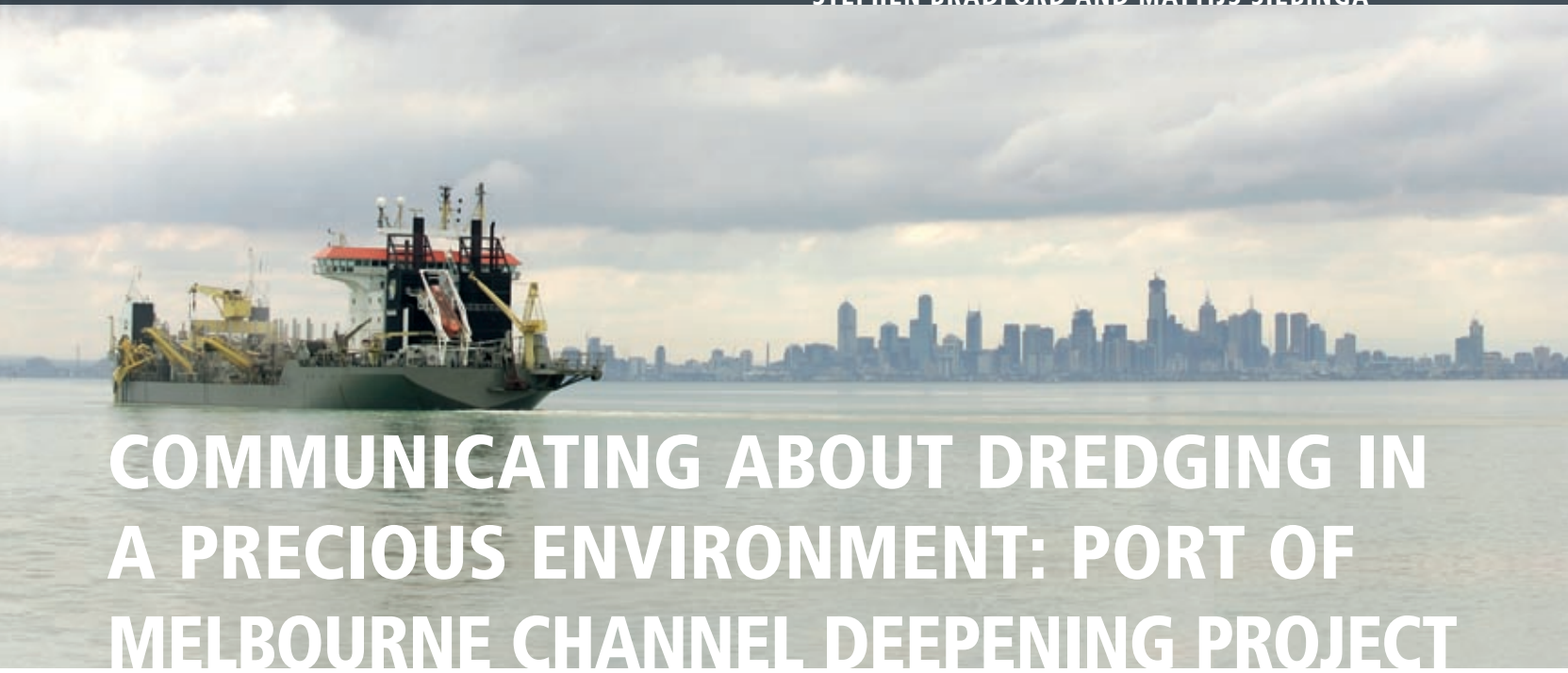
STEPHEN BRADFORD AND MATTIJS SIEBINGA



COMMUNICATING ABOUT DREDGING IN A PRECIOUS ENVIRONMENT: PORT OF MELBOURNE CHANNEL DEEPENING PROJECT

ABSTRACT

The Port of Melbourne is Australia's largest container and general cargo port, with 37% of Australia's container trade. By 2035 the Port aims to expand considerably, increasing the number of containers fourfold, and accommodating vessels up to 7,000 twenty-foot equivalent units (TEUs). This expansion plan depends upon deepening the Entrance to Port Phillip Bay. However, in addition to the harbour of Melbourne being a trade gateway and an enormous asset to the national economy, Port Phillip Bay is also a unique social, cultural and recreational asset. It is almost 2000 sq km, with 264 km of coastline and three million people living in its vicinity. It includes two Marine National Parks and a Ramsar wetlands. It is home to multiple fish species, little penguins, whales, dolphins and seals, various coldwater coral species and natural seagrass habitats and is as well an attractive recreational locale for swimming, diving and boating.

To achieve this major expansion, the Port of Melbourne sought a relationship with a Contractor of shared responsibility and risk. After thorough vetting, an Alliance Contract was signed in May 2004 between Port of Melbourne Corporation (PoMC) and Boskalis Australia Pty Ltd. Essential specialised equipment required for dredging the Entrance of the Bay was developed. As part of the environmental assessment, key environmental and social values were studied extensively, environmental impacts were evaluated and monitoring programmes were planned.

