

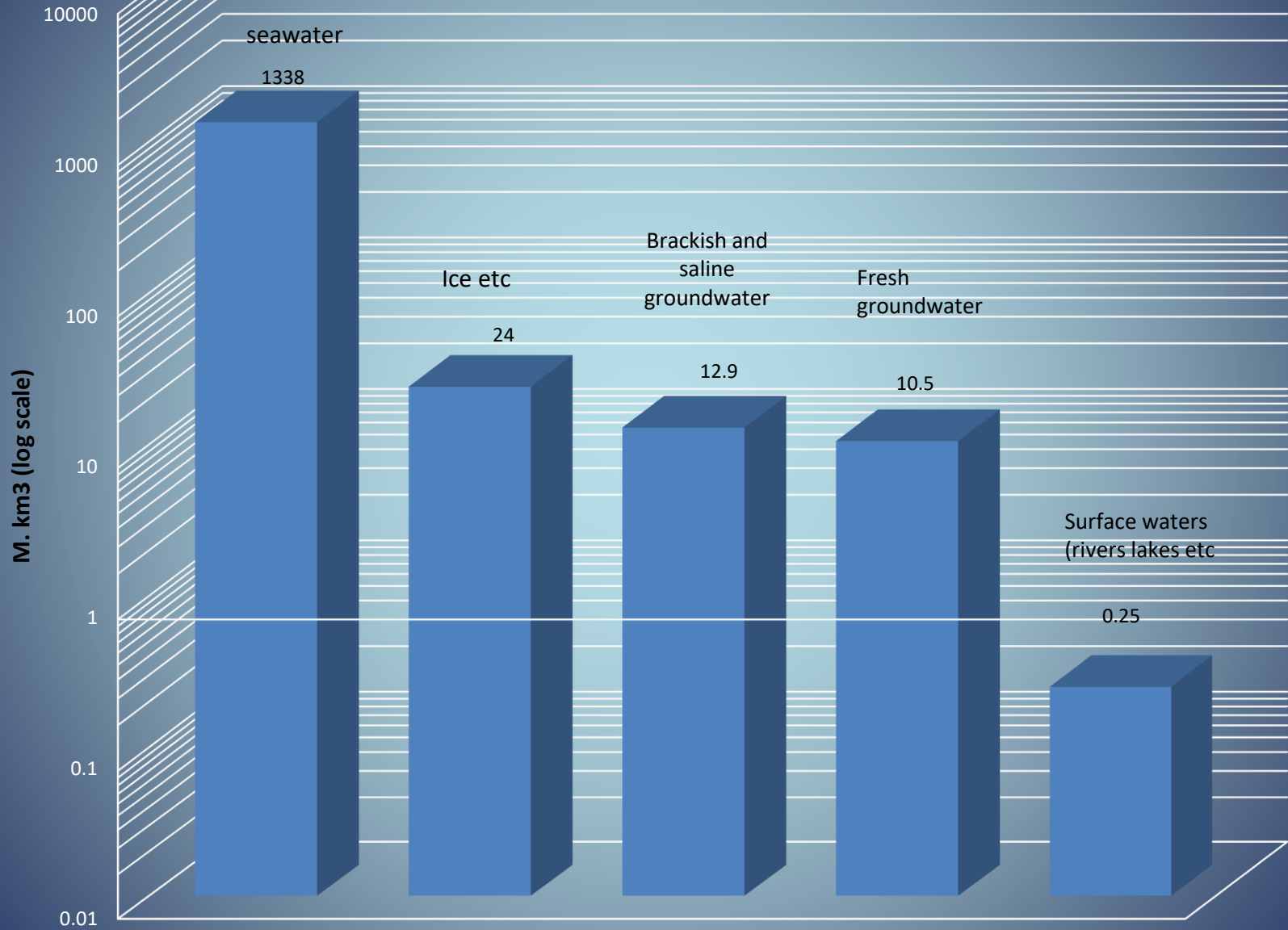
Groundwater for coastal and island water supply

