

Appendix 6 – IFO Report 2007-2010

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Independent Fauna Observer Final Report for the Pluto LNG Dredging Project

Final Report for
November 2007 – May 2010

Prepared for
Woodside Energy Ltd

20 October 2010

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1. Executive Summary

Woodside Energy Limited undertook dredging activities associated with completing Phases One and Two of the Pluto LNG Project in Mermaid Sound off Dampier, Western Australia. These activities began in late 2007 and were completed by mid 2010.

An environmental assessment process undertaken by Woodside Energy Limited identified that dredging activities may impact on marine fauna in the area. As part of their environmental mitigation procedures for the Pluto LNG Project, Woodside Energy Limited commissioned Blue Planet Marine to assist with supply of an Independent Fauna Observer for the period of the Pluto LNG Project, which coincides with the peak turtle nesting activity (November – April) in the area. The role of the Independent Fauna Observer was to coordinate the formal inductions of the dredge crews and associated vessels, implement fauna observer training, and coordinate mitigation activities for potential impacts on marine fauna associated with the Pluto LNG Project Dredging Program. The Blue Planet Marine Independent Fauna Observer undertook site inspections throughout the Pluto LNG Project as stipulated by the SEWPC¹ and DEC Pluto LNG Project conditions of consent. Overall, there were a total of 24 site inspections made during the 2007/08, 2008/09 and 2009/10 summer turtle nesting periods.

During the entire Pluto LNG Dredging Project there were 530 sightings of marine fauna comprised of 1378 animals and one school of over 1000 tuna. These sightings were recorded from 21st November 2007 to 8th May 2010 (predominantly during November – May). Due to the survey design, it is important to note that the sightings cannot be used to estimate the absolute numbers of marine fauna present in the area over the reporting period. They do, however, provide a useful estimate of presence/absence of marine fauna in the areas that were surveyed.

The most commonly observed marine fauna during the entire Pluto LNG Dredging Project were dolphins (68%) (predominantly Indo-Pacific humpback and bottlenose dolphins) followed by marine turtles (16%), whales (7%) (most likely humpback whales). Manta rays (3%), sea snakes (3%) and sharks (1%) were also consistently sighted throughout the Pluto LNG Project although in low numbers. The remaining two percent of animals consisted of low numbers of small cetaceans, dugong, sting rays, fish (i.e. tuna, sailfish, sawfish), and one report of coral spawning.

In total, there were six interruptions to dredging operations due to sightings of turtles or marine mammals during the entire Pluto LNG Dredging Project. Overall, the number of sightings of turtles and marine mammals close to dredging operations that resulted in interruptions to dredging comprised only 1% of the overall sightings. For the majority of turtle and marine mammal sightings (77%), no mitigation activities were required to be undertaken. 9% of sightings caused a number of minor instances that predominantly impacted vessels in transit (mainly support vessels), resulting in a small loss of operating time due to the necessity to either alter the course of the vessel or to slow down to avoid marine fauna.

There was no evidence of direct impacts of the dredging program on marine turtles or marine mammals detected by or reported to the Independent Fauna Observer during site visits.

¹ Note: Department of Sustainability, Environment, Water, Population and Communities (SEWPC) was formerly the Department of the Environment, Water, Heritage and Arts (DEWHA).

2. Introduction

Woodside Energy Limited (Woodside) is in the process of developing the Pluto gas field (approximately 190 km north-west of Karratha, Western Australia) to produce liquefied natural gas for export. The Pluto field was discovered in April 2005 in the Carnarvon Basin, and is operating under exploration permit WA-350-P.

Woodside's Pluto LNG Project (the Project) proposal consists of an extensive operation that includes an offshore production system, offshore platform, a pipeline approximately 200 km to shore, an onshore gas processing plant, storage facilities and an export jetty (Figure 1). The onshore facilities began construction within the Burrup Industrial Estate close to Karratha from late 2007, between the existing North West Shelf Venture gas plant and the Dampier Port facilities. The Dampier Port lies within Mermaid Sound on the North West coast of Australia. These onshore facilities associated with the Project took approximately 36 months to construct from commencement in late 2007.

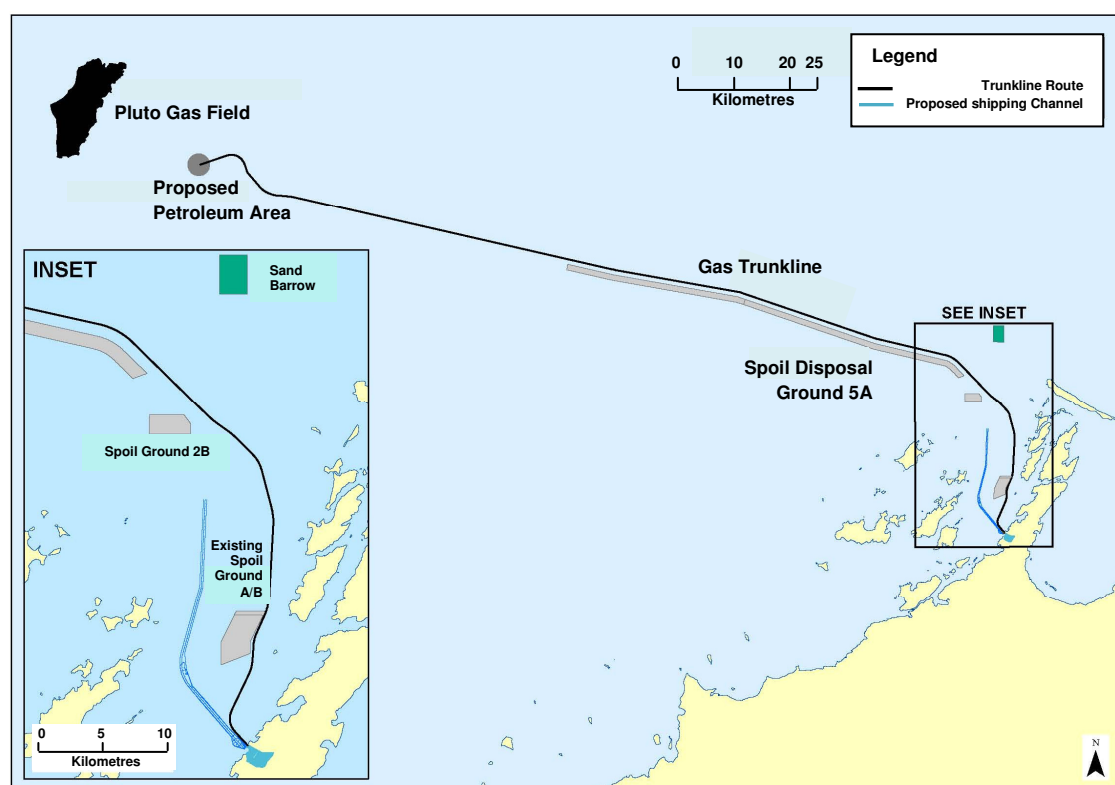


Figure 1: Overview of Pluto LNG Project.

(Source: Pluto LNG Project Dredging and Spoil Disposal Management Plan).

2.1 Environmental assessment

Woodside undertook an environmental assessment process for the Project (SKM/Woodside 2007a, 2007b), which identified that the proposed activities associated with the dredging component of the Project had the potential to have an impact on marine fauna within the region. The activities identified to have a potential impact included:

- Dredging for a trunkline installation, a navigation channel, a berthing pocket, and a vessel turning basin in Mermaid Sound,

- Potential drill and blasting for jetty construction and shore crossing, in the vicinity of Holden Point,
- Dredge spoil disposal both within and outside of Mermaid Sound,
- Rock fill for trunkline stabilisation,
- Construction of LNG and condensate storage and export facilities on Site A,
- Operation of the LNG and condensate storage and export facilities on Site A, and
- Vessel movement during all phases of the Project.

Woodside developed a number of strategies to minimise potential impacts on the marine environment during dredging operations. These strategies are identified in the Pluto LNG Project Sea Turtle Management Plan (STMP) and the Pluto LNG Project Dredging and Spoil Disposal Management Plan (DSDMP).

As part of their environmental mitigation procedures for the Project, Woodside commissioned Blue Planet Marine (BPM) to assist with

1. Supplying an Independent Fauna Observer (IFO) to coordinate the formal inductions of the dredge crews and associated vessels,
2. The implementation of fauna observer training, and
3. Coordination of mitigation activities for potential impacts on marine fauna associated with the Pluto Dredging Program.

3. Regulatory Requirements

The project is located on the north-west coast of Western Australia. Due to the nature and location of the operation, development for the Project was required to comply with relevant International, Commonwealth and State legislative requirements, which includes:

- *Environment Protection (Sea Dumping) Act 1981* (Commonwealth),
- *Environment Protection (Sea Dumping) Regulations 1983* (Commonwealth),
- *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) (Commonwealth),
- *Wildlife Conservation Act 1950* (Western Australian (WA) State),
- *Protection of the Sea (Prevention of Pollution from Ships) Act 1983* (Commonwealth),
- *Australian Quarantine Regulations 2000* (Commonwealth),
- *Environmental Protection Act 1986* (WA State),
- *Pollution of Waters by Oil and Noxious Substances Act 1987* (WA State),
- *Port Authorities Act 1999* (WA State),
- *Shipping Pilotage Act 1967* (WA State),
- *Marine and Harbours Act 1981* (WA State), and
- *International Convention for the Prevention of Pollution from Ships, 1973*, as modified by the protocol of 1978 relating thereto (MARPOL 73/78).

Woodside obtained the relevant environmental approvals for the Project from:

- Department of Sustainability, Environment, Water, Population and Communities (SEWPC) under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC 2006/2968 – Approval Dated 12 October 2007), and
- The Western Australian Minister for the Environment and Climate Change under the *Environmental Protection Act 1986* (Approval Dated 3 September 2007).

These approvals are conditional on the Project being conducted in accordance with a range of environmental conditions, which are specified in Appendices 1 and 2 of the approvals.

One of the conditions was the development of the STMP with incorporated Marine Mammal Management Plan (MMMP) and a DSDMP managing the impacts of the dredging and associated activities on the environment. These plans specify the objectives for the position of the IFO.

4. Objectives of the IFO

The two main objectives of the IFO for the Project are:

1. Assist Woodside to comply with all legislative requirements regarding the protection of marine turtles and marine mammals while carrying out near shore dredging operations associated with the Project, and
2. Assist Woodside with the implementation of the Project STMP.

More specifically, the second objective included the following:

- Development of inductions for fauna observations and input into requirements of the Project STMP,
- Providing training to identified fauna spotters for fauna observations,
- Undertaking a one-day field inspection on a fortnightly basis during peak turtle nesting seasons to conduct additional inductions and/or training if necessary and perform the role of an IFO for the day. This was to ensure compliance with fauna observation procedures in relation to dredging, blasting and vessel operations,
- Undertaking an independent review of the implementation of the Project STMP and fauna observations, and
- Providing Woodside with reports to meet SEWPC and WA State Government requirements regarding the observation and occurrence of marine fauna species encountered during dredging and associated activities.

5. Description of the Environment

Several sensitive marine species and habitats are known to occur in the vicinity of the dredging and spoil disposal activities (SKM/Woodside 2007b). A number of these marine species are known to use the area as part of their migration and/or breeding cycles. Key sensitive marine species and habitats include:

- Coral and coral habitats,
- Dugong and dugong habitats,
- Humpback whales, and
- Marine turtles and marine turtle nesting beaches.

The marine mammal and sea turtle populations of the North West have not been extensively studied (Pendoley 2005a). Those marine mammal and sea turtle species expected to be present in the Project area were determined by a search of the EPBC Act Protected Matter Interactive Search Tool. This list of species is shown in Table 1.

Table 1: Marine mammal and turtle species expected to occur in the Project area.

Common Name	Scientific Name	Status
Marine Mammals		
<i>Cetaceans</i>		
Blue whale	<i>Balaenoptera musculus</i>	Endangered, Migratory
Humpback whale	<i>Megaptera novaeangliae</i>	Vulnerable, Migratory
Bryde's whale	<i>Balaenoptera edeni</i>	Migratory
Minke whale	<i>Balaenoptera acutorostrata</i>	Migratory
Killer whale/Orca	<i>Orcinus orca</i>	Migratory
Risso's dolphin	<i>Grampus griseus</i>	Cetacean
Indo-Pacific humpback dolphin	<i>Sousa chinensis</i>	Migratory
Spotted bottlenose dolphin (Arafura/Timor Sea populations)	<i>Tursiops aduncus</i>	Cetacean
Indian Ocean bottlenose dolphin/ Spotted bottlenose dolphin	<i>Tursiops aduncus</i>	Cetacean
Spotted dolphin/ Pantropical spotted dolphin	<i>Stenella attenuata</i>	Migratory
Bottlenose dolphin	<i>Tursiops truncatus</i>	Cetacean
Common dolphin	<i>Delphinus delphis</i>	Cetacean
Sirenians		
Dugong	<i>Dugong dugon</i>	Migratory
Marine Turtles		
Loggerhead turtle	<i>Caretta caretta</i>	Endangered, Migratory
Green turtle	<i>Chelonia mydas</i>	Vulnerable Migratory
Leathery turtle/Leatherback Turtle	<i>Dermochelys coriacea</i>	Vulnerable Migratory
Hawksbill turtle	<i>Eretmochelys imbricata</i>	Vulnerable Migratory
Flatback turtle	<i>Natator depressus</i>	Vulnerable Migratory

Source: EPBC Act Protected Matter Interactive Search Tool with Search Coordinates -20.3967, 116.4486; -20.7193, 116.4486; -20.7193, 116.8850; -20.396, 116.8850.

A total of 12 cetacean, five turtle and one sirenian species may be potentially found within, and adjacent to, Mermaid Sound. Data from the Woodside LNG Phase V dredging program

undertaken during 2005-2006 indicates that dolphins (of unconfirmed species) were the most common marine fauna observed throughout the year.

Whales (most probably humpback whales – *Megaptera novaeangliae*) are observed in the area during the austral winter and spring months (Jenner *et al.* 2001). The bulk of sightings occur between September and November when the whales tend to utilise inshore waters and sheltered bays, such as Mermaid Sound during the southern migration (Jenner *et al.* 2001).

Turtles utilise the near shore waters of Mermaid Sound throughout the year, with the bulk of sightings in the austral summer months (SKM/Woodside, 2007a). This is consistent with nesting activity during this time of year. There are a number of records of turtles nesting on beaches (e.g. Holden beach, No Name beach) adjacent to the proposed onshore facilities (i.e. Site A) on Burrup Peninsula during the summer months (Pendoley 2005, 2006). Table 2 indicates seasonal timing of key environmental sensitivities associated with the dredging component of the Project.

6. Independent Fauna Observer Site Inspections

The BPM IFO undertook site inspections throughout the Project as stipulated by the SEWPC and DEC Pluto LNG Project conditions of consent. Overall, there were a total of 24 site inspections made during the 2007/08, 2008/09 and 2009/10 summer turtle nesting periods. The dates of the site inspections and personnel undertaking these inspections are listed in Appendix 1. The activities undertaken during the site inspections included:

- Conducting environmental inductions for dredge and associated vessel crews,
- Training of dredge operators and bridge crew as marine fauna observers,
- Undertaking fauna observations during dredging operations while on site,
- Undertaking an independent review of the implementation of the Project STMP and fauna observations, and
- Addressing other environmental issues as required.

In accordance with SEWPC and DEC approvals, IFO inspections were outside the turtle nesting season (i.e. early May to Late November). The IFO submitted Field Inspection Reports to Woodside following the completion of each fortnightly site visit, which included the following standard information:

- Project background,
- Preliminary works,
- Activities undertaken during site visit,
- Dredging environmental inductions and Marine Fauna Observer training,
- Marine fauna observed during dredging operations,
- Mitigation activities as per the SEWPC/DEC conditions and Woodside's requirements,
- Adherence to Woodside's environmental requirements,
- Next IFO site visit, and
- Other issues.

Table 2: Seasonal timing of key environmental sensitivities.

	2007		2008												2009											
	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Adult turtles mating*																										
Adult turtles nesting and interesting*																										
Turtle egg development*																										
Hatchling emerging*																										
Resident foraging turtles*	Year round																									
Humpback whale migration**																										
Coral spawning																										

Notes: For environmental sensitivities:  = increased activity;  = peak activity.

Sea turtle activity refers to green, flatback, and hawksbill turtles and shaded areas for coral spawning show months where coral spawning may occur.

References: * Pendoley 2006; ** Jenner *et al.* 2001.

(Source: Pluto LNG Project Dredging and Spoil Disposal Management Plan.)

7. Pluto Dredging Environmental Inductions and Marine Fauna Observer Training

A condition of consent for the Project dredging program required Woodside to undertake a Dredging Environmental Induction for all personnel involved in dredging and associated activities (i.e. survey and support vessels). The Project DSDMP and STMP also identified the need for inductions. The induction presentations were developed by BPM in consultation with Woodside Environmental personnel, Vivien Wong and Nick Jones. Copies of the IFO Pluto Dredging Environmental induction and IFO Pluto Dredging Marine Fauna Observer training presentations are attached as Appendix 2 and 3 respectively.

During the Project's fortnightly site visits by the IFO, 55 Dredging Environmental Induction sessions involving a total of 336 personnel and 33 Marine Fauna Observer Training sessions involving a total of 180 dredge operators and bridge crew were undertaken.

During periods when the IFO was not on site and new dredging personnel joined the Project, the HSE Managers from the dredging companies (i.e. Boskalis Australia, Van Oord and Tideway) were supplied with a copy of the induction presentations that were used for the induction of new personnel.

8. Marine Fauna Impact Mitigation Protocols

Woodside developed a number of strategies to minimise potential impacts on the marine environment during dredging operations. These strategies are identified in the Project STMP, and the Project DSDMP.

These strategies are summarised in Figures 2, 3, and 4 and were implemented during all dredging and associated activities during the Project dredging operations.

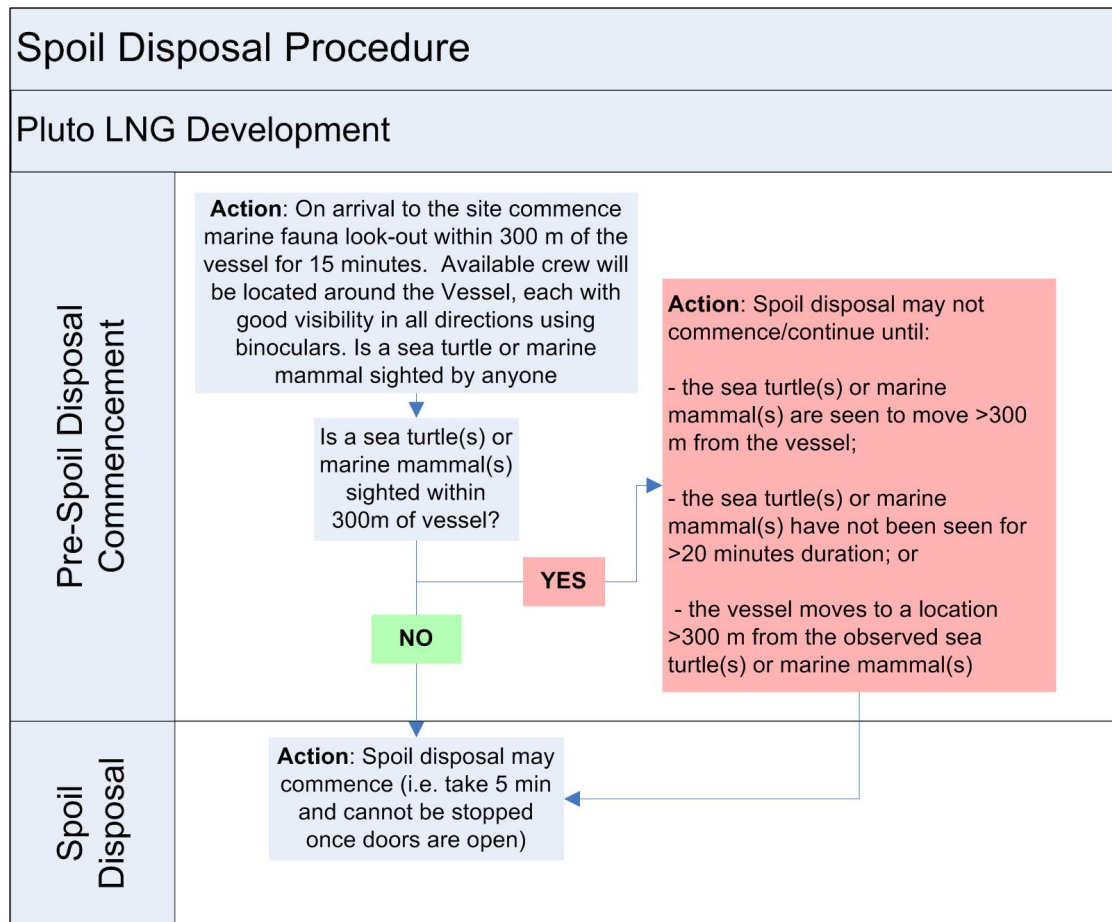


Figure 2: Spoil disposal procedures.

Source: Pluto LNG Project Sea Turtle Management Plan (Woodside/SKM 2007a).

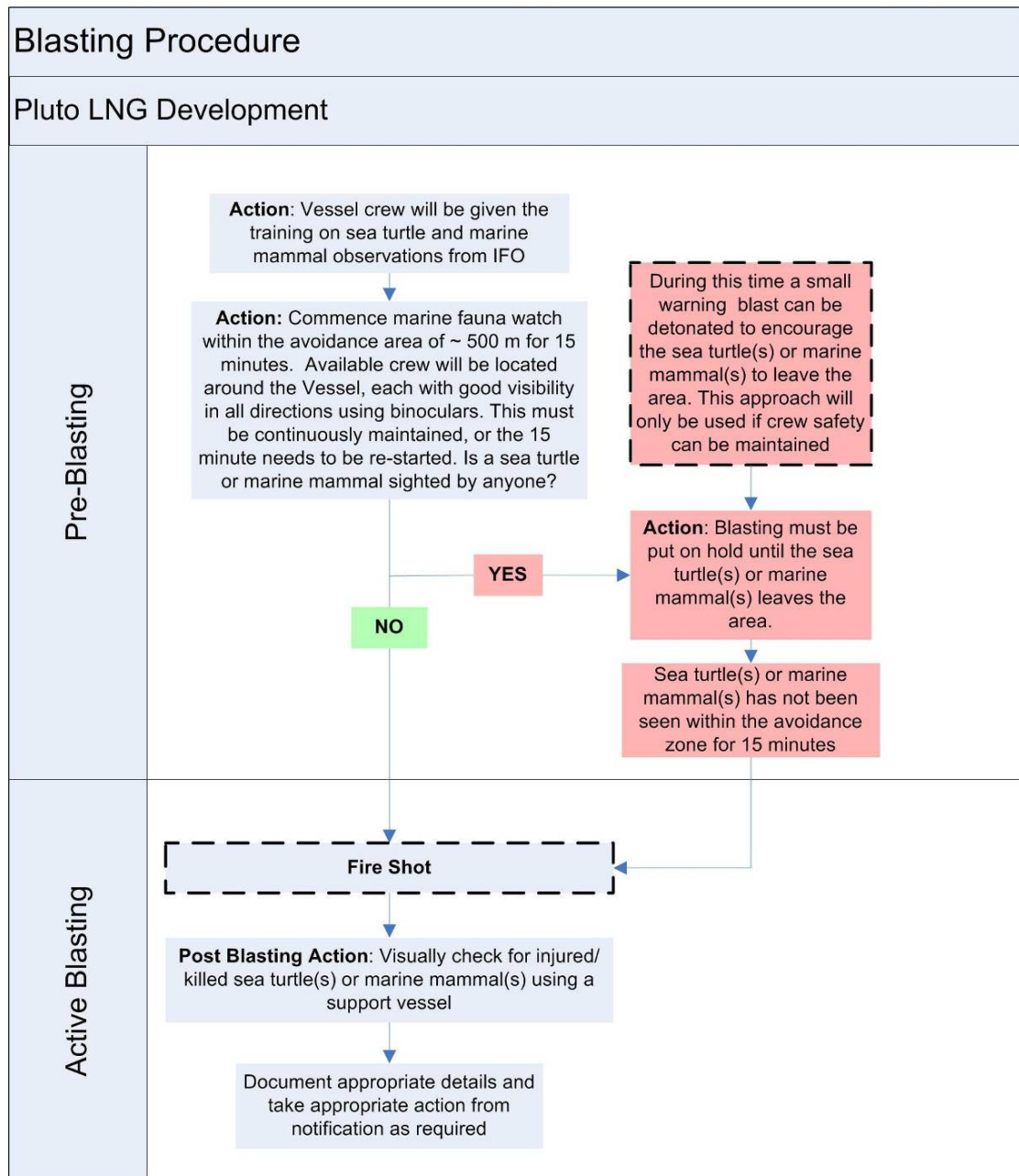


Figure 3: Blasting procedures.

