T. de Gast, P.J. Vardon, M.A. Hicks

Leendert de Boerspolder CPT dataset

GE.TGA.19.R01

Version	Comment	Date
1.0	Publication	14-02-2020

TU Delft

CPT dataset to study soil heterogeneity

GE.TGA.19.R01

By

T. de Gast
P.J. Vardon
M.A. Hicks

Contents

1 Introduction

This report accompanies a dataset of 100 Cone Penetration Tests (CPTs), class 1 accuracy according to NEN-EN-ISO 22476-1, that have been collected to study soil heterogeneity. The data has been collected over a period of two weeks in a location where the original ground surface has been partly compressed by an old dyke. The dataset includes *.GEF files (raw [text] data), and matlab data files containing: Elaborated CPT data according to several correlation functions, Global RD (Dutch reference) XYZ-coordinates for each CPT in the collection.

Location of site investigation

The location of the site investigation was Leendert de Boerspolder (Figure 1), a polder located close to Leiden in the Netherlands. This location is typical of the west of the Netherlands; a dyke founded on soft material in order to defend or 'create' land from water. This particular dyke appears on maps since 1611, and has been maintained first by local farmers and later by the local water authority 'Hoogheemraadschap van Rijnland'.

The material of the dyke itself is not naturally deposited and consists of sand, silt, clay and rubble. The building and maintenance of this man-made embankment has caused the soft layers to compress.

The site investigation was performed in a grid (as shown in Figure 2), the grid of CPTs was parallel to the dyke, with CPT Nos. 34-44 and 69-86 located on the crest of the dyke (Zone 1, Line 7), CPT Nos. 45-54, 92-94, 97 and 98 on the slope of the dyke (Zone 2, Line 6), and CPT Nos. 23-33 and 95-96 located at the toe of the dyke (Zone 2, Line 5). The remaining CPTs were located in the polder next to the dyke (Zone 3, Lines 1-4).

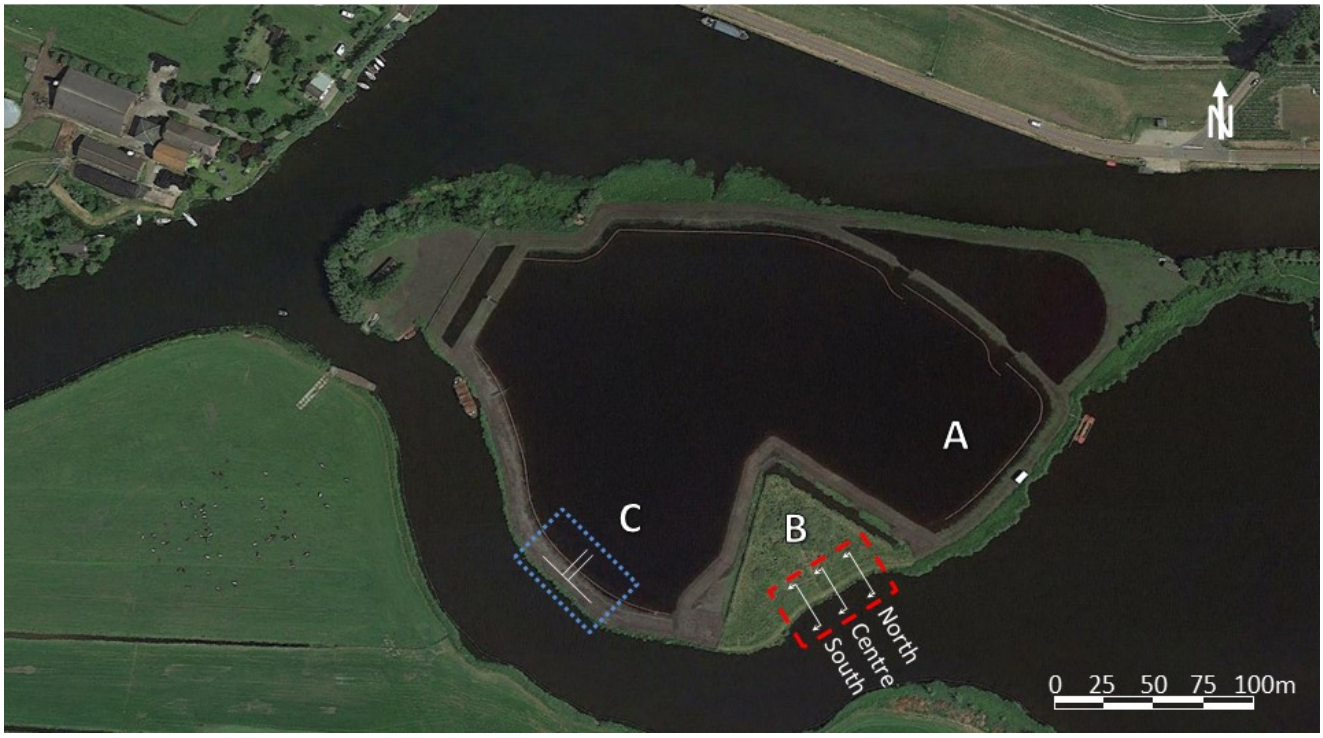

Figure 1: Photo of Leendert de boerspolder, indicated are (A) office location during dyke failure test, (B) field failure test with three CPT rows indicated and (C) location of where the data presented was collected (de Gast, 2020).

