8 FISHERIES

8.1 Introduction

8.1.1 This section presents the approach to and the findings of the fisheries impact assessment. The aim of the assessment is to examine all fisheries resources within the assessment area to ensure their protection.

8.1.2 For the purpose of this assessment the 'assessment area' is the same as that for the marine ecology assessment, i.e., a 1 km radius around the Project site.

8.2 Assessment Approach

8.2.1 The fisheries assessment has been undertaken in accordance with the criteria and guidelines in Annexes 9 and 17 respectively of the EIA-TM, and with reference to the requirements of Clause 3.4.4 of the EIA Study Brief as follows:

(i) Description of the physical environmental background;

(ii) Description and quantification as far as possible existing capture fisheries activities;

(iii) Description and quantification as far as possible the existing fisheries resources;

(iv) Identification of parameters and areas that will be affected;

(v) Identification and quantification as far as possible any direct/ indirect and onsite/ offsite impacts of fisheries;

(vi) Evaluation of impacts and make proposals for any environmental mitigation measures as per Clause 3.4.4.3(vi) of the EIA Study Brief; and

(vii) Review the need for monitoring and, if necessary, propose a monitoring and auditing programme.

8.3 Applicable Regulations, Standards and Guidelines

8.3.1 In addition to the requirements of the EIAO (Cap. 499), the *Fisheries Protection Ordinance and Regulations (Cap. 171)* are applicable. This Ordinance exists "to promote the conservation of fish and other forms of aquatic life within the waters of Hong Kong and … to prevent activities detrimental to the fishing industry".

8.3.2 The *Marine Fish Culture Ordinance (Cap. 353)* is generally not applicable to this Project as there are no fish culture zones within 1 km of the site (the nearest zones are Ma Wan and Cheung Sha Wan – both ~7km away).

8.3.3 A maximum suspended solids concentration of 50 mg/l has been used as a guideline for fisheries impact assessment. The guideline was derived by CityU (2001) using local chronic toxicity data.

8.4 Assessment Methodology

8.4.1 The assessment methodology for fisheries comprised two parts: literature review, and interview / site observations.

8.4.2 The literature review relied upon the AFCD Port Survey 2001/02 (AFCD, 2003) and the AFCD Port Survey 1996/97 (AFCD, 1998). These surveys characterise the fisheries resources and fisheries value in Peng Chau waters.

8.4.3 The field survey element involved informal interviews with fishermen on the Tai Lei bridge – a popular fishing location – conducted on 30th April 2003. The fishermen interviewed could be considered as 'recreational', although the fish catch was for personal consumption. The interviews were supplemented with direct and indirect observations of fishing activity around the coastline of Tai Lei and north Peng Chau during April and May 2003.

8.4.4 Incidental observations of fish were made during the ecological dive survey conducted at high water on 27th April 2003 [*Section 7* also refers].

8.5 Fisheries Baseline

Literature Review

8.5.1 The Port Survey 2001/02 (AFCD, 2003) provides a range of fisheries data, including the following that has been used to generate some of the tables that follow:

- Distribution of fishing operations (number of vessels)
  - Overall
  - By vessel type
- Major species of fish catch (adult fish & fish fry)
- Distribution of fisheries production (adult fish) in terms of kg / hectare
  - Overall
  - By vessel type
  - By Top 10 families
- Distribution of fisheries production (fish fry) in terms of tails / hectare
- Distribution of fisheries production in terms of dollar value (adult fish & fish fry)

8.5.2 Accordingly, catch data for the top ten HKSAR families in waters (i) the north of Peng Chau, and (ii) to the east, south and west of Peng Chau, provide an indication of fish / crustacean family abundance. *Figure 8.1* displays the delineation of these two areas.

8.5.3 To represent the worst-case scenario for impact assessment, the peak adult fish productivity data (kg/ha) for each of the top 10 families for the two Peng Chau fishing areas has been ranked against the top 10 major species of fish catch for the entire HKSAR.* This comparison is presented in *Table 8.1*.

