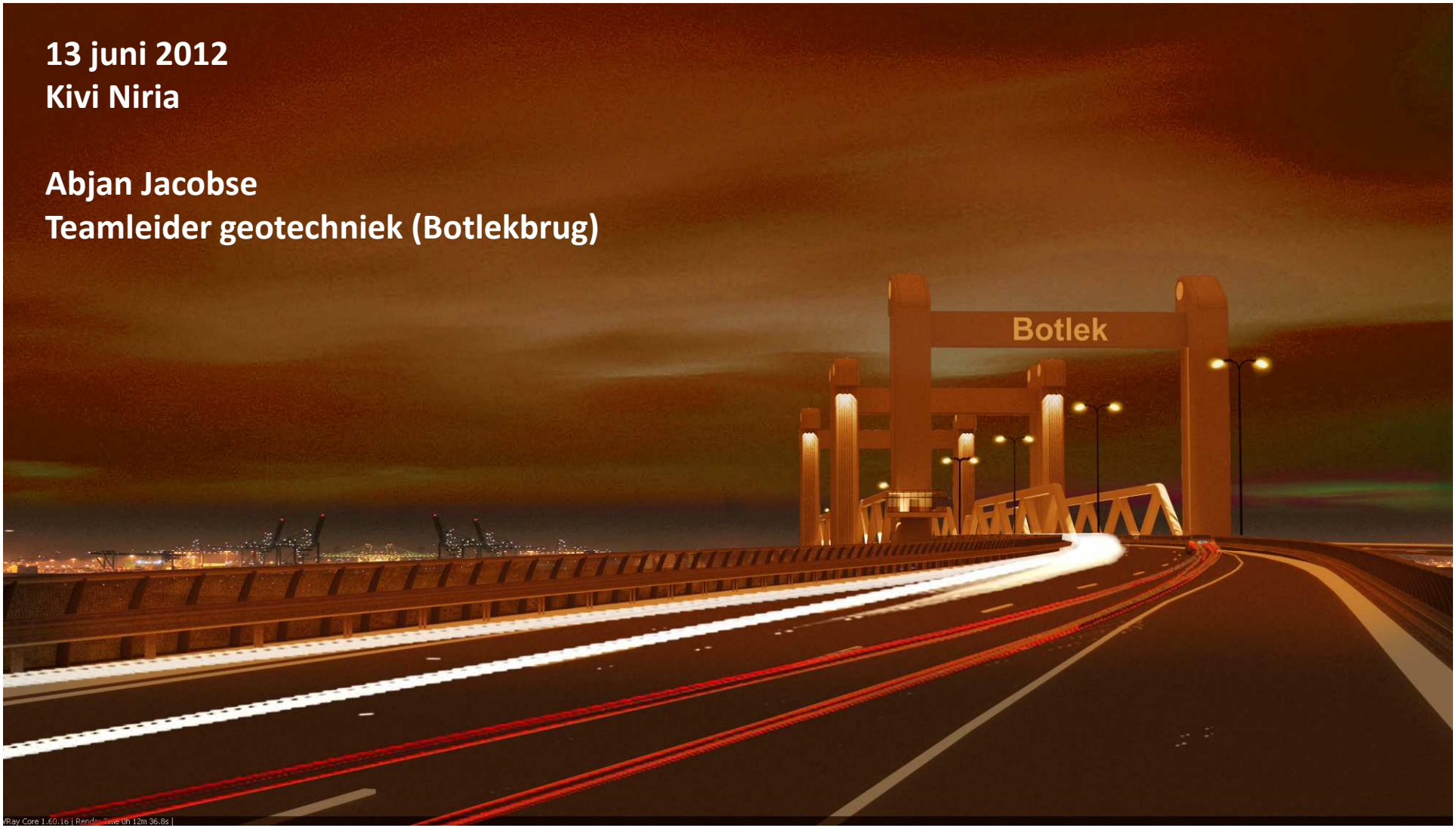
A-LanesA15
RIJSTROKEN MET EEN A-LABEL

13 juni 2012
Kivi Niria

Abjan Jacobse
Teamleider geotechniek (Botlekbrug)



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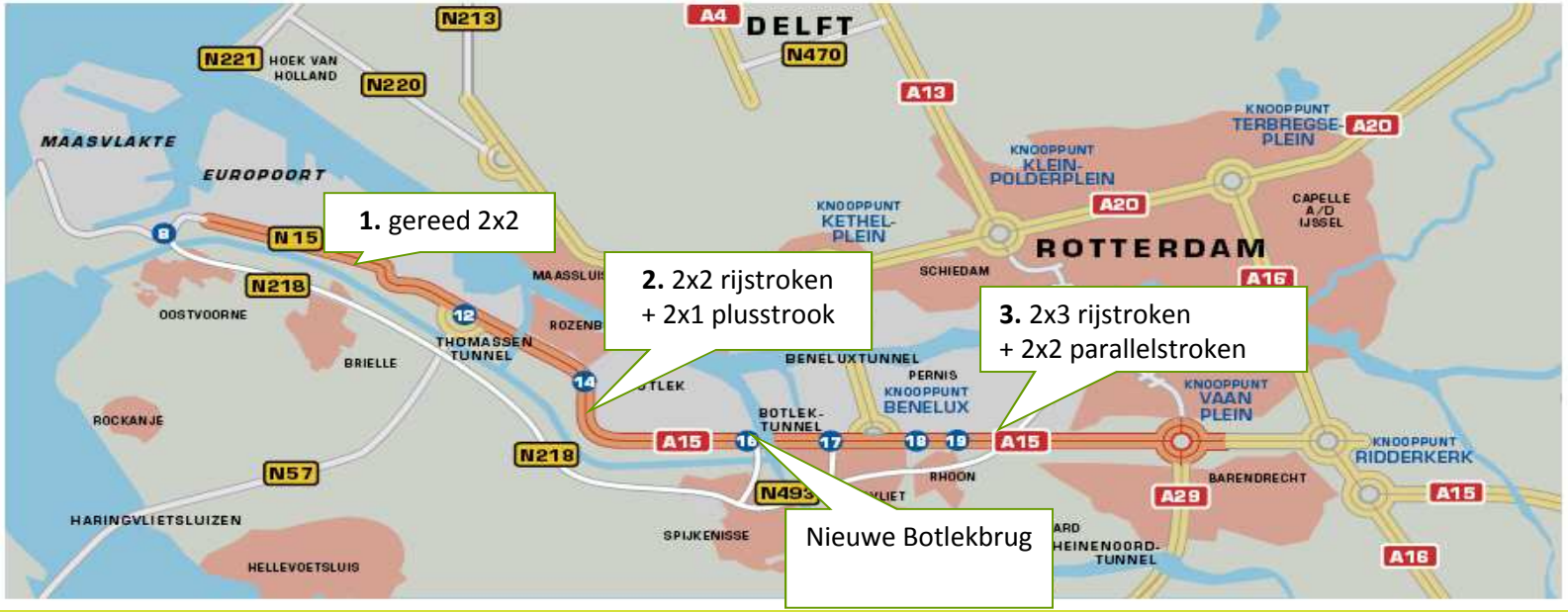
Geotechniek bij de A15

- Algemeen project / geotechniek
- Kunstwerken (Crossings)
- Botlek corridor

Project

Aanpassing snelweg A15 van km 25,0 - km 62,0

- Toevoegen 2 parallelwegen aan bestaande 2x3 en 2x2 rijstroken (over 16 km)
- Uitbreiding bestaande rijstroken van 2x2 tot 2x3 (over ca. 11 km)



Scope geotechniek

Algemeen

- Grondonderzoek opstarten en begeleiden

Crossings

- Geotechnisch ontwerpen 12 nieuwe kunstwerken

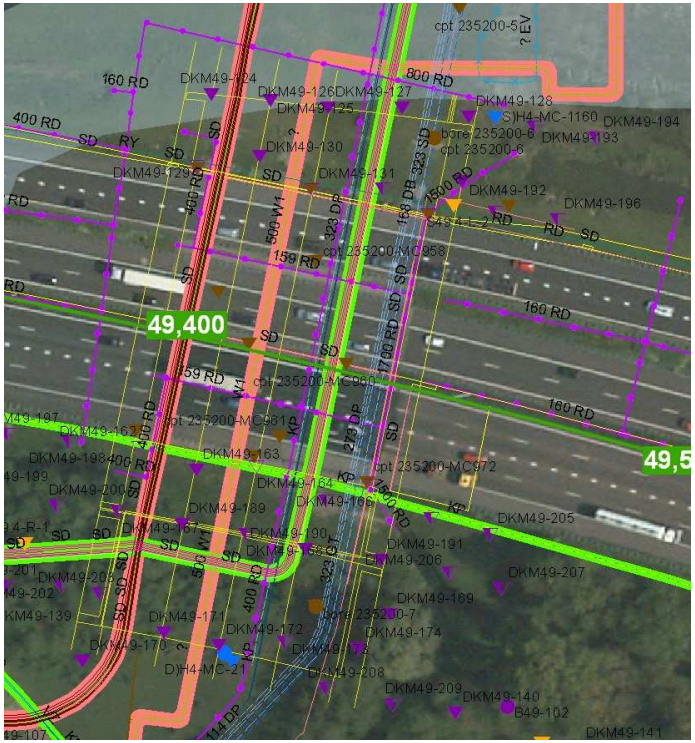
Botlek corridor

- Geotechnisch ontwerp nieuwe Botlek hefbrug (hoofdpijlers)
- Geotechnisch ontwerp aanbruggen (9 ramps)
- Geotechnisch ontwerp kunstwerken Hartelkruis

Scope geotechniek

Roads

- Geotechnisch ontwerp 18 km aardebaan – zetting en stabiliteit
- Beïnvloeding kabels en leidingen
- Ontwerp paalmatrassen
- Beïnvloeding bestaande kunstwerken/objecten



Grondonderzoek

- Verzamelen archief gegevens (Havenspoorlijn, Vaanplein, etc.)
- Meest toegepaste grondonderzoeksmethode: ca. 1000 sonderingen, waarvan ca. 35 op water
- Boringen en laboratorium testen
  - +/- 50 boringen
  - 120 samendrukkingsproeven
  - 30 triaxiaalproeven
  - 280 water gehaltes
    + volumieke gewichten
- Peilbuizen (+/- 15)

Crossings

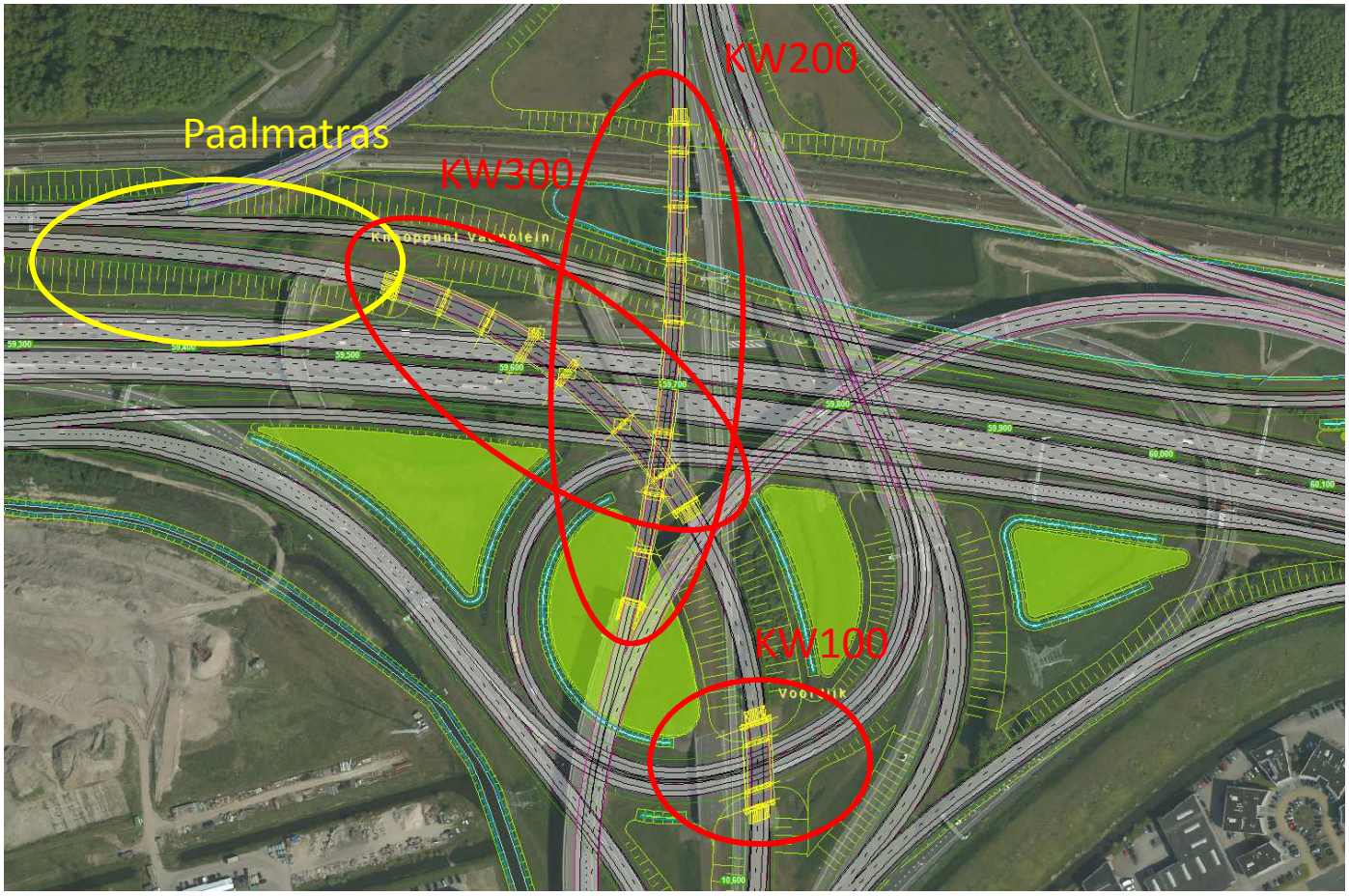
- Vaanplein
- Duiker Molenvliet
- Verlengde Zuiderparkweg
- Oudelandseviaduct

Vaanplein

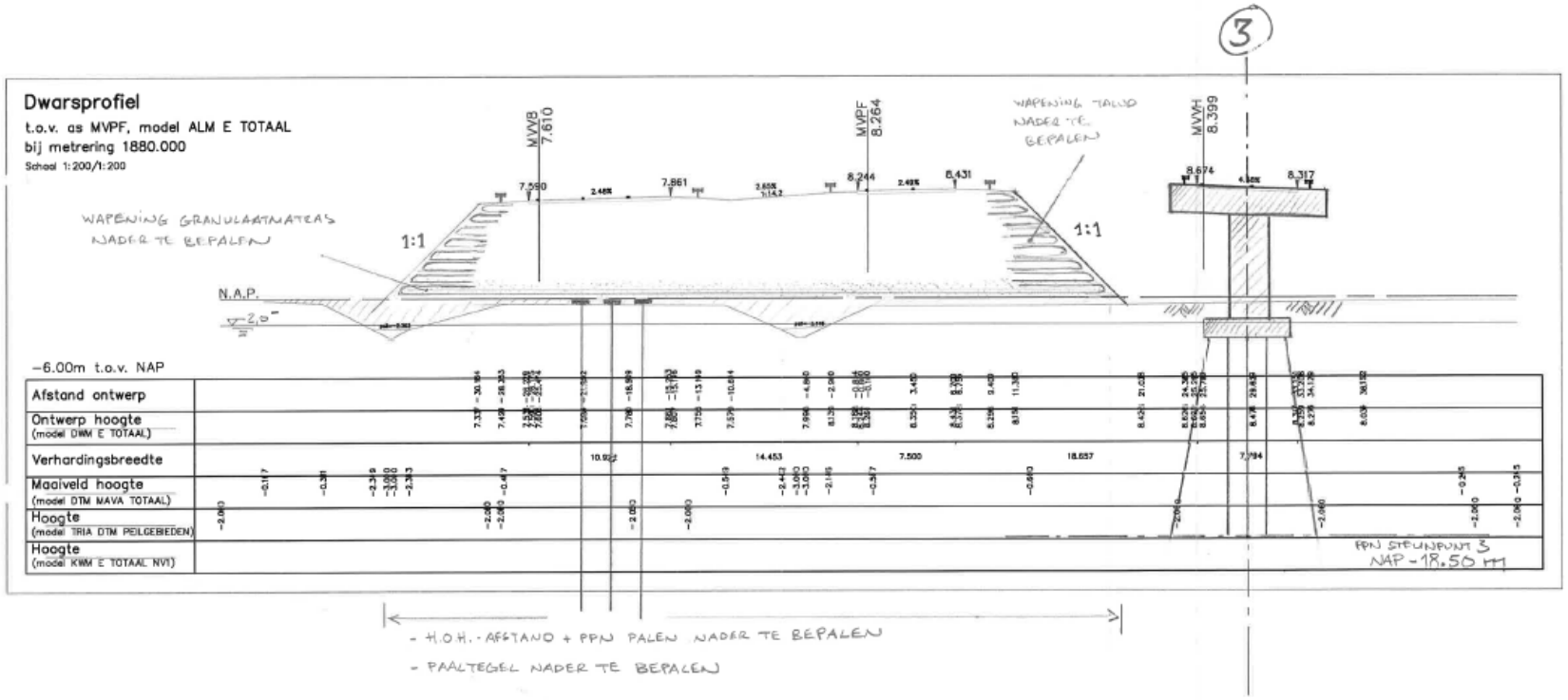
Knooppunt Vaanplein .
Foto in zuidelijke richting.

