



SA Water's - Adelaide Desalination Project Sharing Our PM Journey

Milind Kumar, Project & Operations Director



South Australian Water Corporation

- We Provide clean, safe drinking water & wastewater services to almost 1.5 million South Australians.
- We have a 150-year history, an asset base of AUD \$13 billion that is critical to support growth & economic development of the State.
- We have 53 water and wastewater treatment plants, over 35,000 kilometres of water and wastewater mains.
- We have been recognised by global peers for inspirational programme of education & investment. SA Water was awarded Global Water Intelligence - Public Water Authority of the Year 2012.
- SA Water was appointed by State Government as the lead agency to oversee development & delivery of the AUD\$1.824 billion Adelaide Desalination Project & retain ownership of asset on completion.

Project Environment and Context

Drought threatens crop catastrophe, Australian prime minister says

Agencies in Canberra

The Guardian, Friday 20 April 2007

The Australian prime minister (PM), John Howard said he did not want to talk in “apocalyptic terms” about whether **towns would run out of water completely**. “The longer it goes on, the harder the impact. These are just stark facts,” he said.

Project Environment and Context

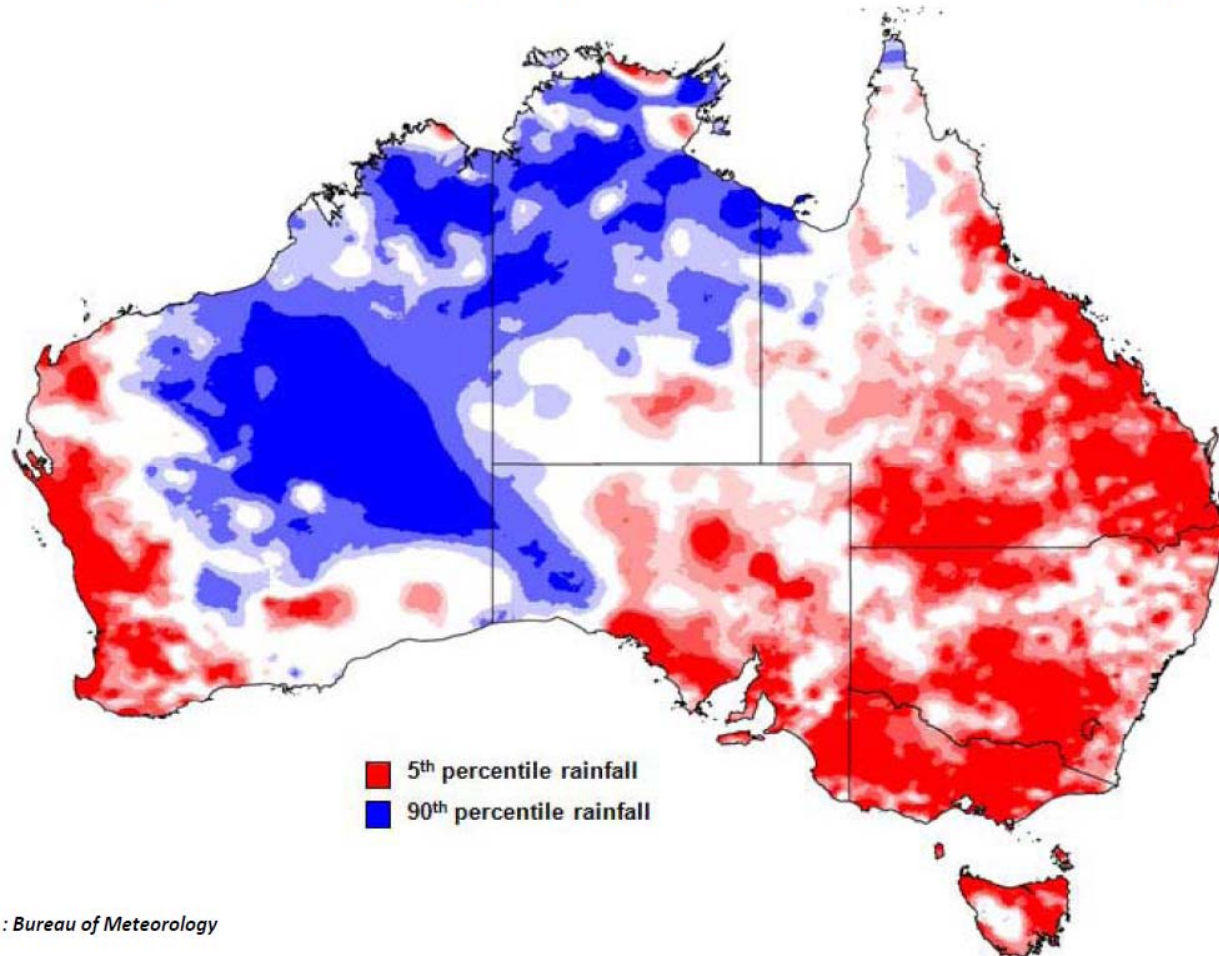
The dry spell is expected to wipe up to \$10 billion from the Australian economy in 2006-07. Australians could face big food price rises.

Australia will have to cut irrigation to prime farmland, decimating harvests, unless heavy rains break the worst drought in 100 years, the PM, John Howard

“If it doesn’t rain in sufficient volume over the next six to eight weeks, there will be no water allocation for irrigation purposes in the basin [until May 2008].”