Source: Pluto LNG Project Sea Turtle Management Plan (Woodside/SKM 2007a).

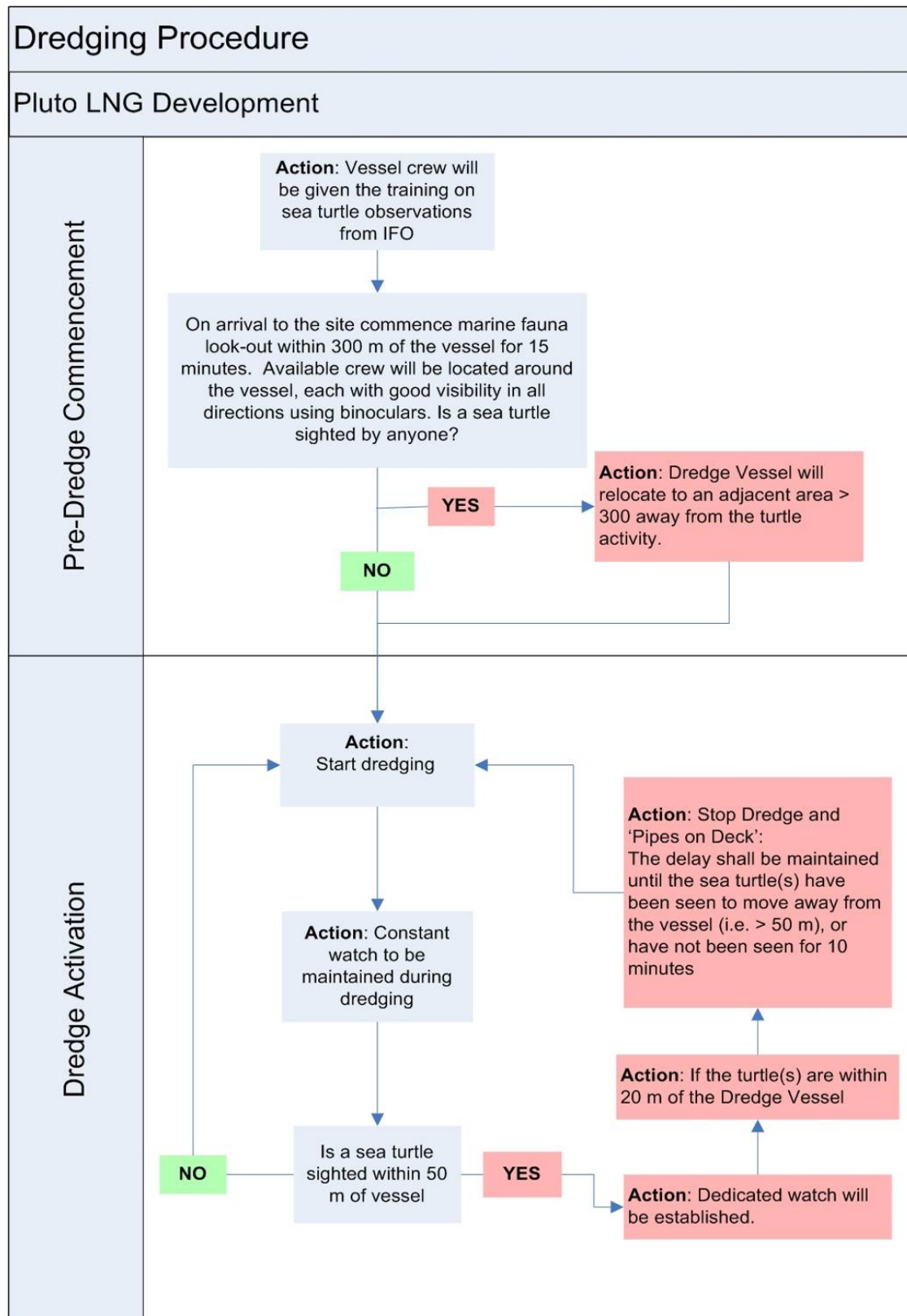


Figure 4: Dredging procedures for Pluto LNG Development.

Note: This protocol was updated once dredging activities had commenced due to an omission of marine mammals in the original procedures.

Source: Pluto LNG Project Sea Turtle Management Plan (Woodside/SKM 2007a).

9. Dredging Operations

During the Project, there were a total of sixteen vessels actively involved in dredging operations and associated activities. The vessels, their roles and the different periods of their involvement are listed in Table 3 (Note: support vessels operated only when required during periods indicated in Table 3).

Table 3 Vessels involved throughout the Pluto LNG Dredging Project

Vessel Name	Vessel Type/Activity	Dates of Operation	
Period 1 - 2007/08		Start	End
Cornelis Zanen	Trailing Suction Hopper Dredge	22/11/2007	24/04/2008
Mermaid Arrow	Survey Vessel	19/11/2007	30/4/2008
Mermaid Boss	Barge support vessel for the Phoenix Cutter	23/01/2008	21/04/2008
Miclyn Legend	Support vessel for the Phoenix	23/01/2008	21/04/2008
Phantom	Crew support vessel Phoenix Cutter/Coza	22/11/2007	25/04/2008
Phoenix Cutter	Dredge	23/01/2008	21/04/2008
Samson 101	Support vessel for the Phoenix Cutter	23/01/2008	21/04/2008
Period 1 - 2007/08 and Period 2 - 2008/09			
Adrenalin Sprint	Survey and crew vessel for Hippo	09/03/2008	09/03/2009
Hippopotes	Excavator	10/03/2008	05/06/2008
		11/11/2008	09/03/2009
Ocean Eagle	Crew/support vessel Phoenix Cutter/Cornelis Zanen	22/11/2007	22/04/2008
PT Kotor	Tug for barges Murray and Yarra and support vessel for the Hippopotes	09/03/2008	09/03/2009
Period 2 - 2008/09 and Period 3 - 2009/10			
Baudin	Support vessel for the Nile River	12/03/2009	29/04/2010
First Class	Survey vessel and support for the Nile River	01/03/2009	01/05/2010
Nile River	Trailing Suction Hopper Dredge	12/03/2009	02/05/2009
		19/02/2010	29/04/2010
Period 3 - 2009/10			
Cornelis Zanen	Trailing Suction Hopper Dredge	31/03/2010	21/05/2010
Leonardo Da Vinci	Cutter Suction Dredge	05/01/2010	11/02/2010
Queen of the Netherlands	Trailing Suction Hopper Dredge	01/09/2009	08/10/2009
		16/10/2009	21/12/2009
		11/04/2010	30/04/2010

10. Marine Fauna Observed

During the entire Pluto LNG Dredging Project there were 530 sightings of marine fauna comprised of 1378 animals and one school of over 1000 tuna. These sightings were recorded from 21st November 2007 to 8th May 2010 (predominantly during November – May). A full list of all marine fauna sightings with relevant information associated with each sighting are shown in Appendix 4.

A breakdown of the numbers of sightings and numbers of animals sighted for each of the three time periods of the Project are given in Table 4. Period one of the Project encompasses sightings from 21st November 2007 to 1st June 2008, period two from 20th November 2008 to 3rd May 2009 and period three from 1st September 2009 to 8th May 2010.

It is important to note that the sightings have not been obtained from a systematic survey design and therefore sighting effort between vessels will vary. Furthermore, sightings are not necessarily independent sightings of animals, especially when more than one vessel was working in close proximity to another and multiple reports of the same individual or group may exist. It is, therefore, not possible to accurately estimate the absolute number of dolphins, whales or turtles present in the area over the reporting period. The sightings made during this survey do, however, provide a useful estimate of presence/absence of marine fauna in the areas that were surveyed.

Generally, animals were identified to a taxa grouping and species identification was not obtained for most sightings. There were a number of sightings, however, in which animals were identified to species level (Table 5).

Table 4: List of sightings in which species identification was possible during the Pluto LNG Dredging Project.

Species	Number of sightings	Number of animals
Marine mammal		
Bottlenose dolphin (<i>Tursiops aduncus</i>)	6	14
Snubfin dolphin (<i>Orcella heinsohni</i>)	1	3
Indo-Pacific humpback dolphin (<i>Sousa chinensis</i>)	2	4
Marine reptile		
Green turtle (<i>Chelonia mydas</i>)	1	1
Marine fish		
Tiger shark (<i>Galeocerdo cuvier</i>)	1	1
Tuna (<i>spp.</i>)	4	1000 (1 sighting)
Sawfish (<i>spp.</i>)	1	1
Sailfish (<i>Istiophorus platypterus</i>)	1	1

Table 5: The number of sightings and number of animals sighted of each marine fauna taxa for each of the three periods of the Pluto LNG Dredging Project.

Marine Fauna	Period 1 (2007/08)		Period 2 (2008/09)		Period 3 (2009/10)		TOTAL			
	No. sightings	No. animals sighted	No. sightings	No. animals sighted	No. sightings	No. animals sighted	No. sightings	% sightings	No. animals sighted	% animals sighted
Marine mammals										
Dolphin	146	471	77	230	137	454	360	68%	1155	49%
Small cetacean	1	3	0	0	0	0	1	0%	3	0%
Whale	0	0	0	0	36	71	36	7%	71	3%
Dugong	1	1	1	1	0	0	2	0%	2	0%
Marine reptiles										
Turtle	30	32	24	25	33	33	87	16%	90	4%
Sea snake	1	1	2	2	11	12	14	3%	15	1%
Marine fish										
Fish	0	0	1	1	5	1001	6	1%	1002	42%
Shark	1	1	2	2	2	8	5	1%	11	0%
Manta Ray	4	5	2	2	10	19	16	3%	26	1%
Sting ray	1	1	1	2	0	0	2	0%	3	0%
Coral										
Coral spawn	0	N/A	0	N/A	1	N/A	1	0%	0	0%
Overall Total	185	515	110	265	235	1598	530	100%	2378	100%

Although whales were not identified to species level, it is most likely many of these were humpback whales. This is because sightings (mostly in September and only in Period 3 of the Project) coincided with the peak time of humpback whale breeding on the NW Shelf of WA.

Bottlenose dolphins that were observed during IFO visits were able to be individually identified due to a number of distinguishing features (i.e. scars and/or distinctive notches in the dorsal fin). It is possible that there are a number of bottlenose dolphins resident to the Mermaid Sound area, although no dedicated assessment of this was undertaken. Those dolphins that were sighted were often observed engaged in apparent foraging behaviour near the edge of dredging plumes.

The most commonly observed marine fauna during the entire Project were dolphins (68%) followed by marine turtles (16%) (Table 4 and Figure 5). Whales consisted of 7% of all sightings and, for aforementioned reasons, were most likely humpback whales.

Manta rays (3%), sea snakes (3%) and sharks (1%) were also consistently sighted throughout the Project although in low numbers. (Table 4 and Figure 5). The 'Other' category (2% of sightings) consisted of small cetaceans, dugong, sting rays, fish (i.e. tuna, sailfish, sawfish) and one event of coral spawning. All were recorded in low numbers (Table 4), except for the large school of over 1000 tuna recorded in one sighting.

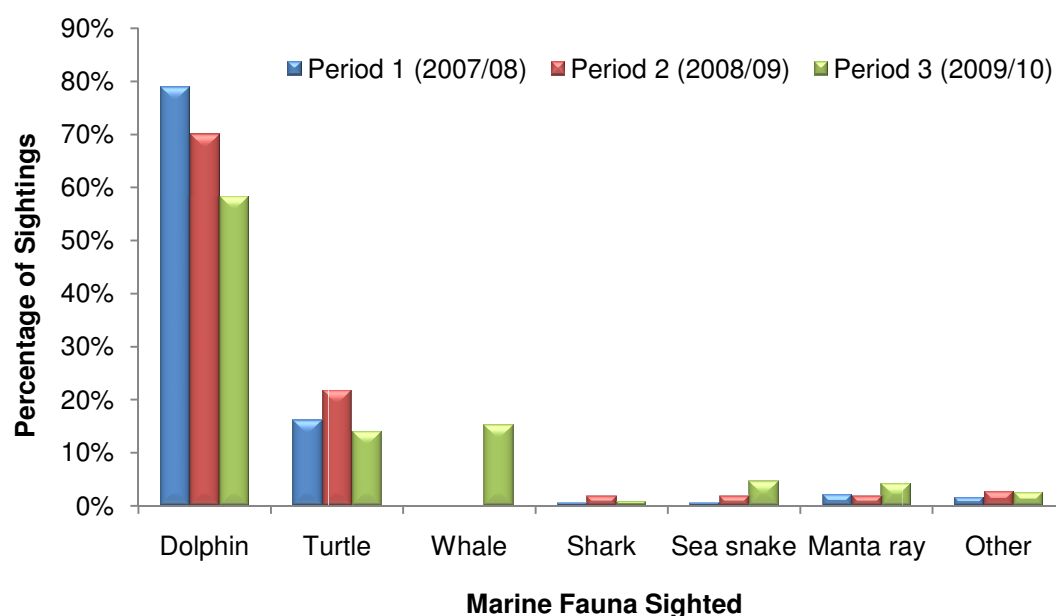


Figure 5: The percentage of sightings of marine fauna taxa for each of the three periods of the Pluto LNG Dredging Project.

Generally, dolphins and turtles were observed in all months of the year that were surveyed. Some slight trends in the numbers of sightings and numbers of animals sighted are evident, however (Figure 6 and Figure 7). In particular, March and April generally exhibited the highest numbers of dolphin sightings (and dolphins sighted). Whales were only sighted in period three of the Project, which was the only period to begin in September. The majority of whale sightings were in September and October and were most likely humpback whales.

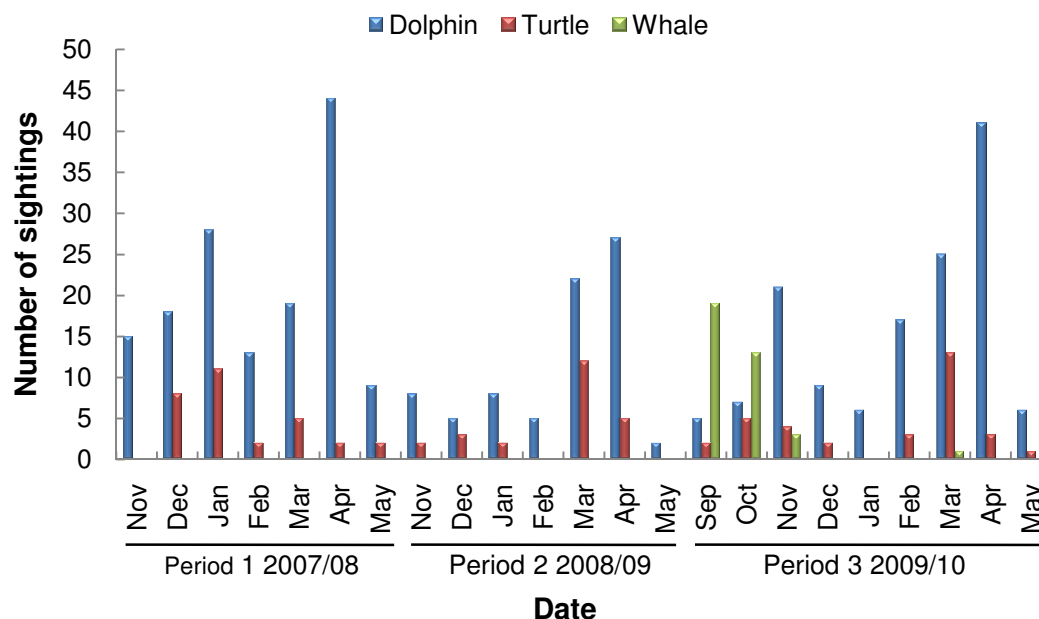


Figure 6: Distribution of the number of sightings for the three most commonly observed taxa (dolphins, turtles, whales) during the Pluto LNG Dredging Project.

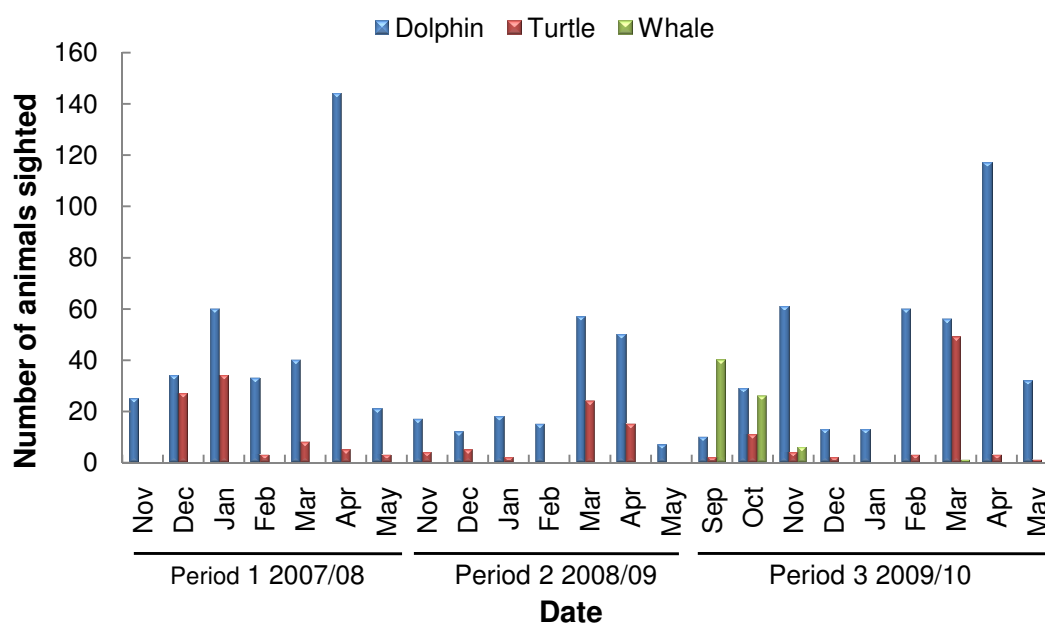


Figure 7: Distribution of the number of animals sighted for the three most commonly observed taxa (dolphins, turtles, whales) during the Pluto LNG Dredging Project.

The vessels that reported the highest number of sightings during the entire Project and contributed to almost half of the sightings recorded were the 'Cornelis Zanen' (26%) and the 'Queen of the Netherlands' (22%), both trailing suction hopper dredge vessels (Table 6 and Figure 8). Next was the vessel 'First Class' (11% of sightings), which was support to the 'Nile River', and then the 'Nile River' trailing suction hopper dredge itself (10% of sightings) (Figure 8). These vessels were predominantly the operational vessels, whereas the other vessels that contributed to the remaining 30% of sightings recorded were functioning as support vessels and/or crew vessels. Consequently, it is more likely that operational vessels

will record a higher number of sightings. These sightings, however, are not adjusted for sighting effort which is likely to have varied between vessels.

Table 6: Number of marine fauna sightings recorded for different vessels

Vessel name	Vessel role	No. sightings		
		Period 1	Period 2	Period 3
Adrenalin Sprint	Survey & crew vessel for Hippopotes	24	0	N/A
Baudin	Support vessel for the Nile River	N/A	26	16
Cornelis Zanen	Trailer Suction Hopper Dredge	112	N/A	26
First Class	Survey vessel & support for Nile River	N/A	20	39
Hippopotes	Backhoe Dredge	29	10	N/A
Leonardo Da Vinci	Cutter Suction Hopper Dredge	N/A	N/A	8
Nile River	Trailer Suction Hopper Dredge	N/A	27	27
Ocean Eagle	Crew/support vessel Phoenix Cutter/ Cornelis Zanen	6	15	N/A
Phantom	Crew support vessel Phoenix Cutter/ Cornelis Zanen	4	N/A	N/A
Phoenix Cutter	Cutter Suction Hopper Dredge	4	N/A	N/A
PT Kotor	Tug for barges Murray and Yarra and support vessel for the Hippopotes	6	12	N/A
Queen of the Netherlands	Trailer Suction Hopper Dredge	N/A	N/A	119
Total		185	110	235

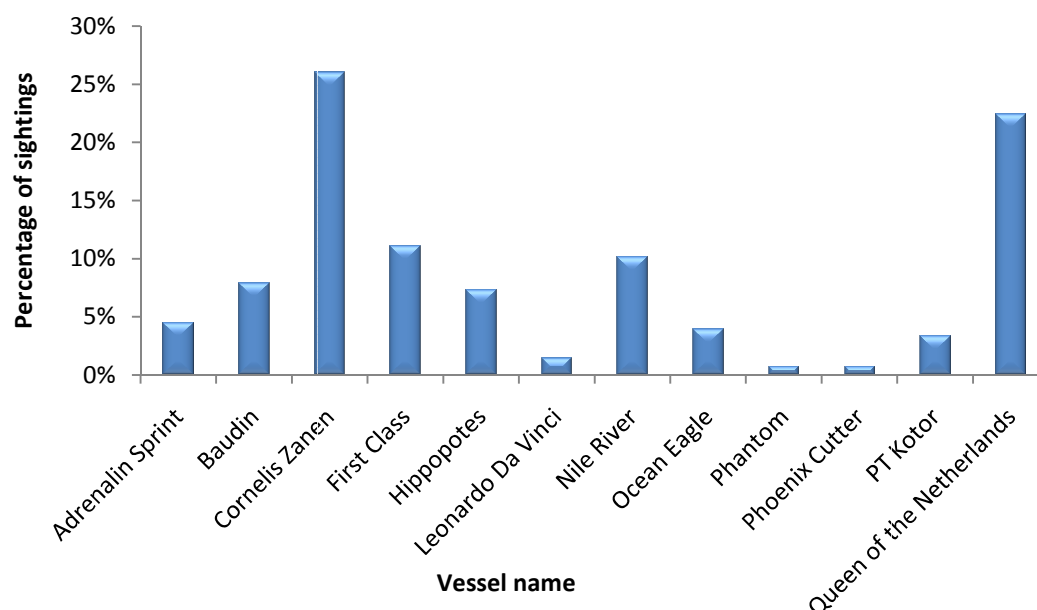


Figure 8: Overall percentage of marine fauna sightings recorded for different vessels operating throughout the three periods of the Pluto LNG Dredging Project.