Knooppunt Vaanplein.
Foto in zuidelijke richting.

Vaanplein



Ontwerp, van idee…



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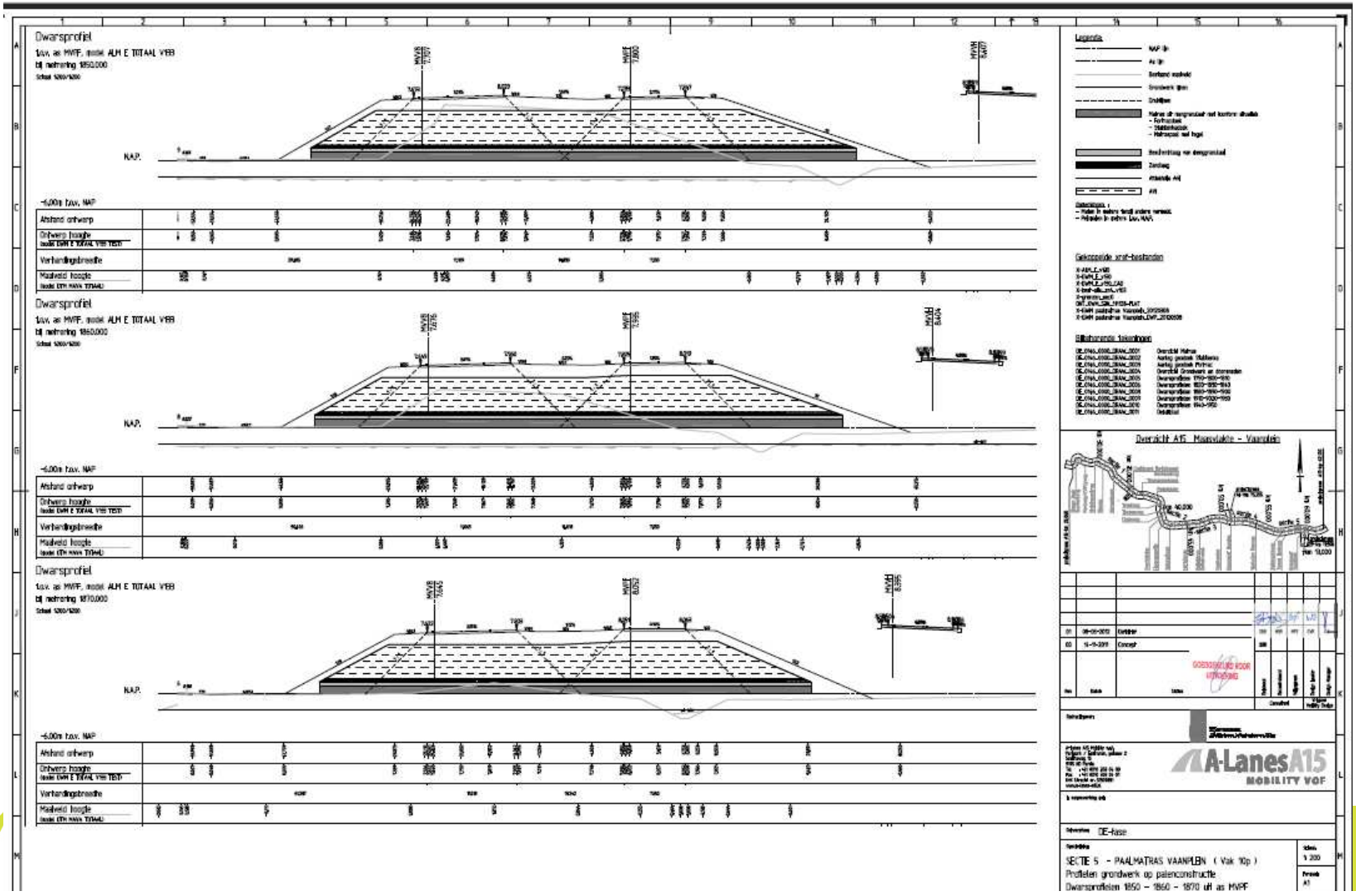
Naar DE ontwerp



Naar uitvoering

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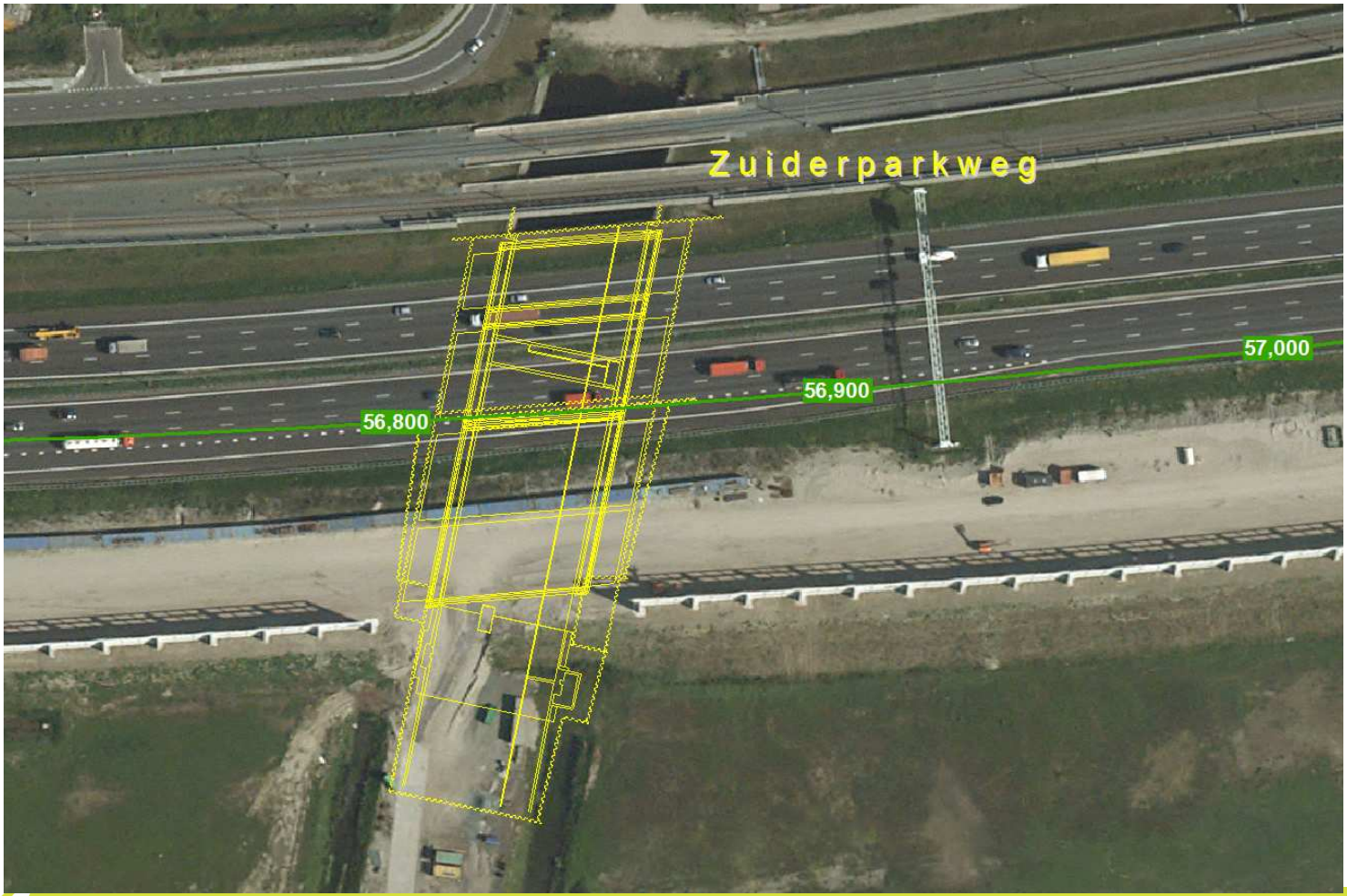
Duiker Molenvliet

Verlengde Zuiderparkweg



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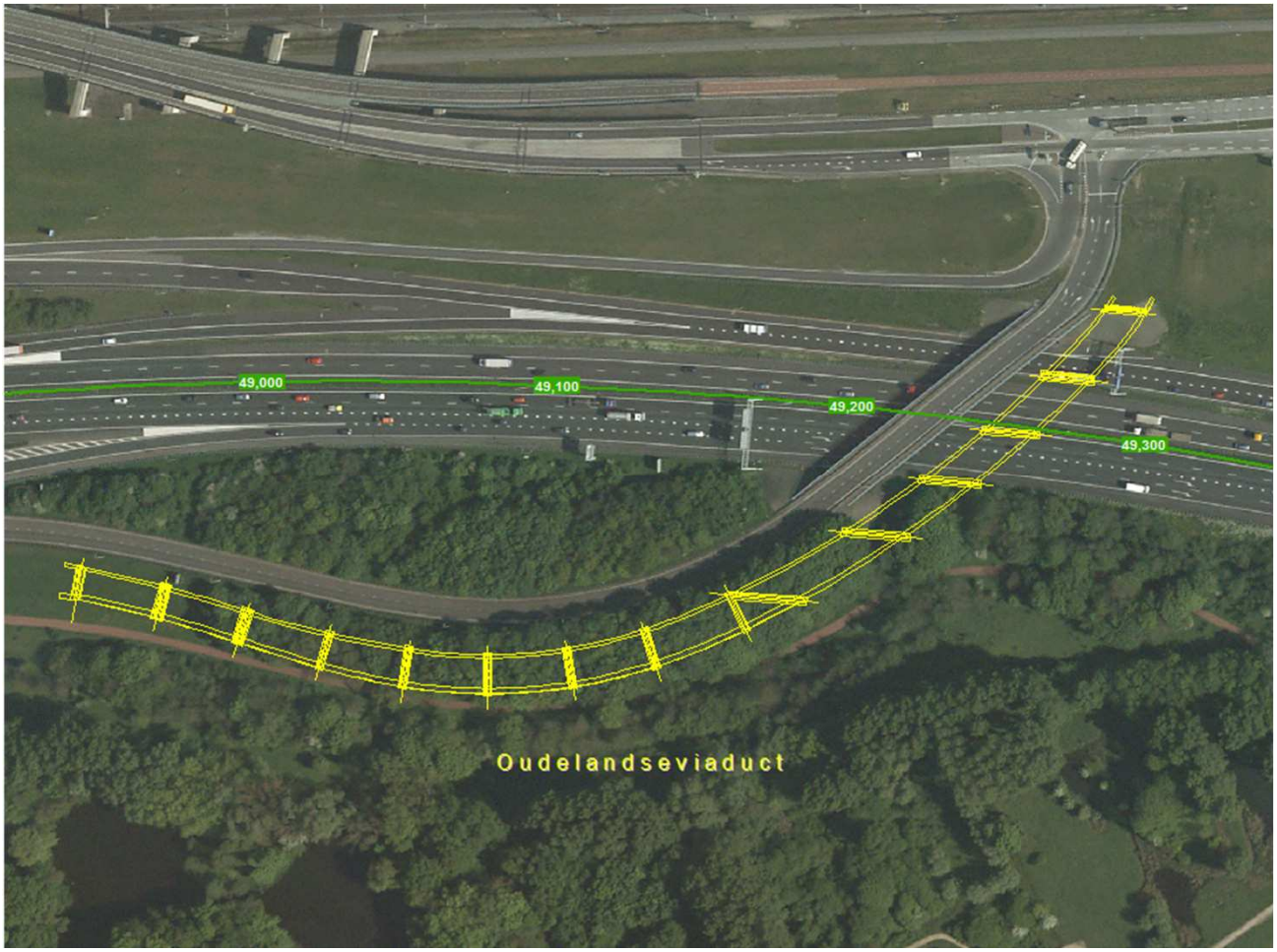
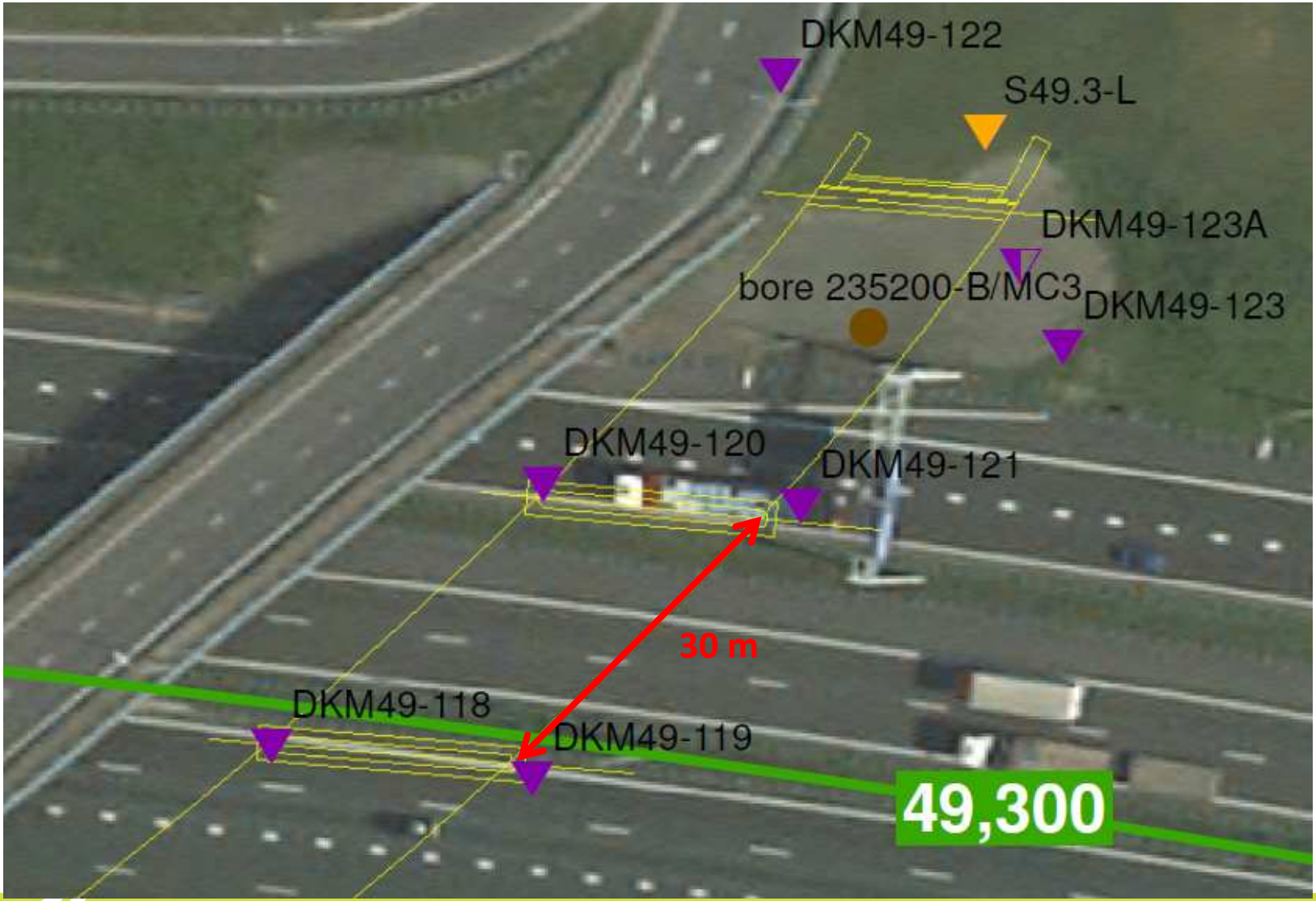
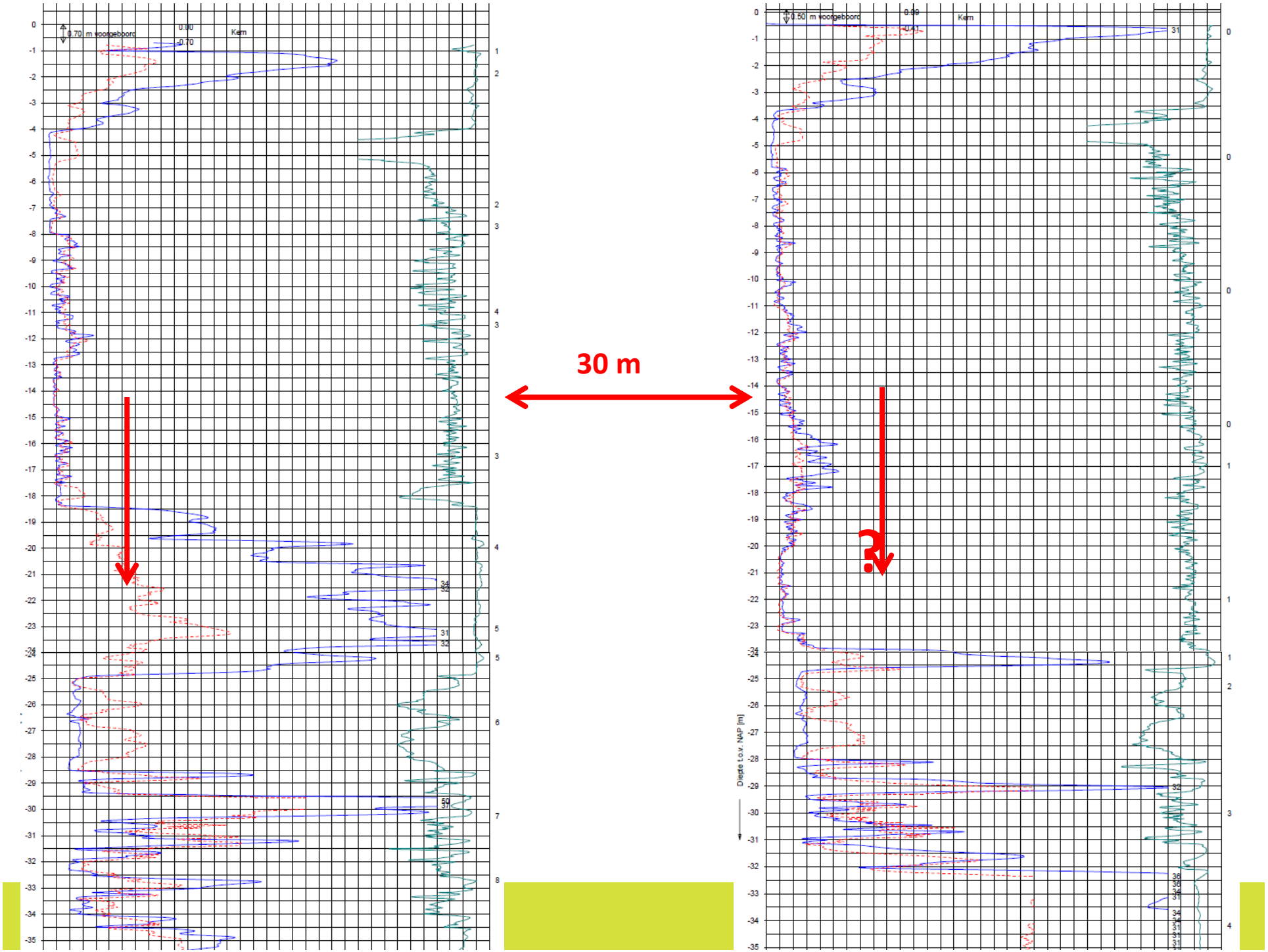
Oudelandseviaduct




