

Permanent Aviation Fuel Facility (EP-139/2002/A)

Revised Baseline Review and Pre-Construction Phase Dolphin Monitoring Report

25th January 2006

Environmental Resources Management

21/F Lincoln House
Taikoo Place, 979 King's Road
Island East, Hong Kong
Telephone 2271 3000
Facsimile 2723 5660

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Prepared by: Jor Fan/Craig A Reid

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For and on behalf of Environmental Resources Management	
Approved by:	Freeman Cheung
Signed:	
Position:	Environmental Team Leader
Date:	25 th January 2006

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EXECUTIVE SUMMARY

A baseline marine mammal survey is required to be conducted before marine construction works for the Permanent Aviation Fuel Facility commence in accordance with the Environmental Permit (EP-139/2002/A). The baseline survey was conducted within 28 days of the construction works. Six, one-day surveys were conducted between 27th October and 1st November 2005. During the surveys, only one type of marine mammal, the Indo-Pacific Humpback Dolphin (*Sousa chinensis*) or Chinese White Dolphin was observed. Sightings occurred throughout the entire survey area; however, more sightings occurred towards the north of the Sha Chau and Lung Kwu Chau Marine Park. Sightings of the Indo-Pacific Humpback Dolphin were made during all of the survey days, with a minimum of 3 and maximum of 11 sightings recorded. The number of individuals ranged from 1 individual to a group size of 8 individuals; however, the majority (over 55%) were in group sizes of 1 to 2 individuals. All age classes of humpback dolphins were recorded including calves.

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1.1 BACKGROUND TO THE STUDY

A Permanent Aviation Fuel Facility (PAFF) is required to ensure a secure means to supply aviation fuel during the operational lifetime of the Hong Kong International Airport (HKIA). The PAFF will eliminate operations at the existing Aviation Fuel Receiving Facility (AFRF) adjacent to Sha Chau and provide the supply to the HKIA. The PAFF must meet the capacity demand for the 2040 planning horizon of the HKIA and must be able to provide the required strategic storage and quality controls. The Airport Authority Hong Kong (AAHK) is committed to expediting the permanent facility, after which the Sha Chau facility will be used for emergency backup purposes only.

The potential environmental impacts of the Project have been studied in the Environmental Impact Assessment (EIA) Report "*Permanent Aviation Fuel Facility for Hong Kong International Airport*" (EIAO Register No: AEIAR-062-2002). The EIA was approved with conditions on 2 August 2002 under the *Environmental Impact Assessment Ordinance (EIAO)*. An Environmental Permit (EP-139/2002) associated with the construction works was also granted on 28 August 2002. An Application for Variation to the Environmental Permit (VEP) (VEP-133/2004) was submitted to the Director of Environmental Protection (DEP) on 28th January 2004 and the amended EP (EP-139/2002/A) was granted by DEP on 24 February 2004.

ERM-Hong Kong, Ltd (ERM) has been commissioned by Leighton Contractors (Asia) Limited (LCAL) to act as the Environmental Team for the project and implement an environmental monitoring and auditing (EM&A) programme during construction works.

1.2 PURPOSE OF THIS REPORT

As part of the EM&A programme, pre- and post-construction phase dolphin monitoring are required to evaluate whether there have been any effects on the animals as a result of the construction works. Prior to the commencement of construction works a review of all new available dolphin data for North Lantau waters should be conducted and reported. This report presents the review of baseline conditions and the results of the pre-construction phase dolphin monitoring.

STRUCTURE OF THE DOCUMENT

Following this introductory sections, the remainder of the report is presented as follows:

- *Section 2* presents the review of available dolphin data for North Lantau;
- *Section 3* presents the methodology and results of the pre-construction phase dolphin monitoring; and,
- *Section 4* presents the summary and conclusions.

2.1 INTRODUCTION

This *Section* presents a review of all new available dolphin data for North Lantau waters. The objective of this review is to provide up-to-date information on dolphin distribution patterns in North Lantau waters and allow the assessment of the overall efficiency of the project-specific mitigation measures.

2.2 BASELINE CONDITIONS

A total of 16 (and possibly up to 18) species of marine mammals, or cetaceans, have been recorded in Hong Kong waters (Jefferson, pers. comm.). The Indo-Pacific Humpback Dolphin, *Sousa chinensis*, and the Finless Porpoise, *Neophocaena phocaenoides*, are the only two species of marine mammals regularly sighted in Hong Kong waters. Recent studies appear to indicate that the Finless Porpoise only occurs in the southern and eastern waters of Hong Kong, with no sightings being recorded in North Lantau waters ⁽¹⁾ ⁽²⁾ ⁽³⁾.

The distribution, abundance, habitat use, and life history of Indo-Pacific Humpback Dolphins in Hong Kong has been extensively studied since 1995 ⁽²⁾⁽⁴⁾. The distribution and abundance of dolphins has been studied using line transect methods allowing any patterns to be determined. As sightings are obtained relative to known levels of search effort, corresponding densities have been obtained.

The line transect analysis of vessel surveys undertaken from 1995 to 2004 for the Indo-Pacific Humpback Dolphin Monitoring Programme showed that the abundance of dolphins is highest in the North Lantau area in all four seasons *Figure 2.1*. North Lantau and West Lantau are considered to be the major habitats for humpback dolphins in Hong Kong waters where individuals of humpback dolphins have been consistently recorded throughout the year in Hong Kong.