The majority of sightings (85%) were recorded when the vessels were engaged in the following three activities (Figure 9):

1. In transit from one location to another and not undergoing any operational task (42%),
2. Undertaking dredging operations (35%), or
3. At anchor (8%).

Section 12 of the report discusses the interruptions to dredging operations due to marine mammals and turtles. The majority of sightings recorded during transit of the vessels resulted in minor interruptions to vessel activity such as course alterations or reductions in speed. Considering the high number of sightings during dredging activities there were very few interruptions as a result of marine fauna sightings.

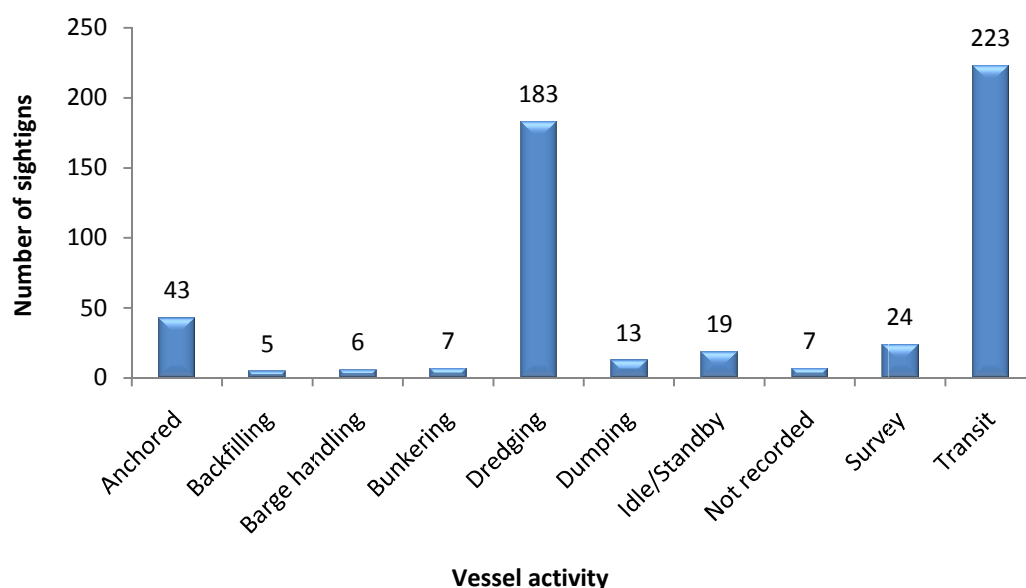


Figure 9: Overall number of marine fauna sightings recorded during different vessel activities throughout the three periods of the Pluto LNG Dredging Project.

A map of the locations for all marine fauna sightings recorded during the Project between 21st November 2007 and 8th May 2010 is shown in Figure 10. It should be noted that sightings in Figures 10-13 are not weighted by effort (i.e. sighting effort occurred around dredging sites only and not in adjacent areas) and it is expected that marine fauna would also occur in areas adjacent to dredging operations. The distribution of animals only reflects the areas of operations of the vessels involved in the Project and the marine fauna that were encountered during these operations.

Most of the dredging effort was focussed close to shore off Burrup Peninsula, which is reflected in the sighting data (Figure 10). When comparing the distribution of the three most commonly sighted marine fauna; turtle sightings are relatively dispersed throughout the Project area (Figure 11), dolphin sightings appear clumped closer to shore (Figure 12) and the few sightings of whales that were made were further off the coast (Figure 13).

Due to the possibility that different vessels may record sightings of the same animals², it is difficult to determine whether the distribution of dolphin sightings reflects their natural distribution and whether numbers are inflated. Regardless, on many occasions IFO visits resulted in resightings of the same individual dolphins (predominantly Indo-Pacific humpback and bottlenose dolphins). This may indicate that individual animals utilise the area on a routine basis. In order to better understand any impact of the Program on these animals it would be prudent to obtain a better understanding of the population size and habitat utilisation for dolphins in this area.

Given the peak in observations (September, which is peak humpback breeding season on NW Shelf of WA) it is logical to assume that the whales that were sighted were most likely humpbacks. This would also account for the relatively few sightings of whales during the Project as only a small overlap occurred between the peak humpback whale breeding season and the Project; most Project operations occurring outside of this time.

² Vessels either recording a sighting of the same animal(s) at the same time, or recording multiple sightings of the same animal(s) during the same day.

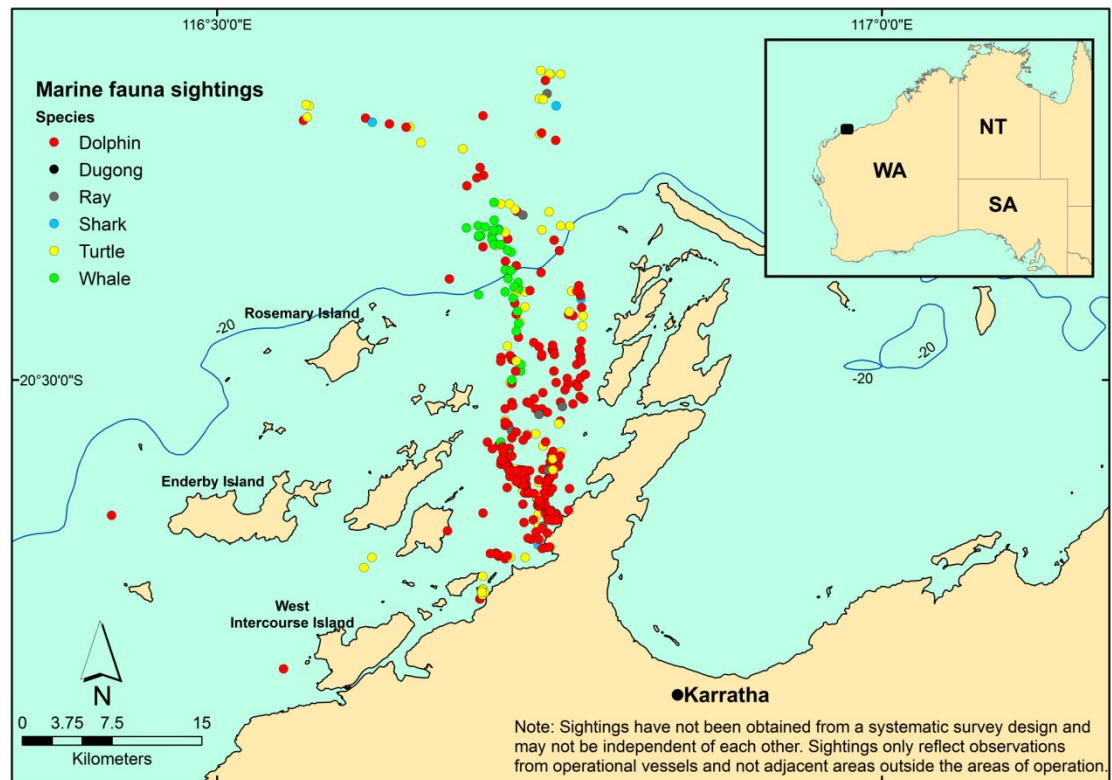


Figure 10: Map of the locations of all marine fauna sightings recorded during the Pluto LNG Dredging Project.

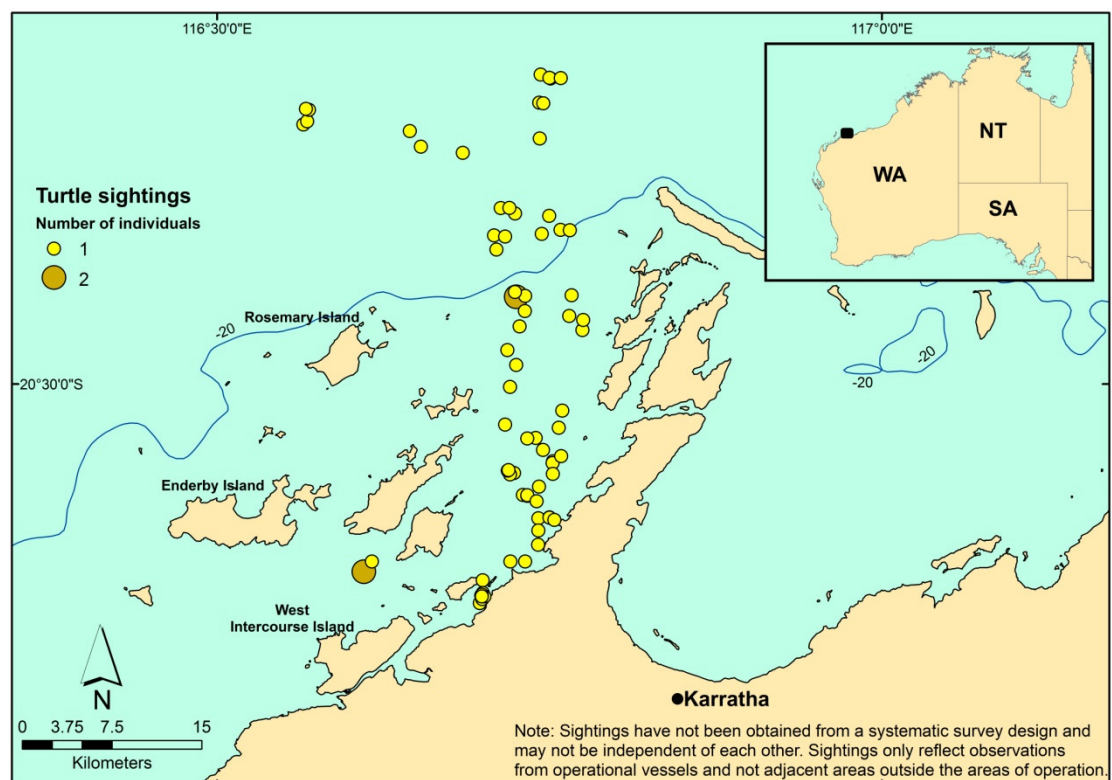


Figure 11: Map of the locations of all turtle sightings recorded during the Pluto LNG Dredging Project.

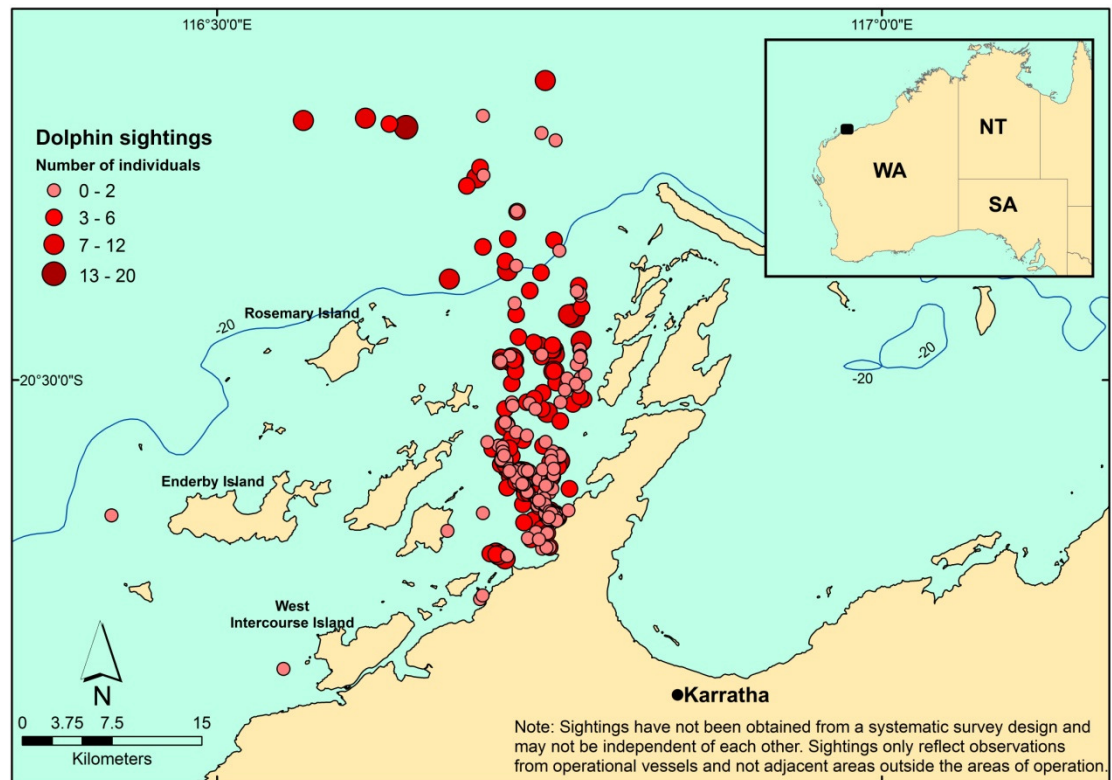


Figure 12: Map of the locations of all dolphin sightings recorded during the Pluto LNG Dredging Project.

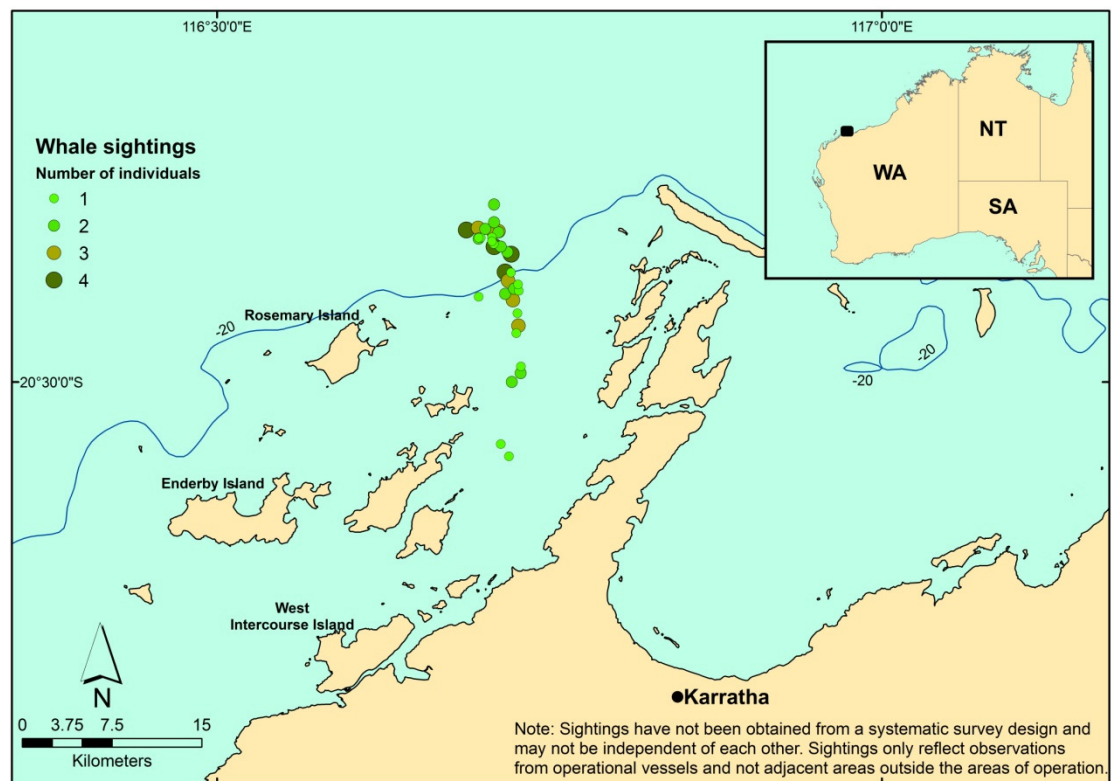


Figure 13: Map of the locations of all whale sightings recorded during the Pluto LNG Dredging Project.

11. Factors Affecting Marine Fauna Sightings

Environmental conditions can impact on the ability to sight cetaceans and other marine fauna at sea. Sea state, as represented by the Beaufort scale (Appendix 5), is the factor that can potentially have the most significant effect on the sighting rate of marine fauna. Other factors include haze, cloud cover, precipitation and glare.

During the Project weather conditions were wide-ranging with sea state varying between Beaufort 0 (e.g. winds below 1km/hour) and Beaufort 7 (e.g. winds between 50 to 60 km/hour). The mean Beaufort sea state during the dredging period of the Project when marine fauna sightings were recorded in was approximately 2. Figure 14 shows the percentage of marine fauna sightings against their corresponding sea state.

Approximately half of the 530 sightings occurred during good sighting conditions (i.e. Beaufort sea state 1), after which sighting numbers decline as the sea state increases. There are only a few sightings in Beaufort Sea State 0 because calm conditions of winds less than 1 km/h are uncommon. Sighting conditions above Beaufort 3 make it difficult to spot marine fauna. As conditions deteriorate beyond Beaufort 5, it is very difficult to spot any marine fauna; however during these conditions dredging operations were typically suspended especially if the increased sea state occurred during a period of increased swell.

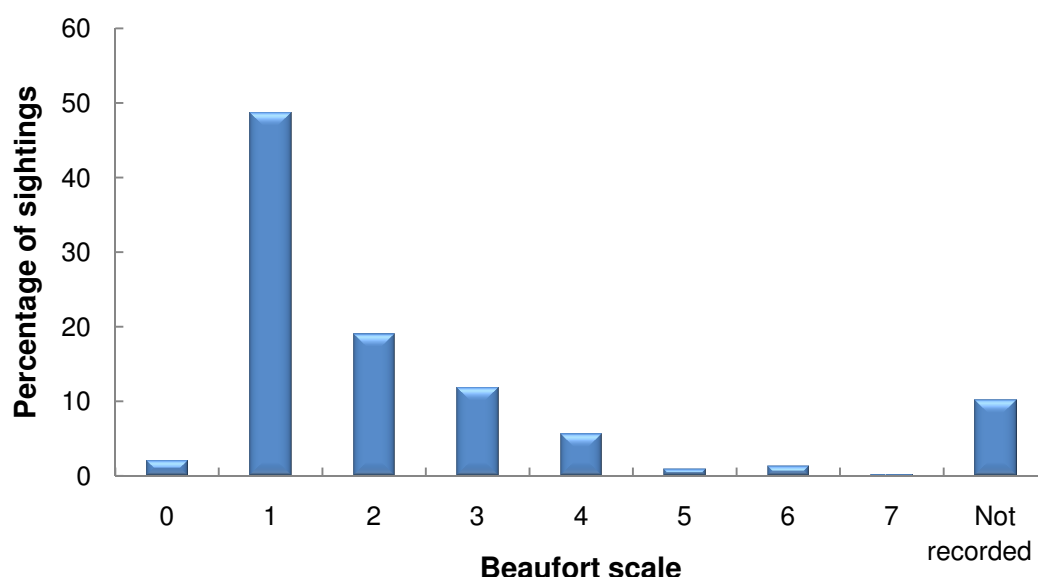


Figure 14: Percentage of marine fauna sightings recorded in different sea states.

Sea state has the potential to bias the ‘sightability’ of marine fauna, and in particular smaller and/or non surface active species. Vessel-based surveys for marine fauna have shown that the probability of sightings of marine fauna for each sea state is not consistent. Gidding and Paton (2006) determined that sightings of cetaceans declined significantly after Beaufort 3.

Given that the number of marine fauna sightings reported during the Project declined significantly in sea states above Beaufort 2 it is likely that sea state had an influence on the sighting rate of marine fauna. It is also likely that dolphins were the most commonly sighted animal because they can be more easily sighted at the surface than other marine fauna species such as turtles.

Another factor that can affect the sighting of marine fauna is sighting effort. Sighting effort will have varied between vessels dependent on the role of the vessel within the Project.

The Project's STMP and DSDMP/EMP require trained marine fauna observers to undertake continual observations for marine fauna during dredging and associated activities throughout the Project. Bridge crew and dredge operators undertook this role and were complemented by the IFO during fortnightly site visits.

The crew on the dredging vessels were all experienced seamen and all undertook specific training from the BPM IFO relating to marine fauna observation requirements and the marine fauna potentially found in the region. Dedicated IFOs are likely to have higher sighting efficiency.

12. Interruptions to Dredging Operations due to Turtles and Marine Mammals

In total, there were six interruptions to dredging operations due to sightings of turtles or marine mammals during the Project. A list of the sightings that resulted in interruptions to dredging operations is provided in Table 7.

Table 7: List of interruptions to dredging operations that occurred as a result of marine fauna sightings during the Pluto LNG Dredging Project.

Interruption number	Date	Marine fauna	Number of animals	Vessel activity
1	31/03/2009	Dolphin	2	Dredging
2	05/04/2009	Turtle	1	Dredging
3	17/10/2009	Whale	3	Dumping
4	16/11/2009	Dolphin	1	Dredging
5	28/02/2010	Turtle	1	Dredging
6	02/03/2010	Turtle	1	Dredging
1	15/04/2008	Manta ray	1	Dredging

The first interruption to dredging activities was due to a pod of two dolphins that approached within the 20 metre radius of the shut down zone of the drag head. This resulted in a temporary suspension of dredging operations, which lasted 20 minutes.

The second interruption occurred when a single turtle was sighted at 17:25 approximately 75 metres from the 'Nile River' dredge head. Dredging operations stopped and visual contact was maintained until the turtle moved outside the area of operation.

The third interruption occurred when a pod of three whales was reported to have approached dumping operations to a distance of approximately 15 metres prior to dumping. In accordance with the required protocols, dumping of spoil was delayed until the whales had moved away from the vessel.

The fourth interruption occurred when a single dolphin approached within the 75 metre radius of the drag head at 07:56 when the 'Queen of the Netherlands' was dredging.

The fifth interruption to dredging operations occurred as a result of a turtle sighted approximately 5 metres (within the 20 metre shut down zone) from the 'Nile River' dredge head. Dredging operations were temporarily suspended and the vessel turned away from the animal to minimise any potential impacts on the turtle.

The sixth and final interruption occurred when a turtle was observed at a distance of approximately 40 metres from the ‘Nile River’ during dredging operations. The ‘Nile River’ stopped dredging until the turtle was observed to move outside of the 50 metre zone from the dredge head.

There was also an interruption to dredging operations on the 15th April 2008 due to a manta ray being within 20 metres of the bucket of the excavator on the Hippopotus. Although not required to cease operations for a manta ray, the excavator operator ceased operations until the manta ray was at a safe range from the excavator.

Overall, the number of sightings of turtles and marine mammals close to dredging operations that resulted in interruptions to dredging comprised only 1% of the overall sightings (Figure 15). For the majority of sightings, no mitigation activities (77%) were needed to be undertaken as a result of turtle and marine mammal sightings. In these cases, marine fauna observers maintained visual contact of the animals and monitored their movement until the animals were out of range.