Still as the first dredging ship arrived, she was greeted by protests from some members of the public and by local media. The actual dredging works were consequently delayed until the courts and the public were satisfied that all environmental approvals had been obtained. Not only were extensive scientific research and risk assessments necessary, but also an intensive communications effort from the Contractor and the Port of Melbourne Corporation was needed to inform and educate stakeholders as to what the environmental effects would be and how these were to be managed. The Port and the Contractor spent considerable time, energy and money to demonstrate to the public that the dredging works were not detrimental to environmental, cultural or social assets. Along the way, they learnt several lessons on the importance of transparency during dredging operations.

Above: The arrival of a trailing suction dredger at the Port of Melbourne, Australia caused consternation and resulted in protests from some members of the public and local media.

INTRODUCTION

The Port of Melbourne is Australia's largest container and general cargo port, with 37% of Australia's container trade, US$27 (€ 20) billion worth of exports and 3,500 commercial ship calls each year (Figure 1). By 2035 the Port aims to expand from 2 million to 8 million containers and to be able to accommodate vessels up to 7,000 TEU with a draught of 14 metres, instead of the present 4,000 TEU for vessels with a draught of 11.6 m at all tides. For this expansion, parts of the access channels to Melbourne in Port Phillip Bay had to be deepened in an environmentally sustainable way. Port Phillip Bay covers a 2000 sq km area, with 264 km coastline and three million people living in the vicinity. However, the plan depended on the technical and environmental viability to deepen the Entrance of Port Phillip Bay from 14 to 17.3 metres (Figure 2).

STEPHEN BRADFORD

has been Chief Executive Officer of the Port of Melbourne Corporation since January 2004. He previously served as Managing Director Transport of Serco Australia Pty Limited from February 2001 and was also the CEO of Great Southern Railway, operator of iconic passenger rail services including *The Ghan, Indian Pacific* and *The Overland,* from November 1998. Prior to that, he was General Manager of the Health and Utilities business for Serco Group Pty Limited and General Manager of MSS Security for Mayne Nickless and later, Chubb. He holds a Bachelor of Commerce degree from the University of New South Wales and is a Fellow Certified Practicing Accountant (FCPA).

MATTIJS SIEBINGA

graduated in 1989 with an MSc in Mine Engineering from Technical University Delft, The Netherlands. From 1989 to date he has worked at Royal Boskalis Westminster, first as a Geotechnical Engineer and from 1992-95 as an Estimator. In mid-1995 he was appointed Project Engineer until in early 1997 he became Regional Manager for Westminster Dredging in Warri, Nigeria. In 2001 he transferred to Australia as Operations Manager for WestHam Dredging Pty Ltd in Sydney and in 2002 he became Managing Director of Boskalis Australia Pty Ltd where he is presently located.

Figure 1. Overview of the Port of Melbourne which handles 2.25 million containers and some 3500 ships per year.

Figure 2. Aerial view of the Port Phillip Bay, Melbourne that covers 2000 sq km with 264 km coastline and 3 million people living in the vicinity.

To achieve this major expansion, the Port of Melbourne sought a relationship with a Contractor of shared responsibility and risk. After thorough vetting, an Alliance Contract was signed in May 2004 between Port of Melbourne Corporation (PoMC) and Boskalis Australia Pty Ltd. An Alliance form of contract was chosen because commitment to such an arrangement gives the best opportunity for the delivery of outstanding outcomes regarding time, budget, safety and environmental performance. An Alliance Contract is based on mutual trust in which the roles, responsibilities and accountabilities of the partners are clearly defined. A win-win outcome is expected, and all decisions by the partners take into account stakeholder interests and are based on full disclosure.

For that reason, the Alliance Contract was instrumental in overcoming one of the major non-technical obstacles to the execution of the dredging works – the negative reactions of some stakeholders in the vicinity of Port Phillip Bay. On-going discussions and the emergence of a local group of bayside residents who were clearly opposed to the project, eventually led to court action, which temporarily stopped the dredging operations. Working together, with a concerted communications effort to involve the public, the Contractor and PoMC were able to demonstrate the environmentally sound dredging methodology. This educational campaign included public hearings, an information programme and school presentations. It also included extensive monitoring before, during and after the works as well as a multi-level corporate communications campaign. These open and transparent communications efforts played a significant role in reassuring many stakeholders that the channel deepening project could be conducted in a safe and environmentally sustainable manner.

Figure 3. Scope of the dredging works.

PROJECT SPECIFICATIONS

The comprehensive project objectives as specified by the Port of Melbourne were to provide channel modifications to sections of the Great Shipping Channel at the Entrance to the Bay, the South Channel, the approach channels to the Port and the Yarra River Channel as well as to protect the existing service pipelines across the Yarra River and Port Melbourne Channel taking into account the deeper channels (Figures 3 and 4). The Alliance Contract signed by PoMC and Boskalis Australia required all actions and decisions to be based on "Best for Project" principles.

