



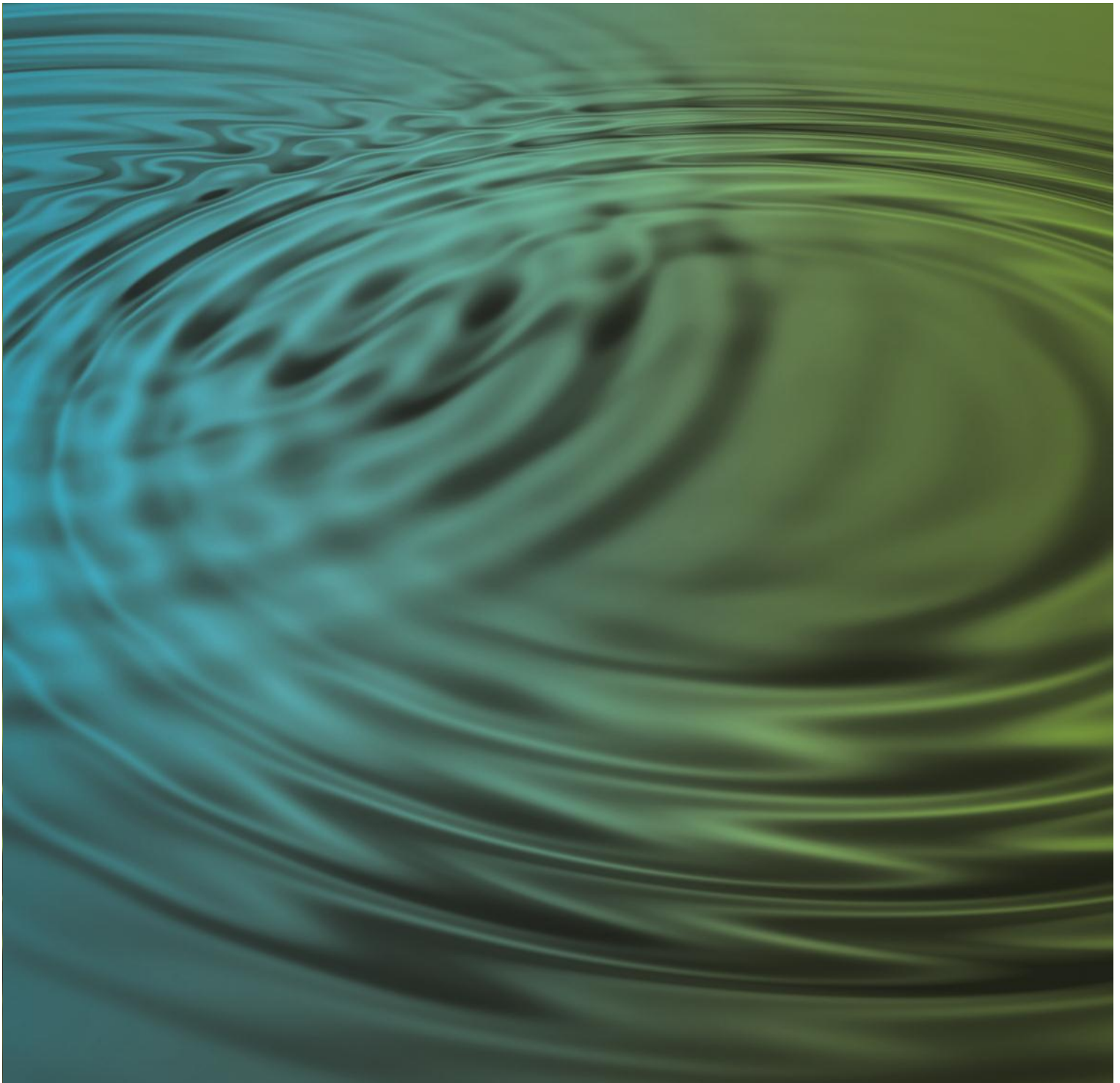
# Wheatstone Social Infrastructure Development

Birdrong Aquifer Source  
Basis of Order of Probable Cost for New Onslow BWRO Water

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# Birdrong Aquifer Source

Basis of Order of Probable Cost for New Onslow BWRO Water



## Birdrong Aquifer Source

Basis of Order of Probable Cost for New Onslow BWRO Water Treatment Plant

WS0-9210-SIF-RPT-AEC-000-00007-000

Prepared for

Chevron

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## Executive Summary

Chevron has entered into a State Development Agreement [1] to provide a new public water supply for Onslow.

The agreement is broadly based on provision of:

- One seawater desalination plant producing 2ML/d of potable water.
- One 5ML storage tank.
- One 900kL elevated head tank and fill pump.
- A pump station, power supply infrastructure and a pipeline from the plant to a point of interconnection with the existing town water supply.

An earlier study [2] has defined the works required by the State Development agreement, as a Base Case. In addition to defining the 2ML/d capacity seawater desalination plant, at the request of Water Corporation, Chevron also investigated the implications of providing a seawater desalination plant with the potential to be expanded to a capacity of 4ML/d.

As an alternative to the Base Case, Chevron is now considering treating saline water from the Birdrong Aquifer, as opposed to seawater desalination. This report outlines the potential infrastructure requirements to supply raw water from the Birdrong Aquifer to a new desalination plant and from there into the Onslow town water supply, and assesses the order of probable cost of the works. It also considers the likely implications of providing a plant with the potential to be expanded to a capacity of 4ML/d.

## 1.0 Introduction

### 1.1 State Development Agreement

The State Development Agreement [1] requires the following works to be undertaken by Chevron in relation to public water supply for Onslow:

*Water Source and Supply Infrastructure – provide a 2 megalitre per day seawater desalination plant producing potable water, a 5 megalitre storage tank, 900 kilolitre elevated head tank and fill pump, pump station, power supply infrastructure and a pipeline from the plant to a point of interconnection with the existing town water supply. Scope will not include the water distribution network from the plant through the town site.*

*The facilities will need to be designed and built to specifications and design standards agreed between Water Corporation and CAPL (both acting reasonably and having regard to Water Corporation's statutory functions and obligations). The location of the desalination plant is to be to the satisfaction of the Water Corporation, Department of State Development and CAPL, having regard to capital efficiency. The desalination plant must be fully functional at the time of handover.*

In an earlier study [2], AECOM defined a Base Case Basis of Design based on the requirements of the State Development agreement. In the study, the implications of providing a seawater desalination plant with the potential to be expanded from an initial capacity of 2ML/d to an ultimate capacity of 4ML/d were also investigated. Chevron included this assessment in response to a request from the Water Corporation

As an alternative to the Base Case, Chevron is now considering treating saline water from the Birdrong Aquifer, as opposed to seawater desalination. This report outlines the potential infrastructure requirements to supply raw water from the Birdrong Aquifer to a desalination plant and from there into the Onslow town water supply, and assesses the order of probable cost of the works. In addition to a 2ML/d capacity plant consideration is given to the implications of providing a 2ML/d plant with the potential to be expanded to a capacity of 4ML/d.

### 1.2 Scope of the Study

This study defines the supply of saline water from the Birdrong Aquifer to a new desalination plant in Onslow, and outlines a concept for the infrastructure. The study is based on the production of 2ML/d of potable water to supply the Onslow scheme. Treating groundwater from the Birdrong aquifer is an alternative to the seawater desalination plant described in the *Base Case Basis of Design Report* [2]. There is limited available information on the Birdrong Aquifer, and the study is based on the assumption it is viable as a supply source.

As with the base case seawater desalination option it is assumed the infrastructure would be provided by Chevron as proponent for the project and handed over to Water Corporation which would become the asset owner. Consequently, the project would need to deliver infrastructure that satisfies Chevron and Water Corporation's specific requirements. It is noted however that Water Corporation has not been consulted in preparing this report.

The concept for the Birdrong Aquifer alternative is defined by the following documents:

- Block flow diagram (Refer to appendix A)
- Conceptual layout (Appendix A)
- Level 1 schedule (Appendix A)
- Order of probable costs (Appendix B)

A description of the concept is provided in Section 2. The primary purpose of the study is to establish the order of probable cost for:

- Birdrong bore supply infrastructure. The supply infrastructure needs to supply sufficient raw water to a brackish water reverse osmosis (BWRO) desalination plant in Onslow producing 2ML/d potable water.
- The new BWRO desalination plant in Onslow.
- Infrastructure to discharge a brine concentrate stream to the ocean.
- Infrastructure to supply water to the new town water storages.
- Town water supply storage infrastructure.



### 1.3 Background – Birdrong Sandstone Aquifer in the Onslow Area

The Birdrong Sandstone is the main confined aquifer of the Carnarvon Basin. AECOM has undertaken an earlier 'reliability assessment' study for Chevron on the various groundwater sources in the Onslow Area and beyond [3]. The AECOM study assessed the probability of adequate yields from the Birdrong Sandstone in the Onslow area as moderate to high, however with high uncertainty of long term viability. The uncertainty is largely due to minimal exploration bores having been drilled in the area, and a lack of information in relation to the recent exploration.

Much of the current knowledge regarding the Birdrong Sandstone Aquifer in the Onslow region is based on historical oil and gas exploration wells in the surrounding area [3]. There is no public-domain information yet available regarding a recent production bore installed by BHP Billiton.

Much of the published understanding of the Birdrong Aquifer in the Onslow region is considered to be based on regional interpretations from petroleum exploration wells and water bores by A.D. Allen in Hocking et al (1987), as summarised in the recent AECOM report [3]. This work defines depths to the top of the aquifer, groundwater levels, salinity and temperature contours. More recent work by others provides additional interpretation, possibly based on limited new information.

The AECOM study [3] notes that:

- The 'Department of Environment (2004) as cited by URS (2009A) suggest an annual total recharge for the entire Carnarvon Basin of approximately 17GL'.
- The yield potential of individual bores in the Birdrong is unknown but is likely to be high, perhaps of the order of 1 – 4 ML/day, citing work by Crostella et al (2000).
- Based on the interpretations of Hocking et al (1987), temperature of groundwater close to Onslow is expected to be in the range from 45 – 60 degrees Celsius.
- The salinity of the Birdrong Sandstone increases towards the coast. Various sources suggest salinity may vary from:
  - An estimate of about 6,000mg/L based on an assessment of down-hole geophysical data by URS (2009A) in the petroleum well Jade 1 (Refer Figure 1).
  - 6,000mg/L to 12,000mg/L based on interpretations of Hocking et al (1987).
  - An estimate of around 15,000mg/L by Rockwater (2009) the basis of which is unclear.

For the purposes of the study a conservative bore water temperature of 60 degrees Celsius and salinity of 15,000mg/L TDS have been assumed. It has also been assumed that two bores will be required to feed the RO treatment plant, each capable of yielding 1.7ML/d.

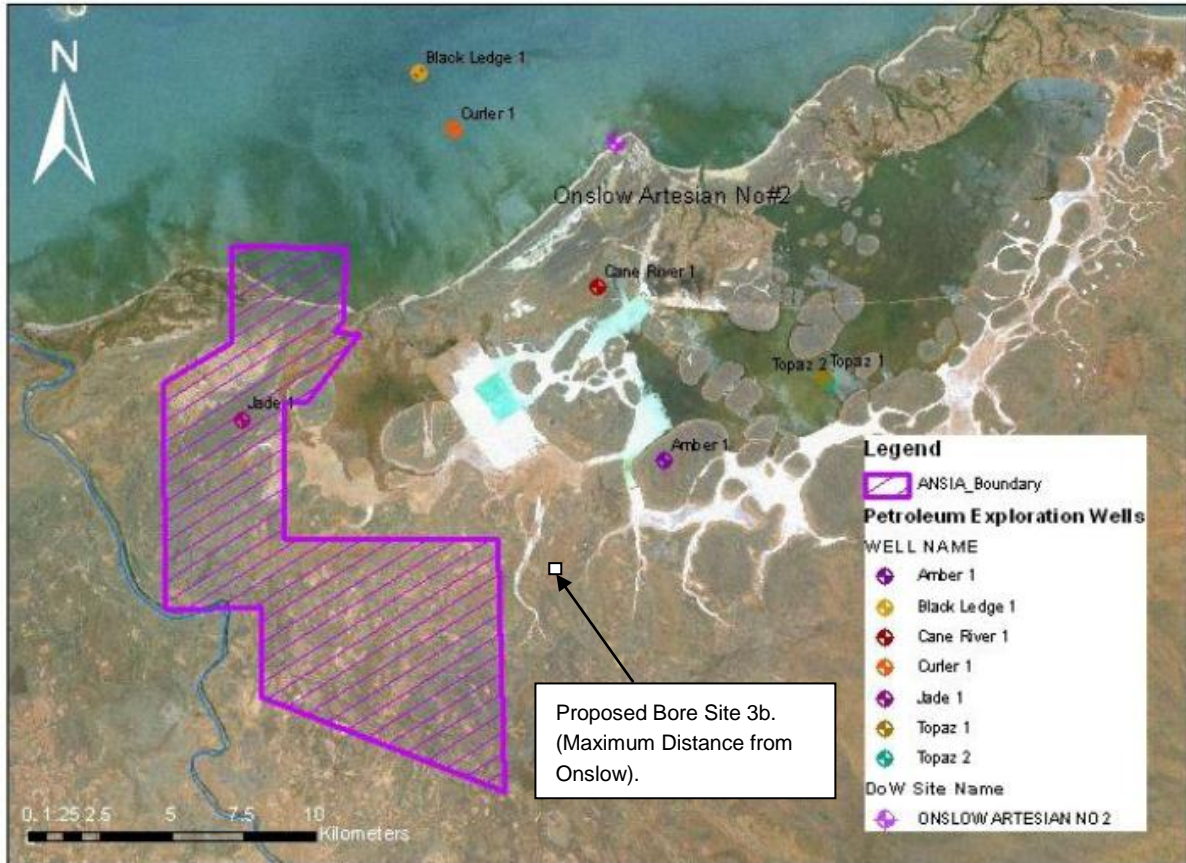


Figure 1 Location of proposed Birdrong Bore site in relation to historical petroleum exploration wells. (Modified from [3])

## 2.0 Summary of the Birdrong Water Supply Concept for production of 2ML/d potable water

### 2.1 Bore site infrastructure

Chevron has identified potential locations to establish bores tapping the Birdrong aquifer, as shown on Figure 2 below.

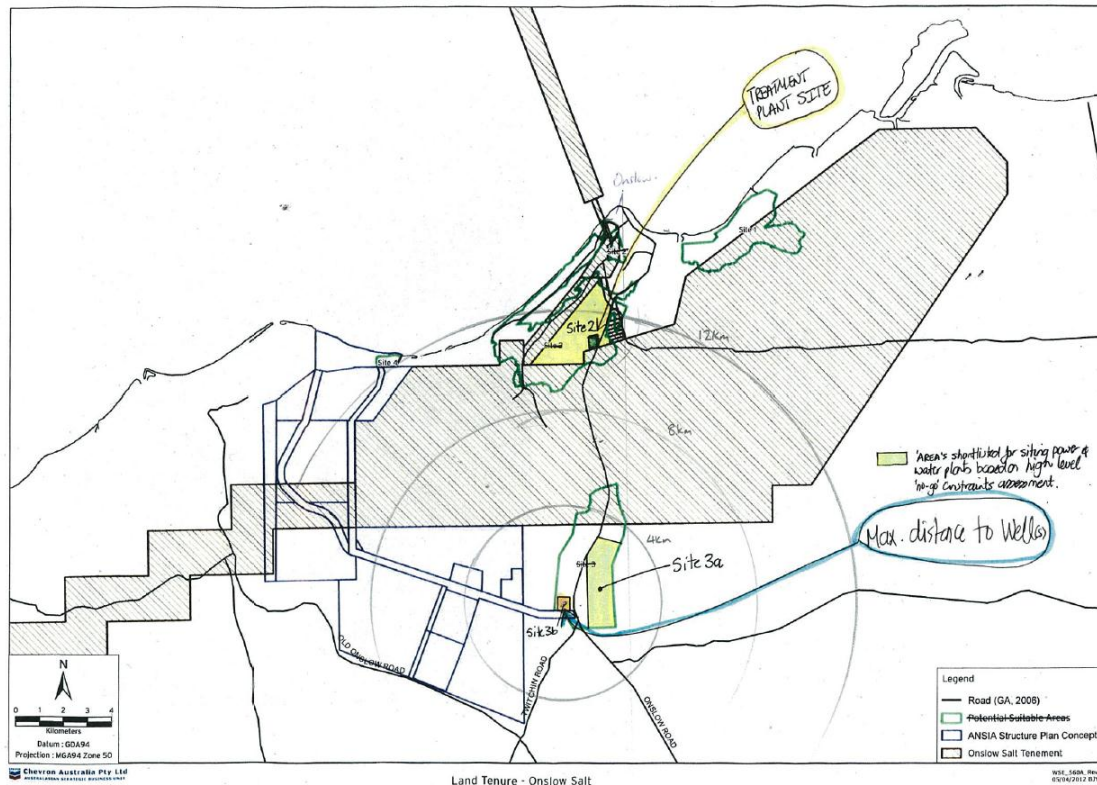


Figure 2 Potential Birdrong bore locations [4]

It has been assumed that:

- A raw water supply of 3.4ML/d would be required for a 2ML/d desalination plant.
- Two separate bores accessing the Birdrong Sandstone aquifer are required, approximately 1km apart to prevent interference.
- 1.7ML/d (20L/s) can be abstracted from each bore on a continuous and sustainable basis.

The concept is for one of the two bore sites to become the main central bore site for power supply, fuel storage, buffer storage, bulk transfer and a communication link between the bores and the treatment plant site. The other bore (and any future bores added to the supply) will function as a satellite of the main central bore site. To supply the ultimate 4ML/d plant being considered by Water Corporation, two additional bore sites would be required to feed the main central bore site.

The main central bore site (Bore Site 1) will include:

- A deep groundwater bore (nominally 400-500m deep) tapping the Birdrong aquifer.
- The bore will be equipped with a submersible borehole pump and associated headwork's infrastructure (pipework, valves etc.), supplying the buffering tank.
- 100kL raw water buffering tank.
- Pumps to transfer bore groundwater to the raw water tank at the 2ML/d BWRO plant site via a DN200 HDPE pipeline up to 12km in length).

- Instrumentation (magnetic flow meters, ultrasonic level sensors, water quality instrumentation (conductivity, pH, temperature). Signals from the level sensor in the tank will be used to control the pump starting and stopping of the borewater supply pumps. Mag flow meters and water quality instrumentation will be used for data acquisition purposes rather than for control.
- Electrical switchroom with MCC's and control cabinets.
- Diesel generator set (115kVA).
- Fuel storage facility providing 28 days storage (equating to 15kL for the 2ML/d plant).
- Provision for emergency overflow of the buffering tank.
- The site will be approximately 70m x 70m and fenced with a security gate.

Bore site 2 will supply water to the tank at the main central bore site (Bore Site1) via a DN200HDPE pipeline up to 1km in length. A power supply of 415V will be supplied from Bore site 1.

Bore site 2 will include:

- A deep groundwater bore (nominally 400-500m deep) tapping the Birdrong aquifer.
- The bore will be equipped with a submersible borehole pump and associated headwork's infrastructure (pipework, valves etc.), supplying raw water the buffering tank at the main central bore site.
- Electrical switchroom including switchboard board to take the incoming 415V feed. MCC and pump control cabinet.
- Radio mast to communicate with the tower at the main central bore site.
- The site will be approximately 25m x 25m and fenced with a security gate.

## 2.2 BWRO Water Treatment Plant Site Infrastructure

Figure 2 shows a potential location for the treatment plant site. A distance of approximately 12 km from the groundwater bore site to the BWRO groundwater treatment site is assumed.

