ENVIRONMENTAL ASSESSMENT

VOLUME 1

OYSTER LEASE DREDGING, LEASE NO. 80 – 178, WALLIS LAKE

Prepared For:

TREVOR DENT

OCTOBER 2006

GEOLYSE

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Submission of
Environmental Assessment (EA)
prepared under the *Environmental Planning and Assessment Act 1979*
Part 3A

EA prepared by	
Name	Justin Meleo
Qualifications	BSc.(Hons. 1), PhD
Address	Geolyse Pty Ltd PO Box 280 TUNCURRY NSW 2428
in respect of	The dredging of sand material from Oyster Lease No. 80 – 178 and the processing and transportation of sand products
development application	
applicant name	Mr Trevor Dent
applicant address	PO Box 163 Tuncurry NSW 2428
Land to be developed: address, lot no, DP/MPS, vol/fol etc	Lots 59, 101, 123, 124, 125 DP 753207, Lot 12 DP 816473 2 – 6 Rodmay St, Tuncurry
proposed development	Oyster Lease No. 80 – 178 or □ map(s) attached
environmental assessment	✓ an Environmental Assessment (EA) is attached
declaration	I, Justin Meleo, certify that I have prepared the contents of this Assessment and to the best of my knowledge • it is in accordance with clause 75H of the Environmental Planning and Assessment Act 1979; and • it is true in all material particulars and does not, by its presentation or omission of information, materially mislead.
Signature	
Name	Justin Meleo
Date	19/10/2006

GEOLYSE

Report Title:	*Environmental Assessment*
Project:	Oyster Lease Dredging, Lease No. 80 – 178, Wallis Lake
Client:	*Mr Trevor Dent*
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Geolyse Pty Ltd and the authors responsible for the preparation and compilation of this report declare that we do not have, nor expect to have a beneficial interest in the study area of this project and will not benefit from any of the recommendations outlined in this report.

The preparation of this report has been in accordance with the project brief provided by the client and has relied upon the information, data and results provided or collected from the sources and under the conditions outlined in the report.

All maps, plans and cadastral information contained within this report are prepared for the exclusive use of Trevor Dent to accompany this study for the land described herein and are not to be used for any purpose or by any other person or entity.

The contours and cadastral information on the plans in this document are derived from digital mapping and are only suitable for the purposes of this study. No reliance should be placed on the information contained on these plans for any purposes apart from the purposes for this study.

Geolyse Pty Ltd accepts no responsibility for any loss, damage suffered or inconveniences arising from, any person or entity using the plans or information in this study for purposes other than those stated above.

Approved By:	*Tony Fish*
Position:	*Project Director*
Signed:	
Date:	19/10/2006

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Position:	*Project Manager*
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Date:	19/10/2006

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Executive Summary

Introduction

This Environmental Assessment (EA) has been prepared to accompany a Major Projects application by Mr. Trevor Dent (hereafter referred to as 'the proponent') for the dredging of accumulated sands over oyster lease No. 80 – 178 and the processing, stockpiling and transportation of sand material. The stockpiling operation will be located over Lots 59 and 101 DP 753207, and Lot 12 DP 816473, while the pipeline carrying dredged materials and return waters will be located on Lots 123, 124 and 125 DP 753207 and Lot 101 DP 753207.

The proposed development is defined as a Major Project under the provisions of Part 3A of the *Environmental Planning and Assessment Act 1979*, in accordance with Clauses 7(1)(c) and 7(2)(a) of Schedule 1 of SEPP Major Projects 2005. The Minister for Planning is the approval authority for the project.

This executive summary provides an overview of the proposed development, the attributes of the existing environment and the potential impacts of the proposal on the surrounding environment. The proposed development has been designed to maximise the use of the existing oyster lease through dredging to an appropriate depth to allow oyster cultivation, while also optimising the potential use of the sand resource from the oyster lease site and minimising any potential for adverse environmental impacts upon the local environment and local community.

Planning Context and Existing Approvals

The oyster lease is unzoned Crown Land, while the area for the proposed stockpile site is zoned 1(c) Future Urban Investigation under the provisions of Great Lakes Local Environmental Plan 1996 (LEP 1996). Extractive industries are permissible within this zone with consent.

The pipelines traverse lots that are zoned 7(a) Wetlands and Littoral Rainforest and 1(c). The transport of dredged materials in the pipeline to the stockpile site and the stockpiling operation (extractive industry) are permitted in the 1(c) zone. The location of the dredge and return waters pipelines, which are part of an aquaculture operation, are permissible in the zone with consent. Further, assessment of their impact indicates that their presence is consistent with the objectives of the 7(a) zone.

Existing and Proposed Operations

The oyster lease is currently not in use, though is identified in the Draft NSW Oyster Industry Sustainable Aquaculture Strategy (DPI, 2006) as a 'Priority Aquaculture Area'. In order to meet the Strategy's objective for this lease as a 'Priority Aquaculture Area', the proposed development involves the dredging of marine sand and fluvial fines deposits that have accumulated over the oyster lease, to an average depth of approximately 1.4 – 1.5 m below present bed level, with maximum dredge depths of approximately 2 m. The area of the lease that is proposed to be dredged is approximately 8 ha. This area has been determined from mapping of aquatic ecological constraints. It is estimated that 1.5 – 2.0 m of material will need to be removed from the dredge footprint which will yield approximately 120,000 – 160,000 m^3 of material. Based on sampling test results, the average sand-fraction is 94 %.

Therefore it is estimated that 112,800 – 150,400 m^3 of sand-fraction will be recovered from the dredge operation.

The dredged material will be pumped in a slurry form approximately 3.8 km to the onshore treatment facility, located 2 km north of the lease area. The dredged material will be dewatered, undergo separation of fines and sands, stockpiled and sold to market.

The stockpile working area, including settling ponds, will occupy a site area of approximately 6 ha. The site is currently used for low intensity cattle grazing and has access to sealed roads for transport of the material to market. Discharge waters will be treated on site via a series of settling ponds and pumped back to the Wallamba River after meeting agreed pH and turbidity criteria.

It is estimated that the dredge operation, if operating continuously, would take about 7 months to complete.

Resource Availability

A comprehensive geotechnical assessment found that the properties of the sand are relatively uniform, dominated by fine to medium sands in the 0.06 – 0.6 mm grain size range. The sand present on site is suitable as an extractive resource.

The maximum depth of dredging below the bed is estimated to be approximately 2 m, equivalent to the depth of adjacent dredged channels and oyster lease areas. Average depth of dredging over the site is estimated to be 1.5 – 2.0 m below present bed levels. Based on a dredge footprint of 8 ha, this equates to a volume of dredged material between 120,000 – 160,000 m^3. Based on sampling test results, the average sand-fraction is 94 %. Therefore it is estimated that 112,800 – 150,400 m^3 of sand-fraction will be recovered from the dredge operation.

Ecological Impacts

The proposal aims to minimise the extent of disturbance to aquatic and terrestrial species, populations and ecological communities and thereby the extent of the site requiring rehabilitation at any given stage. Flora and fauna reports for both terrestrial (which included a Section 5A Assessment) and aquatic biota concluded that the proposed development would not have a significant impact upon Threatened species, populations or ecological communities.

Aquatic Ecology

The dredge area of the oyster lease has been determined based on consideration of aquatic ecological constraints. With respect to seagrass (*Zostera* sp.) coverage, the majority of the lease area is of low habitat value, primarily due to large areas of the lease area being exposed around low tide. Lowering of the bed through dredging, however, will increase the area of suitable habitat for seagrass by crating a permanently inundated environment. Inspection of previously dredged areas surrounding the lease (other leases and channels) at depths similar to those proposed for the dredging indicates a higher density coverage of seagrass that within the majority of the oyster lease area. Therefore, seagrass would be expected to colonise the lowered bed surface of the lease. Notwithstanding, it is proposed to replace areas of seagrass that are of high habitat value that will be impacted by dredging

through replanting adjacent to the lease boundary at a ratio of 2:1. It is also proposed to relocate the Hairy Pipefish, a protected species, if present in affected areas, to other areas in the vicinity of the lease that have suitable *Zostera* coverage.

Threatened and/or protected species which potentially occur in Wallis Lake include mangroves, seagrasses (especially *Posidonia australis*), Black Cod, Estuary Cod and Syngnathiformes (which includes all pipefish and seahorses). Of these, Black Cod is on the endangered list and *Posidonia australis* is also protected (*Fisheries Management Act 1994* and the *Environmental Protection and Biodiversity Conservation (EPBC) Act 1999)*.

Neither Black cod *Epinephelus daemelii* nor Strapweed, *Posidonia australis* occur on the study site. Estuary Cod, *Epinephelus coioides,* could occur in this region but are more likely to inhabit areas with deeper channels, coffee rock ledges, drop offs and structure, as found around Wallis Island and at the Breakwater. The Hairy Pipefish, *Urocampus carinirostris,* was present amongst the seagrasses in one area of the study site. It belongs to a protected group of fish, Syngnathiformes, listed as vulnerable to human impact. The species itself is not threatened, but its lifecycle and habitat should be protected as far as possible. As the majority of this species' habitat will be retained, however, the impact is not considered to be significant.

The exposed low tide areas of the lease have been assessed for their value as foraging habitat for wading birds. The assessment indicates that the area is not an important habitat for waders and that removal of this area would not significantly impact upon waders. Further, the lease does not have any areas of high tide roost for these species.

The aquatic ecology assessment of the pipeline route within the Wallamba River indicated that the proposed location of the pipe in the shallow areas of the river would not significantly impact upon these environments.

Benthic communities lost in the dredge footprint would be recolonised by the adjacent areas and settlement of larvae of benthic animals. Loss of benthic fauna due to dredging would be comparable to the natural loss of benthic fauna due to flood scouring and smothering. In spite of the temporary loss in numbers, most populations should recolonise the area from adjoining habitats.

Commercial fishing pursuits other than oyster farming in the vicinity of the site are either seasonal or occasional (set pocket prawning, trapping, meshing) and not likely to be adversely affected by the dredging of the site. Rather, the increase in depth across the site will significantly enlarge the existing area and make available up to an additional 8 ha for commercial netting during all phases of the tidal cycle.

In terms of recreational fishing, the impact of dredging will result in a reduction of the nipper population and more difficult access for collection, due to the deeper water. The area is, however, used sporadically (in low numbers) during holiday periods in summer months. In light of the extensive areas of low tide flats available for bait collection by recreational fishers in Wallis Lake, the impact of the loss of this area on recreational fishing opportunities in Wallis Lake is considered negligible.

Terrestrial Ecology

The proposal will require minimal native vegetation removal, given that the majority of the proposed dredge pipeline route and stockpile site are cleared of native vegetation. The only vegetation that will require removal is a 0.5 ha area of highly modified Swamp Sclerophyll Forest. The loss of this vegetation is not considered to be significant, given the degree of its disturbance, small size and extant areas of relatively undisturbed freshwater Swamp Sclerophyll Forest habitat present in the immediate locality.

The terrestrial component of the pipeline route is located primarily in existing cleared areas. Two areas are, however, uncleared. These are an approximately 100 m section in the Saltmarsh and an approximately 75 m section through a Swamp Sclerophyll Forest. Assessment of the impact of the pipeline through these uncleared areas indicated that there would be no significant impacts on these communities. Further, management measures have been recommended to minimise any potential impacts from pipeline failure throughout the length of the pipeline.

The potential impact upon fauna and their habitat as a result of proposed development is considered to be low. No clearing will be required for the placement of the pipes and only a small number of saplings (28) and mature trees (31) will be removed for the creation of the stockpile site. The trees proposed to be removed provide a very small amount of potential foraging resources for fauna known to occur or considered potentially occurring in the study area and locality.

The proposed dredge area will remove up to 8 ha of sand flats, of which it is estimated that 7 ha of this area would be suitable for foraging for Waders and Shorebirds at low tide. The remaining area is unlikely to be utilised due to the depth of water covering this areas at low tide. During high tide the proposed dredge area may be used by other bird species such as the Little Tern or Osprey for fishing purposes, however, the dredging activity would only result in the modification of habitat, creating a deeper water hunting area for these species. This increase in the depth of water may also provide additional habitat for the Green Turtle.

In total, 31 fauna species, two (2) flora species and three (3) EEC's listed under the *Threatened Species Conservation Act 1995* or *Environmental Protection and Biodiversity Conservation Act 1998* were considered as Subject Species or Subject Communities for the proposal. An assessment of significance in accordance with Section 5A of the *Environmental Planning and Assessment Act 1979* was prepared for Subject Species or Subject Communities listed under the TSC Act while all other species (including the migratory and marine species) listed under the *EPBC Act* were assessed under the Administrative guidelines.

These assessments determined that due to the limited impacts associated with the proposed development and with the implementation of the recommended mitigation measures, it is considered that the proposal will not have a significant impact on Threatened species, populations or ecological communities or their habitats within the locality.

Hydraulic and Sediment Transport Impacts

Numerical modelling was undertaken of the impacts of dredging on the hydrodynamics and sediment transport in and around the dredge area. Detailed modelling was undertaken by UNSW Water Research Laboratory which indicated the following:

- No changes in predicted water levels in the immediate vicinity of the dredge site;
- No change in total discharge across the Wallamba River, indicating that the overall efficiency of the entrance to the Wallamba River has not changed;
- No change in the hydrodynamic behaviour of the estuary outside the immediate area of the dredging site;
- No initiation of sediment transport in the vicinity of the dredge area as a result of the dredging;
- Minor changes to flow paths between Oaky Island and Native Dog Island;
- The dredging will have no effect on the overall flows or hydrodynamics of the Wallamba River and Wallis Lake estuary.

In summary, dredging of the oyster lease to a maximum depth of 2 m will not induce significant hydraulic or sediment transport changes in the vicinity of the dredge site or to the estuary as a whole.

Air Quality Impacts

A Dust and Odour Assessment report was prepared which identified the main source of emissions from the proposal as being dust emissions from the proposed stockpile operations. The purpose of this report was to quantitatively assess dust impacts that may be associated with the stockpiling site.

It was determined that dredged material, being primarily fine to medium grained sand, would not generate odour emissions as a result of the stockpiling activities. Consequently, no specific mitigation measures for odour control were recommended.

The primary sources of dust were determined as being from loading of sand to trucks, transporting the sand off-site, and wind erosion. Potential air quality impacts of PM_{10}, TSP and deposition of insoluble solids due to dust emissions from the proposed operations were assessed. Computer-based dispersion modelling was used for predicting the dust impacts due to the site operations.

Results from the dispersion modelling indicated that off-site dust concentrations and dust deposition levels at all nearby residences due to the proposed operations would be below relevant air quality goals. The assessment presents worst-case scenarios.

Emissions from the booster pumps along the transfer pipeline are predicted to be minimal.

Noise Impacts

Operations will take place only during the daytime. No fixed plant at the processing site or mobile plant at any of the site operation areas will operate during the evening or the night periods (INP periods of 6pm through to 7am inclusive).

This assessment considered noise and vibration produced by the dredging and processing operations and related activities as well as any potential acoustical impacts on nearby residences and land uses. The assessment was undertaken in accordance with the Department of Environment (DEC) requirements outlined in the Director General's requirements for the preparation of this Environmental Assessment. As required in the Director General's Requirements, the DEC's Industrial Noise Policy (INP) is used in this report to assess noise.

From a noise monitoring survey of the nearby areas, the appropriate DEC noise criterion was assessed to be the Intrusiveness Criterion with a daytime value of 43 dB(A) for the processing site and 48 dB(A) for the dredging site.

For a part of the time the dredge will be located closer to dwellings than at other times. In this assessment this was considered as the worst case situation. In this situation, the assessment concluded that noise levels at the most exposed residences would be up to 48dB(A) and within the DEC's goals. For the processing site, the assessment concluded that noise levels could be contained to within the 43 dB(A) DEC goal.

For road traffic noise related to the movement of heavy vehicles to and from the processing site along Grey Gum Road to the main road system, it was concluded that there would be no meaningful additional noise impact.

This assessment of environmental noise from the proposed sand dredging and processing operations concluded that environmental noise goals could be achieved.

The assessment concluded that noise during worst-case operating conditions (when plant was closest to dwellings) would result in noise levels at the nearest residences being within the Project Specific Goals (environmental noise goals) developed from DEC noise guidelines.

For road traffic noise related to the movement of heavy vehicles to and from the processing site along Grey Gum Road to the main road system, it was concluded that there would be no meaningful additional impact since the road connecting the site to the main road was through an industrial area with no residential uses along its length.

In relation to noise from operations, noise controls will be needed to reduce plant noise levels. It is suggested that:

- Noise from the dredge should be attenuated so that the sound power level is limited to 97 dB(A);
- 3 sided, 3m high noise walls be erected around the return waters pump and the booster pump (shown in the noise map) to reduce noise levels to the appropriate environmental noise goal;
- Noise walls be erected prior to commissioning of pumps;
- Plant and equipment should be maintained in good working order to reduce noise emissions; and

- Work site should be organised to reduce the operation of reversing alarms on vehicles. Where possible, vehicle and plant movement should be designed to maximise forward movements and to minimise reversing movements.

Traffic Impacts

Access to the stockpile site is proposed via the frontage of the site to Grey Gum Road, which services the industrial area of Tuncurry. Detailed analyses of traffic generation from the proposed stockpile operations and traffic on Grey Gum Road and at the intersection with The Lakes Way indicates the following:

- An additional 12 one-way heavy vehicle trips per day will increase total heavy vehicle trips eastbound on Grey Gum Road from 450 to 462 (2.7 % increase) and westbound from 493 to 505 (2.4 % increase);
- Increase in heavy vehicle movements through the intersection of approximately 2.1 % (AM peak) (assuming four trips) and 5.2 % (PM peak);
- Increase in total vehicle movements through the intersection of approximately 0.85 % (AM peak) and 0.87 % (PM peak);
- Analysis of the intersection design indicates that the intersection design is satisfactory for the very minor increase in traffic; and
- The existing road system is therefore considered adequate to cater for this very minor relative increase in additional traffic in terms of access, safety and standard. volumes.

Visual Impacts

The proposed dredge operation and oyster cultivation will be visible from some residences along Taree St. The location of a dredge operating (non-permanent) over the lease area for a period of months will not have a detrimental impact on views of Wallis Lake from any residences. This type of vessel is typical of watercraft to be expected to operate periodically in an active working estuary such as Wallis Lake.

The visual impact of floating oyster cultivation (not the subject of this EA) is benign and is to be expected in parts of the estuary that are licensed for oyster cultivation.

The operation and existence of the stockpile site will not be visible from residences in Aspelini Crescent Sth., (which face away from the stockpile site) as a large (10 m high, 30 m deep) screen of vegetation between these residences and the stockpile site will obscure any views of the sand stockpiles or operating plant and equipment. The proposed development will not significantly affect the landscape or visual amenity of the area.

Socio-Economic Impacts

The proposed project would have a number of positive socio-economic outcomes to the local area, Great Lakes/Greater Taree areas and the Mid North Coast region of NSW.

The primary objective of the development will be the re-establishment of an existing non-productive oyster lease to a productive oyster lease, consistent with the identification of the lease area in the Draft NSW Oyster Industry Sustainable Aquaculture Strategy (DPI, 2006) as a 'Priority Aquaculture Area'. A secondary objective is utilisation of the dredge spoil to meet market demand for sand.

The re-establishment of the lease, once fully operational, will contribute approximately $150,000 per annum to the local oyster industry. The operation will create direct employment for one full-time and one casual position.

The dredging of the lease area will increase the area available for commercial netting and recreational fishing by creating a permanently (as opposed to a partially) inundated environment. The impact of the loss of the low tide use of the lease for recreational bait gathering is insignificant, both in terms of actual usage for this activity and in the context of other areas of sand and mud flats in Wallis Lake available for this activity.

The resale of sand material to market is critical to the project in order to finance the dredging operation. The gross potential yield from the stockpile is estimated at approximately 120,000 – 160,000 m^3 of material. It is estimated that the sale of sand material to market would have a gross value (including Royalties) of up to $250,000 – 300,000 p.a., depending upon demand. Two additional fulltime and one part time staff would be required for this part of the operation.

In addition, the dredge operation has a capital outlay of approximately $1.3M. Therefore, the gross project contribution to the local economy (excluding the ongoing annual oyster lease contribution of $150,000) is approximately $4.8 – 5.5M.

The proposed project would therefore have a positive socio-economic impact, through employment generation and the injection of approximately $5M into the local economy.

Cultural Heritage Impacts

The proposal will have no impacts on items of European heritage.

Forster Local Aboriginal Land Council – Cultural Heritage Section was commissioned to prepare an Indigenous Cultural Heritage impact assessment report for the proposed development.

The surveys and assessments involved the review of the Forster Local Aboriginal Land Council Aboriginal Sites database, review of previous archaeological reports in the local area (DeGroot and Benson, 2000) and transect searches for relics. The transect searches were undertaken by two personnel and covered all areas of the proposed development area and targeted relics or other artefacts representative of open camp sites, middens, scar tress, carved trees and ceremonial places.

The surveys revealed no indications of Aboriginal heritage and Forster Local Aboriginal Land Council has no objections to the proposed development.

Due to the previous disturbance of the site, it is possible that some relics may occur within the proposed development area. Mitigation measures have been developed should any relics or artefacts be uncovered during quarrying.

Conclusions

The proposal to dredge the oyster lease and operate an extractive industry in the manner proposed within this Environmental Assessment would enable the re-establishment of a productive oyster growing area in addition to the use of a substantial high quality sand resource of regional significance. The proposed development is capable of satisfying relevant environmental, planning and engineering objectives.

If approved by the Minister, the development will provide for an increase in the productivity of high quality oysters in Wallis Lake and make available a sand resource for local and regional markets.

If approved, the project operations will be subject to requirements and conditions of Government Authorities and an Environmental Management Strategy, to be prepared and approved prior to commencement of the project.

Based on the details contained in this Environmental Assessment, it is considered that the proposed development could be undertaken in an environmentally acceptable manner and would not have significant adverse impacts upon the environmental, social or economic conditions of the surrounding area and region.

Introduction

1.1 BACKGROUND

The production of oysters in the lower end of Wallis Lake estuary (**Figure 1.1**) is a major component of the local economy in the Great Lakes area. From 2000 – 2004, oyster production in Wallis Lake contributed 30 – 35 % to the $36 M per annum (2003-2004) industry in NSW (NSW DPI, 2004). The Draft NSW Oyster Industry Sustainable Aquaculture Strategy (DPI, 2006) provides a strategy for the management of the NSW oyster industry, with a focus on achieving sustainable growth to a production level of 120,000 bags per annum, up from 72,853 bags in 2003/04 (65 % increase). At present there are numerous oyster leases in Wallis Lake that are non-productive, due to the accumulation of sands and fines of marine and fluvial origin over the lease areas, and the increase in tidal range in the estuary resulting form training of the entrance, which has effectively led to the bed of leases being of a height that exceeds the capacity for sufficient tidal inundation suitable for the growing of oysters.

The lease area was originally established for oyster growing approximately 100 years ago, at which time the bed of the lease was raised to an appropriate height for rack farming by local oyster farmers, through the infilling of the area with felled cabbage tree palms and the addition of marine sand overburden. Therefore the natural state of this part of the estuary was a deeper environment compared to the present. Over time, however, the action of artificially raising the bed has been subject to the accretion of flood tide-activated marine sands and fluvially-derived fines over the lease area. Consequently, due to the lack of maintenance dredging resulting from economic constraints on the lease owners, the bed of the lease is now of a height that prevents sufficient inundation of water for growing of oysters, with large areas of the bed of the lease area being sub-aerial at low tide. Oyster spat has been grown sporadically on the outer edges since the lease was last dredged in 1981 (approximately 3,000 m^3 removed), though the lease has not been farmed for oysters since the mid – 1990's. The lease has been identified as a "Priority Aquaculture Area" in the Draft NSW Oyster Industry Sustainable Aquaculture Strategy (DPI, 2006).

It is proposed to re-establish the lease as a productive oyster growing area through the dredging of accumulated sands and fines and thereby assist in meeting the Draft Strategy's objective of increasing production by up to 65 % above present levels in NSW. It is expected that the gross production value of the oyster lease area once operational would be on the order of $150,000 p.a. (2006 figure). One additional fulltime and one casual staff would be required for the oyster growing operations on the lease.

Ancillary to the dredging operation is the disposal of dredge spoil. It is proposed to establish a stockpile site for the dredged sands and operate an extractive industry (*ie.* sell the sand to market in accordance with demand).

Director General's requirements were initially sought in 2005 for the proposal under Part 4 of the *Environmental Planning and Assessment Act 1979*. Since then, the proposed development has been classified as a Major Project under the provisions of Part 3A of the *Environmental Planning and Assessment Act 1979* (**Appendix A**), in accordance with Clauses 7(1)(c) and 7(2)(a) of Schedule 1 of SEPP Major Projects 2005. This Environmental Assessment (EA) has been prepared under the provisions of Part 3A, with the Minister for Planning being the approval authority. The proposal is also classified as 'Designated Development' in accordance with Schedule 3 Clause 19 (1) (b) of the EP& A Act, as the proposal will *"disturb a total surface area of more than 2 hectares of land….."*. A full project approval is sought for both the dredging works and the operation of the stockpile site (**Section 1.3.1**).

This EA will also provide a basis for any future application to the Department of Environment and Conservation (Environmental Protection Authority) and the Department of Natural Resources for any approvals, permits or licenses required.

1.2 EXISTING OPERATION

The proponent operates several oyster leases in Wallis Lake. The oyster lease that is proposed to be dredged is currently non-operational. The proposed stockpile site is currently used for low intensity grazing.

1.3 THE PROPOSAL IN BRIEF

The lodgement of the Major Projects application for the dredging is based on the proponent's desire to utilise an inactive oyster lease that would add to the proponent's current oyster growing business. The resale of sand material to market is critical to the project in order to finance the dredging operation. Assuming an average annual turnover of 10,000 m^3 of sand (average turnover is provided for illustration purposes only), it is estimated that the sale of material to market could have a gross value of up to $250,000 – $300,000 p.a. (based on an upper limit resale value of $25 – 30/$m^3$), depending upon demand. Two additional fulltime and one part time staff would be required for this part of the operation.

The proposed development will involve the dredging of marine sand and fluvial fines deposits that have accumulated over the oyster lease, to depths of approximately 1.5 – 2.0 m below present bed level, with maximum dredge depths of approximately 2 m. Detailed justification of the dredge depth is provided in **Section 3.2.3**.

The area of the lease that is proposed to be dredged is approximately 8.0 ha. This area has been determined from constraints mapping that aims to minimise the impacts on mangrove and seagrass habitats within the lease area. It is estimated that the dredging will yield approximately 120,000 – 160,000 m^3 of material (**Section 2.9.5**). The dredged material will be pumped several kilometres upstream to a storage site, where it will be dewatered, undergo separation of fines and sands, stockpiled and sold to market. The stockpile working area, including settling ponds, will occupy a site area of approximately 6 ha. The site is currently used for low intensity cattle grazing and has direct access to sealed roads for transport of the material to market. Discharge waters will be treated on site via a series of settling ponds and pumped back to the Wallamba River.

The primary objective of the development will be the re-establishment of an existing non-productive oyster lease to a productive oyster lease. A secondary objective is utilisation of the dredge spoil to meet market demand for sand. The fines will be sold as a soil conditioner mix. The sale of dredge spoil to market is critical to the project, as it will provide funds for the dredging operation. These objectives will be facilitated by:

- Compliance with the provisions of the relevant legislation and policies that relate to the lease area and stockpile site, particularly: SEPP 71; SEPP 14; SEPP 11; SEPP 33; SEPP 44; SEPP 55; the NSW Coastal Policy; *Environmental Planning and Assessment Act 1979*; *National Parks and Wildlife Act 1974*; *Protection of the Environmental Operations Act 1997*; *Rivers and Foreshores Improvement Act 1948*; *Water Management Act 2000*; *Coastal Protection Act 1979*; *Fisheries Management Act 1994*; *Threatened Species Conservation Act 1995*; *Crown Lands Act 1989*; *Environment Protection and Biodiversity Conservation Act 1999*; *Commonwealth Native Title Act 1993*; Great Lakes Local Environmental Plan 1996; and Hunter Regional Environmental Plan 1989;
- The protection of areas of environmental significance, including the protection of water quality; and
- The retention of waterways access in Wallis Lake and Wallamba River during the operation.

1.3.1 PROJECT APPROVALS SOUGHT

The project seeks approval for the following:

- The dredging of Oyster Lease 80-178 to a maximum dredge depth of 2 m below mean low water. Detailed justification of the dredge depth is provided in **Section 3.2.3**;
- The stockpiling of the dredged material at a land-based facility (**Section 2.8.1**). Approval is sought for this operation for 15 years;
- The removal of dredge spoil from the stockpile site of up to 150,000 tonnes per annum. This will require up to 12 one-way truck movements per day. Assessment of traffic impacts (**Section 6.6**) indicates that the existing road network is considered adequate to cater for this very minor relative increase in additional traffic in terms of access, safety and standard.