Project Environment and Context

Rainfall percentiles indicating the spatial distribution of the 2002–07 drought



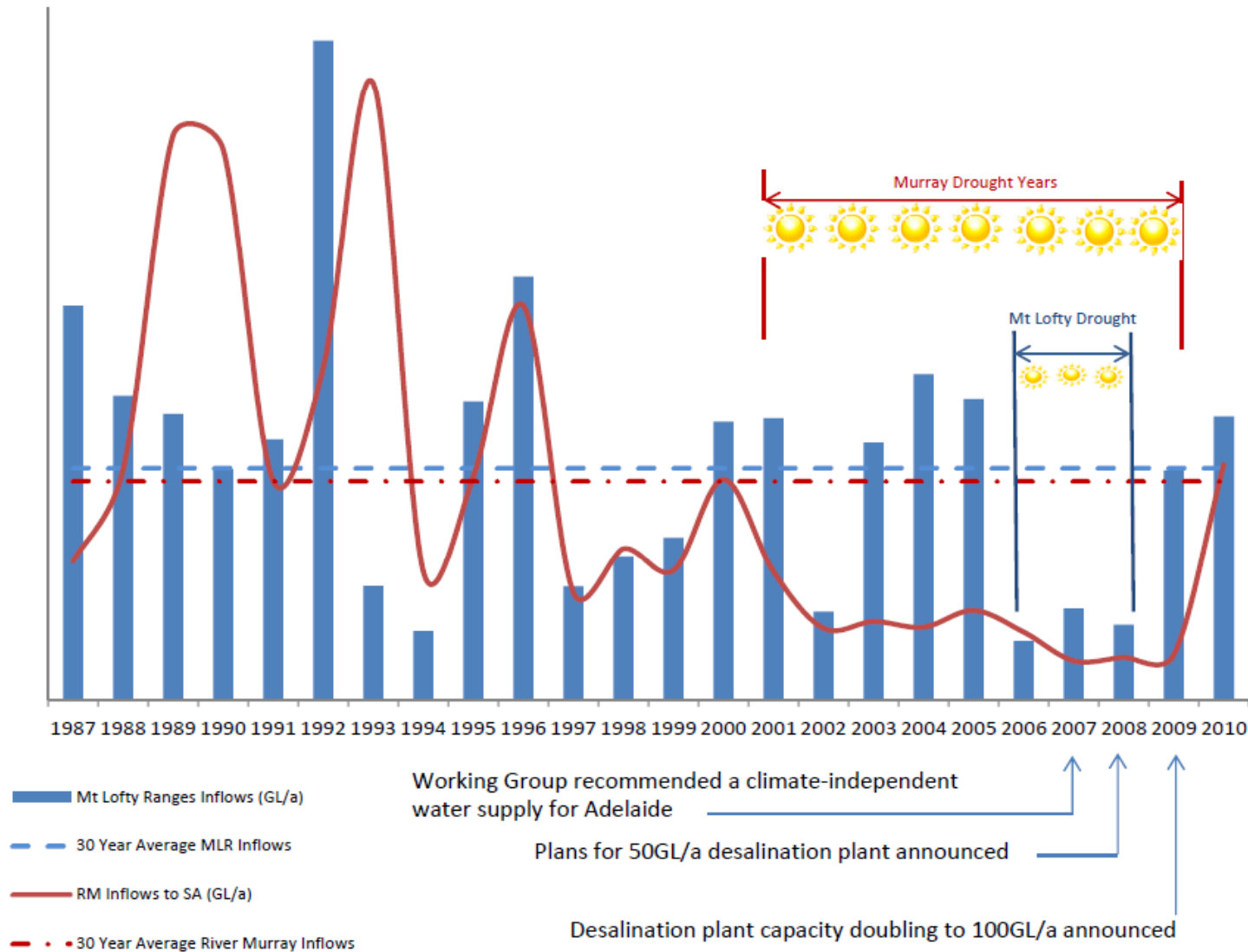
Source : Bureau of Meteorology

Project Environment and Context

- Adelaide's annual water supply demand of approx. 200 GL comes from two traditional climate dependent sources:
 - Mount Lofty Ranges catchments provides approx 60% of supply.
 - The River Murray supplements the remaining 40% but in a drought year, as much as 90% may come from this finite source.
- Adelaide's storages can only accommodate approx. 12 months supply.



Mount Bold Reservoir
part of the Mount Lofty Ranges Catchment



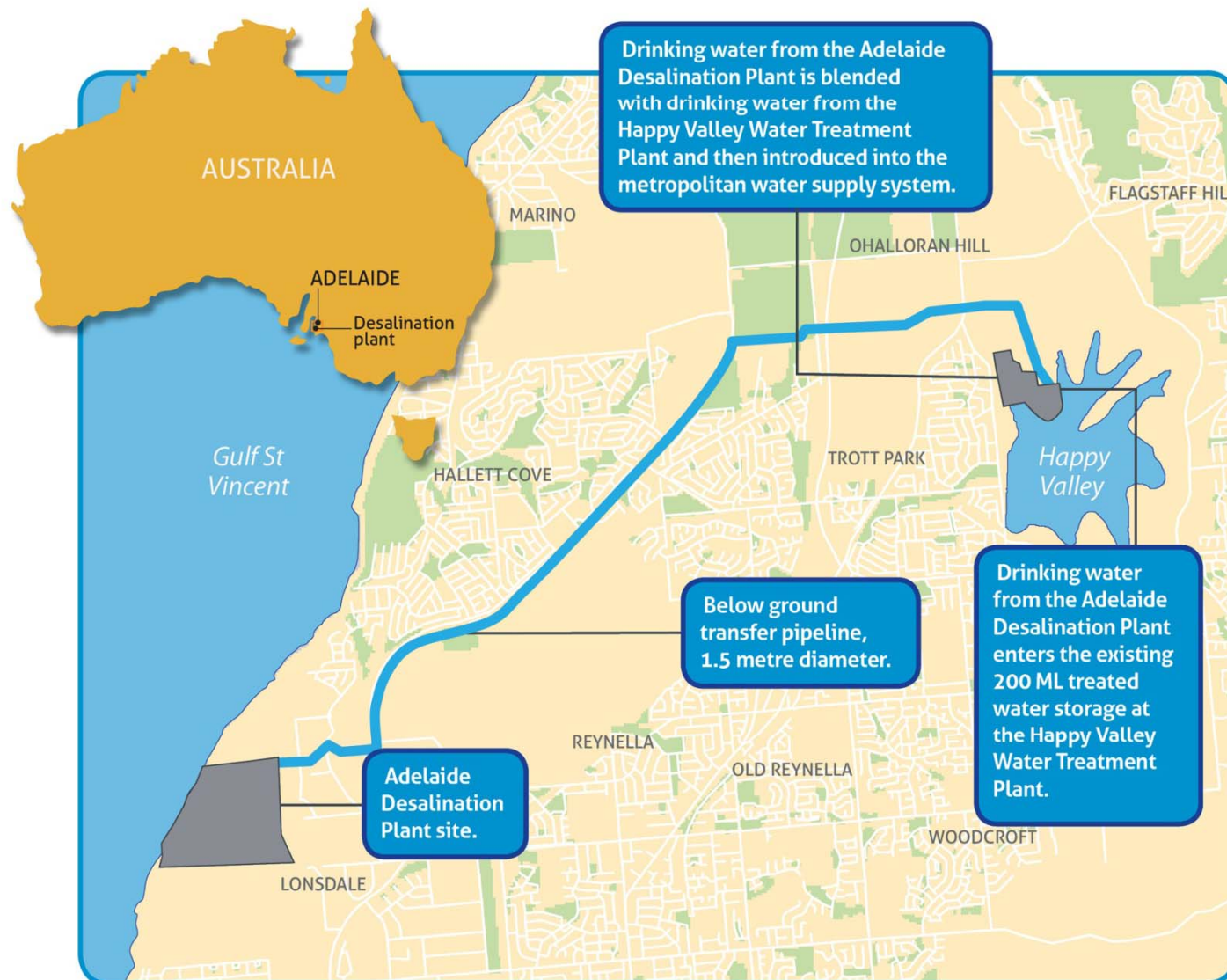
Projections show that Greater Adelaide would likely have a **supply deficit by 2013** in extreme dry year events without a 100GL/a plant (Water for Good, Figure 22, p. 50)





