Academy

Deltares
Enabling Delta Life

Werken met D-Geo Flow

Esther Rosenbrand
Vera van Beek

Inhoud

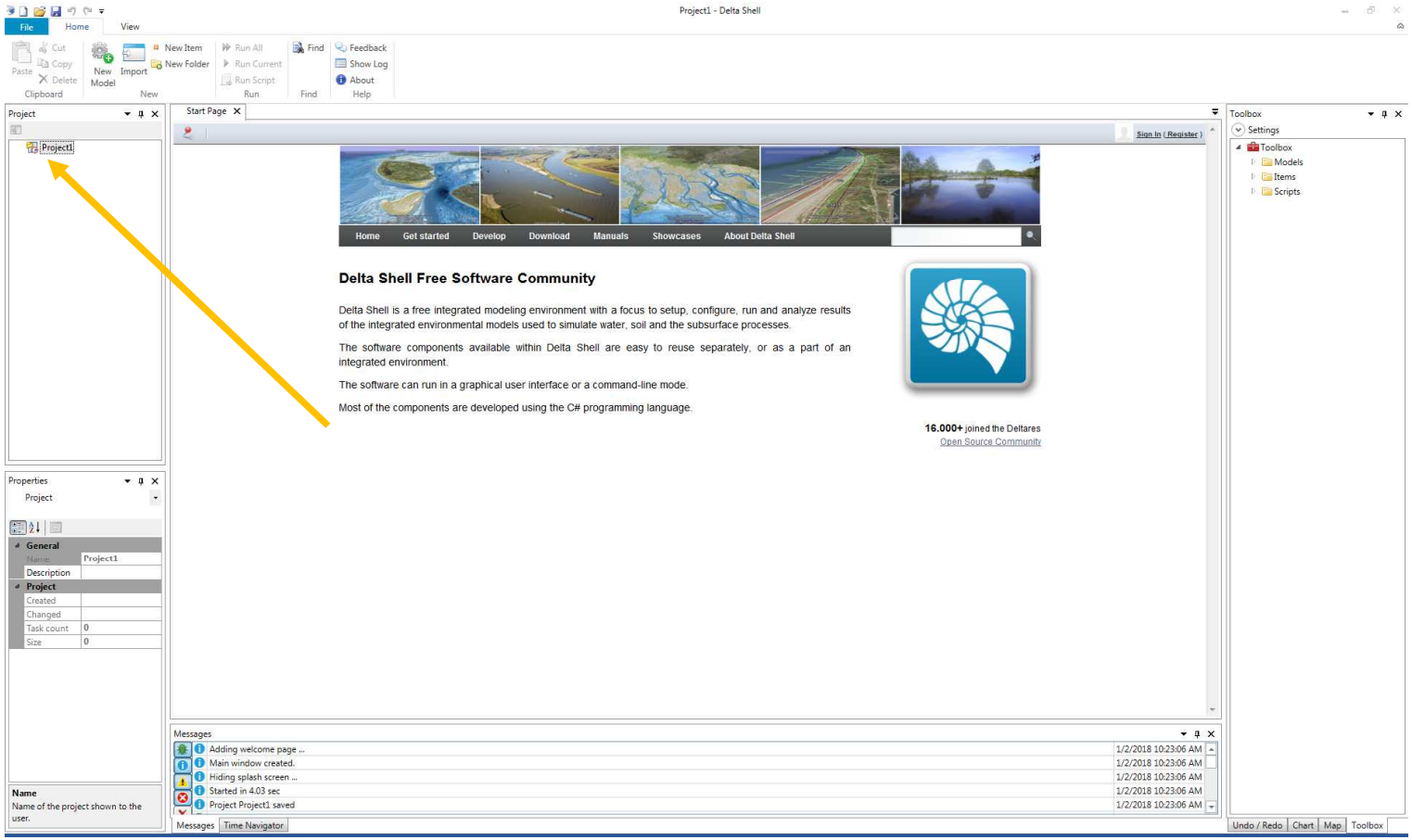
- Inleiding
- Wat kan wel, wat kan niet?
- Aandachtspunten en gevoeligheden
  - Meshing
  - MPicard
- Oefening
- Known issues

Deltares

D-Geo Flow

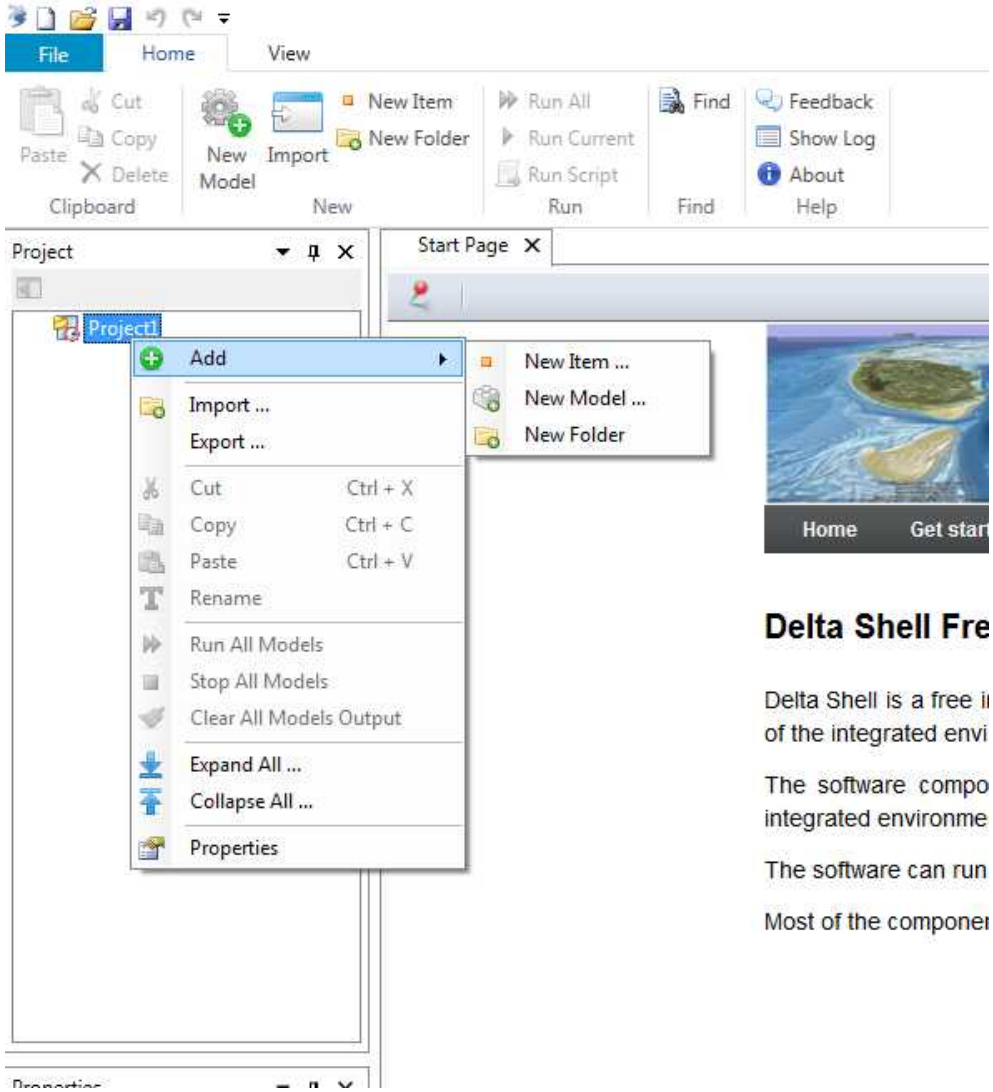
- D-Geo Flow is een gezamenlijke ontwikkeling van RWS en Deltares
- D-Geo Flow wordt gereleased als een eerste versie (v1.0) en is een startpunt voor doorontwikkeling.
- D-Geo Flow wordt kosteloos verstrekt aan geinteresseerde partijen na tekenen van het contract, wat recht geeft op:
  - Versie 1.0
  - Eerste lijn support
  - Eenmalige registratie per bedrijf, met meerdere installaties.
- Verdere verbeteringen via actieve gebruikers community en pilotprojecten
- In 2019 zal D-Geo Flow worden opgenomen in de ontwikkellijn van RWS/I&M

Inleiding



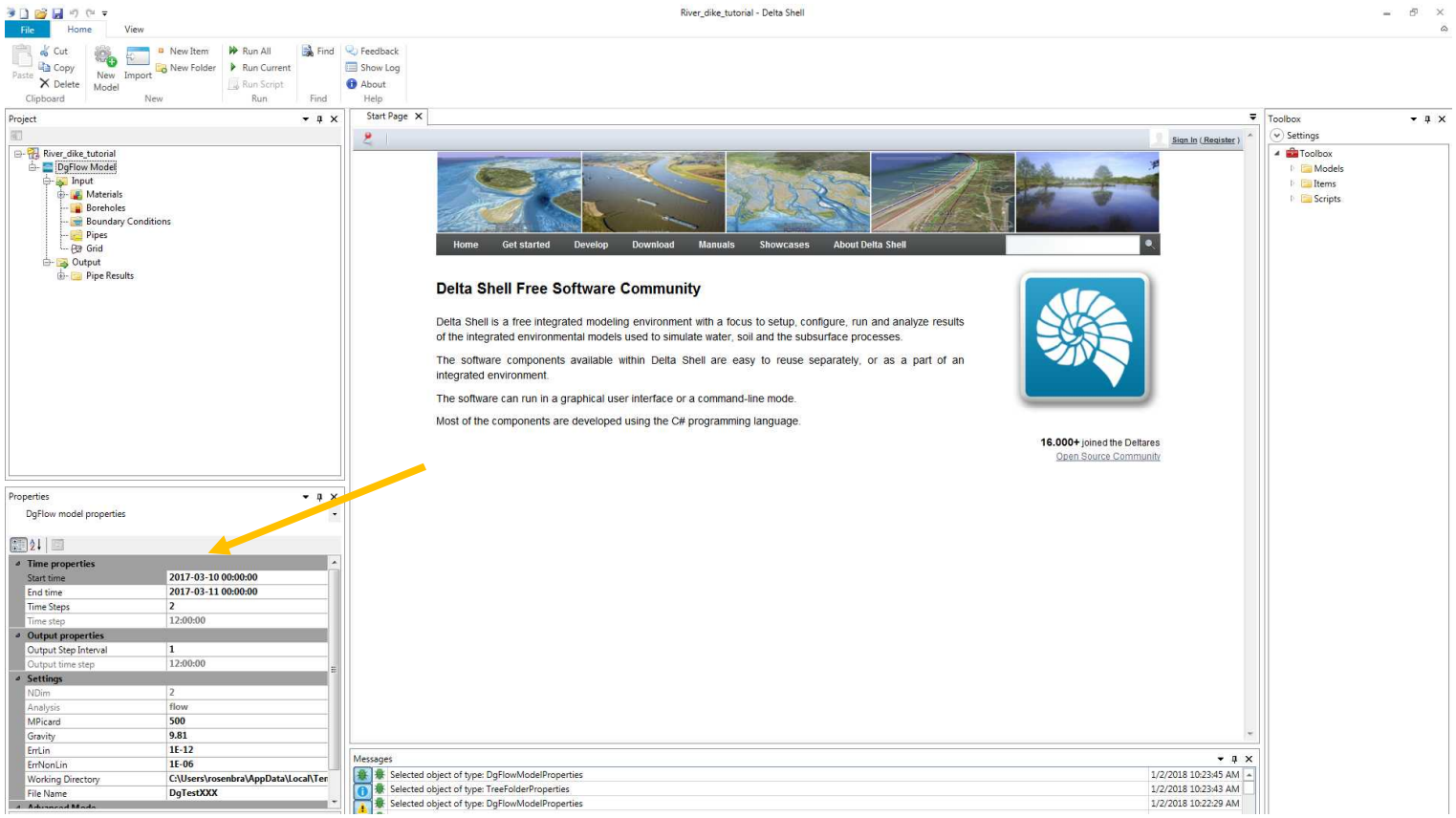
Deltares

Inleiding



Deltares

Inleiding



Deltares

Inleiding

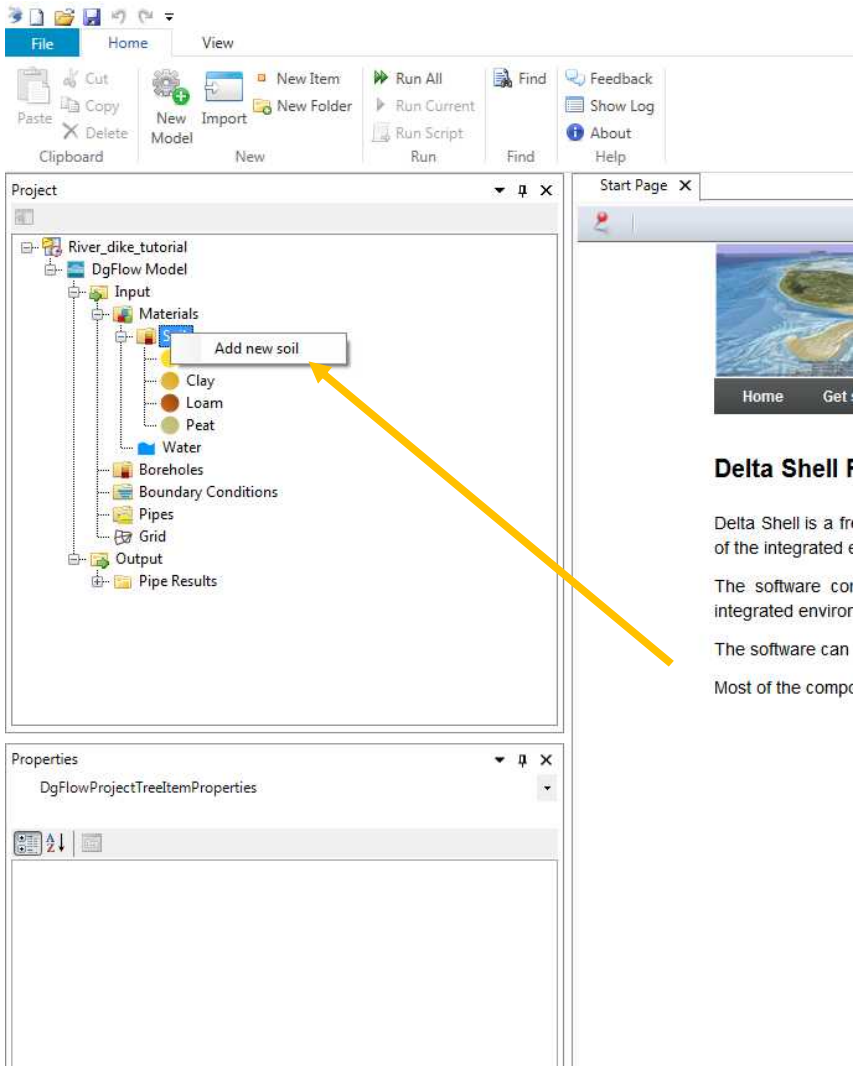
Properties

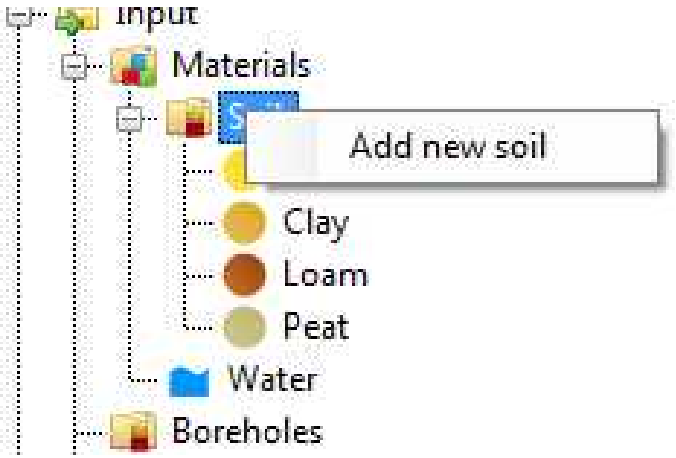
DgFlow model properties

Time properties	
Start time	2017-03-10 00:00:00
End time	2017-03-11 00:00:00
Time Steps	288
Time step	00:05:00
Output properties	
Output Step Interval	1
Output time step	00:05:00
Settings	
NDim	2
Analysis	flow
MPicard	1000
Gravity	10
ErrLin	1E-12
ErrNonLin	1E-06
Working Directory	C:\Users\rosenbra\AppData\Local\Temp\
File Name	DgTestXXX
Advanced Mode	
Advanced Mode	False

