

## Section 18

### Cumulative and Consequential Impacts







## 18 Cumulative and Consequential Impacts

### 18.1 Introduction

This section describes the potential relevant cumulative and consequential impacts on matters of NES as a result of the SoE Project and other relevant projects.

Cumulative impacts are defined in the Tailored EIS Guidelines as the incremental impacts of the action when combined with other past, present and reasonably foreseeable future actions. In terms of shipping, the Tailored EIS Guidelines require an assessment of known current and proposed future shipping activities by RTA and other proponents in the region and vicinity.

Consequential impacts have been assumed to be impacts that result from reasonably feasible further actions (by parties other than the proponent) which are made possible by the proposed Project.

The potential relevant cumulative and consequential impacts have been considered based on the residual impacts associated with the SoE Project.

This section is divided according to the Tailored EIS Guidelines, which are structured into two parts that can be summarised as follows:

- Section 4.5 Part A relates to potential impacts associated with the mine, Port and associated infrastructure and outlines the assessment requirements for three of the six controlling provisions (listed threatened species and communities, listed migratory species and Commonwealth marine area) associated with these activities. It requires an assessment of the matters of NES that are likely to or known to be impacted by the action.
- Section 4.5 Part B sets out the assessment requirements that are to be addressed in relation to the impacts of the Project that have not been addressed in Part A. It includes the requirement to assess impacts relating to shipping activities on all six controlling provisions.

**Section 18.2** provides details of relevant projects (including shipping activities) that have the potential for cumulative and consequential impacts on similar matters of NES as the SoE Project.

**Section 18.3** considers the cumulative and consequential impacts of activities associated with the mine, Port and associated infrastructure and relevant projects identified in **Section 18.2** on relevant matters of NES.

**Section 18.4** considers the cumulative and consequential impacts of shipping activities on the relevant matters of NES, and includes a risk assessment in accordance with the requirements of the Tailored EIS Guidelines for the Project.

## 18.2 Relevant Projects

To enable cumulative and consequential impacts to be assessed, other relevant projects require identification. A search of DSEWPaC's Public Notices and Invitations to Comment webpage and Queensland Government's Approvals and Assessment webpages was undertaken to identify possible future mining projects in the Weipa area together with RTA's knowledge of its own activities and others in the region.

Accordingly, the following relevant projects and existing operations were identified:

- Existing RTA operations north of the Embley River;
- Aurukun Bauxite Project (discontinued);
- Bauxite Hills Project;
- Pisolite Hills Project;
- Urquhart Point Mineral Sands Project;
- Roper Bar Iron Ore;
- Grey Boat Facility;
- Archer River Quarry;
- existing Port of Weipa operations;
- shipping in the Commonwealth marine area related to projects in the Gulf of Carpentaria; and,
- shipping in the GBR and the Commonwealth marine area related to projects on the east coast of Queensland.

**Figure 18-1** illustrates the location of each of the relevant projects and existing operations.

Each of these relevant projects and existing operations are further discussed in the following sections.

It is noted that Gulf Alumina Limited holds tenements west of the proposed Bauxite Hills Project (Skardon River) and south of Aurukun (South Aurukun) on which exploration for bauxite has been conducted. Gulf Alumina has not publicly initiated any State or Commonwealth environmental impact assessment processes and no specific information is available on works that may be proposed for these tenements. Given the absence of information, potential cumulative or consequential impacts cannot be assessed.

### 18.2.1 Existing RTA Operations North of the Embley River

RTA and its parent company Rio Tinto Aluminium Limited (formerly Comalco Aluminium Limited) have collectively mined and shipped bauxite from the existing mining operations located north of the Embley River since 1963. RTA is currently mining the East Weipa and Andoom deposits located on ML7024 and the adjacent Ely bauxite deposit on ML7031 (refer **Figure 2-6**). Mined bauxite is trucked to one of two beneficiation plants located at Lorim Point and Andoom, respectively. Product bauxite is railed from Andoom to Lorim Point and conveyed to RTA's stockpiles prior to shipment from the Port of Weipa (refer **Figure 2-2**).

NQBP is the port authority for the Port of Weipa and the port infrastructure is located on Strategic Port Land. NQBP undertake capital and maintenance dredging from time to time to maintain under keel clearance for ships. Activities undertaken by NQBP are separately authorised under State and Federal legislation and any impacts on matters of NES are managed under those authorisations. The Port of Weipa is primarily involved in the shipment of bauxite from RTA's operations as well as deliveries of fuel and general cargo.

Bulk carriers loaded with bauxite travel from the Port of Weipa north through the Gulf of Carpentaria. Vessels supplying international export markets (e.g. China) typically pass to the west of West Papua then east of the Philippines. Vessels supplying the refineries in Gladstone, travel to Gladstone via the Torres Strait shipping route and the inner GBR Designated Shipping Area.

Bauxite from the existing operations north of the Embley River supplies the Yarwun and Queensland Alumina Limited alumina refineries in Gladstone. The Gladstone operations are separately authorised under State and Federal legislation and any impacts on matters of NES would be managed under those authorisations.

The bauxite reserves north of the Embley River are gradually depleting and without an alternative source, the Gladstone alumina refineries would lose a viable, ongoing source of bauxite. The SoE Project would replace bauxite supply to Gladstone as the reserves north of the Embley River are depleted. The workforce currently engaged in operations at East Weipa and at Andoom would transition to the SoE operation in stages as reserves at those operations are depleted.

### 18.2.2 Aurukun Bauxite Project (discontinued)

The eastern side of ML7024 (south of the Embley River) adjoins the former MDL378 (refer **Figure 18-1**). A 6.5Mdtpa bauxite mining project (the 'Aurukun Bauxite Project') was proposed by Chalco and involved developing the part of the Aurukun Resource Area within the former MDL378 (GHD 2007a). The agreement between Chalco and the Queensland government to develop the Aurukun Bauxite Project (on former MDL378) ended on 30 June 2010. The referral for the project by Chalco under the EPBC Act (2007/3764) was withdrawn on 11 January 2012. The Queensland government has designated the Aurukun Resource Area a "restricted area" pursuant to part 188 of the *Mineral Resources Regulation 2003*. On 27 November 2012 the State of Queensland announced the opening of expressions of interest from companies interested in developing the Aurukun bauxite resource. Responses to expressions of interest closed on 15 February 2013. There is presently no proponent for the Aurukun Bauxite Project.

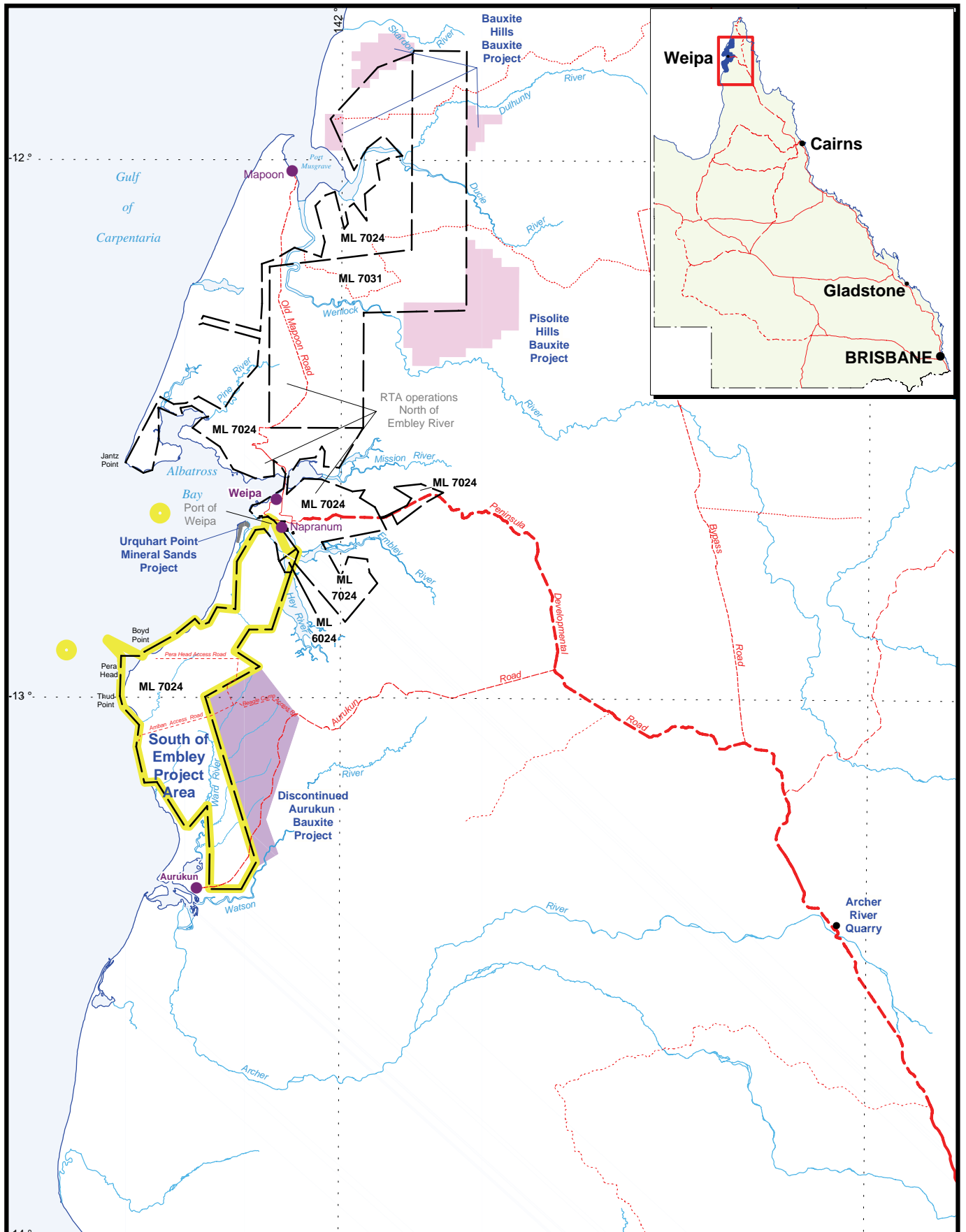
No specific information is currently available on works that may be proposed for the Aurukun bauxite resource. Therefore, in order to provide an assessment of the potential relevant cumulative and consequential impacts of developing the Aurukun bauxite resource on matters of NES, this section contains details on the discontinued Aurukun Bauxite Project proposal (GHD 2007a) where it is applicable.

The proposed Port and stockpile facilities for the SoE Project would not preclude expansion for a third party, if a suitable commercial agreement were reached between the third party and RTA and subject to the additional capacity not being required by RTA.

### 18.2.3 The Bauxite Hills Project

Cape Alumina Pty Ltd holds two Exploration Permit – Minerals (EPMs) over the Bauxite Hills Project area (EPM 15376 and EPM 16899), with an additional EPM that covers the proposed mine village and airstrip for the project (EPM 15374) (refer **Figure 18-1**). Cape Alumina is also planning to negotiate tenure with relevant landholders for transport corridors between the proposed mining areas, the proposed port located on the Skardon River and a proposed barge and ferry terminal at Mapoon (refer **Figure 18-1**). The first export of bauxite from the Bauxite Hills Project is currently planned for 2014 if relevant approvals are in place. Based on current estimated ore reserves, between 50 to 100Mdpt of bauxite would be produced over a 10 to 12 year period (average 4.5 to 9Mdtpa) from three mine areas (Cape Alumina 2012a).





- RTA Mining Lease boundary
- South of Embley Project Area
- Locality
- Drainage
- Road/track

## South of Embley Project

**Fig. 18-1: Other Proposed Projects**



10 0 10km

Datum/Projection: GDA94/MGA Zone 54 Date: 06/09/2012

The pre-feasibility study for the project has confirmed the viability of a 5Mtpa bauxite mine over a life of up to 10 years (Cape Alumina 2012b). The bauxite would be transhipped by barge to bulk carriers. Limited dredging would be required to allow for the transshipment of bauxite to bulk carriers. A shallow draft supply barge and ferry facility is also proposed at Mapoon. A fly-in fly-out workforce is proposed, with accommodation to be provided in a camp on-site. The proposed mining and infrastructure area covers approximately 2,584ha, with total disturbance anticipated to be approximately 3,479ha. Although the Bauxite Hills Project could be a standalone project, Cape Alumina have recognised that there are potential synergies that could be captured with the Pisolite Hills Project (Cape Alumina 2012a) (refer **Section 18.2.4**). The Bauxite Hills Project is likely to be considered as a second stage development once the Pisolite Hills Project is in production. The synergies that may be recognised across both projects include (Cape Alumina 2012a):

- common use of barging and transshipment operations in the Ducie River;
- common infrastructure;
- managing the workforce across the two operations; and,
- common camp facilities, vehicles and beneficiation plant.

A referral under the EPBC Act was submitted in January 2012 for the Bauxite Hills Project (Cape Alumina 2012b) and the project was determined to be a controlled action in February 2012 (EPBC 2012/6246) with the assessment being conducted by the Commonwealth government. EIS guidelines for the project were issued in August 2012. Cape Alumina (2012b) state they propose to carry out an Environmental Impact Statement under the *Environmental Protection Act 1994* (Qld), however, to date, no formal State approval process has commenced for this project.

#### 18.2.4 The Pisolite Hills Project

Cape Alumina Pty Ltd also holds two EPMs over the Pisolite Hills resource area (EPM 14547 and EPM 15278 situated 50km north-east of Weipa), with an additional EPM to cover a barge loading facility (EPM 15984) (refer **Figure 18-1**). The Pisolite Hills Project would have a potential production capacity of up to seven Mtpa of bauxite over 15 years (Cape Alumina 2012c). It was proposed that product would be trucked across ML7024 (north of the Embley River) to a barge-loading facility on the Ducie River. RTA does not currently conduct mining activity or have infrastructure in the vicinity of this proposed transport corridor. Bauxite would then be transhipped from barges to deep sea vessels offshore. A fly-in fly-out workforce is proposed, with accommodation to be provided in a camp on-site. In October 2012, the project was declared a “significant project” under the *State Development and Public Works Organisation Act 1971* (Qld) for which an EIS is required. Terms of reference for the project EIS were released by the Queensland Department of State Development, Infrastructure and Planning in December 2012. The project is a controlled action under the EPBC Act (2008/4046) and subject to a separate Commonwealth EIS process.

#### 18.2.5 The Urquhart Point Mineral Sands Project

Oresome Australia Pty Ltd is the proponent for the Urquhart Point Mineral Sands Project. The proposed project area is within mining lease application MLA 20669, a 366ha area north west of the SoE Project's Hey Point mining area (refer **Figure 18-1**). The proposed project would involve excavating sand ridges using slot mining, processing close to 700,000t of sand per annum to produce 80,000t of zircon and rutile over a project life of four years (Oresome Australia 2012a). However, where additional resources are located during exploration, the project life may be extended up to a maximum of six years. The operation would require four barge movements (two full loads to the ship and two unloaded returns to shore) on the Embley River to transfer stockpiled ore to load a ship

anchored in the Port of Weipa. This would occur four times each year during the project's operation. Shipping would not require any infrastructure, only swinging space for anchorage and a barge landing on the beach.

The project was determined to be a controlled action by DSEWPaC in May 2011 (EPBC 2010/5707) with assessment being conducted by the Commonwealth government. A final Terms of Reference for an Environmental Impact Statement under the *Environmental Protection Act 1994* (Qld.) was issued in July 2011. An EIS addressing matters under both State and Commonwealth jurisdictions was released on 26 July 2012 (Oresome Australia 2012a) with public comment ending on the 5 September 2012. A Supplementary EIS has been prepared in response to submissions (Oresome Australia 2012b).

