

WaterSmart Farms

Water Security and Resilience in a Drying Climate

Anthony Bodycoat, Principal Research and Development,
Water Corporation

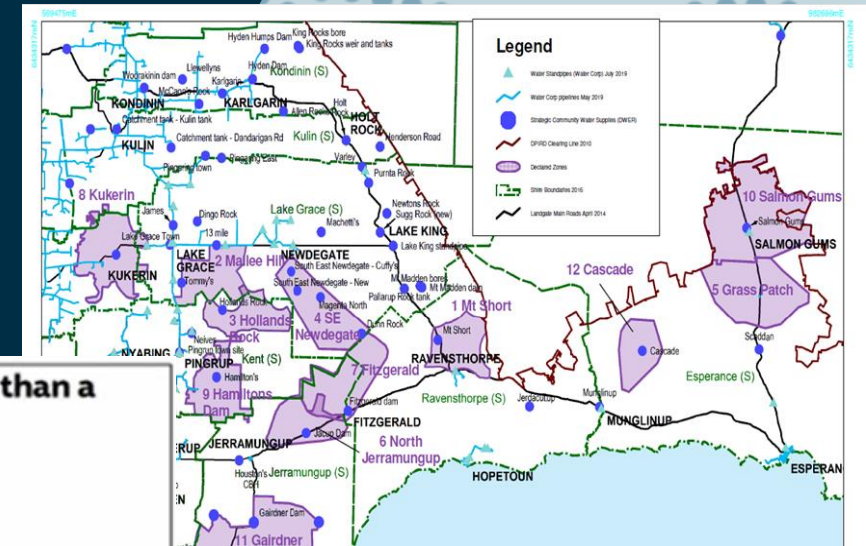
in conjunction with

Dr Richard George, Senior Principal Research Scientist,
Department of Primary Industries and Regional Development



Climate Impact - Previous Seasons

- Rainfall significantly below average across South Coast since 2018 – 2021 reduced runoff.
- Water carting at its peak:
 - Potable water: 9ML/week.
 - Agricultural water: 13 ML/week.



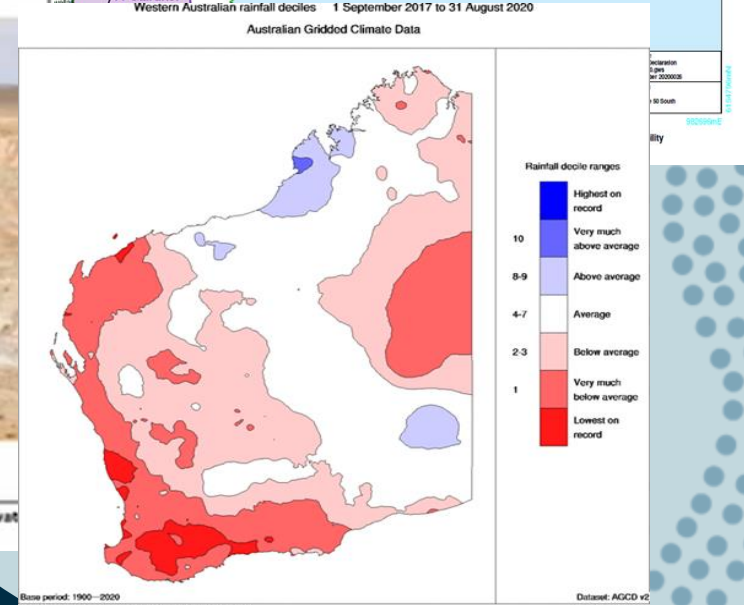
Drinking water to be trucked into more than a dozen West Australian towns due to 'unprecedented' dry

ABC South West WA / By Jon Daly, Tyne Logan, and Georgia Loney
Posted Thu 6 Feb 2020 at 5:48am



Drinking water set to be trucked into more than a dozen WA towns within weeks. (ABC Rural Jon Daly)

Image from ABC News Downloaded 1/6/2022: <https://www.abc.net.au/news/2020-02-06/wa-water-minister-warns-of-unprecedented-shortages/11934262>



Creation of the Unconventional Water Project

 Department of Primary Industries and Regional Development

Project Proposal – Water Smart Farms

Status: DRAFT proposal, subject to final partner agreements & funding approvals

Project description
Water Smart Farms (New Desalination – Smart Dams) will address underlying constraints to development of adequate water supply on farms. This targeted and strategic investment will improve the drought resilience of broad acre businesses and communities they support.

Problem statement
A drying climate is posing a threat to supplies of water to farm businesses and rural communities across dryland areas of Western Australia. Access to water – potable and non-potable is essential for the economic and social sustainability of these areas.

Proposed solution

 Department of Primary Industries and Regional Development

Business case

(2020-2024)



• No guarantee of maintaining supply of water quality, and

• Provision of at least 2 days' worth of supply as storage on the farm.

Within the Wheatbelt, GAWSS is a capital-intensive water supply system delivering small individual quantities of water from a remote source, to meet a very widely distributed demand. It therefore constitutes a very expensive water supply option for supplying water predominantly to relatively low water use broadacre agricultural enterprises. Moreover, the frequency of pipe bursts across the Scheme has been steadily increasing over recent years and has reached a point where Water Corporation is challenged by the task of keeping up with the repairs and maintenance required to ensure it meets its service obligations, and avoids unacceptably long interruptions of supply to customers.

The issues in the Farmlands are multifaceted and include economic, socio-cultural and environmental factors for the farmers, local communities, and Aboriginal traditional owners, as well as for the government and Water Corporation as water managers. These issues can be summarised as:

- Cost of supply,
- Cost of asset replacement,
- Reliability and security of supply

Key data is provided in detail below.

Economic

- **Cost of water supply** - the annual supply cost in the GAWSS Farmland areas is ~\$180 million and the annual operating subsidy per farm ~\$33,000
- The **cost of asset replacement** and refurbishment across the entire Scheme is estimated at \$1.5-3 billion over the next 20-30 years (WIC Farmlands TOTEX Investment Program).
- There are a growing number of farmers who would increase their productivity (particularly for livestock) if a greater volume of water was reliably supplied, hence there is an **unknown opportunity cost** to the economy associated with water insufficiency.
- There is a **cost to the Perth water supply (WSS)** which sends ~23 QL of water from its own constrained supplies to the Wheatbelt region each year. This increases the amount of water needed to be produced to meet Perth's growing water demands.

