A1 INTRODUCTION

The marine ecological survey programme for the Cross Bay Link EIA study included dive survey along the eastern Junk Bay coastline and the Cross Bay Link alignment for corals and any other marine species of conservation concern. This Appendix presents the findings of the dive survey which has confirmed that there were only a small coverage of common/doimnat hard corals and common soft corals on the vertical seawalls near the landing point of the Cross Bay Link (the subtidal area potentially to be directly impacted).

A2 METHODOLOGY

Dive surveys for corals and other hard substrate marine organisms were conducted in August to October 2009. The methodology used in the present survey followed those adopted in the AFCD 2001-2002 territory-wide dive survey (AFCD 2004). The dive surveys focused on shallow coastal waters within the extent of Survey Area, ie mainly artificial coastlines in and near the Project Site (there was no natural coastlines in the vicinity).

A2.1 Survey Area for dive survey

The coral survey areas cover the coastline of the proposed landing point of Cross Bay Link and areas in the vicinity. The locations of the preliminary CBL alignment at Junk Bay and the spot dive survey are shown in **Figure A1**.



Figure A1 Locations of Spot Dive survey

A2.2 Spot-check Reconnaissance Dives

Spot reconnaissance dives were conducted in August and September 2009 along the bridge alignment and along the coastline near the bridge landing point (See the blue line in **Figure 1**).

The purpose of the reconnaissance dives is to check the presence and locations of major coral communities (including all hard corals, octocorals and black corals) and other marine organisms with conservation importance within the areas potentially subject to direct impacts. The subtidal hard substrata (i.e. hard substratum seabed, intertidal rocky area) within the spot-check dive survey areas were surveyed, and any presence of coral communities including hard corals (order Scleractinia), octocorals (sub-class Octocorallia) and black corals (order Antipatharia) were recorded. For each spot-check dive, information recorded included the depth; the substrata of seabed; and the visibility. Areas with corals were located and suitable locations to carry out the REA surveys were determined.Besides the biota, the habitat types present within the areas and their approximate proportions/distributions were also recorded. Representative photographs of any important ecological habitat and coral species were taken.

A2.3 Rapid Ecological Assessment Survey

As corals were recorded during the Spot-check Dives, a more detailed semi-quantitative Rapid Ecological Assessment (REA) was recommended. The REA survey was conducted in October 2009 at two locations on the coastlines of eastern Junk Bay where corals had been identified during the spot reconnaissance dives (including the alignment landing point).

The planned REA transect locations are shown in **Figure 2**. The starting points of the REA transects were determined on site in accordance with the site conditions and underwater visibility.

The REA survey was performed along 100m underwater transects parallel to the coastlines. Perpendicular transects would not be required as the focal area is a section of vertical seawall. The benthic cover, taxon abundance and ecological attributes of the transects were recorded in a swathe of 2m wide, 1m either side of the transects (subject to the underwater visibility), following the REA technique. The exact locations and routes of the REA transects were recorded on site by GPS and map. Photos of REA locations and underwater photos along the transects and of the surveyed areas were taken during the REA dive surveys.

The purposes of the REA survey are to semi-quantitatively record the habitat types and ecological values of the area by SCUBA diving and the application of Rapid Ecological Assessment (REA) approach. The REA approach (see **Annex A** for details) aims at

collecting data on the type of substrate and the abundance of marine organisms in particular the occurrence of corals and the extent of the coral distribution from the coastline, for ranking the ecological values. Other parameters recorded during the surveys included site condition (e.g. observations regarding the degree of exposure of the sites to wave action), species list of corals and other marine organisms, coral colony number, coral sizes, coral health status, and translocation feasibility of corals. The conservation status (including local, regional and international, such as China Redlist and IUCN Redlist) of the recorded biota were also provided.

A3 RESULTS

A3.1 Results of Spot-check Reconnaissance Dives

Spot-check dives was conducted in August and September 2009 along the coastline of eastern Junk Bay and the Cross Bay Link alignment (see **Figure A1**), and the weather conditions were summarized in **Table A1**. Subtidal substrata within the survey areas were surveyed for the presence of coral communities, including hard corals (order Scleractinia), octocorals (sub-class Octocorallia) and black corals (order Antipatharia). Any corals found were identified to the lowest practical levels.

Month	Condition	Average Underwater Visibility
August 2009	Wind direction: eastBeaufort: 3Sunny	1.5 m
September 2009	Wind direction: eastBeaufort: 3 to 4Sunny	1 – 1.5 m

 Table A1
 Weather Condition for the Spot-Check Dives

During the spot dive survey, corals were recorded on sea walls, and the locations of the coral communities were recorded (see **Figure A2**).



