[kN]	[kN]	[kN]	[kN]	[mm]	[mm]	[mm]	[kN/mm]	[kN/mm]
-24.0	826	444	1270	721	1228	2.8	4.3	7.1	294	178
-24.5	967	444	1410	913	1277	3.3	4.6	7.9	308	179
-25.0	1300	444	1744	1426	1335	4.4	5.3	9.8	326	178
-25.5	2740	444	3184	3815	1415	9.4	7.6	17.0	420	187
-26.0	2861	444	3305	3919	1518	10.0	7.4	17.4	446	190
-26.5	2921	444	3365	3919	1622	10.4	7.2	17.6	467	191
-27.0	2982	444	3426	3919	1725	10.7	7.0	17.7	489	193
-27.5	3043	444	3487	3919	1831	11.1	6.8	17.9	512	195
-28.0	3104	444	3548	3919	1934	11.5	6.6	18.1	536	196
-28.5	3164	444	3608	3919	2038	11.8	6.4	18.3	561	197
-29.0	3225	444	3668	3919	2142	12.2	6.3	18.5	585	199

PileCore results for user defined CPT Group

CPT	X coordinate	Y coordinate	Surface level	Groundwater level	Excavation level	ρ
	[m]	[m]	[m NAP]	[m NAP]	[m NAP]	[kN/m]
S07	123787.00	483465.00	0.12	-0.4	0.12	0.0
S06	123789.00	483485.00	0.18	-0.4	0.18	0.0
S02	123797.00	483441.00	-0.63	-0.4	-0.63	0.0
S04	123759.00	483465.00	-0.15	-0.4	-0.15	0.0
S03	123774.00	483449.00	-0.25	-0.4	-0.25	0.0
S01	123805.00	483464.00	-0.22	-0.4	-0.22	0.0
S05	123778.00	483481.00	0.2	-0.4	0.2	0.0

1) Other input parameters that are used to calculate the bearing capacity (e.g. positive skin friction trajectory) can be found in the individual CPT results report.
2) The x and y coordinates of the CPT need to be in a Cartesian metric coordinate system.

Pile Tip Level	R	R	Factor	Var. co-eff	Nominal CPT	R	R	F	R	ξ
[m NAP]	[kN]	[kN]	[-]	[%]	[-]	[kN]	[kN]	[kN]	[kN]	[-]
-24.0	3024	2676	4	14.8	S01	1925	1604	253	1352	1.39
-24.5	4242	2764	4	41.2	S01	1989	1657	253	1404	1.39
-25.0	5117	3268	4	30.3	S06	2351	1959	328	1631	1.39
-25.5	7260	6341	3	6.0	Group av.	5716	4764	324	4440	1.27
-26.0	7536	7266	3	2.5	Group av.	5934	4945	324	4621	1.27
-26.5	7716	7555	3	1.9	Group av.	6076	5063	324	4739	1.27
-27.0	7875	7698	3	1.8	Group av.	6200	5167	324	4843	1.27
-27.5	8019	7842	3	1.8	Group av.	6314	5262	324	4938	1.27
-28.0	8163	7986	3	1.8	Group av.	6427	5356	324	5032	1.27
-28.5	8307	8130	3	1.7	Group av.	6541	5451	324	5127	1.27
-29.0	8452	8277	3	1.7	Group av.	6655	5546	324	5222	1.27

3) The design negative friction force is based on the Nominal CPT. If the 3 factor is applied, the friction force is the group average.
4) The values are related to the net pile bearing capacity (NEN9997-1 7.6.2.3). Based on the lowest outcome of Rc;net;d, this can either be a 3 or 4 value (based on the nominal CPT). In case the variation coefficient is above 12

Pile settlement (SLS):

Pile tip level	SLS loads			Distributed capacity		Pile settlement/ spring stiffness				
	F	F	F	R	R	S	S	S	K	K
[m NAP]	[kN]	[kN]	[kN]	[kN]	[kN]	[mm]	[mm]	[mm]	[kN/mm]	[kN/mm]
-24.0	946	253	1199	781	1145	2.8	4.0	6.9	296	174
-24.5	983	253	1236	783	1206	3.0	3.9	6.9	314	179
-25.0	1141	328	1470	1109	1242	3.8	4.7	8.5	313	173

-25.5	3108	324	3432	4146	1570	9.4	7.2	16.6	474	207
-26.0	3235	324	3558	4250	1683	9.9	7.1	17.0	502	209
-26.5	3318	324	3641	4278	1798	10.3	6.9	17.2	527	211
-27.0	3390	324	3714	4289	1911	10.7	6.7	17.4	553	213
-27.5	3457	324	3780	4289	2025	11.1	6.5	17.6	579	215
-28.0	3523	324	3846	4289	2138	11.4	6.3	17.8	606	217
-28.5	3589	324	3913	4289	2252	11.8	6.2	18.0	633	218
-29.0	3655	324	3979	4289	2366	12.2	6.0	18.2	660	219