



GEUS

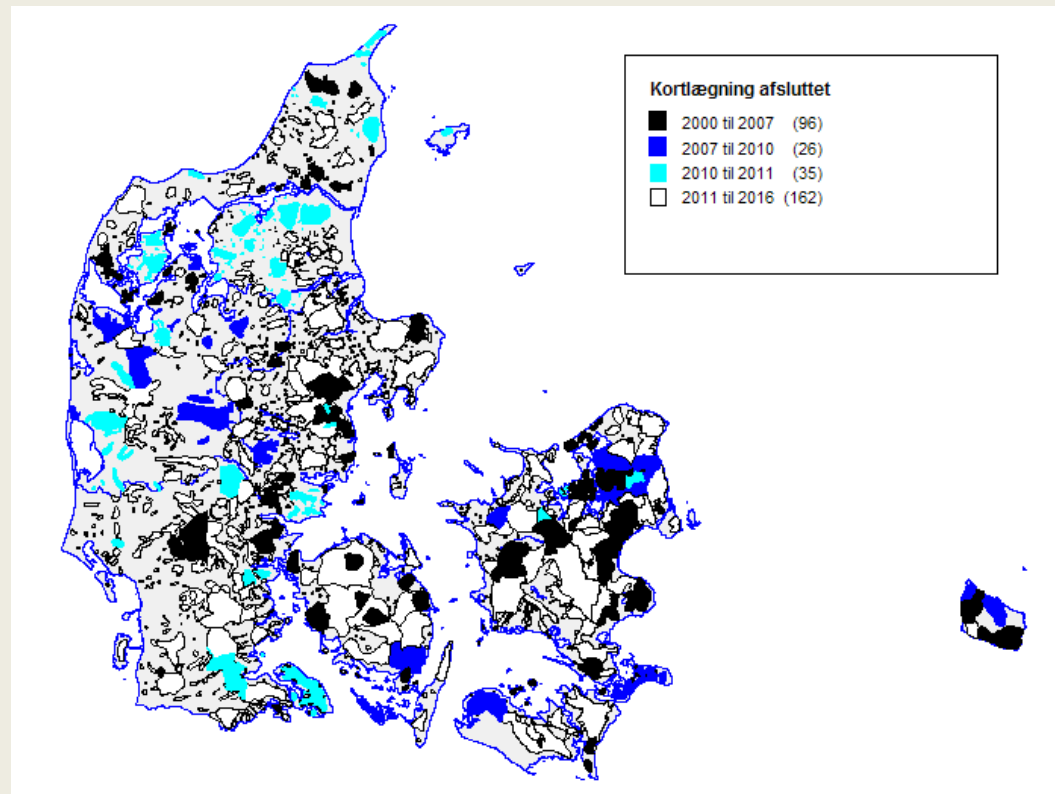
Achieving and sharing improved understanding, and so use, of the ground beneath our cities

GEUS as Survey partner in the 3D modelling of Odense

NAG-CITY Urban Workshop in Utrecht
March, 16th 2012

1. Status 3D modelling in DK

3D modelling used locally by advisors everywhere in the national mapping for groundwater protection
– some geological, but a lot based on hydrogeological layers





Available Digital Data for 3D

Databases

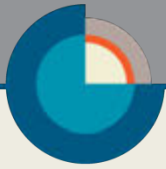
- Bore hole database
- Geophysical database
- Report database
- Model database

Digital maps

- Detailed terrain model
- Surface geological map 0-1 meter
- Pre Quarternary map

Models

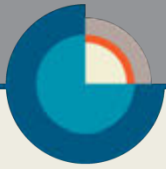
- Local/regional models
- DK- hydrological model



