# A common vision about groundwater entities in Europe

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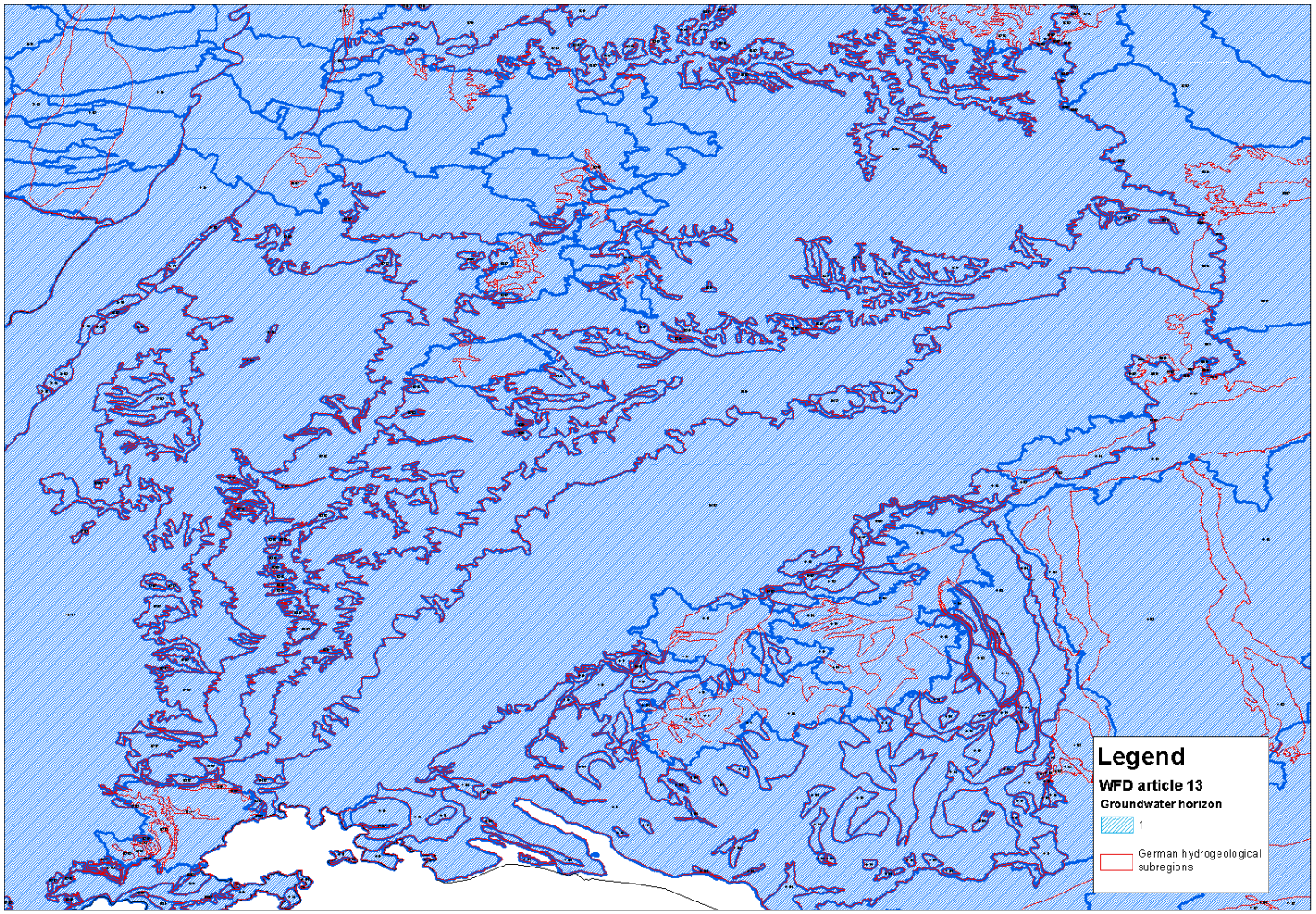
# Topics

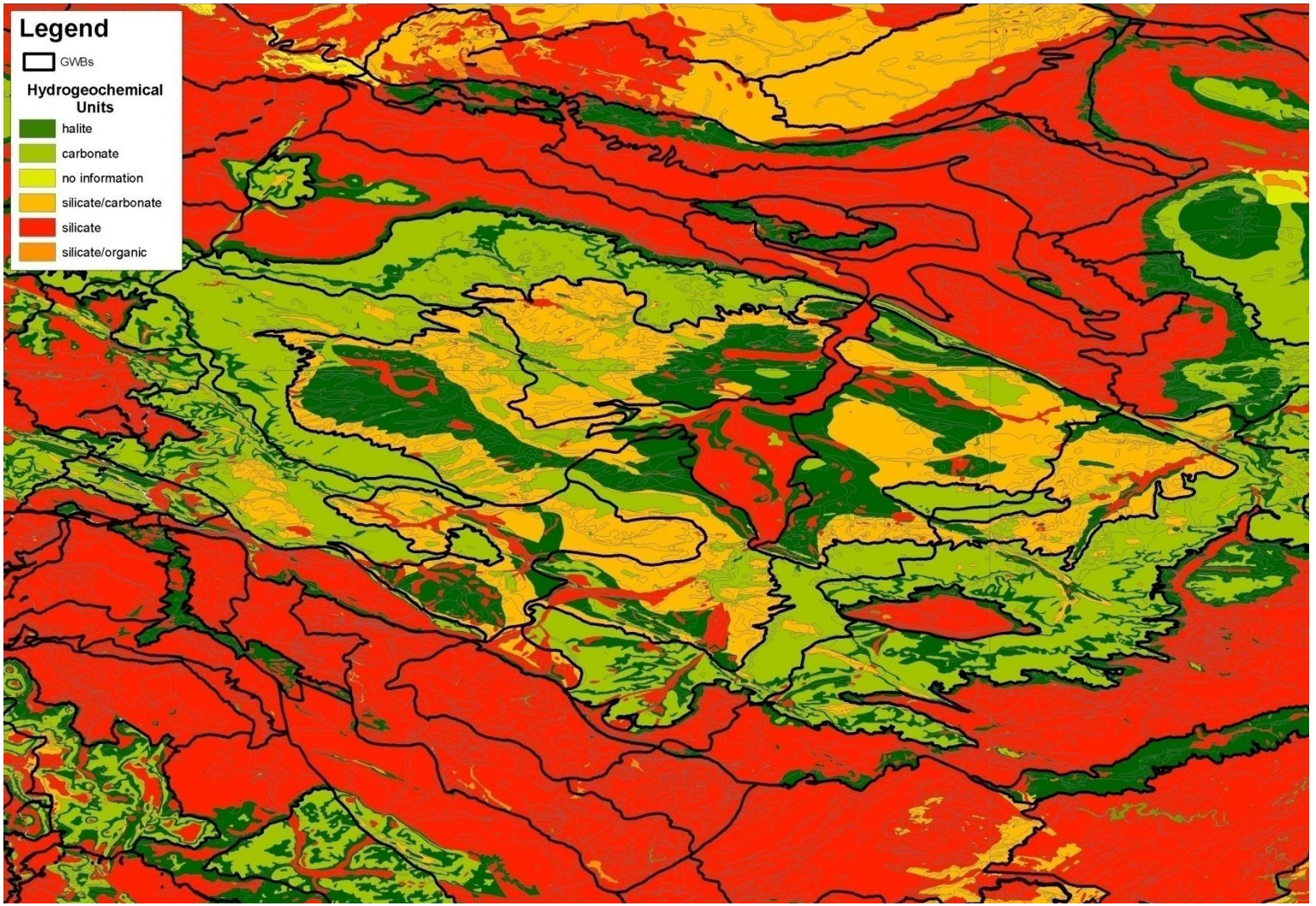
- **GWB delineation criteria**
- **GWB delineation process**
- **Review of actual GWB reference layer**
- **Europe-wide groundwater map (IHME)**
- **Case study: Horizon assignment**
- **Conclusions**

