

The 3D-model Basel region – a planning tool

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GeORG-Project

In 2008 the EU project started “GeORG” with the idea to establish a tool for space planning of the subsurface along the Upper Rhine Graben.

The geological 3D-model of the Basel region (600 km²) is the Swiss contribution to the “GeORG”-project.
12 geological horizons were modelled during the GeORG-project.
In the Basel area additional 8 horizons were integrated.

Cenozoic model horizons

- base Unconsolidated Rocks
- base Tüllinger Schichten
- base Elsässer Molasse
- base Foraminiferenmergel Fm.
- base Cenozoic

Mesozoic / Palaeozoic model horizons

- base Vellerat Fm.
- base St. Ursanne Fm.
- top Hauptrogenstein Fm.
- base Hauptrogenstein Fm.
- base Passwang-Fm.
- base Opalinus-Ton
- base Jurassic (Staffelegg Fm.)
- base Gips-Keuper
- base Keuper
- base Trigodonodus-Dolomite
- top Anhydrite-Group
- base Anhydrite-Group

GeORG-horizons (12) are magenta
additional horizons (8) Basel region green

3D spatial planning tool

Instead of a static geological model, it was the aim to establish a tool for subsurface planning in an urban area.

- the tool should be easily adjustable with new data
- the tool should be flexible for local refinements
- the tool should be open for spatial extension

Development

Step 1: acquisition – analysis – harmonisation of raw data & basic information >> datamanagement