(1) Jefferson TA, Hung SK, Law I, Torey M and Tregenza N (2002) Distribution and abundance of finless porpoises in Hong Kong and adjacent waters of China. Raffles Bulletin of Zoology Supplement 10:43-55.

(2) Jefferson TA (2002) Monitoring of Indo-Pacific Humpback Dolphins (*Sousa chinensis*) in Hong Kong waters. Final Report. For the Agriculture, Fisheries and Conservation Department, Hong Kong SAR Government.

(3) Jefferson TA (2000) Population biology of the Indo-Pacific Humpback dolphin in Hong Kong waters. Wildlife Monographs 144:1-65.

(4) Jefferson TA and SK Hung (2004) A review of the status of the Indo-Pacific humpback dolphin (*Sousa chinensis*) in Chinese waters. Aquatic Mammals. 30:149-158

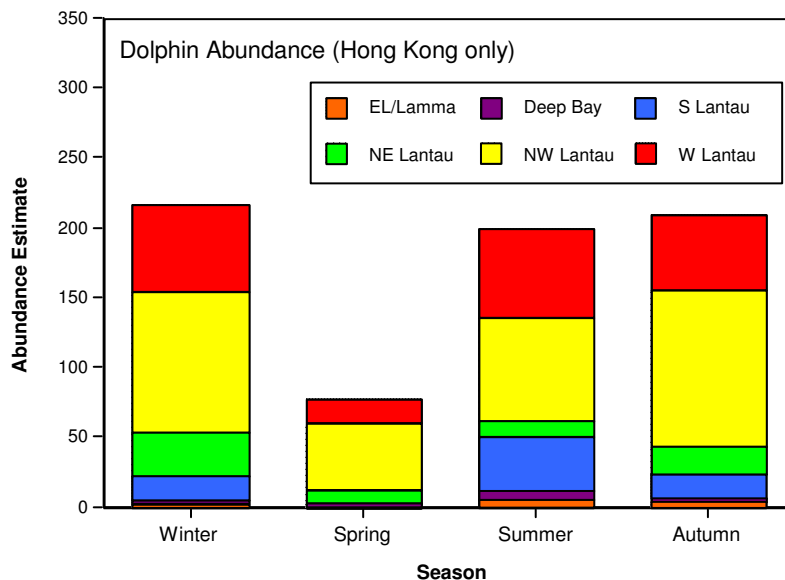


Figure 2.1 *Estimates of abundance of Indo-Pacific Humpback Dolphins in Hong Kong waters, based on line transect analysis of vessel surveys from 1995 to 2004* ⁽¹⁾

In spring, almost all sightings of the Indo-Pacific Humpback Dolphins in Hong Kong have been made in North Lantau with a seasonal influx of individuals into South Lantau (and to a lesser extent, Deep Bay and East Lantau/Lamma areas) during summer, autumn and winter. The seasonal influx of Indo-Pacific Humpback Dolphins is thought to be due to the spread of freshwater from the Pearl River, directly to the west of Hong Kong ⁽²⁾.

Indo-Pacific Humpback Dolphins are present in Hong Kong waters with high densities in summer, autumn and winter and lowest in spring ⁽³⁾ ⁽⁴⁾. The proportion of the local population that utilize the North Lantau waters as opposed to other areas of Hong Kong varies from 72% in spring to 92% in winter when the abundance of Indo-Pacific Humpback Dolphins occurring in Hong Kong waters is at its lowest ⁽⁵⁾.

According to data from the Agriculture, Fisheries and Conservation Department, which has been collected between 1995 and 2004, it appears that the use of waters by Indo-Pacific Humpback Dolphins within the Study Area is not uniform (*Figure 2.2* and *Figure 2.3*). In all four seasons, Indo-Pacific Humpback Dolphins are most abundant in the western waters between Castle Peak and Black Point in the east and the islands of Sha Chau and Lung Kwu

⁽¹⁾ Jefferson T.A. and S.K. Hung. 2004. A review of the status of the Indo-Pacific humpback dolphin in Chinese waters. *Aquatic Mammals* (Special Issue) 30: 149-158, and AFCDC 2004. Monitoring of Chinese White Dolphins (*Sousa chinensis*) in Hong Kong waters - Data Collection, Final Report (1 April 2003 to 31 March 2004), prepared by Hong Kong Cetacean Research Project.

⁽²⁾ *Ibid.*

⁽³⁾ *Ibid.*

⁽⁴⁾ Barros NB, Jefferson TA and ECM Parsons (2004) Feeding habits of Indo-Pacific humpback dolphins (*Sousa chinensis*) stranded in Hong Kong. *Aquatic Mammals*. 30:179-188

⁽⁵⁾ *Ibid.*

Chau in the west. High densities have also been recorded in areas to the north of the airport especially near the northeast corner and around the Brothers Islands (1).

