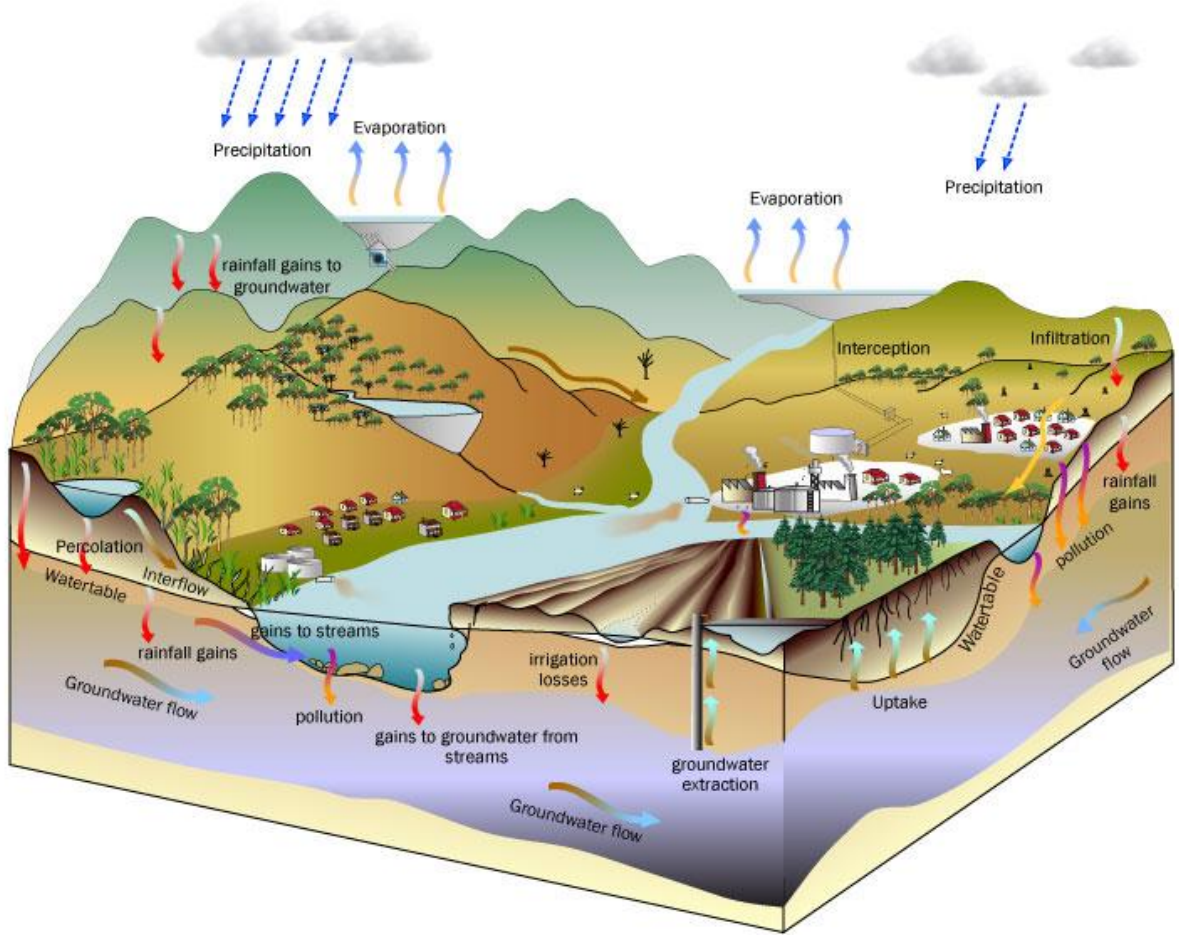
GROUNDWATER

General Facts and Concepts

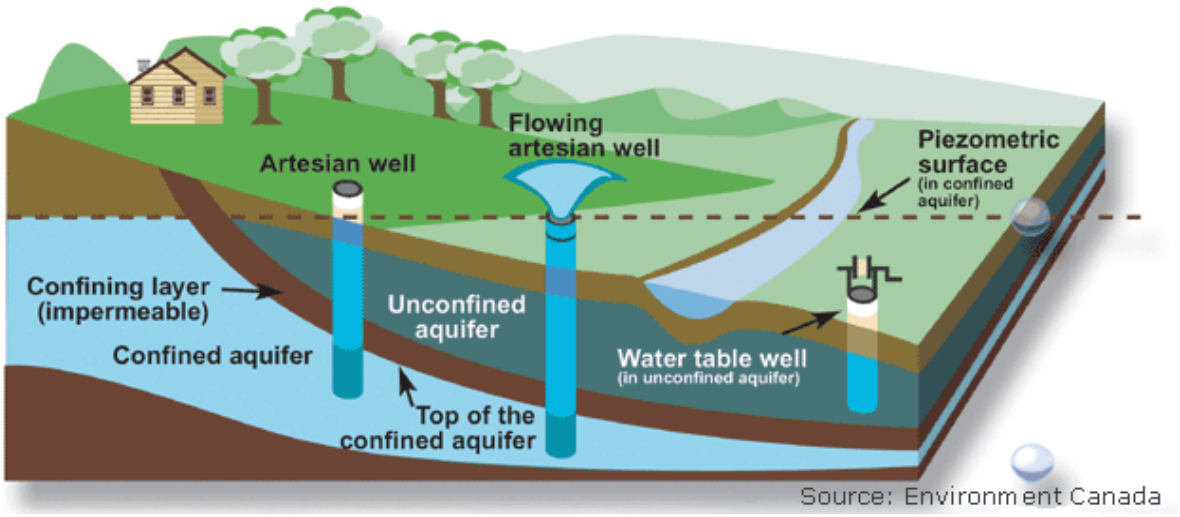
HAWKE'S BAY REGIONAL COUNCIL

Environmental Science

