Waterways Authority

Proposed Extension of Shipping Channels Port of Newcastle

Environmental Impact Statement
Supplementary Report

November 2004

Contents

Table Index

Figure Index

1. Introduction

1.1 Background

The Waterways Authority, on behalf of the New South Wales (NSW) Government, propose to extend the shipping channels in the Port of Newcastle to provide deep-water access to future berth sites along the South Arm of the Hunter River. The proposed channel would enable Panamax and Cape class vessels to travel up the South Arm of the Hunter River.

Waterways Authority (Waterways) as the proponent for this project commissioned GHD Pty Ltd (GHD) in 2003 to prepare an Environmental Impact Statement (EIS) for the proposed shipping channel extension in the Port of Newcastle. The Newcastle Port Corporation (NPC) is managing the EIS process on behalf of the proponent and is responsible for all vessel operations in the Port of Newcastle.

The EIS and Development Application (DA) were lodged with the Department of Infrastructure and Planning and Natural Resources (DIPNR) in November 2003. The EIS was on exhibition for eight weeks at various locations including the Internet and was available for sale to the public. This represented Part A of the public exhibition process.

During the exhibition period, the public, various stakeholders and government authorities were invited to send comments on the EIS to DIPNR. In total, 17 submissions were received and the majority of the comments were related to the specific content of the EIS. Some of the submissions were requests for further information. DIPNR has also provided a request for additional information that will be completed as part of this supplementary report.

In addition, DIPNR has asked that submissions relevant to this proposal from the exhibition of the Newcastle Port Environs Concept Proposal be addressed as part of this supplementary report.

In the interests of ensuring that the information requested by these stakeholders would be available to the public along with the EIS documentation, the decision was taken to address the comments in a supplementary report that would form part of and enhance the exhibited EIS. While the EIS and DA remain lodged with DIPNR, the commencement of the exhibition period of the approvals phase has been delayed to allow this supplementary documentation to be prepared and exhibited.

Change of Name

Please note that as from 1 September 2004, the Waterways Authority commenced trading as NSW Maritime. Once appropriate legislative changes are enacted, the Authority will formally become the NSW Maritime Authority.

1.2 The Purpose of this Report

The primary purpose of this supplementary report is to address the information requests and submissions made by stakeholders including the community. In effect,

this report forms Part B of the public exhibition process. This report will be exhibited by DIPNR for a minimum 30-day period.

The DA and the EIS were originally prepared in an environment where it was anticipated that major developments, such as the 'Austeel' project at Tomago, would proceed in the foreseeable future. A development of this scale is not now anticipated in the short to medium term. While provision is made in the EIS for the dredging programme to be staged, one of the options that were presented as being likely was that the dredging might be carried out continuously over several years. With the change in circumstances of the proposed future land based developments, this option is now seen as unlikely. The dredging is more likely to proceed in an incremental manner, commencing at the downstream end adjacent to the existing channel and proceeding upstream, as each new berth is required.

The change in the time frame for the major dredging has also had an impact on the proposed arrangements for handling the contaminated sediments. BHP Billiton Limited (BHP Billiton) have progressed their voluntary remediation plans to the point that it is important that they take on a major role in the approvals and consent process. As such, the consent sought under the current DA is to be modified to defer the actual treatment and placement of the contaminated sediment. Consent for this part of the work will now be sought after the results of further testing and trials are complete. This supplementary report provides details of this change to the consent process.

In addition, part of the further information required on the proposed treatment of the contaminated sediments involves a proposed trial remediation project which will be carried out by BHP Billiton. The consent sought under the current DA is to be modified to also seek consent for this trial remediation project. This supplementary report provides details of the trial remediation project and an assessment of the impacts of the work.

If conclusions and commitments that appear in this supplementary report differ from those presented in the EIS, this supplementary report supersedes those presented in the EIS. Any conclusions that differ from the EIS have been identified as such in this report.

1.3 Recap of the Approvals Process

1.3.1 Is development consent required?

As a result of the significance of the proposal, and to simplify the development approval process, DIPNR advised that the Minister for Infrastructure Planning and Natural Resources would declare the proposal to be a State significant development, by declaration in the Government Gazette (under Section 76A(7)(b)(iii) of the EP&A Act). This declaration occurred in conjunction with consideration of the Development Application (DA).

Section 76A(8)b of the EP&A Act provides for the Part 5 elements of a State significant development (that is, those parts that do not require development consent) to be considered under Part 4 of the Act.

As a result, development consent under Part 4 of the Act is required for the modified consent now being sought.

1.3.2 Who is the consent authority?

As the proposal has been declared to be State significant, the Minister for Infrastructure Planning and Natural Resources is the consent authority.

An outline of the legislative framework for development consent is provided below.

1.3.3 The Commonwealth Environmental Protection and Biodiversity Conservation Act 1999

Under the *Environmental Protection and Biodiversity Conservation Act* 1999 (EPBC Act), any 'actions' which are likely to have a significant impact on matters of national environmental significance ('NES matters'), or a significant impact on Commonwealth land, require approval from the Commonwealth Minister for Environment and Heritage. An 'action' is considered to include a project, development, undertaking, activity or series of activities.

A referral was sent to Environment Australia in February 2003 to determine whether or not approval would be required under the EPBC Act. On 19 February 2003, Environment Australia advised that the proposal was considered to be a 'controlled action' pursuant to Section 75 of the EPBC Act. This means that approval is required under part 9 of the EPBC Act before the proposal can proceed. The controlling provisions are:

- Sections 16 and 17B (Wetlands of international importance);
- Sections 18 and 18A (Listed threatened species and communities); and
- Sections 20 and 20A (Listed migratory species).

As part of the Commonwealth assessment process, preliminary information was provided in February 2003 to assist the Commonwealth in determining the level of assessment that would be required. Based on this information, Environment Australia advised, by letter dated 17 March 2003, that the Commonwealth would accredit the NSW assessment process, and that a separate Commonwealth assessment would not be required for the proposal.

1.3.4 Environment Protection (Sea Dumping) Act 1981

The placement of material offshore is subject to a separate Commonwealth approval process, under the *Environment Protection (Sea Dumping) Act* 1981.

Although briefly described within the EIS, this activity is subject to a separate application for approval to the Commonwealth Department of Environment and Heritage.

The *Environment Protection (Sea Dumping) Act* provides for the environmental assessment of the placement of dredged material in Australian waters. Additional

assessment may be required under the EPBC Act 1999, however both assessments are generally undertaken together.

Information has been submitted as part of the sea dumping application prepared by Patterson Britton and Partners Pty. Ltd. to the Department of Environment and Heritage under the Sea Dumping Act to complete this requirement.

1.4 The Structure of this Report

This supplementary report is comprised of the following six chapters:

- **Chapter One** provides a general introduction and the purpose of this supplementary report;
- **Chapter Two** describes the proposal and provides some details of the dredging process;
- **Chapter Three** provides a summary of the submissions received to date for the Proposed Extension of Shipping Channels EIS and the Newcastle Port Environs Proposal and additional requests for information;
- **Chapter Four** outlines the proponents response to these submissions and information requests;
- **Chapter Five** contains additional information that has been required from the submissions, details of the Project Environmental Management Plan and monitoring strategies and requirements;
- **Chapter Six** contains details of the proposed pilot trial of dredging, treatment and subsequent placement of contaminated sediments; and
- **Chapter Seven** provides a conclusion including what's next and a final concluding statement.

2. Project Description

2.1 Introduction

The Waterways Authority, on behalf of the NSW Government, propose to extend the shipping channels in the Port of Newcastle to provide deep-water access to future berth sites along the South Arm of the Hunter River. The proposed channel would enable Panamax and Cape class vessels to travel up the South Arm of the Hunter River.

The channel would be dredged and excavated, and the banks left in a stable configuration. The development of the berths along the channel would then occur over an extended period of time, as the associated, land-based developments were approved and built. These berths and any land-based development would be subject to separate assessment and approval processes.

The proposed channel would extend along the South Arm of the Hunter River (referred to as the 'South Arm' for the purposes of this supplementary report). It would start at the end of the existing channel (adjacent to the Kooragang Island coal loader and the former BHP Billiton Limited [BHP] wharves) and terminate just east of the Tourle Street Bridge.

To ensure that shipping vessels could navigate safely, a swing basin is required towards the upstream end of the proposed channel. This would enable vessels to turn, or swing around, before they were being moored or returned to sea.

It is estimated that approximately 13.6 million cubic metres (m^3) of material would need to be removed by dredging and land-based excavation to form the proposed channel and swing basin; of this amount, approximately two percent has been identified as material requiring some form of treatment before its placement.

An associated benefit of this proposal would be the removal and treatment of contaminated river sediments in the South Arm.

The placement options for dredged and excavated material include ocean emplacement, beneficial reuse and treatment followed by reuse.

2.2 Proposal Staging

The development consent sought under the DA is to be divided into two stages as follows:

- Stage One – all dredging activities covered in the EIS but excluding the full transport, treatment and placement of the contaminated sediments. Stage One covers the vast majority of the proposed dredging and includes the dredging of material unsuitable for re-use which would be disposed of at sea subject to relevant Commonwealth approvals. Also covered in this Stage is the dredging of clean sand which would be suitable for beneficial re-use subject to separate consents being obtained for the placement of the sand. As an addition to the Stage One work,

consent is now also being sought for a proposed trial remediation project which would be undertaken by BHP Billiton.

- Stage Two – the transport, treatment and subsequent placement of the contaminated sediments.

The proposed works, including Stage One and Stage Two, are referred to collectively as 'the proposal' for the purposes of this Supplementary Report. The Stage Two work would need to be completed before any other dredging could be undertaken in the vicinity of the contaminated sediments.

Consent for the Stage One work is currently being sought. Consent for the Stage 2 work will need to be deferred until the results of further testing are known and the trial remediation project has been completed.

Chapter 6 provides a complete description of the proposed trial remediation project.

2.3 Proposal Overview

The proposal would involve three main elements:

- Dredging and land-based excavation to form the channel and swing basin;
- Treatment and placement of contaminated sediments; and
- Reuse or placement of materials by various means.

An outline of these elements is provided below.

2.3.1 Dredging and excavation

Dredging and excavation would include:

- Dredging of the South Arm, generally below the high water mark, to provide a navigable channel;
- Excavation of the banks of the South Arm where required. This includes excavation towards the western end of the area that would be dredged, to provide a swing basin allowing large ships to turn. The excavation would impact on the OneSteel site which adjoins the South bank of the South Arm; and
- Once the channel and swing basin have been dredged and excavated, the banks would be stabilised to prevent erosion and slumping.

The nature of the materials within the bed and banks of the South Arm determines the proposed method of dredging and excavation. The material to be removed would include soft silty clays, sand, stiff clay, gravel and rock.

2.3.2 Treatment of contaminated sediments

The upper layers of sediment in the area immediately adjacent to the western end of the former BHP Steelworks site are contaminated. Remediation of this area is the responsibility of BHP Billiton.

The contaminated material would first be isolated within a sheet piled wall to prevent migration of contaminants within the South Arm. The material would then be transferred to the closure area. This area adjoins the Southern bank of the South Arm, and is located to the east of the site owned by OneSteel. This material would be treated on the closure area using a variety of techniques, principally cement stabilisation.

Various treatment alternatives for the contaminated sediments located in the South Arm have been considered and, where possible, tested during the preparation of the EIS. The treatment options explored included thermal desorption and cement stabilisation.

2.3.3 Placement of materials

A commitment has been made to the concept of beneficial reuse of dredged and excavated material where practicable. Material such as clean sand would be reused where possible. Material that cannot be reused would be placed either at sea or at suitable land based sites.

This work element includes:

- Transfer of up to 6.4 million m^3 of clean sand to the Tomago industrial area and the proposed transport corridor to this estate. Clean sand may also be destined for Kooragang Waste Emplacement Facility, Kooragang Island industrial area or other approved sites;
- Beneficial reuse of treated material either on the closure area site, on land sites within the region if suitable uses can be found or on licenced sites on Kooragang Island; and
- Offshore placement of materials unsuitable for reuse.

The commencement of the proposed works would depend on the progress of nearby land based industrial developments and the resulting demand for deep-water port facilities. Similarly, the demand and opportunity for reuse of the dredged sand would also be a factor influencing the timing of the proposal. Economically, it would be preferable for the work to be carried out in a continuous operation, however there may be significant delays to some land-based developments, hence the dredging would most probably be carried out in stages.

3. Submissions Received

3.1 Summary of Submissions

The following submissions were received from the Part A exhibition of the Proposed Extension of Shipping Channels, Port of Newcastle EIS.

Of the submissions received, seven are in support of the proposed extending of the shipping channels and two are against the proposal, stating that the EIS lacks sufficient detail. Seven remain neutral asking that more information be provided to supplement the EIS and that further assessment is required. DIPNR has also provided a submission and this has been provided in Section 3.2 of this report.

Table 3.1 provides a summary of the submissions received, the issues contained therein and an indication of the section of this supplementary report where a response can be found to the issues raised.

Table 3.1 Submissions Received From Exhibition

No.	Response from	Details	Response in Section
S1	**Regional Land Management Corporation** **28 January 2004**	RLMC supports the proposal for extending the shipping channels. RLMC manages the former steelworks site at Mayfield and a waste emplacement site on Kooragang Island. Both of these sites have been identified in the EIS as potential placement sites for contaminated river sediments following treatment. They believe there are two issues that need to be addressed and apply equally to both the former steelworks site and the Kooragang Island emplacement site: ◗ Environmental risks of contaminants leaching into the groundwater and necessitating future groundwater treatment. It is essential that these leachability issues are adequately addressed with the provision of additional work to be undertaken if necessary, with particular emphasis on leachability of organic hydrocarbons; and ◗ Physical properties of the treated materials and their affect on the development potential and marketability and potential economic impact. Physical characteristics such as strength and plasticity and placement locations need to be compatible with future development. Specific issues are: ◗ Long term durability of treated material, with regard to surface fretting, dust generation, and cracking due to traffic loading, ground movement, moisture and temperature variation, and shrinkage associated with hydration processes; ◗ Reworkability of material if it is disturbed by services installation, development earthworks or road-making activities; ◗ Long term field permeability of treated material and ability to satisfy consent conditions for Multi Purpose Terminal relating to permeability of site cap; ◗ Structural suitability of treated material for building and pavement foundations; and ◗ Potential for contamination of site from untreated sediments during process of transport and treatment. RLMC also request that any consent include the following condition: 'Prior to treatment of the contaminated river sediments, landowner approval is to be granted for the physical properties, location(s), thickness, timing and placement specifications for the treated material.'	**4.1**

No.	Response from	Details	Response in Section
S2	**Hunter Catchment Management Trust** **22 January 2004**	Comments: The Trust endorses the removal of contaminated sediments adjacent to the former BHP site and the proposal to re-use as much material as possible, provided contaminated sediments and water do not spread into a wider section of the South Arm. ◗ Mobilisation of contaminants into the water column and leakage from the contaminated site into the river during dredging is of concern, particularly for the Hexham Swamp and Kooragang Wetlands rehabilitation sites; ◗ Statements referring to the lack of and demand for industrial land available for port development are not referenced so that the Trust is unable to assess the source of data underpinning those conclusions; ◗ The EIS makes it appear that the strategic direction for the estuary has been finalised. With references to the Newcastle Port Environs Concept Proposal seem to give it more legal status than the community has been led to believe; ◗ The route of the pipeline to Tomago industrial site is given as the *multi-user port and transport corridor*. An EIS for this corridor has not been released and approval has not been given. The Trust considers that alternative options for the pipeline should be assessed prior to any assumption that this route has been selected; ◗ Cumulative impacts are acknowledged in the EIS for Kooragang Nature Reserve and wetlands to the North of Kooragang Island. Wetlands further upstream in the Hexham Swamp and Kooragang Wetland rehabilitation project areas are also significant environmental features that could be affected by cumulative impacts. An appropriate body is best placed to assess cumulative impacts, a process that the Trust does not feel is being adequately addressed at present. Proposals that are technically and logistically related are generally being presented and assessed separately; ◗ Corrections are required for the section on Kooragang Wetland Rehabilitation Project (KWRP), page 10.6: – The feasibility study for the Kooragang Island Wetland Compensation Project was released in 1992; – The name of the project was modified to Kooragang Wetland Rehabilitation Project and launched in 1993; – NSW Fisheries initiated the project but it has been administered by the Hunter Catchment Management trust with support from all levels of government; – Approximately 40% of the funding comes from the State Government's estuary management program with the remainder being raised from local, regional, federal sources as well as from private industry and volunteers; and – The Tomago Aluminium Co. part of the Tomago site is now owned by the state government. ◗ There is no mention of land uses on the South side of the river opposite KWRP; ◗ The predicted maximum positive changes in water level due to dredging under tidal conditions at the railway Bridge is 0.064m and at Ironbark Ck is 0.054m (pg.112). Average change has been adopted as the indicator of water level change, which is noted as being	**4.2**

No.	Response from	Details	Response in Section
		virtually nil. However, what is most important is the maximum change. Given the initial hydrological statement of almost no change based on the mean level, these issues are not addressed in the terrestrial section; ◗ The increase in water level for all design floods simulated immediately upstream of the proposed pipeline is 50-70mm (pg 11.18). Structures in this area pre-date these requirements, including some on the KWRP Ash Island site. Full assessment of flood impacts of the pipeline is essential and needs to be viewed in conjunction with other plans for that corridor; ◗ Mention is made of Hexham and Tomago but no assessment is made of impacts on the western end of island (KWRP Ash Island site); ◗ The selective reporting of hydrological changes based only on means leads to an understatement of the potential impacts on saltmarsh, especially in upstream sites (the Hexham Swamp Rehabilitation Project (HSRP) and Kooragang Wetland Rehabilitation Project (KWRP) sites; ◗ The comment is made on 11.23 that opening Ironbark Creek floodgates will have a greater effect on Hexham than dredging. If dredging will change the maximum tidal inundation levels, hydrologic modelling for HSRP will have to be revised. No comment is made on the effects on KWRP; ◗ On page 11.27, sediment build up is noted as being 3cm at Ironbark Creek. What would be the impact on KWRP sites? If monitoring indicated higher levels would the dredging operation cease? If sediment is transported upstream, contaminated water could also travel upstream and potentially affect HSRP and KWRP. Sediment deposition of 3cm at Ironbark Creek during dredging (including the contaminated area) is unacceptable. This has the potential for spreading contamination from what is now a relatively restricted site to the whole South Arm. This would have implications for rehabilitating wetlands for increased food production (crustaceans, fish); ◗ Both aquatic and terrestrial sections of the EIS only assess impacts on the immediate dredge site. Off-site impacts are dismissed upfront as being insignificant, no doubt based on selective reporting of data. (conclusion of no change based on mean rather than range) given in the hydrology section. Section 12 only assesses the dredge site. No mention is made of broader impacts; they appear not to have been assessed; ◗ Numerous statements appear in the document (ie. page 12.8), which states that whilst there would be some negative impacts, this needs to be balanced against all the benefits. This seems to be more a promotional statement and is considered to be inappropriate in what is an independent, technical assessment of impacts; ◗ On pg. 12.9 it is only mentioned that mangroves and associated fauna upstream of the dredge site should be monitored as part of the environmental management of the proposal. No indication is given as to where this would be done or details of the monitoring strategy. The results that would be triggers for monitoring actions are not indicated in the EIS; ◗ Regarding the Green and Golden Bell Frog (GGBF) nocturnal surveys on 3 and 11 December 2001 (page 13.2), the fact that GGBF were not found (page 13.9) might not indicate that they were not there;	

No.	Response from	Details	Response in Section
		◗ The NSW Scientific Committee has released a proposal to list Coastal saltmarsh in the NSW North Coast, Sydney Basin and South East Corner Bioregions as an Endangered Ecological Community (page 13.4). Such a listing may have implications for the removal of saltmarsh from the study site, and also upstream, as a result of increased maximum tidal levels (as mentioned); ◗ The fact that Significant areas of saltmarsh are protected in Kooragang Nature Reserve is mentioned on page 13.5, but no mention is made of the significant expanses of saltmarsh on the KWRP Ash Island site; ◗ On page 13.11, it is recommended that habitat compensation consist of augmentation of existing areas, habitat enhancement or contributions to other wetland projects. Compensation is endorsed in principle, but details of how this would be achieved are lacking, especially when this will need to be considered in conjunction with compensatory plans for other proposals associated with the Port. How would compensation for the removed mangroves and saltmarsh be achieved? How will overall habitat loss be avoided? An assessment needs to be made on what rehabilitation or compensation activities are being done for which reasons; and ◗ Page 26, the Ports Environs Concept Plan needs further development. The proposal needs much work prior to it being finalised, so that the preliminary nature of the concept proposal should be indicated earlier in the document.	
S3	**Roads and Traffic Authority** **4 December 2003**	Comments: 'This development will be operating as an extractive industry and will require assessment by the Hunter Regional Development Committee under SEPP 11 Traffic Generating Development, at a date to be determined'	**4.3**
S4	**Protech Steel** **10 December 2003**	◗ Protech supports the proposal for extending the shipping channels ◗ Protech are willing to accept significant quantities of clean dredged materials for use as fill on certain low-elevation areas of their site. ◗ Protech believe they hold current approvals that would enable them to utilise these materials immediately. The proposed dredging of the Northern side of the channel, and acceptance of clean dredge materials, is consistent with Protech's plan to incorporate utilisation of a berthing facility adjacent to our project site in position K-8	**4.4**
S5	**BHP Billiton Limited** **12 January 2004**	BHP Billiton support the proposed development, and in particular the preferred option of cement stabilisation of those sediments from the South Arm of the Hunter River requiring treatment and the beneficial use of those treated materials on the closure area site, or if necessary, on Kooragang Island. Comments: ◗ The document appears to inter-changeably use the terms 'dispose' and 're-use' and in some areas (eg. Chapter 5, section 5.6) separates beneficial reuse and disposal of treated materials. The sediments after treatment will be suitable for beneficial re-use as an engineered	**4.5**

No.	Response from	Details	Response in Section
		fill and will not be a waste material. Therefore the use of the terms such as 'dispose' and 'waste' is inappropriate; ◗ Throughout the document there are numerous references to different volumes (ie. 250,000m^3, 2% of 13.6 million m^3, etc) of contaminated sediment in the South Arm in front of the closure area. However, there is no acknowledgement in the EIS to BHP Billiton's detailed (kriging) studies, which indicates a volume substantially less than 250,000m^3. Any development conditions should identify these studies and only reference the 250,000m^3 as an upper limit of contaminated sediment requiring treatment; ◗ BHP supports a staged approach to the development as discussed in the EIS, for example the remediation of contaminated sediments prior to completion of the dredging and the beneficial use of treated materials; ◗ Whilst we note that the development proposal removes contaminated sediments from the Hunter River this is not the only way to manage the sediments as referenced in Section 9.1.2; ◗ In Chapter 4, one of the stated goals should consider the more complete terminology of '... Achieve maximum possible beneficial use of dredged and excavated material [utilising best available technology not exceeding excessive cost] … ' referred to in Chapter 7 which is part of the framework for the sediment removal and treatment strategy developed in consultation with NSW EPA; ◗ In Chapter 5, Table 5.1 of Section 5.2.3 is misleading and could be interpreted incorrectly such that the mean concentration of total PAHs (for the whole area?) is 50 times an acceptable limit. It should therefore not be used in the consideration of the development proposal; and ◗ In Chapter 6, as discussed above the volume of contaminated sediment that requires treatment is yet to be finalised. Therefore the location of the sheet pile wall (refer to Figure 24 in Appendix C) required during the dredging of the contaminated sediments has also not yet been finalised. Any development approval should acknowledge that the exact location of the temporary sheet pile wall is yet to be determined; ◗ In Chapter 7, the following comments were made: – We confirm that the ocean disposal criteria apply at the disposal area not necessarily to in-situ conditions; – Development approval should acknowledge that the maximum PAH level approved for the closure area site is 400mg/kg, (refer to Development Approval for Multi-Purpose Terminal) rather than 100mg/kg currently referenced in Table 7.3 in Section 7.3.3; – Section 7.7.1 refers to the preferred option being a 'Dolocrete mix'. 'Dolocrete' is a trademarked technology and the preferred option should be more broadly classified under the generic term of 'cement stabilisation', as discussed in Section 7.6.1, in the consent conditions; – Figure 7.1 defines a location for the proposed layout of the treatment site. The text notes two alternative sites, centrally and adjacent to the riverbank. As engineering design and other studies progress there is likely to be a refinement to the location of the treatment plant. Development approval should not preclude treatment within the area of the sheet pile wall since this area has been assessed by the EIS;	

No.	Response from	Details	Response in Section
		– The first bullet point on page 7.15 contains a typographic error referring to ' … offshore disposal …' rather than onshore disposal; – Section 7.7.3 provides details of the treatment plan. These details should only be considered indicative since it requires engineering design and other studies to finalise; ◗ In Chapter 26, BHP Billiton notes and confirms the last bullet point on page 26.8 in section 26.1.11 as meaning the upgrade of the two-lane section of Cormorant Road/Tourle Street and duplication of the Tourle St Bridge are already planned. Therefore these upgrades should not be a prerequisite in the development approval if the transport of treated sediment to Kooragang Island is required; and ◗ Also in Chapter 26, BHP Billiton strongly supports the commitments to stakeholder engagement detailed in Section 26.1.12. We note, however that the extent and level of detail required for community consultation should be consistent with the various stages of work ie. If the excavation and treatment of contaminated sediments was to proceed as a separate stage then the DA should require the consultation be specifically oriented to that stage.	
S6	**NSW Fisheries** **13 January 2004**	Comments: ◗ The contaminated sediments are identified as potentially producing significant odour issues. The Department has concerns that these volatile compounds, as well as the heavy metal contaminants, may be made soluble during the dredging operation and elevate toxicity levels in the water column and would expect that the potential contamination of aquatic organisms be monitored during the operation; and ◗ The Department recommends that the operation be overseen by the Ports Corporation Technical Advisory Coordinating Committee. The Departments general terms of approval for this project: ◗ A permit to harm marine vegetation will be required by the proponent. This is for the destruction of the mangrove forest at Tourle Street Bridge and the fringing mangroves along the Northern bank of the river; ◗ The permit to harm marine vegetation will contain conditions relating to the provision of compensatory habitat, at a nominal ratio of 2 for 1. This compensatory habitat together with a monitoring programme will need to be determined between the Department and the proponent; ◗ A permit to dredge and reclaim may be required from NSW Fisheries. This requirement is dependent on the proponent obtaining a similar approval from the landowner or DIPNR. If a consent is obtained from a relevant public authority or under the Crown Lands Act, then NSW Fisheries is required to issue concurrence; ◗ The proponent is to liaise with commercial fishers to determine the impact of the activity on the commercial fishing operations and develop protocols to mitigate such impacts; and ◗ Notice of operation times and constraints should be posted at public boat ramps to inform recreational fishers and boaters of the operations and identify safety risks.	**4.6**

No.	Response from	Details	Response in Section
S7	**Newcastle City Council** **12 January 2004**	Comments: ◗ The EIS does not consider some of the provisions and objectives of Development Control Plan (DCP) No 41- Kooragang Point and Industrial Area, DCP 20 – Guidelines for Industrial Development, DCP 30 - Landscape Design Principles, DCP 43 – Contaminated Land, DCP 50 - Stormwater Management and DCP 56 – Waste Minimisation; ◗ The Newcastle Port Corporation indicated that the project has been developed over a three year period. The proposal is said to be consistent with the Newcastle Port Environs Concept Proposal, which includes mention of the strategic importance of infrastructure and service corridors to port related development and the need for the integration of these in development and planning. However, significant infrastructure issues associated with the current proposal are not addressed in the EIS. In particular road and/or rail access to the area and associated services on Kooragang Island; ◗ The extension of the Tourle Street Bridge and its approaches indicates some changes to the road, however it is not clear and requires consideration of land allocation to both transport infrastructure, operational areas, storage requirements and access arrangements along the Northern bank; ◗ The provision of a swing basin at this point in the river seems unnecessary given that an adequate swing basin already exists near the coal loading berths within 2 km of the proposed site; ◗ The EIS makes general statements in regard to forecast growth of port activities; ◗ The indication that staging of the development may be required due to process demand for these facilities suggests that an economic supply and demand analysis would inform the extent of works required under this proposal; ◗ A main stormwater discharge channel for Mayfield, North of Crebert St, discharges into the South Arm of the Hunter River within the area proposed to be enclosed with the sheet pile wall. The EIS only refers to stormwater on site conforming with DCP 50; ◗ The report states that a wastewater treatment process would be required for the dredged sediments within this sheet pile contamination area. There is no discussion on treatment processes for this water; ◗ The issue of sediment management is complex and requires further time to assess the details of this. This includes: the extent and degree of contamination of sediments in respective parts of the study area, management options within the estuary and their likely impacts, management options for sea dumping and their likely impacts and other management options; ◗ Table 4.1 of Appendix D (Volume 2) identifies exceedences of the Environment Australia Maximum level for offshore disposal for Zinc (mean) in areas 1,2 and 3 and Naphthalene (mean) in areas 2 and 3. However, only Area 3 is proposed to be treated; ◗ Environmental impacts will occur from the direct loss or modification of protected riverbank and other estuarine habitat along the North bank of the river and riverine habitat as the development proceeds. These could be considered as cumulative as they would be additional	**4.7**

No.	Response from	Details	Response in Section
		to historic habitat losses in the Hunter Estuary. Options for mitigation of incremental loss of these values, such as by way of compensation should be canvassed; ◗ The Hunter Estuary is recognised as nationally and internationally significant for listed Threatened migratory shorebirds and other species. The loss or modification of any habitat values for such species and mitigation of these impacts should be further addressed given their already severely depleted status in the region; ◗ A proportion of the estuary that comprises habitat for significant species but is outside the project area may be impacted by changes in the hydrological balance from the proposed dredging works; ◗ Clarification is requested of the cumulative impacts of this proposal in conjunction with all proposals that would be captured by the 'Newcastle Port Environs Concept Plan' across the whole of the Lower Hunter Floodplain; ◗ It is requested that further information be provided specifically assessing the significance of the potential hydraulic flood impacts of the proposed pipeline. This assessment should also reference cumulative impacts; ◗ It is recommended that the underlying assumptions and information used by the hydraulic flood models be assessed and reported; ◗ It is noted that the submitted information (The Risk Assessment Report), does not provide any assessment of the potential risks to the existing and proposed Tourle Street Bridges by vessels using the South Arm channel, or demonstrate that the design of the proposed submerged dredged batter slope represents a satisfactory mitigation measure; ◗ In December 2003 the NSW Science Committee released a Preliminary Determination supporting a proposal to list Coastal Saltmarsh in the NSW North Coast, Sydney Basin and South East Corner Bioregions as an Endangered Ecological Community. This will have implications for the proposed extension of the shipping channels; ◗ Consideration should be given to the potential noise impacts of the proposed operations on any sensitive commercial or industrial receivers; ◗ Consideration should be given to the scheduling of any drilling and blasting to within normal construction hours, or within ANZECC guidelines. Further consideration should also be given for piling activities. A proposed monitoring program also needs to be established; ◗ The impacts on flora and fauna of variations in salinity and flow velocity upstream of Tourle Street Bridge are inadequate and further detailed assessment should be undertaken; ◗ The odour assessment identifies the dewatering process using geotextile bags as having the greatest potential to cause odour problems. The consultant's report in Appendix K recommends that if dewatering were to be used in the treatment process it would need to be restricted to less than a quarter of the proposed size, therefore expose a surface area of less than 20,000 m^2 rather than the 80,000 m^2 proposed. The main volume of the report however states in section 7.7 that the surface area of geobag dewatering process should be limited to 40,000 m^2 , more than double that recommended by the consultant;	

No.	Response from	Details	Response in Section
		◗ The odour assessment only assesses the impact of 2 treatment options. This modelling, however, does not assess the impact of a combined treatment approach as recommended, therefore there does not seem to be a basis for the recommendation of using stabilisation. Also, there does not seem to be a basis for the recommended reduced size of the dewatering area; ◗ Cumulative impacts associated with the proposal are not adequately addressed in the EIS. In particular the details of the hydrological balance, tidal flux upstream of the project area and consequent impacts on flood management, significant rehabilitation work conducted to date on Kooragang Island, the rehabilitation project for Hexham Swamp and the sustainability of estuarine systems. This aspect needs to be modelled in greater detail; ◗ The configuration of the proposed upgrade of the intersection of Cormorant Road, the Private Access Road and the site access and its relationship to existing infrastructure. A conflict exists between the location of the existing car park area for Energy Australia 'wind turbine' and proposed access road to the contractors site; ◗ The nature and location of proposed haul roads intended to be constructed on the OneSteel site and Kooragang Island; ◗ The nature and location of the proposed traffic management measures in and around the OneSteel site; ◗ The EIS promotes the use of public bus transport. In this regard it is recommended that the applicant investigate the provision of a bus stop on both the east and west bound carriageways of Cormorant Road, in consultation with local bus companies, the RTA and local Council; ◗ Figure 8.1 does not identify the proposed multi-user part and transport corridor to the Tomago Industrial Area; ◗ Alternatives need to be investigated further regarding management of sediment reuse, particularly involving the placement of fill and its specific impact; ◗ The impacts of the installation of these lights on the performance of the existing road network at Cormorant Road is to be addressed inclusive of the intersection at Industrial Drive and Tourle Street. The traffic impacts of this development may constitute the requirement for the upgrade of Cormorant Road in the vicinity of the site access and/or a restriction on operations outside peak periods of 7-9am and 4-6pm; ◗ The EIS states '*that their will be minimal overlap of the various deliveries and as a result the cumulative impacts of this development are minimal',* Details are to be provided on how this will be managed and factoring this into traffic impact studies on the local network; ◗ Details on the proximity of the proposed extended channel and submerged rock berm to the proposed new Tourle Street Bridge; ◗ Details of the proposed berths/embankments to Cormorant Road and the proposed new Tourle Street Bridge approaches. The planning of this area is important due to future use of the berths and road/rail connections; and ◗ The nature and extent of vehicle access required along the Northern embankment inclusive of works and related infrastructure necessary	

No.	Response from	Details	Response in Section
		to facilitate this development.	
S8	**Port Waratah Coal Services Ltd** **14 January 2004**	PWCS supports the strategy of this proposal and agrees that further development of the port is best achieved by developing along the South Arm of the Hunter River. This proposal is consistent with the currently approved expansion plans for Kooragang Coal Terminal PWCS owns and operates the two export coal loading facilities in the Port of Newcastle being the Carrington Coal Terminal (CCT) and the Kooragang Coal Terminal (KCT) Comments: ◗ Hydraulic Interaction**:** The CCT currently has a shiploading capacity restriction as a result of the movement of moored vessels when another vessel is passing in the channel. This proposal would allow for a greater number of passing vessel events to occur and so create a further restriction to the shiploading capacity. This issue will need to be resolved as an impact of this proposal; ◗ The KCT currently has three berths with approval to construct a fourth berth. Should the shipping channel be extended as presented in this proposal then the ships moored at the KCT wharves are likely to experience the problem of hydraulic interaction that is exhibited at the CCT wharves. This would represent a restriction of shiploading capacity and again this issue will need to be resolved as an impact of this proposal; ◗ Coordination of Shipping and Dredging Activities: while it is recognised that this proposal would be taking place in a working port, PWCS expects that the activities of the dredging would be planned around the requirements of the existing operators. Recognition of this requirement could be reflected in the consent conditions; and ◗ Removal of river sediment: as part of Stage 2 and 3 expansion of KCT, PWCS has dredged the South Arm of the Hunter River to extend the shipping channels, swing basin and create the berth pockets. At the time of dredging, approval for offshore disposal of the river sediment was not available and so the material was placed in a secure land based facility. In line with the purpose and benefit of the proposal, PWCS considers it appropriate that the scope of the EIS should be extended to include the removal of the river sediments from the land based facility. This would also make available additional land for port related industry.	**4.8**
S9	**Nature Conservation Council of NSW Inc** **16 January 2004**	Nature Conservation Council are dissatisfied with the EIS published for this proposal. NCC want to reject the proposal on the grounds that the DA and EIS fail to address environmental and planning concerns in necessary detail. Specifically NCC opposes the proponent receiving consent for the dredging and excavation of the South Arm of the Hunter River as described in the EIS. The EIS fails to incorporate state and regional planning and conservation frameworks such as strategies and documents like: ◗ NSW Ports Inquiry;	**4.9**

No.	Response from	Details	Response in Section
		◗ The Healthy Rivers Commission Report for the Hunter River; and ◗ Kooragang Island Conservation Strategies. Therefore declining to outline the cumulative environmental impacts and failing to justify the proposal within the context of strategic regional and state planning directions, NCC is requesting consent not be given for this activity. Comments: ◗ Failure to outline the full environmental impact of the proposal. The ecological systems of the Hunter are dynamic and complex and cannot be considered within the site specific conditions defined by the proponent; ◗ River bed adjustment resulting from dredging and excavation. This process will generate increased suspended sediment loads in the river for some time after completion of the project. As there is an acknowledged high chemical and heavy metal contamination of these sediments it is likely that pollutants present will remain held in suspension well after the completion of the project; ◗ Fishing activities. The EIS fails to outline or address any potential impacts on marine life (aquatic organisms, local fish and prawn stocks and their migratory patterns and habitats) in the region that may result from the proposal (ie turning circle, dredging); and ◗ Absorption of pollutants including arsenic and heavy metals by fish and prawn larvae. The subsequent implications and long term impacts on higher food chain animals, including humans is also not addressed.	
S10	**Mayfield Residents Group** **16 January 2004**	Comments: ◗ Ensure that the environment in this densely populated area will remain clean and free from contaminants; ◗ Of particular concern are the four schools being Mayfield East (mentioned in the EIS), San Clemente (in Crebert St), the Christian School (in Kerr St), and Mayfield West Public School (in Bull St). It is essential that all of these schools be fully protected from environmental hazards; The main concerns of the group: ◗ Any possible carelessness or lack of planning in handling and location of contaminated materials; ◗ Are all trucks and dumps, contaminated or not, to be covered and/or dampened down? (Strong NSW winds, blow along the banks of the river and cause immense clouds of dust especially from truck movements and construction activity). This is a potential health as well as traffic hazard; ◗ While the work is in progress, in what way will the community and the workers on site be protected from the contaminants and dumps on Kooragang?;	**4.10**