Actual groundwater quality data is not available. For the purposes of the study a bore water temperature of 60 degrees Celsius and salinity of 15,000mg/L TDS have been assumed. Preliminary heat dissipation calculations have been undertaken to predict the temperature of the water arriving at the water treatment plant site. The calculations suggest that although the water temperature would reduce in the tanks and along the length of the pipeline, there will still be a requirement for a mechanical cooling system to ensure the feedwater can be lowered sufficiently for treatment by reverse osmosis. The treatment plant site will include the following infrastructure:

- Two transformers 11kV/415V.
- A 300kL raw water buffering tank to receive water supplied by the Birdrong bores. The bores will supply water at a rate of 142m<sup>3</sup>/hr. A level sensor in the tank will be used to control the raw water transfer pumps at bore site 1. The pumps will be started on a low level signal, and stopped on a high level signal from the tank.
- 3 off raw water pumps with a nominal duty of 71m<sup>3</sup>/hr @ 3 bar per pump (N+1 redundancy), feeding three self-backwashing media filters to screen the raw water.
- A series of cooling towers to provide a heat rejection capacity of 6MW, comprising 3 x 3.6MW cooling towers (N+1 redundancy) with an electrical load of 16.5kW per cooling tower. (Each cooling tower will have 2 x 11kW duty/standby pumps and 1 x 5.5kW fans).
- A cooled water collection tank.
- 3 off raw water pumps with a nominal duty of 68m<sup>3</sup>/hr @ 3 bar per pump (N+1 redundancy) feeding three self-backwashing media filters to screen the cooled raw water.
- An RO feed tank and RO permeate tank.
- A steel frame, Colorbond clad, ventilated RO building with reinforced concrete floors, and 4-5m wall height housing:

- Cartridge filters immediately upstream of the RO membranes as a precautionary measure to protect the membranes from any contaminants/suspended solids.
- Two High pressure RO feed pumps per train.
- Two RO trains, of 2ML/d capacity per train.
- Energy recovery systems to recover waste brine pressure.
- Chemical storage area including reinforced concrete bunds, tanks and chemical cleaning systems.
- A control room building, including laboratory, WC facilities, control room, and meeting/lunch room.
- A post treatment potabilisation process.
- A chlorination building.
- A 500kL product water tank (Comprising 288kL fire water storage plus a nominal 2 hours product water storage of 170kL, plus buffering storage).
- A drinking water pumping station to transfer water to the off-site infrastructure.
- An overflow sump.
- Switchroom including:
  - Incoming power cubicle
  - Motor control centres
  - Control cabinets
  - Light and small power distribution board.
- A communications tower.

## 2.3 BWRO Water Treatment Plant Off Site infrastructure

### Brine Discharge:

- An open seawater outfall structure, sized for 2ML/d potable water production, with lengths to be determined based on seawater quality data, benthic environment, seafloor topology and other future infrastructure.

### Downstream potable water supply works including:

- A pipeline from the BWRO desalination plant to the Onslow storage tanks sized for 2ML/d transfer. The pipeline is assumed to traverse existing Water Corporation land or public road reserves. It is unclear at this stage whether a pipeline from the elevated tank to a tie in point with the Water Corporation distribution network is required, and this has been excluded from the cost estimate. This will need to be agreed between Water Corporation and Chevron.
- A 5ML ground level storage tank on existing Water Corporation land [5].
- A 900kL steel elevated tank and fill pump station on existing Water Corporation land. This is based on a Water Corporation 2022 Scheme Concept Diagram for Onslow [5].

Each of these are essentially the same as are required for the alternative base case SWRO plant, and have been reported on in detail in the Base Case report [2].

## 3.0 Implications of Providing a 2ML/d System Capable of Being Expanded to 4ML/d Capacity

### 3.1 Bore Site Infrastructure

To expand to 4ML capacity, two additional satellite bores would be required in future to supply an additional raw water supply of 3.4ML/d to the main central bore site. The additional infrastructure required is summarised below

- Two separate bores accessing the Birdrong Sandstone aquifer approximately 1km apart and one kilometre from the main central bore site, with each site including:
  - A deep groundwater bore (nominally 400-500m deep) tapping the Birdrong aquifer.
  - Each bore will be equipped with a submersible borehole pump and associated headwork's infrastructure (pipework, valves etc.), supplying raw water the buffering tank at the main central bore site.
  - Each bore would include an electrical switchroom including switchboard board to take the incoming 415V feed, MCC and pump control cabinet.
  - Each bore site would have a radio mast to communicate with the tower at the main central bore site.
  - Each site would be approximately 25m x 25m and fenced with a security gate.
- Access roads to the additional bore sites if not served by existing roads.
- Power supply cables from the main central bore site.
- Pipelines to deliver raw water to the main central bore site.

The following additional facilities have been included in the Order of Probable Costs to prepare the site for future upgrade from 2ML/d to 4ML/d:

- A larger transfer pumping station building to allow additional transfer pumping capacity and controls to be added.
- A larger fuel storage tank to provide 28 days storage at the increased load.
- Increased diameter of the raw water transfer pipeline.
- Electrical infrastructure to allow power and controls for the additional transfer pump(s) and borehole pumps to be added.

### 3.2 BWRO Water Treatment Plant Site Infrastructure

To expand to 4ML capacity, additional infrastructure would be required as summarised below:

- Additional RO trains.
- The raw water tank (300kL) would be duplicated.
- The media filter feed pumps would be duplicated.
- The media filters would be duplicated.
- The cooling tower array would be duplicated.
- The RO feed tank would be duplicated.
- The brine tank would be duplicated.
- The brine pumping station capacity would be increased.
- An additional product water tank of 170kL would be added.

The following additional facilities have been included in the Order of Probable Costs to prepare the site for future upgrade from 2ML/d to 4ML/d:

- An increased site area.
- An increased treatment plant building floor area.

### **3.3 BWRO Water Treatment Plant Off Site Infrastructure**

The changes required for the offsite infrastructure to expand to 4ML capacity, are summarised below:

- A larger brine outfall pipeline (based on per kilometre rate).
- A larger diameter transfer pipeline from the BWRO desalination plant to the Onslow storage tanks has been included (based on a per kilometre rate).

It is assumed the other downstream infrastructure provided for the 2ML/d plant, namely the 5ML ground tank and 900kL ground tank are already adequate for an increase to 4ML/d production.

## **4.0 Further Investigations**

In order to progress the design of the project further investigations will be required. Detailed analysis will allow design optimisation, improved accuracy of estimated costs and project delivery schedule. In some cases the investigations will be required to gain regulatory approval whereas in others the analysis may identify specific opportunities to reduce cost or risks. It is recommended that the following studies be completed:

- Site selection and constraints study, including site spec bathymetric data collection.
- Environmental impact assessment and baseline data collection.
- Groundwater and seawater quality monitoring and data collection.
- Outfall design, location and configuration options.
- Geotechnical studies for outfall location and groundwater RO plant site.
- Alternative designs and options for the elevated tank.

## 5.0 Study Assumptions

### 5.1 Hydrogeological

It is assumed that:

- A sustainable yield of 1.7ML/d can be withdrawn from each Birdrong groundwater bore.
- A maximum separation of 1km is required between bores to avoid interference.

### 5.2 Source Water Quality

As noted earlier there is limited information on the Birdrong Aquifer water quality in the Onslow region. It is assumed that the water sourced from the Birdrong aquifer can be completely characterised as below:

Maximum salinity	15,000mg/L TDS
Maximum temperature	60 degrees C

It is assumed the water is of negligible hardness, and that the salinity is effectively only comprised of sodium and chloride ions.

Allowance has been made to remove heat from the bore water to reduce the temperature of the water to a maximum of 35 degrees for RO treatment. A basic screening process has been allowed. It is assumed that the water quality will be suitable for RO treatment and the production of potable water, without any additional pre-treatment and will be acceptable to Water Corporation for that purpose.

### 5.3 Bore Site Locations and Infrastructure

It is assumed that the bore sites will be located as shown in Figure 2, a distance of 12km from the proposed BWRO desalination plant site.

It is assumed there is no existing power supply available to the site, necessitating the use of a diesel generator.

It is assumed that diesel storage of 28 days capacity will be acceptable to Water Corporation.

It is assumed that the main bore site 3b can be accessed by existing paved roads. An allowance has been made to construct a compacted gravel access road between the two bore sites 1km long and 6m wide. It is assumed that such a road would be acceptable to the Shire and Water Corporation.

### 5.4 Bore Water Supply Transfer Infrastructure

It is assumed the transfer pipe will be buried.

### 5.5 Brine/Waste Disposal

It is assumed that the brine concentrate can be discharged to the ocean.

It is assumed that there will be sufficient heat loss along the brine pipeline for the brine stream to reach acceptable ambient sea water temperature before the diffusers.

### 5.6 Downstream Potable Water Supply Works

It is assumed that the downstream potable water supply works are the same as those included in [2]. The order of probable costs for this infrastructure is the same as those reported on in [6], and the same assumptions apply.

### 5.7 Regulatory

It is assumed the scheme would be acceptable to Water Corporation.

It is assumed the scheme would be acceptable to the relevant government agencies and licensing departments.



## 6.0 Basis of Assessing the Order of Probable Costs (OPC)

### 6.1 Quality Control and Assurance

The OPC has been reviewed by AECOM's cost management team.

## 7.0 Estimate Structure and Assumptions

### 7.1 Estimate Overview and Requirements

Due to the early phase of the project and absence of detail, the OPC's are based on a review of costs from previous similar projects and, in some cases budget quotes from contractors.

Two OPC's have been produced as follows:

- 1) 2ML/d base case.
- 2) 2ML/d plant readily expandable to 4ML/d plant.

Each OPC is made up of 3 parts:

- Part 1 is for the bore sites, transfer of water to the BWRO desalination plant, outfall systems and a downstream potable water distribution pipeline. This provides a \$ per km rate for the outfall pipelines.
- Part 2 is for the BWRO desalination treatment plant element of the works.
- Part 3 is for offsite storage tanks and pumping station and is identical for each OPC.

Each part is broken down as follows:

**Table 1 Structure for Intake Bores, Outfall Systems and Downstream Potable Water Distribution Pipeline**

Part 1 Intake Bores, Outfall Systems and Downstream Potable Water Distribution Pipeline	
Item	Description
1	Design, Documentation, Project Management & Commissioning
2	Pipe Supply and Delivery
3	Pipe Joints
4	Pipeline Installation
4.1	Option 1 Open cut trench
4.2	Option 2 Micro tunnelling
4.3	Option 3 Laying pipe on seabed with anchors
4.4	Option 4 Horizontal directional drilling
5	Sea Outfall Pumping Station
6	Brine Diffuser
7	Transfer Pumping Station Infrastructure
8	Remote Bore Site Infrastructure
9	Electrical and Instrumentation for both Bore Sites

**Table 2 Structure for Treatment Plant Works**

Part 2 Treatment Plant Works	
Item	Description
1	Design, Documentation, Project Management & Commissioning
2	Site Works
3	Treatment Plant Process & Facility
4	Tanks & Associated Facilities
5	Treatment Building
6	Electrical & Control

**Table 3 Structure for Downstream Potable Water Supply Infrastructure**

Part 3 Downstream Potable Water Supply Infrastructure	
Item	Description
1	Design, Documentation, Project Management & Commissioning
2	Site Works
3	Tanks and Associated Works

## 7.2 Assumptions, Exclusions, and Clarifications

### 7.2.1 Assumptions

The following assumptions were made for the +/-50% OPC:

- The BWRO desalination plant and associated infrastructure are designed and built to appropriate regulatory standards in WA north region. No allowance was made to specific Chevron standards and Water Corporation standards.
- There are no major constraints that lead to significantly increased costs.
- The project is delivered by an EPC and / or Design & Construct approach using a single head contractor.
- The project has been estimated using rates appropriate to the water infrastructure sector. It is assumed that the normal project controls and procurement approaches, labour agreement etc. from that sector will apply. It has not been estimated using Oil & Gas or resource sector norms.

### 7.2.2 Exclusions

The following exclusions were made for the overall OPC:

- GST. The estimate is GST exclusive
- FEED study
- Owner's cost
- Any cost associated to environmental approval and other regulatory approvals/licenses etc.
- Water Corporation cost
- Land acquisition cost
- Cyclone tie down structures and or points
- Flights and accommodation costs.

The following exclusions were made respectively for the three parts of the OPC.

Groundwater intake and sea outfall systems and downstream distribution pipeline:

- Utility power supply costs
- The cost of installing production or monitoring bores, including head-works and associated piping at the bore sites.
- The cost for pre lay and post lay survey
- Surveys and Geotechnical investigations.

Treatment Plant Works:

- Utility power supply costs
- Water quality sampling and analysis
- Surveys and Geotechnical investigations
- Pilot plant studies
- Bulk earthwork
- Work outside of the treatment plant including access road
- Dust suppression for construction
- Other studies that may be required.

Onslow Potable Water Supply Infrastructure:

- Utility power supply costs
- Water supply pipeline downstream of elevated tank
- Bulk earthworks
- Surveys and Geotechnical investigations
- Dust suppression for construction.

### **7.2.3 Clarifications**

The OPC's are based on a review of costs from previous similar projects and in some instances budget quotes from contractors.

#### **Outfall System Pipeline**

The location of the outfall system and the treatment plant is not known. As the lengths of pipelines are unknown, a unit rate in \$/km has been developed for pipeline construction methods as requested by Chevron as follows:

- Option 1: open cut trench on land
- Option 2: micro tunnelling
- Option 3: laying pipe on seabed
- Option 4: horizontal directional drilling.

This will allow Chevron to develop costs for the scheme once locations are finalized. The outfall pipeline is likely to be a combination of

- Open cut trench on land
- Horizontal directional drilling at the foreshore
- Laid on seabed for sub-sea pipelines.

The length of each section can be identified once a location is known. Micro tunnelling was found not to be a viable option through discussion with various contractors, as the pipe sizes are too small to fit in micro tunnelling equipment.

The intake pump station and associated equipment OPC was based on previous similar projects.

### **Treatment Plant Works**

The quantities and components are based on the preliminary site layout and PFD developed for the Birdrong Water Supply Concept. The process design is subject to change dependent on groundwater quality.

The OPC is based on previous similar projects and covers the cost for supply, delivery, construction (and contractors distributables) and commissioning.

### **Onslow Potable Water Supply Infrastructure**

No engineering design was developed for the potable water supply infrastructure.

The OPC was developed based on previous similar projects and quotes from contractors.

## **7.3 Coding**

No coding was developed as part of +/-50% OPC.

## **7.4 Cost Basis**

Refer to the detailed OPC's in Appendix B Cost Breakdown Spreadsheets, which defines the basis for each item and describes any factors that have been applied for use in this OPC.

### **7.4.1 Currency**

The currency is in Australian Dollars (AUD), dependant on Chevron's procurement approach it is likely that some items would be supplied from overseas and may be quoted in foreign currency.

### **7.4.2 Capital and Expense**

To be completed by Chevron.

### **7.4.3 Vendor Quotes and Contractor Bid Pricing**

The following four budget quotations were obtained from contractors and suppliers:

- Amiad media filter quotation
- Evapco cooling tower quotation
- Permastore tank quotation
- Tyco seawater pump quotation.

The original vendor quotations are attached in Appendix C.

### **7.4.4 Shared Costs (if applicable)**

To be completed by Chevron.

### **7.4.5 Special Costs**

To be completed by Chevron.

### **7.4.6 OPEX**

OPEX was not included. The completed +/-50% OPC is referred to capital costs only.

## 7.5 Project Execution Strategy

The project is to be delivered by Chevron through a FEED study and EPC contracting arrangement. On completion the plant and infrastructure will be handed over to the Water Corporation as asset owner and for operation and maintenance.

### 7.5.1 Contracting Basis

It is understood that the project will be contracted using either a Design and Construct or an EPC procurement route where there is a single point of responsibility for the delivery of the project.

### 7.5.2 Procurement Basis

A more comprehensive review of the procurement strategy, the risk profile of the project and the availability of suitable contractors, sub-contractors and suppliers will need to be prepared at the next stage.

It has been assumed that the procurement approach will use a competitive tender approach and some form of either Design and Construct or EPC form of contract.

To be completed by Chevron.

### 7.5.3 Execution Basis

To be completed by Chevron.

### 7.5.4 Punch list, Turnover, Commissioning, and Start-Up Basis

It is assumed that these will be dealt with in the normal manner applicable to the water infrastructure industry using an optimum programme.

To be completed by Chevron.

## 8.0 Estimate Basis

### 8.1 Work Breakdown Structure (WBS)

A high level WBS for each of the 3 parts of the project is developed as shown on Table 1, 2 and 3.

The basis of each element of the OPC is shown on the detailed OPC listing in Appendix B.

## 9.0 General Allowances

The allowances are shown on detailed OPC in Appendix A.

To be completed by Chevron.

## 10.0 Owner's Costs

Not included in the OPC.

To be completed by Chevron.

## 11.0 Drilling and Completions

To be completed by Chevron.

## 12.0 Contingency

No contingency was allowed in the OPC as requested by Chevron.

To be completed by Chevron.

## 13.0 Escalation

No escalation was made on any of rates used in the OPC unless shown on the cost breakdown.

The OPC is current as of May 2012.

## 14.0 Late Additions Prior to FID

To be completed by Chevron.

## 15.0 Issues and Concerns

It is noted that this OPC is an engineering estimate without thorough engineering development which has been reviewed by our cost management team.

There is no contingency allowed as requested by Chevron.

The fact that the location of the site and the route and length of the various pipe runs have not been identified obviously limits the accuracy of the estimate as no site specific issues can be taken into consideration.

This OPC shall be developed further for financial purpose based on reviewing of the basis of order of probable costs and detailed assumptions, exclusions and clarifications listed in the detailed cost breakdown.

## 16.0 Management of Change Process

The basis of estimate and work breakdown structure have been developed to a level that allow us to easily track the estimate basis and update changes as necessary in the future.

## 17.0 Referenced Documents

The following documents were used for development of the OPC:

- Email correspondence between Chevron and AECOM
- CTR 36 (defining the scope of work)
- Preliminary Design Drawings (Appendix A)
- Vendor Quotations (Appendix C).