Deltares

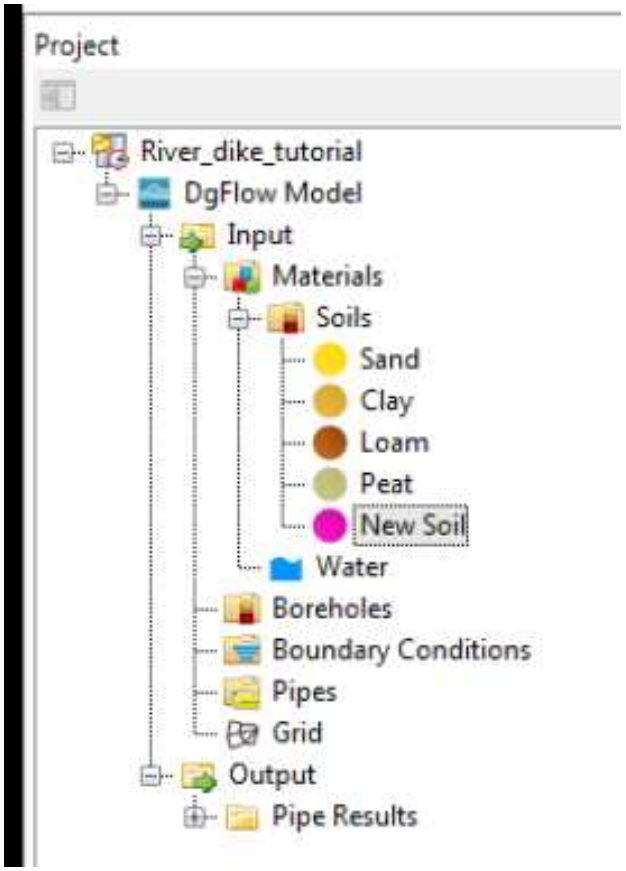
Inleiding





Deltares

Inleiding



Properties

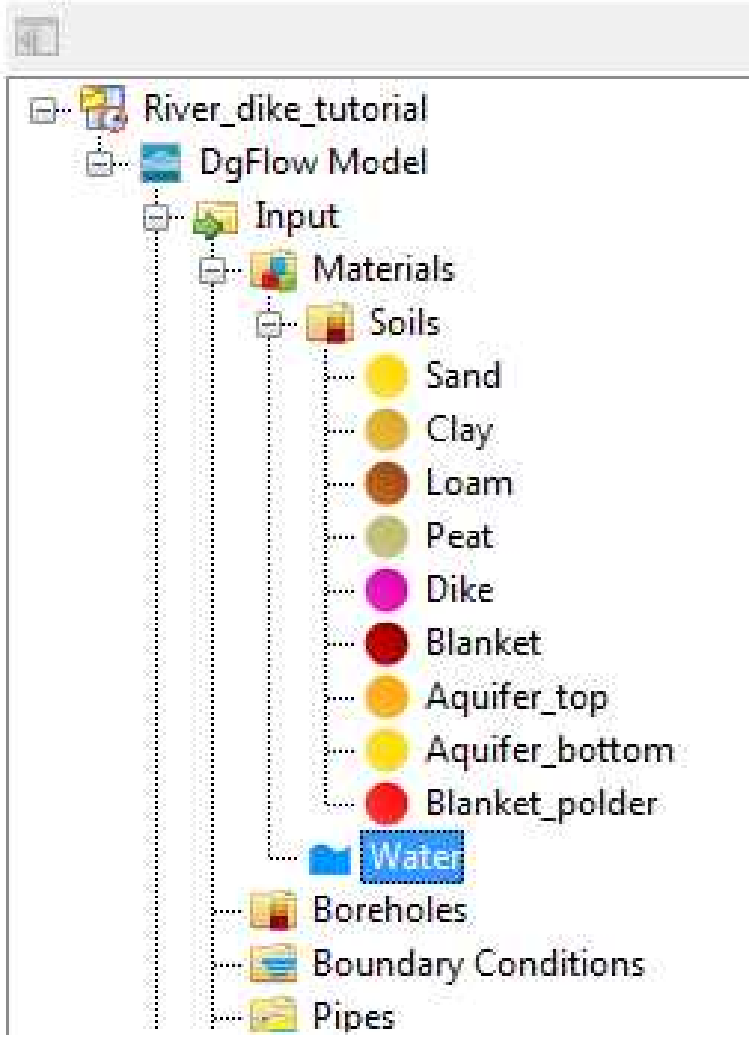
Soil Properties

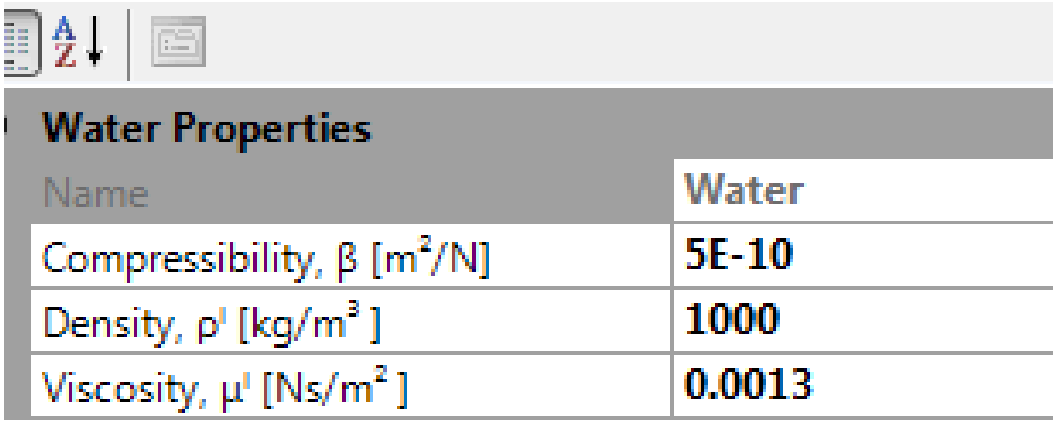
General	
Name	**New Soil**
Color	**213; 2; 165**
Other	
Porosity, n [-]	**0.36**
Compressibility, α [m^2/N]	**1E-07**
Grain Particle Density, ρ^s [kg/m^3]	**2650**
Particle diameter, D_{70} [m]	**0.0002**
White's constant, η [-]	**0.25**
Bedding angle, θ [deg]	**37**
Permeability	
Hydraulic Conductivity, Kx [m/day]	**7.5434976**
Intrinsic permeability, kx [m^2]	1.15700E-011
Hydraulic Conductivity, Ky [m/day]	**7.5434976**
Intrinsic permeability, ky [m^2]	1.15700E-011
Fluid Density, ρ^l [N/m^3]	1000
Fluid Viscosity, μ^l [Ns/m^2]	0.0013

Deltares

Inleiding

Project

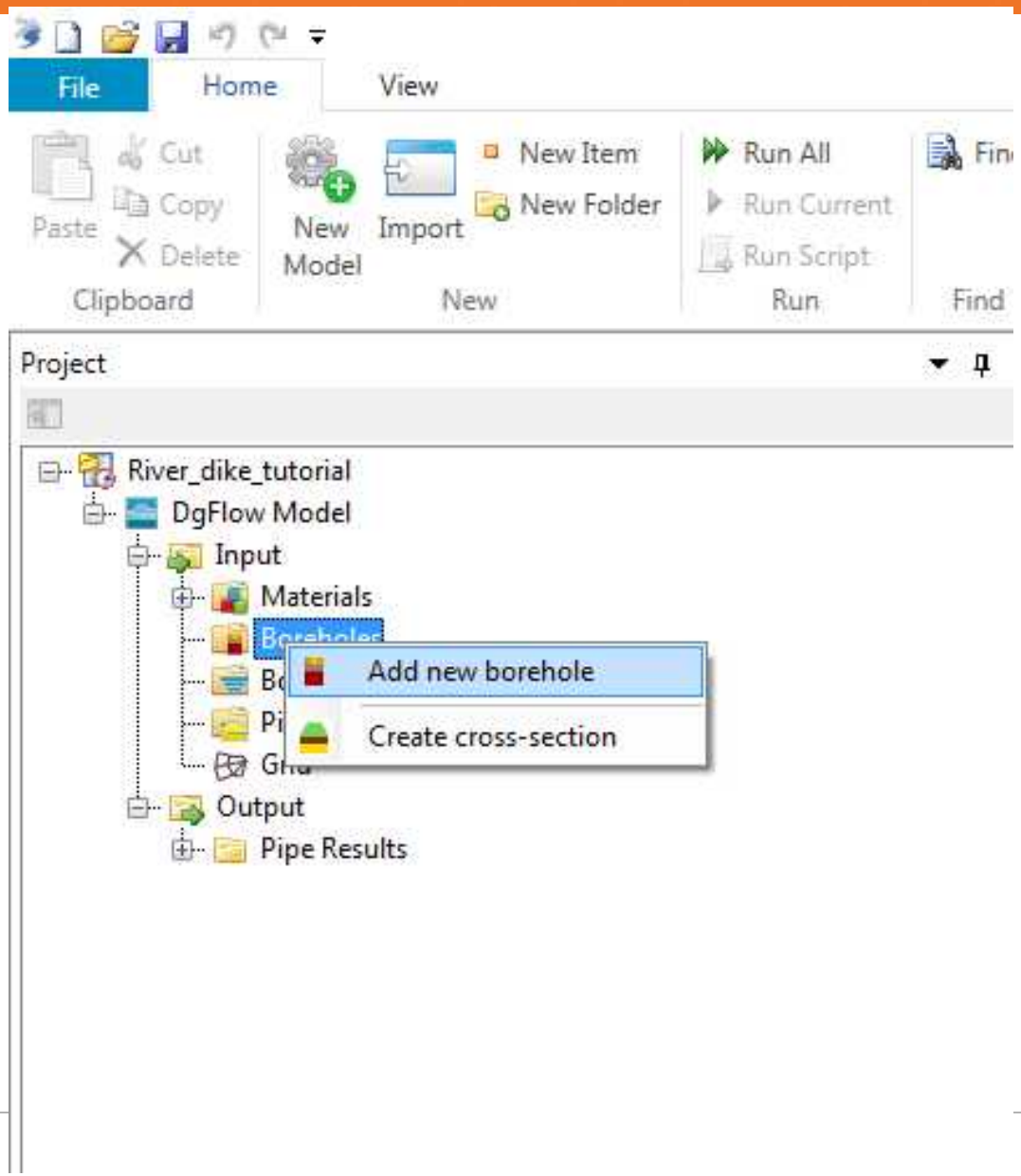




Water Properties	
Name	Water
Compressibility, β [m^2/N]	5E-10
Density, ρ^l [kg/m^3]	1000
Viscosity, μ^l [Ns/m^2]	0.0013