1.4 PROJECT SITE

The project site can be divided into three components – the dredge area; the pipeline route; and the stockpile site.

1.4.1 DREDGE AREA

The dredge area is confined to the area of waterway covered by Oyster Lease 80 – 178 (**Figures 1.2 and 1.3**). The lease covers an area of approximately 8.5 ha, however, the area of dredging will cover approximately 8 ha of the lease area. This area has been determined from constraints mapping that minimises the impacts on mangrove and seagrass habitats within the lease. It is proposed to dredge the area systematically, following a grid pattern that will direct the dredge operation from north to south across the lease area. The area of land occupied by the oyster lease is Crown land.

1.4.2 PIPELINE ROUTE

A pressurised pipeline will be used to transport dredged materials from the lease area to the stockpile site. The pipeline route will traverse the bed of the Wallamba River and privately-owned land to the stockpile site (**Figure 1.3**). On land, the pipeline route will traverse Lots 59, 101, and Lots 123 – 125 DP753207. The length of pipeline route is approximately 3.8 km (1.5 km Wallamba River, 2.3 km on land) (**Figure 1.4**).

1.4.3 STOCKPILE SITE

The dredged materials will be transported to a land-based depot where they will be pumped into a series of settling ponds and undergo separation of fines and sands. Sand material will be extracted from the settling ponds and stockpiled. Fines accumulated in the settling ponds will be extracted following completion of the operation. Stockpiled materials will then be available for sale to market, primarily as construction fill material. The stockpile operations will be over Lots 59 and 101 DP 753207 and Lot 12 DP 816473 (**Figure 1.4**). The stockpile site has frontage to a sealed road with direct access through the Tuncurry industrial area to The Lakes Way.

1.5 NEED FOR THE PROJECT

The primary objective of the proposal is to activate an existing under-utilised oyster lease. Maximising the production of existing oyster lease areas is critical to maintaining oyster production levels in NSW, which have increased slightly over the last few years (NSW DPI, 2004).

An additional benefit of the operation, however, can be gained through the sustainable use of the dredged material from the lease area. This is consistent with ESD principles of the sustainable use of natural resources. Demand for sand products in the region, particularly for construction fill, is high. The use of dredged material for this purpose will divert the use of higher quality (*ie*. washed and white) sand products from being used as construction fill to higher value uses (*eg*. brickies sand, concrete products). It will also meet demand for a sand resource which may, in the future, be otherwise sourced from land-based sites with higher ecological significance.

1.6 OBJECTIVES OF THE PROPOSAL

The objectives of the proposal are:

- to dredge accumulated sand material from an existing oyster lease area in an environmentally acceptable manner and without affecting the adjacent oyster leases or waterway of Wallis Lake;
- to activate an existing under-utilised oyster lease and maximise its productivity;
- to transport dredged materials from the lease to the stockpile site in an environmentally acceptable manner and without affecting adversely aquatic and terrestrial environments along the pipeline route;
- to utilise dredged material from the oyster lease in order to meet market demand for sand products in the area;
- to operate a sand stockpile for the supply of sand in an environmentally acceptable manner and without affecting adversely the neighbouring properties; and
- to conform with the requirements of relevant statutory authorities in the operation of the sand stockpile.

1.7 CONSULTATION

1.7.1 CONSULTATION WITH REGULATORY AUTHORITIES

Director General's requirements for the project were provided by the Department of Planning and are provided in **Appendix A**. The requirements of the NSW Roads and Traffic Authority for the project are also provided in **Appendix A**. The Department of Planning provided verbal advice that a project planning meeting was not required for the project

Regulatory and other relevant government authorities were formally consulted by Geolyse and/or their specialists during preparation of the EA. The consultation was undertaken through a variety of mediums including provision of copies of the Preliminary Assessment Report (Geolyse, 2005) to the Department of Planning and personal communications with relevant officers of the various Agencies. The regulatory authorities consulted during the preparation of the EA included:

- Great Lakes Council;
- Department of Infrastructure, Planning and Natural Resources;
- Department of Lands;
- NSW Roads and Traffic Authority;
- Department of Environment and Conservation; and
- Department of Primary Industries (NSW Fisheries).

A summary of consultation with Government Authorities over and above that provided in the Director General's requirements is shown in **Section 6.7**.

1.7.2 COMMUNITY CONSULTATION

Community consultation with adjoining and potentially affected landowners and relevant community groups was undertaken as part of the EA. Consultation was in the form of a letter and information pack to potentially affected residences in Taree St and Mount View Pde (opposite northern end of oyster lease area), as well as landowners adjacent to the stockpile site in Chapmans Road, Tuncurry. Responses to the community consultation are provided in **Section 6.7**.

Consultation was also undertaken with the Forster Local Aboriginal Land Council (LALC). A site inspection was undertaken by a representative of the Forster LALC, as part of the cultural heritage assessment (**Section 6.5.1**), who indicated no objection to the proposal. The Forster LALC report is provided in the **Appendix F** of the **Volume 2 Report.**

1.8 FORMAT OF THIS ENVIRONMENTAL ASSESSMENT

This Environmental Assessment (EA) has been prepared in accordance with the following documents:

- EIS Guidelines – Extractive industries: Quarries;
- EIS Guidelines – Extractive industries: Dredging and other Extraction in Riparian and Coastal Areas; and
- The Director General's requirement prepared by the Department of Planning (DoP) for the proposal. A copy of the Director General's requirements for the project is contained in **Appendix A**.

This EA is presented in two volumes. Volume 1, the main report, contains a detailed description of the proposal and a summary of the specialist technical reports which are contained in **Volume 2**.

The Main report, **Volume 1**, is structured as follows:

Section 2 – describes the proposed development in detail.

Section 3 – describes the existing environment and assesses potential impacts on the physical, biological and social environment.

Section 4 – recommends mitigation measures to reduce the potential of adverse impacts associated with the development.

Section 5 – provides a conclusion on the significance of likely environmental impacts.

Volume 2 of this EIS includes nine reports prepared by Geolyse Pty Ltd and other specialist consultants engaged by, or on behalf of, Mr. Trevor Dent. These reports include:

- **Appendix A** – Noise and Vibration assessment prepared by Environmental Results Pty Ltd;
- **Appendix B** – Hydro-survey Report prepared by McGlashan and Crisp Pty Ltd;
- **Appendix C** – Flora and Fauna Assessment report prepared by Geolyse Pty Ltd; and

- **Appendix D** – Geotechnical Assessment of Extractive Sand Resources prepared by Geolyse Pty Ltd;
- **Appendix E** – Dust and Odour Assessment prepared by Holmes Air Sciences Pty Ltd;
- **Appendix F** – Aboriginal Archaeology and Cultural Heritage Report prepared by Mr Rob Yettica, Forster Local Aboriginal Land Council;
- **Appendix G** – Aquatic Ecology Report prepared by Pacific Blue Design; and
- **Appendix H** – Hydraulic and Sediment Transport Modelling Report prepared by NSW Water Research Laboratory.

The Proposed Project

2.1 OUTLINE

The proposed development will involve the dredging of approximately 8 ha of the bed of Wallis Lake within the area of oyster lease No. 80 – 178, located 3.3 km upstream of Wallis Lake entrance (**Figure 1.2**). The dredged material will be disposed of to a stockpile site located approximately 2 km north of the lease area (**Figure 1.4**), where the dredged material will be placed, undergo separation of sands and fines and stockpiled for sale to market.

The development will occur in three (3) stages. A description of each stage is provided in **Sections 2.2 – 2.4**.

2.1.1 STOCKPILE SITE AND PIPELINE ROUTE ALTERNATIVES

A critical component of the dredge operation is the management of dredge spoil. Determination of a suitable site for disposal of dredge spoil was based on the following criteria:

- Appropriate land zoning under Great Lakes Council LEP 1996;
- Sufficient land area (5 – 6 ha, preferably already cleared) to accommodate the dewatering ponds and stockpiling of dredge spoil;
- Distance from the dredge area to be no more than the capacity of 4 booster pumps – maximum distance of 3.5 – 4 km. Due to logistical reasons, the operation of 4 booster pumps in line was considered to be at the limit for 'fail safe' operation of the pump system;
- Preferably away from sensitive noise receptors such as residences; and
- Direct access to road network.

Investigations for a suitable stockpile site revealed three parcels of land that could potentially meet the criteria. These were:

- Tern Island;
- Council reserve at the western end of Point Road; and
- The proposed site.

Tern Island is currently the subject of an EIS prepared by Great Lakes Council for the establishment of a depot for dredged sand material from Wallis Lake. This option was attractive due to its relative proximal location to the proposed dredge area. Several constraints for this option were identified, including the timing of the EIS approval (project not yet approved) and commencement of operations and the limited capacity of the proposed depot relative to the volume proposed for dredging. This option was therefore excluded.

The Council Reserve at the end of Point Road was considered due to its proximity to the proposed dredge area. Preliminary discussions with Council officers indicated that this land was operational land and could not be used for such a purpose. This option was therefore excluded.

The parcel of land proposed for the stockpile site (**Section 2.8.1**) was able to fulfil the criteria established for the selection process and was therefore selected as a potential site. Negotiations with the owner of this land were then commenced to determine whether the proposed operations could occur at this location.

Once the stockpile site was determined to be feasible, assessment of the pipeline route to the site was undertaken. Determination of a suitable route for the pipeline was based on the following criteria:

- Pipeline length to be a maximum of the capacity of four booster pumps;
- Preferably in cleared land;
- Minimise impacts on boat traffic and aquatic flora/fauna;'
- Minimise impacts on terrestrial flora/fauna;
- Accessibility for maintenance of booster pumps; and
- Preferably away from sensitive noise receptors such as residences.

A number of routes were investigated, which were reported in the Preliminary Assessment for the project, which was submitted to the Department of Planning with the project application. In summary, the route chosen has minimised the need for clearing, is located away from sensitive noise receptors, can be accessed for maintenance and minimises impacts on aquatic and terrestrial flora and fauna.

While parts of the route are located through a SEPP 14 wetland, it should be noted that the majority of the route through this area is already cleared and degraded from previous grazing activities. The impact of the pipeline through this wetland area has been assessed and found to be negligible (**Section 5.4 and Appendix C – Vol. 2 Report**). Mitigation measures have been developed to deal with any (low probability) incidents.

The option of floating the entire pipeline so as to avoid traversing the SEPP 14 wetland area was also investigated. This option was found to be not suitable for several reasons. First, it would be obstruct boat navigation of the channel. Second, this option would add extra distance to the pipeline route, necessitating an additional booster pump, which would make the operation unfeasible economically and practically. Third, having this length of pipe floating poses an unacceptable risk of pipe failure, due to stress on the pipe from continuous movement associated with tidal and river currents, and wind movement. The risk of pipe failure is greatly reduced if the pipe remains static. This option was therefore excluded.

In summary, the risk to the ecological functioning of the SEPP 14 wetland as a result of the presence of the pipeline was assessed and is considered to be negligible and acceptable, given the potential impacts and proposed mitigation measures (**Appendix C – Vol. 2 Report)**.

Further justification of the proposal is provided in **Section 8.1.**

2.2 STAGE ONE – DREDGING

2.2.1 DREDGING OPERATION

This involves the removal of material from the bed using a 200 mm cutter suction dredger with an estimated production rate of 100 m^3/hr (± 10 %) of sand (**Section 2.2.3**) (300 m^3/hr slurry). The dredge is powered by a 250 hp W7 Cummins diesel motor. Based on this rate, the expected duration of the dredging operation is approximately 7 months (**Table 2.1**). Delays arising from flood events, maintenance of equipment and extraction difficulties may extend this timeframe. Further, as an added precaution, dredging will not be undertaken during the peak oyster growing period of October to March.

The dredged material will be pumped in a slurry form (approximately 33 % solids) via a new, flexible, 200 mm poly pipe (rated to 630 kPa, around double the booster pump output), approximately 3.8 km to the land-based treatment facility, located 2 km north of the lease area. Given this distance, four booster pumps will be required to transport the material from the dredge site to the settling ponds. Booster pumps will be located at approximately 800 – 900 m intervals along the pipe route (**Figure 1.4**). One booster pump will be located on the Wallamba River, while the other three pumps will be located on land.

Each booster pump will be powered by a 180 hp Cummins 6CT diesel engine, with a 1500 L fuel tank, sufficient for 5 days operation. Further details on fuels are provided below. The noise impact assessment (**Vol. 2 – Appendix A**) included assessment of potential noise impacts from the booster pumps and dredge.

2.2.2 DREDGING EXTENTS

Figures 1.2 and 1.3 show the plan detail of the lease area extents. Detailed bathymetry is provided in the hydro-survey report (**Vol. 2 – Appendix B)**, which also provides post-dredge finished levels. It is estimated that 1.5 – 2.0 m of material will need to be removed from the dredge footprint to make it operational for floating oyster cultivation. Maximum dredge extents will be 2.0 m below present bed level, at a depth equivalent to surrounding channels and previously dredge areas of adjacent oyster leases. Based on these parameters, it is estimated that between 120,000 – 160,000 m^3 of material will be removed from the lease area.

The dredge will work from the north to the south, in a series of cells that move progressively from east to west across the lease. This pattern represents the most efficient dredge pattern, as it will maximise the use of each length of additional pipe and minimise the stoppages required for addition of sections to the pipeline.

2.2.3 RATE OF REMOVAL

The maximum production capacity of the dredger is around 150 m^3/hr (sand), however, allowing for delays caused by equipment maintenance and other down time, an average production rate of 100 m^3/hr (sand) and 200 m^3/hr (water) is considered reasonable.

It is proposed that the dredger would operate for 10 hours per day (07:00 – 17:00) per day, Monday to Friday and 5 hours per day (08:00 – 13:00) on Saturdays, with no work on Sundays and Public Holidays. An extra hour would be scheduled each day for maintenance activities. The expected production volumes are provided in **Table 2.1**.

Table 2.1 – Expected Dredge Production Volumes (sand only)

Time Scale	Volume
Hourly	100 m^3
Weekly	5,500 m^3
Monthly	22,000 m^3
7 months	154,000 m^3

2.3 STAGE TWO– ONSHORE HANDLING OF SPOIL MATERIAL

2.3.1 DREDGED MATERIALS TRANSPORT

The dredged material will be transported approximately 3.8 km to the onshore facility via a new, flexible, 200 mm diameter poly pipe (10 mm walls), rated to 630 kPa. The pipeline will be floated on the surface in the vicinity of the dredger (first 200 m of pipe) and then be submerged (to maintain river navigability) until it emerges at the foreshore approximately 1.5 km upstream (**Figure 1.4**). This section of pipe is in a shallow, non-trafficable area of the river. From here, it will traverse existing cleared ground in a SEPP 14 wetland (No. 590) and along previously cleared boundary fence alignments for a distance of 2.3 km to the settling ponds. The pipe will be laid on the ground and 'snake' its way through existing open space areas within the wetland and along the cleared boundary fence alignments. A small section (approximately 100 m) will traverse a vegetated Saltmarsh area.

Another section of the pipe will traverse a small (75 m) vegetated patch of Swamp Sclerophyll Forest in the SEPP 14 wetland along an internal boundary alignment that has not been cleared (**Figure 1.4**). While it will not be necessary to clear vegetation to lay the pipe in this area (the pipe will be fed through in one continuous section – no joins), the pipe will be inspected on foot periodically (every 4 weeks). Impacts associated with placement of the pipe and inspections are addressed in the flora and fauna report (**Vol. 2 – Appendix C**).

The pipeline will be assembled on shore and pulled through the wetland in 100 m sections using a winch and joined on site, with sections connected by 50 mm metal flanges. The pipeline and flange joins will be inspected regularly to check for the potential for pipe and join failure. Failure of the pipe, however, is considered extremely unlikely, given that the pipe will be new and rated to twice the pressure output of the booster pumps. Further, mitigation measures have been developed to manage impacts in the unlikely event of pipeline failure (**Section 4.3.7**).

2.3.2 SEPARATION OF FINES, SETTLEMENT AND DEWATERING

When it reaches the stockpile site, the slurry will be pumped into a series of settling ponds, where the coarse fraction will settle out quickly. The suspended fines (or supernatant) will be diverted into a separate settling pond. Once settled, the excess waters will be returned to the Wallamba River via a return pipeline, after satisfying appropriate turbidity and pH requirements stipulated by the consent conditions. The dewatered sands and silts will then be stockpiled and sold to market on-demand. Management of the stockpile facility is addressed in **Section 2.4**.

2.3.3 ACID SULFATE SOILS TREATMENT

The sediment proposed to be dredged is composed primarily of marine sand. Laboratory investigations (**Vol. 2 – Appendix D**) revealed that the dredged material has very limited acid potential, though has a high insitu neutralisation capacity, as a result of the $CaCo_3$ content (shell fragments). Notwithstanding, measures will need to be implemented to mitigate the potential for acid generation from the dredged sediments during the dewatering process.

An Acid Sulfate Soils Management Plan would form part of the overall Environmental Management Strategy for the project, which would be adopted prior to commencement of the dredging activities. In general, the return waters would be subject to a regular pH testing regime prior to their release and if required, neutralised with hydrated lime in accordance with ASSMAC (1998) guidelines until satisfactory pH levels were achieved, in accordance with accepted guideline values.

2.3.4 DISCHARGE OF RETURN WATERS

As approximately 66 % of the hydraulic slurry is composed of water, timely management of return waters is critical to the continued operation of the dredging. Following dewatering of the sediment and passage through various sediment management ponds, water would be returned to the Wallamba River via a pipeline adjacent to the incoming slurry pipe. Water would be pumped using a '6-inch pump' powered by a 180 hp Cummins 4T diesel engine. The pipe would deviate directly to the Wallamba River at about the halfway point, to reduce pipe length and return times (**Figure 1.4**). The water would be returned to the river after sufficient suspended sediment had been removed and agreed water quality criteria for pH and turbidity had been met. The pipe would be regulated by valves to allow controlled release of return waters.

2.3.5 FUELS, CHEMICALS AND WASTE

The dredger, booster pumps and return waters pump require diesel fuel for operation, as does the machinery used for moving the dredge material on site. The dredger, booster pumps and return waters pump can store sufficient fuel for 5 days of operation (approximately 5000 L for the dredger and 1500 L for the pumps). Refuelling of the dredger would be undertaken using a refuelling barge, with the volume of the barge (26 m^3) acting as secondary containment for spills. The barge will be equipped with all the necessary safety and fuel spill equipment. The land-based booster pumps would be refuelled from mobile plant onshore, while the booster pumps located nearest the dredger and further upstream would be refuelled by the refuelling barge.

Although unlikely to be required due to the relatively neutral state of the dredge material (**Section 4.2.1**), chemicals would be required at the stockpile site for neutralising and acid soil material (Agricultural Lime) and discharge waters (Hydrated Lime). Specific quantities are unknown at this stage, though are estimated to be 5 tonne and 1 tonne respectively. These materials would be stored in a shipping container located on the site.

Refuelling of machinery (*eg*. front end loader, excavator) at the stockpile site would be undertaken using mobile plant. No fuels will be stored on site.

2.4 STAGE THREE – STOCKPILING AND SALE OF SAND TO MARKET

Following the separation of fines and dewatering, the remaining material will be stockpiled and undergo further dewatering, when the dried sand and fines material will then be ready for sale to market. Stockpiling and sale of material to market will necessitate the operation of an extractive industry. Front end loaders, excavators and trucks will be the principle source of machinery for moving and loading sand for hauling to market in accordance with demand.

The sand material will be suitable for a variety of uses including general fill and bedding sand, landscaping and various other construction and land development works. Recovered fines will be suitable for use as a topsoil mix and soil conditioner. The reuse of this sand and fines resource is consistent with ESD principles of resource reuse and improved valuation and pricing, through the application of appropriate market value to the sale of the resource, as well as the contribution through royalty payments to the State for the resource.

The operation of the stockpile yard will necessitate the movement of trucks into and out of the yard. The site has ready access to Grey Gum Rd, a sealed road in the industrial area of Tuncurry. The maximum number of truck movements is likely to be in the order of up to 5 outward truck movements per day (10 two way trips), dependant upon market demand.

The land proposed for the stockpile site and yard is currently used for low intensity cattle grazing. It is anticipated that an area of approximately 6 ha will be required for the on-land operation, which will include:

- Two sediment ponds;
- Stockpile areas; and
- Demountable office/staff facilities.

All services including town water, sewer and communications are available to the site.

2.4.1 EXTRACTION AND PROCESSING

Dredging will not be continuous, as down time will be required for maintenance and for extracting materials from the settling ponds. The stockpiling operation is proposed in three main stages.

Stage 1 – dredged sands are removed from the main settling Pond 1 and stockpiled on site. Any suspended particles remain in the settling ponds, principally Pond 2. Material is stockpiled on site until approximately half of the dredged material (approximately 75,000 m^3) has been received on site.

Stage 2 – the walls of Pond 1 will be gradually built to a height of approximately 5 m. Dredged materials, rather than being removed from the pond, become stockpiled within the pond site. The pond, at this stage, will have enough volume to accommodate the remainder of the dredged materials. Based on the results of the geotechnical assessment, material entering the settling ponds at this stage of the dredging process will be primarily clean sand, with very little fines content compared to material dredged from the oyster lease at the beginning of the operation. Settling Pond 1 continues to fill with material, effectively becoming the final stockpile of sand material on the site. Pond 2 will continue to act as a settling pond for fines and water retention/treatment prior to discharge.

Stage 3 – following completion of dredging, the process of decommissioning the site will commence. This will involve removal of Pond 2. As indicated above, Pond 1 will be a stockpile of sand at this stage. Any fines accumulated in Pond 2 will be removed and stockpiled on site. Depending on volume, some of this material may be reincorporated into the existing stockpiles of sand, or kept separate for sale as a different landscape product. Decommissioning of the ponds will require a front end loader to work progressively across the ponds to remove any accumulated fines material. This will be done to a level equivalent to the pre-development site surface. Following complete removal of accumulated fines, it is proposed to return the site to its former use for low intensity cattle grazing.

The proposed stockpile site layout is shown in **Figure 2.1**

2.4.2 VEGETATION CLEARING

The proposed construction of the settling ponds will require the removal of some regrowth vegetation on the site. The removal of this vegetation has been assessed in the flora and fauna report (**Vol. 2 – Appendix C**). The clearing operations would be undertaken using either a bulldozer or an excavator. This clearing would be limited to the area required for the settling ponds. The impacts associated with this clearing have been assessed (**Vol. 2 – Appendix C**). The assessment determined that the vegetation to be cleared did not contain any Threatened species and was of no habitat significance and consequently, there would be no significant impacts associated with this clearing (**Section 5.2**).

Revegetation/Rehabilitation

As the majority of the site is cleared at present and very minimal clearing is required, it is not proposed to revegetate any of the site following decommissioning (apart from replanting with pasture grasses). The areas to be cleared are of little to no habitat value, comprising young regrowth and isolated paddock trees. A Section 5A assessment undertaken for this clearing indicated that, even without any mitigation measures, there would be no significant impacts associated with the loss of this vegetation (**Vol. 2 – Appendix C**).

The small section (75 m) of uncleared SEPP 14 that is traversed by the pipelines will be inspected to determine whether any revegetation would be required following decommissioning of the pipelines.

2.4.3 CONSTRUCTION OF PONDS

An existing stockpile of sand on the site, sourced from the Tuncurry Waste Management Centre approximately 10 years ago, would be used to construct bund walls for the settling ponds.

Based on the proposed rates of extraction (**Section 2.23**) and expected settling time required prior to discharge of return waters (based on pH and low fines content (**Section 4.2.1** and **Section 2.9.3**)), one deposition pond (Pond 1) and one settling pond (Pond 2) will be required to be constructed. Pond walls would be approximately 4 m high and 7 – 8 m wide at the base. Each pond has been sized to incorporate 1 m of freeboard. The northern side of Pond 1 would utilise the existing embankment on site to form the lower parts of the walls. A front end loader and excavator would be used to construct the pond walls.

Approximate pond volumes (excluding 1 m freeboard) have been calculated as:

- Pond 1 – 50,400 m^3
- Pond 2 – 12,350 m^3

Based on predicted extraction rates (**Section 2.2.3**), Pond 1 has been designed to have sufficient volume to cater for approximately 9 weeks of dredging (sand only) (49,500 m^3). Pond 2 has been designed to have sufficient volume to for one week's inflow of water (11,000 m^3) from dredging operations. Therefore, in total the settling ponds have been designed to cater for at least two months of continuous dredging, without the need to remove sediment from the system. Water would need to be removed after each week. In practice, however, dredged material will be continually removed and upon reaching accepted quality criteria, water would be discharged back to the Wallamba River, most likely every two or three days.

Pond 2 will be lined with plastic to ensure that all water entering the pond is retained. Water entering Pond 1 will be directed to a sump area through contouring of the base of the pond (approx. 10 % slope), where it will be pumped directly to Pond 2. This will provide for continuous pumping of incoming water out of Pond 1. Based on an inflow rate of 0.2 ML hr^{-1}, spread over the area of Pond 1 (16,800 m^2), equates to a daily (9 hour day) depth of 107 mm day^{-1}. Infiltration of water through the base of Pond 1 will be negligible, given that the base will be comprised of insitu silts and clays to depth of approximately 1 – 1.5 m, with saturated hydraulic conductivity (K_{sat}) typically in the order of < 10 mm day. Therefore the removal of saline water from Pond 1 will be instantaneous and will not have any appreciable impact of increasing groundwater salinity in the vicinity of the site.

The ponds have been designed to have sufficient volume to cater for storm events. As the ponds will be turkey-nest, storm water entry to the ponds is restricted to direct rainfall only. Accommodation volumes after one week of dredging prior to discharge or sediment removal are provided in **Table 2.2**, which shows a comparison between the accommodation volume (or depth) of each pond after one weeks storage of dredged material and various worst-case scenario storm events. Note that design of the detention ponds would normally be required to accommodate a 10 or 20 year ARI 2 hour storm event. **Table 2.2** presents data for storm events that are significantly more severe than this and demonstrate that the ponds have more than sufficient capacity to accommodate storm volumes that would reasonably be required to be taken into consideration in the design process.

Table 2.2 – Comparison of Accommodation Volume of Ponds and Design Storm Events

	Pond 1	Pond 2
Dry volume (m^3) *	56,275	12,133
Volume used after 1 week (m^3)	5,500 (sedm. only)	11,000 (water only)
Accommodation volume * after 1 week storage (m^3)	50,775	1,133
Accommodation depth * after 1 week storage (m)	2.70	0.27
10 year ARI 2 hour storm depth (m) **	0.071	
20 year ARI 2 hour storm depth (m) **	0.081	
20 year ARI 24 hour storm depth (m) **	0.218	
50 year ARI 24 hour storm depth (m) **	0.257	
100 year ARI 24 hour storm depth (m) **	0.288	

NB: * Excludes 1 m freeboard ** ARR (1987) values taken from Hallidays Point

Data presented in **Table 2.2** indicates that if all slurry entering the ponds is retained after one week's continuous dredging, then there is up to 10 times the volume required in Pond 1 to accommodate a 100 year ARI 24 hour storm, while Pond 2 has sufficient depth to accommodate at least the 50 year ARI 24 hour storm and three times the depth required to accommodate a 20 year ARI 2 hour storm. It is important to note that these depths do not take into account the 1 m of freeboard available within each pond.

The 100 year and 50 ARI 24 hour storm intensity scenarios presented above are highly unlikely to occur and represent a highly unlikely, absolute worst case scenario. The design of the ponds system is over-engineered to cater for what would normally be considered a reasonable storm event contingency (*ie*. 10 – 20 year ARI 2 hour storm intensity), though can also accommodate extreme, highly unlikely events (*ie*. 50 year and 100 year ARI events).

Maintenance of the settling pond sizes and their sizing will be adaptively managed in response to a regular review of the performance of the system (detention times required prior to discharge and inflow rates). This may result in alteration to the configuration of the ponds (*eg*. reduction in ponds size if material is being removed, and/or waters are being returned quicker than expected).

2.4.4 PROCESSING

Processing of the dredged material is limited to the removal of sand sized particles from the settling ponds. The sand fraction will settle out in Pond 1, along with some of the fines that are attached to sand particles. Suspended material will flow into Pond 2, where the majority of this material will settle out. Pond 3 will be used to store water until it meets required quality criteria prior to being discharged back to the Wallamba River via the return pipeline.

Sand will be progressively removed from Pond 1 using an excavator and stockpiled on site. A front end loader and truck will be used to move sand material around the site into stockpile locations.

2.4.5 STOCKPILING

Areas adjoining the settling ponds will be designated as working and stockpile areas for the material extracted from the settling ponds. These areas are located over both Lots 101 and Lot 59 (**Figure 1.4**). It is proposed to stockpile at least 60 % of the extracted material on site in these areas. After this, Pond 1 will be the main stockpile area (**Section 2.4.1**). These stockpiles will be monitored to ensure that they remain in a moist condition to avoid the potential for wind blown loss of material (**Vol. 2 – Appendix E**).