#17212417 Page 1 of 7

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18 February 2020

Department of Primary Industries and Regional Development, Department of Environment and Water Regulation, Wheatbelt Development Commission, Water Corporation, Murdoch University, Harry Butler Institute, University of Western Australia

Water Smart Farms Business Case page 0 of 44

Farmers encouraged to develop WaterSmart Farms

By BROOKE LITTLEWOOD

"I still have those old water tanks that I built when I was a kid, but they're not really working anymore," says a farmer in the Wheatbelt region of Western Australia. "I've got a lot of water on my farm, but it's not really doing me any good. I need a better way to manage my water."

The Wheatbelt region is made up of 100 local government areas, with a total area of 1.5 million hectares. It is a major agricultural region, producing a wide range of crops and livestock. The region is also home to a large number of small businesses, many of which are dependent on water for their operations.

The region's water supply is currently under strain, with many farmers facing shortages and high costs. This is due to a combination of factors, including a long-term decline in rainfall, increased demand for water in urban areas, and the need to invest in new water infrastructure.

The Government of Western Australia is working to address these challenges through a range of initiatives, including the WaterSmart Farms program. This program aims to help farmers improve their water efficiency and resilience, while also supporting the development of new water infrastructure.

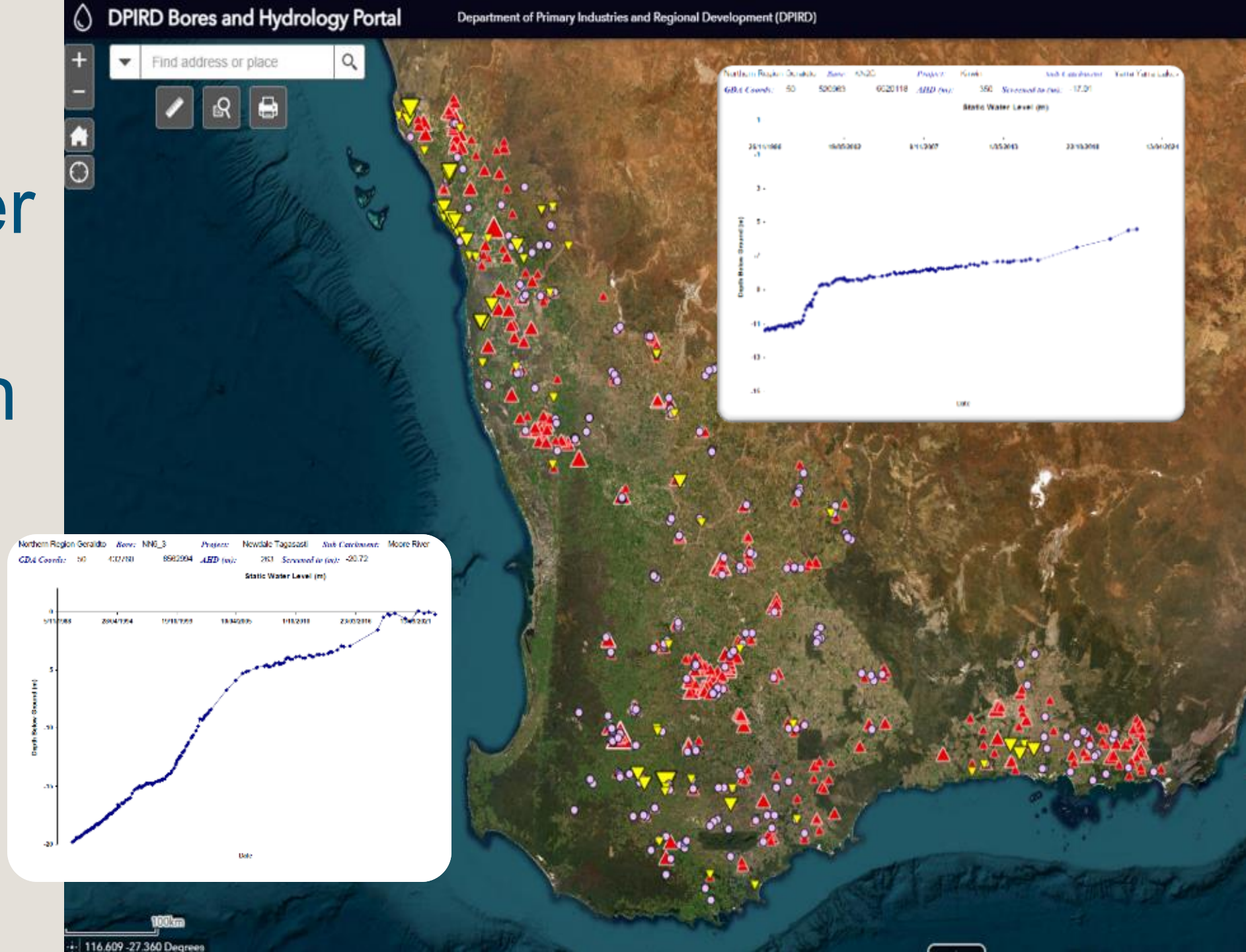
The program is being implemented in partnership with a range of stakeholders, including the Water Corporation, the Wheatbelt Development Commission, and the University of Western Australia. It is also being supported by a range of funding sources, including the State Government and the Commonwealth Government.

The program is currently in its early stages, but it is expected to have a significant impact on the region's water supply in the coming years. It is hoped that this program will help to ensure a secure and sustainable water supply for the Wheatbelt region for many years to come.

Page 1 of 2

Why groundwater and desalination

Agriculture inadvertently created a water resource, that's brackish to saline in most areas.



WaterSmart Projects (2021-25)

Understand surface water options – **WaterSmart Dams**

Finding groundwater suitable for use – **Bores**

Treating water if it's too saline - **Desalination**

Key Stats

1,800

farmers consulted at 30 workshops and meetings about water issues

12

water deficiency declarations were reported in 2020, highlighting the urgency of this work.

75%

of dams in some Shires had no accessible water left after two years without good rain.

2,000

groundwater bores monitored to assess quantity and quality of ground water for direct use or desalination.

50

new on-farm desalination plants assessed to capture learnings and experiences of farmers.

4

plot demonstration reverse osmosis desalination systems installed.

12

demonstration sites established as part of WaterSmart Dams project with partner research and farming groups.

\$11M

contributed to 3 WaterSmart projects now operating.



Unconventional water – deep fractures

Untapped water source in Merredin

4 Nov 2010, 1:19 p.m.

Agribusiness



Fault line: This photograph was taken by a remote-controlled camera inside the Merredin drill hole. As they drilled through solid granite at a depth of 327 metres, Globe Drill came across this fault line (seen here as a dark crack), from which water was flowing in vast quantities.



