

# PORT BOTANY EXPANSION

MAIN CONSTRUCTION COMPANY : Boulderstone  
DEVELOPER / CLIENT : Sydney Ports Corporation  
PROJECT END VALUE : \$535 Million  
COMPLETION : Early 2011  
ARCHITECTS : Hyder Consulting  
ENGINEER : Bilfinger Berger Civil  
SITE SURVEYOR : Pacific Survey

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## BAULDERSTONE - BUILDING SYDNEY PORTS' NEW TERMINAL AT PORT BOTANY

Born of the union between the trusted names of AW Baulderstone and MR Hornibrook, Boulderstone has become one of Australia's largest building and engineering companies. In March 2011, Boulderstone entered a new phase of its company evolution by becoming part of the Lend Lease Group.

With a significant project portfolio, including the Opera House and Anzac Bridge in Sydney, and Melbourne's Etihad Stadium, Boulderstone continues to be recognised for its innovation, quality and service excellence across an extensive range of developments.

Due to Boulderstone's adaptable and responsive approach to project planning and delivery, as well as commitment to sustainability and environmental issues, Boulderstone was also appointed as the main construction company on the significant Port Botany Container Terminal Expansion development.

In a joint venture with Jan de Nul to design and construct the \$535 million new terminal and associated works, Boulderstone has brought its experience in infrastructure development and design to the project.

The joint venture also carried out related environmental and community works, following Sydney Ports Corporation's detailed design.

Encompassing the construction of an additional 1,850 metres of berth, the dredging of 11Mm<sup>3</sup> of shipping channels and foundation trenches, the reclamation of 63 hectares of land, the construction of dedicated road and rail access, as well as a public boat launching ramp and parking, the expansion is expected to almost double the current capacity of the port.

Port Botany Container Terminal Expansion Project Director Vince Newton said that during their involvement on the immense project, Boulderstone's team of professional engineers and supervisors had been responsible for the critically important function of delivering all of the foundation improvement and berth construction.

"The accepted design of the project required 216 precast concrete counterfort wall sections to be manufactured and constructed onsite. These individual wall segments weighed 640 tonnes and were installed by a purpose-built, shear leg crane barge," Mr Newton said.

"Each segment was 21 metres high and nine metres wide and were equipped with double buttress walls."

To ensure settlement and lateral tolerances were designed to withstand the threat of any natural disasters – in particular, earthquakes – Boulderstone engaged Hyder and Golder Associates to provide leading geotechnical engineering expertise to the project.

In fact, extensive modelling and analyses were conducted during the initial design phase, including the use of two and three-dimensional analyses and the delivery of information through new GIS and data-sharing systems.

Another example of the astute engineering capabilities utilised on the Port Botany Container Terminal Expansion was Boulderstone's use of a bridging beam.

"One particular challenge we faced on this project was connecting the existing Brotherson Dock cope beam to the new cope beam," Mr Newton said.



*Photos courtesy of Sydney Ports Corporation*

"In order to overcome this obstacle, we designed a 15-metre long, by 2.3-metre deep, by 5-metre wide bridging beam.

"This was a completely unique structure for the project, especially given the fact that such a beam never before been utilised in a port environment – anywhere in the world," he said.

Despite the fact there were more than 100 mandatory planning conditions and requirements, Boulderstone's innovative techniques and pioneering approach ensured the project exceeded all environmental expectations and sustainability outcomes.

With such a dedicated commitment to the investment of solid working relationships with other project stakeholders, as well as a combination of cutting-edge and sustainable project solutions, Boulderstone has once again exceeded all safety, community and environmental benchmarks and delivered outstanding project results.



# ASSURING DURABILITY, PERFORMANCE AND FUNCTIONALITY

Heralded as one of the most extensive and innovative port infrastructure projects in Australia in the last 30 years, the \$1 billion Port Botany Expansion project has provided Parsons Brinckerhoff (PB) with an opportunity to showcase its outstanding marine, environmental and verification capabilities.

The challenge for any infrastructure owner, when delivering projects of this size and complexity, is to ensure long-term performance and functionality outcomes for the port owner, future operators and the wider community. Sydney Ports Corporation (SPC) selected PB to provide comprehensive verification services for the port expansion, and help SPC achieve these outcomes. In 2007, PB signed a tripartite agreement with SPC and the design and construction joint venture, Baulderstone and Jan de Nul, and has since identified numerous opportunities to add value to the project outcomes.

PB's Project Director, Tony Stein, said the Port Botany Expansion Project features many interesting and bold aspects that make this project one of the major engineering undertakings of its kind in the world, and require the independent project verifier to be dynamic, ingenious and very thorough. "Not only did we have the responsibility to certify all contract requirements, we also had to meet the verification challenges presented by each of the joint venture's design submissions and construction procedures," Mr Stein said.

PB assembled and managed a capable team of specialists in dredging and reclamation, marine structures, materials durability, seismic, geotech and environment disciplines. They effectively addressed many issues that arose in the design and construction of 1,850

metres of quay face for five post-panamax shipping berths, 63 hectares of reclaimed and compacted land, dedicated road and rail access, and improvements to the estuarine environment and public foreshore facilities.