**unique technology approach extracting
freshwater from poor quality aquifers
using desalination**

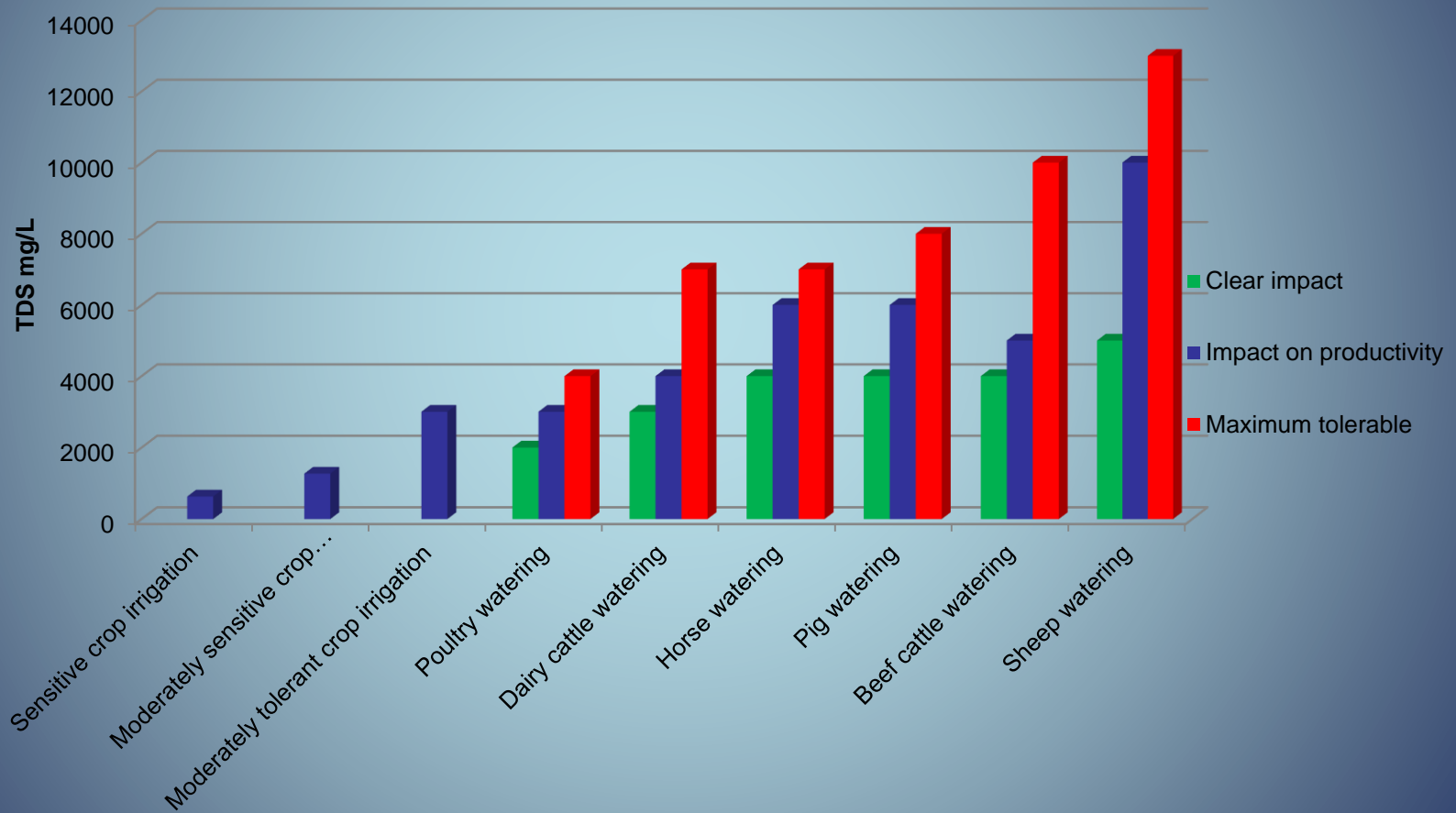
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Crisalis Intl Pty Ltd/C² Water Pty Ltd/Regen Power Pty Ltd

Global Water



Poor quality groundwater: Nuisance or resource?



