Bypass the salt

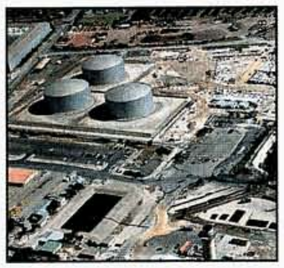
Weighing up the pros and cons of desalinated water

Desalination is one of the water sources of last resort. Expensive and energy-intensive, it also generates large amounts of concentrated brine and salt as a waste product.

It is a measure of the depth of Australia's water crisis that the country has one operating desalination plant in Western Australia (the Perth Seawater Desalination Plant, inset right) and a further four in the planning/construction phase, including one for Sydney.

Desalination technology has been around for decades and is widely used in the Middle East and, to a lesser extent, in Spain, North America and the Caribbean. The most common methods of removing salt from water are distillation (heating saline water to capture water vapour) and reverse osmosis.

The latter, which will form the basis of Sydney's $2 billion desalination plant at Kurnell in the city's south, involves forcing water through tiny pores in a synthetic, semi-



permeable membrane, leaving the larger salt molecules behind. But this process requires huge amounts of energy. Each litre of seawater contains, on average, about 35g of salt.

Desalination plants of the kind planned for Sydney are notoriously expensive to build. Once they are up and running, 1000 litres of usable water can be produced for between $1 and $4 – which is way above the low price tag Australians currently enjoy for water. The plants also require constant and ongoing maintenance work by experts.

The full environmental cost of desalination is not yet known. Although the NSW Government wants to power Sydney's water factory using renewable sources, the amount of energy required to maintain the pressure needed for reverse osmosis is huge. Electricity costs can account for between 50 and 75 per cent of ongoing expenses at a desalination plant.

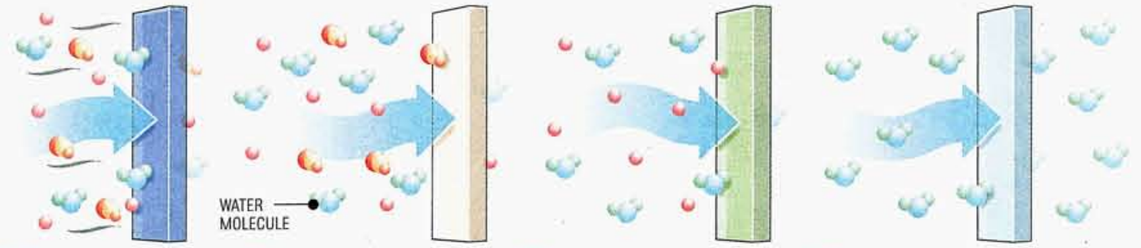
And dealing with the waste brine (mainly salt) once the pure water has been extracted remains a problem in some areas. Factories built in bays and estuaries pump concentrated salt back into the water, which can have a devastating impact on stagnant marine ecosystems. But disposing of waste salt from inland plants can be even more dangerous to the environment and exacerbate existing groundwater salinity.

Desalination does not always involve seawater. Groundwater (water that collects in underground spaces between rocks) with a high salt content can be pumped up to evaporation basins to undergo passive desalination before being released into waterways.

Some scientists and environmentalists believe we should pursue water management strategies such as conservation, rainwater tanks, recycling and stormwater harvesting rather than take the desalination route.

DESALINATION PROCESS

Source: Sydney Water



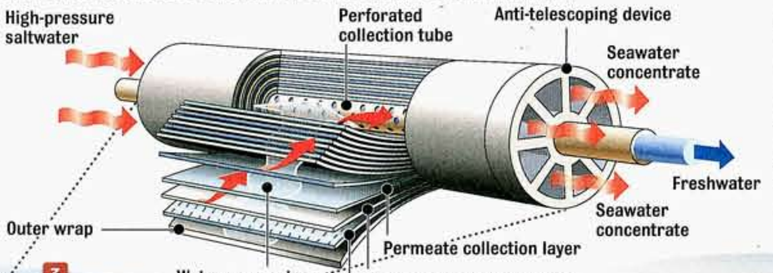
1 SCREENING
Marine organisms and other material such as kelp are removed