As well as reviewing over 300 design submissions and 1500 drawings, which formed the detailed design of the port, PB's verification team reviewed later design changes captured in over 1000 'issued for-construction amendments' and 'requests for information'. The smart use of geotechnical and marine engineering knowledge to identify and address any gaps, shortcomings or risks in the complex designs and construction methodologies was crucial to verifying this expansion.

A prime example of PB adding value occurred during its design review of a unique, continually reinforced cope beam. This crucial component of the quay structure is located in the harshest of marine conditions and required to distribute massive container crane and vessel loads across nearby counterfort units. PB's review led to dramatic design developments and helped arrive at solutions based on sophisticated computer models that assessed effects from corner stiffness, thermal, shrinkage and seismic actions and crack widths that govern durability.

An underwater remotely operated vehicle (ROV) was used to solve the surveillance challenges in the marine environment. The ROV was equipped with lights, camera and depth gauges so it could record clear visual observations of underwater structures and dredged areas.

To be confident in how the contractor's quality systems were applied on the project, PB undertook a broad risk assessment of the proposed

construction processes. This included assessing any potential risk to the durability, functionality and performance of various parts of the project, which allowed PB to set up appropriate verification strategies to manage and mitigate these risks. PB worked closely with project partners to improve quality control processes, audited, reviewed countless compliance records and hold points, and provided surveillance on- and off-site to include products supplied by external subcontractors.

PB's site-based verification team of up to 16 full-time staff applied comprehensive monitoring and surveillance systems. PB's independent verification services made the owner confident the stringent durability and performance criteria were being met.

One of the success factors on this project stems from PB staff members communicating openly, diligently and respectfully with project partners,

particularly when dealing with the inevitable contractual and technical issues that arise on projects of this scale and complexity.

By successfully delivering the Port Botany Expansion Project verification services, and giving the infrastructure owner confidence in the long-term performance and functionality of this magnificent asset, PB has once again reaffirmed its leadership worldwide as an independent project verifier, particularly in civil, highway and marine construction.

PB is one of the world's leading planning, environment and infrastructure firms. With a range of comprehensive services, including strategic consulting, design, construction and project management, PB's work spans a wide variety of projects.

PB's focus on delivering sustainable solutions, as well as its experienced and innovative approach, has led to its involvement in planning, designing and constructing a number of significant intermodal and port projects in Australia. These include the Moorebank Intermodal Terminal, Port of Melbourne-Dynon Port Rail Link and Mayfield Wharf at Newcastle.

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Since their establishment in 1948, the Neumann Group of Companies has maintained a proud and successful history and project portfolio within the building and construction industry.

Initially commencing operations as a sand mining business, the group has since developed and diversified and now also trades within the steel, specialised metals, civil construction, petroleum, pre-mixed concrete, mineral sands and land development industries. Neumann Contractors has more than 50 years' experience in contract dredging, with a modern and well maintained dredging fleet

Attributing their success and outstanding industry reputation to their philosophy of innovation, flexibility and performance, Neumann Contractors is committed to offering professional services, whilst at the same time maintaining strict quality, safety and environmental standards.

With more than 800 employees in the Neumann Group, their experienced management and engineering team work closely with clients from the preliminary stages of a project, through to its completion.

Neumann's has an impressive portfolio showcasing their involvement in a number of significant dredging projects, such as the completion of more than 200 kilometres of inland waterways, as well as the successful dredging of many large scale land reclamation, infrastructure and channel maintenance projects.

Recently Neumann Contractors were involved in the \$500 million Port Botany Container Terminal Expansion Project in Sydney, NSW. Considered to be one of the largest infrastructure projects of its kind in Australia, the Port Botany development incorporates the expansion of the existing container port terminal to increase port capacity.



Brian Madden, Project Manager for Neumann Contractors, said that during their initial involvement they were contracted to undertake the dredging and reclamation of the concrete casting yard area, access platforms and underwater bunds used for turbidity and environmental control.

Neumann's used their 450mm cutter suction dredge the 'Nu Bounty', capable of dredging to a depth of 22 metres. The majority of the dredged material came from the new shipping channel, turning basin and berth pocket. During the dredging, Neumann

Contractors removed in excess of 1,100,000 cubic metres of sand, which was used for land reclamation within the Port Expansion area.

During the Project, Neumann's were faced with a number of onsite challenges. In addition to the tight project delivery timeframes, Neumann Contractors also faced unstable and difficult weather conditions and the interfacing of the dredging with other marine works. Despite the limited time frame, Neumann's were able to maintain the required project schedule completing their project responsibilities on time.

Given Neumann's versatile dredging fleet and expertise, as well as their dedication to innovation, flexibility and performance, Neumann Contractors will continue to deliver the desired project results to the client's satisfaction.



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# THE ANSWER FOR ALL YOUR ENGINEERING PROBLEMS

Specialising in the use of hydraulics to solve complex engineering problems, Industrial Hydraulic Services (IHS) has been servicing a vast local and overseas market since 1973.

With a team of specialist technical engineering consultants, focused on delivering solutions to complex engineering problems through the innovative use of hydraulics, IHS has grown from servicing the local engineering market to becoming a major competitor on the international scene.

Given their extensive experience and cutting-edge approach to engineering, IHS has also been involved on the \$500 million Port Botany Expansion Project in Sydney.

Described as being one of the most extensive and innovative port infrastructure projects undertaken in Australia, the Port Botany expansion will include infrastructure for a new container terminal,

providing 1850 metres of extra berth length through reclamation of 60 hectares of land.