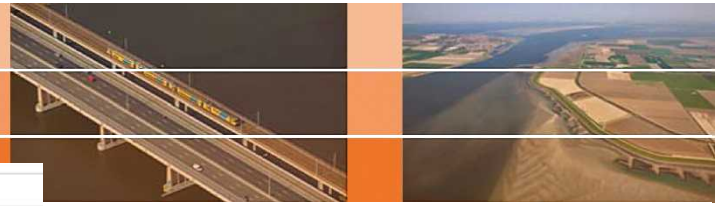
Deltares

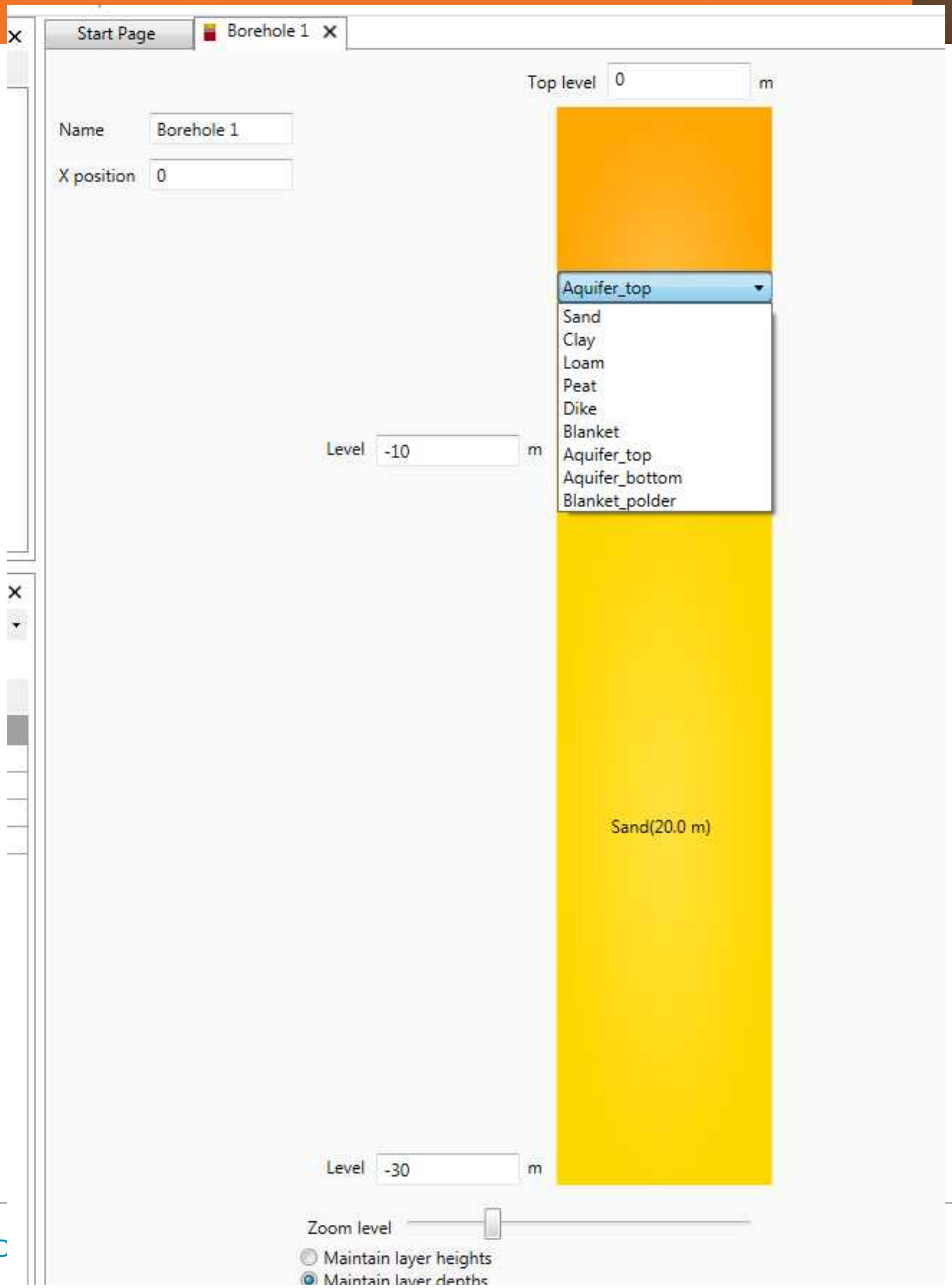
Inleiding



Deltares

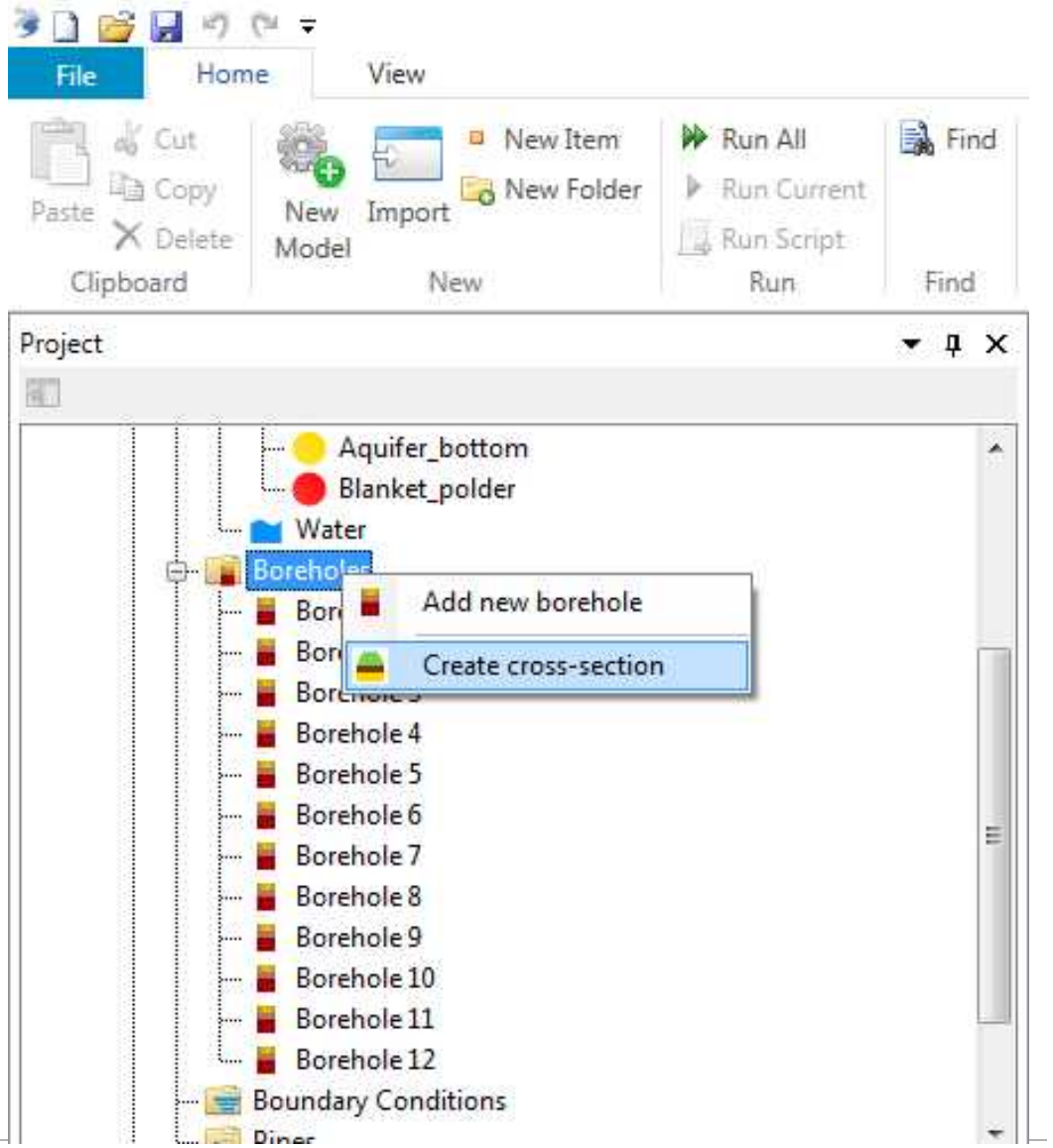
Inleiding





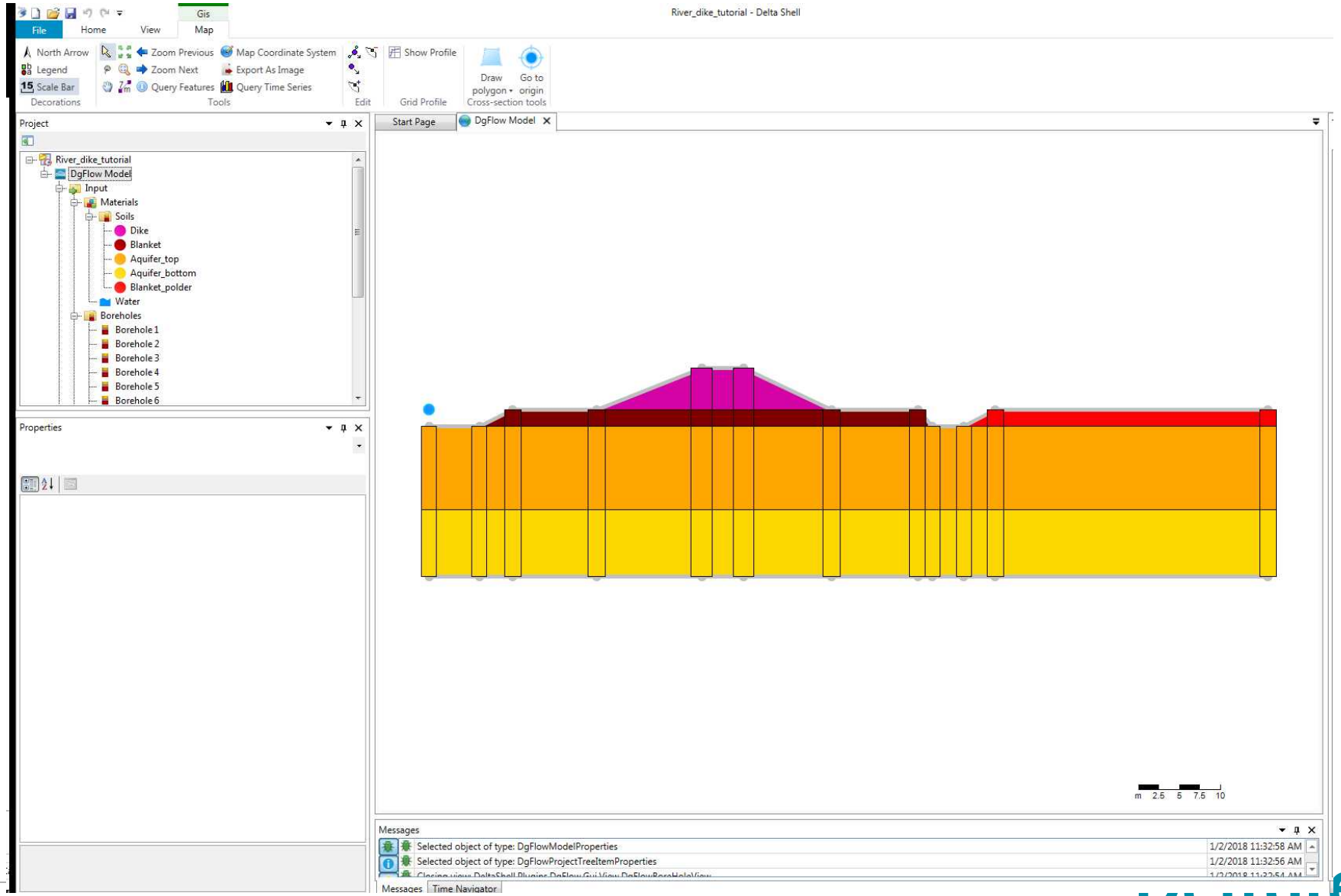
Deltares

Inleiding

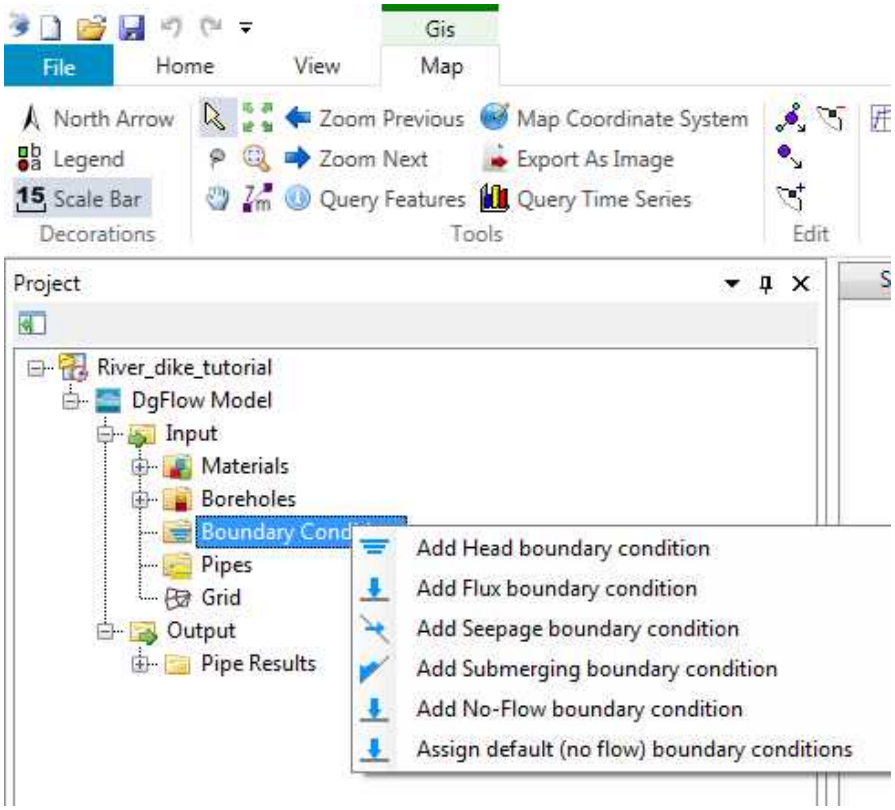


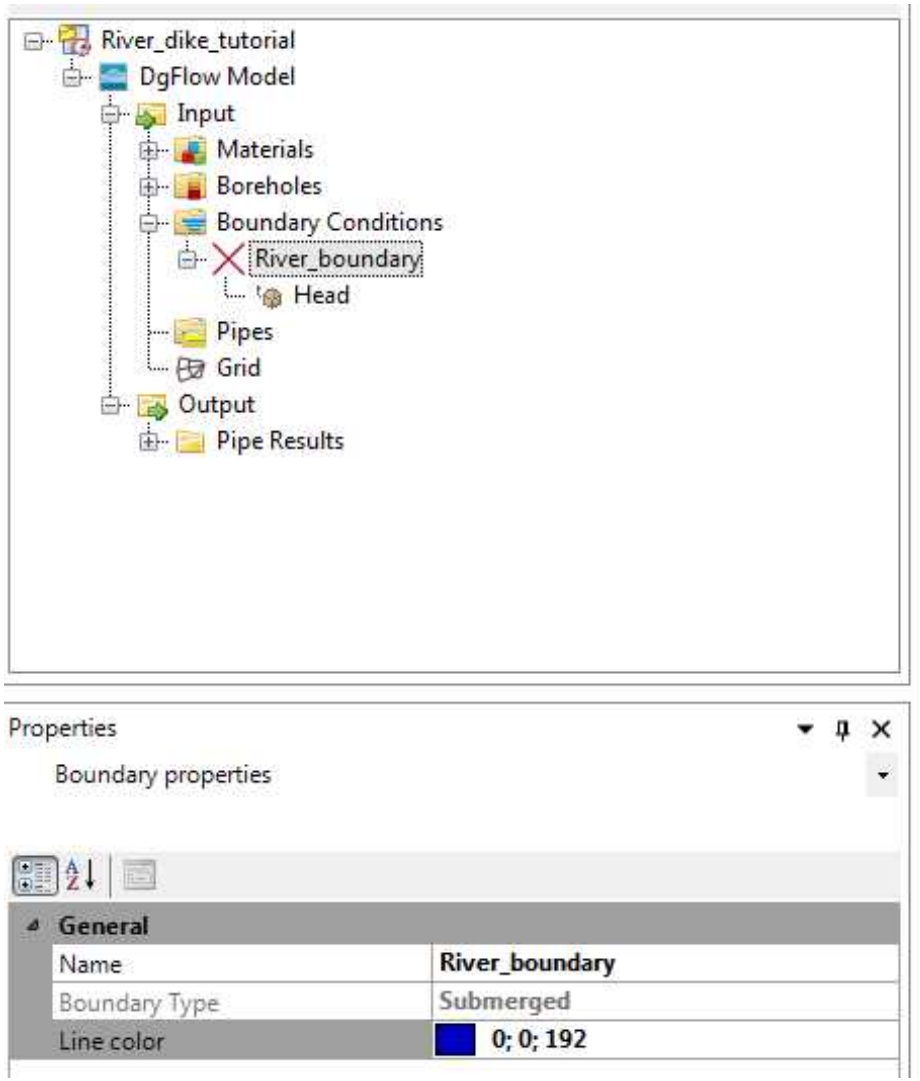
Deltares

Inleiding


River_dike_tutorial - Delta Shell
File
Home
View
Gis
Map
North Arrow
Legend
Scale Bar
Decorations
Zoom Previous
Zoom Next
Query Features
Map Coordinate System
Export As Image
Query Time Series
Tools
Edit
Show Profile
Grid Profile
Draw polygon
Go to origin
Cross-section tools
Project
River_dike_tutorial
DgFlow Model
Input
Materials
Soils
Dike
Blanket
Aquifer_top
Aquifer_bottom
Blanket_polder
Water
Boreholes
Borehole 1
Borehole 2
Borehole 3
Borehole 4
Borehole 5
Borehole 6
Properties
Start Page
DgFlow Model
m 2.5 5 7.5 10
Messages
Selected object of type: DgFlowModelProperties
1/2/2018 11:32:58 AM
Selected object of type: DgFlowProjectTreeItemProperties
1/2/2018 11:32:56 AM
Messages
Time Navigator