#### **18.2.6 Roper Bar Iron Ore**

Western Desert Resources Limited plan to mine iron ore in the Roper Bar region of the Northern Territory (south western Gulf of Carpentaria) within mining lease applications MLA 28264 and MLA 28963. Ore from the Roper Bar Iron Ore Project is planned to be transported by barge from the Port of Bing Bong in the south west Gulf of Carpentaria and transferred off-shore to ocean going vessels for export. The Roper Bar Iron Ore Project will involve the shipment of up to 33 Panamax sized ships annually from the existing Bing Bong Port to Asia. The Project is a controlled action under the EPBC Act (2012/6242). An EIS addressing matters under both Northern Territory and Commonwealth jurisdictions was released on 6 June 2012 (EcOz Environmental Services 2012a). A Supplementary EIS was released on 13 August 2012 (EcOz Environmental Services 2012b). An assessment report was issued by the Northern Territory EPA in September 2012. This assessment report concluded that this project can proceed, provided that the environmental commitments, safeguards and recommendations detailed in the EIS, the assessment report and in the final management plans approved by the Northern Territory government, are implemented and subject to regular reporting and compliance auditing. The project was approved by the Commonwealth Minister for Environment with conditions in December 2012. Construction of this project is planned for 2013.

#### **18.2.7 Grey Boat Facility**

A Port Development Application was submitted to NQBP from Carpentaria Construction for the construction of a Grey Boat Facility on Lot 15 SP 116851. The proposal comprises on-shore boat maintenance facilities and mooring facilities in the Embley River. The Port Development Application was subsequently withdrawn to be amended for resubmission at a later date. This proposed facility would be adjacent to the SoE Project's proposed Humbug terminal. There is no publicly available information about this project at this stage; however, it is expected that scale of the marine works would be similar order of magnitude to the river facilities proposed for the SoE Project.

#### **18.2.8 Archer River Quarry**

The Archer River Quarry is an existing quarry located north of Coen, approximately 200km south-east of Weipa and 100km south-east of the Aurukun Road and PDR intersection. It supplies aggregate to various customers on Cape York, including TMR, Cook Shire Council and WTA. The operator has advised RTA that the supply of the material to the SoE Project, subject to commercial agreement, would not result in the need for any additional vegetation clearing at the quarry. There is therefore negligible consequential impact on matters of NES as a result of supply of aggregate from the quarry.



### 18.2.9 Shipping in the Gulf of Carpentaria

The existing Port of Weipa, operated by NQBP, has four berths (two of which are used for bauxite shipments) and is primarily involved in the shipment of bauxite from RTA Weipa's existing operations to Gladstone and other markets overseas, as well as for deliveries of fuel and general cargo. Regular maintenance dredging is conducted in the Port of Weipa as well as maintenance of navigational aids. Four tugs are resident in the Port to assist with the berthing of large vessels and pilotage services are provided by MSQ. In 2015, prior to the commencement of shipments from the proposed Boyd Port, it is predicted that there would be approximately 430 bauxite shipments per annum from the Port of Weipa depending on international market demand and vessel size. The volume of bauxite shipping using the Port of Weipa will over time decrease as the reserves north of Embley River are depleted and bauxite shipping from the proposed Boyd Port would replace much of this demand.

The Port of Weipa would also continue to receive cargo on barges from the Port of Cairns or other domestic or international ports during construction and operation of the SoE Project as well as fuel from Darwin. This would include approximately:

- 147 cargo and 16 fuel deliveries per annum during construction; and,
- 150 cargo and 22 fuel deliveries per annum during operations (at maximum production of 50mdtpa).

Cargo deliveries would include supplies for construction and operation of the SoE Project as well as supplies to support the Weipa township including an estimate for the predicted consequential increase in cargo as a result of increased population (refer to **Section 17.4.5** for discussion on population). In addition, approximately 11 chartered barges would transport cargo through the Gulf of Carpentaria from the Asia Pacific region during the construction phase of the SoE Project.

The Port of Karumba is located at the mouth of the Norman River in the south-east corner of the Gulf of Carpentaria. The Century Mine started exporting zinc concentrate through the Port of Karumba in December 1999. Zinc slurry is piped 304km to the port from the mine, dewatered, and loaded onto a 5,000t transfer vessel for the 40km journey to export ships that anchor in deep water in the Gulf of Carpentaria, about 24 nautical miles off the coast. The Century Mine is near the end of its life and is expected to cease production before the SoE Project commences production. Other facilities at the Port of Karumba provide for general cargo, fuel, fisheries products, and the export of live cattle. Currently about one bulk carrier of zinc concentrate is loaded per week. The port also acts as a trans-shipment port for Mornington Island and other gulf communities (Ports North 2011).

Skardon River, approximately 100km north of Weipa, was declared a port in February 2002 to export kaolin. To date, only limited shipments of kaolin have been shipped via the port (Ports North 2011).

The Port of Bing Bong, on the south-western corner of the Gulf of Carpentaria, provides trans-shipment of zinc/lead concentrate to ocean going vessels that anchor about 20km off-shore. The concentrate is trucked to the Port of Bing Bong from the McArthur River Mine. In recent years approximately 20 ocean going vessels per year have been loaded via the Port of Bing Bong (Ports Directory 2012).

The Port of Bing Bong is also the port to be used by Western Desert Resources Limited for the Roper Bar Iron Ore Project. The project will involve the shipment of up to 33 Panamax sized ships annually from the Port of Bing Bong to north Asia. It is not expected that the shipping route would overlap with the proposed SoE Project shipping routes in the Gulf of Carpentaria.

The existing mining operation at Groote Eylandt (GEMCO) on the western side of the Gulf of Carpentaria extracts high-grade manganese ore. The manganese ore is transported from the mine's port to destinations around the world, including Asia. It is not expected that this shipping route would overlap with the proposed SoE Project shipping routes in the Gulf of Carpentaria.

A small port is located on Thursday Island in the southern part of Torres Strait, principally servicing the needs of the island communities in the area. Milner Bay on the north-west corner of the Gulf of Carpentaria also has a small cargo wharf (Ports Directory 2012).

Anchorage for ships arriving off the Port of Weipa and awaiting berthing instructions are assigned anchorages by the VTS, as managed by the Regional Harbour Master (**Figure 3-8**).

Recreational fishing activities utilising charter boats as well as privately owned vessels are popular in the Western Cape area and utilise the Evans Landing public boat ramp within the Port of Weipa and the Rocky Point boat ramp which is not within the Port of Weipa. Commercial fishing also occurs in eastern Gulf waters, with approximately 160 licenced operators in 2006, mainly operating out Karumba, with some from Weipa (RTA 2011).

Vessels transiting between the Indian Ocean and the Pacific Ocean and not necessarily making any port calls in Australia travel through the Torres Strait, and the CMA, between Australia and Papua New Guinea. In 2011, it was estimated that approximately 3,000 vessels travelled through Torres Strait (AMSA 2012a). DNV (2011) provide an overall estimated increase in shipping in Australia of 3.6% per year and potentially this rate of increase could be expected for the Torres Strait.

## 18.2.10 Shipping on the East Coast of Queensland

**Section 11.3** provides a detailed summary of the Project-related shipping activities on the east coast of Queensland through the GBRMP and a probable long term forecast for shipping through the inner GBR Designated Shipping Area.

Based on EPBC Act referral applications to DSEWPac for the Abbot Point, Hay Point, Gladstone and Townsville ports (Multiple Cargo Facility excluded), the *Ports and Shipping Information Sheet* (GBRMPA 2012b) provides a predicted shipping number of 11,119 shipments through the GBR in 2020. For the purposes of this assessment, it is assumed that each of these vessels are regarded as ships under the GBRMP Regulations, each ship visits only one port adjacent to the GBR, each shipment results in two movements and 65% of ship movements utilise the inner GBR Designated Shipping Area (GBRMPA 2004). Therefore, it is estimated that 14,455 ship movements per annum would utilise the inner GBR Designated Shipping Area at 2020, based on the above-mentioned assumptions.

A summary of the predicted average annual shipping movements required during the operational phase of the SoE Project is provided in **Table 18-1**.

**Table 18-1 Summary of SoE Project Predicted Average Annual Shipping Movements on East Coast Queensland - Operations**

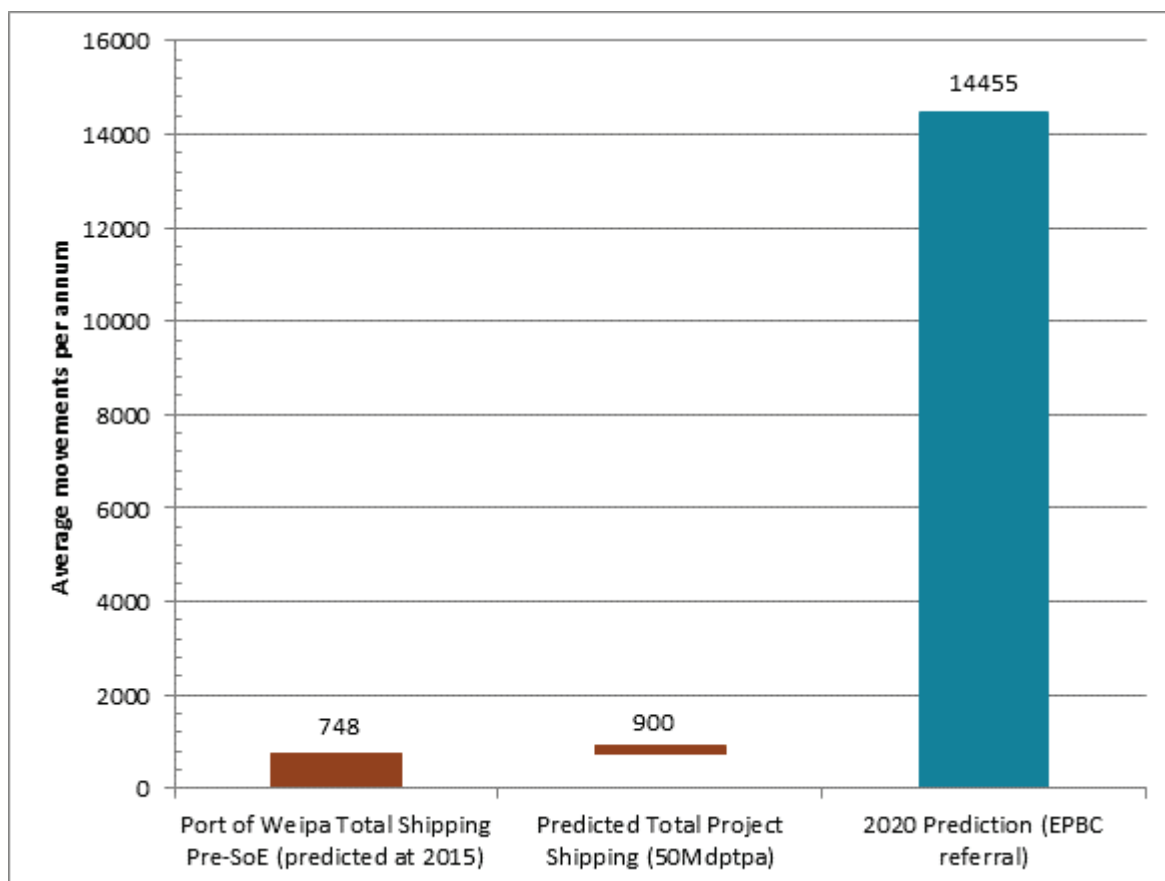
Ship Movements	Other Shipping		Bauxite	Total
	Cargo Barge	Fuel*		
Existing – before Project	208	0	540	748
Additional – Project Maximum Production	92	0	60	152
Total	300	0	600	900

\*Fuel supplies are likely to continue being sourced from Darwin, but it is recognised that this could vary in the future at the discretion of the fuel supply company.

Note: Actual shipping movements would depend on market conditions and size of ships.

Predicted operational shipping movements associated with the SoE Project compared to predicted shipping numbers at 2020 (GBRMPA 2012b) in the inner GBR Designated Shipping Area is illustrated in **Figure 18-2**. The potential additional operational shipping at maximum production (152 movements per annum) equate to approximately 1.0% of estimated 14,455 ship movements in the inner GBR Designated Shipping Area. The potential additional SoE bauxite shipping at maximum production would represent approximately 0.4% of estimated shipping movements in the inner GBR at 2020. The Project's predicted total ship movements (bauxite and cargo) of 900 would represent 6.2% of the estimated 2020 ship movements through the inner GBR Designated Shipping Area.

**Figure 18-2 Total Operational Shipping Movements Compared to Predicted Shipping Numbers**



## 18.3 Mine, Port and Associated Infrastructure

This section provides a summary of relevant aspects of the SoE Project that have the potential for cumulative and consequential impacts with relevant projects identified in **Section 18.2**, including:

- land;
- surface water;
- groundwater;
- threatened marine fauna;
- terrestrial ecosystems; and,
- aquatic ecology.

Each of these aspects is further discussed below.

### 18.3.1 Land

The following summarises the proposed land clearing activities associated with current operations and possible projects within the subregion and bioregion of the SoE Project. Relevant cumulative impacts associated with land clearing related to impacts on surface water, flora and fauna and are discussed in **Sections 18.3.2, 18.3.5.1 and 18.3.5.2** respectively.

**Table 18-2** summarises the proposed land clearing for the life of the SoE Project as well as what is known about land clearing for other relevant existing operations and possible future projects.

**Table 18-2 Land Clearing Summary**

Project	Land Clearing at End of Mine Life (ha)		
	Darwin Stringybark Woodland (RE 3.5.2)	Non-Darwin Stringybark Woodland	Total
SoE Project	29,366	292	29,658
Existing RTA Operations (north of Embley River) (Section 20.7.1, Queensland EIS, RTA (2011))	33,000*	330**	33,330
Discontinued Aurukun Bauxite Project (Section 20.7.1, Queensland EIS, RTA (2011))	9,300***	nd	nd
Pisolite Hills Project (Cape Alumina 2012c)	6,335** (maximum)	nd	6,335
Bauxite Hills Project (Cape Alumina 2012b)	2,536***	nd	2,989
Urquhart Point Mineral Sands Project (Oresome Australia 2012a)	0	110	110
Total	80,537**		
Weipa Plateau Subregion****	671,476		
Cape York Bioregion****	794,330		

\* this includes approximately 21,000ha of clearing before 2006

\*\*estimated

\*\*\*estimated for mining areas only (no data on infrastructure)

\*\*\*\*measured as of 2006

nd - no data

In the absence of publicly stated clearing rates, disturbances within RE 3.5.2 associated with the Pisolite Hills Project and the discontinued Aurukun Bauxite Project were estimated using publicly available information on bauxite reserves. For the discontinued Aurukun Bauxite Project, Pisolite Hills Project and Bauxite Hills Project there is insufficient publicly available information available on the



possible footprints of disturbance of Non-Darwin Stringybark woodland for infrastructure or other purposes for Non-Darwin Stringybark woodland clearing areas to be estimated. All publicly available information on disturbance of non-Darwin Stringybark woodland for other relevant existing operations and possible future projects is presented in **Table 18-2**.

