Deltares

Enabling Delta Life

DAM UI

Functional Design

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Functional Design

1210702-000

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Title
DAM UI

Client	Project	Reference	Pages
Deltares - Geo engineering DKS	1210702-000	1210702-000-GEO-0003	14

Classification
-

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Dike, safety assessment, design, software, macro stability, piping

Summary
This document contains the functional design for DAM UI, a software module that computes the strength of a complete dikering with respect to several failure mechanisms, such as macro stability and piping.

Samenvatting
Dit document bevat het functioneel ontwerp voor DAM UI, een software module die een gebruiker in staat stelt om voor een dijktraject berekeningen uit te voeren voor verschillende faalmechanismen, waaronder macrostabiliteit en piping.

References
Refer to chapter 4.

Version	Date	Author	Initials	Review	Initials	Approval	Initials
0.1	Jan 2018	Irene van der Zwan		Kin Sun Lam André Grijze		Maya Sule	

Status
draft
This is a draft report, intended for discussion purposes only. No part of this report may be relied upon by either principals or third parties.

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1 Introduction

1.1 Purpose and scope of this document

This document contains the functional design for the DAM UI, a user interface for the DAM Engine. The DAM Engine is designed for the automated calculation of the strength of dikes. DAM was developed by Deltares with and for STOWA for all water authorities. This document describes requirements and functional design of DAM UI. What will actually will be implemented depends on the requirements of the clients using this DAM UI. If some functionality is not (yet) needed, then that part does not need to be implemented.

1.1.1 Future options

As mentioned above this document contains some options that will not be implemented in the first release, but are foreseen to be implemented in the near future. Therefore although sometimes a reference will be made to these options, these will not be described in detail yet.

That applies in particular to the following subjects:

- NWO module("Niet Waterkerende Objecten")
- WBI failure mechanisms (Piping, Macrostability)

1.2 Other system documents

The full documentation on the program comprises the following documents.

Title	Content
DAM UI- Architecture Overall (The, 2017a)	Description of overall architecture of the DAM UI and its components.
DAM UI- Functional Design (Zwan, 2017)	Description of the requirements and functional design.
DAM UI- Technical Design (The, 2017b)	Description of the implementation of the technical design of DAM UI.
DAM UI- Technical documentation (Doxygen, 2017)	Description of the arguments and usage of different software components, generated from in-line comment with Doxygen.
DAM UI- Test Plan (Trompille, 2017a)	Description of the different regression and acceptation tests, including target values.
DAM UI- Test Report (Trompille, 2017b)	Description of the test results (benchmarks and test scripts).
Architecture Guidelines (Kleijn *et al.*, 2017)	Architecture guidelines that are used by DSC-Deltares.

Table 1.1: *DAM UI system documents.*

1.3 Document revisions

1.3.1 Revision 0.1

First concept of the document.

2 Non-functional requirements

3 Functional requirements

Main purpose of the DAM UI The DAM UI can import data and combines this data to calculation input for the DAM Engine. After calculations made by DAM Engine the DAM UI can show the results and make analyzation possible.

3.1 REQ Import.Project
The DAM UI can import an excisting project.

3.2 REQ Data.Format
The DAM UI has a defined format for the data input, so DAM users know how to arrange the input data.

3.3 REQ Data.Content
The DAM UI has a defined content for the data input, so DAM users know which input data to provide.

3.4 REQ Data.Combination
The DAM UI combines data per location when data is provide in GIS-files. Locations are defined by RD-coordinates. The design of this functionality is described in Appendix A.

3.5 REQ Data.Generation.Geometry
The DAM UI can combine a surface line with a subsoil scenario. The result is a geometry, usable for the failure mechanism Macrostability.