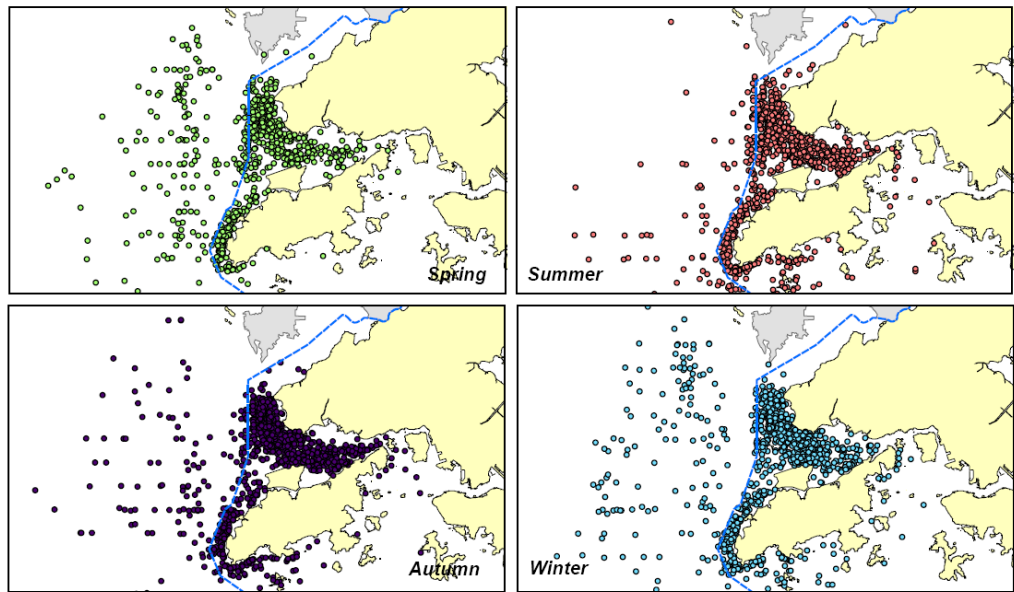


Figure 2.2 *Seasonal Distribution of Indo-Pacific Humpback Dolphins in Hong Kong waters (data collected between 1995 and 2004, AFCD)*

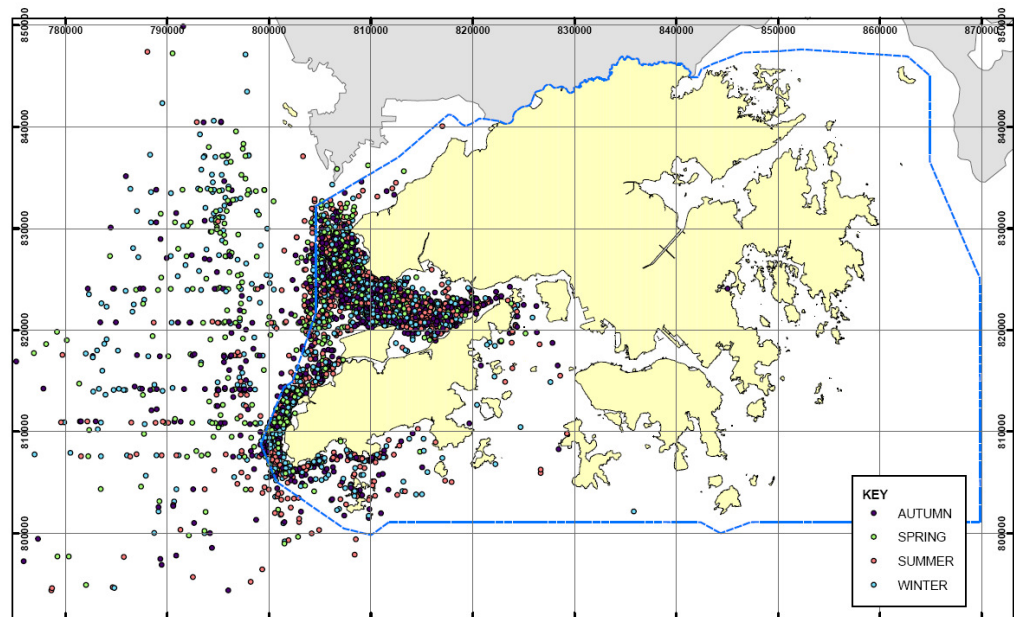


Figure 2.3 *Seasonal Distribution (all four seasons) of Indo-Pacific Humpback Dolphins in Hong Kong waters (data collected between 1995 and 2004, AFCD)*

The exact status of the Hong Kong population of the Indo-Pacific Humpback Dolphin is not known with certainty. An analysis of recent dolphin collected between 1995 and mid 2002 appears to indicate that the population may be relatively stable in North Lantau (

Figure 2.4) (1).