2.4.6 PLANT AND EQUIPMENT

Table 2.3 lists the mobile equipment expected to be utilised on the stockpile site, though is not limited to the equipment items listed. Some additional equipment may be required on an as-needs basis. Notwithstanding, equipment similar in size to the equipment listed in **Table 2.3** would be sufficient for the proposed stockpiling operations. Details of dredge and booster pump equipment were provided in **Section 2.2.**

Table 2.3 – Mobile Equipment and Plant for Stockpile Site

Equipment Type	Number	Purpose
24 t excavator	1	Raw materials extraction from ponds
8 t Front end loader	1	Raw materials loading and moving
20 hp Water Pump	1	Water pumping between storage and settling ponds.
5 hp Water Pump	1	General water pumping

2.4.7 SERVICES

Water

The site is not currently serviced by reticulated water supply, though water services are available at the site boundaries. Water for potable and washroom uses will be sourced from either the reticulated main or from tank water.

Power

Overhead power supply is available to the site, from existing electricity lines in Grey Gum Road. This power supply is considered adequate for the site activities.

Sewerage

The site is not serviced by reticulated sewerage. Connection of the site to a reticulated network is not proposed. Pump-out chemical toilet facilities are proposed for the site.

Communications

Telstra currently services the residential area to the east of the site and has telecommunications lines in Grey Gum Road opposite the site. It is not proposed to connect the site to Telstra services. Communications on site will be conducted through two-way radio and mobile telephones.

Fuel

All refuelling of vehicles will be via mobile plant. No fuel will be kept onsite. An EPA approved 'Spill Kit' will be kept on site. All personnel will be advised of spill management procedures.

2.4.8 HOURS OF OPERATION

The hours of operation of the dredge and stockpile will be from 7.00 am to 5.00 pm Monday to Friday and 8:00 am to 1 pm on Saturdays, with no work activities undertaken on Sundays or Public Holidays. It is proposed that maintenance activities could be conducted on Sundays and public holidays, if required.

2.4.9 WORKFORCE

Dredging

The operation will require one additional full-time position and one part-time position.

Stockpiling

The operation will require two additional full-time positions and one part time position.

Two part-time positions for truck owners/operators will also be created, hauling the resource to various markets (expected maximum outward truck movements of 10 per day dependant upon demand and extraction rates).

2.4.10 ENERGY REQUIREMENTS

Energy requirements for the operation will include the site office facilities and the plant and heavy machinery on the site and the dredge and booster pumps. The plant and on-site equipment would be powered by diesel fuel. Diesel fuel storage is not proposed on-site. Each booster pump will have its own in-built fuel tank, while the dredge will be refuelled from a water-based refuelling barge.

2.5 TRANSPORT AND HAULAGE ROUTES

Transport of products from the stockpile site to the various markets would be undertaken by customer-owned and contractor-owned rigid body and articulated trucks. All haulage from the stockpile site would be via Grey Gum Road in the Tuncurry industrial area and The Lakes Way to the Pacific Highway. Grey Gum Road currently supports heavy vehicle movements, including those from Great Lakes Council's Works Depot. Traffic count data on Grey Gum Road and The Lakes Way intersection is provided in **Section 6.6**. Analysis indicates that the additional estimated maximum of 5 outward bound truck movements per day (**Section 6.6.4**) is not expected to significantly impact upon traffic flows either on Grey Gum Road or the intersection with The Lakes Way.

Products supplied to Forster/Tuncurry will be transported along local roads, while distribution to regional areas would utilise the Pacific Highway, with direct access provided by Tuncurry Road (The Lakes Way).

2.6 SAFETY AND HEALTH

The commercial oyster operation run by the proponent currently operates with an excellent safety record. This commitment to safety would be extended to include the dredging operation, which has traditionally been undertaken in Wallis Lake by oyster growers in the past. The business maintains a safety work policy and operates to standards set by the NSW Work Cover Authority.

Operations on the stockpile site will also focus on OH&S and to standards set by the NSW Work Cover Authority. A Safety Manual would be prepared for the stockpile operation and would be updated as and when required. The Safety Manual would include site induction procedures, safety training, incident reporting, staff health and an outline of safe work practises.

From a road and public safety point of view, the existing intersection of Grey Gum Road and The Lakes Way is considered adequate and safe for the minor increase in traffic that would result from the operation of the stockpile. Similarly, the proposed driveway access to the stockpile site from Grey Gum Road would be considered adequate given the low volumes of traffic. This is discussed in detail in **Section 6.6**.

2.7 ZONING

The lots that comprise the site of the proposed on-land processing and stockpile is partially zoned 1(c) Future Urban Investigation and 7(a) Wetlands and Littoral Rainforest under the provisions of Great Lakes Local Environmental Plan 1996 (LEP 1996) (**Figure 2.2**). The area set aside for the stockpile and settling ponds, however, is zoned 1 (c), while the part of the site that is designated SEPP 14 Wetland No. 590 (**Figure 1.4**) is zoned 7(a). The oyster lease is unzoned. Details of the zoning provisions are provided in **Section 3.4.1.**

The project has been developed taking into account the local planning provisions while also aiming to achieve the most sustainable land use outcome. A sustainability-led planning process was followed to develop the land use outcomes for which approval is sought.

2.8 SITE DETAILS

2.8.1 LOCAL AND REGIONAL CONTEXT

Oyster Lease

The subject oyster lease is identified as *Oyster Lease 80 – 178* (**Figure 1.3**) and is located approximately 3.3 km upstream of the Wallis Lake entrance, in the vicinity of where the Wallamba River enters the main body of Wallis Lake. The lease area is in the region of the estuary that is dominated by the flood-tide delta. This area of the estuary has been modified extensively, being subject to dredging for landfill (Jonnel Channel) and to improve flows of water for oyster leases and for creation/maintenance of oyster leases.

Stockpile Site

The land that is proposed for the stockpile site is located approximately 2 km north of the oyster lease and 2 km north-west of the Tuncurry Central Business District. The site is predominantly cleared and currently used for low intensity cattle grazing.

The stockpile operations will be over Lots 59 and 101 DP 753207 and Lot 12 DP 816473 (**Figure 1.4**). The stockpile site has frontage to a sealed road with direct access to Grey Gum Road which runs through the Tuncurry industrial area to The Lakes Way. The stockpile site working area will occupy an area of approximately 6 ha, which includes the settling ponds, stockpiles and general working area. The final location of stockpiles is unknown at this stage, though will be located within the envelope shown in **Figure 2.1**.

The northern boundary of the site is adjacent to privately-owned, partially-cleared undeveloped land, while the southern and western boundaries adjoin privately-owned vegetated lands. These lands are in one ownership. To the east, the site boundary adjoins a residential estate. The south eastern corner of the site has a frontage to Grey Gum Road in the Tuncurry industrial estate, opposite the entrance to Great Lakes Council works depot.

In summary, the boundaries of the site for the stockpile operations are as follows:

- Northern Boundary –privately-owned cleared land;
- Southern Boundary – privately-owned vegetated land;
- North eastern Boundary – residential area; and
- Western Boundary – privately-owned vegetated land.

2.8.2 OYSTER LEASE BATHYMETRY

The majority of the lease area is sub-aerial at low tide, with the level of tidal inundation dependant on the stage of lunar tidal cycle. The bathymetry is in general flat, however, it grades slightly to the Wallamba River channel in the north of the lease. The south western, western and eastern edges of the lease grade into previously dredged oyster leases of up to 2 m depth. Surveyed levels of the oyster lease range from – 0.1 m to – 1.5 m AHD. Detailed bathymetry of the oyster lease and surrounding areas was produced from hydro-surveys (**Vol.2 – Appendix B**). This information was used for the hydraulic and sediment transport modelling and will also form baseline data for calculation of dredged volumes.

2.8.3 STOCKPILE SITE TOPOGRAPHY AND SOILS

The ground surface of the lot on which it is proposed to operate the stockpile it relatively flat, which is typical of an area of Holocene-age beach ridge deposits (DMR, 1991). Elevation varies between 1 – 2 m AHD. The ground surface has been extensively modified, having been ploughed and sown with pasture grasses since the area was first settled and used as a dairy 80 – 90 years ago. There are no surface drainage features on site, apart from a constructed small dam at the eastern end of the site.

The site is underlain by Holocene beach and foredune sands, with the lower elevation western extents draped by a thin layer of organics and very fine intertidal (fluvially-derived) silts and muds (DMR, 1991). Natural soils on the site are classified as Podzolic, typical of a coastal dune environment. The area of Lot 59 proposed for use in the stockpile operations has been filled previously (10 – 15 years ago) with reworked dune sands excavated from the adjoining residential subdivision to the east of the site. This area is up to 1.6 m above natural ground surface elevations. Tree cover in this area is sporadic, with trees having been left in place as the site ground levels were raised.

2.9 RESOURCE AVAILABILITY

A geotechnical assessment of the material to be dredged was undertaken by Geolyse Pty Ltd (**Vol. 2 – Appendix D**). The assessment characterised the surface and sub-surface conditions of the material through core samples taken across the oyster lease. A copy of the geotechnical assessment report is provided in **Volume 2** of this report. This section provides a summary of the report.

2.9.1 ESTUARINE GEOMORPHOLOGY

Wallis Lake is a barrier estuary (Roy, 1984) with a permanently open (trained) entrance. Historically the entrance has resembled that of an intermittently open estuary, with an associated high degree of tidal attenuation across the entrance, though it is unlikely to have been totally closed at any stage due to the proximity of both the Wallamba and Coolongolook Rivers close to the entrance. Training of the opening has increased the hydraulic efficiency of the entrance, such that the tidal range inside the estuary is still increasing and mean lake levels are slowly decreasing in response.

The oyster lease site is located in the lower end of Wallis Lake, toward the upper limits of the flood tide delta where the Wallamba River enters the main body of the estuary. The lower end of Wallis Lake is characterised by a series of sub-aerial deposits of Quaternary (Holocene) marine sand, with intertidal areas overlain or inter-bedded with thin deposits of fluvially-derived fines deposited during flood events.

The flood tide delta comprises sand from the adjacent coastal dune systems that has been reworked by tidal and fluvial flows. In general, this material comprises well sorted, well rounded, greyish sands with organic coatings, with some mixing with fluvially-derived fines (Webb McKeown, 1999). The area of the estuary around the oyster lease has been heavily modified over the years, with extensive dredging (100,000 m^3) having been undertaken to create the Jonnel Channel (north of the oyster lease) and adjacent residential land in Taree St and Jonnel Park (Webb McKeown, 1999). Additional dredging has also been undertaken around the lease area for oyster leases, to divert flows and further define and channelise fluvial and tidal flows.

2.9.2 SITE GEOMORPHOLOGY

The site of the oyster lease has been modified extensively from its pre-European condition. Large areas of the bed of the site (in particular in the south western extents) were raised through the placement of felled cabbage tree palms and placement of overburden, in order to raise the bed to a height sufficient for oyster cultivation. Other parts of the lease have been dredged to various extents over the ensuing years.

12 core samples were taken across the site to characterise the surface and subsurface sediments (**Vol. 2, Appendix D**). Surface sediments comprised primarily fine sand, with varying degrees of silt content. The subsurface conditions encountered during the geotechnical assessment are detailed in core logs in the report contained in **Volume 2** (Geolyse, 2006). In general, stratigraphy across the site was uniform, with subtle variations in silt content/interbedding and organics in core profiles. In general the profile comprised:

- Yellow/brown sand, minor silt content, well sorted, well rounded, few shell fragments to a depth of 0.4 m; and
- Light grey fine sand, occasional silty lenses, rounded, well sorted. Minor shell fragments, some organics staining to a depth of 2.0 m.

In some cores, there was a distinct inter-fingering of the two layers at depth, indicating episodic deposition of marine sands and fluvial fines.

One core contained a lense of fine mud with numerous shells and shell fragments, representing a relict intertidal deposit.

Cores were sampled for testing of particle size distribution and acid sulfate potential.

2.9.3 SEDIMENTOLOGY

10 samples from the cores were subjected to particle size analysis at a NATA accredited laboratory in accordance with AS 1289.3.6.1. In general, the material to be dredged from the oyster lease is characterised as fine to coarse-grained sand, with some very minor traces of silt and fine gravel, with gravel being composed of shell and shell fragments. In summary, particle size analysis indicates the following:

- Silt/clay fraction ranged between 3.2 – 7.2 % (mean 5.25 %);
- Sand fraction ranged between 89.8 – 96.4 % (mean 93.94 %);
- Fine to medium gravel fraction ranged between 0.1 – 2.9 % (mean 0.81 %); and
- Sand particle density was 2.65 t/m^3.

2.9.4 SAND AND PRODUCT QUALITY

It is not proposed to undertake any processing of the sand, apart from fines removal in settling ponds. Potential uses for the sand resource are listed below:

- Bedding Sand;
- Top Dressing;
- Landscaping;
- Golf Course Construction; and
- Various other construction and land development works.

There is no proposed mineral sand extraction or processing.

2.9.5 RESOURCE QUANTITY

Laboratory analyses of samples taken from cores extracted from the oyster lease area indicate that the material to be extracted is suitable for use as an extractive quarry resource.

The maximum depth of dredging below the bed is estimated to be approximately 2 m, equivalent to the depth of adjacent dredged channels and oyster lease areas. Average depth of dredging over the site is estimated to be 1.5 – 2.0 m. Based on a dredge footprint of 8 ha, this equates to a volume of dredged material between 120,000 – 160,000 m^3. Based on sampling test results, the average sand-fraction is 94 %. Therefore it is estimated that 112,800 – 150,400 m^3 of sand-fraction will be recovered from the dredge operation.

During the processing of dredge slurry in the settling ponds, however, based on previous experience it is estimated that at least 50 % of the fines (average 2.625 % of volume) will be incorporated into the sands as they drop out of suspension. Therefore, it is estimated that 115,950 – 154,600 m^3 of material could be recovered as 'sand' and stockpiled. The remaining fines would be extracted from the settling ponds following cessation of the operation. The fines material would have a variety of uses, primarily for landscaping and horticultural applications as a soil conditioner mix or for topdressing.

2.10 RESOURCE SIGNIFICANCE

2.10.1 THE MARKET AND CURRENT SUPPLIERS

While the main purpose of the project is to re-establish the viability of the oyster lease, commercial use of the dredged material is crucial to the financial viability of the project. The market for extracted material from the oyster lease sand would extend from Port Macquarie to Port Stephens. Major developments along the NSW coast between these regions have increased the demand for sand in the region, however, a number of the current suppliers have diminishing reserves. If no additional reserves are made available, it is likely that the local and regional demand for sand products will have to be sourced from sites outside the region, contributing significantly to the cost of the products due to increased costs of haulage.

2.10.2 RESOURCE SIGNIFICANCE

The material to be extracted from the site is considered to be of local and regional resource significance because of the lack of existing and proposed sand quarries in the region. Due to increased demand for sand within the Forster/Tuncurry region, this material will be able to provide additional sand supply to meet current and future demand for this resource.

Planning Context

3.1 COMMONWEALTH LEGISLATION

3.1.1 EPBC ACT

The Commonwealth Environmental Protection and Biodiversity Conservation Act (1999) (EPBC Act) encompasses an assessment and approvals system for:

- Actions that have a significant impact on matters of National Environmental Significance (NES);
- Actions that have a significant impact on the environment of Commonwealth land; and
- Actions carried out by the Commonwealth Government.

Matters of National Environmental Significance (NES) under the *EPBC Act* are:

- World Heritage areas;
- Wetlands protected by international treaties (*i*e. the Ramsar Convention);
- Nationally listed threatened species and ecological communities;
- Nationally listed migratory species (*i*e. CAMBA, JAMBA agreements);
- All nuclear actions; and
- The environment of Commonwealth marine areas.

An assessment of Matters of NES is provided in the Flora and Fauna Assessment (**Vol. 2 – Appendix C**). This assessment was undertaken with reference to an Environment Protection and Biodiversity Conservation Act Online Database search, with a buffer area of 10 km. The assessment indicates that there are no matters of NES that would be affected adversely by the proposed development.

3.2 STATE PLANNING

3.2.1 STATE ENVIRONMENTAL PLANNING POLICIES

The following provides an outline of the State Environmental Planning Policies (SEPP) applicable to the proposed development, and provides comments on matters required for consideration under these policies.

SEPP Major Projects 2005

The project is an extractive industry in a 'sensitive coastal location', as defined under SEPP 71. Therefore, the dredging component of the project is classified as 'State significant development' in accordance with Clauses 7(1)(c) of Schedule 1 of SEPP Major Projects 2005, being located in an environmentally sensitive area of State significance ('sensitive coastal location' as defined in SEPP 71).

Further, the operation of the stockpile is ancillary to the previously defined State significant development and therefore, in accordance with Clauses 7(1)(c) and 7(2)(a) of Schedule 1 of SEPP (State Significant Development) 2005, this component of the project is also classified as 'State significant development'. Therefore the project is classified as a Major Project under the provisions of Part 3A of the *Environmental Planning and Assessment Act 1979* (**Appendix A**).

SEPP No. 71 Coastal Protection

The NSW Coastal Policy (NSW Government,1997) sets the direction for coastal zone management, planning and conservation in NSW. This policy is also supported by the introduction of *State Environmental Planning Policy No 71 – Coastal Protection (SEPP 71).* The site is located within the coastal zone and accordingly SEPP 71 is applicable to the proposed development.

The objective of State Environmental Planning Policy No. 71 - Coastal Protection (SEPP 71) is to further the implementation the NSW Coastal Policy (1997). SEPP 71 establishes a number of matters for consideration in relation to any land to which the policy applies that:

- should be taken into account by a Council, when it prepares a draft Local Environmental Plan that applies to land which this policy applies;
- are to be taken into account by a consent authority when it determines a development application to carry out development on land to which this Policy applies; and
- SEPP 71 applies to lands within the *coastal zone* as defined in the *Coastal Protection Act 1979*.

The processing of extractive materials including sand, is listed as an 'extractive industry' and is therefore defined as State significant development' in accordance with Clauses 7(1)(c) of Schedule 1 of SEPP Major Projects 2005. Consequently, Part 2 of SEPP 71 – Matters for Consideration' should be taken into account by the Consent Authority when determining the application.

SEPP No. 14 Coastal Wetlands

The aims and objectives of this policy are to ensure that "coastal wetlands are preserved and protected in the environmental and economic interests of the State". SEPP 14 applies to part of the land through which it is proposed to place the pipelines for the dredged materials and return waters. Clause 7 of the Policy applies to the project, as a small section (approximately 100 m) of the proposed dredge pipeline will impact a small area of Saltmarsh habitat while another small section (75 m) will traverse an uncleared area of Swamp Sclerophyll Forest. This impact is classified as "clearing" in accordance with subclause (4) of SEPP 14.

Assessment of the impact of the dredge pipeline on these habitats is provided in **Section 5.2** and **Appendix C** of the **Volume 2 Report**. The clearing of land in a SEPP 14 wetland requires consent in accordance with subclause (1) of SEPP 14 and is therefore declared designated development for the purposes of the *Environmental Planning and Assessment Act 1979*.

SEPP No. 44 Koala Habitat Protection

The objective of this policy is to encourage the conservation and management of areas of habitat for koalas, to ensure the current distribution of koalas is maintained.

A SEPP 44 assessment involves:

- Determination of whether the subject site occurs within the Local Government Areas (LGA's) listed on Schedule 1 of SEPP 44;
- Determination of Potential Koala Habitat within the subject site;
- Determination of Core Koala Habitat; and
- Consideration of the need for a Koala Plan of Management.

The site is situated within the Great Lakes LGA, which is listed on Schedule 1 of SEPP 44, therefore a Koala assessment must be undertaken in accordance with this policy. The study area contained a small number of Koala Feed Trees listed on Schedule 2 of SEPP 44, Swamp Mahogany (*Eucalyptus robusta*). As this tree species comprised less than 15 % of the total number of trees in the proposed development area, it was concluded that the study area does not contain '*potential Koala habitat*' .

Despite that no *potential Koala habitat* being identified in the proposed development area*,* further investigations were undertaken using the Spot Assessment Technique to identify the likely occurrence of Koalas utilising the habitat within the study area. These investigations determined that the site was not '*core Koala habitat*' and therefore a Koala Plan of Management is not required. Further details of the SEPP 44 investigations are provided in the Flora and Fauna Assessment report contained in the **Volume 2** report.

SEPP No. 11 Traffic Generating Developments

The aims and objectives of this policy are to ensure that the Traffic Authority (RTA) is made aware of and is given an opportunity to make representations in respect of developments listed under Schedule 1 of this policy. 'Extractive Industry' is listed as a development under Schedule 1 of the policy. Comments were sought from the RTA in regard to the project and their response is provided in **Appendix A**. Traffic issues relating to the operation of the stockpile site are addressed in **Section 6.6**.

SEPP No. 33 Hazardous and Offensive Development

The aims and objectives of this policy are to ensure that when determining hazardous or offensive developments or potentially hazardous or offensive developments, the consent authority imposes conditions to minimise any potentially adverse impact. Operation of the stockpile site would be considered a "potentially offensive industry" in accordance with Clause 3 of the policy. Consequently Part 3 – Clause 13 "Matters for consideration by consent authorities" should be taken into account by the Consent Authority when determining the application. Noise, dust and odour impacts associated with the operation of the stockpile site were assessed. These reports form part of the **Volume 2** report.

SEPP No. 55 Remediation of Land

The objective of this policy is to encourage a consistent State-wide approach to the remediation of contaminated land. Clause 6 of the policy is applicable to the consideration of contamination and remediation in relation to proposed developments. The consent authority is required to consider whether there is the possibility that the land may be contaminated due to past land uses, and if so, whether the land is suitable for its proposed use in its current or remediated state.

The property proposed to be used for the stockpile site has historically been, and is currently used, for agricultural purposes, which is listed as a potentially contaminating activity, as identified in State Environmental Planning Policy No. 55. Therefore a preliminary contamination assessment has undertaken in accordance with the policy (**Section 4.4**). A preliminary assessment checklist is included in **Table 4.3.**

3.2.2 RELEVANT STATE LEGISLATION AND REGULATIONS

The provisions of relevant NSW legislation are addressed in this section of the report.

Protection of Environment Operations Act, 1997

The *Protection of the Environment Operations Act 1997* (*PoEO Act*) was introduced on the 1st of July 1999. It repeals the *Clean Air Act 1961*, the *Clean Waters Act 1970*, the *Pollution Control Act 1970*, the *Noise Control Act 1975* and the *Environmental Offences and Penalties Act 1989*. Theses Acts and the major regulatory and enforcement provisions of the *Waste Minimisation and Management Act 1995* have effectively been consolidated by the PoEO Act. The Minister for the Environment has redeveloped the majority of regulations under the pollution acts and additional regulations have been introduced.

The PoEO Act replaced existing approvals and licensing requirements with a single schedule of activities requiring an environmental protection licence that will regulate all forms of pollution. Previous requirements for a separate pollution control approval and licence under each Act has been replaced with an integrated system of licensing.

The DEC have advised that "the EA must provide sufficient information to demonstrate that the proposed development can be operated whilst complying with the *PoEO Act*, in particular the protection or water quality during construction and operation of the proposed dredging operation". Other areas of assessment for compliance with the Act, regulations and guidelines include noise (**Vol. 2 – Appendix A**), air quality (**Vol. 2 – Appendix E**) flora and fauna (**Vol. 2 – Appendix C)**, Aboriginal Cultural Heritage (**Vol. 2 – Appendix F**) and adequacy of monitoring programs.

Results of investigations into these areas of environmental management are provided in this report and the Volume 2 report.

Water Management Act 2000

This Act incorporates the *Rivers and Foreshores Improvements Act 1948* and the *Water Act 1912*. A permit is normally required under the *Rivers and Foreshores Improvements Act 1948* for works (extraction) within protected waters, with approval administered through the Department of Natural Resources An approval in accordance with this Act, however, is not required for approved projects (**Section 3.2.4**).

Fisheries Management Act 1994 and Fisheries Management Amendment Act 1997

The *Fisheries Management Amendment Act 1997* amended the *Environmental Planning and Assessment Act 1979* and the *Threatened Species Conservation Act 1995* by introducing provisions relating to the protection and conservation of threatened marine vegetation and fish. The provisions are similar to those that exist for terrestrial flora and fauna. A dredge permit is normally required under the *Fisheries Management Act 1994*, in addition to a permit to destroy or damage any marine vegetation affected by the dredging or pipeline locations. An approval in accordance with this Act, however, is not required for approved projects (**Section 3.2.4**).

The assessment provided in the Aquatic Ecology Assessment (**Vol. 2 – Appendix G**) indicates that there will be no significant impacts on aquatic species and therefore a Species Impact Statement is not required.

Threatened Species Conservation Act 1995

This Act applies to all native flora and fauna (except fish). Its main objectives are to:

- Conserve biological diversity and promote ecologically sustainable development;
- Protect critical habitat of threatened species, populations and ecological communities; and
- Ensure that the impact of any development or activity potentially affecting threatened species is properly assessed.

Flora and fauna surveys have been carried out over the subject site to assess the likely occurrence of Threatened species, populations or ecological communities. The findings of the assessment are provided in **Section 5.2** and **Volume 2 – Appendix C**. The assessment indicates that there will be no significant impact on any Threatened species and as such, a species impact statement is not required.

National Parks and Wildlife Act 1974

This Act governs the activities of the National Parks and Wildlife Service. The relevant aspects of the Act to the proposed development are the conservation and management of native flora and fauna, and Aboriginal sites and relics. Specific requirements of the National Parks and Wildlife Service with respect to the preparation of this Environmental Assessment are addressed in **Section 5** and in the Aboriginal Archaeological Assessment (**Volume 2 – Appendix F)**. Assessment of the project indicates that no sites or relics of Aboriginal heritage significance are present in the study area. Therefore no approvals are required under this legislation.

Native Vegetation Act 2003

The *Native Vegetation Act 2003* (*NV Act*) prohibits the clearing of native vegetation, except for certain exemptions or under certain approvals. Clause 25 (f) states that the Act does not apply to *"any clearing that is, or that is part of, designated development within the meaning of the EPA Act and for which development consent has been granted under that Act"*.

Approval for clearing under this Act is not required, in accordance with Clause 75U (e) of the *EP& A Act* (**Section 3.2.4**).

Heritage Act 1977

The aim of this act is to preserve items of heritage significance. The Act provides an approval process for destruction of Non-aboriginal items of heritage significance. An assessment of impacts of items of heritage significance is provided in **Section 6.5**. An approval in accordance with this Act, however, is not required for approved projects (**Section 3.2.4**).

Crown Lands Act 1989

The area of the oyster lease is identified as Crown land, as defined by this Act. Consent of the Department of Lands is required for lodgement of the DA for the project. Assessment of the implications of the proposal on this Crown land is provided in **Section 6.3.1**.

3.2.3 OTHER GUIDELINES AND POLICIES

Planning NSW EIS Guidelines – Extractive Industries

The former Department of Urban Affairs and Planning published Environmental Impact Statement guidelines for Extractive Industries in Riparian and Coastal areas in 1996. These guidelines outline factors that must be considered when preparing an EIS for Extractive Industries in these areas.

The purposes of these guidelines are to present a clear and comprehensive statement of the matters that may need to be included in an EIS, to fulfil the information requirement for the assessment and determination of quarry or excavation proposals.

The guidelines deal with the information requirements for an EIS for quarries or other excavation proposals. The guidelines state that extractive industries are those: *'which obtain extractive materials by methods including excavation, quarrying, dredging or tunnelling or that store stockpile or process extractive materials by methods including washing, crushing, sawing or separating'*, as stated in Schedule 3 of *EP&A Regulations*.

While this report is not an EIS, it addresses the EIS guidelines and includes all the specific requirements as indicated in Section 6 of the guidelines.

NSW Coastal Policy 1997

The Director General has advised that one of the matters to be addressed in the EA is the consistency of the proposal with the NSW Coastal Policy 1997. The Coastal Policy obliges all New South Wales State agencies and local councils to consider it in the preparation of their own specific plans and policies. There are nine goals that give expression to the vision of the NSW Coastal Policy (1997). Each goal has several objectives that identify strategic actions formulated to provide guidance to State and Local Government Authorities regarding management of the Coastal Zone.

The proposed project is relevant to several Goals and Strategic Actions of the Policy. These are outlined in **Table 3.1**.

Table 3.1 – Relevance of NSW Coastal Policy to Project

Relevant Coastal Policy Goal	Relevant Strategic Action	Comment
1	1.3.1	DEC to impose Licence limits for discharge of return waters
1	1.4.7	Proposal subject to approval process and review/conditions of relevant Stage Agencies
2	2.1.3	Physical and ecological process and hazards addressed in this EA
5	5.1.7	Proposal identifies an area of opportunity for aquaculture within an existing lease area
5	5.2.9	Extractive industry component of project controlled through EIA process

Information presented in **Table 3.1** indicates that the project is consistent with the NSW Coastal Policy.