A total of 29,658ha would be cleared within the SoE Project area, with the vast majority comprising Darwin Stringybark woodland (29,366ha). This represents 4.4% of the total area (671,476ha) of Darwin Stringybark woodland in the Weipa Plateau subregion (as mapped in 2006) and 3.7% of the Cape York bioregion. Darwin Stringybark woodland is the main ecosystem disturbed by mining in the subregion. It is estimated that if all known mining projects proceed to completion, 80,537ha of the ecosystem would eventually be cleared. However, after these cumulative impacts are taken into account, the proportion of remnant Darwin Stringybark woodland remains very high with 88.0% of the woodland (as mapped in 2006) remaining undisturbed in the subregion and 89.9% in the Cape York bioregion.

Disturbance of other non-Darwin Stringybark woodland communities by the SoE Project and Urquhart Point Mineral Sands Project would be very small, totalling only 402ha. No details are available of non-Darwin Stringybark woodland clearing for other possible bauxite mining projects, however, it is noted that such clearing represents only 1% of all clearing for the SoE Project.

### 18.3.2 Surface Water

#### 18.3.2.1 Surface Water Use

The discontinued 6.5Mdtpa Aurukun Bauxite Project was within the catchment of the Ward River estuary (GHD 2007a). While there are uncertainties as to whether mining of this resource would proceed, the operation of this project and the SoE Project simultaneously could result in a cumulative impact on the Ward River hydrologic regime. If the discontinued Aurukun Bauxite Project's surface water demands were proportional to the surface water demands of the Norman Creek beneficiation plant operating at 25Mdtpa, the water demand for that project would be 4.2GL per annum. At maximum production, the SoE Project would pump an average of 2.5GL per annum from the Ward River (refer **Section 16.2.3**). If the Aurukun Bauxite Project demand was met from a dam on a tributary of the Ward River, the cumulative overall decline in mean annual discharge to the Ward River estuary would be negligible (approximately 1.2%) and well within natural seasonal variation. The Ward River catchment makes up a minor part (3.8%) of the Archer Bay Aggregation, along with the Watson and Archer Rivers. Surface water demand associated with mining the discontinued Aurukun Bauxite Project would not have any impact on the Watson River or Archer River and therefore the impact of discharge to the Archer Bay Aggregation would also be negligible, if any. Cumulative impacts on matters of NES associated with the use of surface water from the Ward River are therefore expected to be negligible.

The Bauxite Hills Project, Pisolite Hills Project and the Urquhart Point Mineral Sands Project are all located outside of the Ward River catchment and therefore there would be no cumulative impact on the Ward River hydrologic regime as a result of any surface water demands associated with these possible projects.

Water for the Pisolite Hills Project would be sourced from a combination of the Wenlock River, shallow aquifer and surface water sources (Cape Alumina 2012c). Shallow aquifer sources of water are being investigated for the Bauxite Hills Project, located 95km north of Weipa (Cape Alumina 2012b). The Urquhart Point Mineral Sands Project is not proposing to harvest surface water or construct surface

storages such as dams or weirs (Oresome Australia 2012a). The development of any of these three possible projects simultaneously with the SoE Project would not lead to a cumulative impact on surface water.

#### *18.3.2.2 Mining and Catchment Hydrology*

The potential for bauxite mining to change the discharge from SoE Project area catchments subject to mining was assessed in **Section 16.2.4**. Modelling found there were only very small changes to the annual discharge from the overall Ward River system (–0.1% at maximum mining impact; –0.4% post-closure) resulting from the SoE Project.

The discontinued Aurukun Bauxite Project was located in the catchment of the Ward River estuary. While there are uncertainties as to the scale and nature of any future development of the Aurukun bauxite resource, the development of the SoE Project and the development of the Aurukun bauxite resource simultaneously could result in a cumulative impact on catchment hydrology in the Ward River estuary catchment.

In the absence of publicly stated areas of disturbance, estimations of mining disturbance associated with the discontinued Aurukun Bauxite Project were calculated using publicly available information on bauxite reserves. If the formerly proposed Aurukun Bauxite Project was developed then mining disturbance associated with the development of this area is estimated to total approximately 9,300ha. This would increase the potential aggregate mining disturbance in the Ward River estuary catchment from 4,650ha to approximately 13,950ha resulting in a very minor change on the annual discharge from the overall Ward River system (–0.5% at maximum mining impact; –1.1% post-closure).

The modelling indicates that the overall impact of all potential mining on catchment discharge would be much less than the normal year-to-year variation driven by rainfall variation (refer **Section 16.2**). This is consistent with the calibrated rainfall-runoff model which shows that surface run-off is extremely low and hence changes to surface drainage patterns would have little impact on overall discharge into streams. Therefore there would be negligible cumulative impacts on matters of NES associated with catchment hydrology of the Ward River system if development of the Aurukun bauxite resource was to occur.

All other possible projects are outside the Ward River catchment or any other catchments within the SoE Project proposed mining areas. Therefore any mining activities that may occur as a result of these projects would not contribute to any cumulative impacts on matters of NES associated with potential changes to SoE Project catchment hydrology.

#### *18.3.2.3 Surface Water Quality*

There is potential for cumulative impacts on surface water quality in the lower Ward River system arising from any future development of the Aurukun bauxite resource occurring simultaneously with the SoE Project.

Bauxite ore and tailings are geochemically benign and non-hazardous and any leaching from ore or tailings is not expected to have an adverse effect on water quality (refer to **Section 3.4.5** for test results). As such, two bauxite mines operating in the same catchment are unlikely to have a cumulative impact on water chemistry.

Mining activities may potentially introduce contamination to surface waters from hydrocarbon spills or sewerage. Measures proposed to minimise potential water quality impacts while handling and storage of fuels and lubricants and while undertaking sewage treatment are presented in **Section 16.2.5**.

These measures will be part of the control conditions of the Queensland EA for the SoE Project (Queensland Government 2012). Similar measures are likely to be implemented by other mining proponents and become part of the conditions of their EAs. As such, the cumulative water contamination impact of two bauxite mines operating in the same catchment is expected to be negligible.

Clearing vegetation cover for mining activities and associated infrastructure may result in elevated sediment loads in catchment runoff during some stages of mine development. Stormwater runoff generated within active mine areas would be predominantly contained within the internally draining mine pits. The post-mining landscape would effectively provide internally draining sumps that are lower than the surrounding land and which contain stormwater runoff, which would then infiltrate through the pit floor and walls. On average, a 3.4m thickness of bauxite would be removed for the SoE Project, providing a very large stormwater retention capacity within mine pits. The stormwater management measures and erosion control measures that would be implemented for mining and industrial areas of the SoE Project are described in **Section 16.2.2**.

The water quality of natural surface drainage systems would also be maintained by preserving riparian vegetation corridors. The proposed SoE environmental buffer system will exceed the minimum requirements of the Queensland Government's Regional Vegetation Management Codes as they relate to clearing set-back distances from watercourses and wetlands (DERM 2009b). The discharge from sediment control structures (and internally draining mine pits, if any) would need to pass through the vegetated SoE environmental buffers around and adjoining surface drainage lines and wetland features before entering watercourses. Slow flow velocities through vegetated buffers (due to the very flat topography of the bauxite plateau) and the retention effect provided by ground layer vegetation and leaf litter would provide additional protection against elevated sediment load risks that would otherwise impact aquatic ecosystems.

Given that less than 1% of annual incident rainfall results in direct surface runoff to watercourses, the retention of overland flow in mining pits, the stormwater control measures and the retention of riparian environmental buffers mean that it is unlikely there would be a significant impact on water quality from sedimentation and suspended solids. The stormwater controls and environmental buffers will be part of the control conditions of the Queensland EA for the SoE Project (Queensland Government 2012). The Aurukun bauxite resource is located in a very similar topographical and hydrological environment to the Project and would be expected to be mined in a similar manner. The stormwater control measures and riparian environmental buffers to be implemented by the SoE Project are likely to become part of the conditions of the EA for any future Proponent proposing to develop the Aurukun bauxite resource. As such, the cumulative water contamination impact of the two bauxite mines operating in the same catchment is unlikely to be significant.

The stockpile facilities for the SoE Project have been designed so as not to preclude a third party developer from the construction and operation of an additional stockpile, stacker, reclaimer, and conveyor. In addition, the proposed Port facility would not preclude expansion for a third party. In both cases, expansion could be carried out for a third party if a suitable commercial agreement is reached with RTA and Port capacity is available. Utilisation of common infrastructure in this manner would reduce potential cumulative impacts to surface water quality.

None of the other possible mining projects are within catchments containing SoE Project proposed mining areas. Therefore any activities that may occur as a result of these projects would not contribute to any cumulative impacts on matters if NES associated with surface water quality in these catchments.

Surface water monitoring for the SoE Project would be undertaken in the Ward River system in accordance with the Queensland EA to assess potential water quality impacts. Turbidity and a range of metals would be regularly monitored in surface waters to provide an early indicator of any potential impacts (refer **Section 16.5.1**).

### 18.3.3 Groundwater

#### 18.3.3.1 *Shallow Aquifers*

The shallow aquifers in the SoE Project area are not as uniform as those used to supply existing RTA mining operations north of the Embley River and tend to be poorly developed and discontinuous (refer **Section 16.3.1**). The bauxite layer is present typically as a laminate overlying the kaolinite layer within which poorly developed and discrete aquifers are present. As a consequence, the shallow aquifers are not as uniform as those used to supply operations on the Weipa Peninsula and it is not proposed to source water for the SoE Project from local shallow aquifers.

The Urquhart Point Mineral Sands Project proposes to source 907ML per annum from a separate shallow saline aquifer (Oresome Australia 2012b). Shallow aquifer sources were proposed as a potential source of water for the discontinued Aurukun Bauxite Project (GHD 2007a). Shallow aquifer sources of water are being investigated for the Bauxite Hills Project, located 95km north of Weipa (Cape Alumina 2012b). Given that (a) the SoE Project shall not exploit local shallow aquifers, (b) the discontinuity in shallow aquifers in the region, and (c) the geographical separation of potential projects, the development of any of these three projects simultaneously with the SoE Project would be unlikely to lead to a cumulative impact on shallow aquifers. Cumulative impacts on matters of NES associated with shallow aquifers are therefore expected to be negligible.

#### 18.3.3.2 *Artesian Aquifers*

At maximum production, the overall artesian water demand for the SoE Project averages 12GL per annum, with a peak abstraction of 15GL in any one year (refer **Section 16.4.2**). RTA has an existing Water Licence to abstract 9GL per annum from the Gilbert River Formation and Garraway Beds. Artesian aquifer sources were proposed as a potential source of water for the discontinued Aurukun Bauxite Project (GHD 2007a). Artesian water is not being pursued currently as a water source for the Pisolite Hills Project (AARC 2008, Cape Alumina 2012c). The other possible mining projects have not published any proposals to abstract artesian water.

If the discontinued 6.5Mdtpa Aurukun Bauxite Project's artesian water demands were proportional to the artesian water demands of the Norman Creek beneficiation plant operating at 25Mdtpa, the artesian water demand for that project would average 1.7GL per annum. The cumulative demand from the artesian aquifer could therefore average 13.7GL per annum.

The potential impacts of the SoE Project's artesian groundwater abstraction were modelled under two different scenarios (refer **Section 16.2.4**):

- a constant 12GL per annum over the 40 year mine life (the '12GLpa scenario'); and,
- 12GL per annum for the first 13 years and then 18GL per annum for the remainder of the 40 year mine life (the '18GLpa scenario').

The modelling results indicate that under the proposed abstraction regime (average of 12GLpa), RTA's existing Water Licence condition relating to a 5m maximum relative drawdown at specified monitoring bores would be met. The modelling predicted that the existing Water Licence condition relating to



maximum relative drawdown would also be met for an 18GLpa scenario, except for a slight exceedance of the 5m drawdown over a relatively short period of time at one monitoring bore. The results indicate that the aquifer could sustainably support abstraction rates greater than the proposed average rate of 12GL per annum.

While data on the proposed location of any artesian bores that were to supply the Aurukun Bauxite Project would be required in order to model their impact, it is likely that the cumulative drawdown arising from a cumulative abstraction rate of 13.7GLpa would be between that modelled for the 12GLpa and 18GLpa scenario.

The Queensland Coordinator General has recommended to DNRW, as the State agency administering the Water Act, that work be undertaken to determine the sustainable capacity of the Great Artesian Basin in the Cape York region to inform on any future development in the region including the Aurukun bauxite resource.

Section 39 of GAB-ROP (DNRW 2007) prescribes conditions that must be met for the chief executive to make a decision about a Water Licence, if the decision is associated with a management unit connected to a spring, and the water is for purposes other than domestic and stock watering. A decision associated with abstraction from a management unit connected to a spring is subject to the cumulative spring factor not exceeding 400mm head of water. The GAB-ROP (DNRW 2007) prescribes how the spring factors are to be calculated (refer **Section 16.4.2**).

The proposed artesian groundwater abstraction from existing and proposed new bores would take water from the Gilbert River Formation, which is connected to watercourse and recharge springs. The spring factors for those recharge springs and watercourse springs within the Dividing Range closest to the existing and proposed borefields were calculated by multiplying the spring factor multiplier by the abstraction rate for the two abstraction rate scenarios (12GLpa and 18GLpa). The calculated spring factors are presented in **Table 16-27**. The calculated spring factors represent the highest possible cumulative spring factor for each spring because the spring factors are calculated on the assumption that all of the water is abstracted from the closest bore.

The calculated spring factors for both the 12GLpa and 18GLpa scenarios are all well below the spring factor limit of 400mm head of water (the highest calculated spring factor was 144mm head of water), demonstrating that the spring factor requirement would be met in all cases. The spring factor requirements for recharge springs and watercourse springs within the Dividing Range would also be met in all cases under a cumulative 13.7GLpa abstraction scenario.

It should be noted, that an EPBC Act Protected Matters search was conducted of the pre-defined Cape York NRM region (accessed on 25/03/2011). The search identified the potential occurrence of discharge springs within the Cape York Management Area. The discharge springs are identified through association with the threatened ecological community 'The community of native species dependent on natural discharge of groundwater from the Great Artesian Basin', a matter of NES. The listing advice for the community identifies that these springs are only associated with discharge springs and are an endangered ecological community. Recharge springs and watercourse springs are not associated with this endangered ecological community.

However, the Protected Matters database is in error in regard to the geographical location of this endangered ecological community (refer **Section 16.3.4**) and discharge springs are not associated with the Cape Management Area or the Project area. Cumulative impacts on matters of NES associated with discharge springs are not expected to occur.

### 18.3.4 Marine Ecosystems

Full details of the proposed marine facilities for the SoE Project are described in **Sections 3.6 and 3.7**. These facilities would include the proposed Port and the barge and ferry terminals in the Hey and Embley Rivers as well as temporary barge and ferry access near the Port during site establishment. Dredge spoil from the proposed Port would be disposed at the proposed new spoil ground 17km west of Boyd Point and dredge spoil from the new river facilities would be disposed of at the existing Albatross Bay spoil disposal ground. The proposed Port is in a remote, undeveloped location approximately 40km south of the existing Port of Weipa. The reasons the location was chosen for the proposed new spoil ground, as well as the alternatives considered, are discussed in **Section 3.12**.

#### 18.3.4.1 Dredging Activities

Capital dredging required for the new marine and river facilities are detailed in **Section 3.8** and are summarised in **Table 7-9**.

Subsequent capital and maintenance dredging would be undertaken as required under a separate Sea Dumping Permit. The initial capital dredge volume for the Port (2.6 million cubic metres) would require (on average) annual maintenance dredging of approximately 490,000m<sup>3</sup> to maintain under keel clearance for ships. Based on the maximum 6.5 million cubic metres of capital dredging for Stage 1 of the Port, average annual maintenance dredging of approximately 890,000m<sup>3</sup> is expected to be required. Once the wharf is extended (Stage 2), an extra 2,400,000m<sup>3</sup> of capital dredging and 280,000m<sup>3</sup> on average of annual maintenance dredging would be required. Spoil from subsequent capital and maintenance dredging at the Port would be disposed of at the proposed new spoil ground.

