

Leendert de Boerspolder

Failure and pre-failure of a dyke on soft subsoil

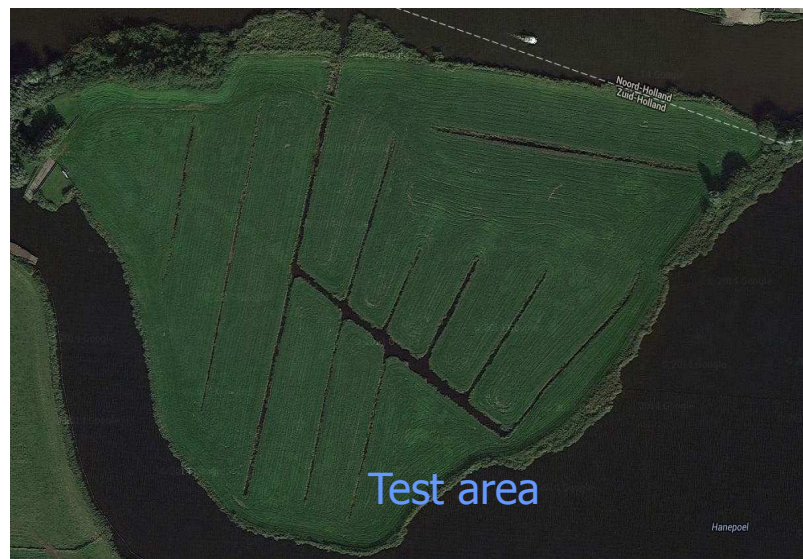
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Ludolph Wentholt, Henk van Hemert



