

---

## **Isotope methods in the delineation of groundwater protection zones in surface water - groundwater interaction.**

---

Jeffrey Turner, Isotope Hydrology Section, IAEA

### ABSTRACT

Mapping of the groundwater capture zones of lakes, wetlands and river systems is a fundamental requirement in developing protection plans for managing both the surface water body and its interconnected groundwater system. For example, groundwater inflow and outflow to a flow-through lake or wetland is a key component of the water mass balance and hence there is potential for groundwater contamination that can be an issue for managing long term water quality. Similarly groundwater discharge estimation into river systems enables a separation of surface water and groundwater nutrient inputs. Currently, there are no accepted protocols for mapping groundwater capture or release zones of lakes, wetlands and river systems and environmental isotope methods provide an approach that allows determination of the geometry in 2D plan and vertical cross section of these zones. In turn, this provides information on the requirements for groundwater protection zones for groundwater systems that interact with such surface water bodies, allowing for planning of appropriate land uses to occur within them.

This presentation examines the application of isotope methods to the delineation of groundwater capture and release zones to surface water bodies. The methods will be illustrated by reference to case studies involving the integration of isotope techniques with numerical groundwater modelling, where isotope techniques are used to delineate and validate groundwater modelling of protection zones. The scales of implementation range from local flow systems (5km) up to regional-scale groundwater management and protection zones (10-50km).