COORONG DISTRICT COUNCIL

Coorong Tatiara

Sustainability, Agriculture & the Environment

Tatiara the good country

Understanding & Accessing Groundwater

This fact sheet covers: ●groundwater ●confined & unconfined aquifers ●checklist for drilling a bore ●construction requirements for bores ●regulatory requirements ●calculating livestock water needs ●salinity & salinity units of measurement ●water savings options ●groundwater contamination ●water quality ●monitoring ●fire water.

Groundwater

When rain falls, some of it flows across the surface of the land and accumulates in creeks, wetlands, and eventually the ocean. But some of the water seeps into the ground and accumulates within cracks or pores in the rocks (aquifers), forming groundwater resources, which in turn also eventually flow into surface water or the ocean.

Groundwater in Australia

In Australia, groundwater makes up approximately 17 per cent of accessible water resources and accounts for over 30 per cent of our total water consumption. Some groundwater is fresh and can be used for drinking. Other groundwater can be brackish water or even saltier than the sea. Some contain high levels of dissolved chemicals, rendering it unsuitable for human consumption or stock water supplies.

Aquifers

What exactly is an aquifer?

The saturated area beneath the water table is called an aquifer, which stores water. When a water-bearing rock readily transmits water to wells, bores and springs, it is called an aquifer. Bores can be drilled into the aquifers and water can be pumped out.

Confined and Unconfined Aquifers

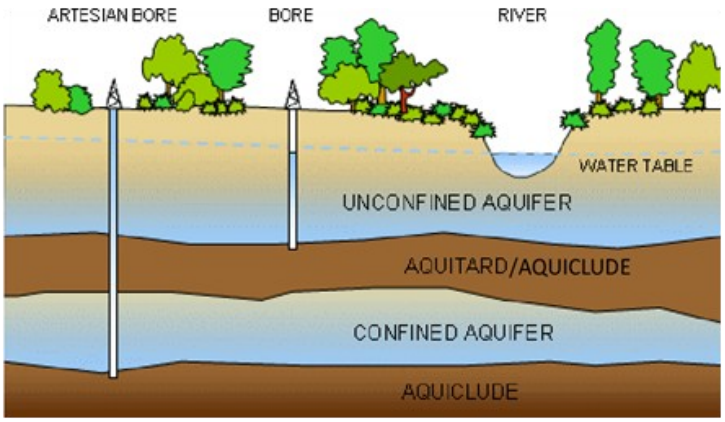
Confined aquifers (usually called the bottom layer of water) are permeable (porous) rock units that are usually deeper under the ground than unconfined aquifers. They are overlain by relatively impermeable rock or clay that limits groundwater movement into, or out of, the confined aquifer.

Groundwater in a **confined aquifer** is under pressure and will rise up inside a borehole drilled into the aquifer. An **artesian** flow is where water flows out of the borehole under natural pressure.

Confined aquifers may be replenished, or recharged by rain or stream-water infiltrating the rock at some considerable distance away from the confined aquifer. Groundwater in these aquifers can sometimes be thousands of years old.

Unconfined Aquifers (usually called the top layer of water) is where groundwater is in direct contact with the atmosphere through the open pore spaces of the overlying soil or rock. The upper groundwater surface in an unconfined aquifer is called the water table. The depth to the water table varies according to factors such as the topography, geology, rainfall, season, and the quantities of water being pumped from the aquifer.

Unconfined aquifers are usually recharged by rain or stream-water infiltrating directly through the overlying soil. Typical examples of unconfined aquifers include many areas of coastal sands and alluvial deposits.



Checklist for Drilling a Borehole

Step 1: Find out if there is any groundwater nearby

- You should do some 'homework' to determine if there are existing bore in your location. Do this by checking with your neighbours to see who has bores, if they have water and the quality, the capacity, and depth.
- Consult the Water Connect Website for you to further build a picture of local bores and bore history in your area.

https://www.waterconnect.sa.gov.au/Systems/GD/Pages/Default.aspx

- Pinpoint the location for drilling the borehole. Seek expert advice where possible. Check on the past success rate of the person they usually use to 'site' their boreholes. In an urban environment, cultural interferences (powerlines, pipe lines, cables etc) preclude the scientific siting of the borehole. In a limited space urban environment the borehole is often drilled where the rig can obtain access (average water well rigs are over 15 tonnes & truck mounted).

Step 2: Costs

Consider the total cost of the project: bore drilling, equipping with a pump, tanks, pipelines, telemetery etc.

Step 3: Applying for a Permit

Drilling bore / wells to access groundwater requires a well permit and work must be carried by a licensed driller. Using a licensed driller to construct, decommission or undertake maintenance work on a well helps ensure that South Australia's groundwater resources are protected.