3.6 REQ Display.result
The DAM UI can display the results of the calculations of the DAM Engine as:

- factor of safety (macrostability and piping)
- slip plane as picture (macrostability)
- new geometry (design mode)
- colored location on map (asssessment mode)

3.7 REQ Link.Standalone
The DAM UI can open a single calculation in a stand alone version of an UI of the used kernel.

3.8 REQ Export.data
The DAM UI can export data as tables and/or shapes.

3.9 REQ Save.Project
The DAM UI can save a project.

4 Literature

Doxygen, 2017. *DAM Engine - Technical documentation, Generated by Doxygen 1.8.10*. Tech. rep., Deltares.

Kleijn, E., A. Grijze, H. Elzinga, S. Hummel and T. The, 2017. *Architecture Guidelines*. Tech. rep., Deltares.

The, T., 2017a. *DAM Architecture Overall*. Tech. Rep. 1210702-000-GEO-0005, version 0.1, jan. 2017, concept, Deltares.

The, T., 2017b. *DAM Engine - Technical Design*. Tech. Rep. 1210702-000-GEO-0004, version 0.2, mar. 2017, concept, Deltares.

Trompille, V., 2017a. *DAM Engine - Test Plan*. Tech. Rep. 1210702-000-GEO-0006, version 0.1, jan. 2017, concept, Deltares.

Trompille, V., 2017b. *DAM Engine - Test Report*. Tech. Rep. 1210702-000-GEO-0007, version 0.1, jan. 2017, concept, Deltares.

Zwan, I. v., 2017. *DAM Engine - Functional Design*. Tech. Rep. 1210702-000-GEO-0003, version 0.1, jan. 2017, concept, Deltares.

Appendix

A Data combination

A.1 Location

The locations are described with a name and RD-coordinates; a point element in GIS files. Each location is connected to a crosssection; a line element in GIS files.

The combination of data from GIS files is made based on these point and line elements.
If the input data is available in a GIS file with line elements the data is collected at the intersection of the crosssection with the line element, see Figure A.1.

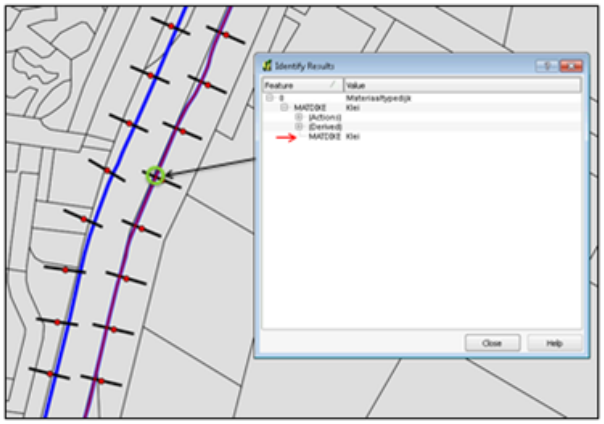

Figure A.1: *Data is collected from the line element at the intersection*

If the input data is available in a GIS file with area elements the data is collected at from the area where the location point is situated, see Figure A.2.

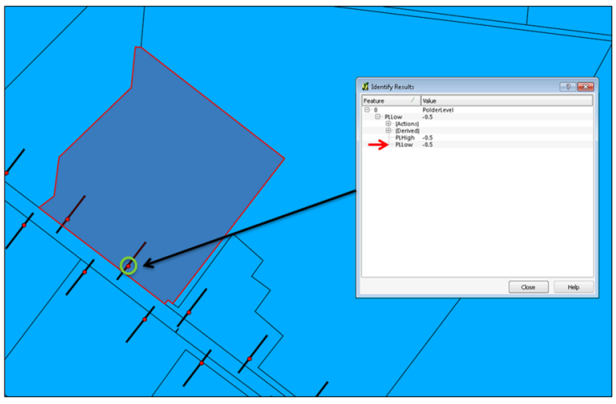

Figure A.2: *Data is collected from the area element where the location point is situated*

If the inputdata is not available in GIS files, all input data can be linked to each location via a table (csv-format).