(1) Barros NB, Jefferson TA and ECM Parsons (2004) *Op cit.*

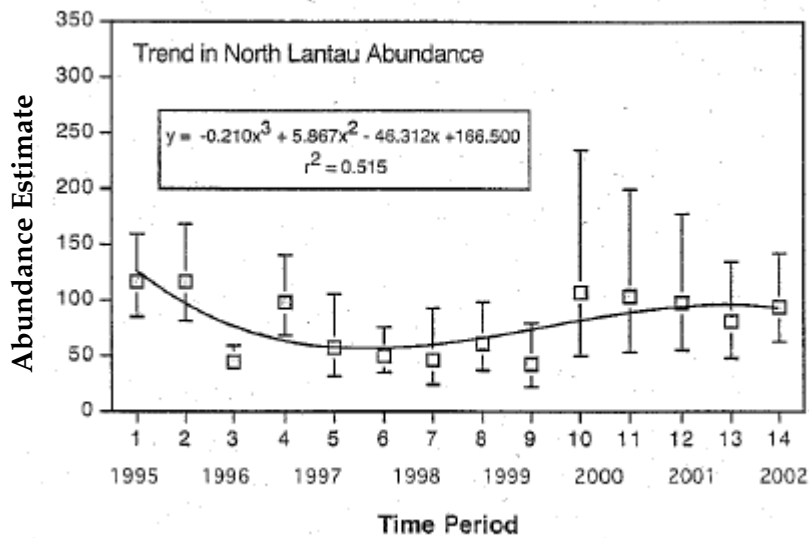


Figure 2.4 Trends in abundance of Indo-Pacific Humpback Dolphins in North Lantau (data collected between 1995 and 2002)

Studies have also revealed several areas of very low Indo-Pacific Humpback Dolphin density in the North Lantau area (Figure 2.3). The occurrence of the dolphins tended to be low at the adjacent northwest area of the Airport. Other low density regions included along shore from Pillar Point to Brothers Point and at South Brothers, ie directly to the east of the airport platform and extending east along the Lantau coastline to Sham Shui Kok. Within this area very low numbers of dolphins have been sighted in comparison to other areas in North Lantau waters and in Hong Kong.

(1) Jefferson TA and SK Hung (2004) *Op cit.*

3.1 INTRODUCTION

This *Section* presents the methodology and results of the pre-construction phase dolphin monitoring.

3.2 METHODOLOGY

Line transect surveying techniques have now been standardised in Hong Kong Special Administrative Region Waters so that data from all surveys are directly comparable. The study area with line transects is presented in *Figure 3.1*. In order to provide a suitable long-term dataset for comparison, pre-and post construction phase dolphin monitoring will employ an identical methodology and follow the same line transects as those presented in *Figure 3.1*.

On each survey day, the survey vessel departed from Tung Chung New Pier. Observation for incidental sighting began immediately on departure from the assigned pier and continued until the vessel reached the survey area.

The survey vessel had an open upper deck, allowing for observer eye heights of 4 to 5m above water level and relatively unobstructed forward visibility between 270° and 90°. When on-effort, the vessel travelled along the survey lines at a speed of approximately 7 to 8 knots (13 to 15 km/hr). The direction of the survey was alternated on different days to avoid possible biases related to the timing of the survey coverage.

Vessel-based transect observations by a three-person team were conducted by searching the 180° swath in front of the survey vessel (270° to 90°). The area behind the vessel was not searched, although dolphins observed here were recorded as off-effort sightings. A primary observer scanned the entire search path (270° to 90°) continuously with Fujinon 7X50 marine binoculars or equivalent as the second member of the team, designated the data “recorder”, scanned the same area with the naked eye and occasional binocular check. The third observer on the boat rotated into the observation team after half an hour, thus relieving one of the initial team. Observers rotated every half an hour. While on-effort, observers were instructed to ignore potential sighting cues that could bias the sighting distance calibration (eg pair-trawl fishing vessels).

