MULTIPLEX

PERTH SEAWATER DESALINATION PROJECT – KWINANA, WA

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ABSTRACT

Awarded as the Worlds Best Desalination Plant commissioned in 2006 and the 2007 Desalination Plant of the Year the Perth Seawater Desalination Plant is a landmark project and a first of its kind within Australia.

The $300M plant which was built on time and on budget, is one of the largest seawater desalination plants ever to be constructed outside the Middle East, is capable of producing at peak capacity 144mgl/day (or 45 giga litres per year) of fresh drinking water, making the plant the largest single water source feeding into Perth's Integrated Water Supply. More importantly the decision to build the plant has supplied Western Australia with its first major climate independent water source, paving the pathway forward for water security through diversity to the people of Western Australia.

KEY WORDS

Western Australia, Kwinana, Perth, Multiplex, Construction, Seawater, Desalination, Reverse Osmosis, Energy Recovery, GRP.

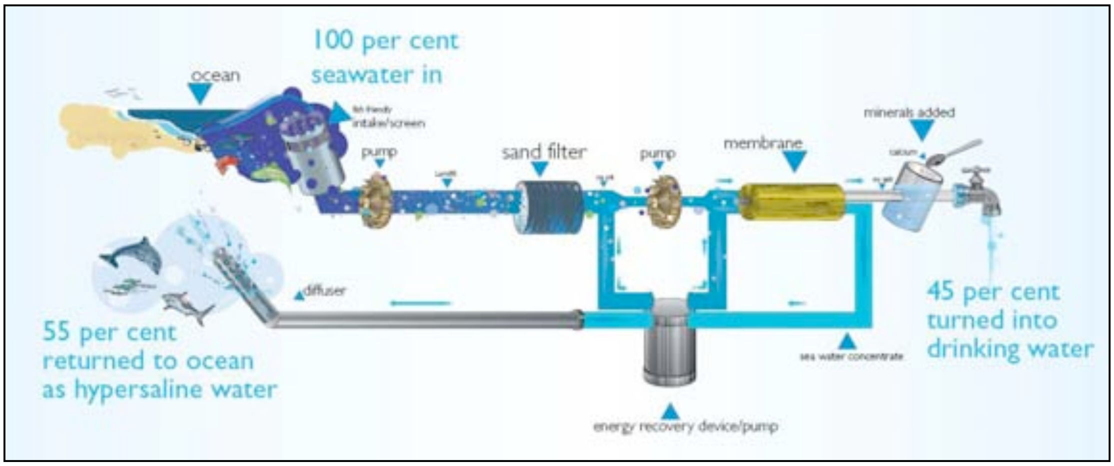

Figure 1: Schematic of the seawater desalination process

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INTRODUCTION

In 2004, the Western Australian State Government committed to the building of Australia's first large-scale desalination facility – the Perth Seawater Desalination Plant (PSDP) to provide Western Australia with its first major climate independent water source. This commitment was considered a landmark decision within the Australian Water Industry as due to the impacts of climate change to Western Australia and more importantly, rainfall levels the Water Corporation (WC) determined that traditional water sources such as dams and groundwater were no longer reliable and security through diversity was the pathway forward into the future.

The $300M plant is one of the largest seawater desalination plants outside the Middle East and is capable at peak water production capacity of producing 144mgl/day (45 giga litres per annum) of fresh drinking water which is the equivalent of filling one Olympic sized swimming pool every two hours. More importantly, the PSDP is the largest single water source feeding into Perth's Integrated Water Supply (IWS) Scheme and provides 17 per cent of Perth's current water requirements at a cost to each house hold of $43.00 per annum (less than $1.00 per week).

The design, procurement, construction, commissioning and project management of the PSDP was awarded by the Water Corporation in April 2005 and was undertaken under the auspice of an alliance based contract between WC, and the unincorporated joint venture of Multiplex Engineering and Degremont SA, collectively known as the proAlliance.