The existing Albatross Bay spoil ground would be used to receive spoil from the capital and maintenance dredging activities at the barge/ferry terminals in the Embley and Hey Rivers. The proposed volume of additional spoil that would be deposited at the existing Albatross Bay spoil ground is less than 10% of the annual average dredge volumes (2002 – 2008) of approximately 950,000m<sup>3</sup> (RTA 2011) from the Port of Weipa. Therefore it is not anticipated that any cumulative impacts on relevant matters of NES would result due to the additional minor volume of spoil associated with dredging at the barge/ferry terminals in the Embley and Hey Rivers being deposited at the Albatross Bay spoil ground. The discontinued Aurukun Bauxite Project proposed to include construction and operation of a jetty, wharf and berth pocket area approximately 1.5km south of Boyd Point, requiring dredging and disposal of sediments related to these marine facilities. On-shore facilities associated with this port were proposed to be located on ML7024 (GHD 2007a). There is a lack of information about any port facilities associated with the discontinued Aurukun Bauxite Project, however dredging and disposal of dredge spoil associated with these facilities may result in cumulative impacts on relevant matters of NES in waters in the Boyd Point area. Without details of the facilities and proposed volumes of dredged material or disposal locations, the nature and significance of such impacts cannot yet be assessed, but may include impacts on corals at Boyd Point and other benthic environments, increased turbidity, underwater noise and the risk of entrainment of marine fauna in dredge equipment.

Some dredging is likely to be required (estimated between 700,000 to 1,400,000m<sup>3</sup>) for the Bauxite Hills Project (if it is a standalone project) to deepen the access channel from the open waters of the Gulf to the barge loading facility within the Skardon River, approximately 115km north of the SoE Project (Cape Alumina 2012b). This would allow for the transport of bauxite via barge from the Skardon River for transshipment to bulk carriers. The use of a moored bulk carrier to supply offshore storage for waiting export vessels is also being considered for the Bauxite Hills Project which may limit or remove the need for dredging within the Skardon River.

Similarly, if the Pisolite Hills Project was to proceed some minor dredging works (approximately 230,000m<sup>3</sup>) would be required to provide for the safe passage of barges out of Port Musgrave to bulk carriers anchored offshore. This dredging would occur approximately 85km north of dredging activities for the SoE Project river facilities and approximately 110km north of Boyd Port dredging and disposal activities. If the synergies between the Bauxite Hills and Pisolite Hills Projects are realised, then dredging required for the Bauxite Hills Project as a standalone project would not be required.

Although it is not known exactly where the spoil disposal for the Bauxite Hills and/or Pisolite Hills Projects would be disposed of, due to the cost of transport of dredge spoil, it is likely to be at least 50km from the Albatross Bay spoil ground and 75km from the proposed new spoil ground for the SoE Project. It is unlikely that capital dredging activities associated with the SoE Project, the Bauxite Hills and/or the Pisolite Hills Project would occur simultaneously and it is considered unlikely that cumulative impacts on relevant matters of NES would result from dredging activities associated with these projects on a local scale. Given the likely distance of the other projects from the SoE Project, any potential cumulative impacts associated with dredge spoil disposal and resultant changes in water quality on the off-shore marine environment is likely to be negligible.

It is anticipated that capital and maintenance dredging would be required for the Grey Boat Facility, however, actual volumes of dredge material is unknown. If dredging activities for the Grey Boat Facility occurred concurrently with dredging activities for the proposed SoE Project Humbug terminal, impacts on the habitat of threatened marine and migratory species utilising habitat within the Embley River would occur. Although it is unknown what the dredging requirements of the Grey Boat Facility would be, it is understood that dredge volumes would be small given that relatively small vessels would utilise the facility. Therefore if dredging activities for both projects occurred concurrently, the cumulative impacts on habitats of threatened marine and migratory species in the vicinity of dredging and spoil disposal operations is considered to be unlikely to be significant.

No dredging is proposed in association with the Urquhart Point Mineral Sands Project.

#### *18.3.4.2 Pile Driving Activities*

Underwater noise associated with marine pile driving activities during the construction of Port facilities for the SoE Project may result in temporary displacement of marine fauna (refer **Section 15.3.2** for potential effects on listed threatened and migratory marine and estuarine fauna). If pile driving for multiple projects were to occur in this vicinity at the same time, there may be some short-term cumulative impacts associated with marine fauna having reduced areas of habitat. However, it is unlikely that these works would occur at the same time, and there are large distances of at least 85km between projects (apart from the discontinued Aurukun Bauxite Project). Modelling shows underwater noise would have only a localised effect (**Section 15.3.2.1**) and predicts that the maximum distance for behavioural disturbance for sensitive marine species would be 1,580m for Bryde's Whale, 630m for marine turtles, and 500m for dolphins and Dugongs. This would be relevant for a scenario where three piling rigs are operating simultaneously (one 1,500mm and two 1,050mm piling rigs) and is the largest potential impact. Impacts are predicted to be less if three rigs were operating on a different combination of piles, or if less than three rigs were operating. It is therefore considered that cumulative impacts on listed threatened and migratory species as a result of marine piling activities are unlikely.

#### *18.3.4.3 Bauxite Shipping in the Weipa Area*

The proposed Port for the SoE Project would be located approximately 45km from the existing Port of Weipa, which are the only existing port operations in the area. As discussed in **Section 18.2.10**, while there would be increased bauxite shipping activities associated with the SoE Project there would over time be progressive decreases in bauxite shipping from the Port of Weipa. The Port of Weipa will continue to be used for cargo and fuel deliveries (refer **Section 18.2.9**), and export of cattle, and remain for future bauxite shipments from resources north of the Embley River.

Whilst some deliveries would be made directly to the proposed Boyd Port area during construction, once operating the primary function of Boyd Port would be for shipments of bauxite. Boyd Port would not be used for bulk fuel or chemical deliveries, bunkering or hull cleaning.

There is limited suitable foraging habitat for Dugong, marine turtles, Estuarine Crocodiles or cetaceans in the shipping channel for the proposed wharf and shipping outside the Port area would be in deeper water channels, so the risk of boat strike by bulk carriers at the Boyd Port and the risk of alienation from habitat would be low. While these species may move through the proposed Boyd Port area when periodically migrating between feeding areas, the proposed Boyd Port and Port activities do not represent a barrier to migration that is likely to result in any meaningful impact on populations of any listed threatened or migratory marine species in the region.

As a result of the distance between the two facilities, it is considered that there would be negligible cumulative impacts on matters of NES within the vicinity of the SoE Project area associated with the joint operation of the Port of Weipa and Boyd Port.

Potential impacts from shipping activities in the vicinity of the SoE Project area on listed threatened and migratory marine species are described in **Sections 7.3.5, 7.4.5, 9.3.4, 9.4.4 and 9.5.4** and include boat strike and alienation from habitat, which may affect Dugongs, cetaceans and marine turtles.

The publicly available information on the number of bulk carrier movements for other potential projects in the Gulf of Carpentaria is summarised in **Table 18-3**.

SoE bauxite shipping would be expected to commence in or about 2016 (or approximately three years after the commencement of construction) subject to the grant of relevant environmental or other regulatory approvals, the determination of internal investment approvals for the Project by Rio Tinto, and the construction schedule). As production from SoE increases there would be a decrease in bauxite shipments from the north of Embley River as mining operations there reduce. If all potential projects in the Gulf of Carpentaria area were to proceed, the number of bulk carriers through the Gulf of Carpentaria would increase. There is insufficient publicly-available information on the numbers of ships other than bulk carriers; however, it can be assumed that these would increase in proportion to bulk carriers. While these proportional increases appear relatively large, the increase in absolute terms is minor and the shipping movements through the Gulf of Carpentaria, inclusive of that generated by the Project, shall remain at relatively low levels. In addition, given the Bing Bong and Groote Eylandt Ports are on the western side of the Gulf of Carpentaria the shipping routes would have limited interaction with the proposed SoE Project shipping routes. Several of the other projects, including Pisolite Hills, Bauxite Hills and Urquhart Point, are of relatively short duration and if they progress under the proposed timeframes, are likely to be completed by the time the SoE Project reaches maximum production (which would only occur if market conditions allow). The Century Zinc Mine, which ships from the Kurumba Port, is nearing the end of mine life and is also unlikely to be shipping at the same time that the SoE Project commences maximum production.



**Table 18-3 Cumulative Bulk Carrier Port Calls in the Gulf of Carpentaria Area (assuming all projects proceed)**

	<b>Prior to SoE Project commencing</b>	<b>22.5Mdtpa Production at SoE Project (ships / year)</b>	<b>Maximum Production at SoE Project (ships / year)</b>
Boyd Port*	0	260 - 320	540 - 700
Port of Weipa*	420 - 450	125-150	0
Aurukun Bauxite Project (discontinued)	0	95	95
Pisolite Hills Project	0	54-98	0 <sup>#</sup>
Bauxite Hills Project	0	49-126	0 <sup>#</sup>
Urquhart Point	0	4	0
Karumba Port	52	0	0 <sup>#</sup>
Bing Bong Port**	38	61	94
Groote Eylandt***	120-150	120-150	120-150
<b>Total</b>	<b>630 - 690</b>	<b>868-1004</b>	<b>855-1005</b>

\* Number of ships will vary depending on actual production rates and size of vessels

\*\* Includes estimate for McArthur River Mine expansion to 5.5Mt (approved by NT Government in July 2012) and the Roper Bar Iron Ore Project

\*\*\* Estimate based on production of 4Mt and use of handy size bulk carriers

<sup>#</sup> Short term project or nearing end of mine life, assumed complete by the time SoE Project reaches full production

As part of the discontinued Aurukun Bauxite Project proposal, a second port near Boyd Point designed to accommodate a nominal 70,000 dead weight tonne Panamax vessel was proposed (GHD 2007a). The operation of two ports near Boyd Point may result in cumulative impacts relevant matters of NES in the area as a result of the increased risk of marine oil spills associated with increased bulk carrier interactions and other vessel interactions.

RTA would develop a Vessel Traffic Management Plan and submit the plan to MSQ, which would assist in managing bulk carrier and vessel interactions in the proposed Boyd Port area and reduce the possibility of a collision (Appendix 2, RTA 2012). If a port was constructed and operated for the Aurukun bauxite resource, a similar management plan would be required by MSQ. Implementation of these management plans would ensure that any potential cumulative impacts on relevant matters of NES as a result of potential marine oil spills associated with increased bulk carrier interactions and vessel interactions from two ports would be minor.

Stage 1 of the SoE Project wharf would be designed and constructed to permit a future extension to provide additional berths. The proposed SoE Project Port facility would not preclude expansion for a third party, if a suitable commercial agreement were reached between the third party and RTA and subject to the additional capacity not being required by RTA. Utilisation of common infrastructure in this manner would reduce potential cumulative impacts to the marine environment associated with constructing and operating two ports.

Cape Alumina proposes to transport ore from the Pisolite Hills Project to a barge loading facility on the eastern side of Port Musgrave, via a proposed haul road (Cape Alumina 2012c). Ore is proposed to be transported by barge for loading onto off-shore moored Panamax or Capesize vessels. Facilities are proposed to be constructed for receiving small barges to supply goods to the mine and camp by sea. If the Bauxite Hills Project is operated as a standalone project, it is proposed that a barge loading facility would be operated on the Skardon River, with barges transporting product to Panamax or Capesize vessels for export (Cape Alumina 2012c). However, if synergies between the Bauxite Hills

and Pisolite Hills Projects are realised then transshipment of bauxite to bulk carriers would originate from the same location. Either way, if one or both of these projects were to proceed either as separate projects or by sharing transshipment facilities and operate simultaneously with the SoE Project, cumulative impacts associated with interactions with bulk carriers and commercial and recreational vessels would be unlikely as each of the possible ports are geographically remote of each other.

Shipping from the Urquhart Point Mineral Sands Project would not require any infrastructure, only swinging space for anchorage. The operation would require only 16 barge movements annually (8 loaded and 8 unloaded) on the Embley River to transfer stockpiled product to a ship anchored in the Port of Weipa.

The increase in shipping in the Weipa area in absolute terms is minor and the shipping movements through the Gulf of Carpentaria, inclusive of that generated by the Project, shall remain at relatively low levels compared to the shipping levels on the east coast of Australia.

Generally, more vessels in a given area increases the likelihood of a vessel collision or grounding that may result in a spill of oil or cargo (noting that none of the product cargoes associated with the possible projects are marine pollutants). This risk is managed to some extent through port traffic management schemes that include vessel separation and vessel tracking to minimise the risk of collisions. All vessels are required to anchor offshore in areas designated by the Harbour Master until they are given berthing instructions, at which time tug support is also made available to the vessel (refer **Section 4.5.3.3**).

More vessels also increases the risk of a vessel striking marine fauna, although vessels in port areas will generally be moving slowly and will be operating in deep water channels. Overall, SoE Project-related vessel movements are likely to have a low risk of impact on Dugongs in the vicinity of the proposed Port as important habitat would not be significantly impacted, and there is a low risk of vessel strike and other direct impacts. The potential for boat strike on dolphins would be less than for Dugongs as dolphins are more agile and able to better react to and avoid approaching vessels (refer **Section 9.4.4** and **9.5.4**). There is the possibility of impacts on marine turtles from both boat strike and alienation from habitat by shipping activities at the SoE Project's Port site. Unlike the Dugong, there is no available information to demonstrate that shipping activity alienates marine turtles from their habitat. Marine turtles are known to co-exist in areas with very high levels of shipping activity (e.g. in Gladstone Harbour). The additional impacts on marine fauna from increased shipping rates in the Weipa area are unlikely to be significant due to the slow movement of these bulk carriers. There have been no shipping incidents that have caused environmental harm in over 40 years that RTA has been shipping in the area.

Marine turtles are likely to nest in the port areas proposed for the discontinued Aurukun Bauxite Project (GHD 2007b) and the Bauxite Hills Project (Cape Alumina 2012b). The Speartooth Shark and three Sawfish Species (Green, Narrow and Freshwater) have been identified in vicinity of the Bauxite Hills Project (Cape Alumina 2012b). However, the potential cumulative impacts of boat strike on these species as well as other marine and migratory species as a result of increased shipping activities associated with other potential projects is unlikely to be significant due to the slow movement of bulk carriers.

Anchor chains have the potential to structurally damage the benthos and associated communities at the anchorage areas and therefore potentially impact on foraging areas for marine and migratory species. The Regional Harbour Master has indicated that the preferred arrival and anchorage area for bulk carriers to Boyd Port would be the existing anchorage area for the Port of Weipa (refer **Figure 3-8**). The existing anchorage area is in Queensland coastal waters outside of the Port of

Weipa limits. The location of the anchorage area is subject to the direction of the Regional Harbour Master. Vessel queuing is not expected to be an issue at the Weipa anchorage area as the supply chain for the proposed Boyd Port would be controlled by RTA. The use of the existing anchorage area rather than developing a separate anchorage area for the SoE Project would therefore result in negligible cumulative impacts on potential marine species foraging or habitat areas.

Discharges to air from shipping, including particulates and nitrogen and sulphur oxides, are primarily considered a human health issue in populated areas surrounding busy ports rather than having impacts on environmental values. Increased shipping from other possible projects in the area would not all be using the same port, and the port facilities in the area have a limited number of berths, so at no time would there be a large concentration of vessels in a small area close to human populations. It is not considered that cumulative impacts from these discharges to air would have any impacts on matters of NES.

