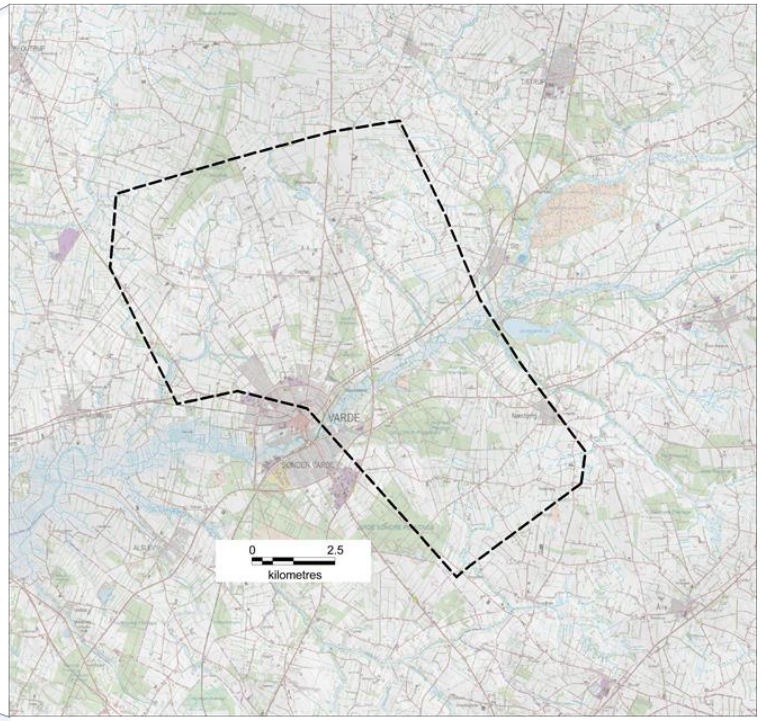
Pilot area reference

WP

Varde Pilot Area

+ Varde: 14,000 inhabitants
+ Lerpøtvej Waterworks: 1,3 mill m3/year



Challenges

- related to drinking water

- Organic content (brown water) in Miocene aquifers and aquifers related to interglacial layers
- Pesticides in shallow, unprotected aquifers
- Nitrate problems in shallow aquifers
- High iron content especially in buried valley aquifers
- Saltwater issues in some deep aquifers

- Blue: water supply wells
- Red: wells extracting groundwater containing pesticides

Challenges

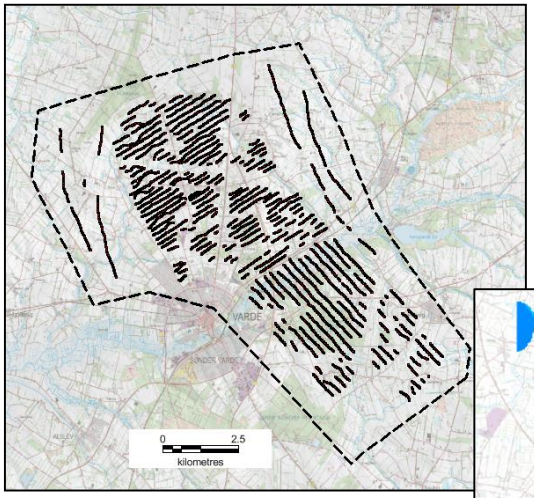
- faced by the water supply

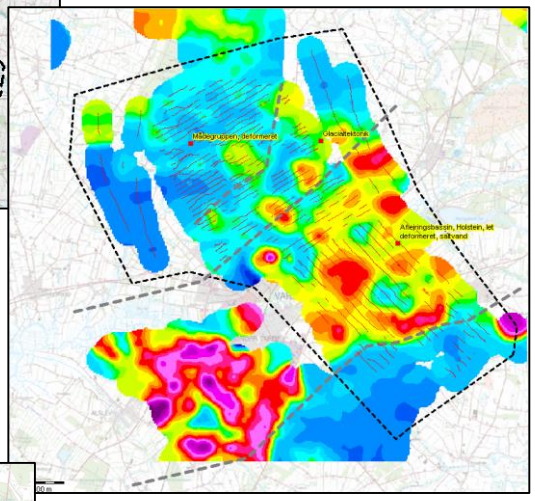
- More production wells are needed
  A secure sustainable drinking water supply
- Protection of future recharge areas against pollution
- Glacial tectonics with huge impact on near surface geology
- Climate adaption issues:
  Rising ground water levels and groundwater flooding?

