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Using GSI techniques to improve modeling results on a river valley scale: integrated water management in an EU WFD context

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Due to the ongoing exploitation of the Danish groundwater resources for drinking water purposes, new sites for the development of well sites are continuously investigated. Volsted plantation, situated approx. 20 km to the south of Aalborg, is one such site. At this site, several limitations apply with respect to groundwater abstraction.

Groundwater surface water interaction (GSI) has been investigated as part of a plan for establishing a new battery of wells with an anticipated abstraction of 1 mill. cubic m/y. While the aquifer conditions at the investigated site are favorable for abstraction, there are a number of minor streams and springs in a nearby river valley that are potentially vulnerable to changes in groundwater level. In addition, the area holds a variety of nature and commercial interests down gradient e.g. an EU habitat area and a fish farm as well as recreational and other nature and public interests that could be affected by significant water abstraction. Therefore, a detailed groundwater model has been set-up for the area to investigate the effect of water abstraction on stream flow, habitat areas etc. The detailed studies address the requirements of the EU Water Framework Directive not least with regard to the critical issue of GSI. The investigations are subdivided into two phases on two different scales. In the first phase the objective is to simulate effects on stream flow on a river valley scale (~ 100 m). At this scale the traditional geological and morphological data are sparse and an intensive data collection programme was initiated. The results show that improved accuracy in model configuration enables a far more detailed simulation of the local flow system at river valley scale. Moreover, the results of the model show excellent agreement between observed and simulated

groundwater heads. In the up-coming second phase, the intent is to simulate GSI on a flow pattern scale (~ 10 m). These investigations will be finalized in the summer and autumn of 2007.