



Government of **Western Australia**
Department of **Water**

Managed Aquifer Recharge in Western Australia

Introduction to the
Department of Water's policy



Operational policy 1.01 – Managed aquifer recharge in Western Australia

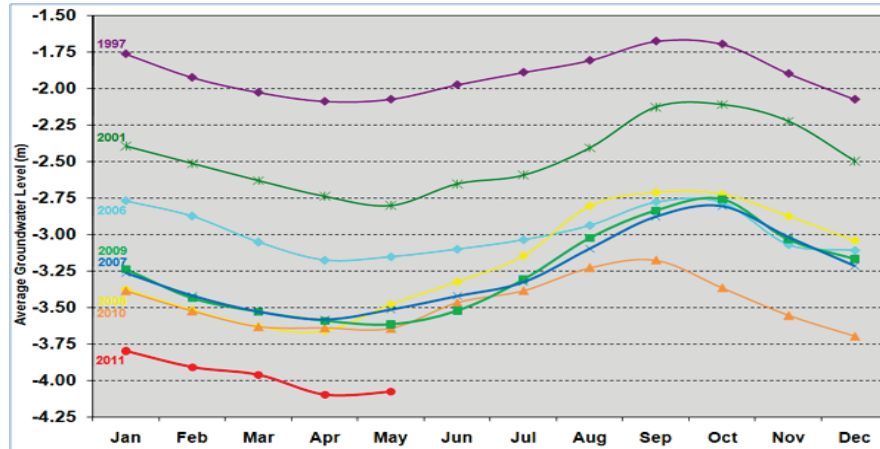
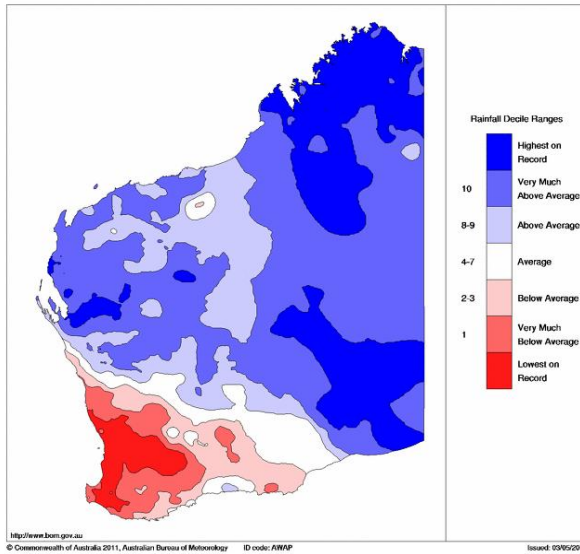
- policy released in January 2011 after consultation
- provides a management framework under the *Rights in Water and Irrigation Act 1914*
- aims to aid the approval of socially and environmentally acceptable MAR proposals
- available on Department of Water website



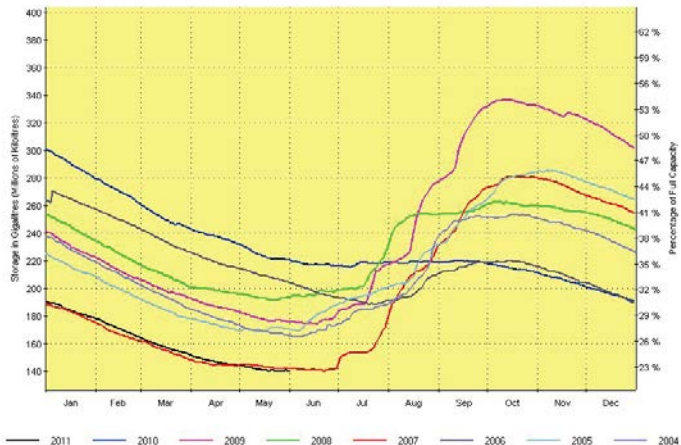
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Drivers for MAR policy - drying climate

Western Australian Rainfall Deciles 1 May 2010 to 30 April 2011
Distribution Based on Gridded Data
Product of the National Climate Centre



Average groundwater level across the Gnamptara Mound (Department of Water)



Total volume of water stored in the Integrated Water Supply System reservoirs (Water Corporation)

- declining rainfall
- reduced inflow to dams
- declining groundwater levels
- impacts on GDEs