Merredin to Manjimup
12 farms drilled
60-120m holes (20)

>10 successful (over 50 kL/d)
Yields up to 1L/s
Stock water
Dolerites 80%

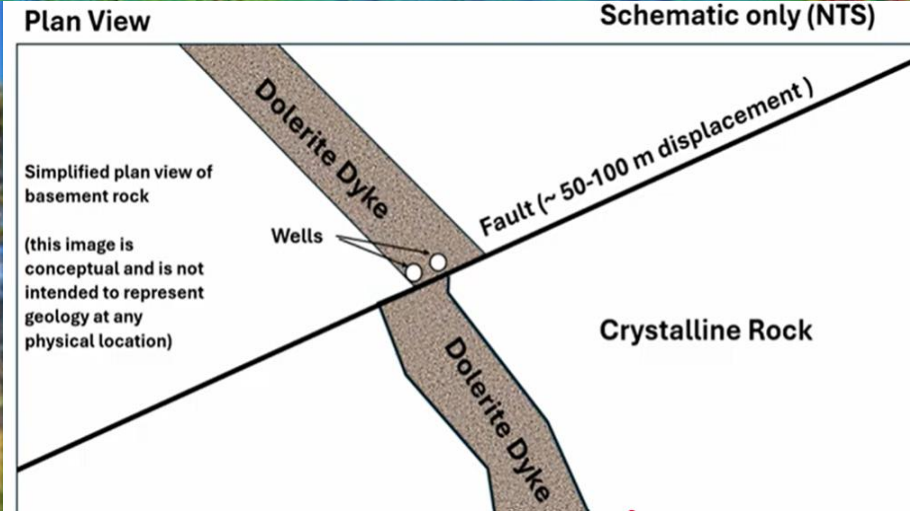
Farmer case study e.g.

- Fracture at 80-89m
- Yield airlift 8-10L/s
- 4500mg/L TDS (ok sheep)

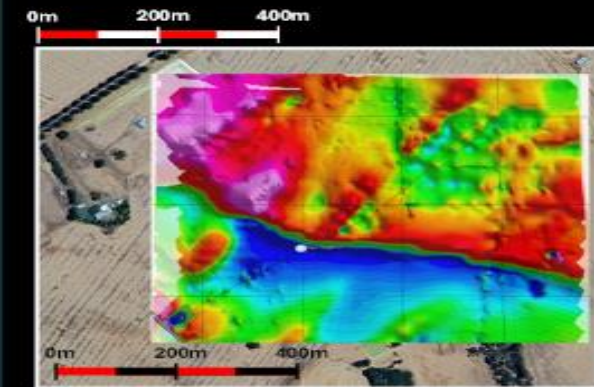
Finding Water

Radiometric opacity: 0%
Geomagnetic opacity: 43%
Geomagnetic 1VD opacity: 100%

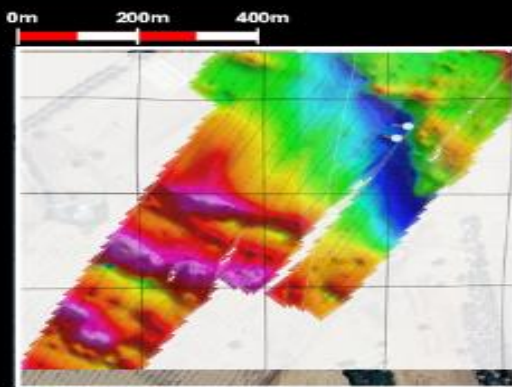
Black and white basemap?
Show structure?
Show dykes?



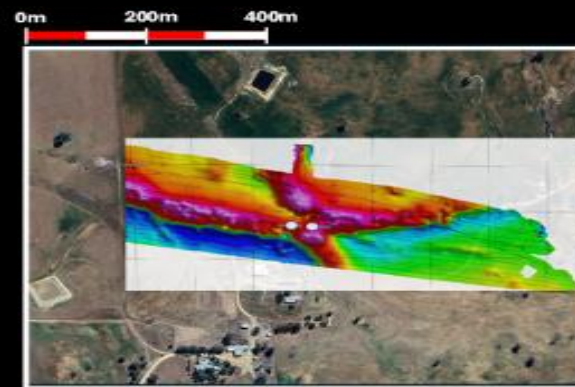
Ground TMI images (Dolerite Dyke Targets)