* This assumes the ranking of "Major species of fish catch (adult fish & fish fry)" has been generated from overall productivity data, and that the contribution to the overall ranking by fish fry is not significant (i.e., the combined adult and fry productivity is broadly indicative of adult fish only, since the weight (kg/ha) contribution of fish fry can be reasonable expected to be small).

Table 8.1 Top Ten Ranked Adult Fish / Crustacean Families *(from AFCD, 2003)*

Family	Rank	
	HKSAR	Peng Chau
Rabbitfish (SIGANIDAE)	1	=1
Sardines / Shad (CLUPEIDAE)	2	=6
Croakers (SCIAENIDAE)	3	3
Scad (CARANGIDAE)	4	=6
Squid	5	9
Shrimp	6	=4
Anchovy (ENGRAULIDAE)	7	10
Crab	8	=1
Seabreams / Breams (SPARIDAE)	9	=4
Threadfin bream (NEMIPTERIDAE)	10	8

Note: The top ranking category, "Mixed Species", has been excluded from Table 8.1, *as it comprises* juvenile *fishes only.*

8.5.4 Of note from the above *Table 8.1* the top ranked Family in both HKSAR and Peng Chau waters is the Siganidae. Other locally important taxa are crabs (mixed species), croakers Sciaenidae, seabream Sparidae, and shrimp (mixed species).

8.5.5 It is noted that the top ten families at Peng Chau presented in *Table 8.1* are relative to the overall ranking for all HKSAR waters, and so it is possible that other families not included in the HKSAR top ten are locally important around Peng Chau. No specific data for the Peng Chau area were presented in the Port Survey 2001/02, although area-specific data does exist from the Port Survey 1996/97. Accordingly, the top adult species caught (by weight) specifically in the Peng Chau fishing zone based on AFCD (1998) data are presented in *Table 8.2*.

Table 8.2 Top Adult Fish / Crustacean Species by Weight from Peng Chau *(AFCD, 1998)*

Species	Common Name	Family
Acetes spp.	Silver Shrimp	N/A
Siganus oramin	Rabbitfish	SIGANIDAE
Charybrids cruciata	Red Crab	N/A
Johnius belengeri	Croaker	SCIAENIDAE
Pseudosciaena crocea	Yellow Croaker	SCIAENIDAE
Ilisha elongata	White Herring	PRISTIGASTERIDAE *
Apogon spp.	Cardinal Fish	APOGONIDAE *
Eleutheronema tetradactylum	Threadfin	POLYNEMIDAE *
Clupanodon punctatus	Gizzard Shad	CLUPEIDAE

Notes: The top ranking category, "Mixed Species", has been excluded from Table 8.2, *as it comprises* juvenile *fishes.*
** Family not in top ten as shown in* Table 8.1.

8.5.6 Of the above species, three belong to families not listed in *Table 8.1*: *Ilisha elongata* (Pristigasteridae), *Apogon spp*. (Apogonidae) and *Eleutheronema tetradactylum* (Polynemidae). Thus, these species / families are of some fisheries importance at Peng Chau.

8.5.7 The Port Survey 2001/02 also provides data on fisheries production (fish fry) in terms of tails / hectare. Fry production in the waters around Peng Chau was in the lowest of six assessment categories: 0 – 50 tails / hectare. The scenario was the same for all southern and western HKSAR waters, with the exception of fishing areas to the east of Peng Chau (around Kau Yi Chau) and southwest of Peng Chau (around Mui Wo / west Hei Ling Chau) where fry production was in the second lowest category of 50 – 100 tails / hectare.

8.5.8 For comparison, fry production in eastern waters (i.e., Port Shelter, Tai Long Wan and Tolo Harbour) was generally in the category 100 – 500 tails / ha, while fry productivity in far northeast waters (i.e., Double Haven / Yan Chau Tong Marine Park) was between 1,000 – 3,000 tails / ha.