The Deepening of the Entrance at Port Phillip Bay, where approximately 400,000 cubic metres of rock had to be removed to achieve acceptable depths, was the first phase of the Project. Considering the difficulties of the sea, the soil and environmental conditions, the project demanded a large investment in Research & Development to find innovative solutions. One of the issues involved responding to a group of local residents who launched a concerted media campaign with the express purpose of ceasing any dredging from occurring (Figures 5 and 6).

THE PROS AND CONS OF DREDGING

Viewed from an economic standpoint, the Channel Deepening Project has a strong, positive business appeal. It is a 30-year infrastructure project, with a budget of US$640 million, creating 2,300 jobs in construction and 300-500 jobs in operations. The expansion is also necessary

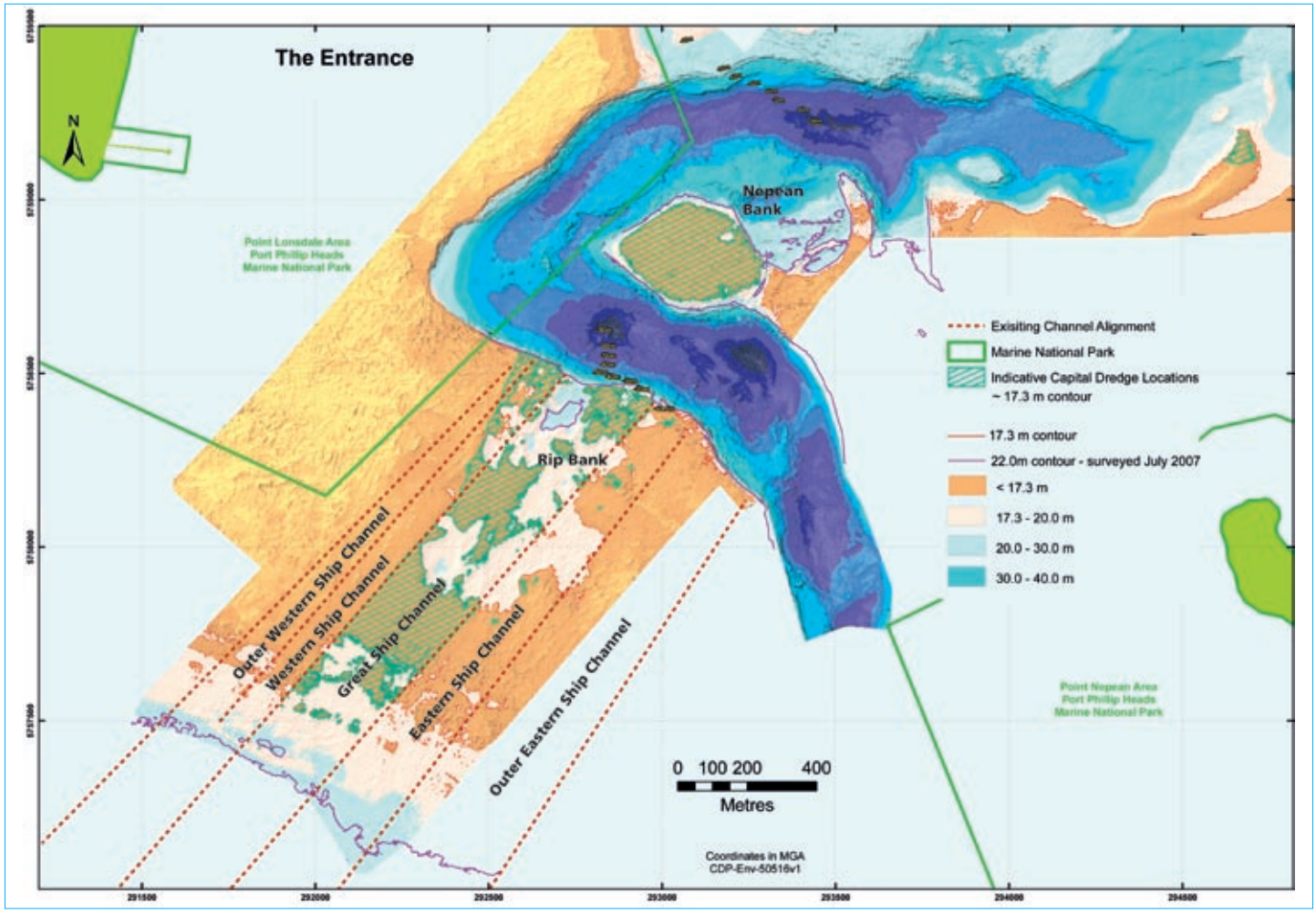


Figure 4. Contour and dredging areas at the Entrance.

