Executive Summary

ES.1 Background

As an island nation Australia relies on its ports for much of its international trade with 99% by volume of this trade being transported by sea. In 2001/02, Australia's international trade was worth $240 billion. Provision of adequate sea port capacity and modern sea port facilities is therefore fundamental to the national economy.

Sydney's sea ports comprise one of New South Wales' (NSW) major infrastructure assets and handled approximately $42 billion worth of trade in 2001/02. By value, this represents more than half of the international air and sea cargo trade in NSW. Sydney's sea ports employ more than 17,000 people directly and indirectly and are central to the health of the NSW economy.

Port Botany is Sydney's largest sea port facility, and is owned and managed by Sydney Ports Corporation. Movement of cargo through Port Botany accounted for almost 60% of the total economic output of Sydney's ports in 2001/02. Currently, more than 4,000 people are employed at Port Botany with almost 6,000 people employed indirectly through port related industries.

Approximately 44% of the cargo volume handled through Sydney's ports is containerised cargo, which represents 80% of the total value of cargo. Currently, more than 1 million twenty-foot equivalent units (TEUs)[1] enter or leave Sydney's ports each year. These containers carry a broad range of primary products, manufacturing items and consumer goods which are distributed principally in metropolitan Sydney.

More than 90% of this volume is handled at Port Botany with approximately 80% of these containers packed or unpacked within the greater metropolitan area of Sydney. This supports the findings of industry research which shows that due to its proximity to the Sydney market, Port Botany is, and will remain, the primary port for the import and export of containerised cargo in NSW.

Sydney is a major city with a population exceeding 4 million people. Conservative estimates of growth show that this figure will exceed 5 million by 2020. The increase in population in the Sydney basin, strong economic growth and the increased containerisation of commodities have been the primary drivers of historical growth in Sydney's container trade which on average has been more than 7% per annum since 1970. Sydney's current challenge is how best to plan for future trade demand.

Growth in the container trade is strongly linked to economic growth in NSW. Access Economics/Maunsell Australia (2003) have forecast that the future economic outlook for NSW is generally favourable and predict continuing strong growth in Sydney's container trade, with annual growth rates of around 5% per annum for at least the next 20 years. Based upon these trade growth forecasts, Port Botany's container trade would increase from approximately 1 million TEUs per year to more than 3 million TEUs per year by 2025.

The Access Economics/Maunsell Australia analysis shows that the existing container terminals at Port Botany are approaching capacity. In the short term, terminal operators would be able to accommodate the predicted increases in container trade volume, but beyond 2010, the capacity of the existing container terminals at Port Botany would be fundamentally constrained by the limited number of berths available for ships to load and unload containers.

[1] An internationally recognised measurement for containers. A standard twenty-foot container equals 1 TEU. A forty-foot container equals 2 TEUs.

If additional capacity is not provided, the limitations on berth availability would result in ships having to queue for a vacant berth and an exponential increase in ship waiting times as trade volumes continued to rise. The cost of direct shipping delays would be tens of millions of dollars, but the flow on economic costs of this congestion would be many times greater. These costs would be increasingly borne by consumers and business in the form of higher shipping and transport costs and delays in deliveries, all of which affect the price of goods and the competitiveness of exports. This could ultimately result in a reduction of NSW's economic competitiveness and in businesses either being lost or relocating to other states or overseas.

The development of Port Botany, rather than alternative NSW ports, to cater for the growth in container trade would produce the most efficient economic outcome for NSW at this time. This is because of the high economic and environmental cost associated with the transportation of containers from ports which are further from the Sydney market, the strong trend in international shipping to consolidate services to fewer ports of call with larger ships and larger exchanges per call, and Port Botany's existing status on global trade routes.

The Port Botany Expansion proposal would create an additional five container ship berths with a capacity of about 1.6 million TEUs per year. This would provide a total capacity at Port Botany of a more than 3 million TEUs per year, which would be sufficient to accommodate the expected increases in Sydney's container trade for the next 25 years and beyond.

Obtaining the necessary approvals for the Port Botany Expansion and completing the construction of infrastructure to provide additional capacity would take approximately seven years. Given that additional capacity would need to be available by 2010, the project needs to commence *now* to provide the required capacity in time to minimise the impacts of congestion.

ES.2 Outline of the Project

The proposal consists of a new container terminal at Port Botany, located on the northeastern edge of Botany Bay, approximately 12 km south of Sydney's Central Business District (CBD) in the suburb of Banksmeadow, NSW. The site for the new terminal is situated between the existing port and the Parallel Runway at Sydney Airport as shown in **Figure ES.1**. The new terminal would cover an area of approximately 63 hectares (ha) and would look very similar to the existing container terminals at Port Botany as illustrated in **Figure ES.2**.

Regional Location **Figure ES.1**

Source: Architectus Sydney Pty Ltd

Indicative Visual Simulation of the Port Botany Expansion **Figure ES.2**

The expansion of container handling facilities at Port Botany is not a new idea. The area to be reclaimed and developed for the current proposal has been earmarked by the NSW Government for port purposes for more than 30 years and represents the completion of the long term vision for the provision of sufficient port capacity at Port Botany to meet the needs of the people of Sydney and NSW.

The key components of the Port Botany Expansion would include the following as shown on **Figure ES.3**:

- a new container terminal with approximately 63 ha of land extending approximately 550 m west and 1,300 m north of the existing Patrick Stevedores container terminal at Port Botany;
- approximately 1,850 m of additional wharf face which allows for five nominal shipping berths;
- dedicated road access from Foreshore Road via an entrance bridge across the channel separating the existing shoreline from the new terminal including a set of new traffic lights on Foreshore Road;

Site Layout **Figure ES.3**

- rail access to the new terminal area by means of an extension of the existing Botany Freight Rail Line parallel to Foreshore Road including a rail bridge and culverts;
- a strip of existing land north of the existing Patrick Stevedores container terminal for an inter-terminal access road and for two additional rail sidings; and
- reclamation adjacent to Foreshore Road to create a tug berth facility.

In total, the Port Botany Expansion would require reclamation of approximately 57 ha of additional land for port purposes. The remainder (approximately 6 ha) would consist of existing land north and west of the Patrick Stevedores' container terminal.

The key operations associated with the new terminal would be:

- marine transport operations, which involves the safe navigation of ships to and from the terminal;
- terminal operations, which involves the loading, unloading and temporary storage of containerised seaborne cargo within the terminal itself; and
- landside transport operations, which deals with the distribution of containerised cargo to consumers.

Sydney Ports Corporation would have overall responsibility for facilitating marine transport operations within the port, however day to day running of the terminal would be the responsibility of the terminal operator(s). Land transport operations beyond the terminal gates would be the responsibility of respective rail and road transport operators.

In addition to the works associated with the provision of the new container terminal, Sydney Ports Corporation would undertake the following public domain works adjacent to the new terminal development:

- reclamation of approximately 2 ha adjacent to the tug berth facility to create a new public boat ramp and car park with direct access to Foreshore Road;
- restoration and enhancement of Foreshore Beach and adjoining landscaped area; and
- ecological habitat enhancement works within Penrhyn Estuary and the channel separating the new terminal area from the existing shoreline.

ES.3 The Proponent

The proponent of the Port Botany Expansion is Sydney Ports Corporation which is a State Owned Corporation responsible for ensuring the availability of quality port facilities and services for Sydney's and NSW's international trade. Sydney Ports Corporation owns the principal port facilities in Sydney – Port Botany and Sydney Harbour. These facilities operate as a partnership between government and the private sector where Sydney Ports Corporation leases land to private sector operators who provide the direct services involved in handling and storing cargo.

The key legislated responsibilities of Sydney Ports Corporation are to:

- manage and develop Sydney's port facilities and services to cater for existing and future trade needs;
- facilitate trade by providing competitive advantage to importers, exporters and the port related supply chain;

- manage the navigational and operational safety needs of commercial shipping;
- protect the environment;
- have regard to the interests of the community; and
- deliver profitable business growth to the State Government.

The Port Botany Expansion represents a key step in the fulfilment of Sydney Ports Corporation's legislated responsibilities as a State Owned Corporation.

ES.4 Planning Approvals Process

The Port Botany Expansion proposal requires assessment of the environmental impacts under both Commonwealth and NSW legislation, namely under the Commonwealth *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act) and the NSW *Environmental Planning and Assessment Act* 1979 (EP&A Act).

The EP&A Act and Environmental Planning and Assessment Regulation 2000 (EP&A Regulation 2000) provide the framework for the assessment of the environmental impact of development proposals in New South Wales. Part 4 of the EP&A Act applies to the Port Botany Expansion.

The proposed development is a "designated development" within the meaning of Schedule 3 of the EP&A Regulation 2000 as it is characterised as "shipping facilities". Therefore an EIS is required to accompany the Development Application (DA).

In 2001, the Minister for Planning (now the Minister for Infrastructure and Planning) declared proposals such as the Port Botany Expansion to be "State significant development" under section 76A(7) of the EP&A Act due to their environmental planning significance for NSW. As such, the Minister for Infrastructure and Planning will be the "consent authority" for the proposal. In addition to development consent from the NSW Minister for Infrastructure and Planning, the proposal also requires approval from the Commonwealth Minister for the Environment and Heritage prior to the project proceeding.

In February 2002, Environment Australia advised that the NSW assessment process had been accredited for this project, meaning that the NSW assessment process, involving the preparation of an EIS under the EP&A Act, can also satisfy the assessment requirements of the Commonwealth under the EPBC Act. Therefore, the preparation of a single EIS can satisfy the environmental assessment requirements under both NSW and Commonwealth legislation.

The Port Botany Expansion is also "integrated development" under section 91 of the EP&A Act. Integrated development is development that, in order for it to be carried out, requires development consent and one or more of certain approvals or permits from various government authorities such as the NSW Environment Protection Authority (EPA).

In accordance with clause 73 of the EP&A Regulation 2000, the requirements for this EIS were sought from relevant government agencies. These requirements, known as the Director-General's Requirements, have been addressed in this EIS.

This EIS has been prepared by URS Australia Pty Ltd (URS), on behalf of Sydney Ports Corporation, to assess the impacts of the construction and operation of all elements of the proposed Port Botany Expansion, and to identify appropriate safeguards to mitigate any such impacts.

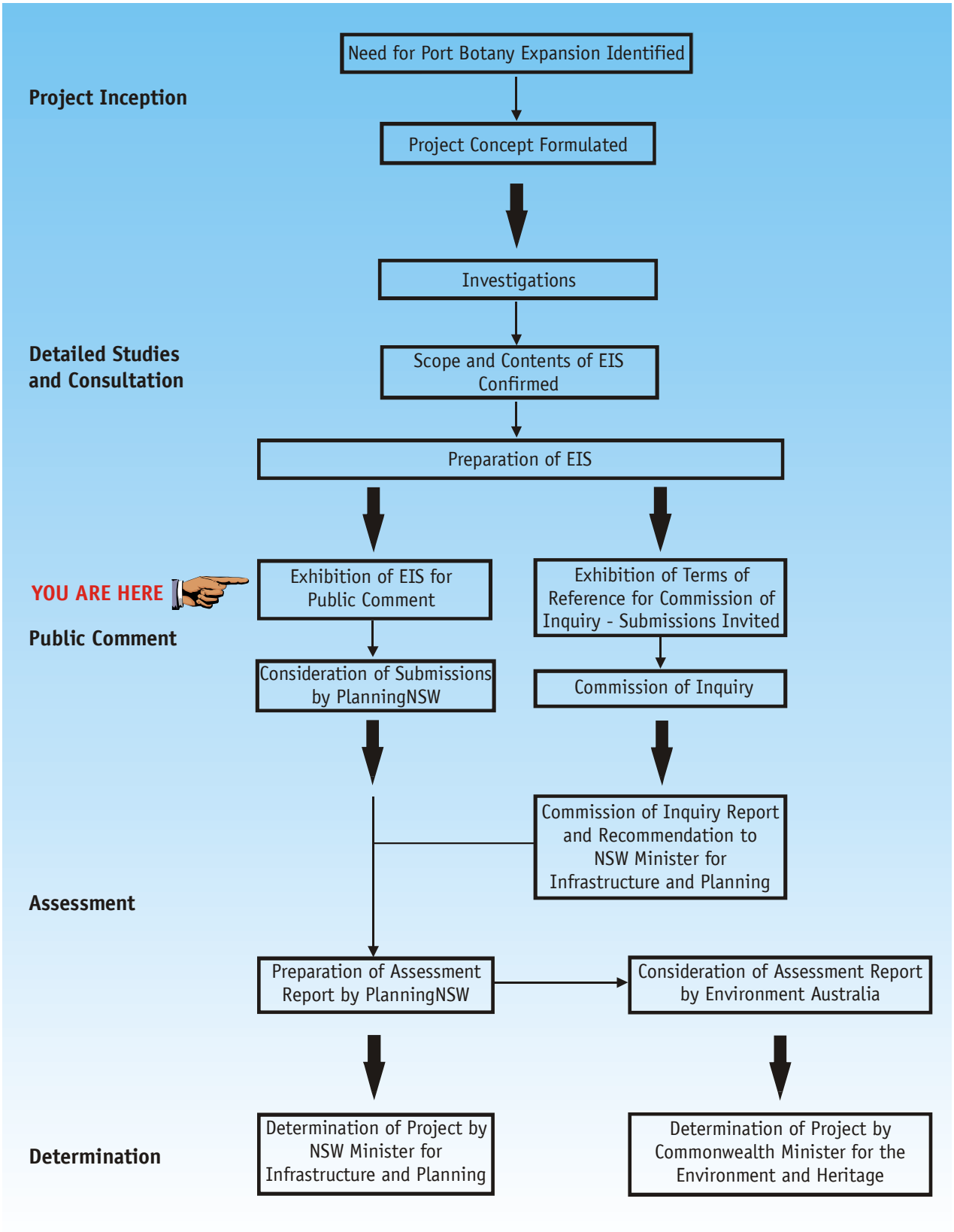
The principal objectives of this EIS are: to comply with the legislative requirements of the EP&A Act as well as those of the EPBC Act, as formalised in the Director-General's Requirements; to provide the consent authority with sufficient information to make an informed decision with regard to the benefits and impacts associated with the Port Botany Expansion; and to inform the community about the proposal.