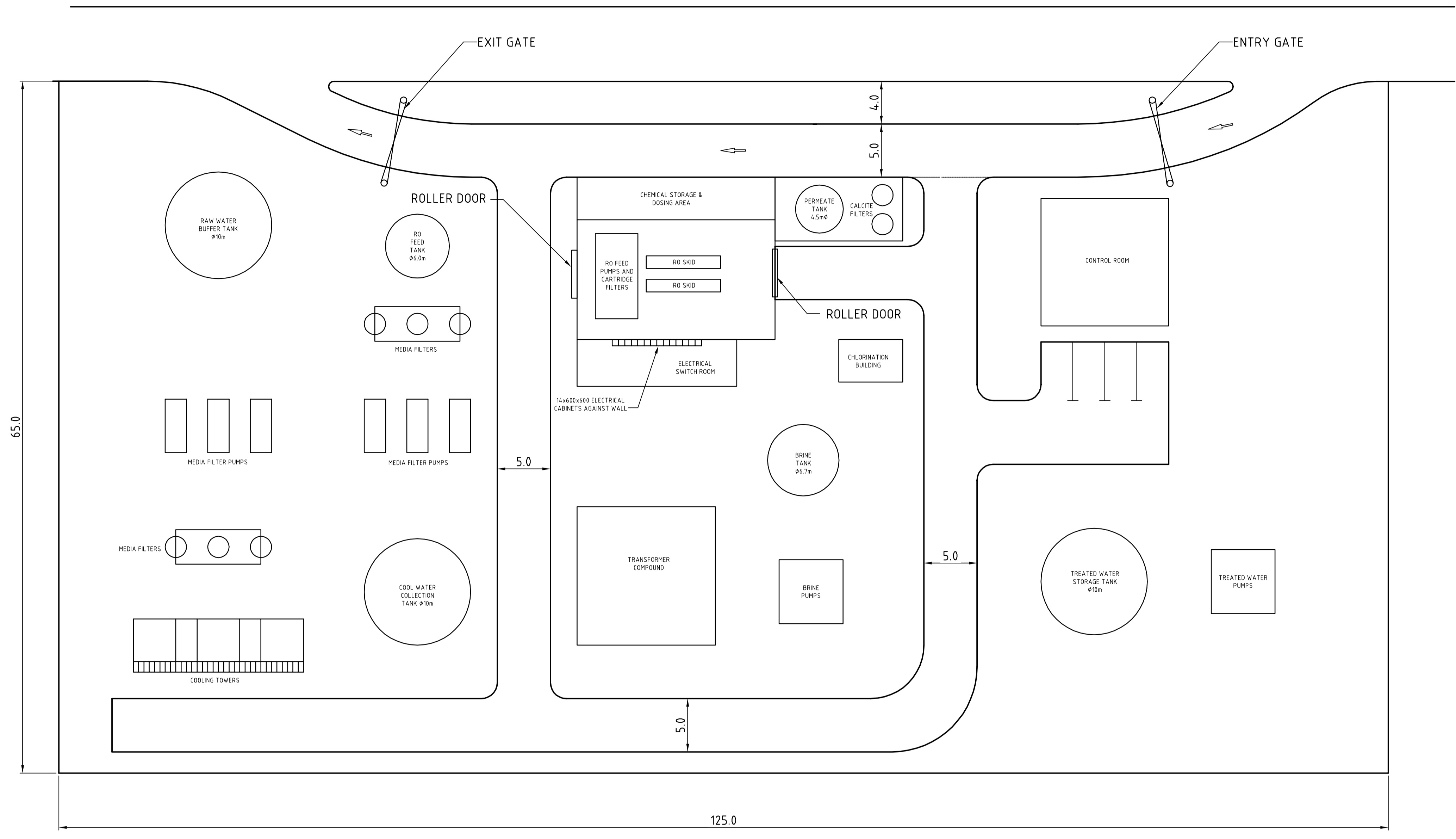
## 18.0 References

- 1) Email from Cooper, Laurence [Fircroft Australia Pty Ltd] [Laurence.Cooper@chevron.com] Sent: Friday, 20 January 2012 8:40 AM, To: Dyke, Robert, Cc: Allen, Geoffrey, Subject: SI Power & Water - State Infrastructure Requirement defined in the SDA.
- 2) AECOM (2012a) Wheatstone Social Infrastructure - New Onslow Water Plant Base Case - Basis of Design Report (Document reference 60218469-0021-GE-REP-0001 Rev B).
- 3) AECOM (2012b) Wheatstone Social Infrastructure Development Onslow Water Plant Alternative Water Supply Options -Identification of Sources and Reliability Assessment (Document reference 60218469-0021-CI-REP-0002 Rev 0).
- 4) Email From: Blight, Nathan [AECOM Australia Pty Ltd] [mailto:NQEP@chevron.com] Sent: Wednesday, 23 May 2012 1:30 PM, To: Ansted, Adam, Subject: RFI Template and Well layout.
- 5) Water Corporation, 2011, Onslow Water Supply 2022 Scheme Concept.
- 6) AECOM (2012c) Wheatstone Social Infrastructure - Basis of Order of Probable Cost for New Onslow SWRO Water Treatment Plant (Document reference 60218469-0021-GE-REP-0003).

Appendix A

# Drawings and Schedule

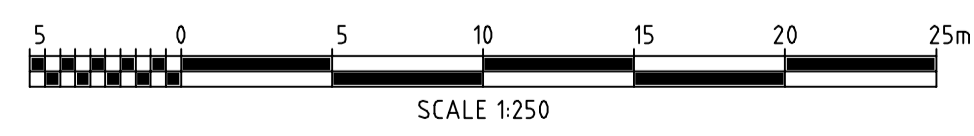




**SITE PLAN**  
SCALE: 1:250

**NOTES**

- DRAWING SHOWS AN INDICATIVE LAYOUT FOR A BRACKISH WATER REVERSE OSMOSIS DESALINATION PLANT FOR FOOTPRINT PURPOSES. THE SITE IS YET TO BE ADVISED.
- COOLING TOWERS ARE REQUIRED TO REDUCE FEEDWATER FROM 60°C TO APPROXIMATELY 35°C.



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CONSTRUCTION PURPOSES

REVISIONS	DATE	BY	DESCRIPTION	APPD	DRG. No	TITLE
A	21.06.12	DT	ISSUED FOR COMMENT			

This drawing is confidential and shall only be used for the purposes of this project. The signing of this title block confirms the design and drafting of this project have been prepared and checked in accordance with the AECOM Quality Assurance system to ISO 9001-2000.

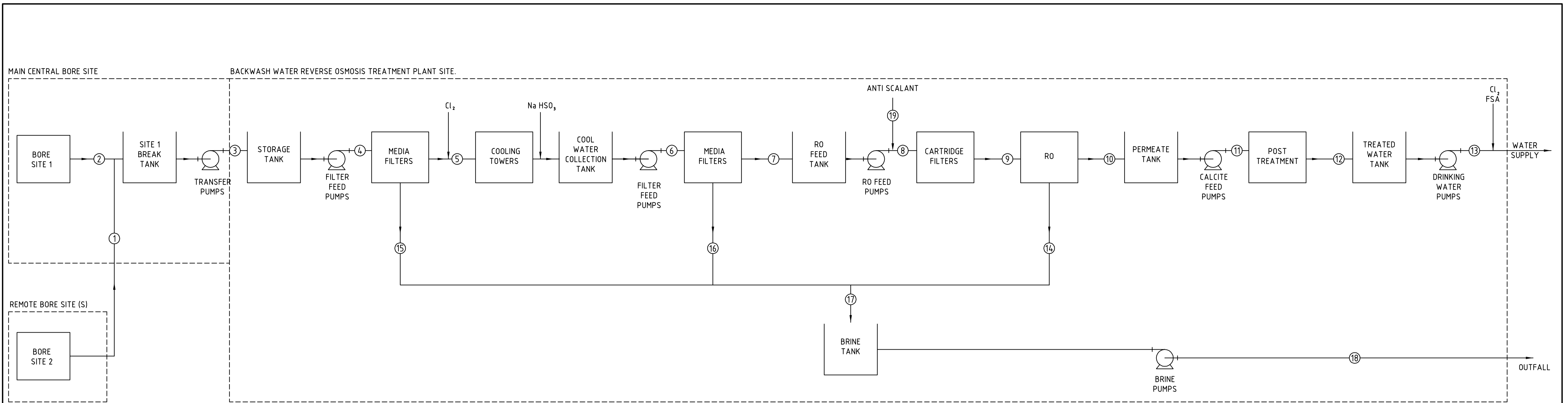
DESIGNED	A ANSTED	CHECKED	P GREEN
DRAWN	D TAYLOR	CHECKED	C HICK
APPROVED	D FARREL	DATE	21.06.12
Datum		Survey	

**AECOM**

AECOM Australia Pty Ltd A.B.N. 20 093 846 925

Client  
**CHEVRON AUSTRALIA**

<b>NEW ONSLOW WATER PLANT</b>	
<b>BIRDRONG AQUIFER SOURCE BWRO DESALINATION PLANT</b>	
<b>2ML/d SITE LAYOUT</b>	
Scale A1-1:250	Scale A3-1:500
Dwg No 60265213-0036-GE-SKT-0001	Rev A



Stream No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Process Fluid	Raw Groundwater	Raw Groundwater	Storage Tank Feedwater	Media Filters Feedwater	Cooling Tower Feedwater	Media Filters	RO Feed Tank Feedwater	Cartridge Filters Feedwater	RO Feedwater	Permeate Tank Feedwater	Post Treatment Feedwater	Stabilised Water	Product Water	RO Reject	Media Filters Backwash	Media Filter Backwash	Reject Water	Outfall
Design Flow (m <sup>3</sup> /h)	71	71	143	143	142	136	135	135	135	87	85	85	85	50	45	45	50	50
Pressure (m)	35	35	35	30	5		5	30	300	5	5	10	15	5	5	5	5	30
Notes	Refer to notes 1 & 2	Refer to notes 1 & 2	Refer to notes 1 & 3	Refer to note 4		Refer to note 5		Pressure depends on cartridge filters manufacturer		Refer to note 6	2m <sup>3</sup> /h for miscellaneous process use		Pressure depends on distribution length and location	Refer to note 6	Refer to note 7	Refer to note 7		Pressure depends on length of outfall

**NOTES:**

- PRESSURES NOMINATED ARE PRELIMINARILY AND BASED ON LEVEL GROUND.
- IT IS ASSUMED THERE IS NO MORE THAN 1km SEPARATION BETWEEN THE BORES, AND THAT BOTH BORES HAVE AN EFFECTIVE HYDROSTATIC WATER LEVEL OF -10m.
- IT IS ASSUMED THERE IS 12km SEPARATION BETWEEN THE BORE TRANSFER PUMPS AND THE TREATMENT PLANT SITE.
- A FILTER FEED PRESSURE OF 3bar IS ASSUMED, AND A 5m STATIC HEAD TO THE TOP OF THE COOLING TOWER.
- IT IS ASSUMED THERE WILL BE 5% LOSSES IN THE COOLING WATER.
- A RECOVERY OF 65% IS ASSUMED.
- BACKWASH FLOW WILL BE INTERMITTENT.

**PRELIMINARY COPY**  
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REVISIONS <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th>No.</th> <th>BY</th> <th>DATE</th> <th>DESCRIPTION</th> <th>APPD</th> <th>DRG. No</th> <th>TITLE</th> </tr> <tr> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> </tr> </table>	No.	BY	DATE	DESCRIPTION	APPD	DRG. No	TITLE								REFERENCE DRS: <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td> </td> <td> </td> <td> </td> <td> </td> </tr> </table>					<p style="font-size: small;">This drawing is confidential and shall only be used for the purposes of this project. The signing of this title block confirms the design and drafting of this project have been prepared and checked in accordance with the AECOM Quality Assurance system to ISO 9001-2000.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td>DESIGNED</td> <td>A ANSTED</td> <td>CHECKED</td> <td>P GREEN</td> </tr> <tr> <td>DRAWN</td> <td>D TAYLOR</td> <td>CHECKED</td> <td>C HICK</td> </tr> <tr> <td>APPROVED</td> <td>D FARREL</td> <td>DATE</td> <td>21.06.12</td> </tr> <tr> <td>Datum</td> <td colspan="3">Survey</td> </tr> </table>	DESIGNED	A ANSTED	CHECKED	P GREEN	DRAWN	D TAYLOR	CHECKED	C HICK	APPROVED	D FARREL	DATE	21.06.12	Datum	Survey			 AECOM Australia Pty Ltd A.B.N. 20 093 846 925	Client <b>CHEVRON AUSTRALIA</b>	<b>NEW ONSLOW WATER PLANT</b> BIRDROG AQUIFER SOURCE BORE WRO DESALINATION PLANT PROCESS FLOW DIAGRAM (PFD) 2ML/d Scale: NTS NTS Dwg No: 60265213-0036-PR-SKT-0001 Rev: A
No.	BY	DATE	DESCRIPTION	APPD	DRG. No	TITLE																																	
DESIGNED	A ANSTED	CHECKED	P GREEN																																				
DRAWN	D TAYLOR	CHECKED	C HICK																																				
APPROVED	D FARREL	DATE	21.06.12																																				
Datum	Survey																																						



## Basis for Level 1 Schedule Preparation – Birdrong Aquifer Source

Task ID	Basis
General	No allowance has been made for weather induced schedule impacts
General	Schedule is based on accommodation not being limiting factor in productivity or manning
2	A nominal FEED start date has been chosen as Monday 3 September
6,8,10	Bores are constructed, bore and aquifer yield confirmed, and initial water quality analysis conducted prior to FEED commencement.
3-18	Assume key decisions are made and Basis of Design complete by FEED. This corresponds to Phase 1 and Phase 2 of Chevron's project framework being completed. No time has been allowed for a site selection study.
17	Assumes Approvals process proceeds concurrently with FEED and is completed within two years.
20-21	One year of groundwater monitoring and seawater has been allowed for. These may not be required if Chevron has detailed water quality and groundwater level data or a robust pre treatment system design is selected in the absence of water quality knowledge.
24	Six months has been allowed for FEED phase.
30	Evaluation and selection of key equipment vendors and implementation and execution plans to run concurrently with FEED.
33	Two months allowed for Chevron and Water Corporation review and approval of FEED. No further significant Water Corporation reviews after this phase have been allowed for. Phase 3 of Chevron's project framework to be closed out after this period.
38	28 weeks of detailed design allowed
45	Assumes max 12 month lead-time for equipment.
56	Based on no construction occurring before approvals and licences have been granted
59	24 weeks for borefield supply pipeline construction.
63	Assumed that the supply infrastructure tanks will be pre fabricated wherever possible. An elevated steel tank has been assumed. Architectural design, if required, will be substantially more expensive and require a much greater lead time. The base case assumes that the tanks, pipeline and pump station will be on Water Corporation land and no significant Works Approvals will be needed.
67-76	Construction of treatment plant assumed to take 60 weeks (WC advised 12-18 months).
45	Currently 12 weeks detailed design allowed for before procurement commences. Unless approvals are brought forward, bringing procurement forward will not condense schedule.
79,82	Time to install subsea pipe and diffusers depends on length and size of outfall required and composition of seafloor.
85	14 weeks allowed for commissioning and handover of treatment plant

Appendix B

# Order of Probable Costs

# Wheatstone Project



## Order of Probable Cost (+/-50%) for Onslow BWRO Water Treatment Plant

Prepared by: Cassie Lowry / Ying Yu/Lorenzo Mascaro  
 Reviewed by: Paul Green / Martin Andrews  
 Authorised by: Laurence McCarthy

Issue Date: 27 June 2012

OVERALL SUMMARY FOR BASE CASE 2ML/D BWRO DESALINATION PLANT AND ASSOCIATED INFRASTRUCTURE		
Part	Description	Total Cost
<b>1</b>	<b>BOREHOLE &amp; OUTFALL SYSTEMS AND DOWNSTREAM PIPELINE</b>	
<b>Outfall Pipeline</b>		
	Option 1 Open Cut Trench (On Land) (\$/km)	\$ 168,244
	Option 2 Microtunnelling (\$/km)	N/A
	Option 3 Laying pipe on seabed with anchors (\$/km)	\$ 1,227,625
	Option 4a Installation Cost of Horizontal Directional Drilling (\$/km)	\$ 4,726,885
	Option 4b Mobilisation & Demobilisation Cost for Horizontal Directional Drilling	\$ 750,200
<b>Borehole Transfer Pipeline</b>		
	Transfer from Remote Borehole Site to Transfer Pumping Station (\$/km)	\$ 205,679
	Transfer from Pumping Station to RO Plant (\$/km)	\$ 251,985
<b>Downstream Pipeline</b>		
	Downstream Distribution Pipeline (\$/km)	\$ 157,649
<b>Other Infrastructure</b>		
	Remote Borehole Site Infrastructure	\$ 867,836
	Transfer Pumping Station Infrastructure	\$ 2,079,954
	Sea Outfall Pumping Station	\$ 217,651
	Brine Diffuser	\$ 89,604
	Electrical & Instrumentation for Both Bore Sites	\$ 784,140
<b>2</b>	<b>TREATMENT PLANT WORKS</b>	<b>\$ 18,643,283</b>
<b>3</b>	<b>DOWNSTREAM POTABLE WATER SUPPLY INFRASTRUCTURE</b>	<b>\$ 6,349,166</b>

OVERALL SUMMARY FOR 2ML/D EXPANDABLE TO 4ML/D BWRO DESALINATION PLANT AND ASSOCIATED INFRASTRUCTURE		
Part	Description	Total Cost
<b>1</b>	<b>BOREHOLE &amp; OUTFALL SYSTEMS AND DOWNSTREAM PIPELINE</b>	
<b>Outfall Pipeline</b>		
	Option 1 Open Cut Trench (On Land) (\$/km)	\$ 205,679
	Option 2 Microtunnelling (\$/km)	N/A
	Option 3 Laying pipe on seabed with anchors (\$/km)	\$ 1,257,324
	Option 4a Installation Cost of Horizontal Directional Drilling (\$/km)	\$ 4,756,584
	Option 4b Mobilisation & Demobilisation Cost for Horizontal Directional Drilling	\$ 750,200
<b>Borehole Transfer Pipeline</b>		
	Transfer from Remote Borehole Site to Transfer Pumping Station (\$/km)	\$ 205,679
	Transfer from Pumping Station to RO Plant (\$/km)	\$ 379,086
<b>Downstream Pipeline</b>		
	Downstream Distribution Pipeline (\$/km)	\$ 248,694
<b>Other Infrastructure</b>		
	Remote Borehole Site Infrastructure	\$ 867,836
	Transfer Pumping Station Infrastructure	\$ 2,272,927
	Sea Outfall Pumping Station	\$ 217,651
	Brine Diffuser	\$ 126,558
	Electrical & Instrumentation for Both Bore Sites	\$ 907,440
<b>2</b>	<b>TREATMENT PLANT WORKS</b>	<b>\$ 19,548,981</b>
<b>3</b>	<b>DOWNSTREAM POTABLE WATER SUPPLY INFRASTRUCTURE</b>	<b>\$ 6,349,166</b>

Note: This Order of Probable Cost Breakdown Spreadsheet shall be read in conjunction with the Basis of Order of Probable Cost for New Onslow BWRO Water Treatment Plant (Chevron Document No: WS0-9210-SIF-RPT-AEC-000-00007-000)