Inleiding





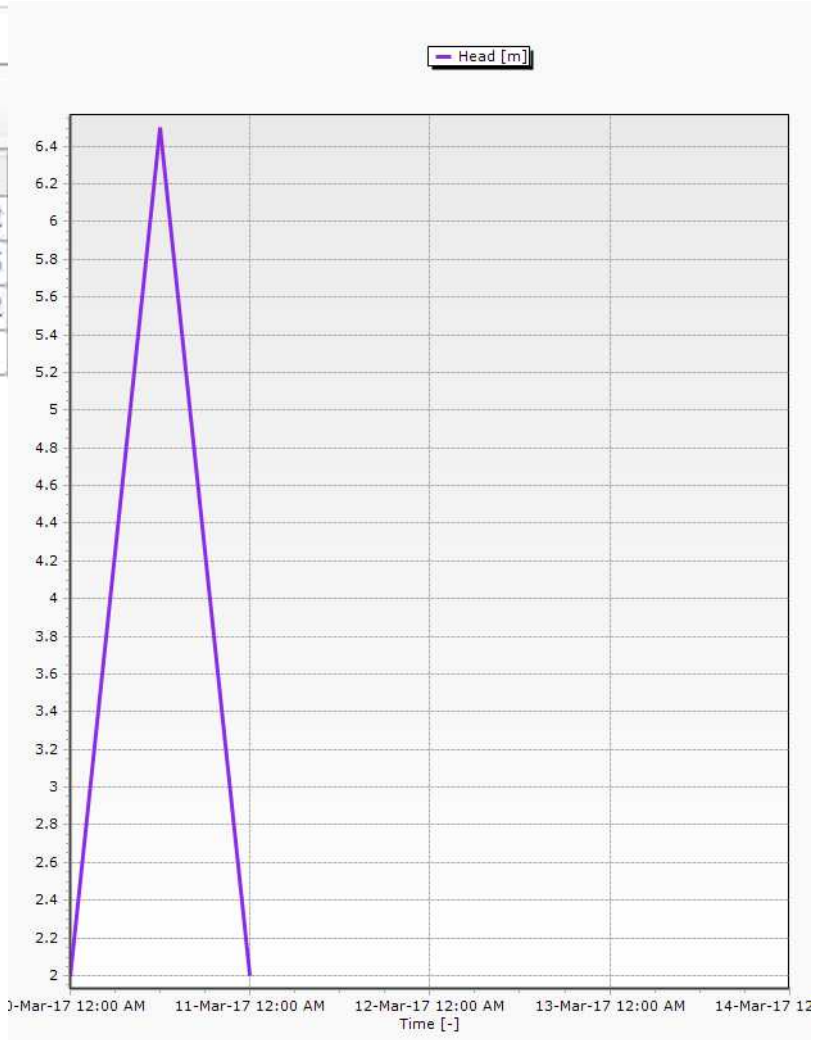
Deltares

Inleiding

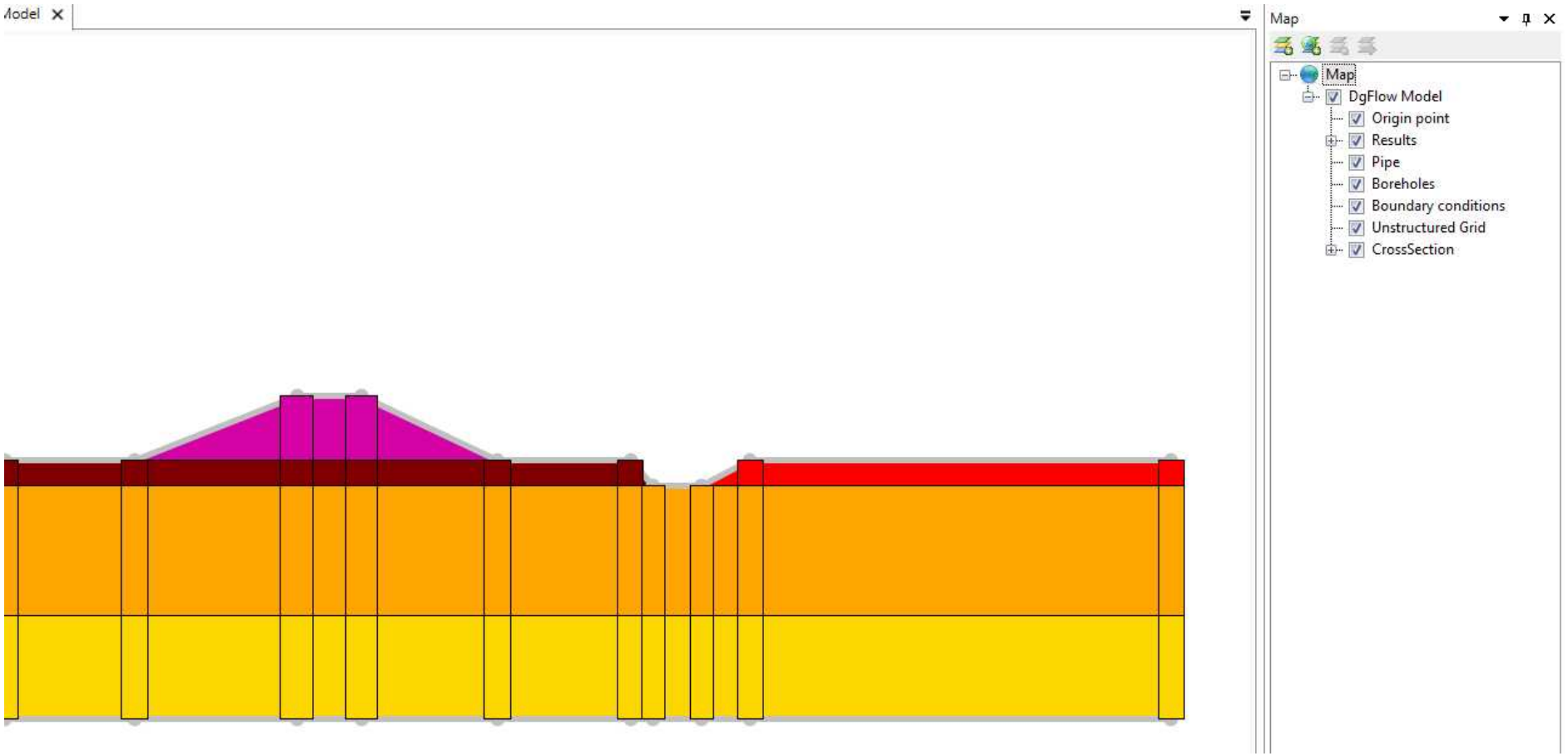
Start Page | DgFlow Model | Head

Clipboard import | Csv import | Csv export

Time [-]	Head [m]
2017-03-10 00:00:00	2
2017-03-10 12:00:00	6.5
2017-03-11 00:00:00	2