# GWB Delineation – Hydrogeological units



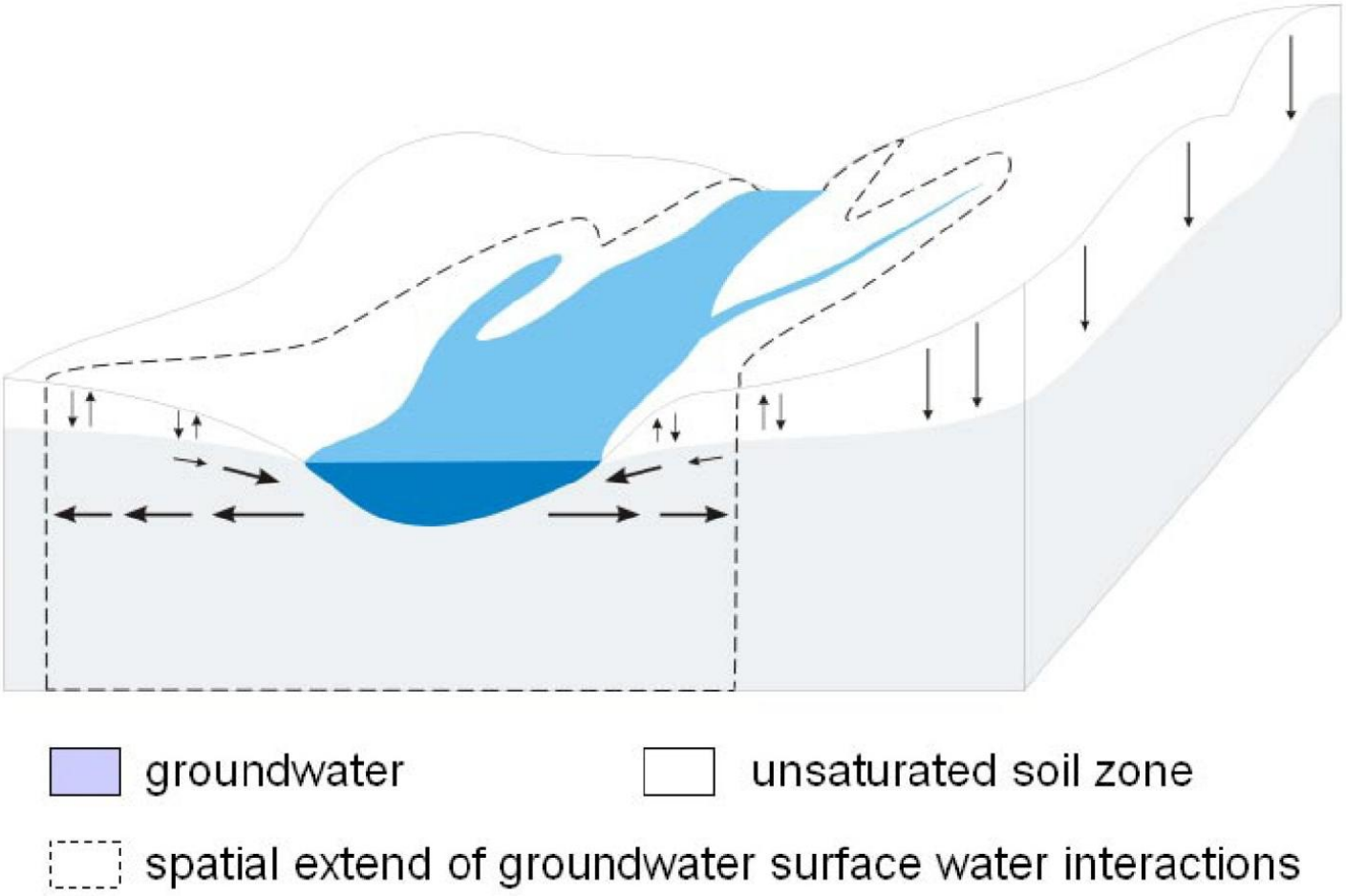

➔ **Hydrogeologic subregions as GWB outlines**

# GWB Delineation – Hydrogeochemical units




➔ **Hydrogeochemical units correspond to GWBs**

# GWB Delineation - Groundwater catchment




S. Krause and A. Bronstert: Catchment delineation and water balance modelling

➔ **Hydraulic boundaries**

# GWB Delineation – Vertical positioning

**3-dimensional delineation**

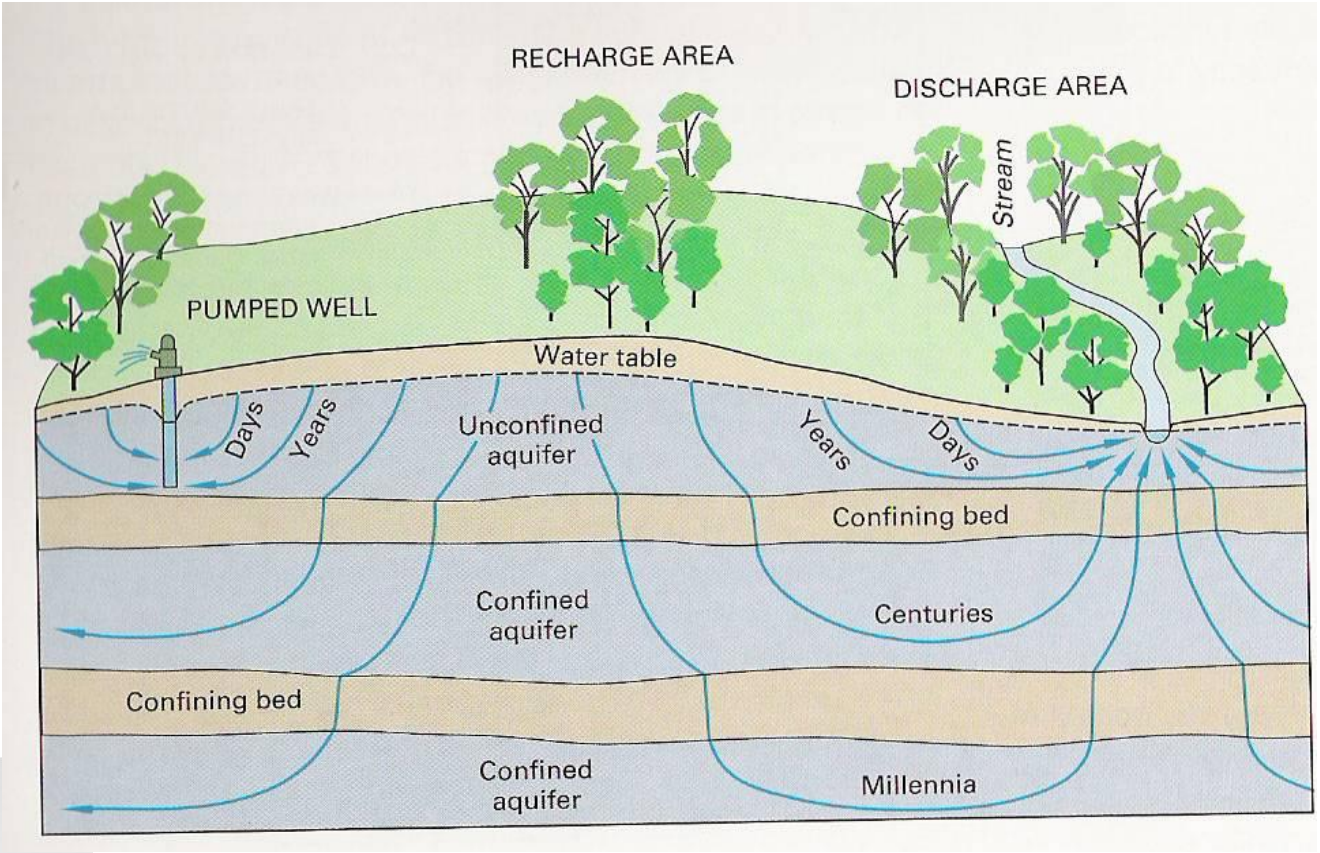
– **Position in vertical aquifer sequence**