Wheatstone Project

Order of Probable Cost (+/-50%) for Onslow BWRO Water Treatment Plant



Detailed Build Up for Intake Bores, Sea Outfall Systems and Downstream Distribution Pipeline - Base Case 2ML/D															
Item	Description	REMOTE BOREHOLE SITE TO TRANSFER PUMPING STATION DN200 HDPE				TRANSFER PUMPING STATION TO RO PLANT DN250 PN12.5 HDPE			OUTFALL PIPE DN160 PN12.5 HDPE			DOWNSTREAM DISTRIBUTION PIPELINE DN150 PN12 PVC-M			Comments
		Unit	Quantity	Rate	Total Cost	Quantity	Rate	Total Cost	Quantity	Rate	Total Cost	Quantity	Rate	Total Cost	
1	DESIGN, DOCUMENTATION, PROJECT MANAGEMENT & COMMISSIONING														
	Percentage of Base Estimate (This percentage is included in each item below)	%					24.0								
1	DESIGN, DOCUMENTATION, PROJECT MANAGEMENT & COMMISSIONING	Total Carried to Summary				\$ -									
2	PIPE SUPPLY AND DELIVERY														
	Nominal Pipe Size	MM	200			250			160			150			
	Supply of Pipe	M	1000	\$ 31	\$ 31,003	1000	\$ 44	\$ 44,496	1000	\$ 20	\$ 19,828	1000	\$ 16	\$ 16,300	
	Delivery Cost	LOT	1	\$ 12,401	\$ 12,401	1	\$ 17,798	\$ 17,798	1	\$ 7,931	\$ 7,931	1	\$ 6,520	\$ 6,520	
	Preliminaries Cost	LOT	1	\$ 10,417	\$ 10,417	1	\$ 14,951	\$ 14,951	1	\$ 6,662	\$ 6,662	1	\$ 5,477	\$ 5,477	
2	PIPE SUPPLY AND DELIVERY	Total Carried to Summary				\$ 53,821			\$ 77,245			\$ 28,297			
3	PIPE JOINTS														
	Pipe Joints	NO.	167	\$ 249	\$ 41,523	167	\$ 311	\$ 51,904	167	\$ 199	\$ 33,218	167	\$ 186	\$ 31,142	
	Preliminaries Cost	LOT	1	\$ 9,965	\$ 9,965	1	\$ 12,457	\$ 12,457	1	\$ 7,972	\$ 7,972	1	\$ 7,474	\$ 7,474	
3	PIPE JOINTS	Total Carried to Summary				\$ 51,488			\$ 64,360			\$ 41,191			
4	PIPELINE INSTALLATION														
4.1	Option 1 Open Cut Trench (ON LAND)														
	Pipe excavation	CM	1283	\$ 33	\$ 42,446	1418	\$ 33	\$ 46,911	1180	\$ 33	\$ 39,033	1155	\$ 33	\$ 38,202	
	Backfill & Reinstatement	CM	1252	\$ 16	\$ 19,718	1369	\$ 16	\$ 21,566	1160	\$ 16	\$ 18,270	1137	\$ 16	\$ 17,913	
	Imported Fill	CM	376	\$ 50	\$ 18,779	411	\$ 50	\$ 20,539	348	\$ 50	\$ 17,400	341	\$ 50	\$ 17,060	
	Preliminaries Cost	LOT	1	\$ 19,426	\$ 19,426	1	\$ 21,364	\$ 21,364	1	\$ 17,929	\$ 17,929	1	\$ 17,562	\$ 17,562	
4.1	TOTAL INSTALLATION COST FOR OPTION 1	Total Carried to Summary				\$ 100,369			\$ 110,379			\$ 92,633			
4.2	Option 2 Microtunnelling	NOT VIABLE													
4.3	Option 3 Laying Pipes on Seabed with Anchors														
	Supply and Delivery Flexmat	TONNE							100	\$ 1,000	\$ 100,000				
	Marine Installation of HDPE pipeline and Flexmat	LOT	1	\$ 570,585	\$ 570,585										
	Surveyors during installation	LOT	1	\$ 174,000	\$ 174,000										
	Preliminaries Cost	LOT	1	\$ 202,700	\$ 202,700										
	Contractor mark up	LOT	1	\$ 104,729	\$ 104,729										
4.3	TOTAL INSTALLATION COST FOR OPTION 3	Total Carried to Summary				\$ 779,214			\$ 1,152,014						
4.4	Option 4 Horizontal Directional Drilling														
	Mobilisation & Demobilisation	LOT	1	\$ 550,000	\$ 550,000										
	Preliminaries Cost for mobilisation & demobilisation	LOT	1	\$ 132,000	\$ 132,000										
	Contractor mark up	LOT	1	\$ 68,200	\$ 68,200										
	Total Mobilisation & Demobilisation Cost					\$ 750,200									
	Drill & install the pipeline	LOT	1	\$ 3,000,000	\$ 3,000,000										
	Offshore divers cost during installation	DAYS	21	\$ 10,000	\$ 210,000										
	Vessel Cost	DAYS	21	\$ 9,525	\$ 200,025										
	Preliminaries Cost	LOT	1	\$ 818,406	\$ 818,406										
	Contractor mark up	LOT	1	\$ 422,843	\$ 422,843										
4.4	TOTAL INSTALLATION COST FOR OPTION 4 (\$/km Excluding Mob & Demob)	Total Carried to Summary				\$ 4,651,274									
5	SEA OUTFALL PUMPING STATION														
	Supply, delivery and construction of pumping station	LOT	1	\$ 175,525	\$ 175,525										
	Preliminaries Cost	LOT	1	\$ 42,126	\$ 42,126										
5	SEA OUTFALL PUMPING STATION	Total Carried to Summary				\$ 217,651									
6	BRINE DIFFUSER														
	Supply Pipe with 2 no. of DN50 nozzle (DN160 PN12.5 HDPE)	M	6	\$ 79	\$ 476										
	Delivery Cost	LOT	1	\$ 190	\$ 190										
	Supply & Delivery of Duckbill Valve	NO	2	\$ 2,000	\$ 4,000										
	Supply and Delivery Flexmat	TONNE	2	\$ 1,000	\$ 2,000										

Basis of Order of Probable Cost					
Basis of Rate	Plant Capacity of Referenced Rate	Source of Referenced Rate	Location of Reference Rate	Base Date of Reference Rate	Costs Covered
1.Design and documentation to completion - 7% of the base estimate is assumed 2.Project Management - 5% of the base estimate is assumed 3.Construction Administration - 5% of the base estimate is assumed 4.Insurance and Performance Bond - 1.5% of the base estimate is assumed 5.Vendor Repts - 0.5% of the base estimate is assumed 6.Commissioning - 5% of the base estimate is assumed	1ML/d SWRO Desalination Plant	+30/-20% cost estimate (completed by estimator)	Near Karratha. The SWRO plant is to be built at existing oil & gas operation plant with port facility	Mar-11	as stated in basis of rate
Ex factory rate is based on Vinindex for PE and Iplex for PVC-M budget price	N/A		N/A	Jun-11	supply cost only
40% is estimated in an order of magnitude					delivery and contractor's mark up
\$/joint=6.4 hrs/joint*dia/1000 x \$185/hr*(1+5%) was based on a budget estimate for a 10ML/d desalination plant with DN1000 pipe	10ML/d SWRO Desalination Plant	Pro-rated based on actual diameters	Near Geraldton. Green field site	Jul-10	labour and equipment cost
Rates were based on the estimate of approx 1000m3 excavation for a 10ML/d plant intake/outfall system	10ML/d SWRO Desalination Plant	-	Near Geraldton. Green field site	Jul-10	labour and equipment cost
Estimator's rate					
Indicative verbal quotation from Flexmat Contractor	-	-	Onslow	Mar-12	
Indicative budget quotation from marine contractor (Oceanic Offshore) dated on 2/4/2012	-	-	Onslow	Apr-12	Include total marine installation cost for HDPE pipeline and flexmat from LAT level to the end of pipeline. The section of pipeline between LAT and the pipe end onland was not covered in this quotation.
Indicative verbal quotation from Contractor	-	-	Onslow	Apr-12	Include the surveyor labour and equipment cost throughout the pipeline installation. The pre-lay and post-lay survey costs were not covered in the estimate
Indicative budget quotation from contractor (LAE) dated on 3/4/2012	-	-	Onslow	Apr-12	Include total Installation cost using HDD for HDPE pipeline from a launching pit onland to the end of pipeline. The section of pipeline between launching pit and the pipe end onland was not covered in this quotation.
Use the same rate as the quotation for laying pipe on seabed. The installation duration was advised by HDD contractor	-	-	Onslow	Apr-12	
\$100,300 estimated for 1ML/d plant. 75% increase to 1ML/d estimate		Pro-rated based on plant size	Near Karratha. The SWRO plant is to be built at existing oil & gas operation plant with port facility	Apr-11	Include onshore brine pumps, pipeworks and pump slabs.
4 times of plain pipe supply cost					
Indicative verbal quotation from Flexmat Contractor	-	-	Onslow	Mar-12	

Wheatstone Project

Order of Probable Cost (+/-50%) for Onslow BWRO Water Treatment Plant



Detailed Build Up for Intake Bores, Sea Outfall Systems and Downstream Distribution Pipeline - Base Case 2ML/D															
Item	Description	REMOTE BOREHOLE SITE TO TRANSFER PUMPING STATION DN200 HDPE				TRANSFER PUMPING STATION TO RO PLANT DN250 PN12.5 HDPE			OUTFALL PIPE DN160 PN12.5 HDPE			DOWNSTREAM DISTRIBUTION PIPELINE DN150 PN12 PVC-M			Comments
		Unit	Quantity	Rate	Total Cost	Quantity	Rate	Total Cost	Quantity	Rate	Total Cost	Quantity	Rate	Total Cost	
	Marine Installation of Brine Diffuser and Flexmat	DAYS							3	\$ 19,675	\$ 59,026				Use the quotation for marine installation of pipeline as the reference to determine the \$/day for marine installation. Including the costs for mobilisation, demobilisation, vessel (Oceanic Dive Support Vessel 20m Mary V), divers, equipment & consumables, administration. Assume all diving operation are conducted in accordance with AS2299 only (no Client standard allowed for). 5 days offshore installation is assumed.
	Preliminaries Cost	LOT							1	\$ 15,766	\$ 15,766				
	Contractor mark up	LOT							1	\$ 8,146	\$ 8,146				Assume 10% contractor mark up
<b>6</b>	<b>Brine Diffuser</b>	<b>Total Carried to Summary</b>									<b>\$ 89,604</b>				
<b>7</b>	<b>Transfer Pumping Station Infrastructure</b>														
	Bore pump	LOT				1	\$ 84,000	\$ 84,000							Including pumps, riser supply and installation 1 x 20L/s @ 36m. Markup total of 40% on supply and install.
	Raw water tank (300 m3)	NO.				1	\$ 298,924	\$ 298,924							Assume total mark up 40% on supply, delivery and installation quote from tank supplier. 40% includes 20% uplift for craning into position, 10% for miscellaneous steel supports etc. and 10% for contractor's mark up. The supply and delivery cost is based on Permastore glass-fused-to-steel tank quotations from supplier. The cost also includes the concrete base, grout and foundation bolts.
	Transfer pump	LOT				1	\$ 84,000	\$ 84,000							40L/s @ 35m. Assume 40% markup.
	Pump/Electrical Slab and Enclosure	SM				60	\$ 4,000	\$ 240,000							
	Hardstand	CM				280	\$ 1,289	\$ 360,920							200mm thick RC. Includes generator/fuel tank and truck turnaround
	Fuel tank	LOT				1	\$ 55,000	\$ 55,000							15kL Type 2 self-bunded wrap tank
	Secure Fencing	LM				280	\$ 200	\$ 56,000							chainwire 2100mm high
	Level and compact site	SM				4900	\$ 11	\$ 53,900							
	Gate	EA				2	\$ 3,719	\$ 7,438							
	Pavement	CM				25	\$ 688	\$ 17,200							
	Area lighting	EA				8	\$ 15,000	\$ 120,000							Pole every 20m
	Drainage	LOT				1	\$ 300,000	\$ 300,000							
	Preliminaries Cost	LOT				1	\$ 402,572	\$ 402,572							
<b>7</b>	<b>Transfer Pumping Station Infrastructure</b>	<b>Total Carried to Summary</b>						<b>\$ 2,079,954</b>							
<b>8</b>	<b>Remote Borehole Site Infrastructure</b>														
	Bore pump	LOT	1	\$ 84,000	\$ 84,000										Including pumps, riser supply and installation 1 x 20L/s @ 36m. Markup total of 40% on supply and install.
	1km Gravel Road - 6m wide	LM	1000	\$ 525	\$ 525,000										
	Secure Fencing	LM	100	\$ 200	\$ 20,000										chainwire 2100mm high
	Gate	EA	2	\$ 3,719	\$ 7,438										
	Level and compact site	SM	625	\$ 11	\$ 6,875										
	Hardstand	CM	19	\$ 1,289	\$ 24,491										
	Pavement	CM	3	\$ 688	\$ 2,064										
	Area lighting	EA	2	\$ 15,000	\$ 30,000										
	Preliminaries Cost	LOT	1	\$ 167,968	\$ 167,968										
<b>8</b>	<b>Remote Borehole Site Infrastructure</b>	<b>Total Carried to Summary</b>						<b>\$ 867,836</b>							
<b>9</b>	<b>Electrical &amp; Instrumentation for Both Bore Sites</b>														
	Electrical - supply and installation	LOT	1	\$ 380,880	\$ 380,880										Internal Estimate
	Instrumentation and controls - supply and installation	LOT	1	\$ 403,260	\$ 403,260										Internal Estimate
<b>9</b>	<b>Electrical &amp; Instrumentation for Both Bore Sites</b>	<b>Total Carried to Summary</b>						<b>\$ 784,140</b>							

Basis of Order of Probable Cost					
Basis of Rate	Plant Capacity of Referenced Rate	Source of Referenced Rate	Location of Reference Rate	Base Date of Reference Rate	Costs Covered
Indicative budget quotation from marine contractor (Oceanic Offshore) dated on 2/4/2012	-	Pro-rated based on no. of installation days	Onslow	Apr-12	
Based on verbal Grundfos estimate. Submers 904L both pump and motor 13kW higher motor rating for inc. temp - 25k, riser piping - 10k, Installation 25k.					
Permastore quote		Budget quotation	Onslow	Mar-12	
Based on verbal Tyco estimate. Seawater pump Tyco - 45k, pipework/valves 15k					
Based on site layout drawing					
DTE verbal budget estimate - tank 30k, delivery 5k, craning/offloading and pipework to genset 20k					
Entire plant site 70 x 70m					
Allowance 5% of site area					
General allowance based on similar project					
General allowance based on similar project					
Supply of Grundfos submers 904L both pump and motor 13kW higher motor rating for inc. temp - 25k, Installation 35k. Verbal budget estimate from Grundfos.					
5m wide standard gravel \$450-600/m based on good ground conditions					
Entire plant site 25 x 25m					
General allowance based on similar project					
Pole every 20m					
Internal Estimate					
Internal Estimate					



Wheatstone Project

Order of Probable Cost (+/-50%) for Onslow BWRO Water Treatment Plant



Detailed Build Up for Intake Bores, Sea Outfall Systems and Downstream Distribution Pipeline - 2ML/D Expandable To 4ML/D															
Item	Description	REMOTE BOREHOLE SITE TO TRANSFER PUMPING STATION DN200 HDPE				TRANSFER PUMPING STATION TO RO PLANT DN355 PN12.5 HDPE			OUTFALL PIPE DN200 PN12.5 HDPE			DOWNSTREAM DISTRIBUTION PIPELINE DISTRIBUTION PIPELINE DN250 PN12 PVC-M			Comments
		Unit	Quantity	Rate	Total Cost	Quantity	Rate	Total Cost	Quantity	Rate	Total Cost	Quantity	Rate	Total Cost	
<b>1</b>	<b>DESIGN, DOCUMENTATION, PROJECT MANAGEMENT &amp; COMMISSIONING</b>														
	Percentage of Base Estimate (This percentage is included in each item below)	%				24.0									
<b>1</b>	<b>DESIGN, DOCUMENTATION, PROJECT MANAGEMENT &amp; COMMISSIONING</b>	<b>Total Carried to Summary</b>													
<b>2</b>	<b>Pipe Supply and Delivery</b>														
	Nominal Pipe Size	MM	200			355			200			250			
	Supply of Pipe	M	1000	\$ 31	\$ 31,003	1000	\$ 89	\$ 89,322	1000	\$ 31	\$ 31,003	1000	\$ 43	\$ 42,600	
	Delivery Cost	LOT	1	\$ 12,401	\$ 12,401	1	\$ 35,729	\$ 35,729	1	\$ 12,401	\$ 12,401	1	\$ 17,040	\$ 17,040	
	Preliminaries Cost	LOT	1	\$ 10,417	\$ 10,417	1	\$ 30,012	\$ 30,012	1	\$ 10,417	\$ 10,417	1	\$ 14,314	\$ 14,314	
<b>2</b>	<b>PIPE SUPPLY AND DELIVERY</b>	<b>Total Carried to Summary</b>				<b>\$ 155,062</b>			<b>\$ 53,821</b>			<b>\$ 73,954</b>			
<b>3</b>	<b>Pipe Joints</b>														
	Pipe Joints	NO.	167	\$ 249	\$ 41,523	167	\$ 441	\$ 73,703	167	\$ 249	\$ 41,523	167	\$ 311	\$ 51,904	
	Preliminaries Cost	LOT	1	\$ 9,965	\$ 9,965	1	\$ 17,689	\$ 17,689	1	\$ 9,965	\$ 9,965	1	\$ 12,457	\$ 12,457	
<b>3</b>	<b>PIPE JOINTS</b>	<b>Total Carried to Summary</b>				<b>\$ 91,392</b>			<b>\$ 51,488</b>			<b>\$ 64,360</b>			
<b>4</b>	<b>Pipeline Installation</b>														
<b>4.1</b>	<b>Option 1 Open Cut Trench (ON LAND)</b>														
	Pipe excavation	CM	1283	\$ 33	\$ 42,446	1724	\$ 33	\$ 57,006	1283	\$ 33	\$ 42,446	1419	\$ 33	\$ 46,911	
	Backfill & Reinstatement	CM	1252	\$ 16	\$ 19,718	1625	\$ 16	\$ 25,587	1252	\$ 16	\$ 19,718	1369	\$ 16	\$ 21,566	
	Imported Fill	CM	376	\$ 50	\$ 18,779	487	\$ 50	\$ 24,368	376	\$ 50	\$ 18,779	411	\$ 50	\$ 20,539	
	Preliminaries Cost	LOT	1	\$ 19,426	\$ 19,426	1	\$ 25,671	\$ 25,671	1	\$ 19,426	\$ 19,426	1	\$ 21,364	\$ 21,364	
<b>4.1</b>	<b>TOTAL INSTALLATION COST FOR OPTION 1</b>	<b>Total Carried to Summary</b>				<b>\$ 100,369</b>			<b>\$ 132,631</b>			<b>\$ 110,379</b>			
<b>4.2</b>	<b>Option 2 Microtunnelling</b>	<b>NOT VIABLE</b>													
<b>4.3</b>	<b>Option 3 Laying Pipes on Seabed with Anchors</b>														
	Supply and Delivery Flexmat	TONNE							100	\$ 1,000	\$ 100,000.00				
	Marine Installation of HDPE pipeline and Flexmat	LOT							1	\$ 570,585	\$ 570,585.00				
	Surveyors during installation	LOT							1	\$ 174,000	\$ 174,000.00				
	Preliminaries Cost	LOT							1	\$ 202,700	\$ 202,700				
	Contractor mark up	LOT							1	\$ 104,729	\$ 104,729				
<b>4.3</b>	<b>TOTAL INSTALLATION COST FOR OPTION 3</b>	<b>Total Carried to Summary</b>							<b>\$ 1,152,014</b>						
<b>4.4</b>	<b>Option 4 Horizontal Directional Drilling</b>														
	Mobilisation & Demobilisation	LOT							1	\$ 550,000	\$ 550,000				
	Preliminaries Cost for mobilisation & demobilisation	LOT							1	\$ 132,000	\$ 132,000				
	Contractor mark up	LOT							1	\$ 68,200	\$ 68,200				
	<b>Total Mobilisation &amp; Demobilisation Cost</b>	<b>Total Carried to Summary</b>							<b>\$ 750,200</b>						
	Drill & install the pipeline	LOT							1	\$ 3,000,000	\$ 3,000,000				
	Offshore divers cost during installation	DAYS							21	\$ 10,000	\$ 210,000				
	Vessel Cost	DAYS							21	\$ 9,525	\$ 200,025				
	Preliminaries Cost	LOT							1	\$ 818,406	\$ 818,406				
	Contractor mark up	LOT							1	\$ 422,843	\$ 422,843				
<b>4.4</b>	<b>TOTAL INSTALLATION COST FOR OPTION 4 (\$/km Excluding Mob &amp; Demob)</b>	<b>Total Carried to Summary</b>							<b>\$ 4,651,274</b>						
<b>5</b>	<b>Sea Outfall Pumping Station</b>														
	Supply, delivery and construction of pumping station	LOT							1	\$ 175,525	\$ 175,525				
	Preliminaries Cost	LOT							1	\$ 42,126	\$ 42,126				
<b>5</b>	<b>Sea Outfall Pumping Station</b>	<b>Total Carried to Summary</b>							<b>\$ 217,651</b>						
<b>6</b>	<b>Brine Diffuser</b>														
	Supply Pipe with 4 no. of DN50 nozzle (DN200 PN12.5 HDPE)	M							12	\$ 124	\$ 1,488				
	Delivery Cost	LOT							1	\$ 595	\$ 595				
	Supply & Delivery of Duckbill Valve	NO							4	\$ 2,000	\$ 8,000				
	Supply and Delivery Flexmat	TONNE							4	\$ 1,000	\$ 4,000				