8.5.9 Despite the low fish fry productivity, the overall value of fisheries production (adult fish and fish fry) around Peng Chau is high, at HK$ 5,000 – 10,000 / ha. This places the waters immediately around Peng Chau is the second highest of six value categories for the HKSAR, and indicates that while the fish fry productivity is low, the adult fishery is of high value.

8.5.10 In terms of overall productivity and fisheries value (HK$ value and ranking), the results of the Port Survey 2001/02 correspond with the results of the first Port Survey 1996/97, as summarised in *Table 8.3* below.

Table 8.3 Production of Peng Chau Fisheries Areas *(AFCD, 1998)*

Name (Code)	Area (ha)	Production (Catch / ha –1)			Rank Production / HKSAR Total		
		Adult Fish (Kg)	Fry (Tails)	Value (HK$)	Adult Fish	Fry	Value
Peng Chau (0027)	542	441	N/A	9,451	17 / 210	N/A	22 / 210

Note: Peng Chau fishing zone from AFCD (1998) covers all waters up to 1 km around Peng Chau.

8.5.11 For comparison, the overall value of fisheries production around Peng Chau based on AFCD (2003) data is the same as that at the Double Haven / Yan Chau Tong Marine Park. Other smaller outlying islands in the western HKSAR have a similar overall production value to Peng Chau (e.g., Lamma Island, Soko Islands and Shek Kwu Chau), while out of all southern and western HKSAR waters only Cheung Chau, Kau Yi Chau and the Po Toi Island have a higher valued total productivity.

8.5.12 The Port Survey 2001/02 presents data for fisheries productivity for a range of fishing methods. Based on a total of between 400 and 700 fishing vessels of all types, *Table 8.4* presents the peak production by each method from the two Peng Chau fishing areas.

Table 8.4 Production Range for Fishing Methods at Peng Chau *(AFCD, 2003)*

Fishing Operation	Peak Production (kg / ha)
Stern Trawler	0
Pair Trawler	0
Shrimp Trawler	100
Hang Trawler	200
Gill Netter	50
Long Liner	50
Hand Liner	50
Purse Seiner	200
Sampan (P4's)	100
Miscellaneous Craft	50
All Methods	***800***

8.5.13 For each of the four most productive fishing methods presented in *Table 8.4* for Peng Chau waters, the percentage contribution of each method to overall HKSAR productivity is as follows: Shrimp Trawler [20%], Hang Trawler [5%], Purse Seiner [7%] and Sampan [40%] (AFCD, 2003).

8.5.14 As regards the commercial value of individual taxa in Peng Chau waters, no such data was presented in the Port Survey 2001/02. However, an estimate can be made with reference to data on the top adult species caught (by weight) in the Peng Chau fishing zone from the Port Survey 1996/97 (AFCD, 1998).

8.5.15 *Table 8.5* below presents an estimate of commercial value for these top adult species based on averaged real commercial data (wholesale price / kg) released by the Fish Marketing Organization (FMO) for various dates in August 2003. A ranking method has been devised based on FMO prices, as follows:

- Very Low Value (up to HK$ 10 / kg).
- Low Value (HK$ 11 – 30 / kg).
- Moderate (HK$ 31 – 60 / kg).
- High (HK$ 61 – 90 / kg).
- Very High (HK$ 91+ / kg).

Table 8.5 Commercial Value of Top Adult Fish Species around Peng Chau *(AFCD, 1998; BMT, 2003).*

Species	Common Name	Commercial Value
Acetes spp.	Silver Shrimp	Moderate / High *
Siganus oramin	Rabbitfish	Very Low
Charybrids cruciata	Red Crab	*Unavailable*
Johnius belengeri	Croaker	Very Low
Pseudosciaena crocea	Yellow Croaker	Moderate
Ilisha elongata	White Herring	*Unavailable*
Apogon /Apogonichthys spp	Cardinal Fish	Very Low
Eleutheronema tetradactylum	Threadfin	Moderate
Clupanodon punctatus	Gizzard Shad	Very Low / Low *

Notes: The top ranking category, "Mixed Species", has been excluded from Table 8.4, *as it comprises* juvenile *fishes.*
** Estimated value based on various past records and professional judgement.*

Field Survey

8.5.16 The survey was undertaken through direct and indirect observations of fishing activities within and adjacent to the assessment area.

