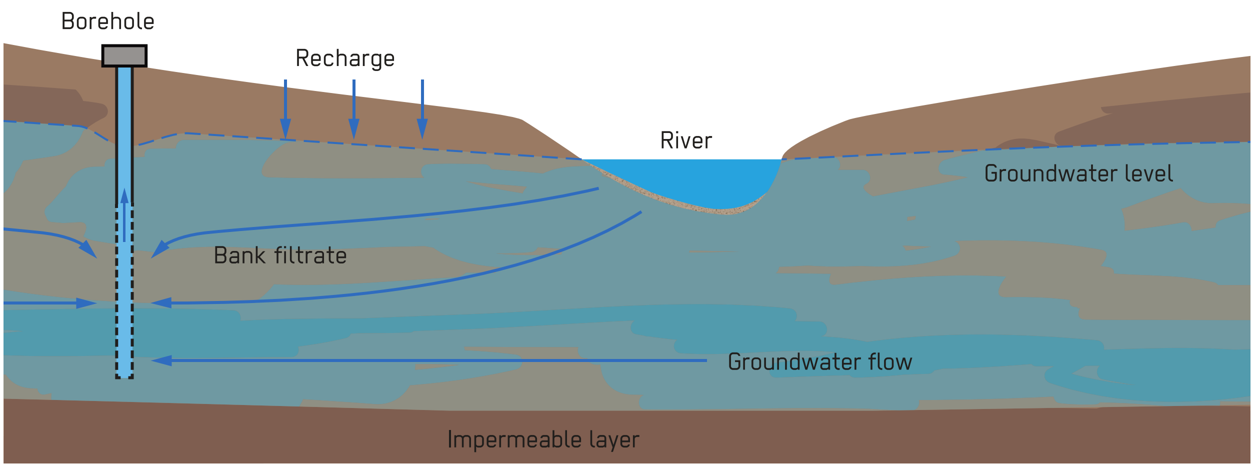
Riverbank Filtration

Response Phase	Application Level	Management Level	Objectives / Key Features
** Acute Response ** Stabilisation ** Recovery	* Household ** Neighbourhood ** City	* Household ** Shared ** Public	Groundwater intake, water quality improvement
Local Availability	**Technical Complexity**	**Maturity Level**	
*** High	** Medium	*** High	



Riverbank Filtration is a water withdrawal method in which water is pumped from the ground via the banks of a river (or other surface water body). The water abstracted is thus surface water that has received a preliminary treatment by passing a short distance through sediments and soil to where it is abstracted. Riverbank Filtration can be very useful both in the acute response phase where certain types of wells (e.g. jetted wells) can be installed quickly, as well as in the recovery and stabilisation phases.

Riverbank Filtration describes a process in which an intake is located a short distance away from a surface water source (typically less than 50 meters). The short distance and time the surface water spends as groundwater means that not much filtration is likely to occur, such that the water may have a lower quality compared to other groundwater sources. Riverbank Filtration can be therefore viewed more as a pre-treatment clarification process prior to final treatment. The intake can be a Protected Dug Well **(I.7)** or Protected Borehole **(I.8)**, or might require more complex ways to improve water flow through the banks (e.g. infiltration gallery).

Design Considerations: The main design considerations when using Riverbank Filtration are water quantity and quality, and any system will require a balance of the two. The intake needs to produce sufficient quantity for the intended purpose at an acceptable quality. Both will be determined by the type of sediments between the surface water source and the intake as well as the distance between the water source and abstraction point.
In most long-term set-ups, the abstraction rate will decrease due to clogging of the interface between the surface and groundwater. Where bank sediments are not permeable enough to allow the required volume to be abstracted from the intake, various improvements can be made. These include creating an artificial channel of permeable sediments between the water source and intake, which is then backfilled above the channel, or using an