Experience in 3D modelling

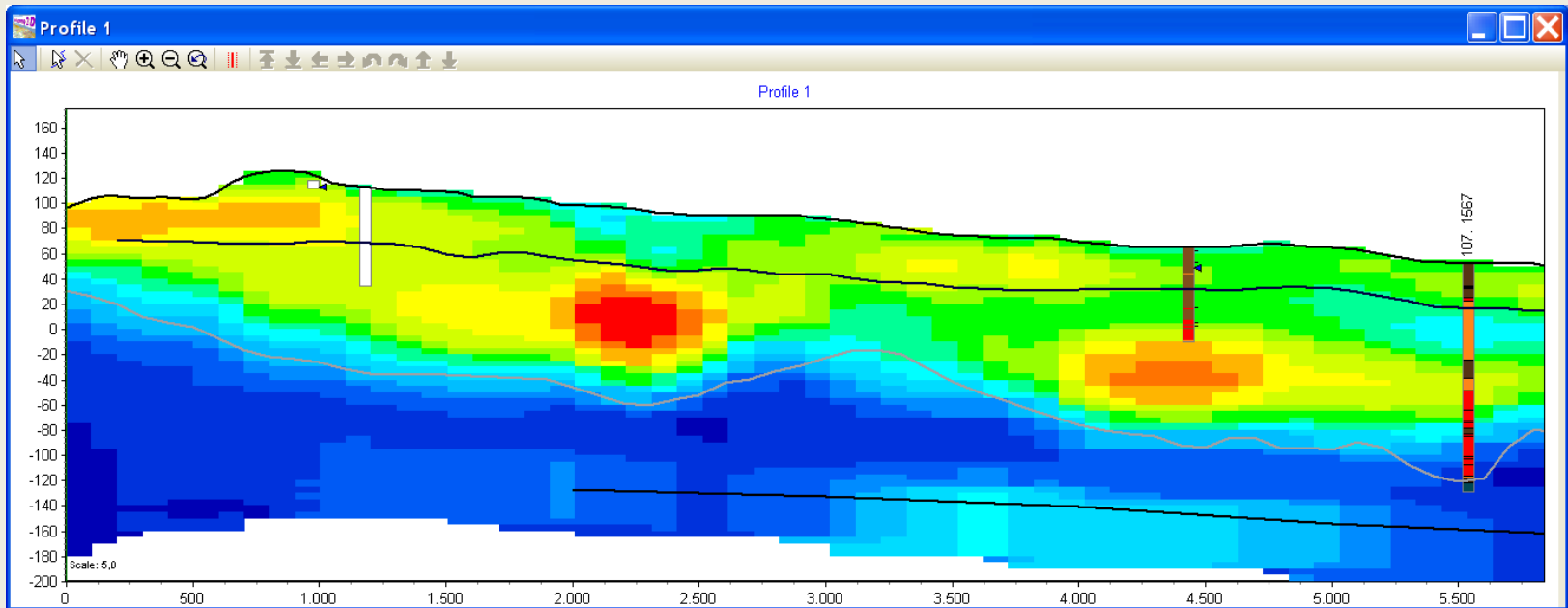
- Comprehensive borehole and geophysical databases
- Access to national databases and data
- Lot of experience with integration of geophysical data

- Mapping of buried valleys
- Mapping of Miocene formations
- Mapping of vulnerability
- Mapping of aquifers



