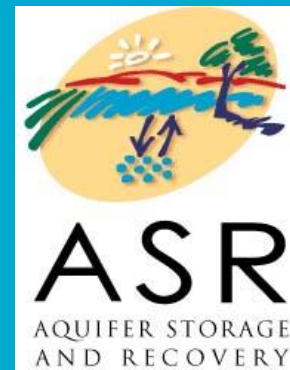




# Bolivar recycled water ASR

## Research project overview

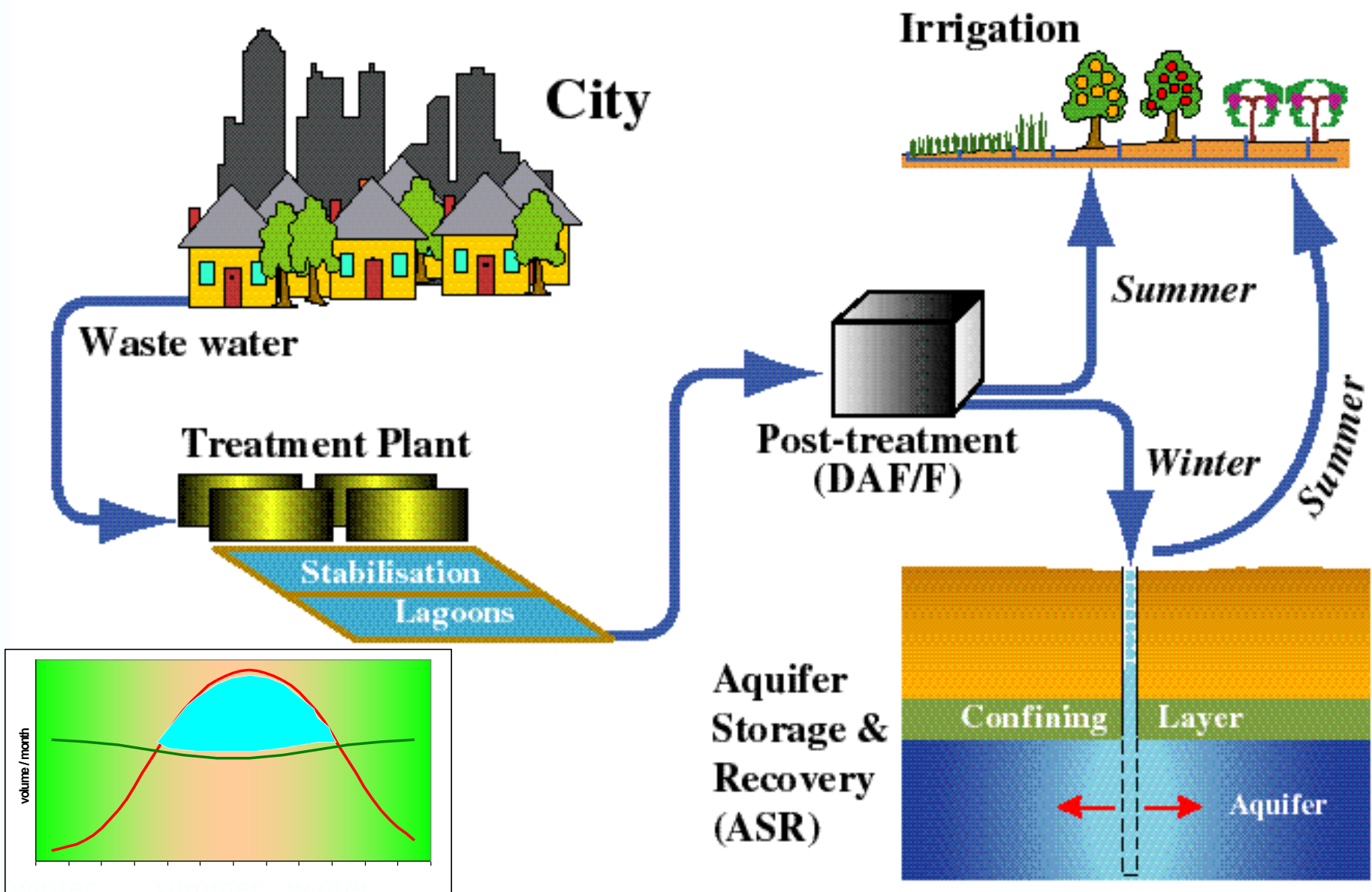
Peter Dillon | Honorary Fellow, co-chair IAH Commission on Managed Aquifer Recharge  
27 January 2016