8.5.17 Within the assessment area, along the Pak Wan shoreline, evidence of fishing activity includes:

- Direct and indirect observations of shellfish harvesting on the rocky shore (and along much of the north coast of Peng Chau) as indicated by rock scars. As the number of oysters removed was significant within the study area (i.e., complete removal), it is possible that the oysters have some commercial value and may have been sold into the local market (as opposed to only personal consumption). It should be noted that no rock oysters were observed during the ecological inter-tidal survey.
- Remnants of hand-lines, fishing weights and nets along the Pak Wan shoreline. Some fishing gear would be used for fishing from the rocky shore, while others would be deployed from small boats (P4's) slightly offshore. For example, 2 - 3 P4's were observed fishing with hand-lines and nets in the assessment area in May 2003.
- Dead fish, apparently cast-aside due to small size and / or unsuitability for consumption – particularly the Hong Kong puffer-fish *Takifugu alboplumbeus*, of which several were found on the rocky promontory beside the proposed helipad footprint.

8.5.18 The Tai Lei bridge is a popular fishing area for hand-liners, with approximately ten individuals fishing off the bridge – most with 2-3 hand-lines each. From interviews and supporting observations, fishing is predominantly for self-consumption.

8.5.19 *Table 8.6* summarises the common catch species based on site interviews and observations. As with the data in Table, commercial value is generally based on averaged market prices from the FMO.

Table 8.6 Common Fish Catch species at Northwest Peng Chau *(BMT, 2003)*

Species	Common Name	Commercial Value
Diagramma pictum	Painted sweetlip	*Unavailable*
Monacanthus chinensis	Filefish	Low
Acanthopagrus latus	Yellow-finned seabream	Moderate
Pagrus major	Red seabream	Moderate *
Mylio macrocephalus	Black bream	*Unavailable*
Lateolabrax japonicus	Sea perch	Moderate
Apogon fasciatus	Broadbanded cardinalfish	Very Low

*Note: * Estimated value based on various past records and professional judgement.*

8.5.20 Of some note during the fisheries survey were observations of schools of adult *Apogon fasciatus* (broadbanded cardinalfish) in the shallows under the Tai Lei bridge, and beside the vertical seawall approximately 50m south of the bridge, indicating that this species is locally abundant in inshore waters of west / northwest Peng Chau. Based on data from the Port Survey 1996/97, *A. fasciatus* was ranked 8th in terms of common adult fish catch in the Peng Chau area.

8.5.21 A number of jellyfish were also observed off the Tai Lei bridge, although it is not known if locally they have a commercial value. From interviews it was also determined there are occasional catches of sea cucumber from the bridge.

8.5.22 Other observations of fishing activity in the broader area include five trawlers and two sampans seen fishing with nets on the western side of Peng Chau. There is a small fleet of ~ 20 sampans (P4's) moored at the south side of Tai Lei. A few of these boats were observed fishing the waters off Pak Wan using nets and hand-lines. However, fishing activity by this method in the immediate vicinity of the Project area would appear to be limited.

8.5.23 The waters further off the north coast of Peng Chau form part of the ferry route between Discovery Bay and Central. Evidence of fishing activity in these waters was limited to a small number of Hang Trawlers – typically only one vessel operating at any one time – observed throughout the period April – August 2003. The most popular area for Hang Trawlers in the general vicinity of the Project is the northern part of Tai Pak Wan (Discovery Bay) where there is no ferry traffic.

8.5.24 Only two species of fish were observed during the sub-tidal ecological survey were limited to just two species seen at very close quarters due to poor visibility: *Therapon jarbua* (tiger fish) and *Sebasticus marmoratus* (rock fish). Based on FMO (2003) data, both of these species have low commercial value.

