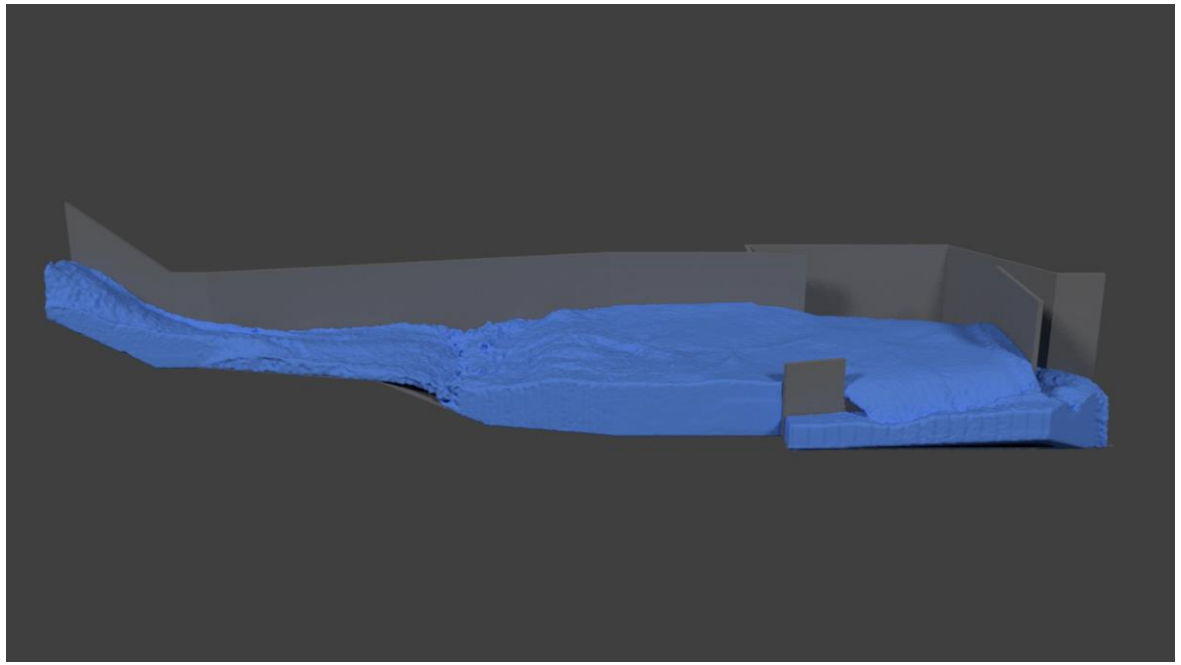
DSM-flux:
a testcase of DualSPHysics



2018/10/23, T. POUZOL

ÆGIR tanguy.pouzol@aegir-ingenierie.fr

- Urban drainage systems
  - mostly combined sewers (wastewater + rainwater)

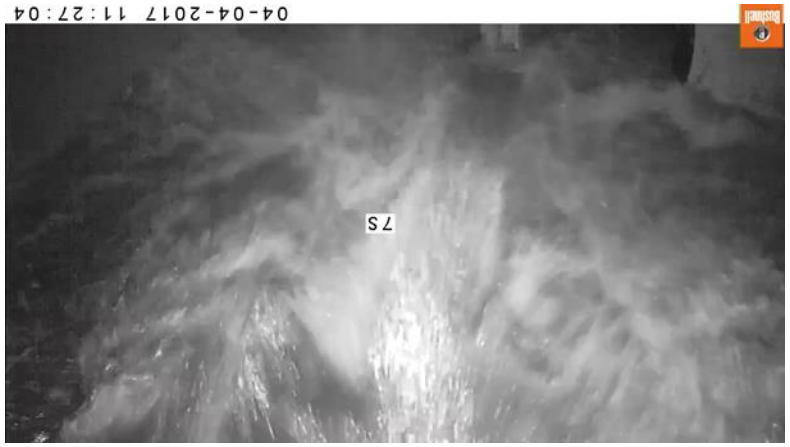
- Important rain event => system overload and possible damages

