

5. ECOLOGY

5.1 Introduction

5.1.1 The previous EIA (April 2002) recommended various EM&A measures for ecology to be undertaken in both the design phase and during construction during piling activities for the PAFF jetty. The objectives of the design audit were to ensure that the design process clearly implements the design ecology mitigation specified in the EIA and to ensure that such designs are ecologically feasible and effective. The construction EM&A objectives were to ensure that the ecological contract works and construction mitigation procedures recommended in the EIA for the protection of the Chinese White Dolphins were carried out as specified and were effective.

5.1.2 However, some construction works have been undertaken in accordance with Environmental Permit EP-139/2002/A and before works were suspended following the Judgement of the Court of Final Appeal of July 2006. As detailed in Table 1.1, the percussive piling for the jetty was one of the activities that has been completed. As such, the following measures were undertaken in accordance with the EP during the piling works:

- ◆ dolphin acoustic monitoring;
- ◆ dolphin exclusion zone;
- ◆ pre-construction abundance monitoring;
- ◆ underwater noise monitoring;
- ◆ piling acoustic decoupling methods; and
- ◆ bubble jacket trial, design and use.

5.1.3 Therefore, the remaining ecological EM&A required comprises post construction abundance monitoring in order to ensure that any shifts in dolphin distribution due to piling are detected and to determine the efficacy of the recommended mitigation measures, together with and an exclusion zone around the dredging operation within the Marine Park. The overall procedures for the ecological EM&A during construction are shown in Figure 5.1.

5.2 Construction Phase EM&A

5.2.1 The Environmental Team Leader (ETL) (refer to Section 1 for a description of the ETL and duties) shall be responsible for conducting the EM&A programme and ensuring the Contractor's compliance with the project's environmental performance requirements during construction. The ETL will be required to establish the dolphin exclusion zone during dredging in the marine park and undertake the post construction monitoring underwater noise monitoring, with the assistance of suitably qualified specialists, as detailed in Section 1. Further details of the EM&A requirements are detailed below.

Dolphin Exclusion Zone: Around the Dredger

5.2.2 There does not appear to be any evidence to suggest that dredging activity has any deleterious impact to dolphins. No impacts are predicted to dolphin populations as a consequence of pipeline construction and as such no mitigation is required. Nevertheless,

an exclusion zone around the dredging operation within the Marine Park and along the entire length of the pipeline should be implemented and dredging should not commence until the area is clear of dolphins. A dolphin exclusion zone within a radius of 250m around the dredger should be implemented and the area visually inspected for dolphins prior to commencement of dredging. Although this exclusion zone is smaller than required for piling, as dredging is a considerably less intrusive activity, 250m is considered appropriate (Jefferson pers. comm.). In addition, as indicated in Section 6.4.6, the dredging plume is not expected to extend more than 100-200m from the dredger and as such a 250m exclusion zone is considered to be sufficient. The dolphin exclusion zone should be monitored by independent dolphin observers with an unobstructed, elevated view of the area. Dredging should not begin until the observer certifies that the area is continuously clear of dolphins for a period of 30 minutes (thereby taking into account the approximate maximum dive time of the dolphins of 4 minutes). Following the 30 minute scan and when the area is found to be clear of dolphins, dredging may commence. Should dolphins move into the area during dredging, cessation of dredging is not required.

- 5.2.3 In addition, as such a measure relies on the visual detection of dolphins, it is not suitable during evening and nighttime. Based upon this, no dredging is recommended after sunset or before sunrise.

Avoidance of Calving Season

- 5.2.4 According to recent dolphin data (AFCD, 2005) the dolphin calving season is from March to August and about 76% of calves are born in this period. Thus, in order to minimise disturbance to mother and calves, it is recommended that the dredging along the entire pipeline will avoid this main calving season.