Government
of South Australia

 **SA Water**



Case Study – Adelaide Desalination Project

Size, Scope and Key Elements



- 100 Gigalitre/annum seawater reverse osmosis desalination plant.
- Flexible load plant capable of production at any capacity from 0% to 100% in steps of 10%.
- Renewable energy sourced in South Australia for 100% of plant's electricity needs.
- Can supply up to 50% of Adelaide's current drinking water needs from a climate independent source. Insurance policy against drought.

Case Study – Adelaide Desalination Project

Size, Scope and Key Elements

- Approved Capital Cost Estimate of \$1.824 billion and included:
 - Desalination plant and marine works – Design Build Operate and Maintain (DBOM) contract model with Independent Verifier;
 - Power supply infrastructure – DBOM contract model;
 - Transfer pumping system, pipeline & connection works – Design and Construct (D&C) contract model; and
 - Project development, land and preliminary site works – D&C.
- Operations and Maintenance (O&M) Cost approx. \$130 million per annum (based on 2015/16).

Key Project Outcomes

- Largest water infrastructure project completed in South Australia, 19 days ahead of program and within approved budget of \$1.824 billion.
- Outstanding build quality and operational performance.
- 600+ local businesses part of the construction effort.
- 10,000+ people worked at the project site.
- 18,000+ visitors and members of public visited site.

Key Project Outcomes

- It has one of the lowest capital cost per megalitre installed capacity .
- Lowest operating cost per megalitre desalinated water produced.
- Project reduces reliance on River Murray and returns 6 GL/a permanently + 120 GL over 10 years.
- No water restrictions for next 3 decades.

Project Management Principles and their Application

Project Integration

Project Integration – with whole-of-Government

- Establishment of a cross-government Steering Committee (ADPSC) comprising Chief Executives of government agencies and Independent Chair.
- Strategic guidance and advisory role; recommendation essential prior to SA Water Board and Cabinet approvals.
- Process started day 1 and provided whole-of-government input in key critical decisions.
- Alignment, support and expediency from cross government agencies through a single platform.

Project Integration - Role Clarity, Objectives and Delegations

- SA Water Appointment as Lead Agency to own, fund and deliver the project.
- SA Water's Objectives and appointment of key positions.
- Getting the financial & procurement delegations right upfront.
- Core Objectives helped to guide us when choices or trade-off had to be made during planning and execution.

Project Integration - SA Water and our Community

- SA Water's Values.
 - *Put Safety Above All Else;*
 - *Act in the Best Interest of the Customers and Community;*
 - *Seek and Apply Better Ways;*
 - *Respect our People and Be Trustworthy .*
- We are “guests” in the community.
- Created, developed and sustained team culture and values to align with SA Water values.



Adelaide Desalination Project

Maintaining the High Performing ADP Team

Maintaining the High Performing ADP Team

This document outlines the strategy to maintain the high level of performance by the ADP Team.

Four targets have been identified:

1. Sharing Project Knowledge;
2. Building Team Resilience;
3. Improving the Project experience; and
4. Sharing SA Water Knowledge.

The strategy and underlying actions include ongoing activities and new actions to address those areas requiring attention as identified by the recent 2009 SA Water Staff Perception Survey. See Appendix 1 for the ADP Team response to the 2009 Staff Perception Survey and specific actions.

Adelaide Desalination Project

Maintaining the High Performing ADP Team

Action Plan

Target 1 – Sharing Project Knowledge

This target aims to provide ADP Team members with:

- An improved understanding of the overall project outcomes, stakeholder expectations, sub-projects within the ADP and how everyone fits into it;
- Lessons learned and importance of capturing 'lessons learnt' progressively;
- Status and performance of the project; and
- An appreciation of complex challenges, important target dates and the detail behind the target dates.

Strategy	Description	Availability	Action Owner	Date to be implemented
ADP Team Building	Structured program of Team Building workshops, including One Team (ADP Team as a whole) and Our Team (Individual Team) sessions.	Periodically until August 2010	PCR Team with assistance from Human Resources	In Progress
Lunchtime Knowledge Sharing Seminars	Regular themed presentations based on upcoming milestones, Water for good Program status, SA Water projects	Fortnightly	PCR Team	February 2010
Face-to-Face Induction Sessions	Project overview, important things to know including safety and probity requirements, short presentation from each team about the team's function and interdependencies	Fortnightly or as required	PCR Team, with assistance from Human Resources and Leadership Team	March 2010

Project Scope Management

Desalination Working Group

- South Australian Government set-up the Desalination Working Group (DWG) with an independent Chair.
- This group considered all possible options for the State's water resources and water security.
- Recommended a 50 GL/a desalination plant with capability to double this to 100 GL/a - in the near-future.
- Government adopted DWG recommendation as part of the Water Security Program of initiatives in December 2007.
- DWG Submission underpins a very compelling business case (that embedded long-term modelling).

Processes to Identify and Manage Scope

- Formal gap analysis (with a range of stakeholders)
- Identification of core scope and project packaging strategy (sub-projects).
- Linkage of sub-projects to overall project objectives, outcomes and benefits.
- Verification of project scope through peer reviews, engagement with market and key stakeholders.
- Baseline scope approved by Steering Committee, SA Water Board and by Cabinet. Resources assigned to deliver scope.

Project Time Management

Key Actions

- Project timeline was key project objective which supported early actions for planning & procurement processes.
- Good definition of key activities. Scheduling to maximise resource efficiency and continued project progress.
- Regular review, control and management of program.
- Specialist program advisers provided independent view.
- Project Handover for Operations was achieved 19 days ahead of original approved time

Early Investment in Planning

- Onerous Major Development Approval pathway.
- Significant consultation on economic, social and environmental issues and early identification key issues.
- Environmental Impact Statement (EIS) - “outcome focussed” performance criteria and future expansion consideration.



