

8.	FISHERIES IMPACT	8-1
	Introduction	8-1
	Environmental Legislation, Standards and Guidelines	8-1
	Assessment Methodology	8-2
	Description of the Environment	8-2
	Fisheries Importance	8-3
	Mitigation of Adverse Environmental Impacts	8-4
	Evaluation of Residual Impacts	8-5
	Environmental Monitoring and Audit	8-5
	Conclusions	8-5
	References	8-5

8. FISHERIES IMPACT

Introduction

8.1 This section of the *EIA Report* presents the findings of the assessment of potential impacts on fisheries arising from the proposed Project. The assessment is based on a desk-top review of the latest relevant literature and with reference to the findings of the *NLDFS EIA Report*. It includes a description of baseline conditions, evaluation of potential impacts and recommends mitigation measures, where appropriate. The objectives of the fisheries impact assessment are as follows:

- ♣ to establish the importance of the fisheries habitats which may be affected by construction and operation of the Project
- ♣ to identify fisheries sensitive receivers;
- ♣ to assess the scale of possible impacts on fisheries resources from the proposed works;
- ♣ to identify any necessary mitigation measures and evaluate residual impacts; and
- ♣ to assess the need for a fisheries monitoring and audit programme.

Environmental Legislation, Standards and Guidelines

8.2 Evaluation of fisheries impacts in Hong Kong is conducted according to criteria set out in the *Environmental Impact Assessment Ordinance Technical Memorandum (EIAO-TM)*. These criteria provide for the complete and objective identification, prediction and evaluation of potential fisheries impacts. In this regard, *Annex 9* of the *EIAO-TM* sets out criteria for evaluating fisheries impact while *Annex 17* denotes the guidelines for fisheries impact assessment.

8.3 Other legislation which applies to fisheries and is relevant to fisheries assessment includes the:

- ♣ *Fisheries Protection Ordinance* (Cap. 171) – It promotes the conservation of fish and other forms of aquatic life within the waters of Hong Kong and regulates fishing practices to prevent activities detrimental to the fishing industry;
- ♣ *Marine Fish Culture Ordinance* (Cap. 353) – It designates, regulates and protects fish culture zones (FCZs) from injury to fish and pollution of waters
- ♣ *Water Pollution Ordinance* (Cap. 358) – It sets limits to water quality parameters in various Water Control Zones.

Assessment Methodology

- 8.4 Baseline information on fisheries in the Assessment Area, which includes waters 500m from the proposed works boundary, were elucidated via a desk-top review of the literature. This review included relevant fisheries baseline data presented in the *NLDFS-EIA Report* and incorporated the most recent information available in other reports and publications. Potential impacts on the fish culture zone at Ma Wan are also discussed. The impact assessment followed the criteria and guidelines for evaluating and assessing fisheries impacts as stated in *Annexes 9 and 17* of the *EIAO TM* respectively.

Description of the Environment

- 8.5 In Hong Kong, marine-based commercial fishing operations are classified as capture or culture fisheries. According to the latest AFCD estimates (AFCD 2005) for 2004, capture fisheries yielded about 167,500 tonnes of fisheries produce, which was valued at HK\$1,600 million. About 90 percent of this catch was caught in waters outside Hong Kong.
- 8.6 Culture fisheries activities, on the other hand, occur at 26 fish culture zones (FCZs) located in various sheltered embayments across the HKSAR and occupy about 209ha of sea area. In 2004, there were approximately 1125 licensed operators at these fish culture zones and they produced about 1,540 tonnes of fish catering for about 9.1% of local demand for live marine fish (AFCD 2005). The only fish culture zone identified in the Assessment Area is at Ma Wan and is the only fisheries sensitive receiver for this Project.
- 8.7 Because of recent and on-going construction and reclamation works at North Lantau (e.g. current Sunny Bay reclamation), it is likely that the fisheries habitat in the area has been disturbed.
- 8.8 In terms of water quality, the Assessment Area falls within North Western Water Control Zone. The Environmental Protection Department (EPD) conducts regular marine water quality monitoring in the area and the most relevant monitoring station in the Assessment Area is NM1. A summary of the latest published monitoring data at station NM1 was presented in Table 5.2. This indicated that WQOs for dissolved oxygen (bottom), unionised ammonia and total inorganic nitrogen were met in 2003.