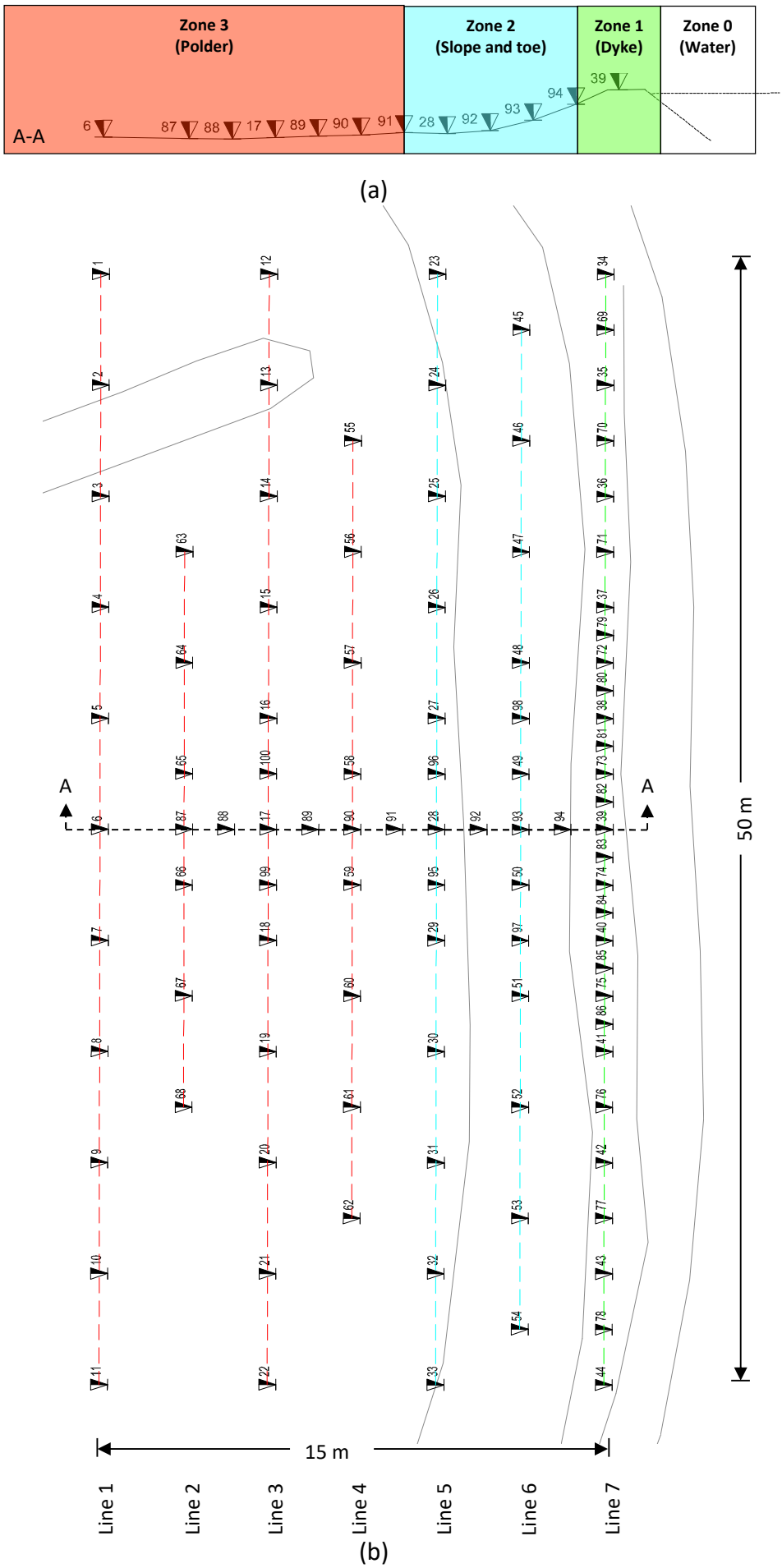

Figure 2: CPT grid (50m x 15m): (a) main testing zones, cross section (A-A) illustrated; (b) plan view of CPT locations.

2 Data structure

There are two types of files containing the same information. The *.GEF files are the raw data files and the *.mat files contain an extra column of information with the derived corrected cone resistance (q_t).