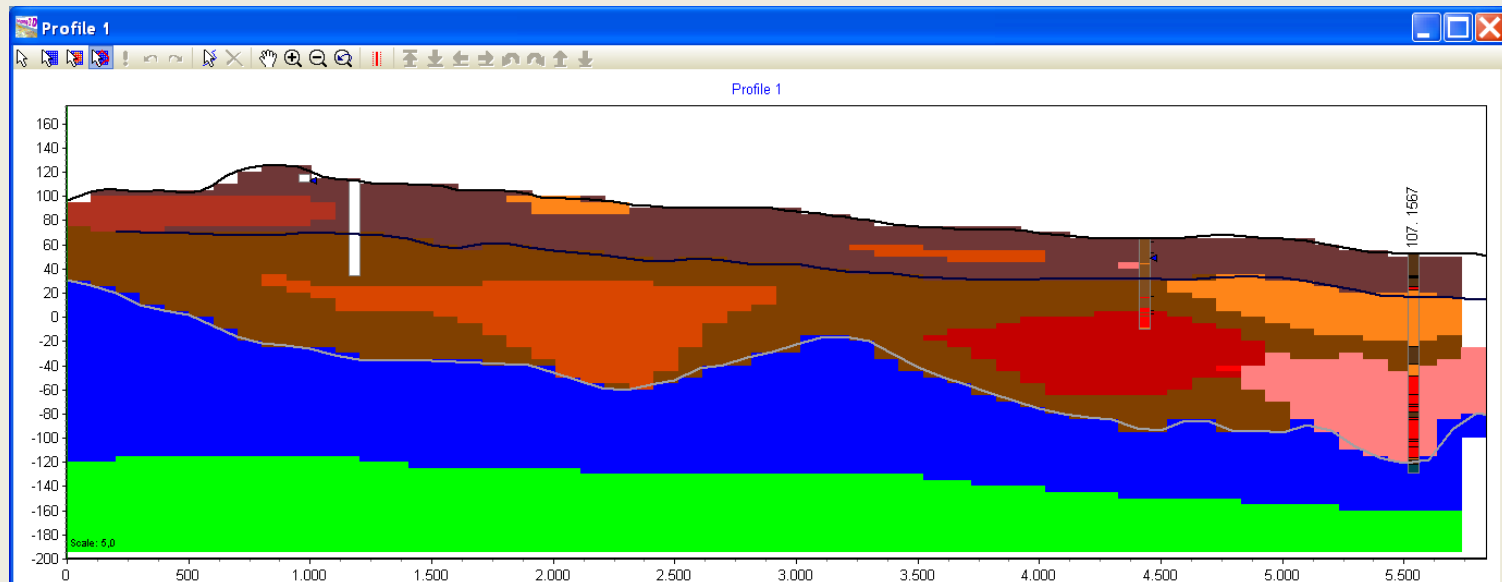
Use of geophysical data

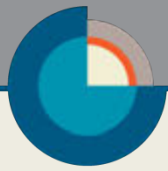
- Dense geophysical airborne data
 - Processed by a geophysicist to a resistivity model