The remaining mitigation measures involved a number of minor instances that predominantly impacted vessels in transit (mainly support vessels), resulting in a small loss of operating time due to the necessity to either alter the course of the vessel while underway in transit (6%) or to slow down (2%) to avoid marine fauna. An example of a vessel requiring to alter its course occurred on September 10th 2009 when a whale breached approximately 50 metres from the ‘Queen of the Netherlands’ while she was in transit. The vessel altered course to avoid the whale.

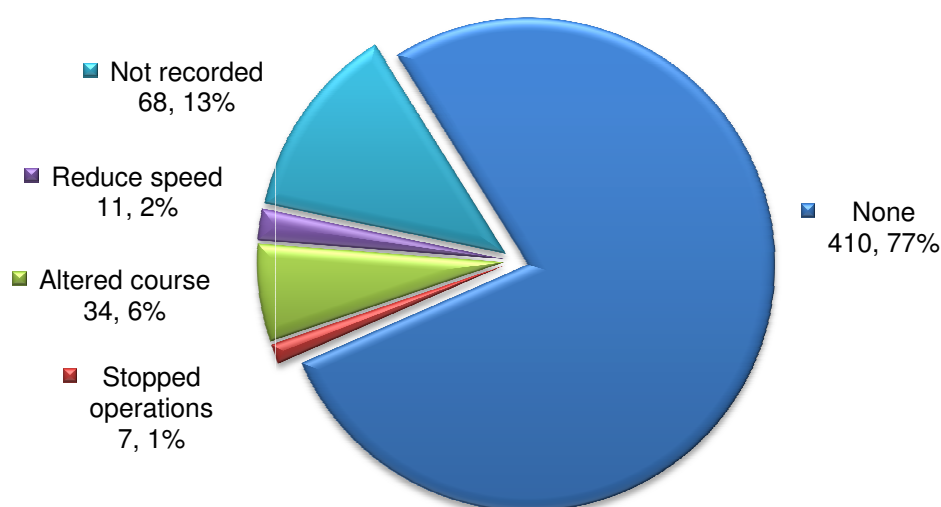


Figure 15: Number and percentage of sightings of marine fauna and the consequent mitigation activity.

13. Dredging Contractor’s Compliance with the SEWPC and WA EPA Conditions of Consent and Woodside’s Management Plans

Part of the IFO’s role during the Project was to monitor and undertake an independent assessment of the dredging contractor’s adherence to Woodside’s requirements and the conditions of consent.

There was no evidence of direct impacts of the dredging program on marine turtles or marine mammals detected by or reported to the IFO during site visits. In total, there were six interruptions to dredging operations due to sightings of turtles or marine mammals (Table 7)

and in each case there was full adherence to the agreed Project STMP. In some cases, mitigation procedures were enacted when non-target species (i.e. manta ray, sailfish) that did not require any mitigation action to be undertaken.

The Woodside dredging contractors were found to be fully compliant in their adherence to:

- The SEWPC and WA EPA requirements in relation to marine fauna interactions,
- The Project STMP, and
- The implementation of marine fauna impact mitigation components of the Project DSDMP.

14. References

- Gidding, L. & Paton, D. (2006) Marine Mammal Observation Survey Report for the Torosa, Snarf and Willem Seismic Surveys. Report to Woodside Energy Limited.
- Jenner, C., Jenner, M., McCabe, K. (2001). Geographical and temporal movements of Humpback Whales in Western Australian Waters. APPEA Journal 2001, pp. 749-765
- Pendoley (2005, 2006) Pendoley Reports Appendix A, Pluto LNG Project Sea Turtle Management Plan 2007. SKM/Woodside
- Pendoley, K. (2005a) Sea turtles and the environmental management of industrial activities in North West Western Australia. PhD thesis, Murdoch University.
- SKM/Woodside (2007a) Pluto Sea Turtle Management Plan. Report produced by SKM for Woodside.
- SKM/Woodside (2007b) Pluto LNG Project Dredging and Spoil Disposal Management Plan. Report produced by SKM for Woodside.
- Woodside Pluto LNG Fact Sheet Q2 2009. Website accessed 11 June 2009. http://www.woodside.com.au/NR/rdonlyres/C59406C5-7349-4C01-B2D1D31BF62E506A/0/PlutoFactSheet_Apr2009.pdf.

15. Appendices

Appendix 1

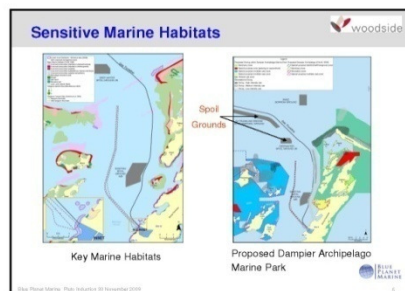
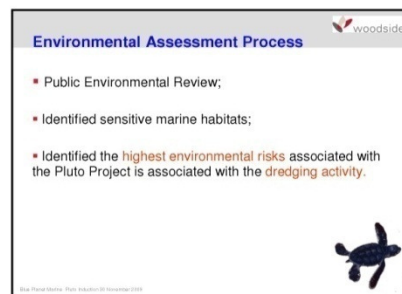
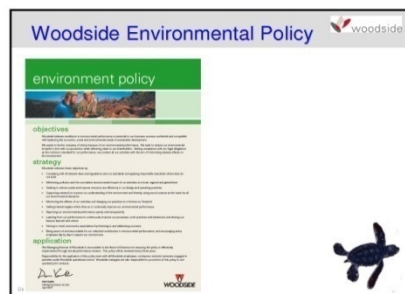
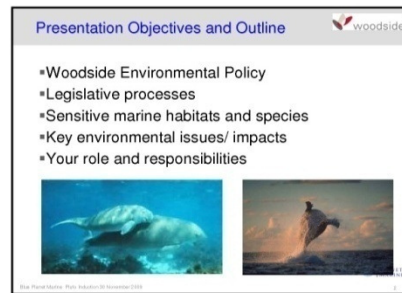
Dates and BPM IFO personnel for Pluto IFO site inspections

Field inspection number	Dates	BPM IFO
1	19 th - 21 st November 2007	David Paton
2	6 th December 2007	Wayne Pellow
3	19 th December 2007	David Paton
4	1 st - 2 nd January 2008	David Paton
5	16 - 17 th January 2008	Wayne Pellow
6	29 th - 31 st January 2008	David Paton
7	13 - 15 th February 2008	David Paton
8	28 - 29 th February 2008	David Paton
9	13 - 14 th March 2008	David Paton
10	14 - 15 th April 2008	David Paton
11	26 th April 2008	David Paton
12	1 st December 2008	David Paton
13	16 th December 2008.	David Paton
14	29 th December 2008.	David Paton
15	14 th January 2009.	David Paton
16	28 th January 2009.	David Paton
17	11 - 12 th March 2009	David Paton
18	30 th March 2009	David Paton
19	15 th April 2009	David Paton
20	1 st - 2 nd December 2009	David Paton
21	2 nd - 3 rd of February 2010	David Donnelly
22	22 nd March 2010	David Paton
23	8 th April 2010	David Paton
24	27 th April 2010	David Paton

Note: A number of IFO field inspections programmed during the dredging program were rescheduled due to coral spawning events or interruptions to dredging operations as a result of no dredging activities being undertaken associated with the Project.

Appendix 2

Pluto Dredging Environmental Induction Presentation



Environmental Sensitivities

- Coral and coral habitats particularly within the Proposed Dampier Archipelago Marine Park;
- Dugong and dugong habitats;
- Humpback whale;
- Marine turtles and nesting beaches.



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Marine Turtles

- Six species of marine turtle are known from the region.
- The region supports foraging grounds for marine turtles that nest elsewhere in Australia and overseas.
- Marine turtles are present in the Dampier Port area year round, however peak numbers of turtles are sighted during the summer months when turtles nest on beaches in the area (including Holden and No Name Beach).



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Marine mammals

- Potentially up to 40 species of marine mammals (whale, dolphin and dugong) are either resident in or migrate along the WA coast line.
- Humpback whales migrate between Antarctic feeding grounds and breeding grounds in the Kimberley, June to October.



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Marine mammals

- Dolphins and Dugongs are the marine mammals most likely to be encountered within the Dampier Port Area.
- Resident pod of Bottlenose and Indo-Pacific Humpback Dolphin
- Potentially present year round.



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Legal and Other Requirements

- *Environment Protection (Sea Dumping) Act 1981 (Cwth).*
- *Environment Protection (Sea Dumping) Regulations 1983 (Cwth).*
- *Environment Protection and Biodiversity Conservation Act 1999 (Cwth) (EPBC Act).*
- *Wildlife Conservation Act 1950 (WA).*
- *Protection of the Sea (Prevention of Pollution from Ships) Act 1983 (Cwth).*
- *Australian Quarantine Regulations 2000 (Cwth).*
- *Environmental Protection Act 1986 (WA).*
- *Pollution of Waters by Oil and Noxious Substances Act 1967 (WA).*
- *Port Authorities Act 1999 (WA).*
- *Shipping Pilotage Act 1967 (WA);*
- *Marine and Harbours Act 1981 (WA);* and
- *International Convention for the Prevention of Pollution from Ships, 1973, as modified by the protocol of 1978 relating thereto (MARPOL 73/78).*

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11

Legal and Other Requirements

- *Environment Protection (Sea Dumping) Act 1981 (Cwth).*
- *Environment Protection (Sea Dumping) Regulations 1983 (Cwth).*
- *Environment Protection and Biodiversity Conservation Act 1999 (Cwth) (EPBC Act).*
- *Wildlife Conservation Act 1950 (WA);*
- *Protection of the Sea (Prevention of Pollution from Ships) Act 1983 (Cwth).*
- *Australian Quarantine Regulations 2000 (Cwth).*
- *Environmental Protection Act 1986 (WA).*
- *Pollution of Waters by Oil and Noxious Substances Act 1967 (WA).*
- *Port Authorities Act 1999 (WA).*
- *Shipping Pilotage Act 1967 (WA);*
- *Marine and Harbours Act 1981 (WA);* and
- *International Convention for the Prevention of Pollution from Ships, 1973, as modified by the protocol of 1978 relating thereto (MARPOL 73/78).*

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Governmental Approval (State and Commonwealth)

Woodside has gained approval from:

- Commonwealth Department of Environment, Water, Heritage and the Arts (DEWHA) under the EPBC Act 1999;
- DEWHA has determined that the proposed activity **is a controlled action** under the EPBC Act.
- Western Australian Department of Environment under the Environmental Protection Act 1986
- DEC has assessed the Pluto LNG Development proposal and has determined conditions to comply with the Environmental Protection ACT 1986.

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Zones of Potential Impact



- Zone A - predicted 100% coral mortality
- Zone B - up to 10% coral mortality
- Zone C - no impacts to corals allowed
Proposed Marine Park
Best Practice Management

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Environmental Management Plans (EMPs)

EMPs required before project starts:

- Dredging and Spoil Disposal Management Plan
- Marine Quarantine Management Plan
- Oil Spill Contingency Plan
- Sea Turtle Management Plan



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Environmental Management Plans (EMPs)

EMPs required before project starts:

- Dredging and Spoil Disposal Management Plan
- Marine Quarantine Management Plan
- Oil Spill Contingency Plan
- Sea Turtle Management Plan



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Environmental Management Plans

- The Dredging and Spoil Disposal Management Plan and the Sea Turtle Management Plan have been developed based on DEWHA and DEC's conditions of consent, and Woodside's Environmental Plan for the Pluto LNG Development.
- These plans identify legislative requirements and actions to minimise impacts on the marine environment and marine fauna.
- They are legally binding documents.



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Sea Turtle Management Plan (STMP)

- These plans provide a management framework to enable Woodside and their contractors to detect and mitigate impacts upon the marine environment and marine fauna with a particular focus on turtles and marine mammals (whale, dolphins and dugongs).
- These plans identify the requirement for a **Trained Marine Fauna Observer** on vessels involved in the Pluto LNG Project.




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Requirements and objectives of STMP


- Provide a management framework to enable Woodside and its contractors to detect and mitigate as necessary any impact upon marine turtles and marine mammals from the project; and
- Identify darkness strategies to reduce as far as practicable lights or light glow interfering with nesting female turtles and hatchlings.



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Activities which may have an impact on turtles and marine mammals


- Dredging for trunkline installation, navigation channel, berthing pocket, and vessel turning basin in Mermaid Sound;
- Potential drill and blasting for jetty construction and shore crossing, in the vicinity of Holden Point;
- Dredge spoil disposal both within and outside of Mermaid Sound;



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Activities which may have an impact on turtles and marine mammals

- Rock fill for trunkline stabilisation;
- Construction of LNG and condensate storage and export facilities on Site A;
- Operation of the LNG and condensate storage and export facilities on Site A; and
- Vessel movement during all phases of the project.




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Operating procedures

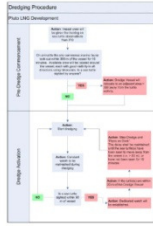

Implementation of standard operating procedures to minimise impacts during

- Dredging;
- Blasting;
- Spoil disposal; &
- Light management.

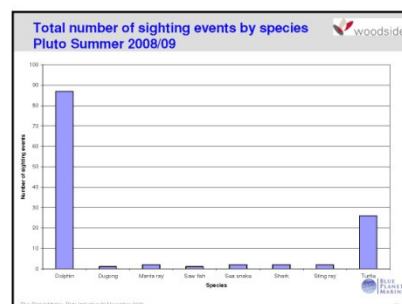


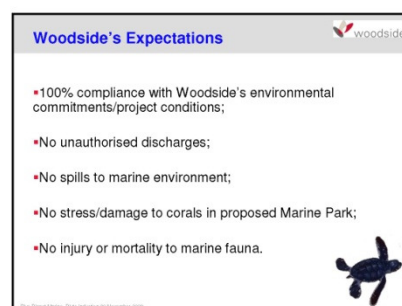
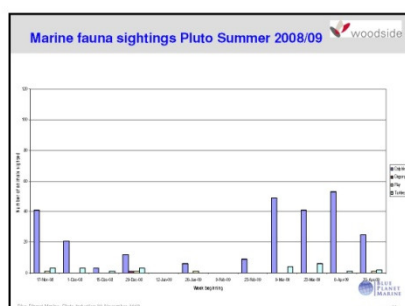
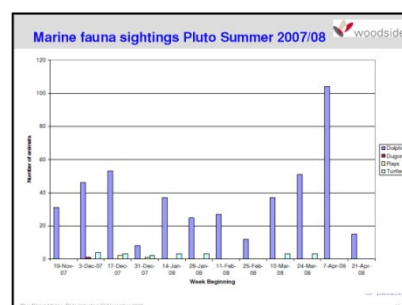
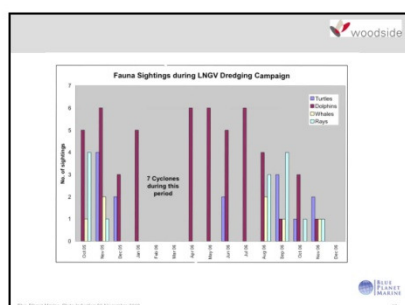
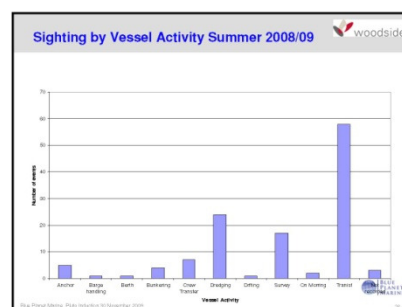
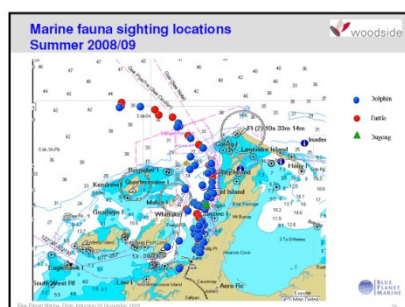
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Dredging Procedures

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Procedures for Managing and Reporting Injury or Death of Marine Fauna

- All whales, dolphins, dugongs, marine turtles, a range of sharks and sea snakes are protected species.
- Sightings of all injured or dead marine fauna are to be reported to the Woodside Environmental Advisor, who will then contact the Department of Environment and Conservation so that appropriate action can be taken.
- **Do not** attempt to capture or handle any marine fauna without approval from Woodside.

Blue Planet Marine Pty Ltd. 10/05/09 10/05/09 2009



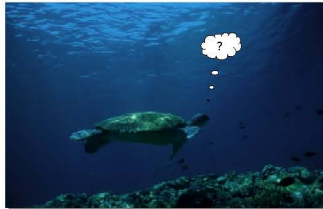
Your role and responsibilities

- Undertake the required wildlife observations and report/record all turtle and marine mammal (whales, dolphins or dugongs) sightings;
- Store chemicals/hydrocarbons appropriately (bund);
- Clean spills as soon as it occurs;
- Report spills and other environmental incidents;
- Segregate waste;
- No disposal of waste over side;
- Noise, vibration and light management;
- Vessel management.



Blue Planet Marine Pty Ltd. 10/05/09 10/05/09 2009

Questions

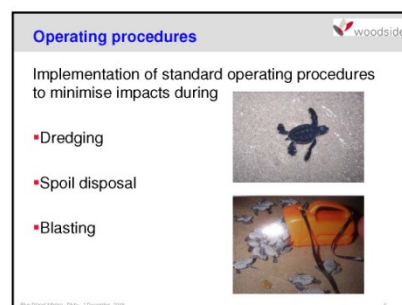
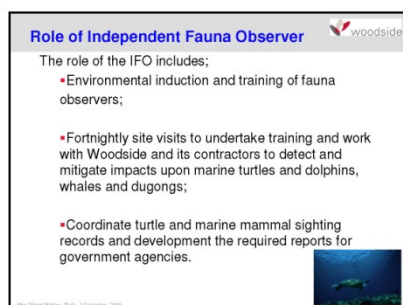
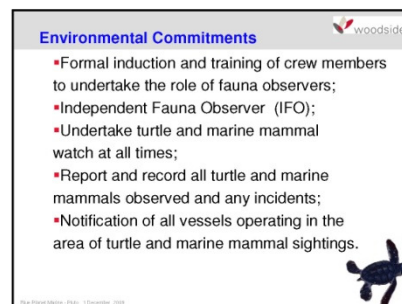
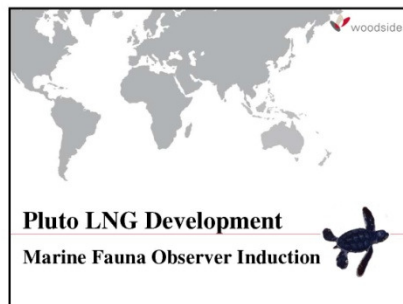


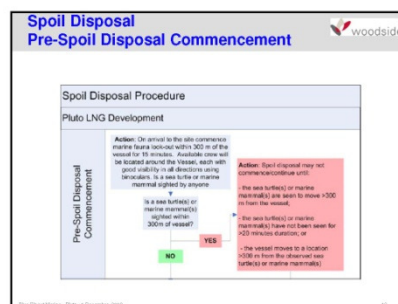
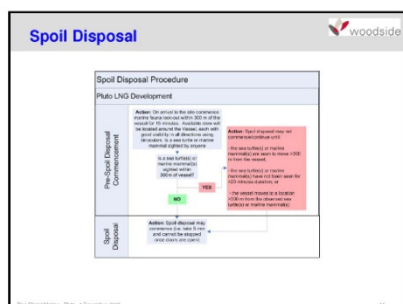
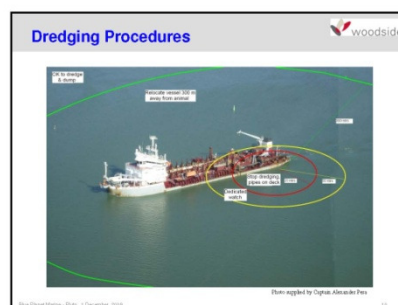
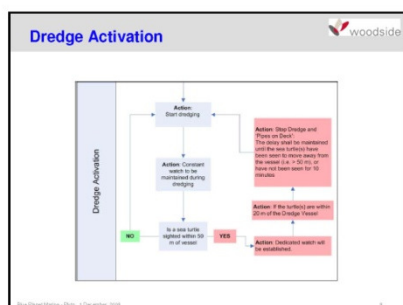
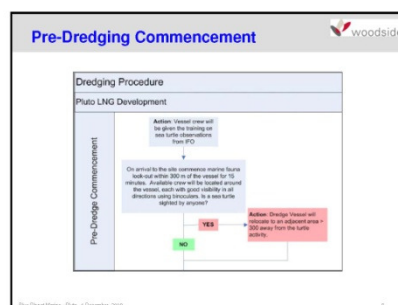
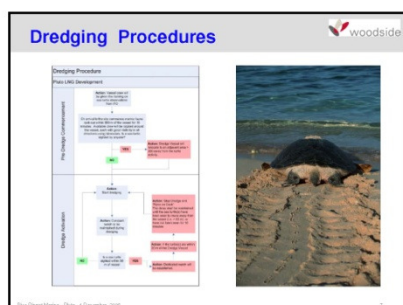
Blue Planet Marine Pty Ltd. 10/05/09 10/05/09 2009

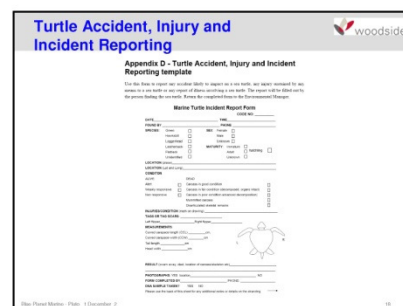
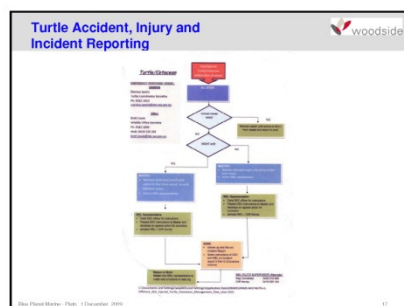
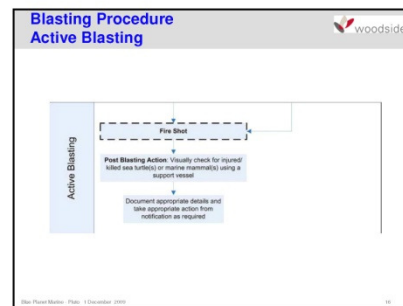
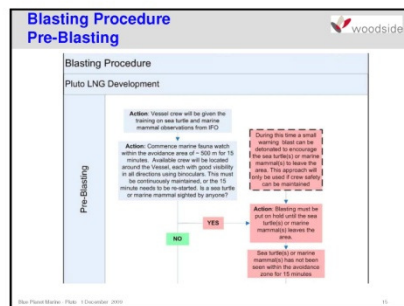
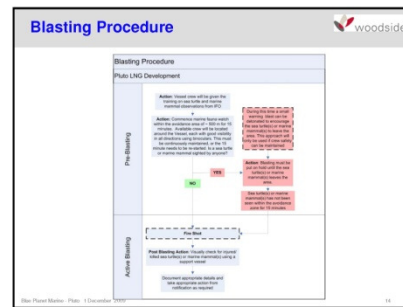


Appendix 3

Marine Fauna Observer Training Presentation







Recording and Reporting Procedures

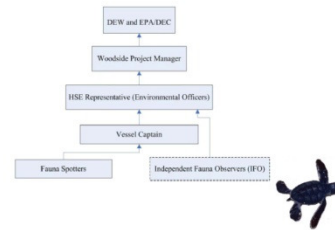
All turtle and marine mammal (whales, dolphins or dugongs) sightings are required to be recorded on the *Marine Fauna Sighting Report* spreadsheet.