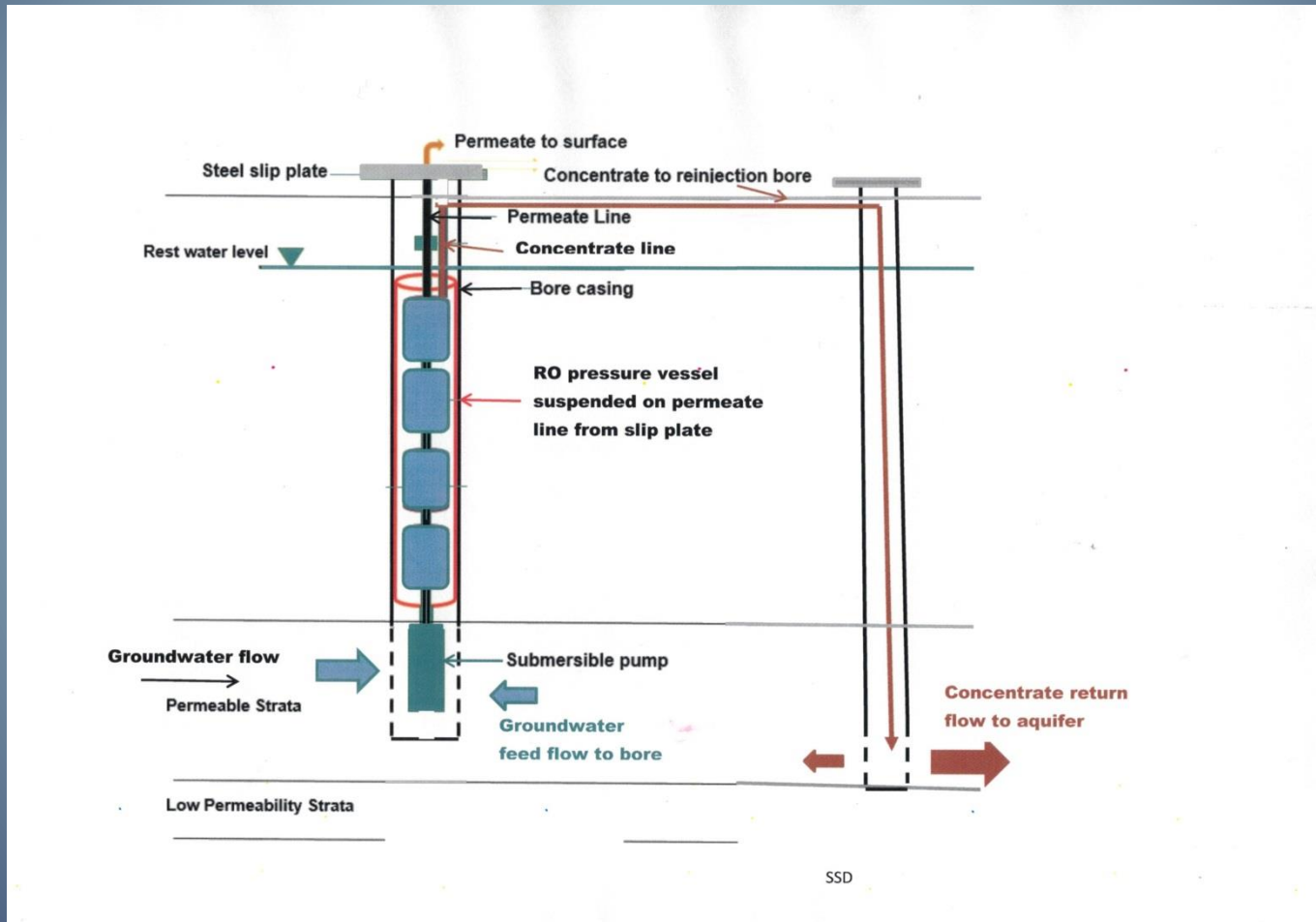
Reverse Osmosis (RO) Desalination Drawbacks