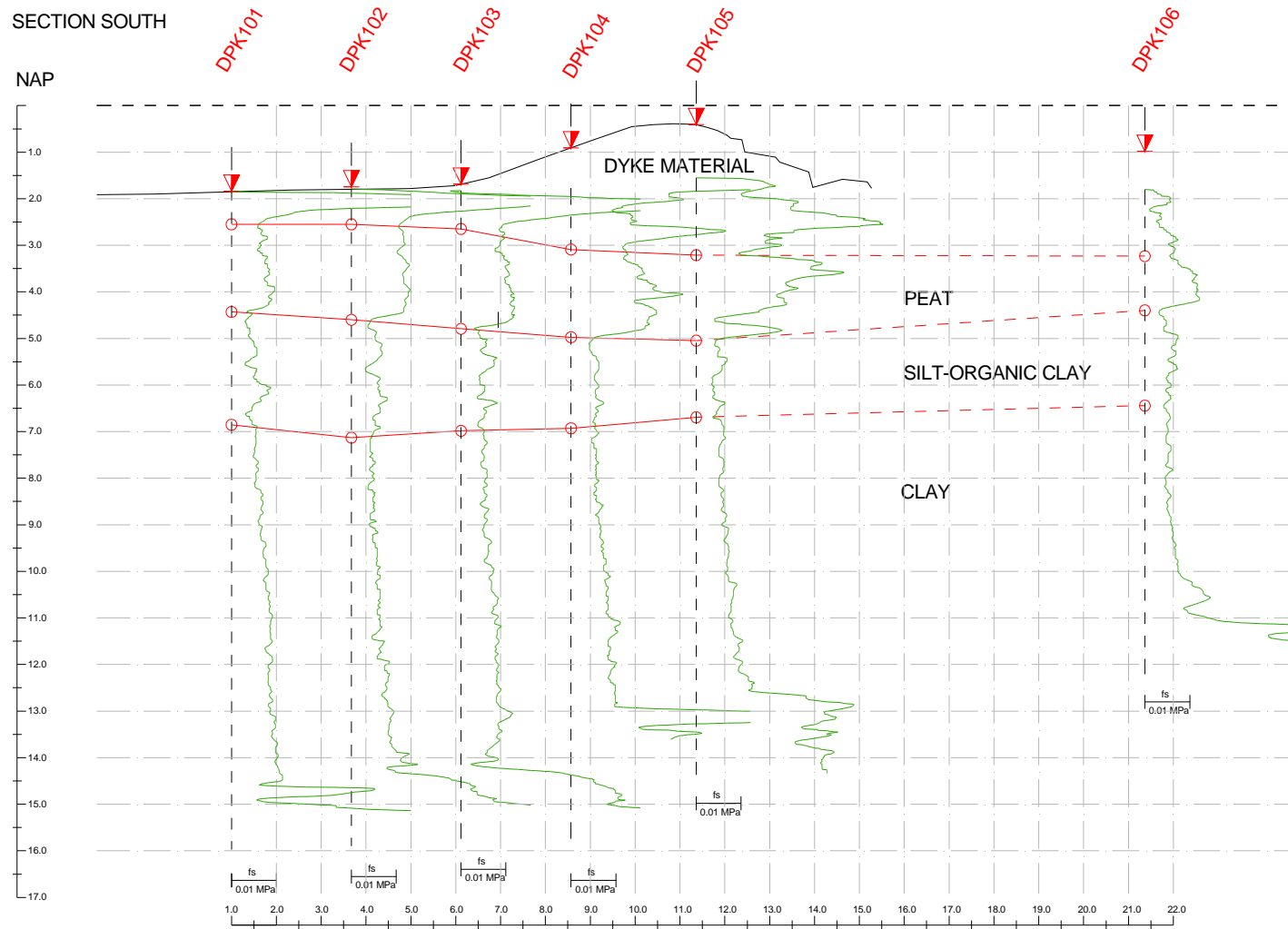
Leendert de Boerspolder – HH Rijnland

A polder protected by dykes, which had to be flooded, was offered to perform a full scale pre-failure and failure test to assess current models for the geotechnical response of the earth structure