Blue Planet Marine - Photo 1 December 2009

11

Reporting Structure



Turtle and Marine Mammal Sightings

Pluto LNG Development Dredging Program
Marine Fauna Observations

Nile River

Log to be maintained by the Vessel Master

Week ending

[illegible]

Any question or marine fauna observations contact David Paton, Blue Planet Marine Ph +61 (0) 431 664472 or email dave@blueplanetmarine.com

Blue Planet Marine - Photo: 1 December 2009

2

Your Role and Responsibilities

- Undertake turtle and marine mammal watch at all times;
- All vessels notified of all sightings;
- In absence of IFO, vessel captain is responsible for ensuring all
 - sighting of turtles and marine mammals are accurately recorded;
 - injury/death of turtles and marine mammals are accurately recorded and reported;
 - other environmental incidents reported;

Eliseo Pérez Marín - Photo - 1 December 2003

Marine Fauna Identification



CD, Park

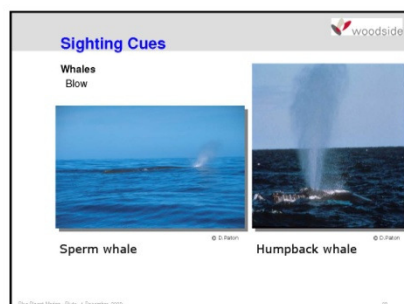
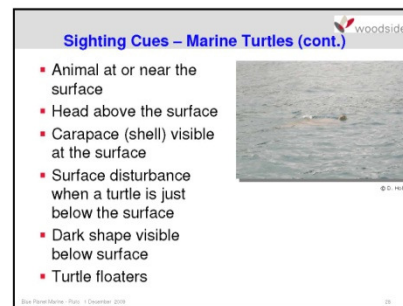
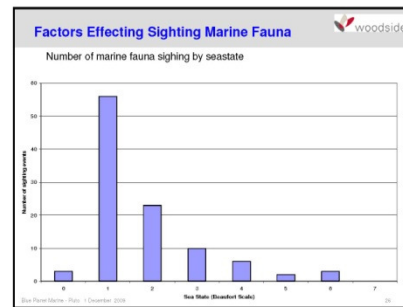
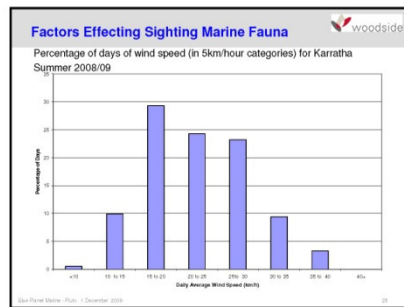
Elton Flavel Marine - Photo: 1 December 2000

7

Marine Fauna Observation Procedures

- Alternate between naked eye and binoculars,
- Scan from side-to-side with the bulk of your effort in front of the vessel,
- Look for not only animals at the surface but signs of animals below the surface (disturbance in the water, dark shapes under the water, birds feeding, bait balls etc).

Blue Planet Marine - Photo: 1 December 2000



Sighting Cues – Whales (cont.)

- Breach



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Sighting Cues

Dolphins

- Dorsal
- Blow



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Sighting Cues – Dolphins (cont.)

- Porpoising
- Feeding



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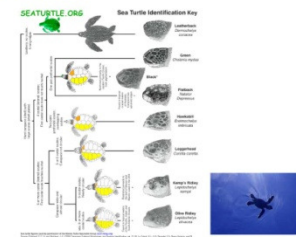
Sea Turtles



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Turtle Identification

SEATURTLE.ORG Sea Turtle Identification Key



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Humpback Whale



© D. Patten

Common name Humpback Whale
Scientific name Megaptera novaeangliae
Global Distribution World wide distribution
Appearance Generally black on dorsal and white on ventral surface, long pec fins, knobs on head, large stock body

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Humpback Whale



©D.Pain

Blue Planet Marine - Pluto - 1 December 2009 37

Minke



Common name
Minke Whale
Scientific name
Balaenoptera acutorostata
Global Distribution
World wide distribution
Appearance
Sharply pointed snout, falcate fin, low indistinct blow

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Brydes Whale




Common name
Brydes Whale, Tropical Whale
Scientific name
Balaenoptera edeni
Global Distribution
Found in the tropics (between 40°N and 40°S)
Appearance
3 parallel ridges on head, prominent falcate fin, skin may be mottled, dark upper side, fluke rarely seen above surface

©D.Pain

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Killer Whale



Common name
Killer Whale, Orca
Scientific name
Orcinus orca
Global Distribution
World wide distribution
Appearance
Black and white coloration, white patch behind each eye, grey saddle-patch, large dorsal fin in mature males

©D.Pain

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False Killer Whales




Common name
False killer whale, Pseudorca
Scientific name
Pseudorca cerasoides
Global Distribution
Widely distributed. Mainly seen in deep off shore waters
Appearance
Uniform dark body colour, long, slim body, prominent fin
Can be confused with
Pilot whales at distance.

©D.Pain

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Bottlenose dolphin



Common names
Bottlenose dolphin/Indo-Pacific bottlenose dolphin
Scientific name
Tursiops truncatus and *T. aduncus*, respectively
Global Distribution
Cold temperate to tropical seas worldwide
Appearance
1.9 – 3.9 m in length and 150 – 650kg in weight
Subdued gray colouring with dark dorsal cape, prominent fin. Differences in coloration, rostrum, general form and degree of spotting

Blue Planet Marine - Pluto - 1 December 2009 42

Spinner Dolphin



Common names

Scientific name

Global Distribution

Appearance

Spinner dolphin (Dwarf form recognised from Timor / Arafura Sea area)

Stenella longirostris

Tropical and subtropical waters worldwide


1.3 – 2.1 m in length and 45 – 75kg in weight

Performs high spinning leaps, is long and slender with a dorsal fin which has an almost vertical leading edge.

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Common Dolphin



Common name

Scientific name

Global Distribution

Appearance

Common Dolphin

Delphinus delphis

Widely distributed

Dark cape with V under fin, hourglass pattern on side

Blue Planet Marine – Pluto – 1 December 2009

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Humpback Dolphin



Common names

Scientific name

Global Distribution

Appearance

Humpback dolphin

Sousa chinensis

Shallow coastal waters of the Indo-Pacific region

2 – 2.8 m in length and 150 – 200kg in weight

There are a variety of forms throughout the species range.

Blue Planet Marine – Pluto – 1 December 2009

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Snub finned Dolphin



Common name

Scientific name

Global Distribution

Appearance

Snub finned dolphin

Orcaella heinsbrohi

Shallow coastal and riverine waters of the Indo-Pacific region

1.5 – 2.2 m in length and 100 – 150kg in weight


Slow moving and usually occurs in groups of 1 – 2.

Slow, rolling surface. Light grey in colour

Blue Planet Marine – Pluto – 1 December 2009

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Dugongs



Common name

Scientific name

Global Distribution

Appearance

Dugong

Dugong dugon

Shallow, nearshore areas of the Indo-Pacific region

1.5 – 2.5 m in length and 150 – 250kg in weight

Slow moving and usually occurs in groups of 1 – 2.

Herbivorous.

Blue Planet Marine – Pluto – 1 December 2009

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Appendix 4

Marine Fauna Observed Pluto LNG Dredging Project

KEY: NR = not recorded

Visibility: P = poor AV = average F = fair G = good VG = very good

Sighting No	Date	Time	Latitude (S)	Longitude (E)	Activity	Distance (Metres)	Species	Number of animals	Mitigation activities	Sea state (Beaufort)	Visibility	Vessel
1	21 Nov 07	8:00	20 36.2	116 45.1	Dredging	20	Dolphin	1	nil - it moved off	2	VG	Cornelis Zanen
2	22 Nov 07	7:15	20 27.4	116 43.5	Transit	30	Dolphin	~6	swimming slowly	calm	VG	Cornelis Zanen
3	22 Nov 07	15:10	20 36.3	116 45.2	Dredging	400	Dolphin	1	Moved off	1	VG	Cornelis Zanen
4	23 Nov 07	22:45	20 36.3	116 45.3	Dredging	15	Dolphin	3	moved away	calm	P/AV	Cornelis Zanen
5	24 Nov 07	12:46	20 36.3	116 45.2	Dredging	100	Dolphin	3	Feeding	calm	VG	Cornelis Zanen
6	24 Nov 07	15:37	20 36.2	116 45.2	Dredging	20	Dolphin	3	Moved off	slight	VG	Cornelis Zanen
7	25 Nov 07	9:36	20 36.0	116 44.9	Starting to dredge	40	Dolphin	3	feeding	slight	VG	Cornelis Zanen
8	26 Nov 07	10:05	20 36.2	116 45.0	Dredging	70	Dolphin	1	swimming	2 slight	VG	Cornelis Zanen
9	26 Nov 07	11:20	20 28.7	116 43.6	Starting to dredge	50	Dolphin	4	following in wake	2 slight	VG	Cornelis Zanen

Sighting No	Date	Time	Latitude (S)	Longitude (E)	Activity	Distance (Metres)	Species	Number of animals	Mitigation activities	Sea state (Beaufort)	Visibility	Vessel
10	27 Nov 07	7:50	20 36.0	116 45.1	Dredging	45	Dolphin	4	feeding in area	clam	VG	Cornelis Zanen
11	28 Nov 07	7:55	20 36	116 45.2	Dredging	40	Dolphin	2	Feeding	Clam	VG	Cornelis Zanen
12	28 Nov 07	11:30	20 36.3	116 45	Dredging	50	Dolphin	4	swimming	clam	VG	Cornelis Zanen
13	28 Nov 07	14:56	20 36. 2	116 45	Dredging	300	Dolphin	3	feeding	clam	VG	Cornelis Zanen
14	29 Nov 07	7:39	20 36.2	116 45.2	Dredging	200	Dolphin	3	Feeding	slight	VG	Cornelis Zanen
15	29 Nov 07	11:08	20 36.2	116 45.2	Dredging	10	Dolphin	3	Playing	slight	VG	Cornelis Zanen
16	05 Dec 07	13:55	20 3.5	116 44.5	Anchored	50	Turtle	1	Not recorded	3	VG	Cornelis Zanen
17	05 Dec 07	14:55	20 36.1	116 45	Dredging	150	Turtle	1	Not recorded	3	VG	Cornelis Zanen
18	05 Dec 07	15:05	20 36.1	116 45	Dredging	150	Dolphin	1	Not recorded	3	VG	Cornelis Zanen
19	05 Dec 07	15:30	20 36.2	116 45	Dredging	20	Turtle	1	Not recorded	3	VG	Cornelis Zanen
20	06 Dec 07	12:59	20 36.2	116 45	Dredging	100	Dolphin	1	Not recorded	2	VG	Cornelis Zanen
21	07 Dec 07	9:20	20 36. 1	116 45	Dredging	300	Dolphin	1	Not recorded	2	VG	Cornelis Zanen
22	07 Dec 07	13:30	20 36.1	116 44.9	Finished Dredging	50	Dolphin	1	Not recorded	2	VG	Cornelis Zanen
23	08 Dec 07	9:20	20 36.1	116 44.9	Dredging	15	Dolphin	1	Not recorded	1	VG	Cornelis Zanen
24	08 Dec 07	10:40	20 26.7	116 43.5	steaming	10	Turtles	2	Not recorded	1	VG	Cornelis Zanen
25	08 Dec 07	15:05	20 29	116 43.3	transit	40	Dugong	1	Not recorded	3	VG	Cornelis Zanen
26	09 Dec 07	10:00	20 36.9	116 45.1	dredging	40	Dolphin	3	Not recorded	0	VG	Cornelis Zanen

Sighting No	Date	Time	Latitude (S)	Longitude (E)	Activity	Distance (Metres)	Species	Number of animals	Mitigation activities	Sea state (Beaufort)	Visibility	Vessel
27	10 Dec 07	8:20	20 25.7	116 43.11	steaming	100	Dolphin	10 to 15	Not recorded	1	VG	Cornelis Zanen
28	12 Dec 07	11:10	20 26.3	116 43.9	steaming	50	Turtle	1	Not recorded	3	VG	Cornelis Zanen
29	13 Dec 07	12:30	20 36.3	116 45.3	Dredging	30-100	Dolphin	3	Not recorded	2	VG	Cornelis Zanen
30	16 Dec 07	13:40	20 29.8	116 43.3	transit	200	Dolphin	20+	nil	4 to 5	VG	Cornelis Zanen
31	18 Dec 07	11:55	20 36.2	116 45.2	Dredging	50	Dolphin	3	nil	4	VG	Cornelis Zanen
32	18 Dec 07	19:00	20 23.5	116 45.5	transit	30	Turtle	1	nil	4 to 5	VG	Cornelis Zanen
33	20 Dec 07	11:30	20 36.2	116 45.2	Dredging	100	Dolphin	3 to 4	nil	1	VG	Cornelis Zanen
34	20 Dec 07	13:40	20 22.7	116 42.8	dumping	100	Turtle	1	nil	1	VG	Cornelis Zanen
35	21 Dec 07	12:05	20 23.07	116 45.92	dumping	80	Turtle	1	nil	1	VG	Cornelis Zanen
36	21 Dec 07	18:55	20 36.23	116 45.20	dredging	200	Manta ray	2	nil	2	VG	Cornelis Zanen
37	22 Dec 07	10:30	20 36.23	116 45.287	dredging	200	Dolphin	2	nil	1	VG	Cornelis Zanen
38	22 Dec 07	16:39	20 36.18	116 45.19	dredging	100	Dolphin	2+	nil	1	VG	Cornelis Zanen
39	23 Dec 07	11:56	20 36.19	116 45.25	dredging	50	Dolphin	1	nil	2 to 3	VG	Cornelis Zanen
40	24 Dec 07	8:00	20 36.10	116 45.2	dredging	200	Dolphin	1	breaching	1	VG	Cornelis Zanen
41	25 Dec 07	10:10	Turing Bain		Survey	3	Manta ray	1	Altered Course	1	VG	Ocean Eagle
42	25 Dec 07	13:37	20 36.10	116.25.24	dredging	100	Dolphin	2	none	2	VG	Cornelis Zanen

Sighting No	Date	Time	Latitude (S)	Longitude (E)	Activity	Distance (Metres)	Species	Number of animals	Mitigation activities	Sea state (Beaufort)	Visibility	Vessel
43	26 Dec 07	12:30	20 34.8	116 43.9	dredging	250	Dolphin	2	Not recorded	2	VG	Cornelis Zanen
44	28 Dec 07	10:10	20 36.19	116 45.11	dredging	100	Dolphin	2	none	1	VG	Cornelis Zanen
45	03 Jan 08	16:15	20 43.8	116 43 8	Dredging	40	Turtle	1	Turtle off port beam then port quarter. No action	W6	AV	Cornelis Zanen
46	05 Jan 08	17:00	20 36.3	116 45.2	Dredging	200	Dolphin	1	Dolphin ahead no action	NW 4	G	Cornelis Zanen
47	06 Jan 08	16:30	20 24	116 42	Transit	300	Dolphin	3	none	W 4	VG	Cornelis Zanen
48	09 Jan 08	13:00	Around Black Marlin		Standby	4	Tiger shark	1	Altered Course	1	VG	Ocean Eagle
49	09 Jan 08	13:15	Around Black Marlin		Standby	50	Manta ray	1	Altered Course	1	VG	Ocean Eagle
50	09 Jan 08	15:00	20 34.6	116 43.8	Transit	200	Dolphin	1	None	W 5	VG	Cornelis Zanen
51	10 Jan 08	11:40	20 34.6	116 43.8	Dredging	200	Dolphin	5	None	3	V G	Cornelis Zanen
52	12 Jan 08		20 34.5	116 43.7	Dredging	200	Dolphin	3	None	1 to 2	VG	Cornelis Zanen
53	12 Jan 08	6:30	20 34.4	116 43.6	Dredging	100	Dolphin	1	None	1	VG	Cornelis Zanen
54	14 Jan 08	12:55	20 23 30	116 42 50	Transit	5	Turtle	1	None	1	G	Cornelis Zanen
55	14 Jan 08	15:32	20 34.8	116 43 82	Dredging	300	Dolphin	3	None	1	G	Cornelis Zanen

Sighting No	Date	Time	Latitude (S)	Longitude (E)	Activity	Distance (Metres)	Species	Number of animals	Mitigation activities	Sea state (Beaufort)	Visibility	Vessel
56	15 Jan 08	10:25	20 28.47	116 43.1	Transit	30	Green turtle	1	None	1	G	Cornelis Zanen
57	15 Jan 08	11:25	20 34.8	116 43.9	Dredging	50	Dolphin	1	None	1	G	Cornelis Zanen
58	15 Jan 08	10:52	20 34.12	116 3.5	Transit	30	Dolphin	3	None	1	G	Cornelis Zanen
59	15 Jan 08	10:54	20 34.27	116 43.56	Transit	25	Dolphin	2	none	1	G	Cornelis Zanen
60	15 Jan 08	13:19	20 30.13	116 43.22	Transit	30	Turtle	1	None	1	G	Cornelis Zanen
61	15 Jan 08	17:00	20 34.98	116 43.97	Dredging	100	Dolphin	1	None	1	G	Cornelis Zanen
62	15 Jan 08	15:12	20 34.7	116 43.87	Dredging	40	Bottlenose dolphin	1	None	1	G	Cornelis Zanen
63	15 Jan 08	15:19	20 34.9	116 44.02	Dredging	35	Bottlenose dolphin	1	Dolphin stayed 30-40 m off Port	1	G	Cornelis Zanen
64	15 Jan 08	16:20	20 34.90	116 43.96	Dredging	100	Bottlenose dolphin	2	None	1	G	Cornelis Zanen
65	15 Jan 08	16:48	3.E+01	116 43.77	Dredging	100	Bottlenose dolphin	1	None. Dolphin was observed for 11 minutes	1	G	Cornelis Zanen
66	15 Jan 08	16:16	20 23.65	116 43.12	Transit	60	Bottlenose dolphin	3	10 minutes before dredging	3	G	Cornelis Zanen
67	17 Jan 08	13:20	20 34.82	116 43.93	Dredging	200	Dolphin	3	None	1 to 2	VG	Cornelis Zanen
68	18 Jan 08	13:40	20 34.87	116.43.92	Dredging	60	Dolphin	4	None	2	VG	Cornelis Zanen

Sighting No	Date	Time	Latitude (S)	Longitude (E)	Activity	Distance (Metres)	Species	Number of animals	Mitigation activities	Sea state (Beaufort)	Visibility	Vessel
69	18 Jan 08	15:50	20 34.54	116 43.62	Dredging	100	Dolphin	2	None	1	VG	Cornelis Zanen
70	19 Jan 08	12:30	20 34.67	116 43.72	Dredging	400	Dolphin	1	None	1	VG	Cornelis Zanen
71	21 Jan 08	12:45	20 34.6	116.43.7	Dredging	200	Small Cetacean	3	None	3	VG	Cornelis Zanen
72	21 Jan 08	14:00	20 33.8	116 43.2	Transit	50	Dolphin	3	None	3	VG	Cornelis Zanen
73	23 Jan 08	20:00	20 31.1	116 43.3	Transit	50	Dolphin	2	None	1	VG	Cornelis Zanen
74	24 Jan 08	12:00	Turning Bain		Survey	20	Turtle	1	Altered Course	1	P	Ocean Eagle
75	24 Jan 08	13:00	Turning Bain		Survey	1	Turtle	1	Turtle suffering from Floater Disease. Relocated out of dredging area	1	P	Ocean Eagle
76	25 Jan 08	10:45	20 34.1	116 43.4	Transit	40	Turtle	1	None	2	VG	Cornelis Zanen
77	25 Jan 08	12:45	20 38	116 43.9	Transit	20	Turtle	1	None	2	VG	Cornelis Zanen
78	25 Jan 08	13:35	20 35	116 43.8	Dredging	50	Turtle	1		2	VG	Cornelis Zanen
79	27 Jan 08	16:35	20 30.15	116 43.3	Transit	150	Dolphin	4	None	1	AV	Cornelis Zanen
80	27 Jan 08	0:00	Dredging area		Idle	50	Dolphin	4	Not recorded	1	AV	Phoenix
81	29 Jan 08	13:00	20 23.94	116 42.61	Transit	50	Turtle	1	None	1	VG	Cornelis Zanen
82	29 Jan 08	16:15	20 36 311	116 45.021	Dredging	300	Dolphin	1	nil	1	VG	Cornelis Zanen

Sighting No	Date	Time	Latitude (S)	Longitude (E)	Activity	Distance (Metres)	Species	Number of animals	Mitigation activities	Sea state (Beaufort)	Visibility	Vessel
83	29 Jan 08	16:30	20 36.05	116 45.3	Dredging	100	Sea snake	1	Nil	1	VG	Cornelis Zanen
84	30 Jan 08	10:20	20 36.11	116 44.9	Dredging	50	Dolphin	3	Nil	1	VG	Cornelis Zanen
85	30 Jan 08	15:00	20 36.27	116 44.94	Dredging	150	Dolphin	1	None	1	VG	Cornelis Zanen
86	31 Jan 08	8:50	20 35.4	116 44	Transit	60	Dolphin	1	None	1	VG	Cornelis Zanen
87	31 Jan 08	8:50	20 35.4	116 44	Transit	100	Turtle	1	None	1	VG	Cornelis Zanen
88	01 Feb 08	13:05	20 36.1	116 45.1	Dredging	100	Dolphin	1	None	1	VG	Cornelis Zanen
89	02 Feb 08	11:55	20 28.91	116 43.22	Transit	100	Dolphin	2	None	1	VG	Cornelis Zanen
90	03 Feb 08	11:50	20 32.5	116 43.0	Transit	200	Dolphin	10	None	1	VG	Cornelis Zanen
91	03 Feb 08	19:30	20 23.35	116 43	Dumping	30	Turtle	1	None	4	VG	Cornelis Zanen
92	04 Feb 08	11:30	20 36.14	116 44.95	Dredging	100	Dolphin	3	None	1	VG	Cornelis Zanen
93	04 Feb 08	13:30	20 36.18	116.44.97	Dredging	200	Dolphin pod	Pod	None	1	VG	Cornelis Zanen
94	05 Feb 08	11:00	20 36.14	116 45.17	Dredging	300	Dolphin	1	none	2	VG	Cornelis Zanen
95	05 Feb 08	14:30	Turning Bain		Survey	2	Dolphin	2	Altered Course	1	P	Ocean Eagle
96	08 Feb 08	13:02	20 34.9	116 44.1	Dredging	50	Dolphin	2	None	1	VG	Cornelis Zanen
97	11 Feb 08	10:50	20 36.1	116 45.1	Dredging	80	Dolphin	1	Nil	1	G	Cornelis Zanen
98	11 Feb 08	8:50	20 36.3	116 45.2	Dredging	150	Dolphin	1	Nil	1	G	Cornelis Zanen

