

Nederlandse Geotextiel Organisatie – IGS Netherlands

2nd Niger Bridge Project in Nigeria



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08-03-2022



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| 02 | The Project | (Max) |
| 03 | Geosynthetic Solutions / Design | (Jeroen) |
| 04 | Execution | (Jeroen) |
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Nigeria

- Population and infrastructure
- Approx. 200 Million people
- Size approx. 3 times Germany
- Infrastructure underdeveloped



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Road maintenance issues



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Population growth

- Lagos city in 2022:
- Population over 15.3 Million

Figures for Lagos City only (UN)

	1950	1970	1990	2000	2010	2025
1	12.3 New York	23.3 Tokyo	32.5 Tokyo	34.4 Tokyo	36.7 Tokyo	37.1 Tokyo
2	11.3 Tokyo	16.2 New York	16.1 New York	18.0 Mexico City	22.2 Delhi	28.6 Delhi
3	8.4 London	9.4 Osaka-Kobe	15.3 Mexico City	17.8 New York	20.3 São Paulo	25.8 Mumbai
4	6.5 Paris	8.8 Mexico City	14.8 São Paulo	17.1 São Paulo	20.0 Mumbai	21.7 São Paulo
5	5.4 Moscow	8.4 Los Angeles	12.3 Mumbai	16.1 Mumbai	19.5 Mexico City	20.9 Dhaka
6	5.1 Buenos Aires	8.3 Paris	11.0 Osaka-Kobe	15.7 Delhi	19.4 New York	20.7 Mexico City
7	5.0 Chicago	8.1 Buenos Aires	10.9 Calcutta	13.2 Shanghai	16.6 Shanghai	20.5 New York
8	4.5 Calcutta	7.6 São Paulo	10.9 Los Angeles	13.1 Calcutta	15.6 Calcutta	20.1 Calcutta
9	4.3 Shanghai	7.5 London	10.5 Seoul	11.8 Buenos Aires	14.6 Dhaka	20.0 Shanghai
10	4.1 Osaka-Kobe	7.1 Moscow	10.5 Buenos Aires	11.8 Los Angeles	13.1 Karachi	18.7 Karachi
11	4.0 Los Angeles	7.1 Chicago	9.7 Delhi	11.2 Osaka-Kobe	13.1 Buenos Aires	15.8 Lagos
12	3.3 Berlin	6.9 Calcutta	9.6 Rio de Janeiro	10.8 Rio de Janeiro	12.8 Los Angeles	15.0 Kinshasa
13	3.1 Philadelphia	6.6 Rio de Janeiro	9.3 Paris	10.3 Dhaka	12.4 Beijing	15.0 Beijing
14	3.0 Rio de Janeiro	6.0 Shanghai	9.1 Cairo	10.2 Cairo	11.9 Rio de Janeiro	14.9 Manila
15	2.9 St Petersburg	5.8 Mumbai	9.0 Moscow	10.0 Karachi	11.6 Manila	13.9 Buenos Aires
16	2.8 Mexico City	5.6 Cairo	8.2 Jakarta	10.0 Moscow	11.3 Osaka-Kobe	13.7 Los Angeles
17	2.9 Mumbai	5.3 Seoul	8.0 Manila	10.0 Manila	11.0 Cairo	13.5 Cairo
18	2.8 Detroit	4.4 Beijing	7.8 Shanghai	9.9 Seoul	10.6 Lagos	12.7 Rio de Janeiro
19	2.6 Boston	4.4 Philadelphia	7.7 London	9.8 Beijing	10.5 Moscow	12.1 Istanbul
20	2.5 Cairo	4.0 St Petersburg	7.4 Chicago	9.7 Paris	10.5 Istanbul	11.4 Osaka-Kobe
21	2.5 Tianjin	4.0 Detroit	7.1 Karachi	8.7 Istanbul	10.5 Paris	11.1 Shenzhen
22	2.4 Manchester	3.9 Jakarta	6.8 Beijing	8.4 Jakarta	9.8 Seoul	11.1 Chongqing
23	2.3 São Paulo	3.5 Manila	6.6 Dhaka	8.3 Chicago	9.4 Chongqing	11.0 Guangzhou
24	2.2 Birmingham	3.5 Delhi	6.6 Istanbul	8.2 London	9.2 Jakarta	10.9 Paris
25	2.1 Shenyang	3.5 Madrid	6.4 Tehran	7.3 Guangzhou	9.2 Chicago	10.8 Jakarta
26	1.9 Roma (Rome)	3.5 Barcelona	5.9 Bangkok	7.3 Lima	9.0 Shenzhen	10.7 Moscow
27	1.9 Milano (Milan)	3.5 Hong Kong	5.8 Lima	7.2 Lagos	8.9 Lima	10.5 Bogotá
28	1.9 San Francisco	3.3 Tianjin	5.7 Hong Kong	6.9 Tehran	8.9 Guangzhou	10.5 Lima
29	1.8 Barcelona	3.3 Tehran	5.3 Madras	6.7 Tianjin	8.8 Kinshasa	10.3 Lahore
30	1.8 Glasgow	3.2 Berlin	5.0 St Petersburg	6.7 Hong Kong	8.6 London	9.9 Chicago
31			4.8 Lagos			
98		1.4 Lagos				
226	0.3 Lagos					