Figure A2 Locations of Area with soft coral and the proposed REA transects

This section presents the major findings from spot dive survey, from which the REA transect locations were derived.

The direct impact area (the landing point) was a section of vertical seawall made of granite blocks. There were some sloping seawalls in the area but far away from the landing point.

A small coverage of common hard coral *Oulastrea crispata* was recorded on the vertical seawalls facing the Junk Bay opening (i.e. facing south). This species is a very common hard corals in Hong Kong.

And a small coverage of isolated colonies of soft corals *Dendronephthya* sp. was found on this section of vertical seawall. But their coverage (less than 1 %) as well as the sizes of the colonies (mainly around 20-30 cm in height) were small.

A small coverage of two species of hard coral *Oulastrea crispata* (common in Hong Kong) and *Porties lutea* (dominant in Hong Kong) was also found on scattered boulders in shallow waters near the sloping seawalls outside the landing point (to the south of the abov-mentioned vertical seawall with soft corals).

No coral was found on other sections of seawalls covered by the present survey. These seawalls were all vertical seawalls formed by granite blocks but all facing west rather than facing south.

No hard or soft coral was found on the subtidal area along the CBL alignment, where the seabed was muddy/sandy and no hard substrates for coral colonisations.

Only very limited other marine organisms were recorded during the survey including Rock oyster *Saccostrea cucullata*, and Barnacle *Balanus amphitrite*.

Hard corals *Oulastrea crispata* and *Porties lutea* and Soft corals *Dendronephthya* sp. are all very common in Hong Kong. *Oulastrea crispata* was recoded in many locations including urban areas (Kai Tak area, Wan Chi and Aberdeen). *Porties lutea* is a dominant hard coral species in Hong Kong. Soft coral corals *Dendronephthya* sp. is not a protected species. This species indeed is common species in eastern Hong Kong waters, and was previously recorded in other locations in Junk Bay (e.g. the western shore of Junk Bay).

A3.2 Results of REA Dive Survey

In accordance with the findings from spot dive survey, REA transect locations were proposed at the vertical seawall facing south, and the section of sloping seawlls(**Figure 2**). The survey plan was submitted to AFCD for review and was considered adequate for the purpose of this study.

The REA surveys were performed in October 2009. The weather was sunny. The sea was windy and the visibility was relative low (approximately 1.5 m or less).

Two REA transects of 100m length were laid, and the coordinates of the starting and end points of the REA transects, the minimum and maximum depth covered, the major bottom substrate type and the underwater visibility were summarised in **Table A2** below.

Transect	Location (GPS) (Starting Point)	Location (GPS) (End Point)	Min. Depth (m)	Max. Depth (m)	Bottom Substrate	Visibility (m)
1	E 114°16'00.11"	E 114°16'03.62"	6	0	Granite blocks	1.5
1	N 22°17'30.37"	N 22°17'30.49"	0	0	& Boulders	
2	E 114°16'15.11"	E 114°16'13.32"	5	0	Boulders	1
2	N 22°17'23.31"	N 22°17'20.68"	3	0		1

Table A2GPS of Transect Starting and Ending, Maximum Depth, BottomSubstrate and Bottom Visibility of the REA Transects

The two REA transects were generally laid down along the seawalls at the eastern coastline of Junk Bay, which is basically exposed continuous seawalls. In subtidal area, the nearshore substrates were sandy/muddy substrate. The degree of exposure for all REA transects were more or less the same, i.e. semi-exposed to wave action.

During the REA survey, two more coral species were found. A small number of sparely distributed Ahermatypic cup coral *Tubastrea* sp. and Gorgonian *Echinomuricea* were found. Besides the small sizes of the colonies, the gorgonians were also in poor conditions with partial mortality. These two corals were both common and widely distributed in Hong Kong. They are often found in deeper waters of lower visibility.