Following lodgement of the DA with PlanningNSW, the EIS will be publicly exhibited for a minimum of 30 days. The public exhibition period allows stakeholders and the community to convey their views on the proposal to the consent authority, in this case the NSW Minister for Infrastructure and Planning.

A Commission of Inquiry (COI) is to be held into the proposed Port Botany Expansion, as announced by the NSW Premier on 5 October 2003. The terms of reference for the COI will be publicly exhibited for at least 28 days. During the exhibition period, public submissions will be invited by the Commissioners of Inquiry. Those who have made a submission to the Commissioners of Inquiry will have the right to appear before the COI to express their views on the proposed development. Once the COI is completed, the Commissioner will prepare a report and make a recommendation to the NSW Minister for Infrastructure and Planning as to whether or not the proposal should be approved, refused or approved with conditions.

PlanningNSW will then undertake an independent assessment of the proposal which will take into account comments from the community and the recommendations from the Commissioner. The NSW Minister for Infrastructure and Planning and the Commonwealth Minister for Environment and Heritage will then determine whether the proposal may or may not proceed, or proceed with conditions.

The environmental impact assessment process is shown in **Figure ES.4**.



Environmental Impact Assessment Process **Figure ES.4**

ES.5 Need for the Project

Access Economics/Maunsell Australia predict that future growth in Sydney's container trade would be around 5% per annum which is consistent with other Australian and international studies all of which predict growth rates of between 5% and 6% for international and Sydney container trade to 2010 and beyond. Based upon these trade growth forecasts, Sydney's container trade will increase from approximately 1 million TEUs per year to more than 3 million TEUs per year by 2025.

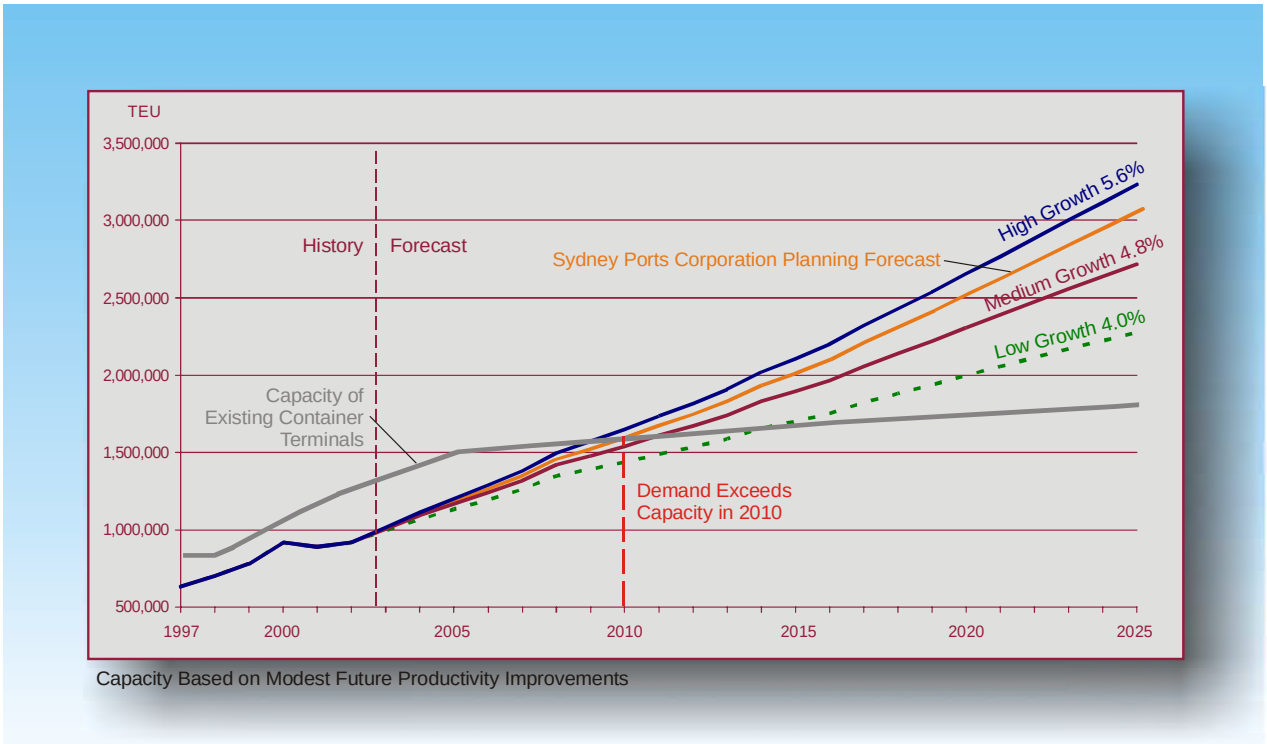
The current throughput at the existing container terminals at Port Botany is just over 1 million TEUs per year. This level of throughput is approaching the current capacity of the existing container terminals at Port Botany. Through a combination of leasing more land, upgrading equipment and improving productivity, the existing container terminals should be able to accommodate the predicted increases in container trade volume, at least in the short term. Beyond 2010, however, the capacity of the existing container terminals at Port Botany would be fundamentally constrained by the limited number of berths available for ships to load and unload containers.

This conclusion is supported by simulation modelling based on actual ship arrival patterns at Port Botany which shows that significant congestion would begin to occur at Port Botany by 2010. Beyond 2010, ship waiting times and costs would rise exponentially and would rapidly grow to become unacceptable unless additional berth capacity was introduced.

In the long term, the direct cost of shipping delays would be the tip of the iceberg as the real economic cost would be the loss of trade, relocation of industry, loss of employment and consequent drop in the standard of living in NSW. Additional berths must therefore be provided by 2010 to avert the consequences of congestion at Port Botany. The need for additional container handling capacity at Port Botany by 2010 is shown in **Figure ES.5**.

For commercial, engineering, environmental and practical purposes, port infrastructure needs to be constructed on a large scale basis. Due to the long lead times for planning, approval and construction; the extended periods required for amortisation of high capital costs; the economies of scale achieved through large scale investment; and the need to minimise environmental impacts, it is commercially and environmentally responsible to construct a container terminal which is of sufficient size to accommodate forecast growth in the Sydney container trade at least until 2025. The proposal to provide an additional five nominal berths and approximately 60 ha of terminal area to cater for 1.6 million TEUs per year would ensure that this is achieved.

If Sydney does not develop the necessary infrastructure to efficiently handle shipping and provide sufficient container handling capacity, it would put itself at risk of demotion from a "must call" status for shipping companies with the resultant loss in trade to interstate ports. This loss in trade and the resultant transport and shipping penalties resulting from the use of more distant alternative ports, would stifle business growth or result in businesses moving interstate or overseas with obvious adverse long term impacts on the NSW economy. Sydney Ports Corporation, as a State Owned Corporation, has as one of its key objectives the responsibility for providing for existing and future shipping trade. It must therefore act now to ensure a situation does not develop which would ultimately affect the standard of living of the people of NSW.



Source: Adapted from Access Economics and Maunsell Australia 2003

Forecast Demand v Capacity **Figure ES.5**

The lead time for planning approval, tender and procurement, reclamation, berth construction, road and rail works and terminal operator's facilities would be approximately seven years. Given that the initial stage of the Port Botany Expansion would be needed by 2010, the project needs to commence now to provide the required capacity in time to minimise the impacts of congestion.

ES.6 Alternatives

In developing the project scope and location, Sydney Ports Corporation has considered a range of alternatives for satisfying the need for additional container handling capacity. The assessment of alternatives has included the evaluation of other locations at a national, regional and local level including interstate development of port facilities in Melbourne and Brisbane and development at other existing NSW port facilities in Port Kembla and Newcastle.

In the analysis of alternatives it was found that the most significant disadvantage of all of these alternative locations was their distance from the Sydney market. The Sydney region currently accounts for more than 80% of the sources and destinations of existing NSW container trade, and with the forecast strong growth of the Sydney basin, this concentration of trade is likely to continue.

The distance of interstate, and the proposed intrastate alternatives of Port Kembla and Newcastle, from the Sydney market would add significantly to ongoing transport costs. The key road and rail links to Sydney have significant capacity constraints which, in the absence of further major capital investment, would detract from the efficiency and reliability of transport services from more distant locations. Australian industry

competes globally and NSW would not be able to afford the additional long term and ongoing costs that would result if trade was diverted to a port that is distant from the Sydney market.

Port Botany has "must call" status on Australasian shipping routes and will, with the existing facilities and proximity to markets, continue to attract the services of major international shipping lines. With the increasing rationalisation of the shipping industry (larger ships, fewer ports of call and larger exchanges per call) it is extremely unlikely that ships would call at both Port Botany and an additional regional NSW port. Newcastle and Port Kembla may attract the services of minor shipping lines and service specific niche markets, but at the present time would not be able to effectively compete for the services of major shipping lines serving major shipping routes.

The high economic and environmental cost of transporting containers from the more remote intrastate or interstate locations, together with the strong trend in international shipping to consolidate services to fewer ports of call with larger ships and larger exchanges per call, are significant factors that detract from the viability of locations outside Sydney. The existing status of Port Botany on global trade routes, as well as the port's proximity to the source of future trade growth, dictate that capacity to provide for future trade growth would best be provided for by expanding the existing facilities at Port Botany.

ES.7 Construction

The overall development of the Port Botany Expansion would have three distinct elements:

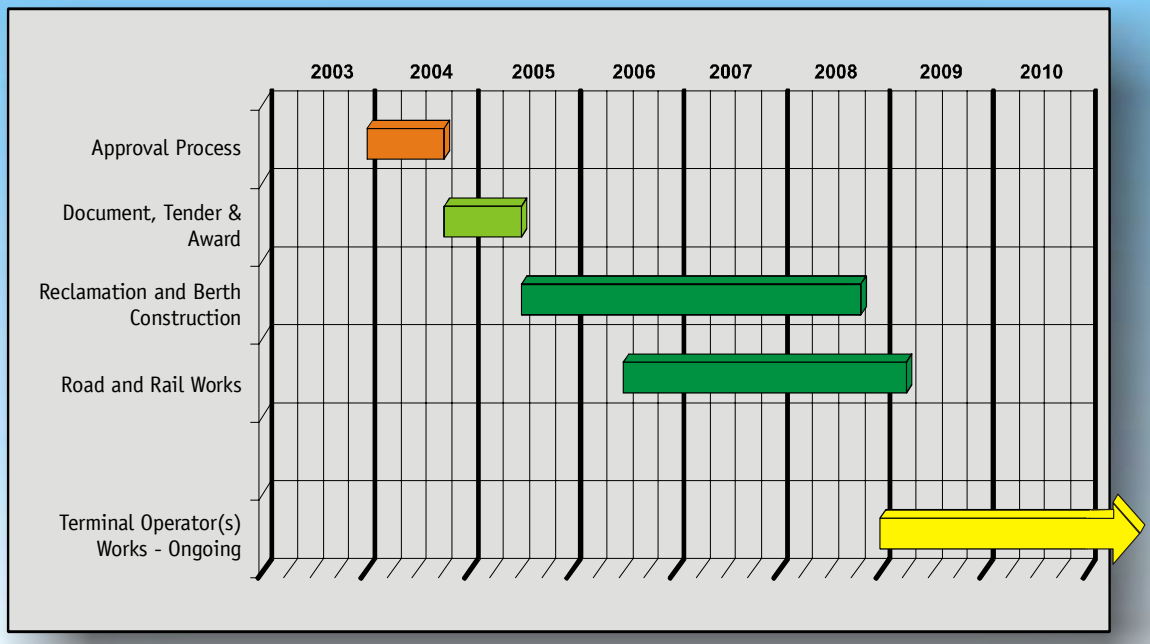
- construction of the new terminal, shipping berths and associated port infrastructure;
- enhancement of public open space areas, public recreational facilities and Penrhyn Estuary; and
- progressive development of terminal facilities for the operation of the new terminal.