infiltration gallery, which consists of a horizontal 75–300 mm jointed or slotted pipe laid beneath the riverbed or in the banks. Infiltration galleries should have a graded gravel filter installed around the pipe, which should be at least 1 metre below the dry-season saturated zone and deep enough to not be affected by river scour (at least 1.5 metres). For infiltration galleries, clogging can still occur with time, so they are best suited to river sections where there is no deposition (i.e. choosing riverbeds with medium to coarse sand and avoiding the inside of river bends where deposition occurs). It is also best to avoid having any gravel bed in direct contact with the river water, as clogging may increase compared with a sand surface (as fine particles tend to penetrate the bed deeper, preventing their subsequent resuspension through scour).
The construction of both of these systems is usually more difficult than for other intakes and requires a significant amount of excavation and de-watering. Various other intakes can be used in conjunction with Riverbank Filtration, such as Protected Boreholes or jetted wells **(see I.8)**, and Protected Dug Wells or riverbed wells **(I.7)**. These can be constructed within/under the riverbed itself (e.g. jetted or riverbed wells with off-set suction pump) or in the riverbanks. Water quantity for all types of Riverbank Filtration intakes can also be increased through managed aquifer recharge methods, such as gully plugs, check dams, leaky dams and groundwater dams in seasonal rivers **(I.5)**.
The microbiological, chemical and physical water quality of surface water will be much improved through Riverbank Filtration due to the combination of natural treatment processes, though a final treatment may still be needed. Alternatives to Riverbank Filtration include treating surface water through Roughing Filtration **(T.1)**, Rapid Sand Filtration **(T.2)** and Slow Sand Filtration **(T.9)** on the riverbanks or in the home.

Materials: Riverbank Filtration can be a good option for using local materials and skills, depending on the type of intake (e.g. PVC pipes, locally available gravel, concrete).

Applicability: Riverbank Filtration is a good option for the acute response phase, as long as the intake can be created quickly (e.g. jetted well). Other intakes will probably be more suited to the recovery and stabilisation phases due to the time taken for excavation and construction (e.g. infiltration gallery or Protected Dug Well, **I.7**). Its main use is to improve water quality to reduce subsequent treatment needs (e.g. to allow for chlorination only).

Operation and Maintenance: The volume of water entering the intake should be monitored for signs of the permeable zone becoming clogged, which is a common issue with Riverbank Filtration systems. This is best mitigated through good design and siting, but it is possible that major rehabilitation works will be needed if the intake becomes too clogged. Apart from that, Riverbank Filtration actually reduces the O & M required for water clarification (e.g. demand for chemicals in coagulation process) and can completely replace clarification in some cases.

Health and Safety: Water may still need treatment or may be a risk to health, particularly from the microbiological contamination that is more likely to be an issue in populated areas or where there are a lot of animals. Other health risks are associated with excavation and will vary according to the type of intake. For infiltration galleries or where channels of permeable material are installed between the source and intake, a risk of collapse in the saturated zone combined with the required deep trench excavation pose a health risk where construction/shuttering procedures are not adequate.

Costs: Cost will vary depending on the type of intake constructed. Jetted wells can be cheap, as they are completed quickly and with little material (around 150 USD per metre) compared to infiltration galleries, which can be more expensive, take longer to install and require significant excavation work (around 11,000 USD or more for a gallery 20 meters long x 3 metres wide x 5 metres deep).

Social and Environmental Considerations: Riverbank Filtration tends to be well accepted by people, as the process of water being filtered through sediments in the riverbank is easily understood. However, over-extraction of water can cause a surface water body to dry out or river flows to reduce, which may cause significant problems to other users.

Strengths and Weaknesses:

- (+) Reduces turbidity in cost-efficient manner
- (+) Improved microbiological, physical and chemical water quality compared to surface water
- (+) Some types of intakes (e.g. boreholes or wells) can be cheaper using Riverbank Filtration compared with deeper aquifers, since the required depth is less and various cheaper forms are possible (e.g. jetted wells)

- (−) Likely to clog over time, reducing long-term water quantity
- (−) Difficult to construct infiltration galleries deep enough to have water at all times
- (−) Requires large excavation works for some intakes (infiltration galleries) with associated cost and health risk

→ **References and further reading material for this technology can be found on page 215**