Common name	Scientific name	Commonness in Hong
		Kong
Hard coral	Oulastrea crispata	Common
Hard coral	Porties lutea	Dominant
Hard coral (Cup coral)	<i>Tubastrea</i> sp.	Common
Soft coral	Dendronephthya sp.	Common
Gorgonian	Echinomuricea sp.	Common
Sea squirt	1	Very common
Purple sea urchin	Anthocidaris crassipina	Common
Long-spine sea urchin	Diadema setosum	Very common
Sea cucumber	1	Very common
Swimming crab	Charybdis sp.	Very common
Barnacle	Balanus amphitrite	Very common
Tube worm		Common

Table A3Marine fauna species recorded during the dive survey

Snail	Thais sp.	Very common
Cowry		Common
Rock oyster	Saccostrea cucullata	Very common
Green mussel	Perna viridis	Very common
Anemones		Very common
Sponges		Very Common

The ecological attributes and substratum attributes of the REA transects were summarised in **Table A4** below.

Table A4	Ecological Attributes and Substratum Attributes of the REA T	Fransects
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Rank	R1	R2
Ecological attributes		
Hard coral	0.5	0.5
Octocoral (soft corals and gorgonians)	0.5	0
Black Corals	0	0
Dead standing corals	0	0
Substratum Attributes		
Bedrock/continuous pavement	4	3
Boulder Blocks (diam.>50cm)	1	2
Boulder Blocks (diam.<50cm)	0	1
Rubble	0	0
Other	0	0
Soft Substrata		
Sand	0	1
Mud/Silt	0	0

* Rank of percentage cover: 0 = None recorded; 0.5 = 1-5%; 1 = 6-10%; 2 = 11-30%; 3 =

31-50%; 4= 51-75 %; 5 = 76-100%.

A4 DISCUSSIONS

Dive surveys were conducted along the coastline of eastern Junk Bay along the Cross Bay Link alignment, at the proposed landing point and in the vicinity. A total of 5 species of corals (including 2 species of hermatypic hard corals, one species of ahermatypic cup coral, one species of soft coral, and one species of gorgonian) were recorded during the survey (from both spot-check reconnaissance dive surveys and REA transect surveys). All corals and all other recorded species were common, abundant or dominant in Hong Kong waters.

The construction of the proposed Corss Bay Link might involve seawall modification and thus cause loss of subtidal hard substrate habitat. As indicated by the results from dive surveys, there was no rare coral species recorded in the area, and the subtidal habitats in the Project Site are not of species ecological value due to the commonness of the species recorded. The loss of subtidal habitats would not constitute insurmountable impacts on coral communities in Junk Bay.

Translocation of coral colonies within the reclamation site however is not recommended, if direct impacts on corals due to construction or reclamation are confirmed, as the coral colonies were small in sizes and colonised on seawall blocks or boulders difficult to move. But it is anticipated that there will be new seawall, and artificial subtidal hard substrate habitat is available for coral colonisation after construction.

Indirect impacts on the nearby coral colonies during the construction should be avoided by control the site runoff and associated water quality impacts.

Photo Plate





Annex 1 RAPID ECOLOGICAL ASSESSMENT METHOD

Rapid Ecological Assessment involves 'semi-quantitative' swim-surveys allowing for assessment and classification of survey areas. The field data are collected by divers experienced in the underwater identification of sessile benthic taxa, swimming along coral communities or identified sections of coastline on SCUBA. REA surveys provide information on the assessment of relative cover of coral and other major benthic groups, as well as an inventory of sessile benthic taxa used to define community types.

Five ecological and six substratum attributes shall be assessed on site and/or by reviewing video footages. Each of the attributes (**Table A1-1**) should be assigned to one of the seven standard ranked categories (from zero to six, representing percentage cover from none to over 76%) (**Table A1-2**).

An inventory of benthic taxa shall be complied for transect. Taxa shall be identified in situ to the following levels:

- 1) Hard corals to species level where possible;
- 2) Soft corals, anemones and macroalgae to genus level where possible; and
- 3) Other benthos to genus level where possible or phylum with growth form.

Each taxon in the inventory shall also be ranked to one of the six categories (**Table A1-3**) in terms of abundance (from 0 to 5, representing from absent to dominant) in the community.

Ecological attributes		
Hard coral		
Dead standing corals		
Soft corals		
Sea anemone beds		
Macroalgae		
Substratum		
Bedrock/Continuous pavement		
boulders		
Rubble		
Cobbles		
Sand with gravel		
Mud		

 Table A1-1
 Ecological and Substratum attributes used in REA

Rank	Percentage cover (%)
0	None recorded
1	1-5
2	6-10
3	11-30
4	31-50
5	51-75
6	76-100

 Table A1-2
 Ranking of Ecological and substratum attributes

Table A1-3Ranking of Benthos abundance

Rank	Abundance
0	Absent
1	Sparse
2	Uncommon
3	Common
4	Abundant
5	Dominant