- Power costs (seawater feed particularly)
- Reject fluids (concentrates) require safe disposal
- Membrane fouling (colloids, biofoulants)
- Scaling
- Seasonal demands

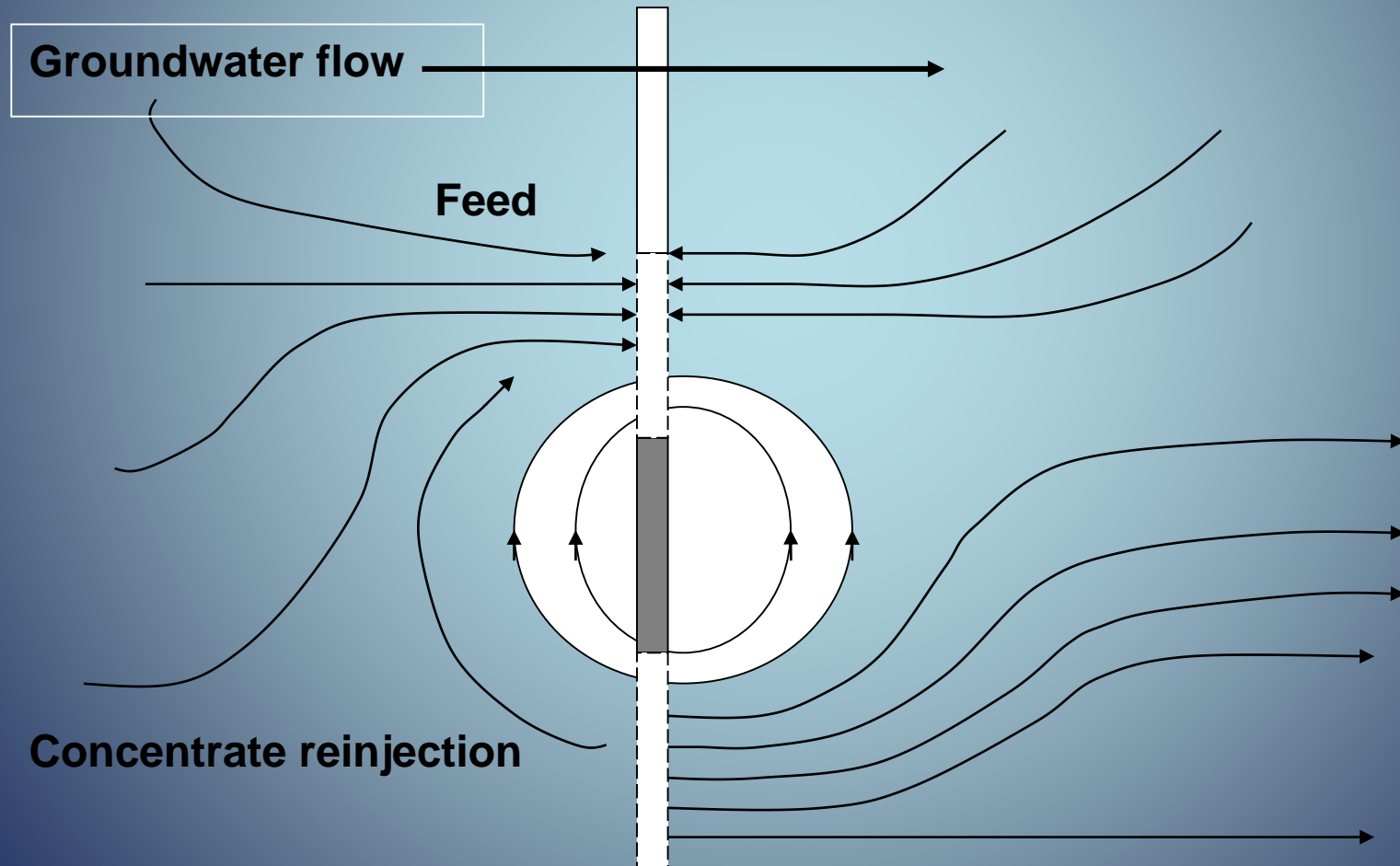
Unique Core Technologies

- Sub-Surface Desalination (SSD) - **downhole process**, based on reverse osmosis (RO) for high quality water supply
- **Managed Aquifer Recharge (MAR) and Aquifer Storage and Recovery (ASR)** for subsurface injection and storage of RO permeate and other harvested water sources for recovery and use during periods of water supply stress
- **Total Water Solution - Unique technology mix**