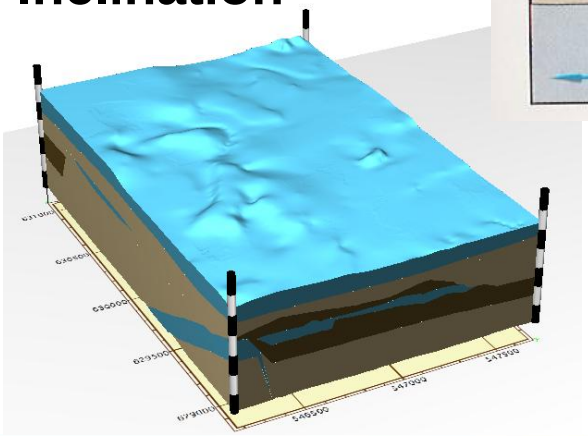
➔**Horizon Layer Assignment**

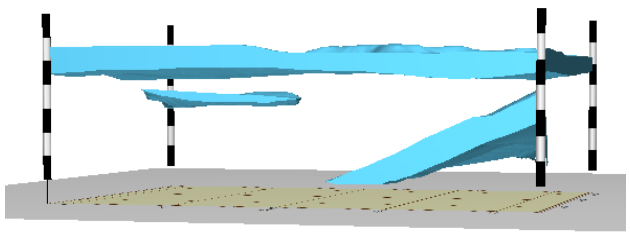
–**Thickness**

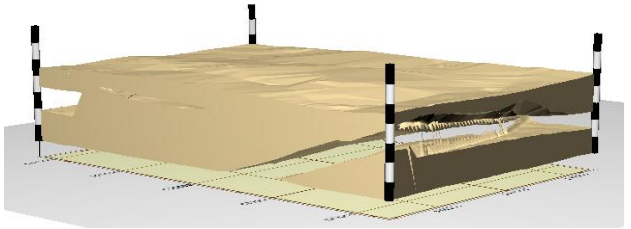
– **Depth**

– **Inclination**

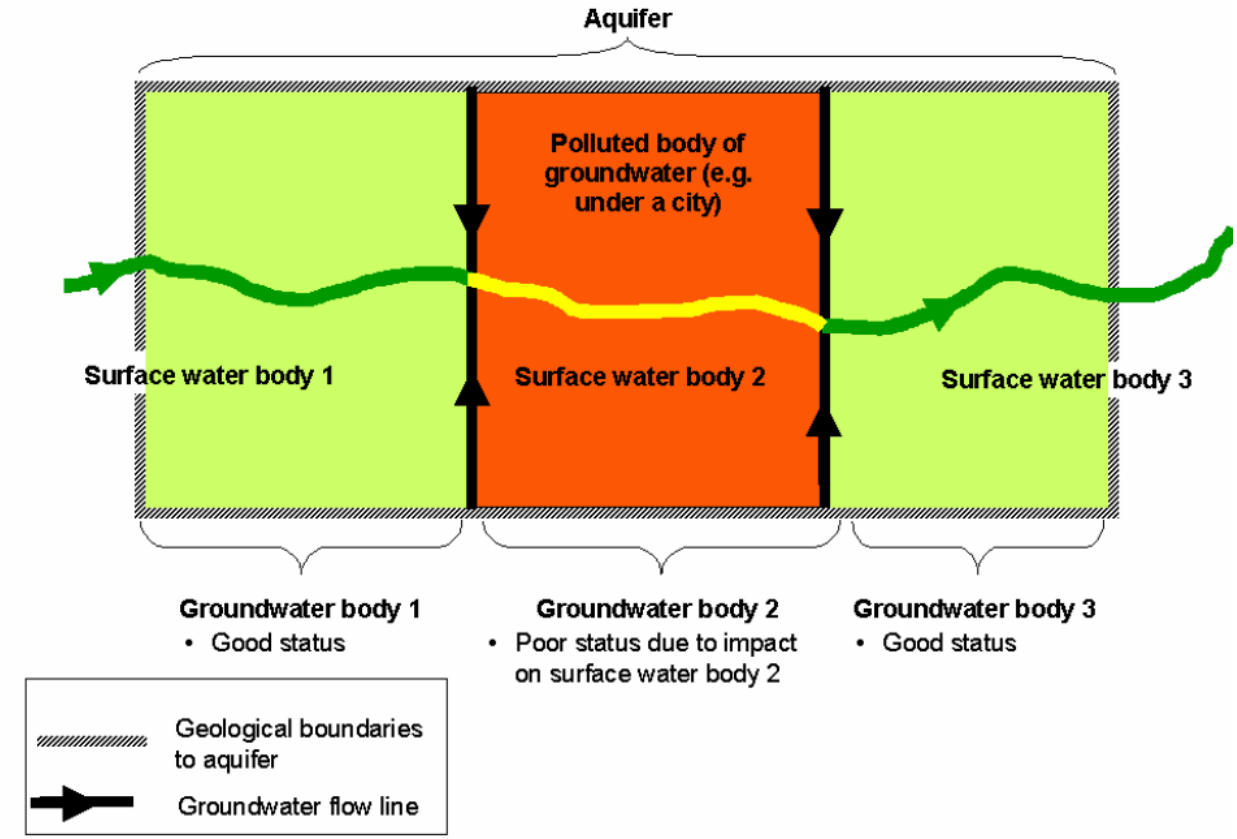


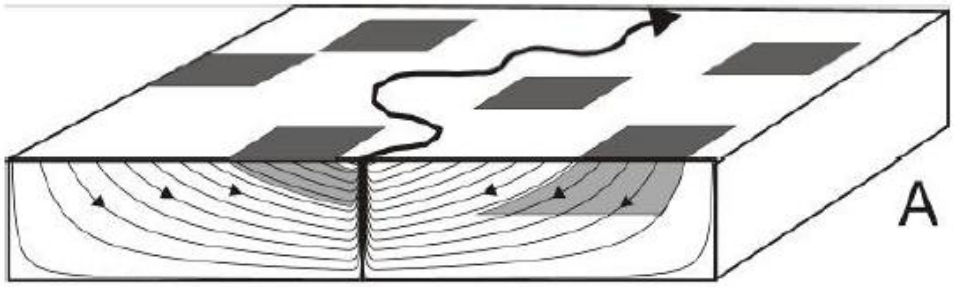







# GWB subdivision – Water composition

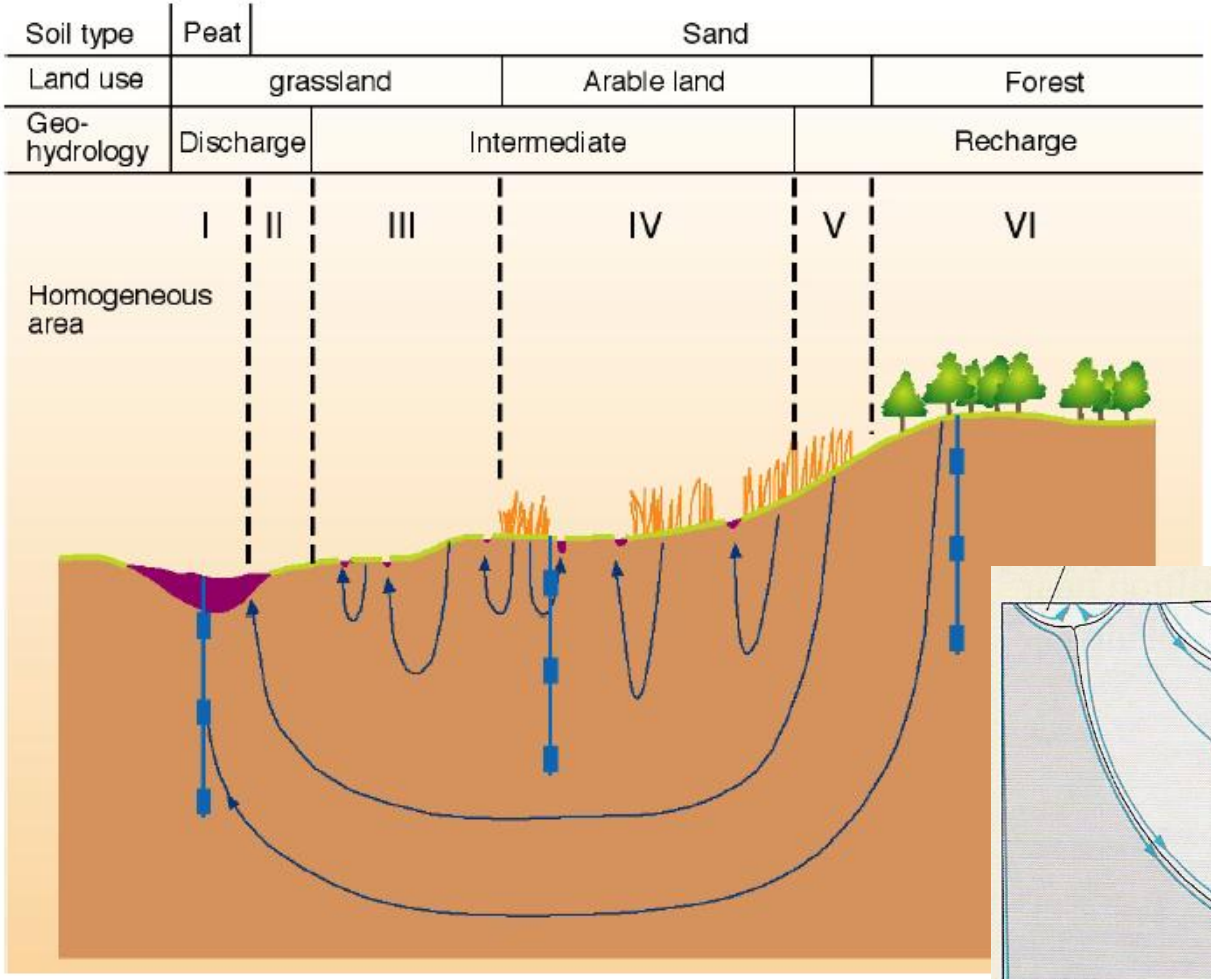


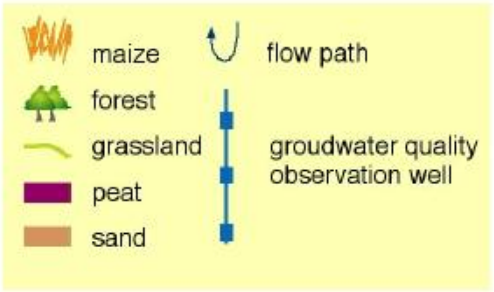



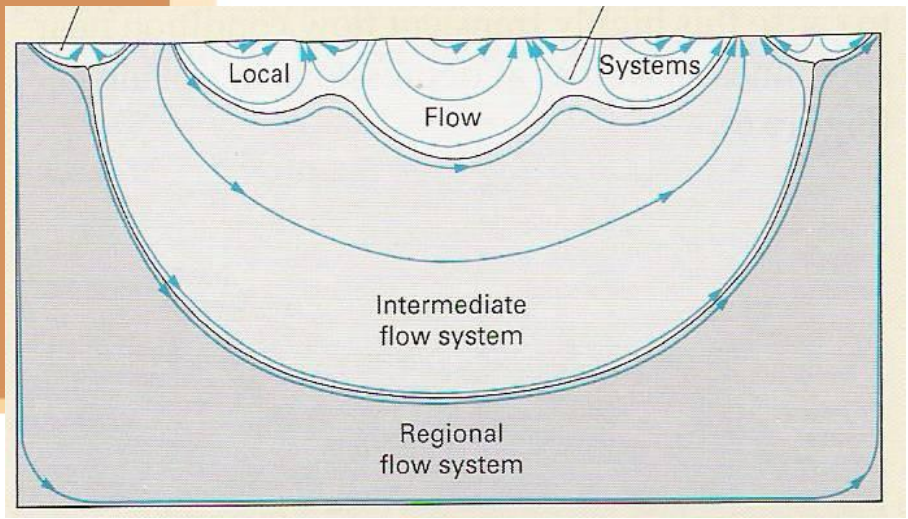

**Pollution sources**

**Subdivision of regions with differing water composition along flow lines**

# GWB subdivision - Stratification




**Divergent flow regimes ➔ GWB stratification**

# Selected Criteria for the Delineation of GWBs

- **Surface water catchment basins**
- **Land use**
- **Administrative/political boundaries**