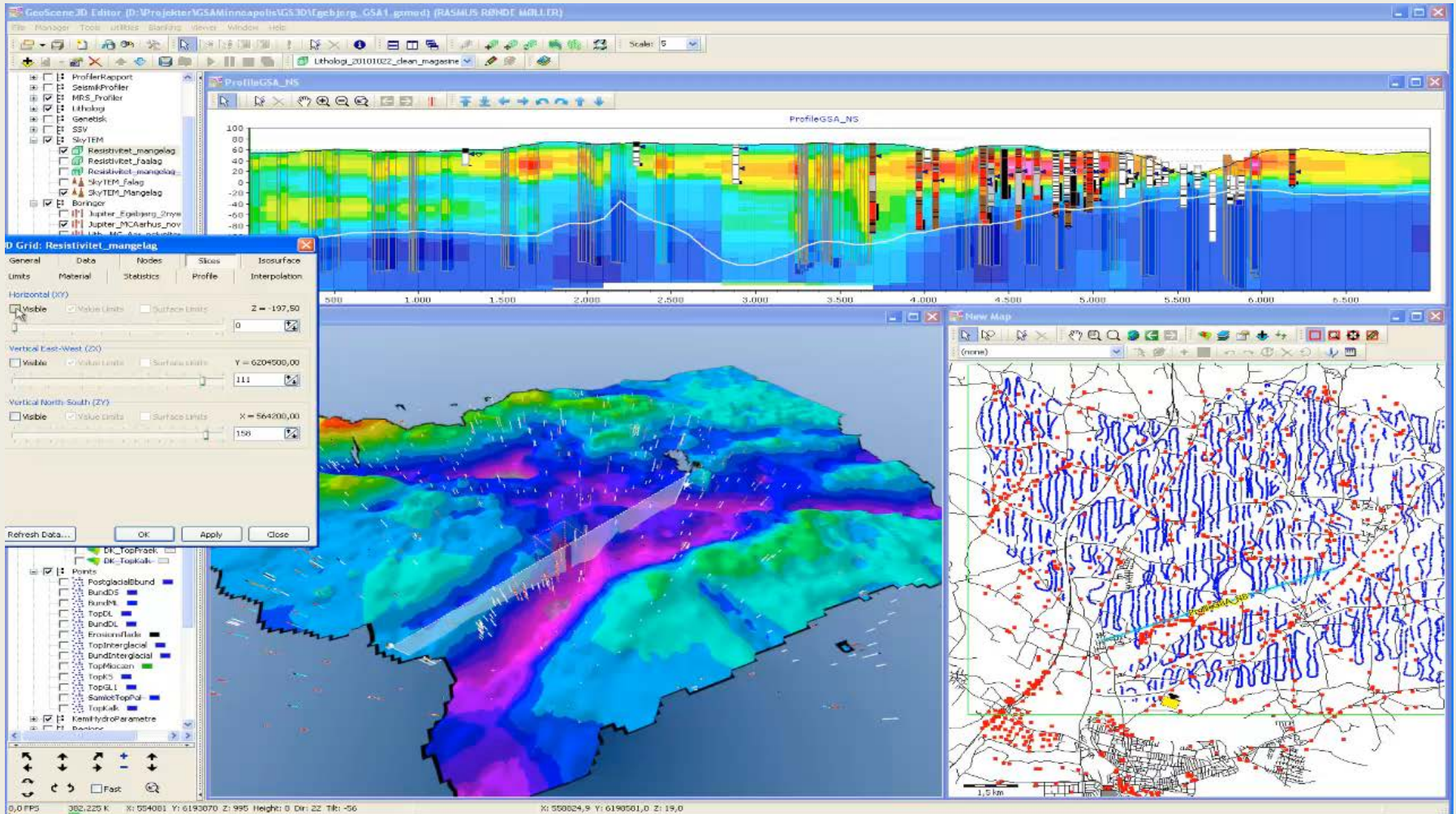
... Use of geophysical data

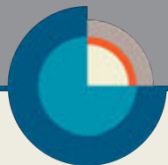
- Dense geophysical airborne data
 - Processed by a geophysicist to a resistivity model
 - Interpreted by a geologist to a geological model
 - Translated into a hydrogeological model



