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The chalk karst of south east England: groundwater vulnerability due to anthropogenic hazards

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The Cretaceous age Chalk of south east England forms a large and very important aquifer. This part of England is experiencing one of the driest periods since the drought year of 1976 as climatic trends show that rainfall has reduced and replenishment of the aquifer is lower than might have been expected. As both river levels and water table levels fall, the need to protect and conserve groundwater supplies is now more important than ever. However, among the problems facing suppliers and regulators, is the maintenance of good quality groundwater resources that do not require expensive pre-treatment, or worse still, a loss of resources through major pollution.

Chalk is a dual porosity aquifer, storing large accessible volumes of groundwater within bedding planes and other tectonic discontinuities. The storage and transmission of groundwater is enhanced by subsurface karstic weathering. To date conventional groundwater modelling has been used to delineate groundwater protection zones and much reliance has been placed on the nature and permeability of surface cover above the chalk for protection. This approach, as discussed, is flawed and does not take proper account of the karstic nature of the Chalk.

The land surface above the Chalk is heavily developed with many large towns and cities, major road/rail transport routes and is also extensively farmed. Within the pattern of development there are many potential point sources (eg landfills and industrial premises) and diffuse sources of pollution (eg farming activities). There is also an historical legacy of past contaminating activities (eg tanneries & gas works).

It is recommended that conventional hydrogeological modelling, used for evaluating groundwater protection, needs to be enhanced using a revised approach that takes into

account the karstic geology and geomorphology of chalk. As case studies demonstrate, it is very important that the formation of chalk karst is assessed via specialist geomorphological mapping techniques and that reference is made to the available national PBA/DEFRA natural cavities database that contains a wealth of relevant information. Continuing reliance on vadose zone attenuation of contaminants and protection afforded by the presence of low permeability clay cover deposits is not realistic in a karst setting. If robust, sustainable environmental management of the chalk aquifer is to be maintained for future generations then its karstic nature needs to be taken into better account by regulators, water suppliers, developers and consumers.