Potential cumulative impacts associated with shipping through the CMA and the GBR are addressed in **Section 18.4**.

#### *18.3.4.4 Lighting*

If it was to operate as a standalone project, the Bauxite Hills proposed port facilities are within the vicinity of the Mapoon area of coastal beaches that provide suitable and regionally important nesting habitat for the Flatback Turtle, the Olive Ridley Turtle, the Hawksbill Turtle and the Green Turtle. The Bauxite Hills Project has considered adopting turtle friendly lighting approaches if required. The proposed port for the Bauxite Hills Project would not be required if synergies with the Pisolite Hills Project associated with the transshipment of bauxite to bulk carriers is realised.

The only marine turtles expected to be impacted by the Urquhart Point Mineral Sands Project are reported to be the Green Turtle and Flatback Turtle. The Urquhart Point Mineral Sands Project area contains suitable habitat for both species, and both were encountered during surveys for this project. Flatback Turtles are also known to nest adjacent to the Urquhart Point Mineral Sands Project area. Although the areas of impact would not overlap that of the SoE project, there may be a cumulative impact on marine turtle nesting from lighting. The Urquhart Point Mineral Sands Project is proposing to restrict operations to daylight hours, and minimise other uses of lighting at night. Furthermore, lighting technology (including use of colour, intensity and positioning) would be adopted to limit the impacts of light on hatchling turtles (Oresome Australia 2012a).

The lighting mitigation measures for marine turtle hatchlings that may be impacted by the operation of Boyd Port are discussed in **Section 7.3.5**. It has been identified that marine turtle species may occur in the Port Musgrave area which would be in the vicinity of the port facilities for the Pisolite Hills Project if it were to proceed. Bell (2003) has recorded turtle nesting sites both north and south of Port Musgrave. No information on proposed lighting mitigation measures for the Pisolite Hills Project port is available, however it is assumed that as this project is owned by the same company that owns the Bauxite Hills Project (Cape Alumina 2012b) that similar lighting mitigation measures would be implemented to reduce the potential for hatchling disorientation from lighting.

The port facilities for the various possible projects would not impact on the same marine turtle nesting beaches or populations. Given the only low amount of marine turtle nesting activity in the area of Boyd Port, it is not considered that the SoE Project would have a significant contribution to cumulative impacts from lighting on turtle hatchlings at a regional scale. This risk would be further reduced by the implementation of the proposed lighting impact mitigation measures and feral pig control program (refer **Section 7.3.6.4**).

#### *18.3.4.5 Small Vessel Activity*

This section discusses the potential cumulative impacts associated with small vessel activities on threatened marine and migratory species. Cumulative impacts associated with the operation of port facilities and marine shipping activities are discussed in **Sections 18.3.4.3 and 18.4**.

A small increase in vessel traffic would occur within the Embley/Hey River estuaries due to barge, passenger vessel and other small vessel movements between the Hey River terminal and Hornibrook and Humbug terminals associated with the SoE Project, as well as tugs and small vessel movements between the Port of Weipa and Boyd Port. These movements are additional to existing commercial and recreational boating undertaken from Weipa, and may result in cumulative effect of potential boat strikes on marine and migratory species that may utilise these estuaries. The population in Weipa is not expected to increase significantly as a result of the Project (Section 16 of RTA 2011) and nor are recreational vessel movements.

If it was to operate as a standalone project, Cape Alumina proposes to operate a ferry in the Skardon River to transport personnel for the Bauxite Hills Project (Cape Alumina 2012b). Seagrass beds in the form of fringing patches adjacent to mangrove communities exist in the Skardon River, however, no large meadows have currently been identified in this area (Cape Alumina 2012b). Seagrass meadows are potential foraging habitat for Dugongs and Green Turtles. The operation of this ferry may increase the risk of boat strike on both species that may utilise the seagrass beds.

Boat strike on Dugong, marine turtles and cetaceans has been identified as a risk associated with the operation of the ferry in the Embley River for the SoE Project. For the SoE Project, transit lanes for the ferry would be defined to reduce the overall area of disturbance from vessel activities and where possible, these transit lanes would generally follow greater water depths to avoid significant meadows of seagrasses. Slow moving displacement vessels such as barges do not pose a boat strike risk.

The Urquhart Point Mineral Sands Project proposes to transport personnel to and from the site on a daily basis by water taxi from Evans Landing, and to transport plant and equipment to the site, via barge. Heavy mineral product would be loaded onto a barge for transfer to a larger bulk vessel anchored off shore, which would require only four barge movements (two loaded and two unloaded) on the Embley River four times each year of the project's operation (Oresome Australia 2012a). It is unlikely that the cumulative impact associated with boat strike from small vessels as a result of possible projects operating concurrently would have a significant impact on threatened marine and migratory species.

#### *18.3.4.6 Fishing Activities*

Threats to listed threatened sawfish and Speartooth Shark populations include incidental capture in fishing nets as well as recreational 'trophy' fishing (refer **Section 7.4.1 and 7.4.2**). The population in Weipa is not expected to increase significantly as a result of the SoE Project (Section 16 of RTA 2011). The Urquhart Point Mineral Sands project would only employ at most 13 personnel, likely to be drawn predominantly from existing residents of Weipa and nearby Napranum (Oresome Australia 2012a). Fly-in fly-out workforce arrangements have been proposed for the discontinued Aurukun Bauxite Project (GHD 2007a), Pisolite Hills Project (Cape Alumina 2012b) and Bauxite Hills Project (Cape Alumina 2012a) and therefore any consequential population increases in Weipa and Napranum from these projects is not likely to be significant. Overall, it would be unlikely that the consequential impact of recreational or charter fishing on sawfish species and the Speartooth Shark would increase as a result of cumulative population increases in Weipa and Napranum associated with possible mining projects.



### 18.3.5 Threatened Terrestrial Flora, Fauna and Avian Migratory Species

#### 18.3.5.1 Threatened Terrestrial Flora

Any impacts on listed threatened flora would occur during the construction and operational phases of the SoE Project. Direct impacts on vegetation would occur as a result of vegetation clearing within the proposed mining areas, and a much smaller area for the construction of SoE Project infrastructure. Clearing for mining would be restricted to the bauxite plateau and would primarily affect Darwin Stringybark woodland, whilst disturbance of vegetation for infrastructure would mainly affect Darwin Stringybark woodland and riparian gallery forest. Air quality studies completed concluded that potential impacts would be minor and localised and that dust deposition would have a negligible impact on vegetation (refer **Section 14.3**). A total of 29,658ha would be cleared within the SoE Project area, the vast majority comprising Darwin Stringybark woodland (29,366ha). Of the six threatened flora species that are either known, likely or could possibly occur in the SoE Project area, none are known to occur in Darwin Stringybark woodland on the Weipa bauxite plateau. None of the six threatened flora species were found during field surveys in Darwin Stringybark woodland within the SoE Project area. Given the lack of suitable habitat in the mining areas, it is unlikely that threatened flora would be cleared as a result of mining for the SoE Project.

Two threatened species, the Cooktown Orchid and the Chocolate Tea Tree Orchid were found during field surveys in areas to be cleared for SoE Project infrastructure. The Cooktown Orchid was found in two pockets for riparian rainforest in the footprint of Dam C, in the vicinity of the infrastructure corridor crossings on Norman Creek, and in the vicinity of road crossings of Norman Creek and Winda Winda Creek (refer **Section 5.4.2**). The Chocolate Tea Tree Orchid was not found within the Dam C footprint but was found within the infrastructure corridor where it crosses the tributary of Norman Creek below Dam C (refer **Section 5.5.2**). Given that the vast majority of known and potential habitat for both these species is in areas not suitable for mining and are within the proposed SoE environmental buffers (**Section 6.3.4.5**) protecting riparian areas, the impact on these species associated with the SoE Project would not be significant (refer **Sections 5.4.4** and **5.5.4**).

Non-Darwin Stringybark woodland is potential habitat for the Cooktown Orchid or Chocolate Tree Orchid. Disturbance of non-Darwin Stringybark woodland by the SoE Project and other projects is described in **Table 18-2**. Given that potential mining areas for other possible bauxite mining projects (Bauxite Hills, Pisolite Hills, and the discontinued Aurukun Bauxite Project) are situated on the Weipa bauxite plateau in areas dominated by Darwin Stringybark woodland, it is unlikely that there would be a cumulative impact on the Cooktown Orchid or Chocolate Tree Orchid due to mining. The Urquhart Point Mineral Sands Project area is defined by coastal landforms, predominantly tidal flats and beaches, estuaries, coastal dune systems dominated by open shrub and woodland communities, interspersed with coastal vine thicket copses. Lower parts of the site are associated with mangrove and Melaleuca communities (Oresome Australia 2012a). Cumulative impacts on terrestrial flora are likely to be limited because the Urquhart Point Mineral Sands Project area contains very different geology and ecology to the SoE Project area.

Flora surveys of the Urquhart Point Mineral Sands Project area found the Cooktown Orchid present in the majority of vine thicket copses throughout the site, and adjacent vine forest ecotones. Oresome Australia (2012a) states that the Cooktown Orchid would be impacted by proposed future clearing of 80.5ha of RE 3.2.2, 5.7ha of RE 3.2.5a/3.2.25 and 15.4 ha of RE 3.2.3. In addition 0.25ha of RE 3.1.1a/3.1.3/estuary would be cleared (Oresome Australia 2012a). RE 3.1.1a is considered to be potential Cooktown Orchid habitat (RTA 2011). Oresome Australia (2012a) concluded that given the species' extensive geographic range and local abundance, regional scale impacts on the Cooktown

Orchid are expected to be minimal. Of the RE's proposed to be disturbed for the Urquhart Point Mineral Sands Project, the only RE proposed to also be disturbed by the SoE Project is RE 3.1.1a, and only 0.04ha would be disturbed. REs 3.2.2, 3.2.5a, 3.2.25 and 3.2.3 are present on the SoE Project area but would not be disturbed for mining or infrastructure and would be protected from direct and indirect impacts by the proposed SoE environmental buffer system.

Oresome Australia (2012a) concluded that although the Chocolate Tea Tree Orchid was not recorded from the project site during flora surveys, potential habitat exists and it possibly occurs on site. Oresome Australia (2012a) states that the Chocolate Tree Orchid could potentially be impacted by proposed future clearing of 80.5 ha of RE 3.2.2 and 15.4 ha of RE 3.2.3 but impacts on the species are not significant. REs 3.2.2 and 3.2.3 are present on the SoE Project area but would not be disturbed for mining or infrastructure and would be protected from direct and indirect impacts by the proposed SoE environmental buffer system.

The Bauxite Hills Project area contains RE's that are potential habitat for both the Cooktown Orchid and Chocolate Tea Tree Orchid (Cape Alumina 2012a) and both of these species possibly occur within the project area. Cape Alumina (2012a) concluded that based on available mapping, no potential habitat for these species occurs within the proposed mining footprint. Cape Alumina (2012a) states that habitats of these species are not the focus of the proposed development footprint and recommends the following mitigation measures for threatened flora:

- developing buffer areas from mining activities;
- limiting clearing to the minimum possible extent where practicable;
- undertaking pre clearing surveys and developing a translocation plan for any threatened flora species identified in areas where clearing cannot be relocated; and,
- development and implementation of a weed management plan and fire management plan.

Cape Alumina (2012c) states that the Chocolate Tea Tree Orchid is known to occur in the Pisolite Hills Project area, however, there is no publicly available information on proposed clearing areas of non-Darwin stringybark woodland for the Pisolite Hills Project (refer **Table 18-2**). The Pisolite Hills Project mine and port infrastructure plan (Cape Alumina 2012c) shows some linear infrastructure crossing watercourses. It is likely that suitable habitat would only be cleared for linear infrastructure such as roads, pipelines or conveyors, or other mining-related infrastructure, but not for mining.

Chalco Australia Pty Ltd (2007) states that the Cooktown Orchid may be present in the project area, however, there is no publicly available information on proposed clearing areas of non-Darwin Stringybark woodland for the discontinued Aurukun Bauxite Project (refer **Table 18-2**). It is likely that suitable habitat would only be cleared for linear infrastructure such as roads, pipelines or conveyors, or other mining-related infrastructure, but not for mining.

The stockpile facilities for the SoE Project have been designed so as not to preclude a third party developer from the construction and operation of an additional stockpile, stacker, reclaimer, and conveyor. Expansion could be carried out for a third party if a suitable commercial agreement is reached with RTA and capacity is available. Although it is unlikely that separate infrastructure would have a significant impact, utilisation of common infrastructure in this manner would reduce potential cumulative impacts on threatened flora.

Based on the above information, the clearing of habitat for the Cooktown Orchid and Chocolate Tea Tree Orchid for the SoE Project, and other possible mining projects, is considered to be unlikely to result in a significant cumulative impact on either of these threatened flora species.

### 18.3.5.2 Threatened Terrestrial Fauna

Direct impacts on potential habitat for threatened fauna would be associated with the removal of vegetation to accommodate mining and SoE Project infrastructure. An assessment of the likely impact of the Project on threatened fauna has been made based on a review of the literature, multiple field surveys, an assessment of the suitability of various RE's as habitat, and the application of mitigation measures (refer **Section 6**). Although no threatened fauna species were found during any of the multiple field surveys, potentially suitable habitat exists in the Project area for the Red Goshawk, Masked Owl and Northern Quoll. A summary of the results of this assessment is presented in **Table 18-4**.

**Table 18-4 Summary of Habitat Suitability and Residual Impacts for Threatened Fauna Species within the Project Area**

Species	Moderate Suitability Habitat Disturbed (ha)  (as % of habitat in Weipa subregion)	High Suitability Habitat Disturbed (ha)  (as % of habitat in Weipa subregion)	Residual Impact	EIS Section Cross Reference
Red Goshawk ( <i>Erythrotriorchis radiatus</i> )	24,680 (3%)	4,899 (0.4%)	Minor	6.3.3 6.3.4
Masked Owl ( <i>Tyto novaehollandiae kimberli</i> )	326 (3%)	No disturbance	Minor	6.4.3 6.4.4
Northern Quoll ( <i>Dasyurus hallucatus</i> )	184 (4%)	No disturbance	Minor	6.5.3 6.5.4

The habitat that is moderately suitable for the Masked Owl and Northern Quoll and would be cleared for Dam C is riparian gallery forest. The habitat that is of high suitability for the Red Goshawk which would be cleared includes the riparian gallery forest (within Dam C footprint) and Darwin Stringybark woodland within 1km of permanent or near permanent water (and within mining or infrastructure footprints). Darwin Stringybark woodland within 8km of high suitability habitat is considered to have moderate suitability for the Red Goshawk. The various mitigation measures proposed for the Red Goshawk, Masked Owl and Northern Quoll to reduce the impacts of the SoE Project on these species are described in **Section 6.3.4**, **Section 6.4.4** and **Section 6.5.4** respectively. It has been concluded that, were the Red Goshawk, Masked Owl or Northern Quoll to be present in the SoE Project area, there would be only a minor residual impact on each species due to Project-related activities.

Air quality studies completed concluded that potential impacts would be minor and localised and that dust deposition would have a negligible impact on habitat (refer **Section 14.3**). Noise studies concluded that impacts during both construction and operations would also be minor and localised and would have negligible impacts on threatened terrestrial fauna species (refer **Section 15.2**).