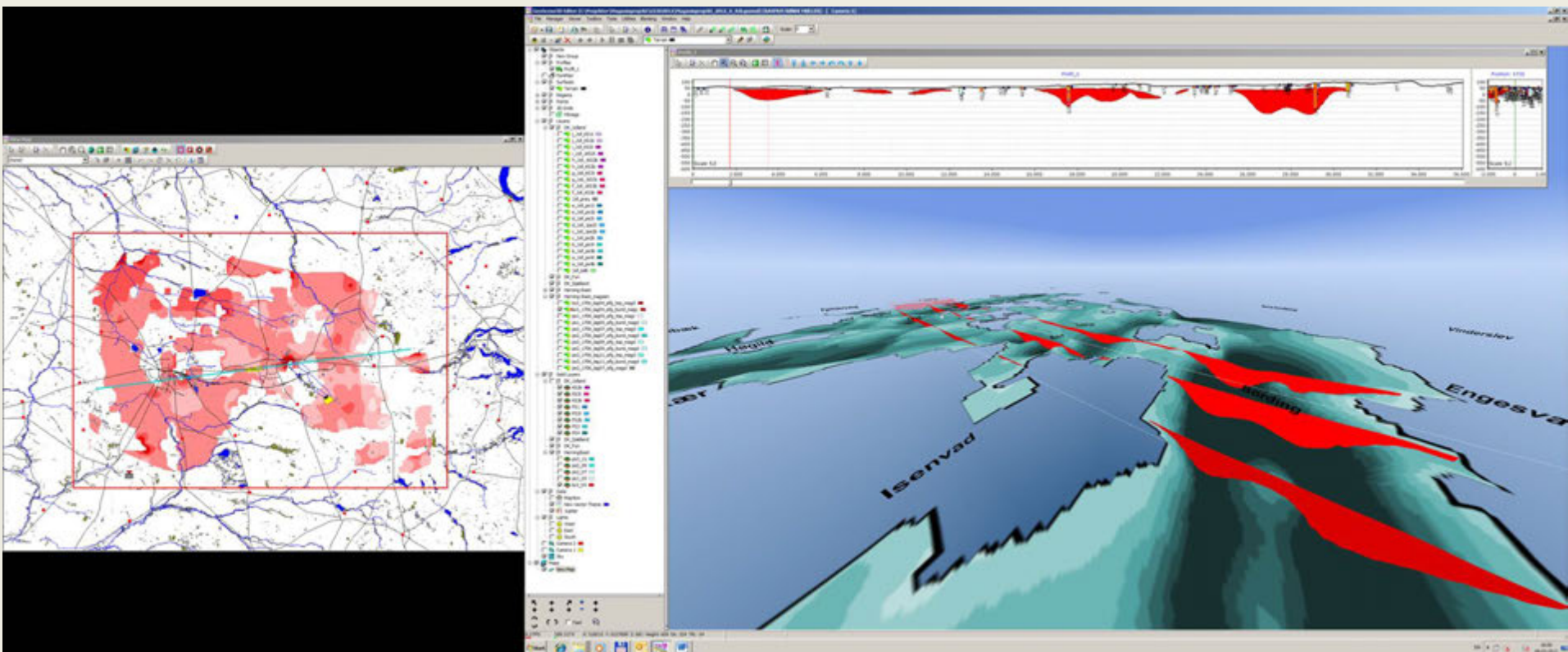


Research projects – ex Egebjerg data



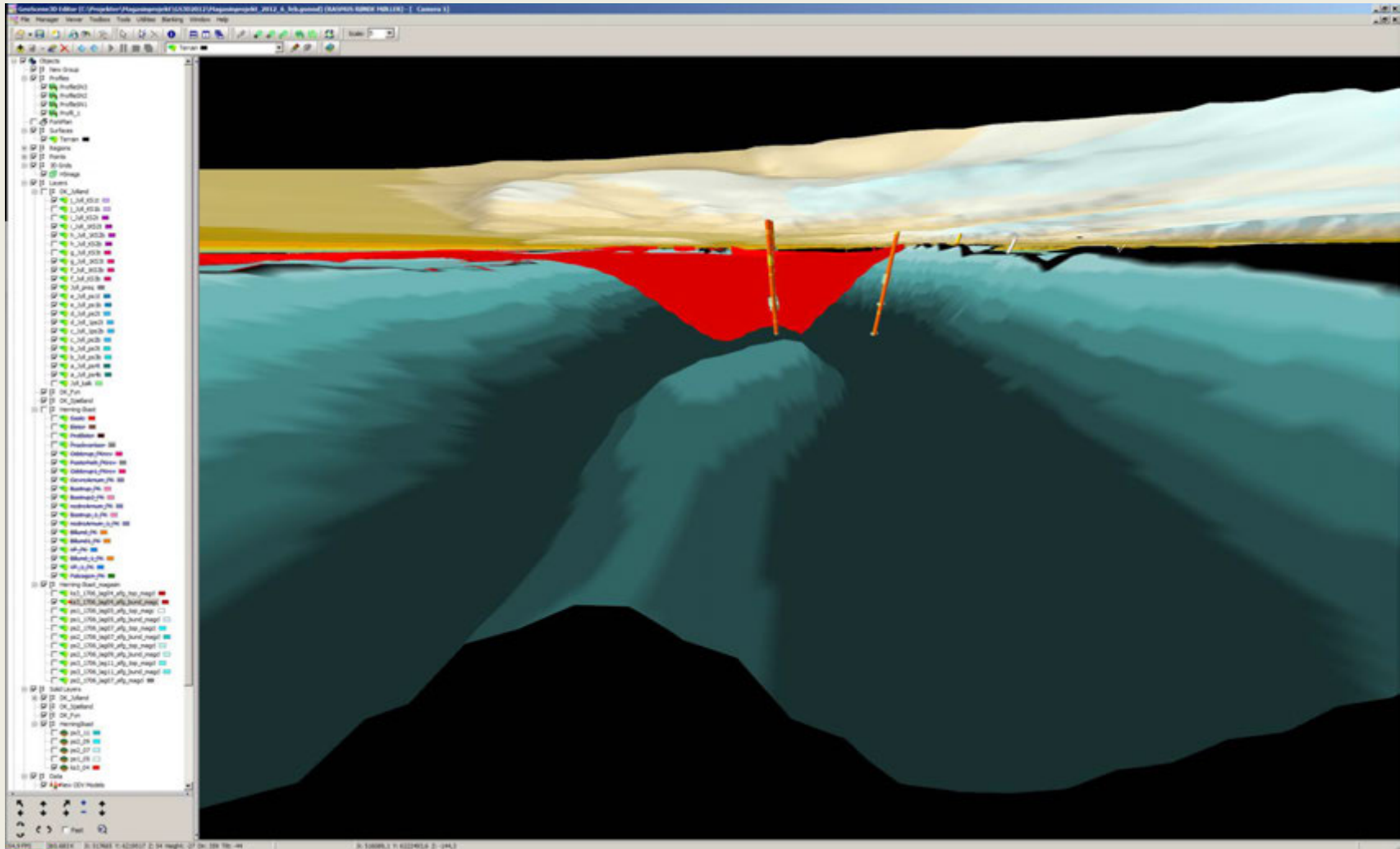


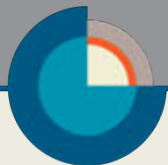
National Aquifer mapping – pilot study





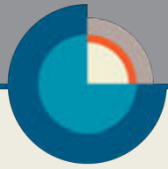
... National Aquifer mapping – pilot study





2. GEUS decision on a National 3D geological model

- 2011 - GEUS Strategy decided
- 2011 Dec. - International workshop in Copenhagen
- 2012 Jan. - First work package finished
- 2012 - 2 pilot projects initiated (DK and Greenland)



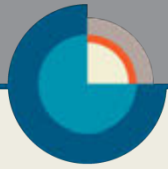
3. Decision on 3D modelling in cities

No coordinated systematic mapping initiatives within the last 30 years

City needs and conditions deviate from those known from the suburban areas

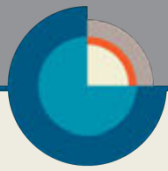
There is a need for a detailed digital 3D geological/hydrogeological model

2011 October - Decision on NAG-City partnership



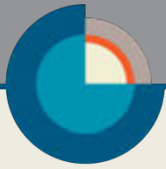
4. Status work with city partners

- 2011 - Application for a local project in Odense got very good scores, but was turned down due to lack of money
- 2012 - Application for a local project in Odense – to be initiated in 2013, if approved



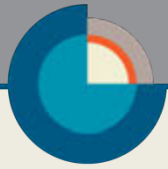
Odense City – Why?

- 3 largest city
- Similar to many other Danish municipalities
 - Coastal near (risk of rising sea level)
 - Odense River crosses city centre (risk of flooding)
- Lot of mapping data (old and new)
- Lot of abstraction wells and data on hydraulic heads
- Lot of activities at the water company