DKM49-122
S49.3-L
DKM49-123A
bore 235200-B/MC3
DKM49-123
DKM49-120
DKM49-121
30 m
DKM49-118
DKM49-119
49,300


0.70 m voorgeboord
0.00
-0.70
Kern
0.50 m voorgeboord
0.00
-0.41
Kern
30 m
?
Diepte t.o.v. NAP [m]

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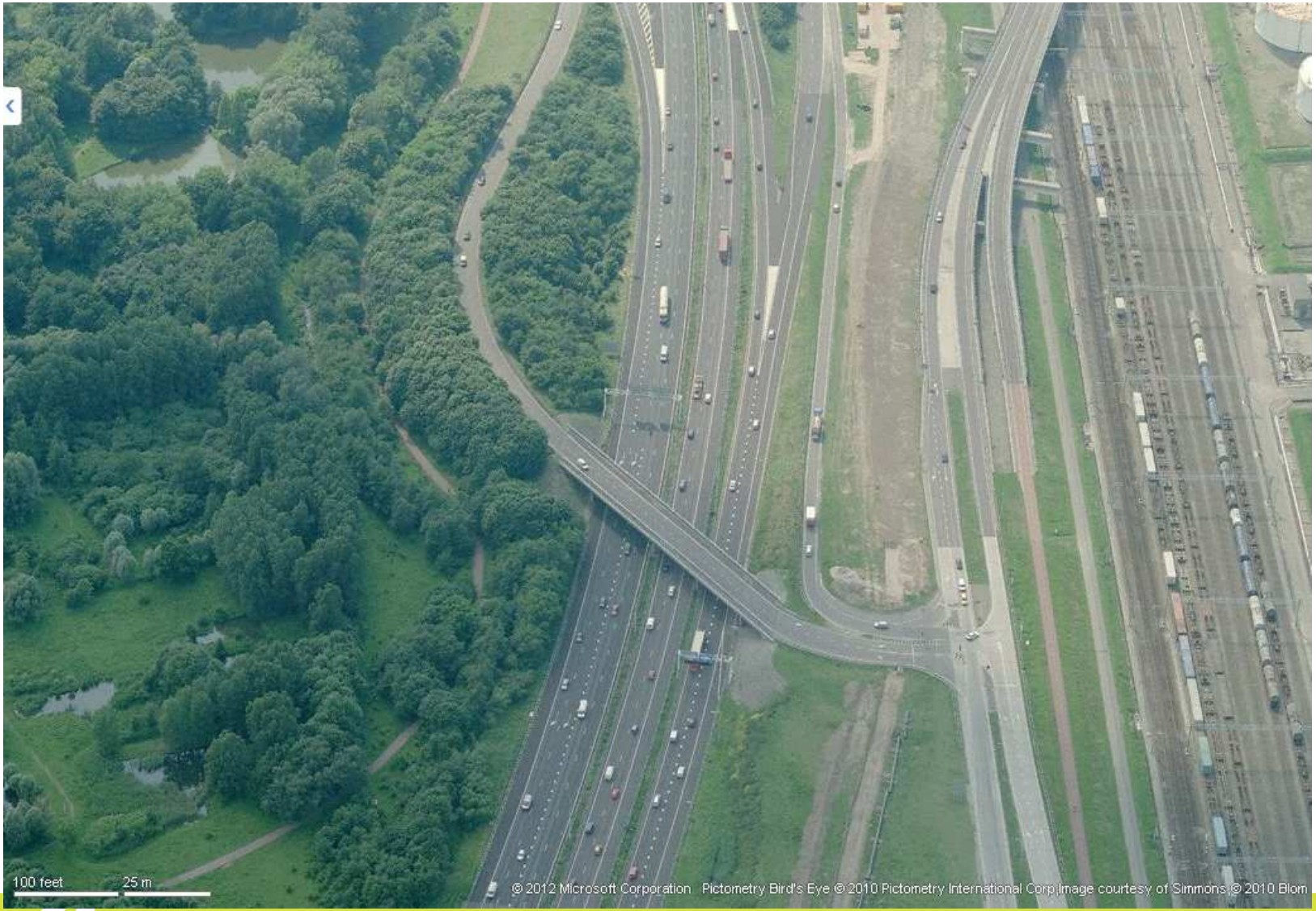

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Nieuwe Botlekbrug

Huidige Botlekbrug tijdens de bouw in 1955

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Huidige Botlekbrug bottleneck spoor, weg en scheepvaart

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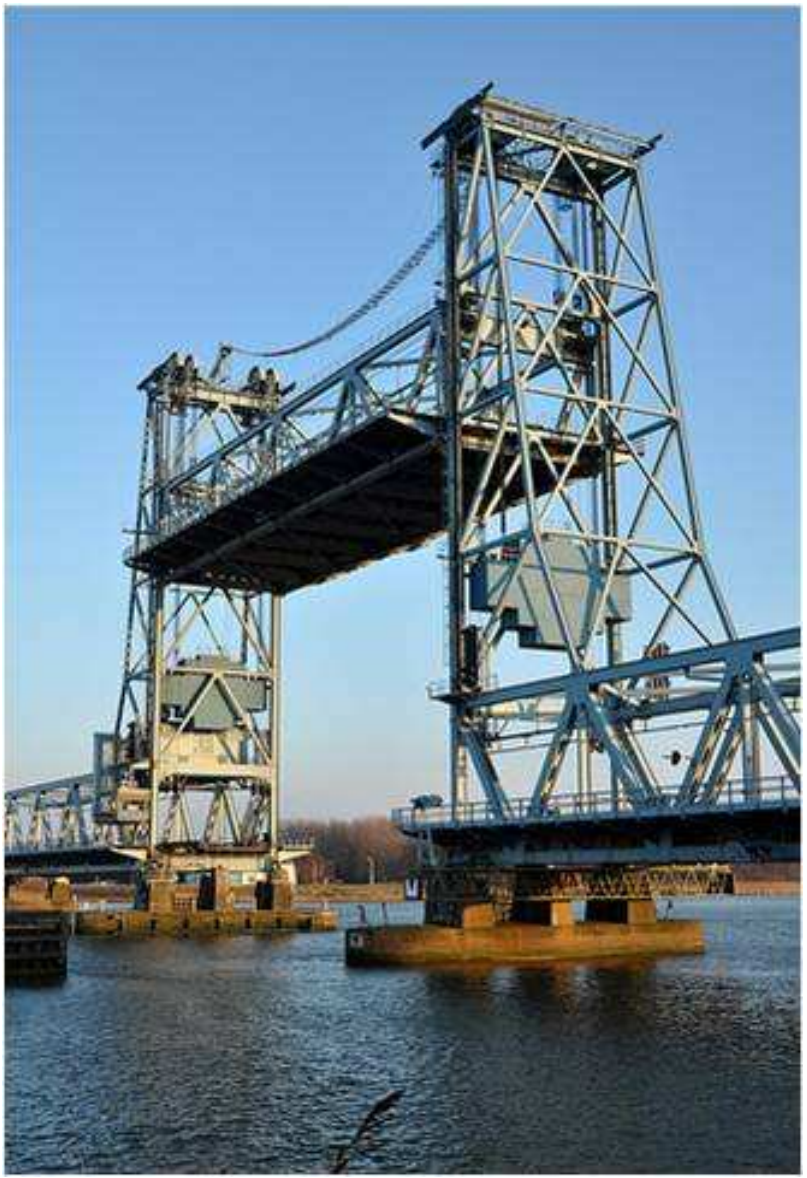

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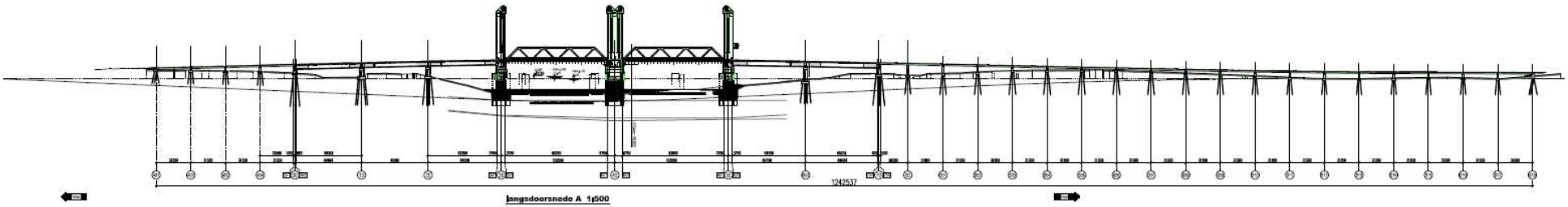
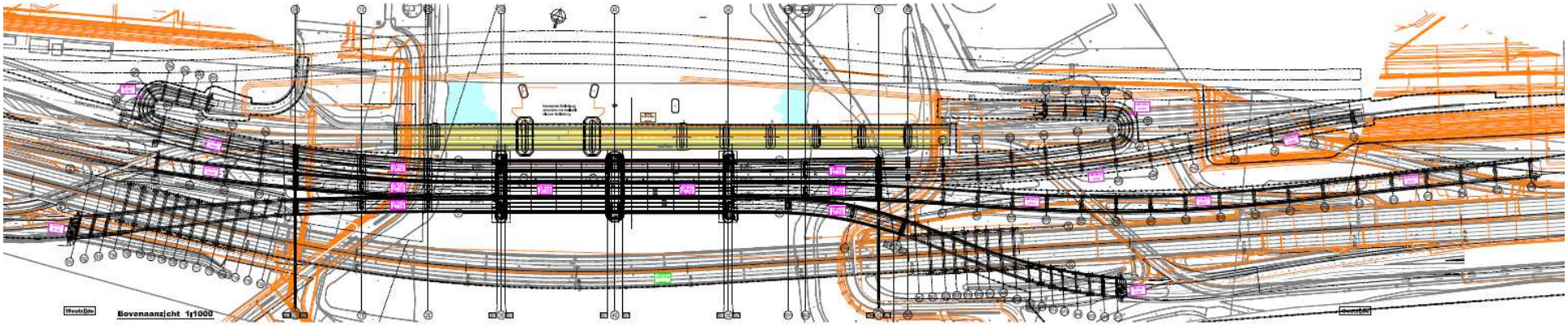
Nieuwe Botlekbrug





Short spans West (31-37 m) | Long spans West (60-66m) | Movable part (2 x 90 m) | Long spans East (60-66m) | Short spans East (31-37m)

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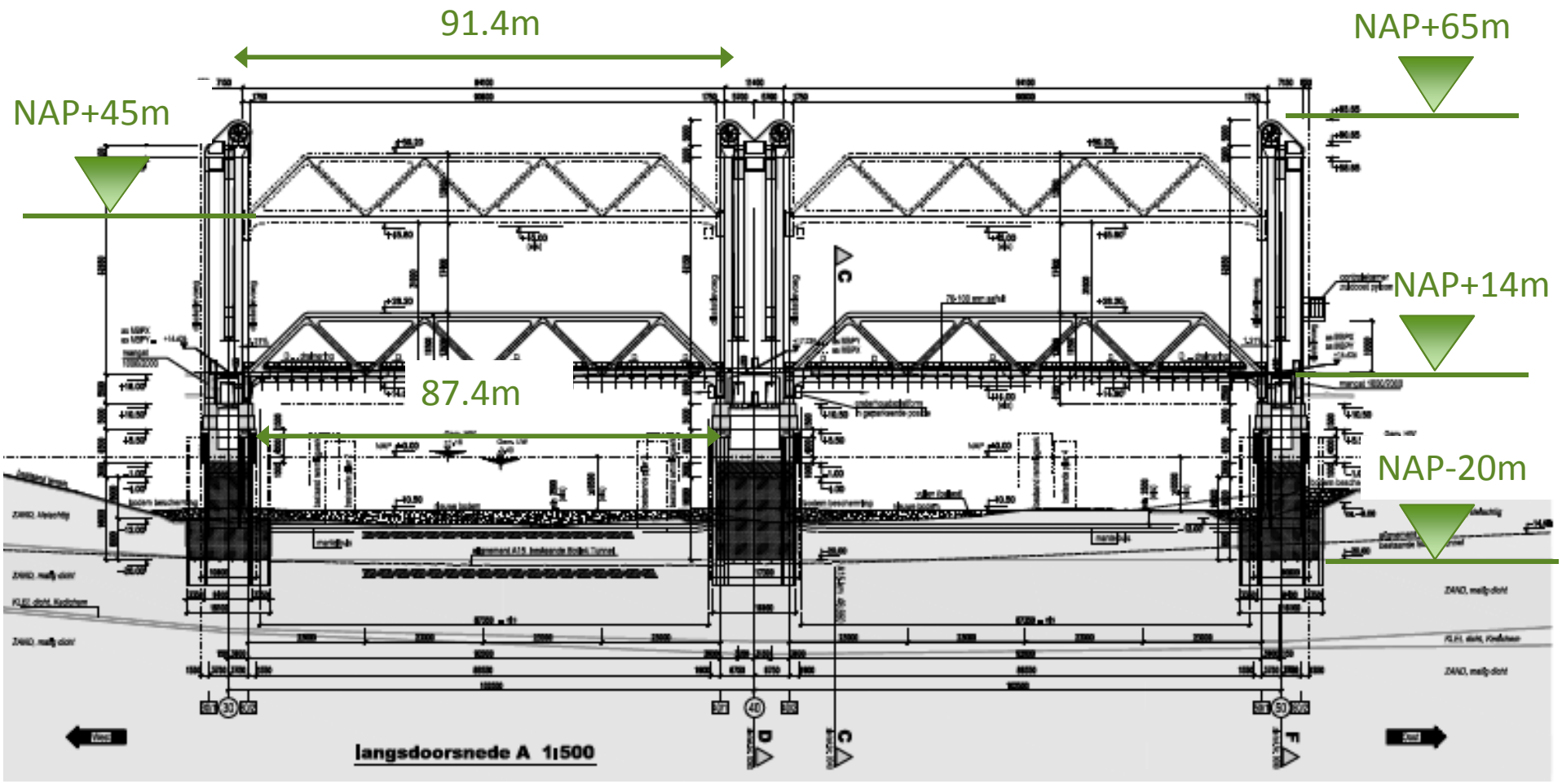