Seawater desalination requires the use of state of the art technology, a high proportion of exotic materials and innovative fabrication and construction techniques to counter the corrosive nature of seawater. Desalination also differs from conventional water treatments due to the basic requirement to extract salt from large volumes of pristine seawater and then returning the resultant hypo-saline concentrate solution back to the ocean. The process involved the construction of a significant onshore processing plant on a small 6.5 hectare footprint, offshore intake receiving structure, installation of a 48 port diffuser and associated large diameter intake and outfall pipeline; all of this together with the shore crossing of a popular public beach created an extremely challenging task for the entire proAlliance team. This task was further complicated by the Water Corporation's commitment to have desalinated water entering Perth's IWS Scheme by November 2006 – only 18 months following Project award in April 2005.

This technical report will specifically focus on the major challenges encountered by proAlliance and the means by which they were overcome through both new and innovative construction methods, together with existing best practices to create what is internationally recognized as a benchmark project based on several world firsts and a model for all future global desalination infrastructure.

Figure 2: Perth Seawater Desalination Site – March 2007

SECTION 1.0: MAJOR PROJECT CHALLANGES

INTRODUCTION

The construction of the PSDP presented many challenges to the proAlliance team from all perspectives of the contract scope (i.e. design, procurement and installation). These challenges were met head on by the team and solved with the philosophy of 'Best for Project' in mind. The major challenges presented to the team are detailed below.

1.1 TIME

Time was the greatest challenge faced by the proAlliance upon award of the PSDP, with the team committing to an 18 month deadline to have first water entering Perth's IWS Scheme by November 2006. In order to achieve the deadline, it was necessary to run the design, procurement and construction processes in parallel paths. A structured approach was developed to achieve this goal with the key to the proAlliance success being through a genuine team effort with good communication and commitment from each of the personnel in the 3 areas of design, procurement and construction.

1.1.1 DESIGN

The engineering design and procurement was co-ordinated from the Perth project office with a considerable amount of work for the reverse osmosis process undertaken by Degremont's office in Bilbao, Spain. In order to ensure that all parties were appropriately aligned and with a clear understanding of common goals the following procedures were implemented:

- Common access to the latest drawings and specifications via an Intranet site
- Regular video conferences / workshops were undertaken; and
- Regular exchange visits between the global engineering offices by key personnel.

Stringent application of these procedures, coupled with the 7 hour time zone difference between Bilbao and Perth essentially facilitated continuous 24hr design of the plant with critical information being sent at the close of business from one office to the next to enable design to rapidly move forward. In addition to 24 hour design, the following initiatives were used by the proAlliance to achieve beneficial outcomes for the project and ultimately improve the design schedule:

- Breakthrough thinking to deliver process efficiencies and other benefits to the project
- Use of proven treatment processes with a robust design wherever possible
- Use of power computer software for design validation
- Risk and Hazard workshops to critically examine the project and its critical components
- Integration of construction, maintenance and operator personnel in regular design reviews
- Modification of the standard internal WC design review process to accommodate the project timetable. The result was a quick consensus on decisions before designs were finalized.

1.1.2 PROCUREMENT

An innovative procurement strategy was essential in ensuring the project schedules and milestones were met with the key to its success being a strict adherence to the project program. In order to ensure that this in fact did occur, the following initiatives were adopted:

- PSDP leveraged from global supply agreements put into place by the individual members of the proAlliance for both goods and services
- Centralizing overseas logistics whereby all goods orders were received into a centralized loading centre in Europe where they were consolidated in order of construction priority and either crated or packed into seatainers for freight forwarding.
- Splitting up critical path items of plant and equipment to obtain supply from a number of difficult locations. In this way failure to deliver from one location would not have a catastrophic effect on the overall schedule.

Utilizing the above initiatives enabled the proAlliance to successfully procure all plant and equipment on time to meet the extremely tight project schedule.

