

We appreciate the opportunity to provide comments on the proposed temporary moratorium on Permits to Take Water for water bottling operations.

Collectively, we support enhanced levels of scientific analysis and evidence-based decision making in assessing risks originating from all large water takings.

This would include rigorous technical standards for the following:

1. Longer term pumping tests and automated dataloggers for pumping/monitoring wells to better understand boundary conditions and heterogeneity in groundwater systems. Automated dataloggers should also be employed throughout a monitoring well network for the duration of the Permit to better understand risks, especially during times of groundwater stress and Low Water Response events.
2. Increased scrutiny of daily water taking volumes to ensure permit holders are within prescribed taking limits (e.g. improved evidence of true daily flows, calibrations of flowmeters, etc.).
3. Acknowledgement and greater focus on how water taking can affect water quality, given that exposing hydrostratigraphic units to additional levels of oxygen can alter water chemistry, affect pH and redox potential, and cause alterations in the solubility of various dissolved parameters in groundwater. One example is the sensitivity of arsenic solubility based on the oxidation of pyrite-based minerals or the reduction of iron oxyhydroxide compounds which naturally occur in groundwater systems.
4. Incorporating emerging research when analysing the potential risks of a large water taking. Of particular interest is Dr. Scott Jasechko's work on the true availability of groundwater within 2 km of the surface. Despite assumptions made by some groundwater professionals, Dr. Jasechko's work states "We find that groundwater replenished over a human lifetime of 25–100 years is a finite, limited resource with a spatially heterogeneous distribution dependent on geographic, geologic and hydrologic conditions." For your reference, this article was featured in the November 2015 edition of Nature Geoscience, entitled "The global volume and distribution of modern groundwater".
5. We are encouraged by and support the recommended steps from the Ministry to reduce the maximum permit from 10 years to 5 years, increased public transparency and reporting, and the requirement of additional scientific studies and monitoring as necessary. We would also suggest that at the time of renewal that an increased level of screening takes place, where the Permit requirements would be analysed and presented in a report by a Qualified Professional upon

renewal. Recent water quality data, and analyses for scenarios such as drought and sustained maximum pumping rates under drought conditions should also be considered during this screening process.

6. We would also like to note that greater engagement with municipalities and their residents is warranted, especially if these takings have the potential to impact municipal wellhead protection areas and/or the supplies of private well owners. Depending on the water resource risks, we also feel that groundwater modelling could be employed to build various scenarios to better characterize these potential risks that could be exposed to municipal wellhead protection areas, where mitigation strategies would be fairly attributed to a corresponding risk.