A.2 Subsoil

The subsoil model is made up of the following elements:

- Soil segments
- Soil profiles
- Soil layers
- Soil materialparameters

A soil segment is located on a map and can contain several soil scenarios. A soil scenario is a combination of a soil profile and its probability. Each soil profile is build up from layers (1D-profile) or areas (2D-profile). A layer (or area) has the name of a material. And finally this material is described via soil type and several parameters (such as strength parameters).
All is displayed in Figure A.3.

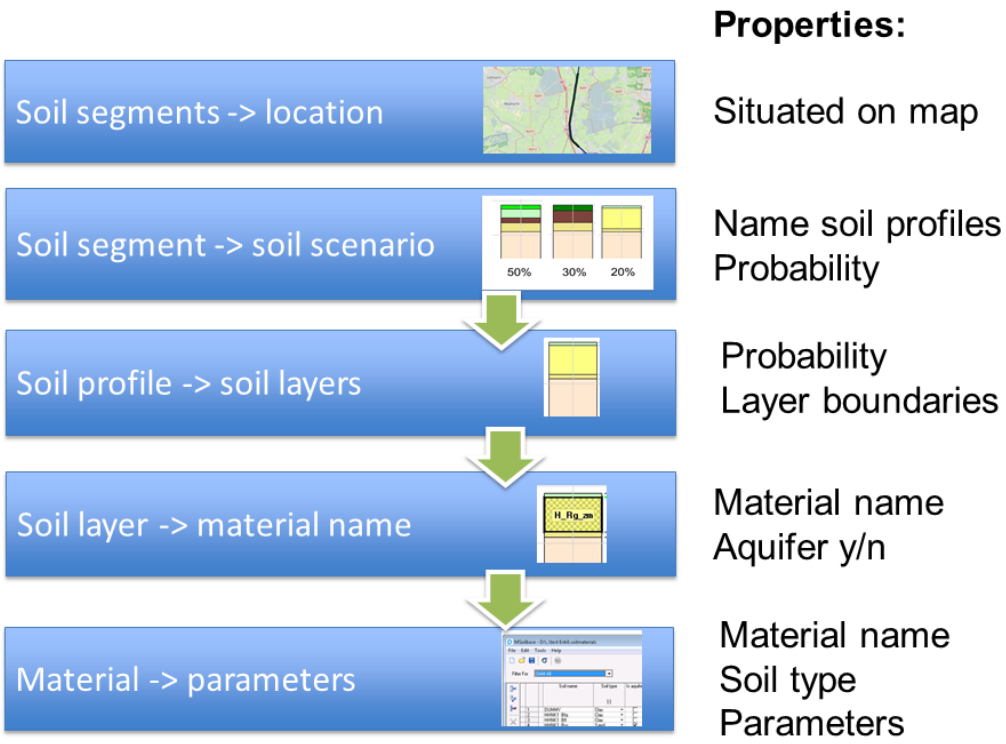

Figure A.3: *The elements of the subsoil model and their properties*

By linking the location to a soil segment, see section A.1, DAM UI combines the location to all soil profiles of the soil segment. The procedure for combining a surfaceline with a soil profile is described in section A.3.

A.3 Combination of surface line with soil profile

A.3.1 Combination of surface line with a 1D soilprofile

A 1D soil profile is a summation of layers with layer boundaries (Z-values) and materialnames. Combination with a surfaceline is uncomplicated if all the Z-values of the surface line are within the boundaries of the soil profile. If not, the user can define a filling material.

A.3.2 Combination of surface line with a 2D soilprofile

A 2D profile already has a topboundary with different Z-values. Combiniation with a surface line is more complicated since this top boundary and surfacel may differ in X and/or Z-values. The origin of the surfaceline can differ from the origin of the top boundary of the soil profile. The user can define this difference. The surfaceline is determing the final length of the combinated 2D-profile. If the surface line xxx soil profile length: subsoil at the right side will be deleted If the surface line xxx soil profile length: subsoil at the right side will be generated with Z-values at boundary.