Below sea tunnelling activities supported by the Santa Fe Jack Up barge situated at Gulf St. Vincent.

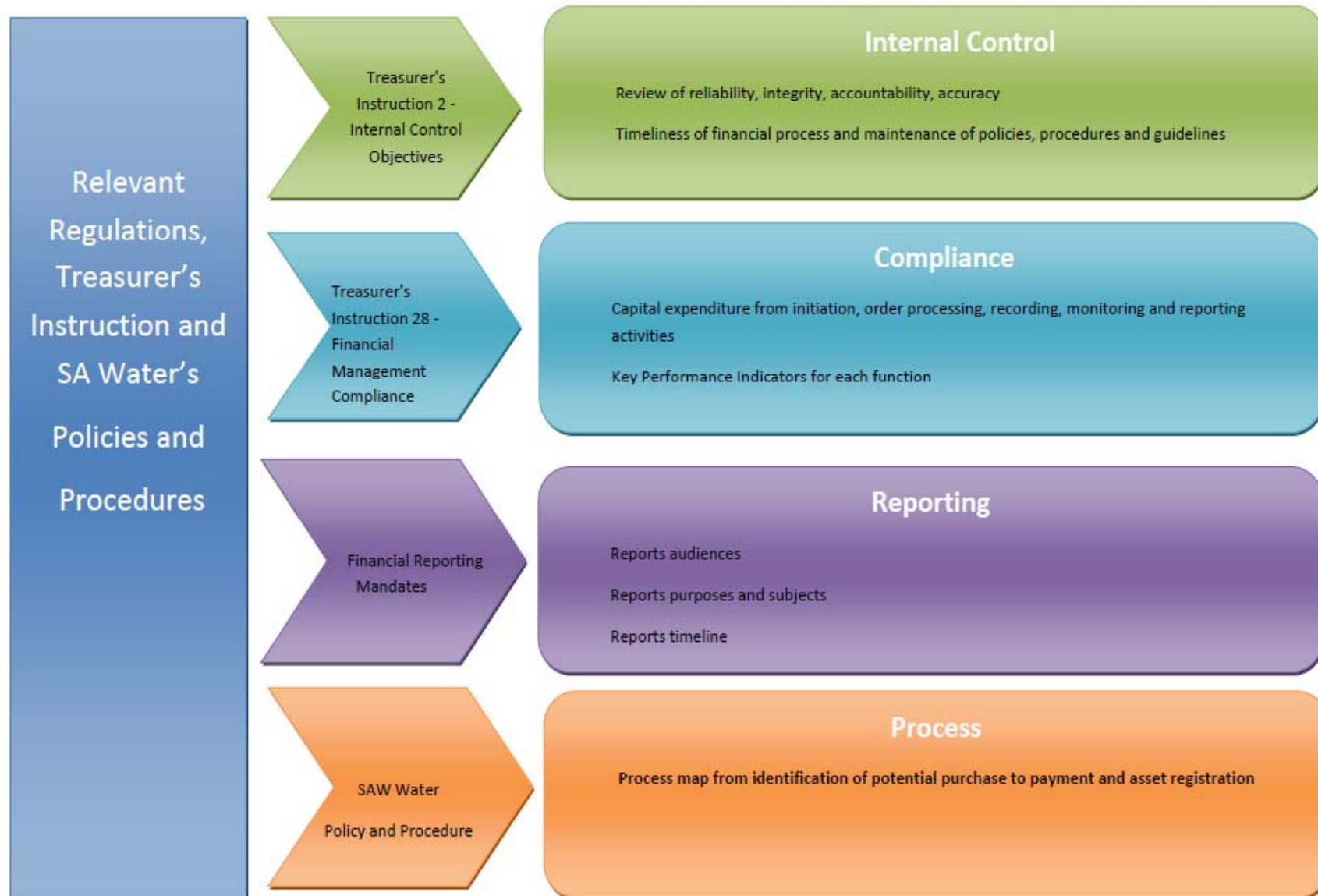
Project Cost Management

Project Cost Baseline

- Work breakdown structure within the individual sub-projects, construction challenges and risks.
- Estimates from first principles and then verified against other similar project benchmark costs.
- Independent reviews and Monte Carlo simulation to determine and quantify the risks costs.
- Assumptions, terminal points and exclusions identified to better-manage changes at interfaces.

Project Cost Review & Approval

- Project budget approved by Public Works Committee.
- Ownership of the elements of the project budget were assigned to key personnel and were reviewed monthly against the baseline budget.
- Regular review and compliance against Financial Management Framework (TI and SA Water Policies).
- Independent audits were also undertaken.
- Project delivered within the original approved budget of \$1.824 billion.



Internal Control Environment is a mechanism that will assist the Project Director and Senior Commercial Manager to maintain control over various aspects of Financial Management using documentation, development and implementation policies, procedures, systems and internal controls to maintain financial management accountability.

Financial Management activities to be considered within these areas include (but not limited to):

[illegible]

Project Stakeholders and Communications Management

Stakeholder and Communications Plan

- Stakeholders and their interest, involvement and impact on the project identified and documented in the Project Communications Plan.
- Project progress and other aspects regularly made available to stakeholders.
- Stakeholder Liaison Group

established to proactively enhance community input and involvement.