8.6 Impact Assessment & Evaluation

8.6.1 The impact assessment shall draw upon the findings of the above literature review and field survey results, and the results of the water quality impact assessment.

8.6.2 Impact evaluated shall be conducted according to the criteria provided in Annex 9 of the EIA-TM, as follows:

- Nature of impact
- Size of affected area (permanent loss and water quality impact)
- Loss of fisheries resources / production
- Destruction of nursery and spawning grounds
- Impact on fishing activity
- Impact on aquaculture

8.6.3 Evaluation of fisheries impacts based on water quality (elevated suspended sediment levels) shall refer to guideline of 50 mg/l determined by CityU (2001).

Construction Phase

8.6.4 The Project will involve dredging over a marine area of some 0.57 hectares, and will result in the permanent loss of approximately 0.33 hectares of shallow coastal environment. As fish are highly mobile species, and as there are undisturbed coastal waters around the Project area, no significant adverse fisheries impacts are anticipated from the reclamation.

8.6.5 The potential for fisheries impacts through deteriorating water quality (i.e., the effects of increased suspended sediment and / or decreased dissolved oxygen levels from dredging activities) has been determined with use of the water quality calculations, as referred to in *Section 6*. The maximum elevation in suspended solids above baseline levels adjacent to the Project area were predicted for each of two dredging scenarios: (1) dredging at the proposed *helipad footprint*; and (2) dredging at the closest point of the proposed *EVA link* to the popular Tai Lei bridge fishing area – a distance of approximately 90 metres to the centre of the bridge.*

8.6.6 Calculations prepared for the water quality impact assessment [Section 6] predict a maximum suspended solids elevation of approximately 0.002mg/l above baseline levels in waters below Tai Lei bridge for scenario (1) – a negligible increase as regards fisheries impacts. Suspended sediment levels would be more elevated within the immediate vicinity of dredging, although as only one dredger will be used during the works, suspended sediment levels greater than the 50 mg/l guideline would be highly localised around the immediate dredging location. In this case, adult fish would be able to avoid these areas, and no adverse fisheries impacts are anticipated.

8.6.7 As the scale and duration of the dredging works for the proposed EVA link are substantially smaller than the helipad dredging works, the extent of the mixing zone under scenario (2) is correspondingly smaller – estimated to be no greater than 25m either side of the dredging point at a water depth of 2m. The main fishing area of the Tai Lei bridge is approximately 90m from the closest EVA link dredging point and is some distance from the mixing zone. However, even at the edge of the mixing zone it can be expected that sediment levels would be within the 50 mg/l guideline. As with the helipad footprint dredging, adult fish can avoid areas of elevated sediment levels around the immediate dredging location, and no adverse fisheries impacts are anticipated.

8.6.8 While there will be greater elevations of suspended solids within the scenario (2) mixing zone close to the Tai Lei bridge, these coastal waters do not support any fisheries nursery area and do not appear to be important as a spawning ground. The adult fish that dominate the fish community are sufficiently mobile to avoid any area of localised water quality deterioration (given the small scale and short

* Most fishing activity off Tai Lei bridge is from the centre or the Tai Lei side where there is a rocky shoreline that is a natural and relatively sheltered (and hence attractive) habitat for fish.

duration of dredging at this location). As such, no adverse fisheries impacts are anticipated from the Project.

8.6.9 As determined from *Sub-section 8.5*, based on the adult fish catch the waters around Peng Chau fall into the second highest of six production (HK$ value) categories for the HKSAR. Despite this, there are no aquaculture production areas in the area that would be affected by the Project. The area around the Tai Lei bridge where recreational fishing is popular can be considered as a kind of capture fishery. Despite this, no adverse fisheries impacts are anticipated at this location.

8.6.10 No fish nursery or spawning grounds have been identified in the Project area from the literature review and field surveys. The Port Survey 2001/02 concluded that fish fry production in waters around Peng Chau was low, at 0 – 50 tails / hectare. Accordingly, no destruction or disturbance of nursery or spawning grounds is anticipated from the Project.