Draft NSW Oyster Industry Sustainable Aquaculture Strategy

This draft document provides a strategy for the management of the NSW oyster industry, with a focus on achieving sustainable growth to a production level of 120,000 bags per annum, up from 72,853 bags in 2003/04 (65 % increase). Section 9.3 of the Draft Strategy outlines draft protocols with respect to maintenance dredging of oyster leases. Dredging requires a licence issued under the *Crown Lands*

Act 1989. The Draft Strategy indicates that the dredging may also require a permit under Section 201 of the *Fisheries Management Act 1994*, although Section 201 does not apply to work authorised under the *Crown Lands Act 1989*. As the area proposed for dredging is Crown land, a permit under Section 201 of the *Fisheries Management Act 1994* is not required.

Notwithstanding, the Draft Strategy defines several 'best practice standards' for dredging works that must be met if a permit under Section 201 of the *Fisheries Management Act 1994* is required. These standards are summarised in **Table 3.2** below, with a comment provided on each in relation to the proposed development.

Table 3.2 – Draft 'Best Practice Standards' for dredging permit under Section 201 of *Fisheries Management Act 1994*.

Draft 'Best Practice Standard'	Comment
Dredge material to be clean marine sand	Dredge material is 94 % clean marine sand
No disturbance of PASS or ASS	Material is not PASS or ASS
Maximum dredge depth of 1.0 m below mean low water	Dredge depth of 2.0 m max. proposed
No *Posidonia australis* allowed in dredge area	Proposed dredge area does not contain *Posidonia australis*
Dredge activity to have no significant impact on any threatened species or habitat	No significant impacts of proposed dredging on threatened species or habitat
An approved spoil site is available	Spoil site proposed as part of application
Dredging to result in no significant water pollution	No significant water pollution anticipated
Preparation of aquaculture lease maintenance dredging plan required	Plan would be prepared prior to commencement of dredging if required

All standards detailed above are met by the proposal, apart from depth of dredging. Although these standards do not apply to the project (as a permit under Section 201 of the *Fisheries Management Act 1994*, is not required) justification of the depth of dredging is provided below.

It is important to understand that the depth of water required over the lease area is directly related to the style of oyster farming. The depth of dredging to a maximum depth of 2 m below mean low water is proposed for the following operational reasons:

1. To prevent scouring of the bed and consequent re-suspension of bed sediment in the event that a rack becomes disengaged from the float at one end. Under this circumstance, insufficient depth of water beneath the floating structures would mean that a disengaged rack would be driven into the bed surface. A maximum depth of approximately 2 m below mean low

water would provide the necessary clearance so that the disengaged rack would swing beneath the structure clear of the bed until it was located and repaired/replaced. This would prevent damage to the float structure, loss of stock (due to smothering of oysters by the bed) and allow for easy sighting of the damaged rack (removing a potential navigation hazard to recreational and professional fishers who will utilise the lease area for mullet netting and line fishing) and rapid repair of the structure without the loss of stock. The requirement to prevent any re-suspension of bed sediment is also critical to ensuring the maintenance of oyster health, particularly during harvest periods.

2. A maximum depth of 1 m below mean low water will not provide sufficient propeller clearance for oyster punts. This will in turn result in damage to the bed, entrain sediment, increase turbidity and prevent the regeneration of seagrass in the lease area. Modern oyster farming equipment is significantly larger and heavier than equipment used 20 – 30 years ago. Older style oyster farming was traditionally undertaken without the use of large punts and motors. Rather, wading was the traditional method of moving around the lease area, hence the shallower water depths that were able to be tolerated (although this affected productivity). This is further evidenced by the old practice of filling in deeper water areas to create suitable conditions for oyster farming techniques used at the time, as has occurred with this lease area.

3. A depth of 2 m below mean low water will draw significantly more water (and therefore food/plankton) through the lease area, providing for more rapid feeding by the growing oysters, producing a saleable product in approximately 18 months. If only half the depth of water is provided and tidal flow is significantly restricted, saleable product can only be produced in 30 -36 months. A reduced timeframe for production is directly consistent with the stated aim of the Draft Strategy to increase overall production in NSW by 65 %, without necessarily increasing the total number of oyster leases.

4. Similar dredge depths to those proposed here have been approved in the last 15 – 20 years for approximately 15 other leases in Wallis Lake, for the reasons stated above.

Further justification is provided by the assessment of impacts as a result of the depth of dredging, which are reported in the hydraulic modelling study (**Appendix B – Vol 2 Report**). The results of the study indicated that there would be no adverse morphodynamic impacts in this area of Wallis Lake as a result of dredging to this depth (**Section 4.1**).

In addition, the Draft Strategy identifies this lease area as a “Priority Aquaculture Area” within Wallis Lake. In order to assist in meeting the Draft Strategy’s objectives of achieving sustainable growth to a production level of 120,000 bags per annum (a 65 % increase above existing production levels), production from the lease needs to be maximised using modern oyster farming techniques and equipment. It is stressed that this can only be achieved by having sufficient clearance between the physical rack structures and the bed.

In summary, the proposal to dredge the oyster lease area in an environmentally sustainable manner and contribute to an increase in the overall productivity of Wallis Lake, is consistent with the overall aim of the Draft Strategy to increase production levels to 120,000 bags per annum in NSW.

3.2.4 NSW WETLANDS MANAGEMENT POLICY 1996

The NSW Wetlands Management Policy 1996 was developed to "*promote the conservation, sustainable management and wise use of NSW wetlands by all stakeholders for the benefit of present and future generations*".

The goals of the Policy that are relevant to this project are stated below:

- Protecting wetland biodiversity, functions and services;
- Protecting social and economic benefits of wetlands;
- Providing flow regimes that mimic natural conditions, where possible;
- Providing wetlands with water of appropriate volume and quality;
- Limiting further fragmentation and reconnecting wetland systems;
- Preventing or limiting catchment activities that impact upon wetlands; and
- Protecting the cultural heritage and spiritual significance of wetlands.

Principles have been developed to assist the Government to achieve these goals. The Principles that are relevant to this project are stated below:

- Natural wetlands should not be destroyed or degraded. When social or economic imperatives in the public interest result in a wetland being degraded or destroyed, the rehabilitation or construction of a compensatory wetland that supports similar biodiversity and ecological functions will be required.

The proposed project includes location of the dredge pipeline through SEPP 14 wetland No. 579. The project is consistent with the goals and principles of the Policy with respect to SEPP 14 wetland No. 579 in that it:

- Does not impact adversely on this wetland's biodiversity, functions and services (**Section 5.2 and Appendix C – Vol. 2 Report**);
- Does not impact adversely on the social and economic benefits of the wetland;
- Does not impact on flow regimes or water quality/quantity in the wetland;
- Does not fragment the wetland;
- Has a minimal overall short-term ecological impacts on the wetland (**Section 5.2 and Appendix C – Vol. 2 Report**);
- Does not affect any cultural heritage values of the wetland (**Section 6.5.1 and Appendix F – Vol. 2 Report**); and
- Proposed rehabilitation of the very limited area of potentially affected Saltmarsh vegetation in the wetland (**Section 5.2 and Appendix C – Vol. 2 Report**).

The impact on the use of the land with the SEPP 14 wetland for location of the project is benign and is therefore considered to be consistent with the aims, goals and principles of the Policy.

3.2.5 EXEMPTIONS FROM PROVISIONS OF OTHER ACTS

In accordance with Section 75U Clause 1 of the *EP&A Act*, the following authorisations are not required for an approved project (and accordingly the provisions of any Act that prohibit an activity without such an authority do not apply):

(a) the concurrence under Part 3 of the *Coastal Protection Act 1979* of the Minister administering that Part of the Act;

(b) a permit under section 201, 205 or 219 of the *Fisheries Management Act 1994;*

(c) an approval under Part 4, or an excavation permit under section 139, of the *Heritage Act 1977;*

(d) a permit under section 87 or a consent under section 90 of the *National Parks and Wildlife Act 1974;*

(e) an authorisation referred to in section 12 of the *Native Vegetation Act 2003* (or under any Act to be repealed by that Act) to clear native vegetation;

(f) a permit under Part 3A of the *Rivers and Foreshores Improvement Act 1948*;

(g) a bush fire safety authority under section 100B of the *Rural Fires Act 1997;* and

(h) a water use approval under section 89, a water management work approval under section 90 or an activity approval under section 91 of the *Water Management Act 2000.*

3.3 REGIONAL PLANNING

3.3.1 HUNTER REGIONAL ENVIRONMENTAL PLAN 1989

The aims and objectives of Hunter Regional Environmental Plan 1989 are:

- To promote the balanced development of the region, the improvement of its urban and rural environments and the orderly and economic development and optimum use of its land and other resources, consistent with conservation of natural and man made features and so as to meet the needs and aspirations of the community;
- To co-ordinate activities related to development in the region so there is optimum social and economic benefit to the community; and
- To continue a regional planning process that will serve as a framework for identifying priorities for further investigations to be carried out by the department and other agencies.

The following summary identifies the relevant matters within the Hunter Regional Environmental Plan (HREP) applicable to proposal, and comments on the consistency of the proposed development with the REP.

PART 4 – LAND USE AND SETTLEMENT

Clause 27 (3)

Before granting consent to an application for open-cut coal or other mining or resource extraction on land identified on the map as prime crop or pasture land consent authorities should consider:

- The degree to which the mining or resource extraction area can be restored for further agricultural use;
- The contents of the policy statement " rehabilitation of land affected by mining " issued by the soil conservation service;
- The likely effects on agricultural land and surface and groundwater resources in the vicinity; and
- The cost of sterilisation of the coal resource, mineral resource or extractive material if mining or extraction does not proceed.

The proposed development complies with this clause of the HREP as, the proposed development is not prime crop or pasture land, areas will be restored to pasture and the proposed development will not impact adversely on surface and groundwater in the vicinity of the proposed development.

PART 6 – NATURAL RESOURCES

Division 1 – Mineral Resources and Extractive Materials, Clause 41 (1)

(1) Consent authorities, in considering proposals for mining or extraction (including dredging):

(a) should consider the conservation value of the land concerned and apply conditions which are relevant to the appropriate post-mining or extraction land use;

(b) should, in respect of extraction from river banks or channels, ensure that instability and erosion are avoided;

(c) should consult with officers of the Department of Mineral Resources, and of the Department of Agriculture, to determine appropriate post-mining or extraction land uses;

(d) should ensure the progressive rehabilitation of mined or extracted areas;

(e) should minimise the likelihood and extent of a final void and the impact of any final void, or facilitate other appropriate options for the use of any final void;

(f) should minimise any adverse effect of the proposed development on groundwater and surface water quality and flow characteristics;

(g) should consider any likely impacts on air quality and the acoustical environment;

(h) should be satisfied that an environmentally acceptable mode of transport is available; and

(i) should have regard to any relevant Total Catchment Management strategies.

The proposed development complies with this clause of the Hunter REP as indicated by the various sections of this EA that address these issues.

PART 7 – ENVIRONMENT PROTECTION

Policies for control of development, Clause 47 (1)

(1) A consent authority should not grant consent to the carrying out of development listed in Schedule 3 to the *Environmental Planning and Assessment Regulations 1980* (including development comprising the expansion of an existing facility) unless it is satisfied that:

(a) topographic and meteorological conditions are such that air pollutants would have no significant adverse effect;

(b) an appropriate buffer zone can be provided to ensure that noise, dust and vibration are maintained at acceptable levels;

(c) the best practicable technology for air, water and noise pollution control will be incorporated in the design and operation of the equipment and facilities to be used for the purposes of the industry;

(d) there will be no significant deterioration of air or water quality as a result of emissions from that equipment or those facilities; and

(e) the site will not become contaminated within the meaning of Part 5 of the *Environmentally Hazardous Chemicals Act 1985*.

(2) A council should not grant consent to any development unless it is satisfied that:

(a) there is adequate provision for setbacks between the development and existing watercourses;

(b) an adequate vegetation cover is maintained or reinstated so as to minimise soil erosion;

(c) where necessary, adequate retardation basins, grassed floodways, sedimentation pits and trash collection facilities are established and maintained; and

(d) adequate measures are provided to control soil erosion during construction of the development.

The proposal has been designed to comply with all parts of this clause of the Hunter REP as follows;

- The noise and air quality assessment studies determined that the proposal would have no significant effects (**Volume 2 report**);
- Water management and sediment and erosion control measures are designed in accordance with currently accepted practice; and
- No site contamination will result from the proposed development.

Hunter Coastal Urban Settlement Strategy (HCUSS)

The HCUSS has been prepared to ensure that urban growth in the Hunter coastal area is planned and managed in a responsible manner which is environmentally and economically acceptable to the community.

The HCUSS requires councils to protect mineral resources and extractive materials, which are important for construction/building purposes and for future urban expansion. The extraction of mineral resources and extractive materials should only occur after detailed environmental assessment has been undertaken.

The proposed development is consistent with these provisions of the HCUSS.

3.4 LOCAL PLANNING

3.4.1 GREAT LAKES LOCAL ENVIRONMENTAL PLAN 1996

The oyster lease is unzoned, while the area for the proposed stockpile site is zoned 1(c) Future Urban Investigation under the provisions of Great Lakes Local Environmental Plan 1996 (LEP 1996). The area of the site zoned 7(a) is outside of the proposed stockpiling area, though the pipelines would traverse this area.

The objectives of Zone No. 1(c) Future Urban Investigation are provided below.

The objective of the zone is to restrict development to that which is unlikely to:

(a) lead to the premature and sporadic subdivision of land which would render the economic provision of public utilities and community facilities unreasonably more difficult or expensive once urban development takes place, or

(b) inhibit, in a significant manner, the potential for urban expansion in selected areas, particularly the urban fringe, or

(c) generate significant additional traffic or create or increase ribbon development on any road, relative to the capacity and safety of the road, or

(d) prejudice economic development, or

(e) significantly detract from the scenic quality of the land within the zone, or

(f) compromise existing significant environmental attributes of land within the zone, or

(g) have a significant adverse impact on the quality of water resources within the area, or

(h) be unreasonably subject to risks from natural hazards.

In summary, the objectives of the zone relate to restricting development to that which is unlikely to prejudice the future urban potential of the land or compromise significant environmental attributes of the land. In addition, the zoning seeks to regulate development so that ribbon development is prevented and traffic impacts are restricted to the carrying capacity of the existing road network.

Based on information presented in this report, the stockpiling and sale of sand from the site is consistent with the objectives of the zone and being an extractive industry, is permissible in the zone with Council consent.

The objectives of Zone No. 7(a) Wetlands and Littoral Rainforest are provided below.

The objective of the zone is to restrict the type and scale of development to that which is compatible with the special ecological or scientific values of coastal wetlands and littoral rainforests and which is unlikely to:

(a) have a significant detrimental effect on the growth of native plant communities, or

(b) adversely affect the survival of native wildlife populations, or

(c) adversely affect the provision and quality of habitats for either indigenous or migratory species.

In summary, the objectives relate to restricting development that is not consistent with special ecological attributes of these areas. The location of the dredge and return waters pipelines, which are part of an aquaculture operation, are permissible in the zone with consent. Information provided in this EA indicates that the laying and operation of the dredge pipeline and return waters pipeline through the area zoned 7(a) would not compromise the objectives of the zone. The proposal would not:

(a) have a significant detrimental affect on the growth of native plant communities; or

(b) adversely affect the survival of native wildlife populations; or

(c) adversely affect the provision and quality of habitats for either indigenous or migratory species.

The effect of the pipelines is assessed in the Flora and Fauna Report (**Vol. 2 – Appendix C**), which indicates that the presence of the pipelines would not have a significant impact on any species, population of ecological communities in these habitats.

3.4.2 SPECIAL PROVISIONS APPLICABLE

The following special provisions within the *Great Lakes Local Environmental Plan 1996* guide and regulate plan making and development control with respect to the proposed development.

Clause 25 Waterways

Maintenance Dredging

"(1A) Notwithstanding subclause (1), the consent of Council is required for development for the purpose of dredging, for maintenance of oyster leases or otherwise, of the bed of any river or lake where more than 1000 m^3 of material is to be removed."

Clause 26 Development of Unzoned Land

Development of unzoned land

"A person must not carry out development on land (including land formed by reclamation or natural accretion in waterways or formerly the bed of a harbour, bay, lake, river, lagoon or natural watercourse) shown uncoloured on the map without the consent of Council."

The proposed development is permissible under the provisions of Council's LEP 1996.

3.4.3 GREAT LAKES COUNCIL DEVELOPMENT CONTROL PLANS

The following Great Lakes Council Development Control Plan is relevant to the project.

DCP No. 33 Acid Sulfate Soils

DCP No. 33 outlines Council's policy regarding management of acid sulfate soils. The DCP outlines the requirements of acid sulfate soil management plans and provides a code of practice for the Great Lakes LGA. As potential acid sulfate soils may be present in the slurry pumped to the stockpile site, PASS will need to be managed in accordance with relevant local and State guidelines. Issues of acid sulfate soils management are detailed in **Section 4.2.1** and the **Volume 2 Report – Appendix D**.

3.4.4 WALLIS LAKE ESTUARY MANAGEMENT PLAN

The Wallis Lake Estuary Management Plan (GLC, 2005) aims to provide a framework for the effective implementation of management measures for Wallis Lake. The objectives of the Plan are as follows:

1. Conserve, protect and enhance areas of significant cultural, ecological and aesthetic value;
2. Restore or remediate degraded areas;
3. Balance the recreational, commercial, social and cultural needs of the estuary;
4. Increase the economic value of the estuary in an ecologically sustainable manner; and
5. Increase community awareness of estuarine processes and management issues.

With respect to these objectives, the proposed development is relevant to Objectives 1 - 4. Consistency of the proposal with these objectives is summarised as follows:

- The dredge operation will enhance the ecological attributes of the lease area by restoring the natural depth of the waterway in this area, increasing seagrass coverage and associated habitat for aquatic fauna (**Section 5.1**);
- The accumulation of marine sands and fluvial fines in this area is considered to be a degradation of the natural morphology in this part of the estuary. Dredging the area will restore it to its natural state;
- By reinstating the oyster lease in an environmentally sustainable manner and restoring former deeper water habitat (providing for previously non-existent commercial and recreational fishing opportunities), the proposed development will balance the recreational, commercial, social and cultural needs of the estuary;
- Reinstating the oyster lease in an environmentally sustainable manner will provide a substantial contribution to the production and value of the oyster industry in Wallis Lake, thereby increasing the economic value of the estuary in an ecologically sustainable manner.

The Plan identifies a series of management themes for which 'Action Plans' have been developed. 'Action Pans' for Oyster Aquaculture, Ecology and Sedimentation are presented which detail management objectives for these themes.

Table 3.3 summaries the management objectives and actions for each theme and provides comment of their relevance with respect to the proposed development. Reference to the management objectives identified for each of these themes indicates that there is no conflict between the proposed development and the management objectives.

Table 3.3 – Relevance of Wallis Lake Estuary Management Plan Management Actions to the proposed development

Management Theme	Management Objective	Comment
Oyster Cultivation	Ensure that oyster leases operate in a sustainable manner	The operation of the oyster lease is ecologically sustainable. No adverse impacts will result from re-instatement of the lease, as detailed in this EA.
	Ensure that land based components of oyster aquaculture operate in a sustainable manner	Not relevant to the proposed development.
Ecology	Protect and enhance existing natural wetlands	The proposed development will not adversely impact on any wetlands, as detailed in this report.
	Protect seagrass beds from propeller chop in shallow areas	Lowering of the bed of the lease will prevent existing shallow seagrass areas from being damaged by propeller chop.
	Protect seagrass beds from being buried by drifting sand shoals	Not relevant to the proposed development.

Table 3.3 – Relevance of Wallis Lake Estuary Management Plan Management Actions to the proposed development

Management Theme	Management Objective	Comment
	Protect seagrass beds from being overgrown and smothered by other aquatic macro algae	Not relevant to the proposed development.
	Establish abundance and distribution data for aquatic vegetation	Aquatic surveys undertaken for this report provide data on abundance and distribution data for aquatic vegetation in and around the lease area
	Protect and enhance riparian vegetation	The proposed development will not adversely impact on any riparian vegetation, as detailed in this report.
	Protect important shorebird roosting, nesting and foraging areas	The proposed development will not adversely impact on any important shorebird roosting, nesting and foraging areas, as detailed in this report.
Sedimentation	Conduct dredging in navigation channels for safe boat passage	The lowered bed will allow for safe passage of commercial and recreation fishing craft through the lease area.
	Remove excess sediment build up at stormwater drain outlets	Not relevant to the proposed development.
	Consider development of a Wallis Lake maintenance dredging strategy	Not relevant to the proposed development.

The proposed development does not conflict with the management objectives of the Plan and is therefore consistent with the Wallis Lake Estuary Management Plan.

Interactions with the Physical Environment

4.1 HYDRODYNAMICS AND SEDIMENT TRANSPORT PROCESSES

4.1.1 NUMERICAL MODELLING OF HYDRODYNAMICS AND SEDIMENT TRANSPORT

The University of NSW Water Research Laboratory (WRL) was commissioned to undertake an assessment of the impacts of the proposed dredging of the oyster lease on hydrodynamics and sediment transport in and around the vicinity of the proposed dredge area. The assessment was undertaken using a three dimensional finite element model (RMA-10) that was developed previously for Wallis Lake to assess possible sources and causes of the viral contamination incident in November 1996. The model was modified for this study with more detailed hydro-survey information (**Vol. 2 – Appendix B**), to investigate circulation changes and possible erosion or accretion around the proposed dredge area. Three model scenarios were investigated:

- The 'previously calibrated' model configuration, as determined for the contamination incident;
- The 'pre-dredge' model configuration, similar to the 'previously calibrated' model, except that higher resolution was added in the area of interest and the bathymetry updated to reflect the recent hydro-survey. Comparison between this and the 'previously calibrated' model was undertaken to ensure that the additional resolution and new bathymetry did not change the overall model calibration; and
- The 'post-dredge' model configuration, which used the resolution and bathymetry of the pre-dredge' model, with the exception that the dredge area was deepened by 2 m.

Differences in results between pre and post-dredge can therefore be attributed directly to the influence of the dredging activity.

Results of the hydraulic and sediment transport modelling investigations are presented at **Appendix H** in the **Volume 2 Report**.

4.1.2 MODEL CALIBRATION

The existing RMA mesh was modified with detailed hydro-survey information of the dredge site and surrounding areas (**Vol. 2. – Appendix B**). The RMA-10 hydrodynamic model was run for a 7 day spring tide period, using data from the same period used in WRL's previous modelling investigations. The model was run for dry weather conditions only and as such, boundary condition was set by the ocean tide. Water level calibration checks were made against selected measurement sites at the entrance, on the Wallamba River and southern Lake. Water level calibration plots indicate no change in predicted water levels between the refined 2006 model and the calibrated 2001 model. Comparison of discharges across various sections in the immediate area near the entrance of the Wallamba River

and the dredge site indicated no change in overall flow discharges between model configurations and a good match between water levels and calibration. Based on this, the refined 2006 model was adopted as the 'pre-dredge' condition.

4.1.3 HYDRODYNAMIC CHANGES

Assessment of the impact of dredging of the oyster lease was made by setting the elevation of the nodes within the dredge area to – 2 m AHD. In summary, the modelling indicates the following:

- No change in predicted water levels in the immediate vicinity of the dredge site;
- No change in total discharge across the Wallamba River, indicating that the overall efficiency of the entrance to the Wallamba River has not changed;
- No change in the hydrodynamic behaviour of the estuary outside the immediate area of the dredging site;
- Maximum velocities are expected in decrease slightly in Jonnel Channel to the north of the dredge site and at the north western end of Native Dog Island;
- Maximum velocities are expected to increase slightly in the southern part of the channel between Oaky Island and Native Dog Island and in a small area immediately north west of the dredge site;
- Locally there would be a change in flow balance between the western and eastern sides of Native Dog Island, with increased conveyance between Native Dog Island and Oaky Island and over the dredge site and a decrease in conveyance through Jonnel Channel to the north; and
- Discharges across the oyster lease are insensitive to the future placement of oyster racks across the site.

4.1.4 SEDIMENT TRANSPORT CHANGES

Detailed numerical sediment transport modelling was not undertaken for this EA. In preference, determination of sediment transport changes was made through assessment of changes in peak bed shear in and adjacent to the dredge site. This method of determining sediment transport changes is justified due to the uncertainties associated with the sediment budget and the localised nature of changes in hydrodynamics (**Section 4.1.3**).

Sediment transport occurs when the movement of water adjacent to the bed or banks creates a shear stress that is capable of mobilising sediment. Peak shear is the most important shear parameter likely to induce sediment transport.

Comparison was made between the expected peak shear stress on the bed resulting from the dredging and critical shear stress (force required to move a given type of material) at six locations within or near to the dredge site. The data indicates a reduction in peak bed shear stress at all sites and hence accretion of sandy silts is expected over time. A slight increase in bed shear was determined for the channel between Oaky Island and Native Dog Island, which would result in initiation of sediment transport of consolidated silts, if present.

It is expected that channel sediment in the channel between Oaky Island and Native Dog Island would be at minimum, as coarse as the sediment present on the dredge site, though due to the higher energy environment this material is likely to be coarser. Therefore, based on the results of sedimentological investigations presented in **Section 2.9.3**, the occurrence of consolidated silts in this area is unlikely and therefore, initiation of sediment transport in this region would not be expected.

4.1.5 SUMMARY OF HYDRAULIC MODELLING RESULTS

Numerical analysis of morphodynamic changes in and around the vicinity of the dredge area resulting from dredging of the oyster lease by a maximum of 2 m indicates the following:

- Increased conveyance of water across the dredge area site and through the channel between Oaky Island and Native Dog Island;
- The modelling indicated possible initiation of sediment transport (consolidated silts) in the channel between Oaky Island and Native Dog Island as a result of minor increases in peak bed shear. However, due to the sediment in this channel (marine sands) being coarser than consolidated silts assumed in the model, initiation of sediment transport would not be expected;
- No predicted increases in tidal or river flood velocity. Minor accretion may occur on the north western end of Native Dog Island in the vicinity of reduced peak velocities; and
- Accretion of sediment, however, is expected over the oyster lease dredge area over an extended period of time, with material being sourced from deposition of fluvial fines during times of flood. Given the minimal impacts on adjacent channel velocities, it is unlikely that the dredge area would be infilled by the reworking of existing flood tide delta deposits in adjacent channel areas.

In summary, the dredging will have no effect on the overall flows or hydrodynamics of the Wallamba River and Wallis Lake estuary. Some localised effects may occur in the channels on either side of Native Dog Island, although these are expected to be insignificant.

4.1.6 FLOODING

The area of the stockpile site that has not been filled is subject to inundation during low frequency flood events. Natural ground levels are between 1 and 1.5 m AHD. Modelled peak flood levels recorded in the Wallamba River less than 1 km upstream of the site are reported in the Forster Tuncurry Floodplain Management Study (DLWC, 1998). Data are provided in **Table 4.1**.

Table 4.1 – Wallamba River Peak Flood Characteristics

Chainage * (km)	Water Level (m AHD)		Maximum Velocity ** (m/s)	
	1 % AEP	5 % AEP	1 % AEP	5 % AEP
22.450	2.44	1.96	0.62	0.57

SOURCE: DLWC (1998). * Distance downstream of Nabiac Bridge. **Velocities measured 'in-channel'.

Given that the stockpile site is located approximately 1200 m from the Wallamba River channel, peak flood velocities would be expected to be significantly less than those modelled for the channel during peak flows and would be more likely to be in the range of 0.1 – 0.2 m/s, typical of a flood fringe/storage environment. Further, the site is considered to subject to low hazard flooding (DLWC, 1998).

As detailed in **Section 2.4.3**, settling pond walls will be constructed to height of 3 m above natural ground surface. Therefore, there will be no inundation of the ponds during peak flood events. The impacts of the ponds on flood flows will be negligible, given the very low peak flow velocities expected in this flood fringe/storage environment. Further, the ponds will not act as a blockage to flood flows, given the nature of flooding in this area as a very slow rise and fall of water level.

Threats from flooding would be monitored by daily weather checks and warnings from the Bureau of Meteorology. Being an oyster farmer of long standing experience in the river, the proponent is well versed in the flood behaviour and responses of the river. Minor flood events (corresponding to a 100 – 150 mm increase in water levels above spring high tide levels) would not affect dredging operations. During flood events where the water level increases to a height greater than this, the dredging would suspended until such time as water receded to a depth suitable for operations. The dredge would remain moored during these events.

An emergency management plan would be prepared that details warning and emergency procedures for personnel and plant. This plan would form part of the Environmental Management Strategy for the project.

4.2 SOILS AND LANDFORM

Landform and soils details of the stockpile site were provided in **Section 2.8.3**. Details of geological/geomorphological characteristics of the oyster lease area are provided in **Section 2.9**. Disturbance to soils on the site will be minimal, with existing sand stockpiles on the site to be used for construction of pond walls. Reference to the published DLWC Acid Sulfate Soil map for the area indicates that the stockpile area is classed as:

- High Probability Estuarine Plain; and
- High Probability Aeolian Sand Plain.