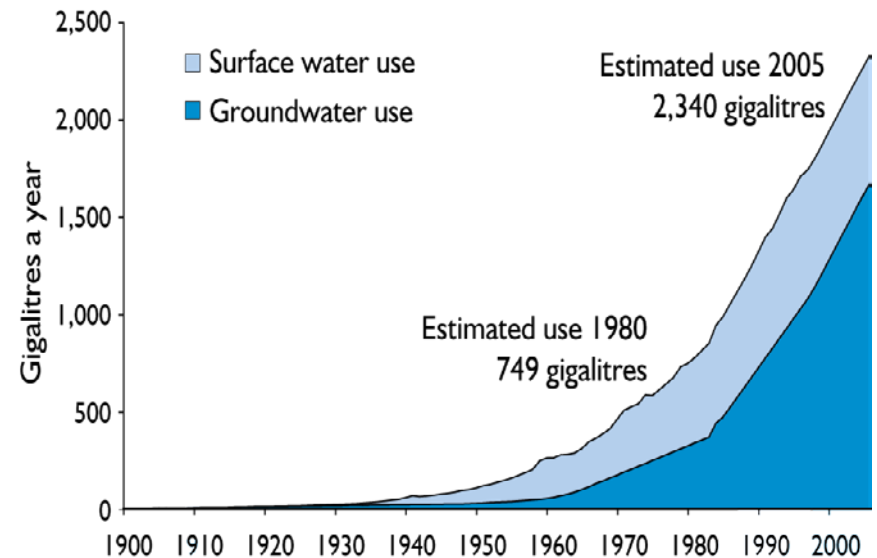
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Drivers for MAR policy - need for water

Current population 2.36m

**Will increase to 4.3m
by 2058**

- growing population
- increased development
- increased water demand



Historical water use in Western Australia



Diverse but integrated

- Surface water
- Groundwater
- Desalination
- **Managed aquifer recharge**
- Recycling
- Water efficiency
- Rainwater tanks
- Demand management
- Local water supply





MAR as a solution

- MAR provides a means to generate water supplies from sources that may otherwise be wasted.
- MAR will not be feasible on all sites, due to hydrogeological, environmental or cost constraints.

