Marine Impacts – Proving the Models

September 2008

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WATER CORPORATION

A Sustainable Solution?

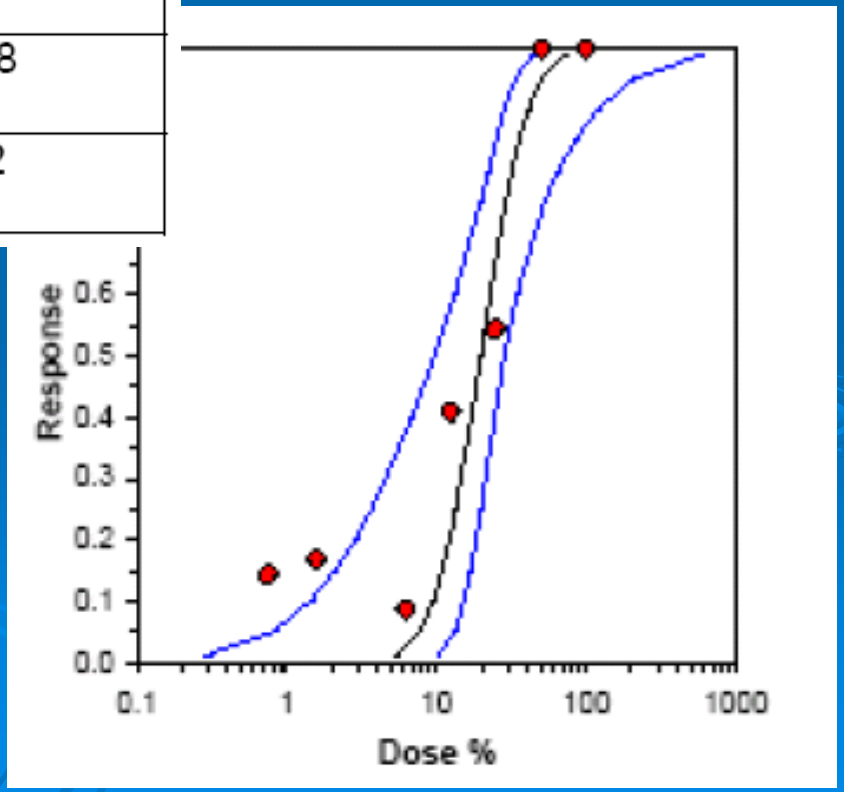
In 1886 the world largest desalination plant was built in WA at Coolgardie

Marine Issues

- Toxic substances
- Brine (salt)
- Dissolved oxygen

Toxicity Testing (WET)

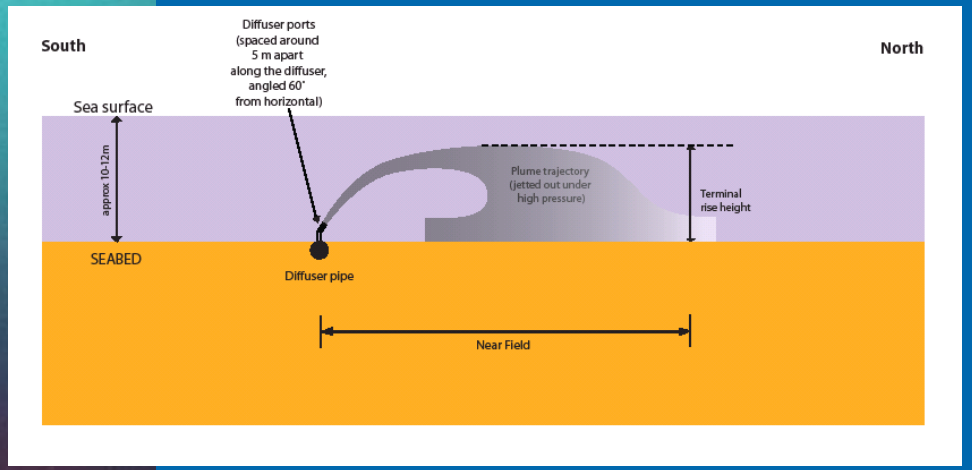
Protection Level with 50% confidence	Protection Value % Brine	Dilution Factor
99	6.64	15.1
95	8.15	12.3
90	9.23	10.8
80	10.93	9.2



“Cockburn Sound will turn into a salt lake!”

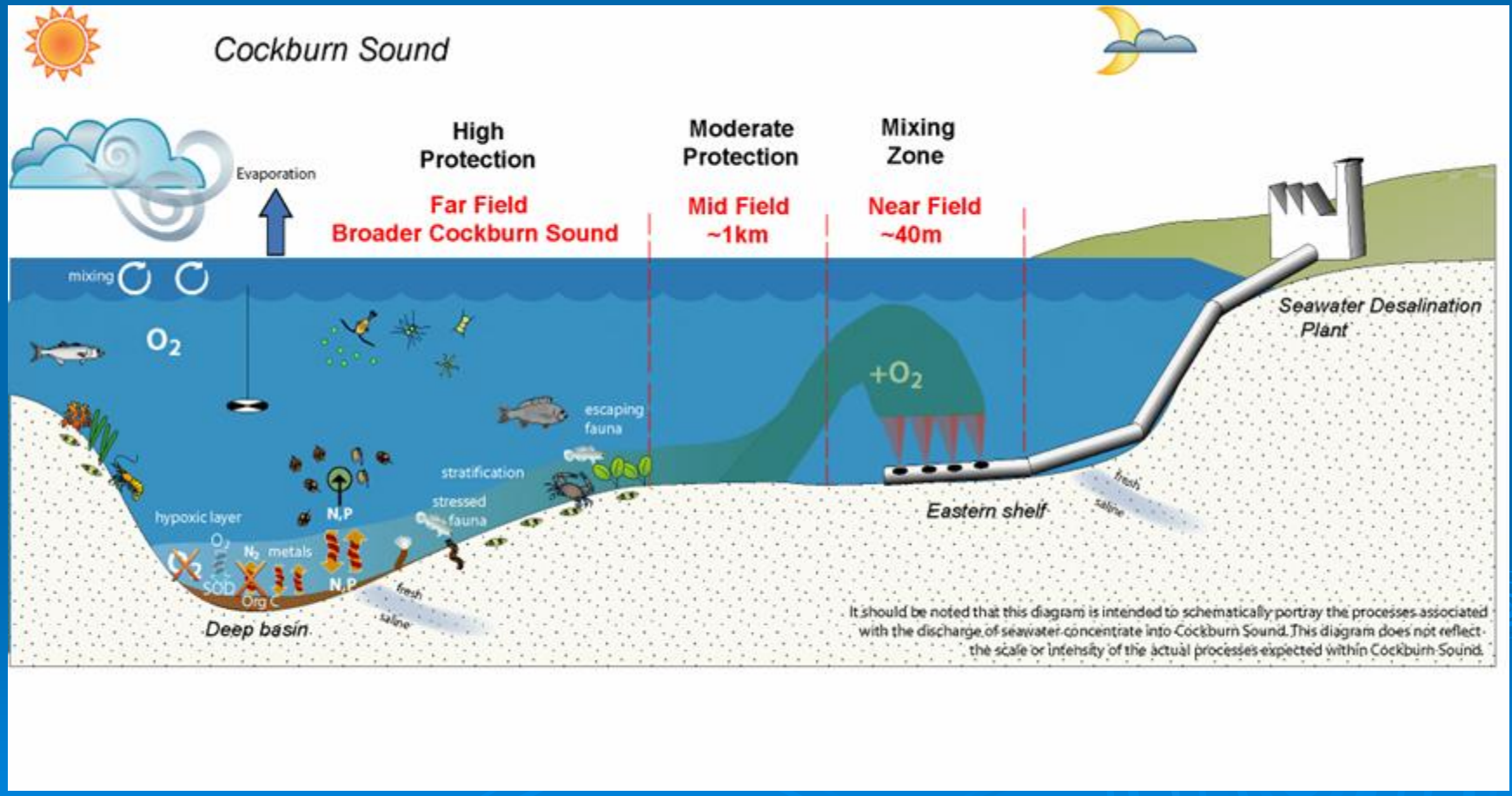
Cockburn Sound Flushing Desalination

“The brine (salt) will kill marine life!”



Dilution is the key …

“Hypothesis: Dissolved oxygen levels will plummet!”