2 PRE-TREATMENT
Suspended solids and fine sediments are removed to protect membranes

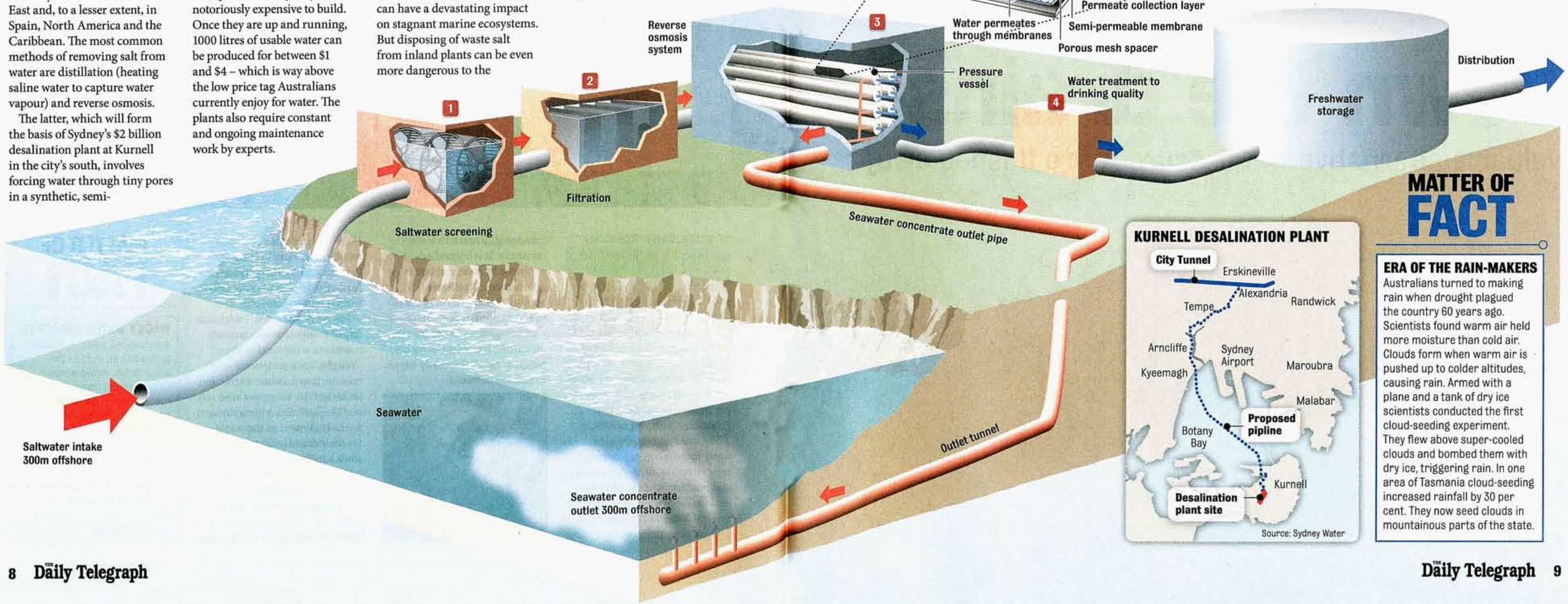
3 REVERSE OSMOSIS (RO)
Pre-treated seawater passes through RO membranes, which retain salt and other impurities

4 POTABILISATION
Desalinated water is treated to drinking water standard with chlorine, lime, carbon dioxide and fluoride before being pumped to the water distribution network

REVERSE OSMOSIS SPIRAL-WOUND MEMBRANE ELEMENT



High-pressure saltwater is pumped into a spiral-wound membrane element. Purified water permeates through the sandwich of membranes until it reaches the collection tube. This leaves salt and other impurities which were too large to pass through the membranes to be flushed through as seawater concentrate which is then pumped back into the sea.



KURNELL DESALINATION PLANT

MATTER OF FACT

ERA OF THE RAIN-MAKERS

Australians turned to making rain when drought plagued the country 60 years ago. Scientists found warm air held more moisture than cold air. Clouds form when warm air is pushed up to colder altitudes, causing rain. Armed with a plane and a tank of dry ice scientists conducted the first cloud-seeding experiment. They flew above super-cooled clouds and bombed them with dry ice, triggering rain. In one area of Tasmania cloud-seeding increased rainfall by 30 per cent. They now seed clouds in mountainous parts of the state.