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# Bolivar ASR original concept



# Objectives of Bolivar ASR research project

- **To determine –**
  - **technical feasibility,**
  - **environmental sustainability, and**
  - **economic viability**
- **To improve knowledge of subsurface (aquifer) processes and develop sound operating practices and ability to predict changes**
- **To define operation and maintenance procedures, and produce manuals for reclaimed water ASR**



# SA Water's Bolivar DAFF water reclamation plant



**WRSV's pipeline pumping station**

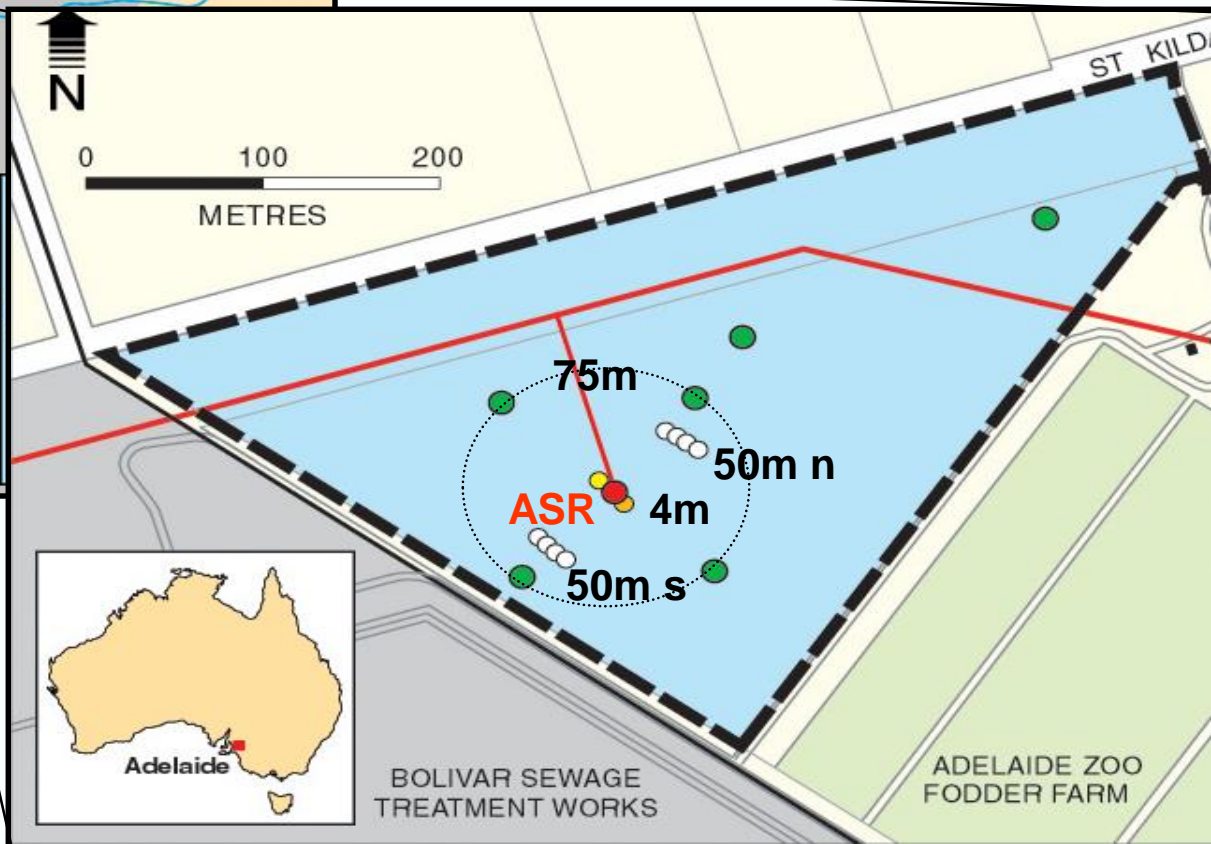
# Bolivar ASR research project



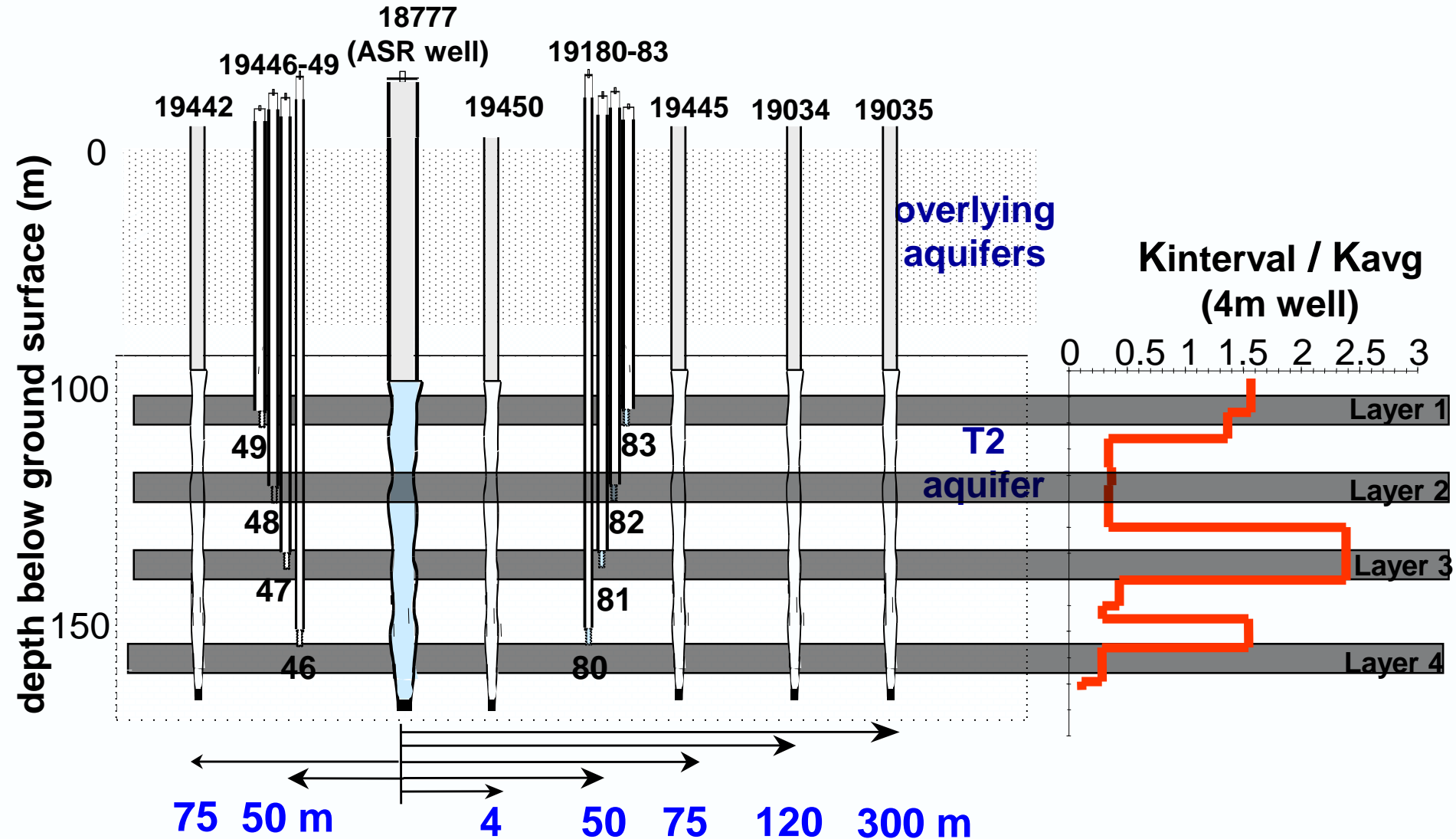
**ASR Injection well**



# Bolivar ASR site



# Hydrogeological section



# Bolivar recycled water ASR research

**Stage I**  
Viability Tests  