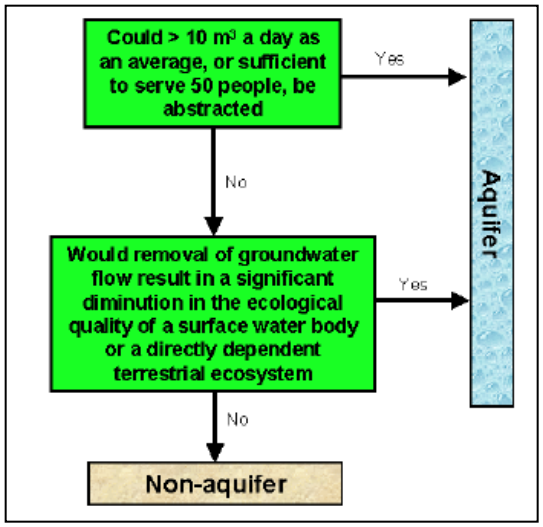
} **Management (I)WRM**

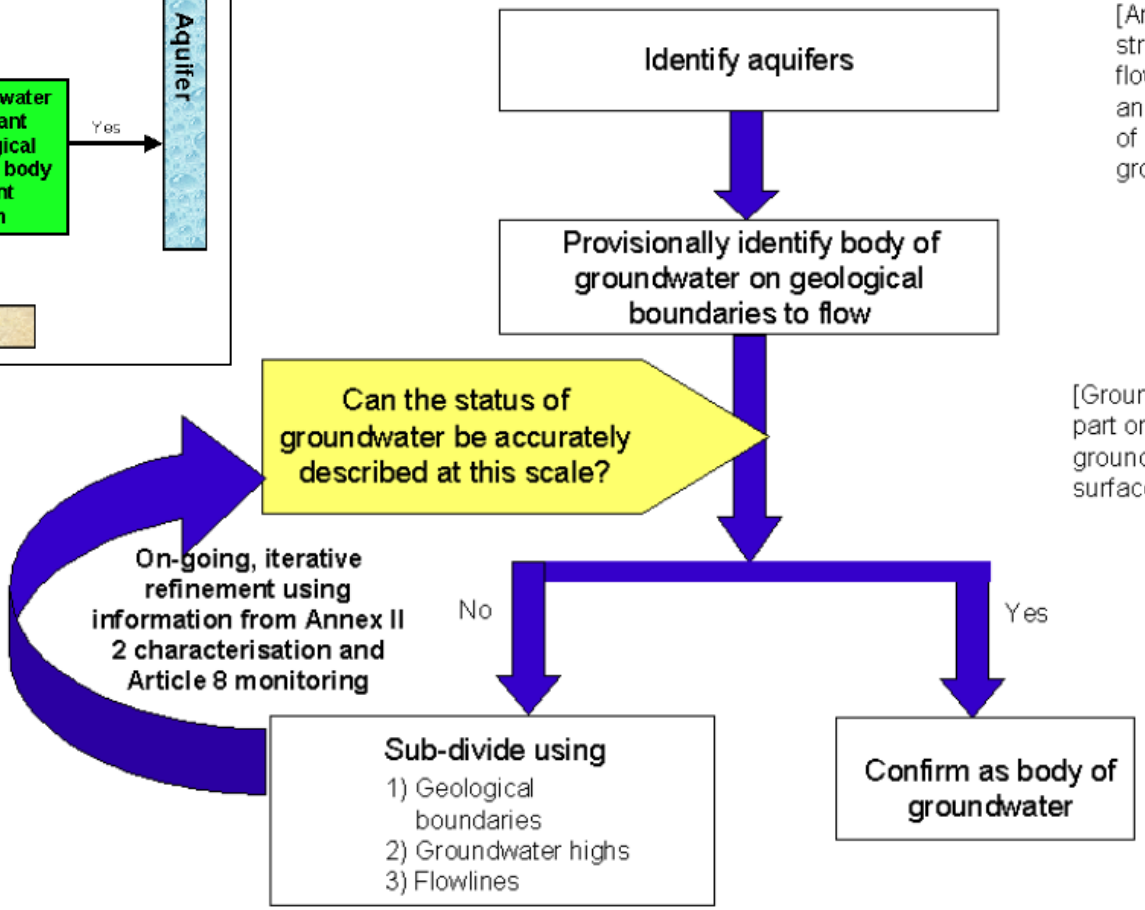
- **Groundwater/surface water nexus**

- **Hydrogeological units**
- **Hydro(geo)chemical units**
- **Groundwater flow systems**
- **Hydrodynamic position** (flow gradient: recharge-transit-discharge)
- **Travel/residence time** (flow velocity)
- **Hydrogeological characteristics** (conductivity, confinement, porosity…)
- **Vertical positioning** (horizons)

} **Management GW**

# Process of GWB delineation (figures)




[An aquifer is a geological strata that provides significant flow to surface ecosystems and/or that permits abstraction of significant quantities of groundwater]

[Groundwater status depends in part on the effects of changes to groundwater quality and levels on surface ecosystems]

Figures from CIS Technical Report No. 2 on Groundwater body characterisation - Workshop 13th Oct 2003

# Process of GWB delineation

- Primary identification of GWB applying
  - Geological boundaries
  - GW catchments / hydraulic boundaries
- Use of further criteria for GWB subdivision
- Iterative delineation process until a proper GWB status description is feasible
- Facultative aggregation / grouping of GWBs

➔ **No limitations on criteria for GWB delineation**

➔ **Analogy of results?**

# GWB Layer amelioration

**Improvement of current GWB reference layer by a coordinated revising of following issues:**

- **Unique GWB code**
- **GWB size and amount**
- **GWB multipart fragmentation**
- **Generalisation of GWB outline / details**
- **Unique GWB position**
- **Data quality**
- **Interpreting Horizons**

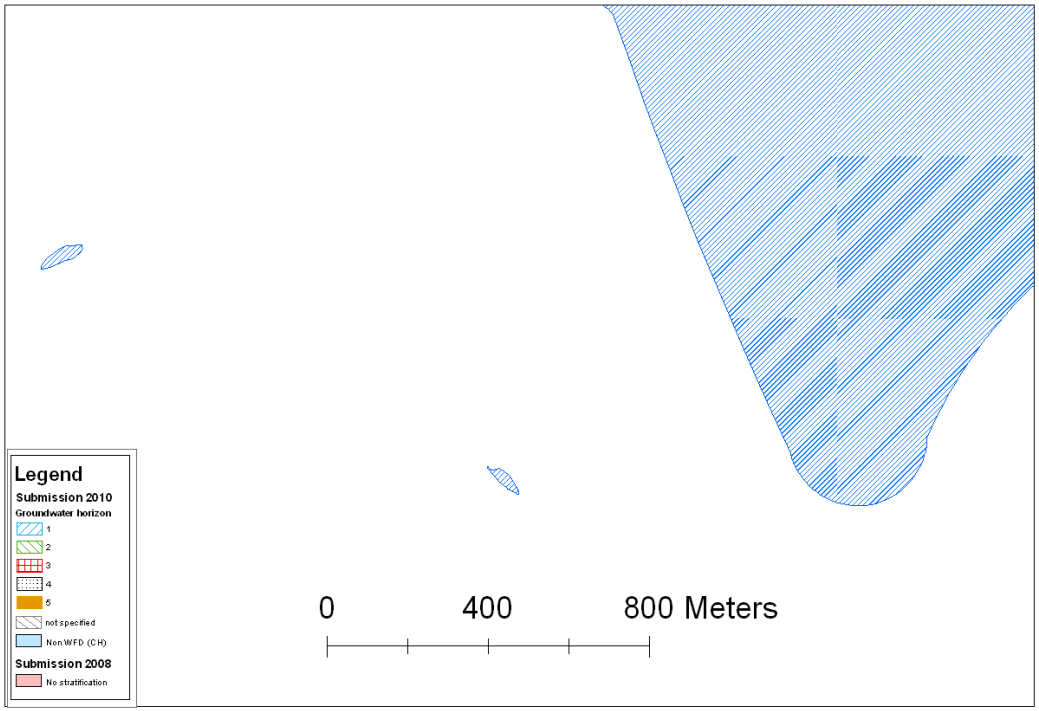
**➔Reports with selected QA issues for every MS will probably be distributed in early 2012**