Step 2: Interpretation and 3D-modeling

Step 3: transfer of results into the datamanagement

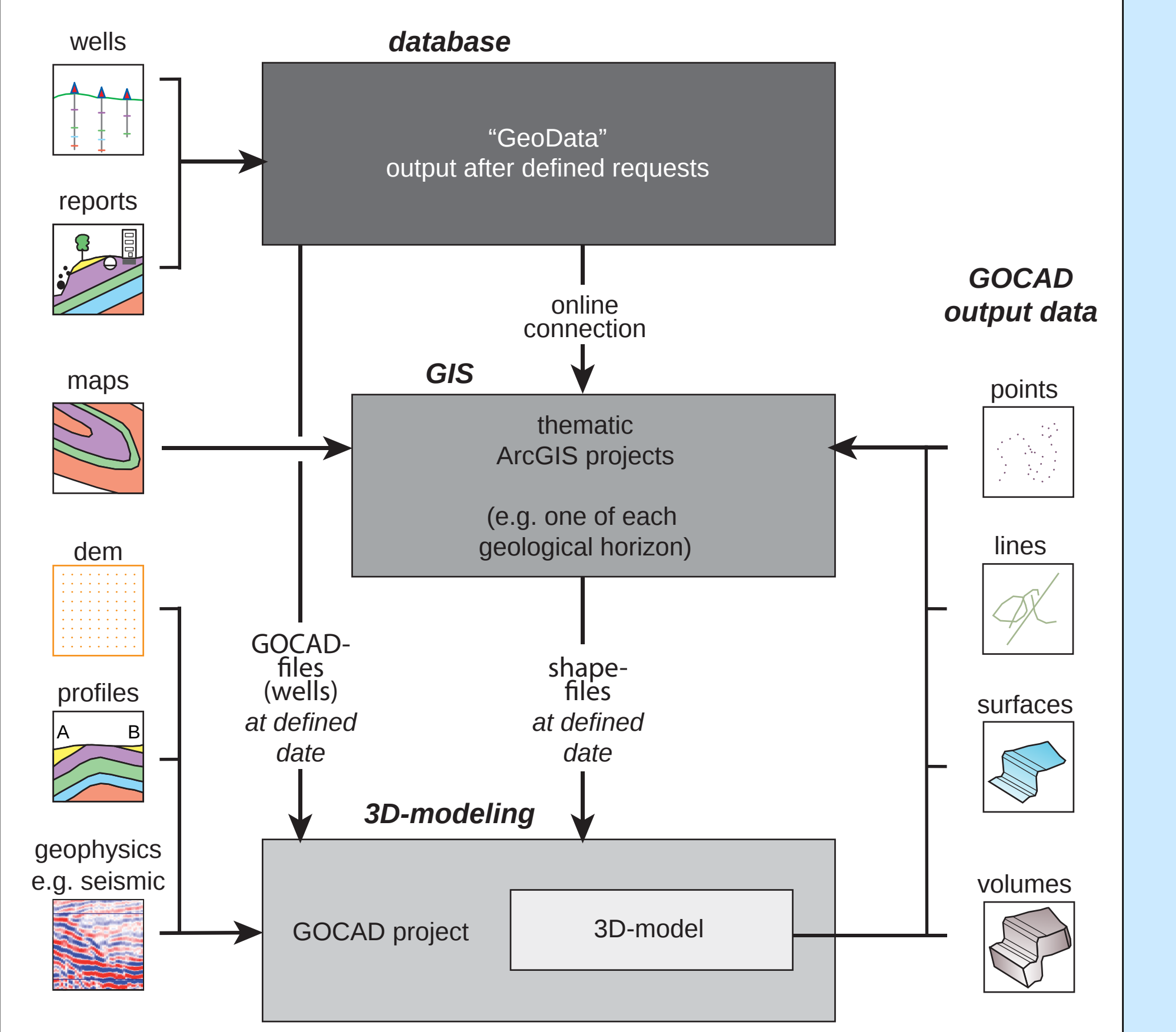
Usage

Step 1: application of a project - by - project operational workflow

Step 2: model and data maintenance

Model maintenance is time-consuming and expensive. The developed project - by - project operational workflow enables a sustainable use of the “tool”.

