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**AGREEMENT NO. CE 65/2013 (EP)
POST-CONSTRUCTION ECOLOGICAL
MONITORING OF RIVER IMPROVEMENT
WORKS IN UPPER LAM TSUEN RIVER
SHE SHAN RIVER AND UPPER TAI PO
RIVER – INVESTIGATION**

**POST-CONSTRUCTION ECOLOGICAL
MONITORING REPORT (No. 41)**

Prepared By:

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For:

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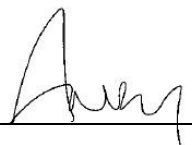
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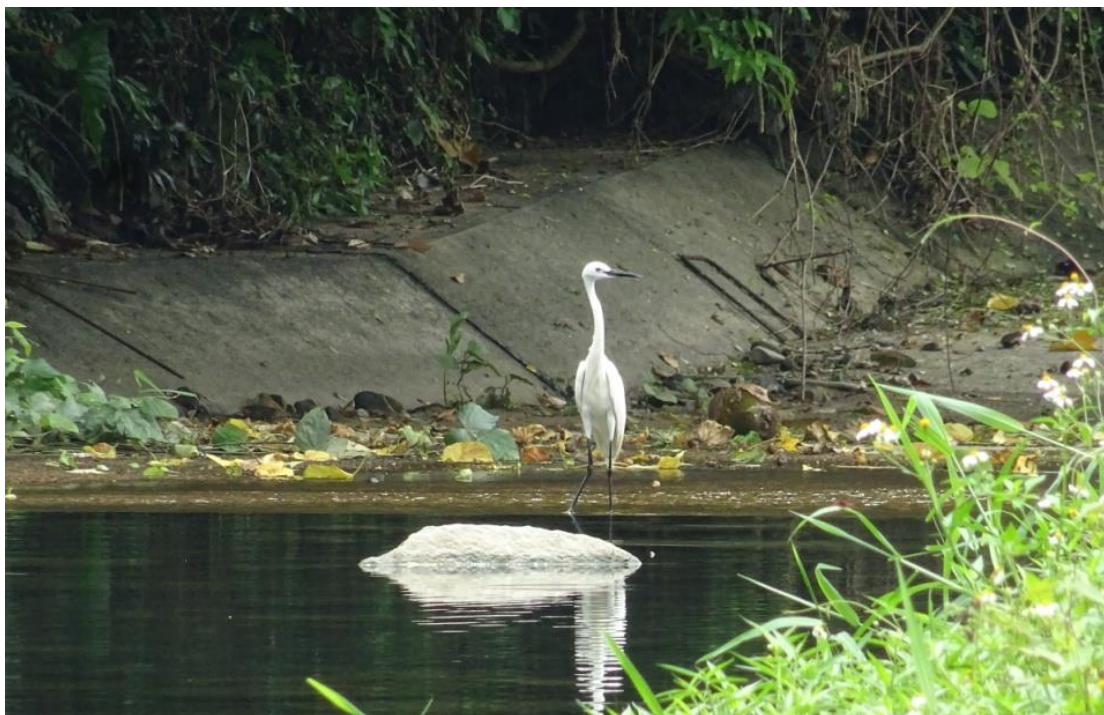
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**Agreement No. CE65/2013(EP)
Post-Construction Ecological Monitoring of River
Improvement Work in Upper Lam Tsuen River, She Shan
River and Upper Tai Po River – Investigation**

**Post-Construction Ecological Monitoring Report (No. 41)
Upper Lam Tsuen River**

May 2017



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June 23, 2017

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June 23, 2017

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Post-Construction Ecological Monitoring of River Improvement Work in Upper Lam Tsuen River, She Shan River and Upper Tai Po River – Investigation Agreement No. CE65/2013(EP)

Post-Construction Ecological Monitoring Report (No. 41)

Upper Lam Tsuen River

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1 Introduction

- 1.1 Agreement No. CE65/2013(EP) Post-Construction Ecological Monitoring of River Improvement Work in Upper Lam Tsuen River, She Shan River and Upper Tai Po River – Investigation required a post-construction ecological monitoring programme when the project completed. The collected data are mainly used to assess ecological recovery process and effectiveness of ecological migration proposed and enforced during the construction period.
- 1.2 The scope of the ecological monitoring was detailed in EM & A Manual of the project. In brief, the survey aimed to collect data on abiotic factors such as water quality, substratum characteristics, water flow as well as flora and fauna.
- 1.3 China Hong Kong Ecology Consultants Ltd. was committed by Allied Environmental Consultants Ltd (AEC) to undertake the ecological monitoring tasks for the project for December 2014.
- 1.4 This is the number 41 post-construction ecological monitoring report for the project conducted **on 19th of May 2017**. It contains the following subsections:
- Summary of major points
 - Monitoring Methods and Results
 - Summary and Comments

2 Summary of Major Points

- Field ecological monitoring was undertaken on **19th of May 2017**;
- Fauna and flora along the drainage project sections are in a process of re-establishing or restoration; Plants on river bed were experiencing seasonal changes in abundance and phenological appearance;
- The species richness of odonata was higher than the record of last month;
- Bird diversity and abundance were in natural fluctuation;
- Hong Kong Newt adult was recorded in the potential habitats along the Lam Tsuen River; and
- Fish abundance was similar to last month with slight decrease.

3 Monitoring Methodology

3.1 Riparian Vegetation

Riparian vegetation, including aquatic and emergent, was sampled using line transects along the affected river channel and riparian habitat. Species, relative abundance and average heights were recorded. Vegetation surveys were conducted at four selected belt transects with two located at the lower portion (T3 and T4) of the river channel and another two at the upper section (T1 and T2) of the river respectively (**Figure 1**). The belt transects was run across the river channel in order to collect quantitative data of the vegetation, e.g., species inventory, height, percentage cover. Qualitative data of plants was collected by recording plant species, relative abundance along line transect. Nomenclature and protection status of the species followed those documented in Lai *et al.* (2004) and Hong Kong Herbarium (2015).

3.2 Avifauna

Avifauna survey was conducted during post construction monitoring period. Special attention was given to the river channel and corridor area which birds used as feeding and foraging habitat. Avifauna surveys were undertaken in the early morning plus species recorded in the rest of the day when conducting other taxonomic groups (benthic, fish, insect) monitoring. Numerical abundance was recorded at fixed count points within a radius of 30-50m according to landscape feature and visual penetration extent. The duration of the point count of birds was standardized for 10 minutes at each location in order to collect comparable data. Transect count along accessible section of river channel were used in order to collect qualitative data. Binoculars and digital camera were the main items of equipment used. Nomenclature and protection status of the species follows the AFCD website (www.hkbiodiversity.net) and Carey *et al.* (2001).

The point count was conducted at four locations with two located at the lower portion of the river channel (T3&T4) and the other two located at the upper section of the river (T1&T2). The point count and survey transect locations for the bird survey and sampling sites for surveys of other faunal groups and flora were presented in **Figure 1**.

3.3 Adult Odonata Survey

Adult Odonata survey was conducted along transects (**Figure 1**). Binoculars, digital camera and hand net were utilized to aid identification. Numerical abundance, species identity and other notable behavior were recorded. Nomenclature and protection status of the species followed those documented in the AFCD website (www.hkbiodiversity.net), Wilson *et al.* (2004) and Tam *et al.* (2011). Adult Odonata survey was conducted along line transects in parallel with river channel within the works area where access was permitted.

3.4 Aquatic Macro-invertebrates

Macro-invertebrates in the river channel were surveyed. Sampling was conducted at five sampling locations including two sites located at the lower portion (T3 and T4) of the river channel and another two sites at the upper section (T1 and T2) of the river, as well as the reference site. Those sampling sites covered major type of river habitats, e.g. river pool and riffle (**Figure 1**) Five replicates were taken at each sampling point and pool together for further sample sorting and identification. Kick sampling and hand netting were the survey methodologies for river organisms. Dissection microscope and digital camera were used to aid identification and enumeration. Numerical abundance and species identity were recorded. Nomenclature and protection status of the species has followed those documented in the AFCD website (www.hkbiodiversity.net) and other literatures such as Dudgeon (1994).

3.5 Fish and Newt

Fish community and Hong Kong Newt at the specified river channel was monitored by live trapping, hand netting and direct observation methods.

Sampling was conducted at five sampling locations including two sites located at the lower portion (T3 and T4) of the river channel and another two sites at the upper section (T1 and T2) of the river, as well as reference site. Those sampling sites covered major type of river habitats, e.g. river pool and riffle (**Figure 1**). The number of the observed fish and newt was estimated and recorded. Nomenclature and protection status of the species followed those documented in the AFCD website (www.hkbiodiversity.net) and Lee *et al.* (2004).

3.6 Abiotic Data Collection

3.6.1 Water Quality Monitoring

Dissolved oxygen level, pH value, conductivity, salinity, BOD and nutrient level (nitrate and ammonium) were measured and analyzed by conventional methods in situ or in laboratory. The instruments for measuring dissolved oxygen level, pH value, conductivity, salinity were model: DO-5510, AZ8685, AZ8361 and AZ8374 respectively. All the instruments were calibrated every monitoring month according to the operation manuals in order to obtain the precise result. BOD test took 5 days to complete within darkness incubator with stable temperature at 20°C and was performed using model: DO-5510 for measuring dissolved oxygen. Nutrient levels including nitrate and ammonia were performed in laboratory by applying the In-house method SOP056 (FIA) and SOP057 (FIA) respectively.

3.6.2 Sediment Characteristics

Sediment/substrate characteristics were recorded of sediment cover in percentage e.g. mud, sand, rock, boulder and cemented bottom in the river bed at sampling sites.

3.6.3 Water Flow

Water flow rates in river channel were measured by recording the time taken for a floating object (e.g. floating ball) to cover a measured distance.

The sampling locations for surveys were presented in **Figure 1**.

4 Monitoring Results

4.1 Vegetation

Vegetation has generally covered the gabion and river bed along Lam Tsuen River (Photos 1-3). In total, 75 flora species were recorded within the survey transects along the river course. Some of the vegetation at river bed has been washed out by flooding, especially vegetation in lower section of the river in previous month. The recorded floras were generally in good health, and the

height of the dominated riparian grass and herb species were in a range from 0.2m to 1.5m as observed along survey transect. Dominant flora species were shown in the **Table 4.1** marked with relative abundance sign “+++”. Results of vegetation survey and belt transect survey were presented in **Table 4.1** and **Table 4.2**. **Figure 1** shows the transect line for the flora surveys.

4.2 Fauna

4.2.1 Avifauna

An avifauna survey was undertaken along survey transects and at four selected point count locations. In total, 20 species of birds were recorded during the bird survey and 6 of the total were wetland dependent species including *Egretta garzetta* (Photo 4), *Ardeola bacchus*, *Alcedo atthis*, *Motacilla alba*, *Amaurornis phoenicurus* and *Motacilla cinerea*. They were commonly observed foraging in the river channel. *Pycnonotus jocosus* was a dominated species along the river. All the birds in Hong Kong are under protection of Wild Animals Protection Ordinance (Cap. 170). Among the recorded species, *Ardeola bacchus* and *Egretta garzetta* are classified as Regional Concern by Fellowes *et al.* (2002). *Centropus sinensis* was observed in the river, which is considered as Vulnerable in China Red Data Book. Apart from species mentioned above, the others recorded in Lam Tsuen River were common species in Hong Kong. Transect and Point Count locations were shown on **Figure 1**. Result of bird survey was presented in the **Table 4.3**.

4.2.2 Adult Odonata Survey

Odonata survey was performed, and a list of recorded odonata species at Upper Lam Tsuen River is shown in **Table 4.4**. In total, 12 odonata species were recorded during the survey and the recorded species were common species and widely distributed in Hong Kong (Photo 5-6). The result obtained this month is similar to previous surveys conducted in approximate period of last year. Species richness in this month increased in comparison with the record of last month. Most of the odoanta species in Hong Kong has the peak emergence from spring to late summer. The increase in abundance of odoanta was due to seasonality. It is expected that number of odonata will keep increasing during coming wet season (Wilson *et al.*, 2004 & Tam *et al.*, 2011). Sampling location was shown in **Figure 1**.

4.2.3 Aquatic Macro-invertebrates

Upper Lam Tsuen River was flowing with constant water during survey (Photo 7). The river benthic fauna collected was mainly comprised of insects, molluscs and crustaceans (Photos 9-10). *Pomacea canaliculata* was found abundant along the river. Details of recorded of river benthic fauna refers to **Table 4.5**. Sampling location was shown on **Figure 1**.

4.2.4 Hong Kong Newt

Surveys of Hong Kong Newt were conducted (Photo 7) at Upper Lam Tsuen River. Adult Hong Kong Newt (Photo 8) were observed at the Lam Tsuen River where the habitat consisted of riparian vegetation during the survey. Riparian vegetation grown along the channel especially along water margin could provide shelter and breeding habitat for Hong Kong Newt. Hong Kong Newt is listed in Wild Animals Protection Ordinance (Cap. 170) and classified as “Near Threatened” under IUCN Red List Status and as “Potential Global Concern” by Fellowes *et al.* (2002). Record of Hong Kong Newts can be referred to **Table 4.6**.

4.2.5 River Fish Fauna

Fish surveys were performed at Upper Lam Tsuen River during field monitoring. In total, 17 species of freshwater fish, including species recorded from reference site, were recorded. *Oreochromis niloticus*, *Zacco platypus* and *Rhinogobius* spp were the dominated species in the river. *Acrossocheilus parallens* is a rare freshwater fish that only recorded in few of reservoir catchments and streams in Hong Kong (Lee *et al.*, 2004) and listed as Global Concern by Fellowes (2002). It was observed along the surveyed river with pool. Except *Acrossocheilus parallens*, *Parazacco spilurus* is classified as Vulnerable in China Red Data Book and observed along the river with low abundance. Fish counting at 2 x 2 meter area were performed and number of fish individuals was similar to the record of last month with slight decrease. Details of recorded of fish fauna refers to **Table 4.6**. Sampling location was shown on **Figure 1**.

4.3 **Abiotic Data**

Data on water quality and major river hydrological feature (water flow and substratum) of the river were collected and are presented in the **Table 4.7**.

Generally, the water was not polluted and nutrient levels were generally low. Results of water test were presented in the **Table 4.7**.

The river substratum was comprised of over 75-93% stones or rocks in most of the river sections with moderate water flow (up to 0.2m/second at pool and 0.5m/second at riffle).

5 **Summary and Commentary**

Post construction ecological monitoring was carried out in May 2017 and relevant biotic and abiotic data was collected according to project specification and EM & A Manual. Benthic fauna was temporally de-faunated in river sections due to river bed engineering works during construction period between 2008 and early 2013 and is under recovery process after that period. Adult amphibian Hong Kong Newt was recorded at river channel where the river margin covered with riparian vegetation. *Acrossocheilus parallens*, a rare freshwater fish species in Hong Kong, was observed at a few locations in the river channel with pool. In addition to *Acrossocheilus parallens*, *Parazacco*

spilurus recorded in the river is also considered with conservation interest and observed along the river with low abundance.

Aquatic and riparian vegetation along river channel were re-established. Vegetation has generally covered the gabion and covered the river bed along Upper Lam Tsuen River.

The water quality of the surveyed river was not polluted although the river receives low concentration of nutrients from the nearby agriculture lands and resident houses.

6 REFERENCES

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FIGURES

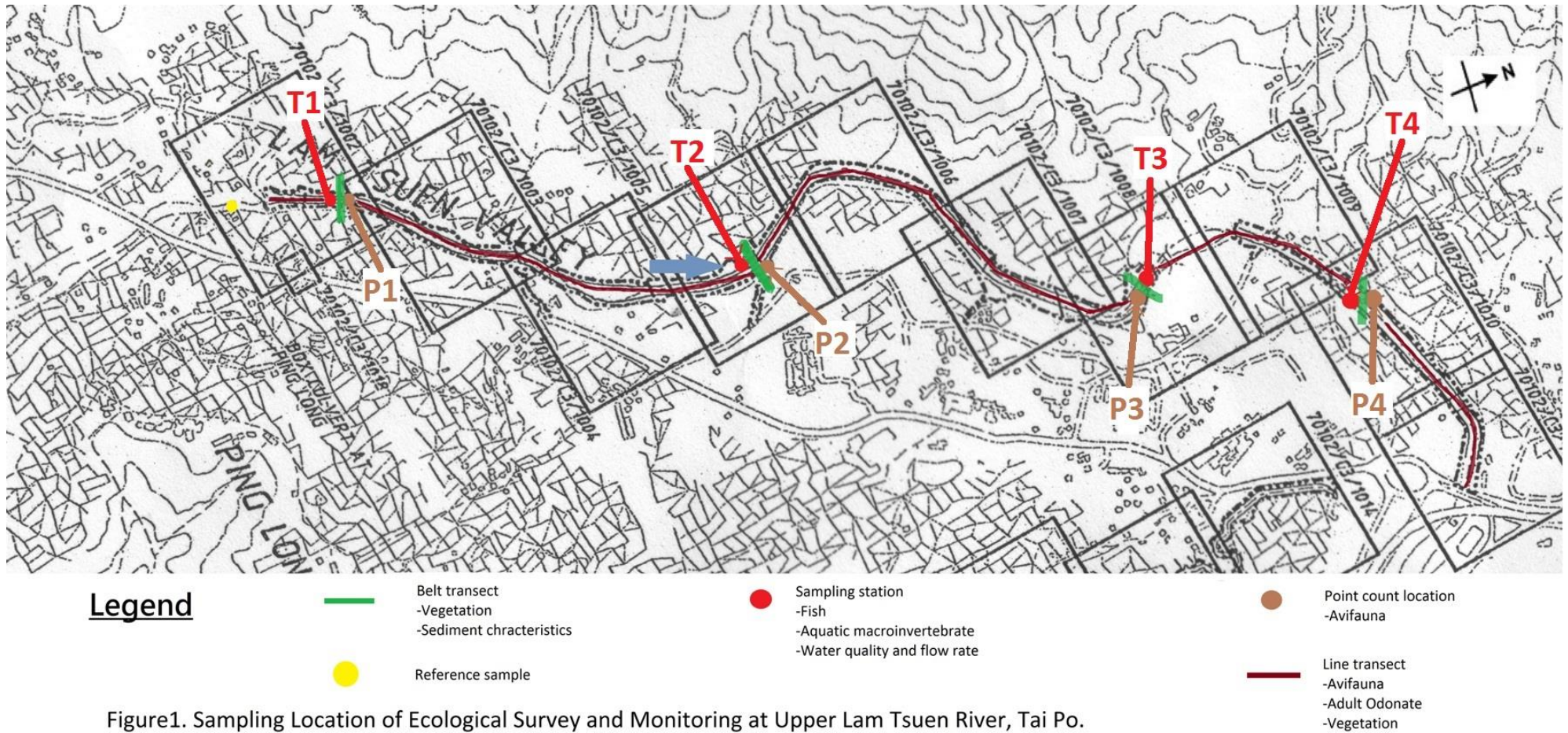


Figure1. Sampling Location of Ecological Survey and Monitoring at Upper Lam Tsuen River, Tai Po.