The construction activities and works to create the new terminal and enhance the public recreation facilities and Penrhyn Estuary would be managed by Sydney Ports Corporation. Development of terminal facilities including roads and pavements, installation of container handling equipment, terminal buildings and services reticulation within the new terminal would be the responsibility of the ultimate terminal operator(s).

The civil construction works to create the new terminal and bring the first container shipping berth online would take approximately five years. Subject to planning approval, construction is expected to commence in 2005 and the first berth should be completed and operational by 2010. Additional berths at the new terminal would be developed by the terminal operator(s) in line with actual trade demand.

The overall development programme for the proposal is shown in **Figure ES.6**.

All dredging, reclamation, berth construction and major infrastructure works would be undertaken in a single construction campaign. This would minimise the high cost of mobilising and demobilising dredging equipment and would limit environmental impacts to a single construction period. Early completion of the entire reclamation would be required to allow for consolidation of the reclamation to occur prior to development activities being undertaken such as pavement construction, installation of services and drainage works.



Indicative Development Programme **Figure ES.6**

The areas to be dredged are shown in **Figure ES.7**. These areas require dredging to provide adequate depth for ship navigation and berthing at the new terminal. The total volume of material needed for the new terminal is 7.5 million cubic metres. Geotechnical investigations indicate that dredging of the areas shown should provide sufficient volume of suitable sand material to complete the reclamation. The dredging operation would be undertaken on a 24 hour a day, 7 days a week basis for a period of 12 to 15 months.

Construction activities within Penrhyn Estuary and along Foreshore Beach would be carried out as early as possible in the construction campaign and staged to minimise any disruption to migratory shorebirds and recreational users of Foreshore Beach.

Construction activities would be undertaken in accordance with a Construction Environmental Management Plan (EMP) which would contain the mitigation measures outlined in this EIS, various statutory requirements and the conditions of approval for the project. Adherence to this plan would ensure that the environmental impacts associated with the construction of the Port Botany Expansion would be minimised.

Dredging Plan **Figure ES.7**

Area to be Dredged

ES.8 Public Recreation and Ecological Plan

The existing public open space areas immediately surrounding Port Botany are important areas for passive and active recreation. The area is also an important ecological habitat for migratory shorebirds which frequent Penrhyn Estuary.

Stakeholder feedback has enabled development of a public recreation and ecological plan to protect and enhance both the recreational amenity of the Foreshore Beach corridor and the ecological integrity of Penrhyn Estuary. This plan forms an integral part of the overall Port Botany Expansion proposal and Sydney

Ports Corporation is committed to the ongoing implementation of management and maintenance measures which are identified in this plan.

The public domain along the foreshore corridor near Port Botany can be divided into two separate zones or precincts as follows:

- Foreshore Beach; and
- Penrhyn Estuary.

In the preferred concept plan, the Foreshore Beach precinct would be a public recreation area while the Penrhyn Estuary precinct would become a conservation zone delineated by the proposed rail corridor and the new terminal.

ES.8.1 Foreshore Beach

Consultation with stakeholders identified a preference for minimising changes to the form and use of Foreshore Beach and ensuring that a boat ramp was provided to replace the loss of the existing boat ramp in Penrhyn Estuary. In recognition of the importance of these issues the Foreshore Beach precinct would include the following major components as shown in **Figure ES.8**:

- retention of Foreshore Beach for public recreation activities;
- a four-lane boat launching ramp;
- car park for approximately 130 cars and boat trailers;
- a jetty and pontoon for temporary mooring of boats;
- public amenities and enclosed fish cleaning facilities;
- pedestrian/cycle path parallel to Foreshore Road between the Mill Stream and Penrhyn Road;
- a footbridge over Foreshore Road connected to Sir Joseph Banks Park;
- restoration, protection and enhancement of the existing beach in areas where erosion is occurring;
- landscaping using native trees and shrubs in the dunes behind Foreshore Beach and along the median strip on Foreshore Road;
- a viewing platform and native landscaping near the mouth of the Mill Stream; and
- lighting and security measures to improve public safety in recreational areas.

ES.8.2 Penrhyn Estuary

In contrast with the recreational emphasis of the western precinct, the Penrhyn Estuary area would focus on the protection and enhancement of important ecological values.

The concept plan for this area would substantially expand the existing shorebird habitat at Penrhyn Estuary to provide a larger, more open area of habitat, with intertidal flats and saltmarsh for feeding and roosting.

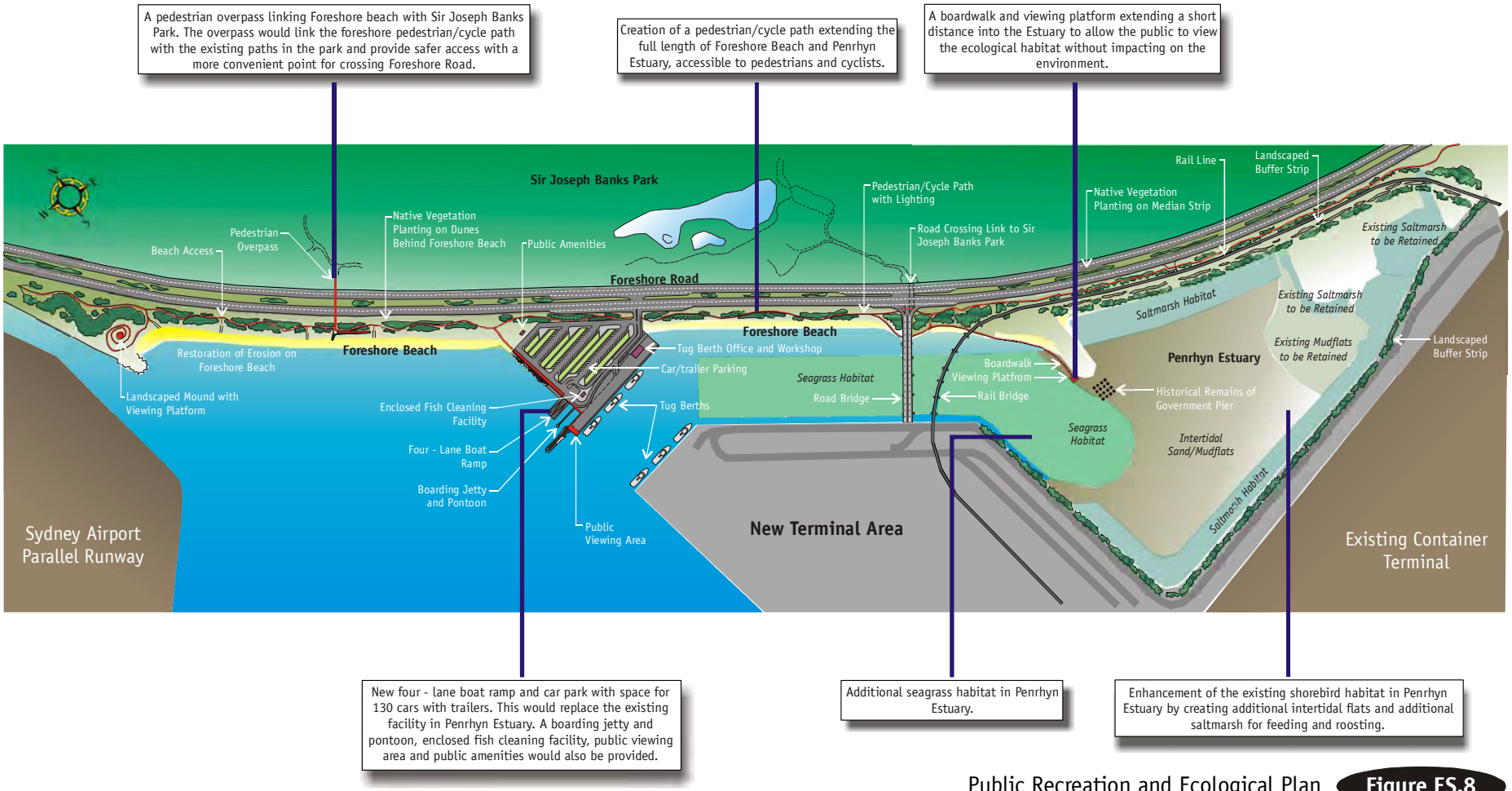
The purpose of these habitat enhancement works would be to continue to attract the migratory shorebird species that currently use the Estuary, and potentially attract a greater number of shorebirds.

The main components of the proposed Penrhyn Estuary ecological protection and habitat enhancement works would include the following as shown in **Figure ES.8**:

- moving sand from the dunes in Penrhyn Estuary to create additional areas of intertidal sand/mudflats habitat which would be used by migratory shorebirds for feeding and roosting;
- expansion of the saltmarsh habitat which is important for roosting shorebirds;
- creation of seagrass habitat for transplanting seagrass that would be lost due to the reclamation and for the natural colonisation of additional seagrass;
- control of public access by means of a pedestrian boardwalk and viewing platform extending a short distance into the Estuary to minimise disturbance of the migratory shorebirds and damage to sensitive seagrass and saltmarsh habitat;
- fencing of the Estuary to limit public access to the location of the boardwalk and to prevent access by feral animals;
- establishment of a native vegetation buffer strip along the edges of the Estuary, including the edge of the new terminal, to minimise disturbance of adjacent port activities on shorebirds; and
- a 130 m wide channel to allow flushing of the Estuary.

Public Recreation and Ecological Plan

The proposed plan for the public open space areas of Foreshore Beach and Penrhyn Estuary would retain and enhance the uses of the beach, provide improved recreational facilities and enhance the ecological habitat of Penrhyn Estuary. This image is a graphic representation of the plan. The plan would incorporate the following features:



Public Recreation and Ecological Plan **Figure ES.8**

ES.9 Consultation

Consultation with the community and stakeholders has been an important part of the environmental assessment and concept development for the proposal. The community and stakeholders were invited to utilise public response mechanisms to make comments or ask for further information about the proposal. The details of these mechanisms were publicised on Sydney Ports' website, in newsletters, during briefings and presentations, and in local newspaper advertorials.

Consultation during the environmental assessment process included:

- establishment of a website, email address, free call telephone number, dedicated fax number and freepost service for public comments;
- nine advertorials in local newspapers inviting people to contact the EIS study team;
- four newsletters each distributed to almost 20,000 people living in the vicinity of the proposed expansion;
- more than 40 meetings and presentations with local community groups and other stakeholders;
- workshops with key government stakeholders to establish design outcomes for the public recreation and environmentally sensitive areas adjacent to Port Botany;
- Planning Focus Meetings with government agencies and key community interest groups; and
- consultation with councils, project stakeholders and other government agencies.

These activities have encouraged significant community involvement in the development of the project and in the preparation of the EIS. Almost 300 submissions were received through the various community response mechanisms. The issues raised in these submissions and in the various community and stakeholder meetings were integrated into the project development and concept design and have been addressed in this EIS.

ES.10 Strategic Policy Considerations

The Port Botany Expansion would be a major long term public investment in NSW's and Australia's international trade infrastructure which would assist the NSW Government to achieve its objectives as set out in key planning, transport and environmental policies including *Shaping Our Cities*, *Action for Transport 2010*, *Action for Air* and the recommendations of the *Independent Inquiry into the Georges River – Botany Bay System*.

Table ES.1 summarises how the Port Botany Expansion proposal is consistent with the main objectives of key NSW Government planning, transport and environmental policies.

Table ES.1 Consistency with Key NSW Government Policies

POLICY OBJECTIVES	CONSISTENCY WITH POLICY
Shaping Our Cities	
Timely and coordinated infrastructure for economic development	▪ provide additional sea port capacity by 2010 to accommodate significant anticipated growth in container trade to avert congestion in port infrastructure
Building on the region's strengths to attract international business	▪ enhance the ability of business in Sydney to efficiently access import and export markets, thereby boosting Sydney's economic competitiveness and ability to attract international business
A robust economy that can provide employment and a high quality of life for all people	▪ create opportunities for employment and business growth by consolidating the majority of Sydney's container trade in a central location which is close to markets and is compatible with existing land uses
Linking environmental sustainability to economic development	▪ incorporate environmental sustainability objectives in the design and operation of the new terminal across a number of areas, including the provision of additional port facilities close to the Sydney market to reduce environmental impacts associated with additional travel distances, and the preservation and enhancement of Penrhyn Estuary as an ecological habitat
Action for Air	
Reduced length of trips travelled by vehicles to reduce air emissions	▪ assisting in reducing the growth in vehicle kilometres travelled by creating a container terminal close to the Sydney market which is the main destination for import cargo received at Port Botany (more than 80% of containers have origins or destinations within the greater Sydney area) ▪ long term environmental benefits associated with an increase in the use of rail for container transport including reduced greenhouse gas emissions of approximately 500,000 tonnes of CO_2 per year compared with the "do nothing" scenario
Better planning and management of freight movement across all transport modes	▪ facilitating more efficient use of roads through increased truck utilisation and better transport planning, such as use of B-doubles and backloading of trucks
Smoother flows of traffic and reduced congestion	▪ avoid contributing to road congestion by distributing port traffic over the day and more evenly through the week to avoid concentrating traffic during peak periods
Action for Transport 2010	
Increase the percentage of freight transported by rail significantly over the next 10 years	▪ significantly increasing the percentage of freight transported by rail to and from Port Botany from the current 25% to at least 40% by 2011
Upgrading of Port Botany rail freight facilities	▪ provision of additional rail infrastructure at the port including dedicated rail access to the new terminal and additional rail sidings for waiting trains to allow efficient transport of freight by rail and to cater for container trade growth
Increasing the use of high capacity freight trains	▪ providing rail exchange facilities at the new terminal with sidings between 400 m and 600 m in length to cater for the use of freight trains

POLICY OBJECTIVES	CONSISTENCY WITH POLICY
Healthy Rivers Commission Inquiry	
Include stakeholder participation from all interest sectors: environmental, transport, commercial and recreational	▪ a broad-ranging stakeholder involvement plan was implemented during the preparation of the EIS. The plan included consultation with government agencies, businesses, transport interests, environmental and recreational groups, indigenous communities and the wider community. Various mechanisms were provided to gather the issues and concerns of stakeholders and these have been addressed in the EIS.
Comprehensive assessment of the impact of specific proposals on the whole of Botany Bay system	▪ a marine and coastal processes study is included in the EIS. The study includes a predictive scientific hydrodynamic model, which treats Botany Bay as a whole, and assesses impacts of the Port Botany Expansion on a Bay-wide basis. The secondary impacts of any changes to marine and coastal processes on aquatic flora and fauna, cultural heritage, and migratory shorebird habitat has also been assessed on a Bay-wide basis.