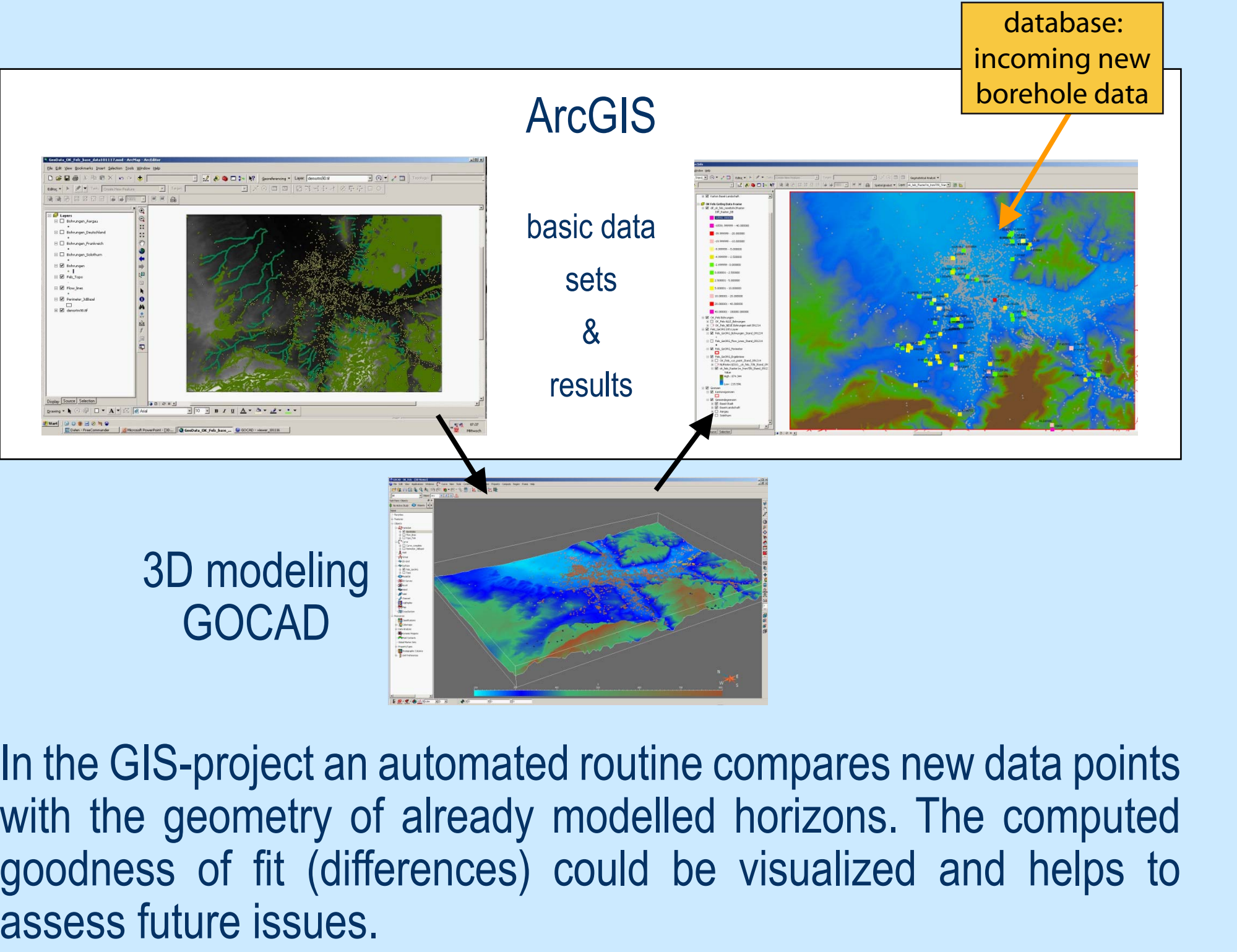
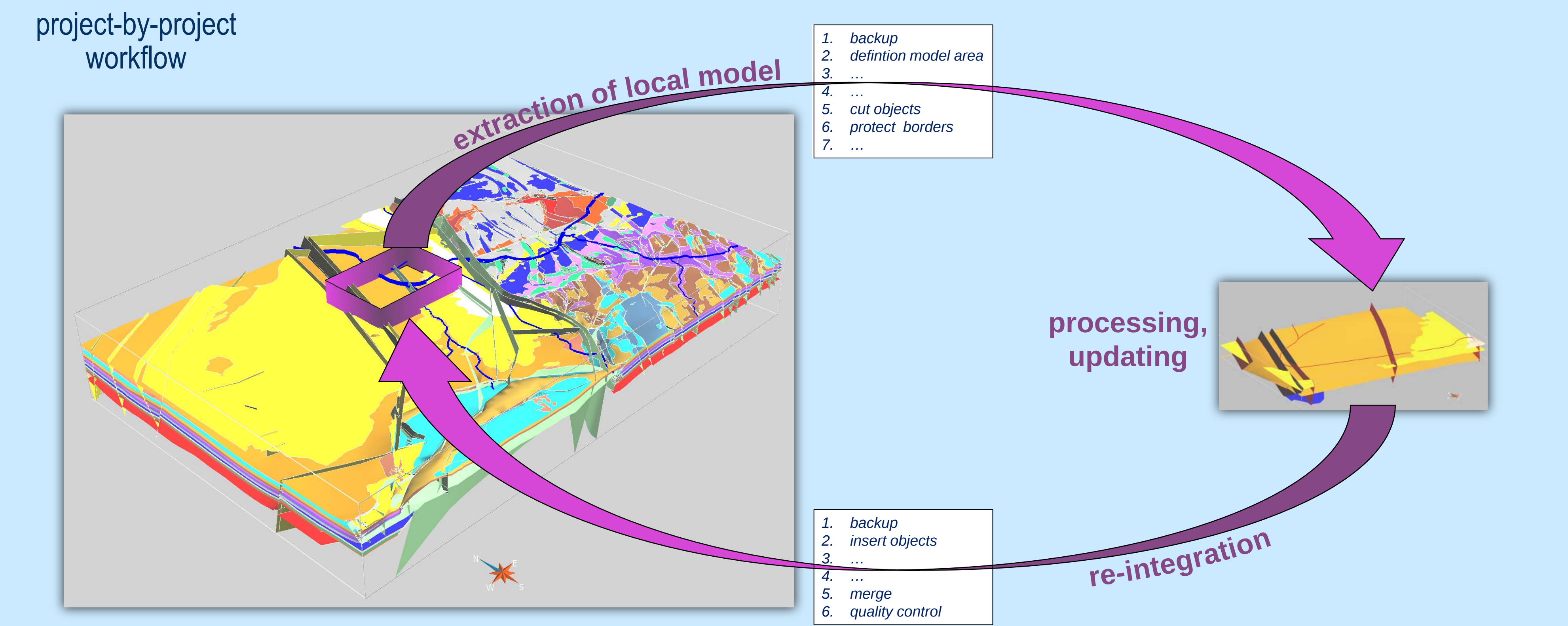
Datamanagement