No.	Response from	Details	Response in Section
		◗ Environmental monitors should be in place to give the community an accurate record of any environmental problems; ◗ Noise is an important environmental hazard. Coal trucking at night has been restricted in this area because of the number of residents seriously affected by the noise. Uninterrupted sleep is a priority; and ◗ Transport. 80 trucks per hour will have a major impact on traffic flow on Industrial Drive and Cormorant Road. There have already been a number of accidents on the Tourle St Bridge. Is this bridge strong enough to cope with this extra heavy traffic?	
S11	**Hunter Regional Development Committee** **9 February 2004**	The Committee objects to the Development Application unless the following matters are addressed: ◗ The EIS is inadequate and does not analyse the coincidence of all activities and impacts on the road network. This would require a comprehensive traffic study in accordance with the RTA's *Guide to Traffic Generating Developments;* ◗ If it is assumed that B-doubles will be used on haulage routes, the RTA and Council should approve these routes to/from approved fill sites; ◗ The Committee requests that alternatives to road transport be considered for the transfer of dredged material to approved fill sites, including pumping through pipelines; ◗ A traffic/construction management plan should be prepared and implemented to RTA and Council requirements; ◗ The RTA should provide comment on and specify requirements in relation to the proximity of dredging near the Tourle Street Bridge due to structural stability issues; ◗ The Committee expressed concerns about the potential road traffic noise impacts generated by fill transport vehicles on adjoining residential areas during night time operations; ◗ The Committee expressed concerns that there was no defined transport option in the EIS; ◗ Car parking should be provided on the work site for staff and other vehicles; ◗ Provision should be made for lighting on Cormorant Road near the proposed intersection. In addition, provision should be made for cyclists at all new intersections; and ◗ The proponent should investigate the need for the provision of public transport and pedestrian facilities at all work sites.	**4.11**

No.	Response from	Details	Response in Section
S12	**The Department of Environment and Conservation** **9 February 2004**	The Department is generally satisfied that the EIS provides sufficient information for the DEC to address the proposal and determine whether it can issue General Terms of Approval for the project in so far as it relates to the dredging of sediments proposed to be disposed of by sea dumping. Additional information on the following issues would assist the DEC in determining General Approval for the dredging and treatments of the contaminated sediments: ◗ The assessment provided in the EIS for 'cement stabilisation' of the contaminated portion of the sediments to be dredged from the Hunter River raises a number of questions with regard to the circumstances under which this form of treatment could be used effectively in a 'remediation' strategy for the sediments; ◗ Data in the EIS also suggests that the stabilisation process produces a relatively low compressive strength material. However, the extent to which the cement/sediment material will be subject to cracking, physical erosion or weathering and in turn the significance of any leaching of PAHs that occurs as a result of these processes is not specifically addressed in the EIS; ◗ The physical characteristics of the sediments and the range in concentration of PAHs in the sediments also suggests that it may be quite difficult to mix cement or other stabilising reagents through the sediments using conventional large scale concrete batching equipment. It follows that the effectiveness of the mixing process needs to be taken into account when determining the conditions under which the cement stabilisation process can be approved; ◗ Given the large volume of contaminated sediments that require treatment and the risk or remobilisation of the PAHs could pose to the environment the DEC believes a more detailed assessment of the performance of the cement stabilised material needs to be conducted. In particular: 1. Using worst case sediment samples, demonstrate that large scale conventional or specialist mixing equipment will efficiently and consistently produce a high degree of uniformity in batches of the cement/sediment material; 2. An evaluation of the extent to which prevention cracking, physical damage, exposure to groundwater or natural weathering and erosion processes is a significant factor in preventing leaching of PAHs from the material after placement when assessed under standard TCLP testing procedures; 3. An evaluation of the engineering properties of the cement stabilised material to determine its suitability as a capping or sub base material for civil engineering projects that might reasonably be conducted on the sites proposed in the EIS to receive the stabilised material; and 4. If a physical barrier system is required in addition to cement stabilisation to prevent the migration of PAHs to surface waters or groundwaters to identify and evaluate the systems that would be feasible for this development proposal. ◗ The DEC notes that the proponent is not specifically seeking development consent at this time to operate a thermal desorption plant to	**4.12**

No.	Response from	Details	Response in Section
		treat the contaminated sediments. A detailed environmental assessment would be required for the specific technology to be used before the DEC would consider issuing a licence for a full scale operating plant. The assessment would also need to take into account any processes proposed to pre-condition the sediments for treatment such as dewatering and the treatment of excess water before it is returned to the environment; ◗ Throughout the document there appears to be some discrepancy with regards to the area of mangrove and saltmarsh vegetation that is to be disturbed by the proposal. The areas of mangrove and saltmarsh given in Volume 1 Chapter 13.11 (for removal) are 5.7 ha and 0.9 ha, respectively, in Appendix H (terrestrial ecology) are 8.6 ha and 1.3 ha respectively, and in Appendix G (aquatic ecology) are 9.7 ha and 1.3 ha respectively. Notwithstanding some of the discrepancy may be due to part of the mangrove/saltmarsh being removed for the berth proposal rather than directly for the dredging and thus not included in Volume 1, the entire area will be impacted by the proposal and should be considered in its entirety. Since the area to be removed affects the area of compensatory habitat that may need to be negotiated, for example, by NSW Fisheries, the area of habitat to be impacted needs to be confirmed; ◗ The DEC understands that the pipeline referred to in the EIS to deliver clean sand to Tomago site will be subject of a separate EIS and assessment process and that the DEC will have an opportunity to review and comment on the EIS; and ◗ The request for an Aboriginal Sites officer to monitor operations throughout the proposed project (Appendix L, pg.14) should be fully justified and documented and submitted to the DEC for consideration.	
S13	**Stockton Community Forum** **1 February 2004**	Submission received outside the recommended time: As residents of this community and people who will be directly affected by any work conducted on this site, we believe these issues require a response from the proponent before approval is given: ◗ The potential for erosion of the bank/rock wall caused by the increase in depth of the channel by several metres and the subsequent increase in shipping traffic; ◗ The ongoing maintenance of the affected areas to ensure there is no degradation of banks over time; ◗ The possible/probable removal of established mangroves along the affected area. These species provide stabilisation of banks as well as species habitat; ◗ The use of sheet piling and the control of sediment; ◗ The safe disposal of contaminants generated by disturbance and dredging of the channel; and ◗ Request the issues be addressed in writing to the Stockton Community Forum to inform the public more fully.	**4.13**

No.	Response from	Details	Response in Section
S14	**Steel River** **30 January 2004**	◗ Applauds the thrust of the project - sees it as being of major importance to the future of Newcastle; ◗ Important to address the traffic infrastructure to and from the expanded port and new industrial facilities; and ◗ Imperative the project includes the duplication of the Tourle Street Bridge ideally at an earlier date and at the same time as the proposed replacement of the existing Bridge.	**4.14**
S15	**OneSteel market mills** **15 January 2004**	OneSteel has not determined a specific position regarding this project, nor have they determined a position on making land available for the proposed Swing Basin. Comments: ◗ Figure 1.2 does not accurately delineate OneSteel's Newcastle operations and property boundaries. The area identified as OneSteel incudes land occupied or owned by BHP Billiton, Koppers, Orica, Donhad, Hymix and Sandvik; ◗ The proposed Swing Basin would necessitate the acquisition of a significant portion of OneSteel's land, and would result in significant impacts on OneSteel's operations during the construction phase and ongoing. A detailed assessment has been undertaken and submitted to the Premiers Department (March, 2003); ◗ In the case of internal traffic movements and contractor lay down areas during the Swing Basin excavation, we assume that should this project advance, additional, more detailed information will be made available to OneSteel; and ◗ Page 2.10, suggests the Closure Area, OneSteel site and adjacent sediments need to be considered by the EPA under the Contaminated Land Management Act (1997) in an 'integrated' fashion. OneSteel has undertaken detailed investigations into contamination on our Lot 222 and concluded that contaminants do not present a significant risk of harm to health or the environment based on current land use. These reports have been submitted to the EPA. OneSteel would not support any actions which would compromise this outcome.	**4.15**
S16	**Hunter Bird Observers Club** **16 January 2004**	Comments: ◗ Cumulative impacts: – Need to assess the project in context of the Austeel Project; – Lacked comprehensive literature review; – No attempt to quantify negative cumulative impacts ie. Loss of both terrestrial and aquatic habitat; – No direction from DIPNR for the proponent to undertake an assessment of these impacts as part of the approval process; ◗ Fauna species list:	**4.16**

No.	Response from	Details	Response in Section
		– Lacked comprehensive literature review and research; – Additional Category 2, vulnerable avian species recorded. Additional migratory waders protected under JAMBA and CAMBA also recorded but not mentioned; – Recommendation: A detailed review of all available literature should be undertaken and a complete list of avian fauna developed for use in the assessment of the impact on avian species; ◗ Dredged sediment disposal: – Impacts from the pipeline across Kooragang Island to deliver dredged sand cuts across recognised foraging areas used by large numbers of migratory and other waders and the Green and Gold Bell frog; – Many of the birds are protected by NSW legislation and by international agreements to which the Australian government is a signatory; ◗ Bird Survey – Surveys conducted by Umwelt Environmental Consultants used a biased sampling methodology, are incomplete, and the conclusions reached are not supported by the data collected or by the other data sources used; ◗ Loss of Habitat: – Contradiction in area to be removed (Vol 1 p13.7 and Vol 4 Appendix G p21); – Quality of the habitat is a major consideration not only the size/area; – Assessment of habitat loss should also address the historical record of destruction and fragmentation of habitat in the region; – Comparisons of habitat lost with similar habitats in other parts of the Hunter Estuary; – NPWS, Environment Australia and reports by the Healthy Rivers Commission require impacts to be addressed; ◗ Impact on Fauna: – Results from the survey are inaccurate therefore 'no important feeding or roosting habitat occurs within the study area' are unfounded; – Utilisation of the inter-tidal mudflat by waders was not considered as habitat in the report; – A migratory wader of national importance is using the area as a roosting habitat – Pacific Golden Plover; – The description of the habitat loss is not considered to be 'important habitat' as defined by the EPBC legislation is incorrect; ◗ Impact on Egrets: – Importance in the local breeding of Little, Intermediate and Great Egret; – Terms of the NSW Protection of the Environment Act (1991), application of the Principles of Ecological Sustainable Development,	

No.	Response from	Details	Response in Section
		implementation of the Precautionary Principle need to be invoked; ◗ Eight Part Tests for Avian Species: – Australasian Bittern, Black Bittern, Osprey, Coastal Birds, Migratory Waders and Waterbirds were not found in the project area. More research needs to be conducted to confirm this, as information on these species and its habitats is limited; – This type of testing should be rejected and a Fauna Impact Statement should be prepared; ◗ Threatened Species occurring within the vicinity of the project area not subjected to an Eight Part Test: – These include: Painted Snipe, Masked Owl, Beach Stone Curlew; ◗ Compensatory Habitat: – The EIS recommends that compensatory habitat should be developed for loss of mangroves and saltmarsh. There are major deficiencies associated with this recommendation; – Financial contributions; ◗ Threatened Species Conservation Act (1995) Key Threatening Processes: – Impacts from the change in hydrology and tidal flows causing physical and chemical conditions that in turn alter the biota, changes to species compositions and life cycles; – Biota and biodiversity impacts; ◗ Commonwealth Legislation: – Migratory waders not listed on the NSW Threatened Species list but protected under the EPBC Act (1999) are likely to be directly or indirectly subject to negative impacts by the loss of this habitat; – SEPP 74 and its conditions for the pipeline and the disposal of dredge spoil; – Major deficiency of the EIS process is that it does not address the fundamental issue of 'key ecosystems' but rather is site specific, focusing on 'protection of ecological components'. This fundamental weakness is also manifested in the judgements made in the Eight-Part Tests; – EPBC Act (1999) states that a person must not take action that has, will, or is likely to have a significant impact on a listed migratory species. Concern is given to the Sharp-Tailed Sandpiper as well as other migratory wader species; and – A comprehensive species list which identifies the status of birds under all state and commonwealth legislation and international agreements must be used to identify all threatened and protected avian species.	

3.2 Summary of DIPNR Request for Additional Information

The following is a summary of submissions that were received from the Department of Infrastructure and Natural Resources (DIPNR) for the Proposed Extension of Shipping Channels, Port of Newcastle EIS. These issues have been addressed primarily in section 4.17 of this supplementary report. The Department request the following issues be addressed:

- The provision of a clear statement regarding what compensatory habitat will be provided with a specific compensatory habitat package with reference to the criteria for compensation referred to in Appendix H (Terrestrial ecology impact assessment report) is required;
- The area of vegetation proposed to be removed needs clarification and more detail is required regarding appropriate monitoring and assessment of wetland restoration work and habitat performance;
- Upstream and downstream impacts should be addressed in more detail;
- Bank erosion should be considered and appropriate scientifically based monitoring including remedial measures are needed to address this issue;
- Provide further details on the mitigation of the risk of PAHs becoming bio-available and of cumulative ecological impacts associated with the proposal;
- The supplementary report should include a summarised species list of fish species recorded in the area and further reference is required on the commercial fishery of the Hunter River regarding management strategies;
- Provide further information on wading birds and in terms of colonisation of man-made structures and provide an eight part test on Green Turtles (*Chelonian mydas*);
- Discuss the possibility of limiting dredging activities to certain times of the year;
- Provide comment on the effects of the dredging operations on benthic productivity;
- More detail required for the issues of connectivity and ecological functional significance of mangroves;
- More details should be provided on the change to habitat that is likely to occur from the works and its significance to the River affecting the type of animals that would colonise these different habitats;
- Provide more details on the monitoring that will take place as part of this proposal including a more scientific based monitoring method for measuring the dredge plume and further detail is required on the types and deployment of measures/structures to mitigate the impacts of the dredge plume;
- Assessment in regard to the *Coastal Protection Act* 1979 and to the Rivers and Foreshores Improvement Act (RFIA) 1948;
- The Department supports further investigation of surplus fill being used for the nourishment of Stockton Beach;
- The flood levels from the RMA model should be compared at critical locations to those in the 'Lower Hunter Flood Study (Green Rocks to Newcastle)', PWD (1994),

and the impact on flood levels of filling of the flood plain or stockpiling of fill on Tomago Industrial Area, Closure Area, and Protect Site needs to be addressed;

- Provide more detail on the cumulative impact on flood levels due to the filling of the flood plain, the sheet pile wall and the pipeline, and proposed dredging on tidal response;
- The potential impacts of the likely bank erosion measures need to be described in more detail as well as the impact of increased tidal velocity and flooding heights on bank erosion;
- An indication of the changes in time taken for flood waters to rise to critical levels at locations of major excavation routes needs to be presented including further investigation in regard to the potential impacts an increased flood level would have on existing properties in Hexham that are well below the 1% Annual Exceedance Probability (AEP) flood event;
- Clarification of references to the relative significance of flow rates throughout Chapter 11. In addition, Chapter 11 should be consistent with issues such as flow distribution covered in detail in Appendix F and should quote the tidal volumes for existing and dredged conditions at the various locations. The table comparing the changes in tidal flows also needs further explanation;
- More details describing the impact on dredging and sediment transport capacity with different flood levels and changes in channel cross-sections. Modelled impacts on increases in turbidity should be added to existing levels to give a final value;
- The salinity modelling needs to be run over a longer period than the 29 days that was modelled. The low fresh water flow inputs used in the salinity modelling should be clearly stated. This also requires clarification of why flushing results are not identical to salinity recovery results;
- Additional sampling and analysis is required to ensure the material within the dredging area is adequately characterised and quantified. How this sampling will be undertaken also requires discussion;
- An Acid Sulphate Soils Management Plan (ASSMP) is prepared prior to commencement of the proposed activity;
- Comment on future effects of operations on water quality eg. Oil and/or fuel discharges from new port developments facilitated by the dredging operations and provide further information on the potential impacts of fouling and contamination from ballast water from ships;
- There is a difference between an increase in the extent and distribution of mangroves due to sedimentation through the creation of additional habitat, and the impacts of sediment deposition on the ecological communities associated with the mangroves, with more detail required to determine whether changes in hydrology are likely to have an effect on the saltmarsh and wetland communities on Kooragang Island;
- Clarification of what mitigative measures will be taken to minimise the amount of sediment moving upstream and whether it will entail the use of turbidity curtains or

turbidity barriers. It is not clear whether these will be deployed in response to the results of monitoring, or put in place to prevent any impacts occurring;

- Further details should be provided on any long term groundwater level changes that may occur from tidal and flood level adjustments;
- Reference should be made to the project in terms of existing land use on Kooragang Island and the impact of filling in conjunction with the Tomago Pipeline needs addressing; and
- Elaboration is required on how the proposal is consistent with the four principles of Ecologically Sustainable Development.

3.3 Summary Submissions - Newcastle Port Environs Concept Proposal

The following is a summary of submissions that were received from the exhibition of the Newcastle Port Environs Concept Proposal. The Department has requested that any issues relevant to the Extension of Shipping Channels Proposal be addressed in this supplementary report. The following issues are summarised from the submissions and were considered mostly relevant to the Proposal and are addressed in Chapter 4.18. Issues that were not considered relevant to the Channel Extension EIS have been omitted from this supplementary report.

It should be noted that these are a summary of the original submissions to a different report which was not the EIS prepared by GHD. These submissions have only been included as a reference and all will not be responded to.

Table 3.2 Summary of Submissions for the Newcastle Port Environs Concept Proposal

Response from	Details
Tank Paddock Conservation Coalition	◗ The proposal does not achieve a balance between conservation and development; and ◗ A Department of environmental and planning report (Moss 1983) proposed that the ideal way of maximising the conservation value of Kooragang Island and Hexham Swamp was as a single ecological unit.
Association of Concerned Citizens Newcastle	◗ Nature reserves are protected from development by buffer zones that only allow low-impact activity. Development should not be allowed in these zones;
Hunter Bird Observers Club	◗ Special requirements of migratory shore birds recognised under the Environmental Protection and Biodiversity Conservation Act; ◗ Concerns of fragmentation of habitats; and ◗ Hexham Swamp and Kooragang wetlands should be viewed as a single ecological unit.

Response from	Details
Citizens Against Kooragang Abuses (CAKA)	◗ Kooragang Island Transport corridor not recommended over a conservation area is not compatible; and ◗ New industries having trouble taking up contaminated land due to a reluctance from insurers and banks. Old BHP dumpsite must be decontaminated.
Parks and Playground Movement Inc	◗ The proposal is an important position statement on the future of the port, but must not be used as a claim for further development that is not sustainable; and ◗ Redundant port related lands must be remediated, damaged ecological areas must be revived.
NSW Fisheries	◗ The conservation status of some areas (Ramsar, SEPP 14) are not reflected in some of the land use zonings; ◗ NSW Fisheries cannot support a proposal that requires filling of more wetlands around the estuary; and ◗ Cumulative impact of the proposed development pattern is not sufficiently addressed.
Port Stephens Council	◗ Suggest that steps need to be taken in the near future to commence establishment of regional settlement and land use principles that would guide the development of a regional strategy prior to finalisation of the locality plan for the port.
Newcastle City Council	◗ No clear timeframe for ongoing process; ◗ Lack of consultation with key stakeholders; ◗ Audit of existing port and industrial land is essential; ◗ Process does not provide for feedback to stakeholders of results of consultation; and ◗ No evidence of communication with indigenous community.
National Parks and Wildlife Service	◗ Consolidation of community support activities e.g. Wetlands Centre, Kooragang and Hexham Rehabilitation Projects.
Regional Land Management Corporation	◗ Former BHP site, opportunity for employment generation such as multi-purpose terminal; ◗ Opportunity to manage and fund wetland environments from Hexham Swamp and Ash Island/Tomago/Kooragang in an integrated way; and ◗ Tomago land has potential for major industry development that requires deep water access.
Department of Planning Infrastructure and Natural Resources	◗ Development should be sympathetic to riparian health, groundwater and acid sulphate soil issues; ◗ Groundwater vulnerability; ◗ Implications on Ramsar wetlands (maintenance of international status should development occur and restrictions imposed by EPBC Act); and ◗ Implications of dredging.
Department of Lands	◗ Proposal encourages use of port-front land by port-related industries, but there should be equal emphasis on benefit of port-front crown land

Response from	Details
	reserved for foreshore protection and public benefit; and ◗ Opportunity to identify Crown land that has been degraded and rehabilitating it for port related uses, rather than using bush land in good condition.
Peggy Svoboda	◗ Public consultation has not been comprehensive for this process and proposal; ◗ Development of the Port and Airport need to be placed into a broader economic context; and ◗ Land South of Tomago Road should be considered as a possible site for compensation.
Amanda Hyde	◗ The proposal gives no indication of the size or location of buffer zones necessary to protect habitat; and ◗ Residents have had little say in their future.
Geoffrey Hyde	◗ Tomago site unsuitable for development making Kooragang more suitable already having rail, road and power; ◗ Proposal provides no support for fishing industry; and ◗ If present ecosystem is lost, it cannot be replicated by compensatory habitats.
Frank Cosgrove	◗ The planning process needs more transparency with more consultation needed; ◗ Transport corridors over Kooragang and Hexham Swamp will compromise ecosystems, tourism and the economy in the region; ◗ Proposal does not base development on an industrial land demand analysis; and ◗ Development footprint has been proposed, however, lack of research of changes to hydrology from dredging and other operations.
Greg Little	◗ Land between Tomago Road and the North channel of the River should not be 'Port Related Industrial Land' but should be an extension of the Kooragang Nature Reserve.
Jack Downes	◗ Transparent planning process required; ◗ Clean up of pollution in the River; ◗ Any development should begin with assessment of the Rivers state of health; and ◗ New flood studies are required to verify accuracy of earlier studies.
Dr Max Maddock	◗ Waterbirds move day and night in all directions, the whole flood plain is essential for viability of all birds; ◗ No community or stakeholder consultation since 1999 for Austeel project; ◗ No adequate buffer zones proposed; ◗ No consideration of implications of Hunter Flood Regime; and ◗ Proposal should take into account sea level rise.
Dr O.M.G. Newman	◗ Kooragang be retained in its entirety for conservation, proposal lacks information about rezoning of this land;

Response from	Details
	◗ Concerns about transport corridors over swamp areas; and ◗ That degraded land be used for port related industry before wetland is considered for development.
Sue Rostas	◗ A greater need for buffer zones; ◗ A better allocation of industry onto previously disturbed sites; and ◗ Decontamination of ex-BHP site should be a priority.
Patricia Hyde	◗ Hunter area sub plan should have been developed prior to the concept proposal; ◗ Inadequate community consultation; and ◗ Impact of filling on flooding is not known.
Lorraine Yudaheff	◗ Take care not to harm potential ecotourism areas; and ◗ Local method for decontamination of land sites should be researched.
EcoNetwork Port Stephens	◗ Need for further consultation; and ◗ Need an audit of existing land uses not just zonings.
Hunter Catchment Management Trust	◗ Current and previously used industrial land to be used for port related activities before any green site is disturbed; ◗ No infrastructure corridor over Hexham Swamp or Kooragang Island; ◗ Strategies for providing port related industrial land include the provision for resourcing the development, maintenance, and management of these lands; ◗ Concerns about locations of infrastructure corridors over Kooragang Island and Hexham Swamp; ◗ Compensatory habitat of a larger size is required; ◗ Management issues; ◗ Proposal should include criteria for land use, timeframes for preparing unsuitable land for future use and buffer zone requirements;
Australian Plants Society	◗ Limited advertising and coverage in the media; ◗ Better use of existing land uses; and ◗ Inappropriate to plan industrial development and transport corridors next to SEPP 14 wetlands, flood prone lands, and Ramsar sites.
Cumberland Bird Observers Club	◗ Kooragang Island is in direct contravention to States Own wetland Management policy and Federal Environment Protection and Biodiversity Conservation Act 1999; ◗ KWRP has increased bird numbers; and ◗ Better use of existing land uses for further development.
Property Council of Australia	◗ Provisions for future upgrading of the North Arm; and ◗ All future port related lands should be zoned industrial to confirm their place in the future development of the area.
National Trust of Australia	◗ Proposal doesn't accurately address cultural heritage and historic significance of the area.

Response from	Details
Birds Australia	◗ Under the EPBC Act, Ramsar sites are considered as having national significance. A port facility with high independence on international markets should adhere to the highest environmental standards; and ◗ Site is of major importance to water birds.

4. Proponent Response to Submissions

The summary of the submission in italics, preceding each response is for general information only. Each response refers to the detailed submission received from each group that was summarised into dot points, for use in this report, as shown in Table 3.1.

4.1 Regional Land Management Corporation

The main issues that have been raised by the Regional Land Management Corporation (S1) are related to contaminant leachability and the physical properties of the contaminants including durability, reworkability, permeability and structural capacity.

Response:

- It is noted that RLMC is supportive of the proposal in general;
- In response to the comment of the environmental risk of contaminants leaching into the groundwater, the groundwater quality north of the river and within the former BHP Steelworks closure area would continue to be sampled and assessed as a component of existing monitoring programs. This testing would form part of Stage One of the Proposal. A groundwater and surface water management plan will be implemented during the placement of stabilised sediments in the closure area and the Kooragang site. No discernable change in groundwater quality is envisaged from the placement of the cement stabilised material and treatment processes would reduce leaching; and
- In response to the physical properties of the treated materials and their effect on the development potential and marketability of the site, this information is being compiled for RLMC.

4.2 Hunter Catchment Management Trust

The trust endorses the removal of contaminated sediments adjacent to the former BHP site, provided contaminated sediments and water do not spread into a wider section of the South Arm. The issues that have been raised by the Trust (S2) are associated with contamination during dredging operations, the need for consideration of alternative options for the route of the Tomago Pipeline, cumulative impacts on wetlands further upstream, the need for a more detailed land use description of the area, the use of selective reporting of average change as an indicator of water level fluctuations with the terrestrial section lacking in this regard, full assessment of flood impacts, no assessment of varied impacts on the Kooragang Wetland Rehabilitation Project (KWRP) Island, aquatic and terrestrial section of the EIS only assess impacts on the immediate dredge site, the proposed listing of coastal saltmarsh on the TSC Act, no mention of the expanses of saltmarsh on the KWRP Island site, and that the details of how compensation would be achieved are lacking.

Response:

- In response to the mobilisation of contaminants into the water column and leakage from the contaminated site into the river during dredging, it is stated in Section 3.5.4 of PBP (2003) (Appendix F of the EIS) that consultation with the EPA indicates that provision of the temporary sheet pile wall may alone be an adequate mitigation measure to control water quality impacts during dredging of sediments within the sheet pile wall. A backhoe dredge working in conjunction with barges would remove all of the material contained inside the sheet pile wall. The backhoe dredge would be fitted with a purpose-built clam working with a turbidity curtain. Other environmental controls would also be used. Turbidity monitoring is proposed during the removal and handling activities. The sediment outside the sheet pile wall is considered non toxic to aquatic organisms and suitable for unconfined sea placement. It would therefore be expected that dredging of the sediment outside the sheet pile wall, which would involve some disturbance of sediments into the water column, would not create circumstances that are toxic to aquatic organisms. It is noted however that the Project Environmental Management Plan (PEMP) and Environmental Protection Authority (EPA) Licence (refer to Sections 5.3 and 5.5 respectively of this report) will be critical in monitoring water quality during dredging.
- The statements in the EIS referring to the lack of and demand for industrial land available for port development are sourced from the Newcastle Ports Environs Concept Proposal (KBR, 2003);
- In response to the comment that the EIS makes it appear that the strategic direction for the estuary has been finalised, the EIS states that "The concept proposal (the Newcastle Ports Environs Concept Proposal (KBR, 2003) is intended as a starting point for a consultation process on which future strategies for conservation and development in the area will be based". This indicates that the EIS states that this direction is still in early stages for the estuary as a whole.
- In response to the comments on the route of the Tomago pipeline and the terminology used (the multi-user port and transport corridor) for this corridor it is acknowledged that this was only used to classify the pipeline and not to assume the route was finalised. In addition, a separate consent would be required for the transport corridor as a prerequisite for consent of the pipeline. The information provided in the EIS was only to confirm that such a pipeline was feasible;
- Cumulative impacts have not been addressed for further upstream in the Hexham Swamp and the Kooragang Wetlands. The following is a list of some of the cumulative impacts associated with the proposal. Potential positive cumulative impacts may include:
  - The provision of compensatory habitats that may connect and/or add to these sites;
  - The decontamination of the South Arm; and
  - Direct financial contributions to the Kooragang Wetlands Rehabilitation Project (KWRP) and the Hexham Swamp Rehabilitation Project (HSRP) would improve these sites directly.

Potential negative impacts that may occur include:

- Potential short term impacts if the dredging causes excessive distribution of sediments, may encroach the foreshore areas of these sites;
- Potential changes to intertidal habitats in the construction area;
- Further development as a result of the dredging proposal encroach on buffer zones that have been established around these sites; and
- Further development corridors could lead to negative cumulative impacts through the loss on both aquatic and terrestrial habitats on and around Kooragang Island.

These impacts are considered negligible if the proposed management techniques are employed during construction.

Removal of the mangroves on the Northern shoreline of the South Arm was considered to have minor ecological impact in the context of the broader Hunter Estuary system. Whilst the intertidal mangrove habitats on Kooragang Island were considered potentially vulnerable due to changes in water flow or quality caused as a result of the proposal, the hydrological modelling indicates insignificant impacts.

- In response to the land uses on the South side of the river opposite KWRP, this land is outside the study area and therefore was not assessed. However, the zonings in this area are:
  - 4(c) Steel River Zone and a small area of 4(b) Port and Industry Zone adjacent to the Tourle Street Bridge. These zonings allow industry related activities.
- The corrections made in the received submissions have been noted;
- In response to the clarification of the measurement of water level change as an average and not as a maximum, referring to Section 3.2.2 of Appendix F of the EIS (2003), equivalent to PBP (2003), it is evident that there is virtually no effect predicted on tidal planes in the estuary due to the proposed dredging. There is a small, localised effect predicted within the dredged area itself, with the tidal range increasing slightly (eg mean spring range predicted to increase by 14mm at Tourle St Bridge). There are negligible effects downstream and upstream of the dredged area, with the maximum changes in tidal planes in the order of 2mm. Reported maximum changes in water level relate to one particular tidal cycle in a 29 day simulation (which has 58 tidal cycles), and should not be interpreted as changes in tidal planes;
- In response to the statement made that selective reporting of hydrological changes based only on means leads to an understatement of the potential impacts on saltmarsh, as noted above in the previous response, there is expected to be virtually no alteration to tidal planes, which are an excellent measure of potential hydrodynamic changes, and thus assessing impacts on saltmarsh;
- It is noted that the issues of high tides are not fully addressed in the Terrestrial Section of the EIS. However page 13.9, in the Terrestrial Flora and Fauna Section of the EIS states ‘indirect potential impacts of the proposal on fauna habitat in the local area could include, *‘Changes in the hydrology of the South and the North*

Arms including Fullerton Cove, North west Kooragang Island and Tomago Wetlands), including the effect of enhanced tidal prism on upstream wetlands'.

- As dredging would not be expected to cause significant alteration to 'maximum' tidal inundation levels such as mean high water springs or mean high water, the comment on 11.23 of the EIS that opening the Ironbark Creek floodgates having more influence on the hydrodynamics and water quality of Hexham Swamp than the proposed dredging is valid. In response to the effects on KWRP sites, KWRP comprises of three sites on and around Kooragang Island namely:
  - Ash Island, with approximately 750 hectares on the western end of Kooragang Island;
  - Tomago, with approximately 800 hectares in the Tomago-Fullerton Cove area; and
  - Stockton, with approximately 10 hectares near Stockton Bridge.

  As Tomago and Stockton sites would not have measurable alteration to tidal planes it would be expected that the changes in tidal planes at Ash Island would be less than a few millimetres (as per Ironbark Creek).
- In response to the submission concerning the full assessment of flood impacts of the pipeline, it is not correct to say that the "increase in water level for all design floods simulated immediately upstream of the proposed pipeline is 50-70mm". For the 1% AEP flood, the increase in maximum flood levels was between about 30mm and 50mm in the Beresfield, Hexham, Hexham Swamp, Tomago and Sandgate areas (refer to Figure 23 of PBP [2003]). The 50-70mm increase refers to higher probability flood events than the 1% AEP flood.

  It is agreed that the impact of the temporary discharge pipeline needs to be assessed in relation to the proposed raised transport corridor across Kooragang Island, which was part of proposed development at Tomago. This permanent transport corridor has been predicted to lead to an increase in flood levels of about 20mm in the 1% AEP event, conservatively ignoring the reduction in flood levels as a result of the South Arm dredging (PBP, 2003).

  Detailed assessment of the impacts of the proposed transport corridor, in conjunction with the proposed dredging, would require additional modelling, which has not been attempted at this stage. It should be noted that the temporary pipeline would be expected to have little additional impact above the effect of the proposed transport corridor. Furthermore, the impact of the pipeline could be mitigated by providing relief floodways under the pipeline, or embedding the pipeline, at critical locations. In addition, it should be noted that the pipeline is a temporary structure that would only be in place for a period of around two years.
- Impacts on the western end of the KWRP, Ash Island Site would be considered to be similar in comparison to other sites within the area with tidal changes less than a few millimetres predicted;
- In reply to the indication of 3cm build up of sediment at Ironbark Creek on page 11.27 of the EIS, and that the impact on KWRP sites has not been assessed. It is

assumed that the question of impact on KWRP sites is referring to Ash Island, given that negligible sediment deposition was predicted at Tomago and Stockton. (See above). In the Ash Island area, most of the sediment deposition upstream of the dredged areas was predicted to be in the mangrove areas lining the Hunter River South Arm near Ironbark Creek, particularly on the South bank. This was conservatively based on only tidal conditions.

It would be expected that flooding rather than tidal hydrodynamics, given the higher elevation of the island relative to tidal levels, would predominantly influence sediment deposition on Ash Island. However, there are numerous tidal creeks on the island, the largest being Cobban's Creek, which was included in the finite element model network for the sediment deposition simulations. Cobban's Creek is located near the junction of Ironbark Creek with the Hunter River.

Although bathymetric information was limited, the simulations indicated that there would be a small region of sediment deposition at the confluence between Cobban's Creek and the Hunter River. This was not expected to extend further upstream into the creek. Monitoring of turbidity and sediment deposition could be extended into the tidal creeks of Ash Island, if necessary.

As noted above, sediment outside the sheet pile wall is not expected to be contaminated (specifically, it is not expected to be toxic to aquatic organisms). For dredging within the sheet pile wall, contamination is expected to be contained due to the wall, and the use of turbidity curtains if necessary. Therefore, sediment transport is not expected to be analogous to contaminant transport.

- If monitoring of turbidity indicated that higher levels than forecasted are occurring, further mitigation measures (e.g. a floating turbidity barrier) would be installed. Details of this is included in Section 5.4 of this supplementary report;
- In response to the dismissal of off site impacts being insignificant, due to the selective reporting of data, as stated above, data was not selectively reported. Predicted changes in 13 tidal plane parameters were given for 5 different locations. It was concluded that changes in tidal planes of only a few millimetres were not significant impacts;
- In response to Section 12 of the EIS only addressing the dredge site, this Section completed an assessment on the whole South Arm and the Hunter Estuary in relation to the study area. Maximum tidal levels are not predicted to significantly increase. At Ironbark Creek, the predicted change in mean high water springs (as a result of dredging) was only 2mm, in fact a decrease;
- In response to the claim that promotional statements such as 'that whilst there would be some negative impacts, this needs to be balanced against all the benefits' does not indicate an independent assessment. This statement reflects that the benefits of the proposal also need to be assessed in relation to the negatives of the project as a whole;
- In response to the comment that no indication is given as to where monitoring of upstream impacts on mangroves and their associated fauna would be undertaken,

this issue would be dealt with in the Project Environmental Management Plan for this proposal (Refer to Section 5.3 of this report);

- The accuracy of the Green and Golden Bell Frog surveys has been noted, and it is anticipated that further assessment may be required;
- In December 2003 the NSW Science Committee released a Preliminary Determination supporting a proposal to list Coastal Saltmarsh in the NSW North Coast as an Endangered Ecological Community. This determination has now been finalised and Coastal Saltmarsh has been listed as an Endangered Ecological Community. The National Parks and Wildlife Service would be consulted prior to any removal of this species; and
- Details of the compensatory habitat that will be provided in conjunction with contributions to other wetland projects (HSRP and KWRP) will be dealt with in the Project Environmental Management Plan. This compensation will be developed in concurrence with other compensatory plans associated with the port.

4.3 Roads and Traffic Authority

The Roads and Traffic Authority (RTA) (S3) has made the following comment that this development will be operating as an extractive industry and will require assessment by the Hunter Regional Development Committee under SEPP 11 Traffic Generating Development, at a date to be determined. The response from the Hunter Regional Development Committee is included in this supplementary report (S14).

Response:

The Hunter Regional Development Committee has considered the application under the requirements of State Environmental Planning Policy (SEPP) 11-Traffic Generating Developments and objects to the Development Application unless the matters raised in their submission are addressed.

It is acknowledged that there is a need for a SEPP 11 assessment once detailed design is complete. The aims, objectives, policies and strategies of this Policy are to ensure that the Roads and Traffic Authority of New South Wales (the RTA):

(a) Is made aware of, and

(b) Is given an opportunity to make representations in respect of this development.

This development is classified under Section *1(j) as the enlargement or extension of any existing transport terminal, bulk store, container depot or liquid fuel depot.* Basically this policy rationalises the consultation required in relation to traffic-generating developments.

4.4 Protech Steel

Protech (S4) supports the proposal for extending the shipping channels and are willing to accept significant quantities of clean dredged materials for use as fill on certain low-elevation areas of their site.

The Protech submission is in line with the purpose of the Channel Extension – to provide sustainable infrastructure to the Port of Newcastle.

It is noted that Protech are willing to accept significant quantities of clean dredged materials for use as fill on certain low-elevation areas of their site.

4.5 BHP Billiton Limited

BHP Billiton support the proposed development, and in particular the preferred option of cement stabilisation of sediments. BHP Billiton's submission (S5) in general supports the proposal however raises several technical issues mostly concerned with the treatment and handling of the more contaminated sediments.