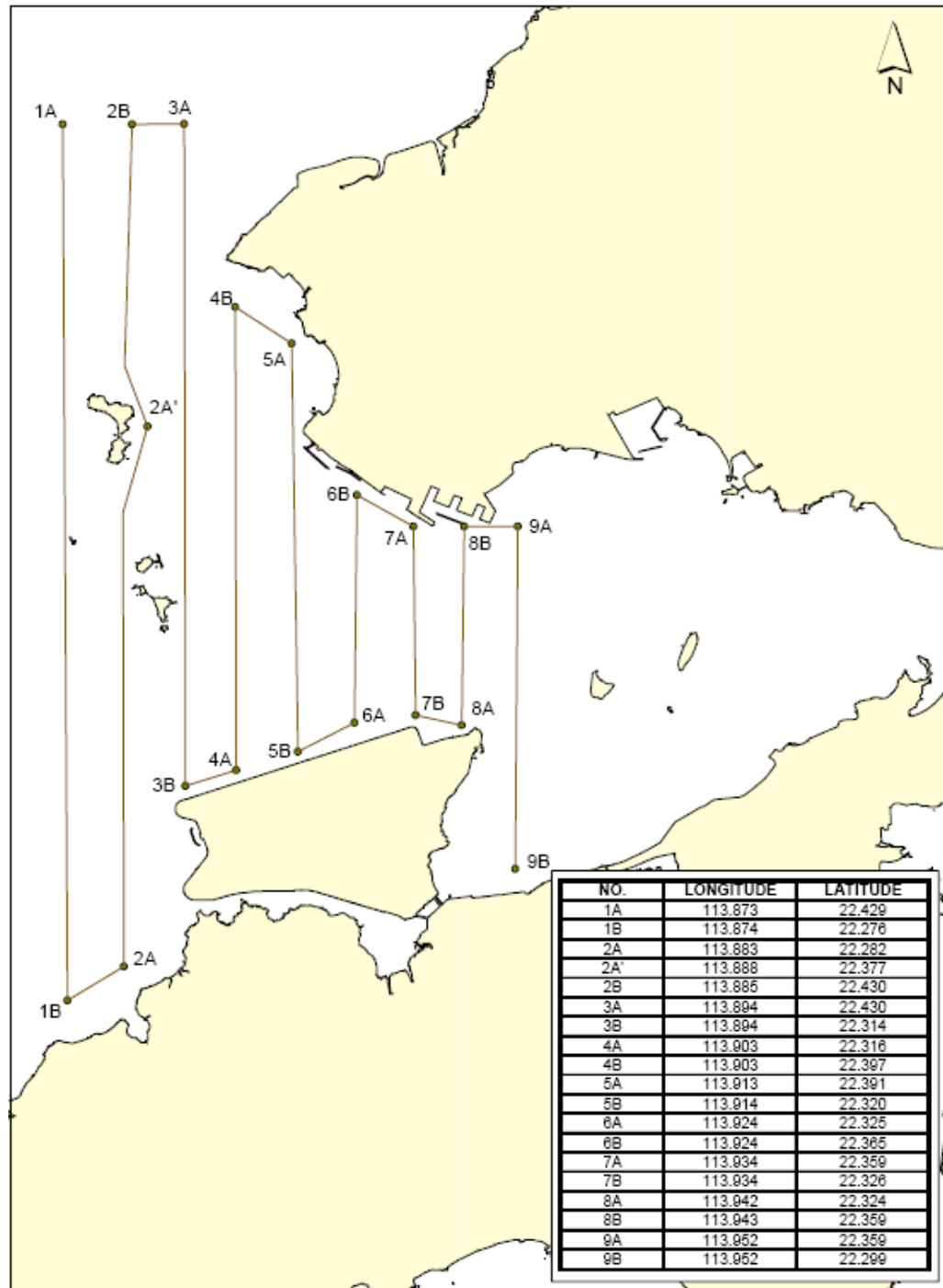


Figure 3.1 *Line Transects for Pre-Construction Dolphin Monitoring*

A critical consideration in the survey was to ensure a strict timed quantification of “sighting effort” in order to maximise the comparative value of the field survey results. The time and position for the start and end of a period of intensive, uninterrupted effort, and the sighting conditions such as visibility range and Beaufort scale associated with it were recorded. The collection of effort data allowed comparisons within a single study as well as between studies. Strict recording of time and speed travelling along the assigned transect (“on-effort”) was always therefore recorded. Time spent during any deviation from the transect was recorded as “off-effort”.

During periods of poor weather, when visibility is hindered (eg below 1km) or when Beaufort force 5 is reached, the survey would normally be postponed. Such conditions did not occur during the survey.

Sightings distant to 500m perpendicular distance and sightings of single dolphins that were hard to track were not pursued (although those distant to 500m ahead of the vessel were pursued). The initial sighting distance between the dolphin and the survey vessel and sighting angle was recorded in order to estimate the positions of the dolphins. These and other details of the sighting, include the exact location of the sighting, number of individuals were on every occasion discussed among the observation team and recorded immediately. Distances and angles were made as accurately as possible.

A global positioning system was available on board and used during every field survey. A sighting record was filled out at the initial sighting with time, position, distance and angle data filled in immediately and verified between primary observer and recorder. All other information on sea state, weather conditions (Beaufort Scale), as well as notes on dolphin appearance, behaviour, and any other information were completed at the end of the sighting.

3.3 *RESULTS*

3.3.1 *Survey Schedule*

Pre-construction phase dolphin monitoring was conducted during daylight hours for six days between 27th October and 1st November 2005. As part of the original transect lines stated in the EM&A Manual were located within the 'Airport Restricted Zone', the survey was conducted along the boundary adjacent to the Airport Restricted Zone.

3.3.2 *Data Collected*

The locations of all marine mammals – dolphin and porpoise sighted during the surveys were recorded on a data sheet (*Annex A*). The species and number of marine mammals, number of sightings and age classes (where possible) were recorded, together with observed behaviours at the times of sightings. The data sheet also included dolphin and boat associations (if any) during the sightings.

Distinguishing Features

Only the Indo-Pacific Humpback Dolphin, which is distinguished by its wide-based, slightly falcate dorsal fin, located at mid-back, was observed during the surveys. Humpback dolphins have a long, slender rostrum, with a shallow groove between the melon and the beak. Adults are white to pink in colour, and often have a variable degree of black spotting or mottling.

Age Classes

Age class of humpback dolphins was identified in accordance with the six age classes ⁽¹⁾. The classification of their age class was mainly based on their body size and length, skin colouring pattern, and density of spotting. Their skin colour pattern changes dramatically throughout their lifespan, whitening increases as age increases. The spot patterns on juveniles and sub-adults disappear gradually as they get older, as presented in *Table 3.1*.