ES.11 Environmental Impact Assessment

Detailed scientific and environmental studies were undertaken as part of the Environmental Impact Statement to enable the potential effects of the proposal to be fully assessed. The findings of studies, assessment of impacts, and the identification of safeguards are presented in this EIS. A number of these studies and assessments were also provided to independent experts for peer review to ensure the rigour of work undertaken, and the validity of predictions made about potential impacts. The assessment of environmental impacts associated with the Port Botany Expansion is summarised below.

ES.11.1 Land Use

The proposed Port Botany Expansion would be compatible with industrial development and transport infrastructure already existing in the area and would consolidate Port Botany's importance as a regionally significant transport hub and employment base.

The most significant impact of the construction and operation of the new terminal on the areas surrounding the site would be traffic and noise. The implementation of environmental mitigation measures outlined in this EIS would minimise impacts on surrounding land uses, including residential dwellings, industry and the operations of Sydney Airport.

The proposal would encourage the continued use of the public open space corridor between Penrhyn Road and the Mill Stream outlet, including Foreshore Beach and Penrhyn Estuary. Improvements on Foreshore Beach would enhance access arrangements and public recreation opportunities along the foreshore and linkages to Sir Joseph Banks Park. A public boat ramp and recreational boating channel would always be maintained to allow access to Botany Bay.

Access to certain areas would be restricted temporarily due to construction activities and permanently for operational and ecological reasons. Habitat enhancement works at Penrhyn Estuary would limit pedestrian access to the Estuary to a boardwalk and viewing platform to protect wildlife in this area. The operation of the new terminal would result in access restrictions to the channel between Foreshore Beach and the new terminal, and to the ship approach channels and turning basins.

ES.11.2 Hydrodynamics and Coastal Processes

In recognition of the need to assess the potential impacts of the Port Botany Expansion on the marine and coastal processes of Botany Bay as a whole, a comprehensive Bay-wide numerical modelling study has been undertaken as part of this EIS. This study assessed potential changes to the wave climate, currents and coastal processes on a Bay-wide basis.

The results of the assessment showed that except for the northeastern embayment of Botany Bay (i.e. between the Parallel Runway and Molineux Point) the wave climate and currents in the remainder of Botany Bay would be effectively unchanged as a result of the construction of the new terminal.

In the northeastern embayment area, with the proposed design of the dredging profile and the new terminal, there would be no increase in swell wave energy on the eastern side of the Parallel Runway and local sea wave heights along the Parallel Runway would be reduced.

Due to the "blocking effect" of the new terminal there would be a large reduction in wave energy at the mouth of Penrhyn Estuary which would significantly reduce the existing erosion along the southeastern portion of Foreshore Beach. A groyne would be built as an extension to the existing Mill Stream training wall at the northwestern end of Foreshore Beach to prevent sand from blocking the Mill Stream outlet which is currently an issue.

ES.11.3 Hydrology and Water Quality

Hydrologic modelling (to determine surface water flow rates under design rainfall conditions) and hydraulic modelling (to determine the flood water levels) before and after the proposed development showed that the Port Botany Expansion would not have an adverse impact on local flood behaviour in the catchments surrounding Port Botany or cause an increase in flood levels within Penrhyn Estuary.

The proposed development would not affect the quality of water draining from the catchments surrounding Port Botany, however, the partial enclosure of Penrhyn Estuary resulting from the reclamation for the new terminal would affect the transport and dispersion of water contaminants and suspended solids which currently enter Penrhyn Estuary via Springvale and Floodvale Drains. It would also result in increased nutrient and faecal coliform concentrations within the Estuary, however, during typical dry weather conditions these increases would not exceed the Australian and New Zealand Environment and Conservation Council (ANZECC) (2000) water quality guideline values and would therefore not be expected to have a significant impact on human health or the marine environment.

Turbidity associated with dredging and reclamation activities would be minimised through the use of a rock embankment design for the new terminal and silt curtains, which would be used around the discharge point of the dredging operations to control sediment plumes. The final surface of the new reclaimed area would be profiled and stabilised to control dust and avoid sediment entering Botany Bay.

The new terminal's stormwater management system would utilise a first flush capture and treatment system to treat runoff discharging into Botany Bay. Treated stormwater runoff from the terminal would be stored onsite and reused for washdown and irrigation purposes.

ES.11.4 Groundwater

The results of numerical groundwater modelling demonstrate that the proposed reclamation for the new terminal would have no effect on groundwater levels on the landward side of the present shoreline and would have no effect on the volume or flow directions of groundwater.

The reclamation for the new boat ramp and the planned enhancement of sections of Foreshore Beach, to address existing beach erosion, would result in minor localised increases in groundwater levels of between 0.01 m and 0.04 m in residential areas immediately to the north of the site.

Habitat enhancement works within Penrhyn Estuary would result in small localised decreases in groundwater levels of between 0.01 m and 0.06 m in areas immediately to the north of Penrhyn Estuary.

The anticipated changes in groundwater levels are so small that they are at the limit of the capability of the model to predict and are insignificant when compared with the natural fluctuations in groundwater levels of between 1 m and 5 m in the Botany area.

The results also demonstrate that the reclamation for the new terminal would have no impact on the natural migration of contaminated groundwater which is already present in areas to the north of the site.

ES.11.5 Geology, Soils and Geotechnical

Geotechnical studies have confirmed that ground and sediment conditions are suitable for the proposed development given adoption of appropriate design and construction techniques and that dredging activities would not impact on the stability of Sydney Airport's Parallel Runway.

Assessment of estuarine sediment in the area to be dredged indicated that contaminant concentrations are generally low compared to ANZECC (2000) sediment quality guidelines. Disturbance of sediment during the proposed dredging operations would therefore be unlikely to cause a significant risk to human health or the environment.

Some limited disturbance of potential acid sulphate soils may occur as a result of construction of the new terminal, however, any potential acid sulphate soils within the dredged area would be contained within the reclamation, or kept below the water level to prevent oxidisation.

ES.11.6 Aquatic Ecology

The main impact on the aquatic environment would be an initial loss of up to 4 ha of seagrass habitat within the footprint of the proposal. This would be compensated for by creating up to 8 ha of seagrass habitat within the channel between the new terminal and Foreshore Beach and within Penrhyn Estuary. Seagrass would then be established in these areas through a combination of transplanting and natural colonisation. Some seagrass would also be relocated to a terraced area adjacent to the Parallel Runway where transplanting of seagrass has been undertaken in the past.

The areas to which seagrass would be transplanted are considered to be suitable for seagrass growth in terms of available light and depth, and are very sheltered and hence not subject to wave action, a major factor attributed to failures in transplanting in the past.

In addition to the impacts on seagrass, the proposed habitat enhancement works would necessitate the removal of small areas of recently colonising mangroves within Penrhyn Estuary to allow additional saltmarsh habitat to be established for migratory shorebirds. The loss of this small stand of mangroves would represent about 0.1 % of the mangroves in Botany Bay and the advantages associated with the opportunity to enhance shorebird habitat with saltmarsh provide a strong ecological justification for their removal. In addition, there is good evidence to suggest that in many locations within the Sydney region saltmarsh is being lost due to colonisation by mangroves.

The rocky reef habitat created by the rock walls of the new terminal and associated structures would have beneficial ecological consequences as this type of habitat has been shown to support a diverse and abundant range of fish and other marine biota.

Apart from the loss of mangroves, the same aquatic habitats would be present in the area following construction of the proposal, but the relative amounts of these habitats would change. On balance, the proposal would help to maintain biological diversity and ecological integrity in Botany Bay.

ES.11.7 Terrestrial Ecology

Penrhyn Estuary is essentially the only habitat remaining on the northern side of Botany Bay for shorebirds. It provides important feeding and roosting habitat for non-migratory and migratory shorebirds listed under Commonwealth and NSW threatened species legislation. To assess the potential impacts of the proposal on shorebirds a Species Impact Statement has been prepared in respect of 23 shorebird and one seabird species that regularly or occasionally visit Penrhyn Estuary.

In order to compensate for potential impacts to these shorebirds, Sydney Ports Corporation plans to carry out ameliorative measures to protect shorebirds and enhance their habitat at Penrhyn Estuary by substantially enlarging the existing area of feeding and roosting habitat as well as securing the site from disturbance by people, dogs and vehicles and shielding the Estuary as far as practicable from the impact of port operations. Evidence from other similar developments suggests that the proposed habitat enhancement works would facilitate the continued use of Penrhyn Estuary by shorebirds and would potentially result in an increase in the number of shorebirds using this important habitat.

Monitoring would be undertaken to assess the impacts of the construction and operation of the new terminal and the degree of success of the reconfigured Estuary in attracting migratory shorebirds. The monitoring program would be conducted in consultation with the NSW National Parks and Wildlife Service.

In total, the proposal would result in the direct removal of approximately 0.6 ha (out of a total of approximately 12 ha) of planted shrubland behind Foreshore Beach for the construction of public recreational facilities and port infrastructure, and approximately 10.5 ha of planted shrubland in Penrhyn Estuary (out of a total of approximately 15 ha) to allow for the creation of feeding and roosting habitat for shorebirds.

The vegetation in this area was planted on land reclaimed in the 1970's as part of previous port development activities and is considered to have limited conservation significance. Therefore, the removal of the planted shrubland community is not considered to be significant in a local or regional sense and is required to facilitate the enhancement of a recognised important migratory shorebird habitat site and should be viewed in this overall context.

Along the foreshore behind Foreshore Beach, much of the existing vegetation would be retained and enhanced in accordance with the proposed Public Recreation and Ecological Plan. Areas that are disturbed during the construction of public recreational facilities or port infrastructure would be revegetated with local native species.

Up to 5 ha of saltmarsh habitat would be created as part of the habitat enhancement works within Penrhyn Estuary. The creation of additional saltmarsh habitat is considered to be a positive impact as it would represent a substantial increase in the total area of this habitat within Botany Bay (approximately 4% increase) and would help in restoring saltmarsh habitat that was lost due to the construction of the Parallel Runway.

ES.11.8 Traffic and Transportation

The bulk of Sydney's container throughput (more than 90%) is handled at Port Botany, with 75% of this volume currently moved by road. This amounts to approximately 1,450 truck visits each day. The number of trucks visiting the proposed new terminal would gradually rise as additional terminal facilities were progressively brought on line by the terminal operator(s) in response to actual trade growth. By about 2025, the number of trucks visiting the new terminal is expected to be about 940 truck visits per day, or 40% of the total volume of traffic generated by the port.

A detailed traffic study has been undertaken to determine the impacts on the local area of the forecast increase in truck numbers generated by Port Botany (including the new terminal). The results of this study show that, even with the expected increases in truck numbers, intersections on the local road network would continue to provide acceptable levels of service to motorists in accordance with the NSW Roads and Traffic Authority (RTA) performance criteria.

Sydney Ports Corporation is targeting a number of initiatives to reduce the growth of truck numbers generated by increased port activities. The main initiatives comprise:

- increasing the transport of containers by rail from the current 25% of container throughput to at least 40% by 2011; and
- encouraging the improved utilisation of trucks serving the port by:
  - increasing backloading of trucks i.e. reducing the number of empty truck trips;
  - encouraging the use of high productivity vehicles such as B-Doubles, which require less vehicle kilometres and road space per unit load;
  - distributing port traffic over the day and more evenly through the week to avoid concentrating traffic during peak periods;
  - improving truck access to and from the port; and
  - provision of sufficient truck parking capacity to prevent queuing of trucks on public roads.