PHOTOS



Photo 1: General view of the river (Lower section)



Photo 2: General view of the river (Middle section)



Photo 3: General view of the river (Upper section)



Photo 4: Avifauna – *Egretta garzetta*



Photo 5: Odonata – *Neurobasis chinensis*

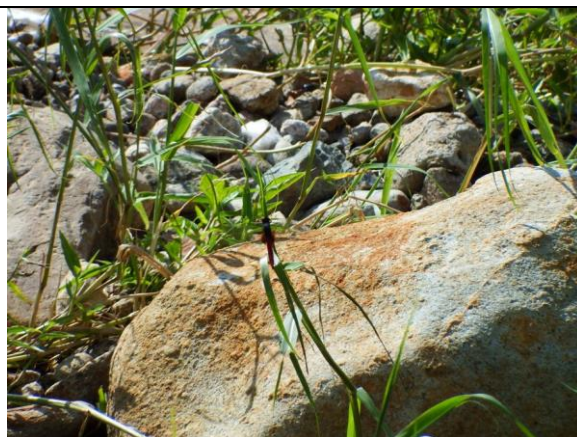


Photo 6: Odonata – *Orthetrum chrysis*



Photo 7: Kick Sampling



Photo 8: Hong Kong Newt



Photo 9: Aquatic sampling



Photo 10: Aquatic sampling

TABLE

Table 4.2. Flora species recorded from belt transect survey at the Upper Lam Tsuen River

(T1- located at upper river channel sampling site to T4 - located at lower river Channel sampling site)

Family	Species	Chinese name	Baseline monitoring								Impact monitoring				Impact monitoring				Impact monitoring				Impact monitoring				Impact monitoring															
			Jul-08				Aug-08				Jan-09				Jan-09				Jul-09				Jan-10				Jul-10				Jul-10											
			P1		P4		P1		P4		T1		T2		T3		T4		T1		T2		T3		T4		T1		T2		T3		T4		T1		T2		T3		T4	
Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%					
Poaceae	<i>Microstegium ciliatum</i>	剛秀竹	0.4	40			0.4	40			0.4	30	0.5	5	1.5	5	1	15																								
Fabaceae	<i>Pueraria lobata</i>	野葛	0.5	30			0.5	30							0.2	5			0.5	50							0.5	5														
Poaceae	<i>Pennisetum purpureum</i>	象草	3	20			3	20																																		
Araceae	<i>Alocasia odora</i>	海芋	1	10			1	10			0.5	2					0.3	<1																								
Caesalpiniaceae	<i>Cassia alata</i>	翅英決明			1.2	10			1.2	10																																
Magnoliaceae	<i>Michelia alba</i>	白蘭			6	10			6	10																																
Poaceae	<i>Brachiaria mutica</i>	巴拉草			1.2	70			1.2	70	1.5	30							0.5	20			1.2	5	1	40	0.8	40	0.9	50	1	15			0.8	20	0.9	30	1	60	1.5	30
Moraceae	<i>Ficus hispida</i>	對葉榕							1.5	5					1.5	5	4	5																								
Asteraceae	<i>Mikania micrantha</i>	蕨甘菊							0.4	20							0.5	1																								
Musaceae	<i>Musa paradisiaca</i>	大蕉											3	5																												
Ulmaceae	<i>Celtis sinensis</i>	朴樹			6	10			6	10																																
Araceae	<i>Pistia stratiotes L.</i>	大漂																																								
Urticaceae	<i>Boehmeria nivea</i>	苧麻																																								
Asteraceae	<i>Bidens alba</i>	白花鬼針草											0.5	5																												
Poaceae	<i>Coix lacryma-jobi</i>	薏苡																																								
Solanaceae	<i>Solanum nigrum</i>	龍葵																																								
Cyperaceae	<i>Cyperus flabelliformis</i>	風車草																																								
Poaceae	<i>Miscanthus floridulus</i>	五節芒																																								
Euphorbiaceae	<i>Macaranga tanarius</i>	血桐											3	5																												
Asteraceae	<i>Wedelia chinensis</i>	鋤耩菊																																								
Commelinaceae	<i>Commelina diffusa</i>	節節草																																								
Asteraceae	<i>Erechtites hieracifolia</i>	革命菜																																								
Thelypteridaceae	<i>Cyclosorus parasiticus</i>	華南毛蕨																																								
Convolvulaceae	<i>Pharbitis nil</i>	牽牛																																								
Verbenaceae	<i>Lantana camara</i>	馬纒丹																																								
Mimosaceae	<i>Leucaena leucocephala</i>	銀合歡																																								
Brassicaceae	<i>Nasurtium officinale</i>	西洋菜																																								
Onagraceae	<i>Ludwigia erecta</i>	美洲水丁香																																								
Poaceae	<i>Pennisetum alopecuroides</i>	狼尾草																																								
Amaranthaceae	<i>Celosia argentea</i>	青葙																																								
Bare Gound																																										

P1 – Point count location 1; P4 – Point count location 4

Table 4.2. Flora species recorded from belt transect survey at the Upper Lam Tsuen River

(T1- located at upper river channel sampling site to T4 - located at lower river Channel sampling site)

Family	Species	Chinese name	Impact monitoring								Post construction monitoring								Post construction monitoring								Post construction monitoring								Post construction monitoring							
			Dec-13								Jan-14								Feb-14								Mar-14								Apr-14							
			T1		T2		T3		T4		T1		T2		T3		T4		T1		T2		T3		T4		T1		T2		T3		T4		T1		T2		T3		T4	
Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%					
Poaceae	<i>Microstegium ciliatum</i>	剛秀竹																																								
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Poaceae	<i>Brachiaria mutica</i>	巴拉草	0.8	10	0.8	10				0.8	10	0.8	10																													
Moraceae	<i>Ficus hispida</i>	對葉榕																																								
Asteraceae	<i>Mikania micrantha</i>	薇甘菊	0.5	10	0.5	5	0.5	10	0.4	10	0.5	10	0.5	5	0.5	10	0.4	10	0.5	10	0.5	5	0.5	10	0.4	10	0.5	10	0.5	5	0.5	10	0.4	10	0.3	5	0.3	15	0.3	5		
Musaceae	<i>Musa paradisiaca</i>	大蕉																																								
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Euphorbiaceae	<i>Macaranga tanarius</i>	血桐																																								
Asteraceae	<i>Wedelia chinensis</i>	鋤耨菊																																								
Commelinaceae	<i>Commelina diffusa</i>	節節草					0.3	5																																		
Asteraceae	<i>Erechtites hieracifolia</i>	革命菜																																								
Thelypteridaceae	<i>Cyclosorus parasiticus</i>	華南毛蕨																																								
Convolvulaceae	<i>Pharbitis nil</i>	牽牛																																								
Verbenaceae	<i>Lantana camara</i>	馬纒丹																																								
Mimosaceae	<i>Leucaena leucocephala</i>	銀合歡																																								
Brassicaceae	<i>Nasurtium officinale</i>	西洋菜																																								
Onagraceae	<i>Ludwigia erecta</i>	美洲水丁香																																								
Poaceae	<i>Pennisetum alopecuroides</i>	狼尾草																																								
Amaranthaceae	<i>Celosia argentea</i>	青葙					1	2																																		
Bare Gound				75		85		73		75		85		73		75		85		73		75		72		82		73		75		63		70		12		65				

P1 – Point count location 1; P4 – Point count location 4

Table 4.2. Flora species recorded from belt transect survey at the Upper Lam Tsuen River

(T1- located at upper river channel sampling site to T4 - located at lower river Channel sampling site)

Family	Species	Chinese name	Post construction monitoring								Post construction monitoring								Post construction monitoring								Post construction monitoring								Post construction monitoring															
			May-14								Jun-14								Jul-14								Aug-14								Sep-14								Oct-14							
			T1		T2		T3		T4		T1		T2		T3		T4		T1		T2		T3		T4		T1		T2		T3		T4		T1		T2		T3		T4									
Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%															
Poaceae	<i>Microstegium ciliatum</i>	剛秀竹	0.3	2						0.3	2																																							
Fabaceae	<i>Pueraria lobata</i>	野葛			0.3	5	0.3	5												0.3	5	0.3	5													0.6	10													
Poaceae	<i>Pennisetum purpureum</i>	象草																																																
Araceae	<i>Alocasia odora</i>	海芋																																		1.8	1													
Caesalpinaceae	<i>Cassia alata</i>	翅荚决明																																																
Magnoliaceae	<i>Michelia alba</i>	白蘭																																																
Poaceae	<i>Brachiaria mutica</i>	巴拉草	0.5	5	0.6	6	0.6	6	0.5	5	0.6	8	0.6	6	0.6	10	0.8	10																		0.8	8													
Moraceae	<i>Ficus hispida</i>	對葉榕																																																
Asteraceae	<i>Mikania micrantha</i>	蕨甘菊		0.3	5	0.3	15	0.3	5			0.3	6	0.3	15	0.3	8			0.3	6	0.3	15	0.3	8			0.3	8	0.3	15	0.3	10	0.3	15	0.3	15													
Musaceae	<i>Musa paradisiaca</i>	大蕉																																																
Ulmaceae	<i>Celtis sinensis</i>	朴樹																																																
Araceae	<i>Pistia stratiotes L.</i>	大漂																																																
Urticaceae	<i>Boehmeria nivea</i>	苧麻																																																
Asteraceae	<i>Bidens alba</i>	白花鬼針草	0.5	20	0.5	10	0.7	15	0.6	10	0.5	20	0.5	10	0.7	15	0.6	10	0.5	20	0.5	12	0.7	18	0.6	10	0.5	20	0.6	12	0.7	15	0.6	10	0.5	20														
Poaceae	<i>Coix lacryma-jobi</i>	薏苡																																																
Solanaceae	<i>Solanum nigrum</i>	龍葵																																																
Cyperaceae	<i>Cyperus flabelliformis</i>	風車草																																																
Poaceae	<i>Miscanthus floridulus</i>	五節芒																																																
Euphorbiaceae	<i>Macaranga tanarius</i>	血桐																																																
Asteraceae	<i>Wedelia chinensis</i>	鋤耨菊																																																
Commelinaceae	<i>Commelina diffusa</i>	節節草	0.2	8			0.3	3			0.2	8			0.3	3			0.2	8			0.3	3			0.3	10			0.3	5			0.3	10														
Asteraceae	<i>Erechtites hieracifolia</i>	革命菜																																																
Thelypteridaceae	<i>Cyclosorus parasiticus</i>	華南毛蕨																																																
Convolvulaceae	<i>Pharbitis nil</i>	牽牛																																																
Verbenaceae	<i>Lantana camara</i>	馬纒丹																																																
Mimosaceae	<i>Leucaena leucocephala</i>	銀合歡																																																
Brassicaceae	<i>Nasurtium officinale</i>	西洋菜		0.2	2	0.2	2	0.2	1			0.2	2	0.2	2	0.2	1			0.3	1	0.3	1	0.3	1			0.3	1	0.3	1	0.3	1	0.3	1	0.3	2													
Onagraceae	<i>Ludwigia erecta</i>	美洲水丁香																																																
Poaceae	<i>Pennisetum alopecuroides</i>	狼尾草																																																
Amaranthaceae	<i>Celosia argentea</i>	青葙																																																
Bare Gound				65		77		60		73		65		74		60		70		58		71		58		70		55		69		59		68		55														

P1 – Point count location 1; P4 – Point count location 4

Table 4.2. Flora species recorded from belt transect survey at the Upper Lam Tsuen River

(T1- located at upper river channel sampling site to T4 - located at lower river Channel sampling site)

		Post construction monitoring								Post construction monitoring								Post construction monitoring								Post construction monitoring												
Stream		May-15								Jun-15								Jul-15								Aug-15												
Transect		T1		T2		T3		T4		T1		T2		T3		T4		T1		T2		T3		T4		T1		T2		T3		T4						
Family	Species	Chinese name	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%						
Poaceae	<i>Microstegium ciliatum</i>	剛秀竹																																				
Fabaceae	<i>Pueraria lobata</i>	野葛						0.3	5							0.3	5	0.5	10											0.4	5	0.5	10				0.4	5
Poaceae	<i>Pennisetum purpureum</i>	象草				2	15							2	15																							
Araceae	<i>Alocasia odora</i>	海芋						0.8	1							0.8	1																					
Caesalpiniaceae	<i>Cassia alata</i>	翅荑決明																																				
Magnoliaceae	<i>Michelia alba</i>	白蘭																																				
Poaceae	<i>Brachiaria mutica</i>	巴拉草	0.9	15	1	18	0.8	20	1	10	0.9	15	1	18	0.8	20	1	10	0.9	30	1.5	30	0.5	70	1	15	1	30	1.5	30	0.8	70	1	15				
Moraceae	<i>Ficus hispida</i>	對葉榕																																				
Asteraceae	<i>Mikania micrantha</i>	蕨甘菊	0.3	5	0.4	10	0.3	5	0.3	10	0.3	5	0.4	10	0.3	5	0.3	10	0.3	5	0.2	5	0.3	5	0.4	5	0.3	5	0.2	5	0.3	5	0.3	5	0.4	5		
Musaceae	<i>Musa paradisiaca</i>	大蕉																																				
Ulmaceae	<i>Celtis sinensis</i>	朴樹																																				
Araceae	<i>Pistia stratiotes L.</i>	大漂																																				
Urticaceae	<i>Boehmeria nivea</i>	苧麻																																				
Asteraceae	<i>Bidens alba</i>	白花鬼針草	0.8	5	0.7	10	0.8	15			0.8	5	0.7	10	0.8	15						0.3	5													0.4	5	
Poaceae	<i>Coix lacryma-jobi</i>	薏苡																																				
Solanaceae	<i>Solanum nigrum</i>	龍葵																																				
Cyperaceae	<i>Cyperus flabelliformis</i>	風車草																				0.6	2													0.6	2	
Poaceae	<i>Miscanthus floridulus</i>	五節芒																																				
Euphorbiaceae	<i>Macaranga tanarius</i>	血桐																																				
Asteraceae	<i>Wedelia chinensis</i>	錦雞菊																0.3	20	0.2	10						0.4	20	0.2	10								
Commelinaceae	<i>Commelina diffusa</i>	節節草	0.5	5	0.4	10			0.3	10	0.5	5	0.4	10			0.3	10	0.3	20	0.2	20	0.2	5	0.4	20	0.3	20	0.2	20	0.2	5	0.4	20				
Asteraceae	<i>Erechtites hieracifolia</i>	革命菜																																				
Thelypteridaceae	<i>Cyclosorus parasiticus</i>	華南毛蕨																																				
Convolvulaceae	<i>Pharbitis nil</i>	牽牛																																				
Verbenaceae	<i>Lantana camara</i>	馬纓丹																																				
Mimosaceae	<i>Leucaena leucocephala</i>	銀合歡																																				
Brassicaceae	<i>Nasturtium officinale</i>	西洋菜																																				
Onagraceae	<i>Ludwigia erecta</i>	美洲水丁香	1.2	10	1.1	5	1.4	5	1.3	5	1.2	10	1.1	5	1.4	5	1.3	5																				
Poaceae	<i>Pennisetum alopecuroides</i>	狼尾草																				0.5	5			2	5							0.8	5	2	5	
Amaranthaceae	<i>Celosia argentea</i>	青葙																																				
Bare Ground				60		47		40		59		60		47		40		59		15		35		13		55		15		35		13		55				

P1 - Point count location 1; P4 - Point count location 4

(Continuous) Table 4.2. Flora species recorded from belt transect survey at the Upper Lam Tsuen River

(T1- located at upper river channel sampling site to T4 - located at lower river Channel sampling site)

Family	Species	Chinese name	Post construction monitoring								Post construction monitoring								Post construction monitoring								Post construction monitoring								Post construction monitoring							
			Stream				Stream				Stream				Stream				Stream				Stream																			
			Sep-15		Oct-15		Nov-15		Dec-15		Jan-16		Feb-16																													
Transect	T1	T2	T3	T4	T1	T2	T3	T4	T1	T2	T3	T4	T1	T2	T3	T4	T1	T2	T3	T4	T1	T2	T3	T4	T1	T2	T3	T4														
	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%														
Poaceae	<i>Microstegium ciliatum</i>	剛秀竹																																								
Fabaceae	<i>Pueraria lobata</i>	野葛	0.5	10					0.4	5	0.5	10																														
Poaceae	<i>Pennisetum purpureum</i>	象草																																								
Araceae	<i>Alocasia odora</i>	海芋																																								
Caesalpinaceae	<i>Cassia alata</i>	翅葉決明																																								
Magnoliaceae	<i>Michelia alba</i>	白蘭																																								
Poaceae	<i>Brachiaria mutica</i>	巴拉草	1.1	30	1.5	35	1	70	1.2	15	0.7	5	1.5	30	1	60	1.2	15	0.7	5	1.5	35	1	60	1.2	20	0.8	5	1.5	35	1.2	60	1.2	20	0.3	5	0.3	20	0.3	30	0.3	10
Moraceae	<i>Ficus hispida</i>	對葉榕																																								
Asteraceae	<i>Mikania micrantha</i>	撒甘菊	0.3	5	0.2	5	0.3	5	0.4	5	0.3	5	0.2	5	0.3	5	0.4	5	0.3	5	0.2	5	0.3	5	0.4	5	0.3	5	0.2	5	0.3	5	0.4	5	0.3	5	0.2	5	0.3	5	0.4	5
Musaceae	<i>Musa paradisiaca</i>	大蕉																																								
Ulmaceae	<i>Celtis sinensis</i>	朴樹																																								
Araceae	<i>Pistia stratiotes L.</i>	大漂																																								
Urticaceae	<i>Boehmeria nivea</i>	芋麻																																								
Asteraceae	<i>Bidens alba</i>	白花鬼針草			0.4	5					0.4	10										0.4	10												0.4	10						
Poaceae	<i>Coix lacryma-jobi</i>	薏苡							1	5												1	5										1	5								
Solanaceae	<i>Solanum nigrum</i>	龍葵																																								
Cyperaceae	<i>Cyperus flabelliformis</i>	風車草			0.6	2																																				
Poaceae	<i>Miscanthus floridulus</i>	五節芒							1	10												1	10									1	10									
Euphorbiaceae	<i>Micaranga tanarius</i>	血桐																																								
Asteraceae	<i>Wedelia chinensis</i>	蟛蜞菊	0.4	20	0.2	10			0.4	5											0.4	5									0.4	5										
Commelinaceae	<i>Commelina diffusa</i>	節節草	0.3	20	0.2	20	0.2	5	0.4	20	0.3	10	0.2	20	0.2	5	0.4	25	0.3	10	0.2	20	0.2	5	0.4	25	0.3	10	0.2	20	0.2	5	0.4	25	0.3	10	0.2	20	0.2	5	0.4	25
Asteraceae	<i>Erechtites hieracifolia</i>	革命菜																																								
Thelypteridaceae	<i>Cyclosorus parasiticus</i>	華南毛蕨																																								
Convolvulaceae	<i>Pharbitis nil</i>	牽牛																																								
Verbenaceae	<i>Lantana camara</i>	馬纒丹																																								
Mimosaceae	<i>Leucaena leucocephala</i>	銀合歡																																								
Brassicaceae	<i>Nasturtium officinale</i>	西洋菜																				0.2	10									0.2	10									
Onagraceae	<i>Ludwigia erecta</i>	美洲水丁香																																								
Poaceae	<i>Pennisetum alopecuroides</i>	狼尾草			0.8	5	2	5														1.5	10								1.5	10			1.5	10	2	5				
Amaranthaceae	<i>Celosia argentea</i>	青葙							0.4	5												0.4	5								0.4	5										
Acanthaceae	<i>Dicliptera chinensis</i>	狗肝菜							0.3	20												0.3	20								0.3	20										
Bare Gound			15		30		13	55	30		45		20	55	30		40		20	45	30		40		20	35	30		55	50	45	30		55	50	45						

P1 – Point count location 1; P4 – Point count location 4

(Continuous) Table 4.2. Flora species recorded from belt transect survey at the Upper Lam Tsuen River

(T1- located at upper river channel sampling site to T4 - located at lower river Channel sampling site)