# Revision - GWB code


➔ **GWB code has to identify a single polygon**

**(Example shows 117 polygons with identical EU_CD_GW)**

# Revision – Size / Amount

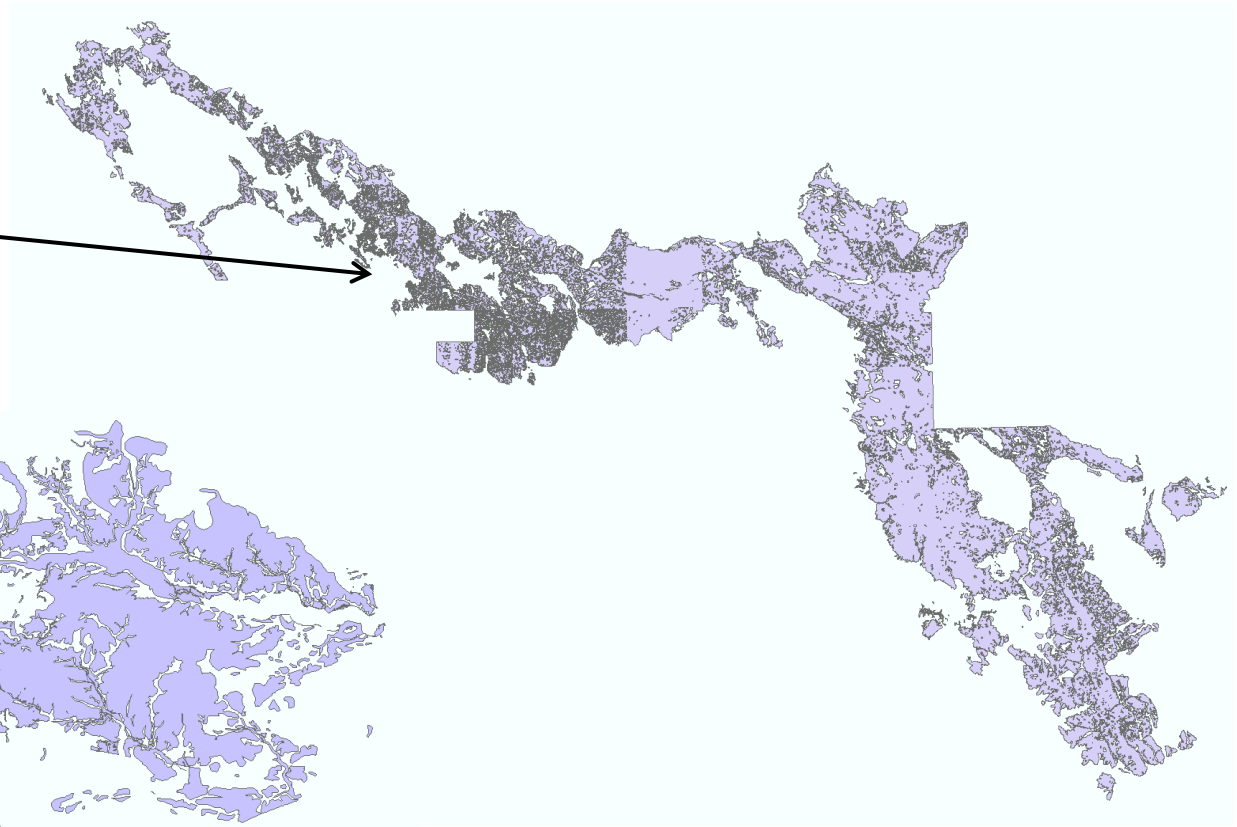


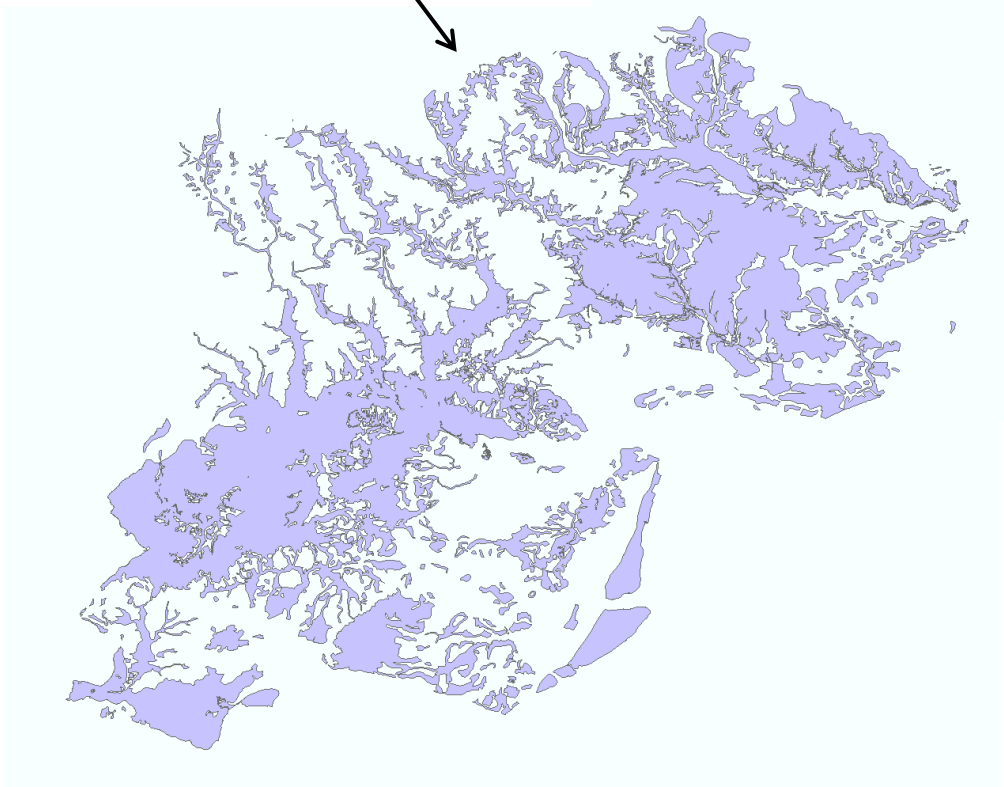


➔**GWBs of small size may be aggregated / generalised**

# Coordination issue – Multipart fragmentation

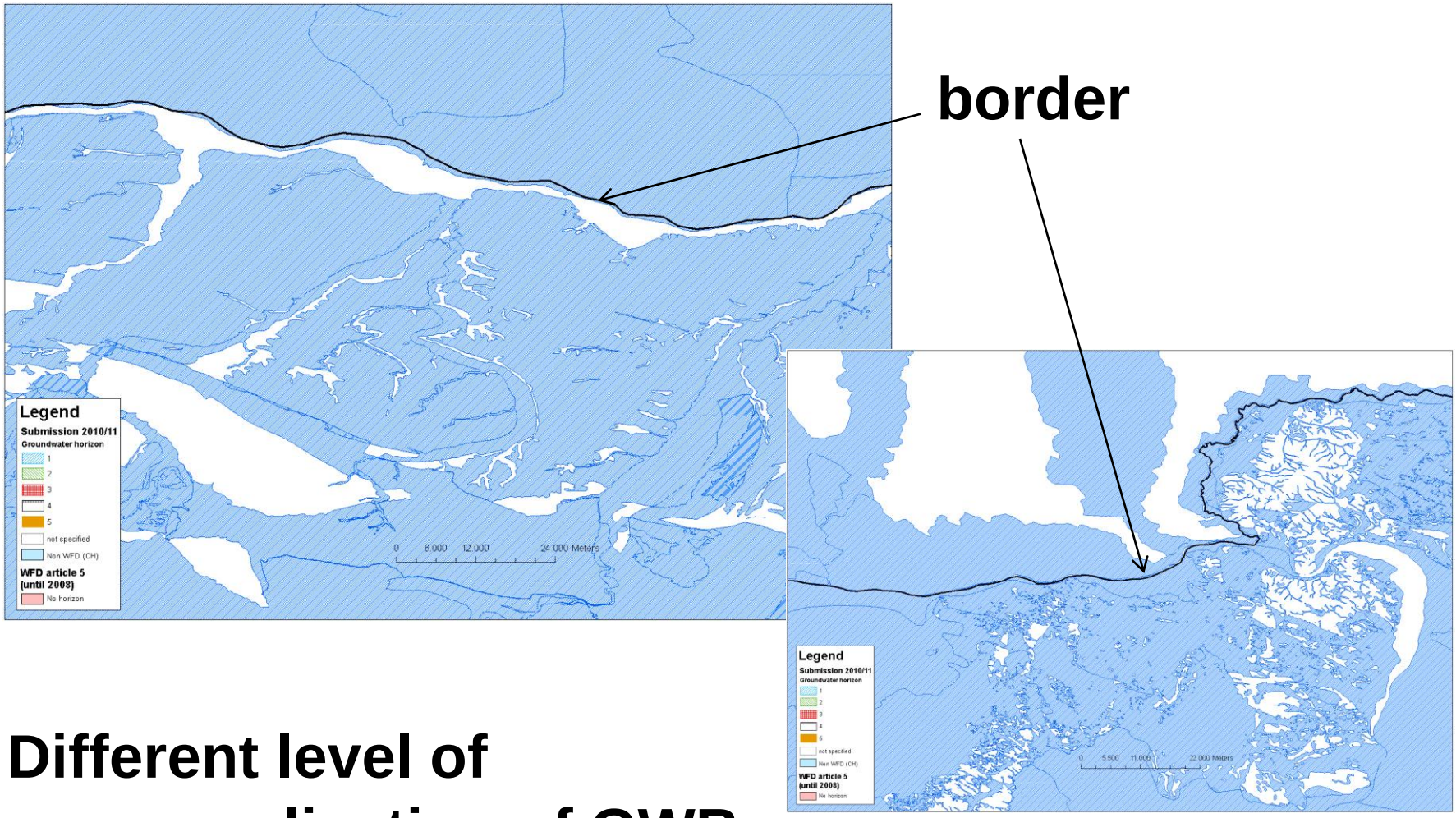
**Multipart polygon consisting of**
**- 1175 elements**
**- 433 elements**





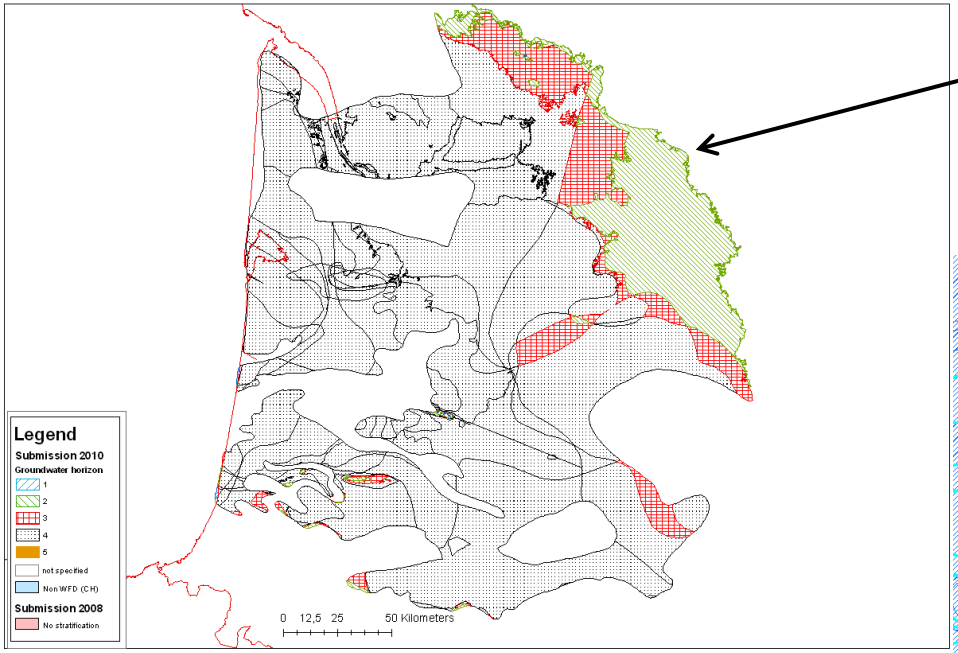
➔ **Generalisation**

# Revision – Level of details

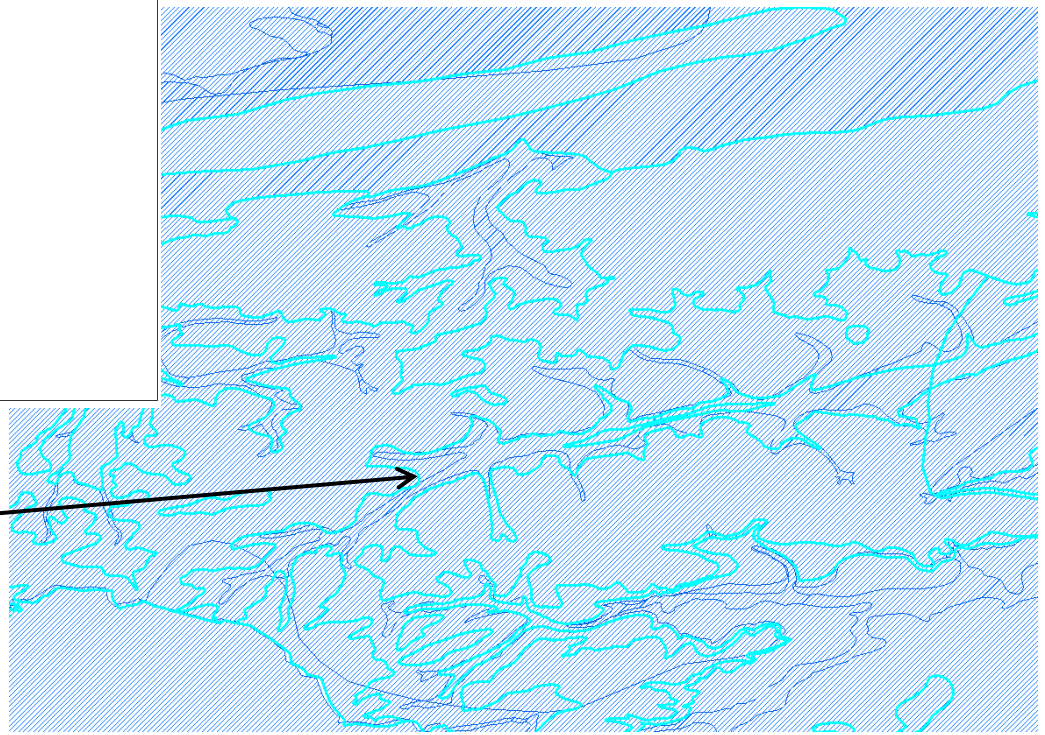



➔ **Different level of generalisation of GWB delineation in neighbouring contries**