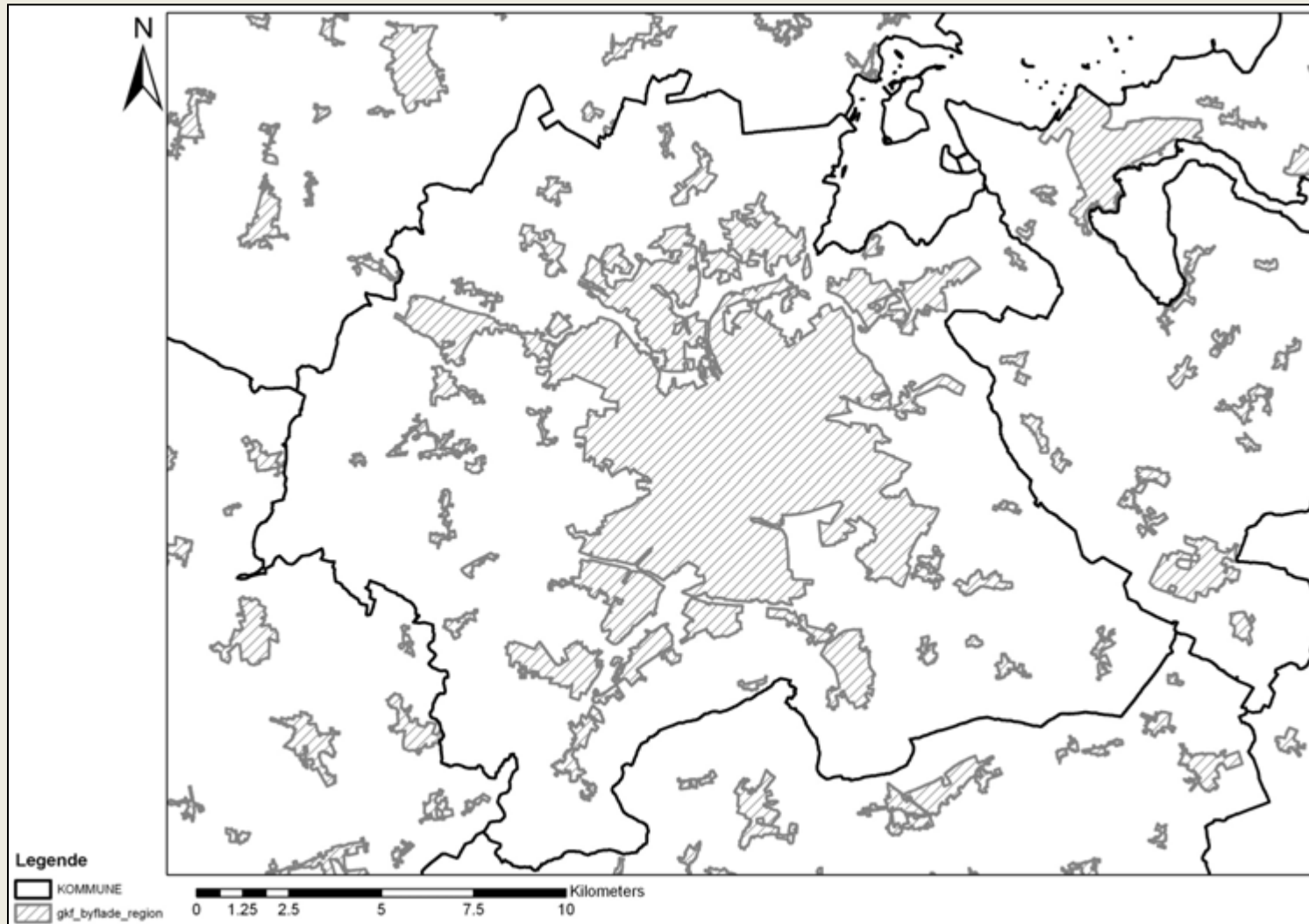


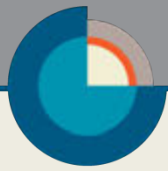
Odense City – Why?

- Ambiguous political goals on “green/blue” city
- Ambiguous water company
- Millions of euros are to be used today on construction works
- The money used for good planning and back ground information will be small compared to the investments spent on construction works