Response:

- The varying definitions of 'dispose' and 'waste' in relation to 'reuse' have been noted.
- BHP raises the fact that the volume of the contaminated sediment may vary somewhat from that specified in the EIS. The total volume of material involved is estimated at 13.6 million m^3. This includes 7.6 million m^3 of materials to be beneficially reused on land and approximately 6 million m^3 of material to be placed offshore. Approximately two percent of the total volume of material has been identified as requiring some form of treatment before its placement. As discussed in the EIS, this figure has been determined by the GHD team through a significant amount of testing, analyses and consultation with both the EPA and Environment Australia.

  It should be noted that further site investigation and analysis could possibly reduce the volume of sediment that requires treatment on land. The factors that determine final volumes suitable for sea placement are subject to approval of the Commonwealth Minister for the Environment. Furthermore it is acknowledged that the volume of contaminated sediment and the exact location of the temporary sheet pile wall are yet to be determined and approved by the NSW EPA and Commonwealth Department of Environment and Heritage (DEH). BHPB has undertaken recent statistical analysis that shows that the volume of sediment requiring treatment may be lower than stated in the EIS. The final volume of sediment that is to be treated will be determined by the offshore disposal limits. The development approval would need to acknowledge this;
- It is noted that the goal of 'achieve maximum possible beneficial use of dredged excavated material' would also include the use of 'best available technology but not exceeding excessive cost';
- It is noted that removing contaminated sediments from the Hunter River is not the only way to manage the sediments, however any proposal that didn't include the removal of the contaminants would not be practical as part of the proposed dredging exercise;
- It is noted that Table 5.1 of Section 5.2.3 of the EIS could be interpreted incorrectly. The total PAHs in some sediments in the South Arm are above the acceptable

maximum level for ocean discharge set by Environment Australia, which (as stated in note 2 of Table 5.1 of the EIS) is the same as the recommended sediment quality high guideline value given in the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC/ARMCANZ, 2000). The sediments that are contaminated therefore require treatment prior to placement or reuse;

- The development approval would acknowledge that the exact location of the sheet pile wall and total volume of contaminated sediment that requires treatment is yet to be finalised;
- It is noted that the classification of the preferred option as Dolocrete was incorrect as this is a registered trademark and should be classified under a generic term such as 'cement stabilisation';
- The typographic error on page 7.15 of the EIS has been noted;
- The duplication of the Tourle Street Bridge is planned for completion in 2006 according to the RTA. It was never the intention that the approvals be linked or interdependent; and
- It is agreed that community consultation and notifications will be conducted and provided in stages to reflect the construction methodology for the project.

4.6 NSW Fisheries

The issues that NSW Fisheries have raised in their submission (S6) are associated with the potential of contaminated sediments producing toxicants that may become soluble, monitoring of aquatic organisms during the dredging operation, that the Ports Corporation Technical Advisory Committee oversee the operations. NSW Fisheries also note permits that are required for the proponent and issues relating to notifications at construction times.

Response:

- Potential contamination of water quality and the impacts on aquatic organisms will be monitored during the dredging operation and Section 5.4 elaborates on some of the details envisaged. The proponent envisages a role for the Newcastle Port Corporation's Technical Advisory and Consultative Committee but questions the need for such an overseer role given the existence of both the Department of Environment and Conservation (DEC) and Department of Environment and Heritage (DEH).

  As noted above, sediment outside the sheet pile wall is not expected to be contaminated (specifically, it is not expected to be toxic to aquatic organisms). For dredging within the sheet pile wall, contamination is expected to be contained due to the wall, and the use of turbidity curtains if necessary. Therefore, sediment transport is not expected to be analogous to contaminant transport.
- It is acknowledged that there is a need to obtain permits for harm of marine vegetation, compensatory habitat and to dredge and reclaim;
- Permits that are required by the proponent, from NSW Fisheries will be obtained prior to the activity commencing;

- Consultation for the project will include local commercial fishers to determine both the impact of the activity on their operations and to put in place management systems. In addition, an environmental management plan will be prepared in consultation with the commercial fisheries to manage any perceived impacts; and
- Public notifications including operation times and constraints will be posted at public boat ramps and other locations to inform recreational fishers and boaters of the dredge operations and safety risks.

4.7 Newcastle City Council

The first issue that has been put forward by Newcastle City Council is that the EIS does not consider the provisions and objectives of Development Control Plan No 41- Kooragang Point and Industrial Area (S7). The Council also raises that significant infrastructure issues are not addressed in the EIS, more clarification of the details of the extension of Tourle Street Bridge are needed, a justification of the location of the swing basin, discussion of treatment processes of wastewater for the dredged sediments within the sheet pile area, sediment management, cumulative impacts, habitat losses, changes in the hydrological balance, noise impacts, odour assessment, management and modelling, infrastructure conflicts, the nature and location of haul roads and proposed traffic management measures.

Response:

Statutory Planning

- Although the EIS does not mention the provisions and objectives of Development Control Plan (DCP) No 41 – Kooragang Point and Industrial Area, the requirements were considered during the environmental assessment process followed in the EIS. The DCP applies to the port and industrial area of Kooragang to the east and south of the railway. This DCP aims to:
  - Guide the development of the Kooragang Port and Industrial Area into the 21st Century as a focus for the port-related activities.
  - Respect the functions of Kooragang as a place of both port and related industrial activity and of environmental significance.
  - Affirm the strategic role and direction of Kooragang as part of the Port of Newcastle as an economic generator of the Hunter Region and a major employment precinct of the City of Newcastle.

  The proposed dredging project would keep within the provisions and objectives of DCP 41.
- In relation to DCP 20 – Guidelines for Industrial Development, detailed development plans and elevations for the proposed land-based facilities will form part of that specific approval process;
- DCP 30 – Landscape Design Principles: Under this DCP, the proposal represents a category 3 development requiring the submission of a site survey and analysis, Landscape Concept Plan and preliminary Landscape Design Report. This would form part of the Landscape Management Plan outlined in Section 5.4.2 of this report;

- DCP 43 – Contaminated Land requires a Remedial Action Plan (RAP) to be developed. This would be developed once the treatment technology is finalised before any removal of contaminated sediments took place. This is also a requirement of State Environmental Policy 55;
- The provisions and requirements of DCP 50 – Stormwater Management will be incorporated into the stormwater pipe relocation process. In addition, a Stormwater Management Plan will be submitted to Council and Council will be consulted concerning this issue;
- In regards to DCP 56 – Waste Minimisation, the EIS presented a Waste Management Plan (WMP). Further to this, a more detailed WMP will be finalised as part of the Project Environmental Management Plan; and
- The Hunter Regional Environmental Plan (REP) applies across the Newcastle area. The REP provides strategic guidelines and a policy framework for the treatment of regionally significant matters in the form of local planning documents. In regards to Division 2 – Ports and Airports, the objectives of this plan in relation to planning strategies concerning ports are to ensure:
  - The efficient operation of the Port of Newcastle through control of development and transport corridors in areas around the Port;
  - That operations and development of the Port of Newcastle is undertaken with minimal adverse impacts on the environment;

The proposed development will conform to the provisions of this REP.

Strategic Planning

- As indicated in the EIS, the infrastructure requirements for the rest of Kooragang Island are outside the scope of the EIS. These would be considered as part of a separate consent process for each of the land based developments;
- Land based developments and their infrastructure will need to be planned so that all of their requirements can be met. The EIS has presented an impact assessment based on a concept level of design, meaning that final design has not yet been formulated. Final design would indicate the placement of rail and road corridors in respect to any new berth development. This is outside the scope of the EIS;
- The RTA is responsible for the Tourle Street Bridge duplication. The RTA have provided details of this duplication and these have been taken into account in the channel design;
- It is obviously very difficult to predict the rate of port growth as this is influenced by both local and overseas factors. There are a significant number of unknowns with regard to the rate of development of local industry as has been seen recently. In addition, even relatively small changes in large overseas markets can have a dramatic affect on shipping activity to and from Australia. The EIS has presented the best estimates available at the time but clearly acknowledges that dredging would only proceed when the associated land based developments are approved and underway; and

- The proponent provided the information that was used for the justification of the increased growth of port activities. Other information in this regard was referenced from the Newcastle Ports Environs-Concept Proposal (KBR, 2003).

Dredging, Excavation and Bank Protection Processes

- The main stormwater discharge channel for Mayfield, North of Crebert Street, discharges into the South Arm of the Hunter River within the area proposed for the sheet pile wall. This outlet has flooded in the past and on-site environmental controls will be used to manage any impact this discharge has on the area.

  There are two main potential impacts with stormwater discharging within the sheet pile wall area:

  1. A head difference building up between the waters inside and outside of the sheet pile wall, causing instability of the wall.
  2. The flow of water causing mobilised contamination to escape through the wall into the Hunter River.

  To mitigate these impacts, potential options could include:

  – Ensuring the wall had adequate stability under the potential loads generated;
  – Stopping dredging during flood events;
  – Diverting/relocating the stormwater discharge away from the sheet pile wall area (upstream or downstream);
  – Continuing the stormwater discharge such that it bridges the sheet pile wall area; or,
  – Providing open areas in the wall that would allow any head differential to be quickly relieved; these could be protected by turbidity curtains to reduce contaminant transport.

  It is acknowledged that further feasibility work will be required at the detailed design stage. Newcastle City Council would be consulted concerning this issue.

- In Section 3.5.4 of PBP (2003) it is stated that consultation with the EPA indicates that provision of the temporary sheet pile wall may alone be an adequate mitigation measure to control water quality impacts during dredging of sediments within the sheet pile wall. Depending on the results of water quality monitoring during the dredging activity, a turbidity curtain could also be installed if necessary around the dredging plant.

Treatment Process

- It is expected that the cement stabilisation process would take up the bulk of the waters associated with the highly contaminated sediments. Any remaining waters would thus require treatment before their discharge into the South Arm. Water treatment plants would be provided on the OneSteel site and on the closure area remediation site if contaminated excess water is generated;
- Other than the on-site environmental controls, the water treatment process could involve the following steps:

- Contaminated water would be directed to an on-site settling pond/tank; the storage capacity of this tank would be such to provide sufficient emergency storage as well as some settling capacity;
- To remove the suspended sediments, the wastewater would be treated by gravitational sedimentation (occasionally with a flocculation agent) and then sand filtration;
- Metals may be removed either by ion exchange, or by precipitation using a chemical additive;
- Water that has been treated by chemical addition would proceed through a sedimentation and filtration sequence to remove the precipitated compounds;
- PAHs would be removed by carbon adsorption (or granulated activated carbon); and
- Ultraviolet oxidation may also be necessary to assist in the breakdown of PAHs.

It is envisaged that the contractor could utilise other water treatment processes such as evaporation or membrane filtration and would need to negotiate with the EPA the terms of the licensing requirements.

Sediment Management

- The issue of contaminated sediment management would be detailed within the specific Environmental Management Plan once this process has been finalised. Furthermore it is acknowledged that the volume of contaminated sediments and the exact location of the temporary sheet pile wall are yet to be determined.

Sediment Quality

- It is noted that further clarification is required in relation to Table 4.1 of Appendix D of the EIS. This table identifies exceedences of the Environment Australia Maximum level for offshore placement for Zinc (mean) in areas 1,2 and 3 and Naphthalene (mean) in areas 2 and 3. However, only Area 3 is proposed to be treated. The results shown in Table 4.1 of Appendix D of the EIS show that although the mean concentrations of total PAH's in Area 1 and Area 2 exceed the EA screening level, the soft silty clays from these areas are considered suitable for unconfined sea placement (this is based on the outcomes of a series of sediment toxicity investigations, i.e. the 95% UCL of the mean total PAH concentration is less than 15 mg/kg, normalised to 1% TOC). These toxicity investigations undertaken by the CSIRO have shown that zinc is not bioavailable and consequently is not toxic to marine organisms, therefore making it suitable for off shore placement.

  The National Ocean Disposal Guidelines for Dredged Material (2002) require that contaminant concentrations in sediment proposed to be placed of offshore must be compared to Screening and Maximum Levels. However, because the guideline Screening and Maximum Levels do not take bioavailability into account, the Maximum Levels only apply as ocean emplacement limits where toxicity testing is not undertaken.

  Therefore, although the concentration of zinc exceeds the Maximum Level in Area 1 & 2 and the concentration of naphthalene exceeds the maximum level in Area 2,

the Maximum Level does not apply as a limit to ocean placement as toxicity testing of the sediment from Area 1 and 2 has shown the contaminants are not bioavailable.

Habitat Loss or Modification

- An assessment for habitat compensation will be conducted reflecting the extent if any, of habitat loss due to the activity. Habitat compensation measures would be discussed with NPWS, NSW Fisheries, Local Council and other rehabilitation projects within the area will also be considered; and
- Changes in the hydrological balance outside the project area will be monitored to determine an impact, if any on significant species. Assuming the term "hydrological balance" is referring to tidal hydrodynamics, as noted above the impacts a distance upstream or downstream of the area proposed to be dredged would be minimal, even at locations as close as Ironbark Creek. The extent of the impact was defined at a number of locations outside the dredge area, including the South Arm Railway Bridge, Ironbark Creek, Stockton, Fullerton Cove, Hexham and Green Rocks (refer to Section 3.2 of PBP, 2003).

  If the term "hydrological balance" refers to flooding, then, as described in Section 3.3.3 of PBP (2003), the extent of the impact was again outlined throughout the lower Hunter Estuary. The main impact noted was that flood levels would reduce in the South Arm immediately upstream of the dredged area. There was not expected to be a significant alteration in the flow distribution across Ash Island and Kooragang Island, flood volumes or flood duration.

Natural Hazard – Flooding

- Issues of cumulative flooding impacts have been discussed in Section 4.17 of this report;
- In response to the cumulative impacts on flood levels due to the Tomago pipeline, various aspects would be reviewed as part of a separate EIS and approval process for filling of any sites in the area. Additional information has been provided in Section 4.17 of this report;
- The underlying assumptions and information used by the hydraulic flood models have been commented on elsewhere in this report. Also, in the Appendix B (PBP, 2003), the development, calibration, and verification of the tidal hydrodynamics model is described;

Aquatic Ecology

- In December 2003 the NSW Science Committee released a Preliminary Determination supporting a proposal to list Coastal Saltmarsh in the NSW North Coast as an Endangered Ecological Community. This determination has now been finalised and Coastal Saltmarsh has been listed as an Endangered Ecological Community. The National Parks and Wildlife Service would be consulted prior to any removal of this species.

Technological Hazards

- It is noted that the Risk Assessment Report, Appendix M of the EIS, does not provide any assessment of the potential risks to the existing and proposed Tourle Street Bridges by vessels using the South Arm channel. However, the report does make reference to vessel collision with other obstacles, such as the sheet pile wall and dredging machinery;

Noise and Vibration

- Noise and vibration management issues will be dealt with in the Project Environmental Management Plan. Consideration will be given to any sensitive commercial or industrial noise receivers. Noisy construction activities such as drilling or blasting will be scheduled to normal construction hours (7.00 am to 6.00 pm, Mondays to Fridays and 7.00 am to 1.00 pm Saturdays), or within ANZECC guidelines. The hours for sheet pilling have been limited to 7.00 am to 6.00 pm Mondays to Fridays (consideration would also be given to further restricting these hours). A noise monitoring program will be established as part of the EMP for the project and incorporated into a complaint management system for immediate response to noise complaints.

Odour

- For the process of dewatering in geobags, the discrepancy of results regarding land area is due to the height of the geobags not being added into the calculation for surface area. This error has been acknowledged and the number of 20,000 m^2 should prevail for this process; and
- It is recommended (Appendix K, EIS 2003), that the two remediation options that can be used: stabilisation using cement based additives, and the combination of dewatering for highly contaminated material. This recommendation is a result of the modelling, which was carried out for only dewatering and covered/uncovered barges. The modelling provides a basis for this combined approach.

Salinity and flow velocity

- The perceived impacts on flora and fauna are noted, and variations in salinity and flow velocity upstream of Tourle Street Bridge are not considered to have a significant impact. This has been discussed elsewhere in this report.

Cumulative Impacts

- Cumulative impact details are required to assess the extent and implications of alterations to the hydrological balance in the Hunter Estuary from the proposed dredging and bank modifications. As noted above, the predicted changes to bank roughness would not be expected to significantly alter hydrodynamics in the estuary;
- For the comment relating to the relevance of tidal flux upstream. It is uncertain if this comment relates to tidal hydrodynamics or flooding, as the terms are used interchangeably. If the comment relates to tidal hydrodynamics, then it has been demonstrated above that the extent of impact on tidal hydrodynamics has been

defined throughout the lower estuary and was found to be minimal. If the comment relates to flooding, then it is assumed that the 50mm increase in water level is related to the predicted increase in flood levels due to the construction of the discharge pipeline across Ash Island (Section 3.3.2 of PBP, 2003). This issue is further discussed in the Hunter Catchment Management Trust, and DIPNR Sections of this report (Sections 4.2 and 4.17 respectively);

- Details of filling and sea placement options for sediment will be subject to conditional consent.

Traffic And Access

- A Traffic Management Plan (TMP) will form part of the Project Environmental Management Plan (PEMP) for the proposal and will detail traffic mitigation measures to ensure that truck movements have a minimal impact on surrounding roads. For example there will be a restriction in place on operations to outside peak periods. For further details on the PEMP refer to section 4.3 of this report;
- The cumulative impacts of the truck movements on the local road network would be short term. Possible impacts that could occur would be short-term traffic congestion causing traffic delays. As noted above, a traffic management plan would be implemented during dredging and deliveries to mitigate such impacts;
- The proximity of the proposed extended channel and submerged rock berm to the extension of the Tourle Street Bridge would be finalised in the detailed design;
- Sufficient area between the Cormorant Road, the new berths and the Tourle Street Bridge would be provided to cater for loading/unloading operations associated with future use of the berths. This would be outlined in the detailed design for the berths;
- Vehicular access issues would be incorporated into the traffic management plan for the project;
- The nature of configuration of the proposed upgrade of the intersection of Cormorant Road is in preliminary stages and will be designed with respect to the surrounding car park and access road;
- The nature of the proposed haul roads intended to be constructed on the OneSteel site and Kooragang Island will be dealt with in the PEMP;
- The nature and location of the proposed traffic management controls will be developed with Council and implemented during the site-specific PEMP for the project; and
- It is noted that the EIS promotes the use of public transport by staff to reduce the traffic generation associated with the project. Additional infrastructure will be provided to support such systems.

4.8 Port Waratah Coal Services

Port Waratah Coal Services (PWCS) support the strategy of this proposal and agrees that further development of the Port is best achieved by developing along the South Arm. The

comments that were received (S8) point out the following issues: Hydraulic interaction and ship loading capacities as a result of the proposal, coordination of shipping and dredging activities and PWCS also considers it appropriate that the scope of the EIS should be extended to include the removal of sediments from the land based Kooragang Coal Terminal fines disposal facility.

Response:

- The proposal would result in additional vessel traffic in the existing port area adjacent to both the Carrington and Kooragang Coal Terminals. Vessel interaction has been studied extensively by Newcastle Port Corporation and PWCS. The movement of moored vessels due to hydraulic interaction with passing vessels is influenced by many factors including the size of the vessels involved, distance between vessels, speed of passing vessel, draft of vessels, the mooring lines used and the mooring configuration. Analysis of interaction at the Carrington Terminal shows that passing speed as well as mooring line quality, pre-tensions and configuration are the most effective means of managing interaction. The possibility of channel widening to reduce interaction is limited by physical geometry of the port and surrounding infrastructure at both the Kooragang and Carrington facilities. Widening adjacent to the Carrington or Kooragang Terminal would also be a cost prohibitive means of reducing interaction in comparison to operational improvements. As such interaction at both Carrington and Kooragang would be best managed through operation practices focused on passing speed and moorings.

  Interaction at the Kooragang terminal will be reduced due to the greater channel width in this area, hence greater vessel separation.

  It is anticipated that this issue will be addressed in consultation with PWCS in due course as part of normal operation interaction, outside of the current development application process.
- The operations of dredging would be staged around existing port activities; and
- In response to the scope of the EIS being extended to include the removal of the river sediments from the previously used land based dumping facility, this is outside the scope of work for this activity and not included in this supplement.

4.9 Nature Conservation Council of NSW

Issues raised by the Nature Conservation Council (NCC) (S9) consist of the EIS failing to incorporate state and regional planning and conservation strategies, a failure to outline the full and cumulative impact of the proposal, river bed adjustment resulting from dredging and excavation, effect on fishing activities, and the absorption of pollutants by aquatic fauna.

Response:

- In response to the EIS failing to place the proposal in context with other key documents, investigations and planning strategies, the EIS had referenced the Newcastle Ports Environs-Concept Proposal KBR, 2003, which was the starting point for future strategies for conservation and development in the area. This would

be the first step in minimising the potential for overall negative cumulative impacts in the region;

- In response to the EIS failing to incorporate state and regional planning and conservation frameworks such as strategies and documents like:
  - NSW Ports Inquiry;
  - The Healthy Rivers Commission Report for the Hunter River; and
  - Kooragang Island Conservation Strategies.

  The EIS mainly focused on existing planning frameworks and incorporated conservation strategies of the Hunter to facilitate the project. These conservation frameworks have been highlighted elsewhere in this report;
- In response to the EIS providing insufficient detail in regards to failing to outline the full environmental impact of the proposal, the EIS detailed the existing environment, the perceived impacts of this proposal and the mitigative strategies that would need to be implemented to ameliorate this impact;
- With regard to readjustment of the riverbed, a potential area where this could occur would be at Tourle St Bridge. However, as discussed in Section 3.6.4 of PBP (2003), a rock berm has been proposed to provide bed stability at this location. Another area of potentially bed instability would be at the channel bank edges adjacent to the dredged areas. However, as described in EIS, the channel banks in the dredged areas are proposed to be armoured with rock that is the banks are proposed to be rock revetments.

  With regard to resuspension of deposited sediment, given that most sediment would deposit in deep dredged areas within the port, it would not be expected that these sediments would be resuspended even in major floods. Sediment deposited in other areas, such as the mangrove areas South of Ironbark Creek, would only be resuspended in floods (if at all), when ambient suspended sediment concentrations would be far greater than any resuspended dredged sediments. Furthermore, as noted above (Hunter Catchment Management Trust, Points 2 and 12), sediment transport should not be considered to be analogous to contaminant transport.

  The proposed turning circle area (swing basin) is deep, with a proposed maintained dredge depth of about –11m AHD, and adjacent channel depth of –15.5m AHD to –16.2m AHD. With armoured banks and these large depths, it would not be expected that active use of this area would cause resuspension of sediments.
- Aquatic organisms will be impacted in the short term by dredging and the operation of the swing basin for this proposal, however recovery to a stable system would take longer. In response to the absorption of pollutants by fish and prawn larvae and the subsequent implications on higher food chain animals (i.e. humans), sediment outside the sheet pile wall is not expected to be contaminated (specifically, it is not expected to be toxic to aquatic organisms). And as noted above, contaminated sediments will be contained due to the sheet pile wall;
- The likelihood of the proposal altering the levels of bioaccumulated contaminants in fish and crustaceans in the river that are then taken by recreational and commercial

fisherman is considered insignificant due to the proposed mitigation barriers proposed. The occasional nature of fishing in the South Arm area, the migratory movement of fish and crustaceans over the period of the development works and the scheduling of the works to minimise impact on these resources also minimises the likelihood of this pathway being significant.

4.10 Mayfield Residents Group

The Mayfield Resident Group (S10) is mainly concerned with the proposals effect on the community, in particular four schools in the area. Other concerns consist of issues relating to the transportation of sediments, community and worker protection, environmental monitoring, noise impacts, and traffic generation.

Response:

- All trucks containing excavated material will be covered using a tarpaulin or similar material. Access tracks will be laid with coarse rock or similar material and watered down to mitigate any possible dust generation. Shade cloth will be provided on the boundary fences of any disturbed site(s) to stop the transport of dust. Environmental monitors will be installed to determine, if any, contaminated dust is being transported off site. Workers will be provided with personal safety equipment;
- The management of noise and these issues will be dealt with in the Project Environmental Management Plan for the activity; and
- In order to reduce the impact of ground vibration and airblast, blasting would only be conducted between 7.00 am and 6.00 pm from Mondays to Fridays and 7.00 am to 1.00 pm Saturdays.

4.11 Hunter Regional Development Committee

The Hunter Regional Development Committee (HRDC) object to the development application mainly due to the EIS being inadequate regarding traffic impacts in relation to SEPP 11- Traffic Generating Developments (S11).

Response:

The HRDC raise valid points centring on the need for the development of a comprehensive Traffic Study once the exact design configuration of the project is known. The EIS has presented an impact assessment based on a concept level of design and found that, subject to the mitigation measures proposed, the proposed development would not cause excessive impacts.

The following is in response to HRDC's submission:

- It is anticipated that the conditions of consent for the proposal include a requirement to complete a comprehensive traffic study and to have this approved prior to any work commencing. This study would be undertaken once the contractor for the project has completed the detailed design. The Minister as the consent authority would require sign off of the traffic study prior to the project proceeding;

- The traffic study would include precise routes to be used. Where possible B doubles would be used on authorised and designated B-double routes only;
- A comment has already been made in Section 1.5 *Recommended Mitigation Measures* of the EIS that spoil transport would be conducted outside peak background traffic periods (most likely 7.00 am to 9.00 am and 4.00 pm to 6.00 pm). It is assumed that the RTA/Council will approve haulage routes described in the report. The adoption of non-peak traffic for B-Doubles periods however is considered to be excessive given the existing characteristic of road users on the area;
- In regard to the transport of dredged material, the EIS promotes a pipeline and/or barge transportation for the vast majority of the material. It is only when this is not suitable that trucks will be used. Where clean fill material is being transported, some transport onus will be on others, however there is still a pressing need for pipeline transport;
- It is acknowledged that a condition of consent stipulating a traffic/construction management plan would be required. This would be provided by the successful contractor;
- The design of the channel extension in the vicinity of the Tourle St Bridge is such that a buffer distance has been included so that collision is not feasible and, which will minimise the likelihood of draw down effects. The proponent would liaise with the RTA regarding any monitoring which may be required;
- A noise impacts assessment has been undertaken which concludes that the increase in noise level due to additional truck movement for the transportation of sediments was calculated to be 0.1 dB $L_{Aeq\ (15\ hour)}$ and 0.1 db $L_{Aeq\ (90\ hour)}$. This impact is considered negligible and would not be detectable by receivers along the roadway. Also a mitigation measure to control noise impacts at night has been proposed, 'Minimising the potential for impact type noise during night time periods', (GHD, 2003);
- Car parking, public transport needs, lighting and the like will be provided in accordance with Part 4 of Council's Draft Development Control Plan (DCP). All staff and service vehicle parking would be accommodated on-site i.e. no impact on external road network and parking facilities (Sections 1.3.1 and 1.4.1 of the EIS);
- Any intersection improvements, including lighting, will be according to relevant Australian Standards and RTA '*Road Design Guide*'. Improvements for the Cormorant Rd intersection will include cyclist facilities to maintain on-street cycle lanes along the length of Cormorant Rd. Public transport was mentioned in Section 19.3.2 – *Staff* of the EIS, as an alternative and more sustainable method. A further comment is reiterated in Section 19.5 - *Recommended Mitigation Measures*. It is envisaged that safe, although informal, pedestrian facilities will be provided at work sites;
- It should be noted that currently, even without any impacts associated with the proposal, an upgrade of the two-lane section of Cormorant Road/Tourle Street (between Egret Street and Industrial Drive, including Tourle Street Bridge) to four

lanes (two lanes each way) is forecast for future traffic loads. The duplication of the Tourle Street Bridge is in the design phase at present with a view to its completion in 2006.

4.12 The Department of Environment and Conservation

The Department is generally satisfied that the EIS provides sufficient information for the DEC to address the proposal (S12) and determine whether it can issue General Terms of Approval for the project in so far as it relates to the dredging of sediments proposed to be disposed of by sea dumping. However additional information is required to assist the DEC to determine the circumstances under which it can issue GTAs for the dredging and treatment for the contaminated sediments.

Specifically more information was requested on the proposed cement stabilisation, the physical characteristics of the sediments, the use and production of the cement stabilised material, thermal desorption and the discrepancy within the report with regards to the area of saltmarsh and mangrove that is to be disturbed by the proposal.

Response:

Cement Stabilisation

Information will be compiled and submitted to the DEC concerning this issue as a separate process and the results will be incorporated into the Stage Two consent conditions, if the project is approved. The results of the Trial remediation Project will form a key part of this information (see Chapter 6).

On other issues raised

- The discrepancy in the exact area of mangrove and saltmarsh that is to be disturbed by the proposal is noted and it is now confirmed that the most likely area of disturbance will be 5.7 ha of mangroves 0.9 ha of saltmarsh. This discrepancy between Umwelt and Ecology Lab is due to a different classification of habitats. Umwelt have classified a large portion of the area east of Tourle Street Bridge as Modified Grassland and Native Species. The Ecology Lab has identified this area as mangrove area explaining the error. This was misinterpreted when transferring the information from the Appendix into the EIS.
- It is acknowledged that a separate EIS process is required for the transport corridor to the Tomago site delivering clean sand. It is noted however that the EIS specifically refers to some of the impacts of the pipeline including noise and flooding and that the Department should be aware of this in issuing its GTAs; and
- The DEC's comment on the requirement for an aboriginal sites officer to monitor operations is noted. The intention was to further discuss this with the relevant aboriginal land council and it was envisaged that this was not necessarily a full time role. An error of translation was made between the specialist report (in the appendix) and the main volume of the EIS.

4.13 Stockton Community Forum

The forum (S13) declare that the following issues require a response before approval is given. The potential for bank erosion, ongoing maintenance of affected areas, the use of sheet piling and the control of sediment and the safe reuse or disposal of sediments.

Response:

- In response to the comment of potential bank erosion, all new channels will be designed with stable and protected banks to suit the size and frequency of shipping vessels that will use the port;
- In regard to a maintenance program, in keeping with other areas of the port, all banks will be monitored for any signs of degradation and remedial work undertaken where necessary (also see section 4.17.4 of this report);
- With the removal of the mangroves on the North bank, bank stabilisation work will be carried out to ensure bank stability;
- In response to the leakage from the contaminated site into the river during dredging, a steel sheet pile wall would be installed to provide a physical barrier to isolate material that is unsuitable for unconfined sea placement from the other material. A backhoe dredge working in conjunction with barges would remove all of the contaminated material contained inside the sheet pile wall. The backhoe dredge would be fitted with a purpose-built clam working with a turbidity curtain. Other environmental controls would also be used. Turbidity monitoring is proposed during the removal and handling activities. For dredging within the sheet pile wall, contamination is expected to be contained due to the wall; and
- Contaminated sediments will be treated for subsequent reuse or placement as part of the Stage Two process.

4.14 Steel River

Steel River (S14) believes it is important to address the traffic impacts of the proposal and requests that the duplication of the Tourle Street Bridge occurs as part of the project.

Response:

- A comprehensive traffic study is anticipated in the conditions of consent for the project to be undertaken once the successful tenderer for the project has presented the detailed design. This is expected to detail more precise impacts and mitigation requirements. In terms of the Tourle St Bridge duplication (to be completed in 2006), it is noted that the RTA is currently preparing environmental approval documentation for the duplication. As these are two distinct, independent projects with differing time requirements, it is impractical to make one dependent on the other; and
- Details of traffic impacts and mitigation measures are detailed above in Section 4.11.

4.15 OneSteel Market Mills

OneSteel (S15) has not determined a specific position regarding this project, nor have they determined a position on making land available for the proposed Swing Basin. Their comments consist of issues dealing with the proposed swing basin, additional information that is required, that Figure 1.2 of the EIS does not accurately delineate OneSteel's operations and boundaries and that the Closure Area, OneSteel site and adjacent sediments need to be considered by the EPA under the Contaminated Land Management Act 1997.

Response:

- It is noted that Figure 1.2 of the EIS does not delineate exactly OneSteel's Newcastle operations and property boundaries;
- In response to the proposed Swing Basin necessitating the acquisition of a significant portion of OneSteel's land, it is acknowledged that negotiations regarding the use of OneSteel area have yet to be completed and that this would need to occur well in advance of any work commencing on the OneSteel site;
- It is confirmed that, prior to any work commencing on the OneSteel area, all internal traffic movements, contractor's areas etc. would be fully discussed with OneSteel with a view to minimising the impacts wherever possible; and
- OneSteel's comments have been noted regarding their detailed investigations into contamination on their area and the submission of their reports to the EPA (now DEC);

4.16 Hunter Bird Observers Club

The Hunter Bird Observers Club (S16) has outlined many issues concerning the EIS which are associated with cumulative impacts, the impacted fauna list, dredged sediment disposal, the bird survey, loss of habitat, impact on fauna (including specifically egrets), Eight Part Tests for avian species (also including Threatened species within the project area), compensatory habitat, Threatened Species Conservation Act 1995 Key Threatening Processes and Commonwealth legislation.

Response:

Cumulative Impacts

- The most significant issues raised in the Hunter Bird Observers Club (HBOC) submission relate to cumulative impact of a number of potential development projects and the need for significant assessment of cumulative impact in relation to avian species occurring in the Lower Hunter.

Fauna Species List

- An updated fauna species list has been prepared based on further assessment of literature and Hunter Bird Observers Club records. The updated fauna species list is included as **Appendix B.**

A significant number of detailed studies have been undertaken into the ecology of the Hunter River Estuary Wetlands, reflecting the ecological significance of this area. The

Hunter River Estuary, which incorporates Kooragang Nature Reserve, Shortland Wetlands and Hexham Swamp (TWC 2002), is particularly important as it supports a large diversity of bird habitats and an estimated 250 bird species (Maddock 2003). This includes 20 species listed as threatened under the NSW *Threatened Species Conservation Act 1995* and 35 migratory bird species protected under one of the three international migratory bird treaties: BONN, JAMBA and CAMBA (Maddock 2003). There are also 16 species for which the Hunter Estuary population represents at least 1% of their estimated Australian population (Smith 1991, in Maddock 2003), further indicating the importance of the Hunter Estuary Wetlands on a national scale.

In recognition of the ecological significance of the Hunter River Estuary, particularly its importance for migratory bird species, the area has been declared a Ramsar Wetland site. The habitats of the estuary are extremely important for both feeding and roosting for a large seasonal population of Palaearctic shorebirds and as a waylay site for transient migrants (TWC 2002). The Hunter River Estuary is considered to be the most important habitat for shorebirds in NSW (KWRP, internet resource), with an estimated 15,000 – 20,000 migratory shorebirds visiting the estuary each year (Van Gessell 1976). Nationally, the estuary has also been ranked as the fifth most important site for shorebirds in Australia (Watkins 1993).

The ecological values of Kooragang Island, which lies within the Hunter River Estuary Ramsar Site, are also high. In January 1995, 12,000 water-birds were recorded on Kooragang Island itself, and therefore the island is considered one of the three most important habitats in NSW for water-bird species. Australia-wide, Kooragang Island is recognised within the top ten water-bird habitats (NPWS 1998). In November 1994, some 6440 migratory birds were observed within Kooragang Island Nature Reserve, emphasizing the importance of the areas as migratory bird habitat (NPWS 1998). During winter, substantial numbers of these migratory birds remain at Kooragang Island and do not return to the northern hemisphere (NPWS 1998).

Since European settlement, large areas of wetland habitats, including sections of the Hunter River Estuary, have been cleared, filled or degraded to make way for development. As a consequence, numerous bird species specific to such habitats are now in decline and their numbers continue to drop as further development of their habitat continues. Past losses of these habitat types increase the conservation value of those remaining, particularly those of good quality which alone are able to make major contributions to conservation. It is essential, therefore, that remaining wetland environments are conserved in order to ensure the survival of the species dependant on these habitats.

Dredge Sediment Placement

In response to the comments on the route of the Tomago pipeline and the filling sites, a separate consent would be required for the transport corridor and fill sites as a prerequisite for consent of the pipeline. The information provided in the EIS was only to confirm that such a pipeline was feasible. The impacts of this proposed pipeline have been discussed elsewhere in this report.

Bird Survey

- The Draft NSW NPWS Threatened Species Survey & Assessment: Guidelines for Developments and Activities (2002) has been prepared to guide surveys for environmental impact assessment. These guidelines were reviewed prior to the bird survey and the method recommended utilised. The following excerpt details the (draft) NPWS requirements for the conduct of diurnal bird surveys.

  Many methods have been used for surveying birds, and summaries can be found in Bibby et al. (1992) and Sutherland (1996). The most common methods are:

  – Area search methods, where observers walk around an area of predetermined size for a predetermined length of time. A 1 ha (200m x 500m) 20 minute search is the most common method (Loyn 1986), although as described later in this Section not as effective as surveys of longer duration.
  – Point count methods, where observations are made from a series of predetermined points for predetermined lengths of time. By recording the bird's distance from the point, density estimates can also be made. Ten minute observations were made at each of five points on a 500m transect (points 100 m apart with observations recorded at 0-5 m 5-10 m, 10-20m, 20-30m, 30-50 m and >50m distances from the point) in the State Forests EIS surveys (York et al. 1991).

  Each method has its advantages and disadvantages (Catterall et al. 1996). In studies where the aim is species inventory, to record as large a list of species as possible and do so as quickly as possible, the area search method is recommended, as this method is slightly more likely to detect small cryptic birds.

  At natural wetlands, a one hour bird observation must be conducted at dawn or dusk. Birds are to be recorded as present within the wetland, flying overhead or outside the habitat. A 20 minute census, at dawn or an hour before dusk should also be conducted at each identified source of water in the survey area. Opportunistic species sightings should be recorded continuously.

  The Umwelt diurnal bird surveys were conducted in the manner described by the draft guidelines. Area searches were conducted with the focal point being that point marked on Figure 2.1 of the Terrestrial Ecology Assessment (Umwelt, 2003). All habitats within the study area were surveyed, including sandy beach habitats. A one hour survey of wetland communities (mangrove, saltmarsh and freshwater wetland habitat) was undertaken at dusk on 19 November 2002, with additional, limited survey of these habitats undertaken on 3 December.

  It is acknowledged that many species of waders occurring within the Hunter are tide dependant. While the survey did not specifically take into account the timing of tides during the survey, the identification of potential habitat was used to create a profile of species that could potentially occur within the project area. These species include all migratory wader and avian species that are tide dependant that are known to occur in the Hunter Estuary as listed in Appendix 2 of the Terrestrial Ecology Assessment (Umwelt 2003). Therefore all potentially occurring species were assessed.