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Onitsha

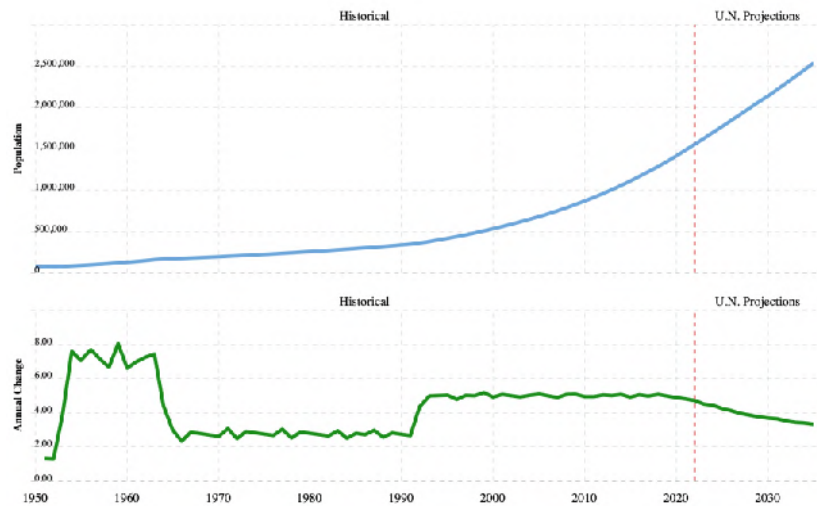
• Population

1960: 129,000

1990: 337,000

2020: 1,415,000

2022: 1,553,000



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Niger bridge at Onitsha

- Link in the trans African highway system



Current Niger bridge

- Meets lifetime
- Congested



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History

(First) Niger bridge

- NEDECO feasibility studies in the 1950's
- 1964-1965 Bridge Construction by Dumez
- 1967-1970 Civil war (Biafra war), bridge partly destroyed
- Rehabilitated under President Jonathan Goodluck Administration after war
- Very fast population growth of Onitsha during oil boom in 1970s and 1980s
- 1987 concerns about the state of the bridge, first discussions about the 2nd Niger Bridge
- 1999-2007 President Obasanju promised to build the 2nd Niger Bridge, no result
- 2012 President Jonathan Goodluck approved contract for final planning and design, and promised to deliver before end of term 2015; PPP project financing
- From 2015 President Buhari cancelled earlier contract, reached new contract and financing model with JB

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FEDERAL MINISTRY OF WORKS

MABUSHI-ABUJA

PRESS RELEASE

SECOND NIGER BRIDGE PROJECT STILL ON-COURSE

The Federal Ministry of Works wishes to clarify that reports suggesting that work on the Second River Niger Bridge has been suspended due to non-compliance with environmental laws were based on inaccurate information.

Contrary to recent reports, work on the Second River Niger Bridge Project continues to progress according to schedule ensuring timely completion of the Bridge, which is set to be executed under the Public Private Partnership (PPP) arrangement for a concessional period of 25 years through the Design, Build, Finance, Operate and Transfer (DBFOT) model. The Ministry is working with the Julius Berger-NSIA Motorways Investment Company (JB-NMIC) Consortium, preferred bidder for the development of the Second River Niger Bridge Project, to ensure timely execution of the project.

In fact, under an Early Works Arrangement, the nominated EPC contractor, Julius Berger Nigeria Plc, has commenced full mobilization to site and timely execution of scheduled activities is anticipated. The JB-NMIC Consortium has assured that compliance with Nigerian Environmental Laws is of paramount priority and that Environment Impact Assessment (EIA) is an intrinsic part of the Early Works, which is being carried out in compliance with the environmental laws of Nigeria. It was highlighted during the groundbreaking ceremony that this landmark project is part of the transformation agenda of the President Jonathan's administration and once again wish to assure the good people of the South East geo-political zone and indeed the entire citizenry of Nigeria who are the beneficiary of this critical national infrastructure project, of the Federal Government's resolve to actualize it.

Signed:

Director (Information)

Federal Ministry of Works, Headquarters, Mabushi, Abuja.