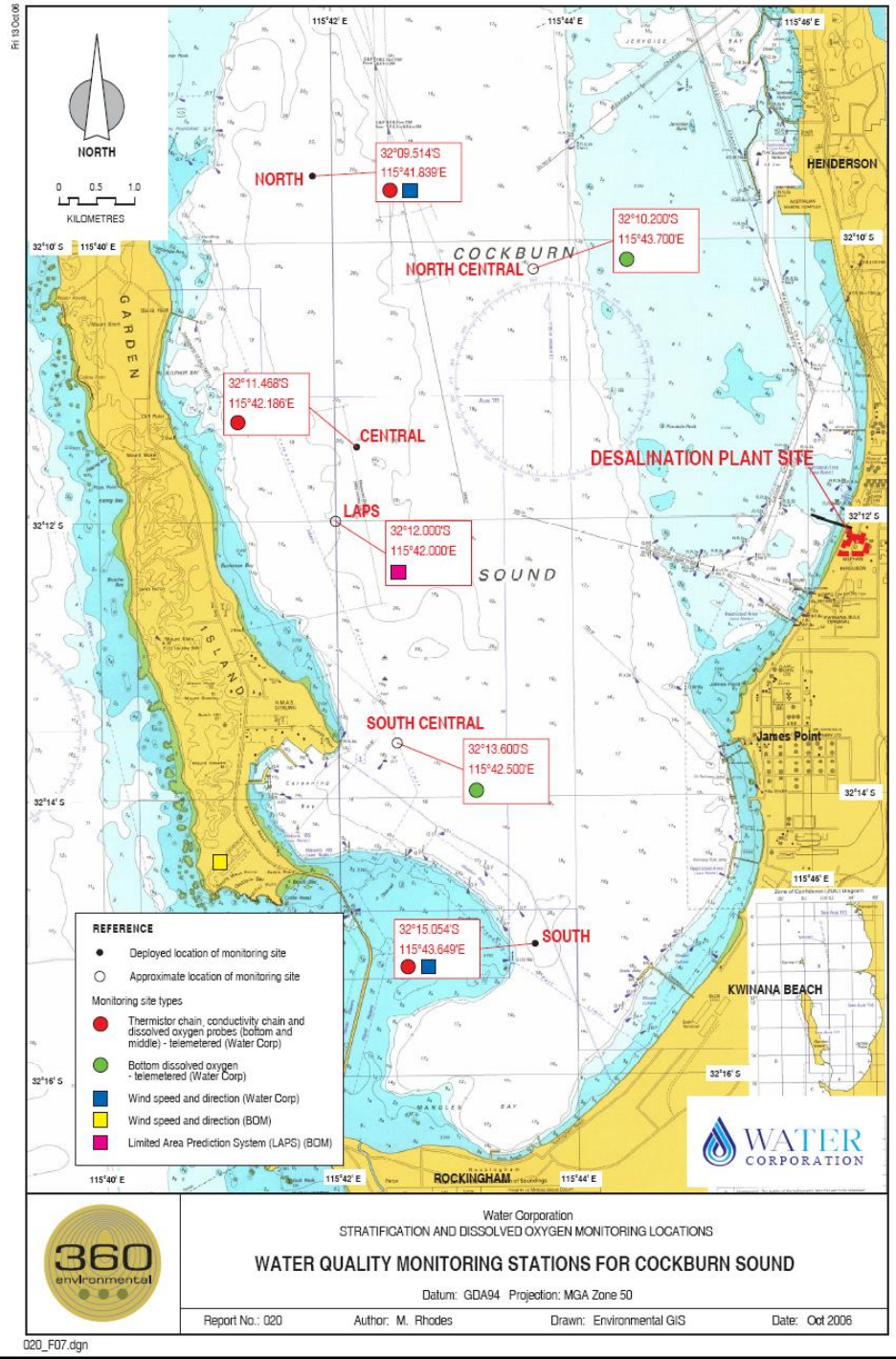
Ongoing Monitoring Program

Real-Time Monitors

June 2006 installation

24 hours per day (real-time) against triggers

Back up instruments for three real-time monitors

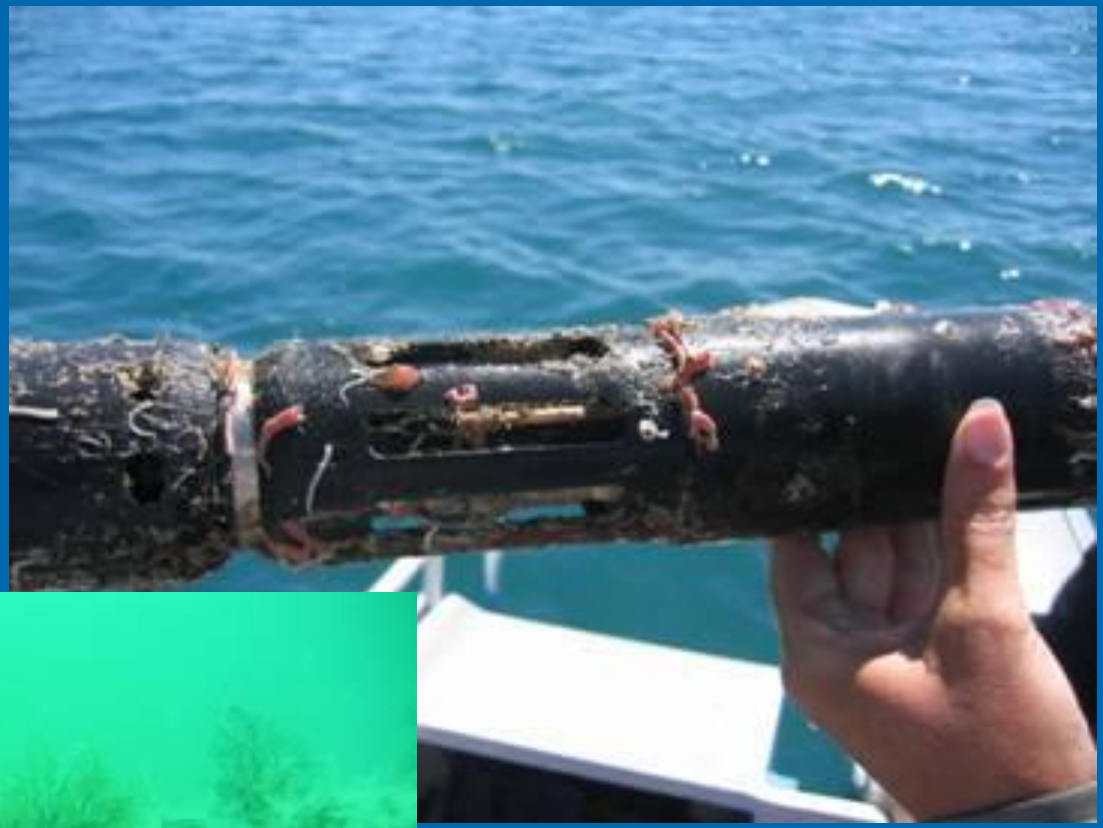


Perth Seawater Desalination Project

Real Time Monitoring


RANK & FILE
ON COURSE
MOORING
PROHIBITED
AWATER

Bio-fouling has been a major problem over the warmer months



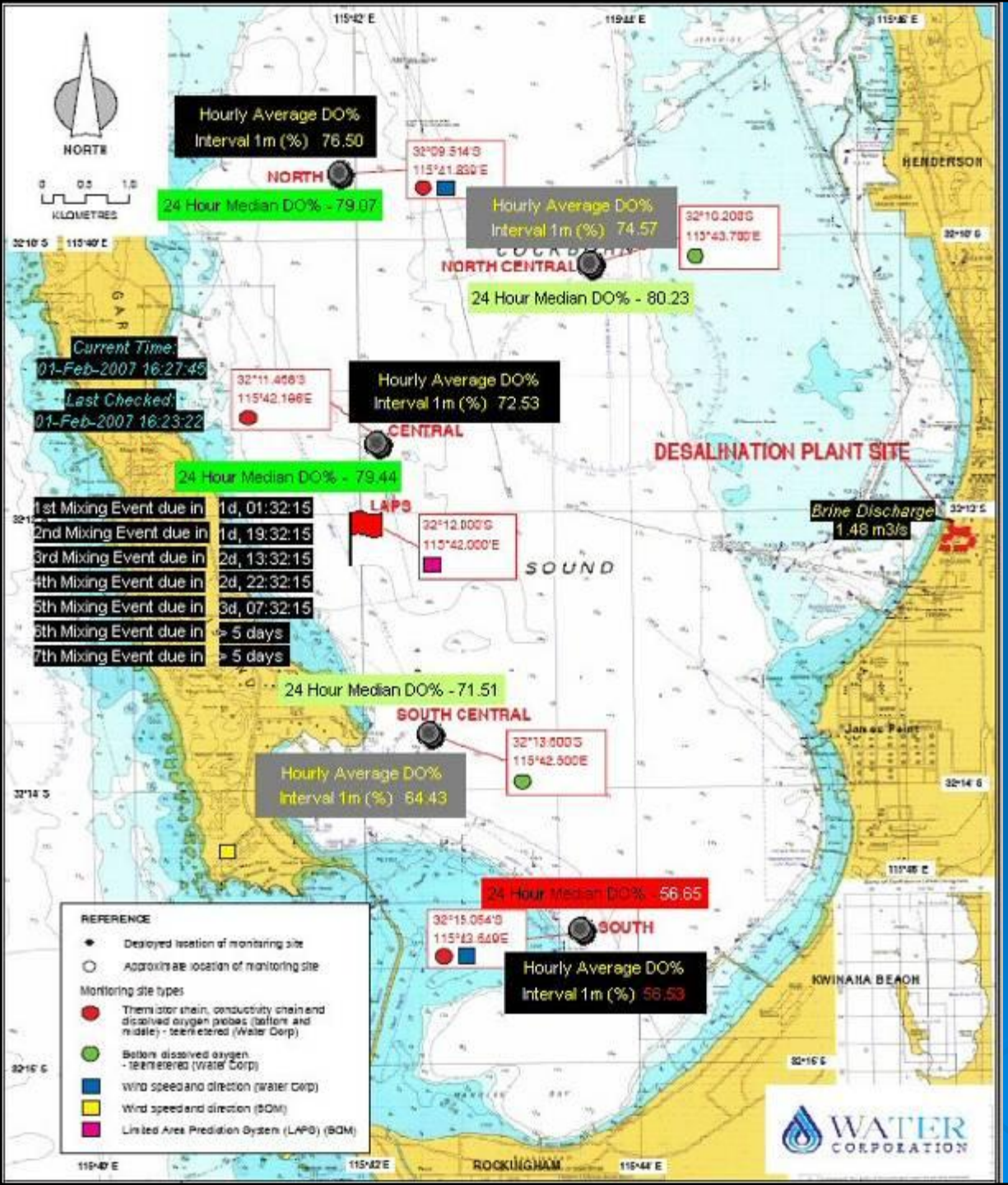
‘Seabird Electronics’ representatives visited from the US to assist in system design