1.1.3 CONSTRUCTION

Meeting the Construction deadline of 18 months to have the PSDP producing first water in November 2006 was the most challenging task presented to the proAlliance. As a result of this, fast tracked construction methodologies and principles combined with innovative processes (some of which are detailed in section 2.0) were necessary. The key construction methodologies implemented by the proAlliance are as follows:

- 3D modeling was not only used to fast track design but also to assist with expediting construction. In particular, below ground services and structural steelwork was detailed in 3D allowing the construction team to identify clashes and interface issues considerably reducing downtime in these areas.
- Offsite construction was utilized wherever possible to minimize site works and ensure adherence to schedule. Often this involved fabricating oversized type items of plant, equipment or structures and transporting them to site with special road permits.
- Pre-cast construction was maximized wherever possible to maximize productivity. All wall panels throughout the site and the deep trench pipe channels within the RO building were precast, enabling the construction of these elements to occur on the projects critical path.
- A high degree of interface planning enabled mechanical and structural works to proceed safely in buildings that occupied a large footprint. The ability to construct the PSDP on rolling work fronts was one of the major keys to the proAlliances ability to construct the plant on time.

Figure 3: Pre-fabricated RO rack delivered to site.

1.2 BRINE DISCHARGE

As part of the brief from the Water Corporation it was necessary for the proAlliance to achieve a non negotiable salinity difference of less that 800mg/L from the background seawater condition within 50 metres of the brine outfall. This was a major challenge to the success of the plant and furthermore a significant departure from the brine discharge methods employed in other desalination plants throughout the world.

As a result of this innovative thinking, verification was required in order to meet the requirements of the WC brief. Various arrangements and sizes of diffusers in the seabed were investigated using state of the art computer modeling techniques with the preferred arrangement being a 40 sub-sea diffuser system located at 4m centers. This system was simulated in a test tank at scaled down flows by the University of New South Wales (UNSW). The proAlliance finally adopted a 48 port diffuser for use on the PSDP which creates a superior environment for the mixing zone of the brine discharge. In-situ trials by the UNSW since the commissioning of the plant have verified the design outputs of the diffuser performance.

1.3 GROUND CONDITIONS

The site was less than 1km from the coast and contained sandy soil conditions, including high volumes of fine beach sand and a mean water table level of approximately 3m below the existing ground level providing difficult conditions for both the design and construction teams. The seawater intake structure highlights the challenges encountered by ground conditions with the seawater pumping station located 10m below the natural ground level (or 7m below the mean water table). Although various construction methods were considered, many were deemed unacceptable due to numerous identified issues, including excavation risk.

The solution was to construct a 1m thick diaphragm wall in a 20x30m rectangle that extended 30m down into bedrock. The wall was built in 22 segments with each section locked together via a hexagonal key and water stop type arrangement. Vertically the seal was created by a 2m penetration into the bed rock enabling the interior section to be excavated and the base slab installed in a relatively dry environment and with minimal dewatering, thereby assisting in the reduction of construction costs.

State-of-the-art geotechnical software was used by the design team to determine the forces on the diaphragm wall during all stages of construction, including the hydrostatic force induced on the wall by the intake structure trench which was flooding during the marine installation of the intake pipeline. This construction technique provided dead-load to enable the intake structure to be located below the water table with leakage from the wall being significantly less than normally expected from similar structures thereby verifying both the engineering design and construction methodology.

Dewatering to all other structures which specifically included the RO Building, Backwash / Filter Effluent / Outfall Tank, below ground pipe work and services and the structural steel support structure for the marine pipeline trench were undertaken by more conventional methods, such as dewatering spear suction. The water table during these construction activities was controlled by specialist dewatering subcontractors and discharged to a common dewatering pond monitored twice daily by the proAlliance for ph and electrical conductivity to ensure compliance with site environmental criteria.

1.4 NOISE

In order to comply with the Water Corporations brief, the proAlliance needed to ensure that a noise level of less than 65dBa was emitted from the PSDP site boundaries. This was a challenging exercise for the design team due to the plants small footprint. Via computer modeling, the solution was achieved by housing all plant and equipment in concrete walled buildings which imposed a significant noise transmission loss (in excess of 50dBa compared to Colorbond sheeting which was around 20 to 25dBa. Further treatments to the PSDP structures included ensuring that all penetrations (such as louvres) and noisy equipment (such as H.P pumps) were acoustically treated and enclosed. The ceilings to high noise emission areas such as the Intake Pump Station and Drinking Water Pump Station were also acoustically treated to ensure that proAlliance met the noise emission target.

