




THE BASEL SYSTEM



Sustainable and Ecological
Drinking Water Production



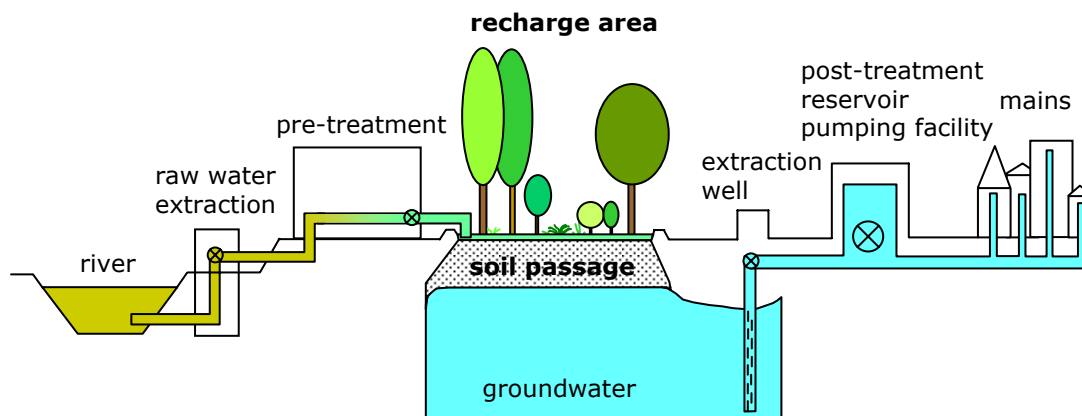
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Artificial Groundwater Recharge with Rhine Water

For the production of drinking water technical measures are used in many cases. Drinking water can however be also gained in a sustainable, ecological and secure way by semi-natural practices. This is shown by the groundwater recharge plant "Langen Erlen" of the Industrial Works of Basel (IWB).

The IWB deliver 25 Mill. m³ of drinking water per year to the 200,000 inhabitants of Basel and its surrounding communities (Northwest Switzerland). Around 60% are gained in the "Langen Erlen" – a former floodplain landscape in the Northeast of the city. There, the natural groundwater is artificially recharged with pre-filtered Rhine water by surface infiltration in forested areas. During the passage through the natural forest soil and the aquifer the infiltrated Rhine water is purified physically, chemically and biologically. After the aquifer passage the extracted groundwater is of a high quality and can be delivered to the drinking water distribution network. This system ("Basel System") is in operation since 1964. The artificial groundwater recharge in the "Langen Erlen" started already in 1912. Until 1964 unfiltered water from the adjacent river Wiese was used as raw water source.



Depending on demand, 700-1'400 L of Rhine water are extracted per second and pumped to the rapid sand filtration for pre-treatment. With a velocity of 5 m per hour the water seeps through a 85 cm thick layer of quartz sand in 20 basins with a total surficial area of 1000 m². Thereby, 95 % of the suspended solids are removed from the Rhine water.



Rapid Sand Filtration – The first purification step in the groundwater recharge plant "Langen Erlen".

Forested Recharge Areas – The Heart of the Basel System

After rapid sand filtration, the Rhine water is discharged into 11 forested recharge areas. They are generally divided in three sections of about 0.5 ha, which one after another are flooded for ten days and afterwards can desiccate for 20 days. The height of the supernatant water during the flooding phase ranges between 0 and 60 cm (max. 1.2 m). The vegetation in the recharge areas consists of typical floodplain plants as ash trees, alders, willows, bird cherry, reed canary grass and sedges.



The recharge area...

...almost a floodplain forest.

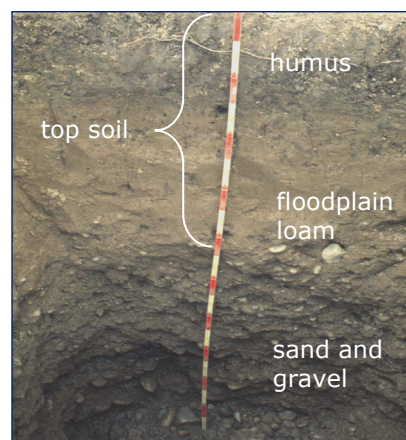
The shading of the supernatant water by the plants prevents a strong warming in the summer and thus also the growth of algae which would lead to great oxygen variations. Together with the flooding cycle, the shading also prevents the development of a biofilm at the soil surface. This gelatinous layer of algae, protozoae, bacteria and fungi is typical for slow sand filtration, the standard technology in groundwater recharge. There, the biofilm is important for a good purification performance, however it is also responsible for a decreasing infiltration rate. Thus, it must be removed typically between every few months till once a year („regeneration“). In the recharge areas of the “Langen Erlen” the desiccation phase of the flooding cycle is the only regeneration measure.

With 1-2 m³/m²/d the infiltration capacity of the recharge areas has been constant since decades. Beside the technical elements rapid sand filtration and flooding cycle, also the floodplain forest ecosystem is responsible for this as plant roots and the soil fauna keep the soil permeability continuously high.

Microbes and the Soil – Central Elements for Purification

During the flooding phase, the top soil is saturated. The permeable sand and gravel layers in the 2 m thick unsaturated zone between the top soil and the groundwater resembles a trickling filter: saturated with air, moist and with a constant nutrient replenishment – an ideal habitat for micro-organisms. Here and in the uppermost 2 m of the groundwater layer, most of the organic contaminants of the recharge water are biodegraded.

After the horizontal passage of 200-800 m in the aquifer the infiltrated Rhine water is purified and mixed with the natural groundwater.



The soil in the recharge areas – an example of a 2 m deep profile.

The Basel System – The Choice for Your Water Supply?

The Basel System is sustainable, cost-effective and ecological. It represents an ideal combination of producing high quality drinking water, while at the same time protecting endangered wildlife habitats and providing recreational areas.

The surface area demand varies around 10 m²/inh. The system is therefore primarily suitable in regions with low land prizes and/or large forests. Depending on pretreatment necessities, generally only few technical expenditures are demanded. It is therefore ideal at places where intensive maintenance and costly operation are difficult to ensure.

The Basel system offers a valuable alternative to expensive and maintenance needing hi-tech-plants. But also regions with lost floodplains and recreational requirements the Basel system might be suitable. It can be easily adapted to the local conditions. Furthermore it can be used as a flexible, ecological and cost-efficient measure for the removal of groundwater decline

Do you have any questions or are you interested in a feasibility study? Do not hesitate to contact us!

You can find additional information at: <http://www.geoserve.ch/drinkingwater.asp> and at <http://www.iwb.ch/de/wasser/versorgung/langeerlen.php> (in German)

We can also provide guided tours through the groundwater recharge plant "Langen Erlen".

For questions turn to:
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