Capture Fisheries

- 8.9 According to the most recently published data (AFCD 2005), annual catches of adult fish within Sunny Bay Assessment Area are typically in the range 100-200kg/ha. In comparison with other fishing grounds across Hong Kong, the fishing grounds of the Assessment Area are therefore considered to support low-moderate adult fish production.
- 8.10 Fry production in the Assessment Area, used as grow-out stock by mariculturists, is very limited. Latest figures indicate that the fry caught in the east of the Assessment Area were at a low density of >0 – 50 tails/ha (AFCD 2005), and no fry production was recorded from the west of Assessment Area.
- 8.11 The scale of fishing operations in terms of number of fishing vessels operating in the Assessment Area is considered moderate-high (100-400 vessels) and high (400-700 vessels) in the west and east of the Assessment Area respectively. Fishing vessels are overwhelmingly dominated by P4 sampans but also include small numbers of stern trawlers, shrimp trawlers, hang trawlers, gill-netters, long liners, purse seiners and miscellaneous craft. In terms of vessel size, the majority of fishing vessels (100-400 vessels) operating in the Assessment Area were less than 15m in length.
- 8.12 In the Assessment Area, production levels are generally low compared to other local fishing grounds with the exception of moderate-high catches (20-40kg/ha) of crab in the western waters of the Assessment Area. Among the other most common components of the catch by Hong Kong fisheries, the Assessment Area has low-moderate production of rabbitfish (10-20kg/ha), Croaker (10-20kg/ha),

and seabream (10-20kg/ha); and low (5-10kg/ha) to very low (<5kg/ha) production of sardine, scad, squid, shrimp, anchovy, and threadfin bream.

- 8.13 Based on annual adult fish and fry production figures, the dollar value of catches was regarded as moderate-high (HK\$5,000 – 10,000/ha/yr) at the Assessment Area when compared to other fishing grounds in Hong Kong.

Culture Fisheries

- 8.14 As of 30th April 2005, the Ma Wan fish culture zone comprised 110 licensed rafts with a total licensed area of 14,554 m² (AFCD, pers. Comm.).

- 8.15 Although no figures are available on the individual production of the Ma Wan FCZ, it is known that Hong Kong production in 2004 totaled 1,540 tonnes. The fish species cultured at the Ma Wan FCZ are of high commercial value and were mainly the spotted grouper (*Epinephelus chlorostigma*), gold-lined seabream (*Rhabdosargus sarba*), mangrove snapper (*Lutjanus argentimaculatus*) and the pompano (*Trachinotus blochii*).

Fisheries Importance

- 8.16 Based on the information presented above, the fisheries within the Assessment Area are considered to be of moderate-high value and of moderate importance to the Hong Kong fishery.
- 8.17 Capture fisheries in the Assessment Area are characterised by moderate-high production of crabs and very low to low-moderate production of other fishes. The Assessment Area also does not appear to be an important spawning or nursery area for commercially important species.

Environmental Impact Identification, Prediction and Evaluation

Construction Phase

- 8.18 Potential impacts on fisheries resources arising from Project would include direct loss of fisheries habitat and fishing area due to reclamation. Impacts may also arise indirectly through deterioration in water quality, particularly due the release of sediment into the water column during dredging.

Loss of fishing area

- 8.19 The reclamation is relatively small in scale and would result in the permanent loss of only approximately 3ha of sea area. The loss of this small area is anticipated to have a very low effect on fisheries production of Hong Kong as a whole: direct fisheries impacts resulting from the Project are considered low in scale.

Effects of suspended sediments

- 8.20 Temporary elevation in suspended sediment (SS) during dredging is identified as the impact on water quality for primary consideration because at high levels may cause injury to fisheries resources. For instance, high SS levels may clog gill structures and hinder transfer of oxygen. Eggs and early life stages (fry) are more susceptible to smothering of respiratory surfaces due to high sediment levels.
- 8.21 In general, fishes that inhabit the typically turbid estuarine environment such as those found at Sunny Bay would be expected to have a good degree of tolerance to sediment in the water (cf. Chan *et al.* 2002). Suspended sediment fluxes occur naturally in the marine environment, particularly in estuarine environments and consequently fish have evolved behavioural adaptations to tolerate increased SS loads, including clearing their gills by flushing more water over them. Where SS levels become excessive, fish may move to less turbid waters. Susceptibility also generally decreases with age, with eggs the most vulnerable and the adults the least sensitive to effects from

sediments. Other factors such as the rate duration of SS elevation will interact with life stage sensitivity to influence the type and extent of impact on fish.