Basis of Order of Probable Cost					
Basis of Rate	Plant Capacity of Referenced Rate	Source of Referenced Rate	Location of Reference Rate	Base Date of Reference Rate	Costs Covered
1.Design and documentation to completion - 7% of the base estimate is assumed 2.Project Management - 5% of the base estimate is assumed 3.Construction Administration - 5% of the base estimate is assumed 4.Insurance and Performance Bond - 1.5% of the base estimate is assumed 5.Vendor Repts - 0.5% of the base estimate is assumed 6.Commissioning - 5% of the base estimate is assumed	1ML/d SWRO Desalination Plant	+30/-20% cost estimate (completed by estimator)	Near Karratha. The SWRO plant is to be built at existing oil & gas operation plant with port facility	Mar-11	as stated in basis of rate
Ex factory rate is based on Vinidex for PE and Iplex for PVC-M budget price 40% is estimated in an order of magnitude	N/A	-	N/A	Jun-11	supply cost only delivery and contractor's mark up
\$/joint=6.4 hrs/joint"dia/1000 x \$185/hr*(1+5%) was based on a budget estimate for a 10ML/d desalination plant with DN1000 pipe	10ML/d SWRO Desalination Plant	Pro-rated based on actual diameters	Near Geraldton. Green field site	Jul-10	labour and equipment cost
Rates were based on the estimate of approx 1000m3 excavation for a 10ML/d plant intake/outfall system Estimator's rate	10ML/d SWRO Desalination Plant	-	Near Geraldton. Green field site	Jul-10	labour and equipment cost
Indicative verbal quotation from Flexmat Contractor	-	-	Onslow	Mar-12	
Indicative budget quotation from marine contractor (Oceanic Offshore) dated on 2/4/2012	-	-	Onslow	Apr-12	Include total marine installation cost for HDPE pipeline and flexmat from LAT level to the end of pipeline. The section of pipeline between LAT and the pipe end onland was not covered in this quotation.
Indicative verbal quotation from Contractor	-	-	Onslow	Apr-12	Include the surveyor labour and equipment cost throughout the pipeline installation. The pre-lay and post-lay survey costs were not covered in the estimate
Indicative budget quotation from contractor (IAE) dated on 3/4/2012	-	-	Onslow	Apr-12	Include total installation cost using HDD for HDPE pipeline from a launching pit onland to the end of pipeline. The section of pipeline between launching pit and the pipe end onland was not covered in this quotation.
Use the same rate as the quotation for laying pipe on seabed. The installation duration was advised by HDD contractor	-	-	Onslow	Apr-12	
\$100,300 estimated for 1ML/d plant. 75% increase to 1ML/d estimate	-	Pro-rated based on plant size	Near Karratha. The SWRO plant is to be built at existing oil & gas operation plant with port facility	Apr-11	Include onshore brine pumps, pipeworks and pump slabs.
4 times plain pipe supply cost					
Indicative verbal quotation from Flexmat Contractor	-	-	Onslow	Mar-12	

Wheatstone Project



Order of Probable Cost (+/-50%) for Onslow BWRO Water Treatment Plant

Detailed Build Up for Intake Bores, Sea Outfall Systems and Downstream Distribution Pipeline - 2ML/D Expandable To 4ML/D															
Item	Description	REMOTE BOREHOLE SITE TO TRANSFER PUMPING STATION DN200 HDPE				TRANSFER PUMPING STATION TO RO PLANT DN355 PN12.5 HDPE			OUTFALL PIPE DN200 PN12.5 HDPE			DOWNSTREAM DISTRIBUTION PIPELINE DN250 PN12 PVC-M			Comments
		Unit	Quantity	Rate	Total Cost	Quantity	Rate	Total Cost	Quantity	Rate	Total Cost	Quantity	Rate	Total Cost	
	Marine Installation of Brine Diffuser and Flexmat	DAYS							4	\$ 19,675	\$ 78,701				Use the quotation for marine installation of pipeline as the reference to determine the \$/day for marine installation. Including the costs for mobilisation, demobilisation, vessel (Oceanic Dive Support Vessel 20m Mary V), divers, equipment & consumables, administration. Assume all diving operation are conducted in accordance with AS2299 only (no Client standard allowed for). 10 days offshore installation is assumed.
	Preliminaries Cost	LOT							1	\$ 22,268	\$ 22,268				
	Contractor mark up	LOT							1	\$ 11,505	\$ 11,505				Assume 10% contractor mark up
<b>6</b>	<b>Brine Diffuser</b>	<b>Total Carried to Summary</b>									<b>\$ 126,558</b>				
<b>7</b>	<b>Transfer Pumping Station Infrastructure</b>	<b>Total Carried to Summary</b>													
	Bore pump	LOT				1	\$ 84,000	\$ 84,000							Including pumps and riser supply and installation 1 x 20L/s @ 36m. Markup total of 40% on supply and install.
	Raw water tank (300 m3)	NO.				1	\$ 298,924	\$ 298,924							Assume total mark up 40% on supply, delivery and installation quote from tank supplier. 40% includes 20% uplift for craning into position, 10% for miscellaneous steel supports etc. and 10% for contractor's mark up. The supply and delivery cost is based on Permatstore glass-fused-to-steel tank quotations from supplier. The cost also includes the concrete base, grout and foundation bolts.
	Transfer pump	LOT				1	\$ 84,000	\$ 84,000							40L/s @ 35m. Assume 40% markup.
	Pump/Electrical Slab and Enclosure	SM				90	\$ 4,000	\$ 360,000							
	Hardstand	CM				296	\$ 1,289	\$ 381,544							200mm thick RC. Includes generator/fuel tank and truck turnaround
	Fuel tank	LOT				1	\$ 70,000	\$ 70,000							30KL Type 2 self-banded wrap tank
	Secure Fencing	LM				280	\$ 200	\$ 56,000							chainwire 2100mm high
	Level and compact site	SM				4900	\$ 11	\$ 53,900							
	Gate	EA				2	\$ 3,719	\$ 7,438							
	Pavement	CM				25	\$ 688	\$ 17,200							
	Area lighting	EA				8	\$ 15,000	\$ 120,000							Pole every 20m
	Drainage	LOT				1	\$ 300,000	\$ 300,000							
	Preliminaries Cost	LOT				1	\$ 439,921	\$ 439,921							
<b>7</b>	<b>Transfer Pumping Station Infrastructure</b>	<b>Total Carried to Summary</b>						<b>\$ 2,272,927</b>							
<b>8</b>	<b>Remote Borehole Site Infrastructure</b>	<b>Total Carried to Summary</b>													
	Bore pump	LOT	1	\$ 84,000	\$ 84,000										Including pumps and riser supply and installation 1 x 20L/s @ 36m. Markup total of 40% on supply and install.
	1km Gravel Road	LOT	1	\$ 525,000	\$ 525,000										
	Secure Fencing	LM	100	\$ 200	\$ 20,000										chainwire 2100mm high
	Gate	EA	2	\$ 3,719	\$ 7,438										
	Level and compact site	SM	625	\$ 11	\$ 6,875										
	Hardstand for electrical, mechanical	CM	19	\$ 1,289	\$ 24,491										
	Pavement	CM	3	\$ 688	\$ 2,064										
	Area lighting	EA	2	\$ 15,000	\$ 30,000										
	Preliminaries Cost	LOT	1	\$ 167,968	\$ 167,968										
<b>8</b>	<b>Remote Borehole Site Infrastructure</b>	<b>Total Carried to Summary</b>						<b>\$ 867,836</b>							
<b>9</b>	<b>Electrical &amp; Instrumentation for Both Bore Sites</b>	<b>Total Carried to Summary</b>													
	Electrical - supply and installation	LOT	1	\$ 413,380	\$ 413,380										
	Instrumentation and controls - supply and installation	LOT	1	\$ 494,060	\$ 494,060										
<b>9</b>	<b>Electrical &amp; Instrumentation for Both Bore Sites</b>	<b>Total Carried to Summary</b>						<b>\$ 907,440</b>							

Basis of Order of Probable Cost					
Basis of Rate	Plant Capacity of Referenced Rate	Source of Referenced Rate	Location of Reference Rate	Base Date of Reference Rate	Costs Covered
Indicative budget quotation from marine contractor (Oceanic Offshore) dated on 2/4/2012	-	Pro-rated based on no. of installation days	Onslow	Apr-12	
Based on verbal Grundfos estimate. Submers 904L both pump and motor 13kW higher motor rating for inc. temp - 25k, riser piping - 10k, Installation 25k.					
Permatstore quote		Budget quotation	Onslow	Mar-12	
Budget estimate seawater pump Tyco - 45k, pipework/valves 15k					
Based on site layout drawing					
Based on 300mm RC rate					
DTE verbal budget estimate - tank 45k, delivery 5k, craneage/offloading and pipework to genset 20k					
Entire plant site 70 x 70m					
Allowance 5% of site area					
General allowance based on similar project					
General allowance based on similar project					
Supply of Grundfos submers 904L both pump and motor 13kW higher motor rating for inc. temp - 25k, Installation 35k. Verbal budget estimate from Grundfos.					
6m wide standard gravel \$450-600/m based on good ground conditions					
Entire plant site 25 x 25m					
General allowance based on similar project					
Pole every 20m					
Internal Estimate					
Internal Estimate					

# Wheatstone Project



## Order of Probable Cost (+/-50%) for Onslow BWRO Water Treatment Plant

Detailed Build Up of Treatment Plant Works - Base Case 2ML/D						
Item	Description	Unit	Quantity	Rate	Total Cost	Comments
<b>1</b>	<b>DESIGN, DOCUMENTATION, PROJECT MANAGEMENT &amp; COMMISSIONING</b>					
	Design and documentation to completion	LOT	1		\$ 1,011,651	7% of the base estimate is assumed
	Project Management	LOT	1		\$ 722,608	5% of the base estimate is assumed
	Construction Administration	LOT	1		\$ 722,608	5% of the base estimate is assumed
	Insurance and Performance Bond	LOT	1		\$ 216,782	1.5% of the base estimate is assumed
	Vendor Reps	LOT	1		\$ 72,261	0.5% of the base estimate is assumed
	Commissioning	LOT	1		\$ 1,445,215.75	10% of base estimate is assumed
<b>1</b>	<b>DESIGN, DOCUMENTATION, PROJECT MANAGEMENT &amp; COMMISSIONING</b>	Total Carried to Summary			\$ 4,191,126	
<b>2</b>	<b>SITE WORKS</b>					
	Fencing	LM	380	\$ 200	\$ 76,000	Entire plant site 65m x 125m
	Gate	EA	2	\$ 3,719	\$ 7,439	Take off from preliminary site layout
	Pavements	CM	70	\$ 688	\$ 48,185	Take off from preliminary site layout
	Hardstand	CM	406	\$ 1,289	\$ 523,352	Take off from preliminary site layout
	Site Road Build All-in	SM	533	\$ 300	\$ 159,900	Take off from preliminary site layout
	Level and compact	SM	8125	\$ 11	\$ 89,713	
	Precast Drains including trenching	LOT	1	\$ 300,000	\$ 300,000	
	Area Lighting	EA	14	\$ 15,000	\$ 210,000	Assume one every 20m along site perimeter
<b>2</b>	<b>SITE WORKS</b>	Total Carried to Summary			\$ 1,414,589	
<b>3</b>	<b>TREATMENT PLANT PROCESS &amp; FACILITY</b>					
	Disk Filter feed pump sets	LOT	1	\$ 252,000	\$ 252,000	3 X
	Media Filters	LOT	1	\$ 990,000	\$ 990,000	2 No duty, 1 No standby
	Chlorination	LOT	1	\$ 400,000	\$ 400,000	Chlorination / Dechlorination building
	Cooling Towers	LOT	1	\$ 498,488	\$ 498,488	
	Disk Filter feed pump sets	LOT	1	\$ 252,000	\$ 252,000	3 X
	Media Filters	LOT	1	\$ 990,000	\$ 990,000	2 No duty, 1 No standby
	RO system	LOT	1	\$ 1,747,381	\$ 1,747,381	Order of magnitude Duty & Standby configuration. Including skids, pressure vessels, high pressure and low pressure pumps, cartridge filters, pipework, chemical dosing equipment etc
	Post treatment	LOT	1	\$ 576,146	\$ 576,146	Duty & Standby configuration. Includes chemical dosing
	Process pipeworks within the treatment plant	LOT	1	\$ 750,000	\$ 750,000	
<b>3</b>	<b>TREATMENT PLANT PROCESS &amp; FACILITY</b>	Total Carried to Summary			\$ 6,456,015	

Basis of Order of Probable Cost					
Basis of Rate	Plant Capacity of Referenced Rate	Source of Referenced Rate	Location of Reference Rate	Base Date of Reference Rate	Costs Covered
1. Design and documentation to completion - 7% of the base estimate is assumed 2. Project Management - 5% of the base estimate is assumed 3. Construction Administration - 5% of the base estimate is assumed 4. Insurance and Performance Bond - 1.5% of the base estimate is assumed 5. Vendor Reps - 0.5% of the base estimate is assumed 6. Commissioning - 10% of the base estimate is assumed	1ML/d SWRO Desalination Plant	+30/-20% cost estimate (completed by estimator)	Near Karratha. The SWRO plant is to be built at existing oil & gas operation plant with port facility	Mar-11	Supply & delivery, labour and contractor distributables
\$3,611 each gate estimated for 1ML/d SWRO plant Gate - Chain link double 2100mm high - 2x4m wide Apply 3% escalation rate on this estimate					
\$668.31/m3 estimated for 1ML/d SWRO plant Apply 3% escalation rate on this estimate					
\$1,251.5/m3 estimated for 1ML/d SWRO plant Apply 3% escalation rate on this estimate					
Average rate for bitumen road built up including kerbs and road markings					
\$10.72/m2 estimated for 1ML/d SWRO plant Apply 3% escalation rate on this estimate					
General allowance based on similar project					
General allowance based on similar project					
Budget estimate Tyco - supply, allow 40% for mark up and estimating allowance and 15k per pump for installation Amiad budget quotation - 40% uplift for mark up/estimating allowance and 150k allowance for installation Estimate from Previous project	1ML/d SWRO Desalination Plant	+30/-20% cost estimate (completed by estimator)	Near Karratha. The SWRO plant is to be built at existing oil & gas operation plant with port facility	Mar-11	Supply & delivery, labour and contractor distributables
Budget quotation from Evapco 3 X 3.8MW cooling towers in SS316. 40% uplift for mark up/estimating allowance and 200K allowance for delivery/offloading and installation.					
Budget estimate Tyco - supply, allow 40% for mark up and estimating allowance and 15k per pump for installation Amiad budget quotation - 40% uplift for mark up/estimating allowance and 150k allowance for installation \$1,519,462 estimated for 1ML/d SWRO plant. Approximately 15% increase is made for 2ML/d estimate					
\$443,189 estimated for 1ML/d SWRO plant. 30% increase is made for 2ML/d estimate					
\$364,040 estimated for pipework within 1ML/d SWRO plant. \$500,000 is estimated in an order of magnitude for 2ML/d plant plus 250k provision for cooling towers/chlorination/de-chlorination/media filters & manifolds					

## Wheatstone Project



### Order of Probable Cost (+/-50%) for Onslow BWRO Water Treatment Plant

Detailed Build Up of Treatment Plant Works - Base Case 2ML/D						
Item	Description	Unit	Quantity	Rate	Total Cost	Comments
<b>4</b>	<b>TANKS &amp; ASSOCIATED FACILITIES</b>					
	Raw water buffer tank (300m3)	EA	1	\$ 298,924	\$ 298,924	Assume total mark up 40% on supply, delivery and installation quote from tank supplier. 40% includes 20% uplift for craning into position, 10% for miscellaneous steel supports etc. and 10% for contractor's mark up.
	RO feed tank (140m3)	EA	1	\$ 171,216	\$ 171,217	Assume total mark up 40% on supply, delivery and installation quote from tank supplier. 40% includes 20% uplift for craning into position, 10% for miscellaneous steel supports etc. and 10% for contractor's mark up.
	RO permeate tank (80m3)	EA	1	\$ 164,348	\$ 164,348	The supply and delivery cost is based on Permastore glass-fused-to-steel tank quotations from supplier.
	Brine tank (50m3)	EA	1	\$ 139,780	\$ 139,780	The cost also includes the concrete base, grout and foundation bolts.
	Treated water tank (500m3)	EA	1	\$ 358,284	\$ 358,284	
	Drinking water pump set	EA	1	\$ 100,000	\$ 100,000	A pump skid including duty/standby pumps, valves and interconnecting pipeworks
<b>4</b>	<b>TANKS &amp; ASSOCIATED FACILITIES</b>	<b>Total Carried to Summary</b>			<b>\$ 1,232,553</b>	
<b>5</b>	<b>TREATMENT BUILDING</b>					
	Treatment Building, including control room and switch room - Metal Frame / Metal Clad	SM	536	\$ 4,000	\$ 2,144,000	Treatment Building (20m length x 16m width x 5m height) - Cyclone Rated Includes Doors, Roller Doors, Insulation, Vents & Concrete Base etc. Including 12m x 12m control room and 18m x 4m electrical switchroom
<b>5</b>	<b>TREATMENT BUILDING</b>	<b>Total Carried to Summary</b>			<b>\$ 2,144,000</b>	
<b>6</b>	<b>ELECTRICAL &amp; CONTROL</b>					
	Total electrical & control cost	LOT	1	\$ 3,205,000	\$ 3,205,000	Order of magnitude. Adjust the total electrical & control cost based on \$/ML from previous similar project. The total cost includes: - Electrical & control within skids - Transformer and Generator - Cabling - Controls - Drives - Miscellaneous electrical - Cooling & ventilation - Cabling termination - Control termination - Drives mounting general arrangement
<b>6</b>	<b>ELECTRICAL &amp; CONTROL</b>	<b>Total Carried to Summary</b>			<b>\$ 3,205,000</b>	
<b>TOTAL COST FOR 2ML/D TREATMENT PLANT WORKS</b>		<b>Total Carried to Summary</b>			<b>\$ 18,643,283</b>	

Basis of Order of Probable Cost					
Basis of Rate	Plant Capacity of Referenced Rate	Source of Referenced Rate	Location of Reference Rate	Base Date of Reference Rate	Costs Covered
Permastore quote	5ML tank capacity	Supplier's budget quotation	Onslow	Mar-12	Supply & delivery, labour and contractor distributables
Permastore quote		Quotation from Permastore dated 12/03/2012.	Onslow	Mar-12	Supply & delivery, labour and contractor distributables
Permastore quote					
Permastore quote					
\$64,339 estimated for 1ML/d SWRO plant. \$100,000 is estimated in an order of magnitude for 2ML/d plant					
\$2500/m2 is a typical rate for warehouse building in Perth including the extra fittings, concrete foundation, chemical bunds and crane. Apply the location factor of 1.6 from Perth to Onslow.					
\$4.8M was estimated for a previous 1ML/d plant (brown field site near Karratha. \$1.1M per ML was estimated for a previous 10ML/d plant near Geraldton. \$3.3M for this 2ML/d plant = \$1.1M x 2 x 1.5 Factor of 1.5 is allowed for scale of project. 10% reduction in motor load/electrical from SWRO, inc allowance for cooling towers and extra pumps of 235k.	10ML/d SWRO Desalination Plant	+/-10% cost estimate	Geraldton	Oct-10	