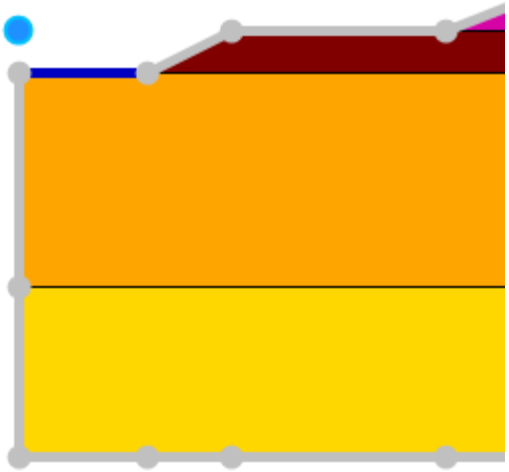


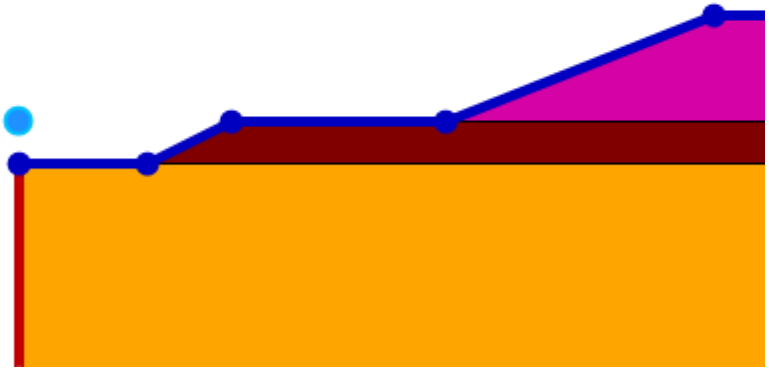
Inleiding



Deltares

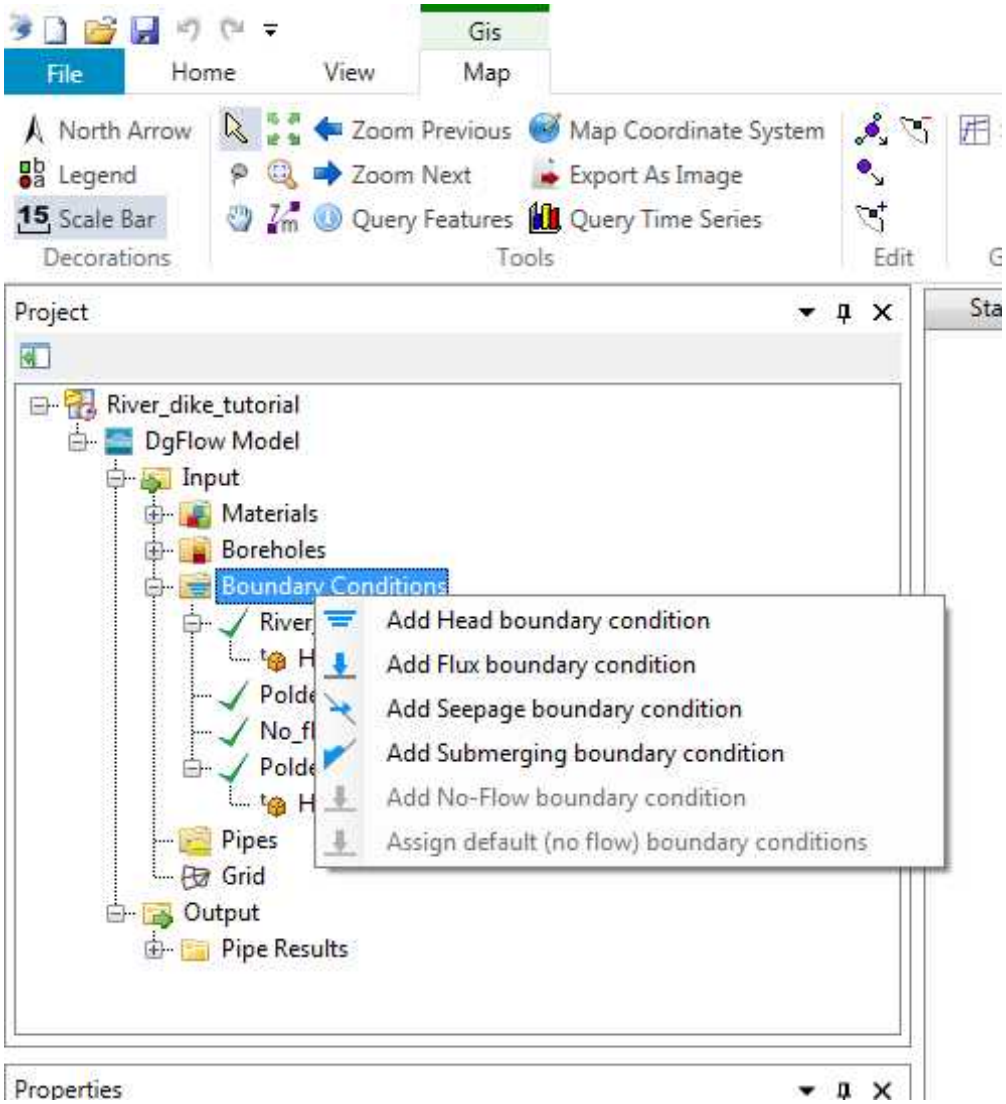
Inleiding





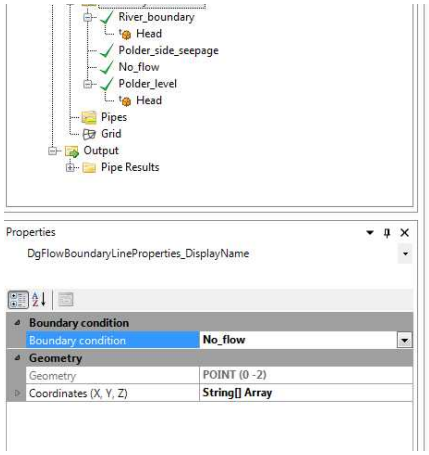
Deltares

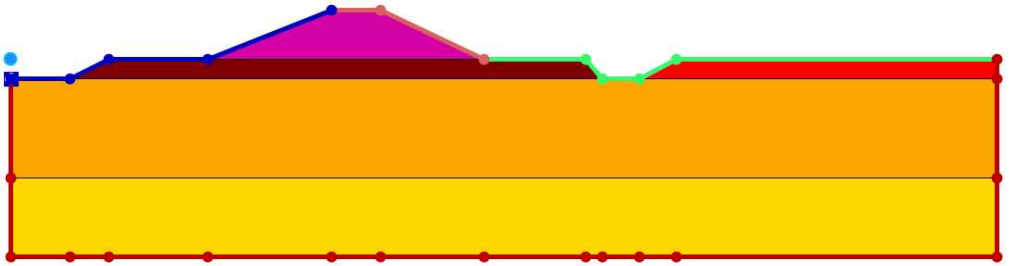
Inleiding



Deltares

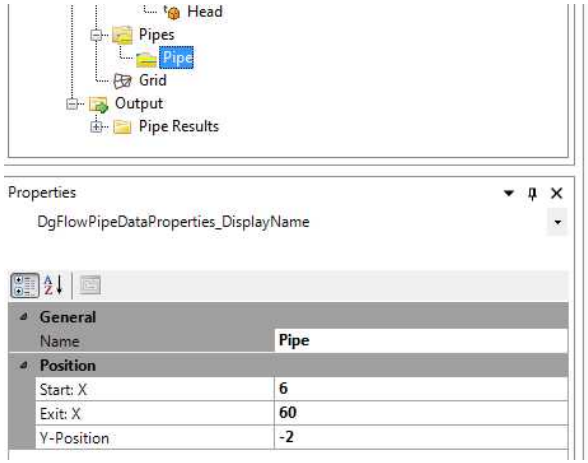
Inleiding

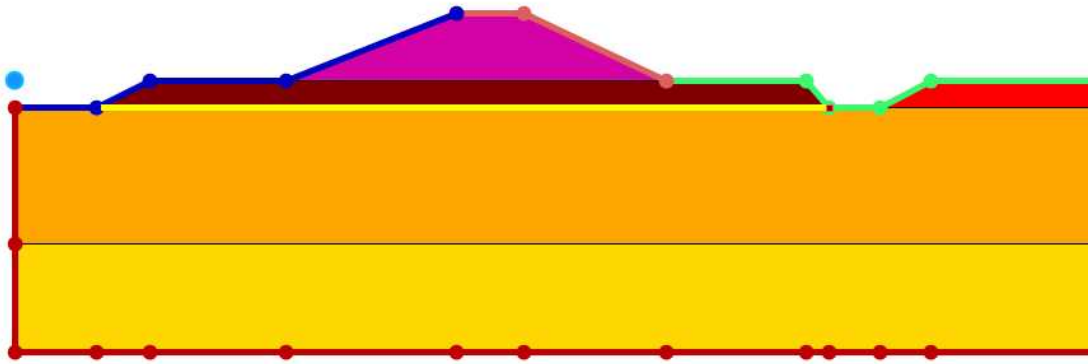




Deltares

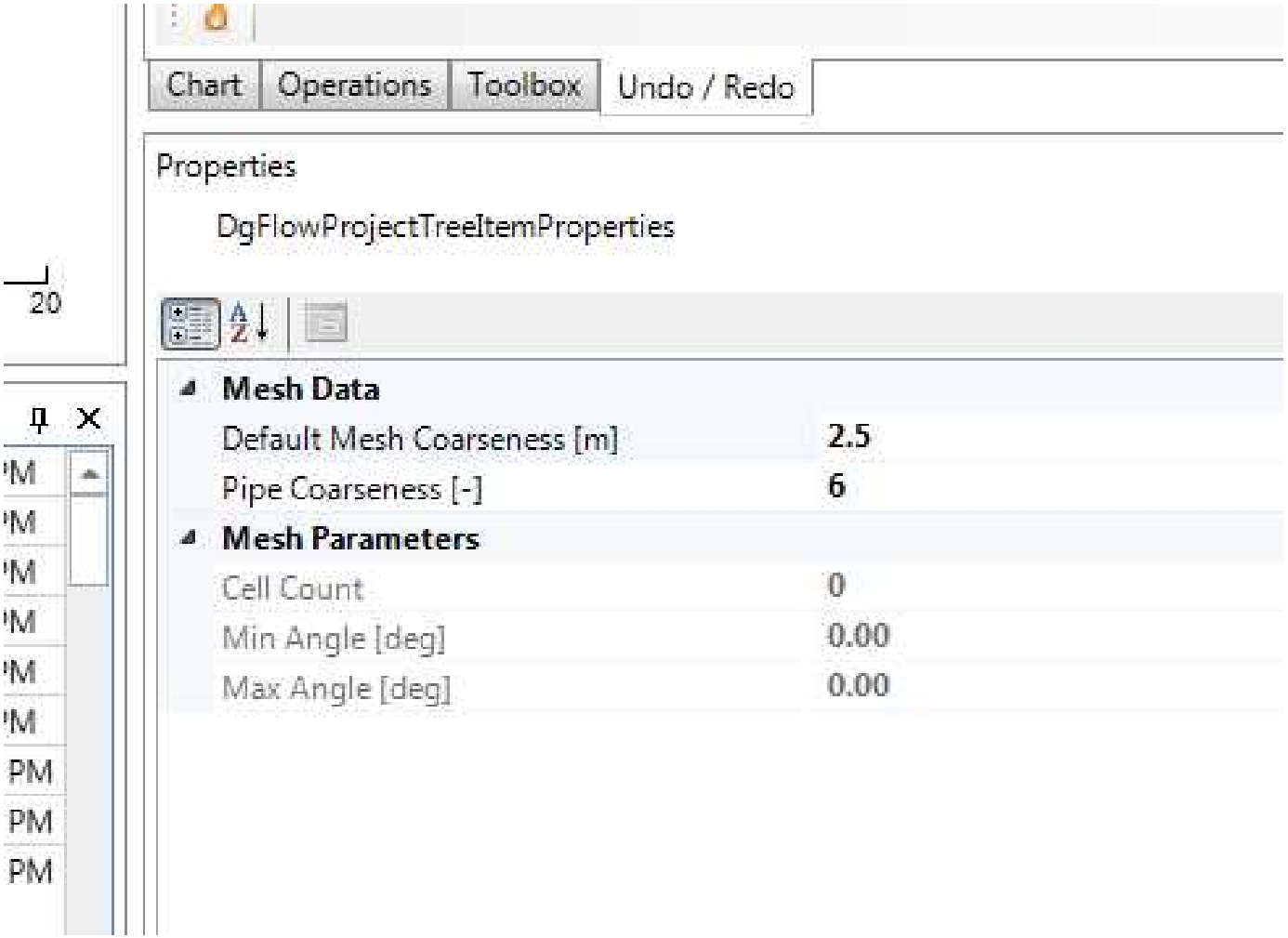
Inleiding





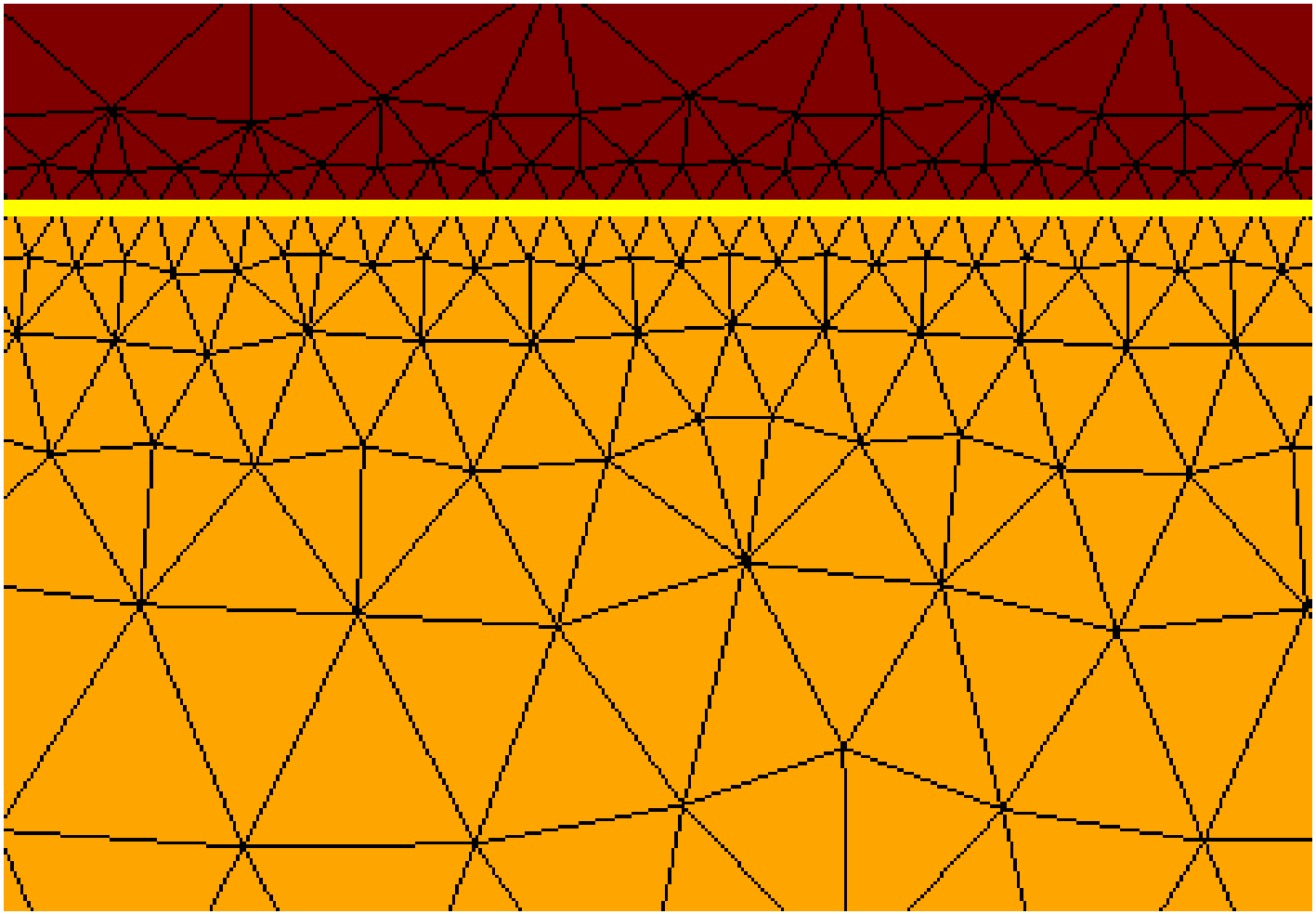
Deltares

Inleiding



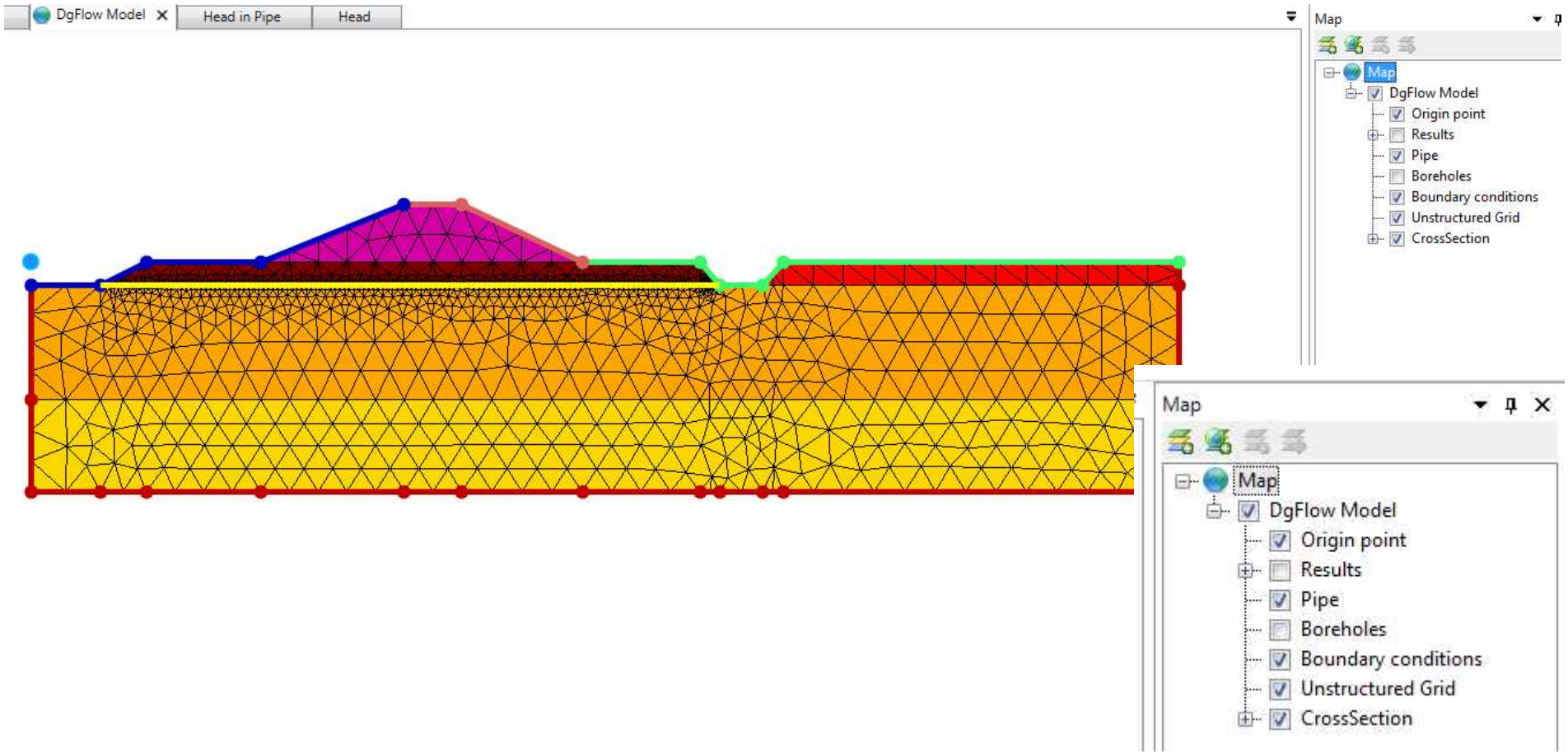
Deltares

Inleiding



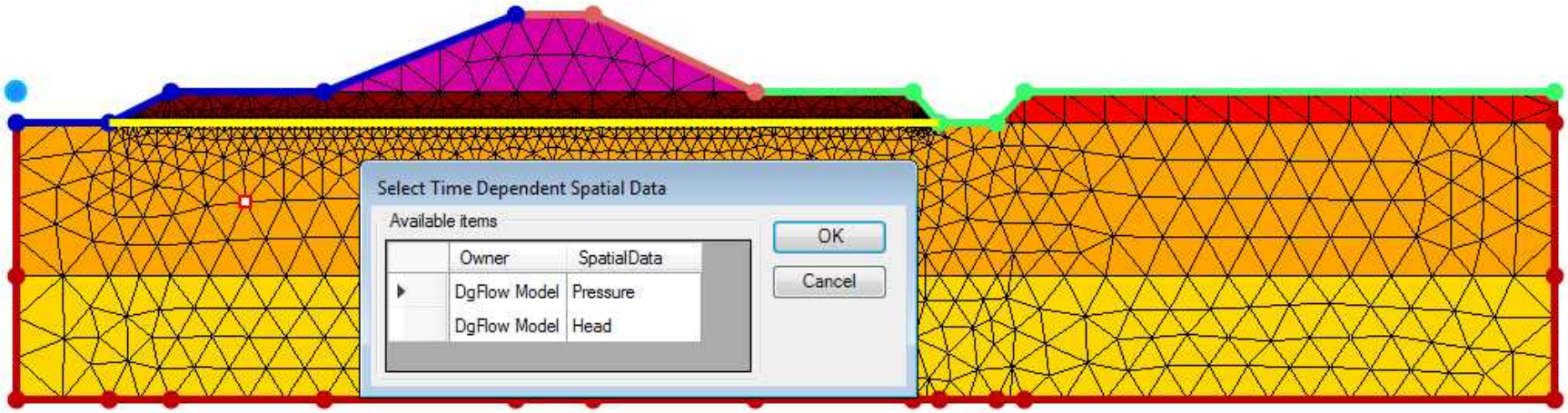
Deltares

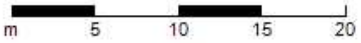
Inleiding



Deltares

Inleiding





Deltares

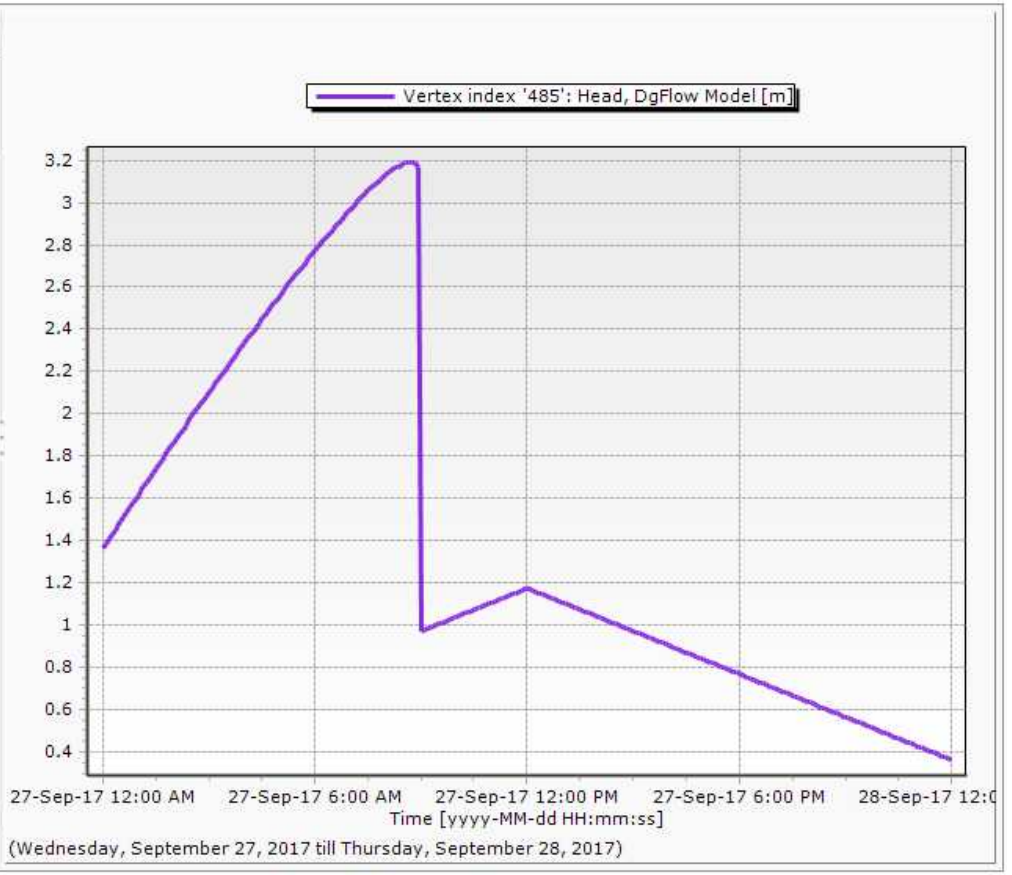
Inleiding

Start Page | DgFlow Model | Head in Pipe | Head

Clipboard import | Csv import | Csv export

Time [yyyy-MM-dd HH:mm:ss]	Vertex index '485': Head, DgFlow Model [m]
2017-09-27 00:00:00	1.364
2017-09-27 00:05:00	1.3857
2017-09-27 00:10:00	1.407
2017-09-27 00:15:00	1.4284
2017-09-27 00:20:00	1.4489
2017-09-27 00:25:00	1.4702
2017-09-27 00:30:00	1.4915
2017-09-27 00:35:00	1.5114
2017-09-27 00:40:00	1.5327
2017-09-27 00:45:00	1.554
2017-09-27 00:50:00	1.5753
2017-09-27 00:55:00	1.5966
2017-09-27 01:00:00	1.6162
2017-09-27 01:05:00	1.6375
2017-09-27 01:10:00	1.6588
2017-09-27 01:15:00	1.6782
2017-09-27 01:20:00	1.6995
2017-09-27 01:25:00	1.7207
2017-09-27 01:30:00	1.742
2017-09-27 01:35:00	1.7612
2017-09-27 01:40:00	1.7824
2017-09-27 01:45:00	1.8036
2017-09-27 01:50:00	1.8226
2017-09-27 01:55:00	1.8438
2017-09-27 02:00:00	1.8629
2017-09-27 02:05:00	1.8841