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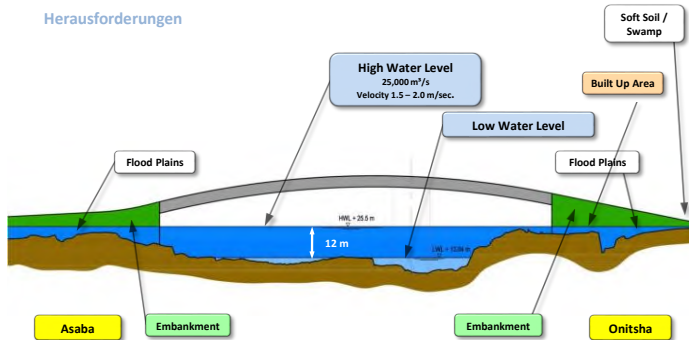
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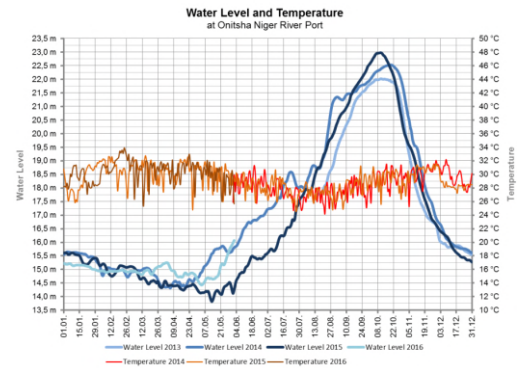
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Challenges for execution

Herausforderungen



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B JULIUS BERGER

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History

2nd Niger bridge

- 2013 First discussions and presentations at JBI and JBN
- 2014 first supply of nonwovens, and trial material GEC; JB negotiating early works packages
- 2015 new president Buhari, new negotiations, new financing options, no activities, demobilization JBN
- 2016 negotiations about new work packages, no activities
- 2017 negotiations, instructions from Minister to JB to prepare for project
- 2018 first supplies of materials (GECs and Stabilenka) and quotations for GECs and PVDs (Cofra)
- 2019 start installation of PVDs and GECs
- 2022 latest supplies

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Key Figures

- Project by Federal Government of Nigeria,
- New bridge of 1590m long
- New highway section of 10km
 - Embankment heights of up to 14m
 - Width of 36m
 - 3,6M m3 sand
 - 840,000 m2 high strength geotextiles (strengths from 300kN/m up to 2500kN/m)
 - 230,000 m geotextile encased columns / 16.000 piles
 - 1,400,000 m vertical drains
- Oweri Interchange
- Toll station
- Main contractor: Julius Berger Nigeria



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Second niger bridge



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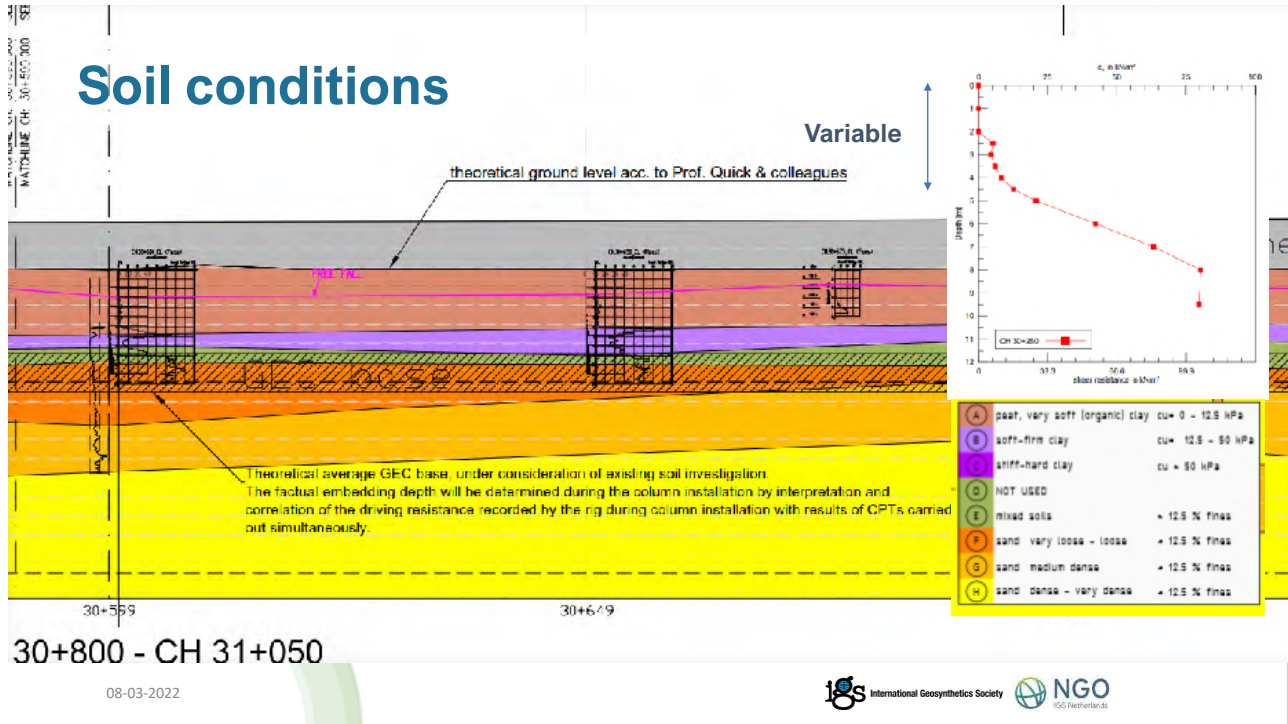
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Soil conditions