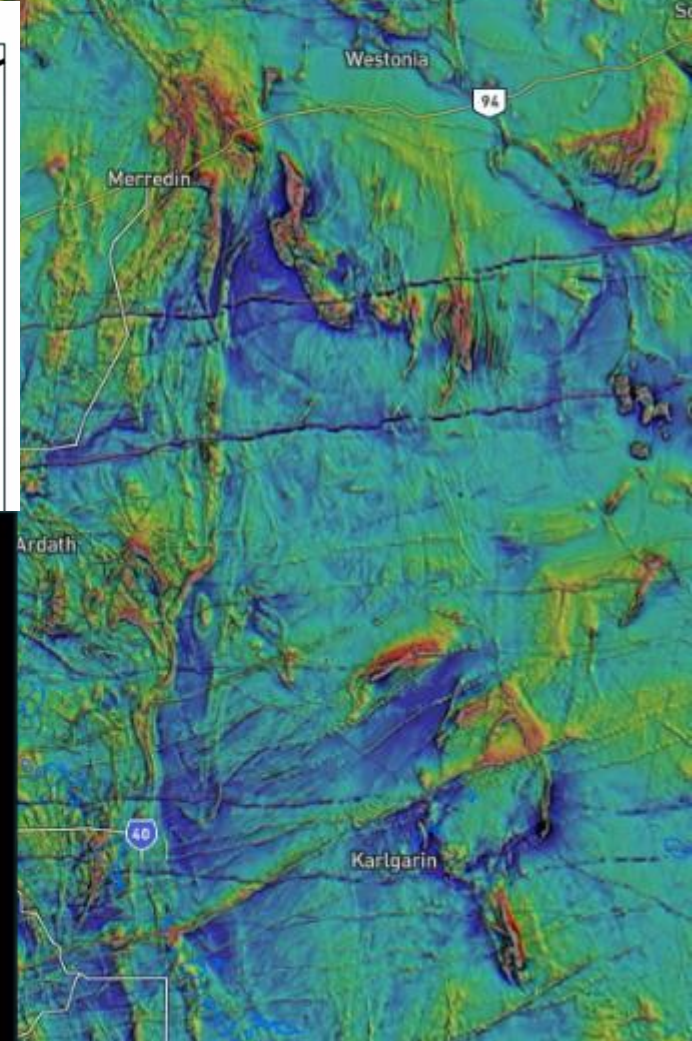
Kylaga ~3L/sec



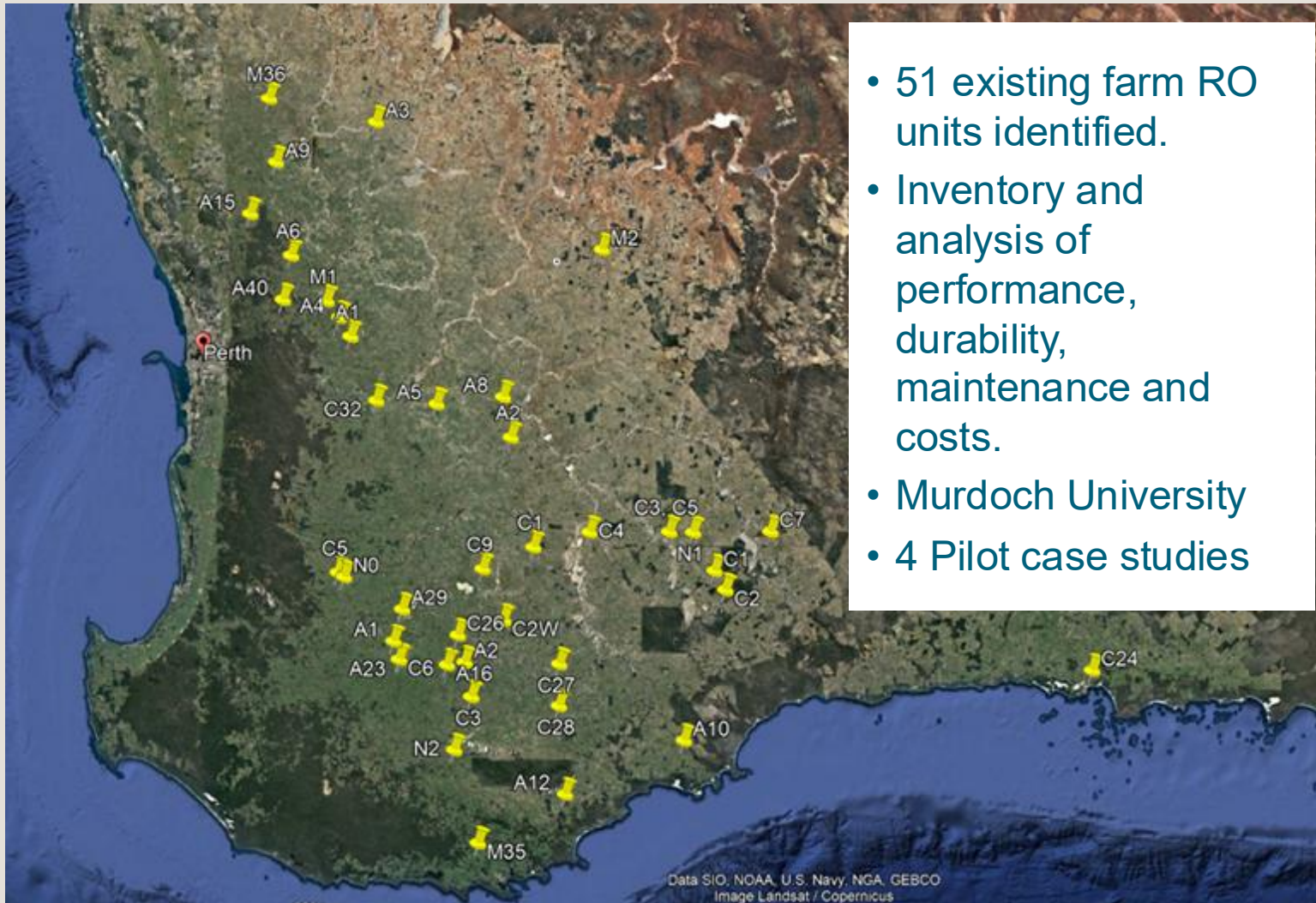
Kojonup ~10L/sec



Narrogin ~4L/sec



Unconventional water - Desalination



- 51 existing farm RO units identified.
- Inventory and analysis of performance, durability, maintenance and costs.
- Murdoch University
- 4 Pilot case studies

WA farmers use desalination to secure water supplies, restore salt-damaged land

By Lucinda Jose By Belinda Varsichetti ABC Rural Water

Thu 6 Jun



Kristin Lufroy has been using a reverse osmosis desalination system for four years. (ABC Midwest & Wheatbelt/Lucinda Jose)



Robert Sewell believes desalination systems can be used to address rising salinity. (ABC Midwest & Wheatbelt/Lucinda Jose)

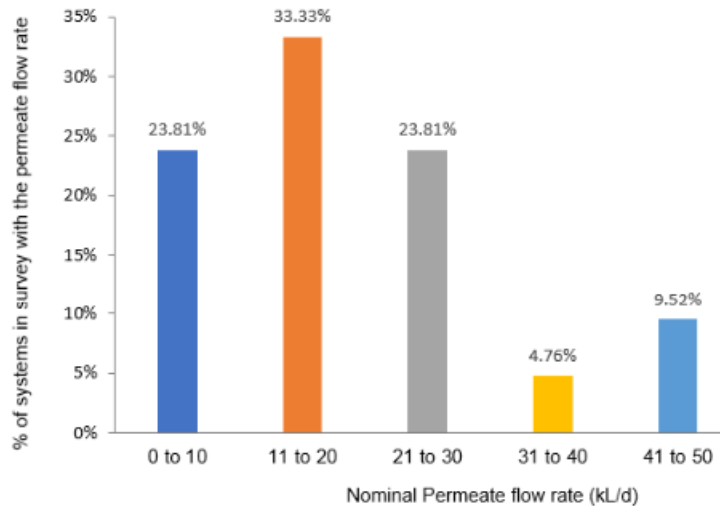


Figure 3-4 Range of design permeate flowrates of systems surveyed (21 farm and 4 community ur

