

Factsheet 11

Te Whakaheke o Te Wai Source Protection Zone (SPZ)

Drinking water suppliers are required to ensure water is clean and safe. A common protective measure is to restrict land use within a groundwater Source Protection Zone (SPZ) or Source Water Risk Management Area (SWRMA). A SPZ targeting pathogen risk is typically defined using groundwater travel time to the well of < 1 year. Aquifer heterogeneity has been recognised as one of the most challenging issues for prediction of contaminant travel, undermining SPZ delineation derived using simple homogenous models. In this workstream ESR and GNS used modelling outputs to develop improved guidelines to account for aquifer heterogeneity.

Research was informed by improved characterisation of heterogenity in aquifers using SkyTEM data and lithological logs. Numerical experiments using real-word inspired aquifers and scenarios were used. The experiments assessed how rapid SPZ delineation methods that assume a homogeneous aquifer could be adjusted for heteregeneous aquifers.



Example SPZ model for a homogeneous aquifer (white) and heterogeneous aquifer (blue). Particles reach the pumping well (red) from much further afield in a (blue) heterogenous aquifer.

Source Protection Zone (SPZ)

The guidelines provide recommended methods for SPZ in heterogeneous alluvial aquifer systems. Key steps include:

- Using lithology and SkyTEM data to characterise geological heterogeneity.
- Parameterising the flow and transport model, while considering aquifer heterogeneity.
- Deriving probabilistic SPZs where their extent is expressed as the probability that contaminants and pathogens from the area will be transported to the well screen.
- Characterising upscaled parameters to allow for possible simplifications to the modelling process to account for the effects of heterogeneity.

By providing detailed methodologies, recommendations, and considerations for various scenarios, these guidelines aim to support timely and cost-effective source protection. This results in safeguarding groundwater supplies from contamination risks.



Figure 1: Overview of source water risk management areas (SWRMAs) for groundwater in New Zealand (Ministry for the Environment, 2023)

Numerical delineation of source water risk management areas in heterogeneous alluvial aquifers: guidelines and recommendations. GNS Science Report 2025/03