Stakeholder and Communication - Learnings

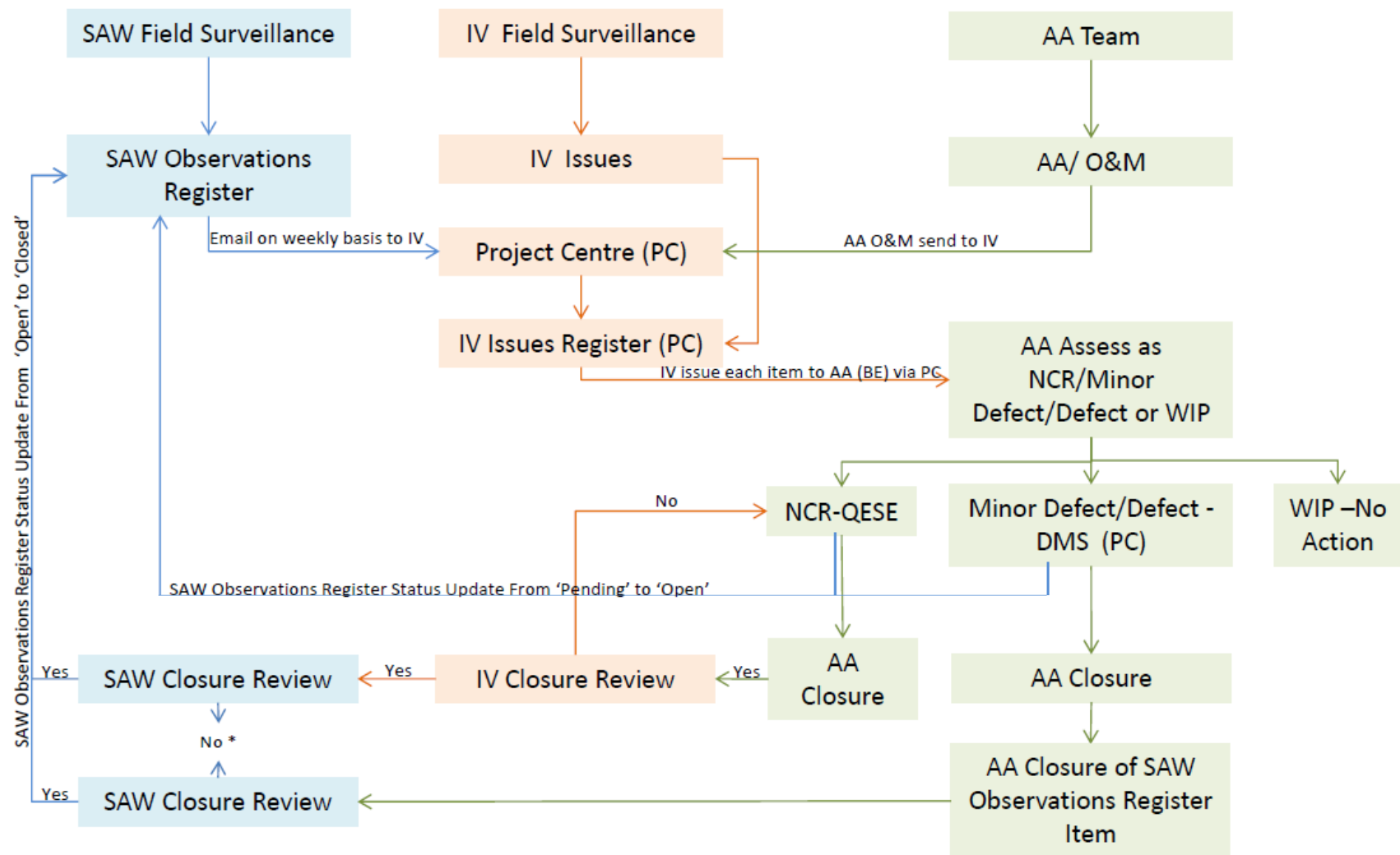
- Seek higher delegations for more open media strategy.
 - Enhance social media and web technology to communicate key challenges (rather than only milestones or good news).
 - Identify and create wider stakeholder support base, especially where projects have large social impacts.
 - Undertake stakeholder prioritisation matrix to adjust to different stakeholder needs over the project lifecycle.
- Create an atmosphere so people could ask the most telling questions and there are no information gaps.

Project Quality Management

Project Quality Plan

- Key requirements and standards established and how those would be achieved and verified e.g. Inspection Test Plans.
- Records transparently available through a document control software system (ProjectCentre).
- Corrective actions monitored, managed and controlled with specific delegations to sign-off quality records.
- Independent verification process/reviews for high risk and latent issue.

ADP Quality System Process Flow Chart



Project Quality – Key Initiatives

- Visits to existing large seawater desalination plants. Knowledge gathered on key quality and durability successes and issues.
- Active market sounding and meetings with large number of national and international industry participants.
- Bidder workshops and discussions to test behaviours of project parties and foster relationships.
- Plant Operators and the market (bidders) provided significant input which improved quality - at lowest cost.

Project Risk Management

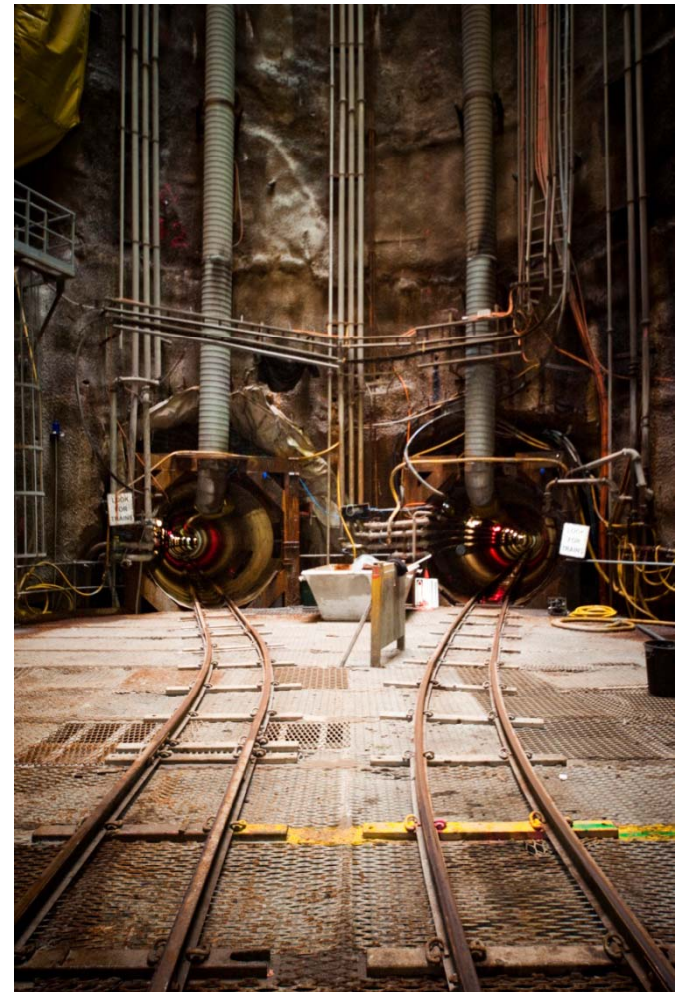
Engage with Risks

- All stakeholders and all risks were considered.
- Underlying assumptions behind the risks understood well and re-test of key assumptions undertaken e.g. seawater quality variability.
- Key risks mitigation strategies regularly followed-up.
- Prompt action initiated when trends indicated a shift from expectations.
- Risk was a 'hidden opportunity' (in most areas where we engaged with the risk early).