The Department for Water & Environment is responsible for:

- Ensuring that only those drillers who meet the required standard are licensed
- Monitoring drillers' to ensure drilling works continue to meet legislated standards
- Issuing well permits authorising the construction of new wells, and work on existing wells

Permits are available from:
https://www.environment.sa.gov.au/licences-and-permits/water-licence-and-permit-forms/statewide

Step 4: Choose a good Borehole Driller

- Check references of previous clients who have had time to assess the quality of work over a reasonable period of time.
- Check that you only have to pay if they drill to the depth specified (unless he/she finds water at a lesser depth).
- Check that he/she will provide samples of material of each and every metre drilled.
- Check before drilling whether there are any add-ons to be considered – such as a surcharge for abrasive lithologies or depths exceeding 100m.
- Check if they provide records of work carried out, e.g. driller's log, construction certificate, electrical clearance, yield test certificate, pump details & commissioning data. When selling property, remember a borehole represents a substantial capital investment and property improvement.
- Check that the driller provides a record of exact depth at which the most promising water fissure is located. This information is vital to the pump installer to enable him/her to select correct pump for your needs.
- Check if they have a standard form of contract. Of vital importance to both parties.
- Check if equipment can reach the target depth.
- Check that he/she will be able to continue drilling when hitting or intersecting clay, unconsolidated sand or hard rock.

The appointed drilling contractor should carry out the work in line with the Occupational Health and Safety standards.

Step 5: Check the equipment your driller is using

- Check what condition his/her equipment is in.
- Make sure his/her drill rods are straight.
- Check on type of casing/well screens to be used.
- Check on diameter of borehole to be drilled. A diameter of 216 mm (8 inches) is recommended for a stock & domestic bores.
- Check if equipment can reach target depth.
- Check that he/she will be able to continue drilling when hitting or intersecting clay, unconsolidated sand or hard rock.

Everything else you to need to think of before drilling a borehole

The drilling contractor can never guarantee that they will intersect water and therefore it is the client who is at risk for the cost of drilling the borehole, regardless of whether it is wet or dry or good quality water is found.

Hidden costs of drilling a borehole

- There are many unknowns, such as final depth, the amount of time taken for development, so you need to agree on a suitable amount to be allowed for 'add-ons' with your contractor.
- Drillers levy a surcharge for drilling through very hard rocks, e.g. granite requires specialized expertise to drill into.
- Make sure that the driller caps the hole after drilling to prevent any foreign material entering the bore.

Drilling a Bore / Well / Wedge Hole to Access Groundwater

Construction Requirements for Water Bores

Poorly constructed bores pose a risk to groundwater resources. Poor bore construction and decommissioning practices have caused contamination and pressure loss in many aquifers.

All bores must comply with the Australian minimum construction requirements for water bores, which include a technical standard for constructing water bores, and correct decommissioning of old unused or failed bores.

Failed bores can significantly pollute the confined aquifer, particularly nearby bores as saline water is denser and can flow down into the confined aquifer. If the confined aquifer is pressurised this can leak upwards into the unconfined aquifer and is lost.

Download the Fact Sheet: *Minimum construction requirements for water bores in Australia (PDF, 10MB)*.

Regulatory Requirements:

Regulatory requirements have been established primarily in response to issues that have created either environmental damage, over-use of resources, infrastructure damage or even conflict between land users. Often these issues were not foreseen, and as such the regulatory frameworks have been put in place to prevent or limit any such adverse impacts occurring.

Landscape South Australia Act 2019 defines a well, bores & wedge holes over 2.5m deep as a well which requires a permit.

Prescribed Wells Areas

Irrigation and industrial water extraction in a Prescribed Wells Area requires a **water allocation and license.** Stock and domestic bores are generally exempt from needing a licence **but do need a permit.** Refer to Section 100 of the Landscape South Australia Act 2019 *https://www.legislation.sa.gov.au/lz?path=%2FC%2FA%2FLANDSCAPE%20SOUTH%20AUSTRALIA%20ACT%202019*

Calculating Livestock Water Needs

The figures used in the link below can be used as a guide in determining your total stock water requirements. It should be noted however that the following are average figures and variations will occur depending on weather conditions, feed available, the breed of animal, and whether they are lactating.

https://www.coorong.sa.gov.au/__data/assets/pdf_file/0032/871286/3.-Calculating-Livestock-Water-Supply-Needs.pdf#Calculating%20Livestock%20Water%20Supply%20Needs

Water Quality for Livestock

A measure of water quality and quantity to effectively plan for livestock water supplies is critical. If water quality is poor, livestock may drink less than they need, or rarely, may stop drinking altogether. When animals drink less, they will eat less and lose condition, and if they are lactating, their milk production will reduce or cease.

Water quality for livestock in South Australia is most affected by water salinity, and the presence of water contaminants such as blue-green algae, organic material, heavy metals and chemicals. This is important to ensure that livestock can access water that will ensure that they thrive, not just survive.

Download Fact Sheet for more information:
https://www.coorong.sa.gov.au/__data/assets/pdf_file/0027/524835/Livestock-Water-Supplies-PIRSA-Fact-Sheet-1.pdf

Salinity, Salinity Units & Salinity Meters

Salinity refers to the presence of soluble salts in the water. It is usually measured as electrical conductivity (EC units) which is an indicator of total dissolved salts (TDS) in the water, which is referred to as parts per million (ppm).