Figure 5. Public protests greeted the start of the dredging trials. Some protests took place on land. *(courtesy of The Australian Greens).*

Figure 6. Other demonstrators greeted the arrival of the dredging vessel with protests from the water.

to maintain Melbourne's competitive edge in water-transported trade (Figure 7).

From an environmental-social viewpoint, however, the main issues related to turbidity and contaminated material, and although regular dredging had been conducted over the past century, very little information was available to the public.

The concern was that dredging induced turbidity within Port Phillip Bay could potentially harm benthic organisms, seagrasses and fauna that depend on these habitats for food and protection. In fact, Port Phillip Heads Marine National Park itself (known as The Heads) had never been dredged before. Up until 1986 the Great Shipping Channel in the Entrance was deepened using explosives. Since that time, however, as a result of new environmental regulations and stakeholder concerns, blasting was no longer acceptable. Besides the potentially detrimental effect of noise pressure pulses, blasting also brings with it the risk of rock falling on deep reef habitats, which is clearly unacceptable, so finding an alternative method became the first focus of the Alliance Team.

Over time contaminated sediment, the result of years of industrialisation in the region, has settled in the Yarra River, so along with the proposed dredging operations came the question of the disposal of this dredged material. Some groups also regarded the possible impact of turbidity on seagrasses and the surrounding habitat in Port Phillip Bay to be a risk factor.

In addition to the environmental challenges, the deepening would cause the services under the Yarra River to become more exposed to potential impacts from the possibility, albeit remote, of dropping or dragging anchors. The Contractor proposed to cover the pipelines with a layer of rock and steel plates, which was much more cost efficient than the initial plans to replace them with deeper lying pipelines. However, the small tolerances for the placement of the rock required special equipment and work methods.

Other factors such as new international and national benchmarks of scrutiny for large projects and a very rigorous environmental approvals process also influenced the Port's expansion project. At the same time, the emergence of issues-specific and cause-related civil society organisations (environmental action groups) added another demand for accountability. In addition, with parallel advances in technological communications and new media such as the Internet, the velocity with which information is distributed resulted in a massive public reaction – both for and against – to the announcement of the dredging project. Add to this the fact that dredging by its nature is invisible, that is, everything goes on below the water's surface. This meant for some groups that the project could very easily engender a high degree of skepticism and misunderstanding.

Figure 7. A cargo dock at the Port of Melbourne, Australia's largest container and general cargo port. The Channel Deepening Project was vital to maintaining Melbourne's competitive edge.

Figure 8. Amongst the assets found in Port Phillip Bay are seahorses, multiple species of fish and precious sponges.

THE PHYSICAL SITUATION

The Entrance to Port Phillip Bay is a naturally dynamic body of water with waves and swell up to five metres in height and complex tidal currents up to 8 knots per hour. The seabed is extremely hard and required specialised dredging techniques. The Port Entrance consists of sandy limestone or calcarenite varying in strength from UCS = 1 – 30 MPa. Some parts have a fine-layered structure, while other, harder, parts were massive. A large cutter dredger would normally be used for this type of rock, but with the extreme turbulence of the sea, a cutter was not stable enough nor was it flexible enough to work in a busy channel with a high volume of commercial shipping vessels.

The operations were also complicated by the location of the Entrance close to the Port Phillip Heads Marine National Park. This Park includes a deep canyon ranging from 80 to 100 metres deep adjacent to the two dredge areas at the Entrance known as Nepean Bank and Rip Bank. Port Phillip Bay itself is characterised by clear water with high visibility. It is rich in many species of fish and other aquatic life as well as sensitive reefs and wetlands.

THE ASSETS

The assets within Port Phillip Bay and at the Entrance to be protected are numerous: listed and protected fish species such as the Australian grayling and Australian mudfish, penguins, anchovy, whales, dolphins, pied cormorants, aquaculture fisheries, seagrass, sponges, hard and soft coral species and benthic micro-algae (Figure 8). In addition, Port Phillip Bay has several Ramsar sites such as Swan Bay, Mud Island and Spit Wildlife Reserve. (Ramsar is an intergovernmental treaty with 159 contracting parties which provides the framework for national action and international cooperation for the conservation and wise use of wetlands.) A deep reef with sessile invertebrates, such as sponges and hydroids, and a shallow reef with kelp communities are found at The Marine National Parks at Port Phillip Heads (Figure 9).

THE THREATS

The environmental threats to the Bay's Entrance were both real and perceived. They included the risk of rock falling on deep reef habitats in the Entrance, the presence of contaminated material within the Yarra River and the need to store this in an underwater-confined disposal facility (UW-CDF). The effects of turbidity caused by dredging and the amounts of released nutrients could be threatening and needed to be measured and monitored. In addition, the potential loss of heritage, economic loss to the fisheries and the reduction of social values needed to be addressed.