It is agreed that sampling in one season significantly limits the potential for detecting the full range of species utilising a particular area. Studies within the Hunter Valley (Hoye, 2000) have shown than one sampling effort is unlikely to record more than 30% of species occurring within a study area. In order to compensate for this limitation, a detailed assessment of habitat was undertaken and review of the NSW NPWS Atlas of NSW Wildlife and other studies to identify the full range of species that could occur in the study area, including threatened species.

It is considered therefore that adequate survey and review of previous studies has been completed in order to meet the stated objectives of the report and the environmental impact assessment.

- In relation to the Long Pond, it is outside the project area and was not included during surveys. An assessment of historical expert reports has been undertaken in order to quantify the importance of this habitat, and an assessment of the impact of the proposed dredging proposal on this habitat has been conducted below.

  Inter-tidal sand and mud flats were surveyed during the field survey as discussed above.

  The Long Pond is an artificial wetland on Kooragang Island that was created by industrial waste dumping. HBOC records indicate that the wetland provides habitat for at least 45 species of waterbird, including migratory waders and is known to provide breeding habitat for the Black Swan and egrets. The wetland provides an important area of habitat in the Hunter Estuary mosaic. The Long Pond will not be directly impacted by the proposal and as the habitat is already highly degraded and adjacent to Cormorant Road, it is not envisaged that the indirect impacts associated with the proposal will result in significant changes to the composition of species currently utilising the habitat as part of their ecological requirements.

- The Masked Owl was not included in the initial assessment as it was not known to occur within 10km of the study area. The Powerful Owl and Barking Owl were both assessed, however due to a lack of suitable habitat in the study area they were not assessed further under the provisions of the 8 Part Test. The Masked Owl would have been similarly discounted on the basis of a lack of available habitat for the species.

  An assessment of the impact of the proposal on the Masked Owl, which is known to occur on Ash Island, has been conducted and is included in **Appendix A**. The proposed dredging of the South Arm of the Hunter River and the associated loss of habitat is not expected to significantly impact the Masked Owl, such that it would be placed at risk of extinction. The study area does not provide a significant foraging resource for this species, with preferred prey species not likely to occur in high numbers within the study area due to a lack of habitat for these species.

- HBOC contends that the proximity of the site to Cormorant Road does not limit and impact on the habitat quality of the study area and the potential for it to provide an important area of habitat. The statement referred to by HBOC on page 4.1 of Appendix H refers to the habitats within the study area, rather than the Long Pond,

which was not specifically assessed under the Terrestrial Ecology Assessment (Umwelt, 2003). To re-iterate this statement, the study areas proximity to Cormorant Road contributes to the decreased habitat quality and complexity present in the study area. The HBOC assertion that thousands of waders roost daily at the nearby Stockton Sandspit and are therefore unaffected by road noise is questioned as this particular habitat occurs beneath rather than adjacent to the source of road noise compared to the study area, therefore indicating that the impact of noise would be lower in this area than the study area.

An assessment of edge effects was included in the discussion of impact. It is difficult to quantify edge effects and therefore the assessment included a qualitative approach to the issue of edge effects. Edge effects that were considered in the assessment included noise from Cormorant Road and adjacent industrial areas, weed invasion, litter, increased light penetration, altered drainage pattern and increased public access to the project area.

The comparison made by HBOC in relation to benthic communities being representative of other mangrove communities within the Hunter Estuary does not take into account the intent of the statement which was to assess the overall habitat quality, not only a small portion of an individual habitat. The degraded nature of the site, the high level of weed infestation and ongoing edge and noise effects from Cormorant Road significantly reduces the overall habitat value and quality of the study area, especially in comparison to high quality habitats such as those within the Kooragang Nature Reserve. The degraded nature of the study area and the proximity of other high quality habitats is considered to reduce the likelihood of threatened and endemic species occurring, however, as addressed in Tables 3.1 and 4.1 of the Terrestrial Ecology Assessment (Umwelt, 2003), potential habitat was identified for a number of threatened species in the study area and these species have been assessed under the provisions of the 8 Part Test.

While no threatened species were identified in the study area, potential habitat for threatened species was noted and species were therefore assessed under the provisions of the 8 Part Test as required under Section 5A of the *Environmental Planning and Assessment Act* 1979.

Low conservation significance was attributed to the majority of the study area due to such factors as history of disturbance, weed infestation and the lack of habitat complexity. The conservation significance assessment in Section 3.3 of the Terrestrial Ecology Assessment (Umwelt, 2003) correctly points out that saltmarsh and mangrove complexes are attributed very high conservation significance on account of the history of clearing and disturbance to these communities in the locality, the restricted nature of the communities and the ongoing threat to the survival of these communities.

The Terrestrial Ecology Assessment (Umwelt, 2003) objectively applied the precautionary principle during the preparation of the assessment. The EP&A Regulation defines the precautionary principle as: "*Where there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental*

degradation. In the application of the precautionary principle, public and private decisions should be guided by:

(i) Careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment, and

(ii) An assessment of the risk-weighted consequences of various options."

In order to apply the precautionary principle, a proposal needs to ensure that there has been careful evaluation of all aspects and that every stage in the assessment and decision-making process has been transparent. The Terrestrial Ecology Assessment (Umwelt, 2003) covers an extensive and careful evaluation of all the project components. Detailed assessment of all potential impacts and necessary management procedures has been conducted and is also comprehensively documented in this Assessment.

The existing environment was scientifically studied and assessed in accordance with relevant guidelines (as discussed in Section 2.4 of the Terrestrial Ecology Assessment). In addition, engineering and scientific modelling has been utilised to assess and determine potential impacts as a result of the project. To this end, there has been careful evaluation to avoid, where possible, irreversible damage to the environment.

The Terrestrial Ecology Assessment (Umwelt, 2003) was undertaken on the basis of the best available scientific information about the project area. Where uncertainty in the data used in the assessment has been identified, a conservative worst-case analysis has been undertaken and contingency measures have been identified to manage that uncertainty. That is to say the limitations of the survey were well known and potentially occurring species were assessed, even though they were not identified within the study area.

Loss of Habitat

- Page 5.1 of the Terrestrial Ecology Assessment (Umwelt, 2003) details the loss of each vegetation community to be disturbed by the project. The proposal involves the removal or alteration of all vegetation in the project area, on the North bank of the South Arm between the Tourle Street Bridge to just South of the intersection of Cormorant Road and Egret Street. Vegetation communities identified in this area were: 13.7 hectares of Modified Grassland; 7.6 hectares of Plantings of Native Species; 8.6 hectares of Mangrove Forest; 1.3 hectares of Saltmarsh Vegetation; and 2.2 hectares of Freshwater Swamp Vegetation (Umwelt, 2003). The discrepancy between the Ecology Lab assessment and the Umwelt assessment has been discussed elsewhere in this report. This was due to a misclassification of habitat area that was added to the final area as stated in the Terrestrial Ecology Assessment (Umwelt, 2003). The discrepancy in the exact area of mangrove and saltmarsh that is to be disturbed by the proposal is noted and now it is confirmed that the most likely area of disturbance will be 5.7 ha of mangroves and 0.9 ha of saltmarsh.

The aerial photograph and vegetation community delineation has been further verified and confirmed as part of the preparation of this response.

The area of fauna habitat to be lost was not quantified in the report, however these habitats were assessed and considered (refer to Section 5.3 of the Terrestrial Ecology Assessment). The area of intertidal mudflats to be removed under the project equates to approximately 1.35 hectares, with approximately 2.7 hectares of sand flats to be removed.

Fauna habitat within the study area is considered to be marginal when considered in the context of Kooragang Island. The habitat present within the study area is generally highly degraded with small areas of mangrove, saltmarsh and mud/sand flats which are considered to provide potential habitat for a range of threatened species (refer to Table 4.1 of Terrestrial Ecology Assessment). The removal of habitats within the study area are not considered likely to significantly impact on the ecological integrity of wider Hunter Estuary.

Impact of Fauna

- Section 5.4.1 of the Terrestrial Ecology Assessment (Umwelt, 2003) detailed the assessment of species in accordance with the *Environment Protection and Biodiversity Conservation Act* 1999. It was considered unlikely that the project would have a significant impact on threatened or migratory species.

  It is agreed that the Hunter Estuary can be defined as 'important habitat' as described by the *Environment Protection and Biodiversity Conservation Act* 1999, however the project area lacks significant area and fauna habitat resources to be considered important habitat as defined by the legislation.

  Further assessment of the impact of the proposal on nationally listed species has been conducted below, which shows that the loss of the habitats of the project area will not significantly reduce the area of occupancy for threatened and migratory species and will not lead to the further decline of species from within the estuary.

  Under the EPBC Act Assessment of Significance, an action has, will have, or is likely to have a significant impact on threatened or migratory species if it does, will, or is likely to:

  - *Lead to a long-term decrease in the size of an important population of a species;*

    The proposed development does not involve significant loss or alteration of native vegetation or fauna habitat from within the lower Hunter Estuary and as such will not result in the long-term decrease in the size of an important population of a species. It is acknowledged that many species are declining globally, nationally and from within the Hunter (Smith 1991), however the loss of degraded habitats from within the study area are not expected to result in a significant decline in species or available habitat.

  - *Reduce the area of occupancy of an important population, or*

    While the Hunter Estuary provides a significant area of important habitat for a range of threatened and migratory species, the highly degraded study area is

not considered likely to provide habitat for an important population. The disturbance associated with the proposal will not constitute a significant reduction in the area of occupancy of any threatened or migratory species, and the compensatory habitat measure prescribed will ensure that a significantly greater, and much higher quality habitat will be conserved and managed in the long term.

- *Fragment an existing important population into two or more populations, or*

  The proposed development is situated adjacent to the existing coal terminal and therefore will not result in the fragmentation of habitat, with the industrial area of Kooragang Island extending through the project area. The significant feeding and roosting habitat within the Hunter Estuary is located along the North arm of the Hunter River, surrounding Ash Island, Tomago and Fullerton Cove. Therefore, the proposal will not result in the fragmentation of the important population of migratory waders and threatened species within the Hunter Estuary.

- *Adversely affect habitat critical to the survival of a species, or*

  While the Hunter Estuary provides a significant area of important habitat for a range of threatened and migratory species, the highly degraded study area is not considered likely to provide habitat critical to the survival of any threatened or migratory species. The disturbance of habitat associated with the proposal will not constitute a significant reduction in the area of occupancy of any threatened or migratory species, and the compensatory habitat measures prescribed in the Terrestrial Ecology Assessment (Umwelt, 2003) and Section 4.17.1 of this report will ensure that a significantly greater, and much higher quality habitat will be conserved and managed in the long term.

- *Disrupt the breeding cycle of an important population, or*

  The removal of habitat and ongoing dredging works are unlikely to disrupt the breeding cycle of any threatened or migratory species. The project area is not considered likely to provide a significant area of breeding habitat, due to the availability of high quality, more suitable habitat elsewhere in the estuary.

- *Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, or*

  There will be no significant modification, destruction, removal, isolation or decrease in the area or quality of habitat within the Hunter Estuary as a result of the proposed development. The loss of degraded areas and small pockets of mangrove and saltmarsh habitat will not result in a significant decrease in the quality and availability of habitat such that the species occurring within the Hunter Estuary are likely to decline. In addition, a significant area of compensatory habitat is proposed, which will result in a net improvement in habitat within the estuary, whether by restoration of existing degraded areas or the creation of new habitat.

- *Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species´ habitat, or*

  The disturbances and vegetation removal associated with the project are not expected to facilitate the proliferation of any introduced flora or fauna species. Weed invasion within environments surrounding the study area is currently high, however the development is not expected to further encourage weed proliferation.

- *Interferes substantially with the recovery of the species.*

  As there will be no significant disturbance to the habitat of any threatened or migratory species, the proposal is not considered likely to interfere substantially with the recovery of any threatened or migratory species. The creation or significant enhancement of habitat as a result of the compensatory habitat package detailed in Section 6.3 of the Terrestrial Ecology Assessment (Umwelt, 2003) is likely to result in a net gain of important habitat within the estuary.

The loss of the habitats from within the project area due to the dredging proposal will not significantly reduce the area of occupancy for threatened and migratory species and will not lead to the further decline of species from within the estuary.

Impact of Egrets

- The population of Egrets in the Hunter Estuary are considered to be regionally significant on account of the "decline observed in breeding colonies at the Shortland Wetland Centre" (M. Maddock pers. obs). As a result, it has been assessed as regionally significant as the provision of the 8 Part Test do not apply to species that are not listed on the schedules of the Act. The HBOC considers that the cumulative loss of habitat as a result of the range of projects proposed within the Hunter Estuary is likely to result in further decline of the species. The strong hold of egret habitat in the Hunter occurs at Long Pond, Ash Island, Tomago Buffer Lands and Hexham Swamp.

  The South Arm dredging project will not have a significant impact on the local regionally significant egret population due to the small area of habitat mangrove, saltmarsh and sand/mud flats that is proposed to be removed. The loss of habitats from within the project area is not considered likely to seriously deplete egret habitat in the local area and region.

  It is acknowledged that the potential for cumulative impacts related to the overall development proposed in the Kooragang Island industrial area to potentially impact the egret population through habitat reduction, therefore requiring investigation. However, this regional assessment of cumulative impacts is outside of the scope of works of this assessment and can only assess the cumulative impacts associated with this specific project.

- The HBOC states that the dredging proposal will not result in the removal of habitat for the Black Bittern and that habitat for the Australasian Bittern is known from the Tomago buffer land, Hexham Swamp, Ash Island and the Tank Paddock. The HBOC considers that the cumulative loss of habitat as a result of the range of

projects proposed within the Hunter Estuary is likely to result in further decline of the species.

The South Arm dredging project will not have a significant impact on the Black or Australasian Bittern due to the lack of known habitat and the small area of potential habitat that is proposed to be removed. The loss of habitats from within the project area is not considered likely to seriously deplete bittern habitat in the local area and region and the dredging proposal is not considered likely to result in the extinction of the species from within the Hunter Estuary.

It is acknowledged that there is the potential for cumulative impacts related to the overall development proposed in the Kooragang Island industrial area to potentially impact the Black and Australasian Bittern population through further habitat reduction, therefore requiring investigation. However, this regional assessment of cumulative impacts is outside of the scope of works of this assessment and can only assess the cumulative impacts associated with this specific project.

- The Osprey was considered as a potentially occurring species due to knowledge regarding local sightings of the species and the biology of the species, which includes estuaries as a significant component of hunting areas. The 8 Part Test conducted as part of the impact assessment considered the area proposed for dredging is likely to provide potential foraging habitat for this species. The assessment further concluded that during dredging this habitat would be isolated from this species as a result of noise and localised reduced water quality.

  Pollution and bioaccumulation of contaminants has been shown to reduce the reproductive success of the Osprey, as the species occurs at the top of the food chain. All contaminated sediments and water associated with dredging will remain inside the sheet pile wall area, and sediment outside the sheet pile wall is not expected to be contaminated (specifically, it is not expected to be toxic to aquatic organisms). For dredging within the sheet pile wall, contamination is expected to be contained due to the wall, and the use of turbidity curtains if necessary. Therefore, sediment transport is not expected to be analogous to contaminant transport.

  In response to the mobilisation of contaminants into the water column and leakage from the contaminated site into the river during dredging, it is stated in Section 3.5.4 of Patterson Britton Partners (2003) that consultation with the EPA indicates that provision of the temporary sheet pile wall may alone be an adequate mitigation measure to control water quality impacts during dredging of sediments within the sheet pile wall. A backhoe dredge working in conjunction with barges would remove all of the material contained inside the sheet pile wall. The backhoe dredge would be fitted with a purpose-built clam working with a turbidity curtain. Other environmental controls would also be used. Turbidity monitoring is proposed during the removal and handling activities. The sediment outside the sheet pile wall is considered non toxic to aquatic organisms and suitable for unconfined sea placement. It would therefore be expected that dredging of the sediment outside the sheet pile wall, which would involve some disturbance of sediments into the water column, would not create circumstances that are toxic to aquatic organisms.

The predicted impact of contaminants therefore indicates that the dredging will not result in the mobilisation of contaminants such that they will be transferred into the biological food chain. As a result, the Osprey, a high order predator, is not expected to suffer as a result of bioaccumulation of contaminants, which has been shown to reduce the reproductive success of this species. As a result, the Osprey will not be significantly affected by the proposal.

The South Arm dredging project will not have a significant impact on the Osprey due to the small area of potential habitat that is proposed to be affected and the extent of habitat that occurs within the estuary which will not be impacted by the dredging. The short-term modification of habitats from within the project area is not considered likely to seriously deplete Osprey habitat in the local area and region and the dredging proposal is not considered likely to result in the extinction of the species from within the Hunter Estuary.

- The HBOC considers that the cumulative loss and degradation of habitat as a result of the range of projects proposed within the Hunter Estuary is likely to result in further decline of the coastal bird species habitat on Ash Island, Kooragang Island Nature Reserve and on the important habitat of Stockton Beach.

  The South Arm dredging project will not have a significant impact on coastal birds including the Sooty Oystercatcher, Pied Oystercatcher and Little Tern due to the small area of potential habitat that is proposed to be removed. The loss of habitats from within the project area is not considered likely to seriously deplete coastal bird habitat in the local area and region and the dredging proposal is not considered likely to result in the extinction of the species from within the Hunter Estuary.

  It is acknowledged that the potential for cumulative impacts, including ongoing current and proposed dredging, related to the overall development proposed in the Kooragang Island industrial area to seriously impact the coastal bird population through further habitat reduction, therefore requiring significant investigation. However, this regional assessment of cumulative impacts is outside of the scope of works of this assessment and can only assess the cumulative impacts associated with this specific project.

- The HBOC considers that the cumulative loss, and degradation of habitat and placement of dredge spoil as a result of the range of projects proposed within the Hunter Estuary is likely to result in further decline of the migratory waders in the Hunter.

  The South Arm dredging project will not have a significant impact on migratory waders including the Great Knot, Broad-billed Sandpiper, Black-tailed Turtle, Terek Sandpiper, Lesser Sandpiper and Greater Sandpiper due to the small area of potential habitat that is proposed to be removed. The loss of habitats from within the project area is not considered likely to seriously deplete migratory wader habitat in the local area and region and the dredging proposal is not considered likely to result in the extinction of the species from within the Hunter Estuary.

It is considered that the findings of the 8 Part Tests presented in the Terrestrial Ecology Assessment (Umwelt, 2003) provide an accurate representation of the

potential impacts of the proposal on these species discussed above. Additional 8 Part Tests have been provided in **Appendix A**.

Threatened Species Conservation Act (1995) Key Threatening Processes

- The dredging of the South Arm is not expected to alter the natural flow regime of the river to an extent which would have a significant impact on surrounding wetland areas. The final dredging profile does very little to alter the tidal hydrodynamics of the Hunter Estuary as discussed elsewhere in this report. Overall, the modelling results indicate that tidal hydrodynamics would remain virtually unchanged after the proposed dredging. Slightly more tidal flow would pass through the South Arm, with a slightly increased tidal range at locations near the dredged area. However, the magnitudes of these changes would be very small and would not be expected to have any measurable impacts (PBP, 2003).

  With regard to flooding, it was found that the general flood flow distribution, volumes and duration would not be altered by a significant amount. It was estimated that there would be a localised and substantial reduction in peak flood levels in the South Arm in the vicinity of Tourle Street Bridge and a slightly reduced flood risk throughout the lower Hunter Estuary. These benefits were not expected to cause significant impacts on ecosystems relying on flood inundation (PBP, 2003).

  Salinity intrusion was predicted to slightly reduce, although not to the extent of significantly impacting on mangroves, saltmarsh and fish (PBP, 2003).

  A range of mitigation measures will be implemented to ensure that any impact on the surrounding environment is minimised, refer to Section 6.2 of the Terrestrial Ecology Assessment (Umwelt 2003), and Section 5.3 of this report.

Commonwealth Legislation

- All of the migratory waders listed by HBOC for assessment were assessed during the EIS process. All of these species were included in the list of species that could potentially occur within the study area. The 8 Part Test only applies to species that are listed on the schedules of the *Threatened Species Conservation Act* 1995. The impact of the proposal on migratory waders not listed as threatened was conducted under the provision of the *Environment Protection and Biodiversity Conservation Act* 1999, with a supplementary assessment conducted as a response to the HBOC submission. It is considered that this has adequately assessed the issue of migratory waders.

4.17 DIPNR Additional Information Required

The Department of Infrastructure, Planning and Natural Resources (DIPNR) has requested that the following issues of terrestrial ecology, compensatory habitat, aquatic ecology, various legislation, placement of materials, floodplain management and hydrodynamics, acid sulphate soils, hydrology and water quality and ecologically sustainable development be responded to in this report. This Section outlines the responses to these issues under the following headings.

4.17.1 Terrestrial Ecology and Compensatory Habitat

This development presents an opportunity to provide an improvement to river health. The removal of contaminated sediments in this Section of the South Arm represents one the positive benefits of the proposal, and the compensatory habitat and other measures provided at the end of the project, can also be noted as another benefit. The exact area of compensatory habitat will be determined after all works have been completed to allow the full potential of habitat compensation to be realised. This will include a specific compensatory habitat package determined with reference to the criteria for compensation referred to in Appendix H of the EIS. This package also provides an opportunity to emphasise the synergies between different programs and to maximise integration. This package must also be flexible to contend with other developments within the region.

The discrepancy in the exact area of mangrove and saltmarsh that is to be disturbed by the proposal is noted and now it is confirmed that the most likely area of disturbance will be 5.7 ha of mangroves and 0.9 ha of saltmarsh. This discrepancy between Umwelt and the Ecology Lab assessments is due to a different classification of habitats. Umwelt have classified a large portion of the area east of Tourle Street Bridge as Modified Grassland and Native Species. The Ecology lab has identified this area as mangrove area justifying this increased area. The area of compensatory habitat needs to be negotiated with Kooragang Wetland Rehabilitation Project, Hexham Swamp Rehabilitation Project, National Parks and Wildlife Service (and possibly NSW Fisheries) and other measures may be used in conjunction with this compensation and are discussed below.

A commitment has been made to habitat compensation and notes that habitat compensation should not be limited to mangrove replacement. One option for habitat compensation is the establishment of new areas of mangrove and saltmarsh vegetation in the local area, or the restoration of existing areas of damaged vegetation in the local area. It is recommended that augmentation of an area of existing habitat would be more valuable than the creation of an isolated area of habitat. Similarly, it is considered that habitat enhancement would be of more value than habitat creation.

The creation or maintenance of intertidal feeding areas and roosting habitat for waders in the local area are recommended as valuable contributions to the ecology of the lower Hunter Estuary. The restoration of riparian habitats and instream vegetation could also be used where practical to enhance foreshore habitats.

Another option is the provision of financial contributions to wetland rehabilitation projects in the local area, such as the Hexham Swamp Rehabilitation Project (HSRP) coordinated by the Hunter Catchment Trust, the Kooragang Wetland Rehabilitation Project (KWRP), or The Wetlands Centre Australia at Shortland.

The Healthy Rivers Commission (HRC, Inquiry into the Hunter River, 2002) supports ‘new’ approaches to river rehabilitation, such as the use of long stem native tubestock, and the restoration of large woody debris and riffles. If required, this will be used as a first step to foreshore habitat compensation.

The PEMP will detail the creation of compensatory habitat specifically; measurable objectives, the timeframe for construction (48 months), a detailed monitoring plan will be linked to the measurable objectives and relevant performance measures.

In response to the potential impacts of the works on upstream and downstream of the dredge area related to variation in tides and changes to groundwater levels and likely affect on wetland productivity, as noted in Section 3.3.4 of PBP (2003), given that there would be little alteration to the flooding regime, and also tidal hydrodynamics, it would not be expected that there would be significant alterations to groundwater characteristics.

In response to the bank erosion issue due to an increased flow velocity, bank protection works are proposed for these sections outlined in Section 6.4 of the EIS. Monitoring of these banks will occur during the works and appropriate remedial measures will be employed to address any potential threats to any sensitive areas.

4.17.2 Aquatic Ecology

Regarding appropriate monitoring and assessment of wetland restoration works, methods proposed in the EIS will be built on to allow a complete analysis of any restoration work.

In response to “the impact of changed hydrology under a range of conditions, including extreme events, the simulation of the spring-neap tidal sequence, as well as 1% to 20% AEP flood events, as per (PBP, 2003), is considered to be sufficient in regard to hydrodynamics. That is, consideration of further “extreme events” was not considered to be necessary from a hydrodynamic viewpoint.

Further to the Management Strategies for the Estuary Prawn and Estuary General, close consultation with NSW Fisheries will be conducted to ensure any impact to the commercial fishery of the Hunter is mitigated.

It is noted that re-suspension of particles within the sheet pile wall will be mitigated by the clamshell working in conjunction with the dredging operations and the location of the sheet pile wall.

A list of fish species that are recorded in the area and were sampled by The Ecology Lab (Appendix G, EIS 2003) from the proposed dredge area, North Arm shallow water and deep water are as follows:

1. Yellowfin Bream
2. Flattail mullet
3. Sandy Sprat
4. Large tooth flounder
5. Tarwhine
6. Yellowtail
7. Silver Biddy
8. Mulloway
9. Luminous Bay Squid
10. Red gurnard
11. School Prawn
12. Woods siphonfish
13. Smooth toadfish
14. Mosaic leatherjacket

15. Eastern fortescue
16. Southern herring
17. Dusky flathead
18. Glassfish
19. Sand whiting
20. Unidentified flatfish

No threatened or endangered fish were caught at any site throughout the study period.

Further information will be sought for wading birds of the area, including species occurrences that would be useful for describing wading bird assemblages.

In regard to colonisation of man-made structures, this is outside the scope of the EIS and supplementary report. The berths and land-based development would be subject to separate assessment and approval process.

Dredging will be conducted in conjunction with prawn trawling activities within the Hunter River Estuary. Prawn trawling occurs seasonally in the Hunter River. In the last few years the season open to trawling has been from October to May. During the season prawn trawling is only permitted from 6.00 am to 6.00 pm weekdays excluding each public holiday and is restricted to the Hunter River Estuary downstream of the junction of the Williams and Hunter Rivers. An environmental management plan will be prepared in collaboration with prawn trawlers to minimise effects to the fishery.

An eight-part test has been conducted on the Green Turtle (*chelonian mydas*) and has been included in **Appendix A**. The assessment has concluded that the Green Turtle has a pan–tropical distribution, occurring in suitable habitat worldwide. As such, the study area does not form the limit of distribution for this species.

Recovery of benthic invertebrate communities after large-scale disturbances (e.g., Minshall et al. 1983) suggests that both the total number of individuals and species diversity could recover even in areas of widespread dredging. These benthic communities can rapidly re-colonise small patches of new or disturbed substrate, meaning that the effect that dredging has on benthic productivity is transient, as these communities can recover quickly.

The issues of introduced species due to ballast water, translocation of fouling organisms on the ship's hulls is currently present as the South Arm already operates as a shipping terminal and port. The requirements for the management of ballast water are laid out in the Quarantine Act 1908 and Quarantine Regulation 2000. The Commonwealth agency Australian Quarantine and Inspection Service (AQIS) administers these pieces of legislation. Management of ballast water is therefore considered an operational issue managed at the Commonwealth level and which has little bearing on the proposal.

It is noted that the connectivity and ecological functional significance of the mangroves is important, and measures will be undertaken to ensure that any compensatory methods incorporate these issues into their development.

As previously mentioned, there will be a minimal change to the habitats that will be likely to be affected by the dredging proposal. This change has a significance to the

animals that would colonise this habitat, and compensatory measures will be implemented to mitigate any impact on these areas.

The monitoring program will be directly linked to the management of the area, in direct conjunction with the Environmental Management Plan for the project. Details of this monitoring program, including applicability will be dealt with in the specific EMP for the project. Some minor details have been dealt with in this supplement.

The extent and impact of bank erosion due to shipping and tug movements will be mitigated by bank works including:

- Permanent and temporary batters;
- Rock batters;
- A geotextile membrane with rock underlay; and
- Various rock layers.

All of these measures have been outlined in the EIS. Bank stabilisation works where necessary would employ river sensitive methods.

In terms of hydrodynamics, armouring of the banks is considered to have very little impact on tidal or flood hydrodynamics anywhere in the estuary, including upstream. On a river of this size, the predicted changes to bank roughness would not be expected to significantly alter hydrodynamics, such as flow velocities.

The previously mentioned safeguards, such as turbidity curtains, will mitigate the impact of the sediment plume from the dredging on upstream habitats.

The impact of changed hydrology on the saltmarsh and mangrove areas of Kooragang Island will be minimal as the tidal and flood related inundation would not be expected to alter significantly after dredging. This will have a minimal effect on migratory wading birds, however this may need further assessment to determine management techniques. There are negligible effects downstream (KWRP) of the dredged area, with the maximum changes in tidal planes in order of 2mm. The EIS proposed a monitoring strategy to determine the extent of any impact, it stated *'to assess long-term changes in aquatic vegetation, it is recommended that the distribution of mangrove and saltmarsh habitat upstream of the dredge site is mapped periodically'.*

A detailed turbidity monitoring program would be developed as part of the project environmental management plan for the dredging operations. Development of the monitoring program would involve identification of a threshold level of turbidity, this has been discussed below. Further monitoring of nutrient levels would be undertaken if turbidity exceedances were identified. Relevant responses (such as ceasing activities in the event of exceedance of certain levels, or reducing the dredging rate) and location of mitigation measures including turbidity curtains would be specified. Further details are discussed in Section 5.4 Monitoring Details.

Details of turbidity monitoring-linked to management techniques are discussed in Section 5.4 of this report.

Given that there would be little alteration to the flooding regime, and also tidal hydrodynamics, it would not be expected that there would be significant alterations to groundwater characteristics. There is the potential for long-term cumulative changes to groundwater systems in the area – particularly when the depth of dredging is considered. The proposed excavation and construction of the swing basin represents the largest potential hydrogeological impact due to the considerable alteration of the river foreshore.

4.17.3 Coastal Protection Act 1979 (CP Act)

It is acknowledged that the proposed offshore placement grounds fall just inside the three (3) nautical mile State/Commonwealth waters boundary and therefore concurrence from the Minister is required under Section 38 of the CP Act for any development in this zone. As a result the Minister when making a determination on the proposal will ensure that the proposed placement methods are 'consistent with the principles of ecologically sustainable development, not adversely affect the behaviour of the sea, and not adversely affect any beach or dune or the bed, bank, shoreline, foreshore, margin or flood plain of the sea'.

Information has been submitted as part of the sea dumping application prepared by Patterson Britton and Partners to the Department of Environment and Heritage under the Sea Dumping Act to complete this requirement.

4.17.4 Rivers and Foreshore Improvement Act 1948

The Project Environmental Management Plan will expand on the recommendation made in Section 11.3.1 of the EIS. Bank stability will be monitored as part of the EMP process and details related to monitoring, contingency thresholds, contingencies and remediation actions would also be included.

4.17.5 Placement of Materials

The Department's support for further investigation for surplus spoil placement on Stockton Beach is noted. Such investigations would require significant resources and, if the dredged material was found to be suitable for use on the beach, then separate development consent would be required. As noted in the EIS, all options for placement or use of the clean dredged material are outside the scope of the dredging project and would be the subject of separate approval processes. It is expected that all such investigation work in this area would be carried out by others.

4.17.6 Floodplain Management and Hydrodynamics

It is noted that flood levels from the RMA model should have been compared at critical locations to those in the Lower Hunter Flood Study (Green Rocks to Newcastle), PWD (1994).

In relation to the impact of flood levels from filling of the floodplain and/or stockpiling of fill, additional modelling has not been undertaken at this stage. Various aspects would

be reviewed as part of a separate EIS and approval process for filling any sites in the area.

Any increase in flood levels as a result of the filling would depend on the location and extent of the fill activities. Based on the proposed volume of sand to be delivered to Tomago of 5,720,000m^3 (GHD, 2003) placed over an approximate area of 1.5km^2, this would represent an average uniform increase in elevation of 3.9m. However, the nature of the effect on flooding is dependent on the configuration of the fill (eg if the sand is filling depressions or more uniformly placed), which can be conveniently assessed using a two dimensional numerical model. Given the magnitude and likely extent of the filling activities, it would be expected to have an effect on flood behaviour.

In response to the cumulative impacts on flood levels due to filling of flood plains, the temporary sheet pile wall and the Tomago pipeline, additional modelling was not undertaken at this stage due to the preliminary nature of these activities. The findings would be refined as part of a separate approval process for all filling proposals, including Tomago and the corridor. Also, the final staging of the South Arm project has yet to be determined. In particular, it may be possible that the temporary sheet pile wall would be removed prior to construction of the temporary discharge pipeline.

Although modelling of the combined effect of the sheet pile wall and proposed pipeline has not been undertaken, it can be inferred that the overall effect on flooding would be similar to the effect of the pipeline alone. This is because the sheet pile wall would have a very small effect on flood levels, localised to the dredged area (see Section 3.3.1 of PBP, 2003), whereas the pipeline would cause increases in flood levels further upstream (see Section 3.3.2 of PBP, 2003). The sheet pile wall was predicted to cause an increase in flood levels of less than 5mm at the Railway Bridge, in which case the effects upstream would be expected to be minimal.

The details of the management and monitoring of bank erosion will be detailed within the Project Environmental Management Plan for the proposal. This has been further discussed in Section 5.4 of this report.

The potential impacts of the likely bank erosion mitigation measures (Revetment works, geotextile membranes and reno-mattress), is that there could be localised eddy formation around these banks. This would have a small effect on flow distribution and not create any major downstream effect.

An indication of the time taken for flood waters to rise to critical levels at locations such as at major evacuation routes is seen as insignificant as discussed in Section 3.3.3 of PBP (2003). It would be expected that there would be a reduction in flood levels as a result of the proposed dredging. Also, shown by the flood hydrographs (Figures 30 to 35, PBP, 2003), there would be vary little alteration to the time of rise of floods. That is, the hydrological shapes (and therefore the time of rise) would not be expected to alter significantly as a result of the proposed dredging.

To clarify Chapter 11, the 10% and 20% AEP flood discharges in the Hunter River upstream of Green Rocks are 2000m^3/s and 1100m^3/s respectively (PWD, 1994).

The reference to 200,000ML/d in Section 11.1.4 of GHD (2003) was outlined more fully in PBP (2003), namely "..a minor flood (peak flow about 200,000 ML/d, approximately a 10-20% AEP event)". A 200,000ML/d flow is about 2300m^3/s, so indeed is in the 10%-20% AEP range, based on PWD (1994). Sanderson et al (2002) described this event as a major flood, but their terminology was altered to be consistent with the urban drainage concept that 10-20% AEP floods are minor, and 1% AEP flood events are major.

The New South Wales Government (2001) described minor, moderate and major flooding based on the level of inconvenience and inundation in the flood, from State Emergency Service and Bureau of Meteorology definitions. As defined, in a major flood, appreciable urban areas are flooded and/or extensive rural areas are flooded. In a minor flood, there is inconvenience such as closing of minor roads and bridges.

In the Hunter, the majority of flow is across the floodplain in the 20% AEP and rarer events (PBP, 2003). Therefore, perhaps, in terms of flood effects, the flood noted in Section 11.1.4 should have been described as a "major" flood, or "large" flood as per Table 11.5.

It was stated in Section 2.1 of PBP (2003) "Sanderson et al (2002) calculated the arithmetic mean of river flows from 1975-2000 to be 3120 ML/d, with a median of 720 ML/d. The latter value indicates that for most of the time the freshwater flow is much less than its mean value.

The calibration and verification events for tidal hydrodynamics were based on actual recorded data for October-November 2002 and June-July 2002. As such, with regard to baseline flow conditions, the actual flows recorded at Greta, Glen Martin, and Gostwyck were used as input to the model (see Section B3.5 of PBP, 2003). As shown in Section B4.2 and B4.3 respectively, the flows during the calibration and verification periods were less than the median flow, in the order of 220ML/d and 520ML/d for each of these periods.

All water quality simulations undertaken (salinity, arbitrary conservative constituent for pollutant flushing and pollutant dispersion, and sediment transport, as described in Section 3.4 to 3.7 of PBP, 2003), were based on the calibration period hydrodynamics. That is, the baseline flow for the water quality simulations was the recorded flow during the calibration period, which was about 220ML/d, during a long period of little rainfall in the Hunter River catchment.

The clarification of flow rates located in Chapter 11 is provided in Section 3.2.4 of PBP (2003) with information on pre and post dredging tidal flows. It was noted that a slight increase in average ebb and flood tide flows would be expected in the South Arm, with a slight decrease in the North Arm. Under existing conditions, the South Arm took about 20% of the average tidal flow at Walsh Point. After dredging, it was predicted that this would increase to 21%.

As requested, these flows can be time integrated to determine tidal volumes. Pre and post dredging tidal volumes over the 29-day tidal simulation are listed in **Table 4.1.** These are the total ebb and flood tide volumes over the 29 days. Tidal volumes for

spring tides only are given in **Table 4.2**, and tidal volumes for neap tides only are given in **Table 4.3**.

Table 4.1 Predicted pre and post dredging total tidal volumes in 29 day simulation

Site	Total Ebb Tide Volume (GL)		Total Flood Tide Volume (GL)	
	Existing	Dredged	Existing	Dredged
Ocean Entrance	1353	1362	1349	1357
Entrance to Throsby Creek	54	54	54	54
Main Channel at confluence with Throsby Creek	1232	1240	1227	1236
Downstream Entrance to South Arm	227	241	232	245
Downstream Entrance to North Arm	933	929	925	922
North Arm near Tomago	293	290	283	281
Tourle St Bridge	116	121	118	127
South Arm near Ash Island Bridge	62	66	69	73
Hexham Bridge	322	322	306	306

It is evident that, after dredging, the total tidal volume entering and leaving the Hunter River at the ocean is predicted to very slightly increase (by less than 1%). In terms of the tidal volume distribution at Walsh Point, 20% of the existing ebb and flood tidal volume was found to be taken by the South Arm, with the remainder taken by the North Arm. After dredging, this proportion was predicted to change to 21%. Both neap and spring tides were found to be affected in a similar manner.

It is assumed that the statement ‘to provide some discussion of the cumulative impact of the proposed dredging on tidal response’ refers to the cumulative impacts on tidal hydrodynamics since pre-European times. As noted in Section 2.8 of PBP (2003), the mean spring tidal range increased by up to about 0.2m between 1955 and 2000 (in the Hexham Bridge to Green Rocks reach), with one reference suggesting this was mainly due to construction of floodgates, and another emphasising the effects of harbour dredging. Given that the effects of the proposed dredging on tidal range are in the order of couple of mm, it can be considered that the additional impact of the proposal would be two orders of magnitude less than what has already been experienced in the estuary.