SSD System schematic



Conceptual model of flowlines during SSD, based on modelling results

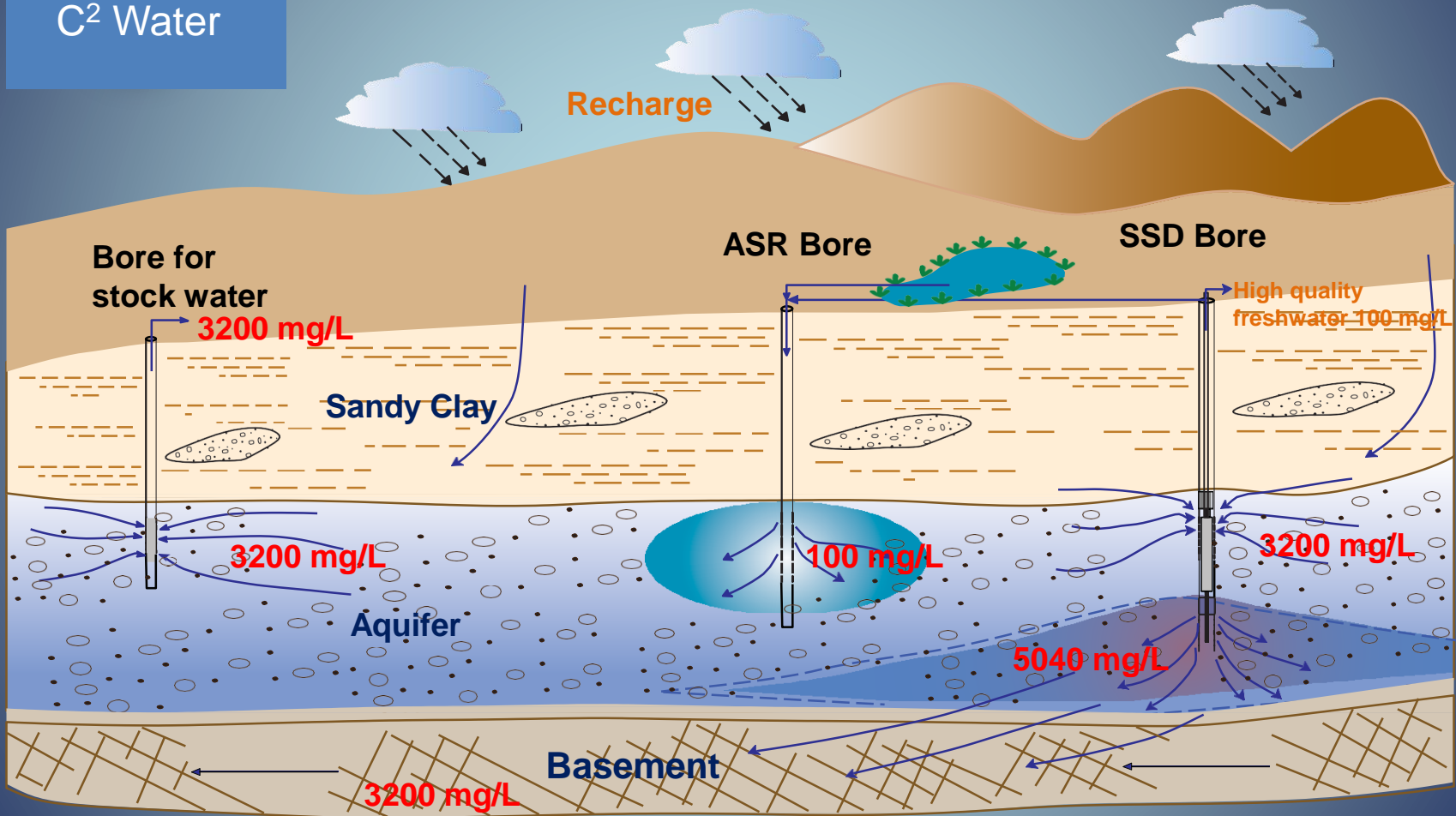


MANAGED AQUIFER RECHARGE

- **Aquifer Storage and Recovery (ASR)** by borehole injection
- **Seasonal subsurface storage** in freshwater or brackish water aquifer
- Combined source water from **SSD permeate** with **harvested rainwater / stormwater** injected
- Seasonal recovery during dry season and drought for **sustainability of supplies**

SSD and ASR

C² Water



Unique SSD/ASR Approach

- **Downhole RO treatment** carried out *in situ* within a brackish aquifer, with connected concentrate reinjection bore
- **Integrated treatment process** – groundwater feed, RO treatment, pumping of permeate to surface and reject (concentrate) reinjection and dispersion in the lower aquifer powered by a single submersible pump
- Seasonal demand for supplies more sustainable using **combined SSD and ASR** – uses aquifer for groundwater feed, SSD for treatment and supply, ASR for storage during wet season and supply during dry season
- **Solar – diesel hybrid power** in remote areas



Advantages of SSD Solution

- **Distributed system** - near point of use
- **Low environmental footprint**
- In situ operation under ambient groundwater conditions (eg anoxia) **reduces potential for fouling; aquifer provides natural filter**