Sighting No	Date	Time	Latitude (S)	Longitude (E)	Activity	Distance (Metres)	Species	Number of animals	Mitigation activities	Sea state (Beaufort)	Visibility	Vessel
99	14 Feb 08	7:00	south Malo Island				Dolphin	6	Not recorded	Good	G	Phoenix
100	20 Feb 08	10:15	20 36.2	116 45.2	Dredging	100	Dolphin	1	Nil	2	VG	Cornelis Zanen
101	22 Feb 08	8:50	Channel crossing		Dredging	600	Dolphin	9	nil	Good	G	Phoenix
102	27 Feb 08	17:04	20 36.12	116 45.22	Dredging	25	Turtle	1	None, turtle continued moving away and observed until out of sight	2	VG	Cornelis Zanen
103	08 Mar 08	12:00	20 39.87	116 41.86	Transit	100	Turtle	1	nil	1	VG	Adrenalin Sprint
104	08 Mar 08	15:52	20 34.34	116 45.05	Dredging	150	Dolphin	10	Continued monitoring until gone	3	VG	Cornelis Zanen
105	08 Mar 08	18:00	20 39.87	116 41.87	Transit	50	Dolphin	2	Nil	2	AV	Adrenalin Sprint
106	11 Mar 08	11:30	20 38.46	116 36.623	Transit	50	Turtle	2	Nil	1	G	Adrenalin Sprint
107	11 Mar 08	11:40	20 38.00	116 36.99	Transit	50	Turtle	1	Nil	1	G	Adrenalin Sprint
108	12 Mar 08	7:00	20 36.307	116 44.270	Transit	20	Dolphin	6	Nil	1	G	Adrenalin Sprint
109	12 Mar 08	11:00	20 36.222	116 44.936	in transit	30	Dolphin	7	not required	1	G	Phantom
110	12 Mar 08	11:30	20 36.4	116 45.0	Dredging	150	Dolphin	2	Nil	2	VG	Cornelis Zanen
111	12 Mar 08	16:15	20 34.48	116 44.98	Dredging	150	Dolphin	1	Continued watch	3	VG	Cornelis Zanen

Sighting No	Date	Time	Latitude (S)	Longitude (E)	Activity	Distance (Metres)	Species	Number of animals	Mitigation activities	Sea state (Beaufort)	Visibility	Vessel
									until out of sight			
112	13 Mar 08	9:00	20 35.871	116 45.859	waiting for barge	15	Dolphin	1	nil	2	G	Adrenalin Sprint
113	13 Mar 08	14:00	20 34.2	116 45.0	Dredging	250	Dolphin	4	continued watch	3	VG	Cornelis Zanen
114	14 Mar 08	11:53	20 34.41	116 45.02	Dredging	300	Dolphin	2	continued watch	3	VG	Cornelis Zanen
115	16 Mar 08	14:20	20 34.45	116 44.93	Dredging	300	Dolphin	1	continued observation until dolphin out of sight	2	VG	Cornelis Zanen
116	18 Mar 08	10:30	20 35.1	116 44.0	Transit	100	Turtle	1	Nil	2	VG	Cornelis Zanen
117	19 Mar 08	12:00	20 35.870	116 45.060	At anchor	100	Dolphin	4		1	AV	Adrenalin Sprint
118	19 Mar 08	14:00	20 34.8	116 43.9	Dredging	300	Dolphin	3	Continued observations	2	VG	Cornelis Zanen
119	20 Mar 08	10:20	20 35 096	116 43 882	In transit	50	Dolphin	3	not required	0	G	Phantom
120	20 Mar 08	16:00	20 34.34	116 45.01	Dredging	300	Dolphin	2	continued watch until out of sight	2	VG	Cornelis Zanen
121	21 Mar 08	7:35	20 34.16	116 45.13	Dredging	250	Dolphin	2	Monitored until out of sight	1	VG	Cornelis Zanen
122	21 Mar 08	16:20	20 34.5	116 44.9	Dredging	100	Dolphin	1	feeding on edge of plum	4	VG	Cornelis Zanen
123	23 Mar 08	12:05	20 37.946	116 42.706	Transit	50	Dolphin	3	Not recorded	1	VG	Adrenalin Sprint

Sighting No	Date	Time	Latitude (S)	Longitude (E)	Activity	Distance (Metres)	Species	Number of animals	Mitigation activities	Sea state (Beaufort)	Visibility	Vessel
124	23 Mar 08	17:35	20 34.	116 44.9	Dredging	250	Dolphin	2	Nil	2	VG	Cornelis Zanen
125	28 Mar 08	9:00	20 39.463	116 42.001	Transit	20	Turtle	1	Not recorded	1	VG	Adrenalin Sprint
126	28 Mar 08	13:20	20 36. 424	116 43.853	Transit	20	Dolphin	3	Not recorded	1	VG	Adrenalin Sprint
127	29 Apr 08	15:05	20 35.871	116 45.059	at Anchor	500	Dolphin	3	Not recorded			Adrenalin Sprint
128	29 Apr 08	15:30	21 35.871	117 45.059	At Anchor	50	Dolphin	2	Not recorded			Adrenalin Sprint
129	31 Mar 08	9:00	20 37. 796	116. 42.582	Transit	50	Dolphin	12	Not recorded	1	VG	Adrenalin Sprint
130	31 Mar 08	11:00	20 37.89	116 42.727	Transit	50	Dolphin	12	Not recorded	1	VG	Adrenalin Sprint
131	1 Apr 08	20:10	location NR		At anchor	2-10m	Dolphin	8	Nil	1	G/night	Hippopotes
132	03 Apr 08	11:15	20 38.843	116 41.988	Transit	20	Turtle	1	Not recorded	2	VG	Adrenalin Sprint
133	3 Apr 08	21:30	location NR		Dredging	2 to 8 metres	Dolphin	1	Nil		AV/night	Hippopotes
134	3 Apr 08	23:00	location NR		At anchor	2 to 8 m	Dolphin	4	nil		AV/night	Hippopotes
135	04 Apr 08	10:20	20 36.024	116 44.945	Drafting	20	Dolphin	3	Not recorded	0	VG	Adrenalin Sprint
136	04 Apr 08	15:05	20 39.416	116 41.995	Transit	20	Turtle	1	Not recorded	0	VG	Adrenalin Sprint
137	05 Apr 08	11:00	Near inner dredge mooring		in transit	10	Dolphin	1	Not required	0	G	Phantom

Sighting No	Date	Time	Latitude (S)	Longitude (E)	Activity	Distance (Metres)	Species	Number of animals	Mitigation activities	Sea state (Beaufort)	Visibility	Vessel
138	05 Apr 08	11:18	20 36.22	116 45.24	Dredging	100	Dolphin	1	None	1	G	Cornelis Zanen
139	05 Apr 08	12:04	20 36.10	116 45.20	Dredging	200	Dolphin	3	None	1	G	Cornelis Zanen
140	5 Apr 08	21:00	location NR		at Anchor	2 to 8 m	Dolphin	4	Not recorded		AV/night	Hippopoties
141	6 Apr 08	20:00	location NR		At anchor	2 to 8 m	Dolphin	2	Not recorded		AV/night	Hippopoties
142	7 Apr 08	20:00	location NR		At anchor	2 to 8 m	Dolphin	8	Not recorded		AV/night	Hippopoties
143	09 Apr 08	12:30	20 35.8	116 45.0	Transit	100	Dolphin	1	none	1	G	Cornelis Zanen
144	09 Apr 08	14:20	20 34. 419	116 44.976	In transit	30	Dolphin	10	Not required	1	G	Phantom
145	9 Apr 08	Time NR	location NR		At anchor	2 to 8 m	Dolphin	1	Not recorded		AV	Hippopoties
146	11 Apr 08	0:36	location NR		At Anchor	2 to 8 m	Dolphin	2	Not recorded		night	Hippopoties
147	12 Apr 08	1:30	location NR		Anchor	2 to 8 m	Dolphin	3	Not recorded			Hippopoties
148	12 Apr 08	11:15	20 36.22	116 45.04	Dredging	100	Dolphin	3	none	3	G	Cornelis Zanen
149	12 Apr 08	13:00	20 36.0	116 44.8	Dredging	100	Dolphin	1	none	1	G	Cornelis Zanen
150	12 Apr 08	13:00	location NR		At Anchor	3	Dolphin	2	not working - no action		VG	Hippopoties

Sighting No	Date	Time	Latitude (S)	Longitude (E)	Activity	Distance (Metres)	Species	Number of animals	Mitigation activities	Sea state (Beaufort)	Visibility	Vessel
151	12 Apr 08	16:00	20 43.2	116 33.0	Transit	100	Dolphin	1	none	3	G	Cornelis Zanen
152	13 Apr 08	1:30	location NR		At Anchor	2 to 8 m	Dolphin	1	Not recorded			Hippopotes
153	13 Apr 08	3:00	location NR		At Anchor	2 to 8 m	Dolphin	2	Not recorded			Hippopotes
154	14 Apr 08	8:45	20 36.2	116 45.3	Moving Hippo	30	Dolphin	1	Nil	1	VG	PT Kotor
155	14 Apr 08	3:30	location NR		Dredging	2- 8 m	Dolphin	8	Feeding to port of midships		F	Hippopotes
156	14 Apr 08	8:05	20 36.3	116 45.4	Dredging	100	Dolphin	2	Nil	1	G	Cornelis Zanen
157	14 Apr 08	12:00			At anchor not dredging	50m	Snub fin dolphin	3	Nil	1	VG	Phoenix
158	14 Apr 08	13:20	location NR		Dredging	20 from bucket	Manta ray	1	waited for animal to depart		G	Hippopotes
159	15 Apr 08	14:15	20 34.7	116 44.9	Towing Barge	5	Dolphin	1	nil	1	VG	PT Kotor
160	16 Apr 08	11:00	location NR		not working	50 from Bucket	Dolphin	4	Nil	2	G	Hippopotes
161	16 Apr 08	20:10	location NR		At anchor	2 to 10 m	Dolphin	10	nil	1	G/night	Hippopotes

Sighting No	Date	Time	Latitude (S)	Longitude (E)	Activity	Distance (Metres)	Species	Number of animals	Mitigation activities	Sea state (Beaufort)	Visibility	Vessel
162	17 Apr 08	5:00	20 33.64	116 45.38	Manoeuvring Hippo	20m	Dolphin	20	Not recorded	1	VG	PT Kotor
163	17 Apr 08	5:00	location NR		Landing barge	At Excavator	Dolphin	10	Not recorded		G	Hippopotes
164	17 Apr 08	20:20	location NR		At Anchor	2 to 8 m	Dolphin	2	Not recorded		G/night	Hippopotes
165	17 Apr 08	21:00	location NR		At Anchor	2 to 10 m	Dolphins	10	Not recorded		G/night	Hippopotes
166	20 Apr 08	17:00	20 33.4	116 45.4	Towing Barge	25	Dolphin	3	Not recorded	1	VG	PT Kotor
167	22 Apr 08	13:00	location NR		Dredging	50	Dolphin	1	heading NNW		G	Hippopotes
168	23 Apr 08	10:00	location NR		Dredging	30	Dolphin	1	Heading north		G	Hippopotes
169	25 Apr 08	14:10	20 37.853	116 42.596	Transit	500	Susadolphin	3	Nil	1	VG	Adrenalin Sprint
170	25 Apr 08	14:15	20 33.708	116 45.029	Transit	30	Bottlenose dolphin	6	Slowed vessel	1	VG	Adrenalin Sprint
171	25 Apr 08	14:45	20 33.644	116 45.089	Dredging	100	Susadolphins	1	Nil	1	VG	Hippopotes

Sighting No	Date	Time	Latitude (S)	Longitude (E)	Activity	Distance (Metres)	Species	Number of animals	Mitigation activities	Sea state (Beaufort)	Visibility	Vessel
172	26 Apr 08	NR	20 33.40	116 45.07	Transit	50	Dolphin	1	None	1	VG	Adrenalin Sprint
173	27 Apr 08	15:00	20 35.50	116 44.70	Dredging	15	Dolphin	4	None	NR	G	Hippopotes
174	3 May 08	12:40	20 34.03	116 44.70	Transit	100	Dolphin	1	None	1	VG	Adrenalin Sprint
175	3 May 08	13:00	20 35.10	116 44.75	Dredging	20	Dolphin	1	None	1	G	Hippopotes
176	6 May 08	7:50	20 32.43	116 44.38	Transit	50	Turtle	1	None	1	VG	Adrenalin Sprint
177	6 May 08	8:00	20 31.85	116 45.49	Transit	50	Dolphin	5	None	1	VG	Adrenalin Sprint
178	8 May 08	8:15	20 35.72	116 44.74	Transit	20	Dolphin	6	None	1	VG	Adrenalin Sprint
179	12 May 08	7:05	20 36.20	116 45.40	Dredging	75	Dolphin	2	None	NR	AV	Hippopotes
180	17 May 08	20:35	20 36.20	116 45.40	Dredging	75	Dolphin	2	None	NR	NR	Hippopotes
181	19 May 08	9:35	20 33. 52	116 45.18	Transit	300	Dolphin	3	None	1	VG	PT Kotor
182	23 May 08	0:10	20 36.20	116 45.40	Bunkering	25	Dolphin	3	Changed direction	NR	NR	Hippopotes
183	26 May 08	11:20	20 33.48	116 45.16	Transit	50	Turtle	1	NR	2	VG	PT Kotor
184	28 May 08	18:50	20 36.00	116 45.20	Anchored	100	Dolphin	1	None	NR	NR	Hippopotes
185	1 Jun 08	9:30	20 36.00	116 45.20	Dredging	NR	Sting ray	1	None	NR	NR	Hippopotes
186	20 Nov 08	11:45	20 18.30	116 33.90	Drop Camera Survey	30	Turtle	1	None	3	G	Ocean Eagle
187	20 Nov 08	13:35	20 18.30	116 33.90	Drop Camera	30	Dolphin	8	None	3	G	Ocean Eagle

Sighting No	Date	Time	Latitude (S)	Longitude (E)	Activity	Distance (Metres)	Species	Number of animals	Mitigation activities	Sea state (Beaufort)	Visibility	Vessel
					Survey							
188	24 Nov 08	16:00	20 34.10	116 45.10	Dredging	50	Dolphin	4	None	6	G	Hippopoties
189	25 Nov 08	13:00	20 36.80	116 40.40	Survey	100	Dolphin	2	None	NR	G	Ocean Eagle
190	25 Nov 08	14:00	20 34.10	116 45.10	Dredging	20	Dolphin	6	NR	6	G	Hippopoties
191	27 Nov 08	17:00	20 36.60	116 44.50	NR	30	Turtle	1	None	NR	G	Ocean Eagle
192	28 Nov 08	5:00	20 34.00	116 45.20	Dredging	30	Dolphin	1	NR	NR	G	Hippopoties
193	28 Nov 08	5:50	20 34.00	116 45.20	Bunkering	5	Dolphin	NR	None	NR	G	Hippopoties
194	28 Nov 08	6:25	20 33.90	116 45.40	Crew change	50	Dolphin	5	None	NR	G	Ocean Eagle
195	29 Nov 08	5:50	20 34.00	116 45.20	Dredging	5	Dolphin	6	NR	NR	NR	Hippopoties
196	1 Dec 08	23:10	NR	NR	Barge handling	30	Dolphin	1	Maintain visual contact	NR	G	Hippopoties
197	4 Dec 08	17:10	NR	NR	Dredging	40	Turtle	2	Maintain visual contact	NR	G	Hippopoties
198	12 Dec 08	7:00	20 37.24	116 44.49	Transit	50	Turtle	1	Changed direction	2	G	Ocean Eagle
199	13 Dec 08	16:05	20 37.43	116 44.48	Transit	50	Shark	1	Changed direction	2	G	Ocean Eagle
200	25 Dec 08	9:45	20 31.00	116 45.50	Transit	50	Dolphin	2	Changed direction	4	G	PT Kotor
201	29 Dec 08	1:15	NR	NR	Stepping	30	Dolphin	1	Maintain visual contact	NR	G	Hippopoties

Sighting No	Date	Time	Latitude (S)	Longitude (E)	Activity	Distance (Metres)	Species	Number of animals	Mitigation activities	Sea state (Beaufort)	Visibility	Vessel
202	30 Dec 08	4:30	NR	NR	NR	30	Dolphin	1	Maintain visual contact	1	G	Hippopotes
203	30 Dec 08	8:10	20 34.89	116 45.13	Transit	50	Dolphin	1	NR	NR	G	PT Kotor
204	30 Dec 08	16:10	20 31.20	116 45.58	Transit	50	Turtle	1	NR	4	G	PT Kotor
205	30 Dec 08	16:15	20 31.20	116 45.58	Transit	30	Dugong	1	NR	4	G	PT Kotor
206	1 Jan 09	9:00	NR	NR	Bunkering	10	Dolphin	1	None	1	G	PT Kotor
207	1 Jan 09	13:00	20 31.83	116 43.00	Transit	40	Turtle	1	NR	1	G	PT Kotor
208	2 Jan 09	16:00	20 34.48	116 44.97	Transit	30	Dolphin	2	NR	2	G	PT Kotor
209	3 Jan 09	18:20	20 35.67	116 44.80	Crew transfer	10	Dolphin	1	Maintain visual contact	1	G	Ocean Eagle
210	4 Jan 09	10:50	20 33.22	116 45.16	Transit	10	Dolphin	2	NR	2	G	PT Kotor
211	5 Jan 09	11:25	20 33.56	116 45.14	Transit	10	Turtle	1	NR	3	G	PT Kotor
212	5 Jan 09	12:05	20 35.65	116 44.46	Crew transfer	50	Dolphin	2	None	1	G	Ocean Eagle
213	10 Jan 09	12:30	20 35.34	116 44.76	Anchored	50	Dolphin	1	None	1	G	Ocean Eagle
214	10 Jan 09	15:20	20 31.20	116 45.58	Transit	10	Manta ray	1	None	2	G	PT Kotor
215	11 Jan 09	1900	NR	NR	Training	50	Dolphin	1	None	1	G	Hippopoties
216	30 Jan 09	11:35	20 34.70	116 44.90	Anchored	100	Dolphin	1	None	3	G	Ocean Eagle
217	1 Feb 09	11:15	20 34.70	116 44.90	Anchored	10	Dolphin	3	None	3	G	Ocean Eagle

Sighting No	Date	Time	Latitude (S)	Longitude (E)	Activity	Distance (Metres)	Species	Number of animals	Mitigation activities	Sea state (Beaufort)	Visibility	Vessel
218	1 Feb 09	9:50	20 35.60	116 44.80	Transit	200	Dolphin	1	None	2	G	Ocean Eagle
219	4 Feb 09	12:50	20 36.60	116 44.70	Transit	50	Manta ray	1	Changed direction	4	G	Ocean Eagle
220	5 Feb 09	9:00	20 36.20	116 45.30	Transit	100	Dolphin	1	None	1	G	Ocean Eagle
221	24 Feb 09	12:30	20 31.00	116 43.98	Transit	100	Dolphin	5	NR	1	G	PT Kotor
222	26 Feb 09	12:40	20 31.30	116 44.66	Transit	20	Dolphin	4	NR	4	G	PT Kotor
223	10 Mar 09	12:55	20 32.97	116 44.71	Transit	500	Dolphin	3	None	1	VG	Baudin
224	10 Mar 09	12:57	20 32.97	116 44.71	Transit	300	Turtle	1	None	1	VG	Baudin
225	10 Mar 09	13:01	20 32.97	116 44.71	Transit	250	Turtle	1	None	1	VG	Baudin
226	10 Mar 09	13:20	20 28.64	116 45.12	Transit	100	Dolphin	3	None	1	VG	Baudin
227	11 Mar 09	14:35	20 34.62	116 44.53	Transit	150	Turtle	1	None	1	VG	Baudin
228	11 Mar 09	16:10	20 28.65	116 45.16	Anchored	NR	Dolphin	6	None	1	VG	Nile River
229	11 Mar 09	17:07	20 28.65	116 45.18	Anchored	80	Dolphin	7	None	1	VG	First Class
230	11 Mar 09	18:26	20 39.71	116 41.98	Anchored	15	Dolphin	2	None	1	VG	First Class
231	12 Mar 09	10:27	20 23.70	116 45.21	Dredging	100	Dolphin	3	Maintain visual contact	1	VG	Nile River
232	13 Mar 09	17:41	20 39.69	116 41.97	Anchored	5	Turtle	1	None	1	VG	First Class
233	14 Mar 09	11:00	20 22.39	116 43.52	Transit	100	Dolphin	1	None	1	VG	Baudin
234	14 Mar 09	11:10	20 22.41	116.43.54	Survey	50	Dolphin	6	None	1	VG	Baudin

Sighting No	Date	Time	Latitude (S)	Longitude (E)	Activity	Distance (Metres)	Species	Number of animals	Mitigation activities	Sea state (Beaufort)	Visibility	Vessel
235	17 Mar 09	14:00	20 18.16	116 34.07	Transit	50	Turtle	1	None	3	AV	Baudin
236	17 Mar 09	15:40	20 19.30	116 39.20	Transit	100	Turtle	1	Maintain visual contact	2	VG	Nile River
237	17 Mar 09	16:32	20 28.98	116 42.81	Transit	80	Dolphin	4	Change direction	1	VG	First Class
238	19 Mar 09	17:30	20 18.60	116 38.70	Dredging	70	Turtle	1	Maintain visual contact	3	VG	Nile River
239	20 Mar 09	15:35	20 18.20	116 36.70	Dredging	100	Dolphin	10	NR	4	VG	Nile River
240	22 Mar 09	12:30	20 37.18	116 44.17	Transit	50	Dolphin	3	None	1	VG	Baudin
241	22 Mar 09	16:15	20 19.58	116 41.09	Survey	50	Turtle	1	None	1	VG	Baudin
242	24 Mar 09	4:20	NR	NR	Transit	0	Sawfish	1	Stopped operations	NR	VG	Nile River
243	25 Mar 09	9:57	20 37.60	116 44.67	Transit	3	Dolphin	2	Reduced speed	1	VG	First Class
244	25 Mar 09	12:16	20 25.97	116 44.11	Transit	60	Dolphin	3	Change direction	1	VG	First Class
245	26 Mar 09	16:30	20 23.23	116 44.65	Dredging	100	Turtle	1	Maintain visual contact	2	VG	Nile River
246	28 Mar 09	15:30	20 32.03	116 43.14	Transit	180	Dolphin	2	None	1	VG	First Class
247	29 Mar 09	10:18	20 31.30	116 44.37	Transit	120	Dolphin	1	None	1	VG	First Class
248	30 Mar 09	11:23	20 27.57	116 46.49	Dredging	70	Turtle	1	None	2	VG	Nile River
249	30 Mar 09	12:17	20 28.25	116 46.43	Dredging	800	Dolphin	10	None	2	VG	Nile River
250	30 Mar 09	15:57	20 26.34	116 46.42	Dredging	50	Shark	1	None	2	VG	Nile River