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Basic concepts of ground improvement

Criteria

- Time
- Stability
- (Residual) Settlement
- Costs



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	Without added material	With added material
Cohesive soils Peat, clay, ...	Consolidation Pressure \downarrow 	Mixing, insertion, displacement
Granular soils Sand, gravel, ...	Compaction Vibrations \rightarrow 	



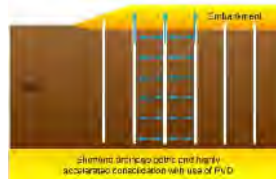
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Consolidation

• Vertical drains

- Shorten consolidation time
- Increase stability
- Often used with a basal reinforcement



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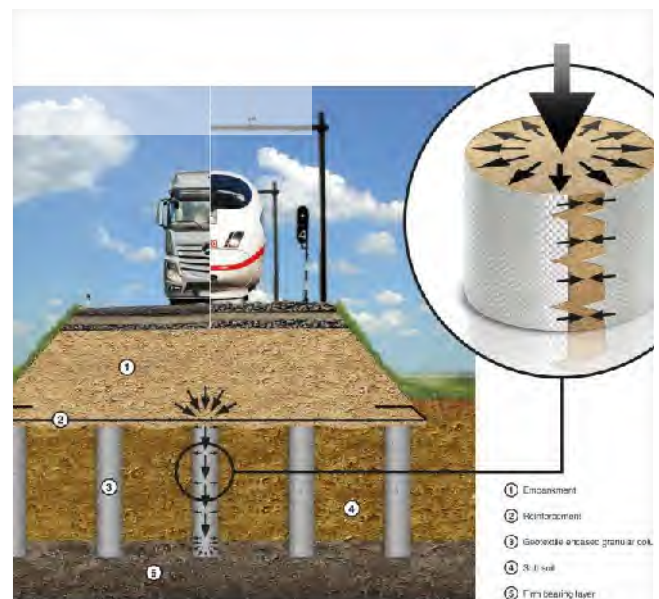
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Element

• Geotextile encased columns

- Load transferred to sand layer
- Geotextile acts as confinement
- Steeper slopes
- Increased stability
- Faster lifting schedule



Huesker Geosynthetics

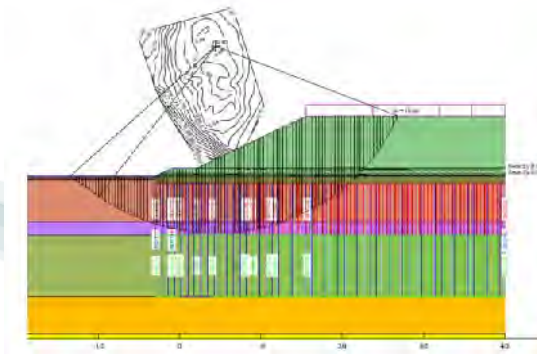
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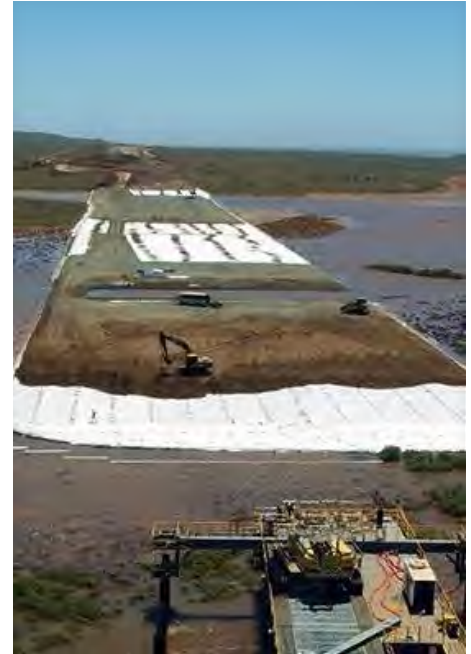
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Basal reinforcement

- Required to provide additional shear resistance
- Faster lift schedule
- Steeper slopes during construction