drilling & lab studies

**Stage II**  
Demonstration  
model development

**Stage III**  
Packaged Methods  
design tools

- clogging processes
- biogeochemical reactions
- pathogen survival and growth
- characterise aquifer hydraulics
- solute transport modelling
- aquitard structural stability
- regional groundwater flow modelling
- additional research objectives e.g. trace organic fate, aquifer ecology, risk management, economic viability, operational management

# Bolivar ASR research –Stage 1 steps

## Concept

- CSIRO and DWLBC successful at Andrews Farm stormwater ASR and put joint proposal to Premier and Cabinet through DAIS as adjunct to Virginia Pipeline Scheme for winter storage
- Draft experimental plan and budget established

## Prove Concept

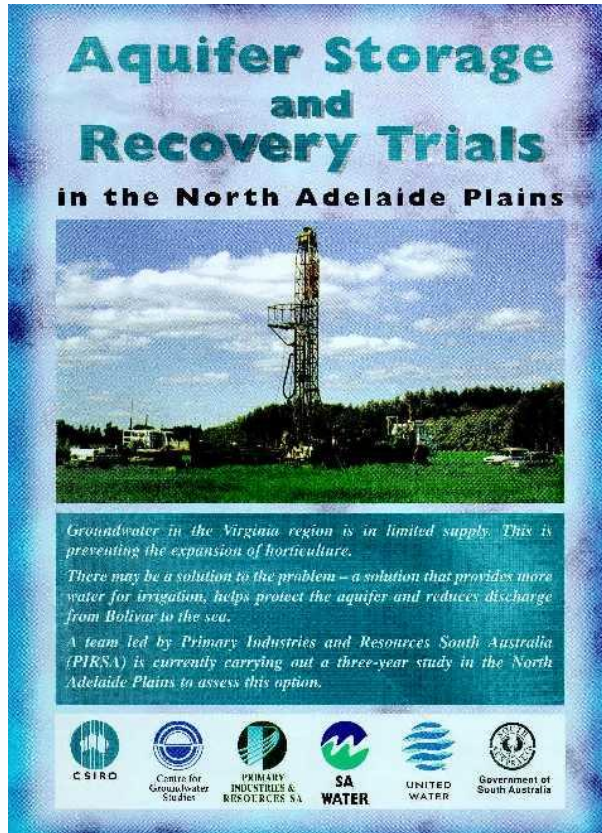
- Drilled one well – with coring, geophysics, pumping test and sampling
- Lab tests on cores, for clogging, geochemistry
- Preliminary groundwater flow and solute transport modelling
- Revised experimental plan and budget, and set management structure

## Approvals

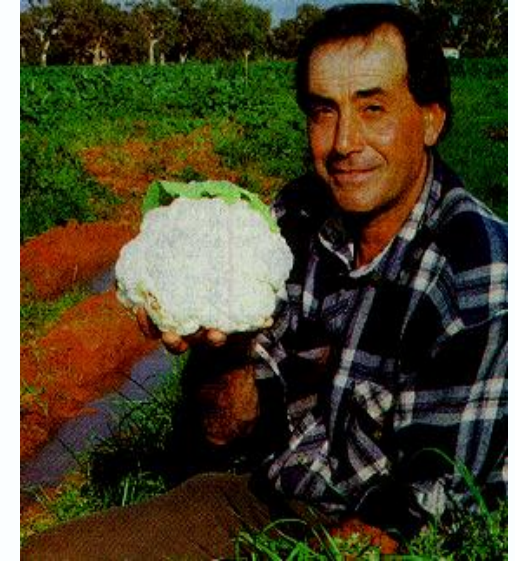
- EPA – Health – approved trial and invited onto advisory committee
- Inform and seek feedback from local community, local council and NAP-CWMB
- Funding approved by P&C via DAIS
- Project commences with Steering Committee, Chaired by DWLBC with CSIRO, SA Water, United Water & DAIS to run project. Also Advisory Committee and Technical Committee