Sighting No	Date	Time	Latitude (S)	Longitude (E)	Activity	Distance (Metres)	Species	Number of animals	Mitigation activities	Sea state (Beaufort)	Visibility	Vessel
251	31 Mar 09	9:09	20 27.05	116 45.86	Transit	150	Dolphin	7	None	1	VG	First Class
252	31 Mar 09	9:35	20 25.75	116 46.32	Surveying	15	Dolphin	4	NR	0	VG	Baudin
253	31 Mar 09	10:20	20 22.54	116 44.10	Surveying	10	Sea snake	1	None	1	VG	Baudin
254	31 Mar 09	10:20	20 26.20	116 46.40	Dredging	100	Dolphin	2	None	2	VG	Nile River
255	31 Mar 09	10:30	20 22.31	116 43.45	Surveying	10	Turtle	1	None	1	VG	Baudin
256	31 Mar 09	11:28	20 29.93	116 45.80	Transit	120	Dolphin	1	None	1	VG	First Class
257	31 Mar 09	12:00	20 26.00	116 46.00	Transit	100	Turtle	1	None	2	VG	Nile River
258	31 Mar 09	13:37	20 26.08	116 46.36	Dredging	20	Dolphin	2	Stopped operations	2	VG	Nile River
259	31 Mar 09	14:10	20 26.00	116 46.24	NR	10	Dolphin	2	None	1	VG	Baudin
260	1 Apr 09	11:25	20 36.90	116 44.90	Bunkering	NR	Dolphin	1	None	2	VG	Nile River
261	2 Apr 09	8:40	20 26.74	116 46.45	Surveying	10	Dolphin	3	None	1	G	Baudin
262	2 Apr 09	15:25	20 24.85	116 43.50	Transit	NR	Dolphin	1	None	3	VG	Nile River
263	3 Apr 09	14:00	NR	NR	NR	NR	Turtle	1	None	2	G	Nile River
264	5 Apr 09	17:25	20 27.11	116 46.52	Dredging	75	Turtle	1	Stopped operations	2	G	Nile River
265	9 Apr 09	7:22	20 28.90	116 46.40	Dredging	140	Dolphin	1	Maintain visual contact	6	VG	Nile River
266	9 Apr 09	8:39	20 37.55	116 44.87	Transit	20	Dolphin	1	Reduce speed	1	VG	First Class
267	9 Apr 09	11:00	20 34.50	116 44.51	Transit	50	Dolphin	2	None	2	VG	Baudin

Sighting No	Date	Time	Latitude (S)	Longitude (E)	Activity	Distance (Metres)	Species	Number of animals	Mitigation activities	Sea state (Beaufort)	Visibility	Vessel
268	9 Apr 09	12:00	20 29.30	116 46.23	Survey	30	Dolphin	1	None	2	VG	Baudin
269	9 Apr 09	12:10	20 30.17	116 46.19	Survey	10	Dolphin	1	None	2	VG	Baudin
270	10 Apr 09	10:30	20 28.96	116 46.38	Surveying	5	Dolphin	1	NR	2	VG	Baudin
271	10 Apr 09	14:17	20 35.70	116 44.54	Transit	120	Dolphin	5	None	1	VG	First Class
272	11 Apr 09	11:30	20 22.06	116 43.19	Surveying	10	Turtle	1	NR	1	VG	Baudin
273	12 Apr 09	9:45	20 31.08	116 46.06	Surveying	30	Dolphin	4	None	0	VG	Baudin
274	12 Apr 09	13:20	20 20.78	116 42.02	Surveying	15	Dolphin	2	NR	0	VG	Baudin
275	12 Apr 09	15:03	20 20.42	116 41.87	Transit	170	Dolphin	3	None	1	VG	First Class
276	13 Apr 09	9:30	20 30.30	116 46.30	Surveying	20	Dolphin	2	NR	1	VG	Baudin
277	14 Apr 09	10:30	20 29.90	116 46.40	Dredging	100	Dolphin	2	Maintain visual contact	NR	G	Nile River
278	14 Apr 09	12:57	20 29.75	116 46.61	Drifting	30	Dolphin	2	None	1	VG	First Class
279	15 Apr 09	11:25	20 36.85	116 44.39	Transit	80	Dolphin	2	None	1	VG	First Class
280	15 Apr 09	11:34	20 35.10	116 44.05	Transit	300	Dolphin	3	None	1	VG	First Class
281	15 Apr 09	11:37	20 34.43	116 43.93	Transit	30	Dolphin	3	None	1	VG	First Class
282	15 Apr 09	11:55	20 29.16	116 42.80	Transit	10	Dolphin	3	None	1	VG	Baudin
283	15 Apr 09	11:55	20 29.16	116 42.80	Transit	10	Dolphin	2	None	1	VG	Baudin
284	15 Apr 09	13:24	20 20.89	116 41.72	Transit	1000	Dolphin	10	Maintain visual	1	VG	Nile River

Sighting No	Date	Time	Latitude (S)	Longitude (E)	Activity	Distance (Metres)	Species	Number of animals	Mitigation activities	Sea state (Beaufort)	Visibility	Vessel
									contact			
285	15 Apr 09	13:37	20 23.27	116 43.10	Transit	50	Sea snake	1	Maintain visual contact	1	VG	Nile River
286	15 Apr 09	13:54	20 26.54	116 43.43	Transit	500	Dolphin	1	Maintain visual contact	1	VG	Nile River
287	16 Apr 09	16:05	20 24.17	116 45.45	Surveying	20	Dolphin	2	NR	1	VG	Baudin
288	20 Apr 09	14:40	20 17.64	116 34.15	Dredging	200	Turtle	1	NR	3	VG	Nile River
289	27 Apr 09	21:52	20 39.57	116 42.07	Anchored	5	Turtle	1	None	1	VG	First Class
290	27 Apr 09	23:05	20 28.85	116 45.22	Anchored	NR	Dolphin	7	None	2	VG	Nile River
291	30 Apr 09	7:46	20 30.20	116 45.82	Transit	200	Dolphin	3	None	1	VG	First Class
292	30 Apr 09	8:27	20 31.46	116 44.90	Transit	150	Dolphin	9	None	1	VG	First Class
293	2 May 09	6:15	20 22.57	116 43.80	Dredging	NR	Sting ray	2	None	5	VG	Nile River
294	3 May 09	8:45	20 36.90	116 44.90	Anchored	NR	Dolphin	4	None	3	G	Nile River
295	3 May 09	20:10	20 36.00	116 42.00	Anchored	NR	Dolphin	2	None	2	G	Nile River
296	1 Sep 09	7:15	NR	NR	Anchored	5	Manta ray	1	None	1	VG	Queen of the Netherlands
297	2 Sep 09	11:40	20 34.50	116 43.60	Dredging	20	Dolphin	4	Maintain visual contact	1	VG	Queen of the Netherlands
298	3 Sep 09	15:51	20 27.40	116 43.65	Transit	200	Turtle	1	Maintain visual	1	VG	Queen of the

Sighting No	Date	Time	Latitude (S)	Longitude (E)	Activity	Distance (Metres)	Species	Number of animals	Mitigation activities	Sea state (Beaufort)	Visibility	Vessel
									contact			Netherlands
299	4 Sep 09	9:27	20 23.78	116 42.48	Transit	250	Whale	1	Reduce speed	1	VG.	Queen of the Netherlands
300												
301	5 Sep 09	10:50	20 32.28	116 43.29	Transit	10	Manta ray	4	Maintain heading and speed 15 knots no reaction time	1	VG	Queen of the Netherlands
302	5 Sep 09	16:25	NR	NR	Transit	600	Whale	1	None	3	VG	Queen of the Netherlands
303	8 Sep 09	6:55	20 34.07	116 43.22	Transit	100	Turtle	1	Maintain heading and speed 15 knots no reaction time	1	VG	Queen of the Netherlands
304	9 Sep 09	8:15	20c 34.07	116 43.25	Dredging	150	Dolphin	2	Maintain visual contact	1	VG	Queen of the Netherlands
305	9 Sep 09	9:10	20c 23.05	116 41 .78	Dumping	500	Whale	3	None	3	G	Queen of the Netherlands
306	9 Sep 09	9:20	20 32.96	116 42.70	Dredging	40	Dolphin	2	Maintain visual contact	1	VG	Queen of the Netherlands
307	9 Sep 09	10:45	20 23.48	116 42.40	Transit	200	Whale	1	Reduce speed	1	VG	Queen of the Netherlands
308												
309	10 Sep 09	8:20	20 23.66	116 42.40	Transit	50	Whale	1	Change direction	1	VG	Queen of the Netherlands

Sighting No	Date	Time	Latitude (S)	Longitude (E)	Activity	Distance (Metres)	Species	Number of animals	Mitigation activities	Sea state (Beaufort)	Visibility	Vessel
310	14 Sep 09	10:00	20 31.55	116 44.53	Anchored	30	Manta ray	4	None	1	VG	Queen of the Netherlands
311	15 Sep 09	11:20	20c 31.55	116 44.53	Anchored	30	Manta ray	4	None	1	VG	Queen of the Netherlands
312	16 Sep 09	9:50	20 36.34	116 45.13	Dredging	300	Dolphin	2	None	1	VG	Queen of the Netherlands
313	18 Sep 09	11:10	20 29.6	116 43.70	Transit	35	Whale	2	Reduce speed	1	VG	Queen of the Netherlands
314												
315	22 Sep 09	8:34	20 23.15	116 41.25	Dumping	800	Whale	4	None	2	G	Queen of the Netherlands
316	22 Sep 09	15:55	20 25.04	116 43.00	Transit	300	Whale	4	None	2	G	Queen of the Netherlands
317	23 Sep 09	10:00	20 27.46	116 43.60	Transit	300	Whale	3	None	2	G	Queen of the Netherlands
318	24 Sep 09	9:25	20 25.89	116 43.61	Transit	500	Whale	1	Maintain visual contact	2	G	Queen of the Netherlands
319												
320	24 Sep 09	9:40	20 23.54	116 41.80	Transit	900	Whale	2	Maintain visual contact	2	G	Queen of the Netherlands
321												
322	24 Sep 09	10:10	20 26.03	116 43.00	Transit	350	Whale	2	Maintain visual contact	2	G	Queen of the Netherlands
323												

Sighting No	Date	Time	Latitude (S)	Longitude (E)	Activity	Distance (Metres)	Species	Number of animals	Mitigation activities	Sea state (Beaufort)	Visibility	Vessel
324	24 Sep 09	13:35	20 23.90	116 42.50	Transit	400	Whale	4	None	2	G	Queen of the Netherlands
325	24 Sep 09	13:45	20 23.10	116 42.10	Dumping	500	Whale	2	None	2	G	Queen of the Netherlands
326	27 Sep 09	7:00	20 36.03	116 44.92	Dredging	200	Dolphin	5	Maintain visual contact	1	G	Queen of the Netherlands
327												
328	28 Sep 09	8:14	20 29.30	116 43.71	Transit	400	Whale	1	Maintain visual contact	1	G	Queen of the Netherlands
329												
330	28 Sep 09	8:50	20 26.31	116 43.35	Dredging	300	Whale	3	None	3	G	Queen of the Netherlands
331	29 Sep 09	17:25	20 25.60	116 43.58	Transit	400	Whale	1	Change direction	6	AV	Queen of the Netherlands
332	29 Sep 09	17:35	20 26.90	116 43.55	Transit	600	Whale	1	Maintain visual contact	6	AV	Queen of the Netherlands
333												
334	30 Sep 09	15:47	20 25.07	116 43.26	Transit	200	Whale	1	Maintain visual contact	4	G	Queen of the Netherlands
335												
336	1 Oct 09	14:00	NR	NR	Transit	600	Turtle	1	Change direction	1	G	Queen of the Netherlands
337	4 Oct 09	6:45	20 24.24	116 43.27	Transit	800	Whale	4	Maintain visual contact	1	G	Queen of the Netherlands

Sighting No	Date	Time	Latitude (S)	Longitude (E)	Activity	Distance (Metres)	Species	Number of animals	Mitigation activities	Sea state (Beaufort)	Visibility	Vessel
338	5 Oct 09	10:08	20 25.85	116 43.44	Transit	200	Turtle	1	Maintain visual contact	1	G	Queen of the Netherlands
339	5 Oct 09	12:24	20 34.72	116 43.85	Dredging	150	Dolphin	3	Maintain visual contact	1	G	Queen of the Netherlands
340	5 Oct 09	13:58	20 34.42	116 43.62	Dredging	200	Manta ray	1	Maintain visual contact	1	G	Queen of the Netherlands
341	6 Oct 09	8:08	20 35.35	116 44.43	Dredging	100	Dolphin	2	Maintain visual contact	1	G	Queen of the Netherlands
342	7 Oct 09	15:53	20 24.15	116 43.10	Transit	100	Whale	2	Maintain visual contact	4	G	Queen of the Netherlands
343	17 Oct 09	12:20	20 23.20	116 42.70	Dumping	15	Whale	3	Stopped operations	4	G	Queen of the Netherlands
344	18 Oct 09	6:15	20 30.00	116 43.30	Transit	550	Whale	2	Maintain visual contact	3	G	Queen of the Netherlands
345	18 Oct 09	12:20	20 23.25	116 42. 70	Dumping	15	Whale	2	Maintain visual contact	4	G	Queen of the Netherlands
346	19 Oct 09	9:00	20 33.90	116 43.12	Dredging	250	Turtle	1	Maintain visual contact	3	G	Queen of the Netherlands
347	20 Oct 09	8:20	20 34.09	116 43.18	Dredging	50	Dolphin	4	None	2	G	Queen of the Netherlands
348	20 Oct 09	8:40	20 33.88	116 43.15	Dredging	100	Turtle	1	None	2	G	Queen of the

Sighting No	Date	Time	Latitude (S)	Longitude (E)	Activity	Distance (Metres)	Species	Number of animals	Mitigation activities	Sea state (Beaufort)	Visibility	Vessel
												Netherlands
349	22 Oct 09	14:15	20 32.80	116 42.80	Dredging	1500	Whale	1	None	3	G	Queen of the Netherlands
350	22 Oct 09	16:45	20 27.80	116 43.50	Transit	300	Whale	1	None	3	G	Queen of the Netherlands
351	23 Oct 09	5:34	20 33.35	116 43.17	Dumping	70	Whale	1	None	NR	NR	Queen of the Netherlands
352	23 Oct 09	17:34	20 25.43	116 43.13	Transit	1000	Whale	3	None	NR	AV	Queen of the Netherlands
353	26 Oct 09	14:00	NR	NR	Transit	200	Dolphin	3	NR	2	G	Queen of the Netherlands
354	27 Oct 09	8:00	NR	NR	Transit	800	Turtle	1	Change direction	2	G	Queen of the Netherlands
355	27 Oct 09	12:30	20 36.00	116 45.00	Dredging	225	Dolphin	6	None	NR	NR	Queen of the Netherlands
356	28 Oct 09	18:00	20 23.90	116 42.80	Transit	600	Whale	2	None	6	AV	Queen of the Netherlands
357	29 Oct 09	8:15	20 34.71	116 43.95	Dredging	500	Dolphin	2	None	3	G	Queen of the Netherlands
358	29 Oct 09	10:18	20 23.24	116 42.47	Dumping	1800	Whale	3	None	2	AV	Queen of the Netherlands

Sighting No	Date	Time	Latitude (S)	Longitude (E)	Activity	Distance (Metres)	Species	Number of animals	Mitigation activities	Sea state (Beaufort)	Visibility	Vessel
359	30 Oct 09	17:10	20 23.50	116 41.90	Dumping	1500	Whale	1	None	2	AV	Queen of the Netherlands
360	30 Oct 09	17:20	20 23.50	116 41. 80	Dumping	1000	Whale	1	None	2	AV	Queen of the Netherlands
361	31 Oct 09	10:00	NR	NR	Transit	NR	Dolphin	2	Changed direction	1	G	Queen of the Netherlands
362	1 Nov 09	8:40	20 25.80	116 43.40	Transit	800	Whale	2	Maintain visual contact	1	AV	Queen of the Netherlands
363												
364	2 Nov 09	8:45	20 31.30	116 43.00	Transit	50	Dolphin	5	Maintained visual contact	1	AV	Queen of the Netherlands
365	2 Nov 09	9:30	NR	NR	Transit	100	Dolphin	2	None	3	G	Queen of the Netherlands
366	3 Nov 09	13:25	20 33.83	116 43.12	Dredging	50	Dolphin	4	None	1	AV	Queen of the Netherlands
367	4 Nov 09	8:00	20 32.45	116 44.00	Anchored	100	Turtle	1	None	NR	NR	Queen of the Netherlands
368	4 Nov 09	11:30	20 32.50	116 43.98	Anchored	20	Dolphin	1	None	1	AV	Queen of the Netherlands
369	4 Nov 09	13:00	NR	NR	Transit	400	Dolphin	4	Changed direction	1	G	Queen of the Netherlands
370	5 Nov 09	11:00	NR	NR	Transit	1000	Dolphin	3	Changed direction	1	G	Queen of the

Sighting No	Date	Time	Latitude (S)	Longitude (E)	Activity	Distance (Metres)	Species	Number of animals	Mitigation activities	Sea state (Beaufort)	Visibility	Vessel
												Netherlands
371	6 Nov 09	14:00	NR	NR	Transit	80	Turtle	1	Maintained visual contact	3	G	Queen of the Netherlands
372	7 Nov 09	15:40	20 22.00	116 42.50	Transit	1500	Whale	2	None	1	AV	Queen of the Netherlands
373	7 Nov 09	15:50	20 22.80	116 42.50	Dumping	500	Whale	2	None	1	AV	Queen of the Netherlands
374	8 Nov 09	8:00	NR	NR	Transit	200	Dolphin	2	Changed direction	3	G	Queen of the Netherlands
375	8 Nov 09	14:30	NR	NR	Transit	1000	Turtle	1	Changed direction	1	G	Queen of the Netherlands
376	9 Nov 09	16:33	20 33.59	116 43.06	Dredging	100	Manta ray	1	None	NR	NR	Queen of the Netherlands
377	9 Nov 09	16:35	20 33.59	116 43.06	Dredging	100	Dolphin	2	None	1	AV	Queen of the Netherlands
378	10 Nov 09	8:30	NR	NR	Transit	100	Dolphin	1	None	1	AV	Queen of the Netherlands
379	11 Nov 09	14:45	NR	NR	Transit	180	Dolphin	1	None	1	AV	Queen of the Netherlands
380	15 Nov 09	9:14	20 31.16	116 43.34	Dredging	150	Dolphin	1	None	NR	NR	Queen of the Netherlands

Sighting No	Date	Time	Latitude (S)	Longitude (E)	Activity	Distance (Metres)	Species	Number of animals	Mitigation activities	Sea state (Beaufort)	Visibility	Vessel
381	16 Nov 09	7:37	20 35.92	116 45.01	Dredging	100	Dolphin	1	None	NR	NR	Queen of the Netherlands
382	16 Nov 09	7:56	20 35.99	116 45.09	Dredging	75	Dolphin	1	Stopped operations	NR	NR	Queen of the Netherlands
383	18 Nov 09	7:30	NR	NR	Standby	80	Dolphin	3	None	2	AV	Queen of the Netherlands
384	19 Nov 09	13:15	NR	NR	Transit	100	Dolphin	4	Changed direction	3	AV	Queen of the Netherlands
385	23 Nov 09	7:10	20 30.57	116 44.70	Anchored	30	Dolphin	3	None	NR	NR	Queen of the Netherlands
386	24 Nov 09	10:45	20 33.80	116 42.80	Anchored	50	Dolphin	3	None	NR	NR	Queen of the Netherlands
387	25 Nov 09	8:44	NR	NR	Transit	110	Dolphin	3	None	1	VG	Queen of the Netherlands
388	25 Nov 09	10:30	20 33.60	116 42.90	Dredging	250	Dolphin	3	None	NR	NR	Queen of the Netherlands
389	27 Nov 09	10:33	NR	NR	Transit	90	Dolphin	2	None	1	VG	Queen of the Netherlands
390	30 Nov 09	10:00	NR	NR	Transit	600	Turtle	1	None	1	G	Queen of the Netherlands
391	30 Nov 09	12:15	20 34.70	116 43.85	Dredging	15	Dolphin	1	Maintained visual	1	G	Queen of the

Sighting No	Date	Time	Latitude (S)	Longitude (E)	Activity	Distance (Metres)	Species	Number of animals	Mitigation activities	Sea state (Beaufort)	Visibility	Vessel
392									contact			Netherlands
393	2 Dec 09	10:15	20 35.50	116 44.50	Dredging	100	Dolphin	6	Maintained visual contact	3	G	Queen of the Netherlands
394	3 Dec 09	11:52	20 35.06	116 44.06	Dredging	60	Dolphin	2	Maintained visual contact	3	AV	Queen of the Netherlands
395	4 Dec 09	12:08	20 34.75	116 43.88	Dredging	250	Dolphin	2	Maintained visual contact	2	G	Queen of the Netherlands
396	4 Dec 09	14:43	NR	NR	Transit	400	Turtle	1	Changed direction	2	VG	Queen of the Netherlands
397	6 Dec 09	13:40	20 34.72	116 43.88	Dredging	80	Dolphin	5	Maintained visual contact	2	G	Queen of the Netherlands
398	11 Dec 09	8:15	20 35.28	116 44.42	Dredging	90	Turtle	1	Maintained visual contact	3	AV	Queen of the Netherlands
399	11 Dec 09	12:55	20 33.10	116 42.42	Dredging	290	Dolphin	6	Maintained visual contact	3	G	Queen of the Netherlands
400	15 Dec 09	9:54	20 34.50	116 43.70	Transit	60	Dolphin	1	Maintained visual contact	1	G	Queen of the Netherlands
401	16 Dec 09	2:30	NR	NR	Transit	80	Dolphin	2	Changed direction	1	AV	Queen of the Netherlands
402	16 Dec 09	10:30	NR	NR	Transit	800	Manta ray	1	Changed direction	1	AV	Queen of the Netherlands

Sighting No	Date	Time	Latitude (S)	Longitude (E)	Activity	Distance (Metres)	Species	Number of animals	Mitigation activities	Sea state (Beaufort)	Visibility	Vessel
403	16 Dec 09	7:40	20 36.30	116 44.93	Dredging	200	Dolphin	5	Maintained visual contact	3	G	Queen of the Netherlands
404	16 Dec 09	10:30	NR	NR	Transit	800	Manta ray	1	Changed direction	1	AV	Queen of the Netherlands
405	20 Dec 09	10:20	NR	NR	Transit	400	Dolphin	3	Changed direction	1	VG	Queen of the Netherlands
406	17 Jan 10	7:28	NR	NR	Transit	400	Dolphin	1	Changed direction	1	VG	Queen of the Netherlands
407	17 Jan 10	8:23	NR	NR	Transit	70	Dolphin	1	Changed direction	1	VG	Queen of the Netherlands
408	22 Jan 10	13:06	NR	NR	Transit	60	Dolphin	3	Changed direction	2	VG	Queen of the Netherlands
409	22 Jan 10	16:55	20 34.16	116 43.41	Dredging	80	Dolphin	2	Maintained visual contact	4	VG	Leonardo Da Vinci
410	24 Jan 10	11:30	NR	NR	Transit	50	Dolphin	2	Maintained visual contact	2	VG	Queen of the Netherlands
411									Changed Direction			
412	28 Jan 10	13:15	NR	NR	Transit	45	Dolphin	1	Maintained visual contact	1	VG	Queen of the Netherlands
413									Changed Direction			
414	1 Feb 10	11:15	NR	NR	Dredging	120	Dolphin	3	Maintained visual	3	VG	Leonardo Da