Record 1 of 289



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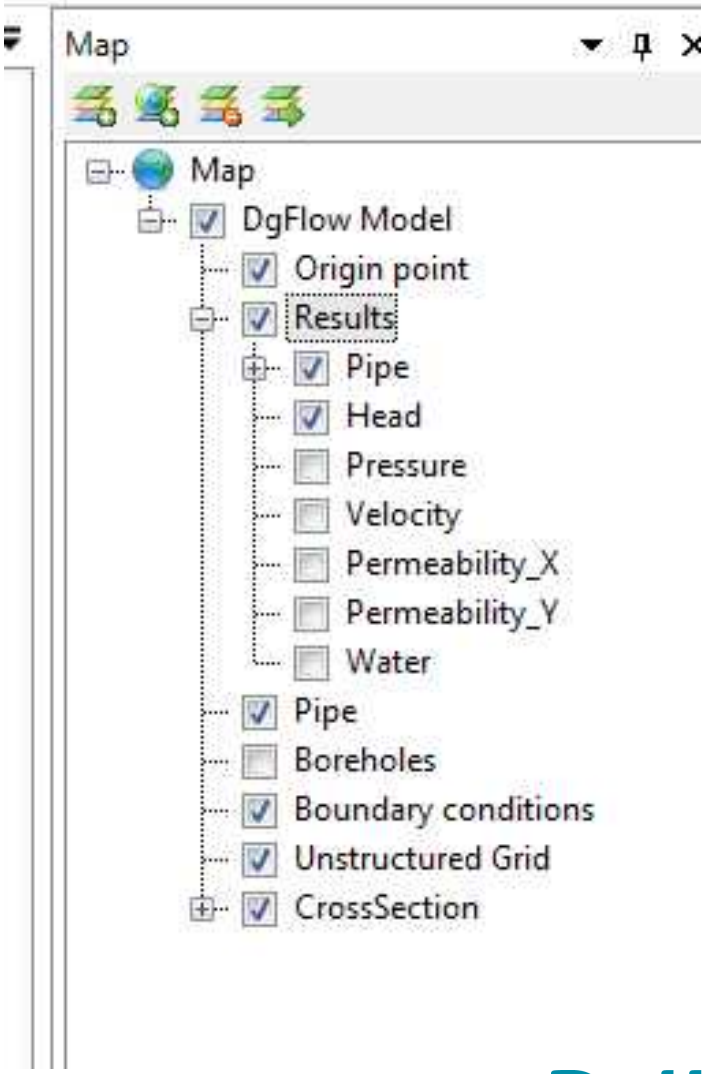
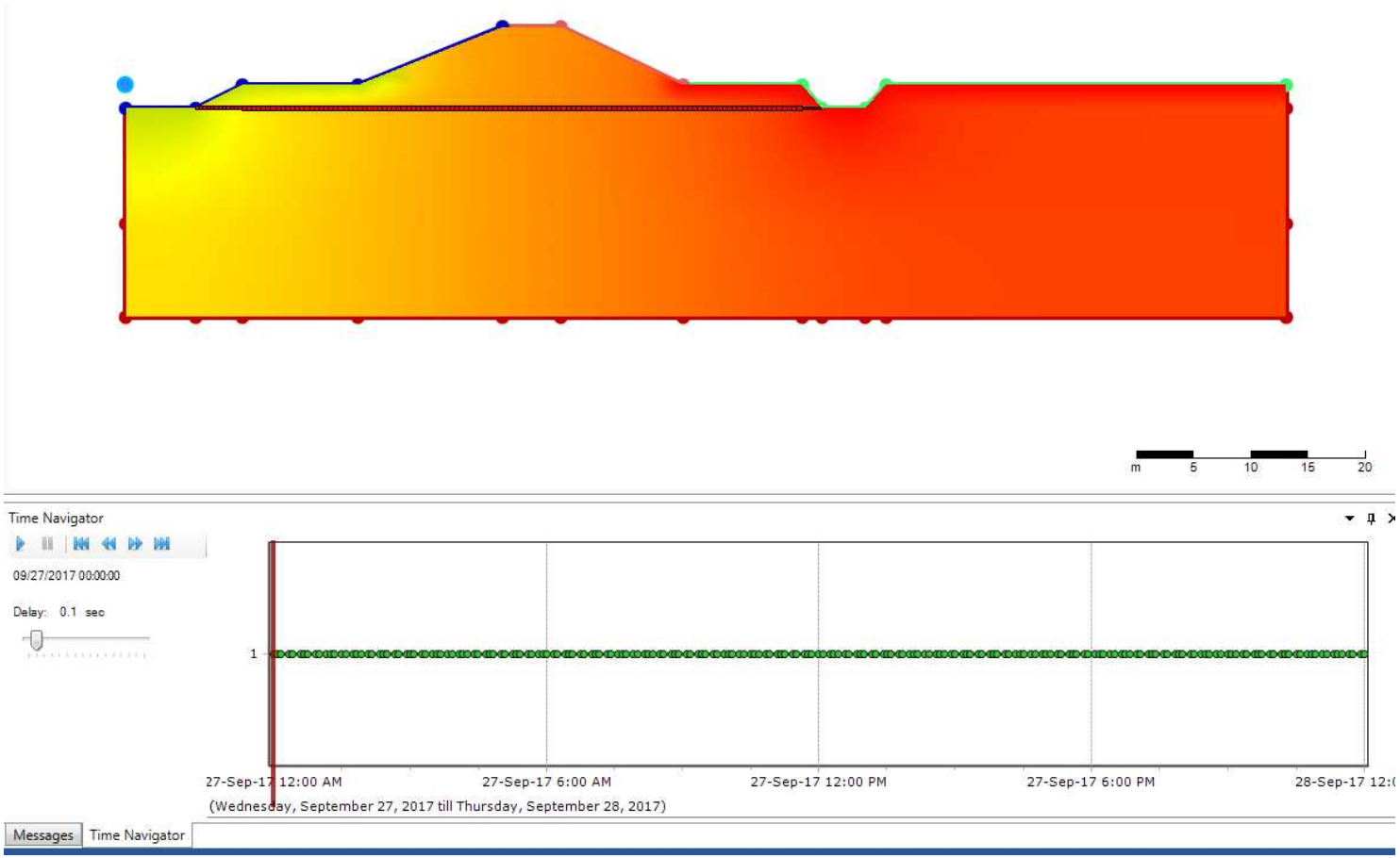
Inleiding



Deltares

Inleiding



Deltares

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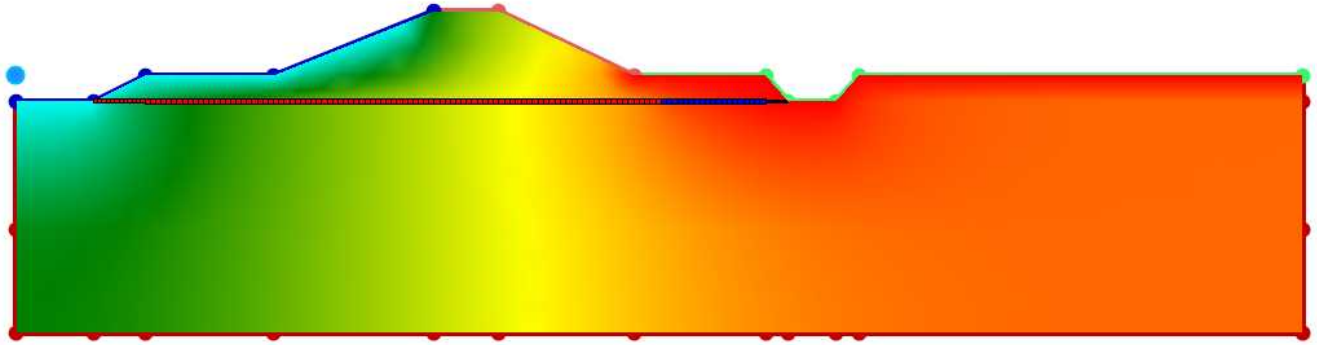
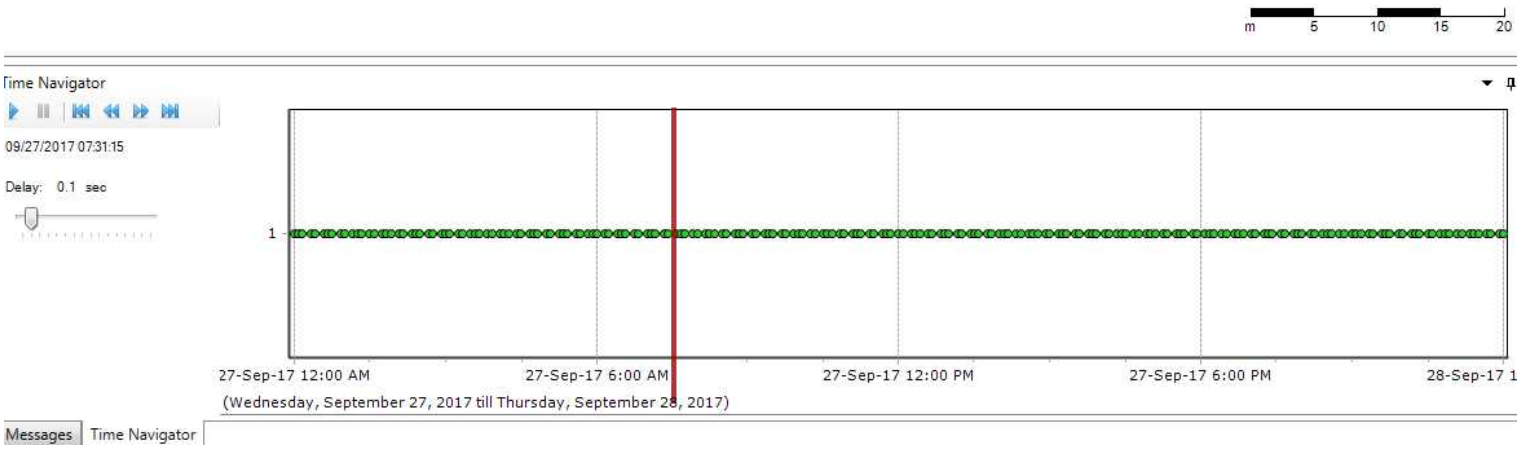
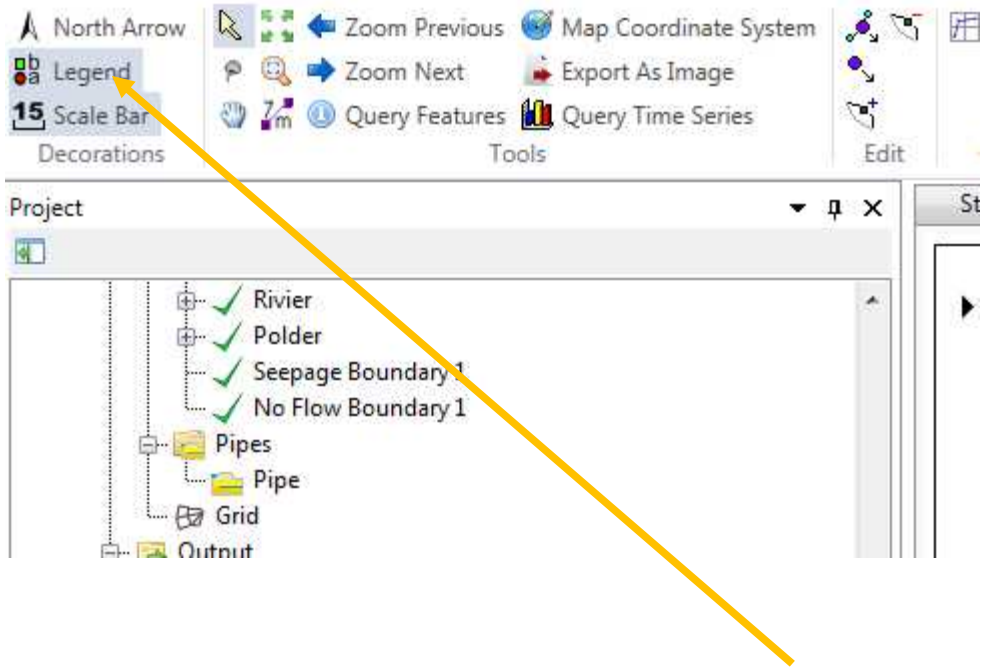
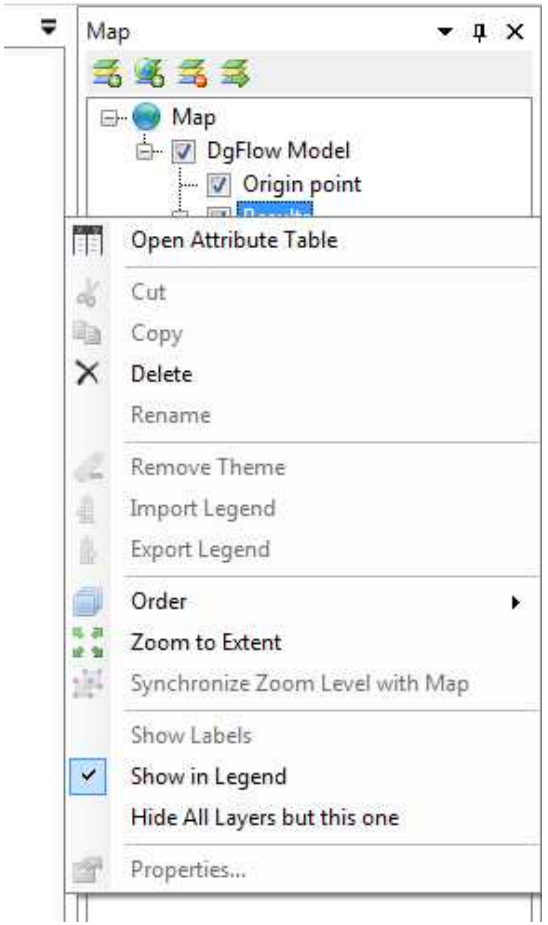