Family	Species	Chinese name	Post construction monitoring				Post construction monitoring				Post construction monitoring				Post construction monitoring				Post construction monitoring				Post construction monitoring																			
			Mar-16				Apr-16				May-16				Jun-16				Jul-16				Aug-16																			
			T1	T2	T3	T4	T1	T2	T3	T4	T1	T2	T3	T4	T1	T2	T3	T4	T1	T2	T3	T4	T1	T2	T3	T4	T1	T2	T3	T4												
Poaceae	<i>Microstegium ciliatum</i>	剛秀竹																																								
Fabaceae	<i>Pueraria lobata</i>	野葛	0.5	10																																						
Poaceae	<i>Pennisetum purpureum</i>	象草																																								
Araceae	<i>Alocasia odora</i>	海芋																																								
Caesalpiniaceae	<i>Cassia alata</i>	翅葉決明																																								
Magnoliaceae	<i>Michelia alba</i>	白蘭																																								
Poaceae	<i>Brachiaria mutica</i>	巴拉草	0.4	10	0.4	25	0.4	35	0.4	15	0.4	8	0.4	25	0.4	35	0.4	10	0.4	7	0.4	20	0.4	25	0.4	5	0.4	7	0.4	15	0.4	20	0.4	5	0.4	7	0.4	15	0.4	20	0.4	5
Moraceae	<i>Ficus hispida</i>	對葉榕																																								
Asteraceae	<i>Mikania micrantha</i>	撒甘菊	0.3	5	0.2	5	0.3	5	0.4	5	0.3	5	0.2	5	0.3	5	0.4	5	0.3	5	0.2	5	0.3	5	0.4	5	0.3	5	0.2	5	0.3	5	0.4	5	0.3	5	0.2	5	0.3	5	0.4	5
Musaceae	<i>Musa paradisiaca</i>	大蕉																																								
Ulmaceae	<i>Celtis sinensis</i>	朴樹																																								
Araceae	<i>Pistia stratiotes L.</i>	大漂																																								
Urticaceae	<i>Boehmeria nivea</i>	芋麻																																								
Asteraceae	<i>Bidens alba</i>	白花鬼針草			0.4	10							0.4	10							0.4	5							0.4	5												
Poaceae	<i>Coix lacryma-jobi</i>	薏苡	1	5							1	5																														
Solanaceae	<i>Solanum nigrum</i>	龍葵																																								
Cyperaceae	<i>Cyperus flabelliformis</i>	風車草																																								
Poaceae	<i>Miscanthus floridulus</i>	五節芒	1	10							1	8											1	7																		
Euphorbiaceae	<i>Macaranga tanarius</i>	血桐																																								
Asteraceae	<i>Wedelia chinensis</i>	蟛蜞菊	0.4	5							0.4	5											0.4	5																		
Commelinaceae	<i>Commelina diffusa</i>	節節草	0.3	10	0.2	20	0.2	5	0.4	25	0.3	8	0.2	20	0.2	5	0.4	20	0.3	7	0.2	15	0.2	5	0.4	15	0.3	7	0.2	10	0.2	5	0.4	10	0.3	10	0.2	15	0.2	10	0.4	15
Asteraceae	<i>Erechtites hieracifolia</i>	革命菜																																								
Thelypteridaceae	<i>Cyclosorus parasiticus</i>	華南毛蕨																																								
Convolvulaceae	<i>Pharbitis nil</i>	牽牛																																								
Verbenaceae	<i>Lantana camara</i>	馬纓丹																																								
Mimosaceae	<i>Leucaena leucocephala</i>	銀合歡																																								
Brassicaceae	<i>Nasturtium officinale</i>	西洋菜				0.2	5								0.2	5								0.2	5								0.2	5								
Onagraceae	<i>Ludwigia erecta</i>	美洲水丁香																																								
Poaceae	<i>Pennisetum alopecuroides</i>	狼尾草			1.5	10							1.5	10											1.5	10							1.5	10								
Amaranthaceae	<i>Celosia argentea</i>	青葙			0.4	5							0.4	5											0.4	5							0.4	5								
Acanthaceae	<i>Dicliptera chinensis</i>	狗肝菜	0.3	20					0.3	15							0.3	15							0.3	5							0.3	5								
Bare Gound				25		50		45		45		38		50		45		55		54		60		60		65		54		60		65		70		65		70		65		

P1 – Point count location 1; P4 – Point count location 4

(Continous) Table 4.2. Flora species recorded from belt transect survey at the Upper Lam Tsuen River

(T1- located at upper river channel sampling site to T4 - located at lower river Channel sampling site)

Family	Species	Chinese name	Post construction monitoring				Post construction monitoring				Post construction monitoring															
			Mar-17				Apr-17				May-17															
			T1	T2	T3	T4	T1	T2	T3	T4	T1	T2	T3	T4												
Poaceae	<i>Microstegium ciliatum</i>	剛秀竹																								
Fabaceae	<i>Pueraria lobata</i>	野葛	0.5	5				0.4	5	0.5	5				0.4	5	0.5	5					0.4	5		
Poaceae	<i>Pennisetum purpureum</i>	象草																								
Araceae	<i>Alocasia odora</i>	海芋	0.4	5	0.2	10	0.3	10	0.4	5	0.4	5	0.2	10	0.3	10	0.4	5	0.4	5	0.2	10	0.3	10	0.4	5
Caesalpiniaceae	<i>Cassia alata</i>	翅葉決明																								
Magnoliaceae	<i>Michelia alba</i>	白蘭																								
Poaceae	<i>Brachiaria mutica</i>	巴拉草	0.6	10	0.6	25	0.6	25	0.6	10	0.5	10	0.7	35	0.7	35	0.5	10	0.6	10	0.8	35	0.7	35	0.7	10
Moraceae	<i>Ficus hispida</i>	對葉榕																								
Asteraceae	<i>Mikania micrantha</i>	蕺甘菊	0.4	5	0.5	5	0.5	10	0.5	5	0.4	5	0.5	5	0.5	10	0.5	5	0.4	5	0.6	5	0.6	10	0.6	5
Musaceae	<i>Musa paradisiaca</i>	大蕉																								
Ulmaceae	<i>Celtis sinensis</i>	朴樹																								
Araceae	<i>Pistia stratiotes L.</i>	大漂																								
Urticaceae	<i>Boehmeria nivea</i>	芋麻																								
Asteraceae	<i>Bidens alba</i>	白花鬼針草			0.5	10	0.4	10					0.5	10	0.4	10					0.5	10	0.4	10		
Poaceae	<i>Coix lacryma-jobi</i>	薏苡	1.1	5						1.1	5								1.3	5						
Solanaceae	<i>Solanum nigrum</i>	龍葵																								
Cyperaceae	<i>Cyperus flabelliformis</i>	風車草																								
Poaceae	<i>Miscanthus floridulus</i>	五節芒	1.1	7						1.1	7								1.3	7						
Euphorbiaceae	<i>Macaranga tanarius</i>	血桐																								
Asteraceae	<i>Wedelia chinensis</i>	蟛蜞菊	0.4	5						0.4	5								0.4	5						
Commelinaceae	<i>Commelina diffusa</i>	箭筈草	0.3	10	0.2	15	0.2	10	0.4	15	0.3	10	0.3	15	0.3	10	0.4	15	0.3	10	0.3	15	0.3	10	0.4	15
Asteraceae	<i>Erechtites hieracifolia</i>	革命菜																								
Thelypteridaceae	<i>Cyclosorus parasiticus</i>	華南毛蕨																								
Convolvulaceae	<i>Pharbitis nil</i>	牽牛																								
Verbenaceae	<i>Lantana camara</i>	馬纓丹																								
Mimosaceae	<i>Leucaena leucocephala</i>	銀合歡																								
Brassicaceae	<i>Nasturtium officinale</i>	西洋菜																								
Onagraceae	<i>Ludwigia erecta</i>	美洲水丁香																								
Poaceae	<i>Pennisetum alopecuroides</i>	狼尾草				1.5	10							1.5	10								1.5	10		
Amaranthaceae	<i>Celosia argentea</i>	青葙				0.4	5							0.4	5								0.4	5		
Acanthaceae	<i>Dicliptera chinensis</i>	狗肝菜	0.3	5						0.3	5								0.3	5						
Bare Gound				43		35		35	60		43		25		25	60		43		25		25		60		

P1 – Point count location 1; P4 – Point count location 4

Table 4.3 Avifauna recorded along survey transects and at four selected point count locations of Lam Tsuen Rive
(T1- located at upper river channel sampling site to T4 - located at lower river Channel sampling site)

Common Name	Species name	Chinese name	Status	Commonness	Post construction monitoring					Post construction monitoring					
					Apr-17					May-17					
					C	T1	T2	T3	T4	C	T1	T2	T3	T4	
Barn Swallow	<i>Hirundo rustica</i>	家燕	PM	C	++						++		6		
Black Drongo	<i>Dicrurus macrocerus</i>	黑卷尾	Sv	C											
Black Kite	<i>Milvus lineatus</i>	黑鷹	R, RC, Cap.586	C											
Black-faced bunting	<i>Emberiza spodocephala</i>	灰頭鵲	WV&PM	C											
Black-necked Starling	<i>Sturnus nigricollis</i>	黑領椋鳥	R	C	++		4	2			++		2	2	
Black-winged Cuckoo-shrike	<i>Coracina melaschistos</i>	暗灰鶇鶇	PM	C											
Blue Whistling Thrush	<i>Myophonus caeruleus</i>	紫嘯鶇	R	C											
Brown Shrike	<i>Lanius cristatus</i>	紅尾伯勞	PM	C											
Buzzard (Common Buzzard)	<i>Buteo buteo</i>	普通鵟	WV,Cap.586	C											
Chinese Bulbul	<i>Pycnonotus sinensis</i>	白頭鵲	R	C	+		2	2			+		3	4	
Chinese Pond Heron	<i>Ardeola bacchus</i>	池鷺	R,RC	C	+		1	1			+		2		1
Common Kingfisher	<i>Alcedo atthis</i>	普通翠鳥	R	C	+						+				
Common Koel	<i>Eudynamis scolopacea</i>	噪鶇	R	C	+						+				
Common Sandpiper	<i>Actitis hypoleucos</i>	磯鶇	WV&PM	C											
Common Tailorbird	<i>Orthotomus sutorius</i>	長尾縫葉鶇	R	C	+	1			1		+		1		1
Crested bulbul	<i>Pycnonotus jocosus</i>	紅耳鵲	R	C	+++	10	6	5	3		+++	12	7	8	2
Crested Goshawk	<i>Accipiter trivirgatus</i>	鳳頭鷹	R, CR, Cap.	U											
Crested Myna	<i>Acridotheres cristatellus</i>	八哥	R	C	+		3	1			+		2	2	
Crested Serpent Eagle	<i>Spilornis cheela</i>	蛇鵟	R, VU, LC	U											
Daurian redstart	<i>Phoenicurus auroreus</i>	北紅尾鶇	WV	C											
Domestic pigeon	<i>Columba sp.</i>	鴿	R	C											
Dusky Warbler	<i>Phylloscopus fuscatus</i>	褐柳鶇	WV	C	+						+				
Eurasian tree sparrow	<i>Passer montanus</i>	麻雀	R	C	++	2	2	4	2		++	3	4	5	2
Great Coucal	<i>Centropus sinensis</i>	褐翅鴉鶇	R,VU	C	+						+				
Great Tit	<i>Parus major(commixus)</i>	大山雀	R	C											
Green Sandpiper	<i>Tringa ochropus</i>	白腰草鶇	PM&WV	C											
Grey Heron	<i>Ardea cinerea</i>	蒼鶇	WV,PRC	C											
Grey Wagtail	<i>Motacilla cinerea</i>	灰鶇鶇	WV	C	+		1		1		+	1	1		
Japanese White Eye	<i>Zosterops japonica(simplex)</i>	暗綠繡眼鳥	R	C											
Jungle Crow	<i>Corvus macrorhynchus</i>	大咀烏鶇	R	C											
Large Hawk Cuckoo	<i>Cuculus sparverioides</i>	鷹鶇	SV	C	+										
Lesser Coucal	<i>Centropus bengalensis</i>	小鴉鶇	R, VU	C											
Little Egret	<i>Egretta garzetta</i>	小白鶇	R, RC	C	+		2	2			+	2	1	1	1
Great Egret	<i>Ardea alba</i>	大白鶇	R,WV, RC	C											
Little Swift	<i>Apus affinis</i>	小白腰雨燕	R,SpM	C											
Maggie	<i>Pica pica</i>	喜鶇	R	C											
Maggie Robin	<i>Copsychus saularis</i>	鶇鶇	R	C	+	1	1	1			+	2	2	1	1
Mandarin Duck	<i>Aix galericulata</i>	鸞鶇	WV	U											
Masked Laughing Thrush	<i>Garrulax perspicillatus</i>	黑臉噪鶇	R	C	+						+			3	
Night Heron	<i>Nycticorax nycticorax</i>	夜鶇	R&WV, LC	C											
Northern Shoveler	<i>Anas clypeata</i>	琵嘴鶇	WV	C											
Olive Backed Pipit	<i>Anthus hodgsoni</i>	樹鶇	WV	C											
Oriental Dollarbird	<i>Eurystomus orientalis</i>	三寶鳥	PM	U											
Plaintive Cuckoo	<i>Cacomantis merulinus</i>	八聲杜鶇	SV	U											
Red-billed Blue Magpie	<i>Urocissa erythrorhyncha</i>	紅咀藍鶇	R	C											
Red-flanked Bluetail	<i>Tarsiger cyanurus</i>	紅胸藍尾鶇	PM&WV	C											
Rufous Turtle Dove	<i>Streptopelia orientalis</i>	山斑鳩	R	C											
Rufous-backed Shrike	<i>Lanius schach</i>	棕背伯勞	R	C	+										
Rufous-capped Babbler	<i>Stachyridopsis ruficeps</i>	紅頭穗鶇	R	C											
Scarlet Minivet	<i>Pericrocotus flammeus</i>	赤紅山椒鳥	R	C											
Siberian Stonechat	<i>Saxicola maurus</i>	黑喉石鶇	WV	C											
Sooty-headed Bulbul	<i>Pycnonotus aurigaster</i>	白喉紅雙鶇	R	U											
Spotted Dove	<i>Streptopelia chinensis</i>	珠頸斑鳩	R	C	++	4	2	4	2		++	5	1	2	3
Spotted Munia	<i>Lonchura punctulata</i>	斑文鳥	R	C											
Velvet-fronted Nuthatch	<i>Sitta frontalis</i>	絨額鶇	R	C											
White Wagtail	<i>Motacilla alba</i>	白鶇鶇	WV	C	+	1	1				+		1		1
White-breasted Waterhen	<i>Amaurornis phoenicurus</i>	白胸苦惡鳥	R	C	+		2				+		1	1	
White-throated Kingfisher	<i>Halcyon smyrnensis</i>	白胸翡翠	R, LC	C											
White-rumped Munia	<i>Lonchura striata</i>	白腰文鳥	R	C											
Yellow Bellid Prinia	<i>Prinia flaviventris</i>	黃腹鶇鶇	R	C	+						+				
Yellow Wagtail	<i>Motacilla flava</i>	黃鶇鶇	WV&PM	U											
Zitting cisticola	<i>Cisticola juncidis</i>	棕鳴尾鶇	WV&PM	C											
Number of birds						19	27	22	9		25	34	29	12	
No. of species						22	6	12	9	5	20	6	14	10	8

Note: R – Resident; WV – Winter visitor; PM – Passage migrant; C – Common; U – Uncommon

SpM – Spring migrant; Sv–Summer Visitor ; C – transect survey;

P1 – Point count location 1; P4 – Point count location 4

+, occurred; ++, common; +++, abundant/dominant species in the the study area

Commonness and status were decided according to AFCD biodiversity website (www.hkbiodiversity.net)

All bird species are under protection of Wild Animals Protection Ordinance (Cap. 170)

Endangered Species of Animals and Plants Ordinance (Cap. 586)

RC : Regional concern Fellowes *et al* (2002)

LC : Local Concern Fellowes *et al* (2002)

PRC: Potential Regional onver Fellowes *et al* (2002)

CR: Rare in China Red Data Book Status

VU: Vulnerable in China Red Data Book Status

Table 4.4. Odonate species recorded at the Upper Lam Tsuen River

Species name	Common name	Chinese name	Status	Commonness	Construction monitoring					Post construction monitoring																		
					Jun-15	Jul-15	Aug-15	Sep-15	Oct-15	Nov-15	Dec-15	Jan-16	Feb-16	Mar-16	Apr-16	May-16	Jun-16	Jul-16	Aug-16	Sep-16	Oct-16	Nov-16	Dec-16	Jan-17	Feb-17	Mar-17	Apr-17	May-17
<i>Actisoma panorpoides panorpoides</i>	Asian Pintail	雜腹蜻	NP	VC		+																						
<i>Brachythemis contaminata</i>	Asian Amberwing	黃翅蜻	NP	VC																								
<i>Ceriatrigon auranticum ryukyuanum</i>	Orange-tailed Sprite	琉球橘黃蝶	NP	VC	+	+	+	+							+	+	+	+	+	+						+	+	
<i>Coeliccia cyanomelas</i>	Blue Forest Damselfly	黃紋長腹蝶	NP	VC																								
<i>Coperia marginipes</i>	Yellow Featherlegs	黃狹扇蝶	NP	VC	+	+	+	+								+	+	+	+	+							+	
<i>Crocothemis servilla servilla</i>	Crimson Darter	紅蜻	NP	VC	+	+	+	+	+		+					+	+	+	+	+	+						+	
<i>Euphaea decorata</i>	Black-banded Gossamerwing	方帶幽蝶	NP	VC				+								+	+	+										
<i>Ictinogomphus pertinax</i>	Common Flangetail	霸王葉春蜓	NP	C	+	+		+	+							+	+	+	+	+								
<i>Ischnura senegalensis</i>	Common Blue Jewel	褐斑異翅蝶	NP	VC																								
<i>Mnais lacteola</i>	Indochinese Copperwing	輝翅綠色蝶	P, LC	C																								
<i>Nannophya pygmaea</i>	Scarlet Dwarf	朱紅小蜻	P, LC	C																								
<i>Neurobasis chinensis</i>	Chinese Greenwing	華麗色蝶	NP	VC	+	+	+	+	+		+				+	+	+	+	+	+						+	+	
<i>Neurothemis fulvia</i>	Russet Percher	網脈蜻	NP	VC	+	+	+	+								+	+	+	+	+							+	
<i>Neurothemis tullia tullia</i>	Pied Percher	截斑脈蜻	NP	C												+	+	+	+	+							+	
<i>Orithetrum chrysis</i>	Red-faced Skimmer	華麗灰蜻	NP	VC			+	+	+		+			+	+	+	+	+	+	+					+	+	+	
<i>Orithetrum glaucum</i>	Common blue skimmer	黑尾灰蜻	NP	VC																								
<i>Orithetrum luzonicum</i>	Marsh Skimmer	呂宋灰蜻	NP	VC		+	+	+	+							+	+	+	+	+						+	+	
<i>Orithetrum pruinosum neglectum</i>	Common Red Skimmer	赤褐灰蜻	NP	VC	+	+	+				+				+	+												
<i>Orithetrum sabina sabina</i>	Green Skimmer	狹腹灰蜻	NP	VC								+																
<i>Pantala flavescens</i>	Wandering Glider	黃蜻	NP	VC	+	+	+	+	+		+					+	+	+	+	+						+	+	
<i>Paracercion calamorum duyeri</i>	Dusky Lilysquatter	蒼尾蝶	P, LC	C																								
<i>Prodasineura autumnalis</i>	Black Threadtail	烏齒原蝶	NP	VC	+	+	+	+																		+	+	
<i>Pseudagrion rubriceps rubriceps</i>	Orange-faced Sprite	丹頂斑蝶	NP	UC		+																						
<i>Rhinocypha perforata perforata</i>	Common Blue Jewel	三斑鼻蝶	NP	VC	+	+	+	+	+							+	+	+	+	+							+	
<i>Rhythemis variegata arria</i>	Variogated Flutterer	斑腹翅蜻	NP	C																								
<i>Trithemis aurora</i>	Crimson Dropwing	曉曙蜻	NP	VC	+	+	+	+	+		+				+	+	+	+	+	+						+	+	
<i>Trithemis festiva</i>	Indigo Dropwing	靛曙蜻	NP	VC	+	+	+	+	+		+				+	+	+	+	+	+	+					+	+	
<i>Zygonyx iris insignis</i>	Emerald Cascader	彩虹蜻	P,PGC	VC																								
No. of species					13	14	15	13	9	7	2	3	1	3	7	11	14	14	13	13	10	7	2	2	2	4	8	12