The key social values that Bay users wished to protect involved the noise and visual impacts of dredging and the disturbance caused by turbidity to recreational activities (diving, fishing, boating and beaches). The potential economic loss to commercial activities like commercial diving, fishing activities, charter fishing and ecotourism were also cause for concern amongst opponents. The Newport Power Station raised questions about whether the dredging works would affect the cooling water with potential loss in efficiency and damage to the cooling system. Also cited by stakeholders were sites of significant cultural heritage, including the shipwreck site HMAS Goorangai and the former Hovell Pile light.

THE APPROVAL PROCESS

The challenges were immediately apparent during the tendering process that started in the summer of 2003 and continued through to the finalisation of the Alliance Contract in May 2004, when the development phase with further study and research work commenced. First of all, an Environmental Effects Statement (EES) costing US$8 million was released in July 2004. Then an independent panel assembled 138 recommendations and advised that there was need for further scientific investigation to be carried out before the project could proceed. This work resulted in what became known as the Supplementary Environmental Effects Statement (SEES).

As part of this process, a trial had to be undertaken to prove that dredging the Entrance was viable and to gather data for further environmental studies. From June through October 2005, trial dredging by the trailing suction hopper dredger (TSHD) *Queen of the Netherlands* was executed. Reliable data were collected, but protests continued even after project approval by the Government. The public outcry eventually led to a Supreme Court challenge.

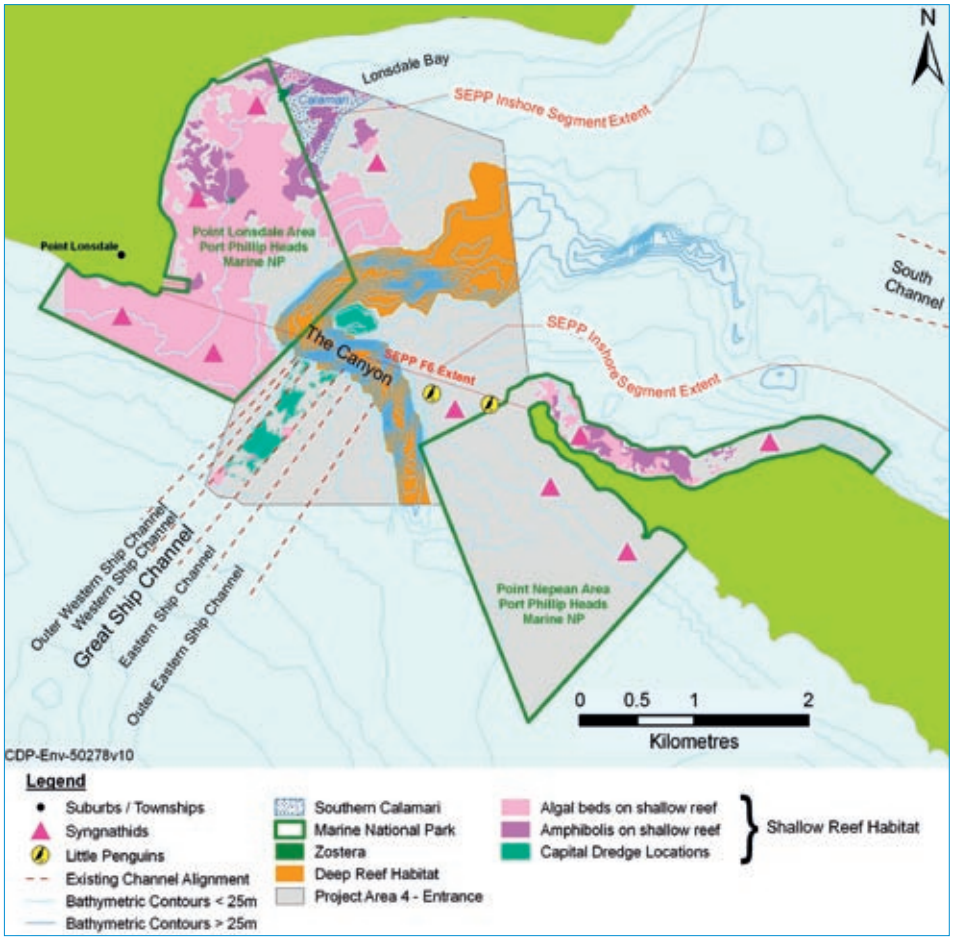


Figure 9. Key ecological assets in the designated dredging area.

Negative Newspaper headlines continued to abound: "Bay fears rising"; "Kiss the fish goodbye fear"; "Queen of all monsters readies for mammoth task"; "Tears flowing over dredging" and daily television reports emphasized the dangers of dredging (Figure 10).

BALANCING THREATS AND ASSETS

To communicate successfully with the public, the Alliance Team of the PoMC and the Contractor had to acknowledge the assets and perceived threats of the dredging operations, and then present means to remedy the threats and protect the assets. In pursuing this action, the Alliance with Boskalis proved to be extremely important. There was in fact no local dredging company available or capable of executing this unique and complex project. The Entrance required specialised technology and expertise, it demanded detailed planning and the approval process required intellectual input from the dredging partner. For the modelling of the intensity and extent of the turbidity plume, input from Boskalis in respect of the turbidity source strength and the dredging cycle was essential. The dredging partner had to be able to assure the environmental controls for delivery of the project. Although Boskalis was surprised at the media attention – protest letters were even sent directly to Queen Beatrix of the Netherlands – they were ready and able to address the issues.