The proposal by the NSW Government, through the Rail Infrastructure Corporation (RIC), to duplicate the rail line between Cooks River and Botany Yard, would complete the full duplication of the dedicated freight rail line between Port Botany and the Enfield Marshalling Yards/Chullora. Once completed, the duplication would increase the capacity of the dedicated freight rail line to around 1.3 million TEUs, which would enable

Sydney Ports Corporation to transport at least 40% of containers to and from the expanded Port Botany by rail.

ES.11.9 Noise

Construction noise levels expected from night time dredging would comply with the EPA night time noise criteria. During the day, some construction activities would produce noise levels above the noise criteria, particularly piling activities during the construction of the wharf. A Noise Management Plan would be implemented to minimise construction noise.

Once the new terminal is fully developed, terminal operations during a "worst case" scenario would result in noise levels at residences closest to the new terminal of up to 5 dBA above the EPA night time noise level criteria. However, these exceedences are limited and would only occur during certain adverse weather conditions. Typically noise levels would be between 0 and 3 dBA above the EPA criteria. A range of noise mitigation measures would be implemented to minimise noise during the operation of the new terminal, including a 4 m high noise barrier and noise control of machinery.

EPA sleep disturbance criteria at the closest residences, particularly to the north and northwest of the new terminal, would also be exceeded. However, noise levels would be below the level of 65 dBA outside buildings which some researchers consider would not result in awakening reactions.

Whilst the operation of the new terminal would result in exceedences of the EPA noise criteria, the noise levels expected from the new terminal would only be about 1 dBA above what would be expected from the operation of the existing terminals in the future without the presence of the new terminal. It is also only once the new terminal is fully developed that noise levels would reach the "worst case" levels predicted by the noise modelling. By this time, technological and operational changes are likely to be available which would reduce operational noise levels at the new terminal.

Noise levels from potential increases in truck movements from the Port Botany Expansion would comply with EPA traffic noise criteria as would the contribution to overall traffic noise levels from all port trucks when the entire port is at capacity.

The number of trains on the Botany Freight Rail Line would increase as a result of the Port Botany Expansion by up to 10 trains per day. This increase in train movements along the freight line would not result in significant increases in noise in residential areas adjacent to the line.

A Noise Management Plan, outlining environmental management measures to assess and reduce noise levels, would be developed and would include noise barriers, equipment alarms, machinery noise control, traffic management, noise monitoring, complaints handling and operator awareness programs. Sydney Ports Corporation would consult with the EPA and PlanningNSW to identify appropriate responses and management protocols to minimise the impacts of construction and operational noise on surrounding land uses.

ES.11.10 Air Quality

The main air quality issue which may affect surrounding land uses during the construction of the Port Botany Expansion would be dust emissions. Dispersion modelling of dust emissions during construction showed

that dust concentrations and deposition rates comply with EPA criteria and would therefore not result in significant impacts on surrounding land uses.

Air quality impacts from Port Botany's current and estimated future operations (i.e. including the existing container terminals and the new terminal) were assessed for both "peak" and "normal" operations. The potential for adverse air quality impacts from the operation of the new terminal, combined with existing container terminals in the future, would be minimal with modelling results showing no exceedences of the NSW EPA criteria within residential areas or at sensitive receivers.

An assessment investigating several potential future operating scenarios for the transport of container cargo to Sydney in the long term found that construction and operation of the Port Botany Expansion would reduce overall greenhouse gas emissions by approximately 500,000 tonnes per annum when compared to the situation where the Port Botany Expansion did not proceed. These reductions are largely a result of the decrease in the total kilometres traveled by trucks and trains that would otherwise have to service the Sydney market from more distant ports.

ES.11.11 Cultural Heritage

The cultural heritage study assessed the impact of the Port Botany Expansion on Aboriginal and European heritage both within the immediate footprint of the proposal and on a Bay-wide basis.

No Aboriginal sites were recorded in the areas affected by the proposal footprint and the potential for Aboriginal relics in this area is negligible as the land surrounding the site has been created by previous reclamation activities associated with Sydney Airport and the existing port.

The main European heritage item in the area is the former Government Pier. The remains of this structure can be seen at the southeastern end of Foreshore Beach. The significance of the Pier lies in its association with the Government's first attempt at fostering trade and creating port infrastructure within Botany Bay. The Pier would be conserved by Sydney Ports Corporation as part of the development.

On a Bay-wide scale, the hydrodynamic and coastal processes study showed that there would be negligible change to waves, currents, and coastal processes. Therefore, the potential impact on any Aboriginal or European cultural resource around the Bay would be negligible.

ES.11.12 Visual Impact Assessment

Representative view locations were selected at the immediate, local and regional level to determine the likely visual impact of the Port Botany Expansion on surrounding areas. The visual impact on views from the air and from the waters of Botany Bay were also assessed.

When viewed from the adjacent foreshore corridor or approaches to Sydney Airport, the proposed development would have a moderate or high visual impact and would partially impede views of Botany Bay. The local area views of the Port Botany Expansion would be low or moderate due to existing vegetation and structures which would impede views of the new terminal. At the regional scale, the Port Botany Expansion would generally have at most a low visual impact due to the long viewing distances. Views from the waters of Botany Bay would vary with distance. All views of the new terminal would be seen within the context of the existing port and other industrial uses which are located immediately adjacent to the site of the proposed expansion.

Mitigation measures to minimise the visual impact of the proposed development would include planting native vegetation screening along the foreshore corridor between the Mill Stream and Penrhyn Road, partial screening of terminal operations by the proposed noise wall and a terminal landscaping buffer strip, lighting control measures, use of low profile quay cranes, and careful selection of materials and colours to minimise the contrast and reflectivity of buildings and equipment at the new terminal. In addition, viewers would have an opportunity to see an increase in visually interesting port related activities including the movement of container ships, cranes and containers.

ES.11.13 Social Impact Assessment

The Port Botany Expansion would have a range of social impacts. At the Sydney metropolitan level, the proposal would result in positive impacts such as an increase in employment opportunities during both the construction and operation of the new terminal. However, at a local level the social impacts would be more complex.

During the community consultation process, the community emphasised the importance of Foreshore Beach, Penrhyn Estuary, the Penrhyn Road boat ramp and waters of Botany Bay for recreational activities and as regional open space sites.

During construction of the new terminal, access to parts of Foreshore Beach and portions of the area between the existing port and the Parallel Runway would be restricted. Staging of the works would, however, ensure that some part of the beach would always be available for public use and access to the greater part of the Bay maintained.

Public access to Penrhyn Estuary would be restricted during construction and operation of the new terminal. Whilst this means that people would no longer be able to access all the parts of the Estuary, it would provide opportunities for visitors to view shorebirds via a boardwalk and viewing platform without impacting on the ecological habitat, thereby improving nature based recreation in the area.

As the proposed design for the Foreshore Beach area retains the majority of the existing beach and enhances the public facilities along the foreshore, recreational activities which currently occur on the beach would still be able to occur once the new terminal is in operation. Walking and cycling opportunities would be enhanced by the creation of a pedestrian/cycle path along Foreshore Road.

The existing boat ramp would be removed and a new ramp and associated facilities constructed in a new location along Foreshore Beach. The new boat ramp would provide an enhanced facility (four lanes instead of two lanes at the existing boat ramp) for the fishing and boating community. Recreational craft would be directed to the wider Bay via a navigation channel between the Parallel Runway and the new terminal.

There would also be social impacts associated with loss of visual amenity and an increase in traffic and noise levels. Mitigation measures outlined in detail in this EIS would be implemented to minimise the impacts of the proposal on the areas surrounding the port.

ES.11.14 Economic Impact Assessment

Economic analysis has shown that the development of the Port Botany Expansion would provide a substantial benefit to the NSW economy and household income of those employed directly and indirectly in port related activities. The cumulative economic benefit of the project (up to 2025) would inject more than

$16 billion into the NSW economy and add $3.6 billion to household income. Once fully developed, the new terminal would employ over 9,000 people, directly and indirectly.

In addition, the provision of adequate international trade infrastructure substantially contributes to the prosperity and quality of life experienced by Australians. Improving the efficiency and reducing the cost of transporting cargo makes exports more competitive and reduces the price of imported products. This essentially improves the terms in which we trade on the world market. This improved competitiveness generates employment in export industries and reduces the cost of living.

ES.11.15 Preliminary Hazard Analysis

A preliminary hazard analysis has shown that the risks of the Port Botany Expansion to individuals, the surrounding communities and to the biophysical environment would satisfy PlanningNSW risk criteria and the recommendations of the *Port Botany Land Use Safety Study* (DUAP 1996), including offsite risks associated with the transport of dangerous goods to and from the new terminal by road and rail.

ES.11.16 Bird Hazard to Aircraft

Certain species of birds flying close to or across an airport on a regular basis may be considered a bird hazard because of the potential for "bird strike". With appropriate design and management, the proposed Port Botany Expansion would not increase the existing bird hazard to aircraft operating from Sydney Airport.

The primary concern at Port Botany, with respect to potential bird hazard, is the existing boat ramp at Penrhyn Road and associated fish cleaning facilities. However, with better management and enclosed fish cleaning facilities, the replacement boat ramp at Foreshore Beach would be less likely to attract birds than the existing ramp at Penrhyn Estuary and would be likely to reduce the overall bird hazard to aircraft operating in the area.

The type of shorebirds which currently use Penrhyn Estuary do not pose a significant threat to aircraft. The proposed habitat enhancement works within Penrhyn Estuary, which may increase the use of this area by the same species of shorebirds, would not be expected to increase bird hazard.

Monitoring and use of appropriate bird deterrent measures during construction and operation of the Port Botany Expansion would be implemented to ensure there is no increased hazard to aircraft operating out of Sydney Airport.

ES.11.17 Operational Aviation Issues

The Port Botany Expansion would not intrude into the protected airspace of Sydney Airport. With the advent of the next generation of larger container ships calling at the new terminal there would, however, be some effect of the proposed development on the airport's existing radar and navigation systems. The majority of these potential impacts would be manageable using system tuning and site operating condition adjustments such that system safety would not be compromised. The exception is the Precision Approach Runway Monitor (PARM), which could potentially be affected by ships approaching and docking at the new terminal. However, the PARM is scheduled for replacement by Airservices Australia by about 2009, prior to commissioning of the first berth of the Port Botany Expansion in 2010. By this time, there will also have been

significant development of PARM and other alternative technologies which would enable any potential impacts resulting from the Port Botany Expansion to be eliminated.

Sydney Ports Corporation would coordinate and work with the Civil Aviation Safety Authority, Airservices Australia and Sydney Airport Corporation Ltd during the detailed design stage of the project and the development/implementation of the radar system technologies to ensure that any impacts or interfaces as a result of the new terminal are satisfactorily addressed.

ES.11.18 Ecotoxicology and Human Health Risk

No changes in existing Bay-wide water or sediment contaminant concentrations would be expected due to the Port Botany Expansion.

The partial enclosure of Penrhyn Estuary by the new terminal may increase localised contaminant concentrations in surface waters within Penrhyn Estuary, but the overall contaminant concentrations are not expected to change markedly from the present conditions as a result of the Port Botany Expansion. Therefore, the proposed development is not expected to significantly alter the risks to human health or the environment.

The future discharge of groundwater contaminated by Orica's (formally ICI) previous industrial activity in the Botany area may increase the concentration of certain contaminants in Penrhyn Estuary. However, the NSW EPA has recently issued a Clean Up Notice to Orica under the *Protection of the Environment Operations Act* 1997. This notice requires Orica to establish a containment area to prevent further discharge of contaminated groundwater into Penrhyn Estuary and Botany Bay. The notice requires that this containment area be established by 31 October 2004. The assessment undertaken in this EIS, however, assumes a "worst case" scenario where the contaminated groundwater does reach Penrhyn Estuary.

Any possible increased risks to human health, due to increased concentrations of contaminants in Penrhyn Estuary from existing sources, would be offset by restricting public access to this area, which is compatible with the objective of enhancing the Estuary for migratory shorebird feeding and roosting habitat.

ES.11.19 Emergency and Incident Management

The future operator(s) of the new terminal, with advice from Sydney Ports Corporation, would be required to prepare and implement an Emergency Response and Incident Management Plan (ERIMP) prior to the new terminal commencing operations. The purpose of the ERIMP would be to provide an organised and practised response to incidents and emergency situations to protect employees, the public and the environment.

The ERIMP would be considered in the context of the existing Port Botany Emergency Plan (PBEP), which was developed by Sydney Ports Corporation in conjunction with existing terminal operators and emergency services organisations. The ERIMP for the new terminal would essentially represent an extension of the existing emergency and incident management system which has proven to be effective in the past.

Emergency response is among the port safety functions mandated by statute for Sydney Ports Corporation. Sydney Ports Corporation has the largest inventory of oil spill equipment of any Australian port to rapidly and effectively respond to spills. In addition, under national mutual aid arrangements, supplementary equipment is available from other states, the Navy and industry.

The new terminal would be a Customs controlled area and would be equipped with security features consistent with the requirements of the International Maritime Organisation *International Ship and Port Facility Security Code*.