Table 4.2: Predicted pre and post dredging total tidal volumes in 29 day simulation (spring tides only)

Site	Total Spring Ebb Tide Volume (GL)		Total Spring Flood Tide Volume (GL)	
	Existing	Dredged	Existing	Dredged
Ocean Entrance	822	828	829	835
Entrance to Throsby Creek	34	33	34	34
Main Channel at confluence with Throsby Creek	747	753	754	760
Downstream Entrance to South Arm	137	146	143	151
Downstream Entrance to North Arm	567	565	568	567
North Arm near Tomago	171	169	166	165
Tourle St Bridge	70	72	71	77
South Arm near Ash Island Bridge	36	39	42	44
Hexham Bridge	188	188	180	180

Table 4.3: Predicted pre and post dredging total tidal volumes in 29 day simulation (neap tides only)

Site	Total Neap Ebb Tide Volume (GL)		Total Neap Flood Tide Volume (GL)	
	Existing	Dredged	Existing	Dredged
Ocean Entrance	531	534	520	523
Entrance to Throsby Creek	20	21	20	20
Main Channel at confluence with Throsby Creek	481	487	473	476
Downstream Entrance to South Arm	90	95	89	94
Downstream Entrance to North Arm	367	365	357	355
North Arm near Tomago	122	121	117	116
Tourle St Bridge	47	49	46	50
South Arm near Ash Island Bridge	26	27	28	29
Hexham Bridge	134	134	126	126

The table comparing the changes in tidal flow shows negligible changes in the 'average' flood and ebb flows, but significant changes in the peak flow rates. In PBP (2003) Table 11 and 12, the Tourle Street Bridge average flow changed by about 3-8%, while the peak flow changed by about 7-8%. It is difficult to interpret the former as a 'negligible change' if the latter is a 'significant change'. Tidal response is non-linear, so an exact correlation in changes between averages (over many tidal cycles) and peaks (maximum in one cycle) would not be expected in this case. Peak values would be expected to show greater variability. However, the general pattern of larger changes in peaks corresponding to larger changes in averages, of the same relative magnitudes, is considered to be evident. For example, the average flow at Ash Island Bridge changed by 4-8%, while the peak flow changed by 4-11%; and, the average flow at the downstream entrance to the North Arm changed by 0-1%, with the peak flow also changing by 0-1%. Therefore, these results are not considered to be contradictory.

It is agreed that it is important to show there is no major change to the flow distributions to both main channels. As noted above, a very small change in the distribution of tidal volume into the North and South Arms was predicted, with a generally similar response in ebb and flood tides, over the full tidal range.

Flood levels will have an impact on the sediment transport capacity. Sediment outside the sheet pile wall is not expected to be contaminated (specifically, it is not expected to be toxic to aquatic organisms). For dredging within the sheet pile wall, contamination is expected to be contained due to the wall, and the use of turbidity curtains if necessary. Therefore, sediment transport is not expected to be analogous to contaminant transport due to flooding.

In relation to the sediment transport capacity due to channel cross-sections and flows from the dredging works, PBP (2003) indicated that the increase in peak mean velocity at Tourle St Bridge was about 40% in the 1% AEP event. Therefore, if sediment transport capacity is proportional to velocity to the 4^{th} power, then this represents an increase of about 3.8 times in the sediment transport capacity.

To indicate the duration of the altered velocities at Tourle St Bridge for a rare event, a time series of mean (cross-section averaged) velocity at Tourle St Bridge, for the 1% AEP event, is given in **Figure 4.1**.

To determine the 50% AEP event, the peak discharges at the upstream end of the RMA model, for each of the design simulations undertaken (1%, 2%, 5% and 10% AEP), were plotted against the AEP of the event (see **Figure 4.2**). A line of best fit through these points was extrapolated to estimate the 50% AEP peak flow.

To determine the 50% AEP hydrograph at the upstream end of the RMA model, the 10% AEP hydrograph was scaled by the ratio between the 50% and 10% AEP peaks, a ratio of 0.44. The 50% AEP tailwater level was determined from Figure 7 of PWD (1994), namely 1.17m AHD.

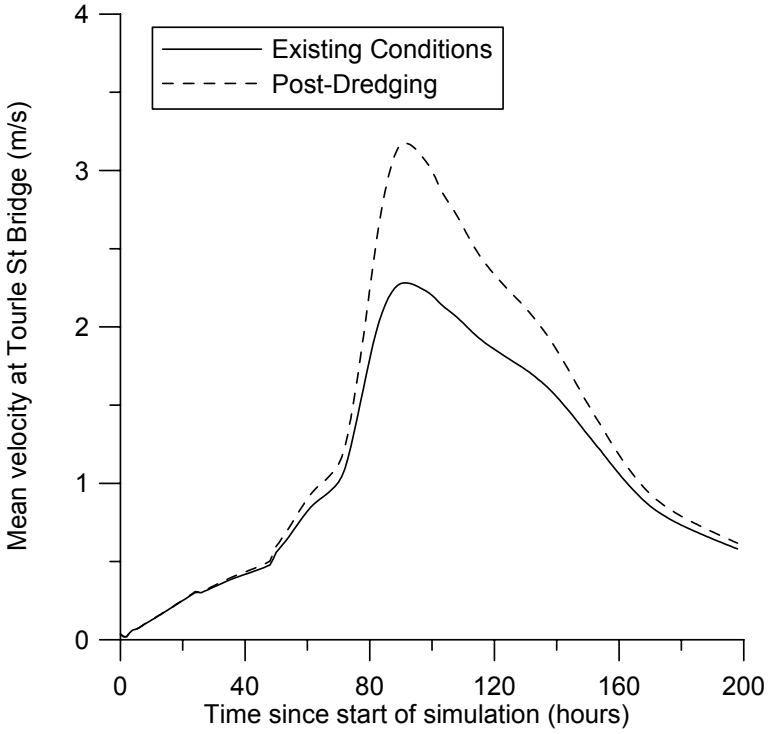


Figure 4.1: Mean velocity at Tourle St Bridge for 1% AEP event, for existing and post-dredging conditions

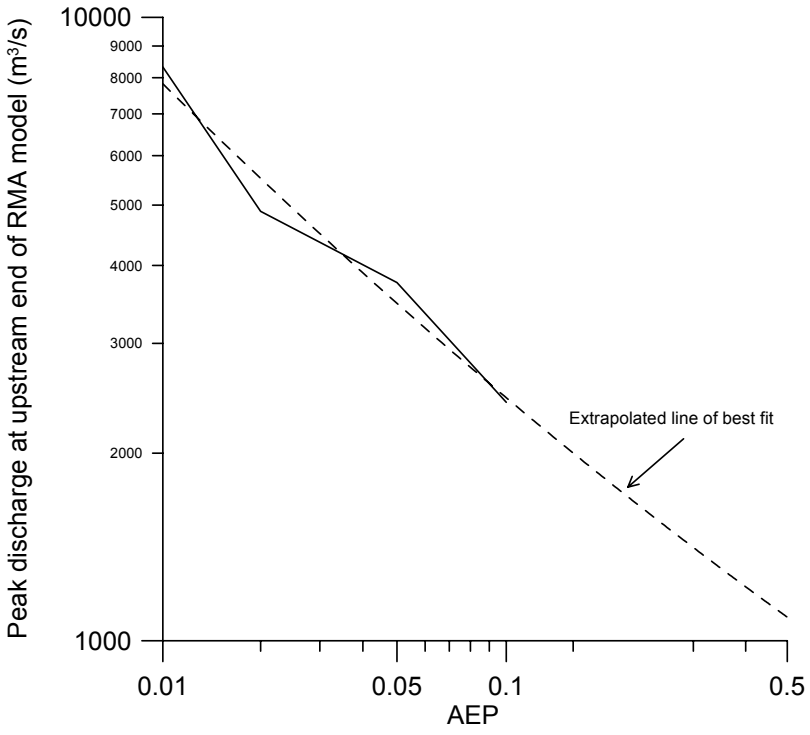


Figure 4.2: Peak flows for design flood events, extrapolated to 50% AEP

The 50% AEP flow and tailwater was simulated in the RMA model. In **Figure 4.3**, the peak mean (cross-section averaged) velocity, raised to the fourth power, for the Tourle St Bridge to Ironbark Creek reach, is shown for this simulation. Note that only in-channel velocities were included. The 50% AEP simulation was an overestimate of the bank-full flow as overbank flow did occur upstream of the Railway Bridge.

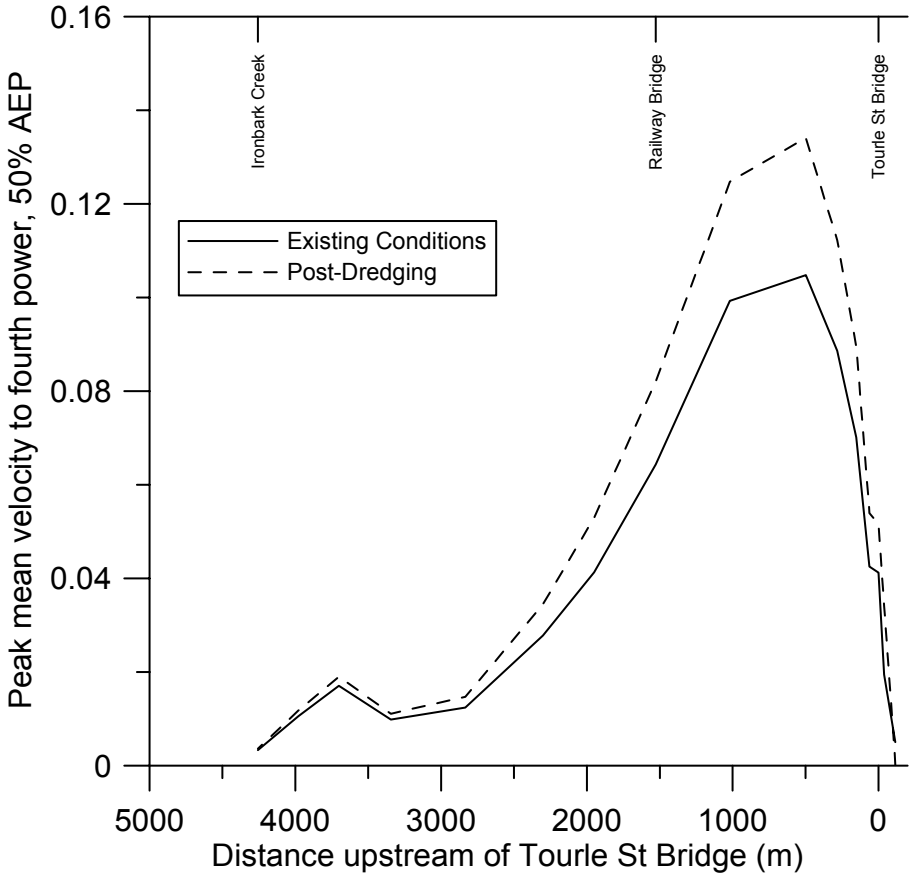


Figure 4.3: Velocity to fourth power upstream of Tourle St Bridge, to Ironbark Creek, for 50% AEP event.

It is evident, assuming the peak 50% AEP velocity to the fourth power is analogous to long-term sediment transport potential, that there would be about a 25% increase in sediment transport potential to about 1km upstream of the Railway Bridge, reducing to 10% at Ironbark Creek. The Tourle St Bridge to Ironbark Creek reach would be monitored to observe any channel adjustments that may occur as a result of the increased sediment transport potential.

Discussion on the potential for sediment transport capacity in the dredged area and future maintenance dredging needs is provided in Section 3.6.3 of PBP (2003).

The salinity simulations described in Section 3.4.1 of PBP (2003) were undertaken using the hydrodynamic data from the calibration simulation as input. That is, baseline flows were the low flows actually measured during the calibration period in October to November 2002, during which time there was very little rainfall (and flows were less

than the median flow). This is an appropriate and conservative method of investigating salinity intrusion.

Continuing the salinity modelling beyond the 29 days simulated in PBP (2003), the results at 87 days (three repeated spring-neap sequences of 29 days each, an additional 58 days over what was simulated previously), for existing and post-dredging conditions, are shown in **Figure 4.4** and **Figure 4.5** respectively. Given the similarity of the results for existing and post dredged conditions (less than 0.6ppt difference throughout the estuary after 87 days), it was not considered necessary to continue the simulations beyond 87 days. The scale is 2000m for both figure 4.4 and 4.5.

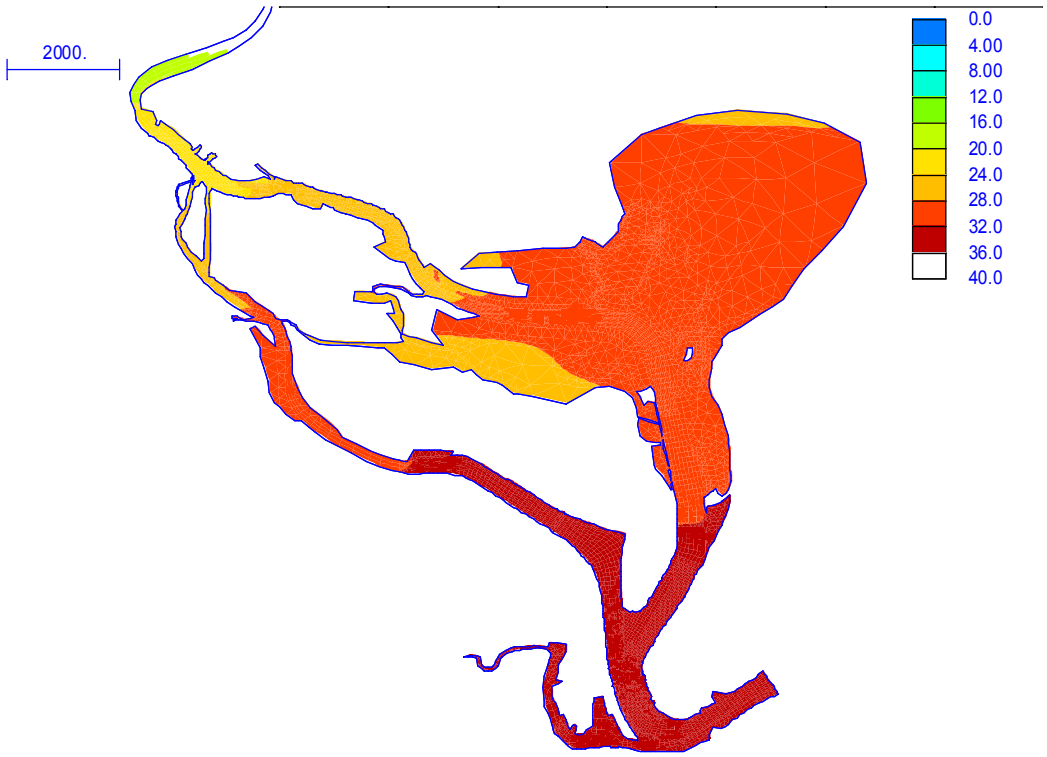


Figure 4.4: Salinity contours after 87 days of tidal simulation, for existing conditions measured in ppt (parts per thousand)

In regard to the flushing results not being identical to the salinity recovery results, as described in PBP (2003), the flushing simulations utilised an arbitrary conservative constituent:

- Assuming an initial concentration of 100g/m^3 throughout the estuary, reducing in time as unpolluted oceanic waters mixed in the estuary (Section 3.5.1); and,
- Releasing a concentration of 100g/m^3 in the South Arm (Section 3.5.2).

As described in Section 3.4.1 of PBP (2003), the salinity simulations involved investigating the inflow of saline oceanic waters into an initially fresh estuary.

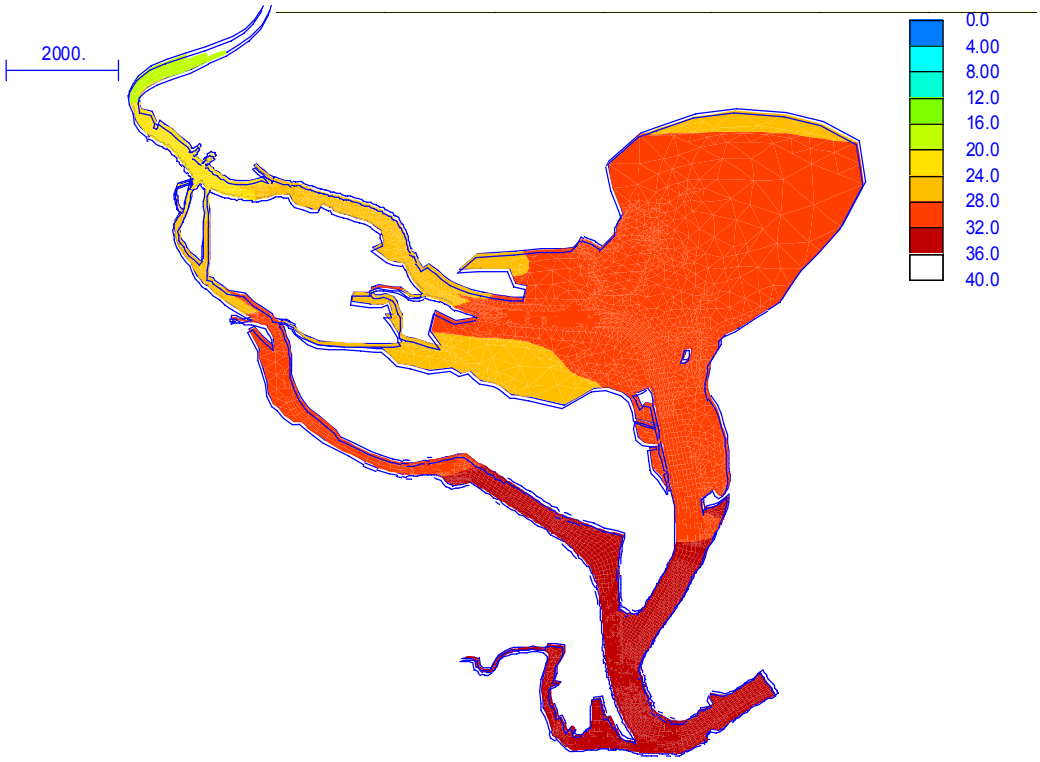


Figure 4.5: Salinity contours after 87 days of tidal simulation, for post-dredging conditions measured in ppt (parts per thousand)

It is assumed that the question is implying that there is an expectation that the results of Section 3.5.1 should be similar to the results of Section 3.4.1.

As described in Appendix D2 of PBP (2003), for the salinity simulations, eddy-diffusivities used were based on the estimates of Sanderson et al (2002), that is 100m^2/s downstream of Raymond Terrace and 60m^2/s upstream, with 3m^2/s in the Williams River. These values were directly used in the simulations for the longitudinal direction, with transverse values one-tenth of the longitudinal values.

However, for the flushing simulations, the method of specifying the diffusion coefficients was different. Horizontal diffusion coefficients were applied in the direction of flow. For the longitudinal direction they were computed from the input values scaled by the velocity magnitude only. The transverse coefficients were defined as a further factor times the longitudinal value. The values used were based on typical parameters used in other studies, being a factor of 0.2 for the longitudinal direction and a transverse multiplier of 0.2.

4.17.7 Acid Sulphate Soils

Additional sampling and analysis will be undertaken to ensure the material within the proposed dredging area is adequately characterised as acid sulphate soil and the extent of Acid Sulphate Soils is adequately quantified. This will be conducted with

regard to *The Acid Sulphate Soils Manual* (ASSMAC, 1998). In accordance with the manual, 2 samples/hectare equates to over 250 sampling locations. The manual also recommends that sampling would take into consideration the depth of soil/sediment to be disturbed and the different layers/horizons within the soil profile and that these samples would not be mixed. It is anticipated that the successful tenderer will undertake this sampling and report to the proponent any outstanding issues.

The material to be exposed to oxygen will mostly be clean sand that is not acid generating. The majority of material (silt), will be placed offshore and will not be exposed to oxygen. An acid sulphate management plan will be prepared prior to the commencement of the proposed activity by the successful contractor.

4.17.8 Hydrology and Water Quality

In regard to flow distribution, this has been outlined above, and overall the modelling results indicate that tidal hydrodynamics would remain virtually unchanged after the proposed dredging. Slightly more tidal flow would pass through the South Arm and at locations near the dredge site, at a slightly increased tidal range. However, the magnitude of these changes would be small and not expected to have any measurable impacts.

The impact on future operations on water quality with respect oil discharges from new port developments would be minimal. Existing procedures are currently in place that would mitigate any oil and/or fuel discharges.

To manage the potential for adverse impacts on water quality, the proposal would be subject to controls documented prior to commencement of construction in a water management plan, which would form a component of the overall environmental management plan for the proposal. In regards to mitigating the dredge plume, a potential location for a turbidity curtain would be at Tourle Street Bridge, or further upstream at the Railway Bridge in the South Arm. Based on the tidal hydrodynamic modelling undertaken, the maximum cross-section averaged tidal velocities at Tourle Street Bridge and the Railway Bridge would be expected to be about 0.4m/s and 0.3m/s respectively. However, maximum tidal point velocities at these locations could be expected to be in the order of 1m/s.

It should be noted that during the bulk sampling and testing program that was completed, as part of the EIS a turbidity curtain was effectively deployed over a 4 day period. It was necessary, during higher flow periods, to adjust the anchoring system to ensure that no leakage occurred. On the basis of this experience it is considered that a turbidity curtain could be successfully managed for the majority of the time during the completion of the actual dredging works.

The EIS explained that there would be impacts on fish with respect to noise, these were outlined in Section 12.3 and were as follows:

- Proposed methods would generate noise during operation and this could disorientate fish; and

- Sound waves created during rock blasting can affect the swim bladder of fish and kill fish depending on the intensity and distance from blasting.

Since the strategies to minimise impacts on fish from blasting were not included in the EIS, the following is proposed for the proposal:

- Fish avoidance techniques include the use of strobe lights;
- High frequency sounds would be affective in excluding fish; and
- Bubble curtains would reduce the pressure wave experienced by fish by essentially creating an energy-absorbing volume of air within the water column.

The method used would be finalised in the Project Environmental Management Plan in consultation with NSW Fisheries.

Turbidity monitoring is proposed during the removal and handling activities. The contractor would be required to ensure that no significant or visible change in turbidity levels occurs in the surrounding waters (it should be noted that some increase would be expected and permitted). This would involve regular measurements and/or inspection of the area immediately surrounding the dredge by the contractor. The results of this monitoring would be recorded in a logbook. Should a significant change in turbidity levels be observed, the contractor would be required to immediately contact the superintendent and cease dredging at this location until turbidity has returned to normal levels and measures had been implemented to ensure that such a change in turbidity levels does not occur again. It is agreed that turbidity monitoring equipment can play a useful role if regularly calibrated and serviced. Note also that suspended solids and turbidity are different parameters. It may be possible to establish a relationship between suspended solids and turbidity for the Hunter River but only if the particle size distribution remains reasonably constant.

Increased tidal amplitudes, caused by dredging and changes in riverine nutrient and sediment loads, can cause the expansion of mangroves into saltmarsh areas (Saintilan, 1999). It has previously been stated that there will be minimal increase to tidal planes, therefore reducing this impact.

Changes in hydrology are likely to have an small effect on the saltmarsh and wetland communities on Kooragang. The comment made on 11.22 of the EIS was related to the fact that there would not be expected to be significant changes in tidal and flood-related inundation. Given that there would be little alteration to the flooding regime, and also tidal hydrodynamics, it would not be expected that there would be significant alterations to groundwater characteristics and saltmarsh and mangrove expansions.

Section 11.2.10 p 11.30 of the EIS identifies a 40-90mg/L increase in turbidity [sic] levels in some parts of the South Arm as a result of the dredging activities. As commented above and noted in Section 3.6.1 of PBP (2003), the sediment transport simulations were undertaken assuming that only dredged sediments were being introduced, that is, background suspended solids concentrations were assumed to be zero.

The existing (background) suspended solids estimate of 40mg/L was based on the mean flow of the Hunter River at Hexham. At the median flow, which is much smaller

than the mean, the suspended solids estimate at Hexham was only 7mg/L, as per Section 2.6.3 of PBP (2003). As noted in this Section, suspended sediment concentrations during low freshwater flows were estimated to be about 4 to 30mg/L in the port area, with higher concentrations near Hexham.

In terms of duration of impact, this would be closely related to the dredging rate and hydrodynamic conditions. For the sediment transport simulations undertaken, the assumed dredging rate was 1740g/s continuously for 27 weeks, with the suspended sediment concentrations shown after a period of 29 days. In reality, the dredging rate would be more pulsating, with generation of suspended solids over the dredging period, then no further generation while the dredge sailed out to sea to dispose of the sediment and then returned. Furthermore, the generation of suspended sediments was mainly related to the trailer suction hopper dredge. Other dredgers, such as the backhoe dredge, would utilise a turbidity curtain, while the cutter suction dredge would remove sands and harder material such as rock, which would not remain suspended in the water column for long periods, therefore not generating the same level of turbidity

To give an indication of the duration of suspended sediment impact, time histories of suspended sediment concentration in the 29-day simulation are shown in **Figure 4.6,** at Kooragang No. 2 berth, Tourle St Bridge, and Ironbark Creek.

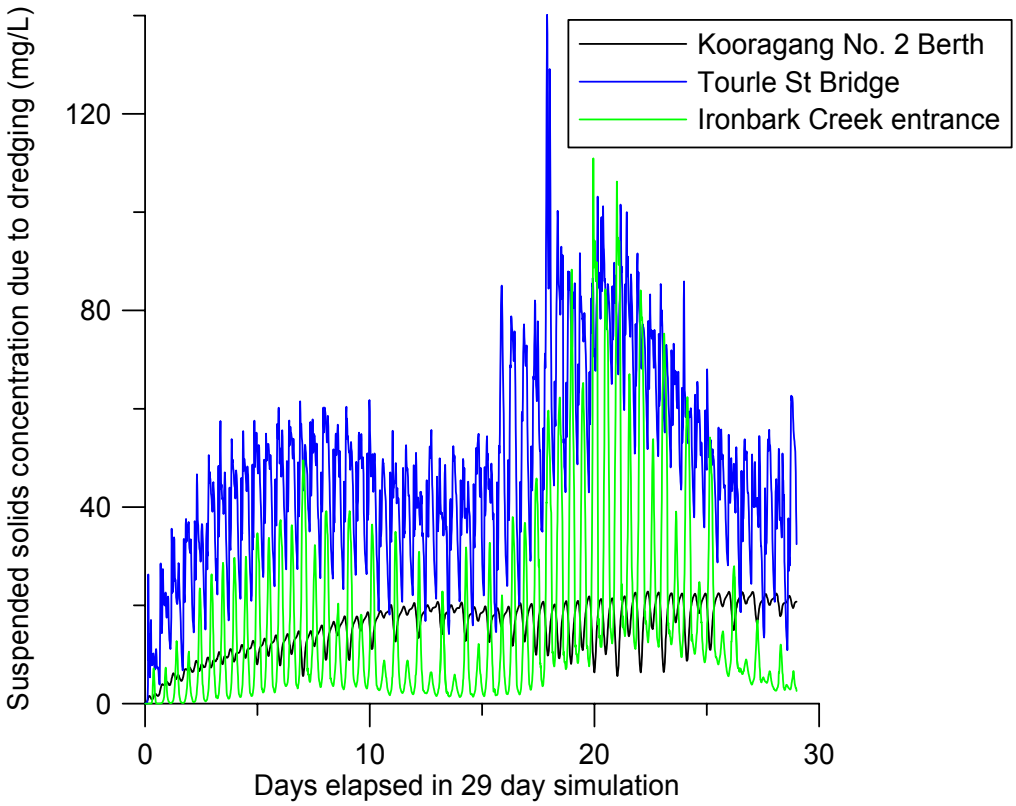


Figure 4.6: Time histories of suspended sediment concentration at Kooragang No. 2 berth, Tourle St Bridge, and Ironbark Creek, during 29 day simulation

In response to turbidity monitoring needs to be based on a scientifically based strategy clearly linked to management techniques, this has been dealt with previously and in Section 5.4 of this report.

With regard to groundwater level changes, refer to Section 3.3.4 of PBP (2003). Given that there would be little alteration to the flooding regime, and also tidal hydrodynamics, it would not be expected that there would be significant alterations to groundwater characteristics.

With regard to bank erosion, the main issue is the potential for increased velocities upstream of the Tourle St Bridge, leading to channel adjustment. This issue was discussed previously in DIPNR, Floodplain and Hydrodynamics.

4.17.9 General Issues

In response to Section 10.2.1 of the EIS not specifically referencing the KWRP, Section 10.2.5 details this project in more detail in terms of its existing land use.

In relation to the impact of filling in conjunction with the pipeline, this has been discussed above in Floodplain Management and Hydrodynamics.

Further investigations will be conducted in regard to the potential impacts an increase in flood level will have on existing properties at Hexham that are well below the 1% AEP. Page 11.18 of the EIS states, '*Given that floor levels for habitable areas of dwellings are generally required to be 500mm above the level of the 1% AEP flood in this area, the effect of increased flood levels is considered to be relatively insignificant for development sited according to this requirement'.* Also, Appendix F of the EIS (PBP, 2003), states that '*there would be a slightly reduced flood risk throughout the lower Hunter Estuary'* as a result of the dredging. The proposed dredging is predicted to lead to a reduction in flood levels. With regard to assessing impacts due to the discharge pipeline, temporary sheet pile wall, and filling activities, this would require additional modelling, which has not been attempted at this stage. The findings from this modelling would need to be refined as part of the separate approval process for all filling proposals, including Tomago and the corridor. See above responses in Floodplain Management and Hydrodynamics for further discussion.

Ecologically Sustainable Development

Sustainable development may be defined as development that 'meets the needs of the present without compromising the ability of future generations to meet their own needs' (Brundtland Report, 1987).

Schedule 2 of the *Environmental Planning and Assessment Regulation* 1994 lists four principles of ecologically sustainable development, which are to be considered. They are:

- The precautionary principle;
- Intergenerational equity;
- Conservation of biological diversity and ecological integrity; and
- Improved valuation and pricing of environmental resources.

Each of the four principles of ESD, as established again by the *EP&A Regulation* 2000, is described below, with a comment regarding how the proposal contributes towards each principle.

Precautionary principle

This principle states that *'if there are threats of serious or irreversible damage, lack of scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation'.*

The assessment of the potential impacts of the proposal is considered to be consistent with the precautionary principle. The environmental assessments undertaken for this EIS are consistent with accepted scientific and assessment methodologies. This has included:

- An odour assessment;
- A noise impact assessment
- Impact assessments on terrestrial and aquatic habitats;
- A tidal dynamics flooding and water quality assessment;
- A sediment quality data assessment;
- A groundwater assessment;
- A heritage impact assessment; and
- A hazards and risks assessment.

These detailed investigations and analysis and field studies that have been undertaken have identified a range of potential impacts. These have been outlined in the EIS and added to, in this supplementary report. A number of safeguards have been recommended to minimise potential impacts, in addition a range of management and monitoring measures have also been proposed, which have also been outlined in the EIS and this report. These safeguards would be implemented during construction and operation of the proposal. No proposed safeguards have been postponed as a result of lack of scientific certainty.

The selected contractor would be required to prepare a detailed Environmental Management Plan (EMP) prior to commencing construction. This EMP would detail all of the mitigation measures outlined in the EIS. This requirement would ensure that the proposal achieves a high level of environmental performance. No mitigation measures or management mechanisms would be postponed as a result of a lack of information.

It is recommended that environmental performance in relation to the EMP be regularly assessed through external environmental audits and monitoring of turbidity, bank erosion and other factors. The audits would assist in assessing the adequacy of safeguards implemented to minimise environmental impacts. In addition, monitoring of these factors would ensure that safeguards are implemented in a correct and timely fashion.

Intergenerational equity

This principle states, '*the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations'*. In other words, we should ensure that future generations do not inherit a degraded environment.

Consistent with this principle, the EIS has identified that the proposal would not result in significant long-term impacts that would lead to degradation of the environment. There is currently a need to increase the capacity of the port facilities for all port users. The proposal will achieve a positive long-term result for the region in terms of increased port capacity, future employment generation and the more effective utilisation of land use within the area. The natural environs surrounding the proposal will be maintained for future generations, as the proposal will ensure that compensatory mechanisms are in place to allow for habitats to be maintained.

The safeguards and management mechanisms recommended within the EIS, and the design features relating to water quality, would minimise the potential for environmental impact and degradation.

It is not expected that the proposal will jeopardise the sustainability of the environment in the long term.

Conservation of biological diversity and ecological integrity

This principle states that *the 'diversity of genes, species, populations and communities, as well as the ecosystems and habitats to which they belong, must be maintained and improved to ensure their survival'.*

The study area has been highly modified and is intensively used. The terrestrial flora and fauna assessment did not identify any significant potential impacts to flora and fauna, other than the removal of a small stand of mangroves located near the Tourle Street Bridge and some effects on inter-tidal areas upstream. Compensatory habitat and other mechanisms will also be provided to ensure the balance of any loss of ecosystems and habitats as a result of this proposal and that local genetic diversity is maintained. These arrangements and agreements would also ensure the enhancement of the ecological units with the area. Areas of significant vegetation and the South Arm will be monitored periodically to determine any cumulative impact.

Water management mechanisms during construction and operation including turbidity curtains and the sheet pile wall would ensure that the potential for impacts to aquatic ecology is effectively mitigated. The use of the best available technologies will be used to ensure the effective management of the process.

Improved valuation and pricing of environmental resources

This principle requires that *'costs to the environment should be factored into the economic costs of a project'.*

The EIS has examined the environmental consequences of the proposal and identified mitigation measures where the potential to experience adverse impacts exists. These have been outlined in the EIS and this report. Construction of the proposal would be

required to conform to a high level of environmental performance, guided by the development and implementation of a rigorous and detailed EMP. Requirements imposed in terms of implementation of these mitigation measures would result in an economic cost to the proponent and contractor and ultimately to the community. The implementation of mitigation measures and compensation measures would increase both the capital and operating costs of the proposal.

The proposal also recommends that the clean sand removed as a result of the dredging process be reused.

The concept design for the proposal has been developed with the aim of minimising potential impacts on the surrounding environment. This indicates that the concept design for the proposal has been developed with an environmental objective in mind.

4.18 Newcastle Port Environs Concept Proposal

As a requirement of DIPNR's submission, the proponent needs to address any submissions from the proposal that are considered relevant to the extension of shipping channels proposal. It should be noted again that this report was not part of the consent process for the EIS and remains a separate document. The following provides a response to these issues.

Response:

As stated in the Concept Proposal, there is vast potential for the Newcastle Port to expand and grow economically through facilitation of access to deep water land. The proposal aims to facilitate and encourage:

- The use of port-front land by port related industries;
- Land that is suitable for port-related industrial development being made available for such uses; and
- Opportunities that exist to build upon the competitive advantages evident in the Newcastle Port Environs for economic growth, including potential for deep water access, proximity to a major airport and the potential for infrastructure links (KBR, 2003).

The areas proposed for port related industrial land mainly include the water front land, in areas around the South Arm. There are approximately 2,800 hectares of industrial zoned land within the Newcastle Port Environs (including the airport) with much of this land constrained by areas of conservation value and existing infrastructure. Currently, emerging industrial uses continue to drive a level of demand for port-related land. Making land available now for future industrial development will ensure that this growth is unconstrained and the heavy industries that can generate significant employment opportunities can create economic activity for the region as a whole.

The special requirements of migratory shore birds recognised under the *Environmental Protection and Biodiversity Act* 1999 (EPBC Act) would be incorporated into any compensatory measures proposed. It is noted that the land South of Tomago Road would be considered as a possible site for compensation, depending on NPWS

requirements. The provision of compensatory habitat would allow a net positive result for the ecological processes of the wider Hunter catchment.

In response to the Regional Land Management Corporation submission that this proposal provides an opportunity to manage and fund wetland environments from Hexham Swamp and Ash Island/Tomago/Kooragang in an integrated way, an assessment for habitat compensation will be conducted reflecting the extent if any, of habitat loss due to the activity. Habitat compensation measures would be discussed with NPWS, NSW Fisheries, Local Council and other rehabilitation projects within the area will also be considered.

In response to the concerns of fragmentation of habitats, in relation to this proposal, a likely area of disturbance of 5.7 ha of mangroves 0.9 ha of saltmarsh is required. Compensatory measures will be in place after the proposal has been completed and have been outlined in this report.

The implications on Ramsar wetlands would be that buffer zones would be maintained around these areas, and no development allowed in this zone as a requirement of the EPBC Act.

It is noted that pedestrian and cycleway access around the estuary would provide more public access to bird observatory sites. This would form part of future developments associated with the region and be provided under a separate development process.

The proposal encourages the use of port front land by port-related industries, and it is noted that there would be equal emphasis on reserving crown land for foreshore protection and public benefit. This report has outlined measures included to stabilise foreshores and to provide compensatory habitat. This would ensure better use of existing land uses and allow for future growth in the Port area.

In response to the development footprint and research into changes in hydrology from dredging, this report has outlined the changes in hydrology expected from dredging of the South Arm as a part of this assessment.

It is noted that any development should be sympathetic to riparian health, groundwater and acid sulphate soil issues. The dredging operations would include monitoring of riparian areas and the testing of groundwater and acid sulphate soils.

5. Additional Information

5.1 Additional Work Undertaken

For the preparation of this supplementary report, Patterson Britton and Partners, and Umwelt and internal groups within GHD were asked to submit additional information to support the responses to the submissions received from exhibition of the EIS. Further research was also conducted by GHD into cement stabilisation and the treatment of contaminated sediments.

5.1.1 Additional Modelling

As noted in various parts of this report, there is the potential for additional modelling if required, partly depending on the future nature of activities that were associated with the now shelved Austeel project (such as a transport corridor and filling activities in Tomago). This modelling is outside the scope of the dredging project and subsequently for the EIS and this supplementary report. The potential additional modelling that may need to be undertaken would need to form part of a separate EIS and approval process for each of the other land based projects as noted. This would comprise of:

- Modelling the discharge pipeline in conjunction with the transport corridor, and/or floodplain filling; and
- Modelling a transport corridor and/or floodplain filling in conjunction with post-dredging conditions.