Longitudinal section bridge + charateristics

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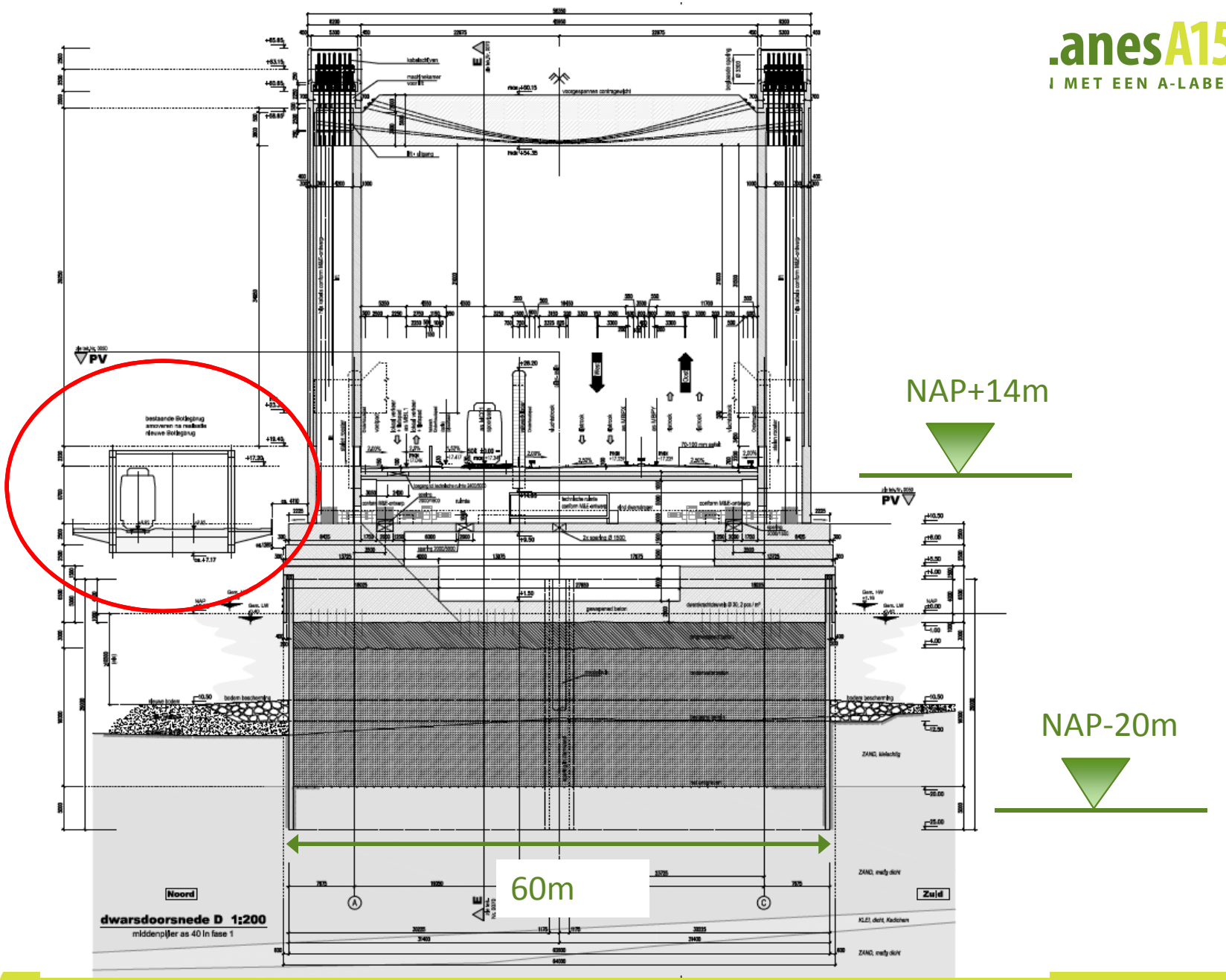
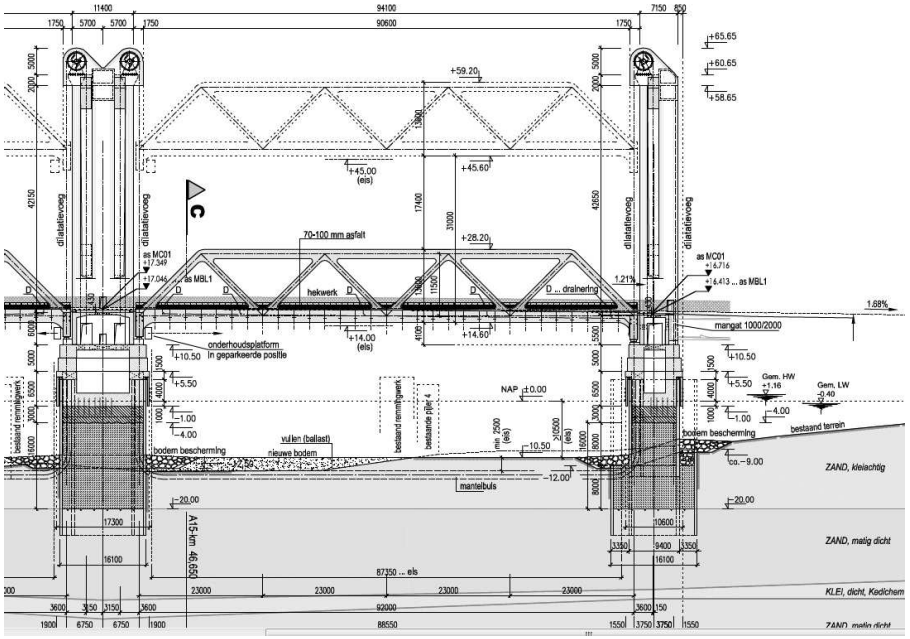


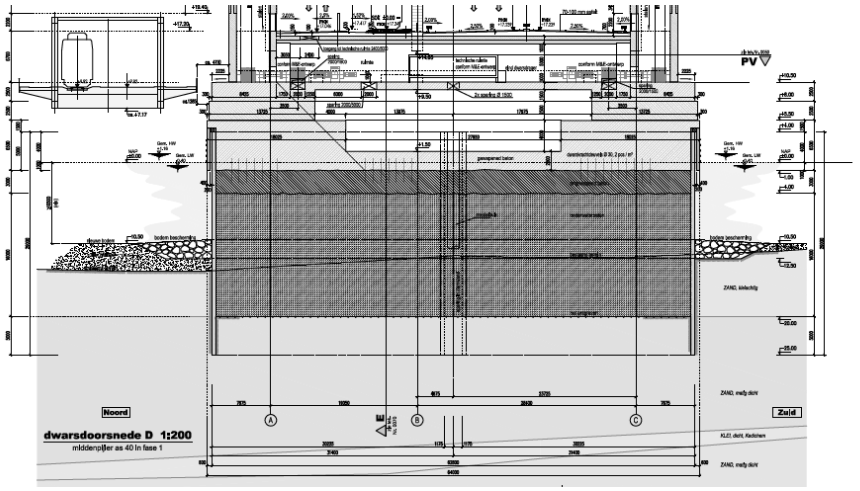
Huidige Botlekbrug vs nieuwe Botlekbrug

	Huidige brug	Nieuwe brug
Snelheid	50 km/h	100 km/h
Gevaarlijke -stoffenroute	2x1 rijbaan	2x2 rijbaan
Langzaam verkeer	1 voetpad, 1 fietspad	Voetpad, fietspad en rijbaan in beide richtingen
Doorvaarhoogte (in gesloten toestand)	8,0 m	14,0 m
Doorvaarbreedte	Enkel hefdeel: 55 m	Twee hefdelen: elk 87,35 m
Opening van de brug	6 a 7 keer per uur	1 a 2 keer per uur
Spoor	1	1(maar voorbereid op mogelijkheid 2de spoor)

Foundation main piers

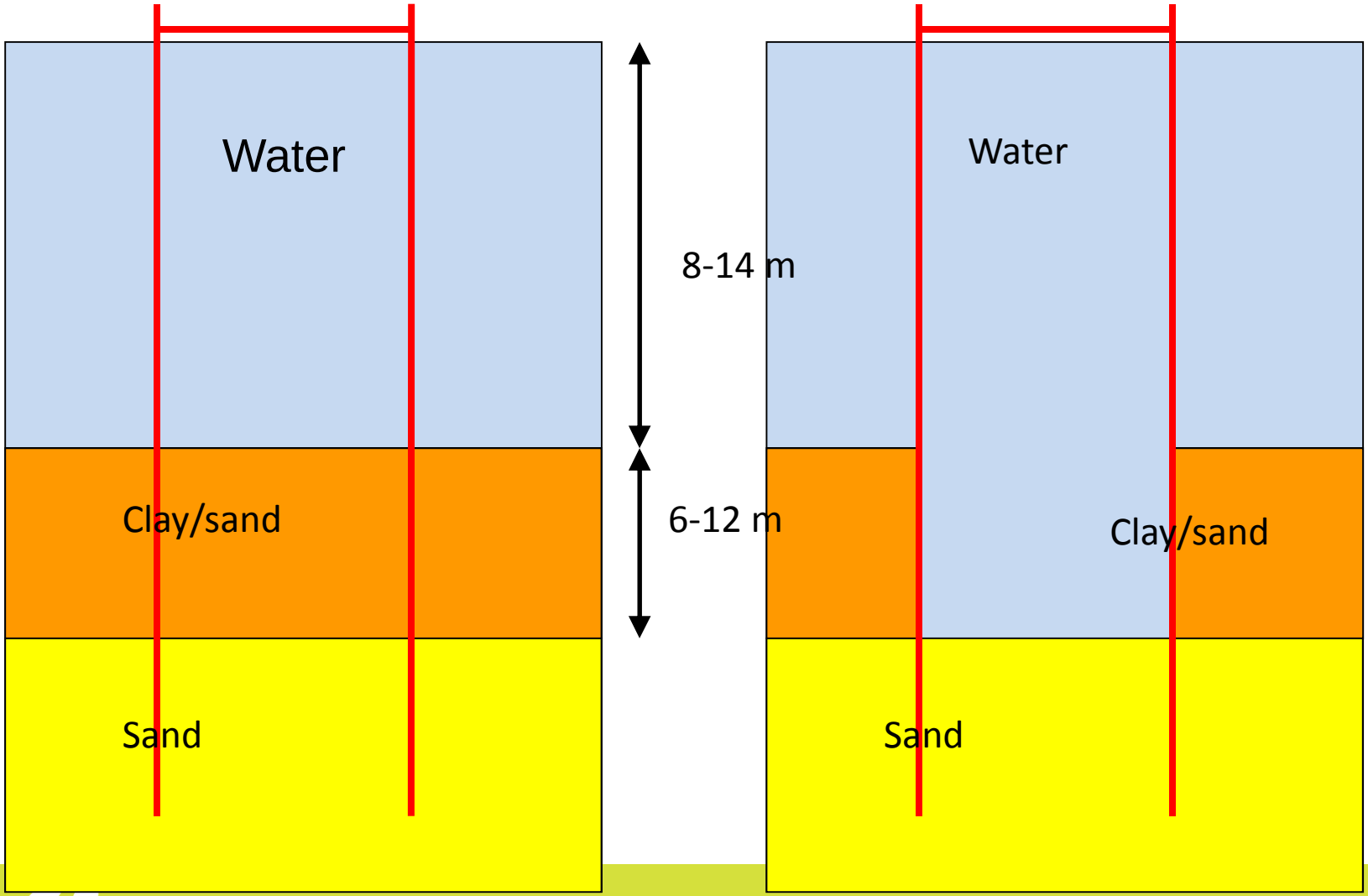
- Footprint: 60 m x 15 m
- Foundation level NAP-20m
- Under water concrete until NAP-1m
- Shallow foundation