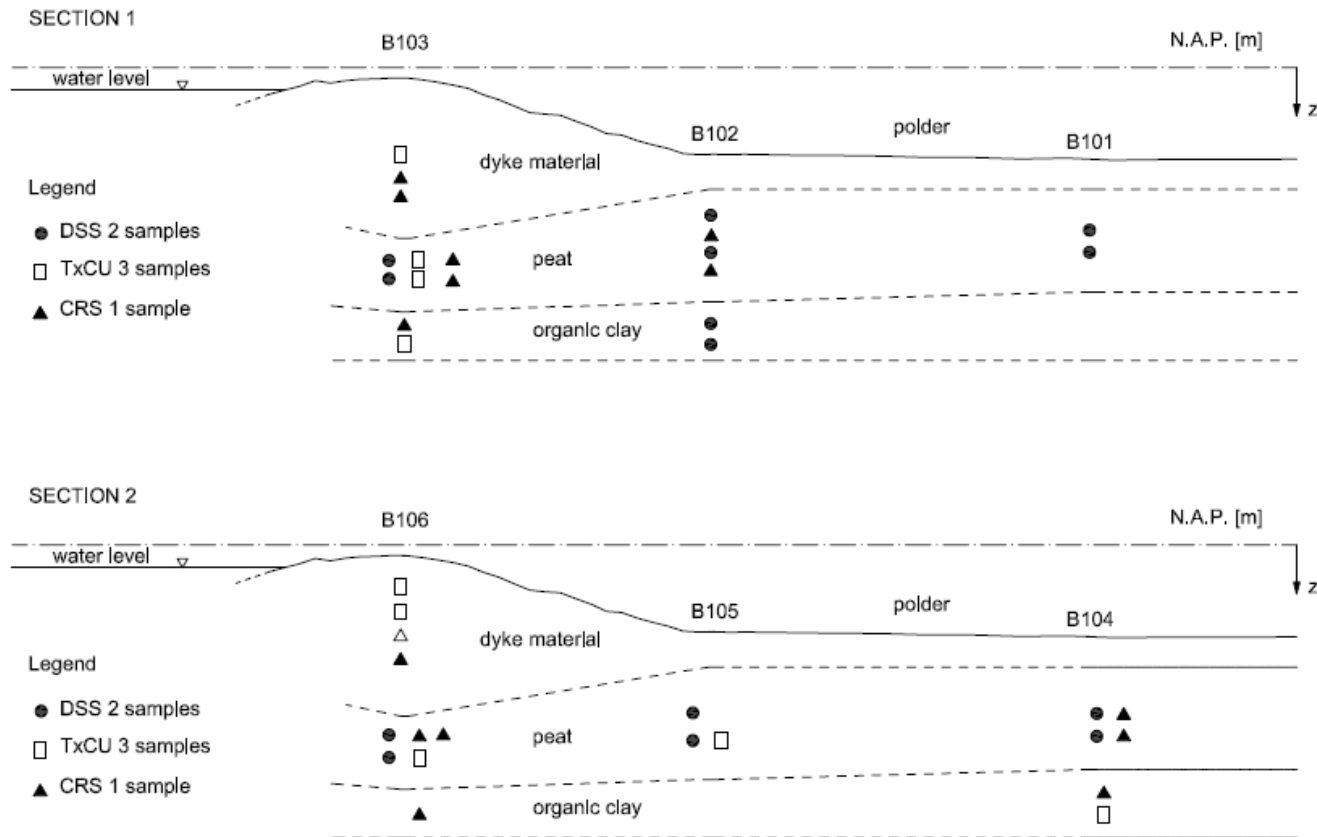
Site investigation: CPTu

SECTION SOUTH

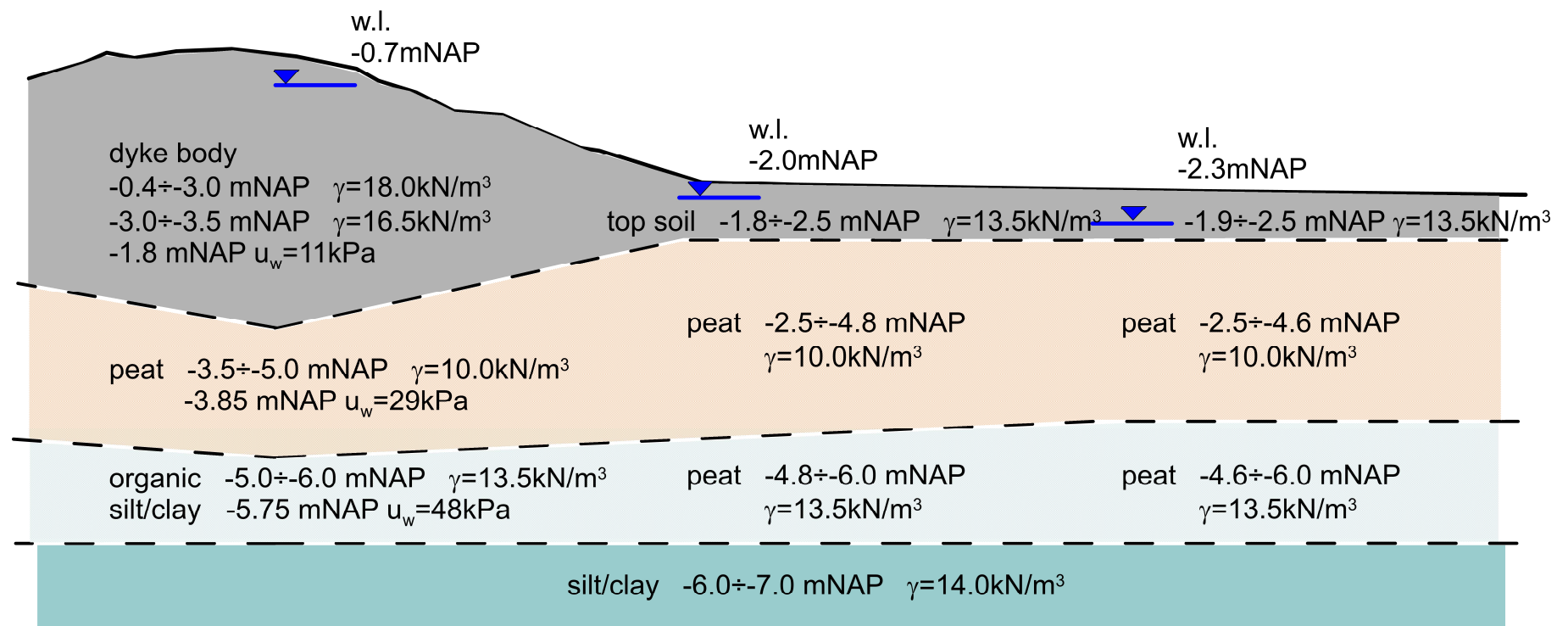


Laboratory testing

Soil classification data, Triaxial CU, Direct Simple Shear, Constant Rate of Strain and Incremental Loading Oedometer Tests