During their involvement, IHS were responsible for the complete design, manufacture and supply of the 20T Mooring Winch System, 30T Double Drum Derricking Winch System, 420T Luffing Cylinders and the 700HP Hydraulic Power Unit run off Remote Control Pendant.

Justin McMillan, Project Manager at IHS, said that in addition to delivering the required engineering services and products, they also took an innovative approach throughout the design and installation of the winch frames and drums.

"In addition to this innovative approach, we used C-Ramic Densification on the rods for the luffing cylinders, which is better suited to a sea water environment," Mr McMillan said.

"The main obstacle we faced on the project was designing the entire system in order to meet the AS1418.1 Crane Mechanism Code.

"As we could not out-source any of the safety requirements necessary, given the fact the code was not one readily used in the industry, we took the initiative to collectively design our own safety redundancy with the system that met all the code requirements of the code," he said.

As a result, IHS was once again able to effectively fulfill their responsibilities within the tight timeframe, ensuring optimum client satisfaction and project results.

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## URS/SCOTT WILSON CONTRIBUTION TO THE PORT BOTANY EXPANSION



Image supplied Courtesy of Sydney Ports Corporation



Image supplied Courtesy of URS / Scott Wilson



Image supplied Courtesy of URS / Scott Wilson

During the preliminary planning phase of this project URS successfully managed and delivered the Environmental Impact Statement for Sydney Ports Corporation. Since 2008, Scott Wilson (now URS/Scott Wilson) has provided significant engineering design and construction phase support services for the design and construct consortium undertaking the major civil and structural marine works including: the maritime structures, reclamation perimeter seawalls, scour protection and a boat ramp.

“As a result of our significant ports and maritime engineering expertise we were able to provide the consortium with optimum project solutions involving Scott Wilson design teams located in Sydney, Hong Kong and the UK.” Alan Betts, NSW Regional Manager of URS/Scott Wilson said. “Working with other local design consultants as part of the engineering design team, our primary responsibility was the engineering design of major elements of the maritime structures comprising the land and water interface.”

There were a number of interesting challenges to be overcome in the design including: minimum settlement criteria, a 100-year design life, a cope beam on top of the counterfort and caisson units which consisted of a combination of precast concrete elements on the front face of the main continuous cast-in-situ beam. In addition, special caisson units were required at the quay wall corners and at the connection with the existing quay wall.

“The challenges presented by the scale of this project such as the 1.8-kilometre length of quay wall and the 20-metre height of reclamation, combined with many other project constraints were considered and

overcome during the design phase of this project which contributed to the successful delivery of this project.” Mr Betts said.

URS/ Scott Wilson has also recently undertaken the engineering design verification of a new Bulk Liquids Berth in Port Botany for Sydney Ports Corporation. Since merging with URS in September 2010, URS/Scott Wilson’s capability provides resources to assist in the delivery of large and complex infrastructure projects including: maritime works, bridges, roads, rail, transport planning, and airport projects

URS/Scott Wilson is a fully integrated engineering, construction and technical services organisation with approximately 46,500 employees in a network of offices in more than 40 countries. The Asia Pacific Region has a staff of 1,300 professionals in 18 office locations.

The organisations’ combined capabilities support every stage of the largest and most complex projects including: environmental investigations, programme management, planning, design and engineering; systems engineering and technical assistance; construction and construction management; operations and maintenance; and decommissioning and closure services.

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## CONNEQ POWERS PORT EXPANSION

Recently, engineering construction and asset management contractor, Conneq, has provided critical services to the Port Botany Container Terminal Expansion Project in Sydney, including connecting the construction site to an electricity supply and maintaining the onsite concrete batch plant and formwork facility.

“Our team was contracted to provide the permanent electrical services for the expansion project including establishing a 11kV-415 volt 800 KVA substation and the installation of street lighting and bridge lighting, an amenities block and electrical services for a fish and boat cleaning area,” said Tony Moller, Operations Manager Electrical Contracting and Major Projects at Conneq.

Connecting the street lighting and the boat ramp area to the new substation required the installation of a kilometre of high voltage cable. This task presented a number of challenges for the team.

“The route of the high voltage cable had to be re-designed on a number of occasions to avoid old services that had not been mapped accurately,” Mr Moller said.

“The altered route also added to the number of cable joints our technicians were required to install – cable jointing is a highly-specialised and time-intensive task and every joint has to be inspected to ensure it meets applicable industry standards.

“Given our extensive engineering and project management experience, we were able to complete this project on time, avoiding workplace injury and disruptions to the construction schedule,” he said.

Another major part of their responsibility involved the installation of a substation and 415 volt electricity supply for the site management facilities and the concrete batch plant to ensure a continuous supply of concrete for the precast walls of the port structure.

The concrete batch plant and formwork facility operated 24-hours a day and produced around 200 precast concrete sections over the life of the project.

“Not only was Conneq on-call 24 hours a day to resolve any associated electrical issues or power interruptions due to failing equipment or construction site lighting, we also maintained equipment spares to allow for a quick swap-out of failed equipment,” said Mr Moller.

Conneq, the new name for Bilfinger Berger Services, draws on over 60 years’ experience to provide the delivery of vital infrastructure, from design engineering and project construction, to long-term operations and maintenance.

