Geophysical Research Abstracts
Vol. 19, EGU2017-2079, 2017
EGU General Assembly 2017

A nationwide classification of New Zealand aquifer properties

Rogier Westerhoff (1,2), Constanze Tschritter (1), Zara Rawlinson (1), and Paul White ()
(1) GNS Science, Taupo, New Zealand (r.westerhoff@gns.cri.nz), (2) Deltares, Utrecht, Netherlands (rogier.westerhoff@deltares.nl)

Groundwater plays an essential role in water provision for domestic, industrial and agricultural use. Groundwater is also vital for ecology and environment, since it provides baseflow to many streams, rivers and wetlands. As groundwater is a 'hidden' resource that is typically poorly understood by the public, simple and informative maps can assist to enhance awareness for understanding groundwater and associated environmental issues.

The first national aquifer map for New Zealand (2001) identified 200 aquifers at a scale of approximately 1:5 Million. Subsequently, regional councils and unitary authorities have updated their aquifer boundaries using a variety of methods. However, with increasing demand of groundwater in New Zealand and drought impacts expected to be more significant in the future, more consistent and more advanced aquifer characterisation and mapping techniques are needed to improve our understanding of the available resources.

Significant resources have gone into detailed geological mapping in recent years, and the New Zealand 1:250,000 Geological Map (QMAP) was developed and released as a seamless GIS database in 2014. To date, there has been no national assessment of this significant data set for aquifer characterisation purposes. This study details the use of the QMAP lithological and chrono-stratigraphic information to develop a nationwide assessment of hydrogeological units and their properties.

The aim of this study is to map hydrogeological units in New Zealand, with a long-term goal to use this as a basis for a nationally-consistent map of aquifer systems and aquifer properties (e.g., hydraulic conductivity estimates).

Internationally accepted aquifer mapping studies were reviewed and a method was devised that classifies hydrogeological units based on the geological attributes of the QMAP ArcGIS polygons. The QMAP attributes used in this study were: main rock type; geological age; and secondary rock type. The method was mainly based on values of permeability after global, continental and New Zealand studies. The classification followed a tiered workflow. Tier 1 ('Hydrolithological units') consisted of the classification of only the main rock type, based on median permeability value. Tier 2 ('Hydrogeological units') consisted of a combined classification of main rock type and age, assuming that permeability shows an exponential decay over geological age. Tier 3 ('Hydrogeological units') included all three attributes, where the permeabilities of main and secondary rock types were averaged with weighting. Tier 4 was a simplification of the 10 classes in Tier 3 to four 'Aquifer Potential' classes, i.e. 'Poor', 'Low', 'Medium', and 'High'.

The results show a good match with existing overlaying maps of aquifer boundaries The map is capable of refining aquifer boundaries at the regional scale where these boundaries have not been updated since 2001. Additionally, the map provides a quick and simple way to communicate hydrogeological information. This fundamental dataset is essential for future studies of the impact of climate and humans on groundwater in New Zealand. Future work will include categorising geological system knowledge (e.g., depositional environment) to allow for 3D mapping and characterisation, compilation and incorporation of nation-wide measured hydraulic conductivity values, including uncertainty, and linking with other national data sets.