ES.11.20 Cumulative Impacts

The key developments in the region which may result in significant cumulative impacts are the existing port facilities, Sydney Airport and the Green Square redevelopment in Alexandria. The major cumulative impact associated with these developments would be traffic. The cumulative traffic impact assessment shows that the predicted increase in traffic resulting from passenger growth at Sydney Airport and the Green Square redevelopment would account for approximately 80% of additional traffic generated by major developments in the Botany Bay region. Port generated traffic would represent less than 2% of the total peak hourly traffic flows by 2021.

Cumulative benefits of the Port Botany Expansion would include employment and economic benefits, a reduction in greenhouse gas emissions and habitat enhancement of aquatic and terrestrial habitats.

ES.12 Environmental Management and Monitoring

An Environmental Management and Monitoring Plan (EMMP) would be developed and implemented for the site in accordance with the management and monitoring measures set out in this EIS, statutory requirements and the conditions of approval for the project. The EMMP would therefore be an important component of the proposal and would outline the commitment of Sydney Ports Corporation and its contractors and operators to the mitigation measures and environmental outcomes identified in this EIS. Construction and Operational EMPs would form an integral part of the EMMP for the project and would be prepared in accordance with the requirements of ISO 9001:2000 and ISO 14001:1996.

Major monitoring programs which would be identified in the EMMP would include:

- monitoring of turbidity within Botany Bay during dredging operations;
- monitoring to assess any changes to beach profiles at locations in Botany Bay as a result of the proposed development;
- water quality, noise and dust monitoring at various locations in the local area;
- monitoring of the diversity, abundance and behaviour of migratory shorebirds in Penrhyn Estuary.
- monitoring of the survival, condition and colonisation of seagrass;
- monitoring of groundwater levels;
- monitoring of all areas of the new terminal to ensure birds which may present a hazard to aircraft operating out of Sydney Airport do not congregate in large numbers; and
- ongoing management and maintenance of Penrhyn Estuary and the recreational areas along the foreshore corridor adjacent to the port.

Implementation of the environmental management and monitoring tools identified in this EIS would ensure that the impact on the physical, social and economic environments of the proposal would be minimised in accordance with one of the Sydney Ports Corporation's key roles which is to protect the environment.

ES.13 Ecologically Sustainable Development

The construction of port infrastructure, particularly in a large, modern city, necessarily requires activities involving a degree of environmental and social disturbance. The environmental and social disturbance posed by the Port Botany Expansion must be balanced against the likely effects from congestion, container handling delays and cost increases to NSW businesses and consumers should the proposal not proceed.

An iterative approach to project development and conceptual design, involving stakeholder and community consultation, has been adopted to ensure that measures to protect the environment and social amenity were adequately incorporated. The Port Botany Expansion has been developed in accordance with the five principles of Ecologically Sustainable Development (ESD): the precautionary principle; inter-generational equity; conservation of biological diversity and ecological integrity; improved valuation, pricing and incentive mechanisms; and the integration of long term and short term economic, environmental, social and equitable considerations in decision making, as described below.

The Precautionary Principle - The project design has been developed in accordance with a precautionary approach to minimise uncertainty and to avoid, minimise or mitigate potential environmental and social impacts. The EIS identifies mitigation measures and environmental management procedures that would be implemented to minimise and monitor impacts which may occur as a result of uncertainties in the impact assessment. Such uncertainties would not pose a risk of serious or irreversible damage to the environment as they have been considered in the context of worst case scenarios which conservatively anticipate environmental impacts and would be managed and monitored during the construction and operation of the Port Botany Expansion.

Inter-generational Equity - As the Port Botany Expansion would deliver long term economic and social benefits without degradation of the broader environment it is consistent with the principles of inter- and intra-generational equity. Whilst the proposal would have long term benefits, it is recognised that it would also have unavoidable environmental impacts. To minimise these impacts a range of management and monitoring measures would be implemented to ensure that degradation of the environment is minimised.

Conservation of Biological Diversity and Ecological Integrity - Whilst the Port Botany Expansion would affect the aquatic and terrestrial environment of the area, it has been designed with the aim of minimising damage to habitats and in some cases, enhancing habitats. Apart from the loss of mangroves, the same habitats would be present in the area following construction, but the relative amounts of these habitats would change. On balance, the proposal would help to maintain biological diversity and ecological integrity.

Improved Valuation and Pricing of Environmental Resources - The approach taken has been to manage environmental impacts by identifying appropriate safeguards to mitigate adverse environmental effects and take up environmental enhancement opportunities. The cost of implementing these safeguards has been included in the total proposal cost, thereby appropriately reflecting the value of environmental resources.

Integration of Environmental, Social and Economic Goals in Decision Making - A whole of government approach has been adopted by Sydney Ports Corporation for the project design and development which included involvement from a wide range of government stakeholders. These stakeholders assisted in the

development of project design outcomes and provided their requirements for the nature and extent of the environmental impact assessment in this EIS. Based on these government requirements, this EIS provides an examination of short, medium and long term impacts and outcomes, taking into account sustainable development, economic, environmental and social considerations.

With appropriate mitigation measures as identified throughout this EIS, undertaking the Port Botany Expansion in the manner proposed is justifiable taking into consideration the principles of ESD.

ES.14 Project Justification

Assessment of whether the Port Botany Expansion is justified requires consideration of the proposal's:

- ability to meet the identified needs and objectives for the project;
- consistency with key government planning, transport and environmental policy objectives;
- environmental benefits and impacts;
- social benefits and impacts;
- economic benefits and impacts; and
- consistency with the principles of ESD.

The consequences of not proceeding should also be examined.

Summary conclusions in relation to how the proposal addresses these considerations are:

- the Port Botany Expansion meets the need and timeframe required for providing additional container handling capacity at Port Botany to cater for long term forecast growth in container trade in NSW;
- the existing status of Port Botany on global trade routes as well as the port's proximity to the Sydney market dictate that capacity to provide for future trade growth would be best served by expanding the existing facilities at Port Botany. There are no other viable alternative locations which would provide the necessary capacity for long term growth in Sydney's and NSW's container trade;
- without the Port Botany Expansion, throughput of containers would be dictated by the capacity of the existing infrastructure at Port Botany together with any future improvements in productivity over time. Ultimately, the cost of this congestion would result in the loss of trade, relocation of industry and loss of employment;
- the proposed design has been developed through the adoption of an iterative approach to project development and conceptual design which involved extensive stakeholder and community consultation. The concept design has been amended to minimise impacts and incorporate enhancement opportunities. Mitigation measures have been included to protect existing environments and reduce social impacts, these measures include enhancement of Penrhyn Estuary as a habitat for migratory birds, improvements to public access to Foreshore Beach, a strategy to increase the proportion of containers transported by rail and the preservation and transplanting of seagrass;
- the proposal is consistent with key government planning, transport and environmental policy objectives and the principles of ESD;

- the development of the Port Botany Expansion would provide a substantial benefit to the NSW Gross State Product, employment levels and household income of those employed directly and indirectly in port related activities; and
- long term adverse environmental impacts would be limited to those associated with the loss of part of Botany Bay from public use as a result of the reclamation for the new terminal and associated infrastructure, loss of visual amenity and increased noise in areas close to the proposed site, additional traffic on roads around the port, and some decline in water quality within Penrhyn Estuary due to alterations in the flushing characteristics of the Estuary.

ES.15 Conclusion

There are substantial benefits that would flow from the proposed Port Botany Expansion. The broader community would benefit from the proposal through job creation, a strong economy, and improved standard of living. At a local level, the community would directly benefit from the construction of a new four-lane boat ramp with associated parking for cars and trailers, a public jetty and pontoon, an enclosed fish cleaning facility, a public amenities building, a pedestrian/cycle path along the rear of Foreshore Beach, a pedestrian overpass linking with Sir Joseph Banks Park and works to restore the existing impacts of erosion on Foreshore Beach. There would also be long term environmental benefits resulting from the protection and enhancement of migratory shorebird habitat within Penrhyn Estuary and the creation of substantial areas of additional seagrass and saltmarsh habitat.

Development of port infrastructure necessarily involves activities which have some degree of environmental and social impact. The environmental and social impacts posed by the Port Botany Expansion must be balanced against the serious economic and social consequences which would result if the proposal did not proceed.

The impacts of the preferred Port Botany proposal have been assessed in detail in this EIS and are considered to be manageable. Where necessary, the concept design has been amended to minimise impacts and mitigation measures have been included to protect existing environments and reduce social impacts. The environmental performance of the proposal would be monitored to ensure the adopted environmental standards are met and maintained.

CLAUSE 71 CERTIFICATE

Submission of
Environmental impact statement (EIS)
prepared under the *Environmental Planning and Assessment Act* 1979 Section 78A(8)

EIS prepared by		
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	Associate, Environmental Planning	Principal, Environmental Planning
address	URS Australia Pty Ltd Level 3, 116 Miller Street North Sydney NSW 2060	URS Australia Pty Ltd Level 3, 116 Miller Street North Sydney NSW 2060
in respect of	The proposed Port Botany Expansion at Port Botany, NSW, involving the construction and operation of new container terminal and associated infrastructure.	

development application			
applicant name	URS Australia Pty Ltd	on behalf	Sydney Ports Corporation
applicant address	Level 3, 116 Miller Street North Sydney NSW 2060	of	PO Box 25 Millers Point NSW 2000

land to be developed

The proposed development is to be carried out on land shown on Figure 1.2 of Volume 1 of this EIS.

The land is described as:
Land owned by Sydney Ports Corporation, and
Land owned by the NSW Waterways Authority, and
Land owned by the NSW Roads and Traffic Authority, and
Crown Land; and
Commonwealth Land.

Folio identifiers of the land to be developed are described as:
20/1045324; 2/1009870; 205/712991; Part of Crown Reserve R91288; 401/816961.

or
☑ map(s) attached

Environmental impact statement

☑ an environmental impact statement (EIS) is attached

Certificate

I certify that I have prepared the contents of this Statement and to the best of my knowledge:

- it is in accordance with clauses 72 and 73 of the Environmental Planning and Assessment Regulation 2000, and
- it contains all available information that is relevant to the environmental assessment of the development to which the statement relates, and
- the information contained in the statement is neither false nor misleading.

Signature		
Name	**Michael Young**	**Matt Coetzee**
Date	1 November 2003	1 November 2003

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APPENDICES

Acknowledgements

The study team wishes to thank the various community and environment groups, individuals, business representatives and government agencies who provided information and dedicated time to discussions that assisted in the preparation of this Environmental Impact Statement. The study team also wishes to thank all of those who participated in consultation activities, by e-mail, phone, fax, letter and through face to face discussions.

Would/Will

As a determination of the project will only be made after the Environmental Impact Statement has been on public display and submissions considered, the future conditional tense is used throughout this Environmental Impact Statement when describing the project, alternatives and assessing impacts. “Would” is, therefore, used throughout the text in preference to “will”.

If all approvals, including those under Commonwealth and NSW environmental planning legislation, are given for the project to proceed, all “would” references should be interpreted as “will”, subject to final conditions of consent.

HOW DOES YOUR SUBMISSION FIT INTO THE EIS PROCESS?

Submissions from members of the public, government agencies and interest groups are invited and sought in response to this Environmental Impact Statement.

PlanningNSW will prepare an Assessment Report of the Environmental Impact Statement and all public submissions received, and will provide that report to its Minister along with a recommendation on whether or not the project should be granted planning approval. The Assessment Report and copies of all public submissions will also be provided to Environment Australia to enable it to make a recommendation to its Minister on whether or not the project should be approved**.**

WHY WRITE A SUBMISSION?

A submission is a way to provide input into the environmental impact assessment process for the proposal.

Submissions can provide information, comment on the proposal and findings, or suggest improvements.

WHAT SHOULD YOU INCLUDE IN A SUBMISSION?

It is particularly useful if you can indicate:

- Your interest in the proposal.
- Your opinion of the proposal (or particular aspects of it).
- What measures you consider would be appropriate to improve the proposal.
- Any errors or omissions in the information presented in the Environmental Impact Statement.
- Any further factual information you have (and its source).

Your comments may also cover related facts or topics that you believe should be considered.

All submissions will be treated as public documents unless otherwise stated.

WHAT SHOULD YOU KEEP IN MIND?

You will make is easier for your submission to be analysed if you:

- Attempt to list points, so that the issues raised are clear.
- Refer to each point to the appropriate sections in the Environmental Impact Statement.
- Include your name, address and the date.
- Ensure that your submission is as legible as possible.
- Provide sketches and/or diagrams if they assist in clarifying your submission.