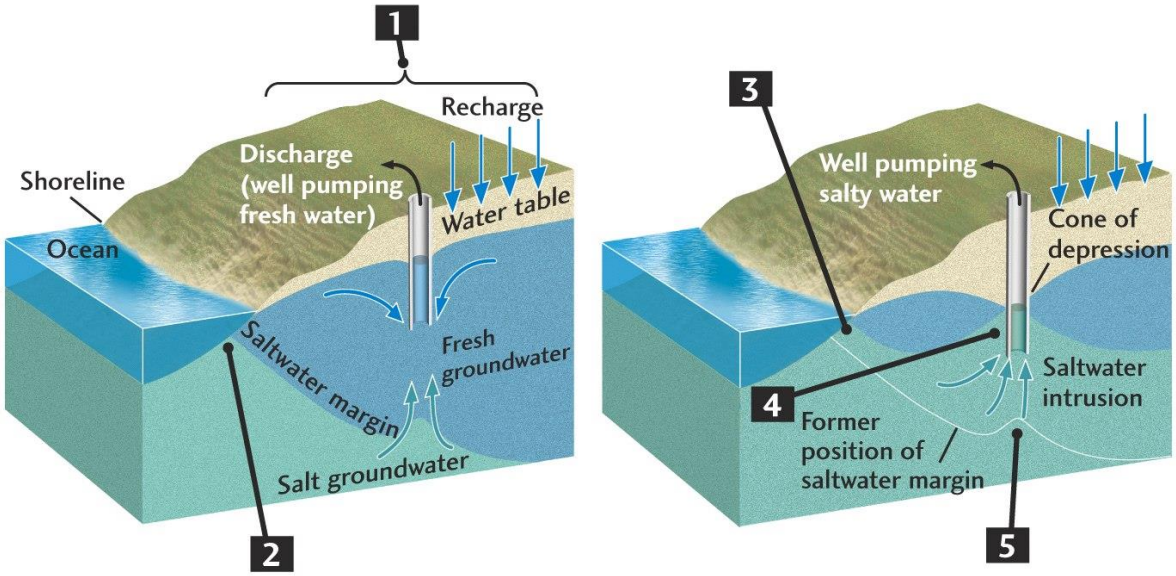


General schematic of hydrologic cycle. As the term implies, water moves within the cycle and groundwater (aquifer) is just one zone of the cycle.