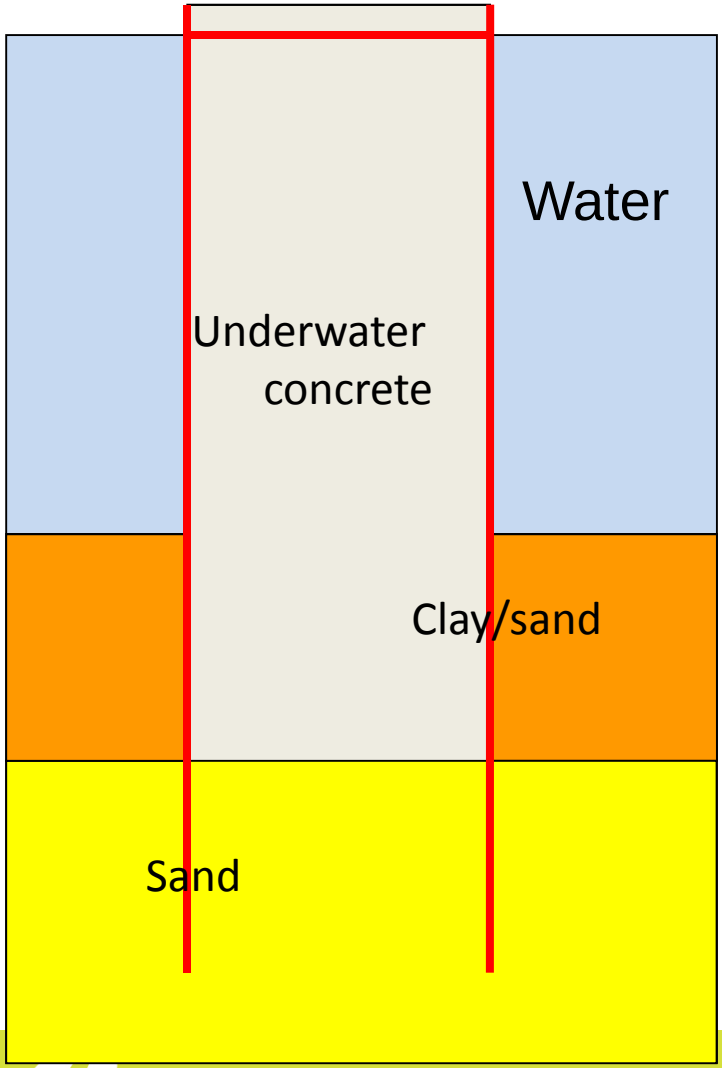


Phase 1: installation sheet piles and strut

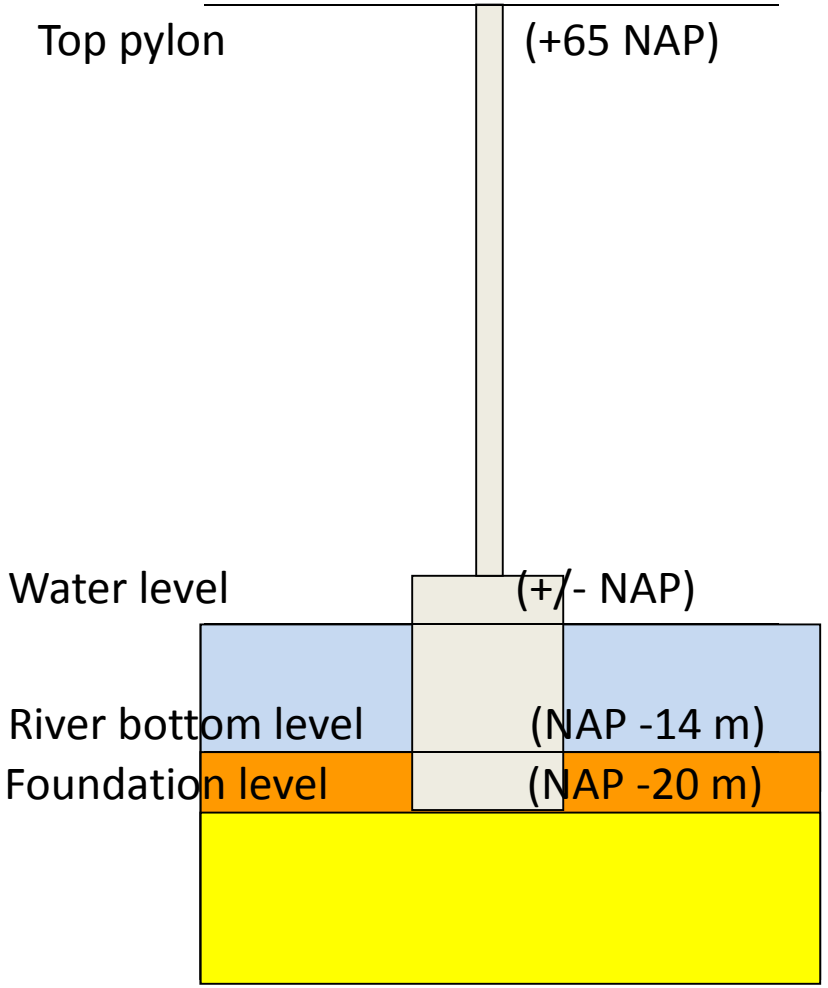
Phase 2: excavation building pit



Phase 3: pouring u.w. concrete



Phase 4: Construction superstructure



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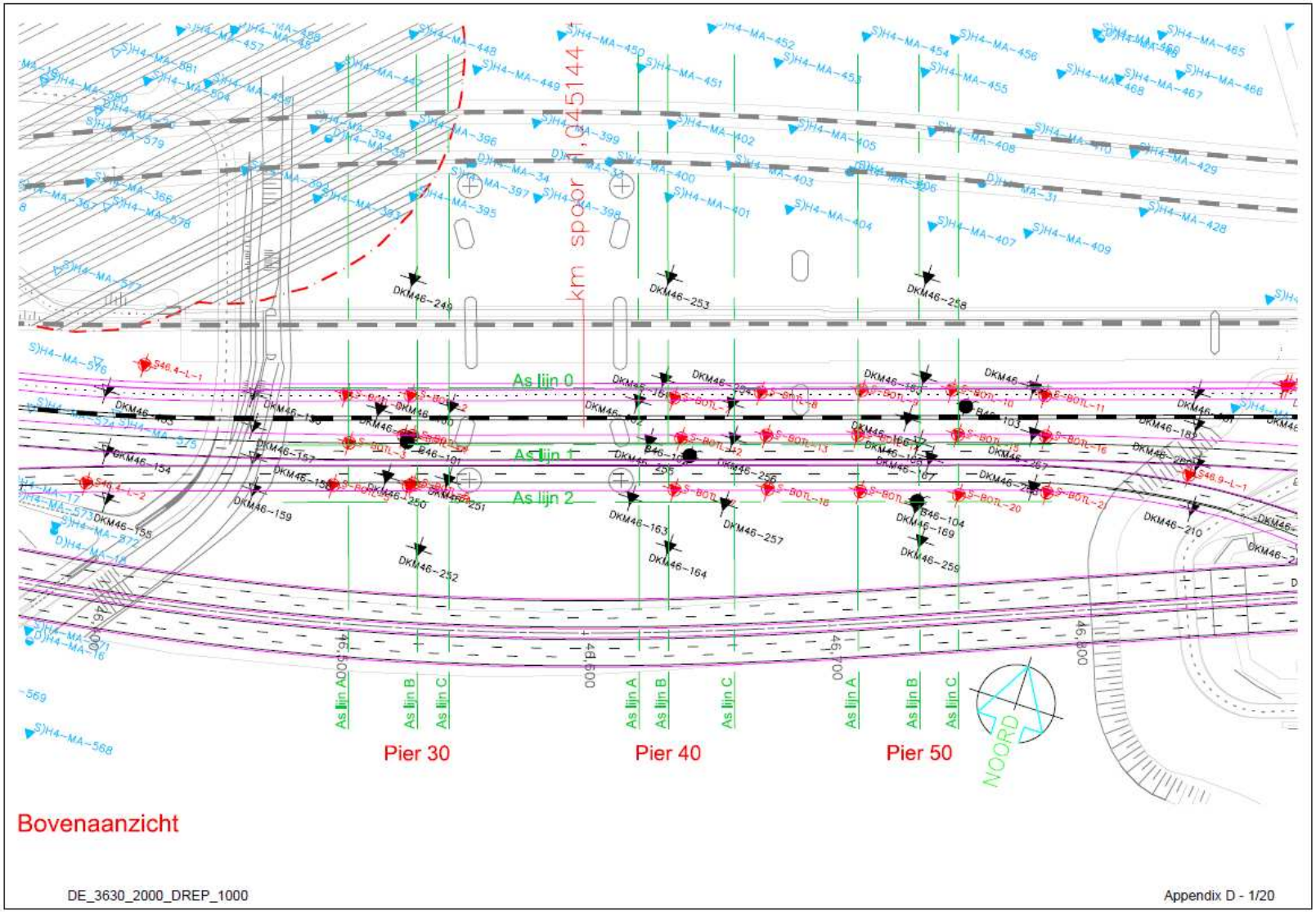
Foundation Design

- Soil investigation and design parameters
- Bearing capacity (ULS) analysis
- Deformation (SLS) analysis
- Influences on adjacent structures

Geotechnical Soil Investigation Summarized

- Site investigation in multiple phases
- 12 CPT’s to NAP-30 to -39m
- 32 CPT’s to NAP-40 to -49m
- 2 CPT’s to NAP-50 to -55m (refusal)
- 1 CPT to NAP-60m
- 4 Boreholes to NAP-40m



Bovenaanzicht

DE_3630_2000_DREP_1000

Appendix D - 1/20

General Soil Stratigraphy

Top of layer [m NAP]	Soil description	Layer description
-7 a -14	SAND, clayey / CLAY, sandy	Soil Cover
-14 a -20 [1)]	SAND, medium dense	1st sand layer
-33 a -39	CLAY, stiff, Kedichem [2)]	deep clay layer
-34 a -42 [3)]	SAND, medium dense, thin clay layers, Kedichem	2nd sand layer
-60	Maximal investigation depth	

[1)] At the north side of pier 50 (DKM46-165) the top of this layer is found at NAP -23 m
[2)] Thickness varies strongly, not present at some locations
[3)] At DKM46-254 a stiff clay layer of about 2 m thickness is found at NAP -46 m; at DKM46-167 a stiff clay layer of about 1 m thickness is found at NAP -51 m

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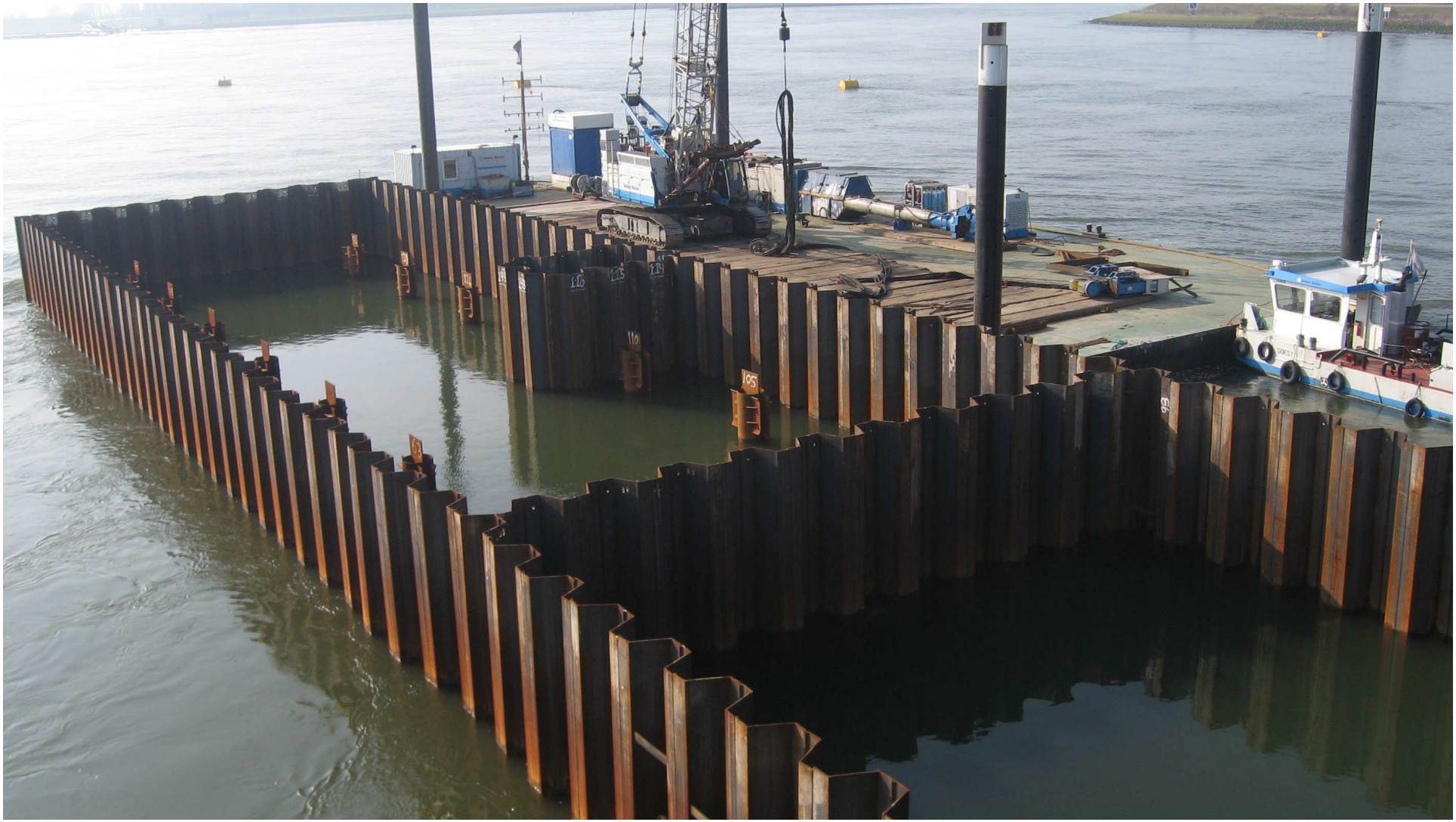
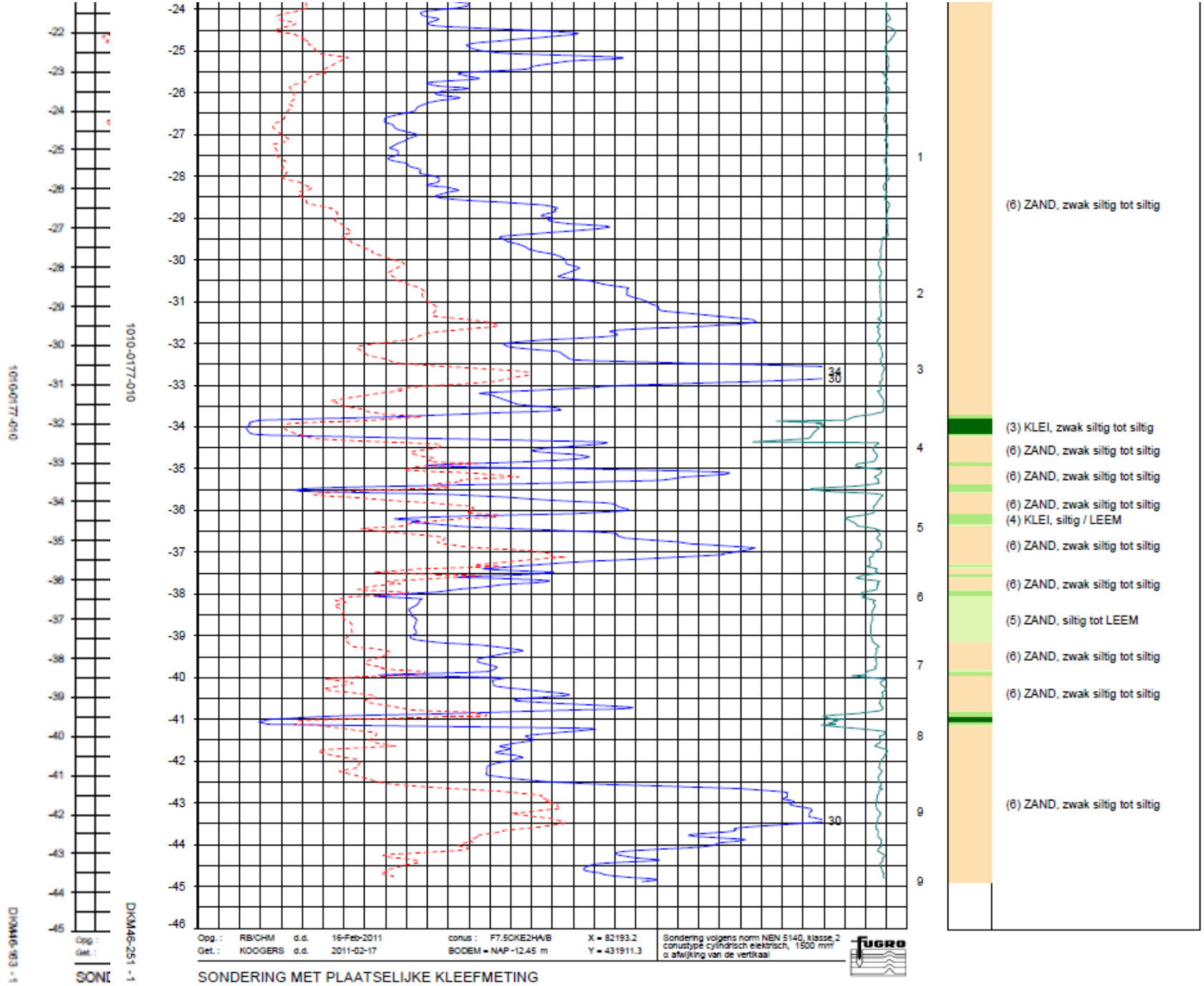
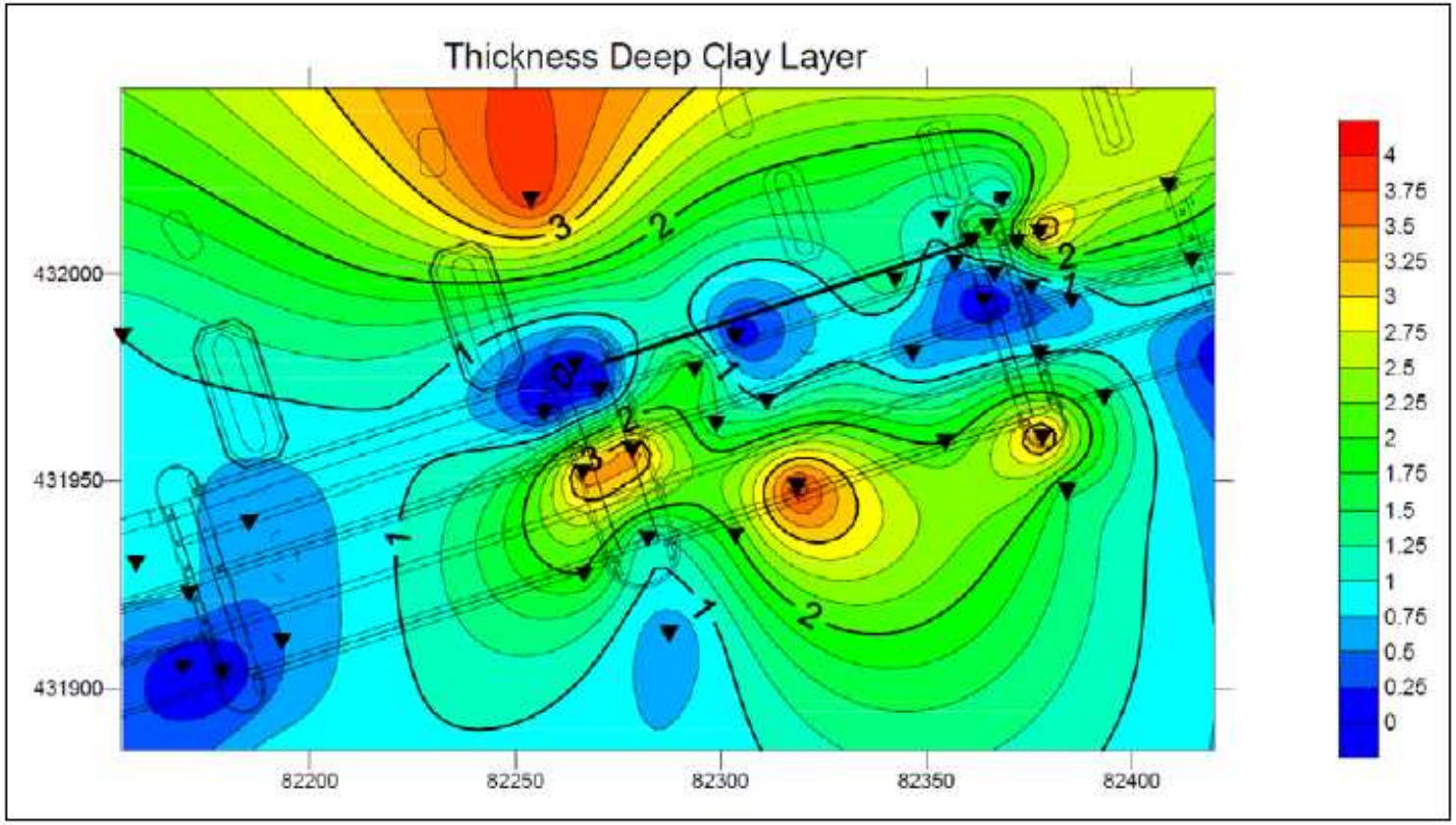