In terms of Great Lakes Council's DCP 34, these areas correspond to:

- Class 2 – Works below natural ground surface (or below sea level) or likely to lower the water table; and
- Class 3 – Works beyond 1 m below natural ground surface or sea level or likely to lower the water table.

Works in these categories trigger the need for development consent and detailed investigation of acid sulfate soils issues. The site is located at approximately 1 m AHD. Works will not occur either below natural ground surface or beyond 1 m below sea level. Therefore, the provisions of Council's DCP are not triggered. The stockpile site operations will not disturb acid sulfate soils.

4.2.1 ACID SULFATE ASSESSMENT OF DREDGED SEDIMENT

Acid sulfate testing was undertaken on samples from cores taken from the dredge site. Results of the screening tests are provided in the Geotechnical Report (**Vol. 2 – Appendix D**). The results indicate that the material is not Actual Acid Sulfate Soil, though is classified as Potential Acid Sulfate Soil (PASS), based on % Chromium reducible Sulfur.

The material was determined, however, to have insitu neutralising capacity due to the negative net acidity and shell content. As such, the addition of lime for neutralisation was not recommended by the laboratory. Notwithstanding, lime will be kept on site if required for the management of return waters. Management of potential acid sulfate soils during the dredging process will therefore be based on ensuring that pH of return waters meets appropriate criteria set in the conditions prior to discharge to the Wallamba River.

4.3 WATER QUALITY MANAGEMENT

4.3.1 INTRODUCTION

Soil disturbance on the stockpile site will be minimal, with pond walls being constructed from an existing sand stockpile on the site. Stockpiles of sand extracted from the settling ponds will be managed to ensure minimal wind-blown losses. Water will be regularly pumped from the settling ponds and sprayed on stockpiles to ensure moisture levels are kept high enough to prevent loss of sand. Further, meteorological forecasts will be monitored daily to allow preparation for high wind events, which will involve regular wetting of the stockpiles.

Runoff from the stockpile areas will be minimal, given the highly permeable nature of the extracted sand and underlying highly siliceous Podzols. Notwithstanding, it is proposed to construct shallow swale drains around each stockpile to direct any runoff from the stockpiles back to the settling ponds.

4.3.2 SEDIMENTATION/SETTLING POND MANAGEMENT

Slurry pumped from the dredge area will discharge into a series of settling ponds, where the coarse fraction will settle out quickly. The suspended fines (or supernatant) will flow into a series of separate sediment basins. Sand material will be excavated from the first pond and stockpiled on site. Design of the settling ponds has allowed for up to one month (**Section 2.4.3**) residence time. Once settled, the excess waters will be returned to the Wallamba River via a return pipeline, after satisfying appropriate turbidity and pH requirements stipulated by the consent conditions.

4.3.3 GROUNDWATER IMPACTS

Groundwater depth at the stockpile site varies from approximately 1 m to 0.5 m below the ground surface. Groundwater is closer to the surface in the lower, western extents of the site. As indicated in **Section 2.8.3**, the site is underlain by Holocene beach and foredune sands, with the lower elevation western extents draped by a thin layer of organics and very fine intertidal (fluvially-derived) silts and muds (DMR, 1991). Natural soils on the site are classified as Podzolic, typical of a coastal dune environment. Dune thickness is greater than 30 m, as indicated from previous boring undertaken on the site for a MidCoast Water sewer pump station. Saturated hydraulic conductivity (K_{sat}) for this soil type is typically 60 – 120 mm hr^{-1}. K_{sat} values for the area of the site underlain by silts and muds is typically < 10 mm/day.

Potential impacts of the dredge operation on groundwater are limited to the effects of infiltration of saline water into the groundwater through the settling ponds and the effect of saline intrusion as the groundwater flows to the Wallamba River.

It is anticipated that inflow of dredge slurry will be approximately 0.3 ML hr^{-1}, of which 0.2 ML will be water (**Section 2.2.1**). Based on a 55 hour week over 6 days (**Section 2.2.3**), average daily flows of 1.8 ML are expected. Water would be discharged as part of the slurry into Settling Pond 1, which will have a gradient of around 10 %. The base of Pond 1, located in the western extents of the site, will be comprised of insitu silts and clays to depth of approximately 1 – 1.5 m. The water would be directed to a collection point, where a pump will transfer the water to Settling Pond 2. Settling Pond 2 will be plastic lined and therefore retain all water.

There will be no excavation at the site for the settling ponds. Return waters (saline) will be in residence in the ponds for a limited time (maximum of one week) before being returned to the Wallamba River.

4.3.4 DISCHARGE WATER MANAGEMENT

Timely management of return waters is critical to the continued operation of the dredging, as approximately 70 % of the hydraulic slurry is composed of water. Following dewatering of the sediment and passage through various sediment management ponds, water would be returned to the Wallamba River via a pipeline adjacent to the incoming slurry pipe. The pipeline outlet would be in an area of the river known as the "Mud Cut", so named due to the perennial muddy water in this section of the river. The water would be returned to the river after sufficient suspended sediment had been removed and agreed water quality criteria had been met. A discussion of water quality in Wallis Lake is provided below, which identifies the key parameters for which monitoring should be undertaken, prior to discharge of return waters.

4.3.5 EXISTING CONDITIONS

Discussion of the results from several studies of water quality in Wallis Lake is presented in the Wallis Lake Estuary Processes Study (Webb McKeown, 1999). Data presented is taken from a sampling program in 1997 – 1998. A summary of data collected in the vicinity of the proposed dredge area and return waters discharge site is provided in **Table 4.2**.

The data are indicative of the dynamic environment of the lower estuary, where the influence of fresh and marine waters can vary significantly. This is indicated by the highly variable salinity and turbidity values, which are sensitive to catchment runoff and flood events. The range of DO (both % sat. and mg/L) includes values that are below ANZECC (2000) recommended levels (min. 80 – 90 % sat. or ≥ 6 mg/L). Similarly, nutrient levels are highly variable, with TP and TN varying by up to an order of magnitude. Maxima for these parameters are high with respect to desirable values specified in ANZECC (2000).

The data indicate that the receiving waters of Wallis Lake and Wallamba River at this location are highly dynamic. It is therefore reasonable to assume that the aquatic ecological communities inhabiting these areas are robust and are able to withstand a considerable degree of variation in a range of water quality parameters, as evidenced by the data (**Table 4.2**).

Table 4.2 – Water Quality Summary – Wallis Lake Site L15*

Parameter	Value Range
Temperature (°C)	15 – 28
Salinity (ppt)	8.9 – 35.2
DO (% sat.)	6.8 – 109.7
DO (mg/L)	5.3 – 9.6
pH	6.96 – 8.52
Turbidity (NTU)	7 – 53.4

Table 4.2 – Water Quality Summary – Wallis Lake Site L15*

Parameter	Value Range
TSS (mg/L)	5 – 40
Faecal Coliforms (cfu/100ml)	0 – 500
Nitrate (mg/L)	BDL – 0.02
Phosphate (mg/L)	BDL – 0.02
Total Nitrogen (mg/L)	0.19 – 0.99
Total Phosphorus (mg/L)	0.008 – 0.085
Total Ammonia (mg/L)	0.1
Chlorophyll-a (mg/L)	1.2 – 7.7

* Site as recorded in Wallis Lake Estuary Processes Study, Figure 17.

For example, it is accepted knowledge that benthic environments, particularly those in estuarine environments such as the lower Wallamba River, are responsive to sustained (press) turbidity events (months/years), as opposed to pulse turbidity events (lasting hours to days), as occurs with flood events. For example, elevated turbidity following flood events can last for weeks with no impacts being recorded in the benthic environment, which is able to accommodate such natural variability. Benthic community structure would not therefore be impacted by this type of pulse of turbidity.

Major Issues

Elevated nutrient levels are not likely to be an issue in return waters, given the very low concentration of fines in the dredge material (**Section 2.9.4**). Comparison with results from sediment samples taken in similar areas of the lake to the dredge site indicates low nutrient concentrations (Webb McKeown, 1999). Similarly, results of sediment samples for heavy metals indicated that heavy metals and pesticides concentration were not indicative of contamination.

Monitoring for Aluminium in return waters has been undertaken for the recently completed Harrington Waters dredging project on the Manning River. Results from three years of analyses indicates that Aluminium in return waters, apart from not ever being elevated (author's *pers. obs.**), can be managed through pH monitoring, as Aluminium is generally only toxic at pH range 4.4 – 5.5 (ANZECC, 1992). In addition, ANZECC (2000) provides no specific guidelines for desirable Aluminium concentrations in marine or fresh waters.

Turbidity and pH are the only water quality parameters that are of concern in return water, although turbidity generally high in the vicinity of the return waters discharge point and is highly variable in this section of the river and the dredge area itself. Notwithstanding, insufficient settling of fines may result in elevated turbidity levels in return waters. Elevated pH in return waters could also occur if there is insufficient treatment of acid sulfate soils.

* Author was Leader of the Expert Panel reporting to DIPNR on impacts of dredging at Harrington Waters (2002-2005).

4.3.6 POTENTIAL IMPACTS OF PROPOSAL

Pollution of Return Waters

It is possible that return waters could contain elevated turbidity from insufficiently settled fines or low pH from untreated acid sulfate soils.

Fuels Spillage

There is the potential for fuels spills to occur when refuelling the dredge or booster pumps.

Pipeline Ruptures

Dredged slurry could be released directly into the Wallamba River or onshore along the pipeline route if the pipeline ruptures at the flanged connections.

Dredging-Associated Turbidity

The proportion of fines material within the sediments to be dredged was determined from the geotechnical investigation (**Section 2.9.3; Vol. 2 – Appendix D**) to be minor (mean 5.25 %). It is possible that disturbance of this material by the bucketwheel dredge could result in re-suspension of fines which would have localised effects of increased turbidity around the dredge head.

4.3.7 MITIGATION MEASURES

Pollution of Return Waters

Monitoring of return waters for pH and turbidity will ensure that waters returned to the Wallamba River are within the range of background values, as determined from previous water quality monitoring results. Criteria will be set in the DEC discharge licence, though based on the background data and the proposed location of the return water, a value fro turbidity of 30 NTU is considered to be reasonable and well within the natural ‘background’ variability of the river, such that it would not cause any adverse impacts on aquatic ecology.

Fuels Spillage

All fittings would be bunded on the refuelling barge so that any spills would be isolated and prevented from entering the estuary. Refuelling on land will be undertaken using mobile tanks. All refuelling barges/vehicles will be fitted with EPA-approved spill kits.

Pipeline Ruptures

To avoid potential water quality impacts from breakage of the discharge pipeline and return waters pipeline, the following will be implemented:

- Continuous monitoring of the hydraulic systems on board the dredge and pressure in the suction head and pipeline dredge pipe to provide warnings about possible leakages of dredged material; and
- Daily inspections of the dredge pipe and return waters pipe by personnel to identify signs of potential breakage.

It is important to note that both the dredge pipe and return waters pipe will be composed of entirely new pipe, that is rated to double the booster pump output (**Section 2.2.1**) and several times greater than the return waters pump output (**Section 2.3.4**). Therefore, all precautions possible have been taken to ensure that the likelihood of pipeline failure is minimised.

Dredging-Associated Turbidity

The proportion of fines material within the sediments to be dredged was determined from the geotechnical investigation to be very minor (mean 5.25 %) (**Section 2.9.3; Vol. 2 – Appendix D**). As such it is highly unlikely that turbidity resulting from the operation of the bucketwheel cutter section dredge head would be a problem, given that the majority (95 %) of the material to be dredged is either sand or coarser.

Notwithstanding, dredging activities have the potential to influence turbidity, dissolved oxygen and pH only. Given the highly variable nature of turbidity and dissolved oxygen (**Section 4.3.4**) in the estuary (and concomitant robustness of aquatic ecological communities), and that pH in return waters will be controlled, it is not proposed to establish any insitu monitoring (automatic or otherwise) of these or any other variables in the vicinity of the dredge area, as the data would yield little information about the effects of the dredge on these parameters. Further, three years of continuous monitoring of turbidity, dissolved oxygen, pH, salinity and temperature undertaken during dredging in the Manning River at Harrington Waters (where 1,500,000 m^3 of material was removed – 10 times the volume proposed for this project) indicated that dredging has no discernable impact on these water quality variables (author's *pers. obs.**).

Potential for increases in turbidity will be monitored by the dredge operator and crew, who will keep a dredge log that will record any incidents of turbid plumes in the vicinity of the dredge. If a turbid plume is observed, dredging will cease immediately and investigations regarding the cause of the plume will be undertaken. Once the plume has dispersed and if it is determined by the dredge operator that there is no risk of a turbid plume developing, dredging would recommence.

* Author was Leader of the Expert Panel reporting to DIPNR on impacts of dredging at Harrington Waters (2002-2005).

4.4 CONTAMINATED SITES ASSESSMENT

A contaminated site checklist has been prepared for the area of land proposed for use as the stockpile site and is provided in **Table 4.3**.

Table 4.3 – Contaminated Site Assessment for Sand Stockpile Area

Checklist Parameters	Description
Describe all land uses and activities to which the site has been put, including the current use.	The majority of the site has been previously used for low intensity cattle grazing, although no dip sites have been located on the site. The site is currently used for low intensity cattle grazing.
Is the proponent, aware of uses to which properties adjoining the site have been put? If so, please specify.	Adjoining properties to the east of the site are used for residential purposes. Surrounding land to the north, west and south are vegetated or partly cleared.
Do any of the current or past uses correlate with the potentially contaminating activities set out in ANZECC/NHMRC "Guidelines for the Assessment and Management of Contaminated Sites"	Yes. Agricultural activities are listed as a potentially contaminating activity, however, the agricultural activities undertaken on the site were limited to low intensity grazing.
If the answer to question 3 is yes has there been any testing or assessment of the site and, if so, what are the results?	A desktop assessment has been undertaken as part of this EA. To the best of the authors' knowledge, no testing for contamination has been undertaken on the site.
Are you aware of any contamination on the site?	No soil testing for contamination of the site has been undertaken. It is unknown whether contamination exists on the site. However, it is unlikely that there is any contamination of the site.
Has any remediation work been taken in respect to contamination, which is or may have been present on the site? Carried out voluntarily or ordered by government agency)	It is unlikely that any remediation works have been carried out on the site, given that no contamination of the site has been previously reported and that the site is unlikely to contain any contamination.

4.5 AIR QUALITY, DUST AND ODOUR

4.5.1 INTRODUCTION

A Dust and Odour Assessment report was undertaken by Holmes Air Sciences Pty Ltd. A full copy of their report is contained at **Appendix E** in the **Volume 2 Report**. The main source of emissions from the proposal will be dust emissions. The purpose of this report was to quantitatively assess dust impacts that may be associated with the stockpiling site.

4.5.2 ODOUR

The dredged material is primarily fine to medium grained sand and therefore no odour emission is expected as a result of the stockpiling activities. Consequently, no specific mitigation measures for odour control are necessary.

4.5.3 ASSESSMENT CRITERIA AND METHODOLOGY

The air quality model used was the US EPA ISCST3 model. The model is fully described in the user manual and the accompanying technical description (US EPA, 1995). The modelling has been based on the use of three particle-size categories (0 to 2.5 μm - referred to as $PM_{2.5}$, 2.5 to 10 μm - referred to as CM (coarse matter) and 10 to 30 μm - referred to as the Rest). Mass emission rates in each of these size ranges have been determined using the factors derived from the SPCC (1986) study and TSP emission rates calculated using emission factors derived from US EPA (1985) and NERDDC (1988) work (refer **Appendix E in the Volume 2 Report** for further information and references).

The distribution of particles in each particle size range is as follows:

- $PM_{2.5}$ (FP) is 0.0468 of the TSP;
- $PM_{2.5-10}$ (CM) is 0.3440 of TSP; and
- PM_{10-30} (Rest) is 0.6090 of TSP.

Modelling was undertaken using three ISC source groups. Each group corresponded to a particle size category. Each source in the group was assumed to emit at the full TSP emission rate and to deposit from the plume in accordance with the deposition rate appropriate for particles with an aerodynamic diameter equal to the geometric mean of the limits of the particle size range, except for the $PM_{2.5}$ group, which was assumed to have a particle size of 1 μm. The predicted concentration in the three plot output files for each group were then combined according to the weightings above to determine the concentration of PM_{10} and TSP.

Dust concentrations and deposition rates have been predicted in the vicinity of the project site for the three stages of the proposed operations. Although the terrain is generally flat, the topography of the site has been taken into consideration for the modelling.

The ISC model also has the capacity to take into account emissions that vary in time, or with meteorological conditions. This has proved particularly useful for simulating emissions on quarrying operations where wind speed is an important factor in determining the rate at which dust is generated.

For the study, the stockpile site was represented by a series of volume sources. Each volume source was a combination of all dust emissions from activities in the general area. Estimates of emissions for each volume were developed on an hourly time step. Thus, for each source, for each hour, an emission rate was determined which depended upon the level of activity and the wind speed. It is important to do this in the ISC model to ensure that long-term average emission rates are not combined with worst-case dispersion conditions which are associated with light winds. For surface sources, light winds correspond with periods of low dust generation (because wind erosion and other wind dependent emissions rates will be low) and also correspond with periods of poor dispersion. If these measures are not taken then the model has the potential to significantly overstate impacts.

4.5.4 RESULTS

This section provides an interpretation of the predicted dust concentrations and deposition levels. The model runs were undertaken using the meteorological data and emissions data described in the report **(Vol. 2 – Appendix E)**. Receptors were positioned across a grid 4 km by 5 km in size with the project in the approximate centre. Additional receptors were positioned at the closest residences, identified in **Table 4.4**.

Dust concentrations and deposition rates due to the stockpile operations for the existing and proposed operations have been presented as isopleth diagrams showing the following:

- Predicted maximum 24-hour average PM_{10} concentration;
- Predicted annual average PM_{10} concentration;
- Predicted annual average TSP concentration; and
- Predicted annual average dust deposition.

The maximum 24-hour average contour plots do not represent the dispersion pattern for any particular day, but show the highest predicted 24-hour average concentration that occurred at each location over the year. The maxima are used to show concentrations which can possibly be reached under the modelled conditions.

The model ISCST3 was used in this instance as it has been the most widely used model in NSW for assessing the dust impacts of extractive industries. Dust impacts and model predictions using ISCST3 are discussed below.

Table 4.4 summarises the model predictions at each of the residential receptors due to dust emissions from the project.

The closest residences are predicted to experience a maximum of 8.8 $\mu g/m^3$. It is unlikely that the DEC 24-hour average goal of 50 $\mu g/m^3$ would be exceeded due to the proposed operations even with existing PM_{10} concentrations.

For annual average PM_{10}, the residences are predicted to experience a maximum of 5.8 $\mu g/m^3$. It is unlikely that the DEC annual average goal of 30 $\mu g/m^3$ would be exceeded due to the proposed operations even with existing annual average PM_{10} concentrations which have been estimated to be 19 $\mu g/m^3$.

For annual average TSP concentrations at the nearest residences, the maximum predicted concentration at the residences is 8.5 $\mu g/m^3$. It is unlikely that the 90 $\mu g/m^3$ NHMRC goal would be exceeded due to the existing operations even with existing annual average TSP concentrations which have been estimated to be 45 $\mu g/m^3$.

For predicted annual average dust deposition levels, the nearest residences are predicted to receive a maximum of 0.9 g/m^2/month. Compliance with the DEC goals of less than 2 g/m^2/month increment and a total of 4 g/m^2/month would therefore be anticipated.

Table 4.4 – Summary of Dispersion Modelling Predictions Due to Project

			PM_{10} ($\mu g/m^3$)		TSP ($\mu g/m^3$)	Dust Deposition (g/m^2/month)
Averaging Period			**24-hour**	**Annual**	**Annual**	**Annual**
Air Quality Goal			*50*	*30*	*90*	*4*
ID	**X (m)**	**Y (m)**	**Worst-case**			
1	451624	6441274	20.0	5.8	8.5	0.9
2	451659	6441376	13.1	3.6	5.0	0.4
3	451609	6441406	12.7	3.3	4.6	0.4
4	451791	6441284	8.8	2.7	3.6	0.4
5	451875	6441282	7.6	2.0	2.6	0.3

4.5.5 DISCUSSION AND MITIGATION

The assessment is based on the use of a computer-based dispersion model to predict ground-level dust concentrations and deposition levels in the vicinity of the stockpile site. To assess the effect that the dust emissions would have on existing air quality, the dispersion model predictions have been compared to relevant air quality goals. Dispersion modelling procedures follow NSW DEC guidelines.

Predictions of dust concentration and deposition levels have been made using the US EPA's short-term industrial source complex dispersion model known as ISCST3 (US EPA, 1995).

The modelling results presented above are based on the assumption that the proponent applies control measures to minimise dust emissions. This section outlines procedures proposed for the management and control of dust emissions.

Proposed Dust Management and Control Procedures

The following procedures are proposed for the management of dust emissions from the site. The aim of these procedures is to minimise the emission of dust and the effects of these are included in the model simulations. Dust can be generated from two primary sources, these being:

- wind blown dust from exposed areas, and
- dust generated by site activities.

The impacts of the proposed stockpile operations are acceptable with the following mitigation:

- any vegetation removal should be undertaken either during damp conditions or when the winds are not from the southwest;
- all loads leaving the site are adequately covered to prevent wind blowing dust from trucks during transit;
- stockpiles are to be maintained in a moist condition to minimise wind blown and traffic generated dust; and
- all roads and trafficked areas are to be watered as required to minimise the generation of dust.

4.5.6 CONCLUSIONS

An Air Quality Assessment for the proposed stockpile operations was undertaken by Holmes Air Sciences and is included in the **Volume 2 Report** as **Appendix E**. This study has assessed air quality impacts from the proposed stockpile activity from the dredging of an oyster lease in Wallis Lake, Tuncurry. The emissions of dust from the proposed activities have been the focus of this assessment. The primary sources of dust would be loading the sand to the trucks, transporting the sand off-site, and wind erosion. Potential air quality impacts of PM_{10}, TSP and deposition of insoluble solids due to dust emissions from the proposed operations have been assessed. Computer-based dispersion modelling has been used for predicting the dust impacts due to the site operations.

Results from the dispersion modelling indicated that off-site dust concentrations and dust deposition levels at all nearby residences due to the proposed operations would be well below relevant air quality goals. The assessment presents worst-case scenarios.

Emissions from the booster pumps along the transfer pipeline are predicted to be minimal.

4.6 BUSHFIRE

The proposed operation of the stockpile will not cause any increase to the bushfire hazard in the areas adjacent to the site.

Interactions with the Biological Environment

5.1 AQUATIC ECOLOGY

A report assessing the impacts of the proposal on aquatic ecology was prepared by Pacific Blue Design and is provided in **Appendix G** of the **Volume 2 Report**. Relevant information from the report is reproduced here.

5.1.1 EXISTING CONDITIONS

Aquatic Habitats and Biota in the Study Area

A brief description of the main ecological units derived from habitat mapping undertaken for the dredge area and surrounding locality is provided below.

Sand Flats

Sand flats comprise approximately 45 % of the dredge area. The sediments of the sand flats within the study site consist of flood tide delta sands. The sand flats support very few mobile invertebrate species and are devoid of vegetation due to the scarcity of holdfasts for anchoring plants.

Invertebrates present included large whelks (some containing hermit crabs) which dominate the surface. Numerous burrows beneath the sand were occupied by ghost shrimps (nippers or yabbies) and various polychaete worms.

The dominant vertebrates were dusky and sand flathead, sand whiting and smooth stingrays, which use the area for feeding on invertebrates.

Seagrass Beds

Seagrass beds are found on the more fine-grained areas and comprise approximately 47 % of the dredge area, similar to the size of the sand flats. Silty sands and sandy silts dominate more sheltered areas. The more muddy areas occur on the western (lee) side of Oaky Island in the south of the study site and around many of the oyster racks. Fine-grained silty sediments deposit out in the depressions in the sand flats and along the edges of the oyster racks and channels within the study site and are often covered with a surface layer of cyanobacteria. The sediments bind together and form fairly stable substrata, suitable for burrowing animals and colonization by seagrasses.

Two species of seagrass occur at the study site - *Halophila ovalis,* and the more dominant seagrass, *Zostera capricorni,* which is found in low-energy areas amongst substrata ranging from sand to mud. Both *Halophila* and *Zostera* can tolerate exposure at low tide and occur at depths from 0 – 1 m at the study site.

The dominant vertebrates found in the seagrass beds are hairy pipefish, *Urocampus carinirostris,* which are protected under the *Fisheries Management Act 1994.* Largemouth gobies *Redigobius macrostoma,* rabbit fish*, Siganus nebulosus,* and numerous unidentified juvenile fish were also present.

The most abundant of all species is the carid shrimp, *Macrobrachium intermedium*, which feeds on small animals and decaying matter. The pistol prawn, *Alpheus euphrosyne*, and bobtail squid – *Sepiola sp.* is also common amongst the seagrass. Numerous small crabs, amphipods, isopods and mysids are found on the leaf blades.

Mangroves

Approximately 3 % of the dredge area, comprises mangrove tree and shoot growth fringing Oaky Island and the adjacent sheltered shoreline strip of approximately 14 m width. The substrate is made up of fine-grained silts (silty-mud). The dominant vegetation is the grey mangrove, *Avicennia marina*. The red alga, *Ceramium* sp. was found attached to various holdfasts and small amounts of cockleweed, *Cystoseira trinodis*. In addition, *Sargassum* and *Padina elegans* was present in some areas, as were small fragments of kelp, *Ecklonia radiata* and the two seagrass species, *Halophila ovalis* and *Zostera capricorni,* also colonised this area in up to thigh depth water.

Dominant vertebrates included common toadfish, dusky flathead, big-mouth gobies and the hairy pipefish, while diamond fish, large jumping mullet and an oyster goby were also observed.

Dominant invertebrates included crustaceans such as amphipods, isopods, mysids and crabs, which included a mud crab and other crabs from the families Portunidae, Ocypodidae, Grapsidae, Hymenosomatidae and Paguridae. Molluscs ranged from top shells and limpets on the mangrove branches to free-growing oysters, whelks, sand snails, bubble shells and eggs of squid. The large whelk, *Pyrazus ebininus,* was present in varying densities. Nematode worms, water striders and diatoms were also present.

Oyster Racks and Beds

Oyster racks consisted of those that were currently in use, those which had been abandoned, and beds of oysters growing directly on the substrate. These constitute approximately 7 % of the site.

The substrate around the oyster racks and beds is typically fairly muddy. Conditions are favourable for *Zostera* to flourish and so high densities of the seagrass are often found around the oyster racks and between the racks and the channels.

Dominant vertebrate species included yellowfin bream, mullet and common toadfish.

Dominant invertebrates around the oyster racks included the oyster itself, barnacles and spirorbid worms growing on the oyster shells and the racks and mussels growing on the oyster poles. Both the common octopus is expected and the blue ringed octopus has been reported around or on the leases (K. Godwin, *pers. comm.*).

Channel

The channels are the deeper water areas between the oyster racks which are currently in use and also between Jonnel Park and the oyster lease. These are have been dredged previously. The bottom of these channels is sandy, with some seagrass on the edges. The dominant vertebrate species seen during snorkelling through the channels were juvenile Flat tail mullet, River garfish and perchlets. The only invertebrate species seen was the sea hare, although portunid crabs, prawns and squid would be expected at night.

Pipeline Route

The pipeline route extends from the north-west corner of the oyster lease along the channel adjacent to the northern bank of the Wallamba River, to the entrance to the land portion of the route to the stockpile site along the Wallamba Broadwater. This covers a distance of approximately 1 km.

The substrate sediments in this area varied from silty sands in the channel opposite Jonnel Park to silty muds with a high percentage of shell fragments at the Wallamba Broadwater. Although the water clarity was poor, a seagrass survey by a combination of sight and feeling showed that low density *Zostera* and *Halophila* colonized the entire route of the pipeline.

Threatened Aquatic Species

Threatened and/or protected species which potentially occur in Wallis Lake include mangroves, seagrasses (especially *Posidonia australis*), Black Cod, Estuary Cod and Syngnathiformes (which includes all pipefish and seahorses). Of these, Black Cod is on the endangered list and *Posidonia australis* is also protected (*Fisheries Management Act 1994* and the *Environmental Protection and Biodiversity Conservation (EPBC) Act 1999)*.

Neither Black cod *Epinephelus daemelii* nor Strapweed, *Posidonia australis* occur on the study site. It is more likely that juvenile Black Cod use seagrass beds as a nursery ground in areas with more substrate structure, although it may be possible for them to use the oyster lease area. *Posidonia australis* could establish itself in the area as it does occur in isolated patches among *Zostera* beds in other parts of the lake. It was, however, not found in surveys.

Estuary Cod, *Epinephelus coioides,* could occur in this region but are more likely to inhabit areas with deeper channels, coffee rock ledges, drop offs and structure, as found around Wallis Island and at the Breakwater. Juveniles inhabit seagrass beds as nursery grounds and could occur in this area, although it is more likely that they utilise areas with a more rocky structure. None were seen during the site surveys.