Project Procurement Management

Procurement Plan and Key Actions

- Market engagement process aimed to achieve a fair and competitive outcome – at lowest whole-of-life cost.
- Contract management frameworks established to achieve contractor performance, good relationship and best for project outcomes.



Tunnel portals for intake and outfall structures.

Procurement Plan and Key Actions

- Strategic packaging of work elements (e.g. transfer pipeline system and power supply infrastructure) to meet a challenging timeframe.
- O&M Operator's involvement in the project from Day 1 contributed to achieving a durable and operable plant.



Transfer Pump Station conveying desalinated water to Happy Valley for integration into the water distribution network.

Procurement Plan and Key Actions

- Invested in bidders (Early Contractor Involvement Process) to undertake more detailed designs and management plans upfront compared to traditional bidding process.
- Framework for resolving significant commercial and technical issues developed.



Energy recovery turbines in the outfall - generates 2.5%-3% of Plant's energy requirements at full production.

Procurement Plan and Key Actions

- Simplified contractor design review process. Allowed early commitment of long lead items.
- Visibility and tracking of contractor's manufacturing progress provided early input and identified air-freighting of high priority items.



Tunnel Boring Machines named 'Cora the Bora' and 'Nessie' by local school children.

Project Human Resources Management

Project Resource Plan

- Our Plan identified the resourcing strategy, key roles, responsibilities and required skills and clarified reporting relationships and involvement by senior managers from within SA Water.
- PM and engineering panel service providers integrated within the team - regular team building sessions
- Team changes managed carefully to enhance a cohesive and high performing team as project progressed through various phases.

Human Resources – teamwork

- Secured the best people and identified top talent.
- Created opportunities to develop, grow, motivate and inspire team members.
- Learning together – knowledge sharing was fun and created performance driven teams that found opportunities to celebrate and reflect regularly – together.
- Assigned best people on activities that were critical and created processes to support them.



Key Success Factors (from PM standpoint)

Investment in planning & development

- *The Desalination Working Group (DWG)* - strong 'baseline'.
- *Environmental Impact Statement (EIS)* – performance outcomes developed with the community.
- ***Good market sounding.*** Enhanced understanding of the risks and opportunities related to packaging, market appetite to deliver the project and accept risks.
- *Independent Procurement Review.* Delivery timeframes, whole of life costs and optimum risk transfer.

Innovative Governance Structure and Effective Decision Support

- Establishment of a cross-government **Project Steering Committee (ADPSC)** comprising Chief Executives of government agencies and Independent Chair.
 - Strategic guidance and advisory role; recommendation essential prior to SA Water Board and Cabinet approvals.
 - Process started day 1 and provided whole-of-government input in key critical decisions.
 - Alignment and support from cross government agencies through a single platform.

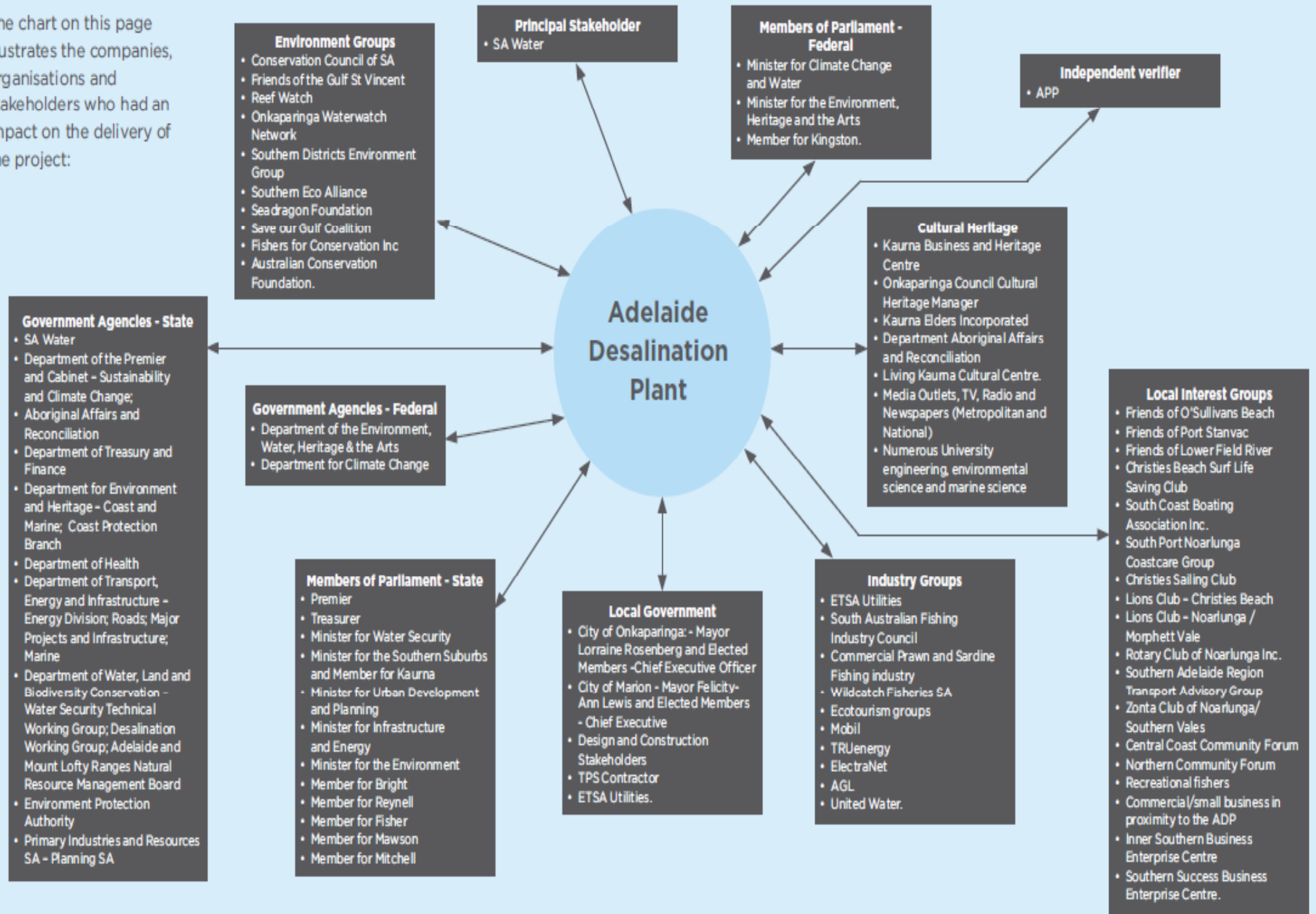
Governance Structure and Effective Decision Support

- **Project Control Group (PCG)** comprising of senior representatives from SA Water and the project partners was established from contract award.
 - Agreed rules of engagement empowering the PCG to test, challenge and resolve issues progressively achieving accountability, transparency, collaboration and resolution.
- **Project Leadership Team.** Role models to communicate clear project vision, develop project culture and high performance teams, share knowledge and grow capability .