### Red Goshawk

Fauna surveys of the Urquhart Point Mineral Sands Project did not find the Red Goshawk. Oresome Australia (2012a) determined that the species is considered unlikely to nest within the project area due to the lack of suitable nesting trees but may use the site for foraging. Oresome Australia (2012a) also determined that clearing 15ha of potential foraging habitat (Melaleuca woodland) for the mining

operation could impact on the species in a very minor way, assuming Red Goshawks forage on the site. The significance assessment for the Red Goshawk presented in the Urquhart Point Mineral Sands Project EIS indicates that impacts on the species are assessed as not significant. Oresome Australia (2012a) notes the following.

*"It is likely that the site forms part of a much larger home range for one or more individuals of this species. Consequently, it is expected that the site could provide occasional foraging opportunities for the Red Goshawk. Therefore, the loss of vegetation during the operational phase of the proposed action could result in a localised reduction of potential foraging habitat for this species over the short to mid-term, until rehabilitation works re-establish habitat values."*

Oresome Australia (2012a) proposes targeted searches for habitat features (e.g. nests) and relocation (where appropriate) prior to clearing as mitigation measures for the Red Goshawk.

No threatened terrestrial species were identified during incidental observations of fauna within the Bauxite Hills Project area during fieldwork for the preliminary constraints assessment for the project, (Cape Alumina 2012b). However, Cape Alumina determined that the Red Goshawk could possibly occur within the project area and have proposed a number of mitigation measures to minimise the impacts on the Red Goshawk within the Bauxite Hills Project area.

Fauna surveys have been undertaken in the Pisolite Hills Project area, however, Cape Alumina (2012b) does not state if the Red Goshawk was recorded in the project area. There is no publicly available information on the proposed extent of clearing of suitable Red Goshawk habitat for the Pisolite Hills Project or the discontinued Aurukun Bauxite Project. The Pisolite Hills Project mine and port infrastructure plan (Cape Alumina 2012c) shows some linear infrastructure crossing watercourses. For the Pisolite Hills Project, or the discontinued Aurukun Bauxite Project, it is likely that some high suitability habitat would be cleared for linear infrastructure such as roads, pipelines or conveyors, or other mining-related infrastructure that crosses riparian zones. It is likely that moderate suitability habitat may be cleared for mining. Based on the above information, should the Red Goshawk be present in the respective project areas, there would be a potential cumulative impact on the species arising from additional clearing by other possible bauxite mining projects. The magnitude of the additional impact, should the species be present, would depend mainly on the extent of additional clearing of high suitability habitat. Proposed land clearing for the life of the SoE Project as well as what is known about land clearing for other relevant existing operations and possible future projects is summarised in **Table 18-2**. The classification of Darwin Stringybark into moderate or high suitability habitat depends on factors such as proximity to permanent water. Without ground-truthed vegetation maps of the disturbance footprint proposed by other proponents, it is not possible to classify the potential habitat as high or moderate. Before the significance of any additional potential cumulative impact on the Red Goshawk could be assessed, information from the other possible mining projects would be required on (a) the results of field surveys for confirm the presence/absence of the Red Goshawk, and (b) the clearing extent of high and moderate suitability habitat. Before proceeding, all the possible projects on Western Cape York would need approval under the EPBC Act.

In the absence of detailed habitat disturbance data for the relevant projects it is only possible to make a rough estimate of the cumulative impact of the combined Cape York bauxite operations on preferred Red Goshawk habitat. Since the vast majority of bauxite mining is in Darwin Stringybark woodland, the cumulative impact was estimated as the area of potential assumed high suitability Red Goshawk habitat (refer **Figure 6-5**) that may be cleared in this regional ecosystem for each project. This was estimated by multiplying the reported clearing area for each project by the proportion of potential assumed high suitability habitat within RE3.5.2 on each of the proposed mining leases. **Table 18-5**

summarises the estimated maximum area of disturbance of assumed high suitability Red Goshawk habitat from potential bauxite mining in the subregion. It is estimated that, in the absence of any avoidance, up to 19,254ha of assumed high suitability Red Goshawk habitat could be cleared if all projects proceeded. This compares to a total area of 249,990ha of assumed high suitability Red Goshawk habitat within Darwin Stringybark forest in the Weipa Plateau subregion.

**Table 18-5 Estimated Cumulative Impact on Preferred Red Goshawk Habitat**

Project	Land Clearing at End of Mine Life (ha)	
	Darwin Stringybark Woodland (RE 3.5.2) (from Table 18-2)	Estimated potential clearing of High Suitability Goshawk Habitat in RE 3.5.2
SoE Project	29,366	4,899 <sup>#</sup>
Existing RTA Operations (north of Embley River) (Section 20.7.1, Queensland EIS, RTA (2011))	33,000 <sup>*</sup>	5,505 <sup>##</sup>
Discontinued Aurukun Bauxite Project (Section 20.7.1, Queensland EIS, RTA (2011))	9,300 <sup>***</sup>	3,560 <sup>###</sup>
Pisolite Hills Project (Cape Alumina 2012c)	6,335 <sup>**</sup> (maximum)	1,120 <sup>###</sup>
Bauxite Hills Project (Cape Alumina 2012b)	2,536 <sup>***</sup>	4,170 <sup>###</sup>
Urquhart Point Mineral Sands Project (Oresome Australia 2012a)	0	0
<b>Total</b>	<b>80,537<sup>**</sup></b>	<b>19,254</b>
Total RE3.5.2 in Weipa Plateau Subregion <sup>****</sup>	671,476	
Total RE3.5.2 in Cape York Bioregion <sup>****</sup>	794,330	

\* this includes approximately 21,000ha of clearing before 2006

\*\* estimated

\*\*\* estimated for mining areas only (no data on infrastructure)

\*\*\*\* measured as of 2006

<sup>#</sup> measured area - see **Section 6.3.3.1, Table 6-9**

<sup>##</sup> estimated by assuming same proportion cleared as in SoE Project

<sup>###</sup> estimated by multiplying cleared area by proportion of potential high suitability habitat in RE3.5.2 on proposed mining lease  
nd - no data

### *Masked Owl*

Oresome Australia (2012a) determined that the Masked Owl could possibly occur within the Urquhart Point Mineral Sands Project area as suitable foraging habitat exists, but it is not known if appropriate roosting or nesting hollows are available on the site for the species. Oresome Australia (2012a) states that the Masked Owl could potentially be impacted by proposed future clearing of 80.5ha of RE 3.2.2 and 15.4ha of RE 3.2.3. The significance assessment for the Masked Owl presented in the Urquhart Point Mineral Sands Project EIS indicates that potential impacts on the species are assessed as not significant. REs 3.2.2 and 3.2.3 are present in the SoE Project area and are considered moderate suitability habitat, but would not be disturbed for mining or infrastructure, and would be protected from direct and indirect impacts by the proposed SoE environmental buffer system (described in detail in **Section 6.3.4.5**).

Oresome Australia (2012a) proposes targeted searches for habitat features (e.g. nests) and relocation (where appropriate) prior to clearing as mitigation measures for the Masked Owl.

Database searches for the preliminary constraints assessment on terrestrial ecology for the Bauxite Hills Project did not identify the Masked Owl as being previously recorded within the vicinity of the project area or within geographic ranges that overlap the project area (Cape Alumina 2012b).

Proposed land clearing for the life of the SoE Project, as well as what is known about land clearing for existing operations and possible future projects is summarised in **Table 18-2**. However, there is no publicly available information on the proposed extent of clearing of suitable habitat of the Masked Owl (i.e. non-Darwin Stringybark Woodland) for the Pisolite Hills Project or the discontinued Aurukun Bauxite Project. Without ground-truthed vegetation maps of the disturbance footprint proposed by other proponents, it is not possible to classify the potential habitat as high, moderate or low. Before the significance of any potential cumulative impact on the Masked Owl could be assessed, information from the other possible bauxite mining projects would be required on (a) the results of field surveys for confirm the presence/absence of the species, and (b) the clearing extent of high, moderate and low suitability habitat. Before proceeding, all the possible projects on Western Cape York would need approval under the EPBC Act.

In the absence of detailed habitat disturbance data for the relevant projects it is only possible to make a rough estimate of the cumulative impact of the combined Cape York bauxite operations on potential Masked Owl habitat. The potential habitat of the Masked Owl in the Weipa Plateau Subregion is shown in **Figure 6-18**. **Section 6.4** outlines the potential impacts of the South of Embley Project on the Masked Owl and demonstrates that the vast majority of disturbance from the South of Embley Project is limited to low/no suitability Masked Owl habitat. Only 326ha of moderate suitability habitat would be cleared. With the implementation of the proposed mitigation measures, the residual impacts associated with the construction and operation of the SoE Project on the Masked Owl would not be significant (refer **Section 6.1.3**). Since the bauxite projects are located in similar areas of potential low/no suitability Masked Owl habitat, it is deduced that they would not have a significant impact on the Masked Owl and nor would the clearing of 96ha of moderate suitability habitat for the Urquhart Point Mineral Sands Project. It is considered the cumulative impact would not be significant.

### *Northern Quoll*

Fauna surveys of the Urquhart Point Mineral Sands Project area (Oresome Australia 2012a) did not find the Northern Quoll. Oresome Australia (2012a) concluded that whilst some marginal habitat may be present on the site, the presence of this species is considered highly unlikely, particularly given the presence of Cane Toads.

No threatened terrestrial species were identified during incidental observations of fauna within the Bauxite Hills Project area during fieldwork for the preliminary constraints assessment for the project, (Cape Alumina 2012b). However, Cape Alumina determined that the Northern Quoll could possibly occur within the project area and have proposed a number of mitigation measures to minimise the impacts on the Northern Quoll within the Bauxite Hills Project area.

Proposed land clearing for the life of the SoE Project as well as what is known about land clearing for other relevant existing operations and possible future projects is summarised in **Table 18-2**. There is no publicly available information on the proposed extent of clearing of suitable Northern Quoll habitat for the Pisolite Hills Project or the discontinued Aurukun Bauxite Project. Without ground-truthed vegetation maps of the disturbance footprint proposed by other proponents, it is not possible to classify the potential habitat as high, moderate or low.

Before the significance any potential cumulative impact on the Northern Quoll could be assessed, information from the other possible mining projects would be required on (a) the results of field surveys for confirm the presence/absence of the species, and (b) the clearing extent of high and moderate suitability habitat. Before proceeding, all the possible projects on Western Cape York would need approval under the EPBC Act.

In the absence of detailed habitat disturbance data for the relevant projects it is only possible to make a rough estimate of the cumulative impact of the combined Cape York bauxite operations on potential Northern Quoll habitat. The potential habitat of the Northern Quoll in the Weipa Plateau Subregion is shown in **Figure 6-29**. **Section 6.5** outlines the potential impacts of the SoE Project on the Northern Quoll and demonstrates that the vast majority of disturbance from the SoE Project is limited to low/no suitability Northern Quoll habitat. It concludes that with the implementation of the proposed mitigation measures, the residual impacts associated with the construction and operation of the SoE Project on the Northern Quoll would not be significant (refer **Section 6.1.3**). Since the relevant projects are located in similar areas of potential low/no suitability Northern Quoll habitat, it is deduced that they would not have a significant impact on the Northern Quoll and that the cumulative impact would not be significant.

### *Bare-rumped Sheathtail Bat*

It is noted that the distribution of the Bare-rumped Sheathtail Bat is shown on DSEWPaC's SPRAT database (DSEWPaC 2012q) as covering large areas of Cape York, although not specifically the Project area. The species has not been found during fauna surveys of the SoE Project area. There are only two records of the species from Cape York, both on the eastern Cape (refer **Section 6.6.1.1**). Given that insufficient information is known about this species and its habitat preferences (it is considered the species is "data deficient", refer **Section 6.6.1**), it is not currently possible to develop predictive habitat mapping. As such, it is currently not possible to assess potential cumulative impacts on the Bare-rumped Sheathtail Bat arising from the potential development of other mining projects on Western Cape York.

### *18.3.5.3 Migratory Avian Fauna*

The listed migratory avian species that are known, likely or could possibly occur within the SoE Project area predominantly utilise habitats that would be located within the proposed SoE environmental buffers and would not be directly affected by mining or other activities. An assessment of the likely impact of the SoE Project on migratory avian fauna has been made based on a review of the literature, multiple field surveys, an assessment of the suitability of various RE's as habitat for these species, and the application of mitigation measures (refer **Section 8.5**). The following avoidance, mitigation and enhancement measures have been proposed to minimise the impact of the SoE Project on migratory avian fauna:

- the proposed SoE environmental buffer system would exceed the requirement of the Queensland Coordinator General's approval conditions and comprise a methodology for determining set-back distances for mining from sensitive vegetation, instead of from the banks of watercourses and wetlands. The sensitive vegetation would be buffered by Darwin Stringybark woodland would comprise the following vegetation types from mining; riparian, wetland, estuarine, vine forest and coastal vegetation on sand, which include those habitats which are predominantly utilised by the avian migratory species. The proposed SoE environmental buffer system would maintain a network of undisturbed habitats and would be enhanced through the proposed fire management program (refer **Section 6.3.4.2** for additional details) which would conserve fire sensitive flora and promote overall vegetation diversity and the feral pig control program (refer **Section 7.3.6.4** for additional details) which would reduce pig damage to riparian and wetland areas (additional details are included in **Section 6.3.4.5**);
- the general avoidance measures discussed in **Section 3.13** would further reduce impacts by siting facilities in areas with less sensitive habitat;



- progressive rehabilitation enabling the establishment of habitat that can be utilised by some migratory avian species (refer **Section 3.10**); and,
- a weed management program would be developed and implemented prior to commencement of construction (refer **Section 6.3.4.3**).

The listed migratory bird species that are known, likely or could possibly occur within the SoE Project area predominantly utilise habitats that would be located within the proposed SoE environmental buffers and would not directly affected by mining or other activities. As a result, and with the implementation of the proposed mitigation measures, it is considered that significant cumulative impacts on migratory avian species as a result of the SoE Project would be unlikely.

A number of EPBC Act listed migratory avian species were identified during surveys for two other possible mining projects in the region, namely the Bauxite Hills Project (Cape Alumina 2012a) and the Urquhart Point Mineral Sands Project (Oresome Australia 2012a) as follows.

- The Bauxite Hills Project EPBC Act referral (Cape Alumina 2012a) states that a number of listed migratory avian species are likely to occur within the region of the project area or intermittently occur within the project site and concluded that there is expected to be no significant impacts on these species or their habitats as a result of the project. It was recommended that where practicable access is restricted to important migratory shorebird feeding, roosting and nesting sites to mitigate potential impacts on migratory birds.
- A number of migratory avian species have been observed or are expected to occur within the Urquhart Point Mineral Sands Project site (Oresome Australia 2012a). Oresome Australia (2012a) concluded that impacts on all migratory avian species were considered to be either minor or negligible.

There is no publicly available information on the proposed extent of clearing by the Pisolite Hills Project or the discontinued Aurukun Bauxite Project on habitats which may support migratory avian species. However, given that the discontinued Aurukun Bauxite Project is more remote than the SOE Project from migratory flight paths, key wetland habitat and key coastal habitat for migratory species, it is also likely that this project would also have a negligible impact on such species.

While the SoE Project, Bauxite Hills Project and Urquhart Point Mineral Sands Project are unlikely to have significant impact on EPBC Act listed migratory avian species, the potential cumulative impact of the two other possible bauxite projects cannot yet be fully assessed in the absence of more site-specific and project-specific information. However, provided these projects minimise their impacts on wetland, riparian and shoreline habitats, the cumulative impact of these projects on EPBC Act listed migratory avian species is unlikely to be significant.