Be careful not to get confused with different salinity measuring units. EC units & parts per million are the most common units used.

The Coorong Tatiara LAP has a **Salinity Unit Conversion Slide Chart** which is available free from the Council Offices.

Salinity meters & monitoring

Monitoring bore water quality is important for livestock health across the seasons.

Extreme salinity levels in unconfined aquifers contribute to rusting of metal confined bore casings.

Bore failure and high salinity levels can occur very suddenly.

Shandying, if you shandy water, an EC meter allows you to monitor the salinity level of the output water.

If you find yourself considering these challenges regularly perhaps it is time to consider purchasing your own Electrical Conductivity (EC) meter to measure the salinity of your water.

- What is the quality of the water my livestock are drinking?
- Why has there been an increase or decrease in my stock water consumption?
- How do I keep my livestock healthy?
- What is the salinity level in my bores, wedge holes, tanks and troughs?

Pocket sized meters are available which are appropriate for use around the farm and are easy to use and not expensive.

Salinity Units of Measure Convertor

Electrical Conductivity (EC units)	Parts per million (ppm) Same as milligrams per litre (mg/l)	Grains per gallon (gpg)
500	320	22
1,000	640	45
1,500	960	67
2,000	1,280	90
2,500	1,600	102
3,000	1,920	134
3,500	2,240	157
4,000	2,560	180
4,500	2,280	202
5,000	3200	224
6,000	3,840	268
7,000	4,480	313
8,000	5,120	358
9,000	5,760	403
10,000	6,400	448
15,000	9,600	671
20,000	12,800	895
30,000	19,200	1,342
40,000	26,000	1,818
50,000 *Sea water*	32,000	2,237

Water Savings Options

Leak Detection Units

Water leaks can be as high as 20% to 40% of total usage.

- Monitor & record flow from SA Water meters & domestic bores.
- Rapid detection of major leaks.
- Identify minor system leaks.
- Daily water usage alerts via SMS & email.
- Simple to fit on existing water meters.

Tank Level Sensors

- Saves time checking tank levels.
- Saves water loss from overflowing tanks.
- Prevents the risk of tanks running dry.

Pressure Reducers

- Pressure reducers can significantly reduce leaks in pipelines and water infrastructure.
- Particularly useful with older class B poly pipe.

Pressure Gauges

- Helps identify loss of pressure. through leaks or overflowing tanks.
- Cheap & easy to install.

Fire Water

To aid fire fighting a 65mm Storz CFS compatible fitting should be fitted on the pump or tank. These cost $40 to $60 each.
The CFS recommend a 65mm Stolz fitting for quickest access and saves time in an emergency looking for adaptors and fittings.

For more information please read the CFS Built Environment Section Policy no. 14 - *Above Ground Water Storage Tanks for Fire Fighting Purposes*, particularly the sections on fire appliance access and storage tank connections, valves & accessories.

Storz pump & hose couplings

This can be downloaded at:
https://safecom-files-v8.s3.amazonaws.com/current/docs/fire_services_policy_0014_above_ground_water_storage_for_fire_fighting_purposes.pdf

Additional Resources

For comprehensive background on water security and management in the Coorong and Tatiara please visit
https://www.coorong.sa.gov.au/council-services/coorong-tatiara-local-action-plan/water-security

For information on permits & regulatory requirements, prescribed wells areas & bore construction,the primary source of advice on well permits and bore construction is the Department for Environment & Water, Water Licencing Branch

Limestone Coast Landscape Board: 08 87 35 1204
Murraylands & Riverland Landscape Board: 08 85 32 9100

Groundwater Contamination

Bores can become contaminated by site activities, from neighbouring properties or by natural processes. Contamination is most likely to be detected in bores where the groundwater is near the surface and there is significant rural activity in the catchment.

Sources of groundwater contamination include:

- Naturally occurring substances in the soil, such as salts and metals.
- Poorly treated sewage and animal waste.
- Stormwater leached matter from waste holding or disposal areas.
- Chemical/ fuel spills or leakage from tanks
- Agricultural chemical, pesticide and fertiliser residues.
- Salt, algae and iron bacteria.
- Old uncapped (not backfilled) bores polluting the confined aquifer.

Some contaminants may be easily detected through observed physical changes such as:

- Stock in poor condition or refusing to drink.
- An odour chemical, sewage, petrol or 'rotten egg' smell.
- Skin or eye irritation, unusual taste.
- Foaming around sprinkler outlets.
- Abnormal colour or sediment in the water.
- Dying or wilting plants.

If groundwater becomes contaminated then you should contact the EPA Site Contamination Branch
https://www.epa.sa.gov.au/environmental_info/site_contamination

Coorong Tatiara Local Action Plan

Tintinara Office

37 Becker Tce Tintinara
PO Box 399 Tailem Bend SA 5260
P: 1300 785 277

https://www.coorong.sa.gov.au/council-services/coorong-

Australian Government | National Landcare Program

LANDSCAPE SOUTH AUSTRALIA LIMESTONE COAST

Coorong Tatiara Local Action Plan

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