WHERE TO SEND SUBMISSIONS

Submissions should be addressed to:

Port Botany Expansion EIS
Department of Infrastructure, Planning and Natural Resources
Henry Deane Building
20 Lee Street
SYDNEY NSW 2000

Abbreviations

A

AASS	Actual Acid Sulphate Soils
ABL	Assessment Background Level
ABS	Australian Bureau of Statistics
ACR	Australian Chemical Refiners
ADS	Automatic Dependent Surveillance
AEP	Annual Exceedence Probability
AGV	Automated Guided Vehicles
AHD	Australian Height Datum
ANZECC	Australian and New Zealand Environment and Conservation Council
AQIS	Australian Quarantine and Inspection Service
ARI	Average Recurrence Interval
ARTC	Australian Rail Track Corporation
ASS	Acid Sulphate Soils
ASSMP	Acid Sulphate Soil Management Plan
AWS	Automatic Weather Station

B

BBCC	City of Botany Bay Council
BBP	Botany Bay Program
BLB	Bulk Liquid Berth
BLEVEs	Boiling Liquid Expanding Vapour Explosion
BMT	Brisbane Multimodal Terminal
BoM	Bureau of Meteorology
BW	Boussinesq Wave

C

CAMBA	China Australia Migratory Bird Agreement
CASA	Civil Aviation Safety Authority
CBD	Central Business District
CO	Carbon Monoxide
CO_2	Carbon Dioxide
COPC	Chemicals of Potential Concern
CORTN	Calculation of Road Traffic Noise
CPS	Coalescing Plate Separator
CRS	Chromium Reducible Sulphur
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CTAL	Container Terminals Australia Limited
CTC	Carbon Tetrachloride
CWMP	Construction Waste Management Plan

Abbreviations

D

D&C	Design and Construct
DA	Development Application
dBA	Decibels
DCP	Development Control Plan
DG Act	NSW Dangerous Goods Act 1975
DISPLAN	Disaster Plan
DLWC	Department of Land and Water Conservation
DME	Distance Measuring Equipment
DMP	Dust Management Plan
DNV	Det Norske Veritas
DO	Dissolved Oxygen
DoTaRS	Department of Transport and Regional Services
DP	Deposited Plan
DUAP	NSW Department of Urban Affairs and Planning (now Department of Infrastructure, Planning and Natural Resources)

E

EA	Environment Australia
ECRTN	Environmental Criteria for Road Traffic Noise
EDC	Ethylene Dichloride
EIS	Environmental Impact Statement
EMP	Environmental Management Plan
EMMP	Environmental Management and Monitoring Plan
EMS	Environmental Management System
EPA	NSW Environment Protection Authority
EP&A Act	NSW Environmental Planning and Assessment Act 1979
EP&A Regulation	NSW Environmental Planning and Assessment Regulation 2000
EPBC Act	Commonwealth Environment Protection and Biodiversity Conservation Act 1999
EPL	Environment Protection Licence
ERIMP	Emergency Response and Incident Management Plan
ESBS	Eastern Suburbs Banksia Scrub
ESD	Ecologically Sustainable Development

F

FAA	US Federal Aviation Authority
FAMP	Feral Animal Management Plan
Fc	Faecal Coliform
FMA	NSW Fisheries Management Act 1994

G

g/m^2/month	Grams per Square Metre per Month
GRA	Gypsum Resources Australia
GSP	Gross State Product
GWMA	Groundwater Management Area
μg/m^3	Micrograms per Cubic Metre

H

ha	Hectares
HA	NSW Heritage Act 1977
HAZMAT	Hazardous Materials
HCB	Hexachlorobenzene
HIPAP	Hazardous Industry Planning Advisory Paper
HRC	Healthy Rivers Commission of NSW
HSE	Health and Safety Executive
HVAS	High-volume Air Sampler
Hz	Hertz

I

IDO	Interim Development Order
ICAO	International Civil Aviation Organisation
IGAE	Intergovernmental Agreement on the Environment
ILS	Instrument Landing System
IMDG	International Maritime Dangerous Goods Code
IMO	International Maritime Organisation
INP	Industrial Noise Policy
ISPS	International Ship and Port Facility Security Code
ISQG	Interim Sediment Quality Guideline
ISQG-L	Interim Sediment Quality Lower

J

JAMBA	Japan Australia Migratory Bird Agreement

K

km^2	Square Kilometres
kL	Kilo Litres
kPa	Kilo Pascals
kV	Kilo Volts
kVA	Kilo Volt Amperes
kW/m^2	Kilo Watts per Square Metre

Abbreviations

L

L	Litres
LAT	Lowest Astronomical Tide
LEP	Local Environmental Plan
LGA	Local Government Area
LALC	Local Aboriginal Land Council
LOS	Level of Service
LPG	Liquid Petroleum Gas
LSA	Low Specific Activity
LSIR	Location Specific Individual Risk

M

m	Metres
m^3	Cubic Metres
MCR	Maximum Continuous Rating
mg/m^3	Milligrams per cubic metre
ML	Mega Litres
MLAT	Multilateration
mm/d	Millimetres per day
mm/month	Millimetres per month
MMHC	Marine Ministerial Holding Corporation
MPT	Multi-Purpose Terminal
MSB	Maritime Services Board
mVA	Milli Volt Amperes
μm	Micrometres

N

NEPC	National Environment Protection Council
NEPM	National Environment Protection Measure (Ambient Air Quality)
NHMRC	National Health and Medical Research Council
nm	Nautical Miles
NO	Nitric Oxide
N_2O	Nitrous Oxide
NO_x	Oxides of Nitrogen
NO_2	Nitrogen Dioxide
NPW Act	NSW National Parks and Wildlife Act 1974
NPWS	NSW National Parks and Wildlife Service
NREM	Natural Resource and Environmental Management
NSW	New South Wales

O

OCGR	Office of Coordinator General of Rail
O/D	Origin/Destination
OLS	Obstacle Limitation Surface

P

PANS-OPS	Procedures for Air Navigational Services – Aircraft Operations
PARM	Precision Approach Runway Monitor
PASS	Potential Acid Sulphate Soils
PC&WM Act	NSW Ports Corporatisation and Waterways Management Act 1995
PBEP	Port Botany Emergency Plan
PEL	Port Entry Light
PFM	Planning Focus Meeting
PFSP	Port Facility Security Plan
PHA	Preliminary Hazard Analysis
PM_{10}	Particulate Matter less than 10 Microns
PMF	Probable Maximum Flood
PlanningNSW	Department of Infrastructure, Planning and Natural Resources
POEO Act	NSW Protection of the Environment Operations Act 1997
ppt	Parts Per Thousand
ppv	Peak Particle Velocity
PSOL	Port Safety Operating Licence

Q

QA	Commonwealth Quarantine Act 1908

R

RBL	Rating Background Level
REP	Regional Environmental Plan
RIC	Rail Infrastructure Corporation
RFIA	NSW Rivers and Foreshores Improvement Act 1948
RMG	Rail Mounted Gantries
RTA	NSW Roads and Traffic Authority
RTG	Rubber Tyred Gantries

S

SACL	Sydney Airports Corporation Limited
SAFETI	Software for the Assessment of Fire, Explosion and Toxic Impact
SC Act	Soil Conservation Act 1938
SEPP	State Environmental Planning Policy
SHFA	Sydney Harbour Foreshore Authority

Abbreviations

SIS	Species Impact Statement
SO_2	Sulphur Dioxide
SOI	Statement of Intent
SPC	Sydney Ports Corporation
SSFL	South Sydney Freight Line
SSP	Ship Security Plan
SSROC	Southern Sydney Regional Organisation of Councils
SSRSP	Southern Sydney Regional Strategic Plan
SW Act	Sydney Water Act 1994
SWMP	Soil and Water Management Plan
SWOOS	Southern and Western Suburbs Ocean Outfall Sewer

T

t	Tonnes
TAA	Total Actual Acidity
TBT	Tributyltin
TCE	Trichloroethene
TDC	Transport Data Centre
TEMO	Terminal Emergency Management Officer
TEU	Twenty-Foot Equivalent Unit
TN	Total Nitrogen
TP	Total Phosphorous
TPA	Total Potential Acidity
TPH	Total Petroleum Hydrocarbon
TSC Act	NSW Threatened Species Conservation Act 1995
TSP	Total Suspended Particulates
TSS	Total Suspended Solids

U

URS	URS Australia Pty Ltd

V

VBS	Vehicle Booking System
VC	Vinyl Chloride
VCA	Victorian Channels Authority
VCHs	Volatile Hydrocarbons
VENM	Virgin Excavated Natural Material
VHCs	Volatile Halogenated Compounds
VMP	Vegetation Management Plan

W

WM Act	NSW Water Management Act 2000
WMP	Waste Management Plan
WRMP	Water Resources Management Plan

X, Y, Z

Aboriginal archaeological site (Aboriginal site)	A place where physical remains or modification of the natural environment indicate past and 'traditional' activities by Aboriginal people. Site types include artefact scatters, isolated artefacts, burials, shell middens, scarred trees, quarries and contact sites.
Acid Sulphate Soils (ASS)	Soils containing pyrite which produces sulphuric acid when exposed to oxygen.
ambient	Surrounding environment.
ambient noise	The all-encompassing noise associated within a given environment. It is the composite of sounds from many sources, both near and far.
aquifer	Rock formation containing water in recoverable quantities.
Assessment Background Level (ABL)	The Assessment Background Level is the single figure background noise level representing each assessment period (day, evening and night) for each day. It is determined by calculating the 10^{th} percentile (lowest 10^{th} percent) background level (L_{A90}) for each period.
background noise	The underlying level of noise present in the ambient noise, excluding the noise source under investigation, when extraneous noise is removed. This is described using the L_{A90} descriptor.
background scatter	Aboriginal artefacts that cannot be usefully related to a place or focus of past activity.
backloading	The practice of utilising a truck so that it carries a load on both directions of its journey.
benthic invertebrates	Animals without a backbone such as worms living in sediments on the bottom of the sea or in lakes and estuaries which provide food for migratory shorebirds.
biodiversity	First coined in 1988 as a contraction of biological diversity; diversity traditionally referring to species richness and species abundance. Biodiversity has been defined subsequently as encompassing biological variety at genetic, species and ecosystem scales (DASETT 1992). The maintenance of biodiversity, at all levels, is acknowledged internationally as a high conservation priority, and is protected by the International Convention on Biological Diversity 1992.
biomass	Total dry mass of an animal or plant population.
biota	All the animal and plant life in a given area.
BLEVE (Boiling Liquid Expanding Vapour Explosion)	A BLEVE is the explosive release of expanding vapour and boiling liquid following the catastrophic failure of a pressure vessel holding a pressure liquefied gas such as propane or LPG.
bunds	An earthwork or wall to contain and control spillages, normally associated with tank farms, fuelling and chemical storage facilities.

Glossary of Terms

burial site	Usually a sub-surface pit containing human remains and sometimes associated artefacts.
Commission of Inquiry (COI)	A Commission of Inquiry is a public process that enables the community to make written submissions to and presentations before independent Commissioners.
Construction Environmental Management Plan (CEMP)	An element of an Environmental Management Plan that addresses the control, training and monitoring measures to be implemented during the construction phase of a project in order to avoid, minimise or ameliorate potentially adverse impacts identified during environmental assessments.
conservation	The management of natural resources in a way that will benefit both present and future generations.
cumulative effect	Refers to the accumulation of effects over time.
dBA	The most common measurement of environmental noise – measured using a simple sound level meter having an A-weighting filter to simulate the subjective response of the human ear.
dead weight tonnage	Dead Weight Tonnage is a measurement of the weight of cargo, stores, fuel, passengers and crew carried by a ship when loaded to its maximum summer loadline.
Designated Development	Development that is declared to be Designated Development by an environmental planning instrument or the Schedule 2 of the Environmental Planning and Assessment Regulation 2000.
draft	The depth of a vessel's keel below the water line when loaded.
Ecologically Sustainable Development (ESD)	Using, conserving and enhancing the community's resources so that ecological processes, on which life depends, are maintained and the total quality of life, now and in the future can be increased. Incorporates four key principles: the precautionary principle; inter-generational equity; conservation of biological diversity and ecological integrity; improved valuation and pricing of environmental resources.
ecosystem	An interdependent system of interacting plants, animals and other organisms together with the non-living (physical and chemical) components of their surroundings.
effluent	The outflow of liquid e.g. from sewerage or an industrial process.
emergency response	The reaction by emergency services such as Fire, Police, Ambulance, Industrial Response Teams, etc., to an emergency.
endangered species	Those plant and animal species listed under Part 1 of Schedule 1 of the NSW Threatened Species Conservation Act 1995 or listed as *endangered* under Subdivision A of Division 1 of Part 13 of the Commonwealth Environment Protection and Biodiversity Conservation Act 1999.

