SUBMISSION NO. 165

Committee Secretariat,
Standing Committee on Agriculture, Fisheries, Forestry,
House of Representatives,
Parliament House,
CANBERRA ACT 2600.

Mrs Anna Heidecker,
39 Norman Street,
Fig Tree Pocket, Q4069.
Tel. 07-33783215.
3rd August 2003.

RE: **Inquiry into future water supplies**-Public hearing, Western Australia.

Recharge landscaping for less obtrusive, sustainable urban storm-water harvesting

Infrastructural recharge.

The Inquiry in Western Australia will be well placed to consider conditions favoring storm-water harvesting to augment future supplies. A proposal shown in Fig. 1 would entail recharge through central bores and infiltration ponds and trenches. Such an infrastructural system would require trash separators, filters, collecting tanks, pumps, pipes, bore screens, excavations and surrounding safety fences. Insect control in tanks and pipes can be difficult, particularly during periods of irregular rainfall deficit.

Investment, maintenance, and environmental costs might be sustainable in favorable geological environments about Perth. However they are a limitation in other urban environments with groundwater supplies used to take the load off reticulated supplies. Groundwater is used to maintain urban gardens, shade, and dust control in towns that need to be attractive tourist destinations as well as healthy residential environments. This is illustrated about my property in Yeppoon, Livingstone Shire, Queensland, see attached Figs 2 & 3. Unfortunately, groundwater supplies seem likely to run down as natural recharge can be intercepted by improved road and culvert drainage , eg up hill behind my property in Fig.2.

An infrastructural recharge system on my property might entail surge tanks and chain-wired rubble infiltration trenches. However excavation might have environmental impacts on the landscape, a tree belt, drainage health, and the aquifer itself. Low-salinity storm-water can remobilize dispersive clays if recharged through sub-soil horizons. These clays can be flushed on to throttle drainage , with unpredictable results , including water logging, salinity, drainage "dieback", aquifer sealing, and declining groundwater quality and less rather than more recharge.

Recharge landscaping.

In this case natural landscape elements, structures, associations, and processes are used to collect run-off and to maintain infiltration. A natural place for recharge on my property is at its lower boundary where there is a change in slope with a greenbelt terrace of gravel , sand, humus, and tree-belt litter indicated in Fig.3. This terrace appears to be able to cope with as much as 15 cubic metres of run-off, indicated by its ready take up of run-off during storms which caused flooding elsewhere in the district. Humus and a rich soil fauna seem to be countering development of a clay recharge throttle. The soil fauna and litter seem to maintain natural insect controls. Trees in the recharge zone are healthy and productive probably through filtering off nutrients in the descending recharge. Included amongst the trees are some that produce anti-microbial and anti-parasite factors.

Secretary: ....
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Government policy

There has been an understandable preference for infrasrtuctural measures rather than landscaping measures. The former are quick to apply and simple in their benefits. . Landscaping takes time and is much more complex in its benefits. Yet these benefits are now regarded as highly desirable consequences of Integrated Planning, recently adopted in Livingstone Shire and more widely as a result of State legislation. Improved recharge by landscaping can be integrated with measures to control environmental change, climate, flooding, water logging, salinity, and "die-back". Policy on all levels of Government might assist by recognizing recharge landscaping as an acceptable option in planning schedules.

More details.

My technical advisor can provide more details in written submissions if called on, or to hearings should they be recalled in Queensland.

Yours faithfully,

Anne Heidecker

Anna Heidecker.

Attachments:
Fig. 1 "Underground... save water" *The Australian* page 18, July 6-7, 2002.
Fig.2 View... across a small aquifer....(Yeppoon, Livingstone Shire, Qld).
Fig.3 Diagrammatic section... Yeppoon.

Cc
1. Manager-Development & Environment, Livingstone Shire Council, PO Box 600, Yeppoon, Q4703.
2. Qld Department of Natural Resources , Groundwater Section, Rockhampton, Qld.