The Hairy Pipefish, *Urocampus carinirostris,* was present amongst the seagrasses in one area of the study site. It belongs to a protected group of fish, Syngnathiformes, as legislated under Section 19 of the *Fisheries Management Act 1994* and the *EPBC Act 1999*. The group is listed as vulnerable to human impact. The species itself is not threatened, but its lifecycle and habitat should be protected as far as possible.

5.1.2 POTENTIAL IMPACTS OF PROPOSAL

The following is a summary of potential impacts on the aquatic environment that could occur as a result of the process of dredging an area of approximately 8 ha:

- Change in land form, with loss of low tide sand flats and shallow soft substrate;
- Minimal removal of approximately 1.14 ha of seagrasses (aggregation estimate);
- Minor loss of habitats and species, as sand flats and shallow non-vegetated soft substrate will disappear. Burrows and resident nippers and other crustaceans, less-mobile fish species (*eg*. gobies, pipefish, scorpaenids, some flathead and juveniles), worms and meiofauna will be removed by the dredge;
- Dredge pipe impact, as the pipe will lie on the substrate, temporarily smothering any seagrass and entrances to burrows en route to the spoil site;
- Noise and vibrations associated with the operation of the dredge and transfer of the spoil by pipe to the spoil site may cause caving in of nearby burrows; and
- Pollution or spills caused by accidental breaks in the dredge pipe, smothering flora and fauna or water contamination by oil pollution associated with the dredge. These impacts can easily be avoided and managed through the implementation of the Environmental Management Strategy.

Seagrass Beds

The removal of the seagrasses will result in the immediate loss of 1.14 ha of *Zostera* and *Halophila*. It is important to note that this is an aggregated sum of mostly low density (<15 % coverage) seagrass areas. This loss will have medium term effects because it may take a few years for seagrass to recolonise the site. However, it is highly likely that dredging will provide an improvement in conditions and greatly increase the area for seagrass to recolonise the lowered bed surface. At present 45 % of the area represents bare sand flats, which is unsuitable for seagrass to colonise because the area is dry at low tide. This is reflected by the very low density and poor condition of these areas of seagrass.

After dredging, the area will be permanently inundated with water, providing opportunity for seagrass to colonise alongside and in-between the floating oyster cultivation. Floating cultivation is more conducive to seagrass colonization compared to traditional rack cultivation, as the cultivation is relatively mobile and is not permanent, being removed after 18 months for a period of 6 – 8 months before being re-instated.

Inspection of previously dredged areas surrounding the lease (other leases and channels) at depths similar to those proposed for the dredging indicates a higher density coverage of seagrass that within the majority of the oyster lease area. Therefore, seagrass would be expected to colonise the lowered bed surface of the lease. Seagrass from the areas peripheral to the site are likely to begin to colonise the newly dredged beds surface following dredging (depending on season). After a few seasons, the overall coverage is likely to be higher than that which currently exists.

In terms of degree of impact, relative to the total amount of seagrass in Wallis Lake, the effect of dredging is considered to be negligible. In terms of impact to the species *Zostera* and *Halophila*, it is also likely to be negligible. Both species have a widespread distribution in Australia and within Wallis Lake. *Zostera* is adaptable and tolerant of a wide range of conditions (including pulse turbidity events associated with river flooding) and is likely to recolonise the area in the years following the dredging. *Halophila* is an opportunistic colonizer which can also tolerate a range of conditions, colonising spaces between other seagrasses, although it can become intolerant to resuspended sediments following colonization (V. Vuki, *pers. comm*., 2006).

Nearly all of the seagrass at the study site constituted sparsely distributed *Zostera*, which has re-established itself over approximately 20 years since the oyster lease was last dredged. It is therefore considered that the seagrass will recolonise areas following the proposed dredging and that the long term impacts of dredging on seagrass habitat are negligible and likely to result in a net increase in seagrass coverage in the lease area.

Loss of Habitat

The effects of dredging on the loss of habitat for other species may be slightly higher than the effects of dredging on the seagrass species itself. Seagrass beds within the study site show diversity typical of these environments in Wallis Lake in terms of taxanomic groups and include fish, polychaete worms, crustaceans and molluscs. Carid shrimp, perchlets, gobies and juvenile mullet were abundant.

However, benthic communities lost in the dredge footprint would be recolonised by the adjacent areas and settlement of larvae of benthic animals. Loss of benthic fauna due to dredging would be comparable to the natural loss of benthic fauna due to flood scouring and smothering. In spite of the temporary loss in numbers, most populations should recolonise the area from adjoining habitats.

Hairy Pipefish

No detailed studies have been made of pipefish in the Wallis Lake estuary. As Syngnathids are vulnerable to the dredge process and they have low rates of reproduction, not only could their numbers diminish in this area but their ability to re-establish the population could also be low. As this group of fishes are afforded protected status within New South Wales, management strategies should be considered to ensure their long term survival. As the majority of this species' habitat will be retained, however, the impact is not considered to be significant.

Impacts of Dredging on Commercial and Recreational Fishing

Commercial fishing pursuits other than oyster farming in the vicinity of the site are either seasonal or occasional (set pocket prawning, trapping, meshing) and not likely to be adversely affected by the dredging of the site. Rather, the increase in depth across the site will significantly enlarge the existing area and make available up to an additional 8 ha for commercial netting during all phases of the tidal cycle.

In terms of recreational fishing, the impact of dredging will result in a reduction of the nipper population and more difficult access for collection, due to the deeper water. It is understood from long term observations by the current and previous lease owners that the lease area is not frequently used for bait collection due to access restrictions posed by surrounding muds flats (C. Goodwin *pers. comm*.) and can only be accessed by boat. It is, however, used sporadically (in low numbers) during holiday periods in summer months. In light of the extensive areas of low tide flats available for bait collection by recreational fishers in Wallis Lake, however, the impact of the loss of this area is considered negligible.

It is unlikely that the proposed dredging will have any negative impact on line fishing and crab trapping. New habitat provided by floating oyster cultivation may have a positive effect by providing more shelter to juveniles and attracting greater numbers of fish and invertebrates to the site.

Cumulative Impacts of Dredging

There are no cumulative impacts on seagrasses in Wallis Lake envisaged as a result of this proposal due to the relative abundance of higher density seagrass beds in other areas of Wallis Lake and the relatively very minor area (< 0.04 %) of seagrass compared to the total area of seagrass in Wallis Lake. Dredging of navigational channels within Wallis Lake may be required in the future but there are no proposals lodged at present.

5.1.3 MITIGATION MEASURES

There are no threatened species likely to occur in the study area. The aim of dredging is to make the site deeper for floating oyster culture. Dredging would create permanent inundation of the area and increase available habitat for fish, particularly with the introduction of floating cultivation. Oyster leases structures act as fish aggregating devices, and would be likely to improve stocks rather than adversely impact on most fish species in the long term. The proposal would not create barriers to fish movement.

The species which could potentially be affected by the dredging are the seagrass, *Zostera*, and the hairy pipefish, *Urocampus carinirostris*. Both are afforded protected status. The seagrass should recolonise the area and impacts on it are not likely to be significant. However, as *Zostera* provides habitat for the hairy pipefish, careful consideration should be given to ensure that the lifecycle of the pipefish is not disrupted.

The following points should be considered in order to minimize the impact of dredging to the environment:

- Dredging along the south-western edge of Zone 1 should be kept to a minimum, and any seagrass located in this area that would otherwise be removed by dredging should be transplanted on a clump to clump basis at a ratio of 2:1. Transplanting should take place alongside the western border of the lease area. The extra seagrass needed to make up the 2:1 ratio will be sourced from within other areas of the dredge site where seagrass densities are low (~15 %);

- Part of the area already designated as Zone 1A should be left in its present state and not dredged. This is located along the south-western corner of the oyster lease site and contains the highest cover of seagrass and the highest numbers of pipefish;
- Prior to dredging all other seagrass areas to be dredged should be searched for presence of pipefish and if found, pipefish should be collected with a fine-mesh scoop net and relocated to other areas of seagrass within the lease and surrounding areas;
- Avoid dredging within 10m of the mangroves on Oaky Island to ensure stability of the shoreline and protection of the mangroves;
- Lay the dredge pipe to the spoil site only on high tide to minimize the possibility of the watercraft damaging seagrass and the substrate;
- Devise a dredge plan to minimize mechanical failures, spills and leakages, and to deal with any breaks or blockages in the pipeline during the dredge process; and
- Remove and dispose of all waste appropriately.

5.1.4 CONCLUSIONS

The oyster lease site does not provide habitat for any threatened species, although one small area (Zone 1) was identified as a habitat area for protected pipefish. The seagrasses consist of *Zostera* and *Halophila*, which, apart from Zone 1, are sparse and patchily distributed and not likely to be of significance in terms of larval recruitment for Wallis Lake, nor habitat for the Hairy Pipefish.

The likely impact of the dredging proposal on commercial and recreational fisheries is considered negligible.

The amount of habitat for fish and invertebrates will increase due to the presence of floating oyster cultivation and the recolonised (increased coverage and density) seagrass coverage.

As the seagrass beds within the proposed dredge area are an example of regrowth following previous dredging operations for aquaculture, it is recommended that maintenance dredging to return the site to its previous condition in order to culture oysters be permitted.

With reference to the proposed management measures, the proposal is considered unlikely to result in serious or irreversible impacts on threatened or protected aquatic species or recreational and commercial fisheries within the locality.

5.2 TERRESTRIAL FLORA AND FAUNA

A detailed Flora and Fauna Assessment and Section 5A Assessment of the impacts of the proposal was undertaken by Geolyse Pty Ltd and is included at **Appendix C** of the **Volume 2 Report**.

The methods employed for the Flora and Fauna Assessment included;

- Plot based botanical surveys and vegetation mapping based on Aerial Photo Interpretation (API);
- Hair Trapping targeting small terrestrial mammals ;
- Anabat surveys;
- Amphibian Surveys;
- Call Playback Surveys for Threatened Owl species and arboreal mammals;
- Avifauna Surveys;
- Spotlighting Surveys for Arboreal Mammals and nocturnal birds;
- Habitat Assessment;
- Fauna Transect Surveys; and
- SEPP 44 Assessment.

5.3 RESULTS

5.3.1 FLORA

The botanical survey yielded a total of five (5) native vegetation communities supporting one hundred and seventeen (117) plant taxa (including fifteen (15) exotics) from fifty six (56) families.

The vegetation communities recorded within the study area are:

- Broad leaved Paperbark (*Melaleuca quinquenervia*) – Swamp Mahogany (*Eucalyptus robusta*) Tall to Very Tall (Freshwater) Swamp Sclerophyll Forest;
- Broad leaved Paperbark (*Melaleuca quinquenervia*) – Swamp Oak (*Casuarina glauca*) Tall to Very Tall Swamp Sclerophyll Forest;
- Swamp Oak (*Casuarina glauca*) Tall to Very Tall Swamp Sclerophyll Forest;
- Saltmarsh Complex (comprising *Sarcocornia quinqueflora subsp. quinqueflora – Sporobolus virginicus* Chenopod Shrubland/Tussock Grassland; *Juncus kraussii subsp. australiensis* Rushland); and
- Grey Mangrove (Avicennia marina subsp. australasica) Woodland.

Of these vegetation communities recorded within the study area, three (3) are listed as EECs under the TSC Act – Coastal Floodplain Swamp Sclerophyll Forest; Coastal Floodplain Swamp Oak Forest; and Coastal Saltmarsh.

Although no Threatened flora species were recorded during the present study, one species (*Pultenaea blakelyi*) was detected which is considered to be locally/regionally significant due to its occurrence in the study area at its known northern limit of distribution in NSW. One recorded taxon, *Galium liratum*, is considered to be locally/regionally significant due to the paucity of records of this taxon in the north coast bioregion (I. Mamott *pers. obs*.).

5.3.2 FAUNA

A total of eight (8) threatened species were detected during the surveys. These are the Grey-headed Flying-fox (*Pteropus poliocephalus*), Wallum Froglet (*Crinia tinnula*), Osprey (*Pandion haliaetus*), Pied Oystercatcher (*Haematopus longirostris*), Little Bentwing-bat (*Miniopterus australis*), Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*), Eastern Freetail-bat (*Mormopterus norfolkensis*), and Southern Myotis (*Myotis macropus*). The locations of Threatened fauna recorded during the surveys are shown in **Figure 3.2** of **Appendix C – Vol. 2 Report**.

Field surveys yielded a total of 52 vertebrate fauna species comprising 33 bird species, 10 frog species, one (1) snake species, one (1) freshwater turtle, and 22 mammal species including 14 Microchiropteran bat species. A list of all vertebrate fauna species detected within the site during the surveys is provided in **Appendix C2** of the **Volume 2 Report**.

5.3.3 TERRESTRIAL FAUNA HABITATS

For the purpose of the fauna habitat assessment, the proposal was assessed in three components - the pipeline route, dredge area and stockpile site.

The pipeline route is located in two general habitat types – the Swamp Sclerophyll Forest community and a Saltmarsh-Mangrove complex. The stockpile site is located in a highly disturbed cleared paddock/with disturbed remnant sedgelands that is regularly grazed and slashed, and contains only a very small number of regrowth trees.

In the Swamp Sclerophyll Forest, the pipeline will be located along boundary fence lines and existing tracks. With the exception of approximately 75 m length through a SEPP 14 wetland, the boundary fence lines and tracks are cleared. In the saltmarsh, the majority of the pipeline will be generally located along an existing cleared, worn track. A small section (approximately 100 m) will traverse a vegetated saltmarsh area. The proposed dredge area is within estuarine and intertidal habitats as described in the aquatic ecology report (**Appendix G – Vol. 2 Report**) .

As the stockpile site is cleared, the habitat resources available in these areas are minimal. Despite this, the pipeline and stockpile site are adjoined by a very large area of relatively intact Swamp Sclerophyll Forest and Saltmarsh communities that provide a variety of habitat resources for both protected and threatened fauna known or considered likely to occur within the locality. The habitat value of the adjoining vegetation communities has therefore been assessed for the proposed development, as fauna utilising these may traverse across the pipeline route and/or stockpile site.

The habitat value of the intertidal areas and estuarine environment (*eg*. proposed dredge site) for terrestrial species is also discussed in the following section.

Pipeline

The pipeline route primarily traverses swamp forest and saltmarsh. The majority of the pipeline route through the swamp forest has been previously cleared of trees (boundary fence clearing) and only disturbed groundcovers remain. The areas of swamp forest adjoining the route, however, contain habitats for numerous threatened species.

The adjoining swamp forest contains numerous hollow bearing trees that would provide potential breeding habitat for forest owls, gliders and hollow dependant microchiropteran bats. Some areas of the swamp forest are also considered to contain potential breeding habitat for the Eastern Grass Owl, however, this species was not detected, despite targeted surveys for this species. The pipeline route represents potential foraging habitat for the Square-tailed Kite and Owl species including Powerful Owl (*Ninox strenua*) and Masked Owl (*Tyto novaehollandiae)* and potential nesting habitat for the Square-tailed Kite and Osprey (*Pandion haliaetus*), however, there were no nests of either species observed during the surveys.

In addition, the swamp forest is considered to contain potential roosting habitat for the Common Blossom Bat (*Syconycteris australis*). As no clearing is required for the proposed development these habitat values will not be compromised.

The swamp forest, including the pipeline route, provides a large area of breeding habitat for amphibian species and a variety of frog species, including the Wallum Froglet, which were detected in this community during the surveys.

A number of wetland birds, shorebirds and waders such as the Black-necked Stork and Black Bittern and Australasian Bittern (*Botaurus poiciloptilus*) may also utilise the Saltmarsh and Swamp habitats however, this area of potential habitat is considered negligible to the area of similar habitat adjoining the pipeline route and also occurring in the locality. In addition, this habitat will not be cleared for the proposal. Further, survey at high tides did not identify any utilisation by shorebirds or waders.

The pipeline route contains some timber and logs that would provide a small amount of foraging resources for insectivorous species. In addition, small rodents and mammals including the Eastern Chestnut Mouse (*Pseudomys gracilicaudatus*) are likely to utilise areas within or adjoining the pipeline route. Despite this, the amount of potential habitat for insectivorous species along this section of the pipeline route is considered negligible in relation to the adjoining habitats.

The Koala is likely to utilise the habitats adjoining the pipeline route due to the abundance of suitable feed trees in this area. Occasional feed trees were observed within the SEPP 14 wetland, however, the pipeline will traverse the ground through this area and no food trees will be removed. The remaining areas of the pipeline route are cleared and therefore do not contain potential Koala feed trees.

Stockpile Site

The stockpile site contains approximately 59 scattered regrowth trees, primarily comprised of Swamp Mahogany (*Eucalyptus robusta*) and Blackbutt (*Eucalyptus pilularis*). These trees are known or considered likely to provide foraging resources for a number of species including the Squirrel Glider (*Petaurus norfolcensis*), Brush-tailed Phascogale (*Phascogale tapoatafa*), Regent Honeyeater (*Xanthomyza phrygia*), Powerful Owl (Ninox strenua) and Masked Owl (Tyto novaehollandiae), Koala (*Phascolarctos cinereus*), Grey-headed Flying-Fox (*Pteropus poliocephalus*) and microchiropteran bats. The scattered trees also represent suitable feed trees for these species, however, the small number of potential feed trees within the stockpile site is negligible compared to the abundance of suitable feed trees within the adjoining Swamp Sclerophyll Forest.

Only a small number of these trees (< 5) were observed to contain hollows, and these hollows were considered to be only appropriate for smaller sized fauna such as gliders and hollow-dependant microchiropteran bats. Some of these trees would represent potential nesting habitat for the Square-tailed Kite and Osprey, however, there were no nests of either species observed in any of these trees.

The proposed stockpile site contains very limited leaf litter and timber as a result of current land use (grazing), and as such provides very limited foraging and shelter resources for reptiles and small mammals.

A constructed pond (approximately 0.24 ha surface area) occurs at the stockpile site and provides foraging habitat for water birds such as Ducks and Moorhens, however, it is unlikely that this pond would be an important area of habitat for any bird species. Although containing pest species Mosquito Fish (*Gambusia holbrooki*), this pond would provide suitable breeding habitat for amphibians. It is unlikely that this pond would provide suitable breeding habitat for the Wallum Froglet.

The heavily disturbed sedgeland habitats within the stockpile site contain an area of suitable breeding habitat for the Wallum Froglet which was heard calling from this area. This area is approximately 0.5 ha and is located at the north western corner of the stockpile site. This habitat, however, is considered negligible in relation to the large areas of relatively undisturbed wallum habitats adjoining the stockpile site to the west.

Dredge Site

The dredge site does not represent potential breeding habitat for shore birds and waders, as it is inundated at high tide. As some areas are exposed at low tide, however, the dredge site represents potential foraging habitat for a number of shore birds such as the Little Tern (*Sterna albifrons*), Terek Sandpiper (*Xenus cinereus*) and Lesser Sand Plover (*Charadrius mongolus*). In addition, the Pied Oystercatcher (*Haematopus longirostris*), was observed foraging at the dredge site at low tide.

At high tide, the dredge site represents potential foraging habitat for the Osprey, and also the Green Turtle, both of which are known to forage in Wallis Lake. In addition, the Osprey was observed flying over the dredge site during the surveys.

While the dredge site is known habitat for Pied Oystercatcher and also represents potential foraging habitat for a variety of species (including those discussed), the area of habitat is considered negligible when compasred to the area of similar habitat associated with the estuarine environment of Wallis Lake.

5.4 POTENTIAL IMPACTS ON TERRESTRIAL FLORA AND FAUNA

5.4.1 VEGETATION REMOVAL

The proposal will require minimal native vegetation removal, given that the majority of the proposed dredge pipeline route and stockpile site are cleared of native vegetation. Where the proposed dredge pipeline traverses through Saltmarsh and Swamp Sclerophyll Forest habitat (SEPP 14 wetland) for a distance of approximately 75 m (**Figure 3.1** of **Appendix C – Vol. 2 Report**), the pipeline will be placed directly on the ground (Saltmarsh) and pulled through the habitat via a winching process (Swamp Sclerophyll Forest).

While this will not require any vegetation removal, some vegetation may be disturbed temporarily by this process. Given the temporary nature of the disturbance of the placement of the pipeline and the very small length (approx. 75 m) within this section of the SEPP 14 wetland, it is considered that the level of impact to this vegetation will be minimal and is acceptable in the context of the total area of this type of vegetation in the vicinity of the site and within the SEPP 14 wetland. Further, this vegetation type is known to regenerate very quickly in response to any disturbance.

The only vegetation that will require removal is a 0.5 ha area of highly modified Swamp Sclerophyll Forest (Vegetation community no. 2 - *E. robusta – M. quinquenervia* Freshwater Swamp Forest) (**Figure 3.1** of **Appendix C – Vol. 2 Report**) within the areas proposed for settling pond No. 1 at the stockpile site. This area supports two distinct disturbance ecotypes of this vegetation community no. 2, these being an Exotic Pasture Grassland-Sedgeland with scattered juvenile trees and a Low Woodland. These areas are subject to continued and repeated disturbance through grazing and/or slashing and are heavily invaded with herbaceous and woody weeds in places.

The loss of these two disturbance Swamp Sclerophyll ecotypes is not considered to be significant, given the degree of their disturbance, small size and extant areas of relatively undisturbed freshwater Swamp Sclerophyll Forest habitat present in the immediate locality.

5.4.2 SOIL COMPACTION

The majority of the pipeline route through the SEPP 14 wetland is in a cleared horse/cattle track area and along cleared property boundary/fenceline alignments.

Where the pipelines traverse vegetated areas in the SEPP 14 wetland, the weight of the proposed dredge and return pipelines (carrying the slurry) on the muddy estuarine sediments and sand substrates would be expected, over time, to result in some degree of soil compaction and ultimately plant damage and death in the saltmarsh and swamp sclerophyll forest (SEEP 14 wetland) habitats. The potential for soil compaction is not considered to be significant given the localised nature of the disturbance (restricted to the narrow pipeline alignment – 200 mm diameter pipe) and the extant areas of relatively undisturbed saltmarsh and swamp sclerophyll forested habitats in the immediate locality. The amount of saltmarsh that would be subject to compaction would be minimised (approx. 100 metres long and 1 metre wide) through the strategic placement of the proposed dredge pipeline within the horse trail that runs along the majority of the length of saltmarsh habitat. The horse trail is essentially comprised of an area of bare mudflat subject to previous soil compaction.

Management measures are recommended in **Section 5** of this report to mitigate against any potential adverse impacts to the Saltmarsh and Swamp Sclerophyll Forested habitats.

5.4.3 ALTERED HYDRAULIC REGIMES

The proposed dredge and return pipelines will not act as a barrier to tidal inundation of the area, as tidal inundation will occur either side of the dredge pipeline. Consequently there will be no adverse impacts to the Saltmarsh and Swamp Sclerophyll Forest habitats.

5.4.4 INCREASED HUMAN ACTIVITY

The proposal would result in increased human activity within the Saltmarsh and Swamp Sclerophyll Forest habitats recorded within the study area during all phases of the project (commissioning, maintenance, decommissioning, restoration/rehabilitation). Increased human activity, particularly within the relatively undisturbed habitats, has the potential to trample and kill plants, compact soil and disperse weeds.

To minimise the potential for adverse impacts on flora habitats recorded, the proposal would minimise the need for vehicles within the relatively undisturbed Saltmarsh and Swamp Sclerophyll Habitats and would essentially rely upon foot traverses only (2 person teams) in these sensitive areas. The commissioning of the proposed pipelines has also been strategically designed to minimise the need for foot traverses through the small section (approx. 75 m) of uncleared SEPP 14 wetland (Swamp Sclerophyll Forest habitat) via a winching system and use of a continuous pipe length with no joins.

Additional management measures (*eg*. weed control) are recommended in **Section 5** of this report to mitigate against potential adverse impacts to the Saltmarsh and Swamp Sclerophyll Forest habitats as a result of increased human activity.

5.4.5 PIPELINE/SETTLEMENT POND LEAKAGE AND SPILLS

The proposal has the potential to result in the release of the estuarine sand/seawater slurry into Saltmarsh and Swamp Sclerophyll Forest habitats from possible pipe burst, join leaks and settlement pond overflow. It is stressed that this is highly unlikely, given the range of controls and safeguards that will be in place, including continuous monitoring of dredge pipe pressure during dredging, the use of new pipe and flange joiners, regular pipeline inspections and the excess pressure capacity of the pipe relative to the pumps outputs. Further, the settling ponds have been designed to cater for volumes under worse case scenarios (**Section 2.4.3**).

The proposed dredge pipeline has been strategically designed to avoid the need for jointed segments within the small area of uncleared SEPP 14 wetland habitat which would eliminate the likelihood of join leakage in this area.

5.4.6 FLORA IMPACTS SUMMARY

Potential impacts on the three (3) EECs and two (2) plant taxa predicted to occur (though not recorded) within the study area have been assessed under Section 5A of the NSW *EP&A Act 1979* (**Appendix C3 – Vol. 2 Report**), which determined that due to the limited clearing and proposed mitigation and management measures, that the proposal will not have a significant impact on Threatened flora or Endangered Ecological Communities occurring in the study area.

5.5 FAUNA HABITATS

5.5.1 GENERAL IMPACTS

The potential impact upon fauna and their habitat as a result of proposed development is considered to be low. No clearing will be required for the placement of the pipes and only a small number of saplings (28) and mature trees (31) will be removed for the creation of the stockpile site. The trees proposed to be removed provide a very small amount of potential foraging resources for fauna known to occur or considered potentially occurring in the study area and locality.

The proposed clearing will reduce the availability of potential nesting habitat for some bird species. Despite this, the amount of potential nesting, denning, or roosting habitat proposed to be removed is considered negligible when compared to the available habitats in the adjoining Swamp Sclerophyll Forest and the locality in general.

The existing artificially-created pond area at the stockpile site will be removed for the stockpile site operations, however, this pond provides limited habitat for fauna.

Limited habitat resources are available along the cleared areas of the pipeline route, with impacts localised to disturbances to regenerating vegetation as a result of the installation and maintenance of the pipelines. These disturbances are unlikely to cause a significant impact to any species or their habitat and will be limited to the initial installation and foot traffic around the pipes from ongoing maintenance checks.

No clearing will occur for the 75 m section of pipeline proposed to be located through the uncleared section of SEPP 14 wetland. A small amount of ground cover vegetation in this wetland is, however, likely to be disturbed during the installation and routine checks of the pipes as discussed previously.

The stockpile site and some areas of the pipeline route currently contain a number of exotic perennial grass species including *Andropogon virginicus*, and *Setaria* sp. It is unlikely that the operations on the stockpile site and placement or operation of the pipeline will increase the amount of weeds occurring in the study area. The proposed maintenance of the pipeline may contribute weed invasion, however, this would not be expected to be significant in these habitats. Weed management will be detailed in the overall Environmental Management Strategy for the project.

The proposed dredge area will remove up to 8 ha of sand flats, of which it is estimated that 7 ha of this area would be suitable for foraging for Waders and Shorebirds at low tide. The remaining area is unlikely to be utilised due to the depth of water covering this areas at low tide. During high tide the proposed dredge area may be used by other bird species such as the Little Tern or Osprey for fishing purposes, however, the dredging activity would only result in the modification of habitat, creating a deeper water hunting area for these species. This increase in the depth of water may also provide additional habitat for the Green Turtle.

5.5.2 FAUNA MOVEMENT

The pipes will be elevated slightly in sections to allow passage beneath in known Wallum Froglet habitat and also at sections surrounded by potential habitat for the Eastern Chestnut Mouse in the Swamp Sclerophyll Forest. The pipes would therefore not create a barrier to smaller fauna such as amphibians and rodents. The pipes are unlikely to create a barrier to larger terrestrial fauna such as the Koala and gilder species.

5.5.3 FAUNA IMPACTS SUMMARY

In total, 31 fauna species listed under the *Threatened Species Conservation Act 1995* or *Environmental Protection and Biodiversity Conservation Act 1998* were considered as Subject Species or Subject Communities for the proposal. An assessment of significance in accordance with Section 5A of the *Environmental Planning and Assessment Act 1979* was prepared for Subject Species or Subject Communities listed under the TSC Act while all other species (including the migratory and marine species) listed under the *EPBC Act* were assessed under the Administrative guidelines. These assessments are contained in Flora and Fauna Assessment Report (**Appendices C3 and C4 – Vol. 2 Report**) respectively.

These assessments determined that due to the limited impacts associated with the proposed development and with the implementation of the recommended mitigation measures, it is considered that the proposal will not have a significant impact on Threatened species, populations or ecological communities or their habitats within the locality.

Interactions with the Human Environment

6.1 NOISE

6.1.1 INTRODUCTION

A Noise Impact Assessment was undertaken by Environmental Results Pty Ltd. A copy of their report is contained at **Appendix A** of the **Volume 2 Report**.

6.1.2 ASSESSMENT CRITERIA AND METHODOLOGY

This assessment considers noise and vibration produced by the dredging and processing operations and related activities as well as any potential acoustical impacts on nearby residences and land uses.