In response to the panel recommendations and the actions of some stakeholders, the project was reconfigured. A team of experts was assembled and technology and science were implemented to achieve a project of the highest environmental standards. The emphasis was placed on protecting natural assets. An extensive risk assessment with a large number of workshops involving all specialists along with the contractor served as the foundation to determine the proper balance between assets and threats. For instance extensive experiments were conducted to determine the impact of biological response to reduced light caused by turbidity (Figures 11 and 12).

TECHNICAL INNOVATIONS

From a technical perspective, the problem was twofold: The hard seabed would normally indicate dredging with a traditional cutter. In this case, however, the heavy seas that exist at the Entrance to Port Phillip Bay, along with the large volume of shipping traffic meant that the cutter's stationary operating procedure would not work. A trailing suction hopper, on the other hand, is more flexible and can work in severe weather conditions, but trailers had never dealt well with dredging rock.

Figure 10. Headlines in the local newspapers reinforced the anxieties about dredging.

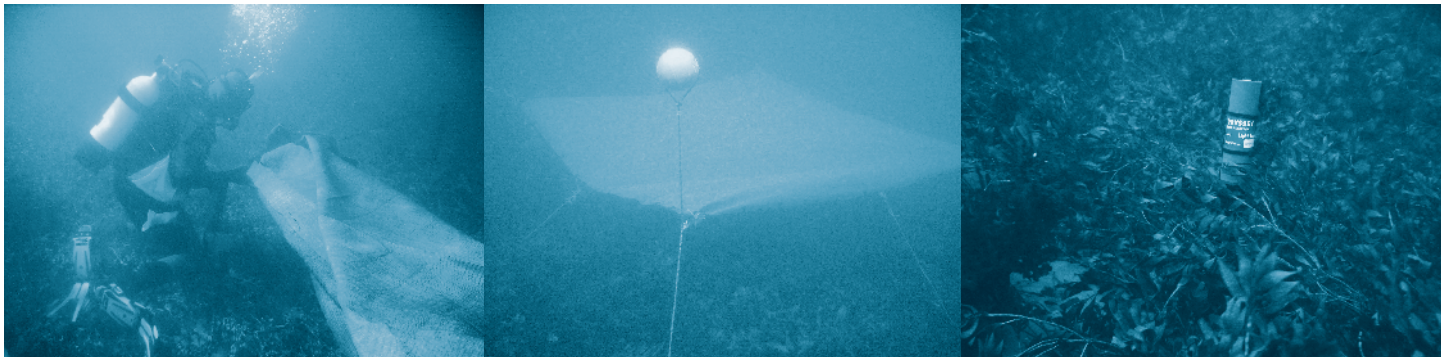


Figure 11. Shading experiments were conducted to determine the impact of biological response to reduced light. From left to right: the installation of a shade, kelp under a shade and a light meter.

Given the hardness of the rock found near the Bay's Entrance, both a jumbo trailing suction dredger and an exceptional and powerful draghead were needed.

The Boskalis Research & Development, Central Technical and the Dredging Departments, working as an inter-disciplinary think-tank, developed an innovative solution: A new type of draghead – a ripperhead – which could be mounted on a trailing suction hopper dredger, a feat which had never been attempted before.

To investigate this cost-efficient and effective solution further, the R&D team considered other industries where the excavation of rock plays a central role. They were inspired by how rock is excavated from quarries, where bulldozers on caterpillar tracks rip open the ground using strong, large teeth. The first tests were conducted on land at a rock quarry in Portland, Australia, 300 km from Melbourne, in an area with the same geology as the Port Phillip Bay Entrance.

Figure 12. The verification of two turbidity probes.

Whilst the cutting processes on land and on the seabed are comparable, they are not exactly the same. As a result, the R&D team went to WLIDelft Hydraulics (now Deltares) in the Netherlands to quantify the differences. The scientists in Delft were able to predict the underwater conditions and the system was applied to the specifics of an improved, submerged ripperhead.

As part of the Supplementary Environmental Effects Statement (SEES), a full-scale trial was launched for two weeks with the TSHD *Queen of the Netherlands* dredging using the improved ripperheads at the Entrance to the Bay. The trial showed that the ripperheads were cutting through the rock adequately, but were leaving too much material on the seabed. These loose rocks were being picked up by currents and waves and deposited on flora and fauna living on a nearby deep reef. To ensure that the Project's strict environmental requirements could be met, the R&D team returned to the Deltares laboratory for more model studies, more simulation trials, and more modifications to minimise spillage. Ultimately the ripperhead was optimised in a way that satisfied both cost-efficiency and environmental norms.