Fig. 1

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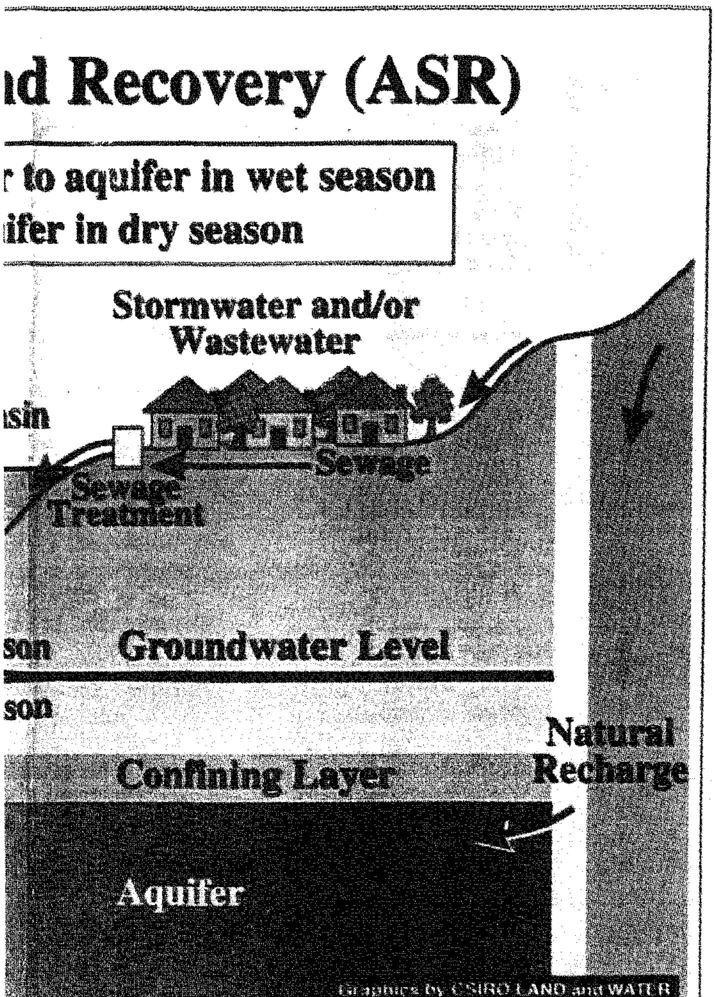
'2 p18, "Resources"

ment to save water



population grows or industrial water demand expands."

One of the great advantages of subterranean storage is its ability to disinfect water. CSIRO microbiologist Dr Simon Toze has produced evidence that storing water underground purges it of disease-causing organisms.

This makes it clean enough to recycle for irrigation and, if properly operated, for drinking supplies.

"We've been studying the behaviour and fate of various microbes in groundwater taken from different parts of the country," he explains. "We've looked at enteric (gut) viruses, the protozoan Cryptosporidium, and disease-causing bacteria like Salmonella and Aeromonas.

"If we are to store large volumes of water underground for recycling, we need to know exactly what happens to these bugs, and whether they survive in reclaimed water."

Once underground, these disease-causing organisms confront an array of hostile conditions such as temperature changes, lack of oxygen, lack of nutrients and an army of naturally-occurring micro-organisms that kill or inactivate them — a form of natural biological control.

In experiments undertaken in aquifers and under controlled conditions in the laboratory simulating conditions of an underground aquifer, Dr Toze has shown that most disease-causing microbes survive for less than a month. Tests of the antimicrobial activity of indigenous bugs in groundwater taken from South Australia, the Northern Territory, Victoria, Queensland and Western Australia found, in every case, the disease-causing organisms added to the water disappeared in less than six weeks.

"Since water injected into an aquifer is likely to remain underground for several months before being re-used for irrigation or landscape watering, it looks as if there will be a comfortable safety margin. This makes underground storage one of the most promising ways to cleanse recycled water," he says.

"Australia is naturally a dry continent, and in many areas our groundwater resources are heavily exploited. Underground storage appears to offer a safe, clean way to recharge them," Dr Toze comments.