-Black casing

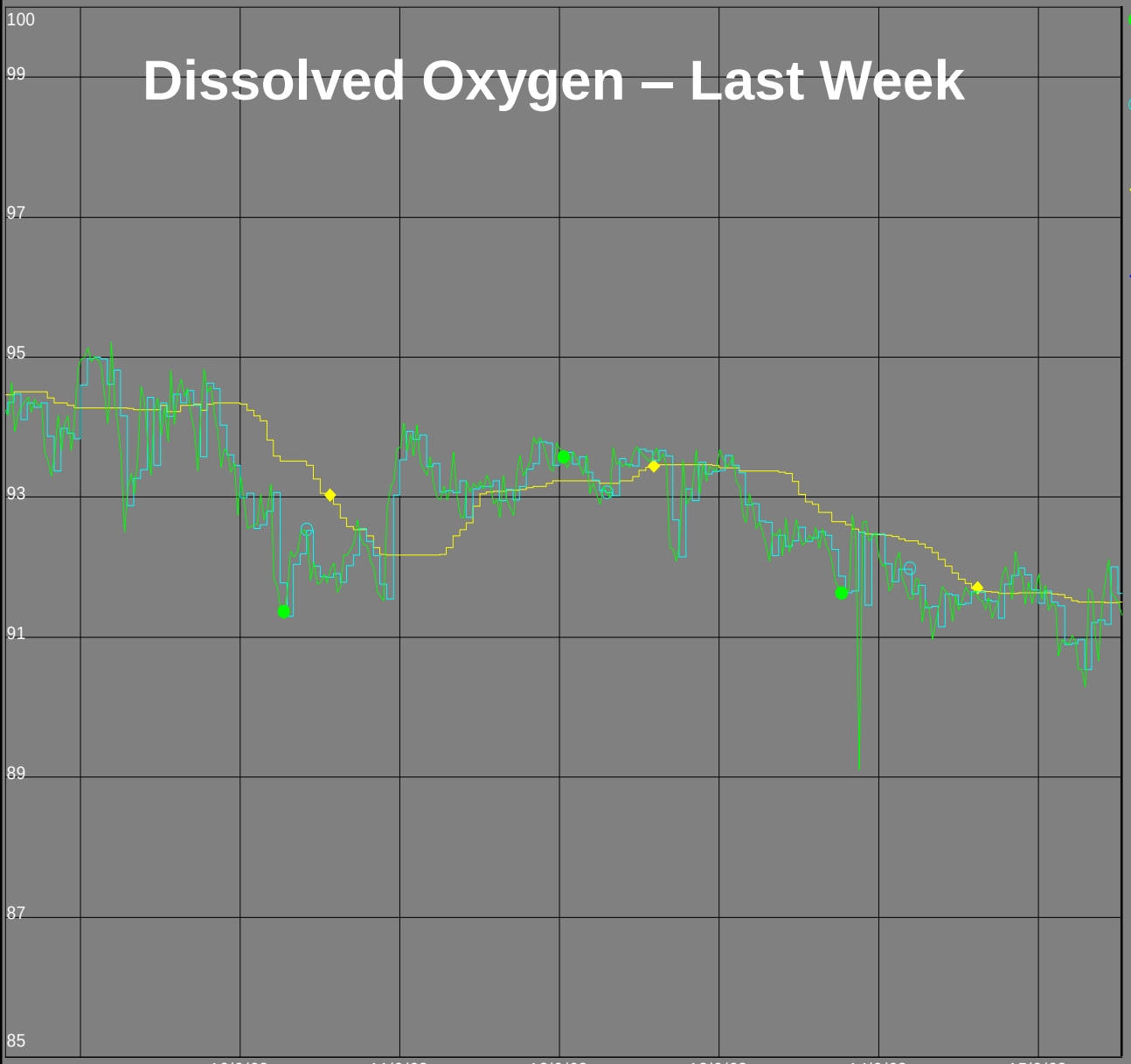
-Copper piping

-Anti-fouling

Automated Information System



Dissolved Oxygen – Last Week



● Cockburn_Sound_NB_Dissolved_Oxygen_0.5m_%
91.31
%

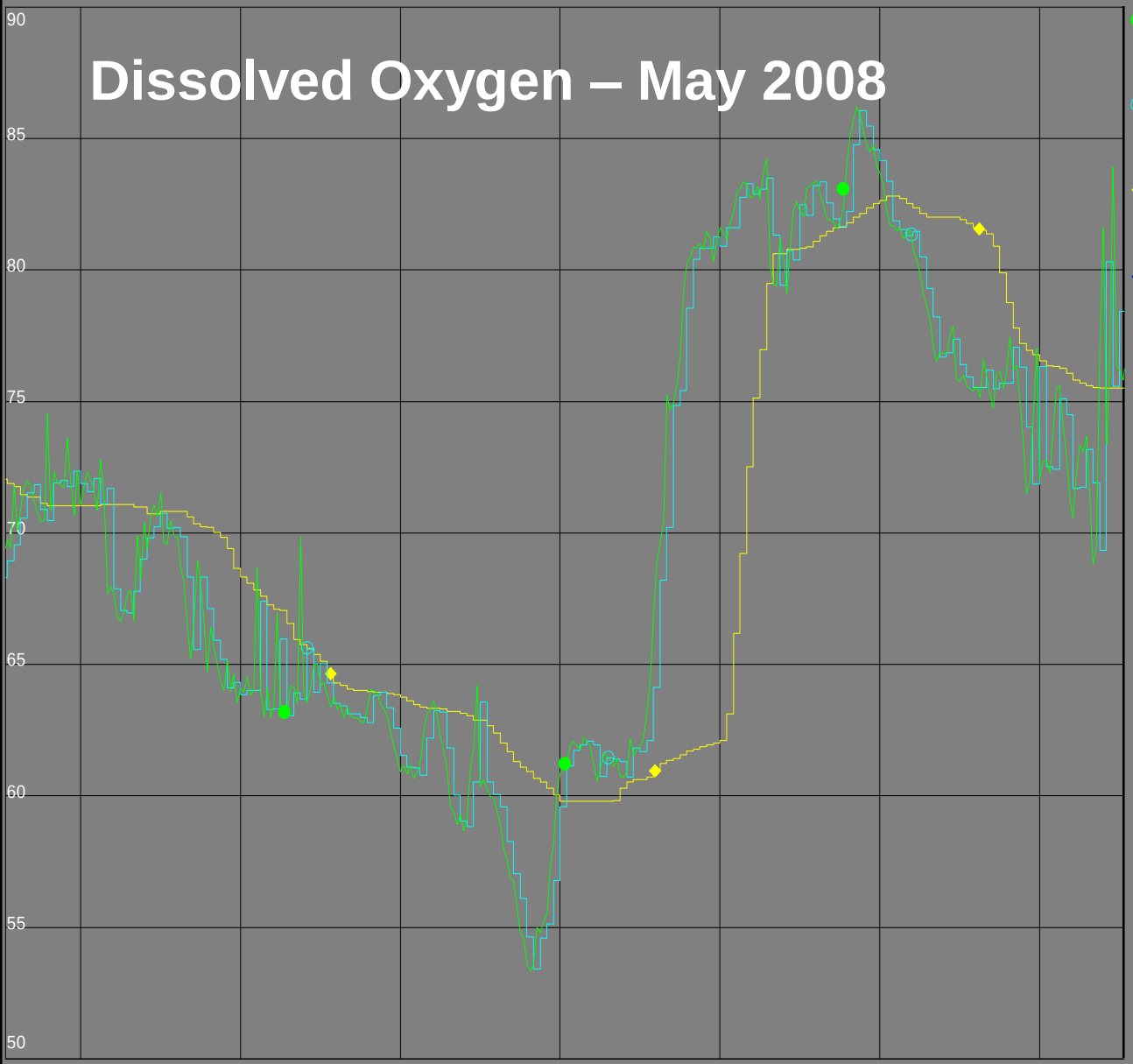
○ Cockburn_Sound_NB_Dissolved_Oxygen_0.5m_Hourly_%
91.63
%

◆ Cockburn_Sound_NB_Dissolved_Oxygen_0.5m_24Hr_Median_%
91.51
%

◇ Cockburn_Sound_NB_Dissolved_Oxygen_0.5m_%_Manual Scan Off
%

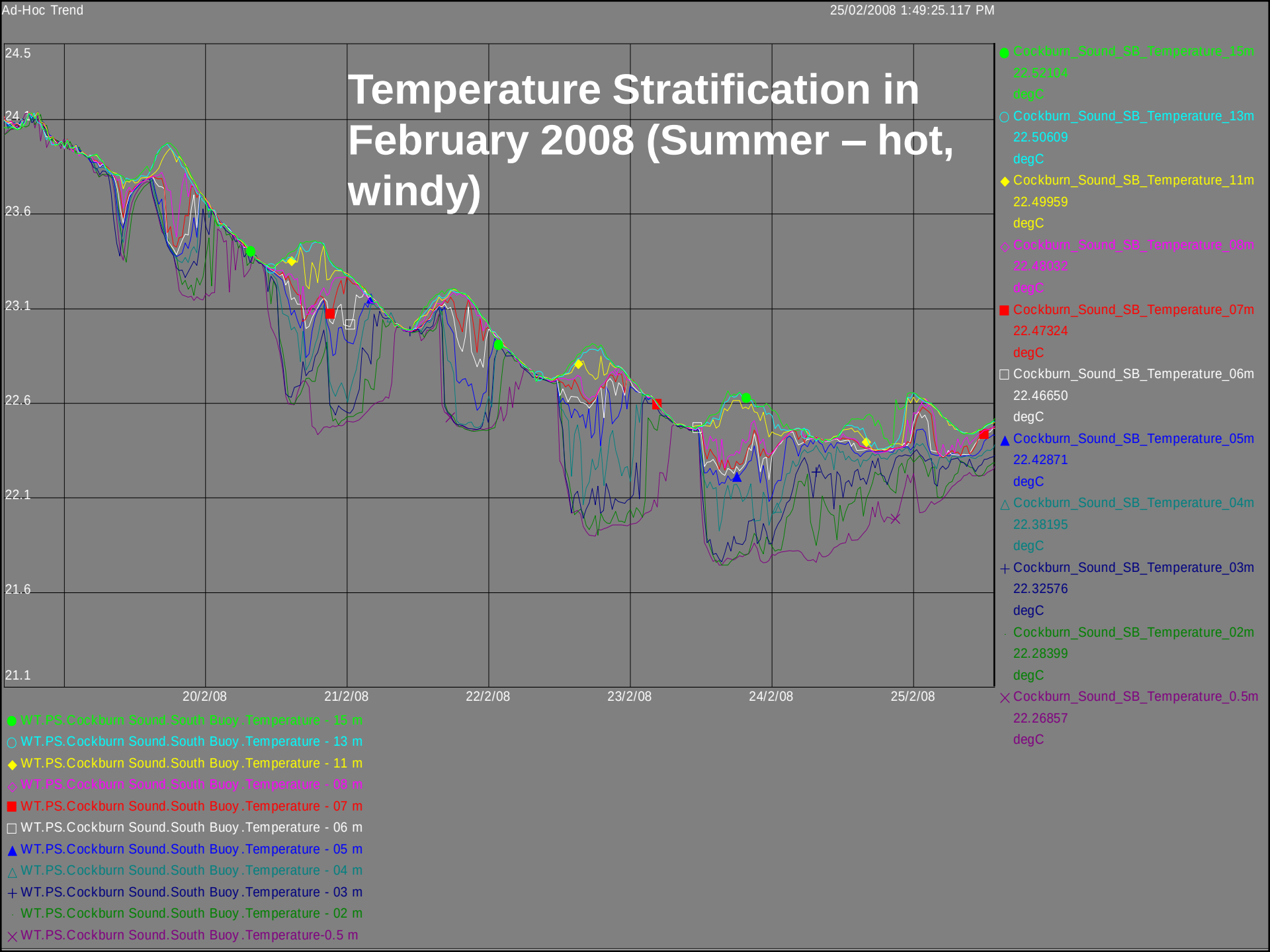
● Calculated DO % 0.5m, Cockburn Sound North Buoy
○ Calculated Hourly DO % 0.5m, Cockburn Sound North Buoy
◆ Calculated 24Hr Median DO % 0.5m, Cockburn Sound North Buoy
◇ Manually sampled DO %, Bottom Level 0.5m, Cockburn Sound North Buoy

Dissolved Oxygen – May 2008

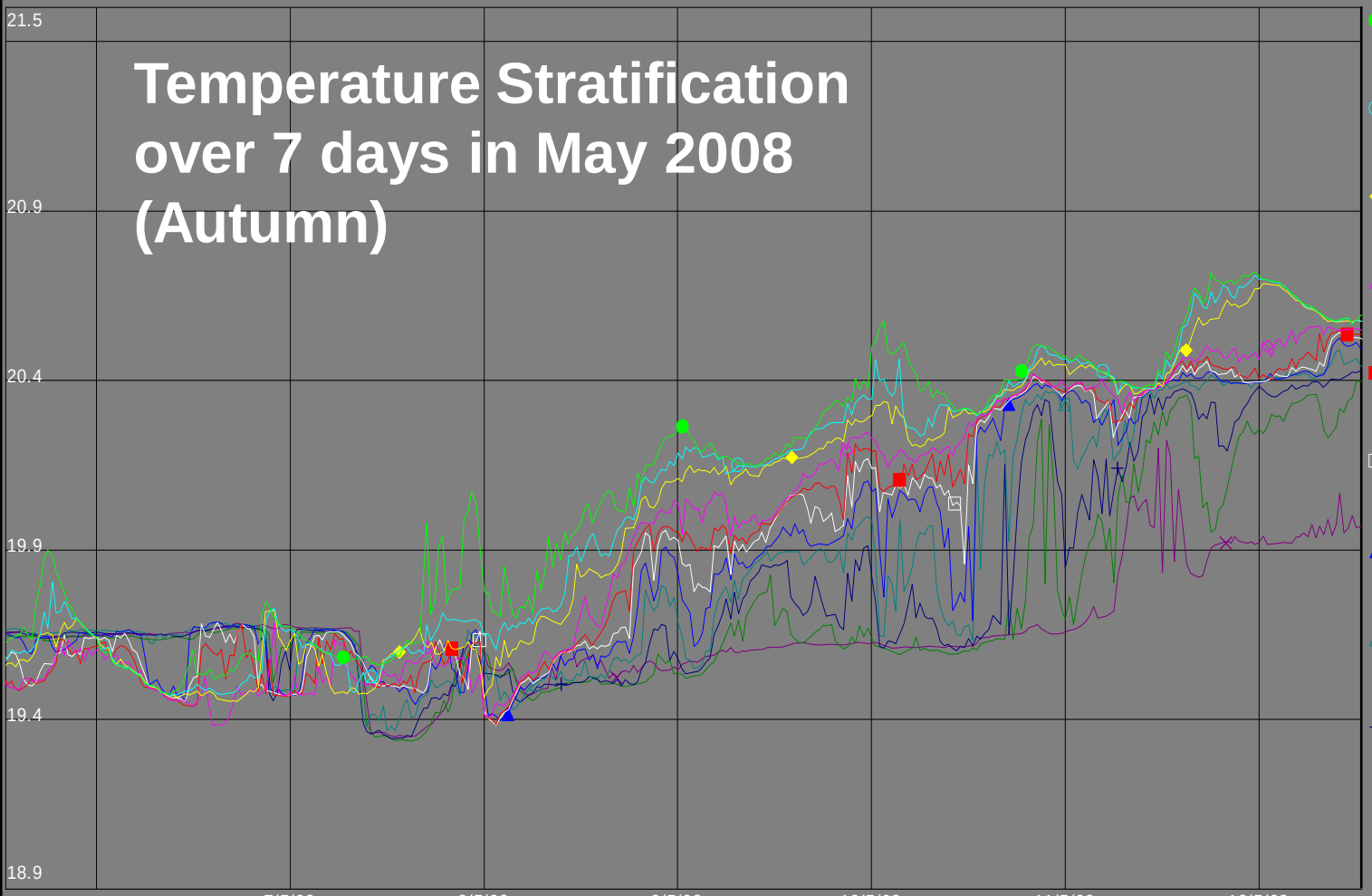


● Cockburn_Sound_CB_Dissolved_Oxygen_0.5m_%
76.26
%
○ Cockburn_Sound_CB_Dissolved_Oxygen_0.5m_Hourly_%
78.44
%
◆ Cockburn_Sound_CB_Dissolved_Oxygen_0.5m_24Hr_Median_%
75.51
%
◇ Cockburn_Sound_CB_Dissolved_Oxygen_0.5m_%_Manual Scan Off
%