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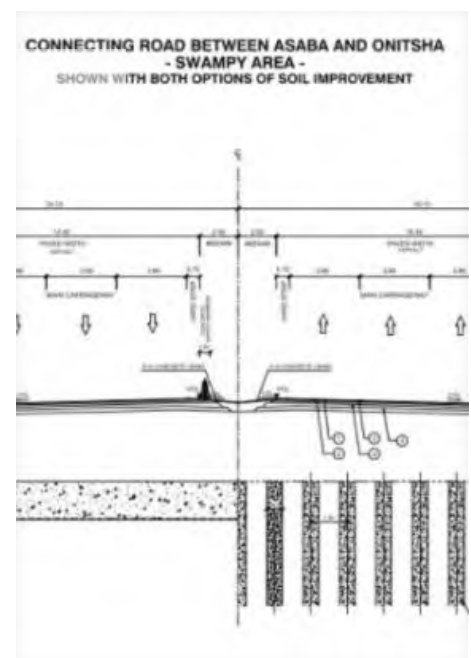
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Design

- Design Kempfert & Partners (Germany)
- GEC section (red)
 - ~16.000 piles (230.000m¹)
- PVD section (yellow)
 - 1.400.000m¹



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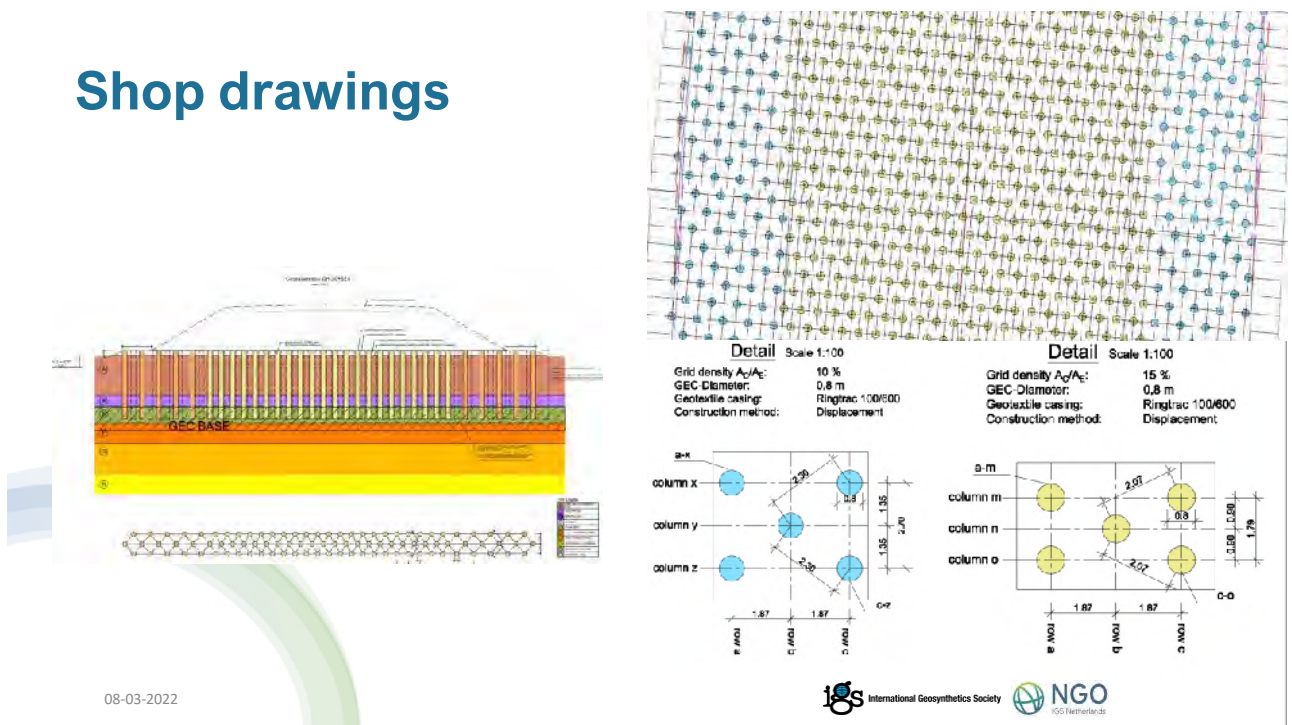
Ground improvement methods