Dr Toze predicts that for many of Australia's more arid towns and cities, reclaiming water will soon become essential — and this applies in hot countries round the world.

"At present there's still a tendency for people to speak of "waste water" — but that is a poor term, and shows how limited our thinking still is towards water. Instead, we need to focus on the productive uses of reclaimed water.

"Reclaimed water is generally not intended for drinking without further treatment, but is ideal for the irrigation of parks, gardens, farms, sports fields, golf courses, tree plantations and street verges.

"I believe that in pioneering this pathway to water re-use, Australia is showing world leadership in a field that will prove increasingly vital to both the human and environmental future," Dr Toze says.

Dr Dillon, Dr Toze and their colleagues say underground dams can provide a wide variety of services:

- harvest city stormwater run-off and save it to irrigate parks, sports ovals, golf courses and gardens during the dry season;
- supplement household water supplies for communities whose natural supply becomes salty or dries out in summer;
- harvest treated urban sewage effluent and improve it to a level safe for watering crops or the urban landscape;
- provide water security fast-growing suburbs ε industry on the outer metr politan fringe without building new dams or destroying local rivers;
- make saline groundwater irrigable and even drinkable by blending it with fresh water harvested on the surface;
- provide farmers, silviculturalists and horticulturalists with a new way to store water without having to construct costly surface dams;
- use surplus water from rare floods in arid regions to recharge natural artesian and fossil aquifers;
- save precious water in hot, arid areas (like the Western Australian Goldfields) for re-use by the mineral processing industry or for greening townships;
- save money and infrastr ture in water storage;
- reduce water losses fro evaporation;
- save environments and productive land that might otherwise be flooded by building a dam.

The knowledge generated by water banking is, potentially, a new export industry for Australia, helping countries and communities that face water shortages, Dr Dillon says.

CSIRO is a co-organiser of an International Symposium on water banking to be held in Adelaide in 22-26 September. For more information see: 4th Intl Symp on Artificial Recharge of Groundwater web page: www.groundwater.com.au/conf/ISAR4.htm Or email: isar4@hartleymgt.com.au

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The Weekend Australian July 6-7 200

Underground move

Australia is pioneering a new way to store large amounts of water – in underground water banks. **Julian Cribb** reports

FONLY a generation ago, the towering concrete wall of a dam was a proud emblem of national prog-s. Nowadays dams are in strife, charged with causing environmental, social and economic problems.

Yet the world is becoming desperately short of clean, fresh water. By 2025, nearly three billion people will face acute scarcity and billions more experience shortages and soaring costs. As megalopolises of 10, 20 and 30 million inhabitants arise, water demand will bloat with them, feeding social unrest. World consumption of water is growing twice as fast as population.

Australians, bred to a continent of erratic droughts and floods, have long had to think creatively about water and how to store it. Like other nations, the 20th century brought Australia an era of dam building. Dams were regarded by governments as visible milestones of national development, leading the late Bert Kelly MP, to famously remark in the lead-up to an election: "I can feel another dam coming on."

By the 1990s, Australia was starting to face up to the fact that its water, once seen as abundant, was strictly finite compared with the growing social, industrial and environmental demands placed on it. The need to recycle, to make use of urban runoff, to store in a way that avoided evaporation losses and to cleanse safely were becoming paramount issues. Step by step, this led to the idea of the "underground dam" or water bank.

Tested since the mid-1970s, the water bank concept has been developed by a team of scientists working for the Commonwealth Scientific and Industrial Research Organisation (CSIRO) and South Australian Department of Water Land and Biodiversity Conservation (SAWLBC), as a way to recycle and purify waters of low quality. Another name is aquifer recharge.

"In this form of water banking we can pump water into the aquifer during the wet season and take it out again during the dry season or whenever it is needed," team leader Dr Peter Dillon explains. "There are several benefits to this.

"First, it is cheaper to store water underground than to spend huge sums constructing a dam on the surface. The minimum economic storage volume is several orders of magnitude smaller than surface dams and you only need to store enough to match demand.