Other precautionary measures were implemented to minimise the possibility that loose rock might fall into the canyon and destroy precious marine life:

- After every 24,000 m^3 of material dredged, a clean-up activity was conducted with an adjusted draghead for a minimum of 18 hours and with at least 90% coverage of the dredged area. Also, before inclement weather (i.e., prior to waves above 3 metres) arrived, a clean-up was required.
- When dredging towards the canyon, the draghead had to be lifted so that no rock would be removed within 5 metres of the canyon edge.
- When dredging the canyon edge itself, only dredging towards the plateau was allowed.
- Along the Northwestern side of the Nepean Bank (closest to the Port Phillip Heads Marine National Park), a ridge was left in place until the remaining area had been dredged to design level. This ridge was removed separately, after additional clean up of the area behind the ridge.

Preliminary results of the post-dredging video survey have clearly demonstrated the effectiveness of the optimised ripper draghead and the strict execution of the prescribed work method.

The Alliance Contract between PoMC and Boskalis Australia facilitated the completion of the SEES as decisions about the proposed work scope, cost estimates and total budget were developed and approved together by the appointed Alliance Team. This helped expedite acquiring the necessary environmental permits as well as addressing the environmental concerns of stakeholders.

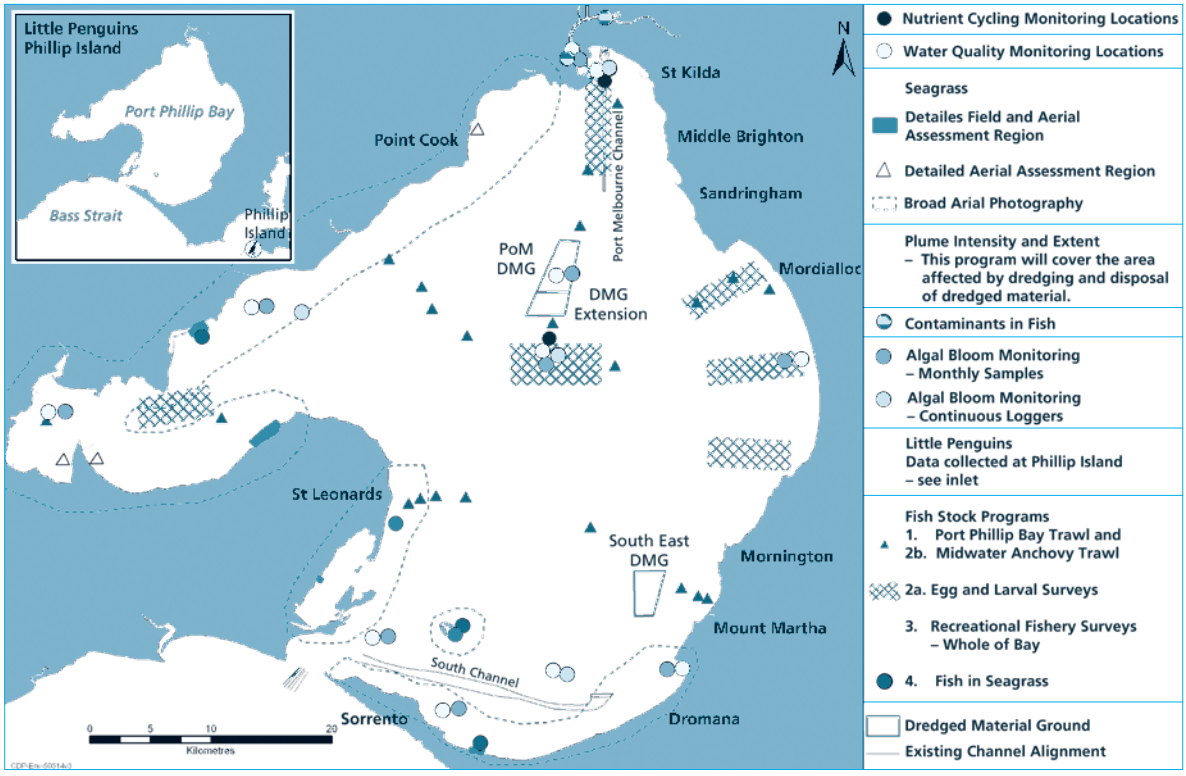


Figure 13. Baywide Monitoring Programme: Monitoring is ongoing and remains an important element in the Environmental Management Plan.

COMMUNICATING WITH THE PUBLIC

On all levels, the cooperation of the dredging contractor was essential to engaging the community in discussions and in developing dedicated communications vehicles, including:

- a project website (www.channelproject.com)
- a toll-free telephone hotline
- community information sessions at which members from the Port of Melbourne Corporation and the contractor Boskalis met with the public at a number of locations around the Bay
- educational programmes with schoolchildren, and
- the establishment of the Community Liaison and Dive Industry Liaison Groups, which involved regular meetings of members of the Port of Melbourne Corporation with representatives from these key Bay stakeholders – comprised of both supporters and opponents of the Channel Deepening Project.