● Calculated DO % 0.5m, Cockburn Sound Central Buoy
○ Calculated Hourly DO % 0.5m, Cockburn Sound Central Buoy
◆ Calculated 24Hr Median DO % 0.5m, Cockburn Sound Central Buoy
◇ Manually sampled DO %, Bottom Level 0.5m, Cockburn Sound Central Buoy

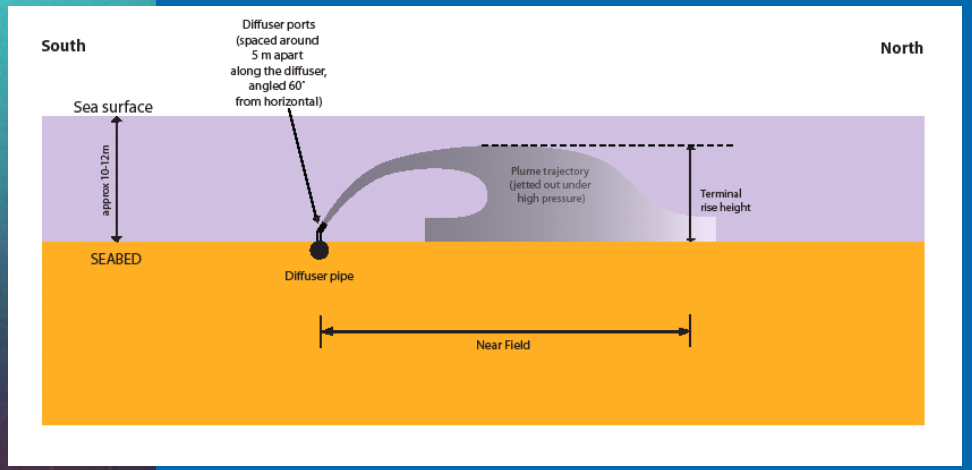

Ad-Hoc Trend
25/02/2008 1:49:25.117 PM
Temperature Stratification in February 2008 (Summer – hot, windy)
24.5
24.1
23.6
23.1
22.6
22.1
21.6
21.1
20/2/08
21/2/08
22/2/08
23/2/08
24/2/08
25/2/08
Cockburn_Sound_SB_Temperature_15m
22.52104
degC
Cockburn_Sound_SB_Temperature_13m
22.50609
degC
Cockburn_Sound_SB_Temperature_11m
22.49959
degC
Cockburn_Sound_SB_Temperature_08m
22.48032
degC
Cockburn_Sound_SB_Temperature_07m
22.47324
degC
Cockburn_Sound_SB_Temperature_06m
22.46650
degC
Cockburn_Sound_SB_Temperature_05m
22.42871
degC
Cockburn_Sound_SB_Temperature_04m
22.38195
degC
Cockburn_Sound_SB_Temperature_03m
22.32576
degC
Cockburn_Sound_SB_Temperature_02m
22.28399
degC
Cockburn_Sound_SB_Temperature_0.5m
22.26857
degC
WT.PS.Cockburn Sound.South Buoy.Temperature - 15 m
WT.PS.Cockburn Sound.South Buoy.Temperature - 13 m
WT.PS.Cockburn Sound.South Buoy.Temperature - 11 m
WT.PS.Cockburn Sound.South Buoy.Temperature - 08 m
WT.PS.Cockburn Sound.South Buoy.Temperature - 07 m
WT.PS.Cockburn Sound.South Buoy.Temperature - 06 m
WT.PS.Cockburn Sound.South Buoy.Temperature - 05 m
WT.PS.Cockburn Sound.South Buoy.Temperature - 04 m
WT.PS.Cockburn Sound.South Buoy.Temperature - 03 m
WT.PS.Cockburn Sound.South Buoy.Temperature - 02 m
WT.PS.Cockburn Sound.South Buoy.Temperature-0.5 m

Temperature Stratification over 7 days in May 2008 (Autumn)



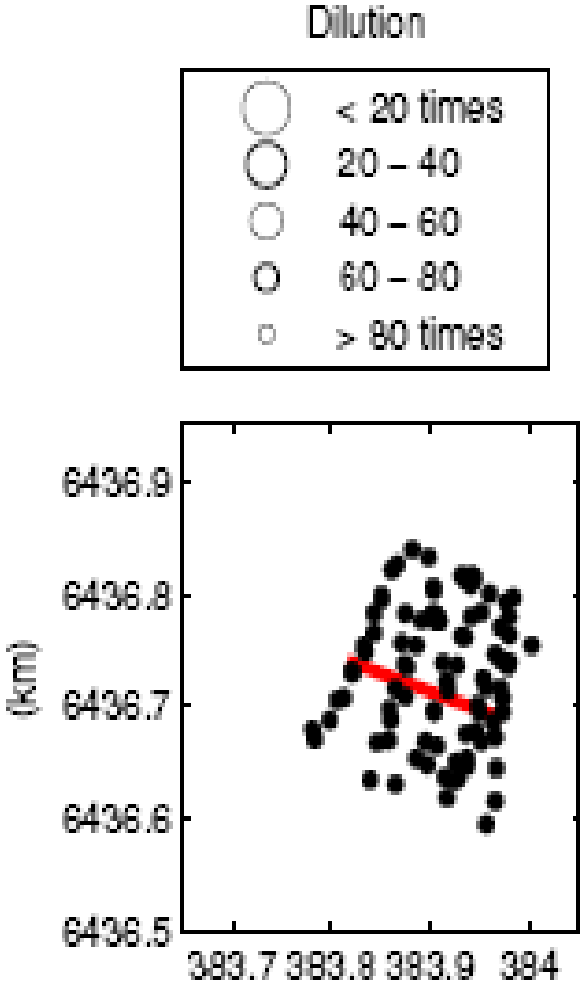
Cockburn_Sound_SB_Temperature_15m
20.59223
degC
Cockburn_Sound_SB_Temperature_13m
20.57585
degC
Cockburn_Sound_SB_Temperature_11m
20.57483
degC
Cockburn_Sound_SB_Temperature_08m
20.54902
degC
Cockburn_Sound_SB_Temperature_07m
20.53541
degC
Cockburn_Sound_SB_Temperature_06m
20.52084
degC
Cockburn_Sound_SB_Temperature_05m
20.49357
degC
Cockburn_Sound_SB_Temperature_04m
20.44009
degC
Cockburn_Sound_SB_Temperature_03m
20.42758
degC
Cockburn_Sound_SB_Temperature_02m
20.39982
degC
Cockburn_Sound_SB_Temperature_0.5m
19.97191
degC

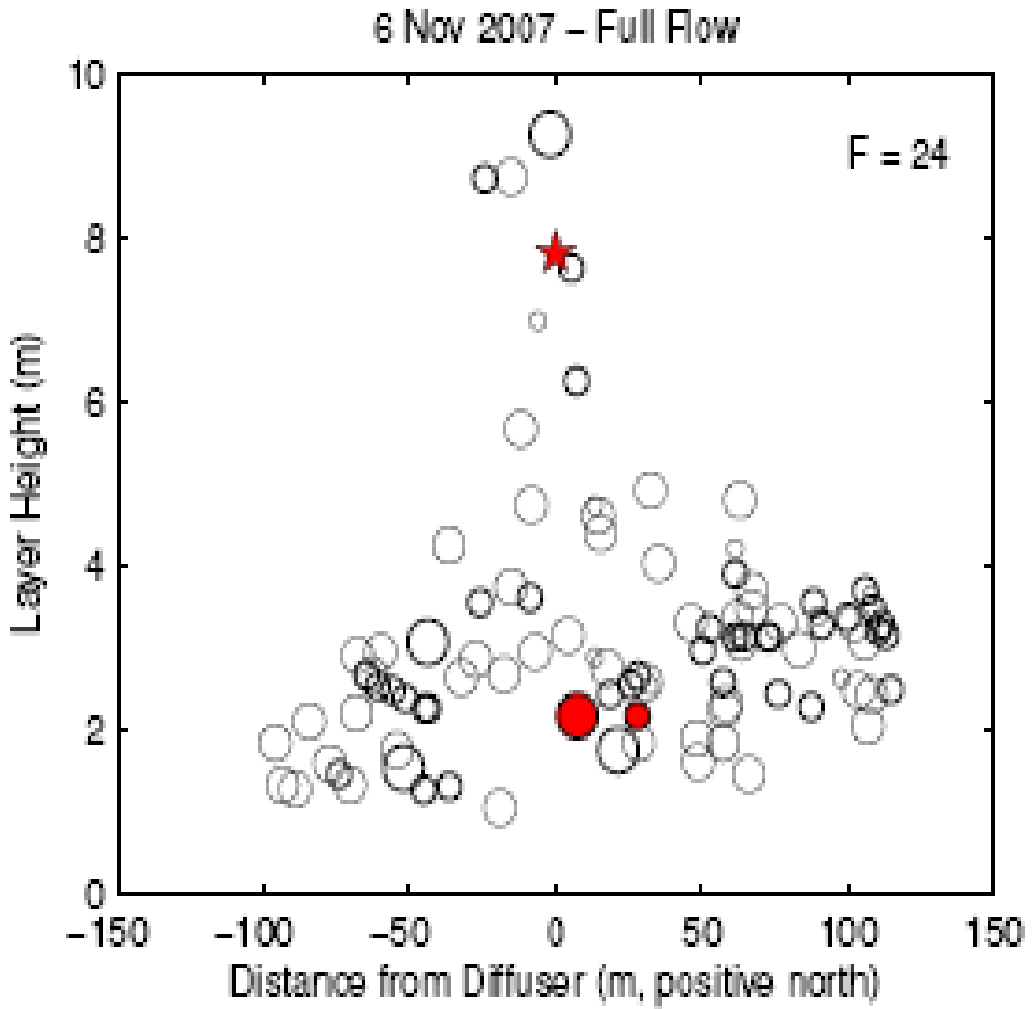
WT.PS.Cockburn Sound.South Buoy .Temperature - 15 m
WT.PS.Cockburn Sound.South Buoy .Temperature - 13 m
WT.PS.Cockburn Sound.South Buoy .Temperature - 11 m
WT.PS.Cockburn Sound.South Buoy .Temperature - 08 m
WT.PS.Cockburn Sound.South Buoy .Temperature - 07 m
WT.PS.Cockburn Sound.South Buoy .Temperature - 06 m
WT.PS.Cockburn Sound.South Buoy .Temperature - 05 m
WT.PS.Cockburn Sound.South Buoy .Temperature - 04 m
WT.PS.Cockburn Sound.South Buoy .Temperature - 03 m
WT.PS.Cockburn Sound.South Buoy .Temperature - 02 m
WT.PS.Cockburn Sound.South Buoy .Temperature-0.5 m