Deltares

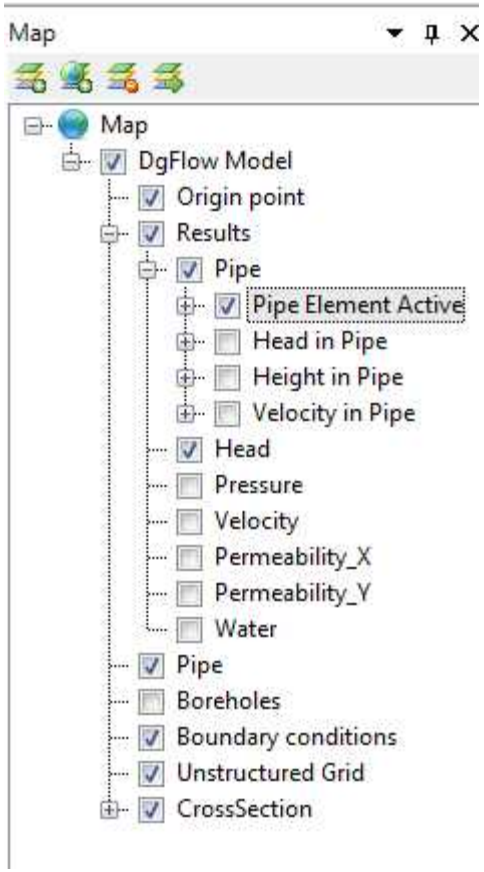
Inleiding





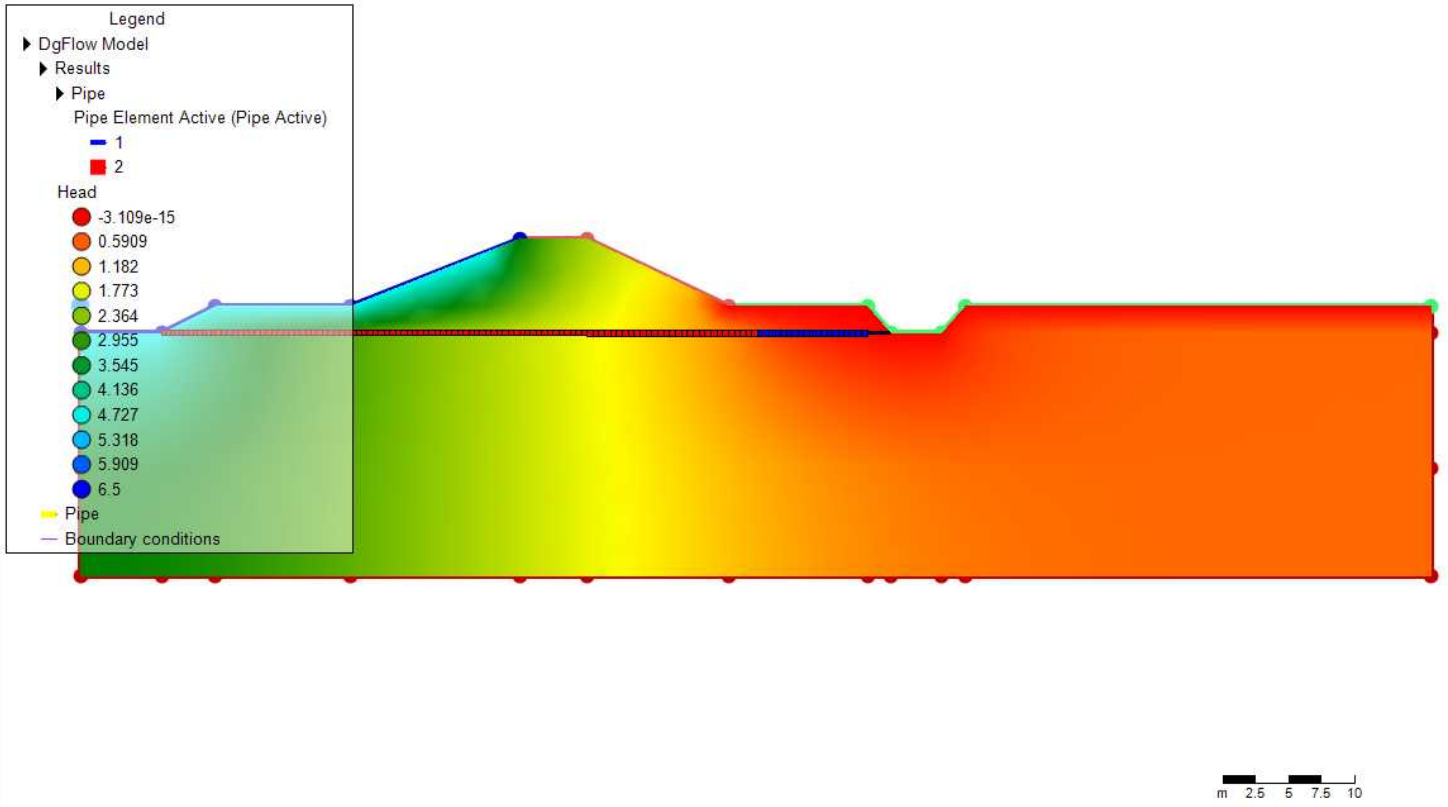
Deltares

Inleiding



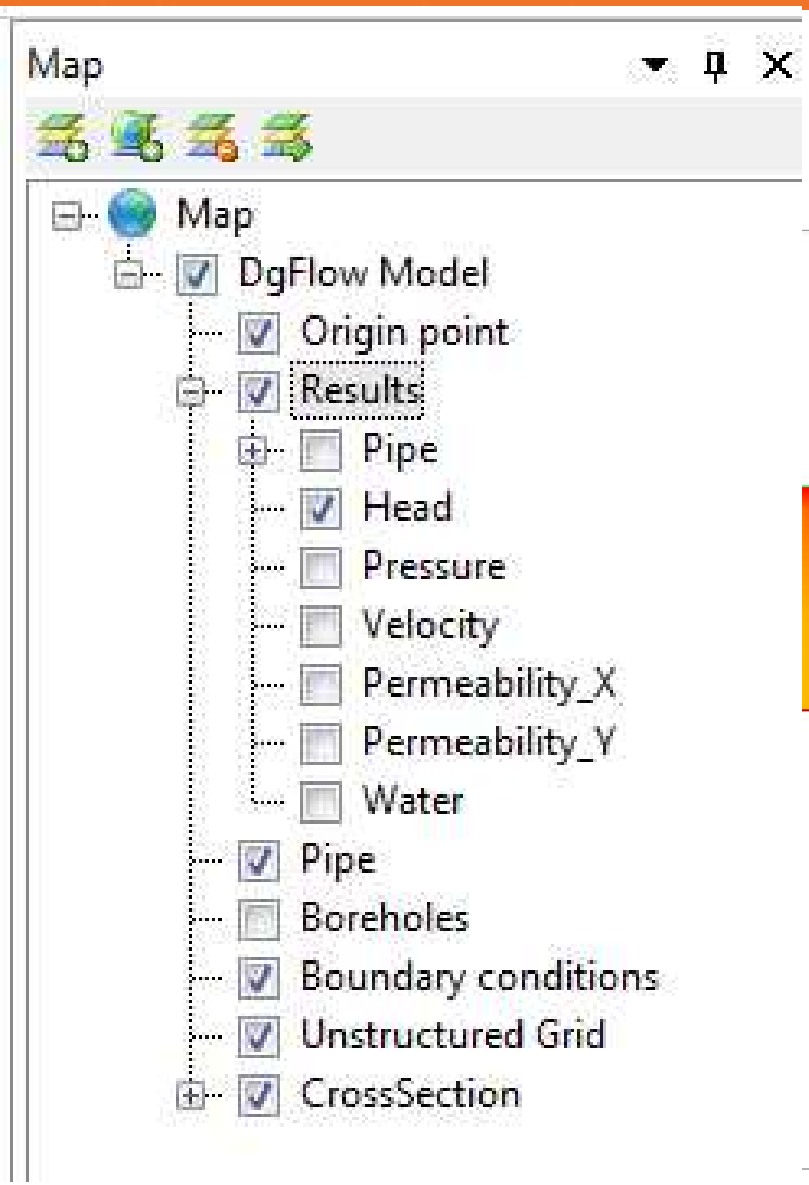
Deltares

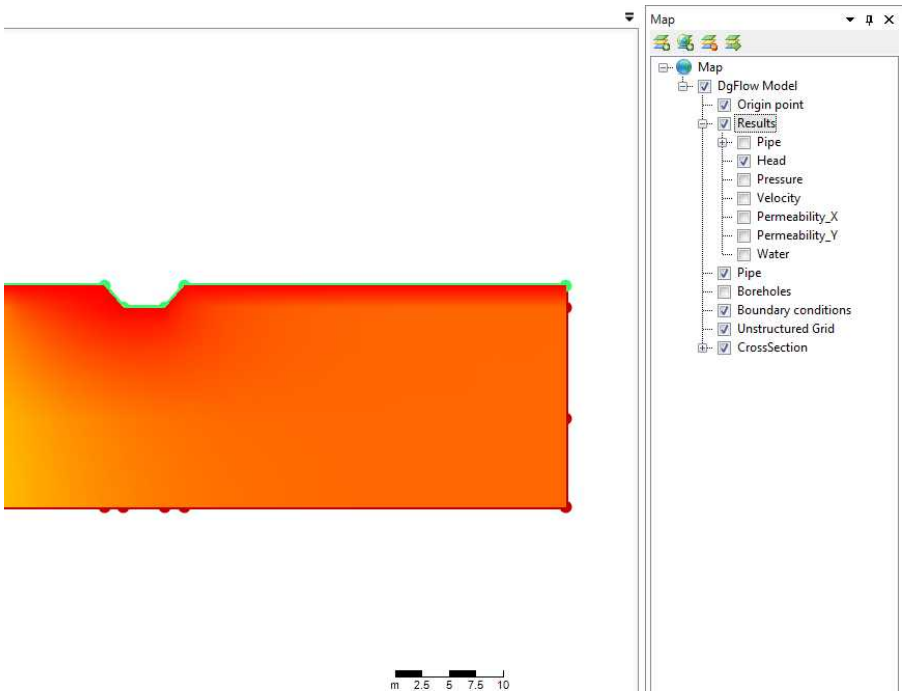
Inleiding



Deltares

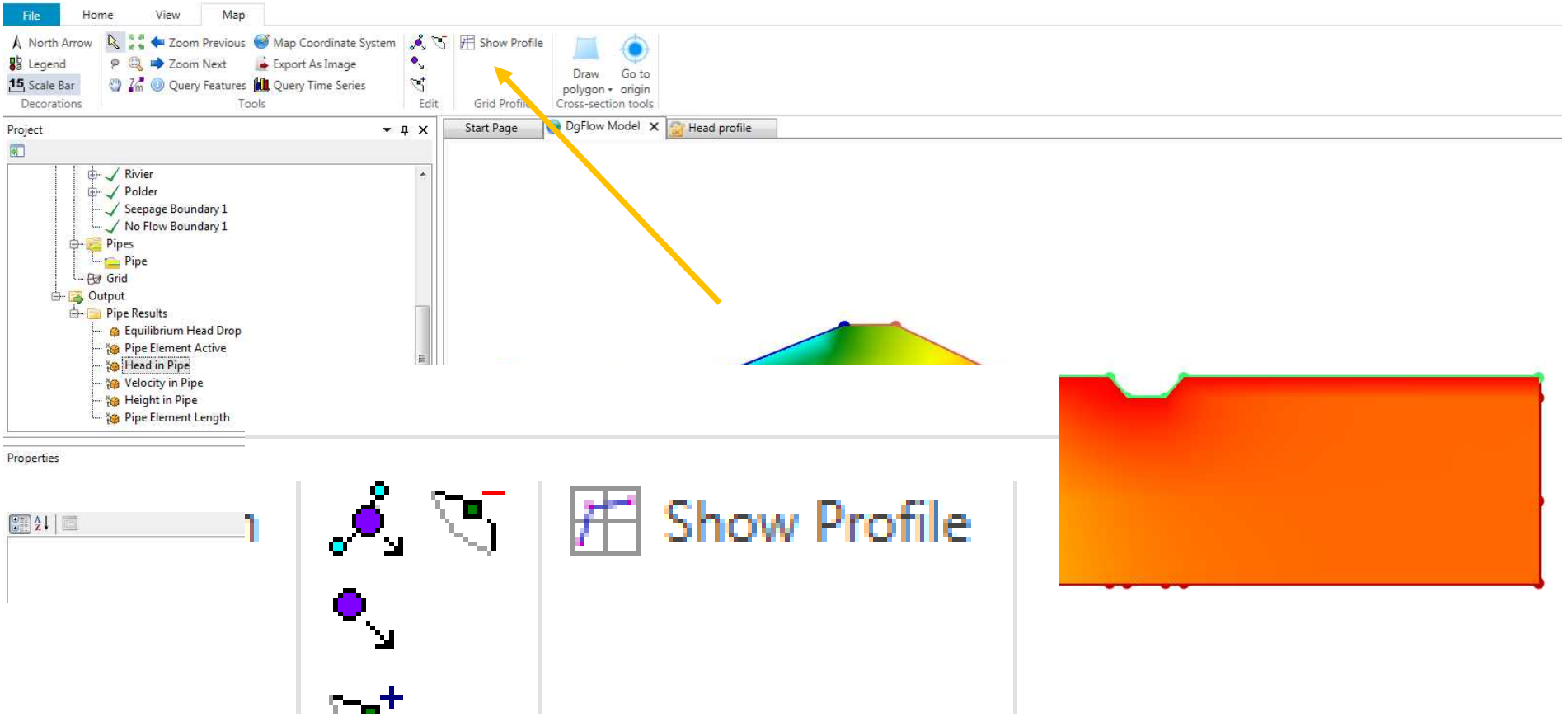
Inleiding





Deltares

Inleiding



Deltares

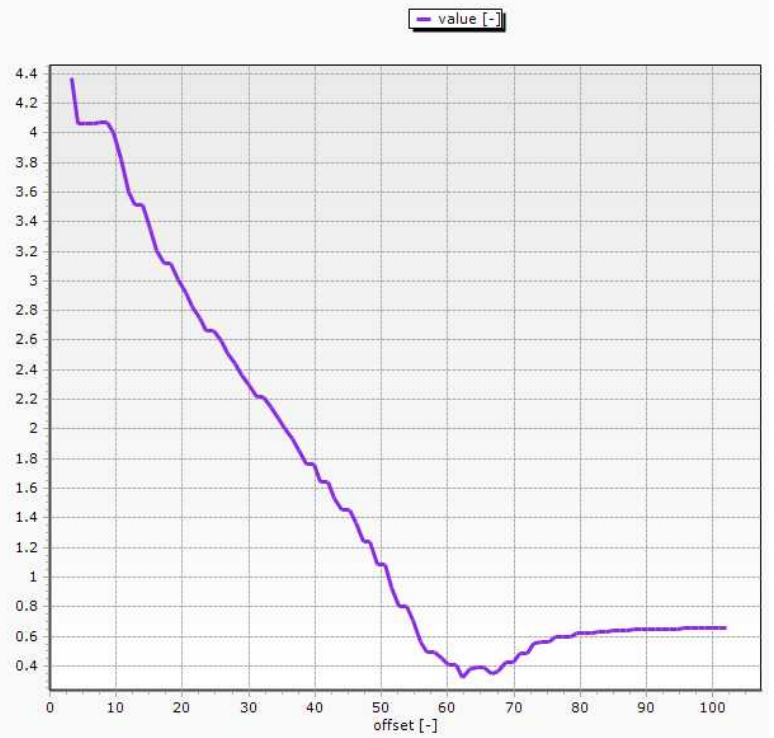
Inleiding

Start Page | DgFlow Model | Head profile | Head profile

Csv export

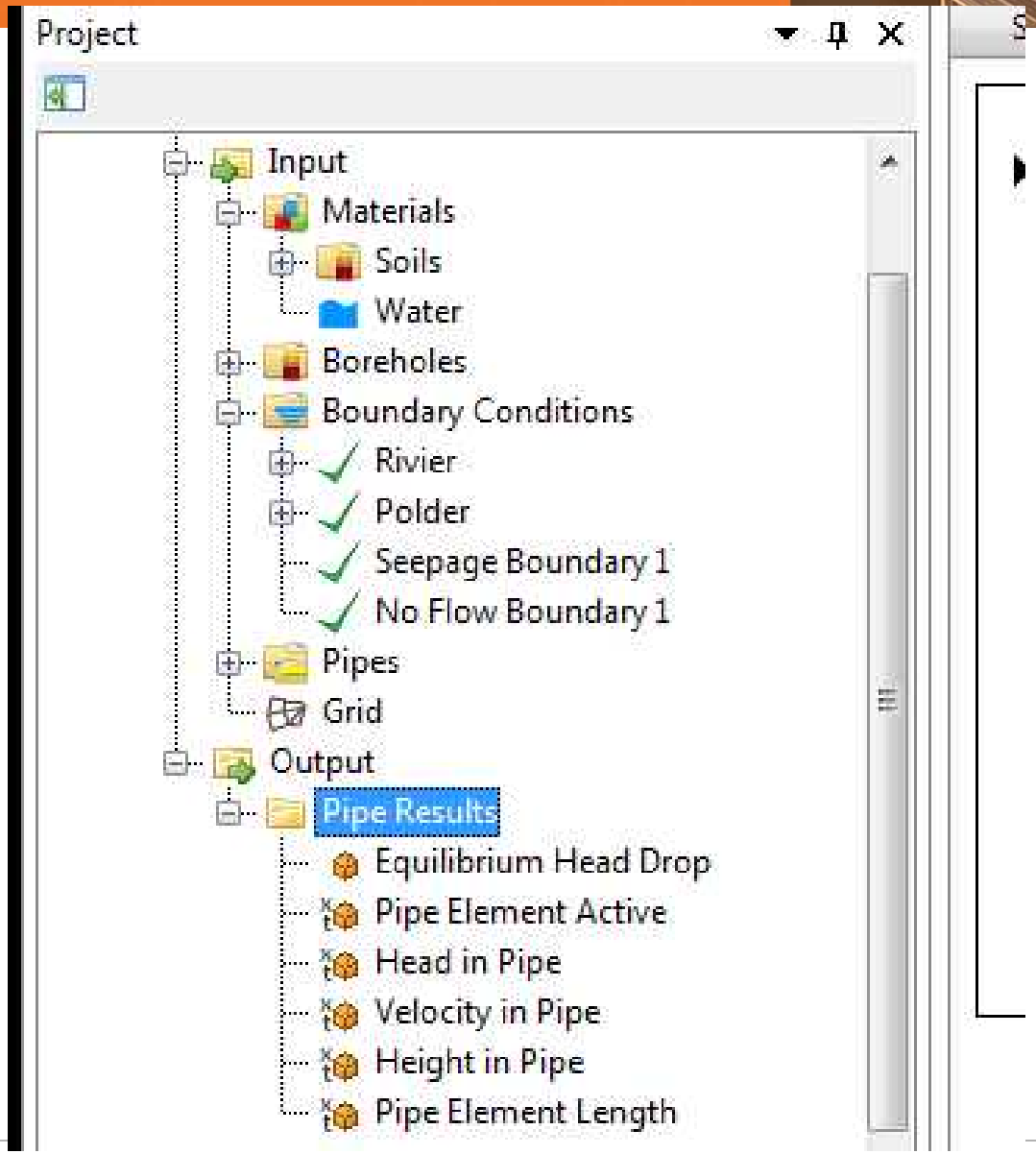
offset [-]	value [-]
0	-999
1.0741	-999
2.1482	-999
3.2222	4.3709
4.2963	4.0637
5.3704	4.0637
6.4445	4.0637
7.5186	4.0666
8.5926	4.0666
9.6667	4.0011
10.741	3.8242
11.815	3.6
12.889	3.5167
13.963	3.5167
15.037	3.3468
16.111	3.2021
17.185	3.1164
18.259	3.1164
19.333	3.0039
20.408	2.9234
21.482	2.8274
22.556	2.7516
23.63	2.6651
24.704	2.6651
25.778	2.5922
26.852	2.5118
27.926	2.4408
29	2.3643
30.074	2.2941
31.148	2.2199
32.222	2.2199
33.296	2.1497