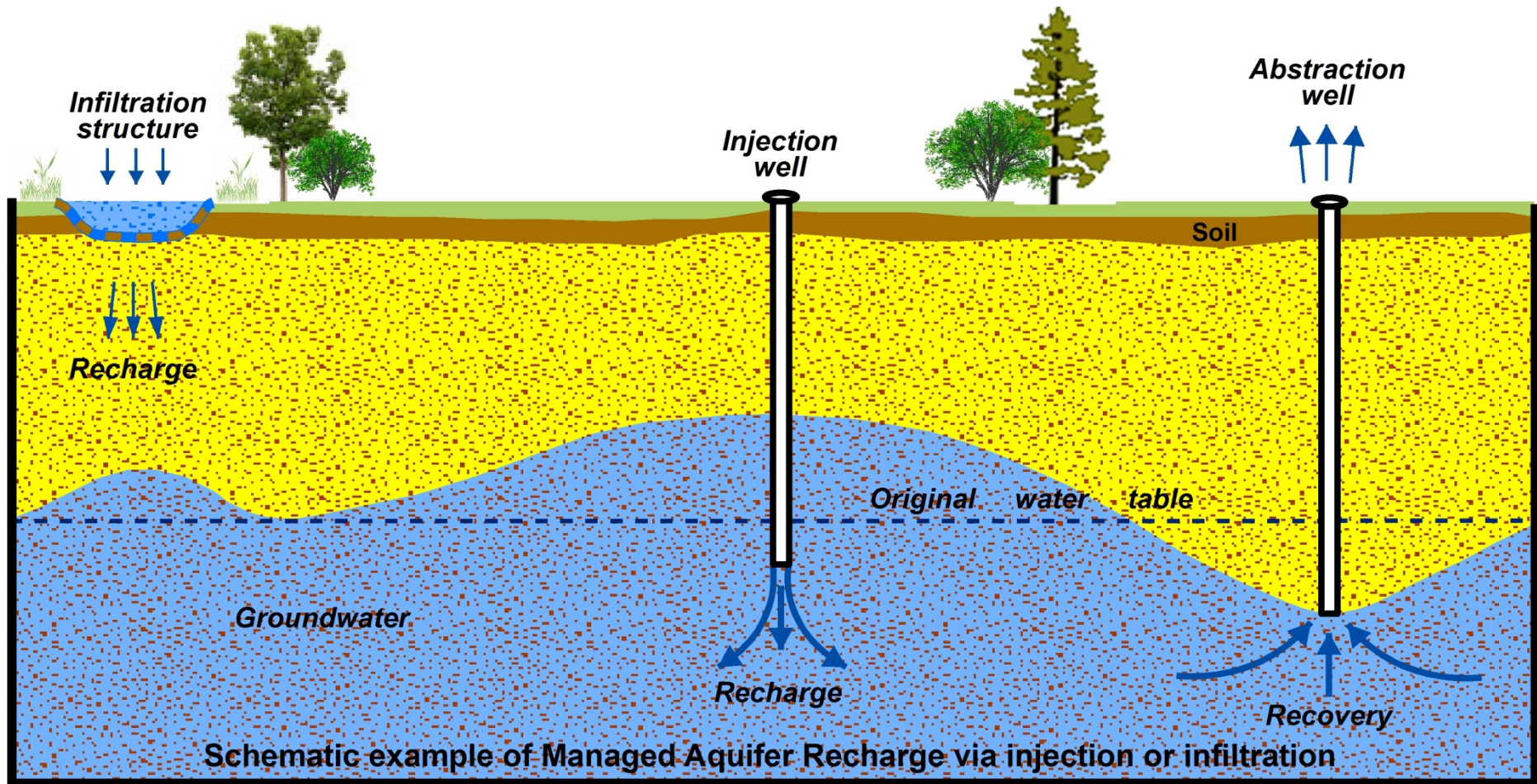


What is Managed Aquifer Recharge ?

- The purposeful recharge of an aquifer under controlled conditions to store the water for later abstraction, or to achieve environmental benefits
- Water can be added to the aquifer by infiltration (via structures such as ponds, basins, galleries or trenches) or by injection into wells



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Source water

- Potential sources of recharge water include stormwater (excess or redirected), wastewater and water from watercourses or aquifers
- Pre-treatment may be needed before recharge, but will generally depend on a risk assessment



Policy in a nutshell

- Recharge and recovery operations must take place within the same groundwater system.
- Recharged water is vested in the Crown. Licence required to abstract. No allocation credits under RiWI Act.
- The recovery volume will generally be less than or equal to the recharge volume.



Policy in a nutshell (cont'd)

- MAR recharge and recovery volumes will be separate from the allocation limit.
- Recharge and recovery volumes will be based on estimates in hydrogeological assessment.
- Banking will be approved if it is demonstrated that the water will be available for use when required and the impacts of recovery acceptable.



Trading

- the permanent transfer of water entitlements will only be allowed when a property is sold and the new owners satisfy DoW that MAR operations will continue
- Temporary transfers of water entitlements can be made through agreements between the MAR scheme operator (licensee) and a third party.



What is and what is not MAR?

MAR	Not MAR
Recharge and later recovery of treated wastewater at WWTPs	Rainwater infiltration – drainage basins, soakwells, etc
Re-injection of dewatering excess	Land use changes or activities that raise water levels (urban development, catchment clearing, thinning/burning of vegetation)
Recharge with stormwater – excess or redirected	



Approval

- We will approve MAR schemes as long as the groundwater system, the environment and existing groundwater users are not adversely affected.



Licensing requirements

- Licence to construct or alter a well: section 26D, *Rights in Water and Irrigation Act 1914*
- Licence to take and use groundwater: section 5C, *Rights in Water and Irrigation Act 1914* - granted to the company undertaking the recharge operations
- No specific licence for injection. Managed under 26D and 5C licences
- Existing operations will need to apply for a licence to undertake MAR



Supporting information

- hydrogeological assessment (Operational policy 5.12, plus information specific to MAR)
 - *assessment of potential impacts, feasibility*
- operating strategy (Operational policy 5.08)
 - *ongoing management, contingency plans*
- risk assessment (Australian guidelines for water recycling: Managed aquifer recharge, 2009)
- local requirements – e.g. a water management plan may be required in the Pilbara region (Pilbara water in mining guidelines, 2009)