Table 3.1 *Age Classes of Sousa chinensis*

Age Class	Body Length (m)	Colour Pattern	Spotted Pattern	Behaviour
Unspotted Calf (UC)	1 m to 1.3 m (approximately half length of adults); up to 6-8 months of age	Uniform black to dark gray	No spots	Swim dependently of adult, presumably the mother
Unspotted Juvenile (UJ)	Approximately 1.5 m to 2 m (two-third of the adult length)	Uniform light gray	No spots	Occur in the vicinity of adults
Mottled (SJ)	Approximately similar length as SAs and UAs	Light pinkish grey	Heaving spotting	Same as SAs and UAs
Speckled (SS)	With same size as SAs and UAs	Pale pink to white	Less spotting pattern than SJ	Full independence of movement and association; hard to distinguish from SA
Spotted Adult (SA)	Same as SS	Purely pink to white	Less spotting pattern than SJ	Same as SSs
Unspotted Adult (UA)	Up to 2.6 m	Purely pink to white	Essentially no spotting pattern but may have a few tiny spotting	Same as SAs and SSs

Behaviour

Marine mammals exhibit certain behaviour and for the humpback dolphins this has been previously characterised based on ongoing studies. These are presented in *Table 3.2*.

⁽¹⁾ Jefferson TA (2000) Op cit.

Table 3.2 *A Summary and Description of Specific Types of Behaviour and Activities exhibited by Indo-Pacific Humpback Dolphin *Sousa chinensis**

Type of Social Behaviours and Activities	Descriptions
Activities	
Travelling	Directional motion, swimming fast, taking regular breaths on water surface.
Feeding	Long jumping and high-speed chasing while hunting fish; On sea surface, swimming slowly rising intermittently before commencing the next dive. They may display certain behaviours such as feeding rushes, fish whacking, carousels, and fluking dives.
Milling/Resting	Remaining in one area without any sign of feeding or social interaction; move slowly with a drifting or gliding motion, rising slowly, or breathing while circling over the same area.
Socializing	Extensive bodily contact, inverted swimming, somersaulting, leaping and chasing with aerial activity; group activities centred on animate or inanimate objects; two to three individuals form a group.
Breaching	A behavioural pattern also known as body slamming or a 'log' jump. The animal rises out of the water at an angle between 90° to 45° to the sea surface. When exiting the water the dolphin's flippers, its abdomen or peduncle may clear the surface.
Spyhopping	Raising the head vertically out of the water, then sinking below the water without a splash. Used to check an area for hazards.
Porpoising	Fast, shallow, arching leaps with the dolphin coming either partially or entirely out of the water. It was only observed when the dolphins were boat chasing and allows the animals to combine shallow dives for fish with a fast rate of travel. The adults will show noticeable colour changes, turning from white to a deep pink. This is probably due to vascular dilation in the blubber layer and is, possibly, a flush response to prevent overheating.

3.3.3 *Survey Results*

There were 38 sighting records of humpback dolphins (a total of 109 individuals), and no sighting records of finless porpoise reported during the surveys. Daily records of marine mammal sightings are presented in *Table 3.3*. The locations of sightings were plotted and presented in *Figure 3.4*.

Table 3.3 *Results of Dolphin Baseline Survey between 27 October and 1 November 2005*

Date	Number of Sightings	Total Number of Individuals
27 October 2005	5	16
28 October 2005	11	36
29 October 2005	3	4
30 October 2005	7	17
31 October 2005	9	25
1 November 2005	3	11

Humpback dolphins were recorded in all survey days and at different areas of the transect lines, including off shore of Black Point, Sha Chau and Lung Kwu Chau Marine Park and near the Airport platform. The majority of dolphin sightings were recorded towards the north of Lung Kwu Chau.

Effort sightings and number of individuals of marine mammals are presented in Figures 3.2 and 3.3, respectively.

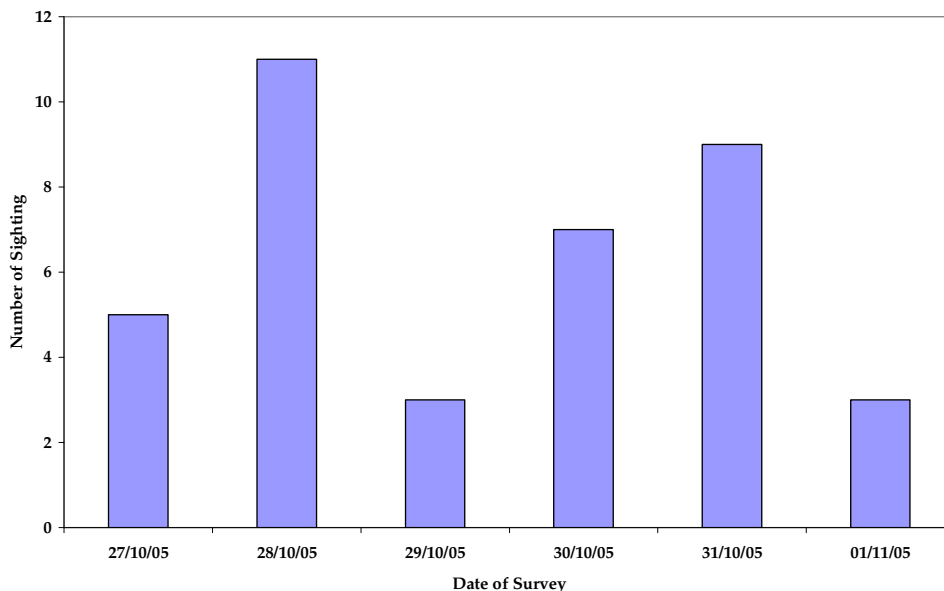


Figure 3.2 *Number of Sightings of Indo-Pacific Humpback Dolphin Sousa chinensis within the Survey Area (Data collected from 27th October to 1st November 2005)*