"Second, as aquifers are far more common than good dam sites, you can generally locate the water supply much closer to the community or industry that uses it. You can decentralise water storage across a city and — for example — create new storages beneath areas of growing demand like new suburbs or industrial sites."

Third, he says, you can harvest surface runoff and stormwater, much of which is normally lost and which, being rich in nutrients and oils from the city, often creates pollution problems if allowed to enter a river or bay.

The CSIRO scientists say that subsurface storage complements surface reservoirs and may not replace large dams — but it could be a robust alternative to expanding storage capacity using reservoirs alone.

The environmental impact of underground storage is also far lower than that of a dam, provided the storage aquifer has been carefully chosen to avoid leakage into other aquifers and pressures are managed correctly. Also, it does not compete with other land uses, such as housing or agriculture.

"Best of all, there are no losses to evaporation, which is a big plus in a hot, dry climate. In a confined aquifer, there is also good protection of the water from pollution from overlying cities," Dr Dillon says.

CSIRO and SAWLBC have shown it is possible to store fresh water in a saline aquifer, creating a large "bubble" of fresh water which can be tapped at will. If the aquifer has a low rate of flow, this limits the mixing of injected fresh water and salty groundwater which, in practice, tends to be confined to the edges of the "bubble".

Dr Dillon cautions that underground dams cannot have the capacity of very large surface storages. Typically, a single injection well may store 200,000 cubic metres of water, instead of 20 million cubic metres.

"But sometimes aquifers are stacked like pancakes and you could have several in one area, supplying different qualities of water for different water uses. For example you could provide different qualities for landscape watering and agriculture, or industry and household supplies.

"Furthermore, within the limits of your aquifers, you can expand local storage as the

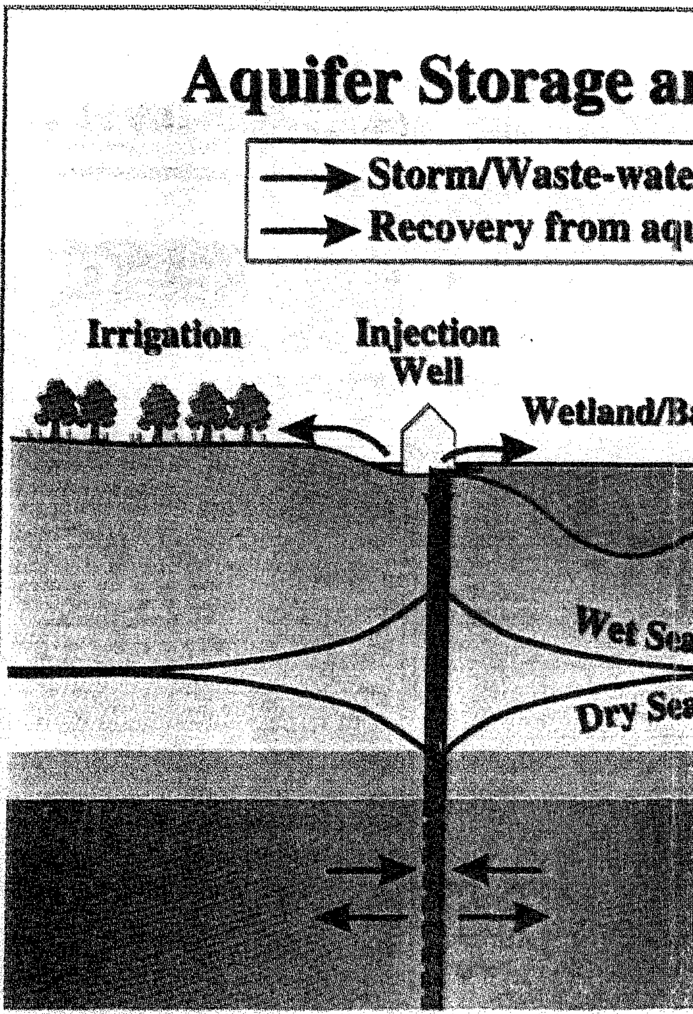

Figure : View northeastwards across gardens serviced by a small aquifer towards Power Street. The large trees in the right half of the figure mark the greenbelt at the rear of 30 Power Street.