# Wheatstone Project



## Order of Probable Cost (+/-50%) for Onslow BWRO Water Treatment Plant

Detailed Build Up of Treatment Plant Works - 2ML/D Expandable to 4ML/D						
Item	Description	Unit	Quantity	Rate	Total Cost	Comments
<b>1</b>	<b>DESIGN, DOCUMENTATION, PROJECT MANAGEMENT &amp; COMMISSIONING</b>					
	Design and documentation to completion	LOT	1		\$ 1,060,797	7% of the base estimate is assumed
	Project Management	LOT	1		\$ 757,712	5% of the base estimate is assumed
	Construction Administration	LOT	1		\$ 757,712	5% of the base estimate is assumed
	Insurance and Performance Bond	LOT	1		\$ 227,314	1.5% of the base estimate is assumed
	Vendor Reqs	LOT	1		\$ 75,771	0.5% of the base estimate is assumed
	Commissioning	LOT	1		\$ 1,515,424.87	10% of base estimate is assumed
<b>1</b>	<b>DESIGN, DOCUMENTATION, PROJECT MANAGEMENT &amp; COMMISSIONING</b>	<b>Total Carried to Summary</b>			<b>\$ 4,394,732</b>	
<b>2</b>	<b>SITE WORKS</b>					
	Fencing	LM	420	\$ 200	\$ 84,000	Entire plant site 85m x 125m
	Gate	EA	2	\$ 3,719	\$ 7,439	Take off from preliminary site layout
	Pavements	CM	83	\$ 688	\$ 57,101	Take off from preliminary site layout
	Hardstand	CM	478	\$ 1,289	\$ 616,492	Take off from preliminary site layout
	Site Road Build All-in	SM	628	\$ 300	\$ 188,332	Take off from preliminary site layout
	Level and compact	SM	10625	\$ 11	\$ 117,317	
	Precast Drains including trenching	LOT	1	\$ 300,000	\$ 300,000	Order of magnitude
	Area Lighting	EA	14	\$ 15,000	\$ 210,000	Assume one every 20m along site perimeter
<b>2</b>	<b>SITE WORKS</b>	<b>Total Carried to Summary</b>			<b>\$ 1,580,680</b>	
<b>3</b>	<b>TREATMENT PLANT PROCESS &amp; FACILITY</b>					
	Disk Filter feed pump sets	LOT	1	\$ 252,000	\$ 252,000	3 X
	Media Filters	LOT	1	\$ 990,000	\$ 990,000	2 No duty, 1 No standby
	Chlorination	LOT	1	\$ 400,000	\$ 400,000	Chlorination / Dechlorination building
	Cooling Towers	LOT	1	\$ 498,488	\$ 498,488	
	Disk Filter feed pump sets	LOT	1	\$ 252,000	\$ 252,000	3 X
	Media Filters	LOT	1	\$ 990,000	\$ 990,000	2 No duty, 1 No standby
	RO system	LOT	1	\$ 1,747,381	\$ 1,747,381	Order of magnitude Duty & Standby configuration. Including skids, pressure vessels, high pressure and low pressure pumps, cartridge filters, pipework, chemical dosing equipment etc
	Post treatment	LOT	1	\$ 576,146	\$ 576,146	Duty & Standby configuration. Includes chemical dosing

Basis of Order of Probable Cost					
Basis of Rate	Plant Capacity of Referenced Rate	Source of Referenced Rate	Location of Reference Rate	Base Date of Reference Rate	Costs Covered
1. Design and documentation to completion - 7% of the base estimate is assumed 2. Project Management - 5% of the base estimate is assumed 3. Construction Administration - 5% of the base estimate is assumed 4. Insurance and Performance Bond - 1.5% of the base estimate is assumed 5. Vendor Reqs - 0.5% of the base estimate is assumed 6. Commissioning - 10% of the base estimate is assumed	1ML/d SWRO Desalination Plant	+30/-20% cost estimate (completed by estimator)	Near Karratha. The SWRO plant is to be built at existing oil & gas operation plant with port facility	Mar-11	Supply & delivery, labour and contractor distributables
Allowance to account for 3 X extra cooling towers and extra tanks					
\$3,611 each gate estimated for 1ML/d SWRO plant Gate - Chain link double 2100mm high - 2x4m wide Apply 3% escalation rate on this estimate					
\$668.31/m3 estimated for 1ML/d SWRO plant Apply 3% escalation rate on this estimate					
\$1,251.5/m3 estimated for 1ML/d SWRO plant Apply 3% escalation rate on this estimate					
Average rate for bitumen road built up including kerbs and road markings					
\$10.72/m2 estimated for 1ML/d SWRO plant Apply 3% escalation rate on this estimate					
General allowance based on similar project					
General allowance based on similar project					
Budget estimate Tyco - supply, allow 40% for mark up and estimating allowance and 15k per pump for installation					
Amiad budget quotation - 40% uplift for mark up/estimating allowance and 150k allowance for installation					
Estimate from Previous project					
Budget quotation from Evapco 3 X 3.8MW cooling towers in SS316. 40% uplift for mark up/estimating allowance and 200k allowance for delivery/offloading and installation					
Budget estimate Tyco - supply, allow 40% for mark up and estimating allowance and 15k per pump for installation					
Amiad budget quotation - 40% uplift for mark up/estimating allowance and 150k allowance for installation					
\$1,519,462 estimated for 1ML/d SWRO plant. Approximately 15% increase is made for 2ML/d estimate					
\$443,189 estimated for 1ML/d SWRO plant. 30% increase is made for 2ML/d estimate					

## Wheatstone Project



### Order of Probable Cost (+/-50%) for Onslow BWRO Water Treatment Plant

Detailed Build Up of Treatment Plant Works - 2ML/D Expandable to 4ML/D						
Item	Description	Unit	Quantity	Rate	Total Cost	Comments
	Process pipeworks within the treatment plant	LOT	1	\$ 750,000	\$ 750,000	
<b>3</b>	<b>TREATMENT PLANT PROCESS &amp; FACILITY</b>	<b>Total Carried to Summary</b>			<b>\$ 6,456,015</b>	
<b>4</b>	<b>TANKS &amp; ASSOCIATED FACILITIES</b>					
	Raw water buffer tank (300m3)	EA	1	\$ 298,924	\$ 298,924	Assume total mark up 40% on supply, delivery and installation quote from tank supplier. 40% includes 20% uplift for craning into position, 10% for miscellaneous steel supports etc. and 10% for contractor's mark up.
	RO feed tank (140m3)	EA	1	\$ 171,216	\$ 171,217	Assume total mark up 40% on supply, delivery and installation quote from tank supplier. 40% includes 20% uplift for craning into position, 10% for miscellaneous steel supports etc. and 10% for contractor's mark up.
	RO permeate tank (80m3)	EA	1	\$ 164,348	\$ 164,348	The supply and delivery cost is based on Permastore glass-fused-to-steel tank quotations from supplier. The cost also includes the concrete base, grout and foundation bolts.
	Brine tank (50m3)	EA	1	\$ 139,780	\$ 139,780	
	Treated water tank (500m3)	EA	1	\$ 358,284	\$ 358,284	
	Drinking water pump set	EA	1	\$ 100,000	\$ 100,000	A pump skid including duty/standby pumps, valves and interconnecting pipeworks
<b>4</b>	<b>TANKS &amp; ASSOCIATED FACILITIES</b>	<b>Total Carried to Summary</b>			<b>\$ 1,232,553</b>	
<b>5</b>	<b>TREATMENT BUILDING</b>					
	Treatment Building, including control room - Metal Frame / Metal Clad	SM	670	\$ 4,000	\$ 2,680,000	25% larger allowance
<b>5</b>	<b>TREATMENT BUILDING</b>	<b>Total Carried to Summary</b>			<b>\$ 2,680,000</b>	
<b>6</b>	<b>ELECTRICAL &amp; CONTROL</b>					
	Total electrical & control cost	LOT	1	\$ 3,205,000	\$ 3,205,000	Order of magnitude. Adjust the total electrical & control cost based on \$/ML from previous similar project. The total cost includes: - Electrical & control within skids - Transformer and Generator - Cabling - Controls - Drives - Miscellaneous electrical - Cooling & ventilation - Cabling termination - Control termination - Drives mounting general arrangement
<b>6</b>	<b>ELECTRICAL &amp; CONTROL</b>	<b>Total Carried to Summary</b>			<b>\$ 3,205,000</b>	
<b>TOTAL COST FOR 2ML/D TREATMENT PLANT WORKS</b>		<b>Total Carried to Summary</b>			<b>\$ 19,548,981</b>	

Basis of Order of Probable Cost					
Basis of Rate	Plant Capacity of Referenced Rate	Source of Referenced Rate	Location of Reference Rate	Base Date of Reference Rate	Costs Covered
\$364,040 estimated for pipework within 1ML/d SWRO plant. \$500,000 is estimated in an order of magnitude for 2ML/d plant plus 250k provision for cooling towers/ chlorination/de-chlorination/media					
Permastore quote	5ML tank capacity	Supplier's budget quotation	Onslow	Mar-12	Supply & delivery, labour and contractor distributables
Permastore quote		Quotation from Permastore dated 12/03/2012.	Onslow	Mar-12	Supply & delivery, labour and contractor distributables
Permastore quote					
Permastore quote					
\$64,339 estimated for 1ML/d SWRO plant. \$100,000 is estimated in an order of magnitude for 2ML/d plant					
\$2500/m2 is a typical rate for warehouse building in Perth including the extra fittings, concrete foundation, chemical bunds and crane. Apply the location factor of 1.6 from Perth to Onslow.					
\$4.8M was estimated for a previous 1ML/d plant (brown field site near Karratha. \$1.1M per ML was estimated for a previous 10ML/d plant near Geraldton. \$3.3M for this 2ML/d plant = \$1.1M x 2 x 1.5 Factor of 1.5 is allowed for scale of project. 10% reduction in motor load/electrical from SWRO, inc allowance for cooling towers and extra pumps of 235k.	10ML/d SWRO Desalination Plant	+/-10% cost estimate	Geraldton	Oct-10	

## Wheatstone Project



### Order of Probable Cost (+/-50%) for Onslow SWRO Water Treatment Plant

Detailed Build Up of Downstream Potable Water Supply Infrastructure - Base Case 2ML/D and 2ML/D Readily Expandable to 4ML/D						
Item	Description	Unit	Quantity	Rate	Total Cost	Comments
<b>1</b>	<b>DESIGN, DOCUMENTATION, PROJECT MANAGEMENT &amp; COMMISSIONING</b>					
	Design and documentation to completion	LOT	1		\$ 358,421	7% of the base estimate is assumed
	Project Management	LOT	1		\$ 256,015	5% of the base estimate is assumed
	Construction Administration	LOT	1		\$ 256,015	5% of the base estimate is assumed
	Insurance and Performance Bond	LOT	1		\$ 76,804	1.5% of the base estimate is assumed
	Vendor Reps	LOT	1		\$ 25,601	0.5% of the base estimate is assumed
	Commissioning	LOT	1		\$ 256,015	5% of base estimate is assumed
<b>1</b>	<b>DESIGN, DOCUMENTATION, PROJECT MANAGEMENT &amp; COMMISSIONING</b>	<b>Total Carried to Summary</b>			<b>\$ 1,228,871</b>	
<b>2</b>	<b>SITE WORKS</b>					
	Fencing	LM	440	\$ 200	\$ 88,000	Take off from preliminary site concept
	Gate	EA	2	\$ 3,719	\$ 7,439	Take off from preliminary site concept
	Pavements	CM	90	\$ 688	\$ 61,952	Take off from preliminary site concept
	Hardstand	CM	90	\$ 1,289	\$ 116,014	Allow 300m2 for hard stand
	Site Road Build All-in	SM	600	\$ 300	\$ 180,000	Take off from preliminary site concept
	Level and compact	SM	11700	\$ 11	\$ 129,187	Site approx 90m x 130m
	Precast Drains Including trenching	LOT	1	\$ 300,000	\$ 300,000	Order of magnitude
	Area Lighting	EA	8	\$ 15,000	\$ 120,000	
<b>2</b>	<b>SITE WORKS</b>	<b>Total Carried to Summary</b>			<b>\$ 1,002,592</b>	
<b>3</b>	<b>TANKS AND ASSOCIATED WORKS</b>					
	Ground level tank 5ML Capacity	EA	1		\$ 1,687,703	Assume total mark up 40% on supply, delivery and installation quote from tank supplier. 40% includes 20% uplift for craning into position, 10% for miscellaneous steel supports etc. and 10% for contractor's mark up.
	Fill Pumps (Duty 170L/s at 30m)	EA	2	\$ 200,000	\$ 400,000	Order of magnitude Duty & Standby configuration
	Pump Station Building - Metal Frame / Metal Clad	SM	82.5	\$ 4,000	\$ 330,000	Building (15m length x 5.5m width x 5m height) - Cyclone Rated Includes Doors, Roller Doors, Insulation, Vents & Concrete Base etc
	Electrical control and switchboard	EA	1		\$ 200,000	Order of magnitude
	Elevated tank 900 kL	EA	1		\$ 1,500,000	Order of magnitude. Apply location factor of 1.5
<b>3</b>	<b>TANKS AND ASSOCIATED WORKS</b>	<b>Total Carried to Summary</b>			<b>\$ 4,117,703</b>	
<b>TOTAL COST FOR DOWNSTREAM POTABLE WATER SUPPLY INFRASTRUCTURE</b>		<b>Total Carried to Summary</b>			<b>\$ 6,349,166</b>	

Basis of Order of Probable Cost					
Basis of Rate	Plant Capacity of Referenced Rate	Source of Referenced Rate	Location of Reference Rate	Base Date of Reference Rate	Costs Covered
1.Design and documentation to completion - 7% of the base estimate is assumed 2.Project Management - 5% of the base estimate is assumed 3.Construction Administration - 5% of the base estimate is assumed 4.Insurance and Performance Bond - 1.5% of the base estimate is assumed 5.Vendor Reps - 0.5% of the base estimate is assumed 6.Commissioning - 5% of the base estimate is assumed					
\$3,611 each gate estimated for 1ML/d SWRO plant Gate - Chain link double 1800mm high - 2x4m wide Apply 3% escalation rate on this estimate	1ML/d SWRO Desalination Plant	+30/-20% cost estimate (completed by estimator)	Near Karratha. The SWRO plant is to be built at existing oil & gas operation plant with port facility	Mar-11	Supply & delivery, labour and contractor distributables
\$668.31/m3 estimated for 1ML/d SWRO plant Apply 3% escalation rate on this estimate					
\$1,251.5/m3 estimated for 1ML/d SWRO plant Apply 3% escalation rate on this estimate					
Average rate for bitumen road built up including kerbs and road markings					
\$10.72/m2 estimated for 1ML/d SWRO plant Apply 3% escalation rate on this estimate					
General allowance based on similar project					
General allowance based on similar project					
Apply total mark up 40% on supply, delivery and installation quote from tank supplier.	5ML tank capacity	Supplier's budget quotation	Onslow	Mar-12	Supply & delivery, labour and contractor distributables
Order of magnitude from previous experience					
\$2500/m2 is a typical rate for warehouse building in Perth including the extra fittings, concrete foundation, chemical bunds and crane. Apply the location factor of 1.6 from Perth to Onslow.					Supply & delivery, labour and contractor distributables
Order of magnitude from previous experience					
Typically \$1M estimated for 900kL elevated tank (multi-legged or spheroid design) in south eastern USA. Location factor of 1.5 is assumed.	900kL elevated tank	Order of magnitude	USA	Mar-12	Supply & delivery, labour and contractor distributables

Appendix C

# Supporting Information



Mascaro, Lorenzo

---

From: Jamie Pickford <Jamie@amiad.com.au>  
Sent: Wednesday, 20 June 2012 2:50 PM  
To: Mascaro, Lorenzo  
Subject: RE: Arkal to replace media filter info and pricing

Hi Lorenzo,

The cost per 1 system for 22 L/S

Multi-Media Filter provide by Amiad consists of:

5 x 1200mm FRP-Pressure vessel (~14 m/hr filtration velocity) , check filter, air valve, Pneumatic valve (internal parts fitted to the given NTU), HDPE piping and fitting, HDG semi-skid (vessel are free standing),

1 x Amiad controller (backwash allow backwash online using filtered water, (provide product of 35 m<sup>3</sup>/hr during backwash), flow control valve on drain manifold, 1 x PD switch, pressure gauge and Media.

1 x Compressor for scouring

Include labour work – design, construction testing, drafting, etc. in house Amiad only.

This will at budget of \$ 200,000.00 ±10% (Ex. Amiad Melbourne, Ex. GST) per system.

Any additional instrument that may be required to be at additional cost.

This cost doesn't include commissioning & training.

You will be expecting higher water quality expecting 20-50 micron subject to feed PSD.

In addition, it is expected to assist with reduction of turbidity value.

Regards



Jamie Pickford  
Western Australia State Manager

Phone: 08 9303 2222 Fax: 08 9303 9270 Mobile: 0425 790 605 [www.amiad.com.au](http://www.amiad.com.au)



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From: Mascaro, Lorenzo [mailto:Lorenzo.Mascaro@aecom.com]  
Sent: Wednesday, 20 June 2012 2:42 PM  
To: Jamie Pickford  
Subject: RE: Arkal to replace media filter info and pricing

Hi Jamie,

We are finalising our proposal, wondering whether you are able to supply indicative sand filter pricing based on the previous data sheet for disc filters by tomorrow lunch-time?

I'll try call you.

Cheers,

**Lorenzo Mascaro**  
Professional Mechanical Engineer  
D +61 8 6208 0420  
Lorenzo.Mascaro@aecom.com

**AECOM**  
Level 4, 3 Forrest Place, Perth, WA 6000  
GPO Box B59 Perth WA 6849  
T +61 8 6208 0000 F +61 8 6208 0999  
www.aecom.com

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**Please note that my contact numbers have recently changed.**

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From: Jamie Pickford [mailto:Jamie@amiad.com.au]  
Sent: Friday, 15 June 2012 1:29 PM  
To: Mascaro, Lorenzo  
Cc: Syed Tanveer Alim  
Subject: Arkal to replace media filter info and pricing

Hello Lorenzo,

Following our discussions, please find below two proposals. Firstly one for 200 micron which is for the filtration prior to the cooling towers and secondly one for the 100 micron after the cooling towers to protect the water treatment plant downstream. ( the one downstream you have mentioned you already have budgeted for but I have included the data anyway).

Arkal disc filters will offer footprint, cost and efficiency advantages over our media systems. The systems we offer, are the CW Corrosive water version of the SK, fully plastic system with 316 SST shafts in the backwash valves, those systems will suit the corrosive environment of the cooling tower and the TDS 15,000 water.

Max TSS : 100 PPM  
If Sand is present in the bore water I will recommend using a Hydrocyclone before the Spin-Klin system.

Offer:

Filtration prior to COOLING towers  
For EACH 22l/s system we offer the supply of a 200 micron Corrosive water automatic disc filter assembly incorporating 3 X 3" disc filters c/w 6" inlet & outlet manifold, 3" 3-way Backwash valves, & 3" drain water manifold.

Tech data;  
Inlet & Outlet manifold connections: 6" Flanged  
Drain manifold connection: 3"  
Minimum operational pressure during the backwash is to be 2.8 bar.  
Backwash flowrate is 20 m3/h  
Backwash regime: Flush one 3" filter at a time sequentially. The filtered water from the remaining filters is utilized for the backwash water source to clean each filter.(I will recommend closing the downstream during back wash if possible)  
Backwash duration: 1minute (20 seconds per filter + approx. 3 seconds dwell between each unit)  
Backwash volume: approx. 333 L

System rated pressure: 10 bar  
Pilot solenoids: 3 x 24VAC 8 watt supplied in a solenoid bank assembly.  
Solenoid command media; compressed air or potable water (by others)  
PD switch: non-metallic diaphragm type mechanism IP55 rated c/w  
Controller: 240VAC powered IP55 rated plastic enclosed c/w alarm & filter flushing outputs

List price (per one system): \$19,855 per system ex-works Perth. + GST  
Three systems required to allow 2 active , one standby.

Availability: 12 – 14 week FRO

Attached is general drawings and technical information.