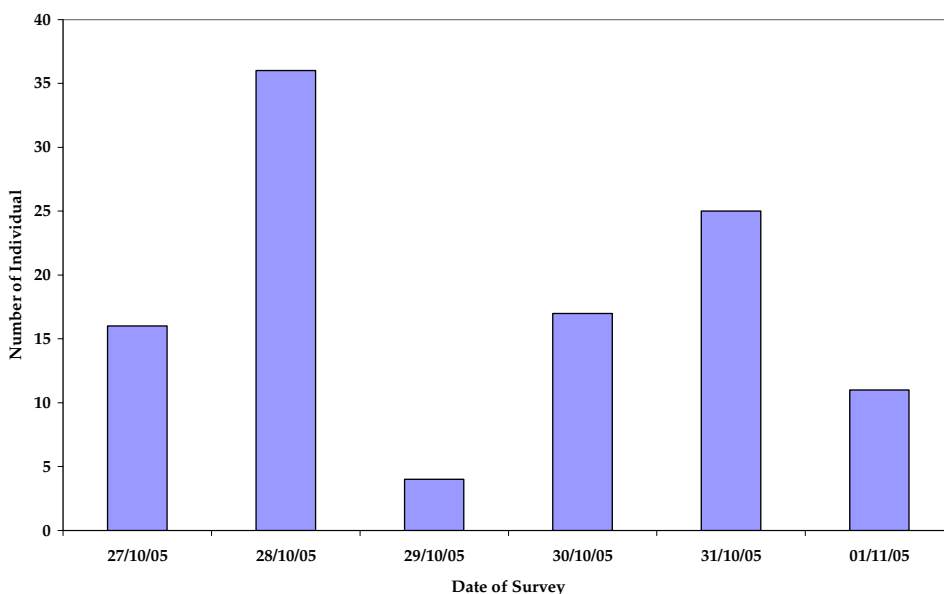


Figure 3.3 *Number of Individuals of Indo-Pacific Humpback Dolphin Sousa chinensis within the Survey Area (Data collected from 27th October to 1st November 2005)*