The company’s current projects include work for Snowy Hydro, Origin Energy, Incitec Pivot and the Esperance Port Authority. Conneq employs more than 3,500 people and has operations in every State and also New Zealand.

Conneq is part of Lend Lease’s infrastructure business, which also includes Abigroup and Boulderstone.

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# KEEPING THE MARINE INDUSTRY AFLOAT



**“BBV Systems contributes to expedited critical path for major precast works and significant budget savings for Port Botany Port Expansion Project”**

Established in 2005, AusBarge Marine Services are able to provide complete marine packages, including the supply of marine plant, consultation and support, to a range of projects within Australia.

Able to assist in all aspects of marine projects, with their capabilities incorporating the provision of plant, equipment and experienced personnel, AusBarge Marine Services also offer leading expertise and industry knowledge.

Having worked on a number of significant Australian projects and developments including, the Sydney Harbour Bridge Infrastructure Upgrade, Port Adelaide's Road and Rail Bridge Construction and Caltex Refineries Crude Oil Berth Bow Anchor Installation, AusBarge Marine Services were also involved on the Port Botany Expansion Development.

This \$500 million redevelopment incorporates the expansion of the current container facilities to provide an additional 1,850 metres of quay line, five new shipping berths, dedicated road and rail access and a secure estuarine environment.

Whilst working on Port Botany, Mark Roche, Director of AusBarge Marine Services, said their on-going involvement had commenced at the early stages of the expansion.

“We have been the primary marine plant, personnel and equipment provider for Baulderstone on this particular project and worked alongside

the client throughout the planning stages in order to achieve outstanding project results,” Mr Roche said.

The project site produced several localised problems such as, exposure to high winds, working in shallow water, congested areas with several barges, dredges and pipelines etc with crew required to work excessive hours to maintain program. These proposed risks to worker safety, damage to plant and equipment and project running behind schedule. Management of these problems was achieved by, constant monitoring of weather forecasts, rostering of crew hours to manage fatigue satisfactorily and a safety management system specifically developed and implemented to manage the risk whilst achieving the required construction program.

Given their major philosophy is to maintain close working relationships with their clients, AusBarge Marine Services consistently liaised with Baulderstone to ensure outstanding cost and time effective results were achieved on the Port Botany Expansion redevelopment.

With years of experience, a range of capabilities and an impressive project portfolio, it could be said that AusBarge Marine Services are at the forefront of the marine construction industry.

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BBV Systems Asia, a wholly owned subsidiary of the Bilfinger Berger Group specializing in post tensioning, geotechnic's, and concrete reinforcing systems was awarded the supply contract for prefabricated reinforcing for “Port Botany Expansion Project” by main contractor “Baulderstone - Jan De Nul Consortium”.

The supply contract of USD16.5 million included over 10,000 tonne of overseas prefabricated reinforcing for the construction of 1,850 metres of new wharf frontage. The wharf consisting of over 200 precast counterfort units measuring 15m wide, 20m high, 9m long and utilizing approximately 47 tonne of reinforcing each were constructed at an onsite precast yard.

Services under BBV's Supply Contract included a design element with detailed workshop drawings, bar bending schedules and delivery to site of the cut and bent bars semi prefabricated into reinforcing cages including mechanical splice couplers. The cages, prefabricated in Thailand in an ISO9001:2008 and ACRS certified factory were broken down into manageable sections to facilitate shipment in 40' open top ocean going containers. On site technical support to assist with cage assembly was also included in the package.

Two key factors contributing to BBV's success include expedition of the construction program critical path by significant reduction of rebar cage installation time (9 months in total) and significant budget savings by extending a fixed price for rebar cages for the duration of entire works.

The original production schedule for pre casting counterfort units was estimated at a maximum of five per week over 23 months. This was expedited to 6 and sometimes 7 counterforts per week at the height of production. It has been acknowledged by the client that BBV's innovative prefabrication concept and quality of rebar processing works significantly contributed to reducing the production schedule to only 14 months overall.

Additionally BBV was able to fix the current price of reinforcing steel from commencement of the project for the entire contract period even while the cage elements were still under design. Currency hedging initiated by the Bilfinger Berger Treasury Department also contributed in securing a favorable exchange rate between Australian and US dollar.

Other notable projects that BBV Systems have been involved in include the Sydney Cross City Tunnel, Brisbane NSBT Bypass Tunnel, Golden Ears Bridge in Vancouver and OK Tedi Mine in Papua New Guinea.

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*Photos courtesy of Sydney Ports Corporation*



## IN TOP 'FORM'

Established in 1999, China Grand Engineering specialises in the supply of fabricated structural steelwork and formwork for the building and construction industry. China Grand is represented in Australia by China Steel Solutions.

With 300 professional and highly skilled employees, China Grand has been involved on a range of prolific projects, such as the Gateway Upgrade Project and Airport Link in Brisbane, as well as the Port Botany Expansion project in Sydney.

Valued in excess of \$500 million, the Port Botany Expansion works will involve the expansion of the existing Port through reclamation of 60 hectares of land for the construction of 1,850 metres of new wharf frontage.

China Grand commenced their involvement in the project in 2008 through James Spence, Director of China Steel Solutions. James said they were responsible for approximately 500 tonnes of formwork for various concrete elements of the Project, including the main counter fort units.