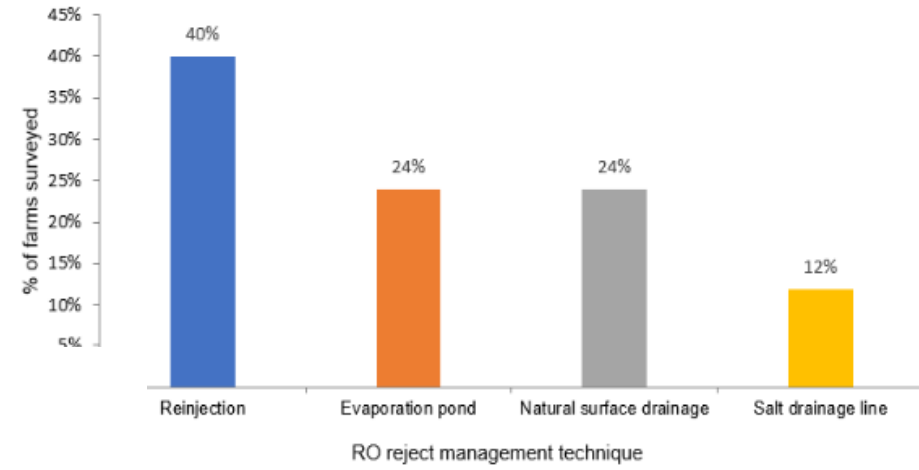


Figure 3-5 RO reject management of surveyed desalination systems (25 units data)

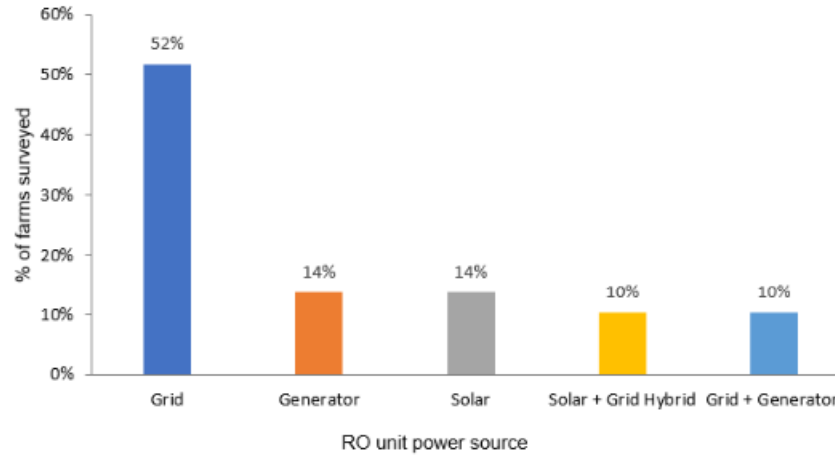


Figure 3-18 Power source for desalination unit operation. Over 75% of the plants used some combination of grid and/or diesel generator power, while the balance depended on some combination of renewable power generation and/or grid power (data from 25 farm and 4 community units).