## 18.4 Shipping Activities in the Commonwealth Marine Area and Great Barrier Reef

The Tailored EIS Guidelines require a risk based approach be taken for cumulative impacts of shipping activities on matters of NES, including a discussion and analysis of the cumulative impacts on the integrity and OUV's of the GBRWHA. This section discusses the known risks and impacts of existing shipping activities on ecosystem resilience and relevant matters of NES and uses a risk based approach to assess the additional contribution that Project-related shipping would have to these risks and impacts.

This assessment addresses the cumulative impacts from shipping in both the CMA and the inner GBR Designated Shipping Area, which traverses the GBRWHA, GBRNHP and the GBRMP. The assessment includes consideration of the relevant impacts of shipping activities with reference to the *Matters of National Environmental Significance: Significant Impact Guidelines 1.1* (DEWHA (2009c)) (**Section 18.4.2**). An assessment has also been made against the relevant natural World Heritage List criteria (**Section 18.4.3**). The World Heritage criteria also incorporate the National Heritage values relevant to the GBR. Hence assessment against the World Heritage criteria also assesses impacts against relevant National Heritage and GBRMPA criteria. The World Heritage criteria also include threatened species and communities. Project-related shipping through the CMA and the inner GBR Designated Shipping Area is not expected to facilitate or enable further actions in the area by parties other than RTA and hence no consequential impacts are expected from Project-related shipping activity.

### 18.4.1 Existing Risks

The Great Barrier Reef Outlook Report (GBRMPA 2009b) provided an assessment of the risks to the ecosystem within the Great Barrier Reef Region. A summary of the risk assessment is illustrated in **Figure 18-3**. As the risk assessment applies to all users of the GBR, not all risks are relevant to shipping. Those risks identified to be relevant to shipping are highlighted in **Figure 18-3** and summarised as follows:

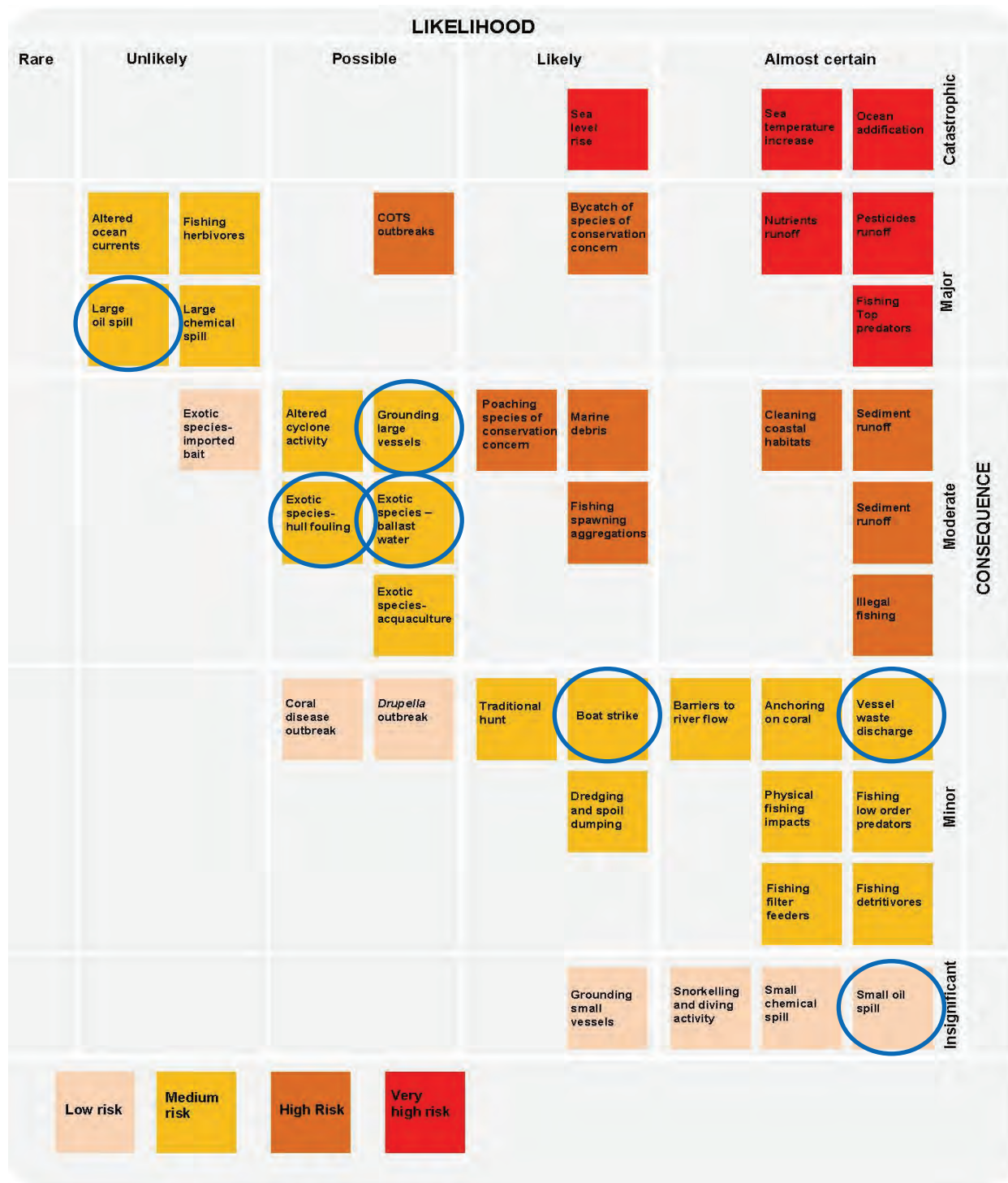
- large oil spill (medium risk);
- grounding large vessels (medium risk);
- exotic species – hull fouling and ballast water (medium risk);
- boat strike (vessel strike) (medium risk);
- vessel waste discharge (medium risk); and,
- small oil spill (low risk).

This provides a baseline of the existing risks to the GBR from shipping. For the purpose of this assessment, these risks have conservatively been assumed to equally apply to the CMA, which has lower shipping volumes and environmental sensitivity based on its environmental risk indices as identified by the DNV (2011) risk assessment (refer **Section 4.5.3.4**).

In addition, the Tailored EIS Guidelines require an assessment of the cumulative impacts on the integrity and OUVs of the GBRWHA.

It is noted that ocean acidification, increased sea surface temperatures and sea level rise have been identified by GBRMPA (2009b) as being the highest risks to the GBR. The GBRMPA assessment is related to the overall risk of impacts from global climate change, and therefore takes into account all greenhouse gas emission sources and other contributors to climate change. Australia contributed 1.5% to global greenhouse gas emissions and domestic shipping contributes 1.9% to Australia's emissions (Commonwealth of Australia 2012). Domestic shipping therefore contributes 0.03% to global emissions.

Figure 18-3 Risk Assessment of Threats to the Great Barrier Reef Ecosystem



Annotated from Source: GBRMPA (2009b)

Note: Circled risks relate to shipping.

Given Project-related shipping is a very small proportion of domestic shipping, the cumulative impact of emissions from domestic shipping would be negligible and has not been considered further.

The UNESCO Reactive Monitoring Mission report (UNESCO 2012) states that climate change factors are expected to pose the greatest threat to the long term conservation of the GBRWHA. The UNESCO report describes the following specific climate change threats and predicted potential impacts that present a risk to all coral reefs, including the GBR:

- Increased seawater temperature which is predicted to lead to increased frequency of coral bleaching, and organisms in coral reefs and coastal habitats becoming more susceptible to disease and predation.
- Increased sea level is predicted to cause changes in tidal habitats and saltwater intrusion into low lying freshwater habitats.
- Increased weather variability predicted to have a range of implications including elevated risks of sedimentation, algal blooms, storm damage and more frequent crown of thorns star fish outbreaks. Heavy rainfall associated with cyclones can lead to extensive flood plumes and lowered salinities that stress or kill sensitive organisms such as corals and seagrasses and can cause widespread physical damage.
- Increasing ocean acidification is predicted to lower the capacity of corals to build skeletons.

The UNESCO report also states that threats posed to the GBRWHA need to be considered for their cumulative and/or combined effect on the area as a whole. However, a detailed analysis of the various aspects of cumulative impacts has not been made for the GBRWHA yet.

There would be no direct impact on coral health, tidal habitats, seagrasses, sedimentation rates, algal blooms, and physical damage to reefs associated with the small potential increase in Project-related shipping activities at maximum production and therefore no cumulative impacts associated with predicted climate change. Potential impacts associated with project-related shipping on the GBRWHA could only occur indirectly as a result of existing risks including oil spills, grounding of large vessels, exotic species introduction and vessel discharges (refer **Section 12.4**). The cumulative impacts of these existing risks are addressed in **Section 18.4.2** and **18.4.3**.

## 18.4.2 Cumulative Risk Assessment

### 18.4.2.1 Methodology

The International Risk Management Standard AS/ANZ ISO 31000:2009 was used as the basis for the cumulative impact assessment of shipping on matters of NES.

The key steps of the assessment were as follows:

1. identify relevant existing risks from the Great Barrier Reef Outlook Report (GBRMPA 2009b) (refer **Section 18.4.1**) and their likelihood and consequence;
2. identify any changes to the likelihood and consequence of the existing risks identified in (GBRMPA 2009b) as a result of Project-related and other shipping taking into account proposed avoidance and mitigation strategies; and,
3. evaluate the cumulative impacts of shipping activities based on the results of item 1 and 2.

The consequence assessment involved assigning a qualitative estimate of the consequence if the event was to occur. The consequence categories used are provided in **Table 18-6** and are consistent with those used by the GBRMPA (2009a).

**Table 18-6 Consequence Categories**

Category	Definition
Catastrophic	Impact is clearly affecting the nature of the ecosystem over a wide area; or Impact is catastrophic and possibly irreversible over a small area or to a sensitive population or community. Recovery periods of greater than 20 years likely; or Condition of an affected part of the ecosystem irretrievably compromised.
Major	Impact is significant at either a local or wider level or to a sensitive population or community. Recovery periods of 10 – 20 years are likely.
Moderate	Impact is present at either a local or wider level. Recovery periods of 5 – 10 years anticipated.
Minor	Impact is present but not to the extent that it would impair the overall condition of the ecosystem, sensitive population or community in the long term.
Insignificant	No impact or, if impact is present, then not to an extent that would draw concern from a reasonable person. No impact on the overall condition of the ecosystem.

The likelihood categories used in the assessment were also taken from GBRMPA (2009a). The likelihood categories are presented in **Table 18-7**.

**Table 18-7 Likelihood Categories**

Category	Definition
Almost Certain	Expected to occur more or less continuously throughout a year.
Likely	Not expected to be continuous but expected to occur one or more times in a year.
Possible	Not expected to occur annually but expected to occur within a 10 year period.
Unlikely	Not expected to occur in a 10 year period but expected to occur in a 100 year period.
Rare	Not expected to occur within the next 100 years.

The overall risk level was assessed as a function of likelihood and consequence, using the same hazard risk grades as used by GBRMPA (2009b). The hazard risk grades are presented in **Table 18-8**.

**Table 18-8 Hazard Risk Grades**

Likelihood	Consequence				
	Insignificant	Minor	Moderate	Major	Catastrophic
Almost Certain	Medium	Medium	High	Very High	Very High
Likely	Medium	Medium	High	High	Very High
Possible	Low	Medium	Medium	High	Very High
Unlikely	Low	Low	Medium	Medium	High
Rare	Low	Low	Medium	Medium	Medium

A discussion of the results of the risk assessment for each risk related to shipping identified in **Figure 18-3** using the above methodology is provided in **Sections 18.4.2.2 to 18.4.2.6**.

#### *18.4.2.2 Oil Spills (large and small)*

Oil spills where oil strands onshore have the potential to impact shorelines, vegetation, intertidal fauna and shorebirds. Oil spills at sea may result in direct toxic impacts to marine fauna, including reef building corals, or indirect impacts as a result of habitat degradation. Potential impacts of oil spills from bauxite ships are discussed in **Section 4.5.3.4**. For all Australian waters the risk of occurrence of oil spills from large commercial vessels, including existing RTA shipping, has been assessed as being 0.826 spills per year with the greatest risk of a spill being from vessels in port (DNV 2011). Oil spills may impact on matters of NES through localised damage to habitat (e.g. corals, mangroves) within the GBR or the CMA, and injury to or mortality of individual listed threatened or migratory marine species.

The localised effects of a large marine oil spill have been assessed by GBRMPA (2009b) as having a medium risk of impact to the GBR ecosystem on the basis that it would have major consequences but is unlikely to occur. Small oil spills have been assessed by GBRMPA (2009b) as having a low risk of impact based on insignificant consequences.

The small predicted increase of Project-related shipping through the GBR compared to existing shipping levels and the continued use of existing control measures (refer **Section 11.3**), would not change the likelihood or consequence of the existing GBRMPA risk assessment for a marine oil spill (GBRMPA 2009a). Therefore Project-related shipping combined with other shipping through the GBR and CMA would not change the existing GBRMPA risk level of medium for an oil spill, resulting in negligible cumulative impacts.

#### *18.4.2.3 Grounding of Large Vessels*

Grounding of a vessel may directly damage benthic substrates such as coral reefs. Grounding impacts are typically localised, and may result in localised contamination from paint being scraped from the hull of a vessel during grounding or subsequent salvage, or increased turbidity resulting from benthic disturbance. Potential impacts from vessel grounding may include localised damage to individual reef structures and resulting impacts on marine species that are dependent on that reef structure for habitat.

The grounding of a large vessel has been assessed by GBRMPA (2009b) as being a medium risk to the GBR ecosystem on the basis that it would have moderate consequences and a possible likelihood. However, it is noted that since the introduction of ReefVTS in 1996, groundings in the GBR have reduced from an average rate of 1 per year to 0.16 per year, which includes vessels of all sizes, despite increases in shipping traffic over that period.

The small predicted increase of Project-related shipping compared to existing shipping levels and continued use of existing control measures (refer **Section 11.3**) would not change the existing likelihood or consequence of the GBRMPA risk assessment for grounding of a large vessel (GBRMPA 2009b). Therefore Project-related shipping combined with other shipping through the GBR and CMA would not change the existing GBRMPA risk level of medium for a vessel grounding, resulting in negligible cumulative impacts.

#### *18.4.2.4 Exotic Species – Hull Fouling and Ballast Water*

Introduced marine pest species may impact the marine environment by outcompeting native species for food and space, and altering habitats and food web function (GISP 2008). Currently, Queensland has no recorded established invasive marine pests, however a total of 26 invasive marine pests are listed as posing a potential threat to Queensland's marine environment (Hayes *et al.* 2004). Potential

impacts from marine pest species have the potential to degrade habitat values, including critical habitat within the inner GBR Designated Shipping Area and CMA, and reduce populations of listed threatened or migratory marine species.

The overall effects of the introduction of exotic species from hull fouling and ballast water have been assessed by GBRMPA (2009b) as having a medium risk of impact to the GBR ecosystem on the basis that it would have moderate consequences and could possibly occur.

The small predicted increase of Project-related shipping compared to existing shipping levels and continued use of existing control measures (refer **Section 11.3**) would not change the existing likelihood or consequence of the GBRMPA risk assessment for introducing exotic species from hull fouling and ballast water (GBRMPA 2009b). Therefore Project-related shipping combined with other shipping through the GBR and CMA would not change the existing GBRMPA risk level of medium for introduction of exotic species from hull fouling and ballast water, resulting in negligible cumulative impacts.