Rijstroken met een A-label


1010-0177-010
DKM46-251 -1
Opg. : RB/CHM d.d. 16-Feb-2011
Get. : KOOGERS d.d. 2011-02-17
conus : F7.5CKE2HA/B
BODEM = NAP -12.45 m
X = 82193.2
Y = 431911.3
Sondering volgens norm NEN 5140, klasse 2
conustype cylindrisch elektrisch, 1500 mm²
α afwijking van de verticaal
FUGRO
SONDERING MET PLAATSELIJKE KLEEFMETING
34
30
30
(6) ZAND, zwak siltig tot siltig
(3) KLEI, zwak siltig tot siltig
(6) ZAND, zwak siltig tot siltig
(6) ZAND, zwak siltig tot siltig
(6) ZAND, zwak siltig tot siltig
(4) KLEI, siltig / LEEM
(6) ZAND, zwak siltig tot siltig
(6) ZAND, zwak siltig tot siltig
(5) ZAND, siltig tot LEEM
(6) ZAND, zwak siltig tot siltig
(6) ZAND, zwak siltig tot siltig
(6) ZAND, zwak siltig tot siltig

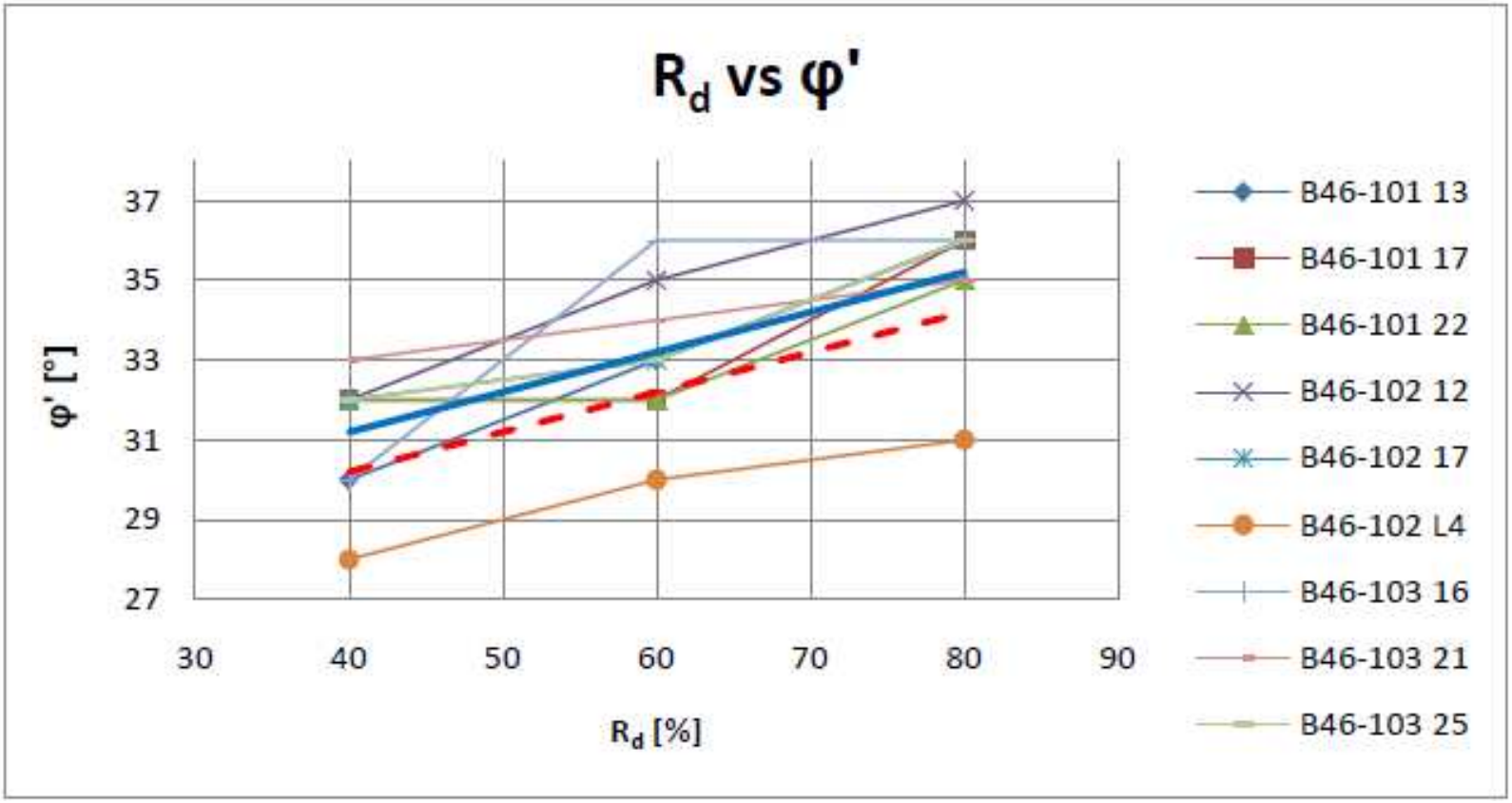
Variability Kedichem Clay From Factual Data



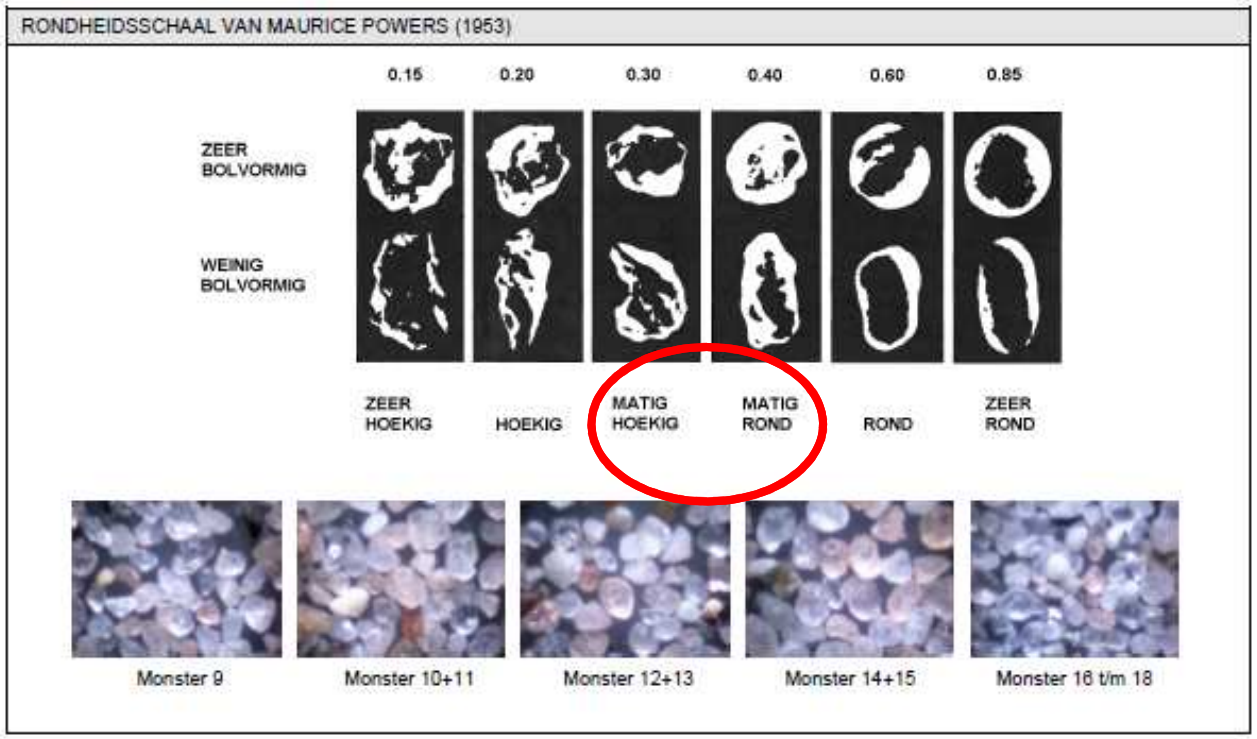
Geotechnical Laboratory Program

- Laboratory tests:
- 23 volumetric weight + water content on clay
- 9 Torvane / Pocket penetrometer tests on clay
- 7 Atterberg Limits on deep clay (Kedichem)
- 28 grain shape descriptions on sand
- 68 PSD’s on sand
- 27 CID triax tests on 9 samples at RD 40%, 60%, 80%
- 4 CIU triax tests on Kedichem clay incl. unload/reload step
- 9 Oedometer tests on Kedichem clay inc. unload/reload step

Design Parameters – Drained Strength



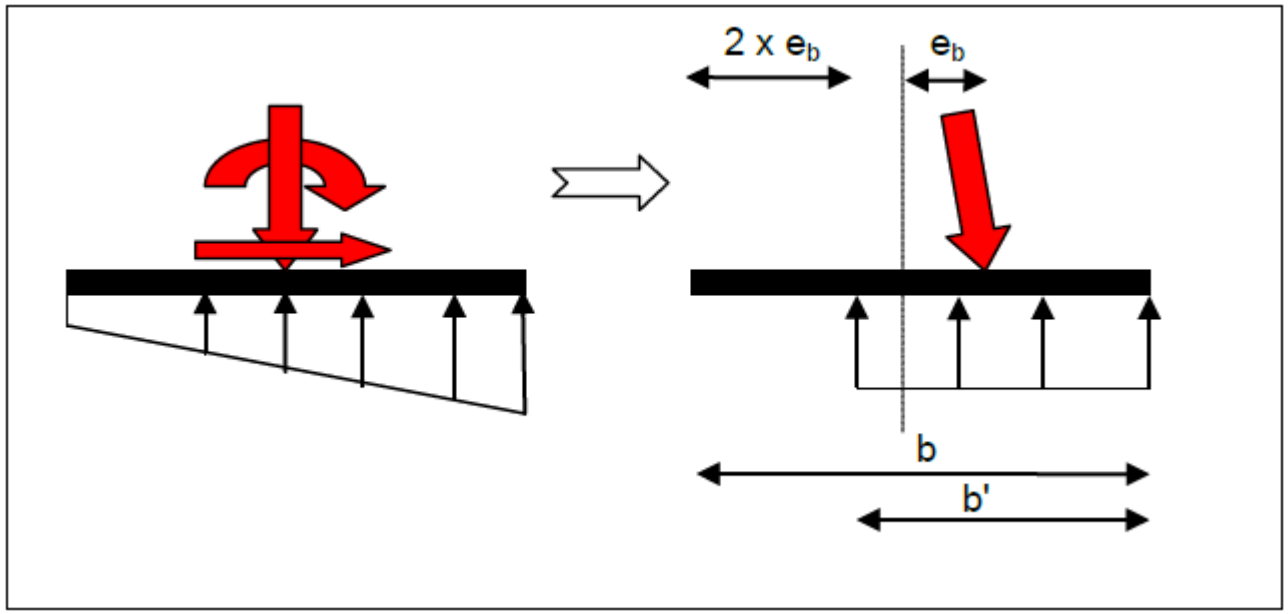
Design Parameters – Particle Shape



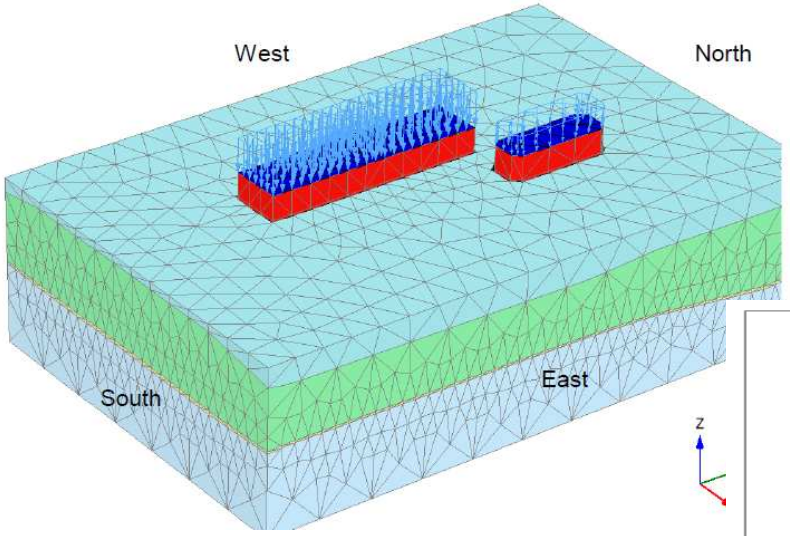
Coefficient of uniformity Cu varies between 1,5 and 6
Grain size d50 varies between 0,2 mm and 0,6 mm

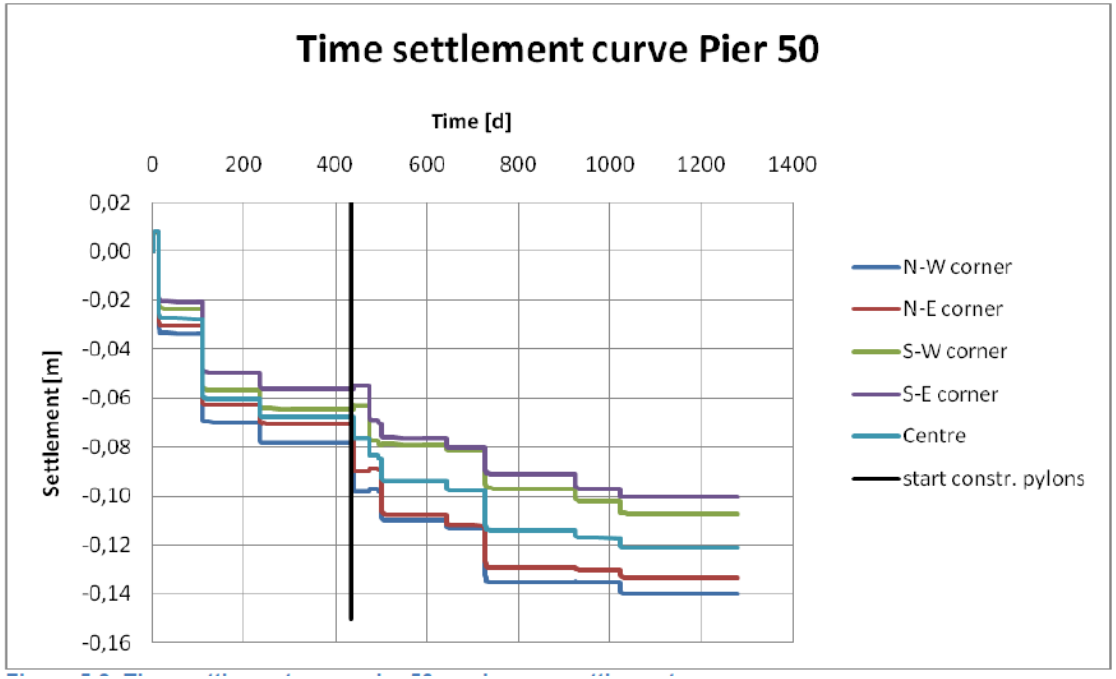
Bearing capacity ULS

- According to NEN 6700/6702/6740:
- “Veiligheidsklasse 3”
- “Geotechnische Categorie 3”
- Shallow foundations NEN 6744
- Extensive parametrical variation studies