Schematic Geotechnical Model



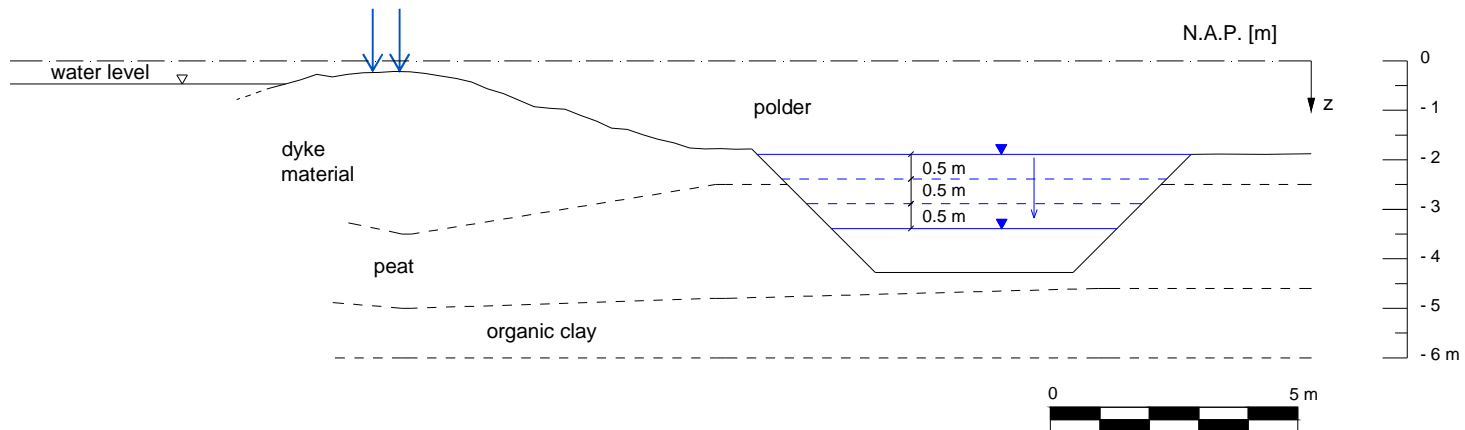
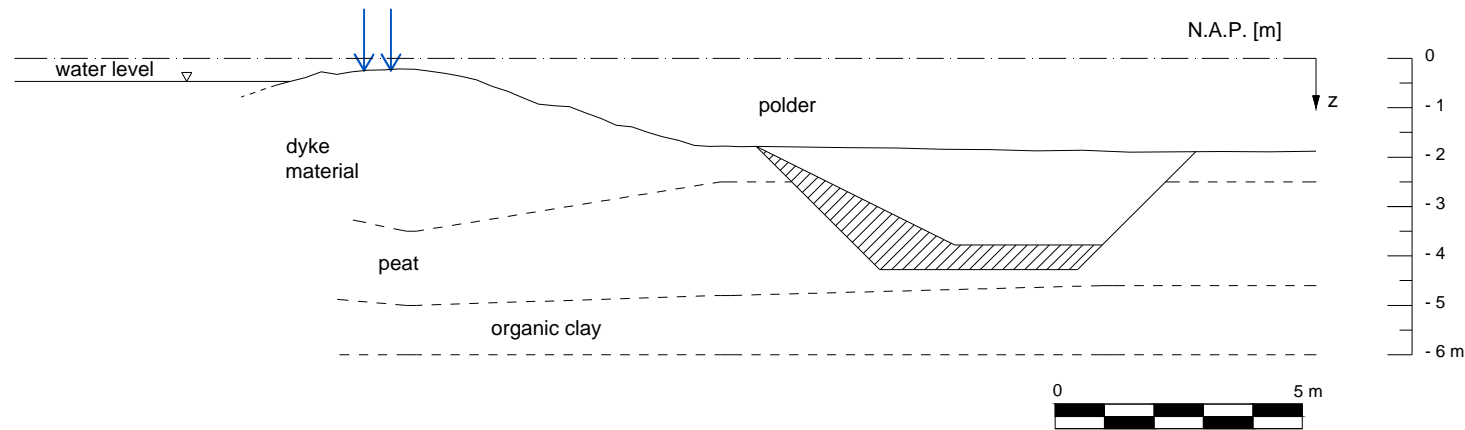
Design of the stress test