# Revision – GWB unique position




**GWB FRFG080 consisting of several polygons in several horizons**

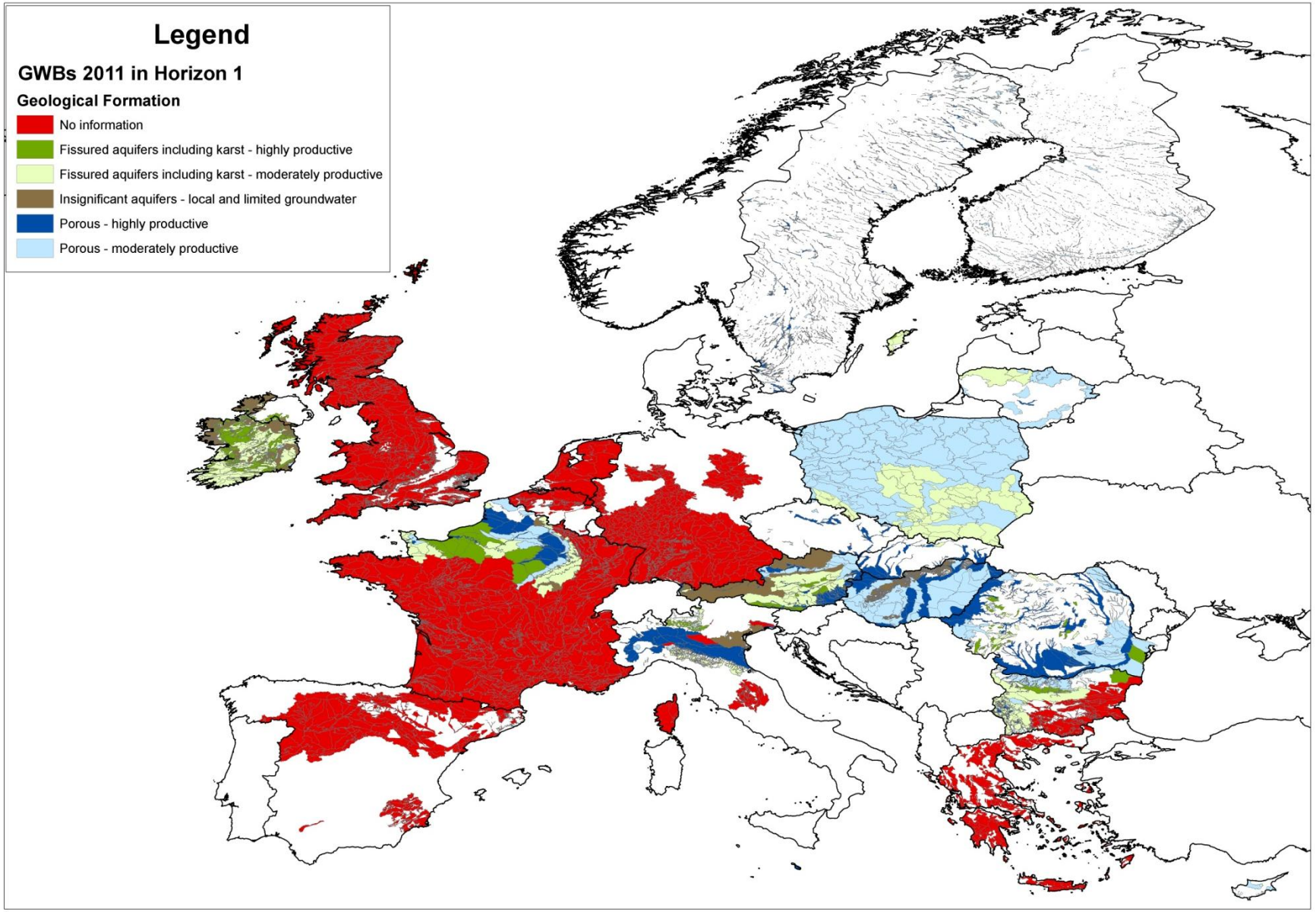


**GWBs in horizon 1 overlying each other**

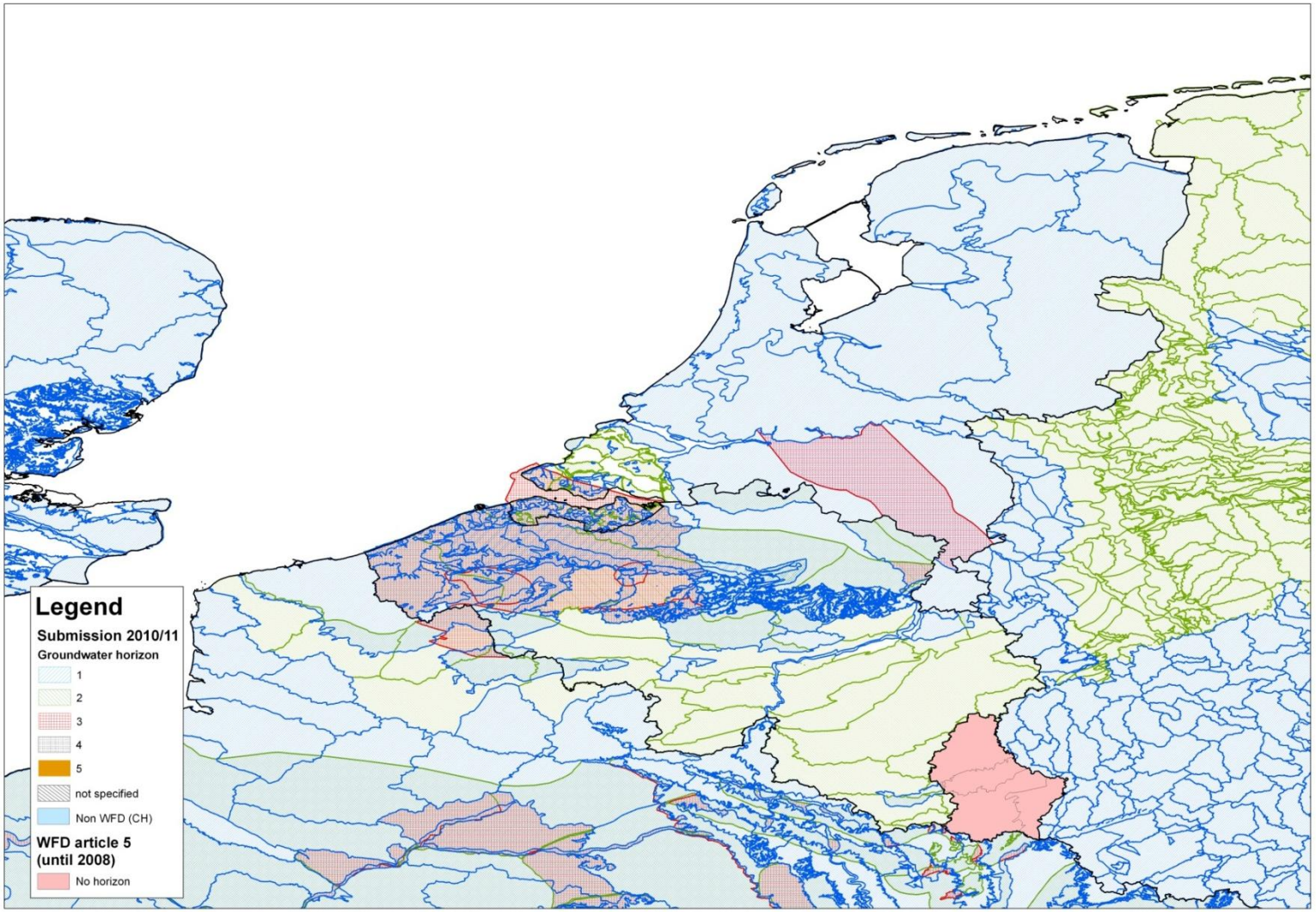
➔ **GWB - single horizon**

➔ **No overlying GWBs in same horizon**

# Coordination issue – Attribute data quality



# MS Coordination – Example map



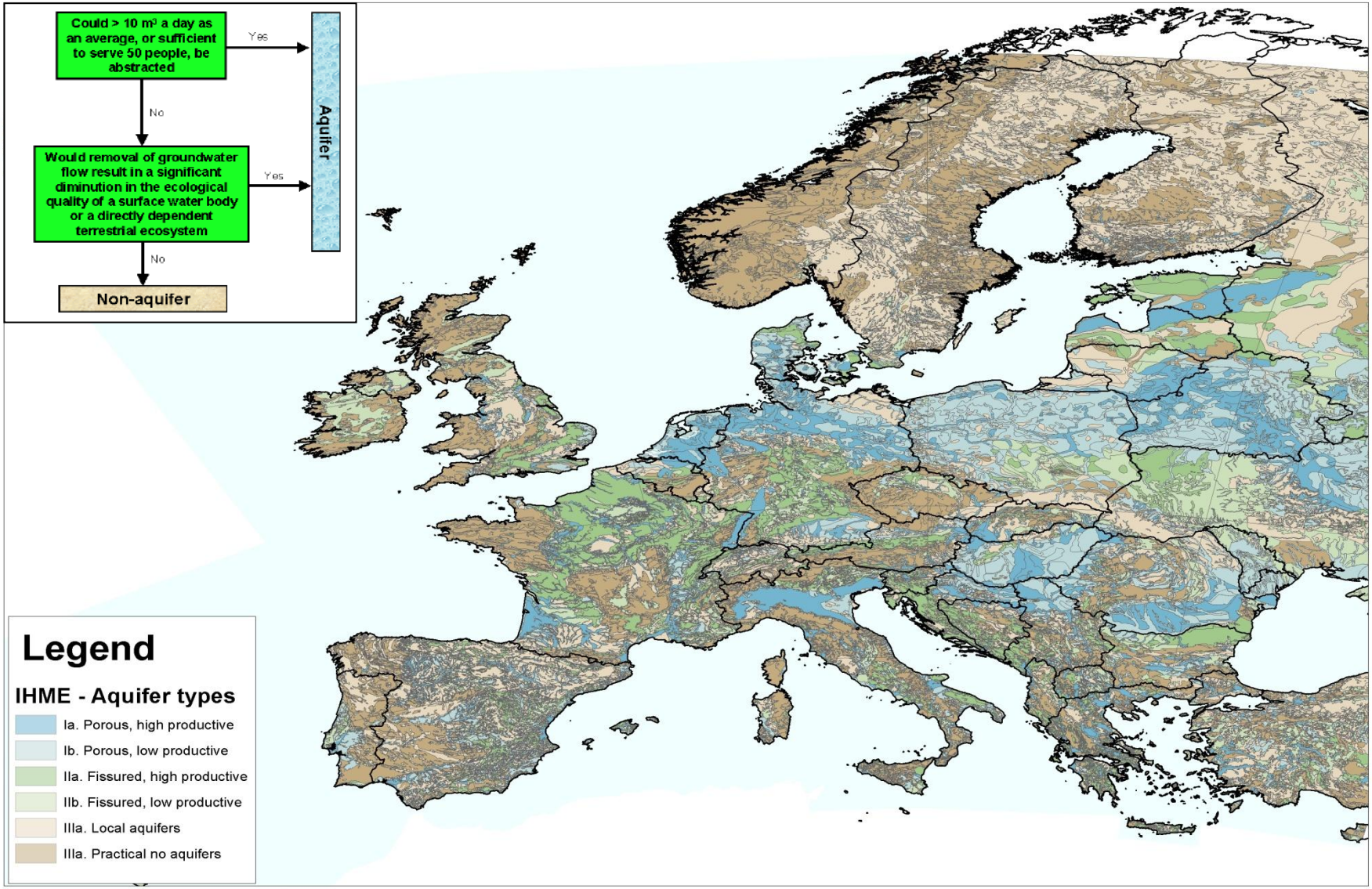

**Boundary transition / Horizon / Outline details / Size**

# GWB Layer and IHME

- **IHME ➔ International Hydrogeological Map of Europe on a scale of 1 : 1,500,000**
- **Europe-wide coherent mapping of groundwater units and features related to groundwater**
- **Several GIS themes are in process of digitisation**
- **Theme Aquifertype (colour wash ) close to publication**