Aquifers and Wells

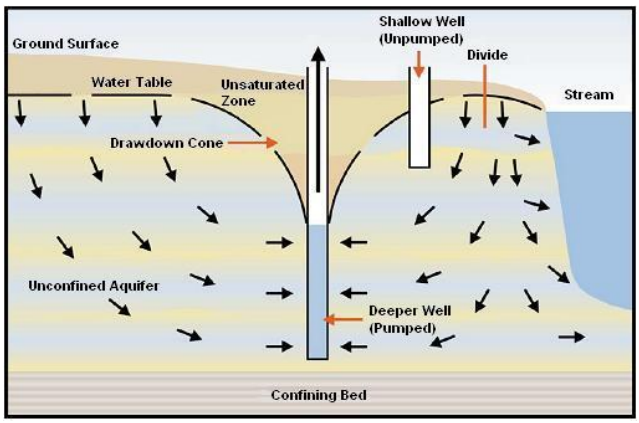


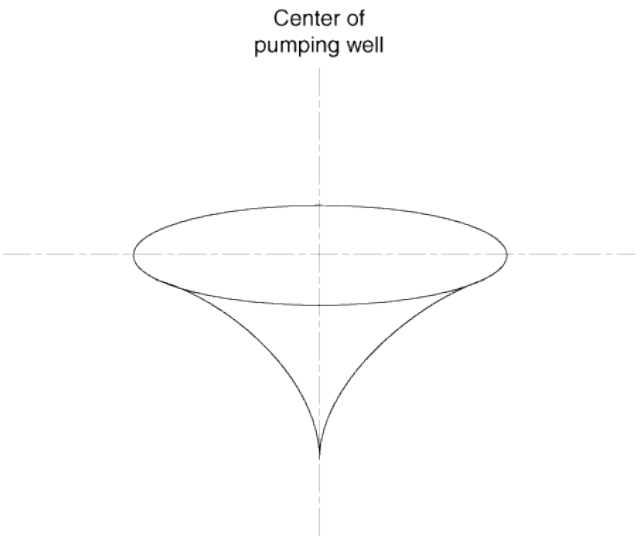
Many aquifer systems contain several aquifers, or aquifer zones, separated by confining layers. In these conditions, pumping from a deeper confined aquifer may have little or no effect on overlying aquifers or surface water.



Flow rates at which groundwater is extracted is key in evaluating potential effects of pumping. At a flow rate that does not exceed the aquifer's ability to recharge (**1**), influence on surface water is minimal to nil (**2**). At flow rates that exceed the aquifer's ability to recharge, effects on the flow system can reverse/modify natural flow conditions (**3**). This can produce unwanted results (depletion of surface water, salt water intrusion (**4.5**), subsidence).