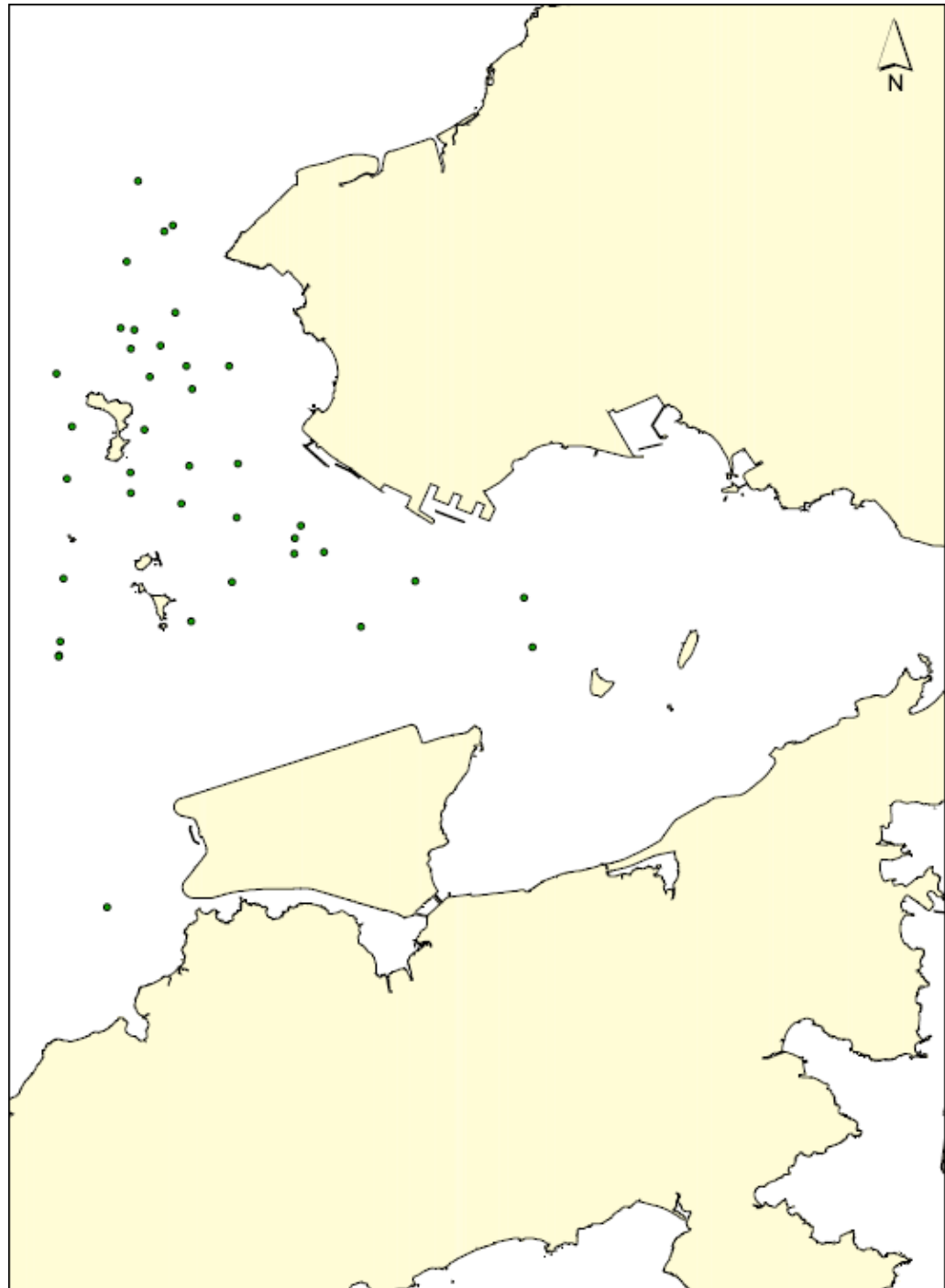


Figure 3.4 *Locations of Sightings of Indo-Pacific Humpback Dolphin *Sousa chinensis* within the Survey Area (Data collected from 27th October to 1st November 2005)*

The number of sightings per survey day varied from a minimum of 3 to a maximum of 11 over the entire survey period. The number of individuals ranged from 1 individual to a group size of 8 individuals, however, the majority (over 55%) were in group sizes of 1 to 2 individuals.

Marine Mammal Age Class

Dolphins of all age classes were observed during the survey. For those which could be identified with age classes, the majority of humpback dolphins recorded were identified as Spotted Adults (SA) (27 individuals), Mottled (SJ) (22 individuals) Speckled (SS) (14 individuals), Unspotted Adults (UA) (6 individuals), Unspotted Juvenile (UJ) (3 individuals) and Unspotted Calf (UC) (6 individuals), as presented in *Table 3.4*.

Table 3.4 *Age Class of Identified Sousa chinensis Individuals*

Date	Unspotted Calf (UC)	Unspotted Juvenile (UJ)	Mottled (SJ)	Speckled (SS)	Spotted Adult (SA)	Unspotted Adult (UA)
27 Oct 2005	0	1	3	1	4	1
28 Oct 2005	1	0	13	3	6	4
29 Oct 2005	0	0	0	1	1	0
30 Oct 2005	0	1	2	3	5	0
31 Oct 2005	4	1	3	3	6	0
1 Nov 2005	1	0	1	3	5	1

Behaviour and Activities

Breaching, Spy-hopping, Feeding, Porpoising and Socialising activities were observed from the sightings. Only 2 sightings had association with shrimp trawlers. No other boat associations were observed during the survey.

CONCLUSION

This report presents a review of available dolphin data for North Lantau and the results of the pre-construction phase dolphin monitoring for Permanent Aviation Fuel Facility.

The Indo-Pacific Humpback Dolphin (*Sousa chinensis*) was the only marine mammal observed during the survey. Sightings were observed on all survey days and were throughout the entire survey area, however, size groups tended to be small. All age classes of humpback dolphins were recorded including calves.

The information presented within this report, along with the data to be collected during the post-construction phase dolphin monitoring, will allow the assessment of the overall efficiency of the project-specific mitigation measures. It is recommended that further monitoring be conducted if the results of dolphin sighting/population from post-construction phase dolphin monitoring is significantly lower than the results from this baseline (pre-construction phase) monitoring. Monitoring should be conducted in a manner that is consistent with the pre- and post-construction phase monitoring to allow direct comparison of results.

Annex A

Dolphin/Porpoise Sighting Sheet

DOLPHIN / PORPOISE SIGHTING SHEET

HIGH PRIORITY DATA (Record at Initial Sighting)

Date _____ Time _____ Sighting No. _____
 Sighting Distance (metres) _____ Sighting Angle (°) _____
 Sighting Angle - Dolphins _____ Sighting Angle - Bow of Boat _____
 Sighting Position (initial) _____
 Sighting Position (dolphin) _____ (Trip: ____ km)

LOW PRIORITY DATA (Record During or After Sighting)

(Please Circle)
Species Humpback Dolphin _____ Finless Porpoise _____ Other _____
Effort ON OFF _____ **Seen By** _____
Group Size Best ____ High ____ Low ____
CWD Group Composition UC ____ UJ ____ SJ ____ SS ____ SA ____ UA ____
FP Group Composition Calves _____ Adults _____
Beaufort 0 1 2 3 4 5 6 7+ _____ **Boat Assoc.** None Pair Shrimp Hang Other _____
Photos NO YES _____ **Videos** NO YES _____
Survey Area _____ **Survey Type** _____

BEHAVIOUR / COMMENTS

(Please Circle)
Feeding Socializing Traveling Milling/Resting Breaching Spy-hopping Porpoising
Other Behaviour _____
Identified Individual(s) _____
Other Comments _____

CONVERTED DATA (To Be Filled by SH)

Perpendicular Distance (m) _____ Position (3 decimal places) _____

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ERM's Hong Kong Office

**21/F Lincoln House
Taikoo Place, 979 King's Road
Island East, Hong Kong
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