**➔ Instrument for identifying and/or describing GWBs?**

# IHME – GIS Layer Aquifer type



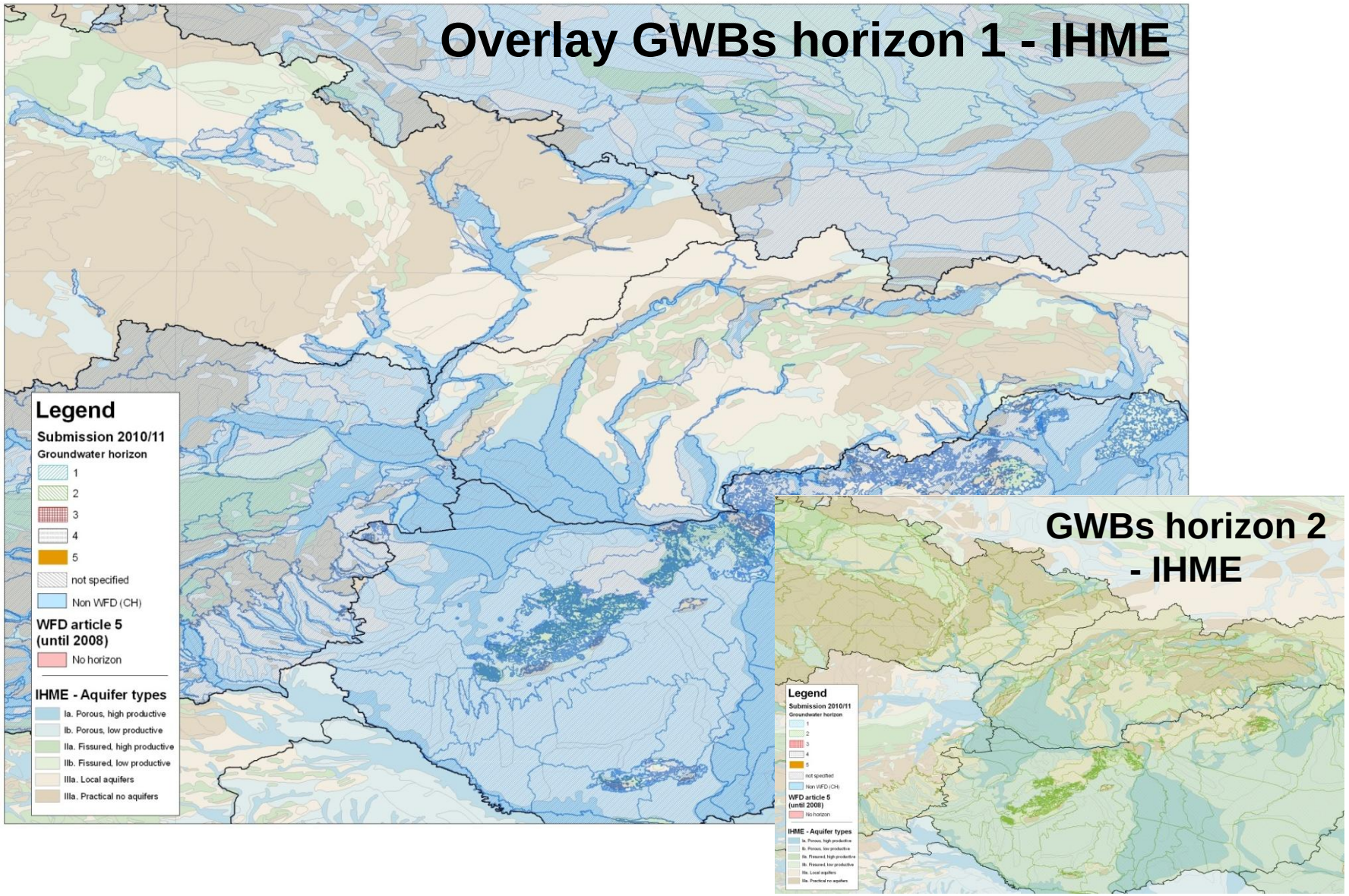
# GIS Guidance – Horizon assignment

| Code of horizon name | Name of horizon | Brief description |
|---|---|---|
| UP | upper | Alluvial deposits, locally delineated |
| M | main | Different geological age of GWBs including quarternary sediments, in principle the entire area of RBD/country |
| D1 | deep | Locally delineated Cretaceous sediments (Turon and Cenoman) |
| TH | thermal water | Locally delineated thermal waters |

- **Outdated methodology taken from GIS Guidance Document 22, App. 13.3, p.21 (2009)**
- **Currently horizons are numbered**

➔ **Importance of methodology to assign horizons 1 and 2 because main GWB amount**

# Horizon assignment – Case study CZ/SK (Maps)

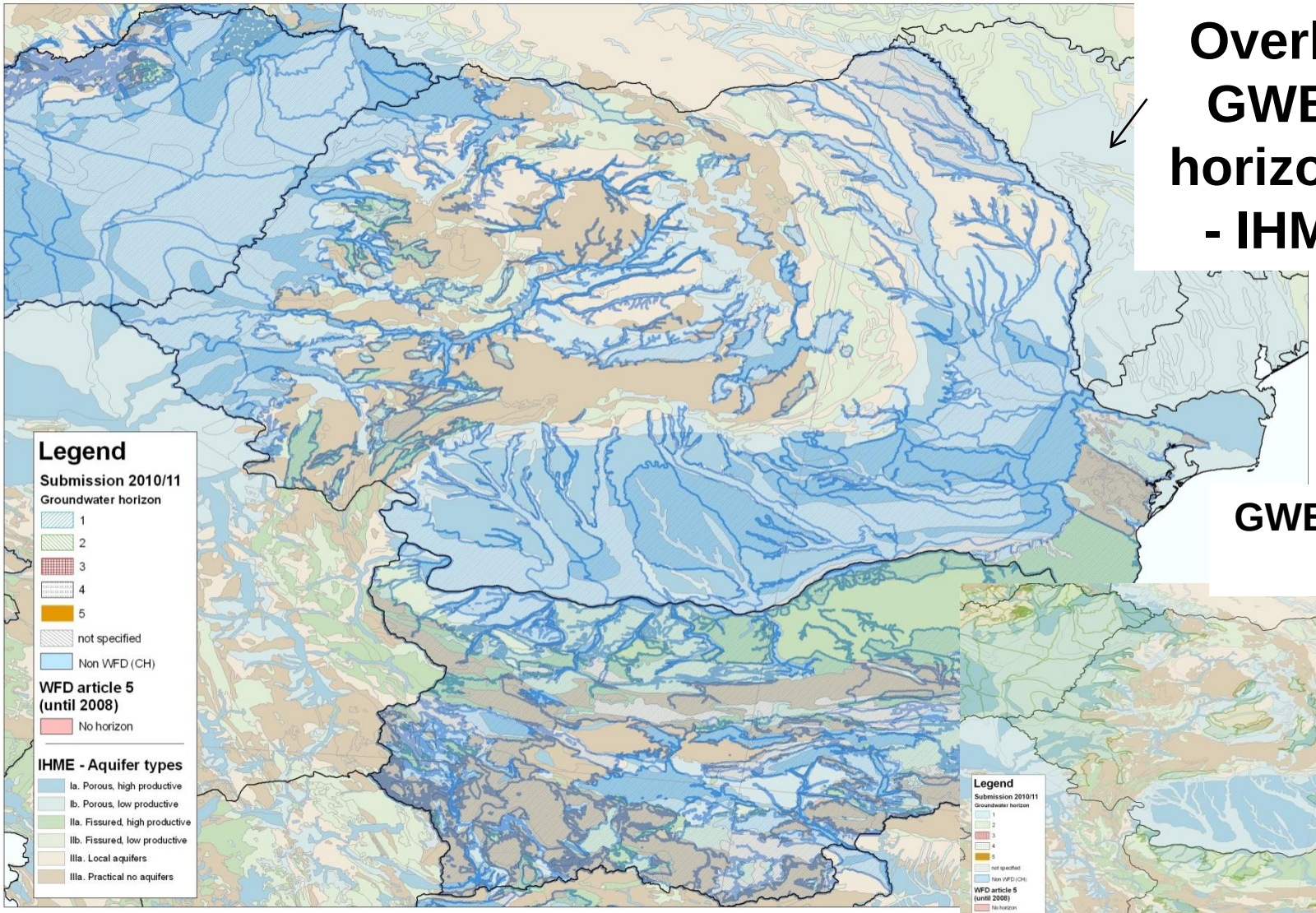


# Horizon assignment – Case study CZ/SK (Conclusions)

- **Good coordination between CZ und SK**
- **Coordination deficits concerning other neighbouring MS**
- **GWBs in horizon 1 of CZ and SK are mostly conform with alluvial aquifers mapped in IHME**
- **GWBs of horizon 2 cover whole territory of CZ/SK**