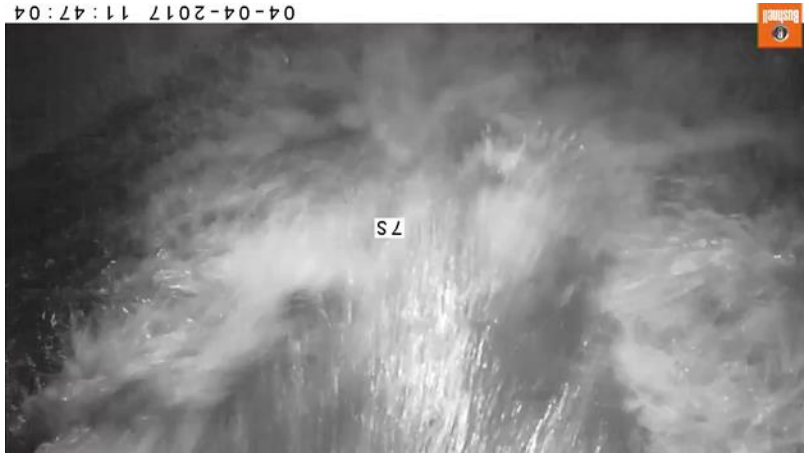
- Protection by direct discharges by Combined Sewer Overflows (CSO)

⇒ How to measure the discharge and quantify the pollution?

⇒ Models to place sensors and validate a discharge law

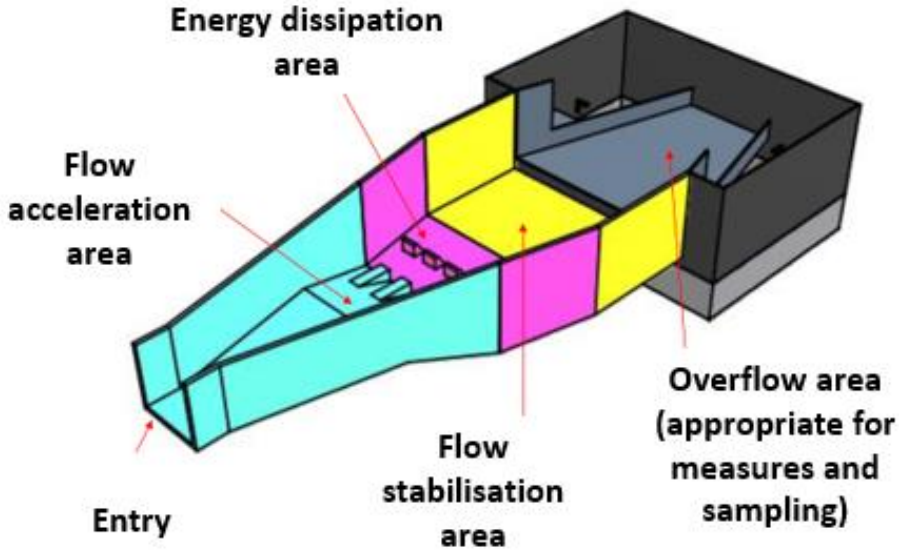
But sometimes CSOs cannot be monitored correctly