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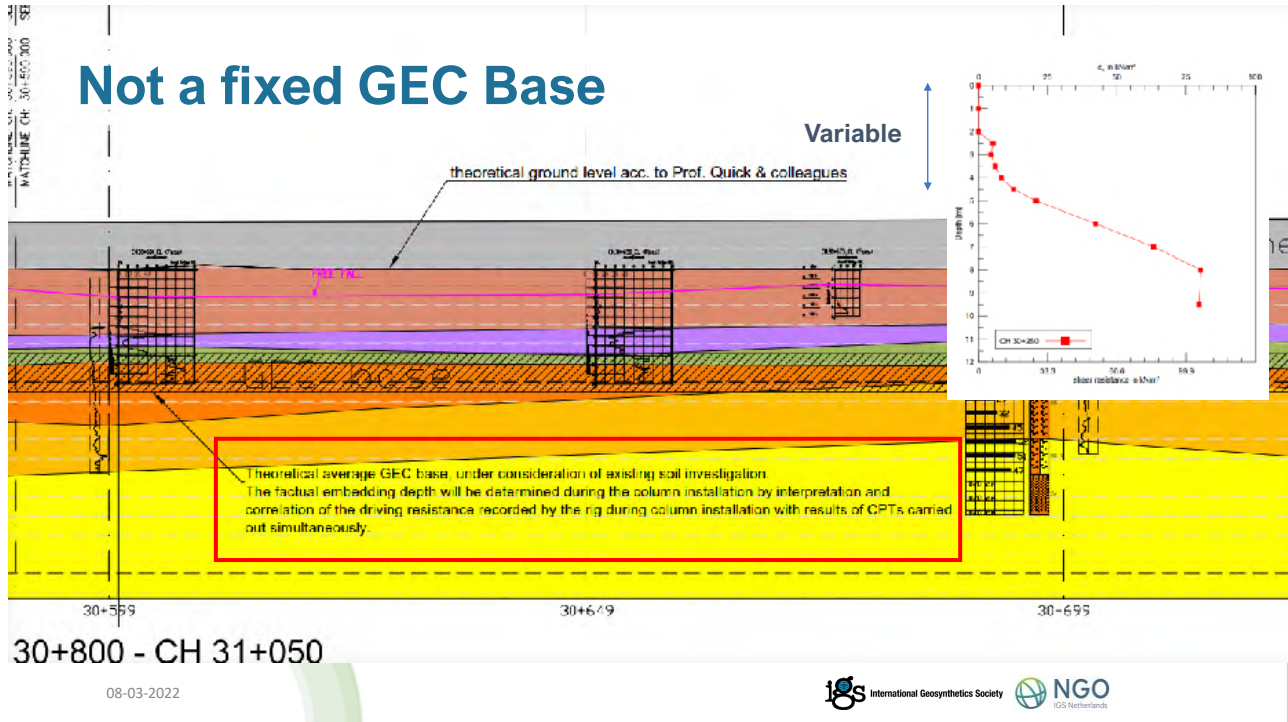
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Shop drawings



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The site



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The area during a site visit



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Working platform preparation



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Working platform preparation



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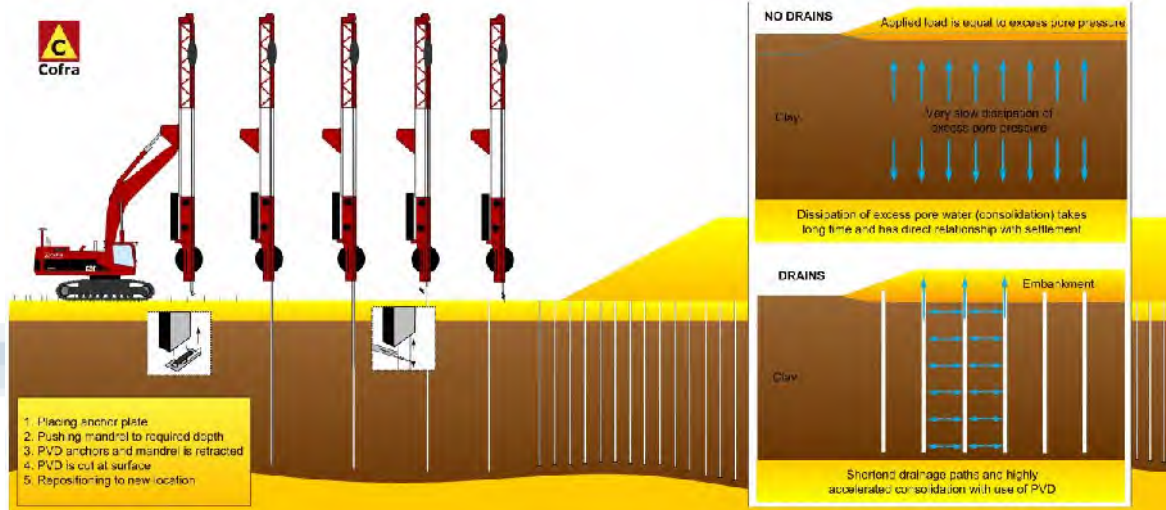