- 8.22 Based on water quality prediction taking into account the recommended deployment of a double-layer silt curtain mitigation, the suspension of sediment into the water column by dredging is not expected to have a significant impact on fisheries resources. According to predictions on SS elevations presented in Table 5.4 and discussed in Sections 5.44 and 5.45, the mixing zone of SS would not extend more than 210m from the dredging area outside which WQO would be achieved.
- 8.23 Ma Wan FCZ is located approximately 3.9km away from the proposed Project. It is predicted that elevations in SS at this, the only fisheries sensitive receiver, would be negligible and would not result in adverse impacts on cultured fish.
- 8.24 In summary, there would be no unacceptable adverse indirect impacts on fisheries resources or fisheries sensitive receivers due to release of sediments during the construction phase of the Project.

Decrease in dissolved oxygen (DO) concentrations

- 8.25 The relationship between SS and DO are complex, with increased SS in the water column combining with a number of other effects to reduce DO concentrations in the water column. Elevated SS (and hence turbidity) reduces light penetration, lowers the rate of photosynthesis by phytoplankton (primary productivity) and thus lowers the rate of oxygen production in the water column. Elevated SS can also cause increased energy retention from sunlight, resulting in higher temperatures, and hence the potential for lower oxygen levels as oxygen is more soluble in cold water. Low dissolved oxygen has a particularly adverse effect on the eggs and larvae of fish, as at these stages of development high levels of oxygen in the water are required for growth due to high metabolic rates.
- 8.26 As discussed in the water quality assessment (see Section 5), there are not expected to be significant reductions in DO levels which could impact fisheries resources

Operation Phase

- 8.27 No impacts on fisheries resources are anticipated during the operation phase of the Project.

Cumulative Assessment

- 8.28 No concurrent project in the Assessment Area was identified that would give rise to cumulative impacts on fisheries (refer to Sections 5.35 and 5.46). Hence, no impacts to fisheries beyond those identified and evaluated in the assessment for this Project, are expected.

Mitigation of Adverse Environmental Impacts

- 8.29 According to the *EIAO TM*, the order of priority for mitigating impacts should be avoidance, minimisation and compensation.
- 8.30 Dredging and reclamation incorporate constraints which serve as appropriate mitigation to control environmental impacts to within acceptable levels. Since no unacceptable adverse impacts on fisheries are predicted, no need for fisheries-specific mitigation measures was identified. The mitigation measures recommended in Sections 5 and 7 of this *EIA Report*, particularly those for controlling water quality would serve to protect fisheries from indirect impacts and ensure no unacceptable impact on fisheries resources and operations.

Evaluation of Residual Impacts

- 8.31 Based on the above assessment, the residual impact of the project would be limited to the loss of 3 ha of fishing ground in the Sunny Bay fishing area. This loss is not anticipated to impact production by the Hong Kong fishery as a whole.

Environmental Monitoring and Audit (EM&A)

- 8.32 Actual impacts from dredging operations during construction phase would be monitored through an EM&A programme (see the separate EM&A Manual). Monitoring and audit activities for detecting and mitigating any unacceptable impact on water quality would also serve to protect fisheries resources. Environmental monitoring and audit to assess the effects of the Project on commercial fisheries resources is not deemed necessary.

Conclusions

- 8.33 With reference to the findings of the *NLDFS EIA Report*, a literature review has been conducted to incorporate the latest relevant information for determining impacts on fisheries arising from the Project.
- 8.34 Fisheries production in the Sunny Bay area is generally low when compared to other fishing grounds in Hong Kong, although the value of the Sunny Bay fisheries were ranked as moderate-high. No important spawning or nursery area was identified in the vicinity of the proposed works. Overall, fisheries in the Sunny Bay area were considered of moderate importance.
- 8.35 The proposed reclamation would result in the direct loss of a small portion (3 ha) of potential fishing area. The loss of this area is anticipated to have a very low effect on fisheries production of Hong Kong as a whole.
- 8.36 Indirect impacts through impact to water quality due to dredging were assessed. Sediment levels in the water would not be elevated to levels that would impact fisheries of the Sunny Bay fisheries area or impact cultured fish at the Ma Wan fish culture zone.
- 8.37 Provided that mitigation measures to protect water quality (Section 5) are fully implemented, specific mitigation measures to protect fisheries resources are not necessary. In a similar way, monitoring and audit activities for detecting and mitigating any unacceptable impact on water quality would also serve to protect fisheries resources, and so an EM&A programme for fisheries is not recommended.

References

Agriculture, Fisheries and Conservation Department (2005). Fisheries, at: http://www.afcd.gov.hk/fisheries/fish_e.htm

Chan D.K.O., Wong, M.H. and Wang, W.X. (2002) Review of Investigations of Fish-kills at Ma Wan and Cheung Sha Wan Fish Culture Zones. Report by the Independent Review Panel submitted to the Civil Engineering Department.