Ongoing management

- groundwater monitoring reports
(Operational policy 5.12)
 - include recharge volumes, abstraction volumes and banked volumes in spreadsheet
- reporting of metering results





Examples of MAR



- MAR using treated wastewater, for non-potable use (e.g. irrigation)
- MAR using recycled water from WWTPs for drinking water use (e.g. Beenyup trial, Gnangara Mound)
- Re-injection of dewatering excess (mines)
- MAR using stormwater
- MAR for environmental benefit (e.g. Perry Lakes)



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Thankyou



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Additional information

Stakeholder List



Stakeholder list

Government departments

- Department of Health
- Department of Environment and Conservation
- Environmental Protection Authority
- Department of Planning and Infrastructure
- Western Australian Planning Commission
- Department of Industry and Resources
- Department of Local Government
- WA Local Government Association (WALGA)
- Department of Regional Development & Lands
- Economic Regulation Authority



Stakeholder list (cont'd)

Water/environment

- Australian Water Association
- Water Service Providers (Aqwest – Bunbury Water Board, Busselton Water Board, Harvey Water, Water Corporation)
- Environmental Consultants Association

Mining/industry

- Chamber of Commerce & Industry of WA
- Chamber of Minerals & Energy WA
- Association of Mining and Exploration Companies (Inc)
- Australian Drilling Industry Association
- International Association of Hydrogeologists (IAH)
- Consultants (groundwater/engineering) - individual
- Burswood Park Board



Stakeholder list (cont'd)

Development

- UDIA
- LandCorp
- Armadale Redevelopment Authority
- Midland Redevelopment Authority
- East Perth/Subiaco Redevelopment Authorities

Research

- CSIRO
- University of Western Australia
- Curtin University of Technology



Banking

- storage of recharge water in the aquifer for a period of time, with recovery at required time
- will be approved if demonstrated that the water will be available for use and the impacts of recovery acceptable
- the allowable period of banking will be based on hydrogeological assessment and groundwater modelling
- the banking period will be set as a licence condition
- recharge undertaken before the licence is issued will generally not count towards the banked volume



Recovery volumes

- percentage recovery dependent on several factors (recharge volume, location of GDEs, migration from site, gw quality, aquifer's level of use)
- recovery volumes to be based on estimates in hydrogeological assessment



Recharge issues

- potential aquifer damage (e.g. fracturing) due to excessive injection pressure
- potential aquifer dissolution
- aquifer clogging and changes to the aquifer's recharge potential
- raising of the watertable (waterlogging, foundations)
- surface discharge (impacts on surface waters, vegetation, health)
- changes to the groundwater flow regime
- changes to gw quality (salinity and mixing, oxidation / reduction processes, acidity)
- changes to water chemistry in connected surface waters
- changes in gw temperature (geochemical changes or stratification)



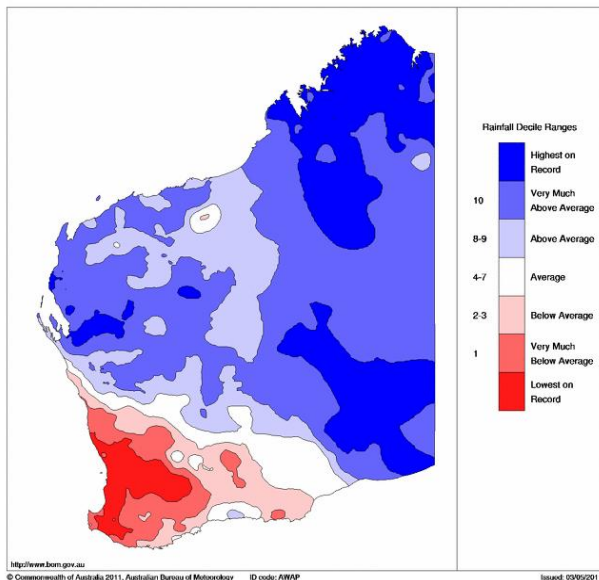
Recovery issues

- Potential impacts on aquifer, GDEs and other bores
- impacts of recovery should largely be offset by impacts of injection or infiltration
- timelag between recharge and recovery - hydrogeological assessment (time to reach recovery bores; passive treatment to meet water quality for end use; period of banking required)



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