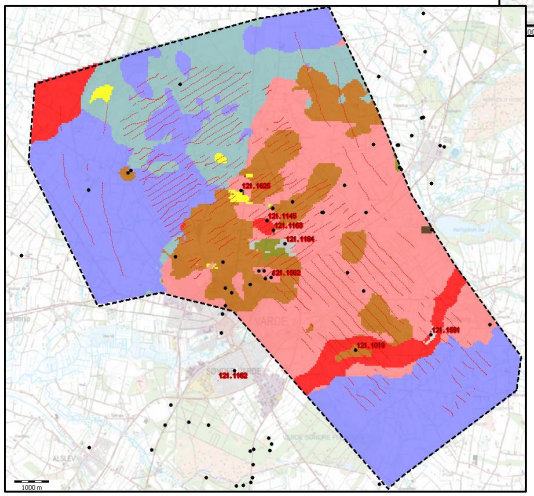
+ **TopSoil contribute to at better understanding of the subsurface**
+ **Improved decision making in the local water management**
+ **Sustainable water supply**

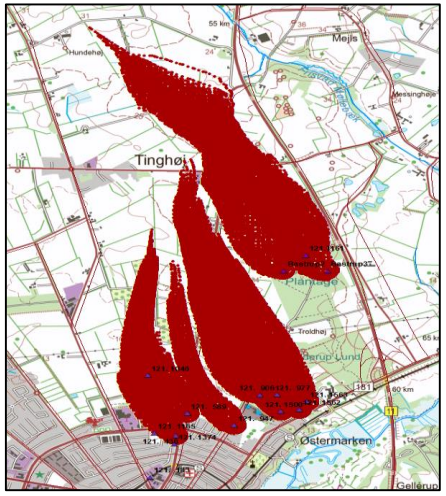
Current status

- A highly detailed SkyTEM survey was conducted early 2015
- Geological interpretation – conceptual model
- Preliminary 3D geological model (voxel model)
- Hydrological modelling of catchment scenarios