Relationships with key stakeholders

- Made a priority throughout the project lifecycle.
- Stakeholder and Communication plans were developed, rigorously implemented and maintained.
- Clear and consistent messages at all times within, across and between all project partners, allowing issues to be addressed and resolved quickly.

The chart on this page illustrates the companies, organisations and stakeholders who had an impact on the delivery of the project:



Heightened Project Controls

- ***Investment in project controls.*** SA Water established cost and schedule control team to carefully track all elements of the project.
- *Good Risk Management* with a dedicated risk manager ensured rigorous and regular attention to risk processes. Robust strategies ensured risks were properly managed and controlled.

Leadership

- A clear project vision ensured everyone worked towards the same goals, objectives and standards.
- Stable and experienced leadership team was key.
- Leaders set the scene (not only for full engagement but also collaboration and solutions approach).
- Leaders cared and believed in the mission, they were fair and expected excellence in everything.
- People from different backgrounds, experiences and cultures – brought diversity to the team.

Collaboration

- Promoted a culture of collaboration, communication, timely decision-making from day 1.
- Communication with the suppliers and manufacturers.
- **Deployment of specialist staff and engineers to manufacturer workshops nationally and overseas.**
- **Products pre-assembled to agreed specifications contributed to efficient construction.**
- Best for project mindset.

Innovation

- Innovation was fostered through good design principles and a robust 'performance' specifications.
- Total risk avoidance is an impediment to innovation and risk sharing was achieved through a good understanding of risk.
- **Innovation has resulted in significant savings in energy, operating cost and improve plant durability.**

Project Capital Efficiency Benchmark

Project name	Installed Daily Capacity	Installed Annual Capacity	Cost in dollars (millions)	Capital Efficiency \$'millions / GL installed capacity
	MLD	GL	AUD millions	
Victorian Desalination Project	435	146	5,500	\$37.74
Gold Coast Desalination Project	125	42	1,200	\$28.66
Sydney Desalination Project	250	84	1,900	\$22.69
Southern Seawater Desalination Project (Perth 2)	140	47	955	\$20.36
Adelaide Desalination Project	300	101	1,824	\$18.15

Project Operational Efficiency Benchmark (with Renewable Energy)

Project name	Installed Daily Capacity	Installed Annual Capacity	Operating Cost per annum	Operating Efficiency \$'millions / GL installed capacity
	MLD	GL	AUD millions	
Victorian Desalination Project	435	146	600*	\$4.11*
Sydney Desalination Project	250	84	258	\$3.07
Adelaide Desalination Project	300	101	129.9	\$1.29

* Includes some elements of financing cost.

Project Milestones

- **28 February 2008**, First public announcement of 50 GL/a Plant with construction completion by June 2012.
- **16 February 2009**, SA Water secured land, secured major development approval and awarded all major contracts.
- **28 June 2009**, SA Water awarded contracts for 100 GL/a expansion works.
- **28 March 2012**, First 50 GL/a plant reached full capacity operation (following First Water in October 2011).
- **30 June 2012**, Second 50 GL/a plant construction completed.
- **12 December 2012**, Project Handover for Operation of the full 100 GL/a plant to the O&M Operator (19 days ahead).