- **No chemicals added** to feed groundwater (antiscalents) so concentrates contain only groundwater salts and disperse at lower elevations in the aquifer (density contrast, natural stratification)
- Scalable and modular, can be fitted to suitable existing bores
- Use SSD combined with **Aquifer Storage and Recovery (ASR)** where there are seasonal demands for water improves sustainability of supply
- Stand-alone operation combined with **Solar hybrid power supply** critical for remote areas

What are the Benefits?

- Solution designed to have **minimal environmental impact**. Relies on an understanding of the aquifer system.
- **Low power consumption** – one pump does everything (desalination, pumping & disposal)
- Combined with ASR, SSD is **more efficient and sustainable**
- No noise, small visual impact, **small physical footprint (<1m²)**,
- **Scalable and modular**; can be retrofitted to existing bores
- Stand alone **solar / hybrid power supply for remote areas**

Early Successful Trial

Glenkara Vineyard, Victoria

| | Modelled DOW ROSA v6.1 model (DOW Filmtec 2007) | After 60 days of operation |
|-----------------------------|--|--|
| Feed groundwater | 3200 mg/L | 3200 mg/L |
| Feed groundwater flow | 9.75KL/h | 10KL/h |
| Permeate TDS | 89 mg/L | 100 mg/L |
| Permeate flow | 3.6KL/h | 3.8-4.2KL/h (~100m³/d) |
| Concentrate TDS | 5000 mg/L | 4800-5040mg/L |

