Submission No 1

INQUIRY INTO INQUIRY INTO A SUSTAINABLE WATER SUPPLY FOR SYDNEY

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Subject:

Summary

SUBMISSION TO THE

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SUSTAINABLE WATER SUPPLY FOR SYDNEY

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STORMWATER HARVESTING

Street stormwater harvesting has the most potential for supplementing Sydney's water supply for the least capital outlay and operating costs. It also uses the least amount of energy, and has the least disruptive and potential health consequences.

Water could initially be harvested via many small cisterns sunk underground at various peripheral stormwater collection points – where underground stormwater, generally enters creeks, parkland, etc.

This water can be filtered, temporarily stored, and then pumped to more centralised bulk storage using the existing secondary street pipeline system generally reserved for fire-fighting.

A new city-wide network of underground pipes is NOT required. The existing fire network is ideal for transferring non-potable water between the cisterns and any central or intermediate storage facilities with very little needed in the way of additional pipeline extensions. Low-volume electric pumps (centrally controlled) are all that is needed to maintain the pressure in the fire-lines at existing fire-fighting pressure levels during the transfer.

Since the peripheral cisterns would be regularly emptied by these pumps after rain, the annual collection capacity of each cistern is many times the individual volume. Small totally-underground cisterns do not physical intrude into local neighbourhoods, and since such large storage systems can easily be sealed from insects, they would not provide a mosquito breeding ground that above-ground domestic tanks do.

Home water tanks can't be refilled until they have been emptied, so most of the potential catchment capacity is lost through overflow when rain comes in batches. However a street cistern system can be progressively emptied during light rainy periods, and completely emptied between major rainfalls so it's catchment capacity is reused many times each year.

The cost-per-litre of harvesting rain water in this way is, at most, only a few percent of the litre-costs of home rainwater tanks (possibly even less than the subsidies offered), and they require less maintenance and have a much longer lifespans than above-ground domestic tanks.

THE BASIC MATHS

A cistern of small-to-average dimensions (say cylindrical in shape, with a 4m radius and 10 m depth) has a capacity of 500,000 litres, which, if refilled say, 30 days in a year, yields approx 15 million litres p.a.

It makes sense to avoid processing and use this as non-potable water for fire-fighting, industrial applications, and the watering of major sports grounds, gardens, etc. provided it can be delivered to major users in a pipeline network separate from the potable water supply.

The fire-fighting network is such a system, and the water in this pipeline doesn't need treatment other than to filter out particulate matter through low-cost, low-maintenance sand filtration.

HOW MANY CISTERNS WOULD WE NEED

As a rough guide, the more hilly northern suburbs of Sydney would need about 1 cistern of the above dimensions for each square kilometre of developed land. Twice this number would probably increase catchment by an additional 25-30% (only when the first overflows).

A square kilometre of homes and roads receives 1 million litres of water for every measured millimetre of rainfall (ie. one litre per sq m). So a 500,000 litre cistern would fill with only half the rain when 1mm of rain had fallen (assuming a 50% loss). A single cistern could handle this volume every 24 hours -- assuming it takes this long for the cistern to pump empty. Obviously more or bigger cisterns can be built in the one location if the water flow justifies the costs, and these would be cheaper since they would just be overflow tanks.

Since Sydney is built on Hawkesbury sandstone it is ideally suited to the cheap excavation and construction of underground cisterns. Automated sandstone crushing machinery can be designed to a standardised cistern dimension, and the cavities excavated would then be capped. Cement lining is probably not necessary for temporary storage, but if it is, then this would be done in the same automated way that cylindrical wheat silos are constructed.

Cisterns with a 4 m radius would fit comfortably within existing easements, road-peripheries, etc. without creating significant disruption during the construction phase other than the relocation of some existing pipes and phone lines. These sites are not likely to be on main roads or anywhere with high traffic densities.

Such a network of cisterns can be installed progressively since very little additional infrastructure is needed and, apart from the constructing the cisterns themselves and some additional pumping and pipeline switching, very little needs to be changed in the management of existing networks and services.

THE NEGATIVES

The perceived problem with the recovery of harvested stormwater in this way has been the fallacious claim that it would require the construction of a new, very expensive, underground pipeline network for water-return (to central storage) or reticulation. This is not so.

Provided the harvested water is filtered to remove large particulate matter, there is no problem with using the existing fire-hydrant supply network for water-return to central storage, or for direct reticulation to large government and commercial users.

Pipelines are usually used in a one direction only, but there is absolutely no reason why they can't be used bi-directionally with only some minor modifications.

It is fairly predictable that the fire-brigade lobby would initially oppose such a secondary use of their pipeline network, but their fears are not justified.

- It is always preferable to use pipelines, rather than to allow them to sit idle awaiting an emergency. Pipelines are more reliable when flushed regularly than when stagnant.
- Peripheral pumps can also supplement existing fire-fighting supplies and maintain higher pressure along the full pipe length, than is possible with any system depending entirely on centralised pumps or gravity feeds.
- It will probably be desirable to maintain some water in the cisterns during bush-fire season, precisely for local fire-fighting use.

CONTROLS

Cistern monitors, pumps and control valves would need to be centrally controlled via PAPL lines (existing copper-pairs from Telstra) or via radio links. Obviously local direct-physical controls would also be available.

The reliability of the fire-fighting requirement would be ensured by making the automatic fallback (default) conditions as OFF. There is nothing difficult or dangerous with any of this: peripheral pumps will lower the risk of catastrophic failure of the fire-fighting network, rather than raise it.

APPLICATIONS

Non-potable water delivered via the fire-fighting pipeline would initially be made available only to large industrial areas, sports-grounds, council parks, etc. It would be expected that these users would install their own tanks/cisterns and only connect to the fire network for daily or weekly replenishment, rather than full-time.

As the system develops it would also be possible to introduce shared intermediate buffer cisterns or tanks which could act as distribution points to distribute the water to domestic and small-scale industrial users. These would have a smaller capacity, and require the installation of new local pipelines feeding only short distances. Presumably the costs would jointly covered by locals who contract to utilise the service, and they would need to be handled and metered separately from the potable water supply.

Since swimming pools need to handle bacterial levels potentially many times greater than this non-potable harvested water, they are equipped with their own filtering and chlorination equipment. It would therefore be possible to legislate that swimming pools could only be refilled by contractors licensed to use the non-potable water from local fire-plugs and hydrants.