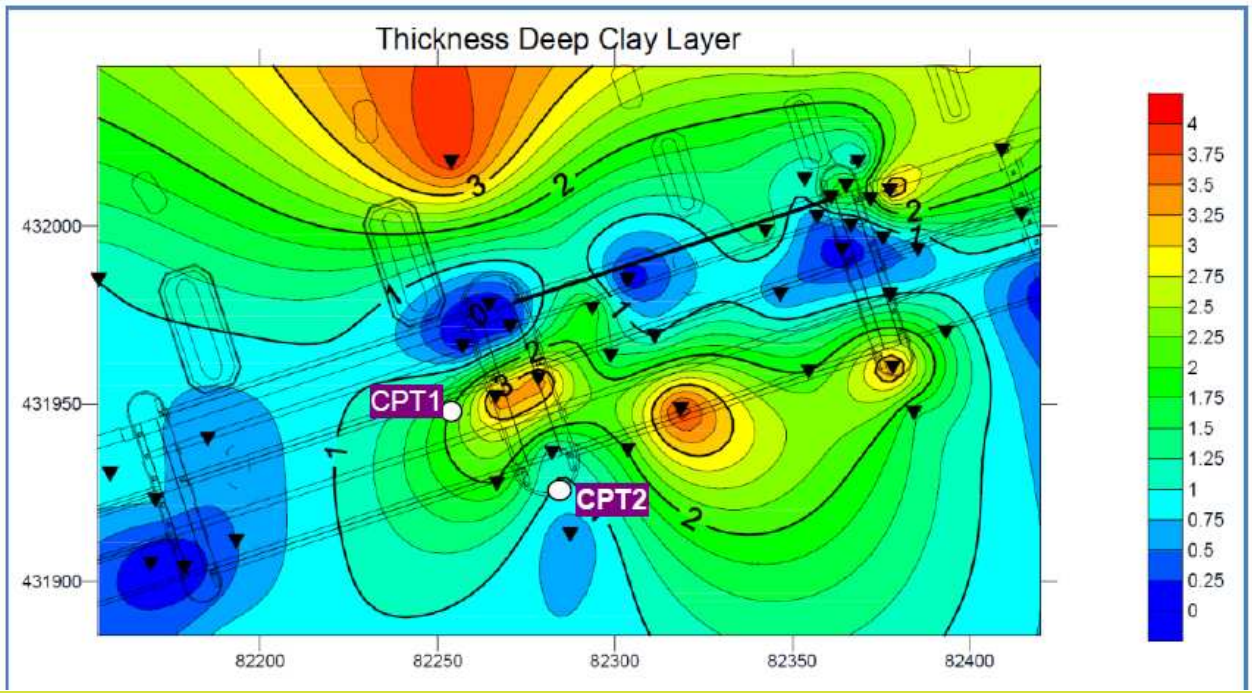
Deformation analysis, settlements – Plaxis 3D





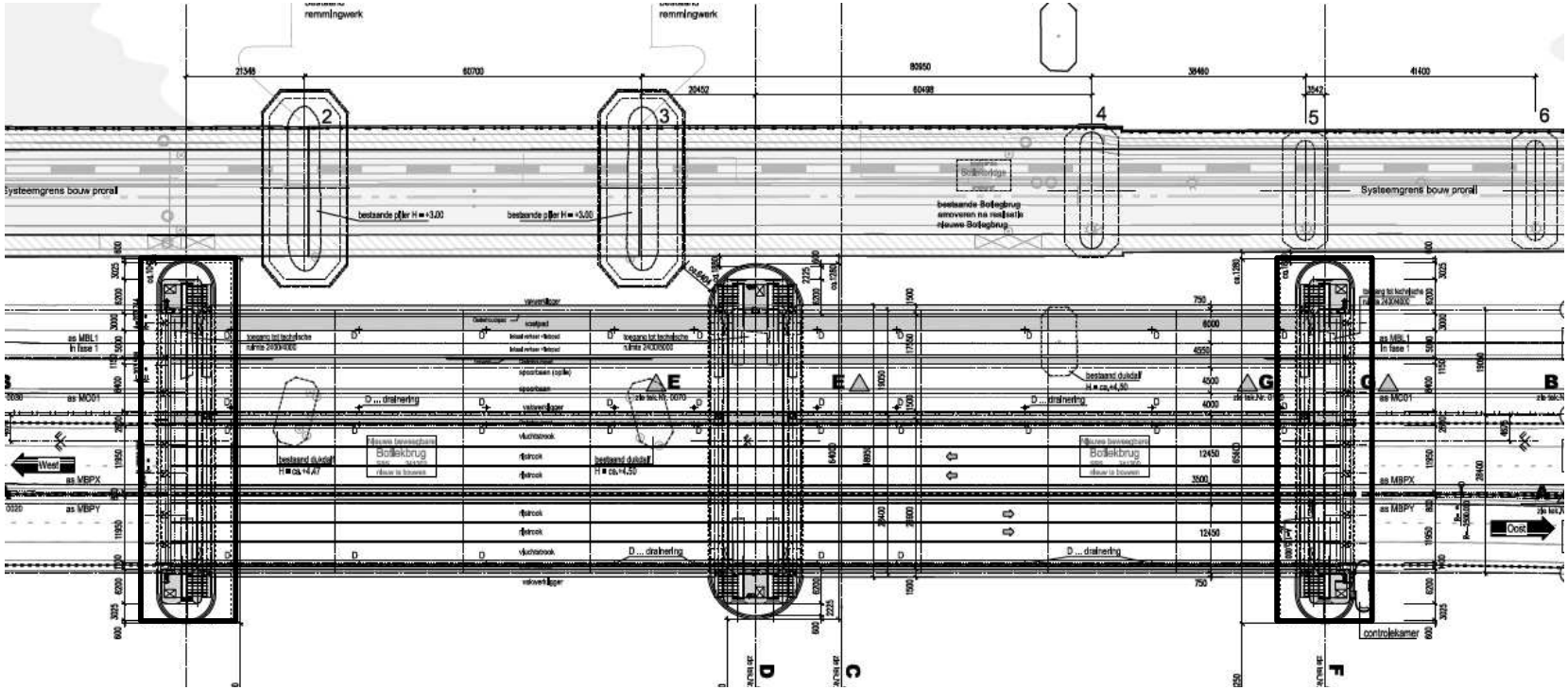
Settlements - Sensitivity analysis

- OCR
- Vertical load
- Permeability clay layer
- Soil stratigrapy



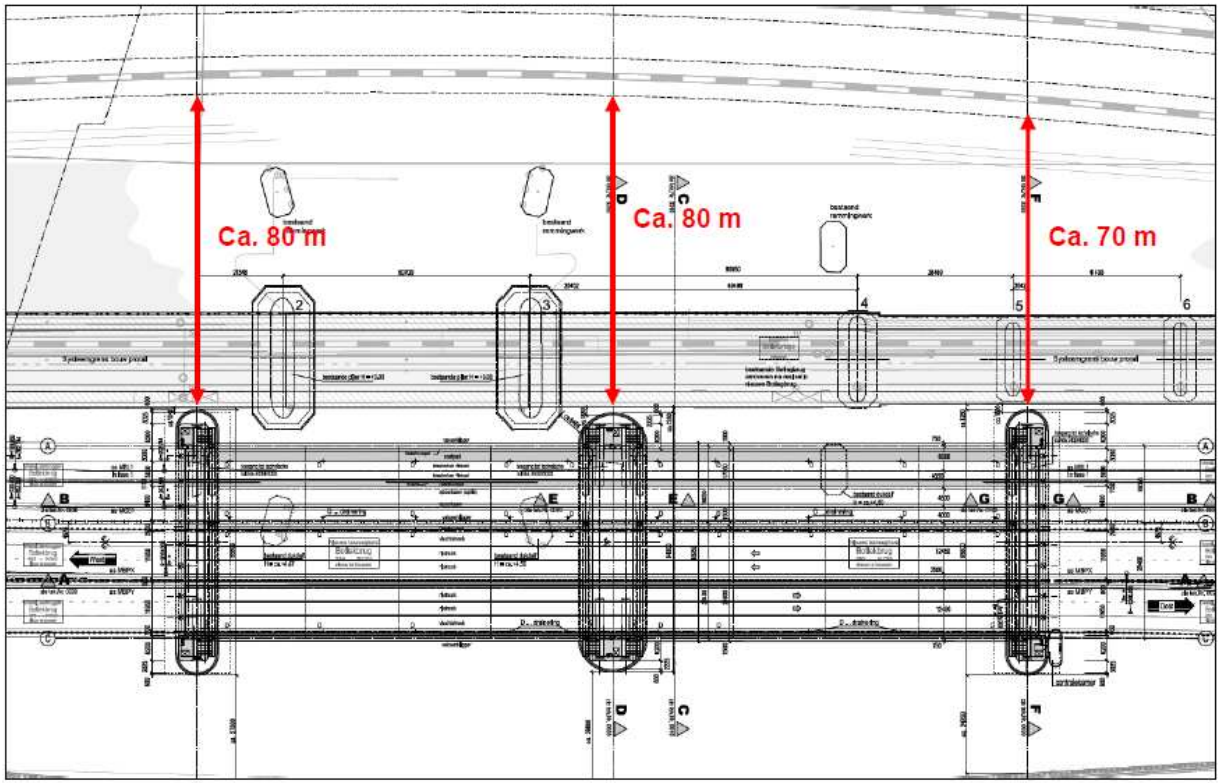
Influences on adjacent structures

Existing Botlek Bridge



	Pijler 2	Pijler 3	Pijler 5
Closest pier new Botlek Lifting Bridge	Pier 30	Pier 40	Pier 50
Distance between foundation block and piles existing bridge	8 m	7 m	3.4 m
Surface area existing foundation block	12.5x32.5m^2	12.5x32.5m^2	8.0x21.0m^2
Level foundation existing block	NAP -10.75 m	NAP -10.75 m	NAP -8.9 m
Pile tip level (edge piles)	NAP -20.5 m	NAP -21.0 m	NAP -24.5

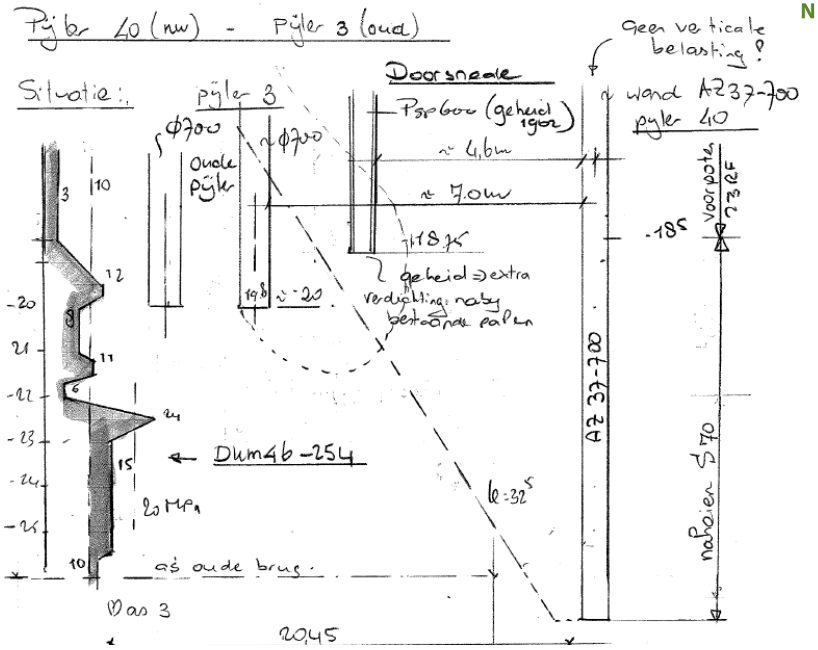
	Pier 30	Pier 40	Pier 50
Distance to Botlek Road Tunnel	27 m	30 m	25 m
Top of Botlek Road Tunnel	ca. NAP -13 m	ca. NAP -14 m	ca. NAP -10 m
Foundation level Botlek Road Tunnel	ca. NAP -23 m	ca. NAP -24 m	ca. NAP -20 m

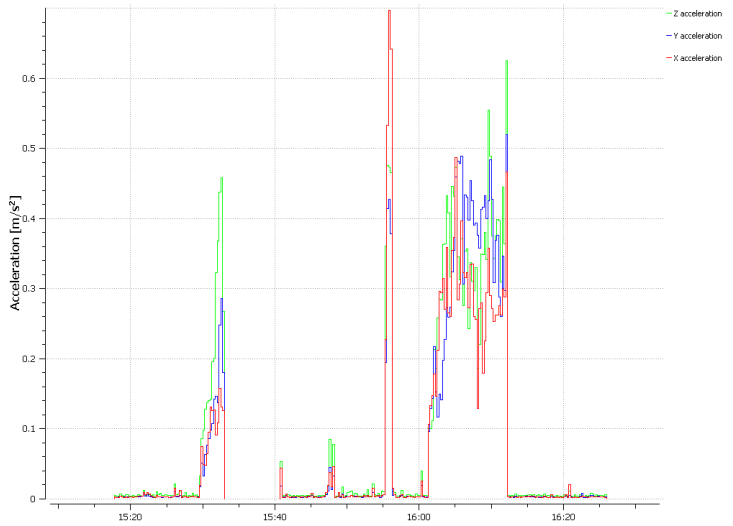


	Pier 30	Pier 40	Pier 50
Distance to Botlek Railway Tunnel	80 m	80 m	70 m
Top of Botlek Railway Tunnel	Ca. NAP-19m	Ca. NAP-19m	Ca. NAP-19m
Foundation level Botlek Railway Tunnel	Ca. NAP-29m	Ca. NAP-29m	Ca. NAP-29m

Installation sheetpiles

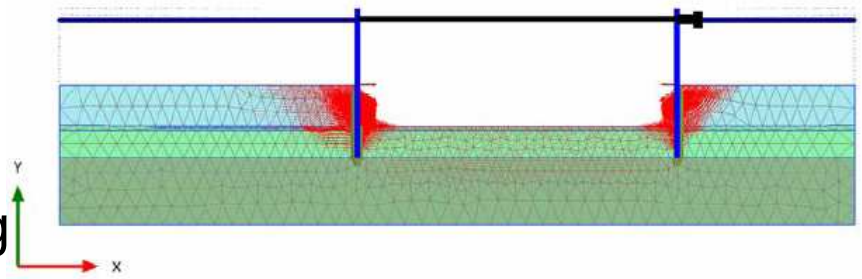
- Risks
  - Compaction due to vibration causes settlements bridge and tunnels

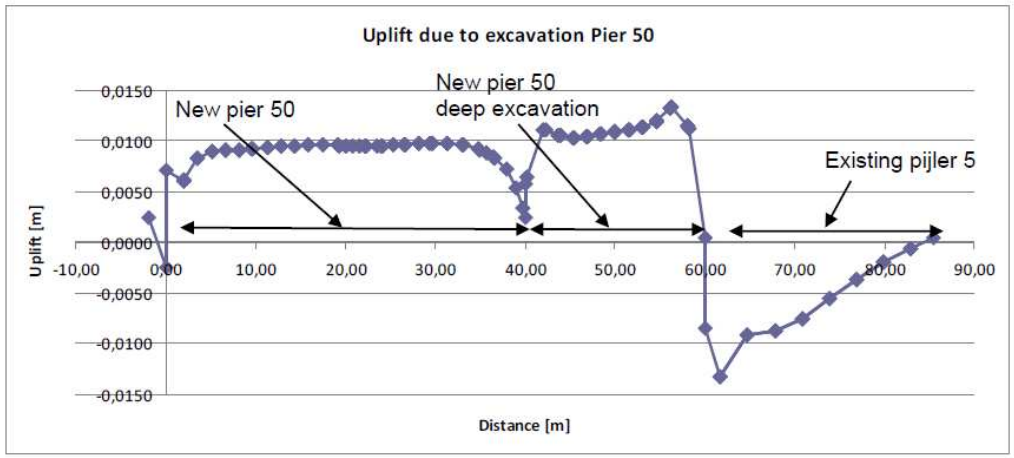


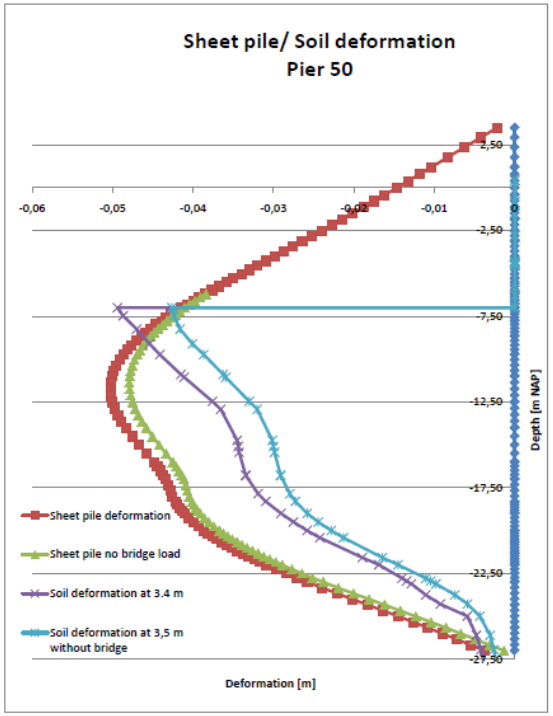


Excavation pits

- Analysis
  - Horizontal loading existing piles
  - Bearing capacity existing piles
  - Settlements/rotation existing bridge