FURTHER STEPS IN THE APPROVAL PROCES

In March 2007, the SEES was submitted for public review and the subsequent governmental approval process, which included a six-week long panel enquiry. It was executed at a cost of US$80 million and represented over two years of peer-reviewed investigation. It comprised 15,000 pages of data and research and 40 new technical studies, which also incorporated findings from the trial dredge.

As a result, PoMC won State and Federal Government approval and implemented a stringent Environmental Management Plan (EMP) at the end of 2007, which would surpass the environmental standards put in place by a dredging project anywhere in the world.

The Environmental Management Plan

The EMP was prepared as part of the SEES and was the last document that had to be approved by State and Federal Government before the project could start. Known as the "Rule Book" of the Channel Deepening Project, the EMP sets out:

- Safeguards to protect Bay assets;
- Project delivery standards with 58 environmental controls for its activities, such as dredging;
- Monitoring programmes;
- Regulatory controls and reporting procedures;
- Contractor and communications measures.

A significant number of the environmental controls in the EMP relate to the control of the dredging. Turbidity monitoring ensures that potential impacts will be limited or minimised in line with the EMP. For example, turbidity is measured at 11 conformance sites in the Bay for the protection of assets such as fish, seabirds and seagrass. So far modifications made to the technology and work methods have proven to be effective, and turbidity levels continue to remain well below prescribed environmental limits.

Vessel tracking and hydrographic surveys ensure that the impacted footprint and dredged quantity are minimised and that the dredging works are delivered as closely as possible to design. In addition to the direct process controls, a Baywide Monitoring Programme is being conducted, which focuses on potential ecological impacts (Figures 13 and 14). The results

Figure 14. One of the monitoring buoys located in the Bay.

Figure 15. Encouraging headlines indicate the success of the extensive communication efforts.

of this monitoring are being presented quarterly and may be used to adjust the direct controls in case the measured effects are different from the predicted. Even after the Channel Deepening Project is completed, some environmental monitoring in the entire area will continue.

At the end of January 2008 the *Queen of the Netherlands* returned to Melbourne to begin the actual work. After several additional court challenges regarding environmental impacts, the Federal Court ruled in favour of the PoMC and on 5 April *the Queen* began dredging hard rock at the Entrance. She completed this work on 17 September 2008, having dredged 461,000 m^3 rock.

As of 30 September 2008, removing the rock seabed at the Entrance was officially concluded and endorsed by the regulators. Meanwhile the deepening of the Channel continues in other sections of the Bay and additional works are also ongoing involving navigation aids, berths and underwater services. As of May 2009, approximately 80% of the overall total dredging volume in Melbourne had been completed, and the entire deepening project remains on schedule to be completed in the second half of 2009.

As part of the communications efforts, the Port offers to inform the public at its weekly media conferences on project progress, project schedule and turbidity, airborne and underwater noise monitoring data. This weekly reporting has informed stakeholders of high and low risk situations and helped them to understand how some risks can indeed be easily mitigated (Figure 15).

CONCLUSIONS

The Port of Melbourne Corporation's Channel Deepening Project provided some key learning experiences regarding the need to establish open and transparent communications protocols about this complex and demanding dredging project. Furthermore, as a result of protracted and costly delays, the importance of engaging with stakeholders much earlier in the process has become a major takeaway for both the Port and its Alliance partners.

One essential ingredient is transparency. Measures suggested to be taken before, during and after the project include:

- create a Stakeholder Advisory Committee
- appoint an independent Chair
- conduct community information sessions, where real give-and-take dialogue is possible rather than public meetings where only the proponent gets to speak
- give stakeholders a chance to meet the experts, including the dredging contractor, and ask them questions
- conduct regular presentations and briefings and establish print and electronic newsletters to keep various groups informed of the project's developments
- organise programmes for schoolchildren so they can learn more about the Bay and its environs and about the need for environmental protection
- invest time and money on television/radio/print advertising campaigns which demonstrate why the project is good for the community and the economy, show that deepening is a normal activity with a long history that only impacts a small part of the Bay, and illustrate the lengths that the organisation has gone to protect the environment
- provide regular media releases
- create a dedicated website and toll-free telephone information line.

Through reliable communications, a true dialogue between various stakeholders developed making it possible to better educate the community and allay many fears they had regarding the Channel Deepening Project. This took both a proactive and multi-faceted media and community relations programme along with a significant financial investment in robust scientific research to meet a rigorous project-approval regime.

Finally, the public has the right to transparency. Their concerns must also be the concerns of the contractor and client. Economic issues are important, but environmental and social issues are equally important. As a result of multi-disciplinary teams, thorough risk assessments, modelling, monitoring, a good EMP and clear communication about these activities, dredging at the Port has progressed solidly, environmental limits on the whole have been met, the opponents and media are less negative, and the concerns about dredging are more realistically perceived.

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