Project Pictures

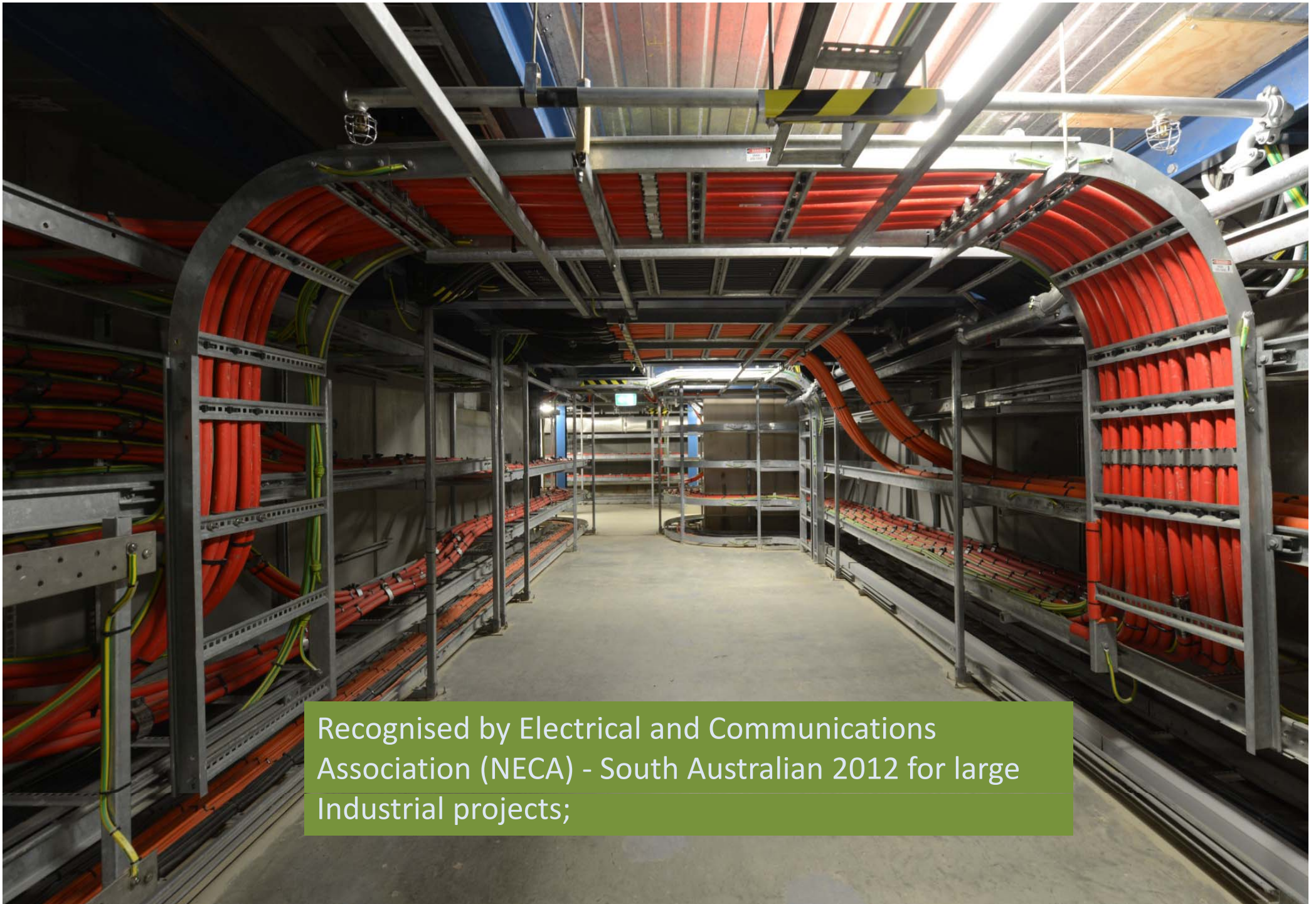




Clean plant layout promotes easy access to all items of plant for ease of operation and maintenance.

World's largest ultra-filtration pre-treatment system provides improved and consistent 'pre-treated' water quality, improves RO membrane life and reduces operating cost.





Recognised by Electrical and Communications Association (NECA) - South Australian 2012 for large Industrial projects;



Recognised by Electrical and Communications Association (NECA) for **National Excellence Award** 2012 for large Industrial projects;

Recognised at the Global Water Summit 2013, Seville (Spain) by a Distinction Award - in the category of Desalination Plant of the Year 2013.





Recognised by Project Management Institute (PMI) – Australian Project of the Year 2013 for superior performance through application of outstanding project management principles.



Awarded Australian Water Association (SA Branch)
Infrastructure Innovation Award 2012.

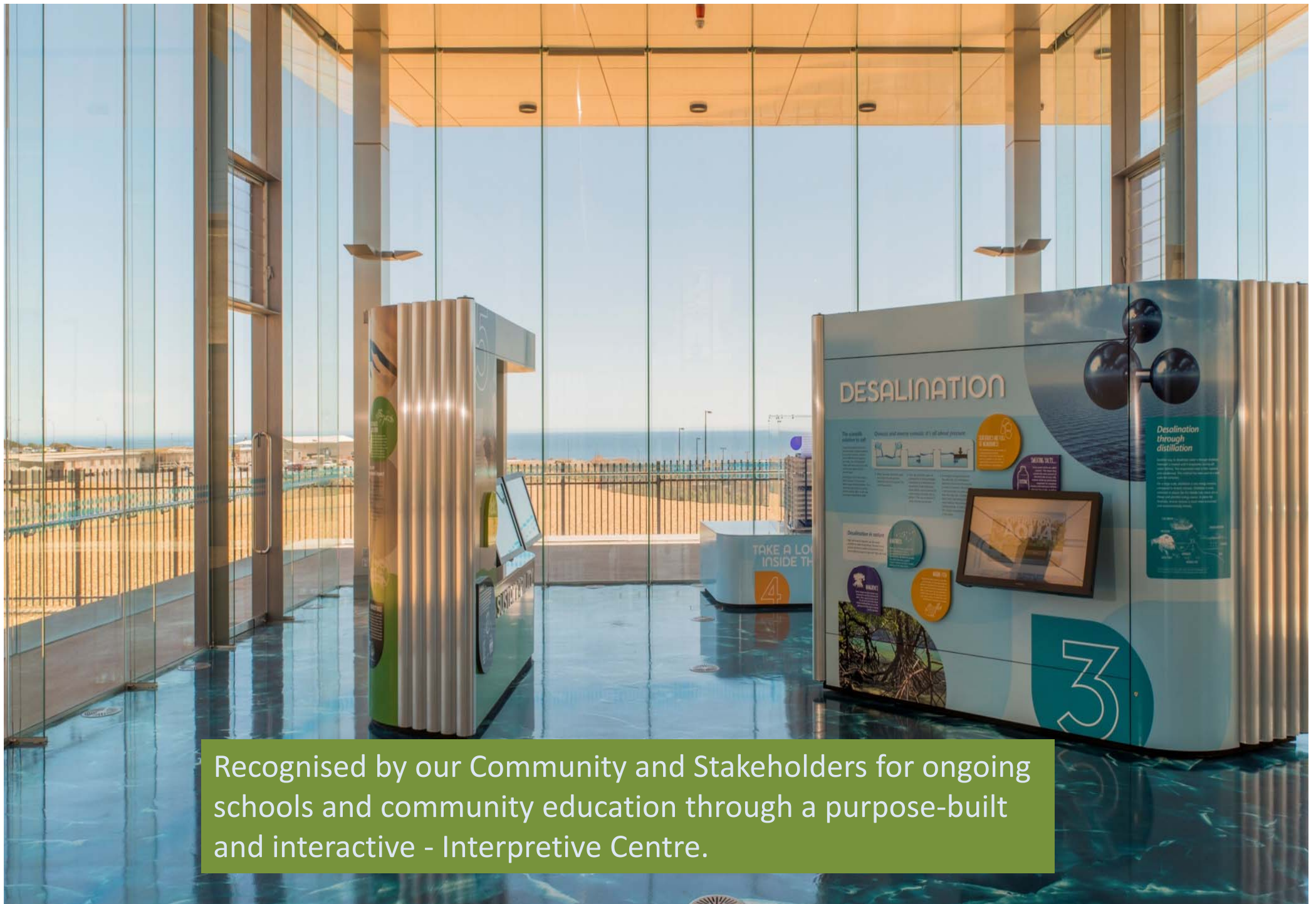
Civil Contractors Federation (SA Chapter) Excellence
Award 2012 – recognition for Civil Construction,
Environment and Project Management.



A photograph of the Kauwi Interpretive Centre building. The building features a large, angular, copper-clad roof that extends over a glass-enclosed entrance. The lower portion of the building is constructed from light-colored concrete blocks. The name "KAUWI" is mounted in large, dark, textured letters, and "interpretive centre" is mounted in smaller, dark, sans-serif letters. The sky is clear blue, and some low-lying vegetation is visible in the foreground.

Recognised by
Master Builders
Association for
Excellence 2012

KAUWI interpretive centre



Recognised by our Community and Stakeholders for ongoing schools and community education through a purpose-built and interactive - Interpretive Centre.