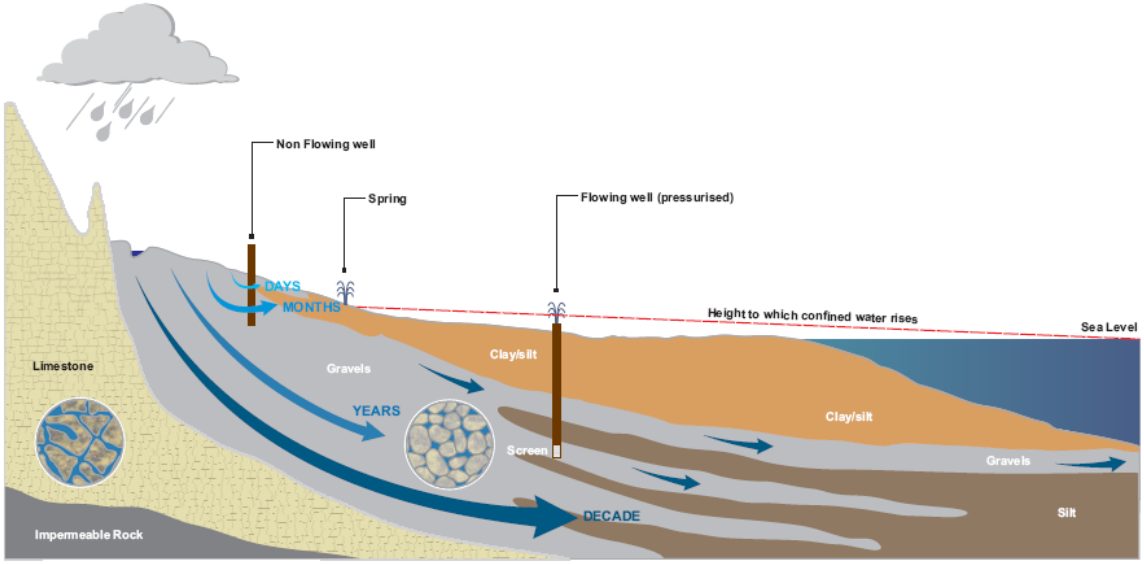
Aquifers and Wells



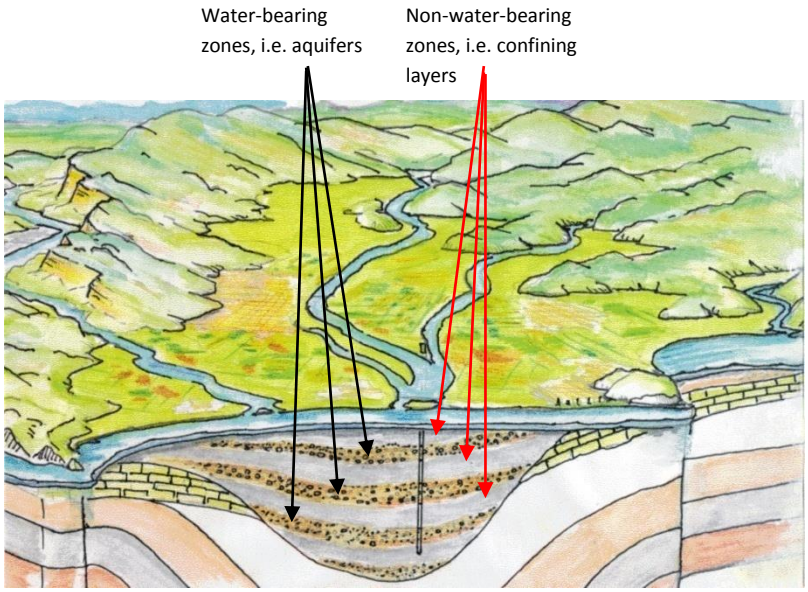


Location is another important factor when determining effects of pumping. When pumping from a well, a “cone” of depression forms. The depth of the cone of depression, or drawdown of the water table, is greatest near the well and lessens farther from the well. The closer a well is to a river, the more likely it is to have an effect of river flow. The likelihood of an effect lessens the further the well is from the river.