Combination of database (boreholes), GIS and 3D-modeling

- easy data exchange,
- fast integration of new data,
- quick views on the model in 2D (maps or sections) and 3D

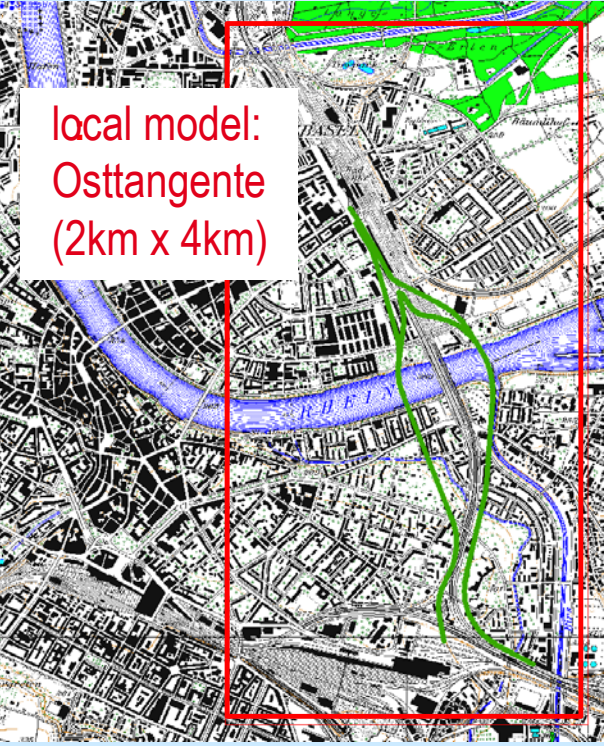
Horizon-specific GIS-projects contain basic data, the resulting horizon geometries from 3D modeling and new data (e.g. boreholes) which were recently inserted into the database.



The tool: 3D model region Basel – case studies

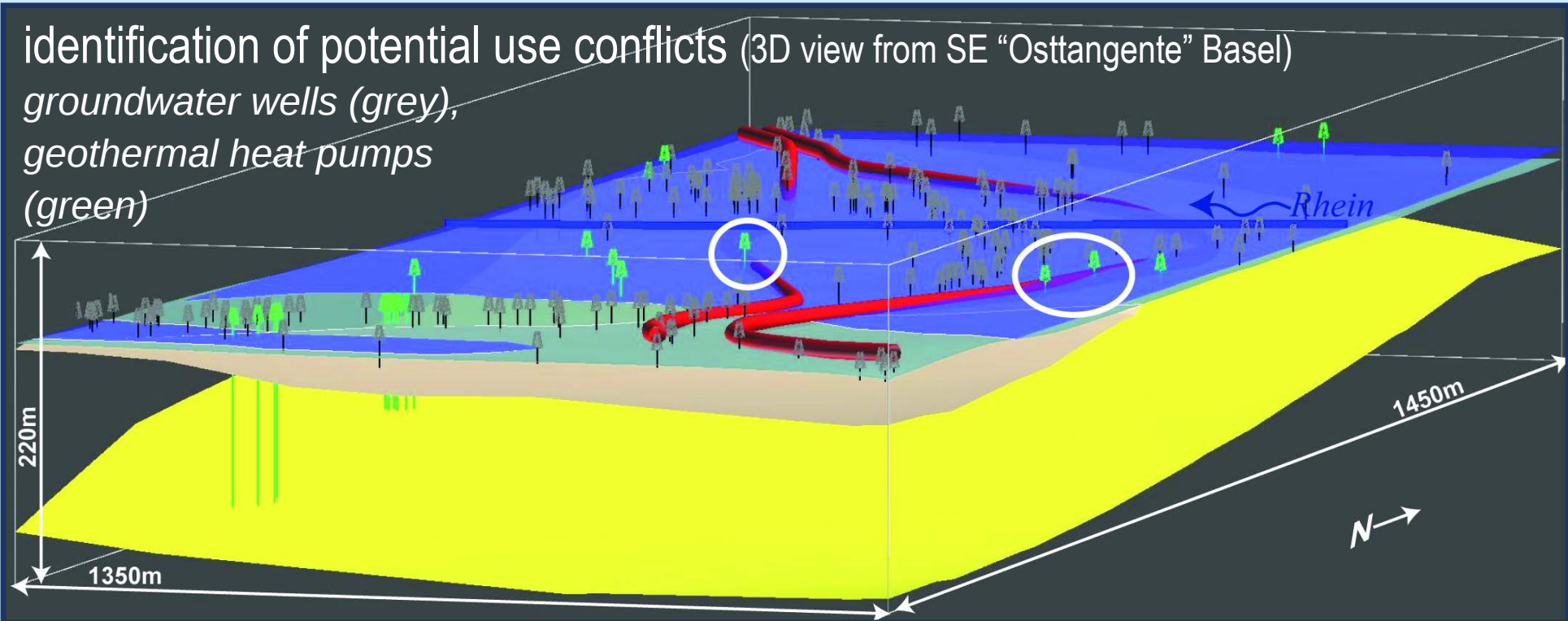
The possibility to generate flexible exports to be able to use the subsurface information in other software applications, as well as to combine hydro-geological information with infrastruktura data for a detailed analysis gives rise to repeated requests concerning local issues in the area of Basel.