8.6.11 While there is some fishing activity from the actual Pak Wan shoreline, as is evident from fishing debris, this is generally limited due to the narrowness, and hence inaccessibility, of the shore. Most fishing in the immediate vicinity is restricted to 'hand-lining' from the Tai Lei bridge, although the Project would not cause permanent loss of fisheries habitat (or general fishing opportunity) in this area.

8.6.12 Shore-based fishing activity at Pak Wan and from the Tai Lei bridge would appear to be recreational, rather than commercial.

8.6.13 Due to very shallow water depth, vessel-based fishing activity in the Project area at Pak Wan is limited to P4's. It would also appear that this is not a popular fishing area as it is exposed and the waters are relatively rough compared to the leeward side of the Island. For the same reason, better vessel-based fishing opportunities exist in waters to south, east and west Peng Chau, and particularly towards the productive waters around Kau Yi Chau.

8.6.14 Given the scale of the Project and the distance from any areas of aquaculture activity, there will be no impacts on aquaculture resources. Accordingly, given the limited use of waters in the Project area for fishing, and the scale of the Project and duration of marine works, no significant impacts on fishing activity are anticipated.

Operation Phase

8.6.15 Given the nature of the Project, there will be no waste / materials generated during the operational phase, and therefore no water quality impacts are anticipated that could potentially translate into impacts on the marine environment.

8.6.16 The small scale of the Project and the coastal works involved, and the absence of any other physical constraints to water flow in the Project area, mean that no hydrodynamic and / or associated water quality and hence fisheries impacts are anticipated during the operational phase of the Project.

8.6.17 It is most likely that as the Project will improve access, opportunities for shore-based fishing in the area will increase. It is also possible that upon construction of the artificial boulder seawall along the seaward edge of the EVA and helipad, a range of benthic and fish species may be attracted to the area. Such a scenario has been observed at the seawall constructed under the Yung Shue Wan Phase I Reclamation project, and whereat signs of the development of a fairly diverse fish community were observed (BMT, 2003).

Cumulative Impacts

8.6.18 The marine works for the Peng Chau STW submarine outfall shall be developed by the open trench method in August 2005 for completion around April 2006. Marine works for the Peng Chau Helipad are scheduled between February and September 2006. Although there is a period of around 2 months

concurrent works, the impact assessment has indicated no overlap in affected area. As such, no cumulative water quality-induced fisheries impacts are anticipated.

8.7 Impact Mitigation & Residual Impact Assessment

8.7.1 No adverse impacts are anticipated and no specific mitigation measures are required. However, the various good site practices that have been recommended to minimize water quality impact potential are also applicable for fisheries [*Section 6.7* refers].

8.8 Environmental Monitoring & Audit Requirements

8.8.1 There are no EM&A requirements for fisheries.

8.9 Conclusions & Recommendations

8.9.1 While the Project will lead to the permanent loss of approximately 0.33 hectares of shallow coastal environment, the permanently affected area is not of any particular fisheries value being situated in very shallow coastal waters. There is unrestricted fisheries habitat in adjacent waters contiguous with the Project area, including undeveloped / undisturbed shallow coastal water habitat east of the Project area.

8.9.2 No significant water quality-induced impacts are predicted in the popular fishing area off Tai Lei bridge given the small scale of the dredging activities for the EVA link, while there are no impacts on the waters of this popular fishing area form the larger dredging activity scheduled for the helipad footprint due to the greater distance separation.

8.9.3 The operational Project will not give rise to any fisheries impacts, while there may be some fisheries benefits from the construction of approximately 200m length of artificial seawall habitat. No fisheries monitoring is necessary.