Note: NP – Not protected in Hong Kong; P-Protection in Hong Kong
 “VC” – Very Common; “UC” – Uncommon; “C” – Common
 “+” – Species exists in the study area
 “++” – Species common in the study area
 “+++” – Species abundant/dominant in study area
 Commonness and status were decided according to AFCD biodiversity website (www.hkbiodiversity.net)
 LC- Local Concern - Fellowes *et al* (2002)
 PGC - Potential Global Concern - Fellowes *et al* (2002)

Table 4.5 Aquatic Macro invertebrates recorded at Lam Tsuen River

(T1- located at upper river channel sampling site to T4 - located at lower river Channel sampling site)

Species name	Chinese name	Status	Commonness	Post construction monitoring				Post construction monitoring				Post construction monitoring				Post construction monitoring				Post construction monitoring				Post construction monitoring				Post construction monitoring				Post construction monitoring																			
				Mar-15				Apr-15				May-15				Jun-15				Jul-15				Aug-15				Sep-15				Oct-15				Nov-15				Dec-15											
				Reference point	T1	T2	T3	T4	Reference point	T1	T2	T3	T4	Reference point	T1	T2	T3	T4	Reference point	T1	T2	T3	T4	Reference point	T1	T2	T3	T4	Reference point	T1	T2	T3	T4	Reference point	T1	T2	T3	T4	Reference point	T1	T2	T3	T4								
Molluscs																																																			
<i>Biomphalaria sp.</i>	--	NP	VC	++	++	+	+	+	++	++	++	+	+	+	++	++	++	+	+	+	++	++	++	+	+	+	++	++	++	+	+	+	++	++	++	+	+	+	++	++	++	+	+	+	++						
<i>Brotia hainanensis</i>	--	NP	VC	++	++	+	+	+	++	++	++	+	+	+	++	++	++	+	+	+	++	++	++	+	+	+	++	++	++	+	+	+	++	++	++	+	+	+	++	++	++	+	+	+	++						
<i>Melanoides tuberculata</i>	縮艇黑螺	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+						
<i>Pomacea canaliculata</i>	福果螺	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+						
<i>Radix plicatulus</i>	羅白螺	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+						
<i>Sinotia quadrata</i>	田螺	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+						
Insects																																																			
<i>Baetis sp.</i>	--	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+						
<i>Caenis sp.</i>	--	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+						
<i>Chironomus sp.</i>	蠓幼虫	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+						
<i>Electrogenus sp.</i>	--	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+						
<i>Hydropsyche sp.</i>	--	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+						
<i>Indobaetis sp.</i>	--	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+						
<i>Mnais sp.</i>	--	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+						
<i>Orithetrum sp.</i>	--	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+						
Crustaceans																																																			
<i>Caridina cantanensis</i>	廣東米蝦	NP	VC	+	++	++	++	++	+	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++							
<i>Cryptopotamon anacoluthon</i>	螺刺溪蟹	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+							
<i>Macrobrachium hainanense</i>	海南沼蝦	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+							
<i>Somaniathelphusa zanklon</i>	東莞蟹	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+							
No. of species				11	13	13	12	12		11	9	12	15	12		11	9	11	13	12		11	9	11	13	12		11	9	11	13	12		11	9	11	13	12		11	9	11	13	13		11	9	11	13	13	

Note: NP – Not protected in Hong Kong; P - Protected in Hong Kong
 “VC” – Very Common; “UC” – Uncommon; “C” - Common; “R” - Rare
 +, occurred; ++, common; +++, abundant/dominant Species in the the study area
 Reference point was the sampling location outside the works area.

Table 4.5 Aquatic Macro invertebrates recorded at Lam Tsuen River

(T1- located at upper river channel sampling site to T4 - located at lower river Channel sampling site)

				Post construction monitoring				Post construction monitoring				Post construction monitoring				Post construction monitoring				Post construction monitoring				Post construction monitoring				Post construction monitoring				Post construction monitoring				Post construction monitoring				Post construction monitoring															
				Jan-16				Feb-16				Mar-16				Apr-16				May-16				Jun-16				Jul-16				Aug-16				Sep-16				Oct-16															
Sampling point				Reference point	T1	T2	T3	T4	Reference point	T1	T2	T3	T4	Reference point	T1	T2	T3	T4	Reference point	T1	T2	T3	T4	Reference point	T1	T2	T3	T4	Reference point	T1	T2	T3	T4	Reference point	T1	T2	T3	T4	Reference point	T1	T2	T3	T4	Reference point	T1	T2	T3	T4							
Species name	Chinese name	Status	Commonness																																																				
Molluscs																																																							
<i>Biomphalaria sp.</i>	--	NP	VC																																																				
<i>Brotia hainanensis</i>	--	NP	VC	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++			
<i>Melanooides tuberculata</i>	縮艇黑螺	NP	VC																																																				
<i>Pomacea canaliculata</i>	福果螺	NP	VC	++	++	++	++	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++				
<i>Radix plicatulus</i>	羅白螺	NP	VC																																																				
<i>Sinotaia quadrata</i>	田螺	NP	VC																																																				
Insects																																																							
<i>Baetis sp.</i>	--	NP	VC																																																				
<i>Caenis sp.</i>	--	NP	VC																																																				
<i>Chironomus sp.</i>	蠓幼虫	NP	VC																																																				
<i>Electrogenus sp.</i>	--	NP	VC																																																				
<i>Hydropsyche sp.</i>	--	NP	VC																																																				
<i>Indobaetis sp.</i>	--	NP	VC																																																				
<i>Mnais sp.</i>	--	NP	VC																																																				
<i>Orithetrum sp.</i>	--	NP	VC																																																				
Crustaceans																																																							
<i>Caridina cantanensis</i>	廣東米蝦	NP	VC	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++
<i>Cryptopotamon anacoluthon</i>	螺刺溪蟹	NP	VC																																																				
<i>Macrobrachium hainanense</i>	海南沼蝦	NP	VC																																																				
<i>Somanniahelphusa zanklon</i>	束鞭蟹	NP	VC																																																				
No. of species				12	10	11	13	13	12	10	11	13	13	12	10	11	13	13	13	10	11	13	13	13	10	11	13	13	13	10	12	14	14	13	10	12	14	14	13	10	12	14	14	13	10	12	14	14	13	10	12	14	14		

Note: NP – Not protected in Hong Kong; P - Protected in Hong Kong
 "VC" – Very Common; "UC" – Uncommon; "C" - Common; "R" - Rare
 +, occurred; ++, common; +++, abundant/dominant Species in the the study area
 Reference point was the sampling location outside the works area.

Table 4.5 Aquatic Macro invertebrates recorded at Lam Tsuen River

(T1- located at upper river channel sampling site to T4 - located at lower river Channel sampling site)

				Post construction monitoring					Post construction monitoring					Post construction monitoring					Post construction monitoring					Post construction monitoring				
				Nov-16					Dec-16					Jan-17					Feb-17					Mar-17				
				Reference point	T1	T2	T3	T4	Reference point	T1	T2	T3	T4	Reference point	T1	T2	T3	T4	Reference point	T1	T2	T3	T4	Reference point	T1	T2	T3	T4
Species name	Chinese name	Status	Commonness																									
Molluscs																												
<i>Biomphalaria sp.</i>	--	NP	VC					+					+					+										
<i>Brotia hainanensis</i>	--	NP	VC	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++
<i>Melanoïdes tuberculata</i>	縮艇黑螺	NP	VC	+				+					+					+										
<i>Pomacea canaliculata</i>	縮果螺	NP	VC	++	++	++	+++	+++	++	++	++	+++	+++	++	++	+++	+++	++	++	+++	+++	++	++	+++	+++	+++	+++	
<i>Radix plicatulus</i>	羅白螺	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
<i>Sinotaia quadrata</i>	田螺	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
Insects																												
<i>Baetis sp.</i>	--	NP	VC	+				+	+	+			+	+	+			+	+	+								
<i>Caenis sp.</i>	--	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
<i>Chironomus sp.</i>	蠅幼虫	NP	VC	+	+	+	+		+	+	+		+	+	+		+	+	+		+	+		+	+	+		
<i>Electrogenus sp.</i>	--	NP	VC	+	+				+	+			+	+			+	+			+	+			+	+		
<i>Hydropsyche sp.</i>	--	NP	VC	+	+	+			+	+			+	+			+	+			+	+			+	+		
<i>Indobaetis sp.</i>	--	NP	VC						+	+			+	+			+	+			+	+			+	+		
<i>Mnais sp.</i>	--	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
<i>Orithetrum sp.</i>	--	NP	VC						+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
Crustaceans																												
<i>Caridina cantanensis</i>	廣東米蝦	NP	VC	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++
<i>Cryptopotamon anacoluthon</i>	鯉刺溪蟹	NP	VC											+	+												+	
<i>Macrobrachium hainanense</i>	海南沼蝦	NP	VC	+					+	+	+	+		+	+	+		+	+	+	+						+	
<i>Somaniatohelphusa zanklon</i>	束腰蟹	NP	VC																									
No. of species				13	10	12	14	14		13	10	12	14	14		13	10	12	14	14		13	10	12	14	14		

Note: NP – Not protected in Hong Kong; P - Protected in Hong Kong
 “VC” – Very Common; “UC” – Uncommon; “C” - Common; “R” - Rare
 +, occurred; ++, common; +++, abundant/dominant Species in the the study area
 Reference point was the sampling location outside the works area.

Table 4.5 Aquatic Macro invertebrates recorded at Lam Tsuen River

(T1 - located at upper river channel sampling site to T4 - located at lower river Channel sampling site)

Species name	Chinese name	Sampling point		Post construction monitoring					Post construction monitoring				
				Reference point	Apr-17				Reference point	May-17			
					T1	T2	T3	T4		T1	T2	T3	T4
Status	Commonness												
Molluscs													
<i>Biomphalaria sp.</i>	--	NP	VC					+					+
<i>Brotia hainanensis</i>	--	NP	VC	++	++	++	++	++	++	++	++	++	++
<i>Melanoides tuberculata</i>	瘤擬黑螺	NP	VC	+			+	++	+			+	++
<i>Pomacea canaliculata</i>	福果螺	NP	VC	++	++	++	+++	+++	++	++	++	+++	+++
<i>Radix plicatulus</i>	羅白螺	NP	VC	+	+	+	+	+	+	+	+	+	+
<i>Sinotaia quadrata</i>	田螺	NP	VC	+	+	+	+	+	+	+	+	+	+
Insects													
<i>Baetis sp.</i>	--	NP	VC	+			+	+	+			+	+
<i>Caenis sp.</i>	--	NP	VC	+	+	+	+	+	+	+	+	+	+
<i>Chironomus sp.</i>	孿幼虫	NP	VC	+	+	+	+	+	+	+	+	+	+
<i>Electrogenes sp.</i>	--	NP	VC	+	+	+			+	+	+		
<i>Hydropsyche sp.</i>	--	NP	VC	+	+	+		+	+	+			+
<i>Indobaetis sp.</i>	--	NP	VC				+					+	
<i>Mnais sp.</i>	--	NP	VC	+	+	+	+	+	+	+	+	+	+
<i>Orthetrum sp.</i>	--	NP	VC			+	+	+			+	+	+
Crustaceans													
<i>Caridina cantanensis</i>	廣東米蝦	NP	VC	++	++	++	++	++	++	++	++	++	++
<i>Cryptopotamon anacolutho</i>	鯉刺溪蟹	NP	VC				+	+				+	+
<i>Macrobrachium hainanensis</i>	海南沼蝦	NP	VC	+		+		+	+		+	+	+
<i>Somanniathelphusa zanklo</i>	束腰蟹	NP	VC										
No. of species				13	10	12	14	14	13	10	12	14	14

Note: NP – Not protected in Hong Kong; P - Protected in Hong Kong
 “VC” – Very Common; “UC” – Uncommon; “C” - Common; “R” - Rare
 +, occurred; ++, common; +++, abundant/dominant Species in the the study area
 Reference point was the sampling location outside the works area.

Table 4.6 Fish species and amphibians at Upper Lam Tsuen River

(T1- located at upper river channel sampling site to T4 - located at lower river Channel sampling site)

Species	Chinese name	Status	Sampling point	Baseline monitoring				Impact monitoring				Impact monitoring				Impact monitoring				Impact monitoring				Impact monitoring				Impact monitoring				Impact monitoring				Impact monitoring				Impact monitoring																	
				Jul-08		Aug-08		Jan-09				Jul-09				Jan-10				Jul-10				Jan-11				Jul-11				Jan-12				Jul-12				Aug-13				Dec-13													
				Upper stream	Lower stream	Upper stream	Lower stream	Reference	T1	T2	T3	T4	Reference	T1	T2	T3	T4	Reference	T1	T2	T3	T4	Reference	T1	T2	T3	T4	Reference	T1	T2	T3	T4	Reference	T1	T2	T3	T4	Reference	T1	T2	T3	T4															
Fish																																																									
<i>Acrossocheilus parrellens</i>	側條光唇魚	P, PGC	R		+																																																				
<i>Channa maculate</i>	斑鰱	NP	C																																																						
<i>Cirrhina moliorella</i>	鯪魚	NP	C																																																						
<i>Clarias fuscus</i>	胡子鯪	NP	C																																																						
<i>Cyprinus carpio var. viridiviolaceus</i>	錦鯉	NP	C																																																						
<i>Gambusia affinis</i>	食蚊魚	NP	VC		+	+																																																			
<i>Limniphomoptera disparis</i>	擬石鰱	NP	C																																																						
<i>Misgurnus anguillicaudatus</i>	泥鰌	NP	C		+																																																				
<i>Oreochromis niloticus</i>	尼羅口孵非鯪	NP	C																																																						
<i>Parazacco spilurus</i>	異鱧	V and	C		+																																																				
<i>Poecilia reticulata</i>	孔雀花魚	NP	VC																																																						
<i>Pseudogastromyzon myersi</i>	麥氏擬腹吸鰕	NP	C			+	+																																																		
<i>Pterocryptis cochinchinensis</i>	黃鰱	NP	C																																																						
<i>Puntius semifasciolatus</i>	七星魚	NP	C		++	+	++	+																																																	
<i>Rhinogobius spp.</i>	鰻虎魚	NP	C/UN/R		+	+	+																																																		
<i>Schistura fasciolata</i>	橫紋南鰍	NP	C			+	+																																																		
<i>Xiphophorus hellerii</i>	劍尾魚	NP	C		+	+	+																																																		
<i>Xiphophorus variatus</i>	藍色劍尾魚	NP	C																																																						
<i>Zacco platypus</i>	寬鳍鱮	NP	C		+	++	+	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++																	
2x2m fish counting		No. of fish		70	60	75	60	38	45	40	40	8	38	20	5	15	7	38	20	5	15	7	32	12	6	10	20	30	22	10	7	5	10	4	2	0	0	6	3	1	0	0	8	5	2	0	0	5	2	3	2	3	5	2	3	2	3
No. of species				5	8	11	12	7	7	4	8	2	5	3	3	5	6	5	3	2	2	2	9	8	10	13	9	9	7	4	4	8	10	8	9	5	3	12	8	6	4	3	14	10	10	4	3	14	11	11	6	4	14	9	12	8	6
Amphibian																																																									
<i>Paramesotriton hongkongensis</i>	香港瘰螈	P (Cap 170, NT, PGC)	R	+		+	+																																																		
<i>Fejervarya limnocharis</i>	澤蛙	NP	VC																																																						
No. of species				1	0	1	1	1	1	0	0	1	1	1	0	1	1	1	0	0	0	1	0	0	0	0	1	0	0	1	1	0	0	0	0	0	0	1	0	1	1	0	0	0	0	1	0	1	1	0	1	1	1	1	1		

Note: NP – Not protected in Hong Kong
 “VC” – Very Common; “UC” – Uncommon; “C” – Common; “R” – Rare
 +, occurred; ++, common; +++, abundant/dominant Species in the study area
 -V – Listed as vulnerable in China Fish Red Data Book
 -Reference point was the sampling location outside the works area used to compare the with the data within works area.
 Cap 170 - List in Wild Animals Protection Ordinance (Cap.170)
 NT - Near Threatened in IUCN Red List Status
 PGC - Potential Global Concern by Fellowes et al (2002)

Table 4.6 Fish species and amphibians at Upper Lam Tsuen River

(T1- located at upper river channel sampling site to T4 - located at lower river Channel sampling site)

Species	Chinese name	Status	Sampling point	Post construction monitoring					Post construction monitoring					Post construction monitoring					Post construction monitoring					Post construction monitoring					Post construction monitoring					Post construction monitoring									
				Sep-14					Oct-14					Nov-14					Dec-14					Jan-15					Feb-15					Mar-15					Apr-15				
				Reference	T1	T2	T3	T4	Reference	T1	T2	T3	T4	Reference	T1	T2	T3	T4	Reference	T1	T2	T3	T4	Reference	T1	T2	T3	T4	Reference	T1	T2	T3	T4	Reference	T1	T2	T3	T4	Reference	T1	T2	T3	T4
Fish																																											
<i>Acrossocheilus parrellens</i>	側條光唇魚	P, PGC	R		++	++	++	+		++	++	++	+		++	++	++	++		++	++	++	++		++	++	++	++		++	++	++	++		++	++	++	++					
<i>Channa maculate</i>	斑鱧	NP	C																																								
<i>Cirrhina moliorella</i>	鯪魚	NP	C																																								
<i>Clarias fuscus</i>	胡子鯪	NP	C					+						+																													
<i>Cyprinus carpio var. viridiviolaceus</i>	錦鯉	NP	C																																								
<i>Gambusia affinis</i>	食蚊魚	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+						
<i>Limparhomaloptera disparis</i>	腹立鰍	NP	C	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+						
<i>Misgurnus anguillicaudatus</i>	泥鰍	NP	C	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+						
<i>Oreochromis niloticus</i>	尼羅口孵非鯽	NP	C	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+						
<i>Parazacco spilurus</i>	異鱧	V and	C	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+						
<i>Poecilia reticulata</i>	孔雀花魚	NP	VC																																								
<i>Pseudogastromyzon myersi</i>	麥氏擬腹吸鰍	NP	C	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+						
<i>Pterocryptis cochinchinensis</i>	黃鰲	NP	C	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+						
<i>Puntius semifasciolatus</i>	七星魚	NP	C	+	+	++	++	+	+	+	++	++	+	+	+	++	++	+	+	+	+	++	++	+	+	+	+	+	+	+	+	+	+	+	+	+	+						
<i>Rhinogobius spp.</i>	鰻虎魚	NP	C/UN/R	+	+	+	+	+	+	+	++	++	++	+	+	++	++	++	+	+	++	++	++	++	+	+	++	++	++	++	+	+	++	++	++	++							
<i>Schistura fasciolata</i>	橫紋南鰍	NP	C	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+						
<i>Xiphophorus hellerii</i>	劍尾魚	NP	C	+	+	++	++	+	+	+	++	++	+	+	+	++	++	+	+	+	+	++	++	+	+	+	+	+	+	+	+	+	+	+	+	+	+						
<i>Xiphophorus variatus</i>	雜色劍尾魚	NP	C																																								
<i>Zacco platypus</i>	寬鳍鱮	NP	C	+	++	++	+	+	+	++	++	+	+	+	++	++	+	+	+	+	++	++	+	+	+	+	++	++	++	++	+	+	++	++	++	++							
2x2m fish counting		No. of fish		20	30	30	20	20	30	40	40	30	30	50	70	70	60	60	60	60	50	50	60	60	60	50	60	60	60	40	50	60	60	60	40	40	50	55	50	40			
No. of species				11	13	14	15	13	11	13	14	15	12	11	13	14	13	11	11	13	14	14	11	10	11	12	13	10	10	11	12	14	10	10	13	13	14	11	13	12	14	15	11
Amphibian																																											
<i>Paramesotriton hongkongensis</i>	香港瘰螈	P (Cap 170, NT, PGC)	R	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+					
<i>Fejervarya limnocharis</i>	澤蛙	NP	VC																																								
No. of species				1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			