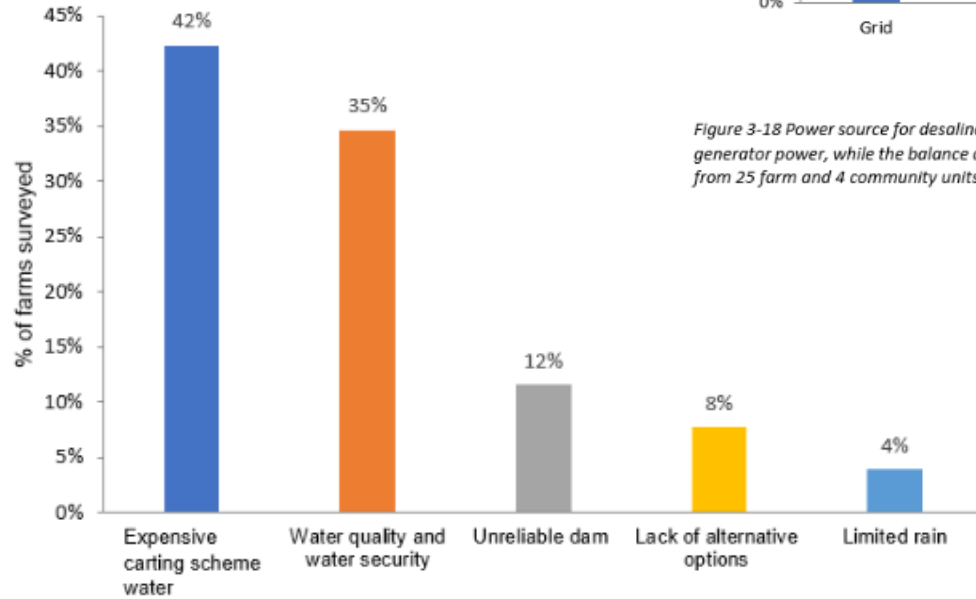


Figure 3-1 Motivation for desalination system adoption

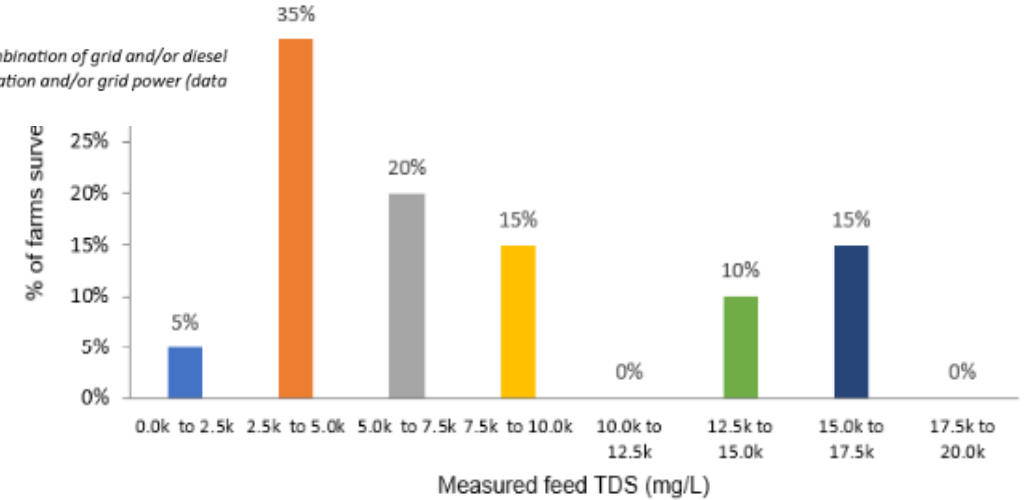
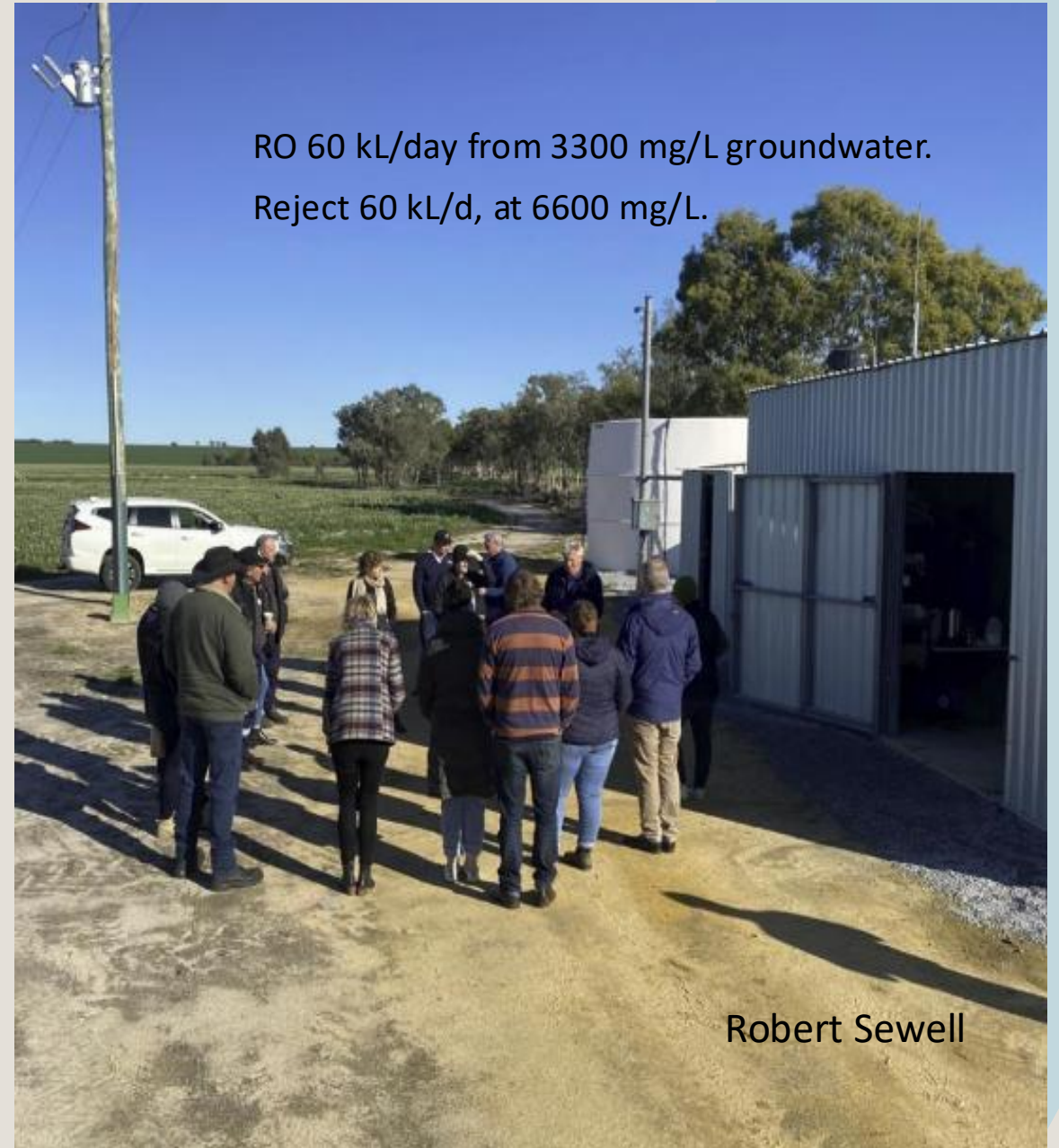


Figure 3-10 Feed water TDS of the regional sites in the survey (16 farm and 4 community units).

Wongan Hills – salinity benefits



Operating Factor Renewables vs Grid

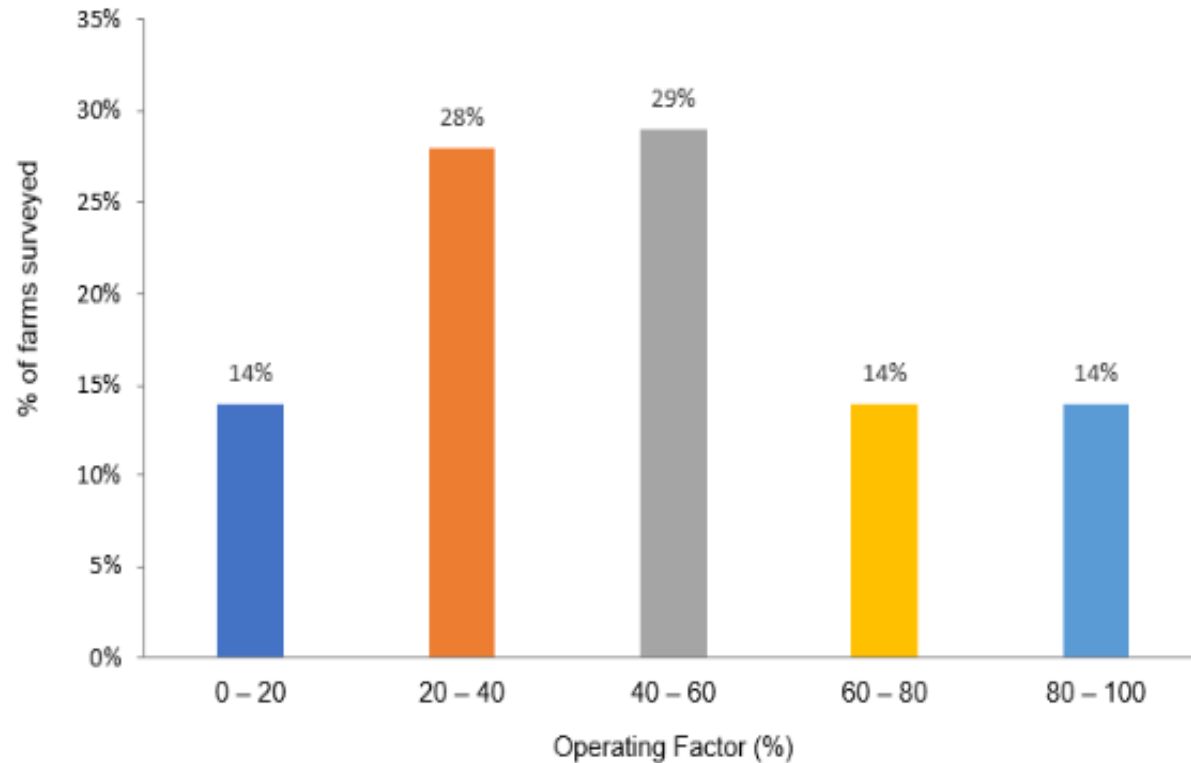


Figure 3-6 Distribution of estimated operating factor on surveyed desalination units (20 farm plus 4 community units data).