Figure 4: Concrete Walls and Acoustically Treated Louvres house the Drinking Water Pumps.

1.5 POWER CONSUMPTION

The Clients power consumption requirement for the plant stipulated that a total of 4kWh (excluding small power and lighting) shall be consumed for each cubic meter of water manufactured, a value considered to be extremely optimistic only a few years prior to the design and construction of PSDP.

In order to reduce the plants overall power consumption the following areas were targeted:

- Gravity Fed intake and outfall pipelines to eliminate the need for pumping, thereby optimizing power consumption and OPEX costs.
- The use of state-of-the-art Energy Recover Systems (ERI).
- The use of natural ventilation systems for the RO Building in lieu of mechanical ventilation systems which are typically used to ventilate structures of this size.

1.6 DURABILITY

The durability brief for the project required that all civil / structural and mechanical / electrical assets be built for service lives of 100 and 25 years, respectively. This was a challenging requirement, compounded with the plants close proximity to the ocean and some of the means and methods by which this was overcome are outlined below:

- Structures constructed predominately from precast concrete elements rather than cladding.
- Specialised coating systems used to protect concrete susceptible to chemical spills and floor and wall areas prone to high salinity.

- Increased cover and reinforcement to concrete structures to enhance service life.
- Specialised paint coating systems used on all structural steelwork and associated mechanical tanks and equipment.
- Glass reinforced plastics (GRP) used for the majority of the below ground distribution pipelines within the plant, including the marine intake and outfall pipelines.
- High grade SAF stainless steel used for all high pressure pipelines with the RO Building.

The solutions derived by proAlliance are considered revolutionary and innovative and have created a new benchmark for seawater desalination plants throughout the world.

2.0 KEY INNOVATIONS

2.1 INTRODUCTION

The PSDP included many features not previously employed in other large scale seawater desalination plants throughout the world. These have been driven by a commitment to the environment, durability, a challenging time frame and producing drinking water with a quality better than required in other countries. The notable innovations of the plant that met, or bettered the requirement for world's best practices are outlined herein this section.

2.2 BROMIDE REMOVAL

The originality of the PSDP and its novel design includes a "two pass" reverse osmosis process to remove the dissolved solids and more importantly reduce bromide to very low concentrations. Bromide has been linked to pour taste and odour issues in drinking Water.

The PSDP is the first desalination plant in the world to target bromide in drinking water with the plant reducing the bromide content down to 0.1mg/L for seawater desalination – a level now being targeted by a number of other cities throughout Australia.

2.3 OFFSHORE MARINE PIPING MATERIAL SELECTION AND BACKFILL

Large glass reinforced plastic (GRP) pipes were used for the marine installation consisting of a 2.3m diameter pipe for seawater intake and a 1.6m diameter pipe for brine outfall, along with a 48 port GRP diffuser. GRP pipe was selected as it offered the benefits of durability (due to its excellent corrosion resistance qualities), cost and ease of fabrication however, the flexible and fragile nature of the GRP made installation, backfilling and supporting of the pipe in the trench a critical construction issue.

After vigorous real life simulation testing, the preferred installation method as determined during the trials was replicated during the offshore construction. This solution saw the GRP pipe connected via a bell and spigot type arrangement with a locking ring to lower the risk of jointing during both installation and backfill. All pipework was installed on a light weight railing system which compensated for the variability in the finished seabed floor level after dredging and backfill. Pea-gravel and blue metal was used for backfill under the haunches of the pipe due to its low void content and further compacted by divers using hydraulic vibrators which were manufactured specifically for these works. Reconstituted concrete materials were used to complete backfilling to the top of the pipe with various sized rock amours subsequently dumped via split hopper barges to complete the backfill of the marine offshore trench. This novel approach offered a new cost effective method of optimizing offshore GRP pipe installation to ensure the long term integrity of the pipeline.