"Furthermore, we supplied several kilometres of cast in stainless steel angles, as well as channels for the crane rails and cabling that runs the length of the extended jetty," Mr Spence said.

"Steel formwork for concrete is temporary and more often than not, scrapped at the end of a project. The stainless steel work, by contrast, will actually become part of the permanent works and the finished product.

"As such, these permanent works, which are now completed, were produced to Australian standards of finish and quality," he said.

Although the team from China Grand/China Steel Solutions was faced with tight delivery deadlines across some elements of the works, given their industry and project experience, they were able to deliver cost-effective and quality results within the required timeframe.

"The Port Botany Expansion has been a fantastic Project to work on and we have been honoured to be such an important part of it and provide our services, ensuring optimum client satisfaction," James said.

China Grand owns and operates two factories in China with a combined output of 25,000 tonnes per year. With a wealth of prolific project experience, it is without a doubt that China Grand will continue to be one of the leading steel and formwork companies in the business.

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## WILTRADING, LEADERS IN PORT AND OFFSHORE SAFETY

Leaders in the Marine Industry since 1986, Wiltrading offers integrated activities in marine safety, fire fighting and protection, equipment and servicing. Wiltrading are experienced providers to the, Offshore, Oil and Gas, Shipping, Military and Cruise industries offering quality products, innovative solutions and impeccable service.

Specialising in the provision of an extensive range of safety products, lifejackets, life rafts, oil rig and ship escape systems, Wiltrading has an outstanding safety and product provision reputation within the marine industry.

Given their professionalism and expertise, as well as being able to provide a leading range of safety and marine products, Wiltrading were also involved on the significant Port Botany Expansion Project in NSW.

Considered to be one of the largest infrastructure projects of its' kind, the Port Botany development, valued at \$500 million, incorporates the expansion of the existing container port terminal, capital dredging and land reclamation.

Peter Iredale, Product Manager at Wiltrading, said throughout their involvement on the project, they had supplied their quality range of lifejackets, lifebuoys and other associated safety gear to the various trades working onsite.

Wiltrading's endeavours are supported throughout the organisation by the corporate vision and mission. VISION: To be leaders in offshore safety. MISSION: To deliver specialist maritime & offshore life saving & asset protection solutions through enduring partnerships.

Procedure and systems back up this extensive service offering.

- Planning and management of maintenance including planned preventative, predictive and corrective maintenance on plant and equipment
- Emergency maintenance including a 24 hour call-out service and flying squads
- Facilities and machinery appraisal
- Solution design and documentation
- Minor works, renovations and refurbishments
- Project Management

A strong industry presence coupled with a skilled and experienced team has resulted in continued growth. Wiltrading are now present in major Australian ports including: Dampier, Fremantle, Melbourne, Sydney, Brisbane and Townsville and Darwin, where reliability and guaranteed delivery are essential for successful operation. In addition to these strategically located and fully equipped workshops, Wiltrading have flying squads of service engineers available for deployment throughout Australia, New Zealand and into the Pacific.

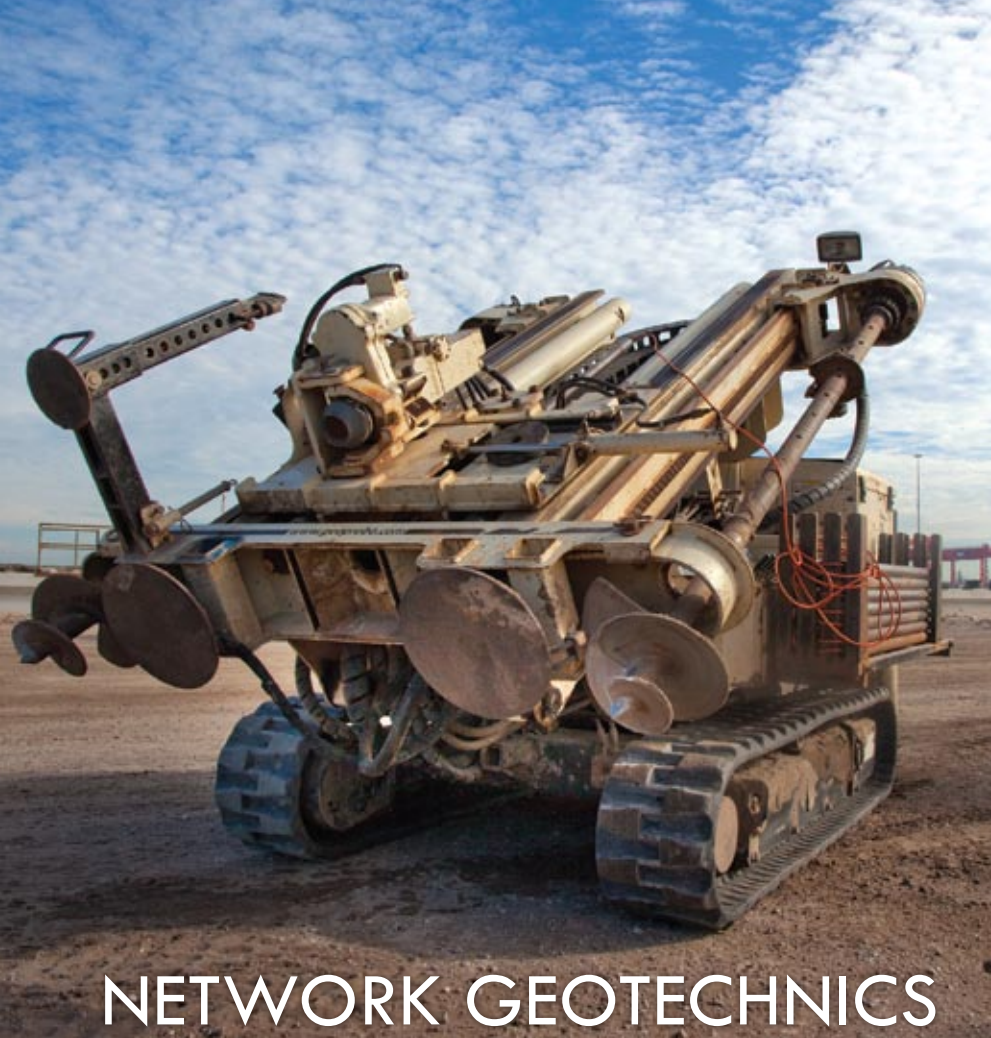
So, when running a port or a new development and you want to provide the best in safety equipment for your employees and contractors