The assessment was undertaken in accordance with the Department of Environment (DEC) requirements outlined in the Director General's requirements for the preparation of this Environmental Assessment.

As required in the Director General's Requirements, the DEC's Industrial Noise Policy (INP) is used in this report to assess noise.

The noise criteria used in the assessment was based on DEC guidelines, specifically the 'Industrial Noise Policy (INP). The DEC's "Environmental Criteria for Road Traffic Noise" contains guidelines and criteria for the assessment of road traffic noise. The guideline was used to assess any potential impact from road traffic noise.

These criteria are widely utilised by DEC and councils in the assessment of a wide range of environmental noise sources.

The INP assessment process involves determining two types of criteria, the Intrusiveness criterion and the Amenity criterion[1]. As required in the INP, each criterion was evaluated and the more stringent one was selected as the Project Specific Goal[2].

The assessment involved computer modelling of noise using SoundPlan[3]. All significant noise producing activities associated with the proposal were included to determine noise levels at the nearest residential premises, taking into account noise attenuation over distance, shielding structures and the meteorology of the area.

[1] The intrusiveness criterion is based on an allowable margin of noise over the existing background noise level. It assumes that the existing background noise level is acceptable. The amenity criterion aims to ensure that progressive background noise level increases do not occur with increasing additions to background noise levels as industry increases in size in a given area.
[2] Project Specific Goals are the noise design goals that are evaluated for the project.
[3] SoundPlan is recognised by DEC as an acceptable noise modelling program for the types of industrial and transportation sources of noise that are assessed in this report.

6.1.3 RESULTS

From a noise monitoring survey of the nearby areas, the appropriate DEC noise criterion was assessed to be the Intrusiveness Criterion with a daytime value of 43 dB(A) for the processing site and 48 dB(A) for the dredging site. It is important to note that background noise levels (the basis for setting environmental noise goals) can vary between different localities according to the activities such as road traffic and industrial activities. As a result the noise survey covered seven separate locations to ensure that goals were appropriate for the different areas.

For a part of the time the dredge will be located closer to dwellings than at other times. In this assessment this was considered as the worst case situation. In this situation, the assessment concluded that noise levels at the most exposed residences would be up to 48dB(A) and within the DEC's goals.

For the processing site, the assessment concluded that noise levels could be contained to within the 43 dB(A) DEC goal.

For road traffic noise related to the movement of heavy vehicles to and from the processing site along Grey Gum Road to the main road system, it was concluded that there would be no meaningful additional noise impact. In part this was due to the fact that the road connecting the site to the main road was through an industrial area with no residential uses along its length. In addition, the noise from approximately one additional vehicle per hour will not add have any impact when considered against DEC's traffic noise guideline.

6.1.4 DISCUSSION

Dredging Site

The noise map (**Appendix A – Vol. 2 Report)** for the dredging site shows the noise contours associated with the operation of the dredge and the booster pump. The pump is located in the proposed position while the dredge is located in a worst-case location, in the closest location to dwellings in Taree Street during the dredging process. The dredge will be moved through all locations (gradually moving away form dwellings) within the designated area over the period of the project.

The LAeq,15min noise levels in the worst case situation of the dredge being at the closet location to the water-front residences in Taree Street are shown to be approximately 48 dB(A) which is within the PSG for this area. The booster pump produces approximately 48 dB(A) at one house at the western end of Taree Street. Noise from the dredge at the Wallis Lake end of Rest Point Drive were calculated to be approximately 40 dB(A) which is within the 43 dB(A) goal.

To ensure that the dredge does not exceed the PSG levels, the sound power rating of the dredge should not exceed 97 dB(A). This will require treatment of the engine enclosure area to reduce noise.

Stockpile Site

The stockpile site is shown in the noise map with noise contours and partial enclosures around the return waters pump and one of the booster pumps. The PSG for the area was assessed to be 43 dB(A). The noise map indicates that noise levels at all the nominated receivers (buildings indicated in the noise maps) are within the assessed PSG.

The return waters pump and a booster pump are shown each with a three sided noise screen with a height of approximately 3m. These will be required to ensure that levels do not exceed the PSG.

Vehicle Movements within the Site

The movement of trucks within the site have been included in the modelling of noise as shown in the noise contour maps. The modelling includes the movement of sand carrying trucks between the stockpile area and the entrance to the site in Grey Gum Road.

The use of reversing alarms can be minimised by the design of loading arrangements in a way that reversing is reduced or avoided.

Truck Traffic on Public Roads and Noise

Grey Gum Road links the site with the main road system. This road services the industrial area along its length. There are no residential buildings adjoining the road.

The processing site traffic would add approximately an additional 1 vehicle per hour to the road system which would not have any meaningful additional impact on the acoustical environment of Grey Gum Road or the main road system.

Site Preparation (construction)

Since the same plant will be used in the site preparation and operational phases, the noise impact from site preparation will be no more than the noise produced by the operational activities.

The assessment of noise from the operational phase contained in this assessment will be indicative of the noise levels associated with the site preparation phase.

Prior to the commission of the pumps, the noise walls should be installed to ensure that noise is contained.

6.1.5 CONCLUSION AND MITIGATION

This assessment of environmental noise from the proposed sand dredging and processing operations concluded that environmental noise goals could be achieved.

The assessment concluded that noise during worst-case operating conditions (when plant was closest to dwellings) would result in noise levels at the nearest residences being within the Project Specific Goals (environmental noise goals) developed from DEC noise guidelines.

For road traffic noise related to the movement of heavy vehicles to and from the processing site along Grey Gum Road to the main road system, it was concluded that there would be no meaningful additional impact since the road connecting the site to the main road was through an industrial area with no residential uses along its length.

In relation to noise from operations, noise controls will be needed to reduce plant noise levels. It is suggested that:

- Noise from the dredge should be attenuated so that the sound power level is limited to 97 dB(A);
- 3 sided, 3m high noise walls be erected around the return waters pump and the booster pump (shown in the noise map) to reduce noise levels to the appropriate environmental noise goal;
- Noise walls be erected prior to commissioning of pumps;
- Plant and equipment should be maintained in good working order to reduce noise emissions; and
- Work site should be organised to reduce the operation of reversing alarms on vehicles. Where possible, vehicle and plant movement should be designed to maximise forward movements and to minimise reversing movements.

6.2 VISUAL IMPACTS

The proposed dredge operation and oyster cultivation will be visible from some residences along Taree St. The location of a dredge operating (non-permanent) over the lease area for a period of months will not have a detrimental impact on views of Wallis Lake from any residences. This type of vessel is typical of watercraft to be expected to operate periodically in an active working estuary such as Wallis Lake.

The proposed cultivation method of oysters uses white PVC pipes floating on the surface, similar to the adjacent leases. Racks are tied to the underside of the pipe and are not visible at the surface. The visual impact of floating cultivation oysters (while not the subject of this EA) is benign and is to be expected in parts of the estuary that are licensed for oyster cultivation.

The operation and existence of the stockpile site will not be visible from residences in Aspelini Crescent Sth., (which face away from the stockpile site) as a large (10 m high, 30 m deep) screen of vegetation between these residences and the stockpile site will obscure any views of the sand stockpiles or operating plant and equipment. The proposed development will not significantly affect the landscape or visual amenity of the area.

6.3 LANDUSE

6.3.1 CROWN LANDS ASSESSMENT

While the area of Crown land that is the subject of this proposal is an existing oyster lease area, an assessment in accordance with the principles outlined in Section 11 of the *Crown Lands Act 1989* is provided in **Table 6.1**. The assessment indicates that the proposal is consistent with these principles. There are no issues in relation to Native Title with respect to this proposal. An indigenous cultural heritage assessment is provided in **Section 6.6**.

Table 6.1 – Assessment of Proposal Against Principles of Crown Lands Act 1989

Principle	Comment
(a) that environmental protection principles be observed in relation to the management and administration of Crown land	Mitigation measures are adopted in the proposal to protect environment
(b) that the natural resources of Crown land (including water, soil, flora, fauna and scenic quality) be conserved wherever possible	Sections of oyster lease with high conservation value retained
(c) that public use and enjoyment of appropriate Crown land be encouraged	Public has access to oyster lease area
(d) that, where appropriate, multiple use of Crown land be encouraged	Proposal will lead to multiple use of this land
(e) that, where appropriate, Crown land should be used and managed in such a way that both the land and its resources are sustained in perpetuity	Proposal in accordance with principles of ESD
(f) that Crown land be occupied, used, sold, leased, licensed or otherwise dealt with in the best interests of the State consistent with the above principles	Land an existing lease area

6.3.2 NEIGHBOURING LANDUSE ASSESSMENT

One oyster lease is located to the west of the subject oyster lease area, although this lease area is not used for harvesting. Another lease located to the east of Oaky Island is used for harvesting.

The Wallamba River water is used by recreational fishers and boaters, as well as other oyster growers. The lease area is used seasonally (summer holidays period) at low tides by small numbers of recreational fishers for collection of bait.

The surrounding land-use (around the stockpile site) is described in **Section 2.8.1**. Residential land is located approximately 250 m to the east of the site and is screened by a stand of vegetation. Partially cleared and vegetated land is located to the north, west and south of the stockpile site. A tourist operation (Lakeside Village) is located to the west of the stockpile site, adjacent to the pipeline route.

The access road to the stockpile site is a sealed public road (Grey Gum Road), which services the industrial area of Tuncurry.

A SEPP 14 wetland is located to the south east of the site.

6.3.3 POTENTIAL IMPACTS

The proposed development would not adversely affect any of the surrounding land uses, primarily due to the range of control measures to be instigated or extended on the site, as discussed in this EA.

The proposed dredging will not have any adverse affects on the operation of this oyster lease, as indicated by the assessment of hydrodynamic and sediment transport processes (**Section 4.1**). The potential for suspended sediment impacts due to the dredging are minimal and will be managed through a monitoring and reporting process. Further, dredging will not occur should it be determined that poor water quality is having an impact on adjacent oyster harvesting areas, based on data collected during routine water quality and oyster meat quality testing undertaken during September.

In light of the extensive areas of low tide flats available for bait collection by recreational fishers in Wallis Lake the impact of the loss of this area on recreational fishing opportunities in Wallis Lake is considered negligible.

The majority of the pipeline will be located on the river bed, apart from the first 50 – 60 m of pipe out from the dredger. The pipeline route is in an area of low boat traffic, due to the shallow waterway. The pipeline route would be flagged to notify all boat traffic of the presence of the pipeline.

Assessment of the impacts of the dredge and stockpile operation on neighbouring landholders/residents is provided in **Sections 6.1**, **6.2**, **6.3** and **6.7**. The assessments indicate that the proposal will not have any adverse impacts on these stakeholders.

Assessment of the impacts of the pipeline on the SEPP 14 wetland indicates no significant impacts and the operation of the pipeline poses no unacceptable risks to this vegetation/habitat (**Section 5**).

6.4 SOCIO-ECONOMIC ISSUES

The proposed project would have a number of positive socio-economic outcomes to the local area, Great Lakes/Greater Taree areas and the Mid North Coast region of NSW.

The primary objective of the development will be the re-establishment of an existing non-productive oyster lease to a productive oyster lease. A secondary objective is utilisation of the dredge spoil to meet market demand for sand.

The re-establishment of the lease, once fully operational will contribute approximately $150,000 per annum to the local oyster industry. The operation will create directly one full-time and one casual employment position.

The resale of sand material to market is critical to the project in order to finance the dredging operation. Based on the estimated average of 140,000 m^3 of sand material, the gross potential yield from the stockpile (based on a conservative resale value of \$25 – 30/m^3) is on the order of \$3.5 – \$4.2M. Assuming an annual turnover of 10,000 m^3 of sand, it is estimated that the sale of material to market would have a gross value of up to \$250,000 – \$300,000 p.a., depending upon demand. Two additional fulltime and one part time staff would be required for this part of the operation.

In addition, the dredge operation has a capital outlay of approximately \$1.3M. Therefore, the gross project contribution to the local economy (excluding the ongoing oyster lease contribution) is approximately \$4.8 – \$5.5M.

The proposed project would therefore have a positive socio-economic impact, through employment generation and the injection of around \$5M into the local economy.

6.5 HERITAGE AND CULTURAL ISSUES

6.5.1 ABORIGINAL HERITAGE

The Forster Local Aboriginal Land Council – Cultural Heritage Section was commissioned to prepare an Aboriginal Heritage assessment report for the proposed development. A copy of their report in included at **Appendix F** in the **Volume 2 Report**.

The assessment was undertaken to provide information on the identification of Aboriginal heritage sites and relics within the proposed development area and to assess the significance of such sites to the local Aboriginal people.

The surveys and assessments involved the review of the Forster Local Aboriginal Land Council Aboriginal Sites database, review of previous archaeological reports in the local area and transect searches for relics. The transect searches were undertaken by two personnel and covered all areas of the proposed development area and targeted relics or other artefacts representative of open camp sites, middens, scar tress, carved trees and ceremonial places.

The surveys revealed no indications of Aboriginal heritage and Forster Local Aboriginal Land Council has no objections to the proposed development.

Due to the previous disturbance of the site, it is possible that some relics may occur within the proposed development area. Mitigation measures have been developed should any relics or artefacts be found during the project (**Section 7.1**).

6.5.2 EUROPEAN HERITAGE

Schedule 2 of the Great Lakes Local Environment Plan 1996 lists heritage items in the Great Lakes Local Government area. The items on this schedule include a number of buildings in Tuncurry, none of which are located near the oyster lease or proposed stockpile site.

Great Lakes Council, in partnership with the NSW Heritage Office, has recently prepared a Draft Heritage Study for the Great Lakes area. The purpose of the study is to investigate the historical context across the entire Great Lakes LGA and to identify and assess items of heritage significance associated with this context.

This study identified one heritage item not currently listed in the LEP, the Former Nabiac Aerodrome, which includes a concrete shelter. This heritage item is not located near the proposal and will not be affected by the proposal.

A search was also undertaken of the State Heritage Register for the locality. This search did not identify any additional heritage items within the area.

6.6 ROADS, TRAFFIC AND TRANSPORT

6.6.1 BACKGROUND

The dredging operation will not have any impact on traffic operations in the local area as all operations will be water-based. One-off movements of trucks carrying plant and equipment will be required during the set up phase of the project. The stockpile site, however, will create additional traffic movements around the entry point to the site in Grey Gum Road, along Grey Gum Road and through its intersection with The Lakes Way. This section of the report provides an assessment of the impact of the operation of the stockpile site on traffic flows in these areas. The report makes no assessment in accordance with the EPA's *Environmental Criteria for Road Noise* as truck movements on the access road to the stockpile site are considered to have no impact in this regard, as the route is through an industrial area (**Vol. 2 Report – Appendix A**).

6.6.2 ACCESS

Access to the stockpile site is proposed from Grey Gum Road which services the Tuncurry industrial area. This road is frequently used by heavy vehicles that service, among other businesses, a cement works, landscape/quarry supplies and Great Lakes Council's works depot.

Grey Gum Road intersects with The Lakes Way at its eastern end in a slightly modified version of the type "CHR" (channelised right turn) intersection as defined for rural roads (RTA, 2000). The essential element of the type "CHR" intersection is a protected right turn lane that allows safe passage for through traffic. The intersection arrangement differs from the standard "CHR" type by replacing the painted median on The Lakes Way south of the intersection with road widening to include a second southbound lane (The Lakes Way is a four lane road south of this intersection), as well as having a median separated left turn (Give Way) into Grey Gum Road from The Lakes Way.

Notwithstanding, the configuration performs the function of a type "CHR" intersection, in that right hand turns from The Lakes Way into Grey Gum Road are protected by a painted median and through traffic is channelled past the turning traffic.

The stockpile site has direct access to Grey Gum Road opposite Council's works depot. The entrance to Council's works depot is at the end of Grey Gum Road, 50 – 100 m past the proposed entry to the stockpile site. Given the low volume of traffic expected to be generated from the stockpile site (**Section 6.6.4**), flat terrain and good sight distances, there would be no traffic conflicts at the proposed entrance to the stockpile site.

6.6.3 EXISTING TRAFFIC ENVIRONMENT

Data of traffic volumes on Grey Gum Road were provided by Great Lakes Council's Traffic Engineer and are shown in **Table 6.2**, while a breakdown of daily traffic volumes into ARX Classes is provided in **Table 6.3**. Intersection data for Grey Gum Road and The Lakes Way was also provided by Council's Traffic Engineer and is shown in **Table 6.4**.

For eastbound traffic, the data indicates AM peak hour traffic volumes of between 132 – 181 vehicles per hour (Mon. – Sat.) and PM peak hour traffic volumes of between 97 – 206 vehicles per hour (Mon. – Sat.). Peak flows were recorded for Friday morning (11a m – 12 pm) and Tuesday afternoon (3 pm – 4 pm). The highest volumes of traffic recorded between 7 am – 7 pm occurred on Friday (1731 vehicles) (**Table 6.2**).

Table 6.2 – Grey Gum Road Traffic Counts

	Mon	Tue	Wed	Thur	Fri	Sat	Sun
EASTBOUND							
AM PEAK*	170.0	164.0	172.0	176.0	**181.0**	132.0	89.0
PM PEAK*	179.0	**206.0**	184.5	184.0	203.0	97.0	84.0
TOTAL 7 am – 7 pm	1517.0	1686.0	1561.0	1592.5	**1731.0**	801.0	591.0
WESTBOUND							
AM PEAK*	162.0	164.0	**169.0**	161.0	168.0	126.0	84.0
PM PEAK*	154.0	163.0	138.5	153.0	**168.0**	82.0	70.0
TOTAL 7 am – 7 pm	1382.0	1533.0	1419.5	1500.0	**1605.0**	771.0	570.0

Source: Great Lakes Council. Survey duration 15/03/06 – 23/03/06 *Vehicles per hour

For westbound traffic, the data indicates AM peak hour traffic volumes of between 126 – 169 vehicles per hour (Mon. – Sat.) and PM peak hour traffic volumes of between 82 – 168 vehicles per hour (Mon. – Sat.). Peak flows were recorded for Wednesday morning (10 am – 11 am) and Friday afternoon (3 pm – 4 pm). The highest volumes of traffic recorded between 7 am – 7 pm occurred on Friday (1605 vehicles) (**Table 6.2**).

Vehicle classification data for daily volumes shows that heavy vehicles account for 14 % of total traffic on Grey Gum Road (**Table 6.3**). The data indicate that the majority of heavy vehicles are Class 4 (two axle truck or bus 5.5 – 14.5 m length), followed by Class 5 (three axle truck or bus 5.5 – 14.5 m length) and Class 10 (6 axle articulated 11.5 – 19 m long) vehicles.

Table 6.3 – Grey Gum Road Average Daily Volume – Vehicle Classification (Weekdays Only)

ARX Vehicle Classification	Average Daily Count		% of Daily Count	Average Daily Count		% of Daily Count
	EASTBOUND			WESTBOUND		
1	21		0.6	31		0.9
2	2752		83.5	2929		83.3
3	64		1.9	58		1.6
4	329		10.0	340		9.7
5	72		2.2	95		2.7
6	8		0.2	12		0.3
7	3		0.1	6		0.2
8	8		0.2	6		0.2
9	6		0.2	5		0.1
10	24		0.7	28		0.8
11	0		0.0	1		0.0
12	0		0.0	0		0.0
		3 % #			3 % #	
TOTAL ALL	3287	4417	100	3511	4718	100
TOTAL LIGHT*	2837	3813	86	3018	4056	86
TOTAL HEAVY**	450	604	14	493	662	14

Source: Great Lakes Council. Survey duration 15/03/06 – 23/03/06
*ARX Classes 1 – 3. ** ARX Classes 4 – 12.
#Growth factor of 3 % p.a. for 10 years

Traffic counts at the intersection of Grey Gum Road and The Lakes Way are shown in **Table 6.4**. The data indicate a total of 143 (AM peak) and 77 (PM) heavy vehicle movements through the intersection. Analysis of traffic generated by Grey Gum Road indicates an AM peak of 31 and PM peak of 5 vehicles. The total number of heavy vehicles entering Grey Gum Road during the AM peak was 25 and 16 during the PM peak. In total, heavy vehicles (ARX classes 4 – 12) account for 10.2 % of AM peak and 5.6 % of PM peak traffic through the intersection. A growth factor of 3 % p.a. for 10 years has been applied for intersection analysis.

Table 6.4 – Grey Gum Road/The Lakes Way Intersection Traffic Counts

Direction	Heavy Vehicles*	All Vehicles
AM PEAK		
Grey Gum Rd out northbound	13	14
Grey Gum Rd out southbound	18	58
Left turn into Grey Gum Rd	14	51
Lakes Way northbound through traffic	43	601
Right turn into Grey Gum Rd	11	32
Lakes Way southbound through traffic	44	650
TOTAL	143	1406
Growth Factor of 3% p.a. for 10 years	192	1890
PM PEAK		
Grey Gum Rd out northbound	2	31
Grey Gum Rd out southbound	3	90
Left turn into Grey Gum Rd	6	56
Lakes Way northbound through traffic	23	545
Right turn into Grey Gum Rd	10	16
Lakes Way southbound through traffic	33	641
TOTAL	77	1379
Growth Factor of 3% p.a. for 10 years	103	1853

Source: Great Lakes Council. * ARX classes 4 – 12.

6.6.4 STOCKPILE OPERATIONS TRAFFIC GENERATION

Traffic movement into and out of the stockpile site will be determined by the demand for sand product. It has been estimated conservatively that demand from the stockpile operation could be up to 75,000 t of sand per annum. Assumptions for traffic generation estimates are:

- 50 weeks operation per year;
- Six day week; and
- Maximum load of 33 – 40 tonnes per truck (truck and superdog or B-double).

Given these assumptions, up to six outward truck movements would be expected to be generated per day (12 two-way trips). These figures are static (*ie*. the stockpile site volume will decrease with time) and therefore no growth factor is applicable to the traffic generated by the stockpile site operations. Trucks hauling sand from the stockpile site will vary between ARX Class 5 – 11 vehicles. The figure of 12 two way trips has been used for the analyses presented below.

6.6.5 INTERSECTION ANALYSIS – THE LAKES WAY AND GREY GUM ROAD

The analysis presented here is restricted to heavy vehicles (ARX Class 5 – 11), given that Grey Gum Road is an access road through the Tuncurry industrial area and the site will only employ up to two full time positions. Therefore, employee car trips are excluded. The analysis is for the operational phase of the project only, as the construction phase will not generate any continuous movements of trucks to/from the site. Machinery necessary for preparation of the stockpile site are already on site.

As the volume of traffic generated by the stockpile site is static during the growth period, the relative contribution of traffic generated by the stockpile site decreases as the volume of traffic through the intersection increases. Worst case scenario is therefore determined by looking at the immediate impact of traffic generated by the stockpile site on existing traffic volumes.

The additional 12 two-way heavy vehicle trips will increase total heavy vehicle trips eastbound on Grey Gum Road from 450 to 456 (1.3 % increase) and westbound from 493 to 499 (1.2 % increase). It is reasonable to assume that the trips would be spread evenly throughout the day. The increase in total daily trips on Grey Gum Road is 0.18 % (eastbound) and 0.17 % (westbound).

With respect to the intersection, as peak hour data is only available, consideration is limited to comparison with the total trips through the intersection. The 12 additional daily trips, if spread evenly throughout the day, would most likely lead to an increase of one to two peak hour trips through the intersection, representing an increase in heavy vehicle movements of approximately 1.4 % (AM peak) (assuming two trips) and 2.6 % (PM peak) (assuming two trips). In terms of total traffic through the intersection, the increase in traffic movement through the intersection is 0.14 % (AM peak and PM peak).

The RTA Road Design guide (RTA, 2000) provides a guide for the application of capacity analysis to unsignalised intersections. Table 8.1 (reproduced below in **Table 6.5**) of the guide shows intersection volumes below which capacity analysis is considered unnecessary.

Table 6.5 – Intersection Volumes Below which Capacity Analysis is Unnecessary

Type of Road	Light Cross & turning Volumes Maximum Design Hour Volumes vehicles per hour (two way)		
Two lane major road Cross Road	400 250	500 200	650 100
Four lane major road Cross Road	1,000 100	1,500 50	2,000 25
Projected volumes* Grey Gum Road and The Lakes Way intersection		Through traffic	Cross Road
	AM Peak	1681	121
	PM Peak	1594	142

Source: RTA (2000). Road Design Guide Table 8.1 ….. * Growth factor of 3 % p.a. for 10 years

The analysis here includes the growth factor for the intersection traffic volumes. Comparison of data presented in **Table 6.4** (AM peak data) and **Table 6.5** (four lane major road data) indicates that the peak volumes for the intersection are at present marginally above the volumes where a capacity analysis is warranted.

Notwithstanding, given the very minor predicted increase in peak hour traffic volumes through the intersection as a result of the stockpile site operations (0.14 %) and as there is a protected right turn lane, it is considered that the traffic generated from the stockpile site will not significantly impact on the existing volumes and safety of the intersection.

Notwithstanding, a capacity analysis is presented for the intersection, based on existing traffic volumes. Projected data are not used, as the impact of the stockpile operations on the intersection would be immediate and due to the very minor overall contribution to the intersection traffic volumes, the effect of growth on intersection capacity is not related to the stockpile operations.

ANALYSIS OF OPERATION OF UNSIGNALISED INTERSECTION

A sketch of the intersection is provided in **Figure 6.1**. The analysis is presented for calculation of queue lengths with a probability of 95 % of not being exceeded for turning volumes from both the major (Stream 1 – The Lakes Way) and minor (Stream 2 – Grey Gum Road) streams. The 'Tables' and 'Figures' referred to in the analysis are as provided in AUSTROADS Guide to Traffic Engineering Practice (AUSTROADS, 1995).

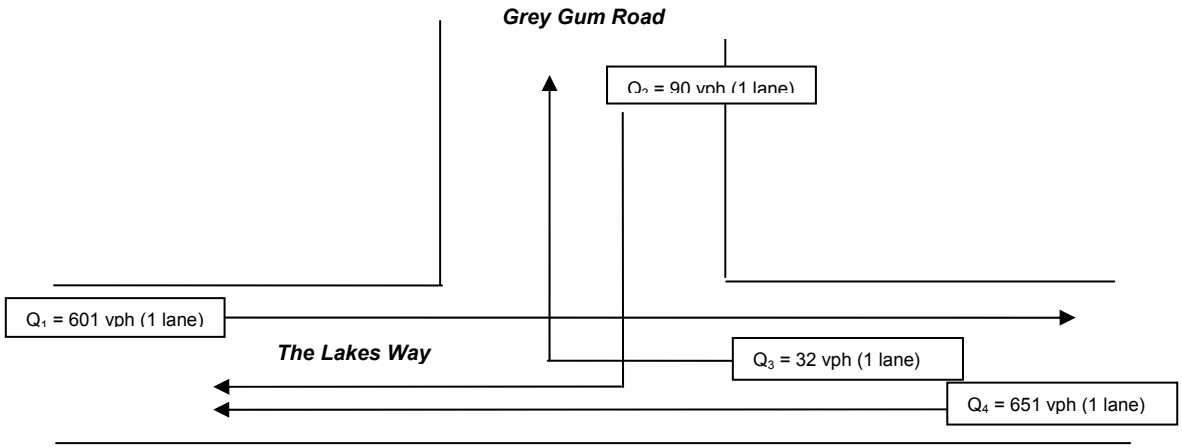

Figure 6.1. Schematic layout and volumes for intersection of The Lakes Way and Grey Gum Road. NB: Traffic volumes taken as higher value from AM or PM peak.

Stream 1 (Q_1)

Practical Absorption Capacity (Cp) of Stream 1

From Table 4.3 t_a = 5 secs, t_f = 3 secs

Major Flow (The Lakes Way) Q_1 = 601 vph

From Figure 4.2, C_p = 525 vph

Service Rate for Q_3

As Stream 3 takes precedence over Stream 2:

Service Rate $Q_s = C_p$ = 525 vph

Determine Queue Length

Service Rate Q_s = 525/0.8 = 656 vph

Arrival Rate $Q_3/n = Q_m$ = 32 vph (n = 1 for single right turn lane)

Ratio p = 32/656 = 0.05

From Figure 4.4 a queue of 1 vehicle would not be exceeded on more than 95 % of occasions.

Therefore provide for queue length of 1 x 8 m = 8 m. Intersection currently meets this requirement.

Stream 2 (Q_2)

Practical Absorption Capacity (Cp) of Stream 1

From Table 4.3 t_a = 5 secs, t_f = 3 secs

Major Flow (The Lakes Way) $Q_1 + Q_4$ = 1251 vph

From Figure 4.2, C_p = 230 vph

Number of lanes required for Minor Flow (Grey Gum Road) Q2

Q_2 = 90

Q_2/C_p = 0.40. Therefore 1 lane required. **Satisfied by existing intersection design**

Average flow per lane = 58 vph/lane

Average delay to Grey Gum Road vehicles

Q_1 = 1251

Minor Flow per lane = 58 vph

From Figure 4.3b, Average delay W_m = 8 secs. **The stockpile site will increase Minor Flows by 2 vph. Therefore, there will be an additional two x 8 second delays during peak periods.**

Queue length for vehicles turning right from Grey Gum Road

Service Rate $Q_s = C_p/0.8$ = 287.5

Arrival rate per lane = 58 vph

Ratio p = 58/287.5 = 0.20

From Figure 4.4 a queue of 1 vehicle would not be exceeded on more than 95 % of occasions.