Note: NP – Not protected in Hong Kong
 “VC” – Very Common; “UC” – Uncommon; “C” – Common; “R” – Rare
 +, occurred; ++, common; +++, abundant/dominant Species in the the study arc
 -V – Listed as vulnerable in China Fish Red Data Book
 -Reference point was the sampling location outside the works area used to compare the with the data within works area.
 “Cap 170” - List in Wild Animals Protection Ordinance (Cap.170)
 “NT” - Near Treated in IUCN Red List Status
 “PGC”-Potential Golar Concern by Fellowes *et al* (2002)

Table 4.6 Fish species and amphibians at Upper Lam Tsuen River

(T1- located at upper river channel sampling site to T4 - located at lower river Channel sampling site)

Species	Chinese name	Status	Sampling point	Post construction monitoring					Post construction monitoring					Post construction monitoring					Post construction monitoring					Post construction monitoring					Post construction monitoring					Post construction monitoring														
				Feb-16					Mar-16					Apr-16					May-16					Jun-16					Jul-16					Aug-16					Sep-16					Oct-16				
				Reference	T1	T2	T3	T4	Reference	T1	T2	T3	T4	Reference	T1	T2	T3	T4	Reference	T1	T2	T3	T4	Reference	T1	T2	T3	T4	Reference	T1	T2	T3	T4	Reference	T1	T2	T3	T4	Reference	T1	T2	T3	T4					
Fish																																																
<i>Acrossocheilus parrellens</i>	側條光唇魚	P, PGC	R			+	+	++																																								
<i>Channa maculata</i>	斑鱧	NP	C																																													
<i>Cirrhina moliorella</i>	鯪魚	NP	C																																													
<i>Clarias fuscus</i>	胡子鯪	NP	C			+																																										
<i>Cyprinus carpio var. viridiviolaceus</i>	錦鯉	NP	C			+																																										
<i>Gambusia affinis</i>	食蚊魚	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+									
<i>Limniphomoloptera disparis</i>	擬單鰻	NP	C	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+									
<i>Misgurnus anguillicaudatus</i>	泥鰌	NP	C	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+									
<i>Oreochromis niloticus</i>	尼羅口孵非鯰	NP	C	+	+	++	++	++	++	+	+	++	++	++	++	+	+	++	++	++	++	+	+	++	++	++	++	+	+	++	++	++	++	++	++	++	++	++	++									
<i>Parazacco spilurus</i>	異鱧	V and	C	+		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+									
<i>Poecilia reticulata</i>	孔雀花魚	NP	VC			+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+									
<i>Pseudogastromyzon myersi</i>	麥氏擬頭吸鰻	NP	C	+	+																																											
<i>Pterocryptis cochinchinensis</i>	黃鰷	NP	C	+	+																																											
<i>Puntius semifasciolatus</i>	七星魚	NP	C	+	+	++	++	+	+	+	++	++	+	+	+	++	++	+	+	+	++	++	+	+	+	++	++	+	+	+	++	++	+	+	+	++	++	+	+									
<i>Rhinogobius spp.</i>	鰻虎魚	NP	C/UN/R	+	++	++	++	++	+	++	++	++	++	++	+	++	++	++	++	++	+	++	++	++	++	++	+	++	++	++	++	++	++	++	++	++	++	++	++	++								
<i>Schistura fasciolata</i>	橫紋南鰻	NP	C	+	++	++	++	++	+	++	++	++	++	++	+	++	++	++	++	++	+	++	++	++	++	++	+	++	++	++	++	++	++	++	++	++	++	++	++									
<i>Xiphophorus hellerii</i>	劍尾魚	NP	C	+	+	++	+	+	+	+	++	++	+	+	+	++	++	+	+	+	++	++	+	+	+	++	++	+	+	+	++	++	+	+	+	++	++	+	+									
<i>Xiphophorus variatus</i>	藍色劍尾魚	NP	C			+	+	+	+			+	+	+			+	+	+			+	+	+			+	+	+			+	+	+			+	+										
<i>Zacco platypus</i>	寬鱮	NP	C	+	+	++	++	++	+	+	++	++	++	++	+	+	++	++	++	++	+	+	++	++	++	++	+	+	++	++	++	++	++	++	++	++	++	++	++									
2x2m fish counting		No. of fish		65	55	55	55	40	60	60	60	55	40	45	45	45	40	30	45	25	25	20	15	40	30	25	25	20	30	20	15	20	25	20	15	15	15	25	25	20	20	15	22	25	25	25	20	20
No. of species				12	10	14	13	10	12	10	14	13	10	12	10	14	13	10	12	10	14	13	10	12	10	14	13	10	12	10	14	13	10	12	10	14	13	10	12	10	14	13	10	12	10	14	13	10
Amphibian																																																
<i>Paramesotriton hongkongensis</i>	香港瘰螈	P (Cap 170, NT, PGC)	R	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+		
<i>Fejervarya limnocharis</i>	澤蛙	NP	VC																																													
No. of species				1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Note: NP – Not protected in Hong Kong
 “VC” – Very Common; “UC” – Uncommon; “C” – Common; “R” – Rare
 +, occurred; ++, common; +++, abundant/dominant Species in the study arc
 -V – Listed as vulnerable in China Fish Red Data Book
 -Reference point was the sampling location outside the works area used to compare the with the data within works area.
 Cap 170 - List in Wild Animals Protection Ordinance (Cap.170)
 NT - Near Treated in IUCN Red List Status
 PGC-Potential Golar Concern by Fellowes *et al* (2002)

Table 4.6 Fish species and amphibians at Upper Lam Tsuen River

(T1- located at upper river channel sampling site to T4 - located at lower river Channel sampling site)

Species	Chinese name	Status	Sampling point	Post construction monitoring					Post construction monitoring					Post construction monitoring					Post construction monitoring					Post construction monitoring					
				Nov-16					Dec-16					Jan-17					Feb-17					Mar-17					
				Reference	T1	T2	T3	T4	Reference	T1	T2	T3	T4	Reference	T1	T2	T3	T4	Reference	T1	T2	T3	T4	Reference	T1	T2	T3	T4	
Fish																													
<i>Acrossocheilus parrellens</i>	副條光唇魚	P, PGC	R			+	+	++			+	+	++			+	+	++			+	+	++			+	+	++	
<i>Channa maculate</i>	斑鱧	NP	C																										
<i>Cirrhina moliorella</i>	鯪魚	NP	C																										
<i>Clarias fuscus</i>	胡子鯪	NP	C				+						+														+		
<i>Cyprinus carpio var. viridiviolaceus</i>	錦鯉	NP	C			+							+														+		
<i>Gambusia affinis</i>	食蚊魚	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
<i>Liniparhomaloptera disparis</i>	擬單鰻	NP	C	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
<i>Misgurnus anguillicaudatus</i>	泥鰍	NP	C	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
<i>Oreochromis niloticus</i>	尼羅口孵非鯽	NP	C	+	+	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++
<i>Parazacco spilurus</i>	異鱧	V and	C	+		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
<i>Poecilia reticulata</i>	孔雀花魚	NP	VC			+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
<i>Pseudogastromyzon myersi</i>	麥氏擬腹吸鰍	NP	C	+	+																								
<i>Pterocryptis cochinchinensis</i>	黃鰲	NP	C	+																									
<i>Puntius semifasciolatus</i>	七星魚	NP	C	+	+	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++
<i>Rhinogobius spp.</i>	鰻虎魚	NP	C/UN/R	+	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++
<i>Schistura fasciolata</i>	橫紋南鰍	NP	C	+	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++
<i>Xiphophorus hellerii</i>	劍尾魚	NP	C	+	+	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++
<i>Xiphophorus variatus</i>	雜色劍尾魚	NP	C			+	+	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	
<i>Zacco platypus</i>	寬鱮	NP	C	+	+	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	
2x2m fish counting		No. of fish		30	30	30	30	25	45	40	40	35	35	50	45	45	35	35	55	50	50	40	40	60	55	55	50	50	
No. of species				12	10	14	13	10	12	10	14	13	10	12	10	14	13	10	12	10	14	13	10	12	10	14	13	10	
Amphibian																													
<i>Paramesotriton hongkongensis</i>	香港瘰螈	P (Cap 170, NT, PGC)	R	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
<i>Fejervarya limnocharis</i>	澤蛙	NP	VC																										
No. of species				1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	

Note: NP – Not protected in Hong Kong
 “VC” – Very Common; “UC” – Uncommon; “C” – Common; “R” – Rare
 +, occurred; ++, common; +++, abundant/dominant Species in the the study arc
 -V – Listed as vulnerable in China Fish Red Data Book
 -Reference point was the sampling location outside the works area used to compare the with the data within works area.
 “Cap 170” - List in Wild Animals Protection Ordinance (Cap.170)
 “NT” - Near Treated in IUCN Red List Status
 “PGC”-Potential Golar Concern by Fellowes *et al* (2002)

Table 4.6 Fish species and amphibians at Upper Lam Tsuen River
 (1+ - located at upper river channel sampling site to 14 - located at lower river channel sampling site)

Species	Chinese name	Status	Sampling point	Post construction monitoring					Post construction monitoring				
				Apr-17					May-17				
				Reference	T1	T2	T3	T4	Reference	T1	T2	T3	T4
Fish													
<i>Acrossocheilus parallens</i>	側條光唇魚	P, PGC	R			+	+	++			+	+	++
<i>Channa maculate</i>	斑鱧	NP	C										
<i>Cirrhina molitorella</i>	鯪魚	NP	C										
<i>Clarias fuscus</i>	胡子鯪	NP	C				+					+	
<i>Cyprinus carpio var.</i>	錦鯉	NP	C			+					+		
<i>Gambusia affinis</i>	食蚊魚	NP	VC	+	+	+	+	+	+	+	+	+	+
<i>Liniparhomaloptera disparis</i>	擬平鰻	NP	C	+	+	+	+		+	+	+	+	
<i>Misgurnus anguillicaudatus</i>	泥鰻	NP	C	+	+	+	+	+	+	+	+	+	+
<i>Oreochromis niloticus</i>	尼羅口孵非鯽	NP	C	+	+	++	++	++	+	+	++	++	++
<i>Parazacco spilurus</i>	異鱧	V and NP	C	+		+	+	+	+		+	+	+
<i>Poecilia reticulata</i>	孔雀花魚蔴	NP	VC			+	+	+			+	+	+
<i>Pseudogastromyzon myersi</i>	麥氏擬腹吸鰻	NP	C	+	+				+	+			
<i>Pterocryptis cochinchinensis</i>	黃鰷	NP	C	+					+				
<i>Puntius semifasciolatus</i>	七星魚	NP	C	+	+	++	++	+	+	+	++	++	+
<i>Rhinogobius spp.</i>	鰻虎魚	NP	C/UNR	+	++	++	++	++	+	++	++	++	++
<i>Schistura fasciolata</i>	橫紋南鰻	NP	C	+	++	++			+	++	++		
<i>Xiphophorus hellerii</i>	劍尾魚	NP	C	+	+	++	+	+	+	+	++	+	+
<i>Xiphophorus variatus</i>	雜色劍尾魚	NP	C			+	+				+	+	
<i>Zacco platypus</i>	寬鰭鱮	NP	C	+	+	++	++	++	+	+	++	++	++
2x2m fish counting		No. of fish		55	50	50	45	40	50	40	40	40	30
No. of species				12	10	14	13	10	12	10	14	13	10
Amphibian													
<i>Paramesotriton hongkongensis</i>	香港澤蛙	P (Cap 170, NT)	R	+	+	+	+	+	+	+	+	+	+
<i>Fejervarya limnocharis</i>	澤蛙	NP	VC										
No. of species				1	1	1	1	1	1	1	1	1	1

Note: NP – Not protected in Hong Kong
 “VC” – Very Common; “UC” – Uncommon; “C” - Common; “R” - Rare
 +, occurred; ++, common; +++, abundant/dominant Species in the the study area
 -V – Listed as vulnerable in China Fish Red Data Book
 -reference point was the sampling location outside the works area used to compare the with the data within works area
 “Cap 170” - List in Wild Animals Protection Ordinance (Cap.170)
 “NT” - Near Threatened in IUCN Red List Status
 “PGC”-Potential Global Concern by Fellowes *et al* (2002)

Table 4.7 Abotic data for Upper Lam Tsuen River

(T1 - located at upper river channel sampling site to
T4 - located at lower river Channel sampling site)

Parameter / date	Baseline monitoring	Impact monitoring				Impact monitoring				Impact monitoring				Impact monitoring				Impact monitoring				Impact monitoring				Impact monitoring							
	8-Aug	Jan-09				Jul-09				Jan-10				Jul-10				Jan-11				Jul-11				Jan-12				Jul-12			
Replicate		T1	T2	T3	T4	T1	T2	T3	T4	T1	T2	T3	T4	T1	T2	T3	T4	T1	T2	T3	T4	T1	T2	T3	T4	T1	T2	T3	T4	T1	T2	T3	T4
DO (mg/L)	9.2	9.8	9.9	9.4	9.1	6.4	6.4	6.5	6.8	9.7	9.5	9.5	9.3	8.3	8.5	8.5	8.7	9.6	9.5	9.5	9.1	9.5	9.6	9.4	9.3	9.4	9.2	9.4	9.2	8.2	8	7.8	7.3
pH	7.49	7.24	7.36	7.53	7.44	7.1	7.25	7	7.05	7.9	8.1	8.1	8.2	7.4	7.5	7.3	7.4	7.1	7.2	7.2	7.1	7.3	7.1	7.1	7.1	7.2	6.9	6.8	6.7	6.8	7.1	7.3	7.6
Nitrate (mg N/L)	0.36	0.79	1.1	1.2	1.2	0.31	0.48	0.48	0.59	0.56	1.11	1.13	1.33	0.1	0.2	0.2	0.3	0.1	0.2	0.4	0.5	0.1	0.2	0.3	0.45	0.2	0.3	0.5	0.6	0.13	0.67	0.62	0.82
Ammonia (mg/L)	<0.01	PO4-P (µg P/L): <100				0.02	0.02	0.02	0.03	0.01	0.16	0.17	0.07	0.2	0.4	0.2	0.2	0.05	0.07	0.07	0.1	0.06	0.05	0.08	0.1	0.04	0.05	0.06	0.2	0.01	0.02	0.04	0.03
Salinity (ppt)	<0.1	<0.1	0.1	0.1	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Conductivity (µS/cm)	60	80	100	120	120	45	51	52	63	62	96	98	114	84	100	460	54	90	87	93	120	93	90	90	100	92	84	96	110	41	38	73	86
BOD (mg/L)	<2	<2	<2	<2	3	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Water flow at pool (m/s)	0.1-0.3	0.01-0.2				0.01-0.2				0.01-0.2				0.01-0.2				0.01-0.2				0.01-0.2				0.01-0.2							
Water flow at riffle (m/s)	0.4-0.7	0.2-0.5				0.2-0.5				0.2-0.6				0.2-0.6				0.2-0.6				0.2-0.6				0.2-0.6							
Sand (%)	15	15	10	10	10	10	10	10	15	8	8	8	15	8	8	8	15	8	8	8	15	8	8	8	15	10	15	10	10	10	10	10	10
Stone (%)	80	80	88	88	88	88	88	88	70	90	90	90	70	90	90	90	70	90	90	90	70	90	90	90	70	80	70	80	70	60	60	60	60
Mud (%)	5	5	2	2	2	2	2	2	5	2	2	2	5	2	2	2	5	2	2	2	5	2	2	2	5	10	15	10	20	30	30	30	30

Table 4.7 Abotic data for Upper Lam Tsuen River

(T1- located at upper river channel sampling site to
T4 - located at lower river Channel sampling site)

Parameter / date	Impact monitoring				Impact monitoring				Post construction monitoring				Post construction monitoring				Post construction monitoring				Post construction monitoring				Post construction monitoring				Post construction monitoring				Post construction monitoring											
	Aug-13				Dec-13				Jan-14				Feb-14				Mar-14				Apr-14				May-14				Jun-14				Jul-14				Aug-14							
	T1	T2	T3	T4	T1	T2	T3	T4	T1	T2	T3	T4	T1	T2	T3	T4	T1	T2	T3	T4	T1	T2	T3	T4	T1	T2	T3	T4	T1	T2	T3	T4	T1	T2	T3	T4	T1	T2	T3	T4				
Replicate																																												
DO (mg/L)	8.9	8.5	8.7	8.8	9.3	8.6	8.8	8.7	9.1	9.0	8.6	8.5	7.8	8.7	9.8	9.8	7.5	7.8	8.2	8.1	7.7	7.6	7.8	8.0	8.2	7.8	8.1	8.2	7.6	7.8	7.4	7.2	7.6	7.2	7.6	7.5	7.6	7.4	7.3	7.6				
pH	6.5	6.8	6.8	7.1	6.2	6.9	7.1	7.1	6.2	6.9	7.1	7.1	8.2	8.5	8	7.8	8.3	8.2	7.6	7.2	7.6	7.8	8.2	7.8	7.7	7.8	7.9	8.2	7.6	7.8	7.8	8.1	7.6	7.7	7.8	8	7.8	7.5	7.6	7.8				
Nitrate (mg N/L)	0.74	0.72	0.83	0.79	0.48	0.57	0.77	0.89	0.9	0.8	1.3	1.26	1.3	1.8	1.6	2.1	1.2	1.4	1.1	1.3	1.5	1.5	1.3	1.2	0.9	0.7	0.6	0.7	0.8	0.8	0.9	0.9	0.8	1.1	1.1	0.8	1.2	1.1	0.9	1.1				
Ammonia (mg/L)	0.02	0.03	0.03	0.04	<0.01	<0.01	<0.01	<0.01	0.04	0.1	0.12	0.15	0.05	0.04	0.1	0.12	0.06	0.04	0.04	0.1	0.1	0.1	0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1				
Salinity (ppt)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.02	0.02	0.03	0.03	0.01	0.02	0.03	0.03	0	0	0	0	0	0	0	0	0	0	0	0
Conductivity (µS/cm)	67	77	74	75	62	64	90	110	72	78	88	108	78	87	118	119	120	123	125	123	96	114	120	122	82	80	72	66	39	58	69	70	43	85	72	75	75	78	82	86				
BOD (mg/L)	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2				
Water flow at pool (m/s)	0.01-0.2				0.01-0.2				0.01-0.2				0.01-0.2				0.01-0.2				0.01-0.2				0.03-0.2				0.03-0.2				0.03-0.2											
Water flow at riffle (m/s)	0.2-0.6				0.2-0.6				0.2-0.6				0.2-0.6				0.2-0.6				0.2-0.6				0.2-0.6				0.2-0.6				0.2-0.6											
Sand (%)	10	10	10	10	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	10	5	5	5	10	5	5	5	10	5	5	5	10	5	5	5	10				
Stone (%)	75	75	75	75	90	85	85	85	90	85	85	85	90	85	85	85	90	85	85	80	90	85	85	75	90	85	85	75	93	90	90	75	93	90	90	75	93	90	90	75				
Mud (%)	15	15	15	15	5	10	10	10	5	10	10	10	5	10	10	10	5	10	10	15	5	10	10	15	5	10	10	15	2	5	5	15	2	5	5	15	2	5	2	15				

Agreement No. CE65/2013(EP)
Post-Construction Ecological Monitoring of River
Improvement Work in Upper Lam Tsuen River, She Shan
River and Upper Tai Po River – Investigation
Post-Construction Ecological Monitoring Report (No.41)
She Shan River

May 2017



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22 June, 2017

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22 June, 2017

Ecology Team: China Hong Kong Ecology Consultants

Post-Construction Ecological Monitoring of River Improvement Work in Upper Lam Tsuen River, She Shan River and Upper Tai Po River – Investigation

Agreement No. CE65/2013(EP Post-Construction Ecological Monitoring Report (No.41) She Shan River

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1 Introduction

- 1.1 Agreement No. CE65/2013(EP) Post-Construction Ecological Monitoring of River Improvement Work in Upper Lam Tsuen River, She Shan River and Upper Tai Po River – Investigation required a post-construction ecological monitoring programme when the project completed. The collected data are mainly used to assess ecological recovery process and effectiveness of ecological migration proposed and enforced during the construction period.
- 1.2 The scope of the ecological monitoring was detailed in EM & A Manual of the project. In brief, the survey aimed to collect data on abiotic factors such as water quality, substratum characteristics, water flow as well as flora and fauna.
- 1.3 China Hong Kong Ecology Consultants Ltd. was committed by Allied Environmental Consultants Ltd (AEC) to undertake the ecological monitoring tasks for the project from December 2014.
- 1.4 This is the number 41 post-construction ecological monitoring report for the project conducted **on 17th of May 2017**. It contains the following subsections:
 - Summary of major points
 - Monitoring Methods and Results
 - Summary and Comments

2 Summary of Major Points

- Field ecological monitoring was undertaken **on 17th of May 2017**;
- Fauna and flora along the drainage project sections are in a process of re-establishing or restoration;
- Fish's abundance decreased in this month ;
- Bird diversity and abundance were in natural fluctuation;
- Odonata abundance was increasing; and
- Hong Kong Newt was not found during the survey.