2.4 ENERGY RECOVERY SYSTEM

The success of any seawater desalination project is often measured in respect to how much energy is required to produce a cubic metre of drinking water. As a result of this objective a critical aspect to the design philosophy was to see the PSDP have the best available energy recovery devices integrated into the plant design philosophy. Consequently, studies were undertaken on the markets latest generation of energy recovery devices to determine the preferred solution for the PSDP.

A critical decision was taken by the ProAlliance to incorporate an isobaric system developed by Energy Recovery Incorporated. This system is able to recover 95% of the energy in the reject stream compared to 85% with that of its nearest competitor – the Pelton wheel.

This “state of the art” form of energy recovery was innovative as it had not been used on a large scale desalination plant previously and had only at the time of making the decision featured on the television program “beyond 2000” as a new technology. The ERI system was one of the “state of the art” and innovative features implemented by the proAlliance which made the PSDP one of the most energy efficient plants in the world. From a technical perspective, the result of this was a specific energy consumption of less that 4kWh/m3 – a value considered to be extremely optimistic a few years ago.

Figure 5: Isobaric Energy Recovery System manufactured by Energy Recovery Incorporated and used at PSDP

2.5 PLANT VENTILATION SYSTEMS

As the use of air cooled condensers in a coastal/marine environment would have resulted in a short service life (due to the high salt concentration), alternative options were investigated and developed during the design phase. The result was a solution whereby produced drinking water was used as the heat sink for the air conditioning system. Water from the drinking water tank was passed through various heat exchanges and was re-used as process water. This removed the need for air cooled condensers or cooling towers and reduced the associated maintenance and operational problems.

Furthermore, the Reverse Osmosis (RO) Building presented the most onerous HVAC requirements because of the heat load generated from the high pressure pumping systems. The most sensitive items within this building are the RO membranes which typically should not be exposed to temperatures in excess of 40°C. In normal operation, this is not an issue as the membranes are cooled by the ambient temperature of the water flowing through them. However when out of service for extended periods, it is possible for the membranes inside the pressure vessels to approach this temperature. Taking into consideration maintenance personnel, the building also has to be ventilated at a rate of 8 air changes per hour. Conventionally, RO buildings of similar size are cooled using mechanically ventilation systems, however in an attempt to improve the sustainability of the plant and reduce OPEX costs it was decided that a natural ventilation system utilizing coastal prevailing winds would be considered.

To develop this solution, the temperature profile and air movement inside the building were established by modeling the heat flux using IES Apache software, which provides a good first order approximation of the temperature at various locations and levels in the building.

Detailed design was then undertaken using computational fluid dynamics modeling. This modeling was used to design passive structural features to the RO Building such as specialized roof forms and ventilation louvres to allow the prevailing winds to create negative pressures and “suck” warm air from the building and consequently providing a unique ventilation solution that met the proAlliance design intent and eliminated the need for mechanical ventilation in the RO Building.

2.6 WASTEWATER TREATMENT SYSTEMS

Ferric sulphate is used as the primary coagulant for removing suspended solids from seawater. The precipitate from the coagulant and suspended solids are captured in dual media pressure filters. In the vast majority of desalination plants the filters backwash is discharged directly back into the ocean. This process creates a brown plume in the ocean, with the precipitate eventually settling onto the seabed, in this case a white sandy seabed visible from the surface. Although inert and the fact that PSDP is located along an industrial zone, the proAlliance committed to prohibit the return of ferric sulphate sludge offshore ensuring that there were no aesthetic impacts on the white sandy coastline.

A treatment plant was designed and constructed to remove the solids from the backwash to enable a clear brine stream to be discharged back into Cockburn Sound. The solids are initially thickened and then dewatered by centrifuges to produce a cake with about 25 percent solids. This cake is stored in a purpose designed skip and safely transported to landfill.