Any assessment of flood damages as a result of increases in flood levels would also require additional work.

5.1.2 NSW Scientific Committee Final Determination-Coastal Saltmarsh

In December 2003 the NSW Science Committee released a Preliminary Determination supporting a proposal to list Coastal Saltmarsh in the NSW North Coast as an Endangered Ecological Community. The Committee, established by the Threatened Species Conservation Act, has now made a Final Determination to list the Coastal Saltmarsh in the NSW North Coast, Sydney Basin and South East Corner Bioregions, as an *Endangered Ecological Community* in Part 3 of Schedule 1 of the Act. The National Parks and Wildlife Service would be consulted prior to any removal of this species.

5.2 Project Environmental Management Plan

A Project Environmental Management Plan (PEMP) for the proposed dredging operations and the sediment treatment and placement methods would need to be developed prior to Stage One of the proposal commencing. For the purposes of this report, Project Environmental Management Plan is equivalent to Environmental Management Plan. The PEMP would cover all operations in the lifecycle of the dredging process and including sediment treatment and placement components. Two

separate Environmental management plans (EMPs) would be produced for the proposal once initial Stage One consent has been obtained from DIPNR, one for the dredging operations (Section 5.3.1), and the other for the treatment of the dredged contaminated sediments (Section 5.3.2). These EMPs would also need to be produced for the Stage Two works once the results of the trial remediation are available.

The selected contractor would be required to prepare the detailed PEMP prior to commencing construction. The following is a guideline of suggested sections within each of the Environmental Management Plans that would need to be addressed by the contractor undertaking the works to form part of the PEMP.

All staff and contractors are to be briefed on the potential impacts of the project and the necessary safeguards/control measures required prior to works commencing.

The EMPs would:

- Provide guidance during the final detailed design of the proposal. This would enable all safeguards, environmental goals and consent conditions to be considered and incorporated during the design phase;
- Ensure all safeguards outlined in the EIS, supplementary report and conditions of approval are implemented on site;
- Ensure that all activities are carried out with due diligence;
- Ensure that all activities comply with relevant environmental legislation including Acts, regulations, Standards and best management practices; and
- Instruct contractors of the measures and standards required when undertaking activities on site (including monitoring and performance requirements). The EMPs would form the basis for environmental specifications in any contractual agreements between the proponent and the contractor.

The PEMP will detail the creation of compensatory habitat specifically, measurable objectives and the timeframe for construction. A detailed monitoring plan will be linked to the measurable objectives and relevant performance measures. Monitoring has been discussed in Section 5.4 of this report.

Some of the additional management policies that would be implemented as part of the Project Environmental Plan would include:

- Health and safety plan;
- Operator training and induction;
- Standard operating procedures;
- Contractor induction;
- Dedicated smoking and non-smoking areas;
- Work permits;
- Safety audits and inspections;
- Safety procedures;

- Control of plant modifications;
- Emergency procedures; and
- Site security.

5.2.1 Dredging Operations EMP

A Dredging Operations EMP for the proposed dredging operations would need to be developed. This EMP would cover all operations in the lifecycle of the dredging process including set-up, operation and dismantling phases. This EMP would also cover the dredging of contaminated sediments. Specific issues that would be addressed by the Dredging Operations EMP would include:

Dredged sediment management plan

This would describe the procedures for handling, transporting and storing of dredged sediments. As described in this EIS, sediments with varying levels of contamination would be encountered and dredged. Sediment treatment methods would depend on the levels of contamination and thus the plan would include procedures for management of sediments in each of the treatment streams. Typical controls and mitigation measures that would be included in the plan would be:

- All trucks carrying sediment off-site would be covered;
- Truck routes and storage locations would be established prior to dredging;
- Details of treatment method, location and type; and
- Transfer areas of sediments between trucks and excavators would be established and protected with the appropriate environmental controls;

Flora and fauna management plan

This would include measures to protect flora and fauna during dredging and blasting, procedures for monitoring impacts on flora and fauna at the dredging site and nearby environmentally sensitive areas, and revegetation of land based and river bed work areas.

The flora and fauna management plan would be prepared by an appropriately qualified and/or experienced ecologist prior to the commencement of site establishment works in consultation with NPWS and to the satisfaction of DIPNR and the proponent. Other measures have been discussed elsewhere in this report.

Typical controls and mitigation measures that would be included in the plan are:

- During and following implementation of the proposal, mangrove forest and associated fauna located upstream would be monitored, to ensure that the proposal does not result in impacts to upstream mangrove habitat;
- Dredge operations would not span the width of the waterway at any time blocking fish passage; and
- Where feasible, a buffer zone of at least 30 metres would be maintained around mangroves that do no need to be affected.

Acid sulphate soils management plan

This plan would clearly state the desired outcome from undertaking the activity, identify the risks involved, the likely implication(s) if acid is generated, strategy(s) to address minimise risks, the monitoring strategy, alternate placement (contingency) plan(s) and remediation/rehabilitation strategy(s). The preferred management strategy would include the following activities:

- Removal of sediment from the removal area utilising the specialist plant and equipment described within the project;
- Initial treatment of material loaded in barges through the addition of lime and transportation to an onshore facility;
- Close monitoring of the material for oxidation prior to unloading of the barges and unloading of the tucks at the onshore placement sites; and
- The implementation of contingency measures such as the addition of lime as required should monitoring indicators exceed acceptable levels.

Soil and water management plan

This would include measures to retain topsoil, prevent erosion, control and confine surface waters and river water with high sediment loads, and ensure rehabilitation of work areas is comprehensive and effective.

Measures to prevent erosion would target the excavated riverbank, any temporary stockpiles of remediated dredged sediments, and the various work areas. This component of the plan would be developed in accordance with the NSW Department of Housing guideline 'Managing Urban Stormwater – Soils and Construction' and other relevant documents. This plan would also describe the procedure for confining sediment laden river waters during dredging and blasting and the safe storage and handling of hazardous materials, dangerous goods or explosives that could have the potential to cause pollution. Typical controls and mitigation measures that would be included in the plan are:

- All trucks leaving the construction site will exit via a wheel shaker ramp. The wheel shaker ramp can be constructed from a cattle grid as wells as a coarse rock layered on geotextile;
- Implement erosion, sediment and pollution control measures and practices during site preparation works and construction including the installation of sandbags/straw bales, with geofabric filters, around culverts discharging to council drains;
- An emergency contingency plan for dealing with accidental spills would be developed;
- Monitor erosion during site preparation works and construction and carry out regular inspections and maintenance of erosion and sediment controls to ensure their correct operation, particularly following rain events; and
- Use best practice construction techniques to minimise disturbance particularly for pile driving.

Other environmental control provisions proposed would include the deployment of turbidity curtains around the land-based excavators, the large cutter suction dredge and the plant and equipment involved in the drilling and blasting.

Dependant on the monitoring of water quality, a potential location for a turbidity curtain would be at the Tourle Street Bridge (or further measures around dredging operations), or further upstream at the Railway Bridge in the South Arm. It would not be necessary for theses curtains to be in place during floods, so this design and location allows relatively convenient removal and reinstatement of the curtain, being advantageous. Possible threshold values in relation to turbidity for this action are discussed in Section 5.4 of this report.

Also a heavy-duty turbidity curtain would be deployed, if required, across some of the South Arm upstream of the dredge area when trailing suction hopper dredges were using overflows. This would control turbidity spreading upstream beyond the disturbed waterway area.

These barriers would be placed permanently, assuming they did not interfere with navigation and fish passage.

There are several options for the arrangement of turbidity barriers depending on the prevailing conditions:

- Open ended - silt curtains along side of channel only;
- Enclosed - silt curtain enclosing all dredging works;
- Staged - smaller area of the enclosed silt curtain were maintained to minimise likelihood of failure; and
- Box silt curtain - deployed with chains at approximately 2.5m depth and on the channel floor to ensure the curtain is hung vertically.

Specific details of this will be dealt with in the PEMP.

Waste management plan

The waste management plan would include procedures for managing and handling wastes that may be salvaged during dredging. The plan would seek to minimise the placement of encountered wastes to landfill. Procedures for waste management including minimisation, segregation, reuse and recycling would also be addressed in this management plan. Typical controls and mitigation measures that would be included in the plan are:

- Site areas and skips would be supplied to ensure any recyclable materials are segregated and stored appropriately for transportation to a recycling centre. Arrangements would be made with a garbage collection service provided to collect garbage from the site; and
- Erection of compulsory ‘PREVENT POLLUTION’ environmental signs for all building sites.

Dust management plan

A dust management plan would include measures to control dust from exposed areas, stockpiles, truckloads and roads subject to heavy traffic. Mitigation measures to minimise the generation of dust would target dust generation by vehicle movements and dust generation from exposed remediated sediment stockpiles. Typical controls and mitigation measures that would be included in the plan are:

- The use of water carts to control dust concentrations as required;
- Shade cloth would be attached to fences around stockpile locations to stop the transportation of dust;
- Trucks would be covered to stop dust; and
- All stockpiles kept moist or covered to stop transportation of dust.

Noise and vibration management plan

A noise and vibration management plan would detail noise and vibration control measures that would be implemented during blasting works, dredging operations and transport of dredged materials. The plan would ensure noise and vibration would comply with various EPA, ANZECC and Australian Standards guidelines and manuals. Typical controls and mitigation measures that would be included in the plan are:

- Sheet piling would only be performed during the daytime, between 7.00 am and 6.00 pm Mondays to Fridays and 7.00 am to 1.00 pm Saturdays;
- Remediation activities would only be performed during the daytime where possible;
- Remediation activities and drilling would not occur simultaneously where possible;
- Remediation activities and sheet piling would not occur simultaneously where possible;
- Sirens and alarms on all equipment would be adjusted so as not to cause disturbance at surrounding residential receivers during night-time operation;
- In order to reduce the impact of ground vibration and airblast, blasting would only be conducted between 7.00 am and 6.00 pm from Mondays to Fridays and 7.00 am and 1.00 pm Saturdays;
- The use of quietest plant available regularly maintained and fitted with appropriate mufflers;
- Minimising the potential for impact type noise events during night time periods;
- Notification of residents prior to noisy or vibration generating activities; and
- Noise monitoring to ensure best practice is being implemented.

Traffic management plan

This plan would describe the procedures for managing:

- Vessel movements during dredging works (The speed and movement of all barges and support vessels would be kept to a minimum and comply at all times with Waterways regulations);

- Truck movements during the transport of materials excavated from the banks of the river; and
- Parking and access requirements for construction personnel.

The plan would include the requirements for safety and hazard signs and markers, traffic detours and road maintenance. Types of controls and mitigation measures that would be included in the plan are:

- The erection of signs at site entry/exit point(s);
- Monitoring of traffic and intersection operations would be undertaken during the early stages of transport operations to evaluate and amend trucking operations if required;
- A temporary signalised intersection of Cormorant Road would be provided at the existing National Power access road at the eastern end of landfill, to improve Cormorant Road access from the Kooragang Island landfill sites and the Northern bank of the Hunter River;
- If transportation of materials were to occur from the Southern bank to the possible placement sites on Kooragang Island, a 24-hour, seven day a week transport regime for the inert material would be adopted. This is required to reduce the traffic impact on the surrounding road network, either by reducing the total amount of time of the operations or reducing the rate of transportation;
- Where possible, concurrent transport of both inert and treated material would not coincide in order to avoid higher trucking rates, resulting in increased impact on the adjacent road network;
- While there would be some potential transport conflicts within the OneSteel site, these would be managed internally within OneSteel;
- Where possible, general deliveries to the site would occur after 9 am to reduce the impact of the delivery vehicles on the road network. Allowance would be made for any specialist deliveries if tasks are critical to the construction program;
- Delivery of inbound materials (particularly the larger quantities such as rock material for river banks) would reduce their delivery rate during or avoid background traffic peak periods (approximately 7.00 am to 9.00 am and 4.00 pm to 6.00 pm) as far as possible, in order to reduce the impact on the adjacent road network during peak times; and
- To reduce the employee traffic impact, shift change times would be aligned so that staff traffic movements do not occur during either the morning or afternoon peak periods on the adjacent road network.

Community participation management plan

This plan would describe the processes that would be established to allow community concerns, issues and grievances to be received, handled and acted upon. The plan would describe the methods and timing of all public communications.

It is recommended that in addition a consultation and communication plan be developed covering local businesses, surrounding residents and the wider community. The plan would detail activities to be implemented in the lead up to, and during, implementation of the main proposal. There would not be such a plan for the trial remediation project. Recommended consultation tools include:

- A nominated and dedicated consultation manager responsible for ongoing liaison with the community and businesses/clubs;
- A community hotline – operating 24 hours during the dredging period – to enable response to questions, complaints etc;
- Regular meetings with key stakeholders and surrounding residents. This would include discussions with surrounding businesses and landowners (including businesses on the OneSteel site and Kooragang Island) regarding access and other requirements to identify potential issues and develop appropriate management mechanisms. Other key stakeholders include residents of surrounding suburbs, environmental and other community groups, and Newcastle Council;
- Widely advertising changes to access arrangements along the South Arm;
- Project newsletters/information sheets distributed to surrounding landowners, businesses and residents;
- Regular project updates in the *Newcastle Herald*; and
- A project information signboard erected in the vicinity of the South Arm providing regular update on the progress of the proposal, contact details and the like.

Other environmental issues

Management plans for energy use, hazards and risks, geotechnical issues and visual screening would be developed. Types of controls and mitigation measures that would be included in the plan are:

- The potential for impacts to operations on the OneSteel site would need to be carefully managed during the implementation of the proposal. In association with the EMP a management plan would be developed, in consultation with OneSteel and its lessees, to detail the management measures necessary to minimise the potential for impact on the operations of these businesses;
- Further liaison with other landowners and tenants would be carried out during the approvals process;
- The transportation of hazardous materials including details of routes to be used for the movement of vehicles to and from the sheet pile wall area;
- Locate well stocked spill response kit on site. Have access to applicable MSDS sheets. Any spills/leaks from machinery must be captured with suitable absorbents; and
- Surrounding land users including commercial and recreational users of the port would be notified of the operating hours and duration of the dredging operations.

One of the most effective means of ensuring the ongoing safe operation of a facility is through implementing a comprehensive Safety Management System, as recommended in the Draft National Code of Practice for the Storage and Handling of Dangerous Goods (NOHSC, 1998). Such a system would ensure that hazards associated with the site are identified and managed, so that all activities are undertaken in a safe manner.

5.2.2 Sediment Treatment and Placement EMP

As for the dredging operations EMP, the sediment treatment and placement EMP would cover all aspects over the life cycle of the sediment treatment and placement component of the proposal. This EMP would need to also include management techniques for the dredging and treatment of contaminated sediments (this process is subject to consent and trial conditions).

All consent conditions relating to sediment treatment and placement together with those conditions that may be required under a Protection of the Environment Operations Licence for the establishment of a contaminated soil treatment works would be included in the sediment treatment and placement EMP.

Specific plans would include:

Water management plan

This plan would include procedures for the management of treatment process wastewater, erosion and sediment control and management of domestic wastewater. Typical controls and mitigation measures that would be included in the plan are:

- All trucks leaving the construction site will exit via a wheel shaker ramp. The wheel shaker ramp can be constructed from a cattle grid as well as a coarse rock layered on geotextile;
- Implement erosion, sediment and pollution control measures and practices during site preparation works and construction including the installation of sandbags/straw bales, with geofabric filters, around culverts discharging to council drains;
- Monitor erosion during site preparation works and construction and carry out regular inspections and maintenance of erosion and sediment controls to ensure their correct operation, particularly following rain events; and
- Use best practice construction techniques to minimise disturbance particularly for pile driving.

The contractor would need to negotiate with the EPA the terms of the licencing requirements.

In regard to discharge waters, the following will need to be addressed in this Section:

- Specification of the compliance standards for discharge waters;
- Details of the testing program of discharge waters (minimum of weekly samples);
- Outline the method of treatment for discharge waters to meet the water quality discharge criterion; and

- Specification of contingency measures to be undertaken to ensure compliance with allowable limits.

Onshore stormwater management plan

The onsite areas associated with the proposal would need to be subjected to rigorous stormwater planning and management. The principles of the stormwater plan would centre on the need for very strict separation of 'clean' and 'contaminated' materials to avoid the contamination of sediments by rainwater. Typical of controls and mitigation measures that would be included in the plan are:

- A sediment pond (size to be determined);
- Erection of Compulsory 'PREVENT POLLUTION' environmental sign for all building sites;
- Silt fences, hay bails, and geotextile barriers around stormwater/discharge culverts near or adjacent to the site and/or access points; and
- The main stormwater discharge channel for Mayfield, North of Crebert Street will need to be relocated prior to the establishment of the sheet pile wall. Newcastle City Council would be consulted concerning this issue.

The contractor would be expected to adhere to the requirements of Newcastle Council's Stormwater Management for Development Sites (DCP No. 50).

Noise and vibration management plan

This plan would include noise control measures, monitoring, remedial measures and procedures to handle complaints about noise. Typical mitigation measures would include:

- Sirens and alarms on all equipment would be adjusted so as not to cause disturbance at surrounding residential receivers during night-time operation; and
- The establishment of a complaint register telephone number for the project that was directly linked to on-site staff to ensure the immediate rectification or reduction of noise impacts.

It is envisaged that the treatment processes would not cause excessive noise.

The offshore placement of sediments is not considered to produce excessive noise impacts.

Air quality and odour management plan

The plan would include procedures for controlling treatment process air emissions, odours, dust and fumes. If dewatering of dredged sediments with geobags is required, the following mitigation measures are recommended:

- Full barges are covered;
- Minimise the exposed surface area of geobags to much less than 80,000 m^2 (the actual acceptable area would need to be determined) by limiting the number of bags in use at any one time; and

- Using suitable odour masking agents.

The following general mitigation measures would be implemented to minimise the generation of dust by vehicle movements during dredging and sediment remediation operations:

- Machinery would be kept to well defined areas and truck loading/unloading areas would be confined;
- Truck movements would be controlled by restricting movements to designated sealed roadways;
- Existing unsealed haulage roads would be upgraded to gravel/ballast covered roads or similar to ensure all weather access;
- The use of wind barriers in potential dust generating areas would be considered during site establishment design, including shade cloth attached to fences;
- Trucks used to transfer dredged materials would be maintained in accordance with the manufacturer's specification and would comply with all relevant regulations;
- 'Smoky' or oil-smoke emitting vehicles would be removed from service;
- Truck wheel washes or other dust removal procedures would be installed to minimise transport of dust offsite;
- On entering and leaving the site, trucks would be covered;
- Water carts would be used to dampen roadways subject to high traffic movements; and
- Inspections of haulage roads would be conducted during days on which construction activities were occurring and dust generation would be monitored visually during operations.

The quantity of material stockpiled would be minimised at all times. Where practicable, clean excavated materials would be loaded, hauled and placed at the designated backfill location without the need for stockpiling.

Stockpiles would only be constructed in areas of the site that have been located and prepared in accordance with the environmental requirements of the proposal. All such preparatory works would be undertaken prior to the placement of material in the stockpile. Exposed stockpile surfaces would be regularly watered to minimise dust generation.

Works would be undertaken initially to clear the area of rubbish, rubble and vegetation. The area would then be trimmed and graded, so that any local depressions or mounds are removed. The final surface of the stockpile area would then be made smooth and even. Silt fences and diversion drains would then be constructed around the perimeter of each stockpile area. The silt fences and diversion drains would be constructed in accordance with the environmental requirements of the proposal.

Signs would be erected at the entrance to the stockpile area and at locations around the stockpile specifying the material type to be stored. Buffer zones and access routes

would be established around each stockpile area to prevent cross-contamination and enable access from adjoining haul roads.

All long-term soil stockpiles on site would receive surface treatments, as required, to reduce dust or odour emissions. Temporary stockpiles would be monitored to determine the need for surface treatment as per long-term stockpile applications on a regular basis. Surface treatments may include:

- Spray grass seeding;
- Mulch cover;
- Coating materials such as PVA spray;
- Non-odorous soil cover; or
- Polyethylene sheet covers.

All stockpiles would be maintained in a safe condition. Batters would be formed with sloped angles that are appropriate to minimise erosion and prevent slumping of the stockpiled material.

The integrity of neighbouring stockpiles of differing materials would be maintained and all measures necessary to prevent mixing of material types would be undertaken.

Sediment management plan

This plan would contain procedures for the management of remediated sediments including handling, transport, storage and placement. The plan would include procedures for placement of remediated sediments to land and sea.

Other environmental issues

Management plans for energy use, hazards and risks, geotechnical issues, and visual screening would be developed.

5.2.3 Environmental Reporting

Audits

Independent environmental audits would be carried out twice a year. These audits would not cover the trial remediation project. The audit report would be made available to the Director-General (DIPNR), Council, DEC, NPWS, and any other interested parties.

Audits would also be conducted on the implementation of the final PEMP.

Records

Full records of all environmental procedures would be kept including:

- Monitoring data and analysis;
- Details of quantities of sediments treated using cement stabilisation;
- Details of quantities of sediment placed at the various placement locations off site;
- Details of the quantities of sediments placed at sea;

- Details of quantities and types of waste removed from site;
- The number of environmental complaints received, their nature and the corrective action taken; and
- Details of all environmental licences and approvals applied for and obtained.

Reporting

An annual review would be prepared and submitted to the EPA and DIPNR. This document would not cover the trial remediation project. This document would include:

- A statement of compliance with all development consent conditions;
- A statement of compliance with all licence conditions; and
- A monitoring and complaints summary.

If any shortcomings of on site activities or environmental controls were identified, the EMPs would be amended accordingly and resources would be provided to ensure compliance.

Incidents that would cause material harm to the environment would be reported to the EPA, investigated and acted upon.

5.3 Monitoring Details

Environmental monitoring is the collecting and interpreting of data to provide quantification of the effectiveness of the Project Environmental Management Plan (PEMP) and accuracy of the predictions made in the EIS and this supplementary report. A monitoring program enables auditing of safeguards to ensure they achieve their objectives and to facilitate modification where necessary. Additional details of the monitoring proposed during dredging and during sediment treatment and placement can be located in Section 27.3 of the EIS.

Environmental monitoring would be required for water quality, air quality, noise and vibration and aquatic flora and fauna. A monitoring plan would be included in the EMPs that would detail monitoring locations, frequency, duration and methodologies. The management techniques will be directly linked to the monitoring of these factors.

An amount of baseline data on the abundance and distribution of benthic taxa and fish species was collected in the present study. There is a need to capture more of this data prior to the dredging operation. Suggested monitoring prior and post dredging include:

- At least two sampling periods before dredging commences to determine the abundance of most species – whilst the proposal would result in total loss in the area of impact – this data provides a baseline to compare recovery following dredging;
- Any test for impact would require additional sampling periods during and after dredging;
- Monitoring of physical water quality parameters (both up and downstream of the dredging area) such as sediment, turbidity and nutrients would determine whether

the safeguards are adequate. Threshold levels for these parameters, and responses should these levels be exceeded, would be specified within the PEMPs. Monitoring during construction would be particularly important during and following rainfall events;

- To assess long-term changes in aquatic vegetation, it is recommended that the distribution of mangrove and saltmarsh habitat upstream of the dredge site is mapped periodically; and
- Long-term water quality measures such as upstream salinity, turbidity and changes in temperature and dissolved oxygen in the dredged section would provide evidence of effects from the proposed dredging.

A monitoring program, to ensure that dredging does not result in adverse impacts to marine communities must be implemented as part of the PEMP. Monitoring must be frequent and sensitive enough to rapidly detect changes so that dredging practices can be changed, if required. In particular, the following requirements would be addressed:

- Establishment of ambient water quality parameters including turbidity, light penetration and chemical indicators at selected sites upstream;
- Continuous monitoring of water quality parameters during dredging to confirm EIS predictions and allow for changes to dredging processes if required.

The turbidity monitoring process involves the contractor monitoring changes in turbidity levels in the surrounding waters. This would involve regular measurements and/or inspection of the area immediately surrounding the dredge location by the contractor. Monitoring would take place, inside and outside the turbidity barrier around the operational plant, and also monitoring could take place at a specified distance upstream. Further details of this would be dealt with in the plan. The results of this monitoring would be recorded in a logbook and the following records must be kept in respect of any samples required to be collected:

1. The date(s) on which the sample was taken;
2. The time(s) at which the sample was taken;
3. The point at which the sample was taken; and
4. The name of the person who collected the sample.

Some typical threshold values, which would yield the deployment of barriers/curtains further upstream or additional measures around operational plant, would be:

- Good (< 5 Nephelometric Turbidity Units (NTU)) – no additional barriers deployed;
- Fair (5-50 NTU) – additional barriers deployed; and
- Poor (> 50 NTU) – cease (or slow) dredging and/or conduct checks.

These are only estimates and are not final values, it should also be noted that visual inspection would also be used to determine the need for additional turbidity barriers. Also, existing turbidity values would need to be measured prior to dredging to ensure an accurate reading. Monitoring during operation would be particularly important during and following rainfall events.

The deployment of barriers will take approximately 25-45 minutes after a fair turbidity reading has been monitored as stated above.

The most effective method of testing for turbidity is by using a turbidity tube. For this test you simply collect water and pour into the tube until you cannot see the markings on the bottom. Record the reading from the side of the tube. If possible, stand the tube on a white tile. These tubes are handy because they are cheap and simple to use. A seechi disc can also be used. For greater accuracy a nephelometer could be used. This instrument determines the scattering of light and is measured in standard Nephelometric Turbidity Units (NTU). This is only a suggested monitoring method, as visual inspection will mostly be used as the criteria for deployment of additional mitigative measures.

Should a significant change in turbidity levels be observed, the contractor would be required to immediately contact the superintendent and cease dredging (or reduce the dredging rate) at this location and deploy additional turbidity curtains until turbidity has returned to normal levels and measures had been implemented to ensure that such a change in turbidity levels does not occur again. This deployment would either involve additional curtains around plant, or curtains placed further upstream (this location would either be at Tourle Street Bridge, or Railway Bridge, as stated elsewhere in this report). Details of this would be dealt with in the final PEMP.

The NSW Government has established a major scientific program referred to as the Integrated Monitoring of Environmental Flows (IMEF), (HRC, 2002). The environmental side of the program involves the collection of biological, physical and/or chemical data from river sites and wetlands within sections of the river that are affected by the flow rules. The program is designed to provide not only additional understanding of the flow responses of riverine ecosystems based on sound scientific methods, but also an opportunity to evaluate the environmental performance of the flow rules themselves. The IMEF program has been designed and progressively implemented across the state since 1997. Monitoring is now underway in the Hunter Valley to assess the response of the river and associated wetlands and estuaries to the environmental flow rules using IMEF methods. The IMEF has the potential to be used in conjunction with the dredging project to determine any upstream impacts.

5.3.1 Monitoring of River Processes and Bank Erosion

The Contractor would formulate and implement a River Processes and Bank Erosion Monitoring Program, to the satisfaction of DIPNR and the proponent. Typical measures that the monitoring program would include are:

- A survey of the quantity of dredged material;
- A survey of the South Arm 1 km upstream and downstream from the dredge site, on each bank;
- Survey cross-sections would be approximately 100-200m. The first survey would be undertaken immediately prior to the dredging operations, and then at 3 month intervals and/or immediately after any flood event;

- Additional survey cross sections would be taken within the area of immediate dredging at intervals no more than 20m;
- The results linked to a recoverable datum;
- Determine the current rate of riverbank and bed erosion at the above points using a method approved by DIPNR and the proponent;
- Under circumstance whereby the dredging operations have induced erosion, suitable mitigation measures are to be applied by the contractor;
- Post dredging, survey monitoring may be reduced to every 6 months with determination by DIPNR; and
- The distribution of mangrove and saltmarsh habitat upstream of the dredge site is mapped periodically.

A restoration project involving compensatory habitat would most likely be monitored by a suitable contractor (or the HSRP and KWRP members) for at least 10 years to ensure the system is stable. Reports on the progress of the compensation project would be submitted to DIPNR or the relevant Council authority.

5.3.2 Remediation Actions

The following remediation actions are recommended for the proposal:

- Conduct bank restoration on either side of the South Arm by way of bank improvements and revegetation.

A Landscape Management Plan (LMP) would be developed to guide revegetation following the dredging work. The landscape management plan would outline measures to ensure appropriate development and maintenance of landscaping on the site. The plan would address the requirements of Council, and include:

- Details of all landscaping to be undertaken on the site;
- Maximisation of flora species endemic to the locality in landscaping the site, and general consistency with any landscaping works undertaken elsewhere on Kooragang Island;
- Details of public access arrangements where appropriate, including improvements to public access to the foreshore of South Arm along Cormorant Road, near the Energy Australia Wind Generated Turbine; and
- Programs to ensure that all landscaped areas on the site are maintained in a tidy, healthy state.

The LMP and bank restoration works would be consistent with the relevant aims and objectives of the following development control plans:

- DCP No. 20 - Guidelines for Industrial Development,
- DCP No. 33 - Landscape Design Principles and Guidelines; and
- DCP No. 41 - Kooragang Port and Industrial Development.

The plan would be included in an information display, that would be mounted in the vicinity of the South Arm to provide both a written and graphic description of the proposal.

5.4 EPA Licencing

Based on the information contained in this EIS, a number of environmental approvals, licences and permits may be required. These are listed in **Table 5.1**.

Table 5.1: Approvals, Licences and Legislation

Act	Administering agency/approval authority	Approval/permit/licence required
NSW legislation		
Environmental Planning and Assessment Act 1979	DIPNR	Development consent
Environmental Planning and Assessment Act 1979	Principal certifying authority	Construction certificate
Maritime Services Act 1935	Waterways Authority	Approval under Section 13D to carry out dredging in the Hunter River.
Fisheries Management Act 1994	NSW Fisheries	s205 permit to cut, remove, damage or destroy marine vegetation on public water land or on the foreshore s219 permit to create an obstruction across a waterway
Protection of the Environment Operations Act 1997	Environment Protection Authority	Environment protection licence under Section 48
Dangerous Goods Act 1975	WorkCover	For keeping/storage of dangerous goods
Road and Rail Transport (Dangerous Goods) Act 1997	WorkCover	Licence to transport dangerous goods by road or rail
Environmentally Hazardous Chemicals Act 1985	EPA	Licences for chemicals subject to chemical control orders
Commonwealth Approvals		
Environment Protection and Biodiversity Conservation Act 1999	Environment Australia	Approval under Sections 8 and 9
Environmental Protection (Sea	Environment	Permit under Section 10 to

Act	Administering agency/approval authority	Approval/permit/licence required
Dumping) Act 1981	Australia	dispose of material at sea and a permit under Section 12 to load a vessel for the purposes of dumping at sea

In addition to the above, approvals may be required from the relevant utility providers for connection to their systems. An approval under Section 138 of the *Roads Act 1993* may also be required from the RTA if the proponent is:

- Erecting a structure or carrying out a work in, on or over a public road;
- Digging up or disturbing the surface of a public road;
- Removing or interfering with a structure, work or tree on a public road;
- Pumping water into a public road from any land adjoining the road; and
- Connecting a road (public or private) to a classified road.

The need for an approval would be determined depending on the final design of the proposal.

The works contractor would also be required to comply with all statutory requirements, which relate directly to work practices such as:

- Trade Practices Act;
- Construction Safety Act; and
- Occupational Health and Safety Act.

5.5 Cumulative Impacts

It is noted that the Newcastle Port Environs Concept Proposal is to be further developed, following consultation with the community, and that it take into account the proposal considered by this supplementary report and other possible future infrastructure and industrial developments that have the potential to affect the significant environmental features of the area.

It is recognised that cumulative impacts of development of the estuary as a whole need to be considered. DIPNR has commenced a process to achieve this objective. The proponent supports this process and believes it is the most appropriate mechanism to address cumulative impacts. The following has been provided as a response to the general comments relating to cumulative impacts. It should be noted that cumulative impacts have been mentioned elsewhere in this report.

In consideration of the cumulative ecological impacts, the proposal is regarded as having a long-term benefit to aquatic organisms, while the short term impacts are noted as being detrimental to aquatic life. The short-term impacts of the proposal include the net loss of habitat on the North bank by removal of mangroves and saltmarshes due to the significant deepening of the channel. The dredging process could also result in some sediment transport increasing the turbidity of the South Arm,

this causing an impact to aquatic organisms. However, the removal of the contaminated sediments would improve the overall health of the estuary in the long term, and the provision of compensatory habitat would allow a net positive result for the ecological processes of the wider Hunter catchment.

The general cumulative impacts are discussed in Section 25 of the EIS. One of the associated benefits of the proposal is to remove the contaminated sediments and to facilitate the entry of large vessels into the port and this would provide increased opportunities for growth, employment and the stimulation of the economy in the area and improve the estuaries quality. During construction, the main cumulative impacts of the proposal are considered negative, for example (the introduction of typical construction related impacts); increased traffic generation; noise impacts, effects on flora and fauna, habitat loss and hydrological effects. These impacts are however, considered to be short term, and other long term cumulative impacts are also considered for the proposal, which would counterbalance some of these impacts.

In regard to cumulative impacts on Kooragang Island (KWRP sites) and Hexham Swamp (HSRP), these areas are adjacent to future development (not associated with this proposal), and these impacts need to focus on development within the Hunter region as a whole, not as just one proposal. The EIS and this supplementary report have identified impacts associated with the dredging proposal, however, further to the Newcastle Port Environs Proposal, more detail is required for all of the proposed development within this region to correctly and accurately define the cumulative impacts.

Long-term effects of dredging include the cumulative effects associated with the dredging or placement of contaminated materials and the landscape changes in estuarine/marine bathymetry and habitat characteristics resulting from dredging activities. Long-term landscape changes that result from dredging include productivity changes, the conversions of shallow subtidal to deeper subtidal habitats, the conversion of intertidal to subtidal habitats, and changes to estuarine circulation. However, as noted above, measures have been proposed that will ensure that long-term impacts have been foreseen and will be managed.

It is noted that any potentially adverse effect and impact of the proposal could be managed by the implementation of specific mitigation measures that would be provided in the Project Environmental Management Plan. That is to say, the dredging proposal in isolation would not lead to any significant environmental degradation in the long term. However, potential cumulative impacts could arise through the facilitation of infrastructure development opportunities arising as a result of the extension of the port.

As part of its strategic planning process for Kooragang Island, Newcastle Port and environs, it is recommended that the NSW Government continue to provide input to, and assist in facilitating, the overall sequencing of all proposed developments in the area. This would be the first step in minimising the potential for overall negative cumulative impacts in the region.

6. Trial Remediation Project

6.1 Overview

The DEC, in its letter dated 9 February 2004, indicated that the results of the testing of the cement stabilisation of contaminated river sediments have raised some questions with respect to the effective use of this process in a remediation strategy. The main concern is the extent to which the material will be subject to cracking, physical erosion or weathering, and in turn the significance of leaching PAHs as a result of these processes. A second concern is the performance of the treatment process in effectively mixing cement or other stabilising reagents through the sediments. The DEC has requested a more detailed evaluation of the performance of the cement-stabilised material.

RLMC, in its letter dated 28 January 2004, indicated that there were two main issues that needed to be addressed, viz. the leachability of the material and the risk of contamination of ground water, and the physical qualities of the treated materials and their affect on the development of the site and marketability.

The proponent has always acknowledged that these issues raised by EPA and RLMC will require further investigation and are largely dependant on the definition of the treatment methodology and technology incorporated in the treatment process as well as the location for placement of the remediated material. Following discussions between the relevant government agencies and BHP Billiton, it has been agreed that these issues would be best resolved by undertaking a trial remediation project. BHP Billiton have offered to undertake such a trial.

DIPNR have advised that the proposed trial remediation project would require development consent in its own right and, in view of this, it has been decided that the trial should be included in the consent currently being sought for Stage One of the work. To enable assessment of the trial, DIPNR have requested that details of the trial be provided as part of this supplementary report together with an assessment of the environmental impacts of the trial.

The proponent seeks approval to undertake a trial to define the preferred treatment methodology and technology, and to assist with the specification of work required to undertake the full-scale remediation project. The following chapter outlines the proposed trial, the planning context surrounding the trial and an assessment of the environmental impacts of the trial.

6.2 Description of the Trial

6.2.1 Overview

The trial will be undertaken to define the preferred treatment methodology and technology, and to assist with the specification of work required to undertake the full-scale transport, treatment and subsequent placement of the contaminated sediments. The trial will involving dredging, treatment and placement of a sufficient quantity of

material to allow investigation of the procedures and mitigation measures required for the full-scale remediation project.

6.2.2 Objectives

The prime objectives of the trial remediation project are to:

- Determine the most suitable technology for sediment stabilisation to allow beneficial reuse (e.g. structural fill, capping) of the treated sediments;
- Carry out procedures for analysing and characterizing the stabilised material to support obtaining EPA and other Authority approvals, prior to commencing the full-scale sediment remediation;
- Complete the works in a safe, cost-effective, efficient, environmentally responsible and timely manner;
- Ensure the protection of the workforce, surrounding communities and the environment throughout the works; and
- Comply with all consent conditions and regulatory and legislative requirements.

6.2.3 What development consent requirements apply to the trial?

The following will be required, or may be required:

- Revision of BHP Billiton's existing EPA licence for the closure area site;
- Relevant statutory approvals (DIPNR, DEC, RLMC, etc); and
- Permits from NSW Fisheries and NPC.