**.GEF files:*

608312_DKP201.GEF - 608312_DKP300.GEF

The files start with metadata, with important entries in bold:

#GEFID	Release number GEF
#FILEOWNER	Owner of the data/file
#FILEDATE	Date the file was generated
#PROJECTID	Company project id
#COLUMN	Number of columns in the data block
#COLUMNINFO	Information of the column
#COLUMNVOID	Placeholder for additional information
#COMPANYID	ID of the company who performed the tests
#DATAFORMAT	Data format
#LASTSCAN	Number of entries after #EOH
#XYID	Dutch reference X-, Y-coordinates
#ZID	Dutch reference Z-coordinate (also referred to as NAP)
#MEASUREMENTTEXT	Text added for CPT
#MEASUREMENTVAR	Tests to identify the type of cone and input of CPT operator
#REPORTCODE	Release of CPT-Report
#PROCEDURECODE	Release of CPT-Report
#TESTID	CPT number corresponding to CPT number in Appendix A
#STARTDATE	Date CPT was performed
#STARTTIME	Time CPT was started
#OS	Operating system
#EOH	End of header (start of data collection

The data collection starts after *#EOH=* (End of Header) and the six columns represent:

Table 1: Column information in *.GEF files

Column	Dutch	English	Symbol	Unit
1	sondeerlengte	CPT depth	**Z**-id	[m]
2	Puntdruk	Cone resistance	q_c	[MPa]
3	Lokale wrijving	Sleeve friction	f_s	[MPa]
4	Waterdruk schouder	Pore pressure (behind cone)	u_2	[MPa]
5	Helling	Angle	α	[°]
6	Wrijvingsgetal	Friction ratio	R_f	[%]

For further details please refer to the document describing the geotechnical exchange format for cpt-data (*link*).

**.MAT files:*

CPTR_storage.mat is prepared in Matlab. CPTR_storage.mat contains a 100 cell array with, in each cell, a matrix containing the properties listed in Table 2. To obtain CPT data from this file, for example the q_t data from CPT 10 in matlab write:

```
load('CPTR_storage_qt.mat');
CPTR{10}(:,9);
```

Table 2 Column information in in CPTR_storage.mat file

Column	Dutch	English	Symbol	Unit
1	X-coördinaat	X-coordinate	X-id	[m]
2	Y-coördinaat	Y-coordinate	Y-id	[m]
3	Sondeerdiepte	CPT depth	**Z**-id	[m]
4	Puntdruk	Cone resistance	q_c	[MPa]
5	Lokale wrijving	Sleeve friction	f_s	[MPa]
6	Waterdruk schouder	Pore pressure (behind cone)	u_2	[MPa]
7	Helling	Angle	α	[°]
8	Wrijvingsgetal	Friction ratio	R_f	[%]
9	Gecorrigeerde puntdruk	Corrected cone resistance	q_t	[MPa]

3 Licence

This data is provided under the CC0 1.0 Universal (CC0 1.0) Public Domain Dedication licence. We offer no warranty for the data.

4 Publications

To the author's knowledge the presented dataset has been used in the following publications:

T. de Gast, P.J. Vardon & M.A. Hicks (2017), Estimating spatial correlations under man-made structures on soft soils, Proceedings of the 6th International Symposium on Geotechnical Safety and Risk (Geo-Risk 2017), Denver, pp. 382-389.

T. de Gast, P.J. Vardon & M.A. Hicks (2018), Detection of soil variability using CPTs, Proceedings of the 4th International Symposium on Cone Penetration Testing (CPT18), Delft, pp. 289-294.

T. de Gast, P.J. Vardon & M.A. Hicks (2018), A practical case study of slope stability analysis using the Random Finite Element Method, Proceedings of the 9th European Conference on Numerical Methods in Geotechnical Engineering (NUMGE 2018), Porto, pp. 531-534

T. de Gast, P.J. Vardon & M.A. Hicks (2019) , Observations and Considerations Regarding Estimating Horizontal Scales of Fluctuation Around Linear Infrastructure, Accepted for ISGSR2019, Taipei.

T.P.W. van Koelen (2019), The influence of man-made structures on spatial variability of soft soils: A case study at the Leendert de Boerspolder, MSc Thesis.

T. de Gast, (2020). Dykes and embankments: a geostatistical analysis on soft terrain. PhD Thesis, Delft University of Technology.

T. de Gast, M.A. Hicks, A.P. van den Eijnden, P.J. Vardon, (2020). On the reliability assessment of a controlled dyke failure. Géotechnique, Ahead of print.

T. de Gast, P.J. Vardon & M.A. Hicks, Assessment of soil variability for linear infrastructure, submitted.

We would appreciate knowing how the data is used and can link to your work. Please contact us on t.degast@tudelft.nl.

5 Acknowledgements

The collection of this data was supported under project number 13864 by the Dutch Technology Foundation STW, which is part of the Netherlands Organisation for Scientific Research (NWO), and which is partly funded by the Ministry of Economic Affairs.

Appendix A: CPTs