3 Monitoring Methodology

3.1 Riparian Vegetation

Riparian vegetation, including aquatic and emergent, was sampled using line transects along the affected river channel and riparian habitat. Species, relative abundance and average heights were recorded. Vegetation survey was conducted at three selected belt transects located at the upper (T1), middle (T2) and lower portion (T3) of the river channel respectively (**Figure 1**). The belt transects was run across the river channel in order to collect quantitative data of vegetation, e.g., species inventory, height, percentage cover. Qualitative data of plants was collected by recording plant species along line transect, e.g., species inventory, relative abundance. Nomenclature and protection status of the species has followed those documented in the Lai *et al.* (2004) and Hong Kong Herbarium (2015).

3 Avifauna

Avifauna survey was conducted during the post construction monitoring period. Special attention was given to those stream channel area which birds used as feeding and foraging habitat. Avifauna surveys were undertaken in the early morning plus species recorded in the rest of the day when conducting other taxonomic groups (benthic, fish, insect) monitoring. Numerical abundance was recorded at fixed count points within a radius of 30 to 50m according to landscape feature and visual penetration extent. The duration of the point count of birds was standardized for 10 minutes at each location in order to collect comparable data. Transect count along accessible section of river channel were used in order to collect qualitative data. Binoculars and digital camera were the main items of equipment used. Nomenclature and protection status of the species has followed in the AFCD website (www.hkbiodiversity.net) and Carey *et al.* (2001).

The point count was conducted at three locations located at the lower (T3), middle (T2) and upper (T1) portion of the river channel respectively. The point count and survey transect locations for the bird survey and sampling sites for surveys of other faunal groups and flora were presented in **Figure 1**.

3.3 Adult Odonata Survey

Adult Odonata survey was conducted along transects (**Figure 1**). Binoculars, digital camera and hand net were utilized to aid identification. Numerical abundance, species identity and other notable behavior were recorded. Nomenclature and protection status of the species has followed those documented in the AFCD website (www.hkbiodiversity.net), Wilson *et al.* (2004) and Tam *et al.* (2011). Adult Odonata survey was conducted along line transects in parallel with river channel within the works area where access was permitted.

3.4 Aquatic Macro-invertebrates

Macro-invertebrates in the riverbed were surveyed. Four sampling sites were selected to collect necessary macro-invertebrate fauna for ecological monitoring information, which covered upper (T1), middle (T2) and lower (T3) sections of the river respectively, as well as reference site (**Figure 1**). Five replicates were taken at each sampling point and pool together for further sample process. Kick sampling and hand netting were the survey methodologies for stream organisms. Dissection microscope and digital camera were used to aid identification and enumeration. Numerical abundance, species identity was recorded. Nomenclature and protection status of the species has followed those documented in the AFCD website (www.hkbiodiversity.net), and other literatures such as Dudgeon (1994).

3.5 Fish Population and Hong Kong Newt

Fish community at the specified river channel was monitored by live trapping, hand netting and direct observation methods. Hong Kong newt was surveyed by direct observation and hand netting as well.

Sampling was conducted at four proposed sampling locations at upper (T1), middle (T2), lower (T3) sections and reference site respectively. Those

sampling sites covered major type of stream habitats, e.g. river pool and riffle (**Figure 1**). The number of the observed fish was estimated and recorded. Nomenclature and protection status of the species has followed those documented in the AFCD website (www.hkbiobiodiversity.net) and Lee *et al.* (2004).

3.6 Abiotic Data Collection

3.6.1 Water Quality Monitoring

Dissolved oxygen level, pH value, conductivity, salinity, BOD and nutrient level (nitrate and ammonium) were sampled and analyzed by conventional methods in situ or in laboratory. The instruments for measuring dissolved oxygen level, pH value, conductivity, salinity were model: DO-5510, AZ8685, AZ8361 and AZ8374 respectively. All the instruments were calculated every monitoring month according to the operation manuals in order to obtain the precise result. BOD test took 5 days to complete within darkness incubator with stable temperature at 20°C and was performed using model: DO-5510 for measuring dissolved oxygen. Nutrient levels including nitrate and ammonia were performed in laboratory by applying the In-house method SOP056 (FIA) and SOP057 (FIA) respectively.

3.6.2 Sediment Characteristics

Sediment/substrate characteristics were recorded of sediment cover in percentage e.g. mud, sand, rock, boulder and cemented bottom in the stream bed at sampling sites.

3.6.3 Water Flow

Water flow rates in river channel were measured by recording the time taken for a floating object (e.g. floating ball) in a measured distance. The sampling locations for surveys were presented in **Figure 1**.

4 Monitoring Results

4.1 Vegetation

In total, 79 flora species was recorded within the survey transects along the river course. The recorded floras were generally common wetland species. The height of the dominated riparian grass and herb species were in a range from 0.2m to 0.7m as observed along survey transect. Dominant flora species were shown in the **Table 4.1** marked with relative abundance sign “+++”. Vegetation has partially covered the river bed in middle and lower sections (Photos 1-2) and generally covered the riverbed and riparian habitat in upper sections (Photo 3). Aquatic plants *Brachiaria mutica* was the most abundant plants found along the river channel. *Mucuna championii* and *Cibotium barometz* are classified as endangered and vulnerable in China respectively, and were recorded in the woodland adjacent to She Shan River. *Cibotium barometz* is also classified as category II in wild plant under state protection. Results of vegetation survey and belt transect survey were presented in **Table 4.1** and **Table 4.2**. **Figure 1** shows the transect line for the flora surveys.

4.2 Fauna

4.2.1 Avifauna

An avifauna survey was undertaken along survey transects and at three selected point count locations. In total, 22 species of birds were recorded during the bird surveys within project area. 5 recorded species were wetland dependant birds and observed foraging in the river channel including *Egretta garzetta*, *Ardeola bacchus*, *Motacilla cinerea*, *Amaurornis phoenicurus* and *Motacilla alba*. The dominant species of the river was a common species *Pycnonotus jocosus*. All the birds in Hong Kong are under protection of Wild Animals Protection Ordinance (Cap. 170). Some of wetland dependent species with conservation interest including *Ardeola bacchus* and *Egretta garzetta* were observed foraging in the river. *Ardeola bacchus* and *Egretta garzetta* are considered as Regional Concern by Fellowes *et al.* (2002). Call of *Centropus sinensis* was heard from the adjacent habitat during the survey period, this species is considered as vulnerable in China Red Data Book Status. Also, a raptor *Milvus lineatus* was observed hovering above the river for few minutes. This species is considered as Regional Concern by Fellowes *et al.* (2002) and protected under Endangered Species of Animals and Plants Ordinance (Cap. 586). Except foraging and roosting behaviour of some birds were observed, no other remarkable behaviour was noticed. Transect and Point Count locations were shown on **Figure 1**. Result of bird survey was presented in the **Table 4.3**.

4.2.2 Adult Odonata Survey

Odonata survey was performed and a list of recorded odonata species at She Shan River is shown in **Table 4.4**. The number of odonata is higher than the abundance recorded in dry season. Most of the odonata species in Hong Kong has the peak emergence from spring to late summer. It is expected that number of odonata will keep increasing in the following months during wet season (Wilson *et al.*, 2004 & Tam *et al.*, 2011). A total of 11 species was recorded, those recorded species were mostly common species in Hong Kong. The result of this month was similar to approximate period of last year. Mating behavior was noticed during the survey. Sampling location was shown on **Figure 1**.

4.2.3 Aquatic Macro-invertebrates

Survey of aquatic macro-invertebrates was carried out (Photo 4). The river benthic fauna collected was mainly comprised of insects, mollusks and crustaceans (Photos 5&6). Details of recorded benthic fauna refer to **Table 4.5**. Sampling location was shown on **Figure 1**.

4.2.4 Hong Kong Newt

Survey of Hong Kong Newt was performed (Photo 4). Hong Know Newt was not recorded in this month. Hong Kong Newt is listed in Wild Animals Protection Ordinance (Cap. 170) and classified as “Near Threatened” under IUCN Red List Status and as “Potential Global Concern” by Fellowes *et al.* (2002). Record of Hong Kong Newts can be referred to **Table 4.6**.

4.2.5 Fish Fauna

Fish surveys were performed at She Shan River and total 12 species of freshwater fish were recorded. Native fish *Zacco platypus* and *Oreochromis niloticus* were abundant species dominating in the river channel. Among the recorded fish, *Parazacco spilurus* is classified as “Vulnerable” in Red China Data Book, it was commonly observed along the river with low abundance. The current fish’s abundance decreased comparing with last month due to disturbance from flooding. Also, the increased water velocity made observation more difficult during the survey. Details of recorded of fish fauna refers to **Table 4.6**. Sampling location was shown on **Figure 1**.

4.3 **Abiotic Data**

Data on water quality and major stream hydrological feature (water flow and substratum) of the stream were collected and are presented in the **Table 4.7**.

Generally, the water was not polluted and nutrient levels were low even though there were cultivation activities observed nearby the river. Results of water test are presented in the **Table 4.7**.

The river substratum was comprised of over 30-80% stones or rocks in large proportion of the river sections with slow water flow (up to 0.2m/second at pool and 0.5m/second at riffle).

5 **Summary and Commentary**

Ecological monitoring was carried out in current months and relevant biotic and abiotic data were collected according to project specification and EM & A Manual. Hong Kong New was not recorded during the survey. More odonata were observed in this month due to seasonality. Fish’s abundance decreased comparing to the record of last month. The rest of fauna was in a natural fluctuation.

Aquatic plants and riparian vegetation were generally established at new drainage channel. Vegetation has generally covered the riverbed and gabion in upper section and partially covered the rest portion of the river.

Water was not polluted and nutrient levels were low to moderate.

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FIGURE

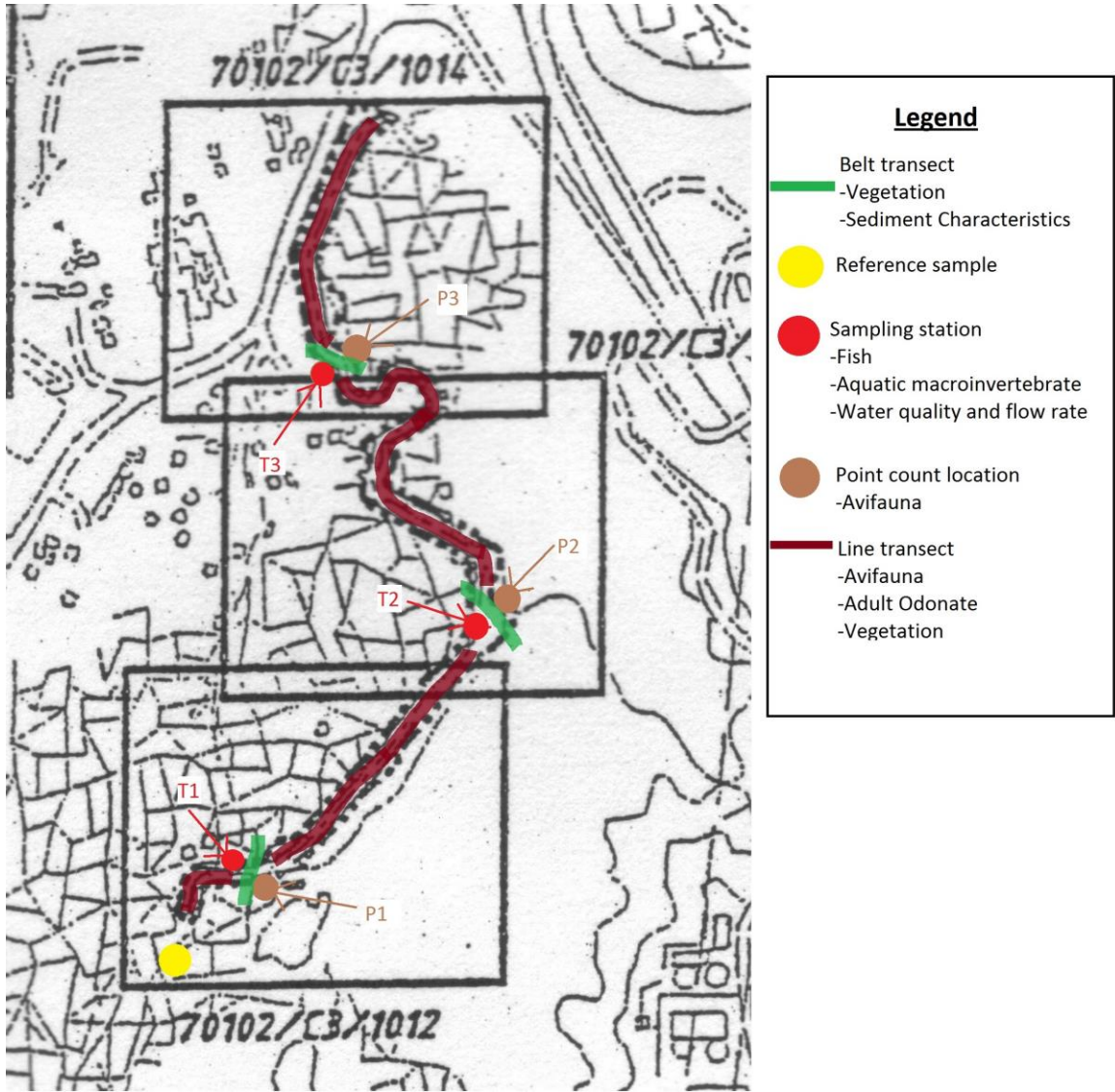


Figure 1. Sampling Location of Ecological Survey and Monitoring at She Shan River, Tai Po.

PHOTOS



Photo 1: General view of the river habitat
(Lower section)



Photo 2: General view of the river habitat
(Middle section)



Photo 3 : General view of the river habitat
(Upper section)



Photo 4 :Kick Sampling



Photo 5: Aquatic sample



Photo 6: Aquatic sample

TABLE

Table 4.2. Flora species recorded from belt transect survey at the She Shan River

(T1 - Upper stream section, T2 - middle stream section and T3 - Lower stream section)

Family	Species	Chinese name	Baseline monitoring						Impact monitoring			Impact monitoring			Impact monitoring			Impact monitoring			Impact monitoring			Impact monitoring			Impact monitoring				
			Jul-08		Aug-08		Jan-09			Jul-09			Jan-10			Jul-10			Jan-11			Jul-11			Jan-12			Jul-12			
			P1	P3	P1	P3	T1	T2	T3	T1	T2	T3	T1	T2	T3	T1	T2	T3	T1	T2	T3	T1	T2	T3	T1	T2	T3	T1	T2	T3	
Commelinaceae	<i>Commelina diffusa</i>	節節草		0.2 20		10 6	0.2 2	0.1 5	0.2 5						0.5 50	0.5 50	0.2 45	0.2 10			0.2 5	0.8 40			0.3 25	0.3 40		0.3 2	0.3 30	0.3 20	
Poaceae	<i>Panicum repens</i>	結節草	0.3 5						0.2 5			0.6 5			0.6 25						0.3 30					0.5 20					
Asteraceae	<i>Mikania micrantha</i>	蕨甘菊				0.2 7									0.2 5						1 20	0.3 5				0.3 30					
Brassicaceae	<i>Nasturtium officinale</i>	西洋菜																													
Moraceae	<i>Ficus microcarpa</i>	細果榕		0.7 5		0.6 7																									
Moraceae	<i>Ficus hispida</i>	對果榕		3 10		3 10																									
Poaceae	<i>Microstegium ciliatum</i>	剛秀竹	0.5 5		0.5 3										1.5 30											1 45	0.8 5			0.8 30	
Fabaceae	<i>Pueraria lobata</i>	野葛		0.3 5	0.5 3	0.3 5		0.2 5	0.2 5																						
Araceae	<i>Colocasia esculenta</i>	芋				0.2 5																									
Urticaceae	<i>Boehmeria nivea</i>	芋麻	1.5 30		2 7										2 5																
Asteraceae	<i>Bidens alba</i>	白花鬼針草												0.3 5	1 5						0.5 2										
Poaceae	<i>Pennisetum purpureum</i>	象草	3 50	1 60	3 80	2 60				4 40																1.5 15					
Poaceae	<i>Coxis lacryma-jobi</i>	薏苡												1.5 20																	
Amaranthaceae	<i>Alternanthera philoxeroides</i>	空心蓮子草	0.2 10		0.2 7									0.3 20																	
Poaceae	<i>Panicum maximum</i>	大黍					0.5 5								0.4 5		1.5 5														
Moraceae	<i>Broussonetia papyrifera</i>	構樹								6 5																					
Polygonaceae	<i>Polygonum chinense</i>	火炭母					0.1 10																								
Onagraceae	<i>Ludwigia hyssopifolia</i>	草龍													0.4 5																
Cyperaceae	<i>Cyperus sp.</i>	莎草													0.5 5																1 5
Poaceae	<i>Miscanthus floridulus</i>	五節草															1.5 5														
Poaceae	<i>Brachiaria mutica</i>	巴拉草																													
Blechnaceae	<i>Blechnum orientale</i>	烏毛蕨																													
Poaceae	<i>Pennisetum alopecuroides</i>	狼尾草																													
Araceae	<i>Alocasia macrorrhizos</i>	海芋																													
Lemnaceae	<i>Lemna minor</i>	浮萍																													
Polygonaceae	<i>Polygonum hydriopiper</i>	水蓼																													
Cyperaceae	<i>Cyperus involucreatus</i>	蘆花草																													
Onagraceae	<i>Ludwigia erecta</i>	美洲水丁香																													
Convolvulaceae	<i>Ipomoea calrica</i>	五爪金龍																													
Bare Ground							98	75	30	##	95	10	15	70	##	80	15	25	15	40	93	30	10	##	3	15	100	93	20	50	

P1 -- Point count location 1; P3 -- Point count location 3

Table 4.2. Flora species recorded from belt transect survey at the She Shan River

(T1 - Upper stream section, T2 - middle stream section and T3 - Lower stream section)