First plannig steps: highway tunnel below Basel



In order to get a quick and substantiated overview on underground condition in an specific area of interest, the Civil Engineering Office (Tiefbauamt, Stadt-Basel) assigned the Applied and Environmental Geology group at the University of Basel to use the tool “geol. 3D model of the Basel region” to describe relevant matters.

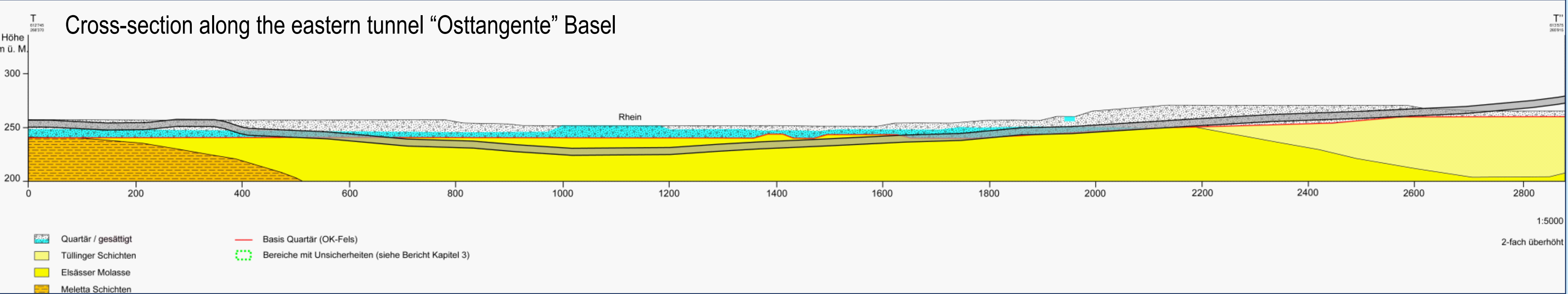
identification of potential use conflicts (3D view from SE “Osttangente” Basel)



results:
technical report containing
> GIS-analysis (maps),
> 3D-analysis
- 3D views
- cross-sections
- maps

- > description geology
- > description hydrology
- > geotechnical matters
 - parameter study
- > risks
- > identification of use conflicts
- > groundwater protection

Cross-section along the eastern tunnel “Osttangente” Basel



Concept for the use of shallow (-200m) geothermal energy, Basel-Landschaft (Butscher et al. 2011)

aim:
establishment of rules for the approval of shallow geothermal energy use (e.g. geothermal heat pumps) up to 200m depth.