environment	The physical, biological, cultural, economic and social characteristics of an area, region or site.
Environmental Impact Assessment (EIS)	The orderly and systematic evaluation of a proposal, including alternatives and objectives, and its effects on the environment, including the mitigation and management of these effects.
environmental management	That part of the overall management system which includes organisational structure, planning activities, responsibilities, procedures, processes and resources for developing, implementing, achieving, reviewing and maintaining environmental policy (Refer to related term Environmental Management System).
Environmental Management Plan (EMP)	The control, training and monitoring measures to be implemented during the design, construction and operation phases of a project in order to avoid, minimise or ameliorate potentially adverse impacts identified during environmental (being socio-economic, cultural, physical, biological) assessments.
Environmental Management and Monitoring Plan (EMMP)	Similar to Environmental Management Plan, but also specifically incorporates monitoring programs.
Environmental Management System (EMS)	The concept and major components of an Environmental Management System (EMS) are set out in the Australian/New Zealand Standard (AS/NZS) ISO 1400l. An EMS has several key components as set out below: organisational commitment, corporate environmental policy, environmental aspects register, objectives and performance indicators, environmental management program documentation (often called an Environmental Management Plan), operational and emergency procedures, responsibility and reporting structure, training and awareness program, environmental impact, regulatory and legal compliance, and environmental performance review audits performance monitoring and measurement.
estuary	The part of a river in which water levels are affected by oceanic tides, and where fresh water and salt water mix.
fauna	Animals.
flora	Plants.
floristic composition	The plant species present in a particular community, sub-community or site.
free ammonia	The toxic fraction of ammonia (NH_3) that is undissociated and therefore available for uptake by organisms. The usual source of ammonia to waterways is domestic sewage and industrial effluents.
geotechnical	Relating to the form, arrangement and structure of the geology.
gross registered tonnage	The gross internal volumetric capacity of a ship as defined by the rules of the registering authority and measured in units of 2.83 m^3 (100 ft^3)

Glossary of Terms

groyne	A protective structure of stone or concrete; extends from shore into the water to prevent a beach from washing away.
greenhouse gas	A gas which has an effect on the radioactive absorptivity of the earth's atmosphere and the atmosphere's temperature (e.g. Carbon dioxide).
Greenhouse Effect	Predicted global climatic change (e.g. global warming) associated with build up of certain gases (such as water vapour, carbon dioxide, methane, chlorofluorocarbons, ozone, nitrous oxide, etc.) within the atmospheric environment of the earth. These are known as Greenhouse Gases.
groundwater	Subsurface water contained within the saturated zone.
heritage (cultural heritage)	A term which encompasses Aboriginal and European sites and material remains (cultural resources).
hydrocarbons	A class or compounds containing only carbon and hydrogen in various structures. Both naturally occurring and from human sources.
hydrology	Surface water and groundwater and their interaction with earth materials.
hydrogeology	The study of subsurface water in its geological context.
Integrated Development	Development that requires development consent and one or more of the approvals listed within Section 91 of the Environmental Planning & Assessment Act 1979.
invertebrate	An animal without a backbone.
isolated find	Single stone artefact, not located within a rock shelter which occurs without any associated evidence of Aboriginal occupation within a radius of 60 m.
isotainer	An isotainer is a tank in a standard ISO 20 ft. x 8 ft. x 8ft 6in. (about 6 m x 2.4 m x 2.5 m) frame, designed to be carried on board container ships.
L_{A1}	The L_{A1} level is the noise level which is exceeded for 1% of the sample period. During the sample period, the noise level is below the L_{A1} level for 99% of the time.
L_{A10}	The L_{A10} level is the noise level which is exceeded for 10% of the sample period. During the sample period, the noise level is below the L_{A10} level for 90% of the time. The L_{A10} is a common noise descriptor for environmental noise and road traffic noise.
L_{A50}	The L_{A50} level is the noise level which is exceeded for 50% of the sample period. During the sample period, the noise level is below the L_{A50} level for 50% of the time.
L_{A90}	The L_{A90} level is the noise level which is exceeded for 90% of the sample period. During the sample period, the noise level is below the L_{A90} level for 10% of the time. This measure is commonly referred to as the background noise level.

L_{Aeq}	The equivalent continuous sound level (L_{Aeq}) is the energy average of the varying noise over the sample period and is equivalent to the level of a constant noise which contains the same energy as the varying noise environment. This measure is also a common measure of environmental noise and road traffic noise.
L_{eq}	The equivalent continuous sound level in dB(A); that is, the constant sound level which has the same acoustic energy as the original fluctuating noise for the same period of time.
L_{Amax}	The maximum noise level over the sampling period (usually 15 minutes).
landbridging	Transport of containers or other cargo over land by road/rail.
LAT	A height measurement based on Lowest Astronomical Tide which is 0.925 metres lower than Australian Height Datum.
lithologies	Rock types.
M_L	Earthquake magnitude on the Richter Scale.
mass tonnes	Units used to measure the weight of goods, including packaging. When cargo is containerised, the tare weight of the container is excluded from the weight of the goods. Empty containers are treated as a commodity category and recorded as weighing 2.5 mass tonnes per TEU if no weight is given on the cargo manifest.
mean	The sum of n values divided by n.
median	The middle value of a set of values.
middens	Evidence of Aboriginal occupation of an area.
migratory shorebird	Trans-equatorial migrants such as whimbrel, godwits, plovers and sandpipers which feed on intertidal estuarine flats on the southeastern coast of Australia generally from spring through to autumn.
monitoring	The checking of impacts of a proposal or an existing activity in order to improve or evaluate environmental management practices. To check the efficiency and effectiveness of the environmental impact assessment process. To determine if the requirements of environmental legislation and associated regulations are being met.
native vegetation	A broad term for vegetation comprised of plant species which occur naturally in Australia (but which are not necessarily indigenous).
natural gas	Combustible gas formed naturally in the earth.
new terminal	The proposed container terminal to be constructed to the west of the existing Patrick Stevedores terminal consisting of five new container berths and approximately 63 ha in area.

Glossary of Terms

organochlorines	A group or organic chemicals used in pesticides. Most organochlorine pesticides have low water-solubility, but high chemical and biological stability. They are fat soluble and tend to accumulate in the fat tissue of organisms.
Operation Environmental Management Plan	An element of an Environmental Management Plan that addresses the control, training and monitoring measures to be implemented during the operation phase of a project in order to avoid, minimise or ameliorate potentially adverse impacts identified during environmental assessments.
ozone	A form of oxygen having three atoms to the molecule. Ozone is a powerful oxidising agent.
particulate	Small particles, usually in suspension.
petroleum hydrocarbons [total petroleum hydrocarbons (TPH)]	A class of organic compounds arising from unburnt fuel sources.
piles	Type of foundation using columns of concrete, steel or timber.
PlanningNSW	All references to PlanningNSW should be taken to mean NSW Department of Infrastructure, Planning and Natural Resources
plume	Area of impact extending from a source.
Polycyclic Aromatic Hydrocarbons (PAH)	A class of organic chemicals, PAHs are formed by incomplete combustion or organic material, diagenesis (during or throughout generation) and biosynthesis. PAHs are naturally occurring, however, a significant proportion are the result of combustion by humans.
Port Botany Expansion	The project in its entirety.
portainer	Quayside container crane
potable water	Water suitable for drinking.
Potential Acid Sulphate Soil (PASS)	Soil material which is waterlogged and contains oxidisable sulphur compounds, usually iron sulphide (pyrite) that has a field pH of 4 or more (1:5 soil:water).
Rating Background Level (RBL)	The Rating Background Level for each period is the medium noise level of the ABL values for the period over all of the days measured. There is therefore an RBL value for each period, day, evening and night.
reclamation	The act or process of reclaiming or creating land from an area covered by water.
Register of the National Estate (RNE)	A list of the National Estate developed under the provisions of the Commonwealth's Australian Heritage Commission Act 1975.

revenue tonnes	Unit of cargo trade defined as the greater of the cargo weight (in tonnes) or cargo volume (in cubic meters or kilolitres); for most commodities volume exceeds weight. For containerised cargo, the revenue tonnes recorded relate only to the goods inside the container. Empty containers are treated as a commodity category with revenue tonnage equal to the internal (net) volume.
risk	Likelihood of a specific undesirable event occurring within a specified period or in specified circumstances. Listed as a frequency or probability.
risk assessment	A process used to determine whether people and the environment are at risk (e.g. health and safety) from exposure to hazardous substances used or produced (mainly in an industrial or work place) so that appropriate control measures or management practices can be introduced to prevent or minimise the risk.
scarred tree	Scars are caused on trees by the removal of bark by Aborigines for the manufacture of utensils, canoes or for shelter. A toehold tree or possum tree also falls under this category as it is a tree which has had small patches of bark chopped out to provide hand and foot holds for climbers after possums or vantage.
security fence	A fence designed to prevent unlawful intrusion to a prohibited area.
sediment curtain	A curtain placed around a dredge or spoil disposal site to contain suspended sediments within the area of the screen.
sediment/detention pond	Artificial earthen depression to retain water runoff for a period of time so as to control high intensity runoff.
State Significant Development	Development that constitutes State Significant Development under Section 76A(7) of the Environmental Planning and Assessment Act 1979. This usually occurs when development is declared to be State Significant Development under an environmental planning instrument or has been declared in the Gazette by the Minister for Planning to be so.
sustainable use	Use of organism, ecosystem or their renewable resource at a rate within its capacity for renewal.
terminal operator(s)	Stevedoring company or companies who would operate the container handling operations at the new terminal.
terrestrial	Of or pertaining to the land as distinct from the water.
thermal efficiency	The proportion of energy converted from the fuel to electricity in the generation process and is an indication of CO_2 emissions.
threatened species	Animals or plants listed as endangered or vulnerable under the NSW Threatened Species Conservation Act 1995 or the Commonwealth Environment Protection and Biodiversity Conservation Act 1999.

Glossary of Terms

total aromatic hydrocarbons	A class of organic chemicals which contain an aromatic ring (e.g. benzene, anthracene, naphthalene and their derivatives). Used in chemical and pharmaceutical industries.
total organic carbon (TOC)	The amount of carbon in the organic form contained in a sample, measured as a percentage.
total suspended solids (TSS)	Total load of particulates in water, measured in mg/L.
turbidity	Liquid's ability to intercept light. Measured in nephelometric turbidity units (NTU). Cannot be consistently correlated with the concentration of suspended matter.
Twenty-foot Equivalent Unit (TEU)	An internationally recognised measurement for containers. A standard twenty-foot container equals 1 TEU. A forty-foot container equals 2 TEUs.
visibility	Measure of extent to which particular components of a development may be visible from surrounding areas.
visual absorption capacity	An estimation of the capacity of the landscape to absorb development without creating a significant change in visual character or producing a reduction in scenic quality.
volatiles	Any chemical compound which will evaporate quickly due to its low boiling point.
vulnerable species	Those plant and animal species listed under Part 1 of Schedule 2 of the NSW Threatened Species Conservation Act 1995 or listed as *vulnerable* under Subdivision A of Division 1 of Part 13 of the Commonwealth Environment Protection and Biodiversity Conservation Act 1999.
waders	Synonymous with shorebirds.
weed	Naturalised, non-indigenous plant species which may be noxious weeds (or agriculture), environmental weeds or any other generally undesirable introduced species.
wetlands	Areas largely inundated with water, yet offering elevated land as a habitat for wildlife, notably waterfowl. Can be landlocked.
wind climate	A description of the meteorological conditions created by the wind involving measurements of wind speed, direction and frequency of gusts for average, seasonal and annual conditions.

Study Team

URS Australia Pty Ltd - EIS Study Team

Matt Coetzee	Project Director
Michael Young	Project Manager
Michael England	Editor
Joseph Cacdac	Senior Engineer
Stuart Taylor	Senior Environmental Scientist
Sophy Townsend	Project Environmental Scientist
Jim Thiakos	Drafting

Subconsultants

Consultation	Manidis Roberts Consultants
Trade and Capacity Study	Access Economics Pty Ltd and Maunsell Australia Pty Ltd
Public Open Space Plan	Manidis Roberts Consultants / Timothy Williams & Associates
Landscape Principles and Guidelines	LandArc
Hydrodynamics and Coastal Processes	Lawson & Treloar Pty Ltd Peer Review - Ron Cox, UNSW
Hydrologic & Hydraulic Studies	Lawson & Treloar Pty Ltd
Water Quality Investigations	Lawson & Treloar Pty Ltd
Stormwater Management	Arup
Groundwater	accessUTS Pty Ltd Consulting Services Peer Review - Dr Frans Kalf, Kalf & Associates
Geotechnical Investigations	Douglas Partners
Aquatic Ecology	The Ecology Lab Pty Ltd Peer Review - Professor Tony Underwood, Centre for Research on Ecological Impacts of Coastal Cities, University of Sydney
Terrestrial Ecology	Species Impact Statement - URS Australia Pty Ltd Shorebird Habitat Enhancement Plan - Avifauna Research & Services
Traffic & Transportation	Maunsell Australia Pty Ltd Peer Review - Masson Wilson & Twiney
Noise	Wilkinson Murray Pty Ltd Peer Review – Renzo Tonin
Air Quality	Sinclair Knight Merz

Study Team

Cultural Heritage	Navin Officer Heritage Consultants Pty Ltd
Visual Impact Assessment	Architectus Sydney Pty Ltd
Social Impact Assessment	Manidis Roberts Consultants
Economic Impact Assessment	EconSearch Pty Ltd
Preliminary Hazard Analysis	QEST Consulting Engineers Pty Ltd
Bird Hazard	Avifauna Research & Services
Radar Navigation Systems	Airservices Australia
	Review- BJ Project Services Pty Ltd
Lighting	Bassett Consulting
Ecotoxicology & Human Health Risk	URS Australia Pty Ltd
Sewerage and Water Supply	Arup