#### 18.4.2.5 Vessel Strike

Vessel movements can result in injury or death of individual marine fauna as a result of vessel strikes. The greatest risk of vessel strike occurs where there are large numbers of fast moving vessels in shallow or confined waters. Vessel strikes may impact on matters of NES through the injury to or mortality of individual listed threatened or migratory marine species.

The effects of a vessel strike on marine fauna have been assessed by GBRMPA (2009b) as having a medium risk of impact to the GBR ecosystem on the basis that it would have minor consequences but is likely to occur.

An assessment was conducted based on available data from the QPWS *Wildlife Stranding Database Reports* on the potential increase in vessel strike on marine fauna associated with the small potential increase in Project-related bauxite and cargo ship movements through the GBR at maximum production. This was compared to the predicted shipping levels in 2020 based on EPBC Act referrals of 14,455 movements (refer **Section 18.2.10**). The results of this assessment are summarised in **Table 18-9**. It must be noted, that most vessel strikes are associated with fast moving vessels. Project-related bauxite and cargo shipping through the GBR would be on slow moving vessels, therefore the data presented in **Table 18-9** is a conservative estimate.

**Table 18-9 Summary of Potential Increase in Vessel Strikes associated with the Small Potential Increase in Project-related Bauxite and Cargo Shipping through the GBR**

Marine Fauna	Database Report Years	Average Annual Qld Mortality	Average Annual Qld Mortality due to Vessel Strike	Average Annual Mortality in the GBR	Estimated Annual Mortality due to Vessel Strike in the GBR #	Potential Annual Increase in Mortality due to Vessel Strike at Maximum Production##
Marine Turtles	1999 - 2010	645	72	281	31	<1
Dugongs	1998 - 2010	52	3	42	2	<1
Whales	2000 - 2007	19	1	11	<1	<1
Dolphins	2000 - 2007	37	<1	19	<1	<1

# Based on percentage of mortalities due to vessels strike for the whole of Queensland

## Based on Project-related bauxite and cargo shipping through the GBR at maximum production being 0.4% of predicted shipping levels through the GBR in 2020 (refer **Section 18.2.10**)

It is acknowledged that only reported marine mortalities are included in the QPWS *Wildlife Stranding Database Reports* and therefore actual mortalities would be greater. Even so the results presented in **Table 18-9**, demonstrate that the small potential increase of Project-related bauxite and cargo shipping compared to existing shipping levels and continued use of existing control measures (refer **Section 11.3**) would not change the existing likelihood or consequence of the GBRMPA risk assessment of vessel strike (GBRMPA 2009b). Therefore Project-related shipping combined with other shipping through the GBR and CMA would not change the existing GBRMPA risk level of medium for vessel strike, resulting in negligible cumulative impacts.

#### **18.4.2.6 Vessel Discharges**

Operational discharges from ships may include oily water, sewage and garbage. These routine vessel discharges are controlled by international and domestic regulations, with more stringent regulations occurring in identified sensitive marine areas, including the inner GBR Designated Shipping Area. Regulatory controls include limits to the volume and rate of discharge, treatment standards, and limitations on the types of waste that may be discharged at sea. In general the levels of regulatory controls are designed to be protective of the marine environment.

The effects of waste discharges from all vessel types have been assessed by GBRMPA (2009b) as having a medium risk of impact on the GBR ecosystem on the basis that it would have minor consequences but is almost certain to occur.

The small potential increase of Project-related bauxite and cargo shipping compared to existing shipping levels and continued use of existing control measures would not change the existing likelihood or consequence of the GBRMPA risk assessment for vessel discharges (GBRMPA 2009b). Therefore Project-related shipping combined with other shipping through the GBR and CMA would not change the existing GBRMPA risk level of medium for vessel discharges, resulting in negligible cumulative impacts.

#### **18.4.3 GBRWHA Outstanding Universal Values**

The GBR is recognised for its OUV and is listed on the World Heritage List based on four natural World Heritage criteria. The GBR is also included on the National Heritage List (GBRNHP). The National Heritage List determination states that, as a property on the World Heritage List, the GBR should be included for those heritage values identified by the World Heritage Committee. Each National Heritage value has one or more corresponding World Heritage value.

The assessment of cumulative impacts from shipping on the GBRWHA has been made against each of the World Heritage criteria, taking account of the specific OUV associated with that criterion. As the GBRNHP's designation is based upon its World Heritage listing, the assessment against the World Heritage List criteria also assesses any impacts against its National Heritage values. Assessment against these criteria also includes assessment of impacts to habitats for listed species.

The contribution of Project-related shipping to cumulative impacts on each of the relevant World Heritage criteria is discussed in **Sections 18.4.3.1 to 18.4.3.4**.



#### **18.4.3.1    *World Heritage Criteria VIII – Outstanding Example of Earth's Evolutionary History***

The values and attribute examples relevant to this criterion, as noted by GBRMPA (2011), are:

- forms the world's largest coral reef ecosystem, extending over 14 degrees of latitude;
- globally outstanding example of an ecosystem that has evolved over millennia;
- environmental history recorded in the reef structure, for example, climatic conditions over many hundreds of years can be seen in old massive coral cores;
- comprises about 3,000 separate coral reefs, ranging from inshore fringing reefs to mid shelf reefs and shoals, exposed outer reefs and deep water reefs, including examples of all stages of reef development; and,
- deep water features of the adjoining continental shelf includes canyons, channels, plateaux and abyssal plains.

The OUV for this World Heritage criterion relate to the size, extent, and diversity of the GBRWHA, which represent environmental history over many hundreds of years. In general, threats from shipping that may impact on this criterion include groundings, marine spills of oil or chemicals, and air emissions that have the potential to damage reef structures. The assessment in **Section 12.4** determined that Project-related shipping would have a negligible impact on these OUVs.

The small potential increase of Project-related shipping compared to existing shipping levels and continued use of existing control measures would not change the existing risk levels to World Heritage Criteria VIII.

#### **18.4.3.2    *World Heritage Criteria IX – Example of Significant Ongoing Geological Processes, Biological Evolution and Man's Interaction with his Natural Environment***

The values and attribute examples relevant to this criterion, as noted by GBRMPA (2011), are:

- globally significant diversity of reef and island morphologies reflecting on-going geomorphic, oceanographic and environmental processes;
- complex cross-shelf, longshore and vertical connectivity influenced by dynamic oceanic currents and ongoing ecological processes such as upwellings, larval dispersal and migration;
- over 900 islands and cays; around 600 are continental (high) islands, 300 are coral cays in various stages of geomorphic development, with the remaining islands comprising mangrove islands that provide important ecological services;
- an ecosystem that has evolved over millennia with evidence of the evolution of hard corals and other fauna;
- globally significant marine faunal groups include over 4,000 species of molluscs, over 1,500 species of fish, plus a great diversity of sponges, anemones, marine worms, crustaceans, and many others; and,
- man's interaction with the natural environment illustrated by strong ongoing links between Aboriginal and Torres Strait Islanders and their sea country, including numerous shell deposits (middens) and fish traps, plus the application of story places and marine totems.

In general, hazards from shipping that may affect the OUV associated with this criterion include groundings, oil or chemical spills and air discharges that may impact on reef features or other habitat or Indigenous cultural heritage sites. Vessel strikes or marine spills also have the potential to impact on fauna.

Reef and island morphologies, oceanic connectivity, the extent and number of islands and other features and the evolutionary history of the GBRWHA are not vulnerable to impacts from Project-related shipping.

The potential for impacts from vessel groundings, marine spills or vessel strikes on marine fauna would generally be limited to localised areas of reef, shoreline or individual animals in most cases. Each of these threats has been assessed by GBRMPA (2009b) as having a medium risk of impact to the GBR and consequently the GBRWHA.

Increased vessel traffic could increase the likelihood of marine pest species introduction in the inner GBR Designated Shipping Area through ballast water or hull fouling, which would have the potential for impacts on habitat and consequential impacts on marine species contributing to the OUV for this criterion. The effects of the introduction of marine pests through hull fouling or ballast water have been assessed by GBRMPA (2009b) as having a medium risk of impact to the GBR and consequently the GBRWHA on the basis that it would have moderate consequences could possibly occur.

The assessment in **Section 12.4** determined that Project-related bauxite and cargo shipping would have a negligible impact on these OUVs. The small potential increase of Project-related bauxite and cargo shipping compared to existing shipping levels and continued use of existing control measures would not change the existing risk levels to World Heritage Criteria IX.

#### *18.4.3.3 World Heritage Criteria VII – Rare Natural Phenomena Formations and Exceptional Natural Beauty*

The values and attribute examples relevant to this criterion, as noted by GBRMPA (2011), are:

- vast mosaic patterns of reefs providing an unparalleled aerial panorama of seascapes and landscapes for example, Whitehaven Beach, Whitsunday islands, Hinchinbrook Island;
- one of the few living structures visible from space;
- beneath the ocean surface, there is an abundance of shapes, sizes and colours, including spectacular coral assemblages (hard and soft corals) and more than 1,500 species of fish;
- globally important breeding colonies of seabirds and marine turtles, including Raine Island, the world's largest Green Turtle breeding area; and,
- superlative natural phenomena include the annual coral spawning, migrating whales, and significant spawning aggregations of many fish species.

This criterion relates to the extent and physical beauty of the GBRWHA as a result of the diversity of marine species as well as the global importance of marine turtle and seabird populations.

Increased shipping numbers could increase the overall risk of a marine oil or chemical spill in the GBRWHA as a result of an increased risk of vessel collisions that may damage fuel tanks or cargo holds. The localised effects of a large marine oil spill or chemical spill have been assessed by GBRMPA (2009b) as having a medium risk of impact on the GBR and consequently the GBRWHA on the basis that it would have major consequences but is unlikely to occur. Marine oil spills have the potential to have localised impacts on adults, gametes and larval stages of corals or fish if they coincide with the spill and are directly exposed to surface oil or elevated hydrocarbons in the water. Breeding colonies of seabirds on land are not at risk, although individual birds may be affected at sea by a marine oil spill.

The important breeding colonies of marine turtles in the GBRWHA are remote from the shipping route that would be used by Project-related shipping. Given the controls and mitigation measures proposed to be implemented as discussed in **Section 4.5.3** and the small increase in overall shipping numbers

in the GBR, the likelihood of a marine oil or chemical spill is negligible, and the consequences of a spill would not change as a result of Project-related shipping. Therefore, the cumulative impact of Project-related shipping would not alter the existing medium risk profile determined by GBRMPA (2009b) and would not increase the risk of impacts on the OUV relating to this criterion.

Vessel strikes have the potential to impact on marine species. However, given the relatively small contribution of Project-related shipping to overall shipping numbers in the inner GBR Designated Shipping Area and the controls and impact mitigation measures proposed for Project-related shipping as described in **Section 4.5.3**, the Project's contribution to increased likelihood of vessel strikes would be negligible and the consequences would not change. Therefore, the cumulative impacts from boat strike on the OUV relating to this criterion would not be expected to change the existing medium risk profile as assessed by GBRMPA (2009b).

The assessment in **Section 12.4** determined that Project-related bauxite and cargo shipping would have a negligible impact on these OUVs. The small potential increase of Project-related bauxite and cargo shipping compared to existing shipping levels and continued use of existing control measures would not change the existing risk levels to World Heritage Criteria VII.

#### *18.4.3.4 World Heritage Criteria X – Habitats where Populations of Rare or Endangered Species Survive*

The values and attribute examples relevant to this criterion, as noted by GBRMPA (2011), are:

- one of the richest and most complex natural ecosystems on earth, and one of the most significant for biodiversity conservation;
- amazing diversity supports tens of thousands of marine and terrestrial species, many of which are of global conservation significance;
- some 39 species of mangroves comprising 54% of the world's mangrove diversity;
- approximately 43,000km<sup>2</sup> of seagrass meadows in both shallow and deep water areas, including 23% of known global species diversity;
- habitat for one of the world's most important Dugong populations and six of the world's seven species of marine turtle;
- a breeding area for Humpback Whales, with at least 30 other species of whales and dolphins also identified;
- 70 bioregions (broad-scale habitats) identified comprising 30 reef bioregions and 40 non-reefal bioregions, including algal and sponge gardens, sandy and muddy bottom communities, continental slopes and deep ocean troughs;
- the reef bioregions contain one third of the world's soft coral and sea pen species (80 species);
- 2,000 species of sponges equalling 30% of Australia's diversity in sponges; and,
- 630 species of echinoderms (for example sea stars) equalling 13% of the known global diversity.

The impacts from Project-related shipping would be localised and would not have population level impacts on marine or terrestrial species, and would not impact the overall richness, complexity or diversity of the GBRWHA.

As discussed in **Section 18.4.2**, shipping risks on the ecology of the GBRWHA including habitats of rare or endangered species of plants and animals include grounding, spills, ship emissions and discharges, and pest species introduction. Given the controls and mitigation measures proposed to be implemented and the small increase in overall shipping numbers in the GBR, the likelihood of occurrence of any of these impacts would be negligible and would not change the consequences. Therefore, the cumulative impacts on habitats of rare and endangered species would not change the

existing risk profiles as assessed by GBRMPA (2009b). Consequently, it has been concluded that the Project's contribution to the cumulative impacts on the OUV relating to this criterion would be negligible.

The assessment in **Section 12.4** determined that Project-related bauxite and cargo shipping would have a negligible impact on these OUVs. The small potential increase of Project-related bauxite and cargo shipping compared to existing shipping levels and continued use of existing control measures would not change the existing risk levels to World Heritage Criteria X.

#### 18.4.4 Summary of Shipping Cumulative Impacts

A cumulative risk assessment of the impacts of shipping (including Project-related shipping) was undertaken using the risk assessment methodology described in **Section 18.4.2**. The cumulative risk assessment considered each of the relevant threats and existing risks from shipping and the Project's contribution to the cumulative impacts of shipping on relevant matters of NES and the OUV of the GBRWHA.

A summary of the likelihood and consequence of existing risks on matters of NES (including the OUV of the GBRWHA) compared to the likelihood and consequence of the combined or cumulative risks of the Project-related shipping and others is provided in **Table 18-10**. The cumulative risks are based on those discussed in **Section 18.4.2** and **Section 18.4.3**.

Based on the consideration of the above matters, the risk assessment concluded that the contribution from Project-related shipping to the cumulative impacts to matters of NES would not alter the existing risk profiles of any of the identified shipping threats. In all cases there would be no changes to either the likelihood or consequence of the shipping threats as a result of the small predicted increase in shipping (at maximum production) generated by the Project. The assessment concluded that Project-related shipping is not expected to change the risk profile of GBRMPA (2009b) for cumulative impacts on relevant matters of NES including the OUV of the GBRWHA.

**Table 18-10 Cumulative Risks from Shipping on Relevant Matters of NES**

Threat	GBRMPA ASSESSMENT			INCLUDING PROJECT-RELATED BAUXITE AND CARGO SHIPPING			Cumulative Risk Comparison
	Likelihood	Consequence	Risk	Likelihood	Consequence	Risk	
Grounding of large vessels	Possible	Moderate	Medium	Possible	Moderate	Medium	No change
Oil spills	Unlikely	Major	Medium	Unlikely	Major	Medium	No change
Boat strike	Likely	Minor	Medium	Likely	Minor	Medium	No change
Exotic species – hull fouling and ballast water	Possible	Moderate	Medium	Possible	Moderate	Medium	No change
Vessel discharges	Almost certain	Minor	Medium	Almost certain	Minor	Medium	No change