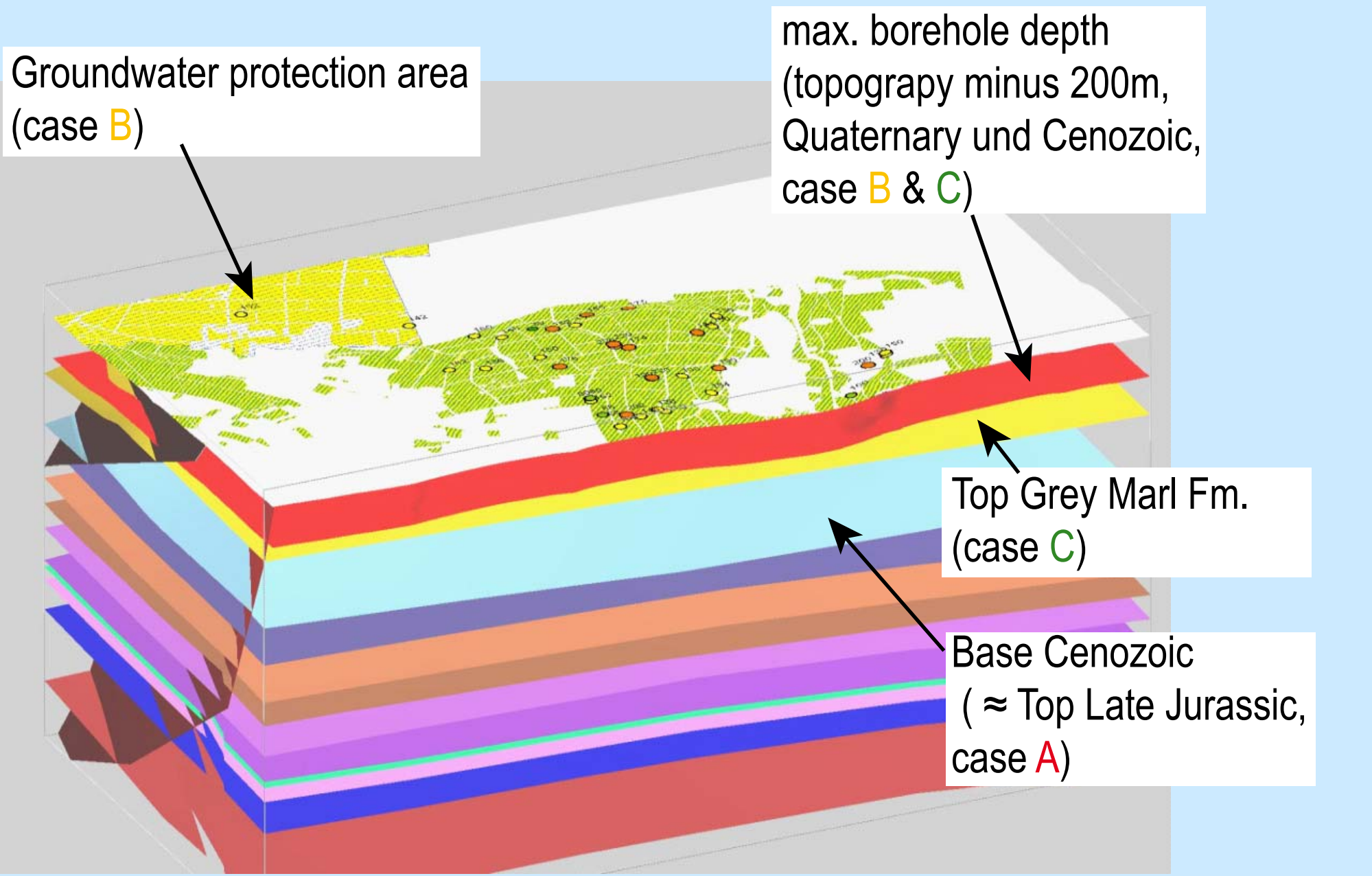
development of a classified map adapted from the geol. 3D model

A = not allowed

B = allowed with distinct conditions

C = allowed with standard conditions

Groundwater protection area (case B)



max. borehole depth (topography minus 200m, Quaternary und Cenozoic, case B & C)

Top Grey Marl Fm. (case C)

Base Cenozoic (≈ Top Late Jurassic, case A)