2.7 CHEMICAL STORAGE AREAS

Chemical Storage and dosing areas were completely enclosed within a building to satisfy both durability and security reasons. A high proportion of fiberglass components were used through the chemical storage (including tanks, walkways, platforms, gratings and hand railings) to maximize operational life. Particular focus was given to operator safety with dosing and dilution panels which were easy to access and enclosed behind Perspex see through screens. The dosing system employed by proAlliance differs from the traditional skid-mounted approach and has been implemented as a standard model for other water treatment plants throughout Australia.

2.8 SEAWATER PUMP STATION

Seawater flows by gravity into the pumping station at a rate of up to 4000L/s to help deliver an optimal OPEX cost for the plant. A traditional onshore pump station would be based upon a tapered transition to maintain a straight path for seawater flow to the pump suction. As the PSDP site did not have sufficient area for a conventional solution and to keep the cost of the diaphragm wall construction to a minimum due to the further complications of existing soil conditions (refer to section 1.3 – Ground Conditions), it was necessary for an alternative solution to be found.

The solution was innovative and significantly deviated from conventional design principles with the design considering a rectangular structure where the seawater had to flow via gravity around a 90 degree angle to enter the wet well.

The governing factor for this design was the suction condition for the seawater forwarding pumps. A comprehensive CFD modeling exercise was undertaken to verify that the concept would be acceptable and to allow the structural geometry to be refined to achieve acceptable pump suction conditions within the specified small footprint and furthermore provide an optimal and innovative solution for the intake to the plant.

The seawater pumping station is located 7 metres below the mean water table which lies approximately 3 metres below the natural ground level. Although a number of construction methods were considered, many were not acceptable because of safety concerns, excavation risk and non-compliance with the project's durability.

3.0 OUTSTANDING PROJECT OUTCOMES

3.1 INTRODUCTION

The PSDP has received recognition throughout the world post completion in the fields of environment, sustainability, engineering and desalination with the plant being internationally acknowledged as the best desalination plant constructed in 2006. In order to receive such acknowledgment, the proAlliance team needed to develop innovative solutions in the fields of engineering design, procurement and construction resulting in a number of outstanding project outcomes. Key outcomes for the project are highlighted within this section.

3.2 ENVIRONMENTAL / SUSTAINABILITY

The PSDP has been benchmarked internationally as having the lowest environmental impact of any seawater desalination plant in the world, exceeding previous "best practice" standards and successfully achieving the following:

- Approval of all statutory requirements including Section 46 and satisfying all 7 ministerial conditions.
- Various shire development applications (DA's) approvals
- Achieved compliance with Cockburn Sounds State Environmental Policy (including approval to allow construction of the marine works within the protected waters of Cockburn Sound)
- Exceeded all environmental water monitoring reporting requirements of both the EPA and WC, providing unprecedented levels of data including macrobenthic investigations which have not only provided increased scientific knowledge of the sound but furthermore provided data which is expected to assist future developments due to the new level of baseline detail.
- Met the EPA's strict criteria for brine discharge, with salinity level within 50m of the discharge point being 1.2ppt of background levels and 0.8ppt within 1km of the discharge.
- Creating the worlds largest desalination plant using renewable energy as the 185GWhr of energy required to the run the plant is sourced from a 82MW wind farm.
- Creating the worlds most energy conscious plant by coupling renewable energy with low specific energy achieved from the plants novel design, incorporating ERI devices.

3.3 HEALTH AND SAFETY

The proAlliance was committed to the provision of safe work procedures and a safe working environment for all personnel associated with the PSDP with safety being a non-negotiable requirement of the project. The proAlliance teams goal was to collectively work towards the prevention of all accidents, especially in a marine environment and on a relatively congested site with construction proceeding on a number of work fronts and in some cases 24 hrs per day.

Table 1: PSDP Safety Statistics

proAlliance Man Hours on site	**1,277,300**
Lost Time Injury Frequency Rate (LTIFR)	**2.35**
Number of LTI's	**6.26**
Number of Worksafe infringements	**1**

The PSDP safety statistics as shown above in Table 1 compare very favorably against the Australian Construction (ACA) statistics.