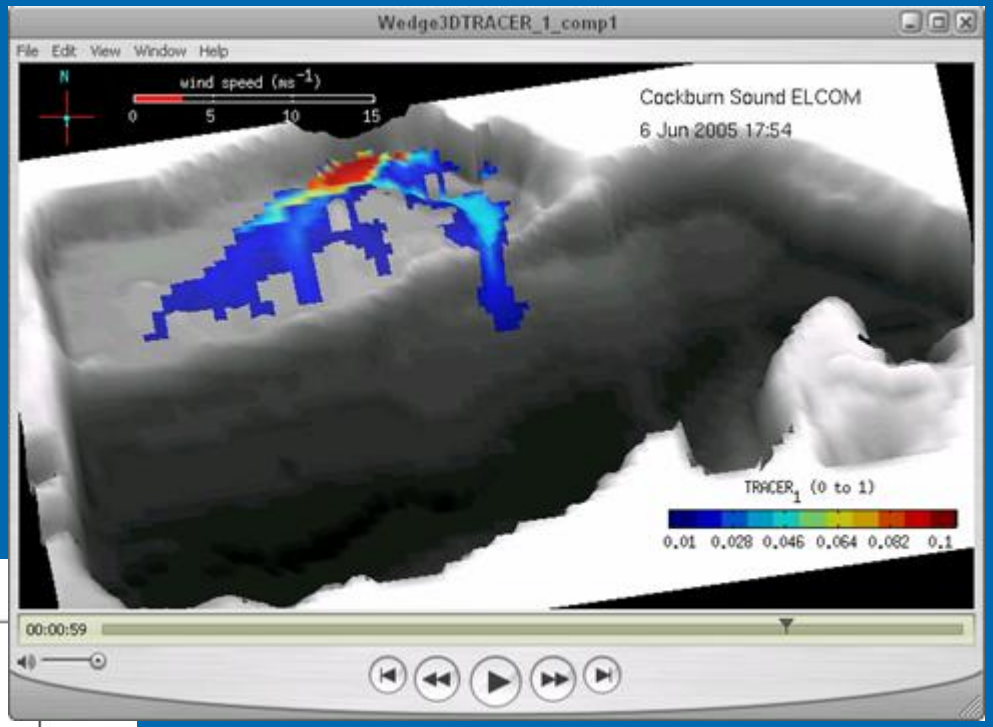
Dilution is the key …

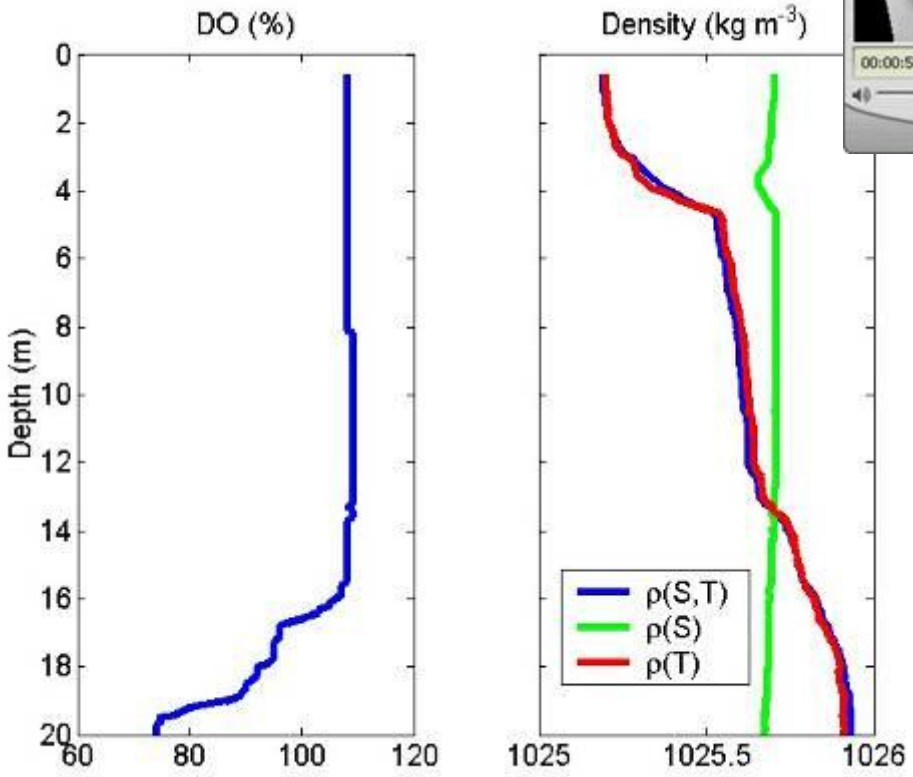
Diffuser Performance



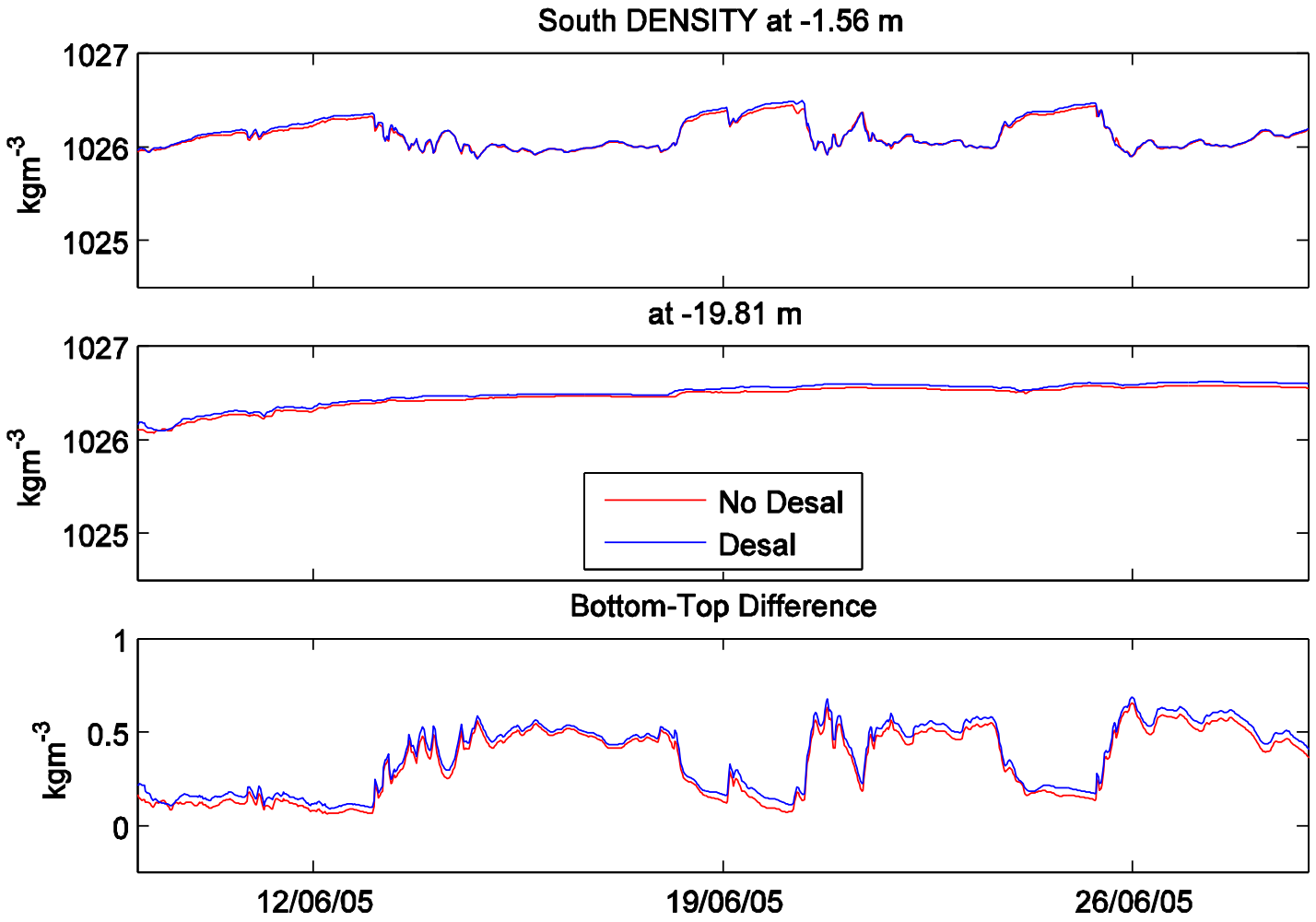


Modelling shows no impacts…

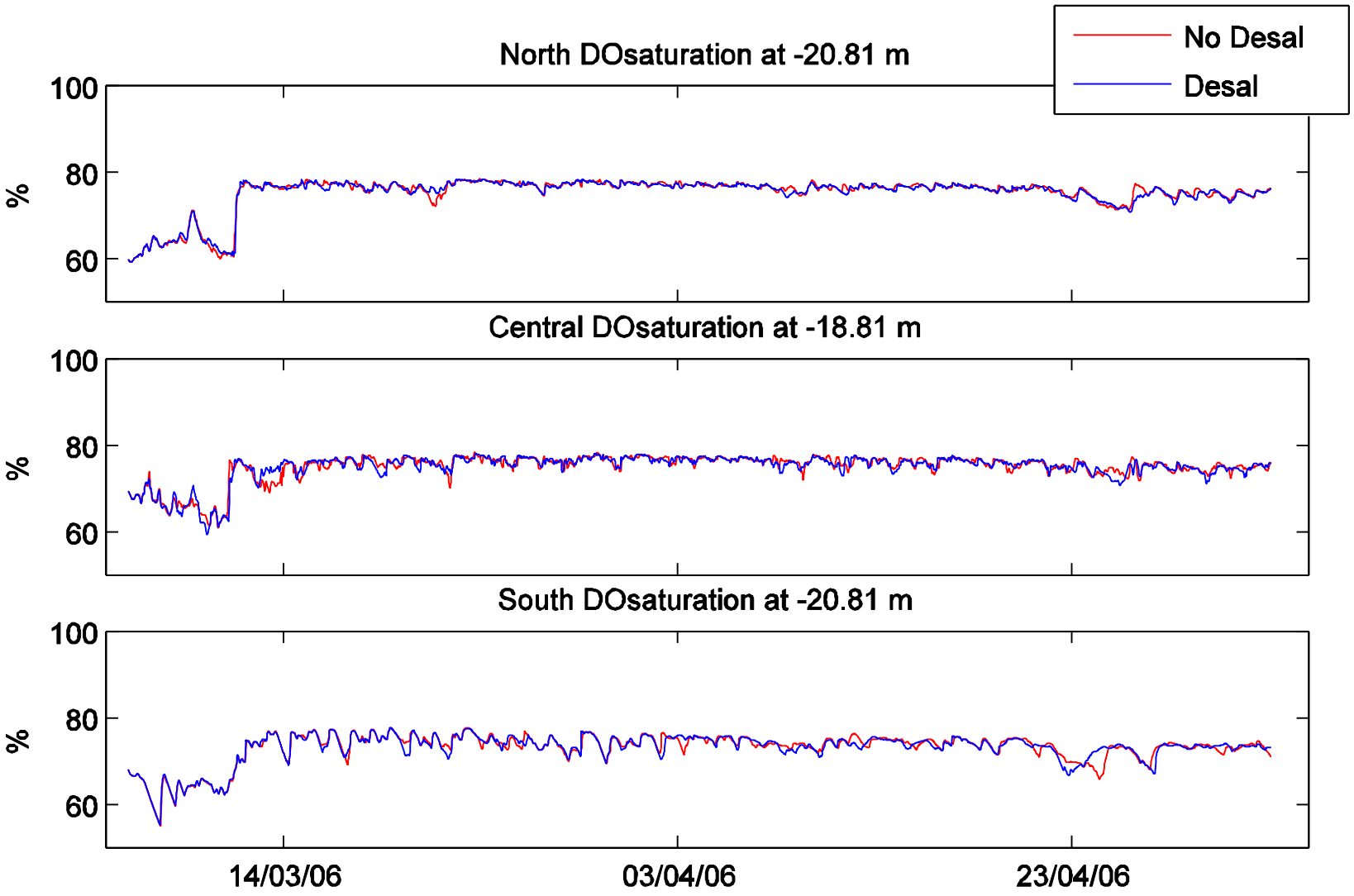




Stratification



Dissolved Oxygen



Conclusions on PSDP

Desalination has an important role in Australia.

