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LUNDS TEKNISKA HÖGSKOLA  
Lunds universitet

Teknisk geologi  
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## VÄLKOMMEN TILL PRESENTATION AV EXAMENSARBETET

The effect of groundwater extraction rates on nitrate  
vulnerable recharge areas (NFI) in Denmark  
MIKE SHE simulations of different extraction scenarios

by

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**Time:** Friday 15 June at 14.15.

**Place:** Meeting room, Teknisk Geologi, V-huset, floor 2.

**Opponent:** Vacant

This thesis aims to outline the effect of different abstraction scenarios on the extent of nitrate vulnerable recharge area (NFI) in two study areas in Denmark. NFI were designated in order to protect vulnerable groundwater resources from nitrate pollution, where the geology overlying the aquifers does not serve as a sufficient barrier. NFI are officially calculated by taking into consideration the recharge area at the permitted abstraction rates of the waterworks, however those rates are often much higher than their actual abstraction.

Two existing MIKE SHE groundwater models were chosen, and several abstraction scenarios were simulated with regard to the change in groundwater recharge area they produce. The studied areas were Halsnæs and Brokilde in the north of the island of Sjælland.

The results of the simulations especially in Brokilde show a significant difference in NFI of 81ha between the actual and the permitted scenario. Also, scenarios in between the actual and the permitted abstraction were simulated, those follow the trend clearly. The results in Halsnæs were not that sharp, since the observed wells were not concentrated in one place as in Brokilde and abstraction rates were significantly lower.

The decrease of NFI for the actual abstraction rates can be of particular interest for municipalities, since the designation of NFI results in costs for reimbursing farmers for their effort to use less nitrate for example. In order to apply the results of this thesis to other areas, further investigation and the simulation of more abstraction scenarios are required.

This study forms a degree project within the MSc programme Water Resources Engineering at LTH/Lund university and it has been carried through in co-operation with Ramböll, Copenhagen (supervisor Gerhard Barmen, Engineering Geology, co-supervisor Paul Thorn, Department of Water Resources, Ramböll; examiner Jan-Erik Rosberg, Engineering Geology).