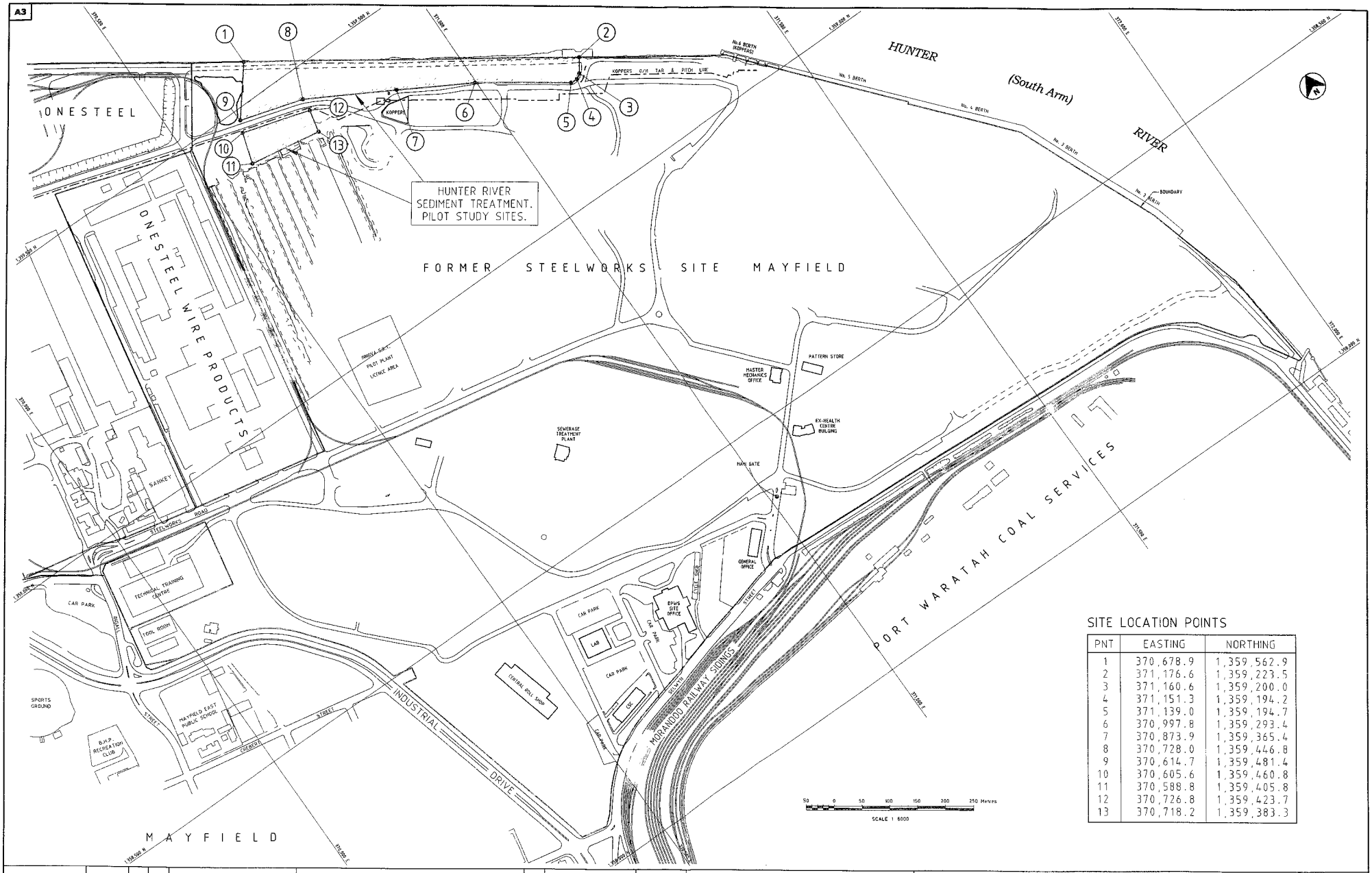
6.2.4 Site description

Treatment works for the pilot trial will be undertaken on the former BHP closure area site (Figure 6.1 – BHP Billiton drawing number ND12624). Sediments for the pilot trial will be recovered from the South Arm adjacent to this site.

6.2.5 Scope of the Trial

The trial will be carried out by BHP Billiton.

The following sections generally describe the works, and may be amended to suit a particular methodology proposed for the trial.



SITE LOCATION POINTS

PNT	EASTING	NORTHING
1	370,678.9	1,359,562.9
2	371,176.6	1,359,223.5
3	371,160.6	1,359,200.0
4	371,151.3	1,359,194.2
5	371,139.0	1,359,194.7
6	370,997.8	1,359,293.4
7	370,873.9	1,359,365.4
8	370,728.0	1,359,446.8
9	370,614.7	1,359,481.4
10	370,605.6	1,359,460.8
11	370,588.8	1,359,405.8
12	370,726.8	1,359,423.7
13	370,718.2	1,359,383.3

ADDITIONAL AREA ADDED. AR 16.09.04 1 REVISION

SURVEYED BY :
DATE OF SURVEY :
FIELD BOOK No.
LEVEL BOOK No. :
DISK FILE No. :
BACKGROUND :

ALL DIMENSIONS ARE IN m UNLESS NOTED OTHERWISE
CO-ORDINATE SYSTEM: MGA ZONE 56/1
DATUM AHD

REF DRG

SCALE AS SHOWN	CHKD ADR
DATE 18.08.04	DE
DRN A.ROWNEY	RE ADR
CAD MicroStation	

HATCH
Hatch Associates Proprietary Limited
Infrastructure - Newcastle
7 Waratah Boulevard, Newcastle NSW 2304.
Tel: 61 2 4968 6868 Fax: 61 2 4968 6800

CLIENT bhpbilliton

TITLE BHP BILLITON
NEWCASTLE STEELWORKS SITE
HUNTER RIVER SEDIMENT TREATMENT - PILOT STUDY SITE
LOCATION PLAN

DRG. No. ND12624 REV. 1

ND 12624
310269/003/-

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01:16:03 PM
16/09/2004

0 20 40 60 80 100 120 140 160 180 200 220 240mm

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Preparatory works

Prior to commencement of site works, further bench scale tests will be undertaken to refine the number of test samples to be evaluated during the trial. These tests will clarify the concentrations of stabilising agents that will be most effective in binding PAH compounds in the treated matrix.

This stage will consist of the following:

- Collection of a representative amount of contaminated sediment recovered from the river;
- Testing of samples to determine PAH concentrations;
- Bench scale testing of up to 6 combinations of treatment options; and
- Review and reporting of results.

The bench scale tests are expected to narrow the test treatments to the following:

- Three levels of cement;
- Three levels Dolocrete; and
- Possibly each of the above with three levels of carbon additives.

Site establishment

Prior to site establishment, the following plans and work method statements will be prepared:

- A Dredging Management Plan, covering:
  - Installation, effective operation and monitoring of an appropriately designed turbidity curtain to control turbidity and booms to control floating product around the dredge site;
  - Details of the dredging locations, program, equipment and transfer of sediment;
  - River and weather conditions necessitating the temporary cessation of dredging operations; and
  - Details of contingency plans to deal with potential adverse impacts resulting from dredging operations.
- An Environmental Management Plan (EMP), which will be submitted to the NSW EPA for comment;
- An Occupational Health and Safety Plan;
- A Quality Management Plan;
- Work Method Statements for all trial works;
- A Traffic Management Plan;
- An Emergency Response/Contingency Plan; and
- A Code of Conduct for the transportation of contaminated materials from the dredge site.

During site establishment all services running through the works area (including electricity, gas, telecommunications, stormwater, sewer, fire hydrants) will be identified and protected, disconnected and/or diverted as necessary. All temporary site services (e.g. electricity, water, sewerage, telecommunications) required for the trial will be supplied, installed and commissioned to the requirements of the appropriate regulatory authorities.

Sediment Control

In accordance with the EMP, sediment and free-phase product control devices will be installed about the dredge and sediment handling areas. The controls will be installed and maintained to preclude the movement of contaminated sediments, other suspended solids and floating product from the dredge area into the Hunter River. It is expected the sediment control devices will:

- Be installed as close of practicable to the boundary of the dredge location;
- Be of a design adequate to guarantee capture of sediment particles, suspended solids and floating product whilst being robust given tidal movements;
- Be of a design allowing removal in the event of flood warnings; and
- Be installed so as to not permit tidal flows about shoreline anchor points.

Surface Water Management

Prior to the commencement of dredging works, surface water quality at and adjacent to the dredge area will be monitored. This monitoring data will be used as a reference for field measurement of the following parameters during the works:

- pH;
- Dissolved oxygen (DO); and
- Turbidity.

During the course of the dredging works, and for one week following completion of dredging, these parameters will be measured daily to assess whether the dredging works are having an adverse affect on the Hunter River surface water quality at and in the vicinity of the dredging area. Should monitoring indicate that the surface water quality has been adversely impacted (as indicated by a change in parameters which can not be explained by natural processes such as rain events), corrective actions will be implemented to address possible sources of the adverse impacts.

The general approach to managing contaminated water at the site will comprise:

- Avoiding adverse environmental impact due to tidal movements;
- Minimising the generation of contaminated water;
- Containing, assessing and classifying potentially contaminated water;
- Recovering and managing contaminated water in accordance with the following hierarchy of measures:
  - Discharge to the Hunter River if assessment of the water quality and receiving environment indicates that such a discharge would not cause water pollution;

- Continue to contain the contaminated water on-site if the assessment of the quality of the water indicates that the contamination will naturally degrade and/or attenuate, such that the water may then be discharged to stormwater, or if the water will evaporate within an acceptable time period;
- Removal from site by tanker and disposal at an off-site aqueous treatment plant licensed by the NSW EPA;

- Maintaining records of water sources, volumes, classification, results of analysis, treatment and/or disposal.

Odour Management

Odour emissions may be generated by the dredging, handling and treatment of the sediments, including odours associated with aromatic and aliphatic hydrocarbons (eg. naphthalene) and ammonia. Odour monitoring during the pilot trial will be based on a methodology for field survey developed in the German Guideline VDI 3940 *Determination of Odourants in Ambient Air by Field Inspections* (October 1993).

During the trial, trained personnel will make odour assessments at nominally 3 locations. The locations will be at increasing distance from the remediation activities and selected to provide a representative evaluation of potential odours emanating from the site during the remediation works.

Each odour assessment at each monitoring location will be carried out for a period of 10 minutes in accordance with Guideline VDI 3940. During this sampling period the assessors will:

- Quantify the percentage of time during the sampling period when a recognisable odour is detected; and
- Note the quality and intensity of the odour based on standard descriptors.

The intensity of the odour will be assessed using the German intensity scale as shown below:

Table 6.1: German odour intensity scale

Rating	Intensity
0	No odour
1	Very slight
2	Slight
3	Distinct
4	Strong
5	Very strong
6	Extremely strong

A list of descriptors to identify the quality of odour will be included to differentiate the type of odours identified.

As well as the odour observations described above, the following information will be noted for each sampling period:

- Date and time;
- Location;
- Wind direction and speed;
- Temperature;
- Cloud cover;
- Precipitation: and
- Estimate of stability class (a measure of the atmospheric dispersion).

Observations will be recorded on specifically designed log sheets.

Odour flux assessments will also be conducted for material stockpiles and placed sediment.

Should excessive odours be noted during the monitoring, contingency measures will be implemented. Contingency measure for control of odours may include:

- Cessation of activities during adverse meteorological conditions (high wind speeds);
- Use of fine sprays and/or surfactants to reduce odour impacts;
- Immediate covering of odorous materials; and
- Covering of odorous materials at night.

Dredging

The dredging works will involve the dredging of all sediments to the level of the underlying rock or sands within nominated areas in the dredge area. The sediments are expected to extend between approximately 1 and 4 metres depth. A total of approximately 1,000 m^3 will be excavated.

The following will be taken into account during the dredging activities:

- Existing debris in the dredge area will be removed during dredging activities as it is encountered. Debris removed will be placed into trucks and disposed of at an appropriately licensed landfill;
- Dredged sediments will be transferred to shore in a manner which prevents loss of materials including water;
- Sediments shall be transferred directly to the receiving stockpile. No dredged sediments or associated debris will be placed or stored outside designated stockpile areas; and
- The pollution control measures (e.g. turbidity curtains) will be removed and disposed of at an appropriate landfill following completion of dredging.

Transportation of Materials

A temporary access/haulage route will be constructed along the foreshore. The design of this access way shall incorporate all measures necessary to provide all weather access for vehicles (both construction plant and road vehicles) and minimise environmental impacts. The access way shall be constructed to suit existing drainage requirements.

The material handling requirements for trucks transporting materials at the site are as follows:

- Trucks used for cartage of sediments will be watertight;
- Trucks carrying sediments will not be allowed to drive other than on the approved haul routes;
- Containers or truck bodies used in the transport of contaminated materials from the site shall be equipped with tautly tied tarps and with seals between doors such that no soil, dust or leachate can escape during transport; and
- Any contaminated liquid removed from site shall be transported in tankers.

Following loading and prior to leaving the site, the exterior of all vehicles shall be thoroughly cleaned. A truck wash facility will be provided to ensure that all vehicles leaving the site do not track contaminated soil, mud and the like onto other parts of the site and public roadways. All wash water will be collected, and treated and disposed of appropriately.

Stockpiling of Materials

Stockpiles will meet the following requirements:

- No stockpiling of sediments will occur outside the treatment area;
- Stockpiles will be located to avoid cross-contamination of other materials;
- Stockpiles will be strategically located to mitigate environmental impacts while facilitating material handling requirements;
- Stockpiles for sediments will be constructed with an impermeable base and be bunded; and
- All stockpile areas will be designed to collect and allow management of leachate and incidental stormwater.

Bunds, silt fences and diversion drains will be constructed as appropriate around the perimeter of each stockpile area. Stockpiles may need to be covered to control odours. Other measures that may be undertaken to minimise the potential for environmental impacts from these areas include the construction of temporary bunds around the handling areas, excavation of drains, erection of siltation barriers and dust suppression by use of appropriate water spraying equipment.

Sediment Treatment

Sediment treatment will generally involve the batch-wise mixing of the sediment with a stabilising agent (such as Portland cement or Dolocrete) and possibly an organic scavenger (such as ground coke or activated carbon) in a pugmill.

Trialling of treatment protocols will be undertaken in accordance with the Test Program and will involve:

- Establishment of necessary plant including a mobile screen, pugmill, reagent storage, stockpile areas and placement test areas necessary to undertake the Test Program;
- Establishment of environmental controls in accordance with the EMP;
- Reagent storage silos and transfer systems will be fitted with bag filters or similar;
- The treatment area will be installed on a paved area and will include segregated test areas for batches of treated material;
- Sediments will be screened and the >50mm fraction stockpiled and disposed offsite in accordance with EPA Waste Guidelines; and
- The undersize fraction will be stabilised/solidified in accordance with the Test Program, involving batch-wise mixing of the sediment with a stabilising agent and possibly an organic scavenger. The treated sediments will be examined to qualitatively assess the performance of the treatment process in effectively mixing the stabilising agent and organic scavenger through the sediments.

Sediment Placement

Sediment placement will generally involve the batch-wise placement of treated sediments in designated areas. Placement will generally be secure storage for curing and testing, however, placement of the materials as general fill or as capping material may also be undertaken.

Potential uses for the treated sediments include:

- General earthwork fill material to be used below finished surface levels. In this application, the treated material would be placed as fill, above the water table. This application would be used in areas subject to only minor or incidental future loading; and
- Capping material for the former Steelworks site or Kooragang Island Waste Emplacement Facility. In this application, the treated material would be placed as a component of a capping system.

Testing of the treated and placed sediments will be undertaken in accordance with the Test Program to assess both the geotechnical and geochemical stability of the treated material for beneficial reuse.

The geotechnical properties of the treated materials will be compared to standard geotechnical criteria for use as general fill and as capping materials. In accordance with the Test Program, the following properties will be tested after different curing times, after compaction, and also upon subsequent remoulding:

- Compaction Characteristics – important in establishing need for dewatering prior to treatment and workability of materials after treatment (Test Method – AS 1289.5.1.1);
- Unconfined Compressive Strength – used to assess the degree of cementation that develops after placement/compaction (Test Method – AS 1141.51);
- Shear strength – used to assess the ability of the compacted, treated material to support future applied loadings (Test Method – AS 1289.6.4.2);
- Permeability – used to assess the as-compacted permeability of treated material, particularly needed if to be used as a capping component (Test Method – ASTM D5084, AS 1289.6.7.2);
- Compressibility – used to assess the as-compacted compressibility (i.e. settlement potential) of treated material when subjected to future loading (Test Method – AS 1289.6.6.1); and
- Shrink/swell potential – important in that excessive shrink/swell after placement and compaction can disrupt cementing bonds, potentially leading to strength/deterioration and increased contaminant mobility (Test Method – modified ASTM D4829).

Chemical testing results will be compared to appropriate ground and surface water quality standards for the range of potential uses. In accordance with the Test Program, the following properties will be tested after compaction, and also upon subsequent remoulding:

- Constant Head Permeation – this test provides an assessment of water quality for water permeating through the as-compacted treated material under a small constant pressure head. This test is an analogue for shallow ponded rainwater infiltration under as-placed conditions.
- Modified ANS 16.1 (American Nuclear Society) test method for assessing the quality of rainwater that may seep through cracks in as-compacted treated material or which may come in contact with its surface. This test, which comprises several cycles of wetting/inundation and drying/draining over a period of several days, simulates physical conditions that could lead to physical degradation and affect contaminant mobility.

The control of materials during the placement trials may include the following general control measures:

- On-site storage units and/or material can be stored in purpose built bays;
- Temporary bunds and drains, appropriate liners;
- Erection of silt barriers (berms, hay bales etc); and
- Dust/odour suppression by use of de-odourisers, water sprays and/or covers.

All water will be contained on site and if necessary water will be treated prior to disposal. Dust, odour and noise controls will be implemented as described in the EMP.

The treated materials from the trial will be disposed of in an appropriate EPA licensed landfill.

6.2.6 Working hours

The working hours for the trial would be as follows:

- Monday-Friday: 7.00 am – 6.00 pm;
- Saturday: 8.00 am – 1.00 pm; and
- No work on Sundays or Public Holidays.

6.3 Environmental Impacts of Trial

6.3.1 Land use and infrastructure

Treatment works for the trial will be undertaken on the former BHP closure area site. Sediments for the trial will be recovered from the South Arm adjacent to this site.

Potential land use impacts as a result of the trial include:

- Temporary occupation of the closure area; and
- Minor disruption to access along the South Arm.

It may be necessary to notify the public during dredging and to possibly prevent fishing activities in the vicinity.

6.3.2 Hydrology and water quality

Dredging

Before dredging activities commence turbidity curtains will be installed about the active dredge area to preclude the movement of contaminated sediments, other suspended solids and floating product from the dredge area into the Hunter River. The results of the water quality testing program undertaken for the EIS indicate that a turbidity curtain is effective in containing levels of contamination within the water column (refer to Chapter 11 of the EIS).

Prior to dredging works commencing, surface water quality at and adjacent to the dredge area will be monitored. This monitoring data will be used as a reference for field measurement of the following parameters during the works:

- pH;
- Dissolved oxygen (DO); and
- Turbidity.

During the course of the dredging works, and for one week following completion of dredging, these parameters will be measured daily to assess whether the dredging works are having an adverse affect on the Hunter River surface water quality at and in the vicinity of the dredging area. Should monitoring indicate that the surface water quality has been adversely impacted (as indicated by a change in parameters which

can not be explained by natural processes such as rain events), corrective actions will be implemented to address possible sources of the adverse impacts.

Dredged sediments will be transferred to shore in a manner that prevents loss of materials including water.

Onsite Stormwater Management Plan

An Onsite Stormwater Management Plan would be prepared as part of the EMP, in accordance with Newcastle Council's Stormwater Management for Development Sites (DCP No. 50). The principles of the Onsite Stormwater Management Plan will centre on the need for very strict separation of 'clean' and 'contaminated' materials to avoid the contamination of rainwater by sediments.

Water treatment

It is expected that the bulk of waters associated with the contaminated sediments would be taken up by the cement stabilisation process. Any remaining waters would be contained and appropriately treated prior to final disposal. Treatment could occur either on or off site.

Any water treatment plant associated with the trial would need to be the subject of a licensing process with the NSW EPA before any discharge were allowed.

6.3.3 Aquatic ecology

An aquatic ecology impact assessment was undertaken for the EIS (refer to Chapter 12 of the EIS). This assessment concluded that no significant direct impacts are anticipated as a result of the proposal, but there is the potential for indirect impacts unless appropriate mitigation measures are implemented, particularly during dredging. Such mitigation measures mainly relate to controlling the potential for impacts to water quality.

6.3.4 Terrestrial flora and fauna

A terrestrial flora and fauna assessment was undertaken for the EIS (refer to Chapter 13 of the EIS). This assessment concluded that the former BHP closure area site is a highly disturbed industrial site, with no significant vegetation or fauna habitat.

6.3.5 Geology and soils

An Acid Sulfate Soils Management Plan would be prepared as part of the EMP, in accordance with the New South Wales Acid Sulfate Soils Management Advisory Committee publication, Acid Sulfate Soils – Assessment Guidelines (1998). The sediments as dredged will be classified as Potential Acid Sulfate Soil (PASS). Cement stabilisation of the sediments would neutralise (buffer) the sediments.

6.3.6 Groundwater systems

In general terms no alterations in groundwater flow direction have been predicted for any of the groundwater bodies in the study area (refer to Chapter 15 of the EIS).

Management procedures would be implemented during all phases of the trial (dredging, treatment, placement) to protect groundwater quality from any potential contamination. Likely management procedures have been identified in Section 6.2 of this report. These will be addressed in detail in the EMP prepared for the trial.

6.3.7 Noise and vibration

A noise impact assessment was undertaken for the EIS (refer to Chapter 16 of the EIS). A computer model was used to predict noise levels at the nearest sensitive receptors, under calm and prevailing weather conditions, based on noise emissions estimated to result from the proposal.

The results of the modelling of dredging noise under calm weather conditions show that all predicted noise levels at the nearest sensitive receptors would be below the site-specific noise criteria. The results of the modelling of dredging noise under temperature inversion weather conditions show that all predicted noise levels at the nearest sensitive receptors would be below the site specific noise criteria, except at North Arthur Street, Mayfield and Mayfield East Public School, where the amenity criteria would be exceeded by 1 dBA and by 2 dBA respectively. However, it is considered unlikely that this small change in noise level would be detectable by the residents of the area.

The results of the modelling of remediation work operational noise show all predicted noise levels at the sensitive receptors would be below the project specific noise criteria.

The results of the modelling of the combined dredging and remediation noise show that, during these periods of combined operation, predicted noise levels at the sensitive receptors are all below the project specific noise criteria.

The results of the modelling of cumulative noise levels from the proposal, the Protech Steel Mill and the construction of the Multi-purpose Terminal show all predicted cumulative noise levels at the nearest sensitive receptors to be below the project specific noise criteria.

The trial will consist of dredging and remediation operations at a pilot scale only, and are not expected to have a significant effect on the nearest sensitive receptors, given the results of the computer modelling of the full-scale activities of the proposal.

Works for the trial will only be undertaken between 7.00 am and 6.00 pm from Monday to Friday, and between 8.00 am and 1.00 pm on Saturdays.

6.3.8 Air quality and odour

Potential impacts on air quality as a result of odour could occur as a result of exposure of sediments containing odorous compounds such as naphthalene.

An odour modelling exercise was carried out as part of the EIS (refer to Chapter 17 of the EIS). It was found that the potential for generation of odours during dredging activities could be controlled, so as not to create significant odour impacts at the closest sensitive receptors. As the trial will consist of dredging and remediation

operations at a pilot scale only, it is not expected to have a significant effect on the nearest sensitive receptors, given the results of the computer modelling of the full-scale activities of the proposal.

One of the purposes of the trial is to determine the potential for odour generation. Odour emissions from stockpiles and from placed sediments will be measured. Odour impacts at the sensitive receptors will be qualitatively assessed.

Dust suppression measures will be implemented as part of the EMP. The nearest residential areas are not expected to be impacted by dust due to the distance to these areas and the implementation of dust generation controls.

6.3.9 Cultural heritage and archaeology

Aboriginal heritage and archaeology

An assessment undertaken for the EIS concluded that no impacts on Aboriginal archaeology and cultural heritage are anticipated as a result of the proposal (refer to Chapter 18 of the EIS).

Non-Aboriginal heritage and archaeology

An assessment undertaken for the EIS concluded that the proposal would have no impact on any known heritage resources and is considered to pose no threat to the heritage values of the locality or region (refer to Chapter 18 of the EIS).

6.3.10 Transport, traffic and access

As the trial will be conducted on the former BHP closure area site, and given that the batching processes will be staged both for treatment and placement trials, there are not expected to be significant truck movements to and from the site. The majority of movements will occur at the end of the trial where up to 1,000 m^3 of material will be removed from the site to a disposal or reuse location. This will result in some 3 truck movements per hour. This would be a very minor contribution to overall traffic generation from the proposal, and should be managed using the mitigation measures proposed for the proposal in Chapter 19 of the EIS.

Similarly, impacts related to internal site movements (i.e. off public roads) should be managed using the mitigation measures proposed for the proposal in Chapter 19 of the EIS.

6.3.11 Socio-economic factors

Potential socio-economic impacts of the proposal are assessed in Chapter 20 of the EIS. The proposal has the potential to give rise to both positive and negative socio-economic impacts.

Of particular relevance to the trial are the long-term environmental benefits and improvements in amenity that would stem from the remediation of the contaminated material that is present in the South Arm's sediments.

Mitigation measures are recommended in the EIS, including development of a consultation and communication plan covering local businesses, surrounding residents and the wider community. The plan would detail activities to be implemented in the lead up to, and during, implementation of the proposal.

6.3.12 Landscape and visual quality

The proposed activities associated with the dredging and treatment works are consistent with that of a working port/industrial area. As a result, visual impacts are not considered to be significant, given the context for the trial.

6.3.13 Waste management

Waste materials would be generated during most phases of the proposal. The actual dredged sediments and treated sediments are not considered wastes in the context of this proposal.

The volumes of wastes that would be generated during implementation of the proposal are expected to be minimal. A number of waste disposal and recycling facilities are located within close proximity to the site and this would facilitate collection of recyclable materials. Disposal of wastes to landfill would be in some cases unavoidable but would be avoided and minimised where possible for economic reasons.

The EIS provides a preliminary waste management plan for the proposal that describes the proposed means of handling wastes. A detailed Waste Management Plan would be prepared for the trial as part of the EMP.

6.3.14 Hazards and risk

A hazard and risk assessment was undertaken for the proposal (refer to Chapter 23 of the EIS). It addressed:

- The nature and level of environmental risk associated with dredging, transport, sediment transport and treatment, and on-site disposal activities;
- Potential health impacts arising from commercial and recreational fishing undertaken on the Hunter River, and consumption of Hunter River seafood; and
- Public health risks associated with the movement of materials, unauthorised access and accidental spillages.

The risk assessment demonstrated that the risk levels during and after the proposal are tolerable in relation to the surrounding land use, and that any risks identified could be appropriately managed.

The EIS identifies control measures, safeguards and procedures that would be implemented to further reduce the potential level of risk associated with the proposal and these should be applied to the trial. BHPB would be responsible for all OH&S issues during the trial.

6.3.15 Cumulative impacts

The EIS identifies that the dredging proposal in isolation would be unlikely to lead to significant environmental degradation in the long term. There are no issues that apply to the proposed trial.

6.3.16 Approach to environmental management

An environmental management plan (EMP) for the trial would be prepared prior to site establishment. The EMP would make provision for the following:

- Preventing erosion, contamination and sedimentation of the site and its surroundings;
- Preventing the erosion and/or migration of contaminated sediments beyond the remediation area;
- Ensuring that fugitive dust from disturbed areas is minimised;
- Ensuring that odours from disturbed areas are minimised;
- Supplying, installing and maintaining of all environmental control measures required throughout the Contract period, including but not limited to:
  - Safety fencing;
  - Surface water controls and sediment control measures;
  - Protection of vegetation adjacent to the Work area;
  - Noise and vibration control measures; and
  - Equipment cleaning and operation including vehicle decontamination.

6.3.17 Conclusion on the impacts of the trial

The trial remediation project will provide valuable information that will assist in defining the full-scale remediation project and confirm, or otherwise, the suitability of the preferred treatment process.

A number of potential negative impacts have been identified, as outlined in the sections above.

It is recognised that the design of the trial incorporates a range of management mechanisms and design features to minimise the potential for negative impacts on the environment. In addition, this supplementary report and the EIS recommend measures to further reduce the potential for negative impacts, and maximise the potential positive impacts.

7. Conclusions

7.1 Conclusion

This supplementary report has responded in detail to all of the submissions made during the exhibition of the Channel Extension EIS November 2003. Additional information has also been supplied in regard to DIPNR and DEC requests. This report has been prepared to support the development application for Stage One of the proposal, including a trial remediation project. Consent for Stage Two will be sought following completion of the trial remediation project.

7.2 What's Next

Stage One of the proposal, as a whole requires consent under Part 4 of the EP&A Act and does not include the treatment and placement of contaminants. Part 4 of the EP&A Act establishes the requirements for the development consent. A DA and EIS have previously been lodged with DIPNR and this supplementary report now forms part of this submission. Stage One would also include planning approvals for BHP's proposed trial remediation activities. The following sections outline the next steps in the consideration of the proposal.

7.2.1 Public Exhibition and Notification

Public participation, exhibition and notification procedures are set out in Section 79 of the EP&A Act. This report forms Stage Two of the public exhibition process. Lodgement and exhibition of the supplementary report involves the following:

- The supplementary report is lodged with DIPNR;
- A copy of the supplementary report is lodged with relevant government agencies;
- DIPNR (acting on behalf of the Minister) will place the supplementary report on public exhibition for a minimum of 30 days at DIPNR offices and other appropriate local venues;
- Placement of a notice on the site;
- DIPNR will place advertisements in the local papers advising of the exhibition and submission period;
- Provision of written notice to adjoining landowners and occupiers;
- Written submissions from public authorities, interested groups and organisations and the general community will be invited; and
- Submissions will be received and considered by DIPNR.

7.2.2 Assessment of the DA, EIS and Supplementary report

DIPNR will examine the DA, EIS, supplementary report and the additional submissions received, and prepare a report to the Minister for Infrastructure Planning and Natural Resources. The Commonwealth Minister for Environment and Heritage will also

receive submissions and DIPNR's report to inform his decision. The report will address matters such as:

- The issues that a consent authority must consider when determining a DA (listed in Section 79C of the EP&A Act);
- The information contained within the supplementary report;
- Issues raised by submissions and additional submissions;
- Any new information on the proposal;
- Any modifications to the proposal;
- Proposed conditions of approval, should the proposal proceed;
- Proposed mitigation measures; and
- Advice from other approval bodies.

Acting on that report, the Minister will decide whether to grant approval to the proposal. The Minister may attach conditions to the approval.

The proponent will then be advised of the Minister's decision, whether it is approval subject to conditions or the application is refused.

The Minister for the Department of Infrastructure, Planning and Natural Resources will make the final determination.

7.3 Final Statement

This supplementary report and the EIS have considered the potential impacts of the proposed dredging and excavation of the South Arm to facilitate the extension of shipping channels in the Port of Newcastle. This supplementary report has been prepared by GHD on behalf of the Waterways Authority to assist the Minister for Infrastructure Planning and Natural Resource in assessing the proposal. This supplementary report has been prepared with regard to the requirements of the Director-General of DIPNR and issues raised by the submissions received from the EIS exhibition process.

It is considered that the proposal would:

- Improve the current operational viability of the Port of Newcastle;
- Allow for the future expansion of shipping channels, addressing the current shortfall in terms of port capacity in NSW; and
- Remove a significant quantity of contaminated material from the aquatic environment.

A number of potentially negative impacts have been identified. The main potential negative impacts relate to the dredging and excavation activities. These include:

- Generation of turbidity and the potential for impacts on aquatic ecology;
- Noise and blasting impacts to surrounding residents;

- Loss of access to and along the South Arm during implementation of the proposal; and
- Occasional odour impacts as a result of the exposure of sediments.

In particular, this supplementary report identifies that:

- Water quality controls must be incorporated in the design, with best practice dredging and construction methods implemented to ensure that the potential for water quality impacts are adequately controlled;
- Monitoring as part of the environmental management process is extremely important to mitigate impacts and to regulate dredging operations;
- Compensatory habitat measures would not be limited to the provision of habitat elsewhere within the South Arm, rather the combination of the techniques outlined in this report;
- The Project Environmental Management Plan for the proposal will need to address the issues contained within this report and form part of the consent process;
- A detailed community consultation and community information program would be required prior to and during detailed design and implementation of the proposal; and
- The potential for cumulative impacts as a result of the various industrial and infrastructure proposals in the port and its environs need to be carefully considered overall, through planning processes such as that set in place by the Newcastle Port Environs Concept Proposal, developed by DIPNR.

Approvals under Stage One will include trial dredging, treatment and placement of a portion of the contaminated sediments. Approval would be sought for all works included in the EIS excluding treatment and placement of the bulk contaminated sediments, and including the trial remediation works.

Approvals for Stage Two will be sought following completion of the trial and detailed assessment of placement sites. Approvals for Stage Two will cover the full-scale remediation and placement of the contaminated sediments.

The proposal would allow significant expansion of port facilities in Newcastle through the extension of the shipping channels into the South Arm. This in turn would facilitate industrial development on or around the South Arm. In considering this proposal, there is a need to balance the benefits to the Hunter region of the potential employment generating activities brought by industrial development against the potential for adverse environmental impacts that may result.

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Appendix A

Eight Part Tests

Assessment of Significance

1. Painted Snipe – *Rostratula benghalensis*

a) In the case of a threatened species, whether the life cycle of the species is likely to be disrupted such that a viable population of the species is likely to be placed at risk of extinction.

The Painted Snipe inhabits well-vegetated shallows and margins of wetlands, dams, sewerage ponds and wet pastures. It may also be found in marshy areas, irrigation systems, lignum, tea-tree scrub and open timber. Breeding occurs from August to December, coinciding with higher rainfall (Pizzey & Knight1997). The saucer-shaped nest is made from vegetation and position above water level. The Painted Snipe is considered part migratory, moving between habitats in response to rainfall.

The study area is not expected to provide a significant area of habitat for this species. Kooragang Island Nature Reserve, Ash Island and Hexham Swamp all provide significant area of conserved, high quality habitat for this species. The removal of potential habitat from with the project area are not considered to be significant in the context of the Hunter estuary and the project is unlikely to result in the extinction of the local population of the Painted Snipe.

b) In the case of an endangered population, whether the lifecycle of the species that constitutes the endangered population is likely to be disrupted such the viability of the population is likely to be significantly compromised.

Currently, only a few specific populations have been identified as endangered under the *Threatened Species Conservation Act 1995*, none of which are relevant to the project area.

c) In relation to the regional distribution of the habitat of a threatened species, population or ecological community, whether a significant area of known habitat is to be modified or removed.

The Painted Snipe potentially utilises the mangrove and saltmarsh and intertidal habitats present within the study area, however this is not considered to be significant habitat for this species. The disturbance of approximately 15 hectares of this marginal habitat is not considered to be a significant reduction in habitat for the Painted Snipe.

d) Whether an area of known habitat is likely to become isolated from currently interconnecting or proximate areas for a threatened species population or ecological community.

Given the mobile nature of the Painted Snipe, the disturbance of 15 hectares of potential habitat will not restrict the movement of this species between other areas of important habitat. The proposal will not result in an area of known habitat becoming isolated from currently interconnecting habitats.

e) Whether critical habitat will be affected.

No areas of critical habitat designated under the *Threatened Species Conservation Act 1995* are located within this area of the state.

f) Whether a threatened species, population or ecological community, or their habitats are adequately represented in conservation reserves (or other similar protected areas) in the region.

The Painted Snipe has been recorded in Lord Howe Island World Heritage Area, Nocoleche Nature Reserve, Mother of Ducks Lagoon Nature Reserve, Nadgee Nature Reserve and Kosciusko National Park (NPWS 1999a). It is unlikely that this species is adequately conserved within these reserves.

g) Whether the development or activity proposed is of a class of development or activity that is recognised as a threatening process.

The clearing of native vegetation that results in a loss of biodiversity has been listed as a key threatening process. The artificial, reclaimed nature of the project area means that much of the native vegetation present is highly disturbed and does not comprise a full complement of local species. The vegetation is not unique in the local area, with similar vegetation located both in the local area and region, and no threatened species were identified. Therefore the loss of this vegetation would not result in a loss of biodiversity.

Alteration to the natural flow regimes of rivers and streams, and their floodplains and wetlands is recognized as a major factor contributing to loss of biological diversity and ecological function in aquatic systems, including floodplains. The dredging of the South Arm is not expected to alter the natural flow regime of the river to an extent which would have a significant impact on surrounding wetland areas. GHD advise that the final dredging profile does very little to alter the tidal hydrodynamics of the Hunter Estuary (refer to **Section 5.4.2.1** of the Terrestrial Ecology Assessment for further details).

h) Whether any threatened species, population or ecological community is at the limit of its known distribution.

The Painted Snipe has a scattered distribution throughout Australia, and is distributed along the east coast. The study area does not form the limit of distribution for this species.

2. Masked Owl – *Tyto novaehollandiae*

(a) In the case of a threatened species, whether the life cycle of the species is likely to be disrupted such that a viable population of the species is likely to be placed at risk of extinction.

Preferred habitat for the Masked Owl consists of forests, woodlands and farmlands with large trees, and adjacent cleared country. Also found in timbered watercourses, paperbark woodlands and caves. Nests in hollow eucalypts or in caves. Roosts by day in tree hollows and thick foliage. Hunts by night in woodlands, clearings, open plains; prey includes possums, rabbits and currawongs.

The study area is not expected to provide a significant area of habitat for this species. Kooragang Island Nature Reserve, Ash Island and Hexham Swamp all provide significant area of conserved, high quality habitat for this species, with the species known to occur on Ash Island. The removal of potential habitat from with the project area is not considered to be significant in the context of the Hunter estuary and the project is unlikely to result in the extinction of the local population of the Masked Owl.

b) In the case of an endangered population, whether the lifecycle of the species that constitutes the endangered population is likely to be disrupted such the viability of the population is likely to be significantly compromised.

Currently, only a few specific populations have been identified as endangered under the *Threatened Species Conservation Act 1995*, none of which are relevant to the project area.

c) In relation to the regional distribution of the habitat of a threatened species, population or ecological community, whether a significant area of known habitat is to be modified or removed.

No known habitat of the Masked Owl is present in the project area. The proposal would not modify or remove an area of known habitat.

d) Whether an area of known habitat is likely to become isolated from currently interconnecting or proximate areas for a threatened species population or ecological community.

The study area is not likely to form important habitat for this species, however it does potentially provide connection between more suitable habitats. Due to the high dispersal capabilities of the Masked Owl, the disturbance of approximately15 hectares of potential habitat is not expected to restrict the movement of this species between other areas of important habitat. The proposal will not result in an area of known habitat becoming isolated from currently interconnecting habitats.

e) Whether critical habitat will be affected.

No areas of critical habitat designated under the *Threatened Species Conservation Act 1995* are located within this area of the state.

f) Whether a threatened species, population or ecological community, or their habitats are adequately represented in conservation reserves (or other similar protected areas) in the region.