Record 1 of 101



Deltares

Inleiding



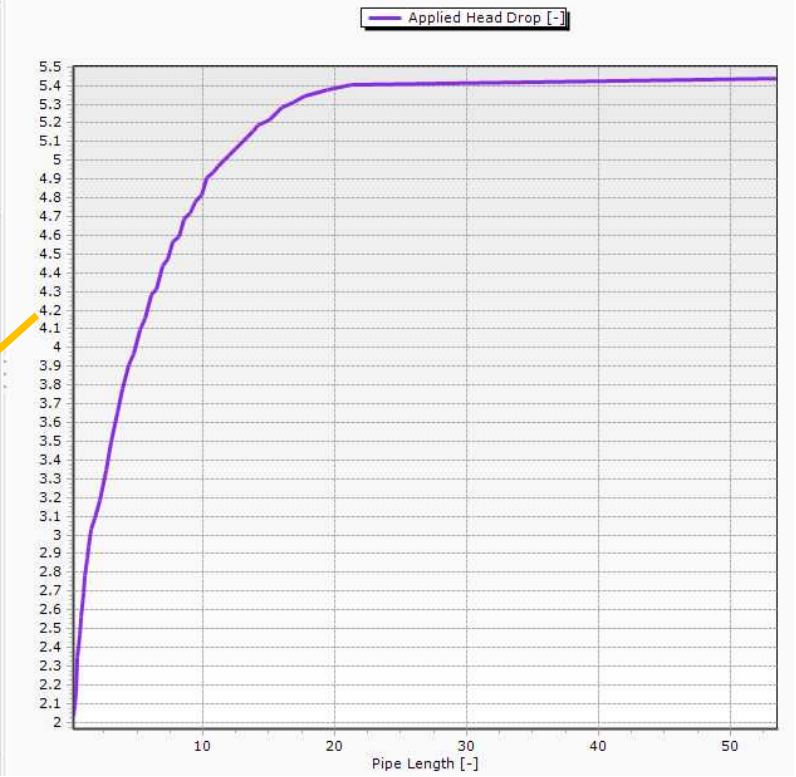
Deltares

Inleiding

Start Page | DgFlow Model | Equilibrium Head Drop | Equilibrium Head Drop

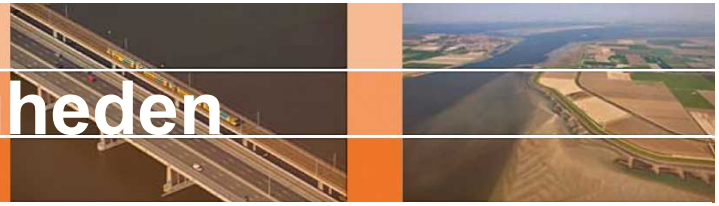
Csv export

Pipe Length [-]	Applied Head Drop [-]
3.0313	3.5
3.4583	3.6563
3.8854	3.7813
4.3125	3.9063
4.7396	3.9688
5.1667	4.0938
5.5938	4.1563
6.0208	4.2813
6.4479	4.3125
6.875	4.4375
7.3021	4.4688
7.7292	4.5625
8.1563	4.5938
8.5833	4.6875
9.0104	4.7188
9.4375	4.7813
9.8646	4.8125
10.292	4.9063
10.719	4.9375
11.146	4.9688
11.573	5
12	5.0313
12.438	5.0625
13.313	5.125
13.75	5.1563
14.188	5.1875
15.063	5.2188
15.938	5.2813
16.813	5.3125
17.688	5.3438
19.438	5.375
21.188	5.4063
53.667	5.4375



Deltares

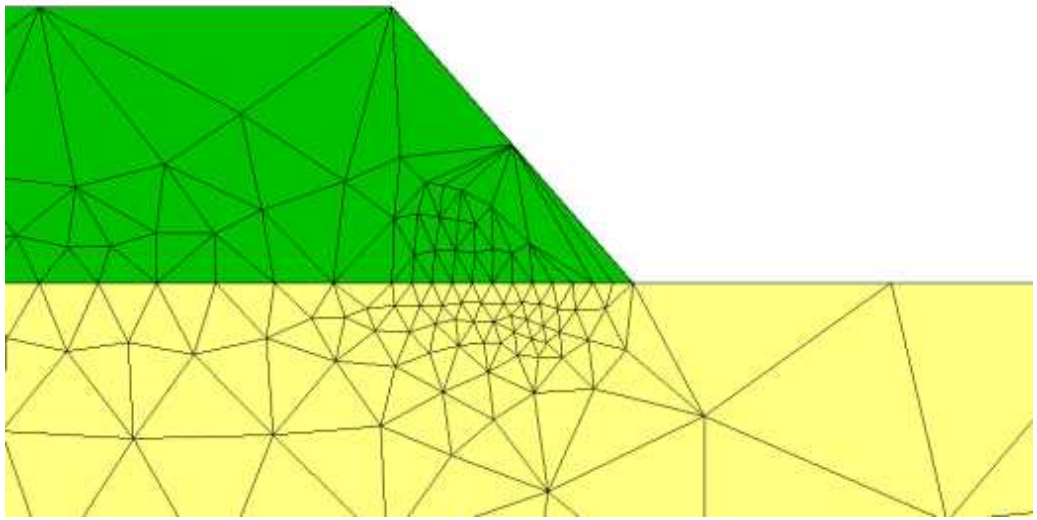
Aandachtspunten en gevoeligheden



- **Dit is een eerste versie**
- Invoer met gebruik van de punt, niet komma voor decimalen
  - 0.02 *niet* 0,03
- Als er meerdere projecten open staan wordt alleen het actieve project opgeslagen door de save functie
- Bij het selecteren van lijnen voor randvoorwaarden zijn nodes niet automatisch mee geselecteerd, die moet je dus apart nog een randvoorwaarde geven.

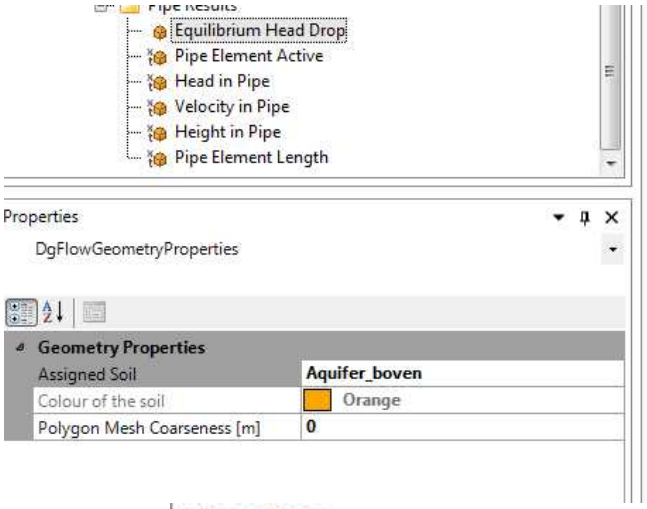
Aandachtspunten en gevoeligheden

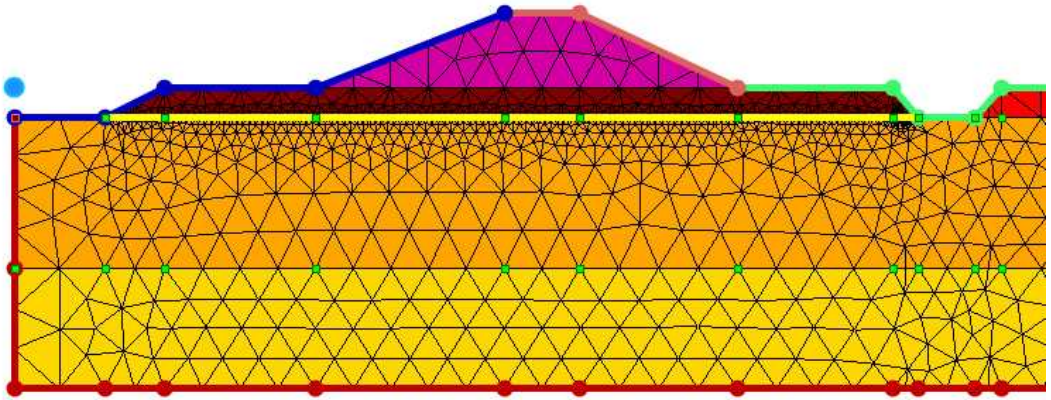
- **Mesh**
  - Resultaten zijn afhankelijk van de meshverfijning
  - Bij grote verfijning om pipe krijg je slecht gevormde elementen.

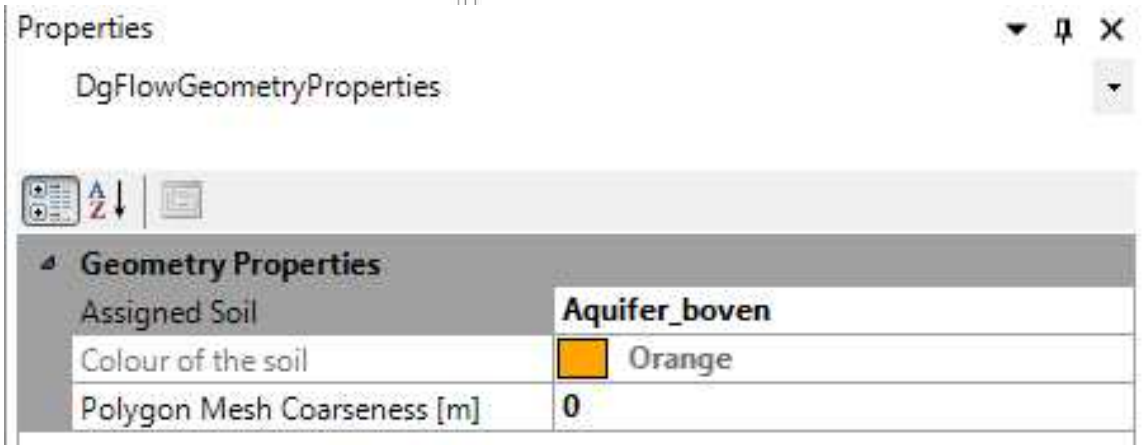


Deltares

Aandachtspunten en gevoeligheden

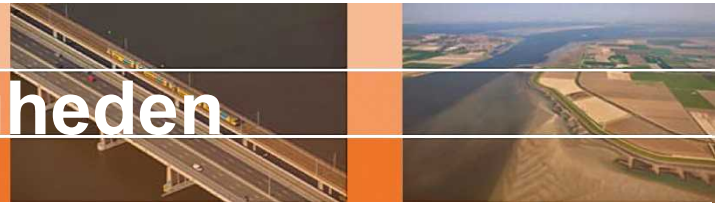






Deltares

Aandachtspunten en gevoeligheden



- **MPicard**
- Pipe hoogte wordt bepaald met een nauwkeurigheid van

$$\Delta a_{pipe} = \frac{100 * D70}{MPicard}$$

Dus een hogere MPicard leidt tot een hogere nauwkeurigheid maar ook langere rekentijden.

Bij een onnauwkeurigere pipe hoogte wordt het criterium overschat wat leidt tot een lager kritiek verval. Dit is onnodig conservatief.

Deltares

Wat kan wel, wat kan niet

- Range waarin rekenregel geldig is van 63-500 mu; dat geldt ook voor D-Geo Flow.
- Grondopbouw door boreholes, niet polygons
- Dezelfde grondlaag mag niet op twee diepten voorkomen, dus zandlaag die gescheiden wordt door kleilaag moet boven en onder klei verschillende namen hebben.
- Een grondlaag mag niet onderbroken worden, dus blanket aan linkerzijde van sloot krijgt een andere naam dan blanket rechterzijde.

Deltares

Transiente berekening

- **<u>Aandachtspunten tijdsafhankelijk rekenen</u>**
- Pipe groei met 1 element per tijdsstap
- Sterkere mesh afhankelijkheid

- Momenteel erg lange rekentijden en onbetrouwbare resultaten bij te lage mesh verfijning en/of te grote tijdsstappen.

- Nog niet aangeraden

Deltares

Oefening

Tutorial River dike in cursusmateriaal

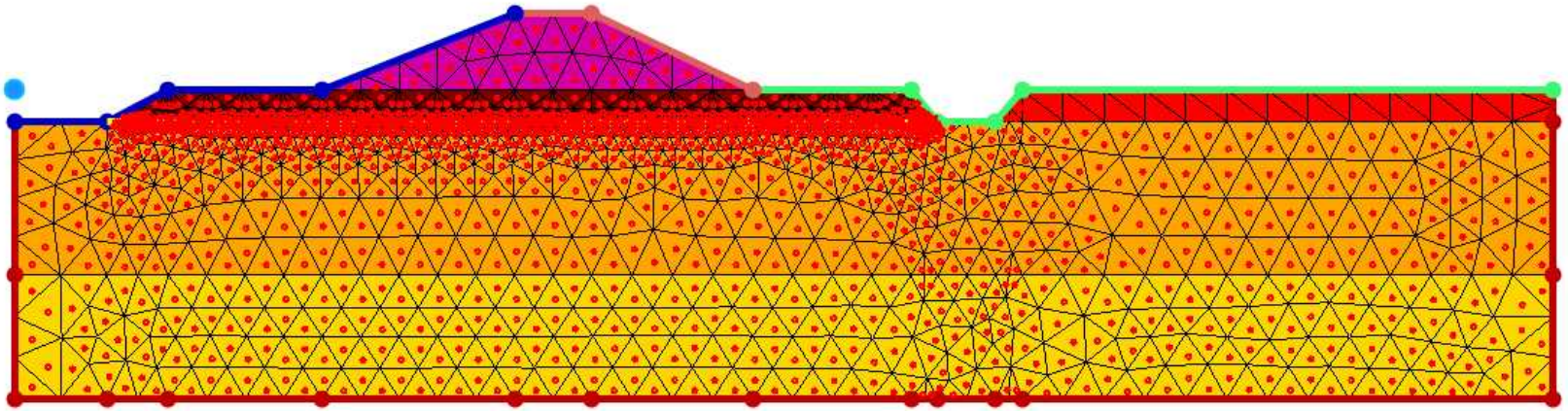
- Let op: dit voorbeeld is slechts ter illustratie van het werken met D-Geo flow, in het voorbeeld is het contact tussen de rivier en het zandpakket erg klein wat in werkelijkheid vaak niet het geval zal zijn. Bij een diepere insnijding van de rivier in het zandpakket moet dit wel meegenomen worden.

Deltares

Known Issues

- **Visualisatie stroomsnelheid**

Geen vectoren die stroomsnelheid weergeven



Deltares

Slide 45

ER3 still an issue

Esther Rosenbrand; 02-Jan-18