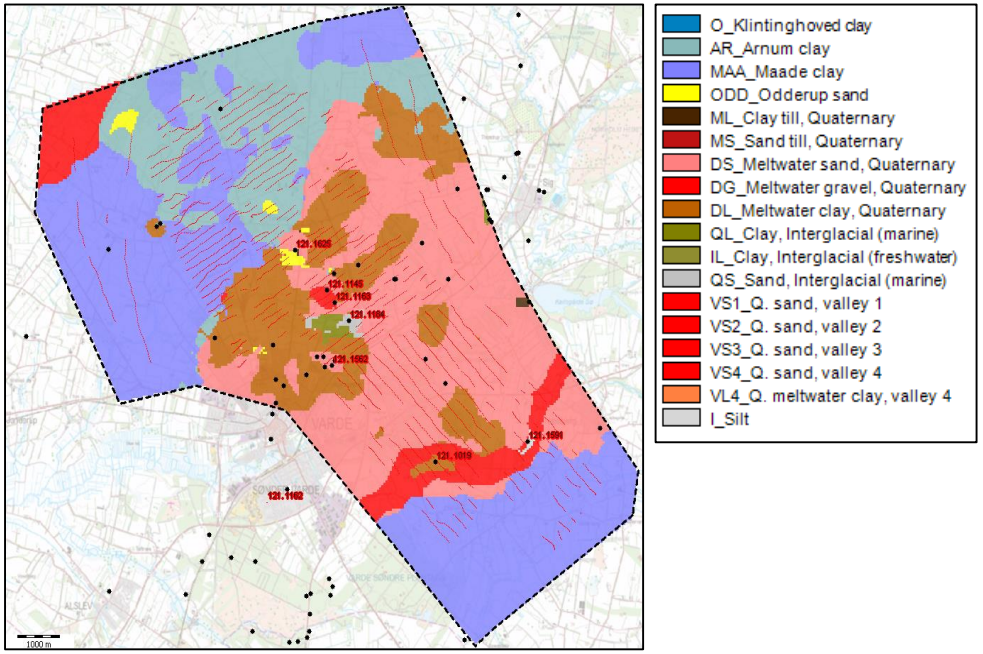


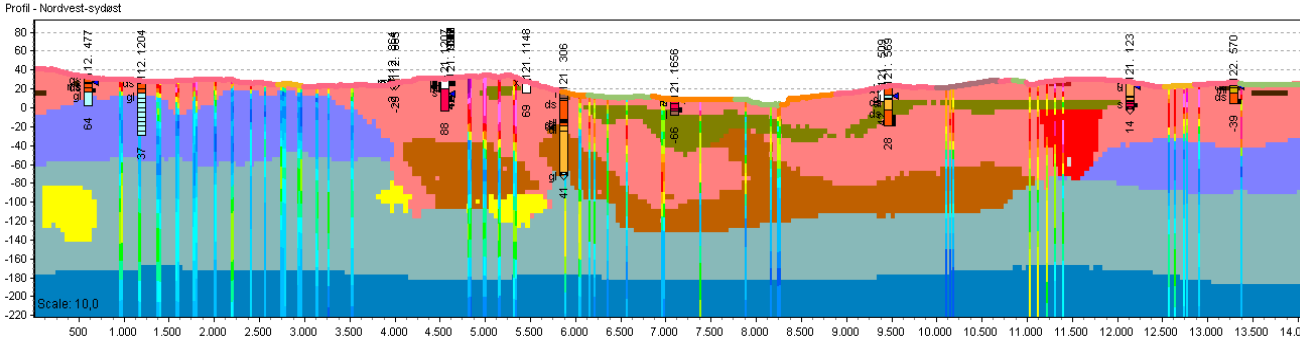




3D geological model

+ Combined layer and voxel model
+ Prepared for detailed updating of the uppermost geology when more geophysical data are collected





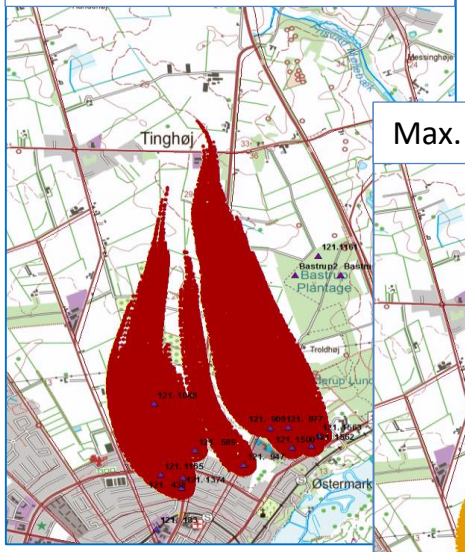
Hydrological modelling

+ The geological voxel model fully integrated in the hydrological model
+ Model scenarios including different production wells and yearly extraction rates

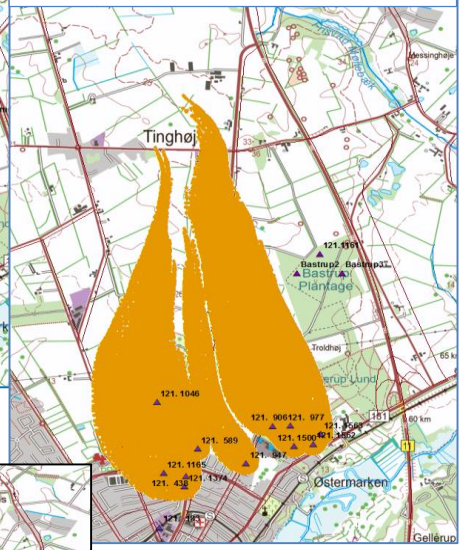
Next activities:

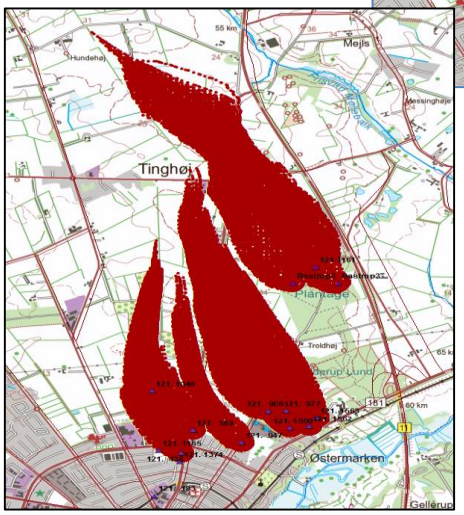
+ Hydrological modelling of new well field
+ Refining of hydrological model discretization to detailed voxel geology (25x25x2.5 m)
  - In upper 30 meters
  - In focus areas for new well fields
  - MODFLOW-USG (Un-Structured Grids)
+ Model climate change scenarios
+ Analyze groundwater flooding risks

Present extraction and wells



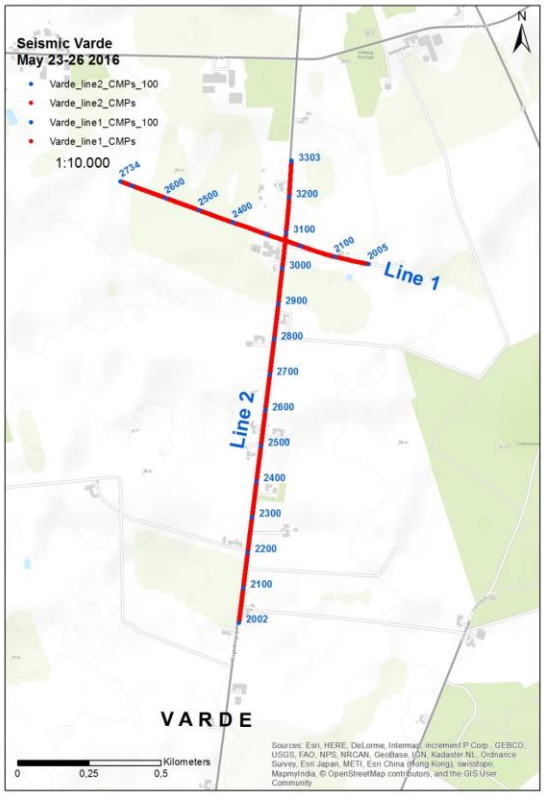
Max. permitted extraction

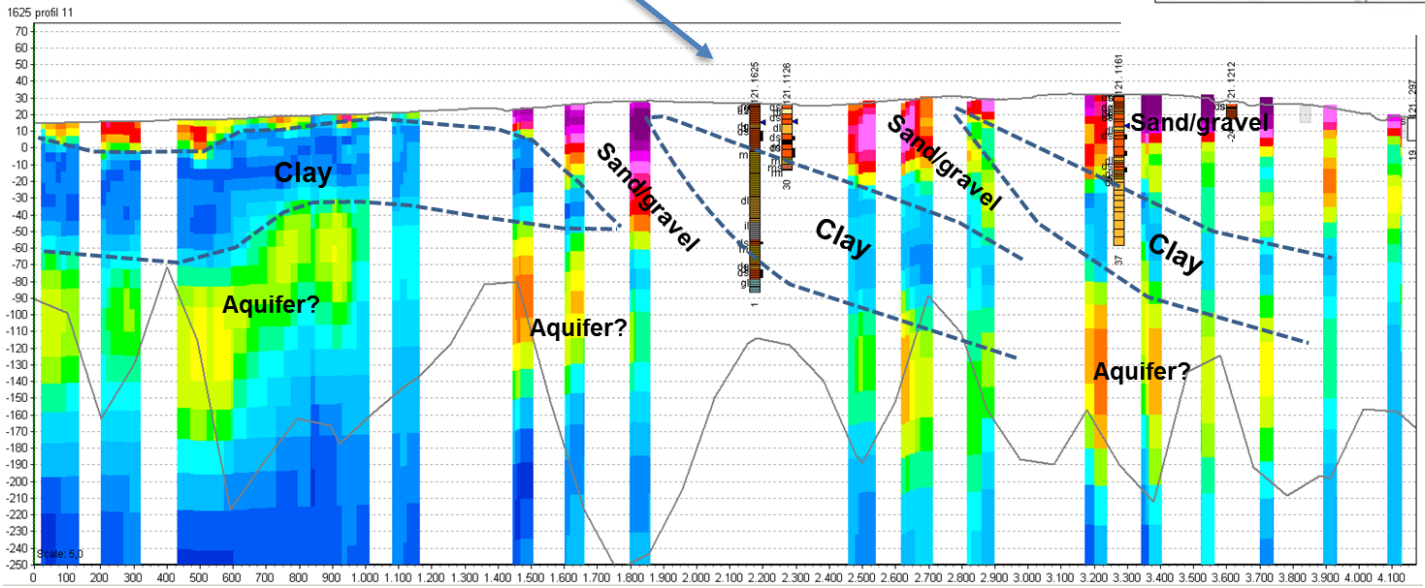




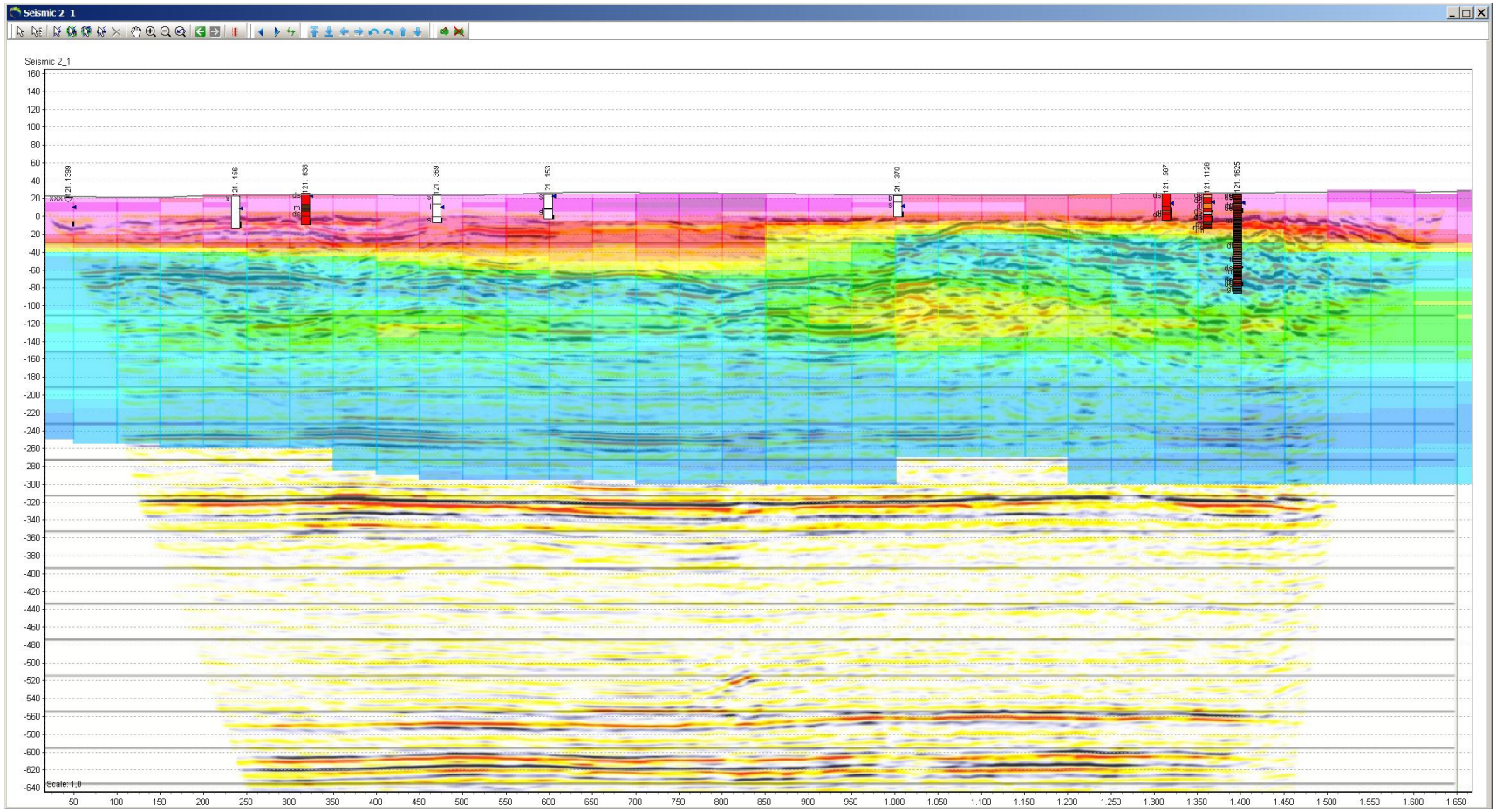
Seismic survey

+ Possible new well field?