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Installation method



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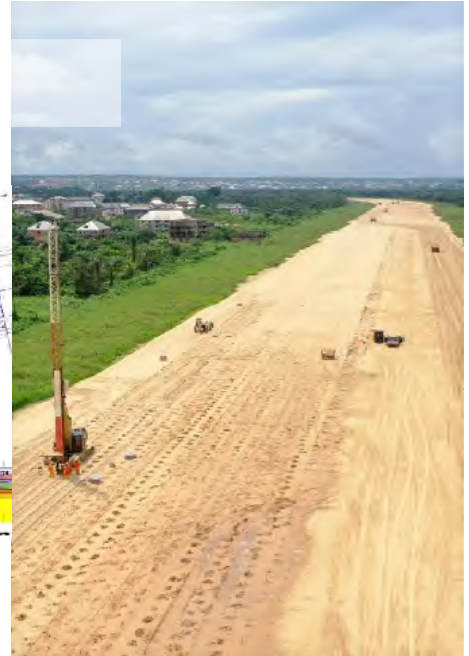
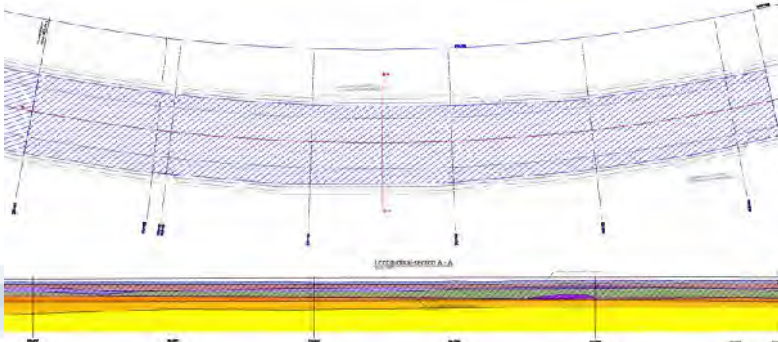
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PVD installation

- CTC 0.8 to 1.5m



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GEC installation

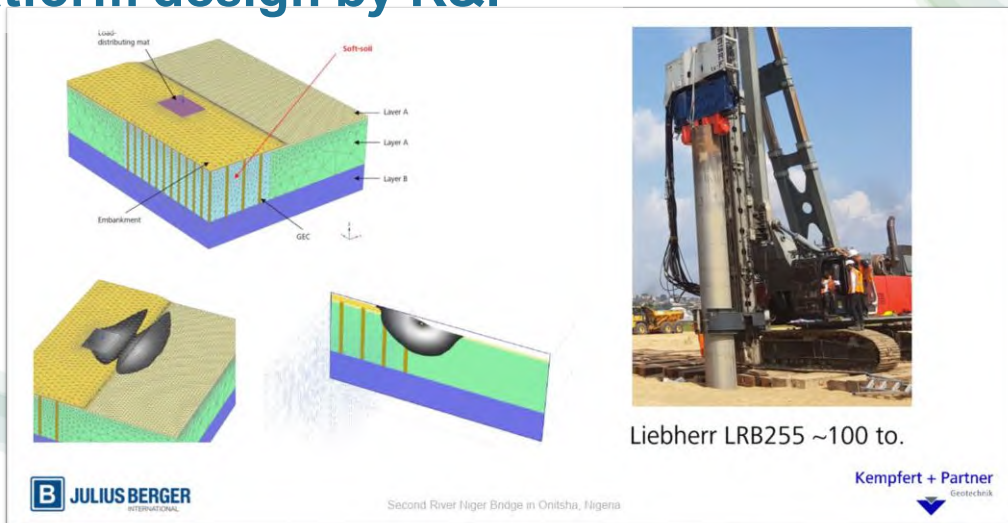


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Platform design by K&P



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Installation method



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Installation



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Google



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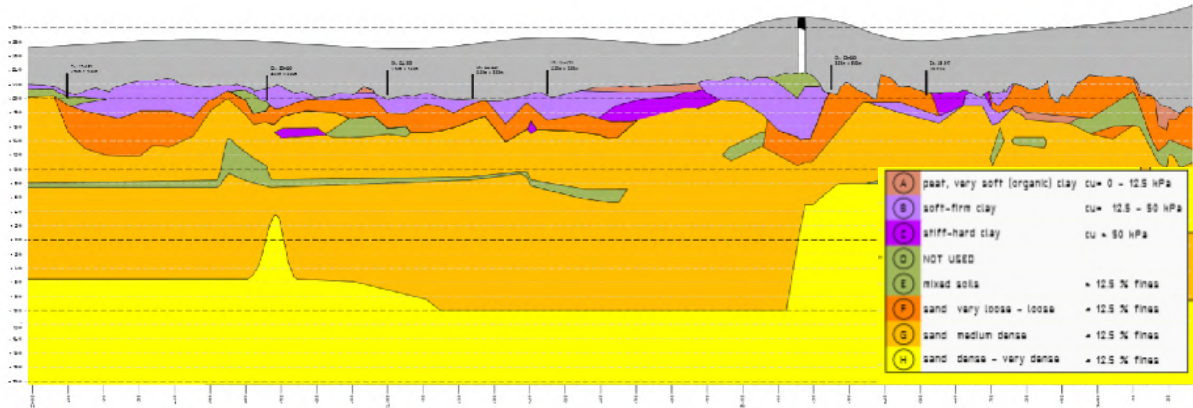
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SECOND NIGER BRIDGE PROJECT