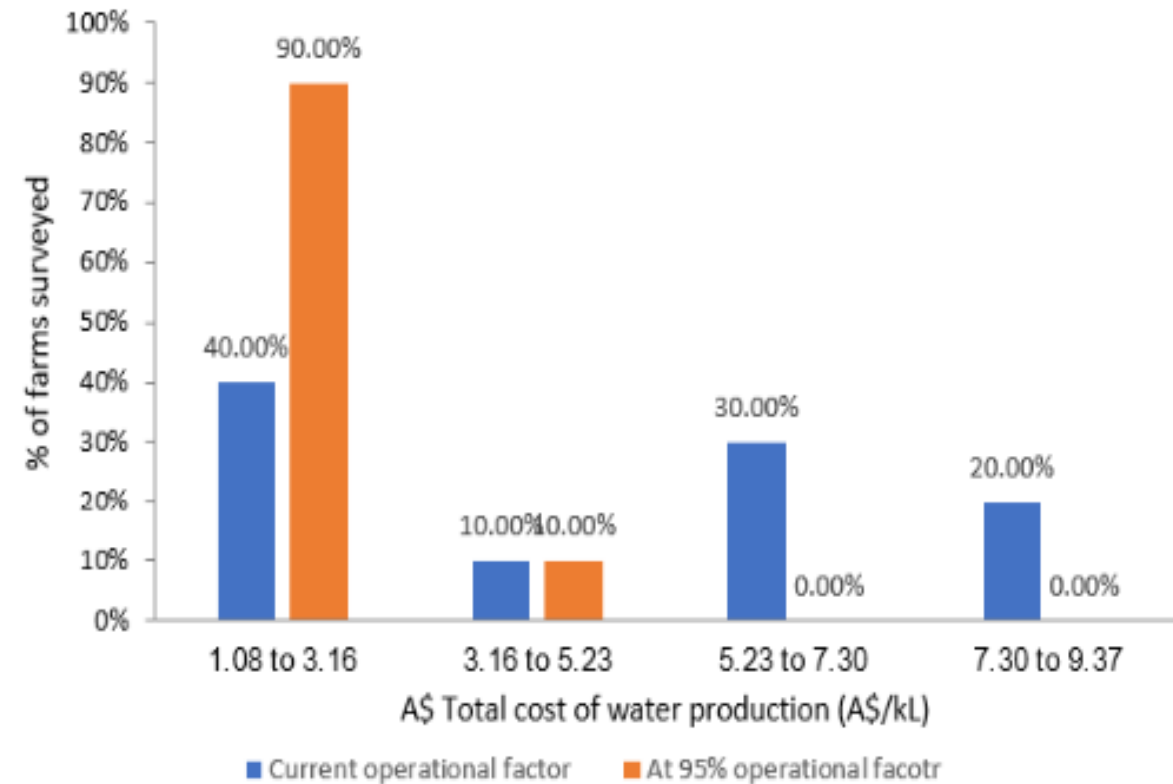
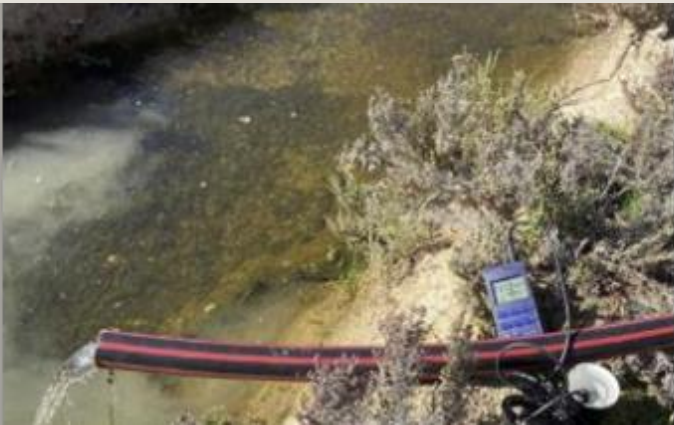


Figure 3-28 Estimated total cost of water production for the surveyed RO units. As currently operated, 50% of the plants are running at < 5.23A\$ per kL permeate. If run with a 95% operating factor, 90% of the plants' cost would be < 3.16A\$ per kL permeate (10 sites).