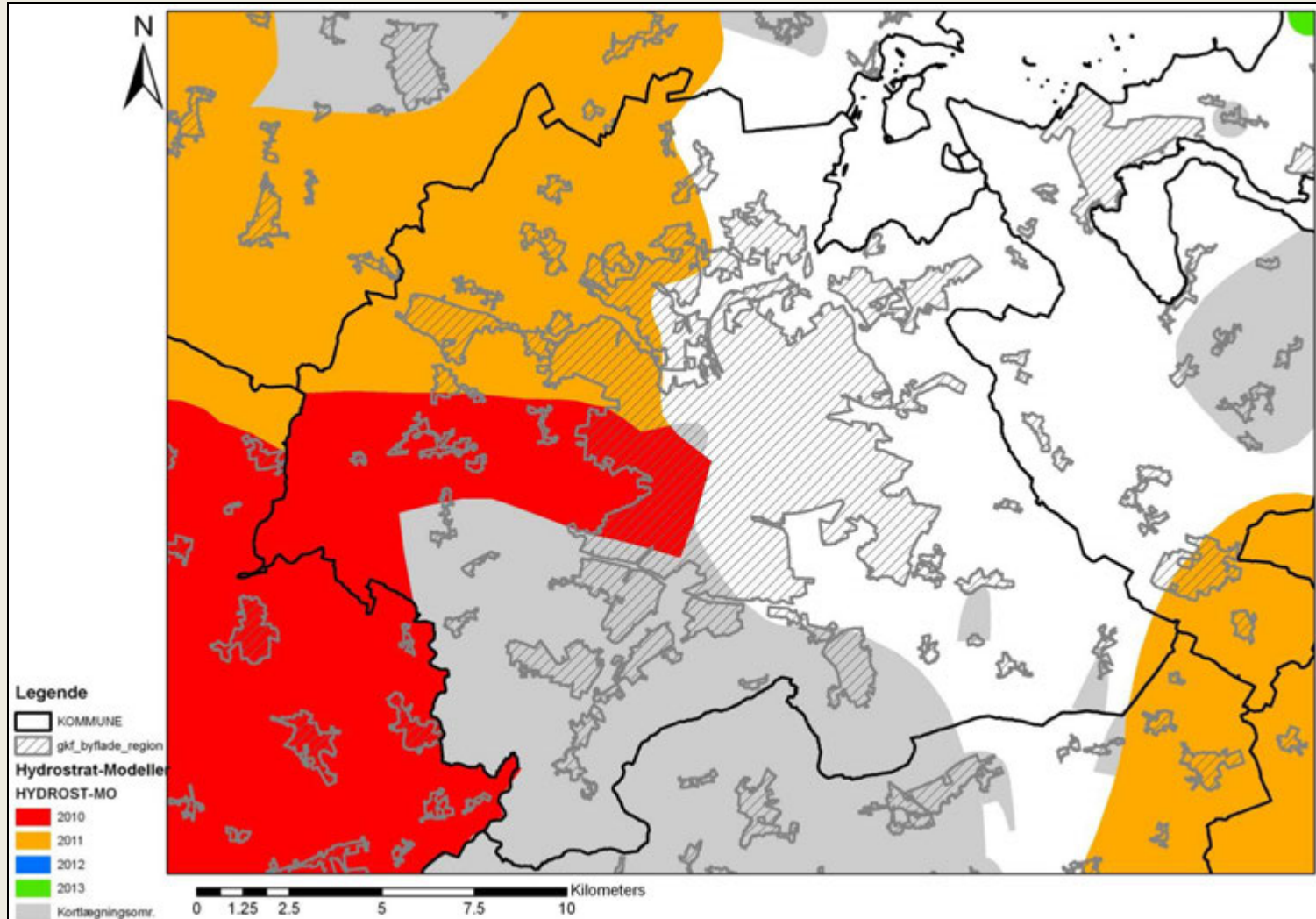


Odense City and the suburban





... Colouring signals hydrogeological models

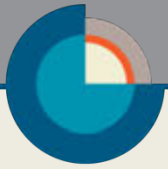




Important challenges in a urban geological /hydrogeological model

- One model - for all data
- The model must be as good and as detailed as the available data allows
- Scale variations shall be dealt with
- Updates shall be taken into consideration
- Improvements with new data shall be expected

- The municipality covers urban and suburban areas
- Nearly all tasks are related to water
- The mapping of saturated and unsaturated areas are important
- The model shall form the a basis for further modelling of water beneath the ground and upon the surface

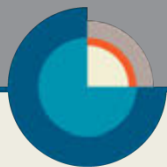


5. Future plans and intensions

Seek international collaboration:

- Expand to an international work field
- Seek knowledge exchange in general
- Exchange “hands on” knowledge

=> Speed up the 3D model process “at home”



Areas of secondments

- Development of 3D geological/hydrogeological modelling
- What to do with anthropogenic deposits
- How to use wetland/organogenic information
- How to combine with sewer network data
- How to combine with building data

- Storage/access to data
- Solving scale problems
- Accuracy of information
- Visualisation at different user levels
(detailed geology -> planning scale)