Direct spill over the weir…

DSM-flux: a new monitoring device
=> standardized and scalable



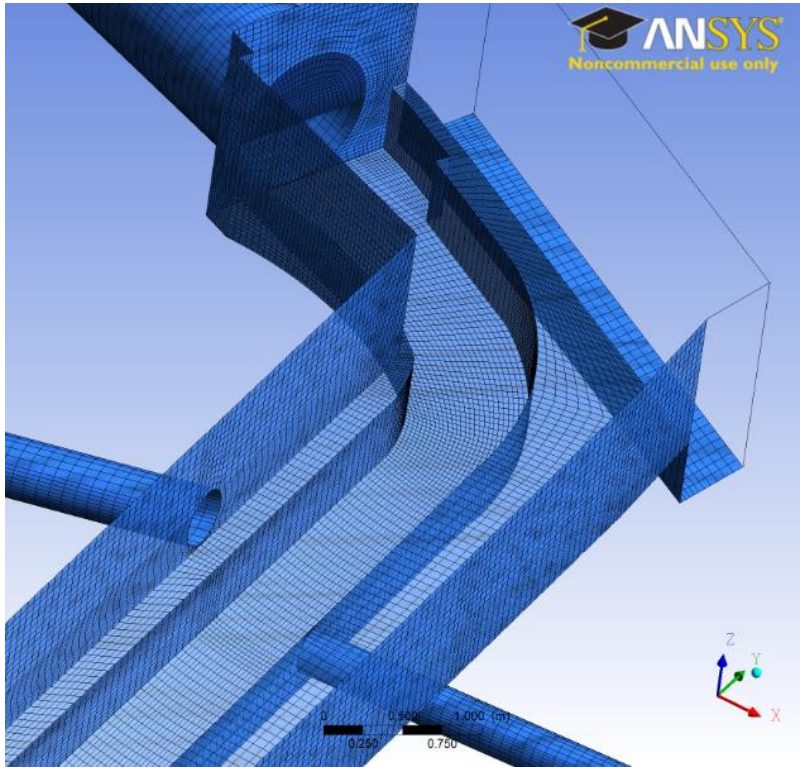
Generic Q = f(h)

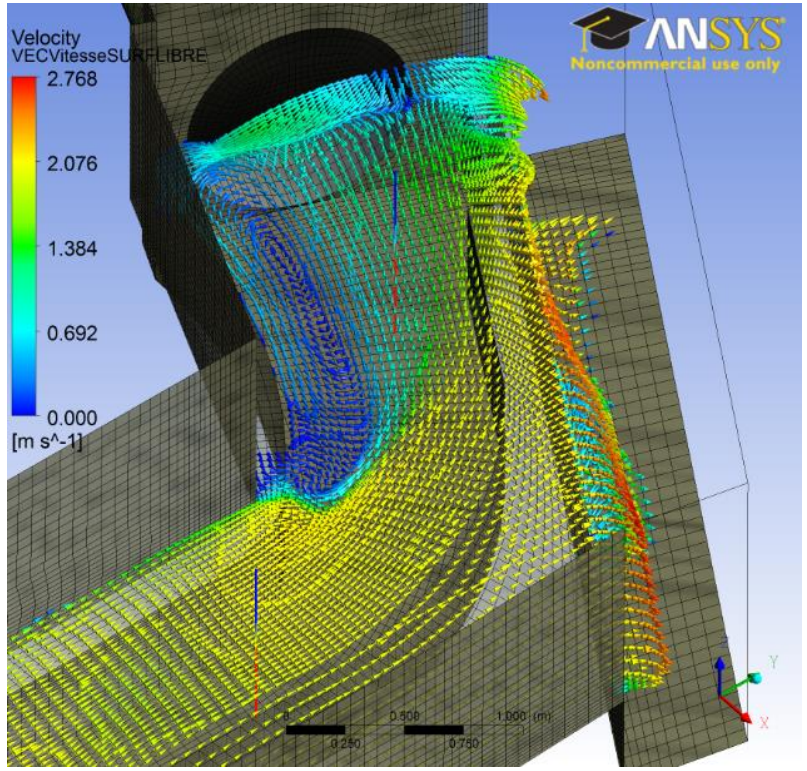
Modelling of CSOs

traditionally: RANS equation – Finite volume method

but costly (set-up and simulation time, hardware and software prices…)