Sighting No	Date	Time	Latitude (S)	Longitude (E)	Activity	Distance (Metres)	Species	Number of animals	Mitigation activities	Sea state (Beaufort)	Visibility	Vessel
									contact			Vinci
415	1 Feb 10	15:40	20 34. 60	116 43.60	Dredging	80	Dolphin	1	Maintained visual contact	2	VG	Leonardo Da Vinci
416												
417	1 Feb 10	15:55	20 34.61	116 43.60	Dredging	60	Dolphin	1	Maintained visual contact	2	VG	Leonardo Da Vinci
418												
419	2 Feb 10	11:00	20 34.69	116 43.70	Dredging	100	Dolphin	3	Maintained visual contact	2	VG	Leonardo Da Vinci
420	2 Feb 10	15:00	20 34.70	116 43.75	Dredging	150	Dolphin	3	Maintained visual contact	2	VG	Leonardo Da Vinci
421	3 Feb 10	7:35	20 34.71	116 43.77	Dredging	70	Dolphin	2	Maintained visual contact	2	VG	Leonardo Da Vinci
422	3 Feb 10	11:45	20 34.71	116 43.77	Dredging	100	Dolphin	4	Maintained visual contact	2	VG	Leonardo Da Vinci
423	6 Feb 10	8:00	NR	NR	Standby	40	Dolphin	8	Maintained visual contact	1	VG	Queen of the Netherlands
424	9 Feb 10	14:00	NR	NR	Transit	300	Turtle	1	Maintained visual contact	1	VG	Queen of the Netherlands
425	10 Feb 10	9:00	NR	NR	Standby	60	Dolphin	9	Maintained visual contact	1	VG	Queen of the Netherlands
426	17 Feb 10	13:47	20 32.79	116 44.82	Transit	250	Dolphin	1	None	1	VG	First Class

Sighting No	Date	Time	Latitude (S)	Longitude (E)	Activity	Distance (Metres)	Species	Number of animals	Mitigation activities	Sea state (Beaufort)	Visibility	Vessel
427	17 Feb 10	19:00	20 29.60	116 45.20	Anchored	NR	Dolphin	7	None	4	VG	Nile River
428	17 Feb 10	19:15	20 29.60	116 45.20	Anchored	NR	Dolphin	3	None	4	VG	Nile River
429	20 Feb 10	9:32	20 35.20	116 49.93	Transit	150	Dolphin	4	None	1	VG	First Class
430	23 Feb 10	9:15	20 27.10	116 46.06	Transit	40	Dolphin	17	Reduced speed	2	VG	Baudin
431	23 Feb 10	9:18	20 26.93	116 45.89	Transit	40	Turtle	1	None	2	VG	Baudin
432	23 Feb 10	15:34	20 18.43	116 45.18	Transit	20	Sea snake	1	None	1	VG	First Class
433	24 Feb 10	11:10	20 19.04	116 39.04	Drifting	20	Sea snake	1	None	1	VG	Baudin
434	24 Feb 10	13:30	20 17.64	116 45.30	Dredging	100	Shark	7	None	5	G	Nile River
435	25 Feb 10	12:55	20 17. 28	116 32.62	Transit	50	Tuna	NR	None	4	VG	Baudin
436	26 Feb 10	17:02	20 30.86	116 46.54	Drifting	100	Dolphin	5	None	1	VG	First Class
437	27 Feb 10	7:31	20 29.38	116 45.28	Transit	300	Birds, tuna	NR	None	1	VG	First Class
438	27 Feb 10	9:50	20 30.74	116 46.38	Transit	200	Dolphin	4	None	1	VG	Baudin
439	27 Feb 10	8:50	20 17.09	116 44.89	Dredging	100	Manta ray	NR	None	3	VG	Nile River
440	27 Feb 10	9:24	20 17.01	116 45.56	NR	2	Sea snake	1	None	1	VG	First Class
441	27 Feb 10	9:31	20 18.23	116 44.60	Transit	15	Sea snake	1	None	1	VG	First Class
442	27 Feb 10	9:38	20 20.02	116 44.98	Transit	20	Birds, tuna	1000	None	1	VG	First Class
443	28 Feb 10	6:49	20 38.06	116 43.00	Transit	150	Dolphin	12	None	1	VG	First Class
444	28 Feb 10	8:50	20 16.23	116 45.05	Dredging	5	Turtle	1	Changed direction	3	VG	Nile River

Sighting No	Date	Time	Latitude (S)	Longitude (E)	Activity	Distance (Metres)	Species	Number of animals	Mitigation activities	Sea state (Beaufort)	Visibility	Vessel
445									Stopped operations			
446	2 Mar 10	7:08	20 35.60	116 44.61	Transit	30	Dolphin	3	None	1	VG	First Class
447	2 Mar 10	16:30	20 16.05	116 44.60	Dredging	40	Turtle	1	Stop operations	3	G	Nile River
448	2 Mar 10	17:19	20 18.29	116 45.59	Transit	15	Sea snake	1	None	1	VG	First Class
449	3 Mar 10	10:10	20 16 .20	116 45.00	Dredging	150	Turtle	1	NR	3	VG	Nile River
450	3 Mar 10	13:56	20 19.20	116 45.28	Transit	50	Dolphin	2	None	1	VG	First Class
451	3 Mar 10	15:15	20 34 .06	116 44.94	Transit	100	Manta ray	2	None	2	AV	Nile River
452	4 Mar 10	10:25	20 28.62	116 46.34	Transit	15	Dolphin	2	None	3	G	Baudin
453	6 Mar 10	6:41	20 39.53	116 41.92	Anchored	10	Turtle	1	None	1	VG	First Class
454	6 Mar 10	13:45	20 34.28	116 45.18	Backfilling	80	Dolphin	1	None	2	VG	Nile River
455	7 Mar 10	9:10	20 22.69	116 43.94	Backfilling	200	Sea snake	1	None	1	VG	Nile River
456	7 Mar 10	10:35	20 29.60	116 43.47	Transit	30	Dolphin	3	None	1	G	Nile River
457	8 Mar 10	17:31	20 37.82	116 42.33	Transit	50	Dolphin	4	None	1	VG	First Class
458	9 Mar 10	8:33	20 39.49	116 41.95	Anchored	10	Turtle	1	None	1	VG	First Class
459	10 Mar 10	8:24	20 18.10	116 44.49	Transit	NR	Coral spawn	NR	None	1	VG	First Class
460	10 Mar 10	12:48	20 18.61	116 38.53	Transit	50	Dolphin	20	None	2	VG	Baudin
461	10 Mar 10	13:10	20 19.04	116 46.04	Transit	10	Sailfish	1	Stopped operations	2	VG	Baudin

Sighting No	Date	Time	Latitude (S)	Longitude (E)	Activity	Distance (Metres)	Species	Number of animals	Mitigation activities	Sea state (Beaufort)	Visibility	Vessel
									Maintained visual contact			
462	11 Mar 10	8:12	20 19.07	116 44.09	Transit	NR	Birds, tuna	NR	None	1	VG	First Class
463												
464	11 Mar 10	17:58	20 25.45	116 40.48	Transit	100	Dolphin	7	None	1	VG	First Class
465	12 Mar 10	7:32	20 28.31	116 44.29	Transit	100	Dolphin	4	None	1	VG	First Class
466	12 Mar 10	10:20	20 33.25	116 45.53	Drifting	75	Turtle	1	None	2	VG	Baudin
467	13 Mar 10	9:00	20 30.12	116 45.30	Transit	750	Dolphin	6	None	3	VG	Nile River
468	13 Mar 10	9:06	20 31.97	116 45.42	Transit	15	Turtle	1	None	1	VG	First Class
469	13 Mar 10	9:42	20 36.70	116 44.65	Transit	120	Dolphin	5	None	1	VG	First Class
470	13 Mar 10	9:58	20 38.00	116 43.24	Transit	40	Turtle	1	None	1	VG	First Class
471	13 Mar 10	10:20	20 17.60	116 34.01	Transit	50	Turtle	1	None	2	VG	Baudin
472	13 Mar 10	11:30	20 34.76	116 44.83	Backfilling	50	Dolphin	1	None	1	VG	Nile River
473	17 Mar 10	10:30	20 29.15	116 46.43	Backfilling	100	Dolphin	2	None	1	AV	Nile River
474	17 Mar 10	11:45	20 33.42	116 45.49	NR	50	Dolphin	2	Maintained visual contact	1	G	Nile River
475	17 Mar 10	12:00	20 34.05	116 45.15	Transit	50	Turtle	1	None	1	G	Nile River
476	18 Mar 10	8:46	20 28.50	116 44.53	Transit	120	Dolphin	7	None	1	VG	First Class

Sighting No	Date	Time	Latitude (S)	Longitude (E)	Activity	Distance (Metres)	Species	Number of animals	Mitigation activities	Sea state (Beaufort)	Visibility	Vessel
477	18 Mar 10	8:48	20 28.94	116 44.64	Transit	100	Dolphin	5	None	1	VG	First Class
478	18 Mar 10	11:10	20 32.71	116 43.81	Stopped	50	Dolphin	4	None	1	VG	Nile River
479	19 Mar 10	9:15	20 16.21	116 45.51	Transit	100	Turtle	1	None	1	VG	Nile River
480	19 Mar 10	9:51	20 30.84	116 44.32	Transit	80	Dolphin	3	None	1	VG	First Class
481	21 Mar 10	9:20	20 18.93	116 44.56	Dredging	100	Turtle	1	Maintained visual contact	1	VG	Nile River
482	21 Mar 10	16:53	20 26.16	116 41.80	Transit	90	Whale	1	None	1	VG	First Class
483	22 Mar 10	11:54	20 17.32	116 44.54	Transit	20	Turtle	1	None	1	VG	First Class
484												
485	23 Mar 10	8:27	20 22.42	116 44.99	Drifting	30	Turtle	1	None	1	VG	First Class
486	23 Mar 10	9:13	20 28.43	116 45.14	Transit	20	Dolphin	3	None	1	VG	First Class
487	24 Mar 10	16:48	20 28.85	116 44.65	Transit	10	Sea snake	1	None	1	VG	First Class
488	25 Mar 10	8:28	20 16.50	116 44.81	Transit	50	Dolphin	12	None	1	VG	First Class
489	25 Mar 10	16:30	20 16.30	116 44.50	Dredging	150	Sea snake	1	None	4	VG	Nile River
490	26 Mar 10	7:55	20 34.57	116 44.91	Transit	NR	Dolphin	3	None	1	VG	Baudin
491	27 Mar 10	12:32	20 37.93	116 43.09	Transit	100	Dolphin	1	None	1	VG	First Class
492	30 Mar 10	15:49	20 28.85	116 44.65	Drifting	20	Sea snake	1	None	1	VG	First Class
493	31 Mar 10	8:00	20 37.13	116 44.03	Transit	NR	Dolphin	1	None	2	G	Baudin

Sighting No	Date	Time	Latitude (S)	Longitude (E)	Activity	Distance (Metres)	Species	Number of animals	Mitigation activities	Sea state (Beaufort)	Visibility	Vessel
494	31 Mar 10	9:00	20 29.10	116 43.40	Transit	NR	Dolphin	3	Maintain visual contact	2	VG	Cornelis Zanen
495	31 Mar 10	10:50	20 34.90	116 45 90	Dredging	200	Dolphin	3	Maintain visual contact	2	VG	Cornelis Zanen
496	1 Apr 10	10:41	20 37.18	116 44.53	Transit	50	Dolphin	1	None	1	VG	First Class
497	1 Apr 10	12:15	20 35.75	116 50.20	Dredging	150	Dolphin	2	Maintain visual contact	4	VG	Cornelis Zanen
498	2 Apr 10	8:45	20 34.85	116 43.09	Dredging	120	Dolphin	3	Maintain visual contact	4	VG	Cornelis Zanen
499	2 Apr 10	9:35	20 32.35	116 43.50	Dredging	50	Dolphin	2	Maintain visual contact	4	VG	Cornelis Zanen
500	3 Apr 10	11:45	20 35.60	116 43.80	Dredging	50	Dolphin	4	Maintain visual contact	4	VG	Cornelis Zanen
501	4 Apr 10	10:25	20 28.62	116 46.37	Transit	15	Dolphin	2	None	1	G	Baudin
502	5 Apr 10	13:46	20 30.45	116 45.70	Drifting	20	Dolphin	1	None	NR	VG	First Class
503	5 Apr 10	15:20	20 31.05	116 44.10	Dredging	150	Dolphin	2	Maintain visual contact	5	VG	Cornelis Zanen
504	6 Apr 10	16:18	20 18.09	116 42.00	Transit	NR	Dolphin	2	Reduce speed	1	VG	Nile River
505	7 Apr 10	12:25	20 21.25	116 41.27	Transit	NR	Dolphin	6	NR	4	G	Baudin
506	8 Apr 10	9:19	20 28.85	116 44.65	Transit	15	Dolphin	1	None	1	VG	First Class

Sighting No	Date	Time	Latitude (S)	Longitude (E)	Activity	Distance (Metres)	Species	Number of animals	Mitigation activities	Sea state (Beaufort)	Visibility	Vessel
507	9 Apr 10	8:18	20 18.87	116 44.64	Transit	30	Dolphin	2	None	1	VG	First Class
508	9 Apr 10	11:28	20 18.38	116 37.00	Backfilling	NR	Shark	1	Maintain visual contact	0	VG	Nile River
509	10 Apr 10	10:45	20 18.10	116 38.20	Transit	NR	Sea snake	2	NR	0	VG	Nile River
510	10 Apr 10	16:40	20 39.57	116 41.95	Anchored	NR	Turtle	1	NR	1	G	Baudin
511	12 Apr 10	7:35	20 33.40	116 42.95	Dredging	200	Dolphin	1	Maintain visual contact	3	VG	Cornelis Zanen
512	12 Apr 10	8:05	20 33.80	116 43.00	Dredging	150	Dolphin	3	Maintain visual contact	3	VG	Cornelis Zanen
513	12 Apr 10	NR	20 26.71	116 43.89	Transit	NR	Turtle	1	Reduce speed	NR	VG	Nile River
514	12 Apr 10	10:35	20 32.61	116 43.30	Transit	NR	Dolphin	4	Reduce speed	NR	VG	Nile River
515	12 Apr 10	15:51	20 37.53	116 45.01	Transit	800	Dolphin	2	None	2	VG	Queen of the Netherlands
516	13 Apr 10	13:05	20 33.01	116 42.88	Transit	30	Dolphin	2	None	2	VG	Queen of the Netherlands
517	13 Apr 10	12:20	20 34.00	116 43.20	Dredging	150	Dolphin	1	Maintain visual contact	4	VG	Cornelis Zanen
518	14 Apr 10	6:08	20 17.50	116 44.49	Dredging	150	Sea snake	1	Change direction	NR	VG	Nile River
519	15 Apr 10	10:30	20 34.48	116 43.72	Dredging	300	Dolphin	6	Maintain visual contact	2	VG	Queen of the Netherlands

Sighting No	Date	Time	Latitude (S)	Longitude (E)	Activity	Distance (Metres)	Species	Number of animals	Mitigation activities	Sea state (Beaufort)	Visibility	Vessel
520	15 Apr 10	12:40	20 18.46	116 37.78	Survey	NR	Dolphin	6	None	2	G	Baudin
521	15 Apr 10	14:20	20 33.50	116 42.90	Dredging	70	Dolphin	5	Maintain visual contact	1	VG	Cornelis Zanen
522	15 Apr 10	7:16	20 37.53	116 45.01	Transit	1000	Dolphin	4	None	4	VG	Queen of the Netherlands
523	15 Apr 10	7:50	20 37.53	116 45.01	Transit	600	Dolphin	4	None	1	VG	Queen of the Netherlands
524	15 Apr 10	16:58	20 25.16	116 44.62	Transit	NR	Dolphin	3	None	0	VG	First Class
525	16 Apr 10	13:00	20 34.20	116 43.70	Dredging	70	Dolphin	3	Maintain visual contact	1	VG	Queen of the Netherlands
526	16 Apr 10	13:40	20 34.40	116 43.50	Dredging	40	Dolphin	4	Maintain visual contact	2	VG	Queen of the Netherlands
527	17 Apr 10	13:00	20 34.10	116 43.40	Dredging	200	Dolphin	1	Maintain visual contact	2	VG	Cornelis Zanen
528	19 Apr 10	NR	20 33.09	116 42.99	Transit	60	Dolphin	7	Reduce speed	NR	VG	Nile River
529	19 Apr 10	12:40	20 34.40	116 43.50	Dredging	165	Dolphin	1	Maintain visual contact	3	VG	Cornelis Zanen
530	19 Apr 10	17:02	20 17.35	116 44.72	Standby	200	Turtle	1	None	2	G	First Class
531	21 Apr 10	9:10	20 33.23	116 42.90	Dredging	50	Dolphin	2	Maintain visual contact	1	VG	Queen of the Netherlands

Sighting No	Date	Time	Latitude (S)	Longitude (E)	Activity	Distance (Metres)	Species	Number of animals	Mitigation activities	Sea state (Beaufort)	Visibility	Vessel
532	22 Apr 10	10:52	20 33.94	116 43.10	Dredging	100	Dolphin	7	Maintain visual contact	7	VG	Queen of the Netherlands
533	24 Apr 10	17:45	20 34.35	116 43.21	Transit	NR	Dolphin	6	None	1	VG	Queen of the Netherlands
534	24 Apr 10	17:50	20 34.10	116 43.20	Dredging	120	Dolphin	1	Maintain visual contact	1	VG	Cornelis Zanen
535	25 Apr 10	6:00	20 24.65	116 43.01	Transit	100	Dolphin	3	Maintain visual contact	3	VG	Cornelis Zanen
536	25 Apr 10	16:15	20 32.80	116 42.20	Transit	100	Dolphin	2	Maintain visual contact	1	VG	Queen of the Netherlands
537	25 Apr 10	16:25	20 31.90	116 43.00	Transit	75	Dolphin	1	Maintain visual contact	1	VG	Queen of the Netherlands
538	26 Apr 10	8:45	20 33.43	116 43.30	Dredging	500	Dolphin	4	None	1	G	Queen of the Netherlands
539	28 Apr 10	9:50	20 35.12	116 44.31	Dredging	100	Dolphin	3	Maintain visual contact	4	VG	Cornelis Zanen
540	28 Apr 10	12:30	20 34.10	116 43.50	Transit	20	Dolphin	2	Maintain visual contact	3	VG	Cornelis Zanen
541	30 Apr 10	8:55	20 36.09	116 45.21	Dredging	80	Dolphin	2	Maintain visual contact	2	VG	Cornelis Zanen
542	30 Apr 10	15:35	20 35.54	116 44.56	Transit	100	Dolphin	2	Maintain visual	2	VG	Cornelis Zanen

Sighting No	Date	Time	Latitude (S)	Longitude (E)	Activity	Distance (Metres)	Species	Number of animals	Mitigation activities	Sea state (Beaufort)	Visibility	Vessel
									contact			
543	1 May 10	7:50	20 35.90	116 45.04	Dredging	100	Dolphin	2	Maintain visual contact	1	VG	Cornelis Zanen
544	1 May 10	11:21	20 36.33	116 45.33	Dredging	40	Dolphin	1	Maintain visual contact	1	VG	Cornelis Zanen
545	2 May 10	11:50	20 29.14	116 43.50	Transit	70	Turtle	1	Maintain visual contact	2	VG	Cornelis Zanen
546	4 May 10	9:20	20 33.64	116 42.82	Dredging	70	Dolphin	2	Maintain visual contact	3	VG	Cornelis Zanen
547	5 May 10	11:05	20 33.59	116 42.83	Dredging	100	Dolphin	2	Maintain visual contact	3	VG	Cornelis Zanen
548	7 May 10	13:40	20 34.58	116 43.50	Dredging	120	Dolphin	3	Maintain visual contact	5	VG	Cornelis Zanen
549	8 May 10	16:30	20 35.43	116 44.53	Dredging	100	Dolphin	1	Maintain visual contact	3	VG	Cornelis Zanen

Appendix 5

Beaufort Scale (sea state)

Beaufort number	Description	Wind speed	Wave height (m)	Sea conditions	Land conditions
0	Calm	< 1km/h < 1 knot	0 m	Flat.	Calm. Smoke rises vertically.
1	Light air	1.1–5.5 km/h 1-2 knots	0–0.2 m	Ripples without crests.	Smoke drift indicates wind direction, still wind vanes.
2	Light breeze	5.6–11 km/h 3-6 knots	0.2–0.5 m	Small wavelets. Crests of glassy appearance, not breaking	Wind felt on exposed skin. Leaves rustle, vanes begin to move.
3	Gentle breeze	12–19 km/h 7-10 knots	0.5–1 m	Large wavelets. Crests begin to break; scattered whitecaps	Leaves and small twigs constantly moving, light flags extended.
4	Moderate breeze	20–28 km/h 11-15 knots	1–2 m	Small waves with breaking crests. Fairly frequent white caps.	Dust and loose paper raised. Small branches begin to move.
5	Fresh breeze	29–38 km/h 16-20 knots	2–3 m	Moderate waves of some length. Many white horses. Small amounts of spray.	Branches of a moderate size move. Small trees in leaf begin to sway.
6	Strong wind	39–49 km/h 21-26 knots	3–4 m	Long waves begin to form. White foam crests are very frequent. Some airborne spray is present.	Large branches in motion. Whistling heard in overhead wires. Umbrella use becomes difficult. Empty plastic garbage cans tip over.
7	High wind, moderate gale,	50–61 km/h 27-33 knots	4–5.5 m	Sea heaps up. Some foam from breaking waves is blown into streaks along wind direction.	Whole trees in motion. Effort needed to walk against the wind.

Beaufort number	Description	Wind speed	Wave height (m)	Sea conditions	Land conditions
	near gale			Moderate amounts of airborne spray.	
8	Fresh gale	62–74 km/h 34–40 knots	5.5–7.5 m	Moderately high waves with breaking crests forming spindrift. Well-marked streaks of foam are blown along wind direction. Considerable airborne spray.	Some twigs broken from trees. Cars veer on road. Progress on foot is seriously impeded.
9	Strong gale	75–88 km/h 41–47 knots	7–10 m	High waves whose crests sometimes roll over. Dense foam is blown along wind direction. Large amounts of airborne spray may begin to reduce visibility.	Some branches break off trees, and some small trees blow over. Construction/temporary signs and barricades blow over.
10	Storm	89–102 km/h 48–55 knots	9–12.5 m	Very high waves with overhanging crests. Large patches of foam from wave crests give the sea a white appearance. Considerable tumbling of waves with heavy impact. Large amounts of airborne spray.	Trees are broken off or uprooted, saplings bent and deformed. Poorly attached asphalt shingles and shingles in poor condition peel off roofs.
11	Violent storm	103–117 km/h 56–63 knots	11.5–16 m	Exceptionally high waves. Very large patches of foam, driven before the wind, cover much of the sea surface. Very large amounts of airborne spray severely reduce visibility.	Widespread damage to vegetation. Many roofing surfaces are damaged; asphalt tiles that have curled up and/or fractured due to age may break away completely.
12	Hurricane-force	≥ 118 km/h ≥ 64 knots	≥ 14 m	Huge waves. Sea is completely white with foam and spray. Air is filled with driving spray, greatly reducing visibility.	Very widespread damage to vegetation. Some windows may break; mobile homes and poorly constructed sheds and barns are damaged. Debris may be airborne.