The PSDP is a leading model for sustainable desalination:

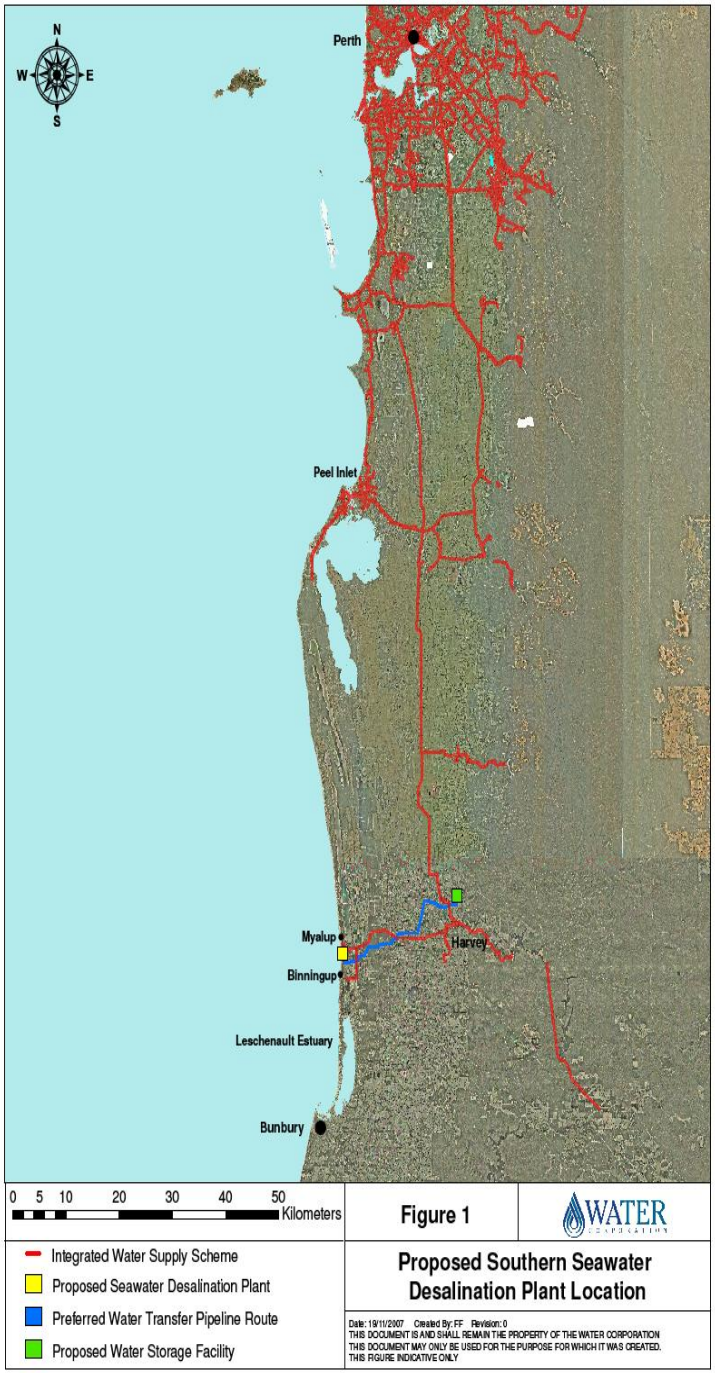
- **High energy efficiency**
- **Energy from wind**
- **High dilution of discharge**
- **Toxicological testing**
- **Unprecedented marine monitoring**

Southern Seawater Desalination Project

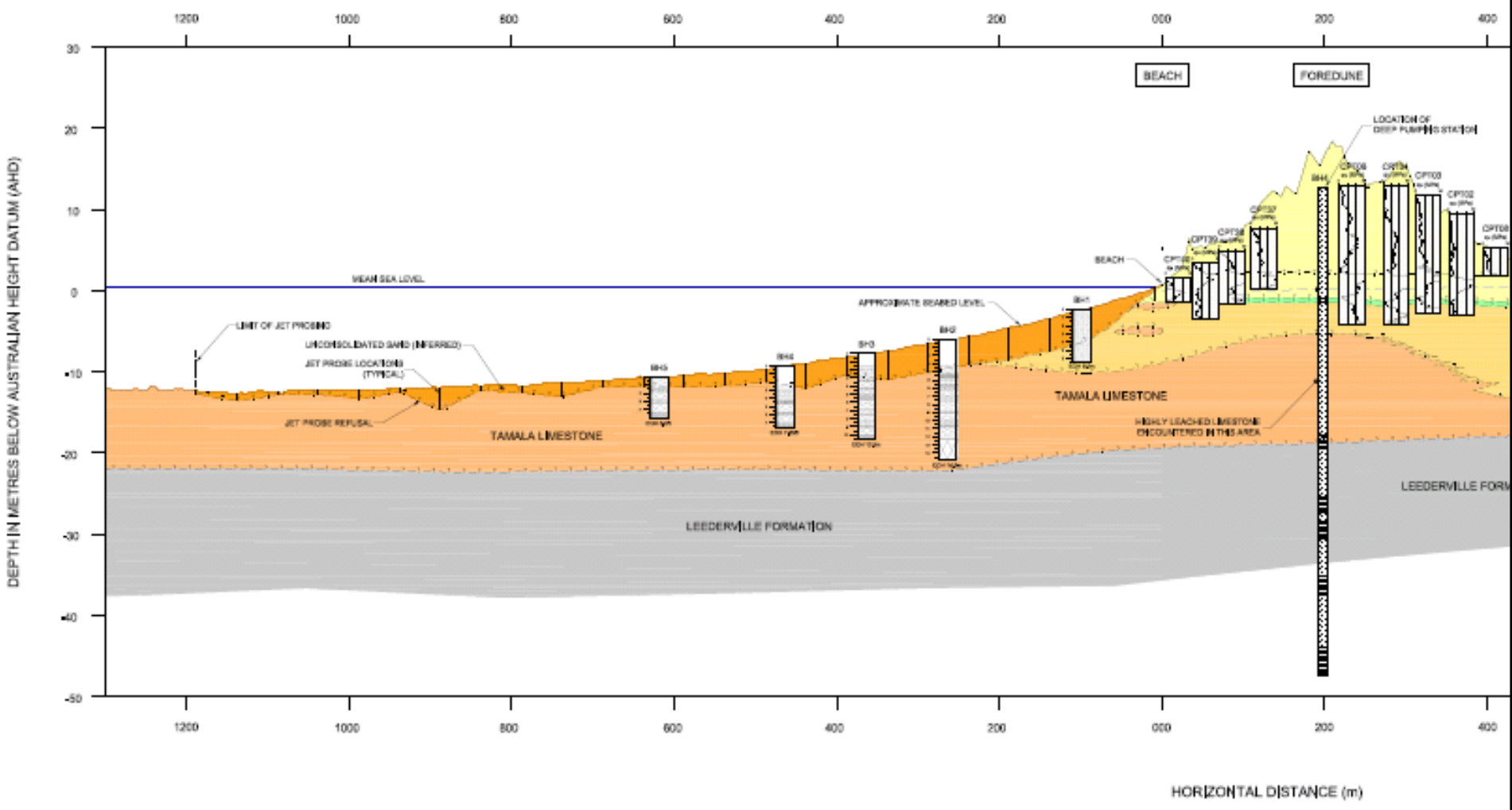
- 50 GL per year desalination plant / expandable to 100 GL per year