It is uncertain as to whether this species is supported in conservation reserves within the region. It is unlikely that this species is adequately conserved.

g) Whether the development or activity proposed is of a class of development or activity that is recognised as a threatening process.

The clearing of native vegetation that results in a loss of biodiversity has been listed as a key threatening process. The artificial, reclaimed nature of the project area means that much of the native vegetation present is highly disturbed and does not comprise a full complement of local species. The vegetation is not unique in the local area, with similar vegetation located both in the local area and region, and no threatened species were identified. Therefore the loss of this vegetation would not result in a loss of biodiversity.

Alteration to the natural flow regimes of rivers and streams, and their floodplains and wetlands is recognized as a major factor contributing to loss of biological diversity and ecological function in aquatic systems, including floodplains. The dredging of the South Arm is not expected to alter the natural flow regime of the river to an extent which would have a significant impact on surrounding wetland areas. GHD advise that the final dredging profile does very little to alter the tidal hydrodynamics of the Hunter Estuary (refer to **Section 5.4.2.1** of the Terrestrial Ecology Assessment for further details).

h) Whether any threatened species, population or ecological community is at the limit of its known distribution.

The Masked Owl occurs throughout suitable habitats along the east, north and south-west coasts of Australia. The study area does not form the extent of the distribution of this species.

3. Beach Stone-Curlew – *Esacus neglectus*

a) In the case of a threatened species, whether the life cycle of the species is likely to be disrupted such that a viable population of the species is likely to be placed at risk of extinction.

The Beach Stone-Curlew is a large wader occurring in singles, pairs or groups and becoming most active at dusk, dawn and night (Pizzey and Knight, 1997). This species is found throughout the north coast of Australia and associated islands. The range extends from Onslow, WA to Manning River NSW, however has rarely been recorded in NSW (NPWS 1999b). The Beach Stone-Curlew favours open, undisturbed beaches, islands, reefs and estuarine and intertidal sandflats and mudflats. Often found in habitats associated with mangroves or estuaries. Other suitable habitat for this species includes river mouths and offshore sandbars associated with coral atolls, reefs and rock platforms and coastal lagoons (NPWS 1999b). The Beach Stone-Curlew forages on mudflats and sandflats for crabs and other marine invertebrates. Breeding occurs from September to November, with only one egg being laid per season. The nest is made in sand just above the high tide mark (Pizzey and Knight 1997).

The study area is not expected to provide a significant area of habitat for this species. Kooragang Island Nature Reserve, Ash Island, Hexham Swamp and potentially Stockton Beach all provide a significant area of conserved, high quality habitat for this species. The removal of potential habitat from with the project area is not considered to be significant in the context of the Hunter estuary and the project is unlikely to result in the extinction of the local population of the Beach Stone-curlew.

b) In the case of an endangered population, whether the lifecycle of the species that constitutes the endangered population is likely to be disrupted such the viability of the population is likely to be significantly compromised.

Currently, only a few specific populations have been identified as endangered under the *Threatened Species Conservation Act 1995*, none of which are relevant to the project area.

c) In relation to the regional distribution of the habitat of a threatened species, population or ecological community, whether a significant area of known habitat is to be modified or removed.

No known habitat for the Beach Stone-Curlew is present in the project area. The regular likely occurrence of the species as far south as the Hunter Estuary is considered to be low. The proposal is not expected to modify or remove an area of known habitat.

d) Whether an area of known habitat is likely to become isolated from currently interconnecting or proximate areas for a threatened species population or ecological community.

No known habitat of the Beach Stone-Curlew is present in the project area, and therefore the proposal would not result in an area of known habitat becoming isolated from other nearby areas.

e) Whether critical habitat will be affected.

No areas of critical habitat designated under the *Threatened Species Conservation Act 1995* are located within this area of the state.

f) Whether a threatened species, population or ecological community, or their habitats are adequately represented in conservation reserves (or other similar protected areas) in the region.

The Beach Stone-Curlew has been recorded in Yuragir National Park, Bundjalung National Park, Ukerebagh Nature Reserve and Brunswick Heads Nature Reserve (NPWS 1999b). Suitable habitat for this species is present on the nearby Kooragang Island Nature Reserve. The Beach Stone-Curlew is not likely to be adequately protected in conservation reserves within the region.

g) Whether the development or activity proposed is of a class of development or activity that is recognised as a threatening process.

The clearing of native vegetation that results in a loss of biodiversity has been listed as a key threatening process. The artificial, reclaimed nature of the project area means that much of the native vegetation present is highly disturbed and does not comprise a full complement of local species. The vegetation is not unique in the local area, with similar vegetation located both in the local area and region, and no threatened species were identified. Therefore the loss of this vegetation would not result in a loss of biodiversity.

Alteration to the natural flow regimes of rivers and streams, and their floodplains and wetlands is recognized as a major factor contributing to loss of biological diversity and ecological function in aquatic systems, including floodplains. The dredging of the South Arm is not expected to alter the natural flow regime of the river to an extent which would have a significant impact on surrounding wetland areas. GHD advise that the final dredging profile does very little to alter the tidal hydrodynamics of the Hunter Estuary (refer to **Section 5.4.2.1** of the Terrestrial Ecology Assessment for further details).

h) Whether any threatened species, population or ecological community is at the limit of its known distribution.

In NSW, the Beach Stone-Curlew is only expected to occur as far south as the Manning River. Should the Beach Stone-Curlew be recorded in the Hunter Estuary, it would be approximately 300 kilometres south of its known distribution.

4. Green Turtle – *Chelonia mydas*

a) In the case of a threatened species, whether the life cycle of the species is likely to be disrupted such that a viable population of the species is likely to be placed at risk of extinction.

The Green Turtle has a pan-tropical distribution throughout the world, and occurs along the tropical and sub-tropical coasts of the northern half of Australia. The Green Turtle has been recorded occasionally, in small numbers, in temperate waters south of Port Stephens including Lake Macquarie, however it returns to tropical waters to nest. Adults of this species are entirely herbivorous, eating a diet of seagrass and seaweed, including the generas *Zostera, Thallassina, Enhalus, Posidonia* and *Halophila*. Juveniles, however, may be carnivorous, supplementing their diet with worms and other small animals. In order to obtain these resources, the Green Turtle frequents shallow seas where there is an abundance of marine flora. When not mobile, the species requires rest areas, such as rock overhangs, which provide protection from predators.

In Australia, adult female green turtles come ashore from November to January laying up to 100 eggs on islands of the Great Barrier Reef and the Gulf of Carpentaria, and along the coast near Broome. They also breed on the coasts of Indonesia, Malaysia and New Guinea. The onshore migration to lay eggs opens the Green Turtle up to a number of threats, both natural and anthropogenic. For example, sea gulls are known to feed on the Turtle's eggs, resulting in a small percentage reaching hatchling stage.

The proposed dredging of the South Arm of the Hunter River is not expected to significantly impact the Green Turtle such that the species would be placed at risk of extinction in the local area. The portion of the South Arm proposed for dredging does not support significant seagrass foraging resources (The Ecology Lab 2003) or nesting resources for this species and therefore the species is unlikely to rely of the study area for a significant part of its lifecycle requirements.

b) In the case of an endangered population, whether the life cycle of the species that constitutes the endangered population is likely to be disrupted such that the viability of the population is likely to be significantly compromised.

Schedule 1, Part 2 of the Threatened Species Conservation Act 1995 (TSC Act 1995) does not identify any endangered populations of this species occurring within the study area.

c) In relation to the regional distribution of the habitat of a threatened species, population or ecological community, whether a significant area of known habitat is to be modified or removed.

The proposed development is not expected to modify a significant area of potential habitat for this species as no potential foraging habitat (The Ecology Lab 2003) or nesting sites occur within the estuary.

d) Whether an area of known habitat is likely to become isolated from currently interconnecting or proximate areas for a threatened species population or ecological community.

The proposed development will result in the temporary isolation of habitat as dredging occurs, however there will be no ongoing isolation of habitats within the upstream and downstream sections of the estuary once dredging has been completed.

e) Whether critical habitat will be affected.

The study area does not contain any areas listed as 'critical habitat' under Part 3 of the TSC Act 1995.

f) Whether a threatened species, population or ecological community, or their habitats are adequately represented in conservation reserves (or other similar protected areas) in the region.

Due to the absence of sufficient data on the populations of Green Turtles distributed throughout the waters of the east coast of Australia, it can not be accurately determined whether this species is adequately conserved within the region. While there is no available supporting data, there are three conservation reserves within the region which may provide suitable foraging and habitat resources for the threatened Green Turtle. The closest reserve is the 70 hectare Fly Point-Halifax Park Aquatic Reserve which lies between Fly Point and Nelson Head and extends seaward from the mean high water mark out to 500 metres. North of Port Stephens is the Myall Lakes National Park which conserves one of the State's largest coastal lake systems. Further north again is the Solitary Islands Marine Park, which stretches for 75 kilometres along the coast north of Coffs Harbour.

It is unlikely that the species is adequately represented in conservation reserves.

g) Whether the development or activity proposed is of a class of development or activity that is recognised as a threatening process.

Alteration to the natural flow regimes of rivers and streams, and their floodplains and wetlands is recognized as a major factor contributing to loss of biological diversity and ecological function in aquatic systems, including floodplains. The dredging of the South Arm is not expected to alter the natural flow regime of the river to an extent which would have a significant impact on surrounding wetland areas or potential habitat for the Green Turtle. GHD advise that the final dredging profile does very little to alter the tidal hydrodynamics of the Hunter Estuary (refer to **Section 5.4.2.1** of the Terrestrial Ecology Assessment for further details).

h) Whether any threatened species, population or ecological community is at the limit of its known distribution.

The Green Turtle has a pan–tropical distribution, occurring in suitable habitat worldwide. As such, the study area does not form the limit of distribution for this species.

References

NPWS (1999a) *Threatened Species Information: Painted Snipe.*

NPWS (1999b) *Threatened Species Information: Beach Stone-Curlew.*

Pizzey, G. and Knight, F., 1997. *Field Guide to the Birds of Australia*, Harper Collins Publishers, Sydney.

Appendix B

Fauna Species List

Fauna Species List

This fauna list has been compiled from NPWS Atlas of NSW Wildlife records and other studies of the local area. The species listed have been recorded within a 10 kilometre radius of the project area in the NPWS Atlas of NSW Wildlife, except for those species in bold type, which have been identified in local studies. The Umwelt Study column records those species identified in the project area during the fauna surveys conducted in November and December 2002.

X = Species recorded by Umwelt in the project area
E1 = Endangered under Schedule 1 of the *Threatened Species Conservation Act, 1995*
V = Vulnerable under Schedule 2 of the *Threatened Species Conservation Act, 1995*
P = Protected under the *National Parks and Wildlife Act, 1979*
U = Unprotected

1. Umwelt survey 2002
2. Long Pond Bird Count Summary HBOC 1999-2003.
3. Clarke C. J. and van Gessel, F.W.C. (1983) Appendix 5: Habitat Evaluation – Birds. Pp117-145 in Moss, T. (Ed.) (1983) *An Investigation of Natural Areas: Kooragang Island, Hunter River*, Department of Environment and Planning, Sydney.
4. Gosper, D.G. (1981) Survey of Birds on Floodplain-estuarine Wetlands on the Hunter and Richmond Rivers in Northern NSW, *Corella* 5 (1):1-17.
5. Van Gessel, F. and Kendall, T. (1972) A Checklist of the Birds of Kooragang Island, *Hunter Natural History* 4 (3):194-215.
6. Van Gessel, F. and Kendall, T. (1972) A Checklist of the Birds of Kooragang Island, Supplement No 1. *Hunter Natural History* 4 (4):194-215.
7. Results of search of NSW NPWS Wildlife Atlas Database within 10 km radius of study area.
8. Geering, D. and Winning, G. (1993) *Threats to Habitat and Opportunities for Habitat Restoration*. Report to Hunter Catchment Management Trust and NSW Public Works Department.
9. Maddock, M. (2003) *Impacts of Proposed Developments on Threatened Bird Species in the Hunter Estuary and Catchment Wetlands*.

Scientific Name	Common Name	Status	Record
AMPHIBIANS			
Adelotus brevis	Tusked Frog	P	
Crinia signifera	Common Eastern Froglet	P	
Limnodynastes ornatus	Ornate Burrowing Frog	P	1
Limnodynastes peronii	Striped Marsh Frog	P	
Limnodynastes tasmaniensis	Spotted Marsh Frog	P	1
Pseudophryne coriacea	Red-backed Toadlet	P	
Litoria aurea	Green and Golden Bell Frog	E1	
Litoria caerulea	Green Tree Frog	P	
Litoria dentata	Keferstein's Tree Frog	P	
Litoria fallax	Eastern Dwarf Tree Frog	P	
Litoria latopalmata	Broad-palmed Frog	P	
Litoria lesueuri	Lesueur's Frog	P	
Litoria peronii	Peron's Tree Frog	P	
Litoria phyllochroa	Green Stream Frog	P	
Litoria tyleri	Tyler's Tree Frog	P	
Litoria verreauxii	Verreaux's Tree Frog	P	
REPTILES			

Scientific Name	Common Name	Status	Record
Chelonia mydas	Green Turtle	V	
Chelodina longicollis	Eastern Snake-necked Turtle	P	
Pygopus lepidopodus	Southern Scaly-foot	P	
Amphibolurus muricatus	Jacky Lashtail	P	
Pogona barbata	Eastern Bearded Dragon	P	
Varanus varius	Lace Monitor	P	
Ctenotus robustus	Robust Ctenotus	P	
Cyclodomorphus michaeli		P	
Egernia major	Land Mullet	P	
Eulamprus quoyii	Eastern Water-skink	P	
Eulamprus tenuis	Bar-sided Forest-skink	P	
Lampropholis delicata	Dark-flecked Garden Sunskink	P	
Lampropholis guichenoti	Pale-flecked Garden Sunskink	P	
Lampropholis sp.	unidentified grass skink	P	
Saiphos equalis	Yellow-bellied Three-toed Skink	P	
Tiliqua scincoides	Common Bluetongue	P	
Ramphotyphlops nigrescens	Blackish Blind Snake	P	
Morelia spilota spilota	Diamond Python	P	
Cacophis krefftii	Dwarf Crowned Snake	P	
Demansia psammophis	Yellow-faced Whipsnake	P	
Hemiaspis signata	Marsh Snake	P	
Pseudechis porphyriacus	Red-bellied Black Snake	P	
BIRDS			
Coturnix chinensis	King Quail	P	7
Coturnix pectoralis	Stubble Quail	P	4,5,7
Coturnix ypsilophora	Brown Quail	P	3,5,7
Anseranas semipalmata	Magpie Goose	V	7,9
Anas castanea	Chestnut Teal	P	1,2,3,4,5,7
Anas gracilis	Grey Teal	P	2,3,4,5,6,7
Anas platyrhynchos	Mallard	U	2,6,7
Anas querquedula	Garganey	P	7
Anas rhynchotis	Australasian Shoveler	P	3,4,5,6,7
Anas clypeata	Northern Shoveler	P	9
Anas superciliosa	Pacific Black Duck	P	2,3,4,5,6,7
Aythya australis	Hardhead	P	3,4,5,7
Biziura lobata	Musk Duck	P	3,4,5,7
Chenonetta jubata	Australian Wood Duck	P	3,4,5,6,7
Cygnus atratus	Black Swan	P	2,3,4,5,7
Dendrocygna arcuata	Wandering Whistling-Duck	P	7
Dendrocygna eytoni	Plumed Whistling-Duck	P	3,4,7
Malacorhynchus membranaceus	Pink-eared Duck	P	3,4,5,6,7
Oxyura australis	Blue-billed Duck	V	7,9
Stictonetta naevosa	Freckled Duck	V	3,7,9
Tadorna tadornoides	Australian Shelduck	P	3,7,9
Podiceps cristatus	Great Crested Grebe	P	3,4,5
Poliocephalus poliocephalus	Hoary-headed Grebe	P	3,7

Scientific Name	Common Name	Status	Record
Tachybaptus novaehollandiae	Australasian Grebe	P	2,3,4,5,7
Pachyptila turtur	Fairy Prion	P	7
Pterodroma solandri	Providence Petrel	V	7
Puffinus gavia	Fluttering Shearwater	P	6, 7
Puffinus pacificus	Wedge-tailed Shearwater	P	3,7
Puffinus tenuirostris	Short-tailed Shearwater	P	3,7
Morus serrator	Australasian Gannet	P	3,7
Anhinga melanogaster	Darter	P	3,4,5,7
Phalacrocorax carbo	Great Cormorant	P	1,2,3,4,5,7
Phalacrocorax melanoleucos	Little Pied Cormorant	P	2,3,4,5,7
Phalacrocorax sulcirostris	Little Black Cormorant	P	2,3,4,5,7
Phalacrocorax varius	Pied Cormorant	P	3,4,5,7
Pelecanus conspicillatus	Australian Pelican	P	1,2,3,4,5,7
Ardea alba	Great Egret	P	1,2,3,4,5,6,7,9
Ardea ibis	Cattle Egret	P	3,4,5,7
Ardea intermedia	Intermediate Egret	P	2,3,4,5,6,7,9
Ardea pacifica	White-necked Heron	P	1,2,3,4,5,6,7
Botaurus poiciloptilus	Australasian Bittern	V	3,4,7,9
Butorides striatus	Striated Heron	P	3,4,5,7
Egretta garzetta	Little Egret	P	2,3,4,5,7,9
Egretta novaehollandiae	White-faced Heron	P	1,2,3,4,5,7
Ixobrychus flavicollis	Black Bittern	V	3,7,9
Ixobrychus minutus	Little Bittern	P	3,4,6,7,9
Nycticorax caledonicus	Nankeen Night Heron	P	3,4,5,6,7
Platalea flavipes	Yellow-billed Spoonbill	P	3,4,5,7
Platalea regia	Royal Spoonbill	P	2,3,4,5,6,7
Plegadis falcinellus	Glossy Ibis	P	3,4,5,6,7
Threskiornis molucca	Australian White Ibis	P	3,4,5,7
Threskiornis spinicollis	Straw-necked Ibis	P	3,4,5,7
Ephippiorhynchus asiaticus	Black-necked Stork	E1	3,4,5,7,9
Accipiter cirrocephalus	Collared Sparrowhawk	P	3,5,7
Accipiter fasciatus	Brown Goshawk	P	3,5,7
Accipiter novaehollandiae	Grey Goshawk	P	5,7
Aquila audax	Wedge-tailed Eagle	P	5,7
Aviceda subcristata	Pacific Baza	P	7
Circus approximans	Swamp Harrier	P	2,3,4,5,7
Elanus axillaris	Black-shouldered Kite	P	1,2,3,5,7
Haliaeetus leucogaster	White-bellied Sea-Eagle	P	3,4,5,7
Haliastur sphenurus	Whistling Kite	P	3,4,5,7
Hieraaetus morphnoides	Little Eagle	P	2,3,7
Lophoictinia isura	Square-tailed Kite	V	7
Milvus migrans	Black Kite	P	7
Pandion haliaetus	Osprey	V	7,9
Falco berigora	Brown Falcon	P	3,4,5,7
Falco cenchroides	Nankeen Kestrel	P	2,3,5,7
Falco longipennis	Australian Hobby	P	3,4,5,6,7
Falco peregrinus	Peregrine Falcon	P	3,4,5,7

Scientific Name	Common Name	Status	Record
Falco subniger	Black Falcon	P	7
Fulica atra	Eurasian Coot	P	2,3,4,5,7
Gallinula tenebrosa	Dusky Moorhen	P	3,4,5,7
Gallinula ventralis	Black-tailed Native Hen	P	9
Gallirallus philippensis	Buff-banded Rail	P	3,4,7,9
Porphyrio porphyrio	Purple Swamphen	P	2,3,4,5,7
Porzana fluminea	Australian Spotted Crake	P	3,4,5,7,9
Porzana pusilla	Baillon's Crake	P	3,4,5,7,9
Porzana tabuensis	Spotless Crake	P	3,6,7,9
Rallus pectoralis	Lewin's Rail	P	7,9
Turnix pyrrhothorax	Red-chested Button-quail	P	7
Turnix varia	Painted Button-quail	P	7
Actitis hypoleucos	Common Sandpiper	P	3,4,5,6,7,9
Arenaria interpres	Ruddy Turnstone	P	3,4,5,7,8,9
Calidris acuminata	Sharp-tailed Sandpiper	P	2,3,4,5,7,8
Calidris alba	Sanderling	P	3,5,8,9
Calidris canutus	Red Knot	P	3,4,5,6,7,8
Calidris ferruginea	Curlew Sandpiper	P	3,4,5,6,7,8,9
Calidris melanotos	Pectoral Sandpiper	P	3,5,7,8,9
Tryngites subruficollis	Buff Breasted Sandpiper		3,8
Calidris minuta	Little Stint	P	7
Calidris parmelanotos	Cox’s Sandpiper	P	8
Calidris ruficollis	Red-necked Stint	P	3,4,5,7,8,9
Calidris tenuirostris	Great Knot	V	3,4,5,6,7,8,9
Gallinago hardwickii	Latham's Snipe	P	3,4,5,6,7,8,9
Rostratula benghalensis	Painted Snipe	V	3,4,8,9
Heteroscelus brevipes	Grey-tailed Tattler	P	3,4,5,7,8,9
Heteroscelus incanus	Wandering Tattler	P	3,7,8,9
Limicola falcinellus	Broad-billed Sandpiper	V	3,4,5,7,8,9
Limnodromus semipalmatus	Asian Dowitcher	P	7,8,9
Limosa haemastica	Hudsonian Godwit	P	7,8,9
Limosa lapponica	Bar-tailed Godwit	P	3,4,5,6,7,8
Limosa limosa	Black-tailed Godwit	V	3,4,5,7,8,9
Numenius madagascariensis	Eastern Curlew	P	3,4,5,7,8,9
Numenius minutus	Little Curlew	P	3,5,7,8,9
Numenius phaeopus	Whimbrel	P	3,4,5,7,8
Philomachus pugnax	Ruff	P	3,4,7,8,9
Tringa erythropus	Spotted Redshank	P	8
Tringa flavipes	Lesser Yellowlegs	P	9
Tringa glareola	Wood Sandpiper	P	3,4,5,7,8,9
Tringa nebularia	Common Greenshank	P	3,4,5,7,8
Tringa stagnatilis	Marsh Sandpiper	P	3,4,5,6,7,8
Tryngites subruficollis	Buff-breasted Sandpiper	P	7
Xenus cinereus	Terek Sandpiper	V	3,4,5,7,8,9
Irediparra gallinacea	Comb-crested Jacana	V	3,4,7,8,9
Esacus negrectus	Beach Stone-curlew	E1	9
Burhinus grallarius	Bush Stone-curlew	E1	7

Scientific Name	Common Name	Status	Record
Haematopus fuliginosus	Sooty Oystercatcher	V	7,8,9
Haematopus longirostris	Pied Oystercatcher	V	3,4,5,7,8,9
Cladorhynchus leucocephalus	Banded Stilt	P	3,4,6,7,8,9
Himantopus himantopus	Black-winged Stilt	P	2,3,4,5,7,8
Recurvirostra novaehollandiae	Red-necked Avocet	P	3,4,5,6,7,8
Charadrius bicinctus	Double-banded Plover	P	3,4,5,6,7,8,9
Charadrius hiaticula	Ringed Plover	P	3,5,9
Charadrius leschenaultii	Greater Sand Plover	V	3,4,5,6,7,8,9
Charadrius mongolus	Lesser Sand Plover	V	3,4,5,7,9
Charadrius ruficapillus	Red-capped Plover	P	3,4,5,7,8
Charadrius veredus	Oriental Plover	P	3,7,8,9
Elseyornis melanops	Black-fronted Dotterel	P	2,3,4,5,7,8
Erythrogonys cinctus	Red-kneed Dotterel	P	3,4,5,7,8
Pluvialis dominica	Lesser Golden Plover	P	3,4,5,7,8
Pluvialis fulva	Pacific Golden Plover	P	7
Pluvialis squatarola	Grey Plover	P	3,7,8,9
Glarecola maldivarum	Oriental Pratincole	P	8,9
Vanellus miles	Masked Lapwing	P	1,2,3,4,5,7,8
Vanellus tricolor	Banded Lapwing	P	4,5,6,7,8,9
Anous stolidus	Common Noddy	P	7
Chlidonias hybridus	Whiskered Tern	P	3,4,5,6,7
Chlidonias leucopterus	White-winged Black Tern	P	3,4,5,7
Chilidonias nigra	Black Tern	P	5
Larus dominicanus	Kelp Gull	P	3,5,6,7
Larus novaehollandiae	Silver Gull	P	1,3,4,5,7
Stercorarius parasiticus	Arctic Jaeger	P	5,7
Sterna albifrons	Little Tern	E1	3,4,5,6,7,9
Sterna bergii	Crested Tern	P	3,5,7
Sterna caspia	Caspian Tern	P	3,4,5,7
Sterna hirundo	Common Tern	P	3,4,5,7
Sterna nilotica	Gull-billed Tern	P	3,4,5,6,7
Sterna paradisea	Arctic Tern	P	5
Sterna striata	White-fronted Tern	P	3,4,5,7
Chalcophaps indica	Emerald Dove	P	7
Columba leucomela	White-headed Pigeon	P	7
Columba livia	Rock Dove	U	3,5,7
Geopelia humeralis	Bar-shouldered Dove	P	3,5,7
Geopelia placida	Peaceful Dove	P	5,7
Lopholaimus antarcticus	Topknot Pigeon	P	5,7
Macropygia amboinensis	Brown Cuckoo-Dove	P	7
Ocyphaps lophotes	Crested Pigeon	P	3,5,7
Phaps elegans	Brush Bronzewing	P	7
Ptilinopus magnificus	Wompoo Fruit-Dove	V	7
Ptilinopus regina	Rose-crowned Fruit-Dove	V	7
Ptilinopus superbus	Superb Fruit-Dove	V	7
Streptopelia chinensis	Spotted Turtle-Dove	U	7
Cacatua galerita	Sulphur-crested Cockatoo	P	7

Scientific Name	Common Name	Status	Record
Cacatua sanguinea	Little Corella	P	7
Cacatua tenuirostris	Long-billed Corella	P	7
Calyptorhynchus funereus	Yellow-tailed Black-Cockatoo	P	7
Eolophus roseicapillus	Galah	P	5,7
Alisterus scapularis	Australian King-Parrot	P	7
Glossopsitta pusilla	Little Lorikeet	P	5,6,7
Lathamus discolor	Swift Parrot	E1	7
Neophema pulchella	Turquoise Parrot	V	7
Platycercus adscitus eximius	Eastern Rosella	P	3,5,7
Platycercus elegans	Crimson Rosella	P	7
Psephotus haematonotus	Red-rumped Parrot	P	3,4,5,7
Nymphicus hollandicus	Cockatiel	P	5
Trichoglossus chlorolepidotus	Scaly-breasted Lorikeet	P	7
Merops ornatus	Rainbow Bee-eater	P	5
Cacomantis flabelliformis	Fan-tailed Cuckoo	P	3,5,7
Cacomantis variolosus	Brush Cuckoo	P	3,6,7
Chalcites basalis	Horsfield's Bronze-Cuckoo	P	2,3,5,6,7
Chrysococyx osculans	Black-eared Cukoo	P	5
Chalcites lucidus	Shining Bronze-Cuckoo	P	3,5,7
Cuculus pallidus	Pallid Cuckoo	P	3,5,7
Cuculus saturatus	Oriental Cuckoo	P	7
Eudynamys orientalis	Pacific Koel	P	5,7
Scythrops novaehollandiae	Channel-billed Cuckoo	P	7
Centropus phasianinus	Pheasant Coucal	P	7
Ninox connivens	Barking Owl	V	7
Ninox strenua	Powerful Owl	V	7
Tyto alba	Barn Owl	P	1,3,5,6,7
Tyto novaehollandiae	Masked Owl	V	7
Podargus strigoides	Tawny Frogmouth	P	7
Eurostopodus mystacalis	White-throated Nightjar	P	7
Aegotheles cristatus	Australian Owlet-nightjar	P	7
Apus pacificus	Fork-tailed Swift	P	1,3,5,7
Hirundapus caudacutus	White-throated Needletail	P	4
Alcedo azurea	Azure Kingfisher	P	3,4,5,7
Dacelo novaeguineae	Laughing Kookaburra	P	3,4,5,7
Todiramphus macleayii	Forest Kingfisher	P	7
Todiramphus sanctus	Sacred Kingfisher	P	3,4,5,7
Eurystomus orientalis	Dollarbird	P	6,7
Cormobates leucophaeus	White-throated Treecreeper	P	7
Malurus cyaneus	Superb Fairy-wren	P	2,3,4,5,7
Malurus lamberti	Variegated Fairy-wren	P	5,6,7
Pardalotus punctatus	Spotted Pardalote	P	7
Pardalotus striatus	Striated Pardalote	P	7
Acanthiza chrysorrhoa	Yellow-rumped Thornbill	P	5
Acanthiza lineata	Striated Thornbill	P	7
Acanthiza nana	Yellow Thornbill	P	2,3,5,7
Acanthiza pusilla	Brown Thornbill	P	3,5,7

Scientific Name	Common Name	Status	Record
Acanthiza reguloides	Buff-rumped Thornbill	P	7
Gerygone levigaster	Mangrove Gerygone	P	3,5,7
Gerygone mouki	Brown Gerygone	P	7
Gerygone olivacea	White-throated Gerygone	P	5,7
Sericornis frontalis	White-browed Scrubwren	P	5,7
Acanthorhynchus tenuirostris	Eastern Spinebill	P	7
Anthochaera carunculata	Red Wattlebird	P	7
Anthochaera chrysoptera	Little Wattlebird	P	7
Entomyzon cyanotis	Blue-faced Honeyeater	P	7
Epthianura albifrons	White-fronted Chat	P	2,3,4,5,7
Lichenostomus chrysops	Yellow-faced Honeyeater	P	3,5,6,7
Lichenostomus leucotis	White-eared Honeyeater	P	7
Lichenostomus penicillatus	White-plumed Honeyeater	P	7
Lichmera indistincta	Brown Honeyeater	P	1,3,5,7
Manorina melanocephala	Noisy Miner	P	7
Manorina melanophrys	Bell Miner	P	7
Meliphaga lewinii	Lewin's Honeyeater	P	7
Melithreptus brevirostris	Brown-headed Honeyeater	P	7
Melithreptus lunatus	White-naped Honeyeater	P	7
Myzomela sanguinolenta	Scarlet Honeyeater	P	7
Philemon citreogularis	Little Friarbird	P	7
Philemon corniculatus	Noisy Friarbird	P	5,6,7
Phylidonyris nigra	White-cheeked Honeyeater	P	7
Plectorhyncha lanceolata	Striped Honeyeater	P	3,5,7
Xanthomyza phrygia	Regent Honeyeater	E1	7
Eopsaltria australis	Eastern Yellow Robin	P	3,7
Petroica boodang	Scarlet Robin	P	7
Petroica rosea	Rose Robin	P	3,5,7
Psophodes olivaceus	Eastern Whipbird	P	7
Daphoenositta chrysoptera	Varied Sittella	P	7
Colluricincla harmonica	Grey Shrike-thrush	P	3,5,7
Falcunculus frontatus	Eastern Shrike-tit	P	7
Pachycephala pectoralis	Golden Whistler	P	3,7
Pachycephala rufiventris	Rufous Whistler	P	3,5,7
Dicrurus bracteatus	Spangled Drongo	P	7
Grallina cyanoleuca	Magpie-lark	P	3,4,5,7
Monarcha melanopsis	Black-faced Monarch	P	5,7
Monarcha trivirgatus	Spectacled Monarch	P	7
Myiagra inquieta	Restless Flycatcher	P	3,5,7
Myiagra rubecula	Leaden Flycatcher	P	3,5
Rhipidura albiscapa	Grey Fantail	P	2,3,5,7
Rhipidura leucophrys	Willie Wagtail	P	2,3,4,5,7
Rhipidura rufifrons	Rufous Fantail	P	5,7
Coracina novaehollandiae	Black-faced Cuckoo-shrike	P	5,7
Coracina papyensis	Little Cuckoo-shrike	P	5,7
Coracina tenuirostris	Cicadabird	P	5,7

Scientific Name	Common Name	Status	Record
Lalage tricolor	White-winged Triller	P	3,5,6,7
Oriolus sagittatus	Olive-backed Oriole	P	5,7
Sphectotheres viridis	Figbird	P	5
Artamus cyanopterus	Dusky Woodswallow	P	3,6,7
Artamus leucorynchus	White-breasted Woodswallow	P	2,3,7
Cracticus nigrogularis	Pied Butcherbird	P	3,5,6,7
Cracticus torquatus	Grey Butcherbird	P	2,3,5,7
Gymnorhina tibicen	Australian Magpie	P	2,3,5,7
Strepera graculina	Pied Currawong	P	7
Corvus coronoides	Australian Raven	P	2,3,4,5,7
Corvus orru	Torresian Crow	P	7
Corcorax melanorhamphos	White-winged Chough	P	7
Ptilonorhynchus violaceus	Satin Bowerbird	P	7
Sericulus chrysocephalus	Regent Bowerbird	P	7
Anthus australis	Australian Pipit	P	5,7
Anthus novaeseelandiae	Richard's Pipit	P	4,5
Motacilla flava	Yellow Wagtail	P	7,9
Passer domesticus	House Sparrow	U	3,5,7
Carduelis carduelis	European Goldfinch	U	3,5,7
Lonchura castaneothorax	Chestnut-breasted Mannikin	P	2,3,7
Lonchura punctulata	Nutmeg Mannikin	U	7
Neochmia modesta	Plum-headed Finch	P	7
Neochmia temporalis	Red-browed Finch	P	7
Taeniopygia bichenovii	Double-barred Finch	P	3,7
Taeniopygia guttata	Zebra Finch	P	2,3,5,7
Dicaeum hirundinaceum	Mistletoebird	P	5,7
Hirundo neoxena	Welcome Swallow	P	2,3,4,5,7
Hirundo rustica	Barn Swallow	P	7
Petrochelidon ariel	Fairy Martin	P	2,3,4,5,7
Petrochelidon nigricans	Tree Martin	P	3,4,5,7
Pycnonotus jocosus	Red-whiskered Bulbul	U	7
Acrocephalus stentoreus	Clamorous Reed-Warbler	P	2,3,4,5,7
Cincloramphus cruralis	Brown Songlark	P	3,4,5,7
Cincloramphus mathewsi	Rufous Songlark	P	3,6,7
Mirofra javanica	Singing Bushlark	P	3
Aluda arvensis	Skylark	P	3
Cisticola exilis	Golden-headed Cisticola	P	2,3,4,5,7
Megalurus gramineus	Little Grassbird	P	2,3,4,5,7
Megalurus timoriensis	Tawny Grassbird	P	3,7
Zosterops lateralis	Silvereye	P	3,5,7
Turdus merula	Eurasian Blackbird	U	7
Acridotheres tristis	Common Myna	U	5,7
Sturnus vulgaris	Common Starling	U	1,2,3,4,5,7
MAMMALS			
Tachyglossus aculeatus	Short-beaked Echidna	P	
Antechinus stuartii	Brown Antechinus	P	

Scientific Name	Common Name	Status	Record
Phascogale tapoatafa	Brush-tailed Phascogale	V	
Sminthopsis murina	Common Dunnart	P	
Isoodon macrourus	Northern Brown Bandicoot	P	
Perameles nasuta	Long-nosed Bandicoot	P	
Phascolarctos cinereus	Koala	V	
Vombatus ursinus	Common Wombat	P	
Petaurus breviceps	Sugar Glider	P	
Petaurus norfolcensis	Squirrel Glider	V	
Pseudocheirus peregrinus	Common Ringtail Possum	P	
Acrobates pygmaeus	Feathertail Glider	P	
Trichosurus vulpecula	Common Brushtail Possum	P	
Macropus rufogriseus	Red-necked Wallaby	P	
Wallabia bicolor	Swamp Wallaby	P	
Pteropus poliocephalus	Grey-headed Flying-fox	V	1
Pteropus sp.	Flying-fox	P	
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	V	
Mormopterus loriae	Little Northern Freetail-bat	P	
Mormopterus norfolkensis	Eastern Freetail-bat	V	
Mormopterus sp 1	undescribed mastiff-bat	P	
Mormopterus sp 2	Little Freetail Bat	P	
Nyctinomus australis	White-striped Freetail-bat	P	
Chalinolobus dwyeri	Large-eared Pied Bat	V	
Chalinolobus gouldii	Gould's Wattled Bat	P	
Chalinolobus morio	Chocolate Wattled Bat	P	
Miniopterus australis	Little Bentwing-bat	V	
Miniopterus schreibersii	Common Bentwing-bat	V	
Myotis adversus	Large-footed Myotis	V	
Nyctophilus geoffroyi	Lesser Long-eared Bat	P	
Nyctophilus gouldi	Gould's Long-eared Bat	P	
Scoteanax rueppellii	Greater Broad-nosed Bat	V	
Scotorepens orion	Eastern Broad-nosed Bat	P	
Vespadelus pumilus	Eastern Forest Bat	P	
Vespadelus vulturnus	Little Forest Bat	P	1
Mus musculus	House Mouse	U	
Pseudomys novaehollandiae	New Holland Mouse	P	
Rattus fuscipes	Bush Rat	P	
Rattus lutreolus	Swamp Rat	P	
Rattus norvegicus	Brown Rat	U	
Rattus rattus	Black Rat	U	
Lepus capensis	Brown Hare	U	
Oryctolagus cuniculus	Rabbit	U	
Arctocephalus forsteri	New Zealand Fur-seal	V	
Arctocephalus sp.	Unidentified Fur-seal	P	
Seal sp.	Unidentified Seal	P	
Canis lupus	Dingo, domestic dog	U	

Scientific Name	Common Name	Status	Record
Vulpes vulpes	Fox	U	
Felis catus	Cat	U	
Dugong dugon	Dugong	E1	
Megaptera novaeangliae	Humpback Whale	V	
Kogia breviceps	Pygmy Sperm Whale	P	
Mesoplodon layardii	Strap-toothed Beaked Whale	P	
Delphinus delphis	Common Dolphin	P	
Stenella attenuata	Spotted Dolphin	P	
Equus caballus	Horse	U	
Bos taurus	European cattle	U	

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