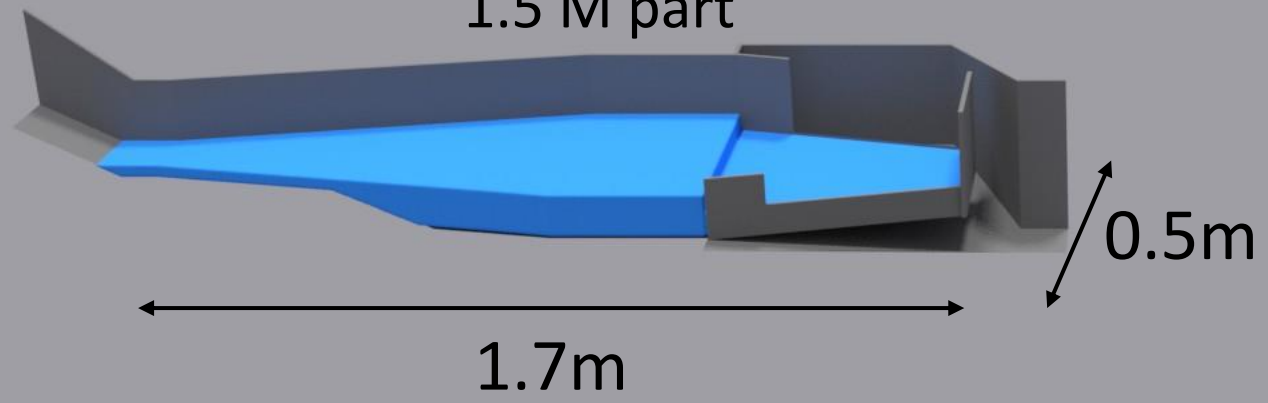
=> SPH as a possible alternative ?