Filtration downstream of COOLING towers for UF membrane protection  
For 22l/s system we offer the supply of a 100 micron Corrosive water automatic disc filter assembly incorporating 5 X 3" disc filters c/w 6" inlet & outlet manifold, 3" 3-way Backwash valves, & 3" drain water manifold.

Tech data;

Inlet & Outlet manifold connections: 6" Flanged

Drain manifold connection: 3"

Minimum operational pressure during the backwash is to be 2.8 bar.

Backwash flowrate is 20 m<sup>3</sup>/h

Backwash regime: Flush one 3" filter at a time sequentially. The filtered water from the remaining filters is utilized for the backwash water source to clean each filter. (I will recommend closing the downstream during back wash if possible)

Backwash duration: 1minute (20 seconds per filter + approx. 3 seconds dwell between each unit)

Backwash volume: approx. 555 L

System rated pressure: 10 bar

Pilot solenoids: 5 x 24VAC 8 watt supplied in a solenoid bank assembly.

Solenoid command media; compressed air or potable water (by others)

PD switch: non-metallic diaphragm type mechanism IP55 rated c/w

Controller: 240VAC powered IP55 rated plastic enclosed c/w alarm & filter flushing outputs

List price (per one system): \$31,671 per system ex-works Perth. + GST  
Three systems required to allow 2 active , one standby.

Availability: 12 – 14 week FRO

Attached is general drawings and technical information.

*Please Note : The prices above are RRP. Our agents receive a discount.*  
I am available next week to meet and discuss at your convenience.

Regards



Jamie Pickford  
Western Australia State Manager

Phone: 08 9303 2222 Fax: 08 9303 9270 Mobile: 0425 790 605 [www.amiad.com.au](http://www.amiad.com.au)



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Evapco Western Australia  
Level 18, Central Park  
152-158 St Georges Tce  
Perth, WA 6000.  
Ph: (08) 9288 4549  
Fax : (08) 9288 4400  
Mobile : 0400 956 058

## Cooling Tower Selections/Budget Quotation

---

<b>Company</b>	AECOM
<b>Attention</b>	Lorenzo Mascano
<b>Project</b>	Onslow De-Salination Plant
<b>Evapco Reference</b>	12-068 REV 2
<b>Equipment Reference</b>	Evapco USS Induced Draft Cooling Towers.
<b>Date</b>	13/06/2012

Thank you for requesting a quotation for EVAPCO equipment. We are pleased to submit selections as follows.

Cooling Tower ID	CT 1-3
Total Heat Rejection Each	3824 kW
Cooling Tower Model	USS-19-98
Number of Units	3
Number of Cells Per Tower	3
Cyclone Compliant	YES
Construction	316 S/S
Hardware and Steel Items	316 S/S
Design Flow Rate	43.5 l/sec
Entering Water Temperature	56.0°C
Leaving Water Temperature	35.0°C
Design Ambient Wet Bulb Temperature	30.0°C
Cooling Tower Price	\$140,225.00
Ladders and Platforms	\$9,984.00
Sidestream Filtration Price	\$15,745.00
Freight of Cooling Towers to Site	\$32,252.00
On Site Cooling Tower Assembly	\$15,000.00
<b>Total Budget Price (Excl GST)</b>	<b>\$213,206.00</b>

Kind regards



Australian Harvestore Products Pty Ltd T/A  
[ABN 52 866 813 394]  
**Permastore (Australasia) Tanks & Silos**  
P.O. Box 240 (4/8 Leighton Place)  
HORNSBY  
NSW 2077

Telephone: (02) 9477 7944  
Mobile: 0438 696 943  
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Quote Reference No. 0530 110329

**To:**

Name	:	Ying Yu
Company	:	AECOM
Date	:	29 March 2011
No of pages	:	6 (including this one)

**RE: Various Tanks for SWRO Desalination Plant, Karratha, WA**

Dear Ying,

Thank you for your valued enquiry. We are pleased to offer our indicative budget quotation for your consideration as requested.

**Tank Design**

PERMASTORE® structures are engineered with a minimum design life in excess of 30 years, a proven service history of at least 40 years and an actual service life in excess of 50 years in accordance with the requirements of BS ISO 15686 Part 1, 2 & 3 and incorporate the relevant international design standards.

The materials, design and fabrication of the tank shall conform to “DESIGN OF VITREOUS AND PORCELAIN COATED BOLTED STEEL TANK FOR THE STORAGE OR TREATMENT OF WATER OR MUNICIPAL OR INDUSTRIAL EFFLUENTS AND SLUDGES –ISO 28765:2008”

The design assumes a top liquid level no higher than the operational freeboard, liquor contents at ambient temperature with specific gravity as detailed. We offer a range of glass specifications to allow an optimum cost effective choice for your application. In circumstances where commercial factors or ongoing process requirements dictate that future access for inspection and maintenance will be impractical, the end user may wish to consider cathodic protection. The application considerations are set out in our Glass-Fused-to-Steel Specification Guide and the chemical resistance and physical properties of the glass coatings are published in Quality Standards, copies are available upon request. No loads, cut-outs or fitments should be applied to the tank without prior consultation and advice.

The basic tank kit comprises Glass-Fused-to-Steel panels, with external colour blue (to BS4900, shade 20-C-40) or green (to BS4900, shade 12-B-29), internal colour blue-green (to BS4900, shade 14-C-40), and includes fixings, black plastic nutcaps, galvanised top stiffeners, galvanised wind stiffeners (as necessary), primer painted base angles, black polyurethane panel sealant, peripheral base seal, expanding type anchor bolts for flat base design.

## Tanks Supply to Comprise

### 1.0 Seawater Buffer Tank

Basic tank kit as detailed including ancillaries as itemised:

- a. To supply and install Glass-Fused-to-Steel tank, Model reference No. 2815 – 8.54m diameter x 4.27m nominal wall height (less 125mm in the rebate) giving a nominal shell gross volume of 237m<sup>3</sup>, assuming a flat base (concrete by others) with our standard rebate design to drawing MK001/F and to be suitable for liquid contents of up to SG 1.00
- b. 1 x No. Tapered beam roof comprising Permastore Glass-Fused-To-Steel panels complete with galvanised mild steel roof beams, 440mm diameter epoxy coated inspection hatch, 500mm diameter GRP fresh air vent and all necessary fixings and sealants.

The tank also includes the following:

- 3 x 125mm NB black epoxy coated mild steel single flanged connection nozzles to AS 4087-2004
- 1 x 50mm NB black epoxy coated mild steel single flanged nozzle connection to AS 4087-2004
- 1 No. Standard 1m x 1m galvanised mild steel viewing platform mounted approximately 1.1m below eaves complete with galvanised mild steel hooped safety access ladder.
- Galvanised Internal ladder
- 1 x Level indicator
- Lightning protection
- 1 x 800mm diameter black epoxy coated mild steel side wall access hatch.

### 2.0 Clarified Seawater, UF Feed, RO Concentrate, Brine and Sludge Storage Tanks

Basic tank kit as detailed including ancillaries as itemised:

- a. To supply and install Glass-Fused-to-Steel tanks, Model reference No. 1415 – 4.27m diameter x 4.27m nominal wall height (less 125mm in the rebate) giving a nominal shell gross volume of 59m<sup>3</sup>, assuming a flat base (concrete by others) with our standard rebate design to drawing MK001/F and to be suitable for liquid contents of up to SG 1.00

- b. 1 x No. Tapered beam roof comprising Permastore Glass-Fused-To-Steel panels complete with galvanised mild steel roof beams, 440mm diameter epoxy coated inspection hatch, 500mm diameter GRP fresh air vent and all necessary fixings and sealants.

The tank also includes the following:

- 3 x 125mm NB black epoxy coated mild steel single flanged connection nozzles to AS 4087-2004
- 1 x 50mm NB black epoxy coated mild steel single flanged nozzle connection to AS 4087-2004
- 1 No. Standard 1m x 1m galvanised mild steel viewing platform mounted approximately 1.1m below eaves complete with galvanised mild steel hooped safety access ladder.
- Galvanised Internal ladder
- 1 x Level indicator
- Lightning protection
- 1 x 800mm diameter black epoxy coated mild steel side wall access hatch.

### **3.0 Treated Water Storage Tank**

Basic tank kit as detailed including ancillaries as itemised:

- a. To supply and install Glass-Fused-to-Steel tank, Model reference No. 5320 –16.22m diameter x 5.67m nominal wall height (less 125mm in the rebate) giving a nominal shell gross volume of 1,147m<sup>3</sup>, assuming a flat base (concrete by others) with our standard rebate design to drawing MK001/F and to be suitable for liquid contents of up to SG 1.00
- b. To supply and install Alumadome roof to cover Permastore tank with the following:
- Mill finish aluminium
  - 1 x 24 inch diameter frost-free gravity vent with aluminium insect screen
  - 1 x 24 inch square access hatch
  - Venting around the periphery with stainless steel insect screen
  - Strut cap with enclosed neoprene weather seal.

The tank also includes the following:

- 3 x 125mm NB black epoxy coated mild steel single flanged connection nozzles to AS 4087-2004
- 1 x 50mm NB black epoxy coated mild steel single flanged nozzle connection to AS 4087-2004
- 1 No. Standard 1m x 1m galvanised mild steel viewing platform mounted approximately 1.1m below eaves complete with galvanised mild steel hooped safety access ladder.
- Galvanised Internal ladder
- 1 x Level indicator
- Lightning protection



- 1 x 800mm diameter black epoxy coated mild steel side wall access hatch.

## Tank Details

<b>G-F-T-S Tank &amp; Roof</b>	<b>Seawater Buffer Tank</b>	<b>Clarified Seawater, UF Feed , RO Feed, Brine and Sludge Storage tanks</b>	<b>Treated Water Storage Tank</b>
Model	2815	1415	5320
Roof	Tapered Beam Roof	Tapered Beam Roof	Alumadome Roof
Floor	Concrete (by others)	Concrete (by others)	Concrete (by others)
Diameter (metres)	8.54	4.27	16.22
Height (metres)	4.27	4.27	5.67
Rebate depth (metres)	0.125	0.125	0.125
min head metres)	0.00	0.00	0.00
Volume (brim full) (m3)	237	59	1,146
Freeboard (metres)	0.300	0.300	0.300
Volume (above min head) (m3)	220	55	1,084
<b>Price</b>	<b>\$ 178,500.00</b>	<b>\$ 105,600.00</b>	<b>\$ 320,900.00</b>
<b>No. of Tanks</b>	<b>1</b>	<b>5</b>	<b>1</b>
<b>Total Price</b>	<b>\$ 178,500.00</b>	<b>\$ 528,000.00</b>	<b>\$ 320,900.00</b>

This price is for tanks with a minimum design life in excess of 30 years based on a comprehensive assessment of the service life of the components used in the structure, in compliance with the requirements of BS ISO 15686 part 1.

### Conditions:

Our price includes as follows:

- Supply of Permastore tank, roof and flanges as above
- Freight and delivery to Karratha Site
- Installation of tank on concrete foundations (foundations and civils provided by others).

Price excludes as follows (to be supplied locally or by others or quoted separately):

- Civil works including- bulk earthworks, subgrade preparation, concrete foundation slab, and steel support structures.
- Design for any loadings other than hydrostatic and wind loadings (Region D)
- 3 phase electricity and site amenities
- Pipework and connection to pipework
- Floor treatment if required

- Supply of water for Hydrostatic testing
- Provision of office, power and water for site staff for the installation
- External access stairs, railings, walkways and davits
- Craneage or forklift for delivery and construction to transport sheets on site. (nb: Crane required to unload the delivery and then position the sheet pallets around the perimeter in readiness for assembly of the tank and roof. IS NOT INCLUDED)
- Enforced stoppages due to site requirements/instructions or industrial disputation. (Any lost time or delays will be charged at day work rates as a variation of the contact).
- Assumes 6 day/week site works and up to 12 hours per day on site with no compulsory RDOs
- Prices exclude GST or local state duties and taxes if applicable

**Note:** Mastic shelf life is four (4) months. Due to the limited shelf life of the sealants, the customer must inform Permastore (Australasia) Tanks & Silos of the proposed construction program to facilitate the supply of the sealants.

### Drawings and Availability

General arrangement drawings will be provided following an acknowledgement of order. One set of related fabrication and assembly drawings can be provided upon request.

Final approval of drawings is a critical programme activity; without your unqualified approval we cannot accept any responsibility for consequential delays. In order to produce approval drawings we require all necessary information, associated drawings, the final scope of supply and a written instruction to proceed.

### Validity

The prices quoted are based on the currency exchange rates below and this quotation is valid for 90 days.

- *AU\$1.00 = £0.62*
- *AU\$1.00 = US\$0.98*

Due to volatility in the current market, we reserve the right to review pricing and adjust our quotation accordingly.

### Terms of Payment

Due to the overseas pre-manufacturing of the glass-fused-to-steel panels, payment terms to Australian Harvestore reflect the purchase of the raw materials and fusing of the panels prior to their arrival in Australia (not withstanding payment schedule in the main contract) and are:

- 20 percent with Instruction to proceed (Note: Instalment must be paid and received prior to placement of materials order by Permastore Australasia Tanks & Silos Pty. Ltd.)
- 30 percent ex works UK (Note: Instalment must be paid and received prior to shipment by Permastore Australasia Tanks & Silos Pty. Ltd)
- 20 percent on arrival in Fremantle, WA
- 30 percent balance paid in monthly instalments based on an agreed percentage as at an agreed date at the end of each month.
- terms are 14 days from date of invoice for milestone payments and 30 days

- for monthly instalments.
- Interest charges of 11.00% per annum will be applicable for late or unpaid invoices.

### Delivery

Anticipated delivery ex UK factory is 6-8 weeks from final approval of drawings and Instruction to proceed with Manufacture. UK transit time is 3 days and ocean transit time is estimated at 42 days to Fremantle. i.e. allow approximately 3 – 4 months for delivery from placement of order plus approximately 11 weeks installation time.

We look forward to assisting you further and demonstrating our abilities to deliver a quality containment system for this project.

Kind regards,

A handwritten signature in black ink, appearing to read 'R. Philp'.

Rod J. Philp - OMIEAust  
Contracts Engineer

To: <b>Aecom</b>	From: <b>TYCO</b>
Name: <b>Lorenzo Mascaro</b>	Fax No: <b>(08) 9406 6574</b>
Tel No: <b>8 6208 0420</b>	Tel No: <b>(08) 9406 6500</b>
Fax No:	Email: <b>sxsmith@typac.com.au</b>
Pages: <b>5</b>	Mob: <b>0438 149338</b>
Subject: <b>RFQ – Seawater Pumps</b>	Date: <b>15/6/2012</b>
Your Ref:	Our Ref: <b>EQ - ALM-1506-SXS</b>

We have pleasure in submitting our quotation for the supply of a Southern Cross Star-Line Pro pump unit as follows.

**#1 Star-Line PRO Motor Drive Pump - Duty – 22l/s at 25m**

Pump Details – 6 x Southern Cross Star-Line PRO Motor Drive Pump 100x80-160 of construction –AB2 Marine Alloy/ AB2 Marine Alloy Impeller/ Duplex Stainless Steel Shaft – SAF2205, Sea Water & Grit Mechanical Seal, mounted on a galvanised Pressed Steel Base Frame.

Electric Motor Details – WEG High Efficiency W22 E3+ – 11kW, 2 Pole, IP66, 415v – 50Hz

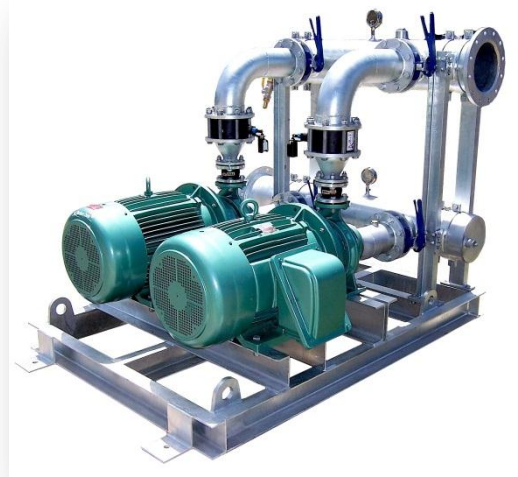
Other Information:

- Horizontal Close Coupled End suction- pull out type to ISO 2858
- AB2 Marine Alloy Construction
- Sea Water & Grit Hastelloy Mechanical Seal
- All Stainless Steel Shafting to grade SAF 2205 SS
- Pump Painted Jade green G21 – AS2700

Items not included in price:

- Pipes,
- Manifolds,
- Valves.
- Any items not listed above

**Net Invoice Price \$270,738.00 + GST**



**Example only of a Typical Southern Cross Star-Line Motor Pump.**

**Freight:** Ex Works, Perth.

**Delivery:** 13-15 working weeks, Subject to confirmation at the time of ordering.

**Warranty:** All equipment is covered under the Manufacturers' Standard Warranty for Supply and/or Service for a period of 12 months from date of installation.

**Commissioning:** No

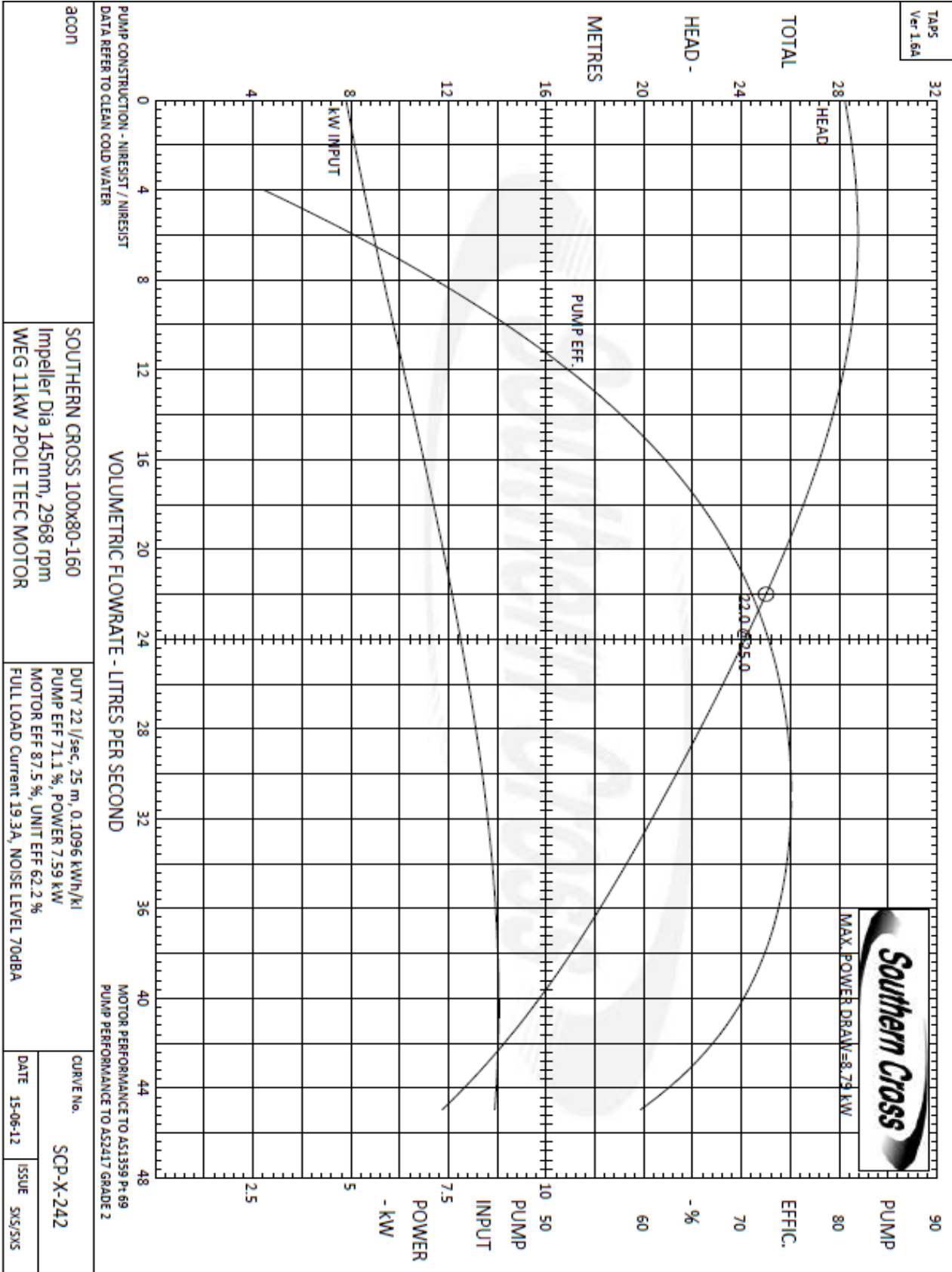
**Validity:** This quotation is valid for a period of 30 days.

