Groundwater access trenches

Shallow groundwater aquifers on southern and western Eyre Peninsula are used extensively for water supply. As many aquifers are within a few meters of the surface it has been common practice to excavate deep and open trenches to provide direct access to the groundwater resource.

What is a GAT?

A Groundwater Access Trench, or GAT, is an opening in the ground excavated for the purpose of obtaining access to underground water. Under the *Landscape South Australia Act 2019*, GATs are legally classified as wells.

Contamination and salinisation of groundwater resources

Where GATs are used for stock watering, stock drink directly from the aquifer, gaining access by walking down the inclined excavation to the water. This practice results in pollution of the aquifer by dung, dead animals and also surface in flows carrying contaminants into the water such as agricultural chemicals.

GATs evaporate not only from the exposed aquifer, but also from soil within two metres above the aquifer via capillary rise. The evaporative area is therefore larger than the exposed aquifer's surface area. Over a metre of evaporation occurs from all of these surfaces each year and the salt from this evaporated water remains in the GAT and surrounding soil. Over a number of years, the build-up of salt spoils the water with some GATs abandoned and new ones dug.

The Environment Protection Act 1993 (EPA Act) states that "A person must not undertake an activity that pollutes, or might pollute, the environment unless the person takes all reasonable and practicable measures to prevent or minimise any resulting environmental harm". Most GATs breach the EPA Act due to the risk of faecal, chemical and pathogenic contamination of the groundwater resource.

Sustainable use, sharing and better water quality

Many aquifers may have been spoiled or are at risk by inappropriate access and/or management. This has a detrimental impact on water dependent ecosystems, other users and future generations.

Remediating GATs into proper wells that comply with the appropriate guidelines can greatly enhance the reliability and sustainability of these valuable resources and improve water quality for the user.

Planning and undertaking works on GATs

If you are planning to remediate, excavate, construct or clean out a GAT, you should contact your local Landscape Board office for advice and to establish if you require a Water Affecting Activity Permit – before you commence any work.

Undertaking works on a GAT without appropriate approval may place you in breach of the Landscape Act and be subject to penalties.

GAT remediation

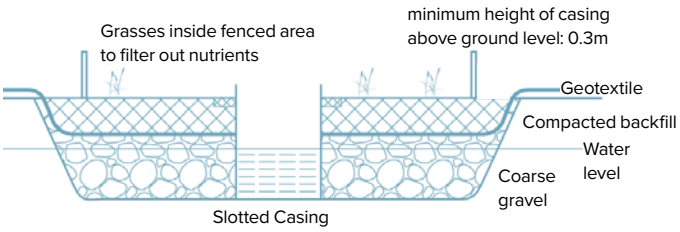
These remediation options will make a GAT legally compliant, minimise groundwater contamination risk and improve water quality for stock and other uses. Well managed water sources are important assets to any property or business.

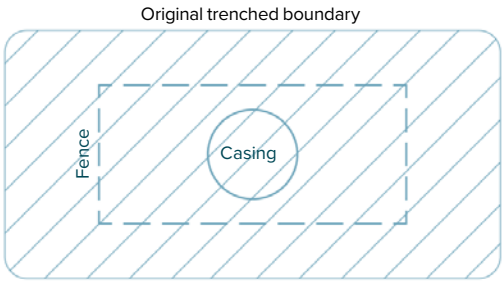
Option 1 – Install casing and cover (proper well)

This option is the recommended method for rehabilitating a GAT into a sustainable water source that is significantly protected from pollution and evaporation. Being more technical it involves installing a slotted well casing along with appropriate aggregate (clean gravel or rock) and a natural earth covering.

Note that in the diagrams below the casing material can be varied in diameter relative to the requirements of the user and the rate of the aquifer to 'make water'. Expert advice is recommended for this option, and for safety, large exposed well casings must have locking covers to prevent access.