Family	Species	Chinese name	Post construction monitoring						Post construction monitoring						Post construction monitoring						Post construction monitoring							
			Mar-16		Apr-16		May-16		Jun-16		Mar-16		Apr-16		May-16		Jun-16		Mar-16		Apr-16		May-16		Jun-16			
			T1	T2	T3	T1	T2	T3	T1	T2	T3	T1	T2	T3	T1	T2	T3	T1	T2	T3	T1	T2	T3	T1	T2	T3		
Commelinaceae	<i>Commelina diffusa</i>	節節草		0.3	5	0.2	5		0.3	10	0.2	5		0.3	5	0.2	8			0.3	5	0.2	8		0.3	5	0.2	8
Poaceae	<i>Panicum repens</i>	結節草	0.5	10	0.5	5		0.5	10	0.5	10		0.5	10	0.5	8		0.5	10	0.5	8		0.5	10	0.5	8		
Asteraceae	<i>Mikania micrantha</i>	蕨甘菊			0.3	10				0.3	10				0.3	8					0.3	8				0.3	8	
Brassicaceae	<i>Nasturtium officinale</i>	西洋菜																										
Moraceae	<i>Ficus microcarpa</i>	細果榕																										
Moraceae	<i>Ficus hispida</i>	對果榕																										
Poaceae	<i>Microstegium ciliatum</i>	剛秀竹																										
Fabaceae	<i>Pueraria lobata</i>	野葛																										
Araceae	<i>Colocasia esculenta</i>	芋																										
Urticaceae	<i>Boehmeria nivea</i>	芋麻																										
Asteraceae	<i>Bidens alba</i>	白花鬼針草	1	35				1	35					1	15					1	15							
Poaceae	<i>Pennisetum purpureum</i>	象草																										
Poaceae	<i>Coxis lacryma-jobi</i>	薏苡	1	2				1	2					1	10					1	10							
Amaranthaceae	<i>Alternanthera philoxeroides</i>	空心蓮子草																										
Poaceae	<i>Panicum maximum</i>	大黍																										
Moraceae	<i>Broussonetia papyrifera</i>	構樹																										
Polygonaceae	<i>Polygonum chinense</i>	火炭母																										
Onagraceae	<i>Ludwigia hyssopifolia</i>	草龍																										
Cyperaceae	<i>Cyperus sp.</i>	莎草																										
Poaceae	<i>Miscanthus floridulus</i>	五節草																										
Poaceae	<i>Brachiaria mutica</i>	巴拉草	0.3	15	1	5	1	5	0.3	15	1	5	1	5	0.3	15	1	5	1	10	0.3	15	1	5	1	5	1	10
Blechnaceae	<i>Blechnum orientale</i>	烏毛蕨																										
Poaceae	<i>Pennisetum alopecuroides</i>	鵝尾草																										
Araceae	<i>Alocasia macrorrhizos</i>	海芋																										
Lemnaceae	<i>Lemna minor</i>	浮萍																										
Polygonaceae	<i>Polygonum hydropiper</i>	水蔥																										
Cyperaceae	<i>Cyperus involucreatus</i>	羅漢草		1.2	5	0.4	2		1.2	5	0.4	2		1.2	5	0.4	5			1.2	5	0.4	5		1.2	5	0.4	5
Onagraceae	<i>Ludwigia erecta</i>	美洲水丁香				0.3	5				0.3	5				0.3	5					0.3	5				0.3	5
Convolvulaceae	<i>Ipomoea calrica</i>	五爪金龍		0.3	5				0.3	5				0.3	5					0.3	5				0.3	5		
Bare Ground				38		70		83	38		60		83	50		69		72	50		69		72		50		69	72

P1 - Point count location 1; P3 - Point count location 3

Table 4.2 (Continued). Flora species recorded from belt transect survey at the She Shan River

(T1- Upper stream section, T2 - middle stream section and T3 - Lower stream section)

Family	Species	Stream Transect	Post construction monitoring			Post construction monitoring			Post construction monitoring			Post construction monitoring			Post construction monitoring			Post construction monitoring			Post construction monitoring																			
			Jul-16			Aug-16			Sep-16			Oct-16			Nov-16			Dec-16			Jan-17																			
			T1	T2	T3	T1	T2	T3	T1	T2	T3	T1	T2	T3	T1	T2	T3	T1	T2	T3	T1	T2	T3																	
Chinese name	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%																		
Commelinaceae	<i>Commelina diffusa</i>	通靈草																																						
Poaceae	<i>Panicum repens</i>	結草		0.3	5	0.2	8		0.3	5	0.2	8		0.5	15	0.3	8		0.5	15	0.5	8		0.6	15	0.6	8													
Asteraceae	<i>Mikania micrantha</i>	燕甘菊																																						
Brassicaceae	<i>Nasturtium officinale</i>	西洋菜					0.5	3	0.5	5																														
Moraceae	<i>Ficus microcarpa</i>	細葉榕		0.3	5				0.3	5																														
Moraceae	<i>Ficus hispida</i>	對葉榕																																						
Poaceae	<i>Microstegium ciliatum</i>	剛秀竹		0.3	5	0.3	15		0.3	5	0.3	15		0.4	10	0.4	15		0.5	10	0.5	15		0.6	10	0.5	15		0.1	10		0.2	10							
Fabaceae	<i>Pueraria lobata</i>	野葛																																						
Araceae	<i>Colocasia esculenta</i>	芋																																						
Urticaceae	<i>Boehmeria nivea</i>	芋麻																																						
Asteraceae	<i>Bidens alba</i>	白花鬼針草																																						
Poaceae	<i>Pennisetum purpureum</i>	象草	1	15			1	15					1.3	15					1.4	15			1.5	15																
Poaceae	<i>Coxia lucryma-jobi</i>	蕨草																																						
Amaranthaceae	<i>Amaranthus phytolacroides</i>	空心蕒子草	1	10			1	10					1	10					1.1	10			0.1	10					0.2	10										
Poaceae	<i>Panicum maximum</i>	大黍																																						
Moraceae	<i>Broussonetia papyrifera</i>	楮樹																																						
Polygonaceae	<i>Polygonum chinense</i>	水銀母																																						
Onagraceae	<i>Ludwigia hyssopifolia</i>	碧錦																																						
Cyperaceae	<i>Cyperus sp.</i>	莎草																																						
Poaceae	<i>Miscanthus floridulus</i>	五節草																																						
Poaceae	<i>Brachiaria nutica</i>	巴拉草		0.4	10	0.5	25		0.4	15	0.5	20		0.4	15	0.5	20		0.5	15	0.5	20		0.6	15	0.6	20		0.1	15	0.1	15	0.1	20	0.2	15	0.2	15	0.2	20
Blechnaceae	<i>Blechnum orientale</i>	烏毛蕨	0.3	15			0.3	15				0.3	15				0.4	15		1	10		1	10		0.5	15		1	10		0.1	15	0.1	10	0.1	10	0.1	10	
Poaceae	<i>Pennisetum alopecuroides</i>	狗尾草																																						
Araceae	<i>Alocasia macrorrhizos</i>	海芋																																						
Lemnaceae	<i>Lemna minor</i>	浮萍																																						
Polygonaceae	<i>Polygonum hydropiper</i>	水蓼																																						
Cyperaceae	<i>Cyperus involucreatus</i>	風車草																																						
Onagraceae	<i>Ludwigia erecta</i>	萊洲水丁香		0.2	5	0.3	5		0.2	5	0.3	5		0.2	5	0.3	5		0.2	5	0.3	5		0.3	5	0.4	5		0.1	5	0.1	5		0.2	5	0.2	5			
Convolvulaceae	<i>Ipomoea cairica</i>	五爪金龍		0.3	5				0.3	5				0.3	5				0.3	5			0.4	5		0.4	5		0.4	5		0.5	5		0.5	5				
Bare Gound				60		65		37		57		50		42		60		45		42		60		45		42		60		45		42		75		60		65		

P1 - Point count location 1; P3 - Point count location 3

Table 4.2 (Continous). Flora species recorded from belt transect survey at the She Shan River

(T1- Upper stream section, T2 - middle stream section and T3 - Lower stream section)

Family	Species	Stream Transect	Post construction monitoring						Post construction monitoring						Post construction monitoring						Post construction monitoring					
			Feb-17						Mar-17						Apr-17						May-17					
			T1		T2		T3		T1		T2		T3		T1		T2		T3		T1		T2		T3	
Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%			
Commelinaceae	<i>Commelina diffusa</i>	龍眼草																								
Poaceae	<i>Panicum repens</i>	結骨草																								
Asteraceae	<i>Mikania micrantha</i>	燕甘菊																								
Brassicaceae	<i>Nasturtium officinale</i>	西洋菜																								
Moraceae	<i>Ficus microcarpa</i>	細葉榕																								
Moraceae	<i>Ficus hispida</i>	對葉榕																								
Poaceae	<i>Microstegium ciliatum</i>	剛秀竹		0.3	10					0.4	12					0.5	15	0.3	10				0.7	15	0.4	10
Fabaceae	<i>Pueraria lobata</i>	野葛																								
Araceae	<i>Colocasia esculenta</i>	芋																								
Urticaceae	<i>Boehmeria nivea</i>	苧麻																								
Asteraceae	<i>Bidens alba</i>	白花鬼針草			0.2	2				0.3	5				0.4	5							0.5	5		
Poaceae	<i>Pennisetum purpureum</i>	象草																								
Poaceae	<i>Coxia lucryma-jobi</i>	蕨草																								
Amaranthaceae	<i>Amaranthus phytolaceroideus</i>	空心蕨子草	0.3	10					0.5	10				0.5	10							0.5	10			
Poaceae	<i>Panicum maximum</i>	大黍																								
Moraceae	<i>Broussonetia papyrifera</i>	檣樹																								
Polygonaceae	<i>Polygonum chinense</i>	水銀母																								
Onagraceae	<i>Ludwigia hyssopifolia</i>	曾龍																								
Cyperaceae	<i>Cyperus sp.</i>	莎草																								
Poaceae	<i>Miscanthus floridulus</i>	五節草																								
Poaceae	<i>Brachiaria nutica</i>	巴拉草			0.3	20	0.3	20		0.6	25	0.6	25		0.7	35	0.7	30				0.7	35	0.7	30	
Blechnaceae	<i>Blechnum orientale</i>	烏毛蕨	0.3	15	0.2	10	0.2	10	0.3	15	0.3	15	0.3	15	0.3	15	0.3	15	0.4	15		0.3	15	0.3	15	
Poaceae	<i>Pennisetum alopecuroides</i>	狗尾草																								
Araceae	<i>Alocasia macrorrhizos</i>	海芋		0.2	5	0.2	5			0.2	5	0.3	5			0.5	5	0.3	5				0.5	5	0.3	5
Lemnaceae	<i>Lemna minor</i>	浮萍																								
Polygonaceae	<i>Polygonum hydropiper</i>	水蓼																								
Cyperaceae	<i>Cyperus involucreatus</i>	風車草		0.3	5	0.3	5			0.3	5	0.3	5			0.3	5	0.3	5				0.3	5	0.3	5
Onagraceae	<i>Ludwigia erecta</i>	澳洲水丁香																								
Convolvulaceae	<i>Ipomoea cairica</i>	五爪金龍		0.2	5	0.2	5			0.2	5	0.2	5			0.2	5	0.2	5				0.3	5	0.2	5
Bare Gound				0.5	5					0.3	5					0.3	5						0.3	5		
			75		43		55		75		28		45		75		15		30		75		15		30	

P1 - Point count location 1; P3 - Point count location 3

Table 4.4. Odonate species recorded at the She Shan River

Species name	Common name	Chinese name	Status	Commonness	Baseline monitoring		Impact monitoring				Post construction monitoring											Post construction monitoring														
					Jul-08	Aug-08	Jan-09	Jul-09	Jan-10	Jul-10	Jan-11	Jul-11	Jan-12	Jul-12	Jul-13	Dec-13	Jan-14	Feb-14	Mar-14	Apr-14	May-14	Jun-14	Jul-14	Aug-14	Sep-14	Oct-14	Nov-14	Dec-14	Jan-15	Feb-15	Mar-15	Apr-15	May-15			
<i>Agriocnemis pygmaea</i>	Wandering Midget	游尾小蜻	NP	VC																																
<i>Brachythemis contaminata</i>	Asian Amberwing	游尾小蜻	NP	VC																																
<i>Burmagomphus vermicularis</i>	Dog-legged Clubtail	狗腿豆娘	P, LC	C																																
<i>Ceragrion auranticum raiyuanum</i>	Orange-tailed Sprite	橙尾小蜻	NP	VC																																
<i>Copera ciliata</i>	Black-knees Featherlegs	白脚豆娘	NP	VC																																
<i>Copera marginipes</i>	Yellow Featherlegs	黃脚豆娘	NP	VC																																
<i>Crocothemis servilla servilla</i>	Crimson Darter	紅蜻	NP	VC																																
<i>Diplacodes trivialis</i>	Blue Percher	藍翅小蜻	NP	VC																																
<i>Ictinogomphus pertinax</i>	Common Flangetail	霸王薄翅豆娘	NP	C																																
<i>Ischnura senegalensis</i>	Common Bluetail	褐斑黑痣豆娘	NP	VC																																
<i>Nannophya pygmaea</i>	Scarlet Dwarf	佛紅小蜻	NP	C																																
<i>Neurobasis chinensis chinensis</i>	Chinese Greenwing	綠翅色蟌	NP	VC																																
<i>Neurobasis fulvia</i>	Russet Percher	樹膠蟌	NP	VC																																
<i>Orithetrum chrysis</i>	Red-faced Skimmer	紅臉灰蜻	NP	VC																																
<i>Orithetrum glaucum</i>	Common blue skimmer	藍臉灰蜻	NP	VC																																
<i>Orithetrum luzonicum</i>	Marsh Skimmer	呂宋灰蜻	NP	VC																																
<i>Orithetrum pruinosum neglectum</i>	Common Red Skimmer	赤翅灰蜻	NP	VC																																
<i>Orithetrum Sabina sabina</i>	Green Skimmer	綠翅灰蜻	NP	C																																
<i>Pantala flavescens</i>	Wandering Glider	游蝶	NP	VC																																
<i>Pseudagrion autumnalis</i>	Black Threadtail	黑齒豆娘	NP	VC																																
<i>Pseudagrion pruinosum fraseri</i>	Ferruginous-faced Sprite	赤翅小蜻	NP	C																																
<i>Pseudagrion rubriceps rubriceps</i>	Orange-faced Sprite	橙尾小蜻	NP	UC																																
<i>Rhinocypha perforata perforata</i>	Common Blue Jewel	三斑鼻蟌	NP	VC																																
<i>Rhyothemis variegata arria</i>	Variegated Flutterer	斑翅豆娘	NP	C																																
<i>Tritheimis aurora</i>	Crimson Dropwing	曉霞蟌	NP	VC																																
<i>Tritheimis festiva</i>	Indigo Dropwing	靛霞蟌	NP	VC																																
<i>Zygonyx iris insignis</i>	Emerald Cascader	青須小蜻	P, PG	VC																																
No. of Species																																				
						6	4	3	4	1	6	1	11	1	4	10	4	6	6	8	7	9	13	9	11	9	11	7	2	2	1	5	10	12		

Note: NP = Not protected in Hong Kong ; P = Protected in Hong Kong
 "VC" = Very Common ; "UC" = Uncommon ; "C" = Common
 "+" = Species exists in the study area
 "++" = Species common in the study area
 "+++" = Species abundance in the study area
 Commonness and status were decided according to AFCD biodiversity website
 LC: Local Concern - Fellowes *et al.* (2002)
 PGC = Potential Global Concern - Fellowes *et al.* (2002)

Table 4.4. Odonate species recorded at the She Shan River

Species name	Common name	Chinese name	Status	Commonness	Post construction monitoring																								
					Jun-15	Jul-15	Aug-15	Sep-15	Oct-15	Nov-15	Dec-15	Jan-16	Feb-16	Mar-16	Apr-16	May-16	Jun-16	Jul-16	Aug-16	Sep-16	Oct-16	Nov-16	Dec-16	Jan-17	Feb-17	Mar-17	Apr-17	May-17	
<i>Agriocnemis pygmalis</i>	Wandering Midge	遊尾小蠅	NP	VC																									
<i>Brachythemis contaminata</i>	Asian Amberwing	嘉邊蠅	NP	VC																									
<i>Burmagomphus vermicularis</i>	Dog-legged Clubtail	雞紋纏春蠅	P.LC	C																									
<i>Ceragrion auranticum rukyuanum</i>	Orange-tailed Sprite	環球橘奇蠅	NP	VC	+	+	+	+																					
<i>Copeura ciliata</i>	Black-knees Featherlegs	白膝闊蠅	NP	VC																									
<i>Copeura marginipes</i>	Yellow Featherlegs	黃膝闊蠅	NP	VC	+	+	+	+																					
<i>Crocothemis servilla servilla</i>	Crimson Darter	紅蜻	NP	VC	+	+	+	+	+	+																			
<i>Diplacodes trivialis</i>	Blue Percher	藍藍小蜻	NP	VC																									
<i>Ictinogomphus pertinax</i>	Common Flangetail	霸王箭春蠅	NP	C	+	+	+	+	+																				
<i>Ischnura senegalensis</i>	Common Bluetail	褐斑黑痣蠅	NP	VC																									
<i>Nannophya pygmaea</i>	Scarlet Dwarf	朱紅小蜻	NP	C																									
<i>Neurobasis chinensis chinensis</i>	Chinese Greenwing	綠翅色蠅	NP	VC																									
<i>Neurothemis fulvia</i>	Russet Percher	銅藍小蜻	NP	VC	+	+	+	+	+																				
<i>Orithetrum chrysis</i>	Red-faced Skimmer	紅面灰蜻	NP	VC																									
<i>Orithetrum glaucum</i>	Common blue skimmer	藍尾灰蜻	NP	VC																									
<i>Orithetrum luzonicum</i>	Marsh Skimmer	呂宋灰蜻	NP	VC	+	+																							
<i>Orithetrum pruinosum neglectum</i>	Common Red Skimmer	赤腹灰蜻	NP	VC	+	+																							
<i>Orithetrum Sabina sabina</i>	Green Skimmer	綠腹灰蜻	NP	C																									
<i>Pantala flavescens</i>	Wandering Glider	嘉蠅	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+			
<i>Prodasineura autumnalis</i>	Black Threadtail	黑齒原蠅	NP	VC	+	+	+	+																					
<i>Pseudagrion pruinosum fraseri</i>	Ferruginous-faced Sprite	赤腹小蜻	NP	C																									
<i>Pseudagrion rubriceps rubriceps</i>	Orange-faced Sprite	丹頂翠蠅	NP	UC																									
<i>Rhinocypha perforata perforata</i>	Common Blue Jewel	三斑鼻蠅	NP	VC	+	+	+	+	+																				
<i>Rhyothemis variegata arria</i>	Variagated Flutterer	斑藍翅蠅	NP	C	+	+	+	+																					
<i>Trithemis aurora</i>	Crimson Dropwing	赤腹小蜻	NP	VC	+	+	+	+	+	+																			
<i>Trithemis festiva</i>	Indigo Dropwing	藍腹小蜻	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+			
<i>Zygonyx iris insignis</i>	Emerald Cascader	青須小蜻	P.PG	VC																									
No of Species					13	13	13	12	9	7	2	3	1	3	10	12	15	14	14	14	13	11	8	2	2	3	6	9	11

Note: NP = Not protected in Hong Kong ; P = Protected in Hong Kong

"VC" = Very Common; "UC" = Uncommon; "C" = Common

"+" = Species exists in the study area

"++" = Species common in the study area

"+++" = Species abundant in the study area

Commonness and status were decided according to AFCD biodiversity website

LC - Local Concern - Fellowes et al (2002)

PG - Potential Global Concern - Fellowes et al (2002)

Table 4.5 Aquatic Macro invertebrates recorded at She Shan River.