- Approximately 30km pipeline to north east Harvey

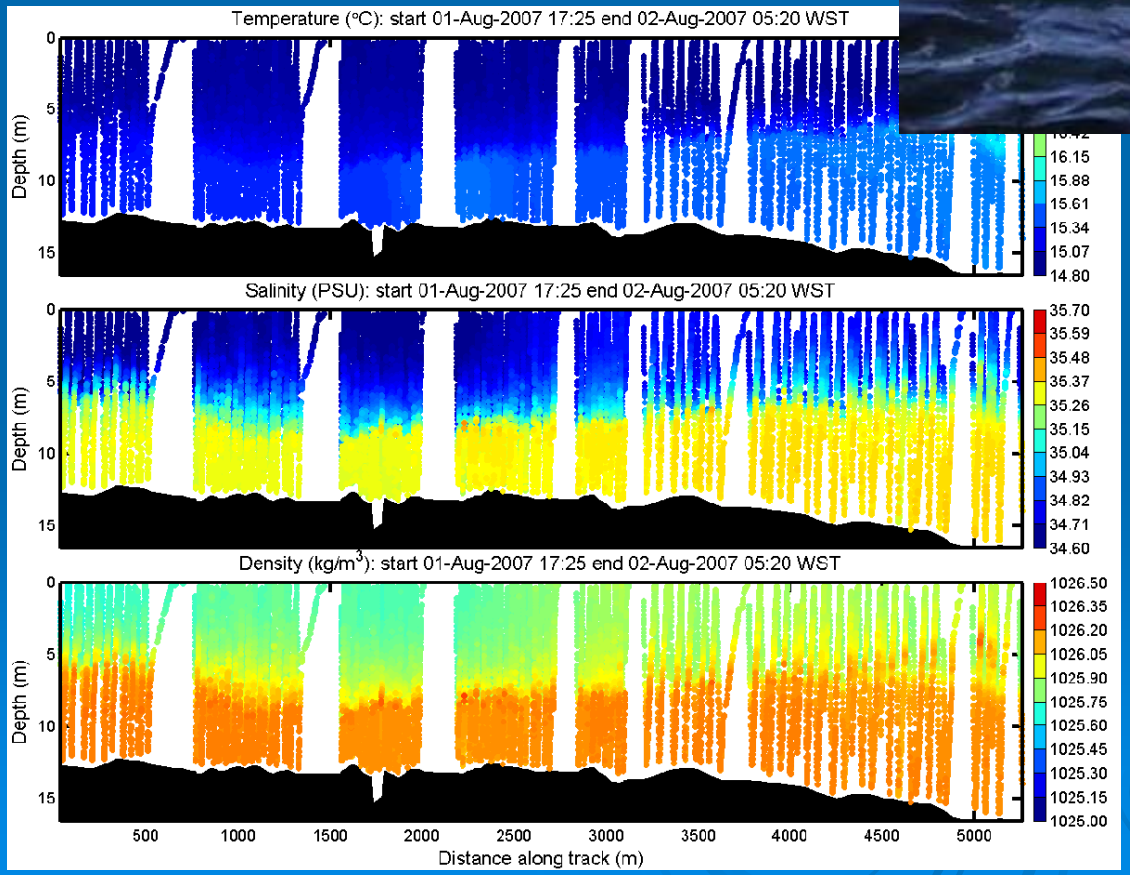
- Harvey Summit Tank



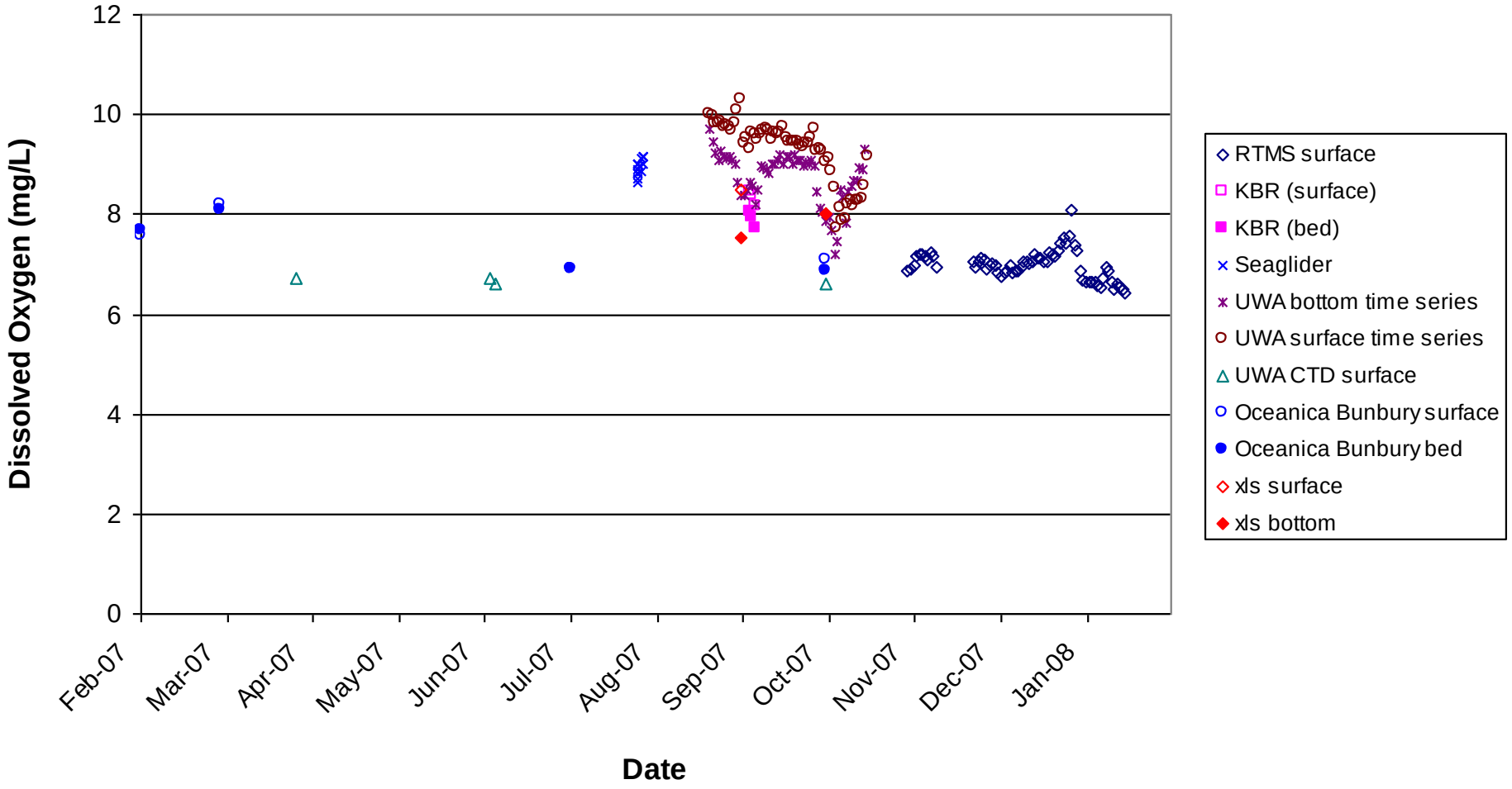
Bathymetry


BEACH
FOREDUNE
MEAN SEA LEVEL
LIMIT OF JET PROBING
UNCONSOLIDATED SAND (INFERRED)
JET PROBE LOCATIONS (TYPICAL)
JET PROBE REFUSAL
TAMALA LIMESTONE
LEEDERVILLE FORMATION
HIGHLY LEACHED LIMESTONE ENCOUNTERED IN THIS AREA
DEPTH IN METRES BELOW AUSTRALIAN HEIGHT DATUM (AHD)
HORIZONTAL DISTANCE (m)