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## NETWORK GEOTECHNICS

Established in 1995, Network Geotechnics is a multi-disciplined group that provides geotechnical engineering, laboratory, drilling and in-situ testing services to the NSW construction and civil engineering industries.

Given their project experience and innovative approach, Network Geotechnics were selected for the \$500 million Port Botany Expansion Project.

Commencing in October 2008, Network Geotechnics were responsible for carrying out approximately 450 marine based cone penetration tests (CPTs) and approximately 900 land based CPTs on loose and compacted dredged sand. They also provided testing services for all marine grade rock protection products from quarry to site, as well as testing of the onsite civil works.

CPT testing involves pushing a cylindrical probe with a cone-shaped tip statically into the ground. Sensors within the probe provide a real time continuous measurement of soil strength and other characteristics, which are then used for geotechnical modelling.

Matt King, Business Development Manager for Network Geotechnics said the marine based CPTs were used by Baulderstone to evaluate the marine trench foundation conditions that provided support for the 2km length of precast sea wall, whilst the land based CPTs were used to evaluate the effectiveness of dynamic and vibro compaction.

To undertake the project Network Geotechnics sourced and commissioned a Geoprobe 6625CPT crawler rig from the USA.

“We chose the Geoprobe 6625CPT as it was lightweight, self anchoring and crawler-mounted, therefore it was well suited to both marine and loose sand conditions,” Mr King said.



As a result they were able to carry out most of the two year testing program using the Geoprobe, only requiring the use of an external rig prior to its commissioning.

“The rig is also very compact and was able to be stored on-site in a container, which enabled us to keep costs for Baulderstone down,” he said.

Throughout their involvement in the project, Todd Redman, Drilling Manager at Network Geotechnics said the team were met with a number of challenges.

“One of which was reaching nominated test depths within the marine trench. After some initial setbacks, the feedback we provided to Baulderstone enabled them to develop a single length of specialised casing in order to get the CPT probe to the trench floor ready for testing.”

“Once installed, the equipment operated within a cone tip resistance range of 1 to 60 MPa and was able to achieve full penetration to nominated design depths of up to 18m below the seabed,” he said.

This collaborative approach to problem solving saw Network Geotechnics and Baulderstone achieve daily productivity on land and over water that exceeded their initial expectations.

Given their ability to successfully assist in the delivery of such a significant project, it is without a doubt Network Geotechnics will remain at the forefront of their industry.

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## “ACHIEVING EXCELLENCE IN UNDERSEA ENGINEERING SINCE 1945”

For sixty five years, Gray Diving Services has been providing underwater engineering and construction solutions to major construction companies and government departments in the demanding marine and submarine industry.

Utilising the latest state-of-the-art equipment and teams of highly trained industry professionals, Gray Diving is able to provide services including inspection, consultancy, specialist fabrication, underwater welding and non-destructive testing in marine, sub-marine, offshore and inland locations throughout Australia, South East Asia and the Pacific Rim.

Having worked on a number of prolific projects for a range of clients and industries throughout Australia, Gray Diving was also recently involved in the Port Botany Expansion project which commenced in 2008.

Responsible for all underwater construction and installation works undertaken on the project, Greg Vitnell, Managing Director of Gray Diving, said since their involvement on-site, his professional team of up to 26 divers and supervisors had used both new equipment and years of expertise to ensure the smooth running of the underwater phase of the Expansion Project.

“Given that we have dedicated a great deal of equipment and almost our entire workforce to this particular project, we have been able to provide effective solutions for the client in a time efficient manner,” Mr Vitnell said.

“Although the divers faced sometimes difficult underwater conditions, such as low visibility and contaminated sediments when carrying out the placement of the 650 tonne precast concrete units, our qualified tradesmen have been able to install all 247 units overcoming many obstacles and getting the job done to the clients satisfaction,” he said.

Mr. Vitnell also said that whilst working on the Port Botany Expansion Project, the company had utilised a new Nitrox diving system to allow far greater diving times to be achieved. “Nitrox is enriched air which has a greater than normal percentage of oxygen, this system coupled with the companies 3 recompression chambers set up onsite has provided a disciplined and effective approach to diving works,” Mr Vitnell said.