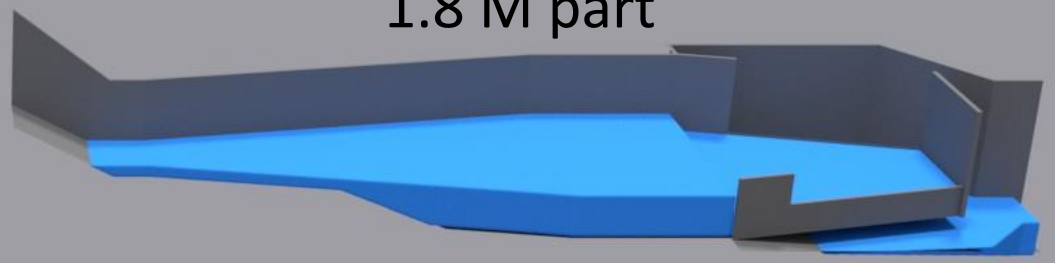


dp = 3 mm

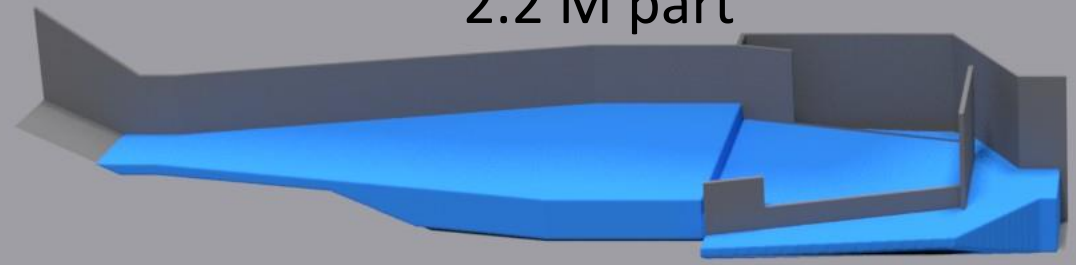
1.5 M part



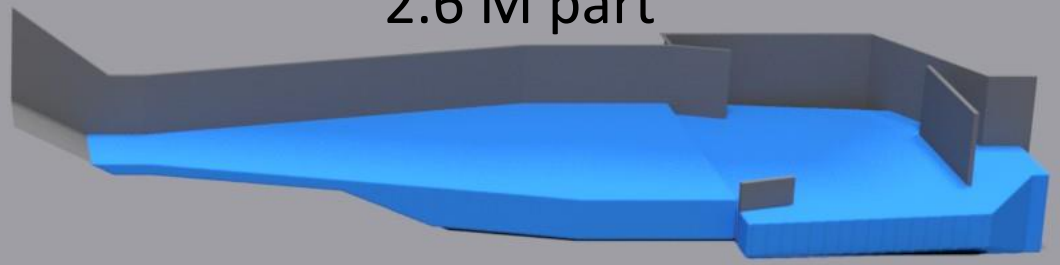
1.8 M part



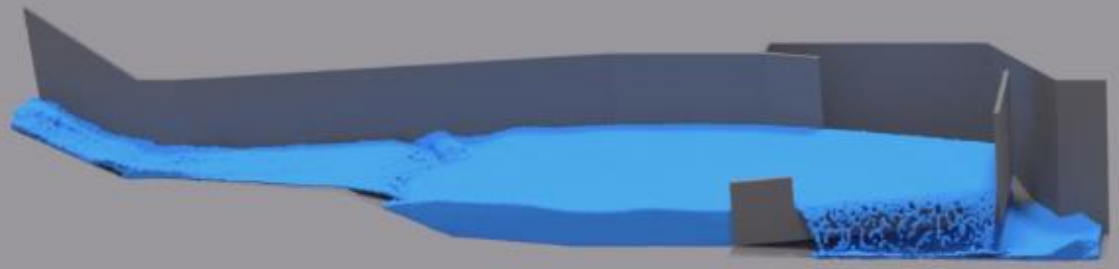
2.2 M part



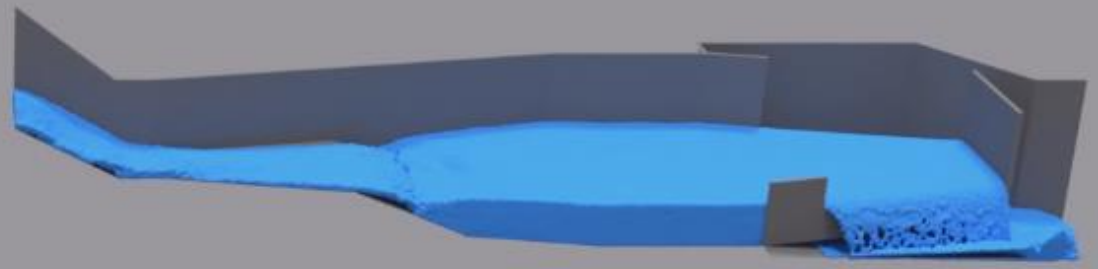
2.6 M part



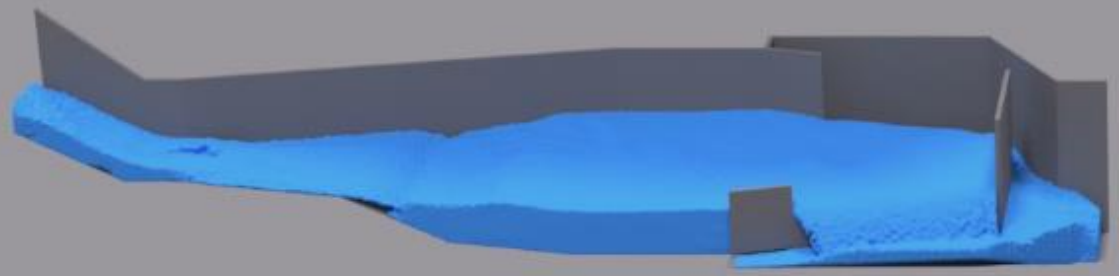
Q = 2.5 L/s, Error 1.5%



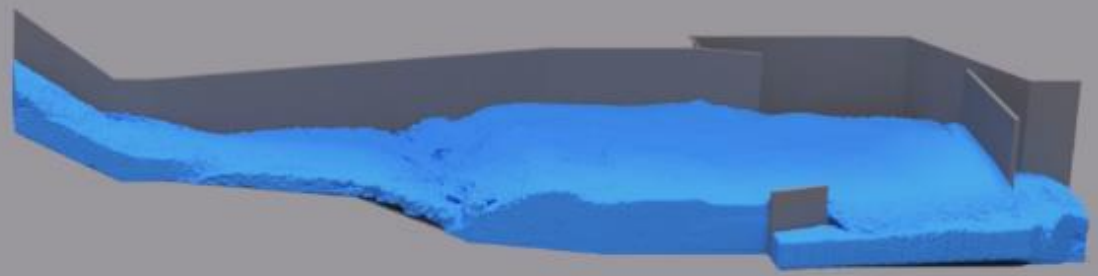
Q = 4.9 L/s, Error 2.7%



Q = 7.7 L/s, Error 1.6%



Q = 13.9 L/s, Error 2.0%



Simulation on a Nvidia GTX1060 (from 7 to 15h)

https://bit.ly/2Sg8oeX (Youtube: ÆGIR Ingenierie)