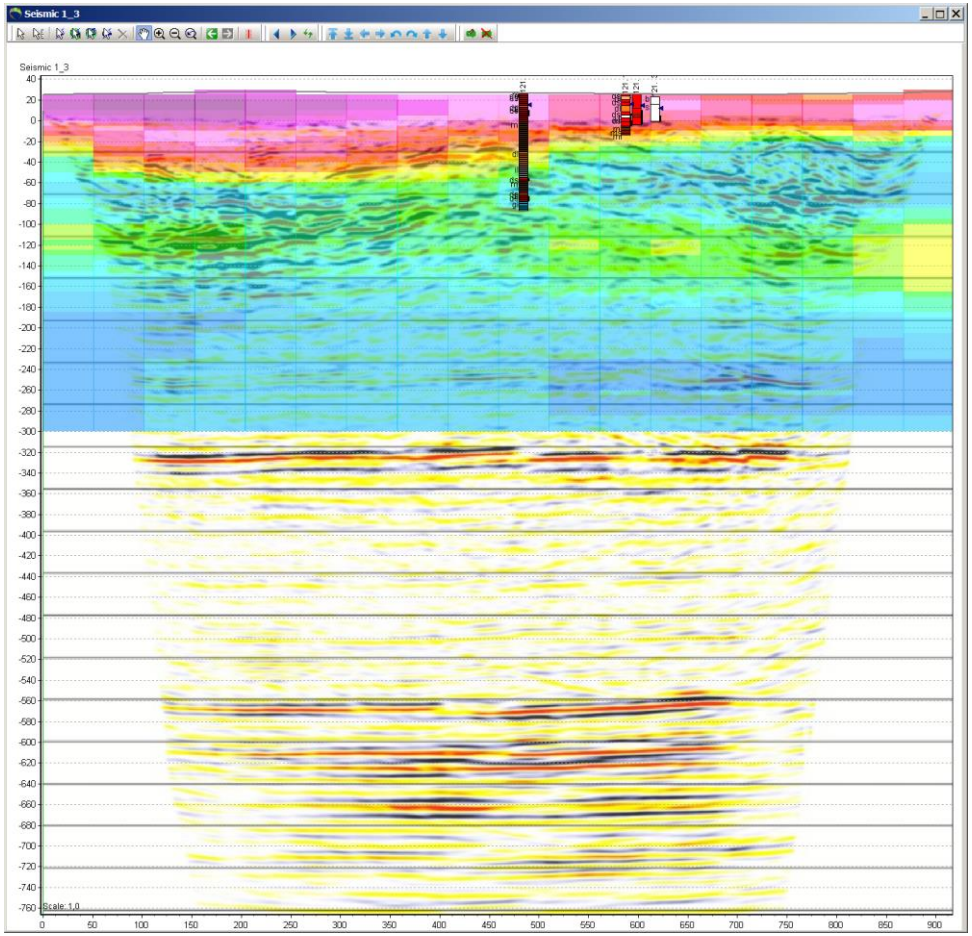




Seismic line 2

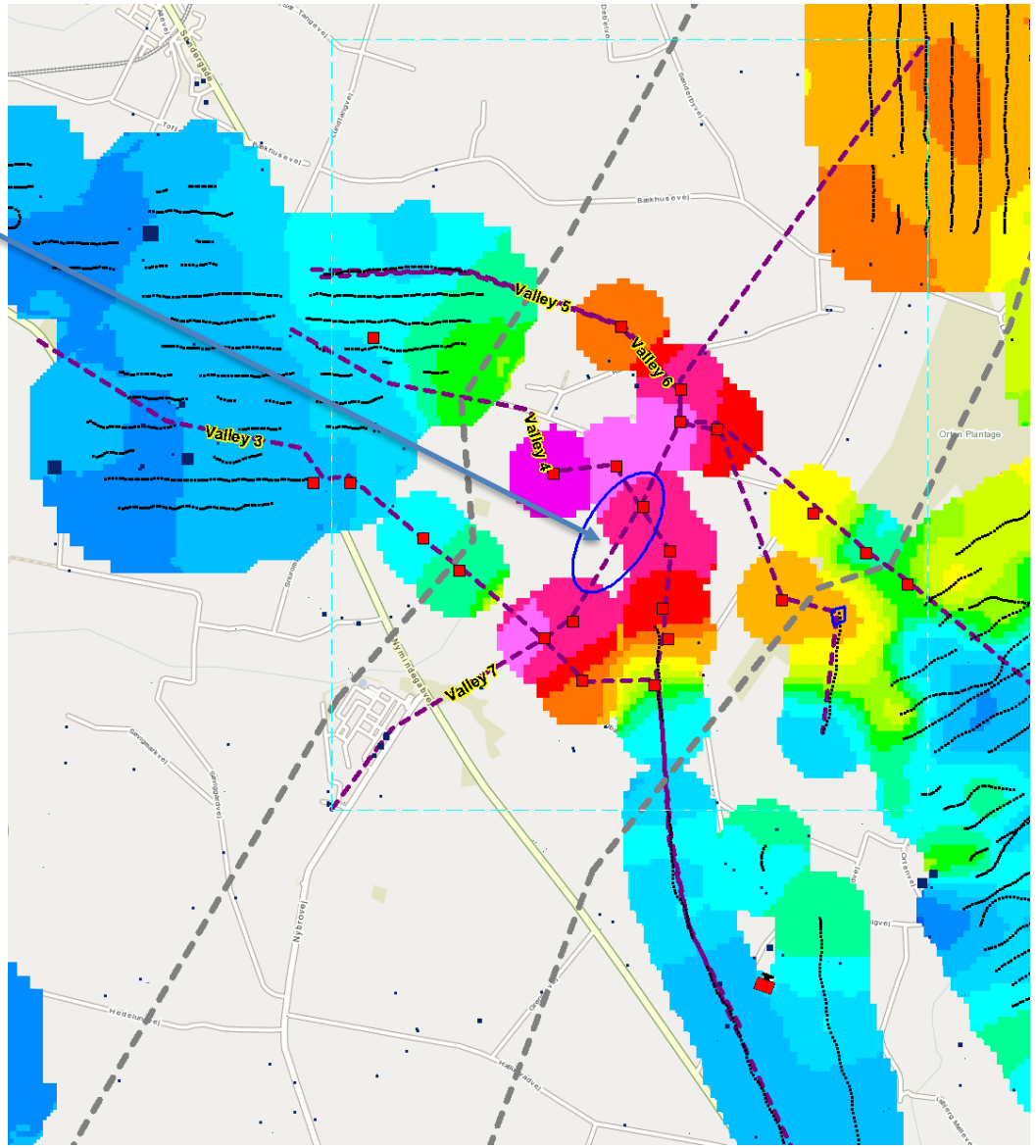


Seismic line 1



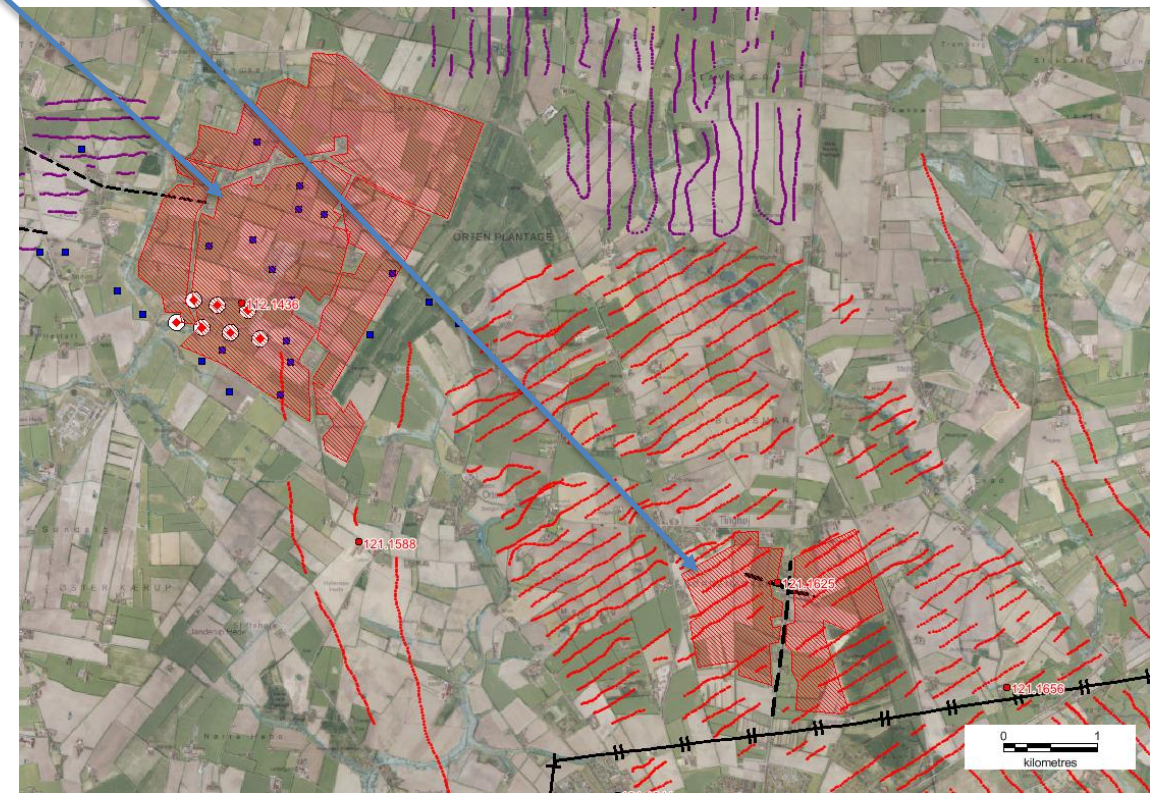
New well field!?

- SkyTEM and walk TEM revealed an unknown buried valley
- An exploration well was recently drilled
- Water quality is currently evaluated
- The well field will probably be moved to this new location



tTEM survey

+ The survey is going on right now..



Next activities

- The 3D geological model will be updated with detailed information from tTEM
- New wells will be drilled at the new well field
- Vulnerability maps will be produced
- The groundwater flow model will be updated with the improved geological model
    - Groundwater catchments and recharge areas updated
    - Different groundwater and climate change scenarios
    - Climate change effects will be simulated
    - Analyze groundwater flooding risks
- Action planning with stakeholders to protect the well fields against pollution and future climate change effects

Pilot area reference

WP

My most important outcome

Please indicate to which WorkPackage indicator the activity contributes:

So far only:

- WP 4 Field investigations and technical development
- WP 5 Interpretation of data and modeling

Pilot area reference

WP

My network

What data was necessary to achieve my results?

+ SkyTEM, WalkTEM,
+ Seismic reflection survey
+ (tTEM)
+ (Drillings)

Which stakeholders are involved?

+ The local water supply – DIN Forsyning
+ (Varde municipality?)
+ (Farmers and their organisations?)

Pilot area reference

WP

Challenges & solutions

- **What are the challenges experienced and/or expected**
  - We are behind scedule!
  - Difficult to catch up
  - We cannot engage stakeholders before we know the exact well field location and catchment areas

- **Help from other partners would be particularly useful for…**
  - Groundwater protection planning (if we cannot engage stakeholders)
  - Climate change adaption planning (if we cannot engage stakeholders)

Pilot area reference

WP

Questions to the TOPSOIL consortium

\+ ....