“As a result, our divers working on the Port Botany Expansion have been able to perform the required project tasks in a safe and professional manner,” he said.

With a team of highly qualified divers, who have a wealth of knowledge in underwater construction and engineering projects, Gray Diving will no doubt remain the leader of its industry, as they not only provide project solutions, but also use cutting-edge equipment to ensure optimum results and client satisfaction.

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# THE NUMBER ONE AUSTRALIAN VESSEL PROVIDER

Since their establishment in 2004, Australia Marine Services (AMS) Tugs and Barges, has become one of the leading vessel suppliers in Australia and is recognised within the marine offshore industry for its' outstanding services and quality supply of marine vessels.

Specialising in the charter and sale of a range of various tugs, supply vessels and barges, AMS have been involved in a number of coastal and offshore projects around the Northern Coastal areas of Australia, Oceania and the SE Asian region.

Given their expertise and specialised range of barges, workboats and utility supply vessels; AMS have also recently been involved on the Port Botany Expansion Project in NSW.

Valued in excess of \$500 million, the Port Botany Expansion works will involve the expansion of the existing Port through reclamation of 60 hectares of land for the construction of 1,850 metres of new wharf frontage.

Alan Yeo, Managing Director of AMS, said that throughout their engagement on the Expansion Project, AMS had designed a Construction Barge that was particularly suited to the development.

"We developed a hi-spec'd, 35 metre construction barge which was also equipped with a 150 tonne crawler crane on deck," Mr Yeo said.

"In addition, we designed and constructed B.P.L.1, a 59 metre, self-ballastable, SWL 640 tonne sheer leg crane barge.

"We took great lengths to not only ensure these barges met the specific requirements of our client, Baulderstone, but that they also ensured optimum results for the marine construction operations on the Expansion Project," he said.

Whilst working on the Port Botany Expansion, Mr Yeo said the AMS team faced challenges throughout the design and construction phases of the barges.

"Although we had very limited time to construct the sheer leg crane barge based on our client's high requirements, as well as maintain a high standard of quality and barge function, our professional team were able to fulfil these demands and deliver the barges on schedule," he said.

With such an impressive reputation to provide client solutions and cutting-edge barges, it is without a doubt AMS will continue to be one of the leading vessel suppliers for the Australian building and construction industry.

## AUSTRALIA MARINE SERVICES

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## 'STEELING' THE SHOW

With more than ten years of experience within the industry, Concrete Reinforcement Services are a steel fixing company able to deliver cost and time efficient solutions to a range of projects throughout Australia.

Having worked on a number of prolific projects, such as Sydney's M7, the Parramatta-Chatswood Railway and the Lane Cove Tunnel, Concrete Reinforcement Services were also recently involved on the \$500 million Port Botany Expansion Development.

Encompassing an additional 1,850 metres of extra berth length, through reclamation of 63 hectares of land, five new shipping berths, dedicated road and rail access, as well as a public boat launching ramp and parking, the significant Botany expansion is expected to almost double the current capacity of the Port.

Noel O'Neill, Director of Concrete Reinforcement Services, said that throughout their involvement, their professional team were responsible for carrying out all of the steel fixing on the Port's counterforts, walls and buttresses, which required 10,000 tonnes of steel and 6,000 tonnes of steel in the crane rail and cope beam.

"A unique aspect of the product we used whilst working on the Port Botany Expansion development, was that we directly imported the steel, already pre-welded and spliced, from Thailand," Mr O'Neill said.

"These pre-fabricated steel structures were extremely time effective for the project in the fact they greatly enhanced and facilitated the installation process," he said.

Given the significant size of the development, Concrete Reinforcement Services did face a number of challenges whilst working on the project.

"Our biggest challenge was that we were required to install over 350 tonnes of steel every week, which was an immense scale and as a result, created a lot of pressure for us," Mr O'Neill said.

"However, using our industry expertise and professionalism, our committed and driven team were able to deliver successful results and a quality product for the client," he said.

Based on the recent success of the Port Botany Expansion Project completion, as well as their pioneering steel installation techniques and product range, Concrete Reinforcement Services will continue to remain at the forefront of the steel fixing industry.

Concrete Reinforcement services have also just won a tender to work on 'Thiess' Hunter Express Alliance which will require 6,500 tonnes of steel to be installed.

## CONCRETE REINFORCEMENT SERVICES

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## PROVIDING A GREENER FUTURE



**E**cologically Sustainable Development, (ESD) is a landscape contracting firm, with in-depth technical knowledge on construction, horticulture and ecological rehabilitation.

Since 1998, ESD have been delivering sustainable projects around Sydney's riparian corridors and community parks. In addition, they have been growing and installing green roof and wall projects and are committed to developing a 'greener' city.

With experience in working on large infrastructure projects, such as the Cronulla Business Park and the Hume and Pacific Highways, ESD has also been involved on Sydney's Port Botany Expansion Project.

Responsible for six hectares of terrestrial and salt marsh habitat, which was in poor ecological condition, ESD designed a special soil treatment for the area and established a thriving plant community.

Robert Griffith, Managing Director of ESD, said as a result, the land had become a thriving plant community, with over 500,000 endemic and provenance plants propagated. "The salt marsh represents one of the most successful establishments of species growing in the tidal zone, hence our aim was to provide optimum conditions for the benthic organisms that form a food source for migratory birds," Mr Griffith said.

