Groundwater protection zone delineation at a large karst spring in western Ireland

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Abstract

Pouladower Spring is a large karst spring in County Clare, Ireland which is being considered for use as a public supply. Groundwater protection zones have been delineated as a water quality management strategy for the spring. The Irish national groundwater protection scheme methodology is adapted to take account of the hydrological and hydrogeological complexities of the karst regime. The catchment area for the spring is large (approximately 380 km2) and comprises the zones of contribution for two major outlets of water, the spring and the River Fergus. The actual zone of contribution to the spring varies with different water level conditions and the risk to the source from any point within the catchment, at any given time, is less than that for a conventional groundwater source. The catchment area is highly vulnerable, but dilution and sedimentation occurring in the lakes up gradient of the source, the high throughput, and the contribution from fissures outside the main flow conduits have helped maintain good water quality at the spring. The source is considered to be a combination of both groundwater and surface water as they are intricately inter-linked throughout the catchment. An Inner Protection Area is delineated which does not provide the 100-days travel time to the source required by the national scheme, as this would be impractically large and over-protective. Rather, it delineates the area of highest hydrogeological risk to the source and should allow the local authority sufficient time to act in the event of an accidental spill. A certain degree of microbial contamination is inevitable in a karst regime and treatment is essential, as it would be for a surface water source. The remainder of the catchment is classed as an Outer Protection Area. These protection areas are then combined with the vulnerability in a GIS to give groundwater protection zones which will be used by the planners, in conjunction with groundwater protection responses, to control potentially contaminating activities.