Fig. 2

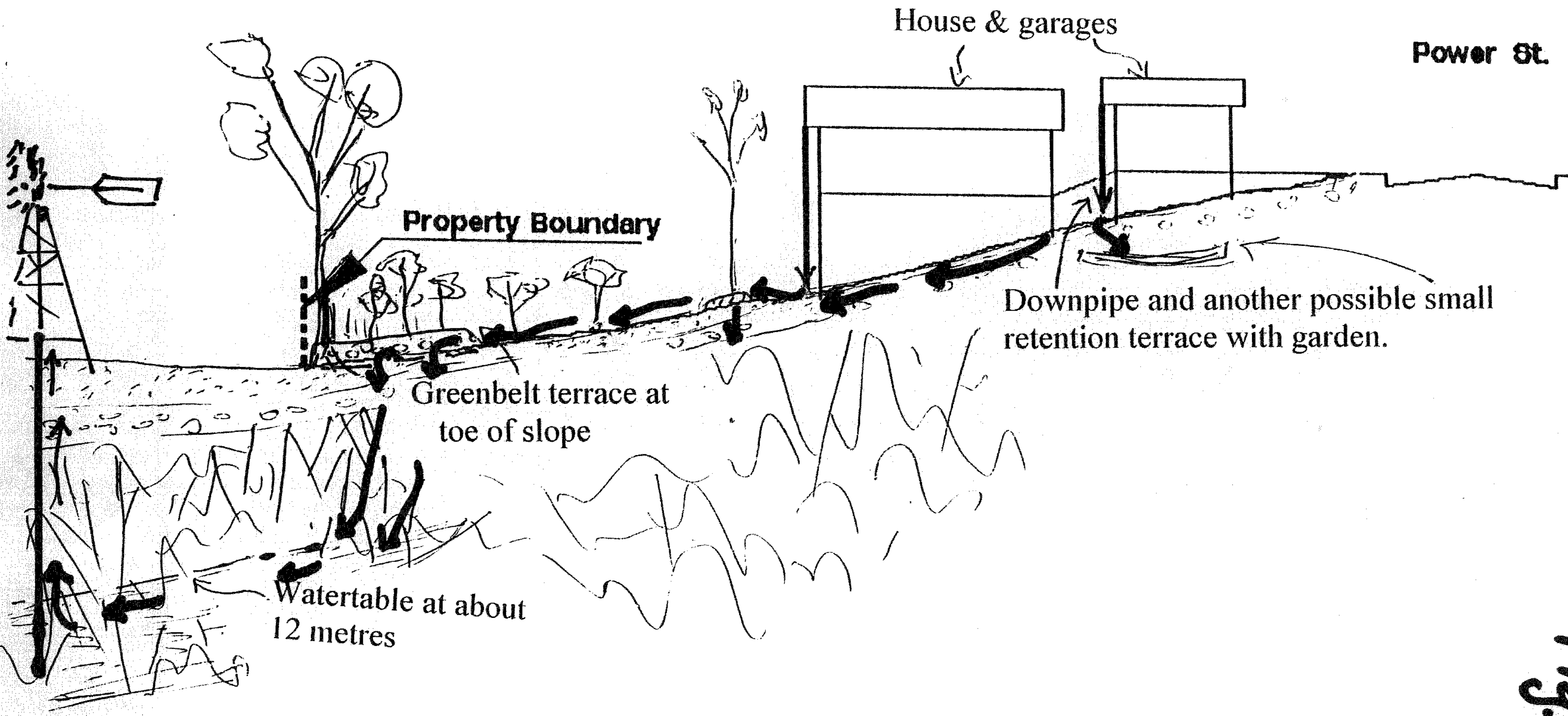

Fig.3

Figure Diagrammatic section viewed northwards with Power Street , Yeppoon on the right (east) , with the western property boundary of 30 Power Street shown. Properties fronting onto Hughes Street are to the left.