Utilising the Adder 2.0 © software application, ESD developed specialised cost-effective soil mixes to establish the native vegetation.

Furthermore, they were able to access difficult areas by blowing product across the salt marsh, which not only avoided the use of noisy machinery, but also avoided scaring the birds.

However, Mr Griffith said throughout their involvement on the Port Botany Expansion, ESD were faced with a number of obstacles.

"One of the biggest challenges was the constant wind and sand movement that changed land levels and covered new plants.

"However, given our industry expertise and dedication to conserving the area, we were able to overcome this by constant monitoring and adjustment of the site," he said.

Given the fact ESD have also been applying their expert landscape systems in the United Arab Emirates, it is without a doubt they will be the leading force in creating a more sustainable local environment.

### ESD LANDSCAPE CONTRACTORS

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## DJ ADAIR CRANE SERVICES

**D**J Adair Crane Service, located in Blacktown, Sydney, has over 25 years of experience within the mobile crane hire industry.

With a team of professional, experienced staff, DJ Adair Crane Services is able to provide efficient, personalised service, with a particular emphasis on attention to detail and safety.

In addition to providing crane hire services, DJ Adair also offer a range of materials handling equipment, including brick cages, rubbish bins, personal boxes, landing platforms and spreader bars.

Given the fact the scope of their works ranges from highway maintenance and construction, commercial development and civil works, DJ Adair Crane Services were also involved on the Port Botany Expansion project in Sydney.

This \$500 million re-development, which is expected to almost double the current capacity of the Port, encompasses an additional 1,850 metres of extra berth length, five new shipping berths, dedicated road and rail access, as well as a public boat launching ramp and parking.

Danny Adair, Director of DJ Adair Crane Services, said that as part of their involvement on the Port Botany redevelopment, they provided a range of cranes throughout various stages of the Project.

"Given the fact we have an extensive range of cranes available for hire, some of which are capable of dealing with extremely heavy loads, we were able to provide the right crane for the particular job," Mr Adair said.

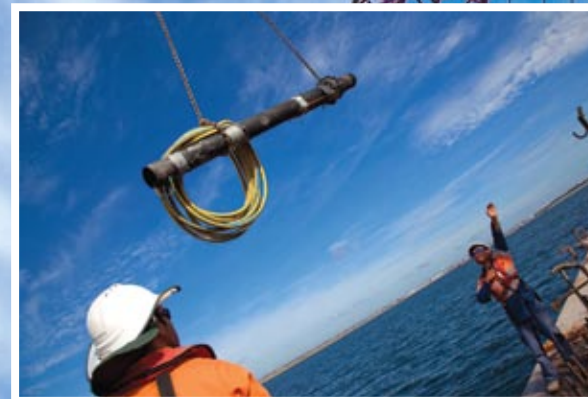
"As a result, we delivered quality services and product and minimised any potential construction delays.

"The fact that we were able to meet the significant demands of such a large project, in regards to providing suitable cranes and getting the job completed, also ensured optimum client satisfaction," he said.

DJ Adair Crane Services is definitely a name to remember within the mobile crane hire industry.

### DJ ADAIR CRANE SERVICES

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## A NAME YOU CAN RELY ON

Coastwide Civil is a family-owned company with a diverse range of civil construction, marine, transport and highway construction capabilities.

With more than 30 years of industry experience and approximately 100 skilled staff, Coastwide Civil was contracted by Baulderstone to construct five kilometres of breakwaters, groynes and rock revetments on the Port Botany Expansion project in Sydney.

During their involvement, Coastwide Civil was responsible for handling 7.5 million cubic metres of dredged material that was being pumped into the reclamation area, at a rate of 120,000 cubic metres per 24 hours, seven days a week.

Using heavy machinery, equipped with the latest GPS technologies, Coastwide Civil was required to load, haul and place the stockpiled dredged material over the 60-hectare site.

The use of sand containment bunds and high volume pumps also ensured sand profiles remained unaffected, regardless of weather exposure.

Having completed a variety of Australian marine projects ahead of time, within budget and of superior quality, it is without a doubt they will continue to be one of Australia's leading marine contractors.

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## THE SURVEYING SOLUTION

Since 2000, Pacific Survey has demonstrated their astute ability to safely and efficiently supply complete surveying solutions for a range of projects.

Given their prolific project portfolio, Pacific Survey were also involved on the significant \$500 million Port Botany Expansion Project.

Using the latest in Robotic Total Stations, GPS instruments and 12d Model Civil Engineering & Surveying Software, Pacific Survey provided a range of survey control and set-out responsibilities, pre-pour checks and work for the onsite concrete structures. These included the 215 pre-cast counter fort wall units, the front and rear crane beams, the pedestrian bridge and the new Terminal Access Bridge.

Pacific Survey's experienced team was also responsible for the setout and conformance of the bulk earthworks. This consisted of a number of

underwater rock revetments and sixty hectares of reclaimed land. As well as providing positional guidance for 1,850 metres of additional wharf face that created five new ship berths, Pacific Survey were also instrumental in the construction of a public boat ramp and parking facility.

Despite their extensive responsibilities on the Port Botany site, Pacific Survey incorporated their precise monitoring program and planning skills to deliver successful solutions and optimum results.



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