Wetting – staged excavation – staged pumping



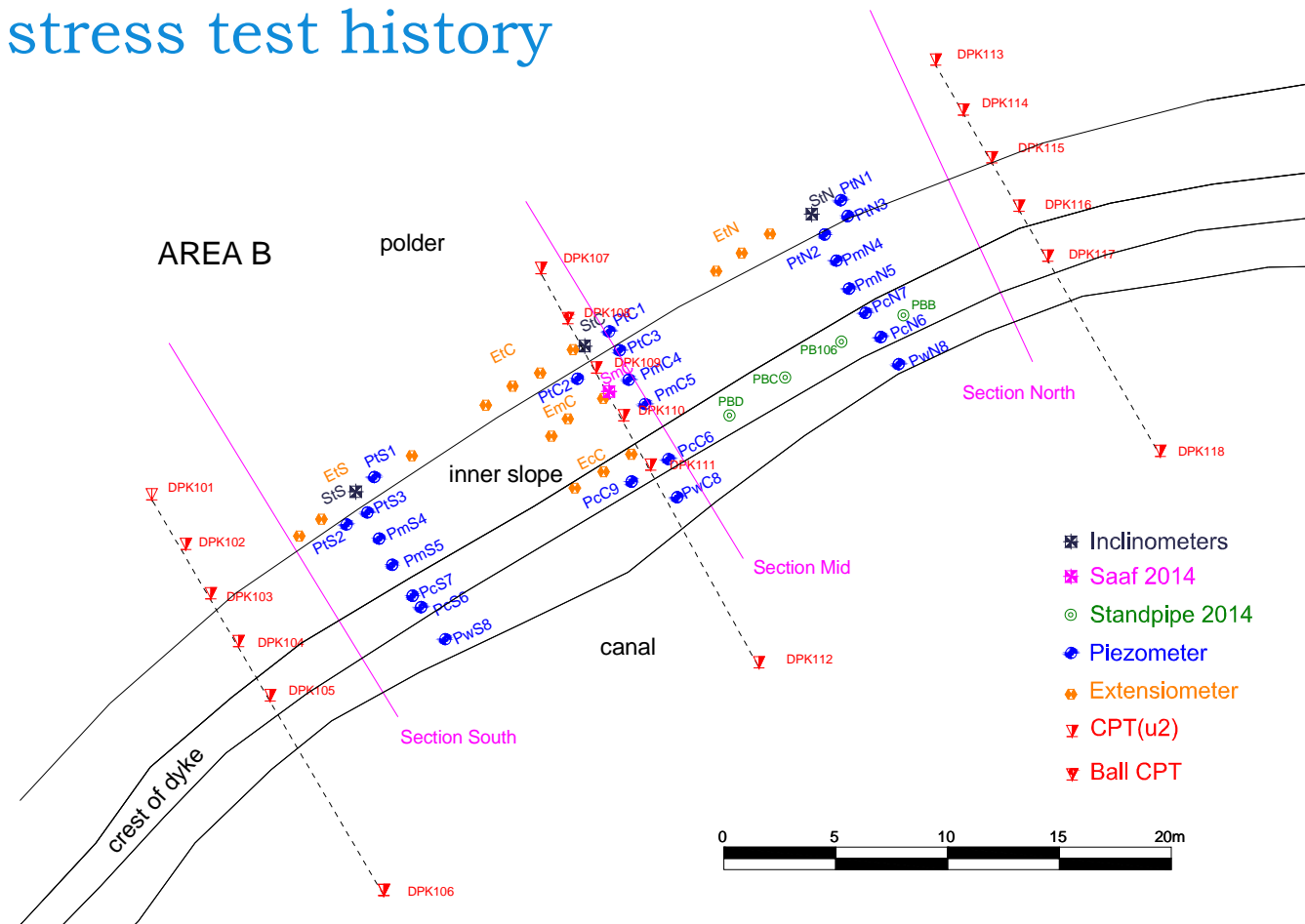
Excavation 3: 12/10/2015

Pumping 3: 14/10/2015



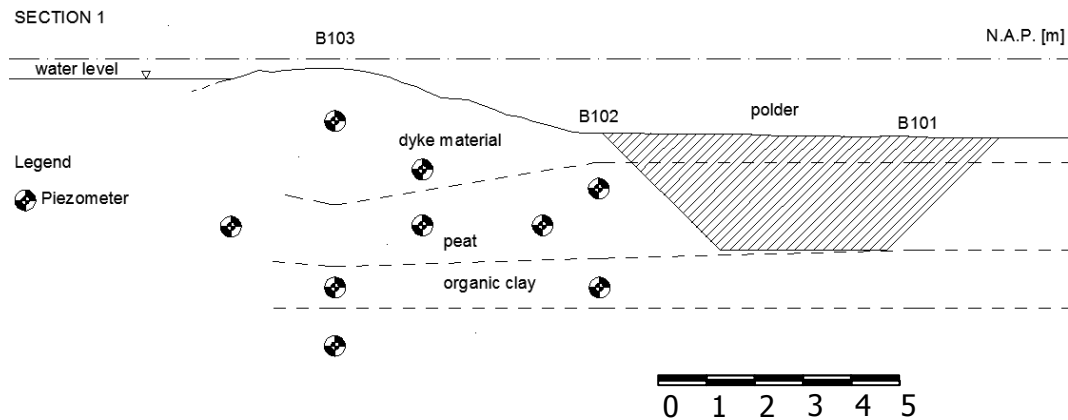
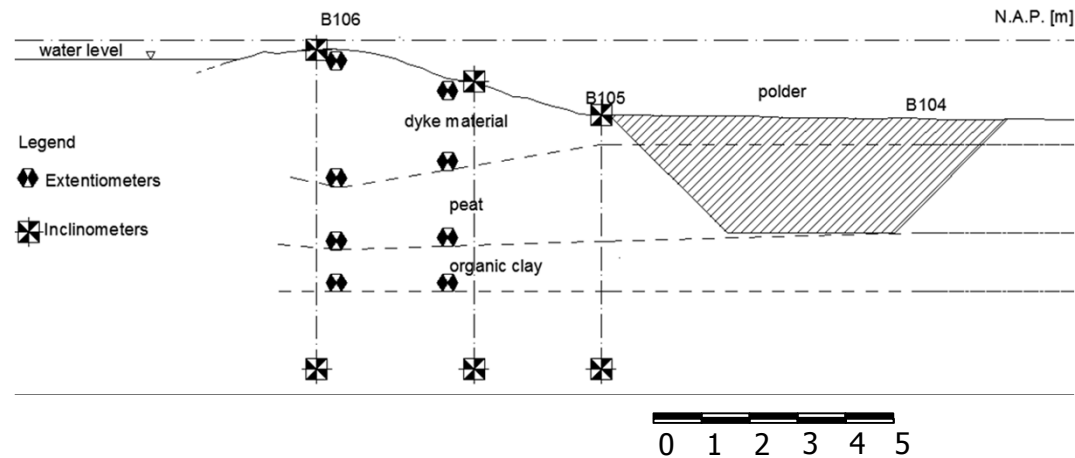
Available information

Geometry, site investigation, laboratory data, and selected monitoring data on three cross-sections, complete stress test history



Monitoring data

Inclinometers - Piezometers



Main questions

Part I: Failure

When did failure occur?

What was the role of pore pressure?

How accurately do current models for strength predict failure?

Part II: Pre-failure

What material models fit the best the subsoil and material behaviour observed in the laboratory?

Are laboratory tests representative of the behaviour of the material in the field?

Can the pre-failure displacements and pore pressures be predicted accurately with current models?

Complementary questions

Part III: Geometry and Geotechnical model

Does the true 3D geometry of the dyke influence significantly the response of the dyke during the stress test and at failure?

Can we get better prediction of pre-failure and failure including a 3D geometry of the geotechnical system?

Which elements of the models are most affected by uncertainty?

Acknowledgments

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stowa



Hoogheemraadschap van
Rijnland



Hoogheemraadschap van
Delfland



hoogheemraadschap
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WETTERSKIP
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Rivierenland



HOOGHEEMRAADSCHAP
DE STICHTSE
RIJNLANDEN

provincie **HOLLAND**
ZUID

NH Provincie
Noord-Holland

Programme

H van Hemert	Relevance of the case history	
D Sterpi	Reference drained and undrained analysis	
M Bakeš, T Mészáros & M Minárik	Coupled stress-strain analysis	
C Marulanda Escobar, JS Tello & DL Vanegas	Coupled stress-strain analysis	
M V Schwager, A D Tzenkov & GMA Schreppers	Coupled stress-strain analysis	
A Amicarelli & E Abbate	Failure and post-failure (SPH)	
C Jommi	Design and evidence of failure	
ALL	Round Table - Discussion Perspectives	