Dolphin Monitoring

- 5.2.5 It should be noted that as some construction activities commenced in November 2005, before the Judgement of the Court of Final Appeal of July 2006, the pre-construction abundance monitoring was undertaken in late 2005 and the results are provided in Appendix F3 of the EIA report. As such, the post-construction dolphin abundance monitoring will be required to be undertaken for during a period of 28 days prior to the operation of the PAFF.
- 5.2.6 In order to ensure that any shifts in dolphin distribution due to piling are detected and to determine the efficacy of the recommended mitigation measures, post construction monitoring of dolphin abundance is required. Should dolphin sighting numbers be significantly different (taking into account naturally occurring alterations to distribution patterns such as due to seasonal change) to the pre-construction activity (following the post-construction monitoring) recommendations for a further post-construction monitoring survey will be made. Data should be then be re-assessed and the need for any further monitoring established.
- 5.2.7 A monitoring programme is required for during a period of 28 days prior to the operation of the PAFF. The period required for the post-construction monitoring is based on the monitoring conducted for the AFRF and is considered to be adequate to derive a

reasonably large amount of data thereby allowing any significant trends in dolphin distribution to be detected (Jefferson pers. comm.). Six, one-day survey events will be undertaken within the 28 consecutive day period for the post-construction monitoring events.

- 5.2.8 The monitoring should also be undertaken by a suitably qualified person (in biology) and should be independent of the construction contractor and should form part of the independent Environmental Team (ET). The IEC may audit the work of the ET if deemed necessary. Monitoring will be conducted following the methodology detailed below.

Vessel-based Observations

- 5.2.9 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 5.2. In order to provide a suitable long-term dataset for comparison, post construction phase dolphin monitoring will employ an identical methodology and follow the same line transects as those presented in Figure 5.2.
- 5.2.10 On each survey day, the survey vessel will depart from Tung Chung New Pier. Observation for incidental sighting will begin immediately on departure from the assigned pier and continue until the vessel reaches the survey area. The survey vessel shall have 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 shall travel along the survey lines at a speed of approximately 7 to 8 knots (13 to 15 km/hr). The direction of the survey shall be alternated on different days to avoid possible biases related to the timing of the survey coverage.
- 5.2.11 Vessel-based transect observations by a three-person team shall be conducted by searching the 180° swath in front of the survey vessel (270° to 90°). The area behind the vessel need not be searched, although dolphins observed in this area should be recorded as off-effort sightings. The primary observer will scan 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”, scans the same area with the naked eye and occasional binocular check. The third observer on the boat is required to rotate into the observation team after half an hour, thus relieving one of the initial team. Observers should rotate every half an hour. While on-effort, observers shall ignore potential sighting cues that could bias the sighting distance calibration (eg pair-trawl fishing vessels).
- 5.2.12 A critical consideration in the survey will be 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 shall be recorded. The collection of effort data allows comparisons within a single study as well as between studies. Strict recording of time and speed travelling along the assigned transect (“on-effort”) shall, therefore, be recorded. Time spent during any deviation from the transect will be recorded as “off-effort”.

- 5.2.13 During periods of poor weather, when visibility is hindered (eg below 1km) or when a Beaufort force 5 is reached, the survey should normally be postponed.
- 5.2.14 Sightings distant to 500m perpendicular distance and sightings of single dolphins that were hard to track should not be pursued (although those distant to 500m ahead of the vessel should be pursued). The initial sighting distance between the dolphin and the survey vessel and sighting angle shall be recorded in order to estimate the positions of the dolphins. These and other details of the sighting, including the exact location of the sighting and number of individuals should be agreed among the observation team and recorded immediately. Distances and angles shall be as accurate as possible.
- 5.2.15 A global positioning system shall be used during the surveys. A sighting record shall be 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 shall also be completed.
- 5.2.16 An action plan has also been defined (Table 5.2) to indicate that should dolphin numbers be significantly different (taking into account naturally occurring alterations to distribution patterns such as due to seasonal change) to the pre-construction activity following the 6 days post-construction monitoring, recommendations for a further 6 days monitoring with a 28 day period will be required. The action plan should be undertaken within a period of 1 month after a significant difference has been determined. For the purpose of the EM&A works, the “significance” level which will trigger the action plan shall be proposed by the ET as part of the post-construction monitoring programme design to be agreed with AFCD prior to the monitoring being undertaken.
- 5.2.17 A summary of equipment requirement is summarized in Table 5.1 below.

