

6. ECOLOGY AND FISHERIES

6.1 Introduction

The contractors are responsible for the implementation of any mitigation measures to minimise ecological impacts from site activities. The implementation of ecological mitigation measures shall be checked as part of the environmental monitoring and audit procedures during construction.

6.2 Terrestrial Ecology

The following mitigation measures in relation to protecting the important plant species, and good construction practice to minimise disturbance to the surrounding environment, are recommended:

- Adjust the construction area to avoid/minimize encroaching into the *fung-shui* woodland FSW4 and FSW1, as well as where the locally rare/protected plant species are present. A Tree Survey, particularly of the affected *fung-shui* woodlands, is recommended to investigate the amount of important trees affected, and to provide information for any compensation planting. If avoidance of important plant species is not possible due to engineering constraints, transplanting to similar habitats in the immediate vicinity should be undertaken.
- On-site planting should be provided for a total loss of approximately 1ha of high to moderate importance *fung-shui* woodlands, as well as the moderate important secondary woodlands. Discussions with the engineering and landscaping teams have indicated that areas totalling approximately 10ha within the project limit can be used for native woodland planting. These consist of area such as work sites, underneath high viaducts at So Kwun Wat and Siu Lam, portal area. Species used for planting should take reference from the species identified in the Tree Survey and native to the Hong Kong or South China region which bear fruits preferred by birds and/or which are larval or adult butterfly food plants. Subject to geotechnical acceptability, there will also be large areas of cut slopes or embankment areas for tree, shrub or grass planting.
- Erect fences along the boundary of construction sites before the commencement of works to prevent tipping, vehicle movements, and encroachment of personnel into adjacent areas, particularly near the *fung-shui* woodlands and where rare/protected plant species are located.
- Any damage that may occur to individual major trees in the adjacent area should be treated with surgery.
- Temporary work sites/disturbed areas should be reinstated immediately after completion of construction by on-site tree/shrub planting. Tree/shrub species used should take reference from those in the surrounding area.
- Stream sedimentation during construction should be prevented by erection of sediment barriers and operation of stilling ponds in any streams which potentially could be affected.

- Select the exact location of haul routes, storage and works areas etc. to minimize as far as possible disturbance on/avoid secondary woodland, *fung-shui* woodland and stream habitats.
- Regularly check work site boundaries to ensure that construction activities do not exceed them and that no damage occurs to surrounding areas.
- Prohibit and prevent open fires within the site boundaries during construction and provide temporary fire fighting equipment in the works areas.

6.3 Marine Ecology

It is recommended that monitoring the effectiveness of the mitigation measures to protect Chinese White Dolphin *Sousa chinensis* from direct impacts of underwater blasting¹ shall be carried out as part of the EM&A programme. To implement these mitigation measures properly, the following tasks shall be undertaken by the contractors:

- charges shall be placed in cores within the rock in order that there will be no blast directly into the water, with consequent reduction in shock wave pressures.
- the installation of an air-bubble curtain created by production of bubbles from a perforated compressed air hose placed on the seabed in the vicinity of the blasting area could mitigate the shock waves² and noise³ generated from blasts. It has been reported that such an air curtain can reduce shock pressures approximately ten times⁴. It is therefore likely that the impacts due to underwater blasting will be mitigated to acceptable levels.
- The surveillance procedures shall be as follows:
 - (a) three observers (two on land and one on a small patrolling vessel) shall start observations being made of the entire area up to and around the 500m zone, distances shall be checked with radar or by range finding devices.
 - (b) if marine mammals are sighted, blasting must be postponed until they have moved outside the 500 m zone;
 - (c) after sighting marine mammals, the vessel shall follow no closer than 100 m of them (between the blast site and animals) and blasting shall be postponed until after the marine mammals have cleared the 500 m zone. The discovery of marine mammals shall not preclude a diligent search for other marine

¹ Information on the type and amount of explosives will be provided during the detailed design stage. The preliminary setting is that the maximum charge per day will be 1kg for the east foundation and 5kg for the west foundation.

² Graves M (1968). air-bubble Curtain in Sub-aqueous Blasting at Muddy Run. Civil Engineering - ASCE, July 1968, pp59-61.

³ Wursig B, C R Greene Jr, T A Jefferson (1999). Development of An air Bubble Curtain to Reduce Underwater Noise of Percussive Piling. Environmental Research 48: 1-15.

⁴ Graves M (1968) *op cit*

mammals in the 500 m zone and, if found, such animals shall be treated similarly;

- (d) after the blast and after "all-clear" signal, the observer boat shall spend 10 minutes patrolling the 500 m zone to confirm no injured marine mammals are present.
- (e) any changes to these procedures must be agreed by the Agriculture and Fisheries Department.

The ET Leader is responsible for ensuring that the dolphin mitigation measures are complied with. Other mitigation measures that shall be in place to minimise impacts to marine mammals include the following:

- (a) all vessel operators who will be working on the Project shall be given a briefing, alerting them to the possible presence of marine mammals and the rules of safe vessel operation around marine mammals;
- (b) a policy of no dumping of rubbish, food, oil or chemicals by any of the contractors should be strictly enforced, this should also be covered in the contractor briefing;
- (c) every attempt should be made to minimise the effects of the construction and operation of the Project on water quality of the area;
- (d) the marine stages of the reclamation works for the Toll Plaza and the blasting works for the Tsing Lung Bridge North Tower should be aimed to take place in the spring and summer seasons when dolphin density in the area is low.

6.4 Fisheries Impact

The monitoring and audit activities designed to detect and mitigate any unacceptable impacts to water quality and marine ecology will also serve to protect against unacceptable impacts to fisheries resources.

As impacts resulting from the Project are predicted to be confined to within the dredging or reclamation areas, adverse impacts to fisheries resources are not expected.