Therefore provide for queue length of 1 x 8 m = 8 m.

SUMMARY OF INTERSECTION ANALYSIS

Based on data presented here, the capacity of the existing intersection to meet existing traffic demands is adequate. Right turns from The Lakes Way into Grey Gum Road and from Grey Gum Road out require a queue length of 8 m, which is accommodated by the existing intersection design.

More importantly, however, the stockpile site will only increase total peak volumes through the intersection by 0.14 %. This contribution to the intersection volumes is extremely minor and as such, it is considered that traffic generated from the operation of the stockpile site would not have an adverse impact on the existing operation or safety of the intersection. The intersection currently services the industrial area of Tuncurry and accommodates heavy vehicles, up to ARX Class 11. The increase in heavy vehicles through the intersection as a result of the stockpile site operations is also very minor (1.4 % AM peak and 2.6 % PM peak). This increase will not adversely affect safety of the intersection at current traffic volumes and its effect will diminish with time (as trips from the stockpile site are static) as overall volumes through the intersection increase with population growth.

Based on the results of the analysis presented here, the additional traffic volume through the intersection as a result of the stockpile site operations is extremely minor. Therefore, given the adequate operation of the intersection at present, there is no requirement for the proponent to provide for any upgrade to the intersection in respect of traffic generated by the proposed development.

6.6.6 TRAFFIC IMPACTS SUMMARY

Based on the analysis presented here, the stockpile site would lead to a very minor increase in heavy vehicle road traffic on Grey Gum Road and through The Lakes Way intersection. A test of the sensitivity of the analysis was made by doubling the expected number of traffic movements. This also allows for the likely scenario of smaller trucks hauling from the site, though still allowing the stockpile site to be able to meet demand for product, as the figure of 12 two way trips is based on the annual haul volume being met by 33 – 40 tonne capacity trucks. Based on this scenario, the following impacts on traffic would be expected:

- Increase in total heavy vehicle trips eastbound on Grey Gum Road from 450 to 462 (2.7 % increase) and westbound from 493 to 505 (2.4 % increase);
- Increase in heavy vehicle movements through the intersection of approximately 2.1 % (AM peak) (assuming four trips) and 5.2 % (PM peak) (assuming four trips); and
- Increase in total vehicle movements through the intersection of approximately 0.85 % (AM peak) and 0.87 % (PM peak) (assuming four trips).

It is submitted that even under this scenario, the increase in traffic volumes on Grey Gum Road and through the intersection with The Lakes Way resulting from the proposed stockpile site are extremely minor and are considered to have a negligible impact on traffic flows in the area.

The existing road system is therefore considered adequate to cater for this very minor relative increase in additional traffic in terms of access, safety and standard.

6.7 CONSULTATION

Consultation was undertaken with relevant Government Authorities as per the DG's requirements, as well as potentially affected landowners and relevant members of the community. Details regarding the consultation process are provided in **Section 1.7**, while the results of the community/landowner consultation are provided in **Table 6.6**.

Follow up consultation was undertaken with relevant Government Authorities in order to review information provided in the DG's requirements and to determine whether there were additional issues to be addressed. Details of this follow up consultation are provided in **Table 6.7**.

Table 6.6 – Project Consultation Details

Person/Organisation Consulted	Issues Raised	Section Where Issue Addressed in EA
Great Lakes Council	No reply at time of writing	N/A
Adjoining lease owner	No reply at time of writing	N/A
Potentially affected residents in Taree St	Noise, ecology, recreational amenity, water quality, navigation	6.1, 5, 5.1.2, 4.3, 6.3.3
Potentially affected residents in Mount View Pde	No replies at time of writing	N/A
Landowners adjacent to stockpile site in Chapmans Road	No replies at time of writing	N/A
Wallis Lake Fishermen's Co-operative	Planning relevance, hydraulics and sediment movement, ecology	3, 4.1, 5

Table 6.7 – Additional Government Authority Consultation

Authority Consulted	Date	Comments
NSW Fisheries – Dave Harasti	24/03/06	No additional issues to those advised in DG's. Agreed that we would send through a draft of the aquatic ecology report for them to review and comment prior to finalising the report. Possible site meeting or a meeting in the office if necessary.
Dept of Lands – Cam Cocchini	03/05/06	Indicated that they had no additional requirements. Department reiterated the need for owner's consent for the proposal prior to lodgement with Dept of Planning.
Department of Natural Resources – Peter Medi	04/05/06	Discussed issues of hydraulic impacts, flooding impacts. No additional issues required over and above those stated in DG's.
Department of Environment and Conservation – Bill George	04/05/06	Need to pay particular attention to noise impacts, especially from booster pumps, also dewatering and management of return waters. Also, particular attention to impacts on saltmarsh area in SEPP 14 wetland.
NSW Roads and Traffic Authority	19/05/06	Advice provided in **Appendix A**.

Mitigation and Management

7.1 MITIGATION MEASURES

Subject to the Minister's approval of the proposed development, an Environmental Management Strategy (EMS) would be prepared and approved by the Department prior to commencement of any physical works.

The mitigation measures proposed within the EMS will be based on identified areas of environmental risk highlighted in this EA and management measures concomitant with the identified risk.

For any proposed safeguard measures to be successful, they must be feasible, effective, and simple to execute. A summary of mitigation measures for the proposed project is provided in **Table 7.1**.

Table 7.1 – Summary of Mitigation Measures

Impacts	Mitigation Measures
Flooding	• Threats from flooding would be monitored by daily weather checks and warnings from the Bureau of Meteorology. • During flood events where the water level increases to a height greater than 150 mm above normal high tide slack water, the dredging would suspended until such time as water receded to a depth suitable for operations.
Acid Waters	• Lime will be kept on site if required for the management of return waters. Management of potential acid sulfate soils during the dredging process will be based on ensuring that pH of return waters meets appropriate criteria set in the conditions prior to discharge to the Wallamba River.
Water Quality	• It is proposed to construct shallow swale drains around each stockpile to direct any runoff from the stockpiles back to the settling ponds. • Monitoring of return waters for pH and turbidity will ensure that waters returned to the Wallamba River are within the range of values specified by DEC • All fittings would be bunded on the refuelling barge so that any spills would be isolated and prevented from entering the estuary. • All refuelling barges/vehicles will be fitted with EPA-approved spill kits. • Continuous monitoring of the hydraulic systems on board the dredge and pressure in the suction head and dredge pipe to provide warnings about possible leakages of dredged material • Daily inspections of the dredge pipe and return waters pipe by personnel to identify signs of potential breakage. • Potential for increases in turbidity associated with the dredge head will be monitored by the dredge operator and crew, who will keep a dredge log that will record any incidents of turbid plumes in the

Table 7.1 – Summary of Mitigation Measures

Impacts	Mitigation Measures
	vicinity of the dredge. • If a turbid plume is observed, dredging will cease immediately and investigations regarding the cause of the plume will be undertaken. • Once the plume has dispersed and if it is determined by the dredge operator that there is no risk of a turbid plume developing, dredging would recommence.
Air Quality	• Any vegetation removal should be undertaken either during damp conditions or when the winds are not from the southwest; • All loads leaving the site are adequately covered to prevent wind blowing dust from trucks during transit; • Maintain stockpiles in a moist condition to minimise wind blown and traffic generated dust; and; • Water all roads and trafficked areas to minimise the generation of dust.
Aquatic Ecology	• Replanting of seagrass along the western margin of the oyster lease • Part of the area already designated as Zone 1A should be left in its present state and not dredged; • Prior to dredging all other seagrass areas to be dredged should be searched for presence of pipefish and if found, pipefish should be relocated; • Avoid dredging within 10m of the mangroves on Oaky Island; • Lay the dredge pipe to the spoil site only on high tide to minimize the possibility of the watercraft damaging seagrass and the substrate; and • Remove and dispose of all waste appropriately.
Terrestrial Ecology	• Revegetation of affected saltmarsh areas following decommissioning of the dredge pipeline; • Use of geotextile aprons beneath all flange joins on pipeline; • Establishment of hygiene protocol to minimise weed seed dispersal onto and off the site; • Pre-clearing surveys; • Clearing supervision; and • Raise sections of pipeline in known and potential Wallum Froglet and Eastern Chestnut Mouse habitat
Noise	• Noise from the dredge should be attenuated so that the sound power level is limited to 97 dB(A); • 3 sided, 3m high noise walls be erected around the return waters pump and the booster pump (shown in the noise map) to reduce

Table 7.1 – Summary of Mitigation Measures

Impacts	Mitigation Measures
	noise levels to the appropriate environmental noise goal; • Noise walls be erected prior to commissioning of pumps; • Plant and equipment should be maintained in good working order to reduce noise emissions; and • Work site should be organised to reduce the operation of reversing alarms on vehicles. Where possible, vehicle and plant movement should be designed to maximise forward movements and to minimise reversing movements.
Landuse	• Dredging will not occur should it be determined that poor water quality is having an impact on adjacent oyster harvesting areas, based on data collected during routine water quality and meat quality testing undertaken during September. • The pipeline route would be flagged to notify all boat traffic of the presence of the pipeline.
Indigenous Cultural Heritage	• Should any items of indigenous cultural heritage be uncovered during the project, work in the area would cease immediately and the area cordoned off. A representative of the Forster LALC and a NPWS representative would be contacted to provide advice regarding appropriate action.
Traffic/Transportation/Road Use	• No truck haulage outside of normal working hours. • Avoid compression braking in proximity of residences. • Cover loads, ensure all tailgates are secured to eliminate rattling noises.
Monitoring	• Environmental Management Strategy prepared incorporating details of all proposed safeguards and mitigation measures. • Twelve monthly Audit Report or AEMR to Department of Planning reviewing all facets of the operation.

7.2 ENVIRONMENTAL MANAGEMENT STRATEGY

An Environmental Management (EMS) will be prepared for the project after the receipt of development approval. The EMS will establish the environmental management framework for both the short term and long-term environmental strategies for the project and form the basis of the annual reporting protocol to the Department.

The EMS will include details of the operational practices for the dredge and stockpile operations and will set out the measures to achieve the stated environmental impacts/outcomes. The EMS will outline measures to ameliorate impacts, monitoring protocols and corrective actions. The information will reflect measures identified in the Environmental Assessment and provide detail on the methods to implement these measures.

In summary, the EMS will include, although not be limited to:

- All statutory and other obligations that the applicant is required to fulfil in relation to the operation of the proposed development, including all consents, licences, approvals and consultations;
- Standards and performance measures to be applied to the development and a means by which the environmental performance can be periodically reviewed and improved;
- Management policies to ensure that environmental performance goals are met and comply with any conditions of consent; and
- Monitoring requirements in accordance with the EA and conditions of consent;

7.3 ENVIRONMENTAL MONITORING

The environmental monitoring proposed for the project will include monitoring of the dredge operation. revegetation works and return waters monitoring. The required monitoring programs will be included in the EMS.

7.4 STATEMENT OF COMMITMENTS

Table 7.2 lists the 'Statement of Commitments' for the project. These are a set of actions that will be undertaken by the proponent to ensure that the potential environmental impacts of the project are minimised. The commitments are divided into areas of potential impact.

Table 7.2 – Statement of Commitments

Issue	Commitment
Hydrodynamics and sediment transport	• Dredge area to be buoyed off to ensure dredge is kept within confines of lease area • Hydro-survey on completion of dredging to confirm dredge extents and volume calculation for royalty payment
Flooding	• An emergency management plan would be prepared that details warning and emergency procedures for personnel and plant. This plan would form part of the EMS for the project.
Water Quality Management	• Dredge log to be kept detailing observations of turbidity in and around dredge head • Dredging to cease upon turbidity being observed and investigations and remedial actions taken if necessary to prevent further leakages/turbidity events • Daily measurements of pH and turbidity in discharge pond to be made and records kept.

Table 7.2 – Statement of Commitments

Issue	Commitment
	• Discharge waters to be released only when pH is between 6.5 – 8.5 and turbidity is < 30 NTU • Pipeline to be monitored daily and joints checked for wear and potential leaks • Dredging to cease if leaks detected and not re-commence until leaks rectified • Pipe to be elevated in Wallum Froglet and Eastern Chestnut Mouse habitat.
Air Quality	• Vegetation removal undertaken either during damp conditions or when the winds are not from the southwest • Cover all loads leaving the site to prevent wind blowing dust from trucks during transit • Stockpiles to be kept in a moist condition to minimise wind blown and traffic generated dust • All roads and trafficked areas to be watered to minimise dust generation.
Aquatic Ecology	• Areas of high value seagrass habitat to be replanted at a ration of 2:1 • Hairy Pipefish to be relocated prior to removal of high habitat value seagrass areas • Replanting to be monitored as specified in EMS.
Terrestrial Ecology	• Pipeline route to be inspected quarterly to ensure no impacts on surrounding vegetation communities and reported in an annual report for the project; • Revegetation of affected saltmarsh areas following decommissioning of the dredge pipeline; • Geotextile aprons placed beneath pipe joins; • Pre clearing surveys; and • Clearing supervision.
Noise	• Dredge and stockpile operations to be restricted to proposed operating hours. Booster Pump 4 will be soundproofed with a barrier to direct noise away from Lakeside Village.

Proposal Justification

8.1 ALTERNATIVES TO PROPOSAL

Schedule 2 (3) of the *Environmental Planning and Assessment Regulation 1994*, requires that an EIS (or in this instance an EA) address any feasible alternative to carrying out the proposed development, as well as the consequences of not proceeding. Alternatives for the cultivation of oysters are discussed below. The assessment of alternatives to the project is limited to oyster cultivation, as this is the principle reason for the project. No assessment of alternative sand resources is assessed, as the extractive industry is a by product of the dredging operation and is not the principle driver for the project. Alternative options for spoil disposal, are however, addressed.

8.1.1 OYSTER CULTIVATION

With respect to oyster cultivation, one option would be to buy out an existing lease area. However, this would not lead to increased oyster production in Wallis Lake and at present there are no leases of this size for sale in Wallis Lake, nor are any new leases being created. A further alternative would be to cultivate oysters in another estuary, however, this would not be economically feasible given that the proponent's infrastructure is located in Wallis Lake.

8.1.2 SPOIL DISPOSAL

At present there are no land-based approved disposal facilities in the vicinity of Wallis Lake. Council has been in the process of preparing an EIS for a disposal facility at Tern Island over the last two years for spoil generated from maintenance dredging in Wallis Lake, which once operational, would receive 50,000 m^3 per year (although considerably more than this (80,000 m^3) would need to first be removed from Tern Island). This option is not feasible for the disposal of spoil from the oyster lease site given the timing (EIS approval date indeterminate) and the volume proposed to be removed from the oyster lease, which far exceeds the capacity of Tern Island, if it becomes fully operational.

A further option is to pump the material out of the estuary to the ocean. While the pumping distances are roughly equivalent to those of the proposed disposal site, this option is not feasible for several reasons. First, dredging of the lease is reliant upon sale of the material to fund the cost of the dredge operation. Disposal to the ocean would not generate any income. Second, the sand is a scarce resource that should be utilised where possible. Third, pumping to the entrance of Wallis Lake would have impacts on navigation and create other environmental issues for ocean disposal that would be more difficult and possibly unable to be controlled.

8.1.3 DO NOTHING

The consequences of not proceeding with this proposal are manifold. The proponent has recognised the need to utilise the existing lease area and identified its potential to produce oysters in an economically viable manner. Doing nothing would lead to an under-utilisation of this area of land which for the majority of the last 100 years, has been a productive oyster cultivation area. An opportunity to increase in the local production of high quality oysters would not eventuate.

In addition, the economic and social benefits to the local community and region would not eventuate, with approximately $5M lost to the local economy and a number of existing and new indirect jobs would be lost or foregone, such as truck drivers involved in product transportation.

Further, the benign nature of the proposal (as identified by the outcomes of this EA) makes the "Do nothing" option less of a feasible alternative.

8.2 CUMULATIVE IMPACTS

An assessment of the cumulative impacts of the proposal is provided in **Table 8.1**. The cumulative impacts of the proposal are determined through an assessment of the proposed development in the context of the existing state of the surrounding environment, social and economic conditions, both at the local and regional scale.

Table 8.1 – Cumulative Impacts Assessment

Impact Type	Section in EA Where Impact Addressed	Comment
Hydrodynamics and Sediment Transport	4.1	• No major changes to hydrodynamics and sediment transport predicted
Soils/landform	4.2	• No acid sulfate soils will be impacted • Mitigated by concurrent rehabilitation of the site. • No public views or visual impacts of the extraction area.
Water Quality	4.3	• Turbidity and pH of return waters managed in settling ponds. Discharge waters to be monitored and released only after meeting appropriate criteria. • Dredge operation highly unlikely to affect surrounding waterway. Background water quality highly variable.
Contamination	4.4	• No site contamination issues. Potential leaks (fuel and oil) from dredge and booster pumps all controlled within bunded environment.
Air Quality	4.5	• Sand and dust air quality control measures are proposed within the site.
Bushfire	4.6	• No bushfire issues.

Table 8.1 – Cumulative Impacts Assessment

Impact Type	Section in EA Where Impact Addressed	Comment
Aquatic Ecology	5.1	• No aquatic environments will be significantly impacted by the proposal. Areas of higher conservation value to be retained.
Terrestrial Ecology	5.2	• No terrestrial environments will be significantly impacted by the proposal. Mitigation measures will ensure terrestrial environments are protected. • SEPP 14 wetlands areas will not be detrimentally affected by the proposed development. • Existing local water quality to be regularly monitored. • No significant impact on rare, endangered or threatened species of flora and fauna are expected as a result of the proposed development.
Noise	6.1	• Dredge operation – noise emissions are expected to result in satisfactory noise levels at the closest residences to the dredge site. • Stockpile operation – possible traffic noise on the haul route is within the relevant criteria for the predicted level of truck movements. Predicted levels of machinery noise from site are also within the relevant criteria.
Visual	6.2	• Presence of dredge considered reasonable on a working estuary. • The proposed stockpile site is screened from the view of the general public and/or any adjoining residences. Impacts are benign and include presence of machinery and sheds.
Landuse	6.3	• Principles in *Crown Land Act 1989* are satisfied by the proposal. • Impacts of dredging on surrounding oyster leases minimal and can be controlled. • Impacts of pipeline on boat traffic minimal and can be controlled. • The proposed stockpile site is within an area where extractive industries are permissible under Council's LEP. Operation will not impact adversely on neighbours.
Socio-economic	6.4	• Approximately $5M capital value of project. • Local employment benefits are likely to accrue from the development. • Enables extraction of a high quality sand product for local and regional end users.
Cultural Heritage	6.5	• Assessment indicated no known impacts.
Roads and Traffic	6.6	• Proposal increases traffic movements on Grey Gum Road by < 1.5 % • Proposal increases traffic movements through intersection

Table 8.1 – Cumulative Impacts Assessment

Impact Type	Section in EA Where Impact Addressed	Comment
		by < 0.14 % • No traffic conflicts at stockpile site entry point • No impacts on traffic flows in local area

8.3 PROJECT JUSTIFICATION

8.3.1 BIOPHYSICAL CONSIDERATIONS

The proposed dredging and sand stockpiling operations have been designed so that the material can be transported from the oyster lease to the dredge area and extracted from the settling ponds without impacting adversely on the biophysical state of the surrounding area. Although some physical impacts will occur, it has been determined that the level of these impacts would fall within specified criteria or reasonable community expectations.

An assessment of the biophysical impacts of the proposal on the surrounding environment and the justifications of those impacts are set out below.

i. The proposal would result in modification of the bathymetry of the oyster lease. Assessment of the impacts of this physical change on hydrodynamics and sediment transport indicate that there will be no significant changes to flows of water and sediment in the vicinity of the site. Specifically, the dredging will not lead to erosion of any adjacent bed and banks, will not affect tidal or flood flows, nor will it induce significant accretion from the surrounding flood tide delta or adversely affect sediment budgets in the estuary.

ii. The proposal will not disturb any actual acid sulfate soils, though the material to be dredged is classified as PASS. Due to shell content, however, it has the capacity for in-situ neutralisation. Return waters will be monitored for pH level prior to discharge.

iii. Water quality of the estuary will not be impacted adversely by the dredging or by the return waters. The type of dredge to be used will ensure that the potential for any dredging-associated turbidity is minimised. Constant observation in the vicinity of the dredge head will ensure that should a turbid plume be observed, dredging would cease immediately and an investigation as to the cause of dredging would be undertaken. Dredging would not recommence until the problem had been identified and rectified. The pipeline will be checked daily to ensure that there are no leaks. It is proposed to use brand new pipe, which ensures that the potential for leaks is minimised. Settling pond water will be monitored daily for pH and

turbidity and records maintained. Return waters will not be released until criteria set by the DEC for these parameters have been met.

iv. The proposal will not create any odour issues. Air and dust impacts are limited to the primary sources of dust, which would be the loading of sand onto the trucks, transporting the sand off-site, and wind erosion. Results from the dispersion modelling indicated that off-site dust concentrations and dust deposition levels at all nearby residences due to the proposed operations would be below relevant air quality goals. Emissions from the booster pumps along the transfer pipeline are predicted to be minimal.

v. This assessment of environmental noise from the proposed sand dredging and processing operations concluded that environmental noise goals could be achieved. The assessment concluded that noise during worst-case operating conditions (when plant was closest to dwellings) would result in noise levels at the nearest residences being within the Project Specific Goals (environmental noise goals) developed from DEC noise guidelines. For road traffic noise related to the movement of heavy vehicles to and from the processing site along Grey Gum Road to the main road system, it was concluded that there would be no meaningful additional impact since the road connecting the site to the main road was through an industrial area with no residential uses along its length.

vi. Dredging will involve removal of seagrass. Assessment of the impact indicates that the majority of seagrass habitats to be removed are of low ecological value. As the project proposes to leave higher quality habitats on the margins of the lease area, the impacts on aquatic ecology are not considered significant. Further, the creation of a permanently inundated area where at present much of the site is sub aerial for large periods of the tidal cycle will improve conditions for expansion of high quality seagrass habitat. Therefore, there will be not net loss of seagrass habitat. The pipeline route will not impact adversely on terrestrial vegetation communities and habitats. Impact assessment of the pipeline on these communities and habitats indicates no significant impacts.

vii. Assessment of traffic impacts indicates that the surrounding road network is of a suitable standard to cater for the additional minor traffic load generated by the stockpile site. Therefore the impacts of additional traffic are considered to be negligible.

8.3.2 ECONOMIC CONSIDERATIONS

The economic considerations of the proposal are assessed by comparing the benefits to the economy if the dredging of sand and sale of dredged sand occurs and the impacts upon the local economy if it does not proceed. Should the Development Application be approved, there would be a number of economic benefits for the proponent, employees and contractors, as well as for the local community. These benefits are set out below.

8.3.3 SOCIAL CONSIDERATIONS

The principal social considerations that would arise from the approval of the Development Application would be as follows:

i. An injection of up to $5M into the local economy, as well as long term injection of capital through the operation of an additional large oyster lease in Wallis Lake;

ii. Long term direct employment of 2 to 4 persons by the proponent would be maintained and/or generated;

iii. Continued support of local services through expenditure by the proponent, its contractors and employees;

iv. Indirect employment would continue, such as employment for sub-contactors; and

v. The community would be able to ensure that the sand extraction, processing and transportation operations are undertaken in an environmentally responsible manner and in accordance with a Development Consent that reflects the Department's and community expectations.

8.3.4 PRINCIPLES OF ECOLOGICALLY SUSTAINABLE DEVELOPMENT

One of the most important requirements for an Environmental Assessment is to justify the operation of an extractive industry having regard to the principles of ecologically sustainable development. This is detailed for EIS's in Item 6 of Schedule 2, Clause 72 of the *Environmental Planning and Assessment Regulation 2000*. For the purposes of Schedule 2, the principles of ecologically sustainable development are as follows:

- The precautionary principle – namely that if 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;
- Inter-generational equity – namely, that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations;
- Conservation of biological diversity and ecological integrity; and
- Improved valuation and pricing of environmental resources.

The objective of 'sustainable development' is to ensure that future generations inherit a healthy and safe environment and improved living standards. This objective does not mean, however, that only 'no growth' or 'no development' options are mandatory. Ecologically Sustainable Development relates to the ability to use, conserve and enhance a particular resource in such a way that ecological processes are maintained, both now and in the future and which can achieve an improvement in present and future quality of life.

The subject lease area has been modified previously to grow oysters, as has much of the lower estuary of Wallis Lake. These operations and previous dredging have had no known detrimental impacts on the environment of the area.

A number of specialist consultants have been engaged during the preparation of this Environmental Assessment to examine the existing environment of the proposed dredge site and surrounds, to predict possible impacts and to recommend appropriate safeguards in order to ensure that the level of impacts associated with the proposed development are acceptable.

The dredging is crucial to the operation of a productive oyster lease on this site. Recovery of the sand resource, which represents a significant high quality and quantity resource is crucial to local and regional industries/development.

Dealing Cautiously with Risk

This ESD principle requires that risk, particularly the risk of irreversible ecological damage, be dealt with cautiously. In this regard, the proposal has adopted a precautionary approach to all aspects of the dredge operations and stockpiling process. The resulting environmental impacts are minimal and are considered to be acceptable.

Equity Between and within Generations

This ESD principle requires that the present generation pass onto subsequent generations an environment which is not impoverished and allows for quality of life at least equal to that of the current generation. The proposal will not lead to a degraded environment or reduced quality of life for future generations.

The proposal has been designed and managed to ensure efficient recovery of the valuable sand resource from the oyster lease site and the provision of a level of safeguards, which ensure that environmental degradation does not occur.

Maintenance of Biodiversity

In both the short and long term, the biodiversity of the dredge area, pipeline route and stockpile site and surrounding area can be conserved and maintained. The ecological integrity of the area will not be jeopardised by the proposed development. The Department of Urban Affairs and Planning's publication 'Environmental Impact Statement Practise Guideline – Extractive Industries Quarries' itemises a number of matters that are relevant to a consideration of ESD principles that would be applicable to the proposed stockpile operation. Those relevant matters are addressed in **Table 8.2**.

Improving Valuation and Pricing of Environmental Resources

This principle of ESD applies to the proposal in that it only provides employment opportunities, financial investment and infrastructure improvements, while assisting to maintain employment and investment in the region. The proposal seeks to achieve non-material well being or 'quality of life' by ensuring that the general amenity of the local area is maintained throughout and beyond the life of the project through implementation of safeguard measures to mitigate any environmental impacts and progressive rehabilitation programs. Further, by utilising the sand resource, the project will be returning investment to the community through the royalty contribution payable to the State.

The proposed development complies with ESD principles in that:

- It does not impact adversely on the environment in which it proposed to operate;
- It will incorporate environmental management as an integral component of the planning and operation of the dredge, pipeline route and stockpile area; and
- It seeks to adopt a transparent approach to environmental objectives and monitoring of dredging and stockpile operations.

The dredge operation will also be meeting the community's need for raw materials. The proposed development is thus considered to comply with the above ESD considerations.

Table 8.2 – Ecologically Sustainable Development Checklist

Item	Degree of Compliance
Effect on Cultural and Heritage Significance	No known impacts. Complies.
Likelihood of Soil/ASS Contamination	Investigations undertaken. No known risk. Complies.
Impact on Flora and Fauna	No significant adverse impacts have been identified. Complies.
Likelihood of Air, Noise or Water Pollution	No significant adverse impacts. Capable of mitigation. Complies.
Impact on health of people in neighbourhood	No likely adverse impacts. Complies.
Any hazards arising from the development	None likely. Complies.
Impact on traffic	Acceptable impacts. Complies.
Effect on local climate	No impact. Complies.
Social and economic impact	No significant adverse impacts. Significant benefits available. Complies.
Visual impact	Acceptable impacts. Complies.
Effect on soil erosion and potential for impacting the SEPP 14 Wetland	No adverse impacts likely. Complies.

8.4 CONCLUSION

The proposal to dredge the oyster lease and operate an extractive industry in the manner proposed within this Environmental Assessment would enable the re establishment of a productive oyster growing area and the further development of a substantial high quality resource of regional significance. The proposed development is capable of satisfying relevant environmental, planning and engineering objectives.

If approved by the Minister, the development will provide an increase in the productivity of high quality oysters in Wallis Lake and make available a sand resource for local and regional markets.

If approved, the project operations will be subject to requirements and conditions of Government Authorities and an Environmental Management Strategy.

Based on the details contained in this Environmental Assessment, it is considered that the proposed development could be undertaken in an environmentally acceptable manner and would not have significant adverse impacts upon the environmental, social or economic conditions of the surrounding area and region.

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Appendix A

DIRECTOR GENERALS REQUIREMENTS
NSW RTA REQUIREMENTS