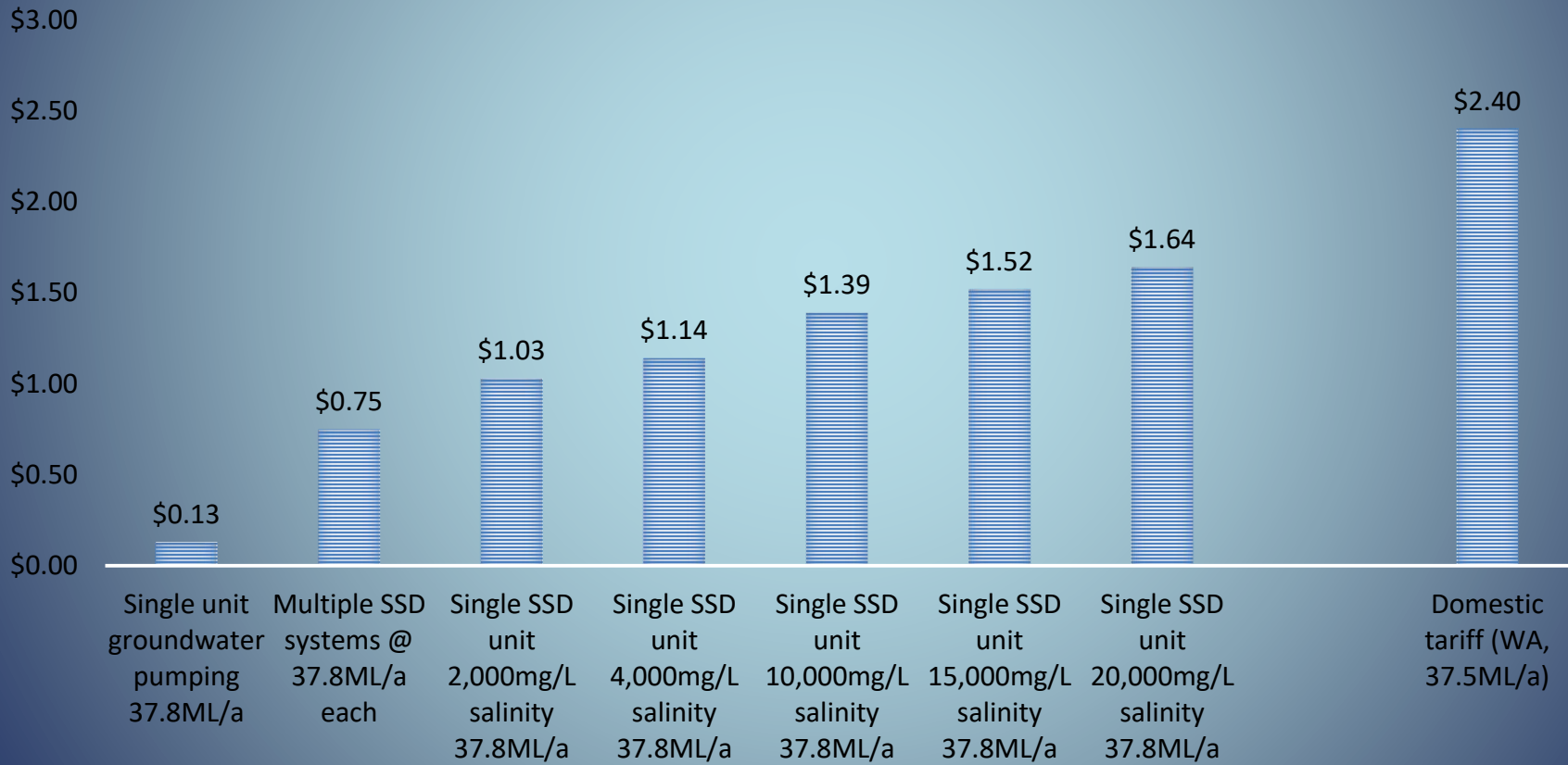


Overall costs

- Vary – dependent on local site conditions
- Costs for delivery of water to site using SSD (including investigation, borehole drilling, system installation and capital costs, concentrate disposal, 3-monthly maintenance program, power and depreciation) can range from approximately <\$1 to ~\$1.5/KL dependent on local conditions - **less than half of current costs for mains water supply in Australia**

Cost Comparisons

\$/KL



Crisalis Intl / C² WATER

Turning Poor Quality Water into a Good Quality Water Supply