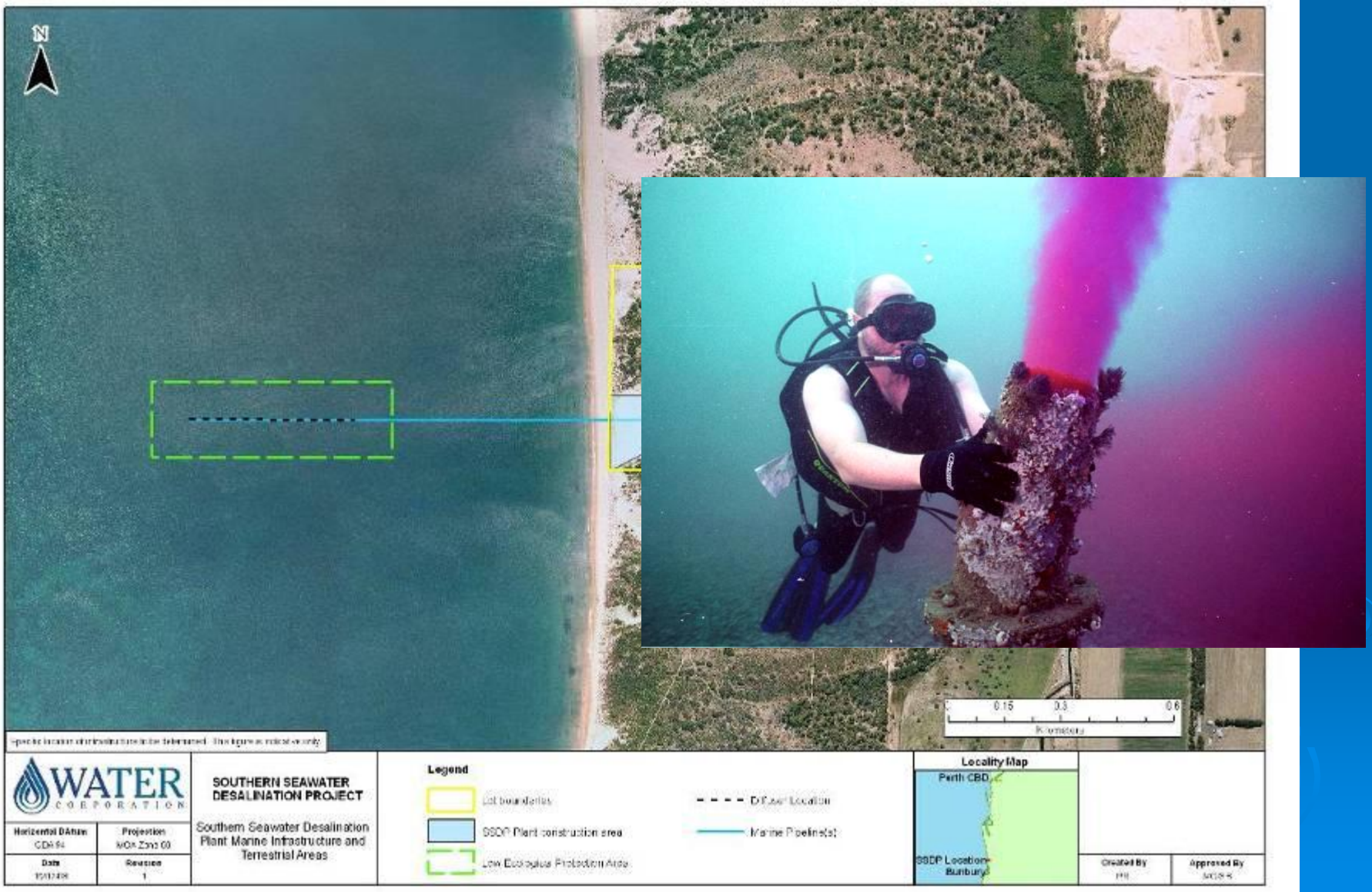
New technology…



Dissolved Oxygen

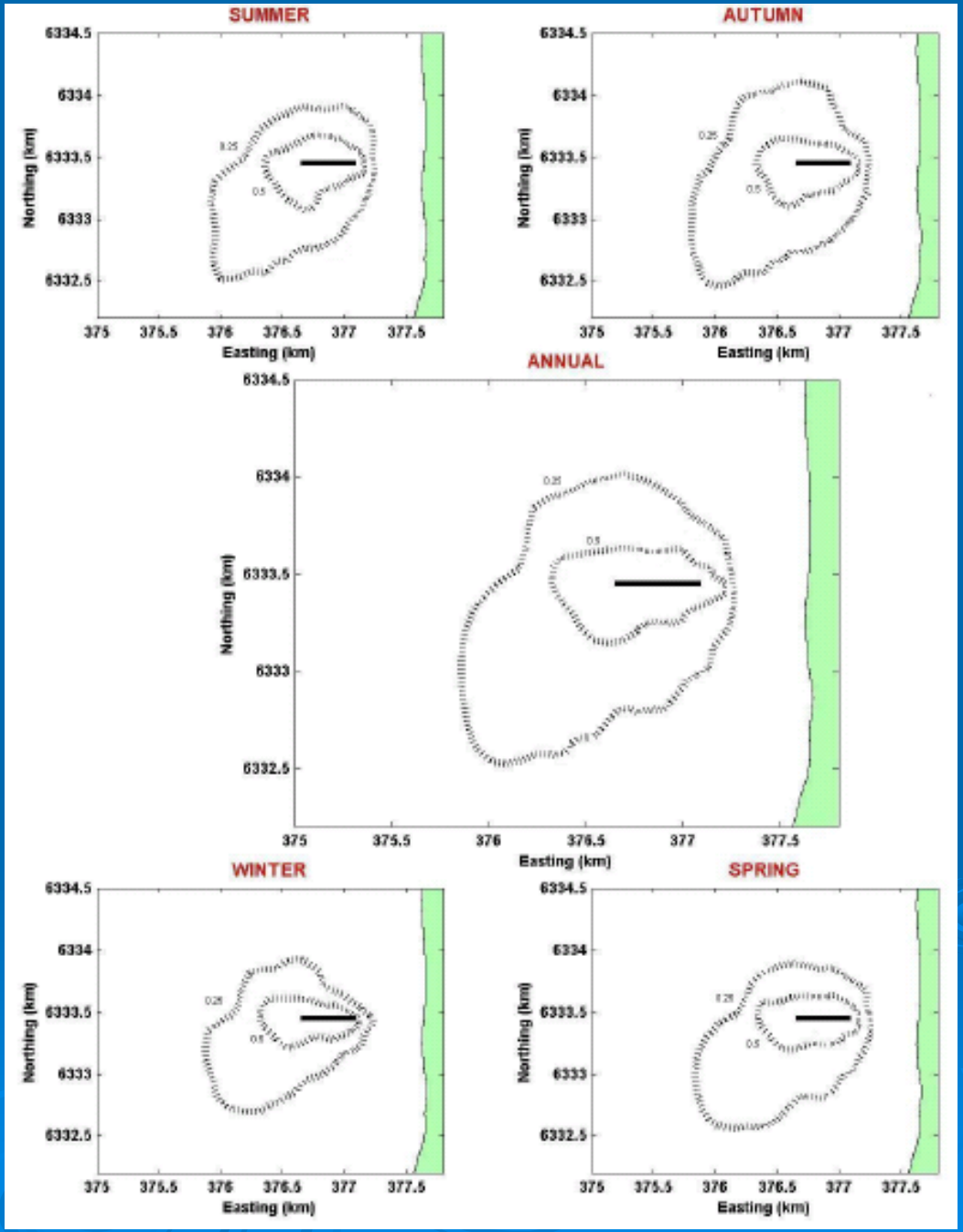


LEPA & Diffuser Design

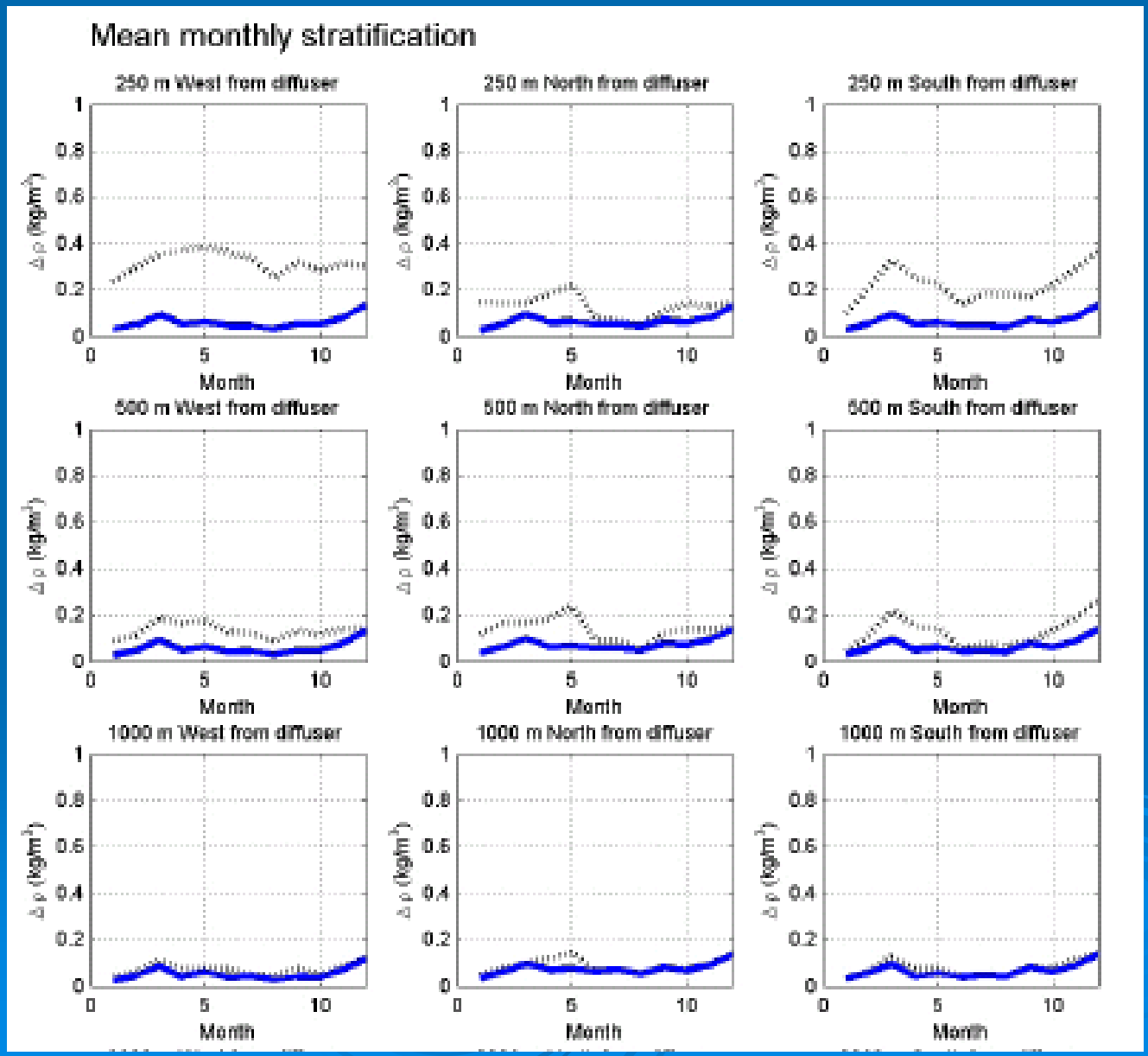


Dye Release

SSDP modeling

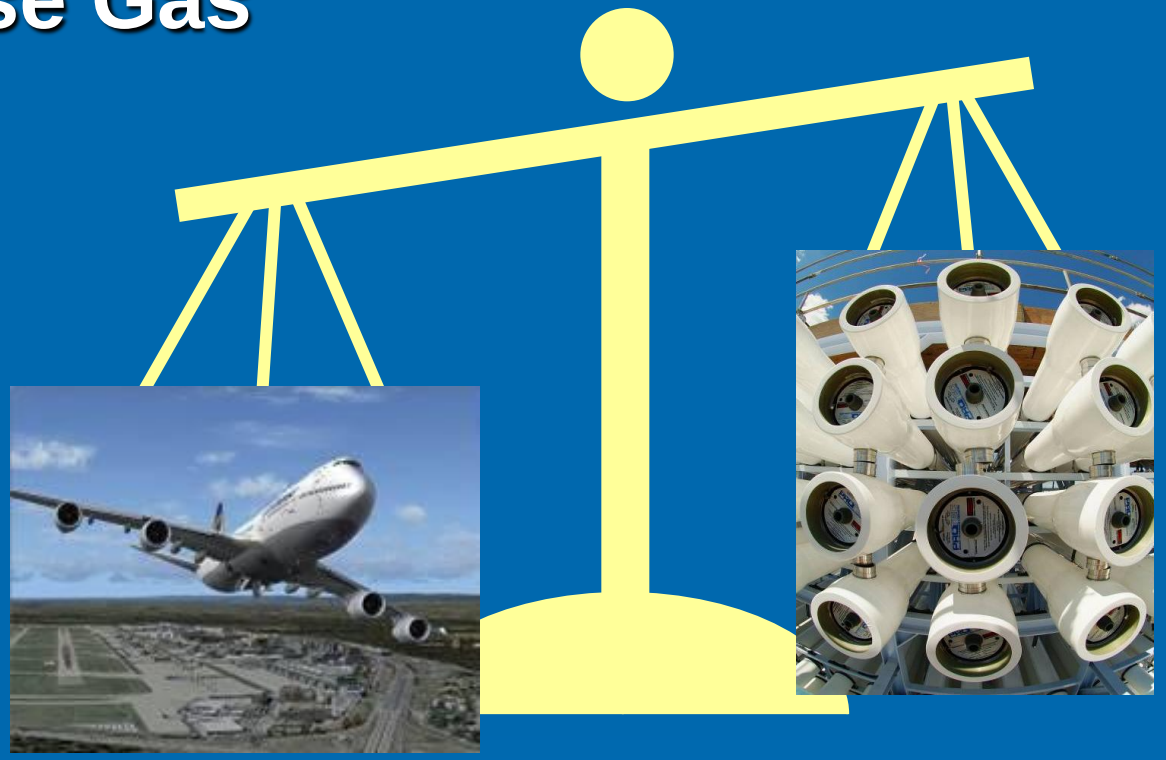


SSDP modeling



Greenhouse Gas

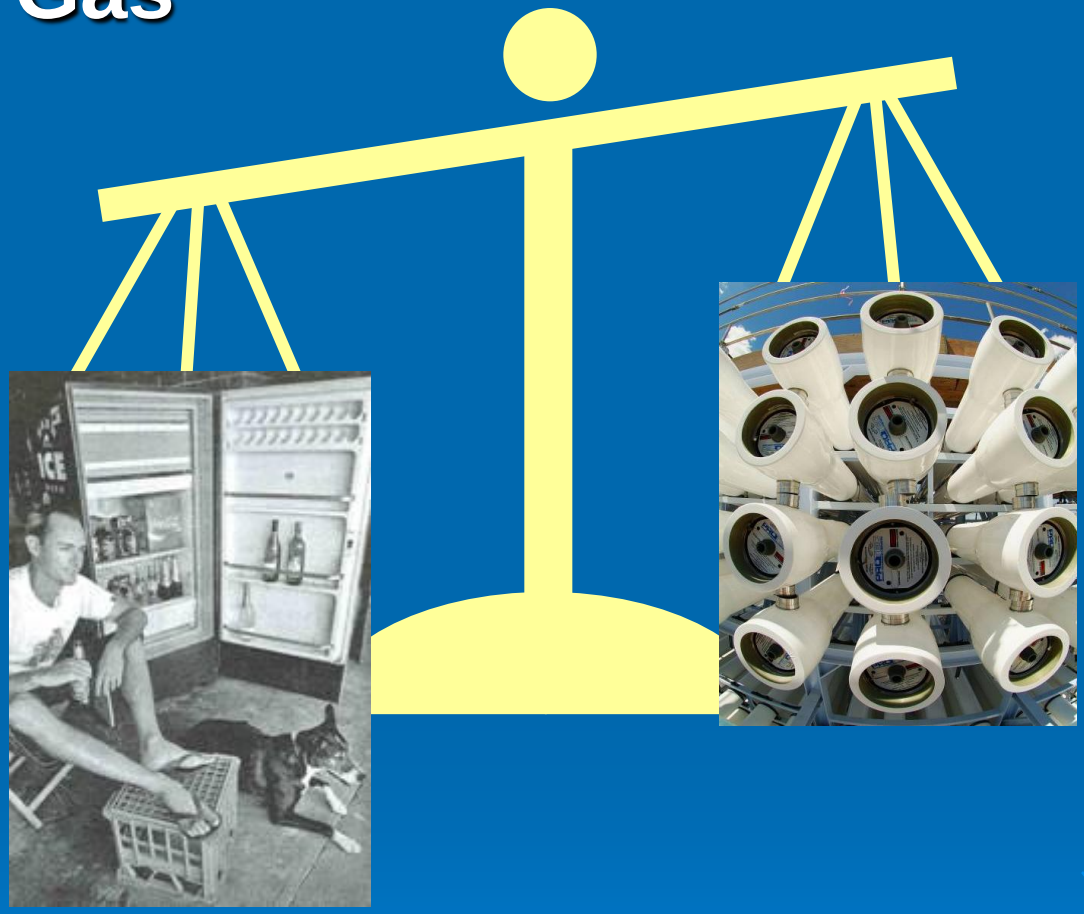
Energy Footprint



	Jumbo Jet	Desalination
Power	75 MW	24 MW
	(90,000 homes)	(30,000 homes)

Greenhouse Gas

Energy
Footprint

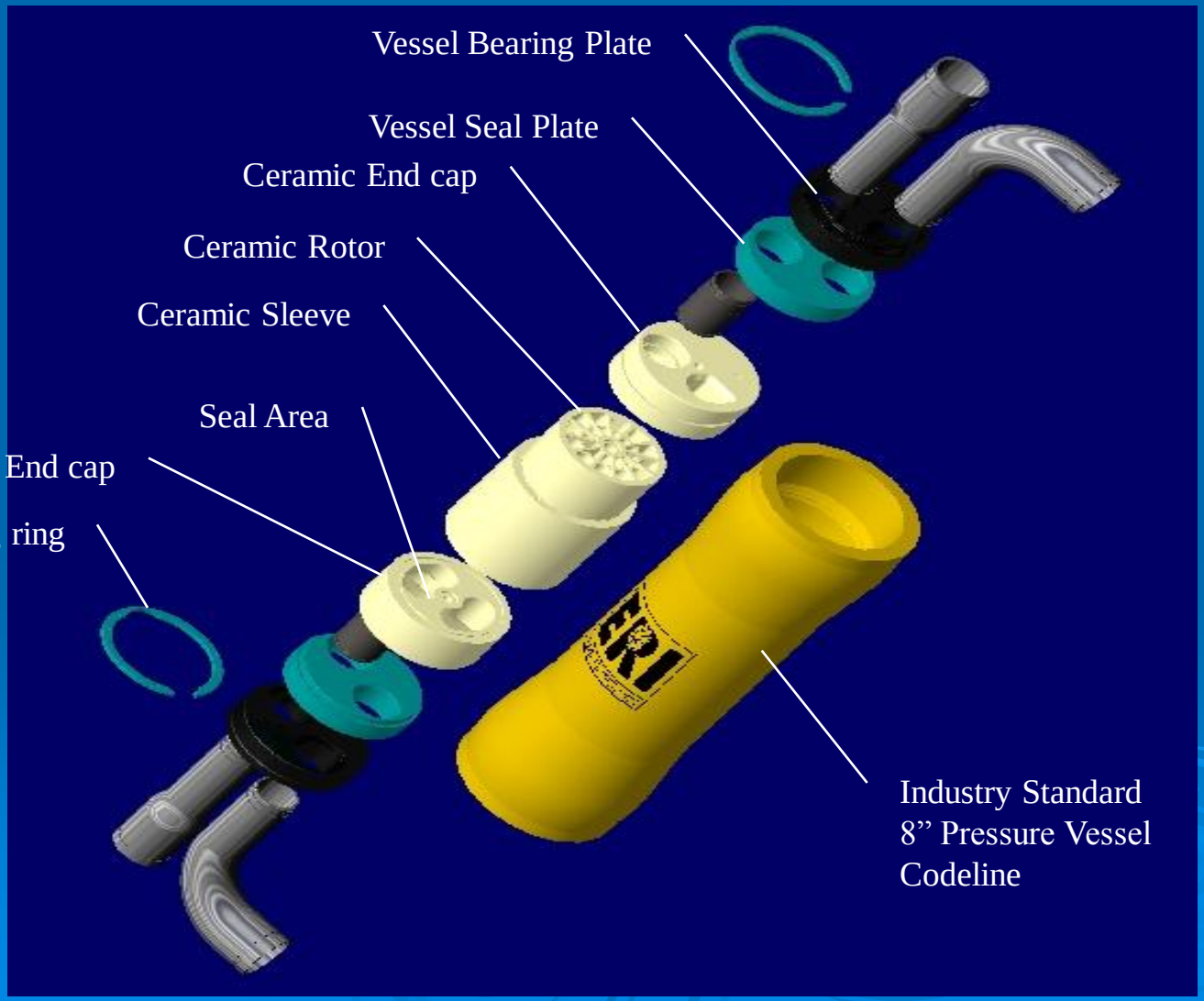


- Old Beer Fridge = Desalination water for one house
- Hot water system uses 4-6 times more energy than that needed to produce desalinated water for a household

Greenhouse Gas

Energy (MW)	Option (tonnes per annum)		
	Grid	Gas	Renewable with Credits
24	231,000	85,000	0

PX – Pressure Exchanger



Questions?