**Trading Terms:** Tyco Flow Controls Pacific P/L Standard Terms and Conditions. (Copy attached)

**Goods & Services Tax (GST):** This quotation is subject to GST.

**Propriety:** This quotation is the property of Southern Cross. Its contents are confidential and subject to return on demand and may not be copied or disclosed to any third party or used directly or indirectly for any other purpose than as expressly determined in writing by Southern Cross.

**Pumping Systems**



**Pumping  
Systems**

**W22 Line – High Efficiency Motors**

The increasing demand for electrical energy to sustain global development requires consistent heavy investments in power generation. In addition to complex medium and long term planning, these investments rely on natural resources, which are becoming depleted due to constant pressures upon the environment. The best sustainable strategy is to prevent wastage and increase energy efficiency. Electric motors play a major role in this strategy, for around 40% of all global energy demand is estimated to be related to electric motor applications. Consequently, any initiatives to increase energy efficiency, by using high efficiency electric motors and frequency inverters, are to be welcomed, as they can make a real contribution to reducing global energy demand and carbon emissions.

At the same time as efficiency initiatives make an impact in traditional market segments, the application of new technologies results in profound changes in the way electric motors are applied and controlled. By integrating these changes together with the demands for increased energy efficiency, WEG has taken up this global challenge and produced a new design of high efficiency motor; one that exceeds the performance of

WEG's existing W21 line, which has been recognized worldwide for its quality, reliability and efficiency.

Combining engineering know-how to the latest generation of computerised tools, such as structural analysis (finite element analysis), fluid dynamics and electrical design optimization software, an innovative, next generation product range has been developed: the W22 motor.

Several key objectives have been achieved in the design of the W22 motor:

- Reduction of noise and vibration levels
- Increased energy efficiency and reduced thermal footprint
- Easy maintenance through robust modular design
- Compatibility with present & future generations of frequency inverters
- Low carbon emissions during manufacturing, installation and throughout its long operating life
- High torques keeping up with the toughest load and voltage oscillations.

W22 Industrial



W22 Mining



# **TYCO FLOW CONTROL PUMPING SYSTEMS - STANDARD TERMS AND CONDITIONS OF SALE**

## **1. General**

Unless the context otherwise requires:

**Agreement** means the agreement between Tyco and Customer for the supply of Goods by Tyco to Customer and shall be constituted in its entirety by these Terms and Conditions of Sale and, if any, Tyco's quotation and the Confidential Credit Application and Agreement;

**Credit Arrangement** means the credit terms available to Customer pursuant to an application by Customer for the provision of Goods on credit submitted to Tyco using Tyco's standard credit application form and accepted in writing by Tyco (referred to as the Confidential Credit Application and Agreement);

**Customer** means the party to whom Tyco has agreed to supply Goods pursuant to the Agreement;

**Goods** means the goods and/or services agreed to be supplied by Tyco and purchased by Customer pursuant to the Agreement;

**GST** has the meaning given by the *A New Tax System (Goods and Services Tax) Act 1999 (Cth)*, or if that Act does not exist means any Act imposing or relating to the imposition or administration of a goods and services tax in Australia and any regulation made under that Act;

**Guarantee** means the guarantee document provided by Customer or Customer's directors, shareholders or principals to Tyco to guarantee the performance of the Agreement by Customer;

**Proprietary Information** means any and all information and intellectual property relating to the Goods or the installation or operation of the Goods including but not limited to patents, designs, drawings, instruction booklets, specifications, circuit drawings, componentry, trade secrets, trade marks and copyright in such information and intellectual property;

**Purchase Order** means the written purchase order by Customer to Tyco for the supply of the Goods;

**Tyco** means Tyco Flow Control Pacific Pty Ltd ABN 83 000 922 690. Tyco PUMPING Systems is a trading division of Tyco Flow Control Pacific Pty Ltd

**Tyco Group** means that group of companies that has as its ultimate parent Tyco International Ltd.

## **2. Quotations and purchase orders**

- (a) Subject to the clause immediately below, quotations from Tyco are valid for a period of 30 days from the date of issue or as otherwise specified in the quotation. Prices given in any quotation by Tyco are applicable to that quotation only, and will not apply in any other instances. A quotation from Tyco is not an offer to sell.
- (b) In order to purchase the Goods, Customer must place with Tyco a Purchase Order setting out an order number, Tyco's quotation number (if applicable), the price, full description of the Goods to be purchased, the delivery date, delivery point and any other information required by Tyco. The Purchase Order may be accepted or rejected by Tyco at Tyco's sole discretion.
- (c) A contract shall be formed by and upon Tyco accepting from Customer a Purchase Order pursuant to the clause immediately above and subject to the details outlined in Tyco order confirmation. Each contract shall be governed by the Agreement.
- (d) The Agreement shall take precedence over any other representations, agreements, arrangements or understandings relating to the Goods and any matters in connection with the Goods.
- (e) Any conditions or terms of purchase submitted by Customer deviating from or inconsistent with the Agreement will not bind Tyco, notwithstanding any statement by Customer in its Purchase Order that its terms and conditions prevail over the Agreement.
- (f) Where the Goods to be supplied contain raw materials, the price and availability of which is unpredictable (for example, PVC, copper, steel), and there is a lack of available such raw material either to enable Tyco to supply the Goods or to supply the Goods at the price stated in the Purchase Order, Tyco may, at its sole option:
- expand additional time to make reasonable efforts to attempt to locate raw material, and if raw material cannot be located, serve notice of immediate termination of the Purchase Order under the Agreement; or
  - endeavour to reach agreement with Customer on an increase in the purchase price for the Goods, and if agreement cannot be reached, serve notice of immediate termination of the Purchase Order under the Agreement; or
  - serve notice of immediate termination of the Purchase Order under the Agreement.
- In no case shall Tyco have any liability to Customer as a result of termination, but Customer shall pay to Tyco the purchase price of Goods actually supplied or to be supplied under the Agreement.

## **3. Payment of purchase price**

- (a) Unless otherwise agreed in writing, Tyco accepts Purchase Orders subject to the condition that Customer agrees to pay the purchase price appearing on Tyco's price list for those Goods current as at the date that Tyco accepts the Purchase Order.
- (b) A copy of Tyco's price list for the Goods is available on request. All prices on Tyco's price list are subject to alteration without notice.
- (c) The purchase price stated in the price list do not include GST, assembly costs, installation costs, any special requirements stated on the customers purchase order, costs and charges of third party suppliers such as electricians, insurance or any statutory, sales, excise, or other taxes, duties or imposts, all of which may be added to the purchase price or otherwise will be paid by Customer or reimbursed by Customer to Tyco, as Tyco may elect. Any special requirements must be stated on the customers purchase order.
- (d) Payment of the purchase price must be made in accordance with Customer's Credit Arrangement subject to the requirements of clause (e) and (f) below. If no agreement is in place payment terms will be 25% of the order value with the placement of the order and the balance prior to despatch or as agreed in writing by both parties.
- (e) Tyco at its discretion, as a condition of acceptance of a purchase order may require the customer or another person to do one or more of the following: provide progress payments; provide personal guarantees; provide a bank guarantee; enter a credit arrangement.
- (f) Tyco reserves the right to receive payments where the agreed credit limit has been reached or will be exceeded with the despatch of a current order, prior to despatch of any further orders.
- (g) Customer must not set off any money owing or alleged to be owing by Tyco against money due by Customer to Tyco.
- (h) Customer acknowledges that Tyco is a member of the Tyco Group. Customer agrees that Tyco and/or any other Tyco Group company is entitled to exercise a right of set off to the extent Customer is indebted to Tyco or to any Tyco Group company against any monies due by Tyco to Customer or any Tyco Group company on this or any other account.
- (i) If Customer does not pay money by the due date for payment, without prejudice to any other rights which it may have against Customer, Tyco may require Customer to pay on demand interest at the Westpac Indicator Lending Rate effective from time to time plus 4% per annum calculated from the due date on daily balances of amounts unpaid.
- (j) Tyco reserves the right to implement a minimum order value for any Goods and to amend any such value without notice.

## **4. Cancellation of orders**

Customer may not alter or cancel a Purchase Order without Tyco's prior written consent. If Tyco agrees to alter or cancel the Purchase Order, Customer will indemnify Tyco against any loss, damage and expense incurred by Tyco in relation to the alteration or cancellation of that Purchase Order, including the cost of return freight, return shipping to factory of origin, items purchased from third parties for inclusion in the Goods and all labour and engineering costs incurred by Tyco in the execution or part execution of the Goods and including compensation payable to any of Tyco's suppliers and loss of profit.

## **5. Return of Goods and credits**

- (a) Customer is deemed to have accepted the Goods unless it makes a claim in accordance with the clause immediately below.
- (b) Customer may reject any Goods that are wrongly supplied or oversupplied by notifying Tyco of the claim and providing full particulars of the claim in writing within 5 days of receipt of those Goods. Tyco may dispute any such claim.
- (c) Goods referred to in the clause immediately above may be returned to Tyco for credit if all of the following is complied with:
- the Goods are returned to Tyco's premises by prior arrangement and with Tyco's written approval within 7 days of delivery, at no cost to Tyco, unless delivered as the result of an administrative error by Tyco, in which case Tyco will bear the cost of return;
  - the Goods are accompanied by a dispatch note stating Tyco's original invoice number and reason for return; and
  - the Goods are returned in an unsoiled, undamaged and resaleable condition in their original packing.
- (d) Customer must not return any Goods to Tyco unless it has complied with the two clauses immediately above and has done all things necessary to permit Tyco to examine the Goods to Tyco's satisfaction within that period.
- (e) Without limiting any other clause in the agreement, if Tyco accepts the return of goods as ordered by the customer, Tyco may charge a restocking fee up to 20% of the Price payable for the Goods. The Restocking fee will be a minimum of \$50.

## **6. Delivery and storage**

- (a) All quoted delivery or consignment dates are estimates only. Tyco is not obliged to meet such dates and will not be liable to Customer by reason of delays caused by any reason whatsoever.
- (b) Tyco is deemed to have delivered the Goods when the Goods are made available to Customer for physical collection by or on behalf of Customer at Customer's nominated delivery point (**Delivery**). Any unloading or loading shall be Customer's responsibility, unless Tyco otherwise agrees in writing.
- (c) Tyco may deliver the Goods by instalments (where, in Tyco's opinion, this is reasonable) and issue interim invoices to Customer.
- (d) Without limiting any other provision of the Agreement, failure by Customer to pay any instalment, or any other amount when due, will entitle Tyco to withhold or delay delivery of any remaining Goods ordered.
- (e) If Customer is unable to collect the Goods at Customer's nominated delivery point on the delivery day, Tyco may (at its option and without limiting its other rights and remedies) arrange suitable storage of the Goods, whether at its premises or elsewhere, and Customer must pay or reimburse all costs and expenses of storage, insurance, demurrage, handling and other charges associated with such storage.

Notwithstanding Customer's inability to collect the Goods, Delivery is deemed to have occurred.

## **7. Title and risk**

- (a) Title to the Goods shall remain with Tyco until all monies owing by Customer to Tyco have been paid in full (whether such monies are payable under a specific contract or on any other account).
- (b) Until such time as Customer has paid in full all monies owing to Tyco, Customer shall:
- store the Goods separately and mark them so that they are clearly and easily identifiable as Tyco's property and, if Supplier requests, inform Tyco of the location of the Goods;
  - hold the Goods as bailee for Tyco, subject to Customer's right to deal with the Goods in the ordinary course of Customer's business (**Bailment**);
  - indemnify Tyco against any claim arising out of the possession, use or disposal of the Goods by Customer or repossession or attempted repossession by Tyco.
- (c) If:
- a payment is not made in accordance with the Agreement;
  - Customer commits any other breach of the Agreement;
  - Customer becomes bankrupt, has an administrator, a receiver or a receiver and manager appointed, goes into liquidation (whether voluntarily or otherwise), or is wound up, dissolved or declared insolvent, then Tyco may at any time, without notice to Customer and without prejudice to any other rights that it may have against Customer:
- terminate the Agreement and the Bailment;
  - suspend some or all its obligations to Customer under the Agreement; and/or
  - enter upon any premises owned or occupied by Customer where Tyco reasonably believes the Goods may be stored and repossess the Goods (including uninstalling the Goods) without being liable for any damages caused.
- (d) If Customer sells the Goods before payment in full to Tyco, or uses the Goods in a manufacturing or construction process of its own or some third party, Customer holds the proceeds on trust for Tyco in respect of those Goods, and must keep such proceeds in a separate account until the liability to Tyco is discharged and must immediately pay that amount to Tyco.
- (e) The risk in the Goods passes to Customer at the time of Delivery.

## **8. Insurance**

Customer must keep the Goods insured against all risks for Goods of that kind from the time the risk in the Goods passes to Customer until the time that title to the Goods passes to Customer. Customer holds the proceeds of that insurance on trust for Tyco up to the amount it owes Tyco in respect of those Goods, and must keep such proceeds in a separate account until the liability to Tyco is discharged and must immediately pay that amount to Tyco.

## **9. Limitation of liability for Goods**

- (a) Other than is provided for in this clause 9, Tyco makes no warranties or representations to Customer.
- (b) Tyco warrants the Goods to be free from defects in workmanship and materials under normal use and service for a period of 1 calendar year from the Delivery (**Warranty Period**). This warranty does not cover costs of recovery of the Goods from the site or damage, fault, failure or malfunction due to external causes including accident, abuse, misuse, mechanical or electrical overload, abrasion, corrosion, incorrect installation, failure to perform required preventative maintenance or normal wear and tear.
- (c) During the Warranty Period, to the extent permitted by law, Customer's sole remedy with respect to breach of warranties set out in the clause immediately above will be to repair or replace (as Tyco may elect) any such defective Goods at Tyco's expense. The replacement or repaired Goods shall be covered by the unexpired portion of the Warranty Period in respect of the original Goods or for a period of 90 days, whichever is the greater.
- (d) For equipment forming part of the Goods, which equipment is not manufactured by Tyco, the original manufacturer's warranty will apply. Tyco's liability for such equipment shall not exceed the liability of the manufacturer.
- (e) In respect of Goods that are not ordinarily acquired for personal, domestic or household use or consumption, the liability of Tyco for a breach of any condition or warranty implied by law is limited at Tyco's option to the repair the Goods or supply replacement Goods.
- (f) Tyco's liability under the Agreement will be reduced by the amount of any contributory loss or damage to the extent caused by Customer's act or omission.
- (g) Customer acknowledges and agrees that, to the extent permitted by law, Tyco has no liability in contract, tort (including negligence or breach of statutory duty), by statute or otherwise for loss or damage (whether direct or indirect) of profits, opportunity, revenue, goodwill, bargain, production, contracts, business or anticipated savings, corruption or destruction of data or for any indirect, special or consequential loss or damage whatsoever.
- (h) Tyco's total liability under any contract and the Agreement shall not exceed the total dollar amount of the Goods purchased by Customer under each contract.

## **10. Proprietary Information**

- (a) Customer acknowledges that all Proprietary Information and all right, title and interest therein are the sole property of or licensed by Tyco and Customer shall gain no right, title or interest in the Proprietary Information whatsoever. Customer specifically acknowledges Tyco's exclusive rights to ownership of any modification, translation or adaptation of the Proprietary Information and any other improvement or development based thereon, whether developed, supplied, installed or paid for by or on behalf of Customer or any buyer of Customer or otherwise.
- (b) Customer must not and must not permit any person reasonably within its control nor procure any person to modify, copy, clone or reverse engineer the Goods, or copy, modify or decompile any of Tyco's documentation relating to the Goods.
- (c) The Customer indemnifies, and agrees to keep indemnified Tyco against any loss, costs, expenses, damages and harm suffered or incurred by Tyco in connection with or arising from the breach by the Customer of any of the provisions of this clause and/or any claims arising against Tyco arising out of matters referred to above.

## **11. Installation**

- (a) Where Tyco are installing the Goods the customer will do both of the following:
- Be solely responsible at its own expense to obtain any permits or authorities required to install the goods at the site
  - Prepare the site in accordance with the specifications and requirements of Tyco at the customer's costs.
- Unless otherwise agreed by Tyco in writing.

## **12. Export/re-export/resale**

- (a) The Goods supplied are intended for use only in Australia, unless Tyco otherwise agrees. If Customer exports or re-exports the Goods, it is Customer's responsibility to ensure that the Goods and the use to which they are put comply with the laws of the destination.
- (b) Customer acknowledges that the Goods purchased by Customer may not be sold, leased or otherwise transferred to or utilised by a terrorist organisation, a party listed on any US denied persons or entities list or by an end-user engaged in activities related to weapons of mass destruction, including but not limited to activities related to design, development, production or use of nuclear materials, nuclear facilities or nuclear weapons, missiles or support of missile projects, or chemical or biological weapons.
- (c) If Customer resells the Goods, it shall not, in connection with their resale, pay or offer to pay, money or any thing of value to any government official, entity or organization, any political party, any candidate for public office, or their employees or relatives, for the purpose of influencing purchasing decisions or for any other improper purpose.

## **13. Miscellaneous**

- (a) The fact that Tyco fails to do, or delays in doing, something it is entitled to do under the Agreement, does not amount to a waiver of its right to do it. Tyco must agree in writing to any waiver.
- (b) If a clause or part of a clause can be read in a way that makes it illegal, unenforceable or invalid, but can also be read in a way that makes it legal, enforceable and valid, it must be read in the latter way. If any clause or part of a clause is illegal, unenforceable or invalid, that clause or part is to be treated as removed from the Agreement, but the rest of the Agreement is not affected.
- (c) Tyco shall not be liable for any failure to fulfil or any delay in fulfilling any obligation arising under the Agreement if the failure or delay has been caused directly or indirectly by any act of God, war or other civil commotion, strikes, lockouts, stoppages and restraints of labour, breakdown of machinery, inability to obtain raw materials or fuel, fire or explosion, any government action or any other cause beyond Tyco's reasonable control and not as a consequence of Tyco's negligence.
- (d) Any notice to be given to a party under the Agreement must be in writing and must be sent by post, facsimile or email to the address of that party shown in the quotation, Purchase Order or order acknowledgment. Notice is deemed to have been given at the time it would have been received in the normal course of post if sent by post, or if otherwise given at the time it was actually received.
- (e) The Agreement is governed by and must be interpreted in accordance with the laws of the State or Territory where Tyco supplies the Goods and the Goods are delivered. Where there are multiple places of supply and/or delivery, Tyco may elect the State or Territory in Australia that shall have jurisdiction over the Agreement. Customer unconditionally submits to the non-exclusive jurisdiction of the courts of the State or Territory determined in accordance with this clause.
- (f) Where there is more than one Customer then the liability of each shall be joint and several.
- (g) The rights and remedies provided in the Agreement will not affect any other rights or remedies available to Tyco.
- (h) Customer shall not assign this Agreement without Tyco's prior written consent.