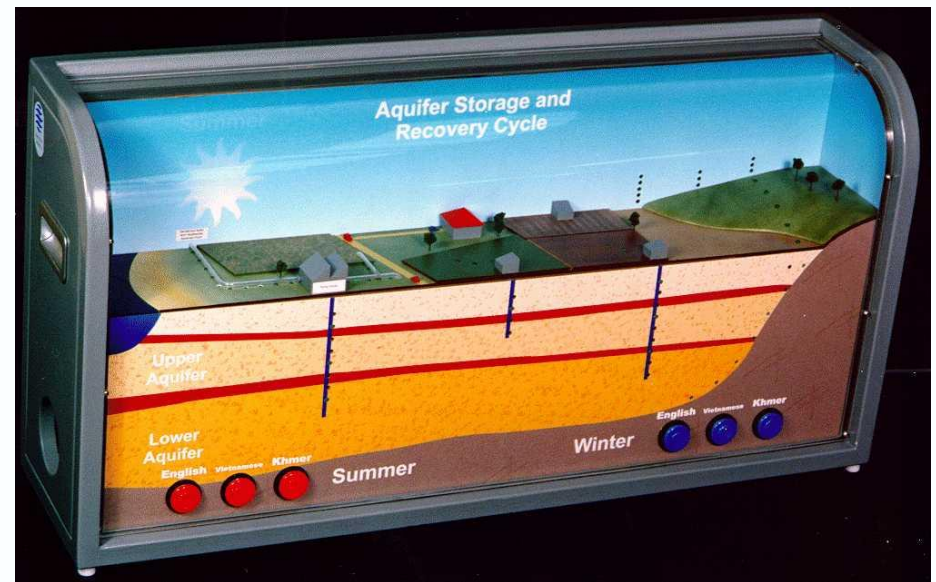
# Community information



Brochures



Meetings with groundwater users, catchment board and local government



Multilingual interactive display

# Community Consultation

Feedback – desires & concerns	Responses
<b><i>Project governance and credibility</i></b>	
State government to manage the injection trial	Agreed – DWLBC to manage the trial, even though it was on SA Water land
CSIRO to undertake independent research and report publically	Agreed – CSIRO led and did most of the research and involved universities and international partners. Published extensively.
<b><i>Aquifer and groundwater protection</i></b>	
Potential for leakage from T2 to T1 aquifer through unknown improperly completed or abandoned wells	FEFLOW modelling of an abandoned well interconnecting aquifers between ASR well and nearest T1 well showed undetectable impact
Wanted baseline monitoring of all local water supply wells in T1 aquifer	Baseline monitoring implemented and reported back to owners
You could cause damage to the aquifer or our wells that you will not be able to fix	Investigation undertaken to assess potential risks

# Project progression 1996-2010

## Series of projects (est budget \$5M)

- DAIS – original 3 year project to support capital costs and CSIRO and DWLBC costs
- CSIRO, SA Water, United Water – all contributed substantial in-kind
- NHT – supported DWLBC costs
- PRF – to support supplemental costs
- AWWARF – 2618 Water quality improvements during ASR
- AWWARF – 2968 Water quality changes during ASR
- WaterReuse Foundation – trace organic fate
- NWC – AGWR- MAR Guidelines
- NWC – Facilitating recycling of stormwater and reclaimed water via aquifers in Australia
- EU- AquaRec – water quality risk assessment and management
- EU- Reclaim Water – water quality risk assessment and management
- AWRCOE- MAR and Recycling options 2012-2015

## Research Outcomes:

- Bolivar Publications: 23 journal papers, 40 conference papers, 15 reports, 7 PhDs, 1 Hons.
- Major input to Australian MAR Guidelines
- Major input to establishment of Perth Groundwater Replenishment Program
- Some SA Water input into Southern Vales recycled water ASR

## Practical Outcomes at Bolivar:

- Proven viable at pilot scale and 134 ML supplied for irrigation Sept 2009-Mar 2010



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