V1 Single casing





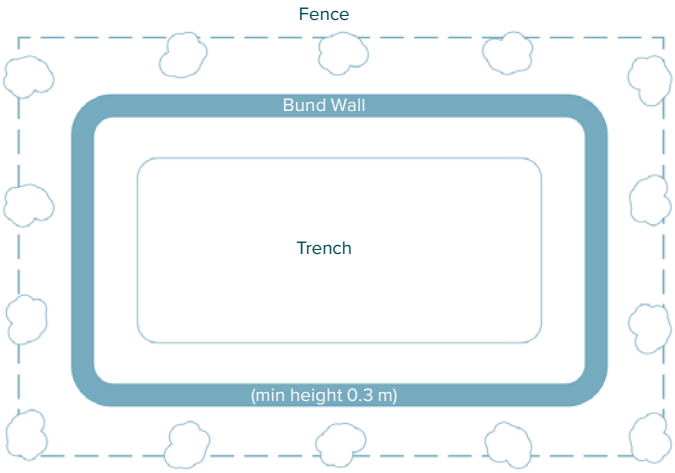
Back filled with coarse gravel/ rock to above water level. A layer of geotextile to underlay compacted spoil to original surface level.

Option 2 – Bund and fence

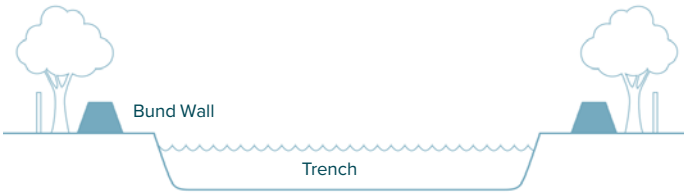
The simplest option that ensures a GAT is less degraded and subsequently complies with legislation is to build a bund wall around the GAT (approx. 300mm high earthen levee) to prevent surface water inflows and fence it off.

Groundwater in this style GAT is still an open pool and will increase in salinity due to evaporation. Sunlight can still contribute algal growth and birds and some animals can still enter the water. Additional roofing or a cover will minimise this.

Option 2 diagrams



Trees/grasses inside fenced area
to slow overland flow and filter nutrients



A GAT in limestone aquifer

Option 3 – Decommission by backfilling.

Fill the trench in with clean, suitable material, e.g. the overburden from original excavation.

Option 4 – Drill a new proper well

Backfill existing GAT and use a licensed well driller to develop a new water well.

Materials

Casing

It is important that the casing material is chemically inert and stable and of a suitable size for the particular application. HDPE plastic pipe is a popular product.

Geotextile

This construction fabric is used between the clean gravel/rock filling and natural earth backfill. The fabric will help to keep the gravel/rock filling clean and free of sediment.

Fill material

Two types of material are used. Firstly a layer of clean coarse gravel or rock for the water bearing zone, generally to just above the water table and above the casing slots. Geotextile is then laid over the top of the clean gravel/rock. Secondly the trench is filled with suitable earth material to ground level and compacted. This material will typically be the original overburden.

A GAT in weathered basement aquifer

Proper well casing to access groundwater following a GAT rehabilitation.

Groundwater Access Trench Rehabilitation example: Option 1

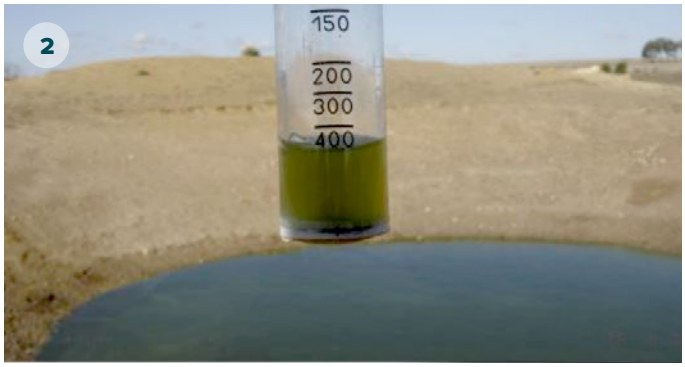
1. Common GAT to access groundwater in tertiary aquifer

2. Highly polluted water

- Salinity 5526 ppm (16/04/2008)
- Extremely high algal growth
- Extremely High faecal Contamination (E.coli), well in extreme of documented safe levels for healthy stock water.

3. GAT rehabilitation

- Clean silt from existing GAT
- Install slotted casing
- Fill saturated zone with appropriate gravel



4. GAT rehabilitation

- Cover gravel with Geotextile cloth
- Backfill with original earth material

5. GAT rehabilitated into proper well

- Protection of groundwater resource

6. Water quality improved

- Salinity 4500 ppm (24/06/08)
- Salinity 2145 ppm (21/11/08)
- No algal growth
- No faecal contamination

Note: A permit may not be required if the activity has been authorised under other legislation, for example the Development Planning and Infrastructure Act 2016, Environment Protection Act 1993 or the Landscape South Australia Act 2019. Please call us to confirm.

Contact us

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