Heterogeneous conditions

SECTION	1																					2																				
200704 POLLING	1-1																					200704 POLLING																				
200704 POLLING	1-1																					200704 POLLING																				



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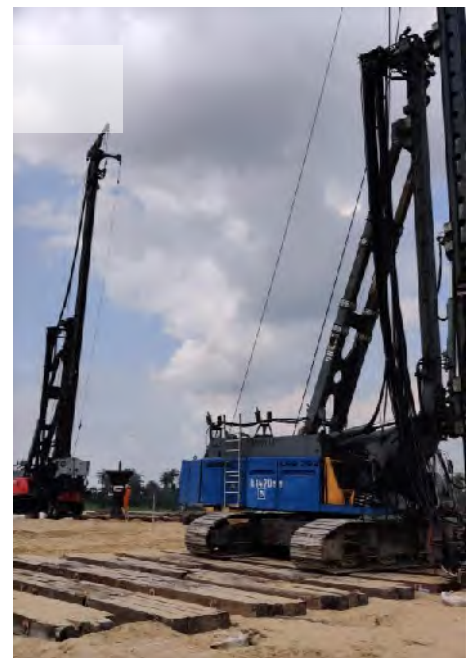
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Installation criteria

- **Stop criteria**
 - Driving speed and hold time
 - RPM/Frequency of the vibrator
 - Pulldown force
- **Found not useful due to dependency on variable parameters**
 - Amplitude
 - Vibration pressure



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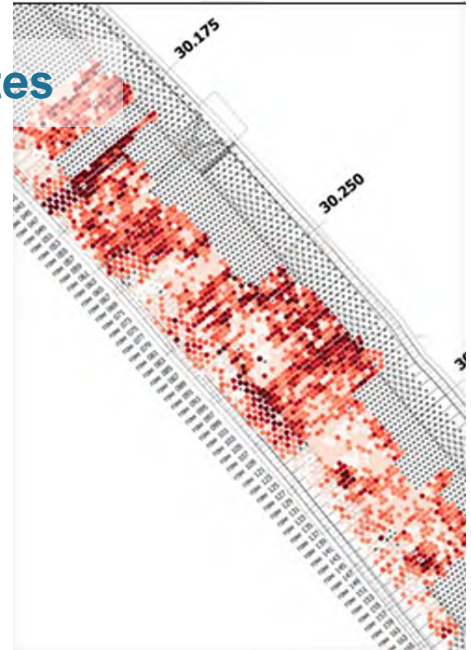
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Registration using GPS coordinates

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Please refer to Jeroen.Dijkstra@cofra.com when additional information is required

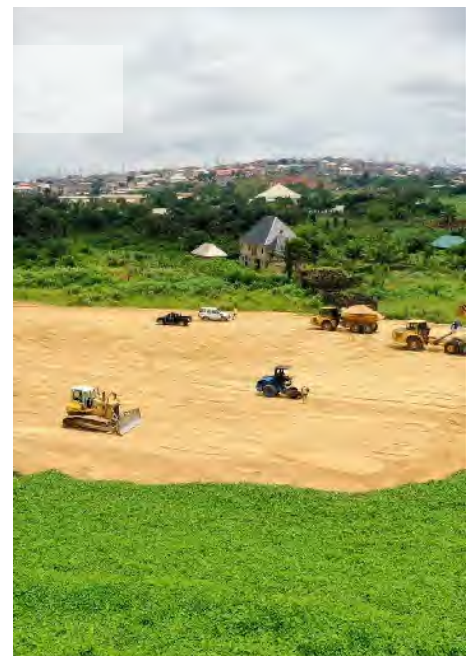
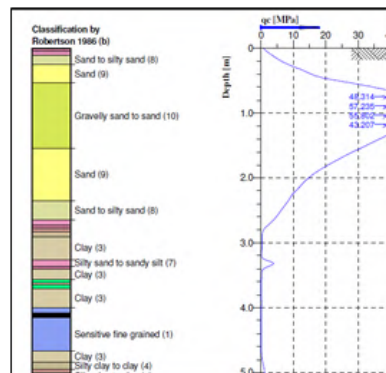


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Subsoil typical CPT

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CPT inside column

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Lessons learned

- **Thickness and density of the working platform**
 - *Not to long present and no constant levelling*
 - *Be careful with roller and bulldozer compaction, haul road*
- **Installation depth.**
 - *Stiffening downward profile*
 - *Highly variable geology*
- **Quality control is very important**

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Current situation GEC

- Last flight out before lock-down / travel bans
- Transferred installation and experienced crews to JBN

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Basal reinforcement



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Stabilenka as basal reinforcement



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Thank you for your attention



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