Reject management SLC Act

DPIRD Commissioner of Soil and Land Conservation

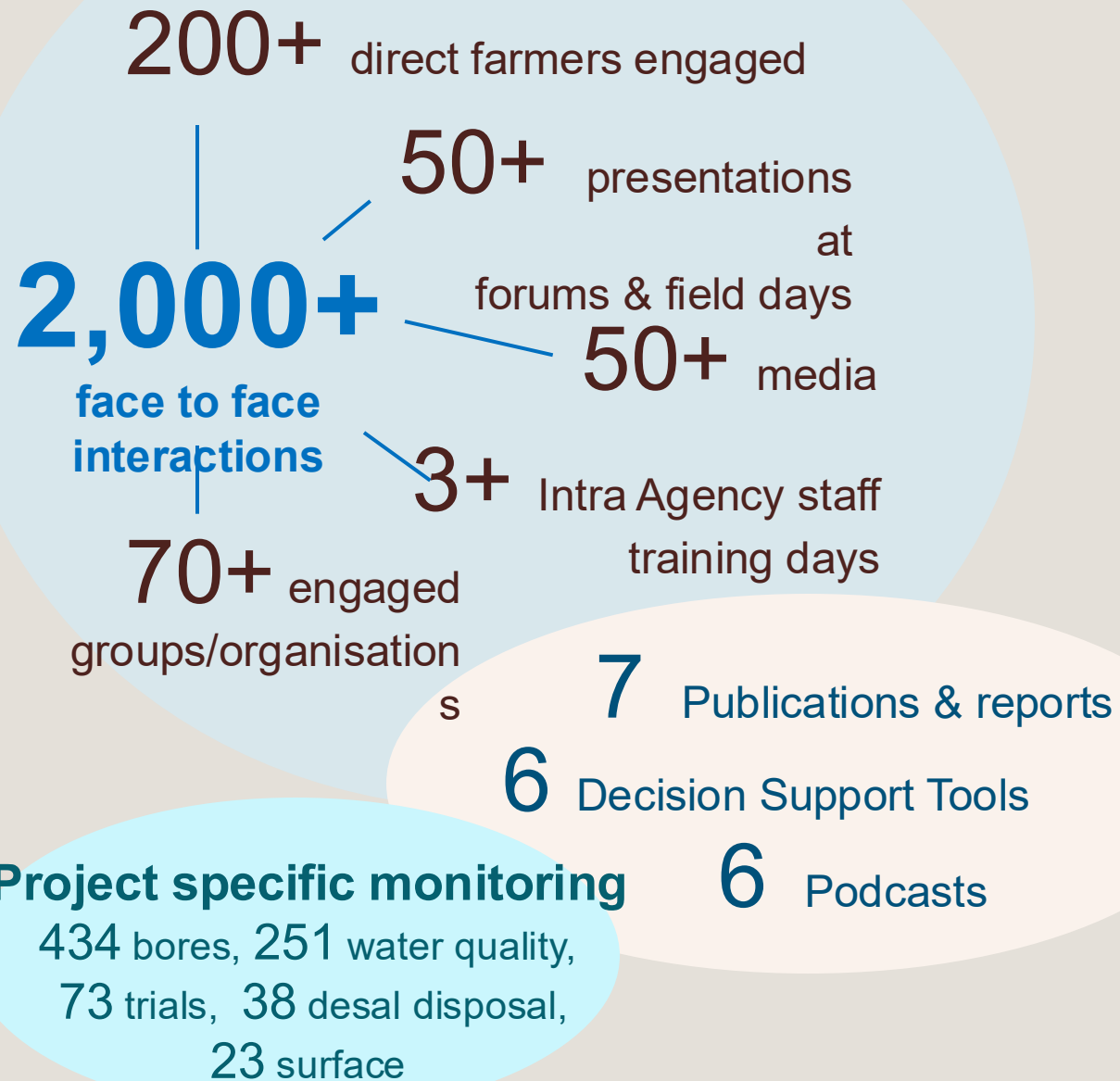




Water for \$20,000-\$100,000



Community Engagement & Reach (2021-24)



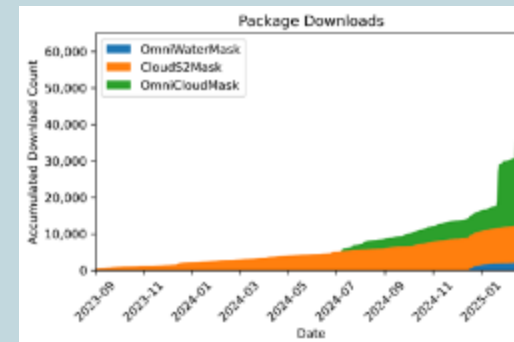
Notable

Australian Water Association

AWARD for Organisational Excellence

WaterSmart Farms:

- Winner, WA
- Winner, National



130,000+
OmniCloudMask
code downloads



THE UNIVERSITY OF WESTERN AUSTRALIA
Centre for Water & Spatial Science

PhD PRESENTATION

Nick Wright
UWA PhD Student
Senior Research Scientist, DPIRD




Aerial electromagnetic groundwater survey
Beaufort River
Flying from 20 April 2024
for 3 weeks, across 200km



Albany Advertiser

Helicopter to carry out aerial groundwater survey around Beaufort River across two weeks



WA farmers use desalination to secure water supplies, rest salt-damaged land

By Luciano Jose | By Belinda Vortscholli | ABC Rural | Water

Thu 6 Jan



DESALINATION WORKSHOP




Partners: Curtin University, Murdoch University, THE UNIVERSITY OF WESTERN AUSTRALIA, WATER AUSTRALIA, Wheatbelt Commission, GROWER GROUP ALLIANCE, WAFARMERS, GREAT SOUTHERN



West & East Drainage Tours
18th & 19th February



Australia Government Department of Agriculture, Water and the Environment | Future Drought Fund

GROWER GROUP ALLIANCE Together we grow | South-West WA Drought Resilience Mission and Innovation Hub



2024 SPRING FIELD DAY
In conjunction with the MERRIDIN RESEARCH STATION

WEDNESDAY SEPTEMBER 18TH

HIGHLIGHTS:

- 10am breakfast and farm tour
- 11am field tour of the new 100ha water saving system
- 12pm lunch and refreshments

REGISTER TODAY! www.bookings.com/CURC

ABOUT THE WORKSHOP


Event Details: 1:00pm, 19 September 2024, Merredin 103 Hwy, Goolburri, Goolburri

PRESENTATION: Current and future desalination options for the wheat belt

INFORMATION: We will provide live information on desalination technology and how it can be used on your farm

Q&A: Members will also have the opportunity to ask questions of the experts

MAD FIG FARMING IN THE EASTERN WHEATBELT



EPISODE 2 DIVING INTO WATERSMART FARMS WITH DR. RICHARD GEORGE (DPIRD)

Department of Primary Industries and Regional Development | THE UNIVERSITY OF WESTERN AUSTRALIA

COMPASS AGRICULTURAL ALLIANCE | MAD FIG | Southern Dirt | FBG



\$1.5m WaterSmart Farms

- Built a consortium of ‘water’ knowledge
- Successfully engaged 100s of farmers in project, with > 60 involved in R&D work
- New exploration method to access water in the bedrock
- Successfully trialled desalination, and evaluation of reject flows
- Delivered 100’s of workshops, field days, Apps and podcasts etc
- With **WaterSmart Dams**, demonstrated improvements to conventional options
- Building an understanding of importance of water quality

WaterSmart Farms

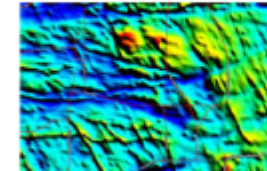
Water security and resilience in a drying climate

Decision Support Tools

Groundwater and Salinity - Interactive Map



GeoMap - Geology & Geophysics



HydroGuide - Surface water accumulation & dams



Water Evaluation Platform - Farm dam modelling and analytics



WaterSmart Farms Goals

Goal - improve resilience of agricultural systems

Reliable supplies in challenging years

RO Desalination +/- new groundwater – test technology – *aspiration* 1000 farms x < 20kL systems - equate to the total IWSS Farmlands supply

However desalination is a new cost and we have 200,000 dams. So how many do we keep, rebuild and update – design life 20 - 50 years?

#WaterSmart Dams partnership with UWA, GGA and DPIRD has that goal



Questions

<https://linktr.ee/watersmartfarms>



watersmartfarms

Water security & resilience
in a drying climate

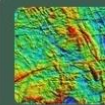
TOOLS



GW & Salinity Map



Hydro Guide



GeoMap



WaterSmart Dams | WEP