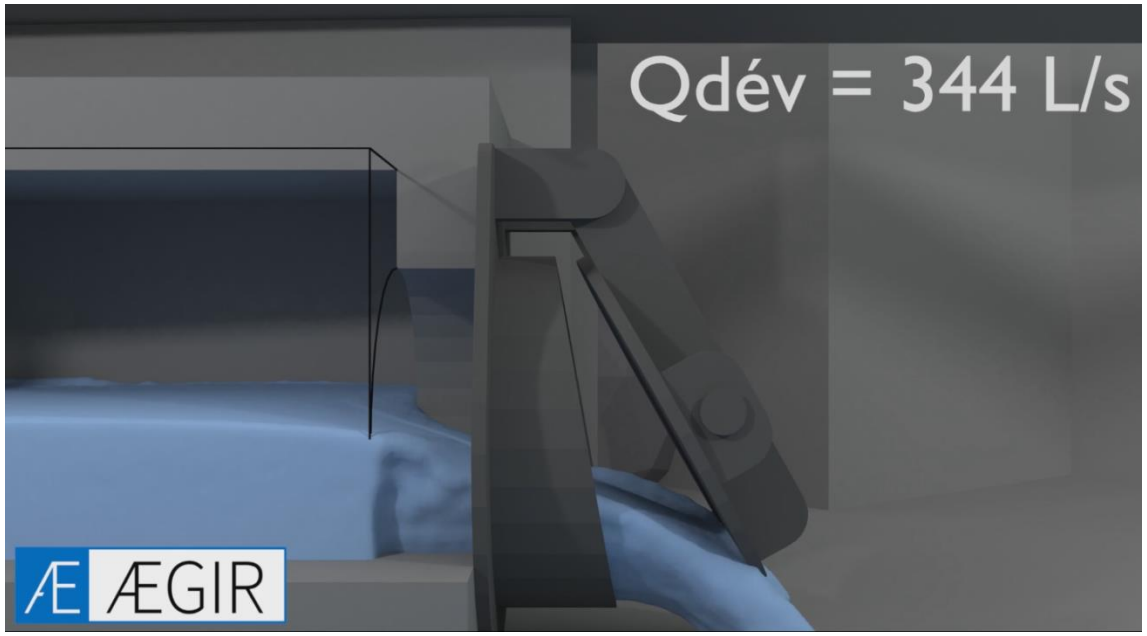
CONCLUSIONS

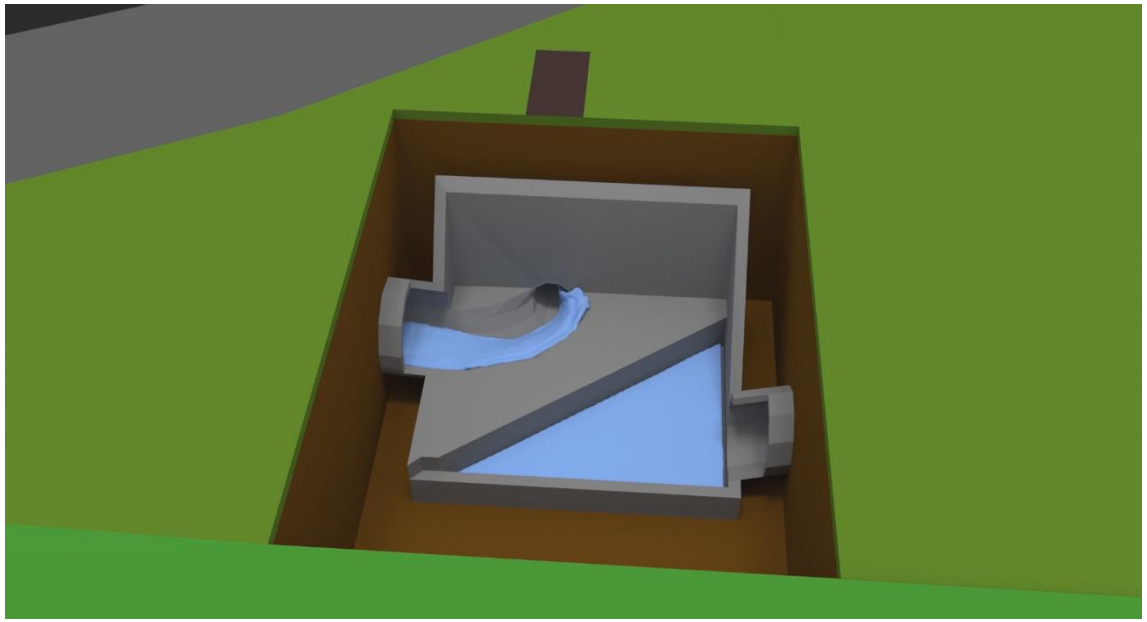
DualSPHysics for urban drainage:

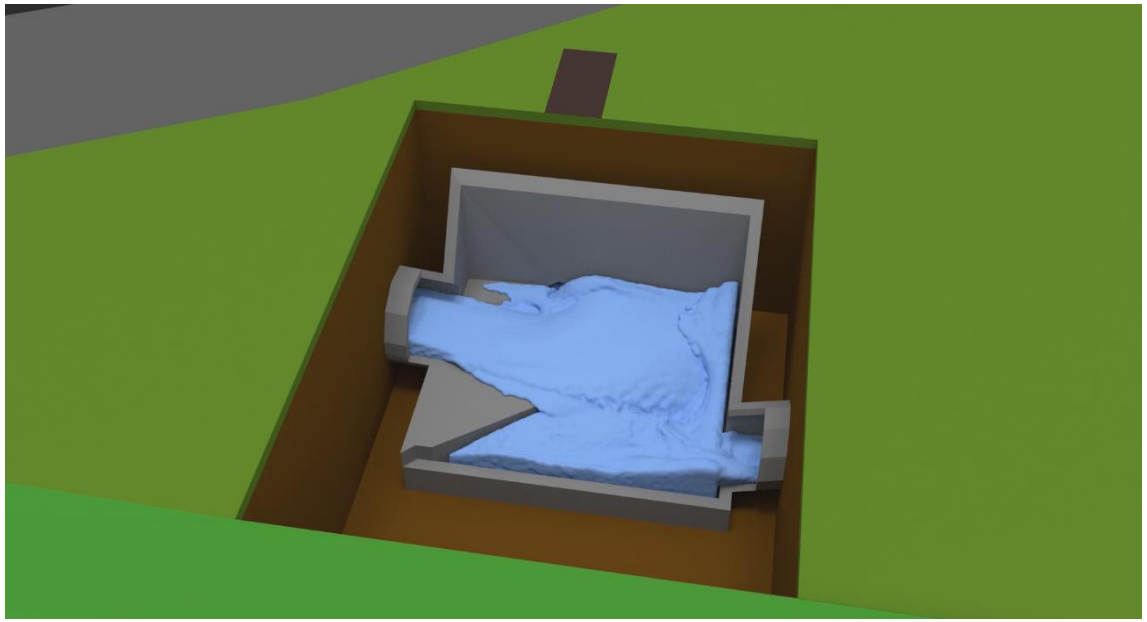
- Accurate
- Easy to use and learn (with a few tricks)
  - gap around boundaries
  - inflow/outflow
  - staircases effect
  - fixed resolution
  - …
- Fast and cheap

PERSPECTIVES

- Great visualization possibilities
- Many possible applications
  (non-return valves, sediments…)







Thanks to the DualSPHysics team !!!

Questions ?