Table 5.1 Summary of Equipment Requirements

Equipment	Type
Vessel for Monitoring	A monitoring boat which should have a flying bridge or upper deck with a relatively unobstructed forward visibility (270° – 90°) allowing for observer eye height of 4-5m above water
Observation	Fujinon 7x50 marine binoculars (or similar) with compass/reticule
Calibration	Leica Geovid laser range finder binnacles or equivalent
Navigation and Positioning	Global Positioning System Device (Magellen NAV 5000D or similar approved) (+ spare batteries)

5.3 Mitigation Measures

- 5.3.1 As the piling of the jetty has been completed and this has the highest potential to result in impacts to the Chinese White Dolphin, mitigation measures to minimise impacts from the remaining construction activities on the Chinese White dolphin have been recommended by the EIA. No other significant ecological impacts are predicted as a result of the project, however, measures recommended to minimise impacts on water

quality will also reduce impacts on ecological resources. The ecological mitigation measures to be implemented during the construction phase are as follows:

- ◆ implementation of a 250m dolphin exclusion zone during dredging in the Marine Park and along the length of the pipeline (as indicated in EIA report, the dredging plume is not expected to extend more than 100-200m from the dredger and as such a 250m exclusion zone is considered to be sufficient);
- ◆ restricted dredging to a daily maximum of 12 hours within daylight hours except for the section crossing Urmston Road Channel. The Urmston Road section of the pipeline is indicated in Figure 5.2;
- ◆ avoid dredging during the calving season between March and August; and
- ◆ undertake 6 days post construction dolphin abundance monitoring within a 28 day period.
- ◆ Comparison of the post construction dolphin monitoring with that of over the pre-construction dolphin monitoring will allow the assessment of the overall efficacy of the project-specific mitigation measures through the implementation of an Action Plan detailed in the Table 5.2 below. Statistical procedures shall be used for data comparison. A range of applicable statistical procedures exist (e.g., *t*-test, ANOVA and ANCOVA, etc.) and the ET shall propose the procedure to be applied as part of the post-construction phase dolphin monitoring programme design to be agreed with AFCD prior to the monitoring being undertaken.



Table 5.2 Event / Action Plan for Post Construction Dolphin Abundance Monitoring

EVENT	ACTION			
	ETL	IEC	FSR	Contractor
Dolphin numbers recorded in the post-construction monitoring are significantly lower than those recorded in the pre-construction monitoring	1. Repeat statistical data analysis to confirm findings; 2. Review historical data to ensure differences are as a result of natural variation or previously observed seasonal differences; 3. Identify source(s) of impact; 4. Inform the IEC, FSR and Contractor; 5. Check monitoring data,; 6. Discuss additional dolphin monitoring and any other measures, with the IEC and Contractor.	1. Discuss monitoring with the ET and the Contractor; 2. Review proposals for repeat monitoring and any other measures submitted by the Contractor and advise the FSR accordingly.	1. Discuss the repeat monitoring and any other measures proposed by the ET with the IEC; 2. Make agreement on the measures to be implemented.	1. Inform the FSR and confirm notification of the non-compliance in writing; 2. Discuss with the ET and the IEC and propose measures to the IEC and the FSR; 3. Implement the agreed measures.

Note: ETL – Environmental Team Leader, IEC – Independent Checker (Environmental), FSR – Franchisee’s Site Representative

Action to be instigated within 1 month of an event.