

# **DAM UI**

**Functional Design**





# Deltares

## **DAM UI**

### **Functional Design**

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**Title**

DAM UI

**Client**Deltares - Geo engineer-  
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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 dike ring 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<br>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.



## Contents

|                                                         |            |
|---------------------------------------------------------|------------|
| <b>List of Figures</b>                                  | <b>iii</b> |
| <b>List of Tables</b>                                   | <b>v</b>   |
| <b>1 Introduction</b>                                   | <b>1</b>   |
| 1.1 Purpose and scope of this document                  | 1          |
| 1.1.1 Future options                                    | 1          |
| 1.2 Other system documents                              | 1          |
| 1.3 Document revisions                                  | 1          |
| 1.3.1 Revision 0.1                                      | 1          |
| <b>2 Non-functional requirements</b>                    | <b>3</b>   |
| <b>3 Functional requirements</b>                        | <b>5</b>   |
| 3.1 REQ Import.Project                                  | 5          |
| 3.2 REQ Data.Format                                     | 5          |
| 3.3 REQ Data.Content                                    | 5          |
| 3.4 REQ Data.Combination                                | 5          |
| 3.5 REQ Data.Generation.Geometry                        | 5          |
| 3.6 REQ Display.result                                  | 5          |
| 3.7 REQ Link.Standalone                                 | 5          |
| 3.8 REQ Export.data                                     | 5          |
| 3.9 REQ Save.Project                                    | 5          |
| <b>4 Literature</b>                                     | <b>7</b>   |
| <b>Appendix</b>                                         | <b>9</b>   |
| <b>A Data combination</b>                               | <b>11</b>  |
| A.1 Location                                            | 11         |
| A.2 Subsoil                                             | 12         |
| A.3 Combination of surface line with soil profile       | 12         |
| A.3.1 Combination of surface line with a 1D soilprofile | 12         |
| A.3.2 Combination of surface line with a 2D soilprofile | 13         |



List of Figures

A.1 Data is collected from the line element at the intersection . . . . . 11

A.2 Data is collected from the area element where the location point is situated . . 11

A.3 The elements of the subsoil model and their properties . . . . . 12



List of Tables

1.1 DAM UI system documents. . . . . 1



## 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 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<br>(The, 2017a)             | Description of overall architecture of the DAM UI and its components.                                                 |
| DAM UI- Functional Design<br>(Zwan, 2017)                | Description of the requirements and functional design.                                                                |
| DAM UI- Technical Design<br>(The, 2017b)                 | Description of the implementation of the technical design of DAM UI.                                                  |
| DAM UI- Technical documentation<br>(Doxygen, 2017)       | Description of the arguments and usage of different software components, generated from in-line comment with Doxygen. |
| DAM UI- Test Plan<br>(Trompille, 2017a)                  | Description of the different regression and acceptance tests, including target values.                                |
| DAM UI- Test Report<br>(Trompille, 2017b)                | Description of the test results (benchmarks and test scripts).                                                        |
| Architecture Guidelines<br>(Kleijn <i>et al.</i> , 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 (CSV-format) 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.
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- Trompille, V., 2017b. *DAM Engine - Test Report*. Tech. Rep. 1210702-000-GEO-0007, version 0.1, jan. 2017, concept, Deltares.
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## Appendix

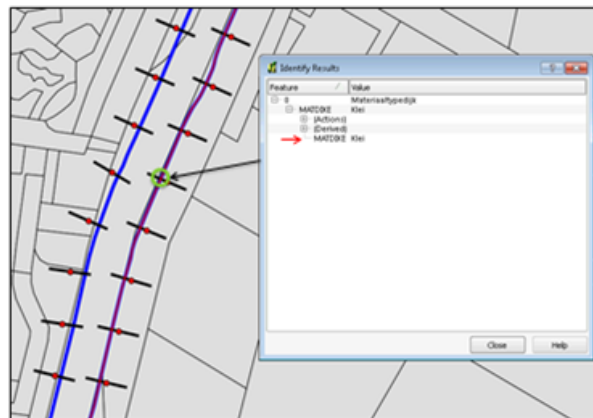


## A Data combination

### A.1 Location

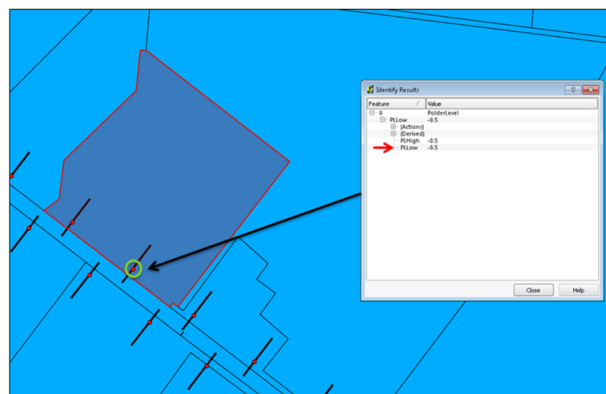
The locations are described with a name and RD-coordinates; a point element in GIS files. Each location is connected to a crosssection; a line element in GIS files.

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

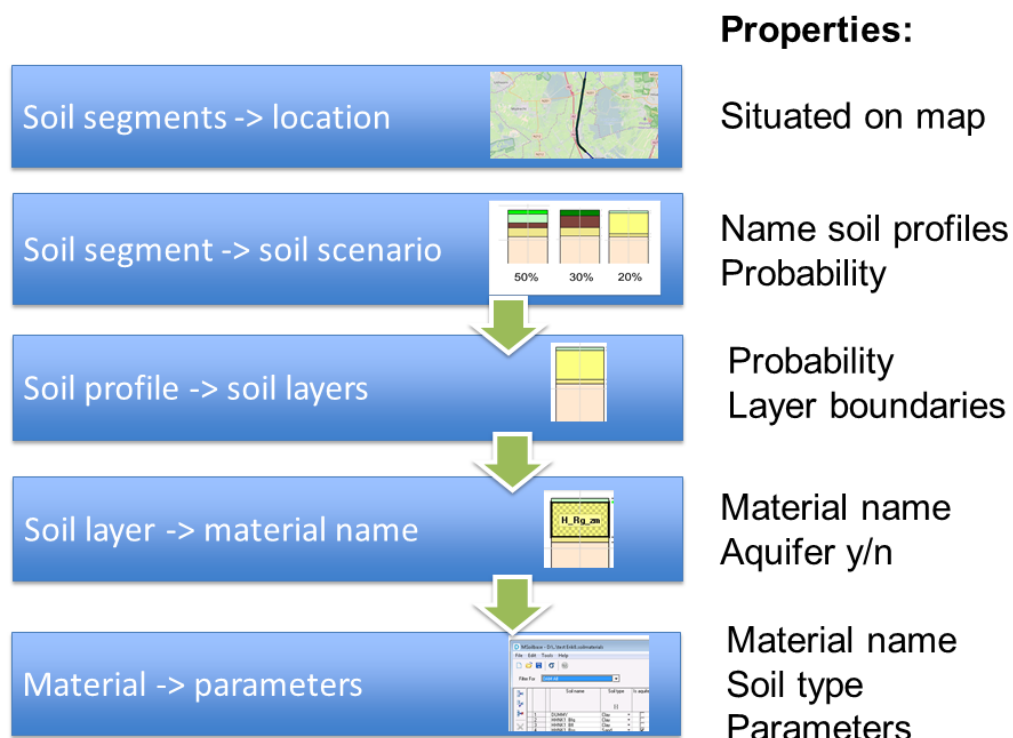
## A.2 Subsoil

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. Combination 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 determining the final length of the combined 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.

