The AAEV Water Supply System and Philosophy

Some times the reasons why things are done a certain way in the village is either forgotten or not ever known; even known by those who were involved at the beginning. Our water supply system is one of those things. This article to inform people of how our water supply system functions, and allow them to make the choices needed when building or correcting already installed systems.

Background

In the earlier planning stages of the village, it was decided to not undertake the traditional development model where SA Water would provide a full distribution infrastructure. Reasons were:

- Cost: To provide a full service from SA water would have required an upgrade of the SA water main which the developer (and ultimately the community would have paid for). Referred to as an augmentation fee, it is believed that this was in the order of $150,000.
- Water Self-Sufficiency: Limited street water (from SA Water) would encourage self-sufficiency in supply.
- Materials: With a SA Water supplied system, there would have been issues to resolve with the use of PE (polyethylene) instead of PVC (polyvinyl chloride), meaning that PE was not “standard practice”

It was decided to operate the community off a single extra domestic supply inlet (20mm). This in itself was a coup in that the then minister for infrastructure agreed to this unusual event (amazing), and then SA Water agreed to not charging fees per allotment (also amazing).

The basic philosophy of the design was that all buildings would operate off “house” tank water, which was filled primarily by rain-water with backup water available through the distributed water system, which would be used to top up the “house” tanks. To this end the minimum tank volume of 10kL was included in the bylaws and storage buffer tanks were installed to store the “trickle feed” from the SA Water 20mm domestic supply.

Water Reticulation System Design

The entire physical infrastructure was designed on the basis of this philosophy. The water reticulation system consists of water piped to each lot within the community, as well as to the various orchards and gardens within common land. Within this reticulation system, there are also fire hydrant takeoff points.

At the main entrance of the village there are two 176 kL (approx) tanks. These two tanks are filled using the single 20mm domestic street feed. It is from these tanks that water is drawn to supplement household use and irrigate

orchards. It also serves as the reservoir of fire fighting water, should it be needed (and as such a minimum level needs to be maintained).

The volume of storage is predicated on supplementing household use. The rate of water delivery is predicated on a slow and gradual use of water, not the high peak flows required for normal domestic flows (SA water standards) supplied to each household. The volume is also based on being able to provide sufficient fire fighting water.

The original system was based on gravity feed, on the assumption that only low flow rates were required to trickle feed to the water tanks on each lot. Fire booster points were installed to allow connection of a pump truck at the main tank (near entrance) to "suck" water from the tanks and "blow" it into the pipes, with another pump truck at the fire "sucking" from the pipes and "blowing" onto the fire.

Subsequently, a pressure pump was installed to increase flow rates and pressure as some of the "house" tanks at higher elevation and the orchards were not getting any flow at all. The pressure pump however is not sized nor intended to provide the pressure and flow that would be required to deliver flow directly to all residences within the village.

The Issue

Unfortunately, having pressurised the water reticulation system, it has become expected that the water be delivered as if it was a SA water system with the same level of flow, pressure and reliability. **The system is not designed to nor intended to do this.**

Households are beginning to connect directly and draw directly of the reticulation system when the "house" tank is empty. While we get away with this at the moment, it is unsustainable and will in time place an undue burden on the pumping system.

Why the distribution system should not provide high pressure and flow to all houses?

The sizing of the pipes is such that to achieve the flow required to supply all residences at the same time would require high-pressure delivery due to high friction within the pipes. This would require a much larger pump than is currently used and a correspondingly greater amount of energy to operate (just to overcome friction). This is neither energy efficient or good for the pipe system to be operating continuously at high pressure (though is manageable for the short bursts that would occur in a fire fighting situation).

Why use storage over peak loading

With storage in the "house" tanks, the draw on the main tanks is gradual over 24 hours which can be matched by the continuous but gradual feed from the domestic feed over 24 hours. With sufficient houses connected directly to

main tank, the peak flow (morning and evening) could be greater than the tank can refill, causing the tank to be drained below its minimum levels. To increase the input flow from the street to compensate would incur some augmentation costs and possibly result in losing the previously agreed arrangement with SA water for not charging individual lots.

How should the house water systems be connected?

Your street feed water (from the main water tanks) should be fed directly into the water storage tanks on your lot. The house and garden is then supplied directly from your own tank. It should also be noted that the bylaws require "whole of house" use of tank water and include requirements for the safe connection.

There are options and it is your discretion as to how this is achieved.

a. Feed from tap using a hose directly into the tank, when a top up is needed. Though this is not recommended as cannot be sure there isn't back flow into the reticulation system (potential contamination). Care needs to be taken that hose does not end up in the water but remains above the water level.
b. Plumb in a permeant water feed, with a valve/tap that can be operated when top up is required. The in-feed needs to be 75mm above the overflow point. (See bylaws).
c. Use an automatic cut-off valve that allows water to be added when the level drops to a certain point and stops when is rises to a certain point. Once again the in-feed needs to be 75mm above the overflow point. (See bylaws).

Whether automatic or manual, the system should be designed to top–up between 1/8th and ¼ full and stop filling between ¼ and 1/3rd full. Do not fill up over 1/3rd tank volume; you want room to be able to collect water "when" it does rain. An earlier recommendation was to ensure that 1KL is maintained at all times.

If you wish to keep street water separate from rainwater (no mixing), then use separate tanks (the street feed tank can be much smaller and can be 100% filled). A change over valve can be used to cycle between rain and street water.

For those building during these periods of low rainfall, the first thing to be done is to top-up your own tank to the ¼ to 1/3 level rather than wait for the rain.

How do I supply water from the tank to the house?

To supply water under pressure there are two options:

a. Use a "pressure pump" to pump water into the house. Use a pump with an accumulator; this will prevent the pump cycling on and off for small

flows. The pump will usually be outside, so give consideration to some noise insulation around the pump to prevent noise disturbance; ensuring also that the motor still has access to air for cooling.

b. Pump the water up to a header tank (3 metres or higher though 2.4 metres should be adequate) which then gravity feeds to the house. A smaller pump is needed and if there is loss of power you still have some water pressure. If using a header tank, consider where it will be located in the house design and what supporting structures are required.

What about when there is no power?

Yes, your house pump will cease to operate, but so will the village pressure pump, so pressure and flow will be very limited from the distribution system. If you are concerned about having access to water during power outages, consider a header tank within your house design, or a backup (stand alone power supply) to operate the pump.

Why do we have water meters?

All lots are asked to have water meters installed at commencement of building. This is because we do have to pay SA Water for the water supplied via the 20mm domestic feed into the main storage tanks. As it is a domestic with large volume, we pay excess charge rates almost immediately in any billing cycle. This is currently $1.06 per kL. Usage from each lot needs to be recovered from the lot owners. Bills are issued once per year based on meter readings. The community covers fixed service charges. Expect that as water becomes a scarce commodity that this charge will go up, especially if we are forced to transport water in with a tanker.

Quality of Rain and Street Water

Storage of water means that more care is required in regards to maintaining water quality. The village “main” tanks are tested for water quality on a regular basis. It is also recommended from time to time that you get your house tank water tested.

Another reason for having your own water storage (whether rain or street water) is that should the village “main” tank become contaminated; then you will still have your own water supply. This is where manual fill is also of benefit, as you will know when last a top up occurred from the “main tank”.