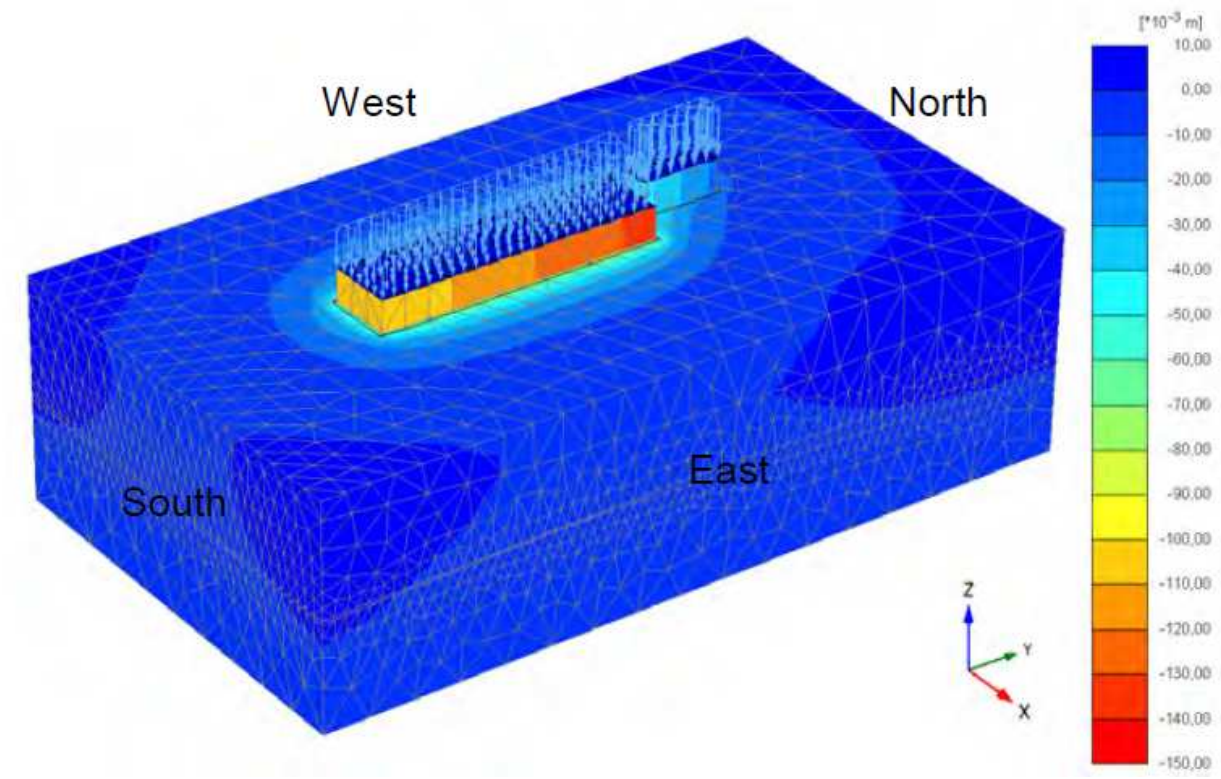




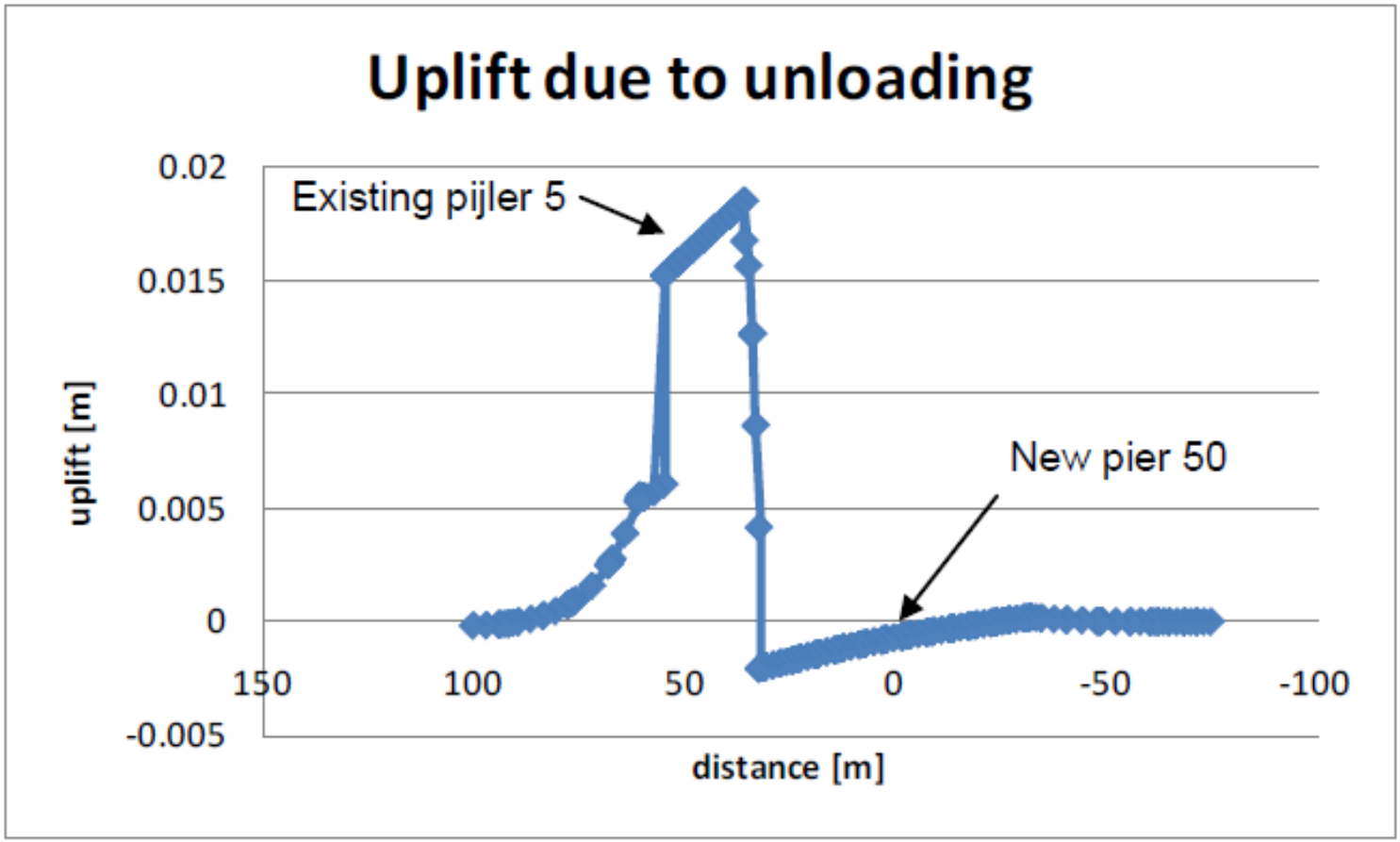


Construction of the new bridge (loading)

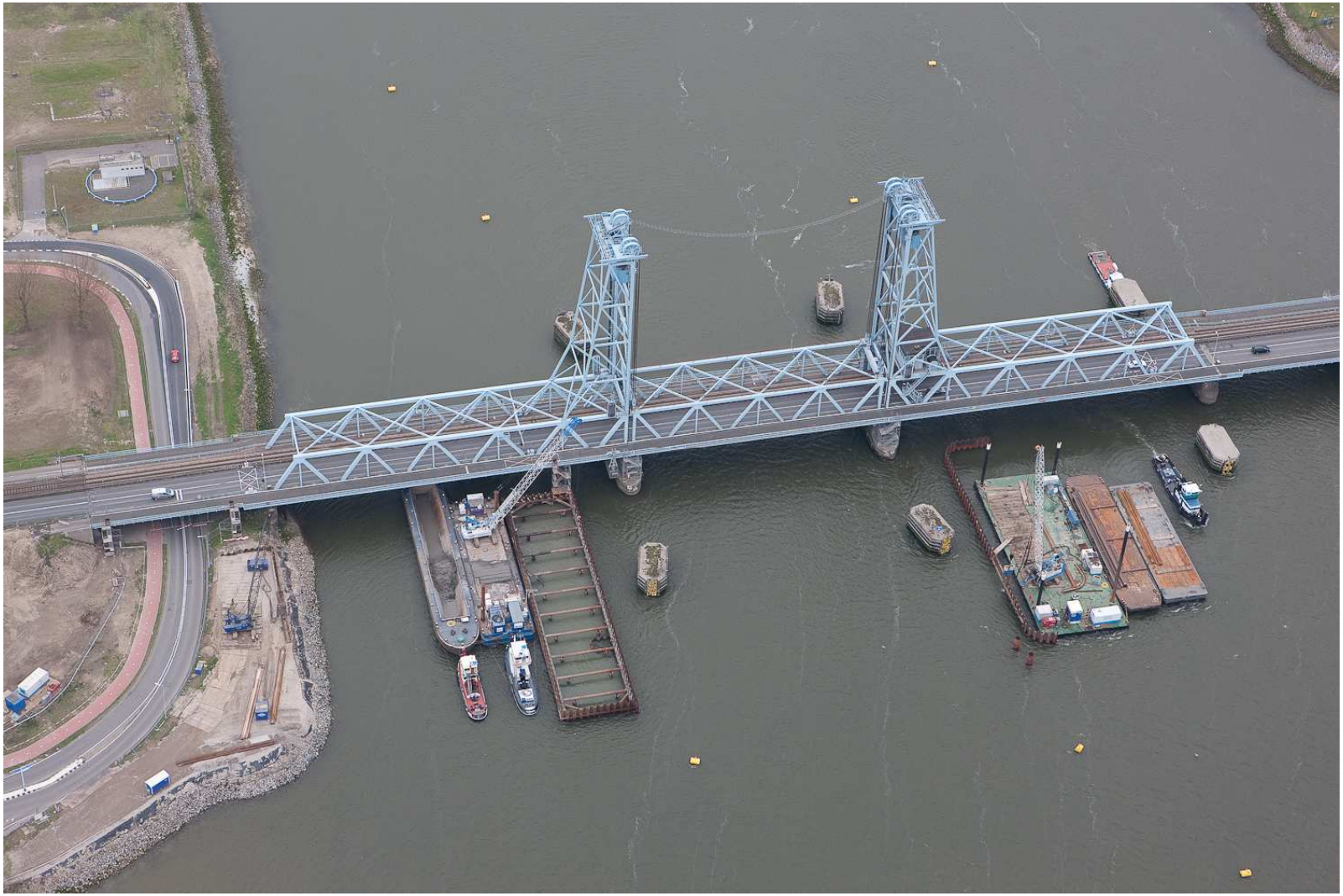
- Settlements of existing bridge and tunnel(s)



Removal of the existing bridge

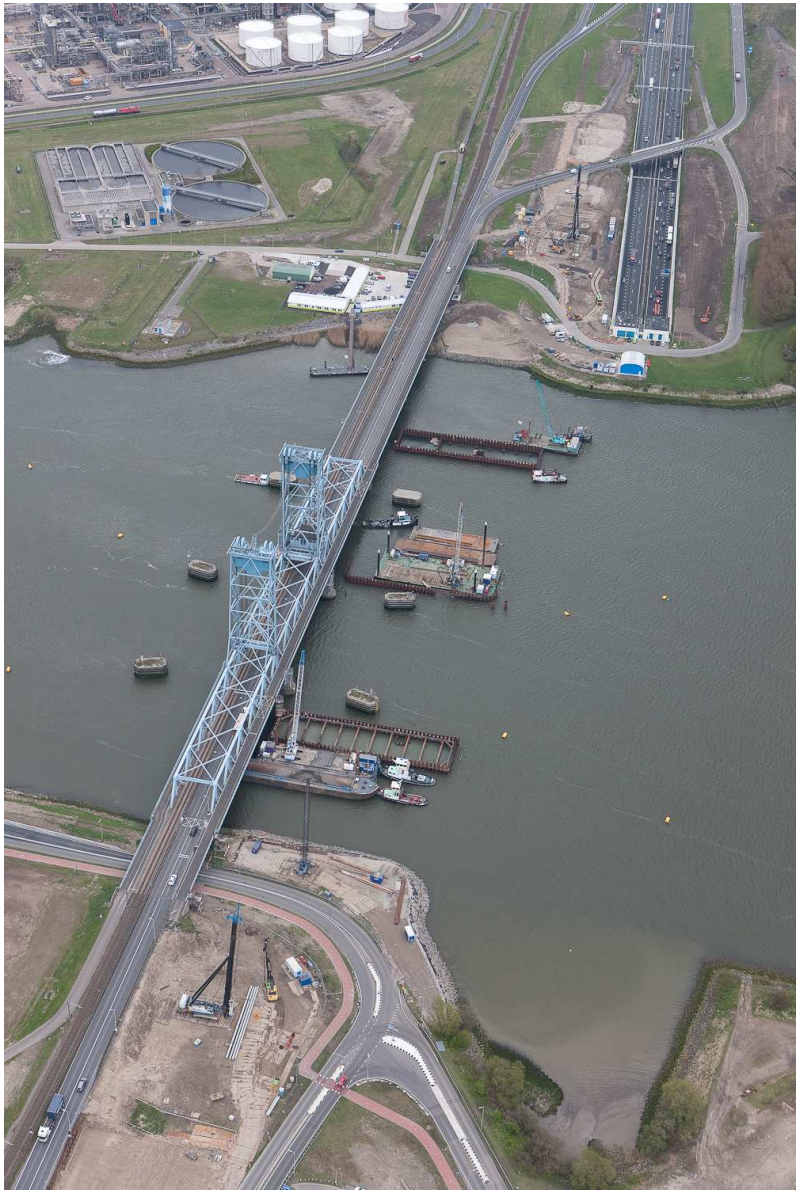


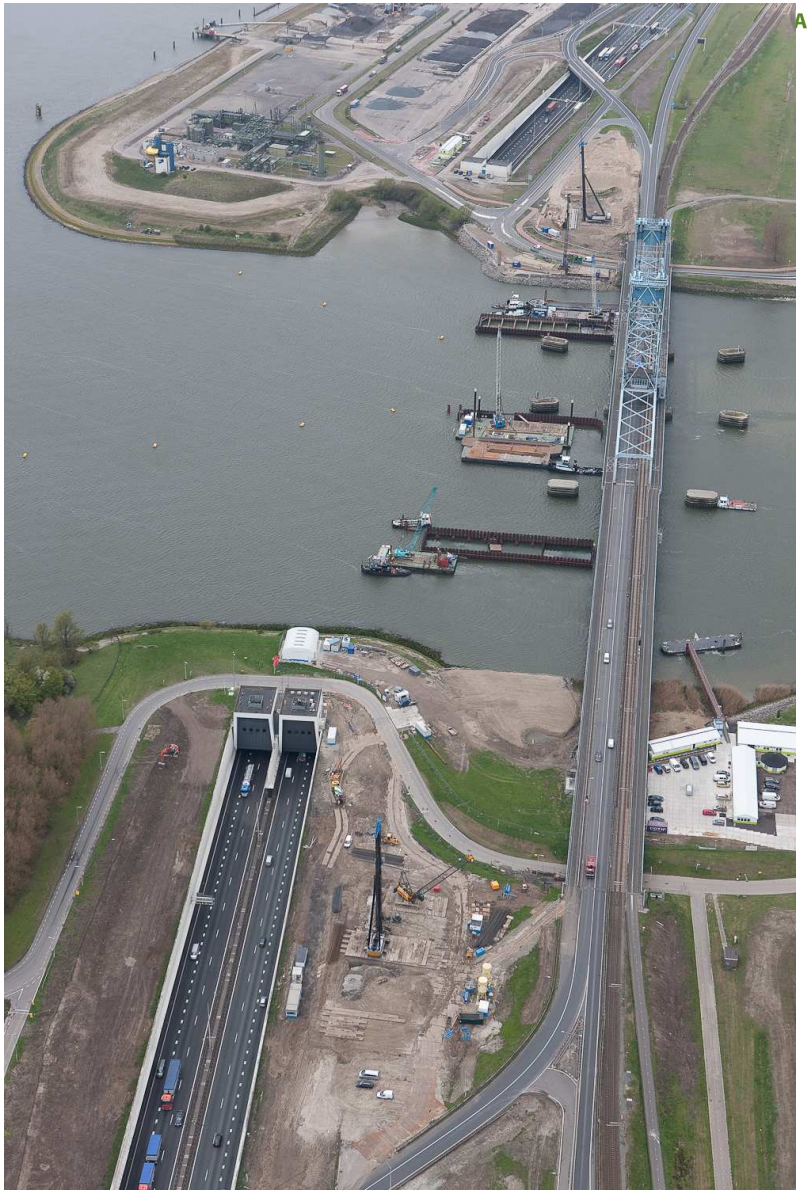
A-LanesA15
RIJSTROKEN MET EEN A-LABEL



Rijstroken met een A-label

A-LanesA15
ABEL





Rijstroken met een A-label

A-Lanes A15

Bedankt voor uw aandacht!