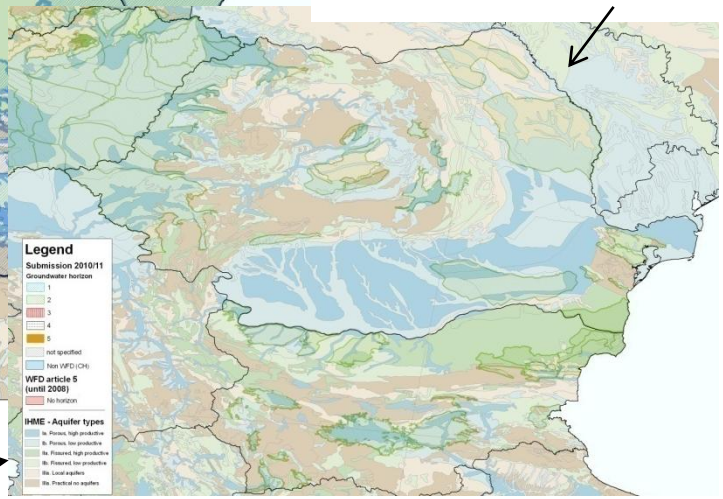
➔ **Example of applied horizon assignment according to GIS Guideline**

# Horizon assignment – Case study RO / BG




**Overlay GWBs horizon 1 - IHME**

**GWBs horizon 2 - IHME**



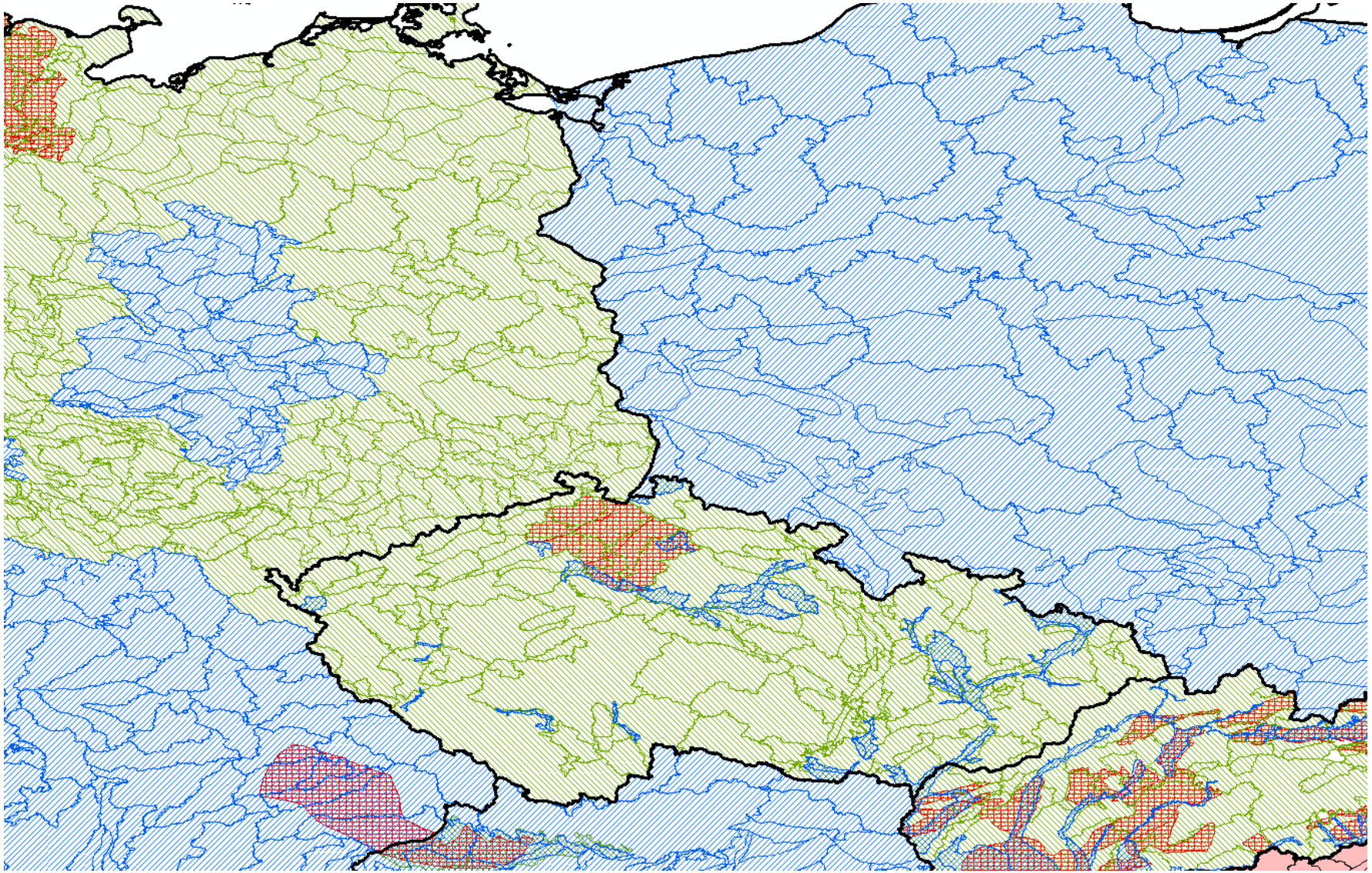

**Overlay GWBs horizon 2 - IHME**

# Horizon assignment – Case study RO / BG (Conclusions)

- **GWB delineation is coordinated between RO, BG and HU, but may be optimised (especially horizon 3)**
- **GWBs in horizon 1 of RO and BG correspond in many respects with alluvial aquifers mapped in IHME**
- **GWBs of horizon 2 do not cover whole territory**

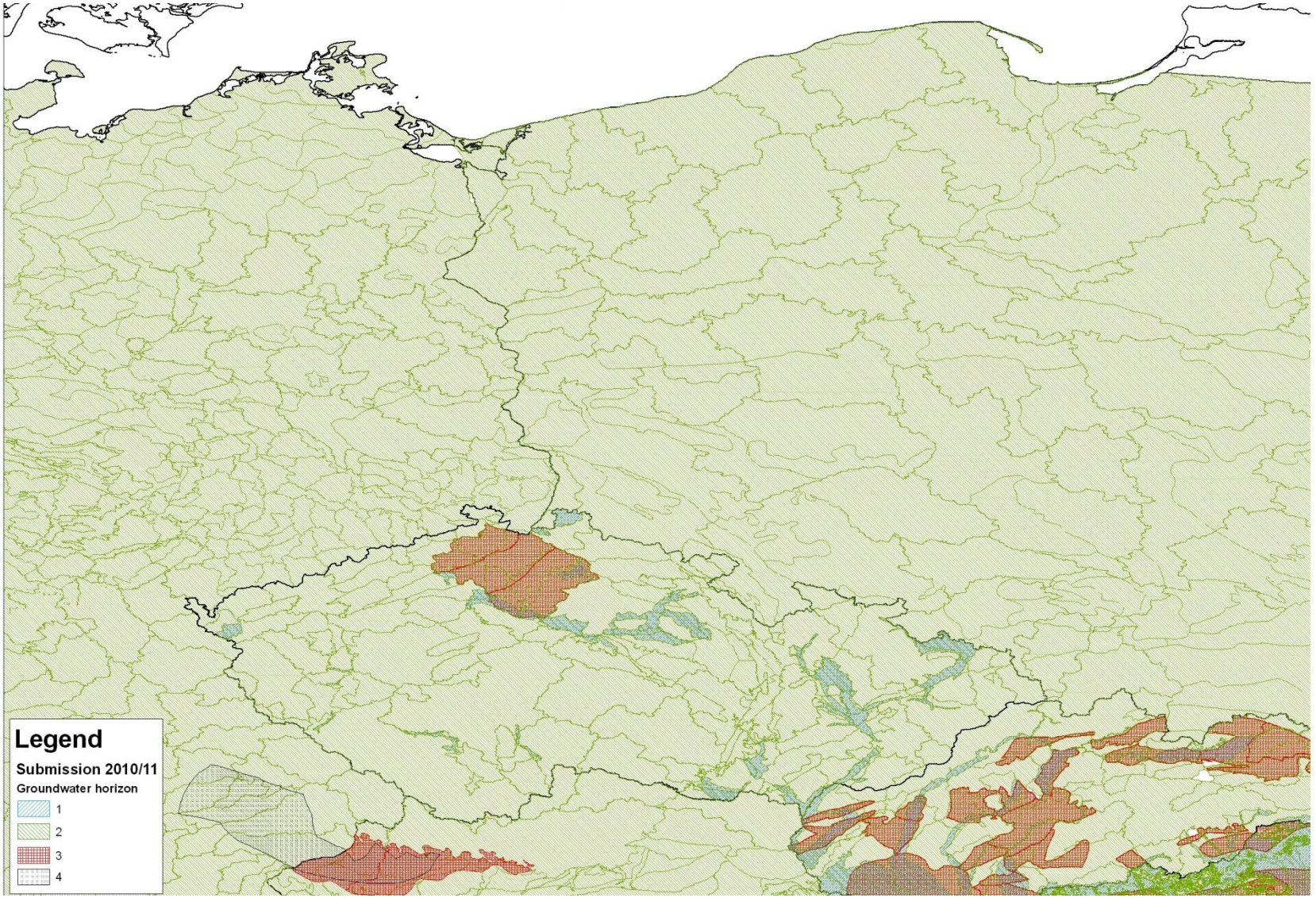
➔ **Example of an applied horizon assignment according to GIS Guideline with variations**

# Horizon assignment – Current status



➔ **Horizon allocation changes along borders**

# Horizon assignment – Solution proposal




**GWBs of DE, AT, PL in section ➔ horizon number + 1**

# Common Vision – Summary

- **Improvement of current draft status of GWB GIS Layer**
  - **Iterative process of GWB qualification not completed**
  - **Correction of deficiencies requested (QA issues by MS!)**
  - **EU wide harmonisation and common standards required**

  **➔ Suggestions / guidance from this workshop**
- **Intensified EEA – EGS cooperation**
- **IHME constitutes a basis for a harmonised GIS layer**
  - **Subdivision of aquifers and non-aquifers**
  - **Additional information of aquifer lithology, faults and springs**
  - **Relation to GW dependent ecosystems missing!**
  - **Update necessary (analogy to OneGeology Europe?)**

  **➔ Digitising IHME, interpretation for EU GWB GIS-layer and updating**