8.10 References

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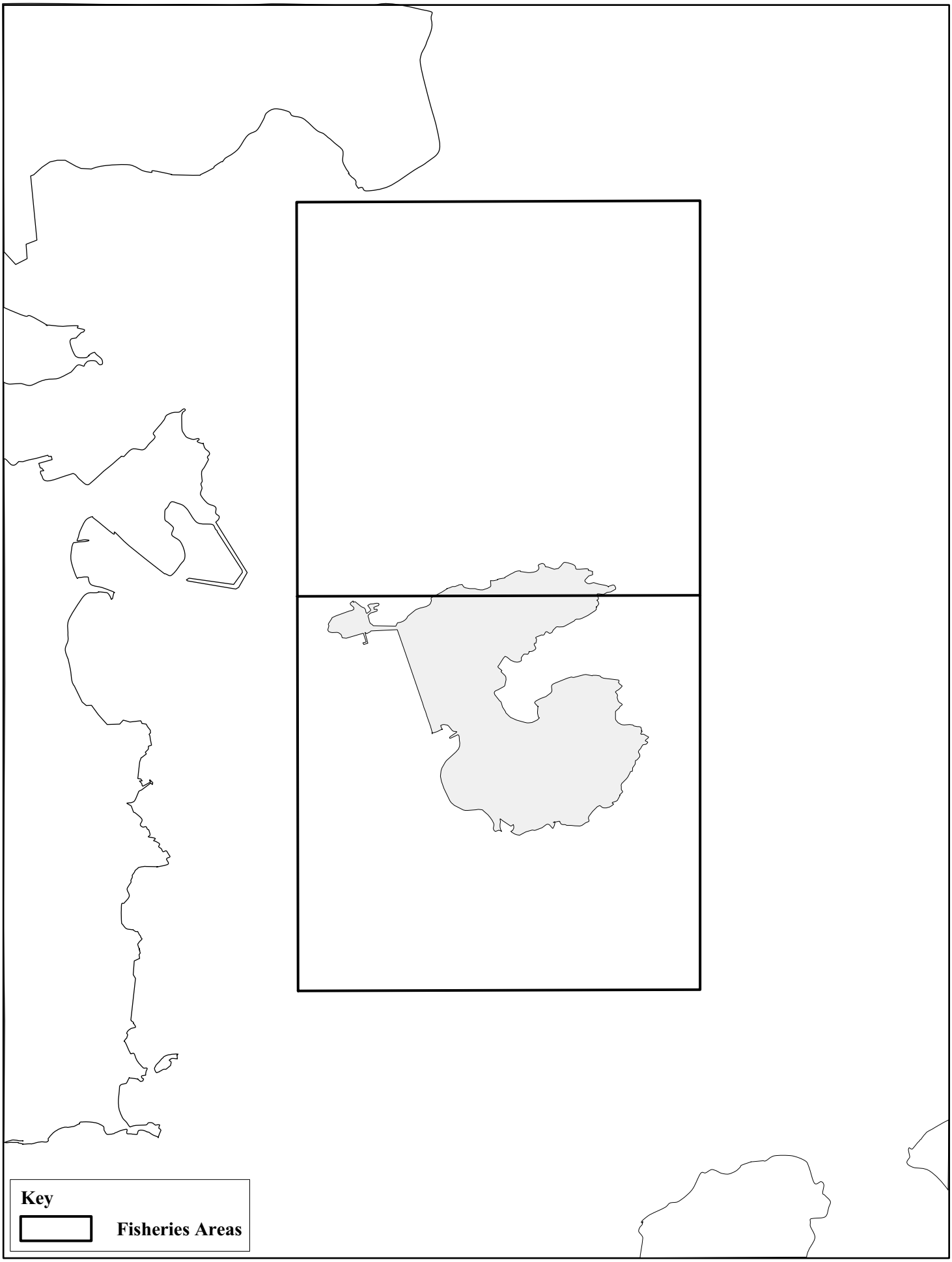

EIA Study for Peng Chau Helipad

FISHERIES AREAS OF PENG CHAU

Figure 8.1

Drawn	FEW	Checked	RBR
Scale	1:10000	Date	June 2005