Heretaunga Plains

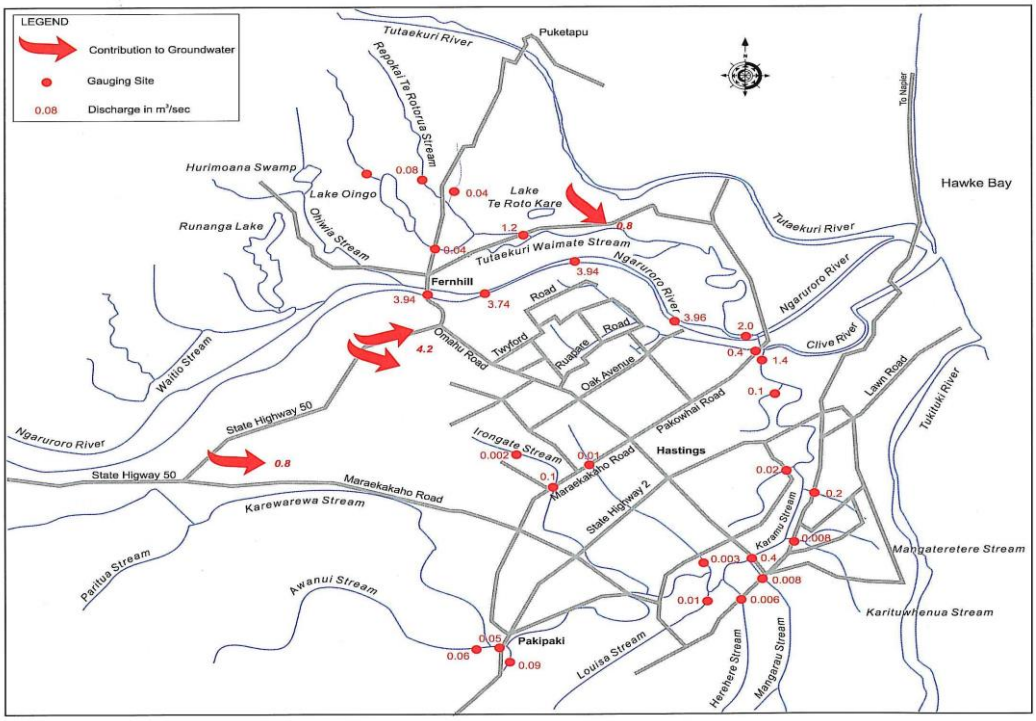


Generalized depiction groundwater flow from hills to ocean in the Heretaunga Plains.



Generalized cross-section of Heretaunga gravel aquifer system.

How Groundwater Flows in the Heretaunga Plains



Generalized schematic of groundwater and surface water interaction within the Heretaunga Plains. Red arrows indicate river segments loosing water to the subsurface (aquifers gaining water from rivers). Red dots indicate areas where rivers receive (gain) flow from water stored in the subsurface (groundwater). Generally speaking,

- Water enters the Heretaunga aquifer mainly from rainfall over the unconfined aquifer and from the Ngaruroro River between Maraekakaho and Fernhill.
- Groundwater flows east toward the coast recharging aquifer water levels.
- Near the middle of the plains the groundwater is confined by marine clays. As the land elevation decreases, the clay layers act as a lid to the aquifer and causes water pressure to build up inside the aquifer.
- Where groundwater levels are higher than land surface and the confining layers are groundwater can return to the surface as springs.
- The remaining groundwater that does not return to surface water discharges as submarine springs. Water balance studies for the Heretaunga suggest submarine discharge is small with most water re-entering surface water.

General facts and concepts about Groundwater in the Heretaunga Plains

- The Heretaunga Plains consist of layers of sediment which contain water commonly referred to as groundwater.
- Generally, the most productive groundwater layers, commonly referred to as aquifers, consist of gravels which were deposited by the Ngaruroro, Tutaekuri and Tukituki Rivers.
- The sedimentary layers have been deposited over the last 250,000 years and in some cases are separated by finer materials such as silt and clays. Most of the significant silt and clay layers were deposited when the sea covered much of the plains.
- The Heretaunga Plains is mainly recharged by the Ngaruroro River with an estimated 4.4 cumecs lost between Maraekakaho and Fernhill.
- When groundwater is pumped, aquifers respond by either increasing the amount of water entering the system, reducing water leaving the system, removing water from storage or a combination of these three.
- Changes in our groundwater system are observed in our monitoring wells in the form of seasonal fluctuations and long-term groundwater level declines and rises. Monitoring over the last 40 years indicates the rates of declines are relatively small and mainly concentrated in the unconfined zone.
- Evidence from drilling records from the early 19th century indicates static water levels in the confined aquifer have not changed significantly over the last 100 years.
- State of the Environment (SOE) monitoring of groundwater and surface water along with monitoring of consented groundwater and surface water takes help HBRC understand the condition of water resources within the Heretaunga Plains and help ensure the effects of consented takes and/or land uses are not causing detrimental effects to the water resource environment.