3.4 INDUSTRIAL RELATIONS

The proAlliance opted to engage trade union involvement as its preferred Industrial strategy. Forming part of this strategy was the establishment of a common site wide agreement that was framed on the premise of an existing model that was previously utilized on a similar engineering type project located on the renowned Kwinana industrial strip. With the assistance of the local branch of the Chamber of Commerce and Industry (CCIWA) and acting on behalf of the proAlliance individual agreements were put in place between each of the participating contracting entities and with each of the relevant trade unions. The Project was high profile, fast track in nature and the associated expectations with respect to providing drinking water to the local community before the commencement of the 2006 / 07 summer, therein negating the potential requirement to impose further water restrictions on the community, was used to focus the entire project workforces attention on achieving what some thought of as nigh on impossible. This is particularly relevant when one considers at the time of constructing the plant it was taking an average of two years to build a standard four bedroom house in Perth due to the resource boom and the squeeze on building materials and products.

The workforce itself bought into the challenge of achieving the nominated water delivery in the time frame which was set by the West Australian Premier. As a result, the project recorded more down time for inclement weather than that associated with the accumulated industrial related events.

3.5 IMPACT ON LOCAL ECONOMY / COMMUNITY

The development of the PSDP has had many positive effects on the local economy due to the large percentage of the cost of building of the plant being spent within Western Australia. Originally, it was envisaged that local content would be approximately 60%, however at the completion of the plant the local content was calculated in excess of 75%. The benefits of the PSDP to the local community and economy have been summarized below:

- Allowed Perth the ability to maintain its moderate 2-day per week water restrictions whilst other states have had to resort to strict and severe water restrictions
- Offered employment for over 65 engineers and support staff, 500 direct workers overseen by a number of key specialists in various areas of desalination, resulting in the improvement of the projects workforce knowledge and expertise in the field of desalination.
- Provided employment for 19 Degremont personnel – all but two of which are from WA, thereby providing hands on experience and training for local personnel in a new technology being more widely applied both in Australia and overseas.
- Presented local vendors and services providers with opportunities and experience in fields such as GRP fabrication and installation, control systems engineering, environmental monitoring, and engineering design.

- Provided involvement to local universities in both WA and Sydney with various aspects of modeling undertaken in both an engineering and environmental capacity for the plant. The design and construction of the plant has provided these universities with the ability to develop their knowledge and knowhow that could provide future opportunities Australia wide.
- Post construction the plant has provided the need for ongoing maintenance contracts which shall be undertaken by locally based vendors and service providers.

3.6 PROGRAM AND BUDGET

A project target cost in the region of $300M was committed to and a risk reward formula was developed to incentivize delivery under budget and ahead of schedule.

The project schedule developed was based upon a 24 month program, completing the PSDP by November 2006. The design phase of the project was awarded in April 2005 and construction commenced on site the following month.

The project achieved an extremely aggressive program in order to meet the completion and delivery dates set by the Premier of Western Australia, successfully delivering first water in November 2006 in time to meet the expected summer water demands in Perth within the $300M project target cost.

4.0 CONCLUSION

In concluding it would be fair to say that **“relationships”,** the building of respect and the willingness to trust and truly work together was the key to the Projects overall success.

The multiple partnerships that were established was a true testament of what can be achieved with the right mindset, incentive and the overall desire to rise to the challenge.

The Projects philosophy was **“Best for Project”** this provided the inspiration and focused attention to achieve exactly that. The Perth Seawater Desalination Project has attracted intense national and international attention both during its construction and following its successful commissioning. It was voted as the Worlds Best Desalination Plant commissioned in 2006 and was awarded the coveted Global Water Industry Award for Desalination Plant of the Year 2007 at a ceremony in Barcelona.

Our Sincere Thanks and Congratulations go out to all that had any involvement and association with the Building of this Land Mark Development within the Australian Water Industry.

5.0 REFERENCES

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