(T1 - Upper stream section, T2 - middle stream section, T3 - Lower stream section)

Species	Chinese name	Sampling location	Status	Common-ness	Baseline monitoring		Impact monitoring			Impact monitoring			Impact monitoring			Impact monitoring			Impact monitoring			Impact monitoring			Impact monitoring			Impact monitoring			Post construction monitoring			Post construction monitoring																						
					Jul-08	Aug-08	Jan-09			Jul-09			Jan-10			Jul-10			Jan-11			Jul-11			Jan-12			Jul-12			Jan-13			Dec-13			Jan-14			Feb-14																
					Upper stream	Lower stream	Reference	T1	T2	T3	Reference	T1	T2	T3	Reference	T1	T2	T3	Reference	T1	T2	T3	Reference	T1	T2	T3	Reference	T1	T2	T3	Reference	T1	T2	T3	Reference	T1	T2	T3	Reference	T1	T2	T3														
Mollusks																																																								
<i>Anodonta woodiana</i>	背角無齒蚌	NP	VC		+	+																																																		
<i>Biomphalaria sp.</i>		NP	VC		+	+																																																		
<i>Brotia hainanensis</i>		NP	VC		+	+																																																		
<i>Corbicula fluminea</i>	沼螺	NP	VC		+	+																																																		
<i>Melanosides tuberculata</i>	細螺	NP	VC		+	+																																																		
<i>Pomacea canaliculata</i>	福壽螺	NP	VC		+	+																																																		
<i>Radix plicatulus</i>		NP	VC		+	+																																																		
<i>Sinoatala quadrata</i>	田螺	NP	VC		+	+																																																		
Insects																																																								
<i>Baetis sp.</i>		NP	VC		+	+																																																		
<i>Caenis sp.</i>		NP	VC		+	+																																																		
<i>Chironomus sp.</i>	線幼虫	NP	VC		+	+																																																		
<i>Ephaeta sp.</i>		NP	VC		+	+																																																		
<i>Indobaetis sp.</i>		NP	VC		+	+																																																		
<i>Odonata larvae</i>		NP	VC																																																					
<i>Orithetrum spp.</i>		NP	VC																																																					
<i>Pseudagrion spp.</i>		NP	UC																																																					
<i>Pseudocloeon sp.</i>		NP	VC		+	+																																																		
<i>Serratella sp.</i>		NP	VC		+	+																																																		
Crustaceans																																																								
<i>Caridina cantonensis</i>	廣東水螳	NP	VC																																																					
<i>Cryptopotamon anacoluthon</i>	網刺溪蟹	NP	VC																																																					
No of Species					12	12	12	12	9	0	7	11	9	0	0	12	10	0	11	0	10	8	14	4	10	9	9	8	10	10	9	7	11	7	6	5	9	8	7	5	11	8	7	6	11	8	8	7	11	8	8	7	13	10	9	8

Note: NP – Not protected in Hong Kong;
P - protected species in Hong Kong
“VC” – Very Common; “UC” – Uncommon; “C” - Common
“+” – Species exists in the study area
“++” – Species common in the study area
“+++” – Species abundance in the study area
- Reference point was the sampling location outside the works area used to compare the with the data within works area.

Table 4.5 Aquatic Macro invertebrates recorded at She Shan River.

(T1 - Upper stream section, T2 - middle stream section, T3 - Lower stream section)

Species	Chinese name	Sampling location	Status	Common -ness	Post construction monitoring			Post construction monitoring			Post construction monitoring			Post construction monitoring			Post construction monitoring			Post construction monitoring			Post construction monitoring			Post construction monitoring			Post construction monitoring			Post construction monitoring			Post construction monitoring																													
					Mar-14			Apr-14			May-14			Jun-14			Jul-14			Aug-14			Sep-14			Oct-14			Nov-14			Dec-14			Jan-15			Feb-15			Mar-15			Apr-15			May-15																	
					Reference	T1	T2	T3	Reference	T1	T2	T3	Reference	T1	T2	T3	Reference	T1	T2	T3	Reference	T1	T2	T3	Reference	T1	T2	T3	Reference	T1	T2	T3	Reference	T1	T2	T3	Reference	T1	T2	T3	Reference	T1	T2	T3	Reference	T1	T2	T3	Reference	T1	T2	T3												
Mollusks																																																																
<i>Anodonta woodiana</i>	背角無齒蚌	NP	VC																																																													
<i>Biomphalaria</i> sp.	-	NP	VC																																																													
<i>Brotia hainanensis</i>	-	NP	VC																																																													
<i>Corbicula fluminea</i>	沼螺	NP	VC																																																													
<i>Melanosides tuberculata</i>	細螺	NP	VC																																																													
<i>Pomacea canaliculata</i>	福壽螺	NP	VC																																																													
<i>Radix plicatulus</i>	-	NP	VC																																																													
<i>Sinoatala quadrata</i>	田螺	NP	VC																																																													
Insects																																																																
<i>Baetis</i> sp.	-	NP	VC																																																													
<i>Caenis</i> sp.	-	NP	VC																																																													
<i>Chironomus</i> sp.	線幼虫	NP	VC																																																													
<i>Ephraea</i> sp.	-	NP	VC																																																													
<i>Indobaetis</i> sp.	-	NP	VC																																																													
<i>Odonata larvae</i>	-	NP	VC																																																													
<i>Orthetrum</i> spp.	-	NP	VC																																																													
<i>Pseudagrion</i> spp.	-	NP	UC																																																													
<i>Pseudocloeon</i> sp.	-	NP	VC																																																													
<i>Serratella</i> sp.	-	NP	VC																																																													
Crustaceans																																																																
<i>Caridina cantanensis</i>	廣東水螳	NP	VC																																																													
<i>Cryptopotamon anacoluthon</i>	網刺水螳	NP	VC																																																													
No of Species					14	12	12	9	14	12	13	9	11	11	13	8	10	12	13	8	10	11	14	7	10	12	15	6	12	12	14	8	12	12	13	7	12	11	13	7	10	8	13	6	10	11	14	6	7	10	12	6	9	12	13	6	9	12	13	6	9	12	13	6

Note: NP – Not protected in Hong Kong;
P - protected species in Hong Kong
“VC” – Very Common; “UC” – Uncommon; “C” - Common
“+” – Species exists in the study area
“++” – Species common in the study area
“+++” – Species abundance in the study area
- Reference point was the sampling location outside the works area used to compare the with the data within works area.

Table 4.5 Aquatic Macro invertebrates recorded at She Shan River.

(T1 - Upper stream section, T2 - middle stream section, T3 - Lower stream section)

Species	Chinese name	Sampling location	Status	Common-ness	Post construction monitoring				Post construction monitoring				Post construction monitoring				Post construction monitoring				Post construction monitoring				Post construction monitoring				Post construction monitoring				Post construction monitoring				Post construction monitoring																							
					Jun-15				Jul-15				Aug-15				Sep-15				Oct-15				Nov-15				Dec-15				Jan-16				Feb-16				Mar-16				Apr-16				May-16				Jun-16				Jul-16			
					Reference	T1	T2	T3	Reference	T1	T2	T3	Reference	T1	T2	T3	Reference	T1	T2	T3	Reference	T1	T2	T3	Reference	T1	T2	T3	Reference	T1	T2	T3	Reference	T1	T2	T3	Reference	T1	T2	T3	Reference	T1	T2	T3	Reference	T1	T2	T3												
Mollusks																																																												
<i>Anodonta woodiana</i>	青魚無齒蚌	NP	VC																																																									
<i>Biomphalaria</i> sp.	-	NP	VC	+	+	+		+	+	+		+	+	+		+	+	+		+	+	+		+	+	+		+	+	+		+	+	+		+	+	+		+	+	+																		
<i>Brotia hainanensis</i>	-	NP	VC	+	+	+		+	+	+		+	+	+		+	+	+		+	+	+		+	+	+		+	+	+		+	+	+		+	+	+		+	+	+																		
<i>Corbicula fluminea</i>	河蚌	NP	VC	+	+	+		+	+	+		+	+	+		+	+	+		+	+	+		+	+	+		+	+	+		+	+	+		+	+	+		+	+	+																		
<i>Melanosides tuberculata</i>	縲絲黑螺	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+																			
<i>Pomacea canaliculata</i>	福壽螺	NP	VC	+	+++	+++	+++	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+																			
<i>Radix plicatulus</i>	-	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+																			
<i>Sinoaita quadrata</i>	田螺	NP	VC	+	+	+	+++	+	+	+	+++	+	+	+	+++	+	+	+	+++	+	+	+++	+	+	+	+++	+	+	+++	+	+	+++	+	+	+++	+	+	+++	+	+	+++																			
Insects																																																												
<i>Baetis</i> sp.	-	NP	VC			+				+					+						+						+														+																			
<i>Gaenis</i> sp.	-	NP	VC																																																									
<i>Chironomus</i> sp.	孑孓幼虫	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+																			
<i>Ephemera</i> sp.	-	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+																			
<i>Indobaetis</i> sp.	-	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+																			
<i>Odonata larvae</i>	-	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+																			
<i>Orthetrum</i> spp.	-	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+																			
<i>Pseudagrion</i> spp.	-	NP	UC		+	+				+	+				+	+					+	+					+	+																																
<i>Pseudocloeon</i> sp.	-	NP	VC																																																									
<i>Serratella</i> sp.	-	NP	VC			+				+					+						+						+																																	
Crustaceans																																																												
<i>Caridina cantanensis</i>	廣東米蝦	NP	VC												+																																													
<i>Cryptopotamon anacolumbon</i>	網刺溪蟹	NP	VC																																																									
No of Species					9	12	13	6	9	12	14	6	9	12	15	6	9	13	15	6	9	13	15	6	9	14	15	6	9	14	15	6	9	14	15	6	9	14	15	6	9																			

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Table 4.5 Aquatic Macro invertebrates recorded at She Shan River.

(T1 - Upper stream section, T2 - middle stream section, T3 - Lower stream section)

Species	Chinese name	Sampling location	Status	Common-ness	Post construction monitoring				Post construction monitoring				Post construction monitoring				Post construction monitoring				Post construction monitoring				Post construction monitoring				Post construction monitoring				Post construction monitoring											
					Aug-16				Sep-16				Oct-16				Nov-16				Dec-16				Jan-17				Feb-17				Mar-17				Apr-17				May-17			
					Reference	T1	T2	T3	Reference	T1	T2	T3	Reference	T1	T2	T3	Reference	T1	T2	T3	Reference	T1	T2	T3	Reference	T1	T2	T3	Reference	T1	T2	T3	Reference	T1	T2	T3	Reference	T1	T2	T3				
Mollusks																																												
<i>Anodonta woodiana</i>	青島無齒蚌	NP	VC																																									
<i>Biomphalaria</i> sp.		NP	VC																																									
<i>Brotia hainanensis</i>		NP	VC																																									
<i>Corbicula fluminea</i>	沼螺	NP	VC																																									
<i>Melanoides tuberculata</i>	福壽螺	NP	VC																																									
<i>Pomacea canaliculata</i>	福壽螺	NP	VC																																									
<i>Radix plicatulus</i>		NP	VC																																									
<i>Sinoatala quadrata</i>	田螺	NP	VC																																									
Insects																																												
<i>Baetis</i> sp.		NP	VC																																									
<i>Caenis</i> sp.		NP	VC																																									
<i>Chironomus</i> sp.	孑孓	NP	VC																																									
<i>Ephraea</i> sp.		NP	VC																																									
<i>Indobaetis</i> sp.		NP	VC																																									
<i>Odonata larvae</i>		NP	VC																																									
<i>Orthetrum</i> spp.		NP	VC																																									
<i>Pseudagrion</i> spp.		NP	UC																																									
<i>Pseudocloeon</i> sp.		NP	VC																																									
<i>Serratella</i> sp.		NP	VC																																									
Crustaceans																																												
<i>Caridina cantonensis</i>	廣東水螳	NP	VC																																									
<i>Cryptopotamon anacoluthon</i>	網刺水螳	NP	VC																																									
No of Species				9	14	16	6	9	14	16	6	9	14	16	6	9	14	16	6	9	14	16	6	9	14	16	6	9	14	16	6	9	14	16	6									

Note: NP – Not protected in Hong Kong;
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“VC” – Very Common; “UC” – Uncommon; “C” - Common
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Table 4.6 Fish species and Hong Kong Newt recorded at She Shan River (T1- Upper stream section, T2 - middle stream section and T3 - Lower stream section)

Species	Status	Commonness	Post construction monitoring		Post construction monitoring			Post construction monitoring			Post construction monitoring			Post construction monitoring			Post construction monitoring			Post construction monitoring			Post construction monitoring			Post construction monitoring			Post construction monitoring			Post construction monitoring																							
			Mar-14				Apr-14				May-14				Jun-14				Jul-14				Aug-14				Sep-14				Oct-14				Nov-14				Dec-14				Jan-15				Feb-15				Mar-15				
			Reference	T1	T2	T3	Reference	T1	T2	T3	Reference	T1	T2	T3	Reference	T1	T2	T3	Reference	T1	T2	T3	Reference	T1	T2	T3	Reference	T1	T2	T3	Reference	T1	T2	T3	Reference	T1	T2	T3	Reference	T1	T2	T3													
<i>Channa maculata</i>	斑鱧	NP	C	+	+	+		+	+	+		+	+	+		+	+	+		+	+	+		+	+	+		+	+	+		+	+	+		+	+	+		+	+	+		+	+	+									
<i>Clarias gariepinus</i>	革胡子鯪	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+									
<i>Gambusia affinis</i>	食蚊魚	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+									
<i>Misgurnus anguillicaudatus</i>	泥鰍	NP	C	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+									
<i>Oreochromis niloticus</i>	巨暹羅口鯽非鯽	NP, V	NP	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+									
<i>Parazacco spilargenteus</i>	黑鰱	NP, V	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+									
<i>Poecilia reticulata</i>	孔雀魚	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+									
<i>Pterocryptis cochinchinensis</i>	綠背隆頭魚	NP	C	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+									
<i>Puntius semifasciolatus</i>	七星魚	NP	C	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+									
<i>Rhinogobius spp.</i>	鰻虎魚	NP	C	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+									
<i>Xiphophorus hellerii</i>	劍尾魚	NP	C	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+									
<i>Xiphophorus variatus</i>	雜色劍尾魚	NP	C	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+									
<i>Zacco platypus</i>	寬胸鰱	NP	C	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+									
			2x2m fish number	60	60	70	70	40	40	50	40	20	10	20	10	12	5	8	6	16	8	10	10	12	10	16	12	20	20	30	16	40	30	40	30	50	50	60	50	60	50	40	50	40	40	50	40	30	40	40	40	40	50	50	
			No of Species	12	11	11	8	12	11	12	9	10	10	13	9	10	9	11	9	9	8	11	10	9	9	12	10	9	9	12	10	8	9	11	10	8	9	12	8	7	6	11	9	7	8	11	8	7	9	12	8	8	10	12	9
Amphibian																																																							
<i>Paramesotriton hongkongensis</i>	香港瘰螈	R, Cap 170, NT, V	R	+	+	+																																																	

Note: NP - Not protected in Hong Kong
 "VC" - Very Common; "UC" - Uncommon; "C" - Common
 "+" - Species exists in the study area
 "++" - Species common in the study area
 "+++" - Species abundance in the study area
 - Reference point was the sampling location outside the works area used to compare the with the data within works area.
 "Cap 170" - List in Wild Animals Protection Ordinance (Cap.170)
 "NT" - Near Threatened in IUCN Red List Status
 "PGC" - Potential Global Concern by Fellowes *et al.* (2002)
 "V" - Vulnerable - in Red China Data Book

Table 4.6 Fish species and Hong Kong Newt recorded at She Shan River (T1- Upper stream section, T2 - middle stream section and T3 - Lower stream section)

Species	Status	Commonness	Post construction monitoring			Post construction monitoring			Post construction monitoring			Post construction monitoring			Post construction monitoring			Post construction monitoring			Post construction monitoring			Post construction monitoring			Post construction monitoring			Post construction monitoring			Post construction monitoring																		
			Apr-15			May-15			Jun-15			Jul-15			Aug-15			Sep-15			Oct-15			Nov-15			Dec-15			Jan-16			Feb-16			Mar-16															
			Reference	T1	T2	T3	Reference	T1	T2	T3	Reference	T1	T2	T3	Reference	T1	T2	T3	Reference	T1	T2	T3	Reference	T1	T2	T3	Reference	T1	T2	T3	Reference	T1	T2	T3	Reference	T1	T2	T3													
<i>Channa maculata</i>	斑鱧	NP	C		+				+	+				+				+				+				+					+				+																
<i>Clarias gariepinus</i>	革胡子鯪	NP	VC			+	+				+	+				+	+				+	+				+	+				+	+			+	+															
<i>Gambusia affinis</i>	食蚊魚	NP	VC	+	+	+	+		+	+	+	+		+	+	+		+	+	+		+	+	+		+	+	+	+	+	+	+	+	+	+	+															
<i>Misgurnus anguillicaudatus</i>	泥鰍	NP	C	+	+				+	+	+			+	+	+		+	+	+		+	+	+		+	+	+	+	+	+	+	+	+	+	+															
<i>Oreochromis niloticus</i>	巨頭口孵非鯽	NP	C	+	+	+	++	++	+	+	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++														
<i>Parazacco spilatus</i>	異鱮	NP, V	C	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+															
<i>Poecilia reticulata</i>	孔雀花魚膽	NP	VC			+	+				+	+				+	+				+	+				+	+				+	+			+	+															
<i>Pterocryptis cochinchinensis</i>	越南陸鰻鯪	NP	C			+					+					+						+																													
<i>Puntius semifasciolatus</i>	七星魚	NP	C	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+															
<i>Rhinogobius spp.</i>	鰻虎魚	NP	C	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+															
<i>Xiphophorus hellerii</i>	劍尾魚	NP	C	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+															
<i>Xiphophorus variatus</i>	雜色劍尾魚	NP	C	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+															
<i>Zacco platypus</i>	寬胸鰻	NP	C	+	++	++	+	+	+	++	+	+	++	+	++	+	+	+	++	++	+	+	++	++	+	+	++	++	+	+	++	++	+	+	++	++															
	2x2m fish number			30	35	55	45	20	10	20	10	20	10	15	8	15	8	20	10	20	10	20	12	23	12	35	35	25	20	45	45	35	30	55	50	40	35	55	45	35	25	60	45	40	30	60	50	35	25		
	No of Species			8	10	12	9	8	9	13	10	8	8	13	10	8	8	13	10	8	8	13	7	8	8	13	6	8	8	13	6	8	8	13	6	8	8	13	6	8	8	12	7	8	8	12	7	8	8	12	7
Amphibian																																																			
<i>Paramesotriton hongkongensis</i>	香港康蠵	R, Cap 170, NT, V	R			+					+																																								

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Table 4.6 Fish species and Hong Kong Newt recorded at She Shan River (T1- Upper stream section, T2 - middle stream section and T3 - Lower stream section)

Species	Commonness	Status	Reference	Apr-16			May-16			Jun-16			Jul-16			Aug-16			Sep-16			Oct-16			Nov-16			Dec-16			Jan-17																		
				T1	T2	T3	T1	T2	T3	T1	T2	T3	T1	T2	T3	T1	T2	T3	T1	T2	T3	T1	T2	T3	T1	T2	T3	T1	T2	T3	T1	T2	T3																
				Reference	T1	T2	T3	Reference	T1	T2	T3	Reference	T1	T2	T3	Reference	T1	T2	T3	Reference	T1	T2	T3	Reference	T1	T2	T3	Reference	T1	T2	T3	Reference	T1	T2	T3														
<i>Channa maculata</i>	斑鱔	NP	C		+			+			+			+			+			+			+			+			+			+			+														
<i>Clarias gariepinus</i>	革胡子鯪	NP	VC		+	+	+	+		+	+	+		+	+	+		+	+	+		+	+	+		+	+	+		+	+	+		+	+	+													
<i>Gambusia affinis</i>	食蚊魚	NP	VC	+	+	+	+	+		+	+	+		+	+	+		+	+	+		+	+	+		+	+	+		+	+	+		+	+	+													
<i>Misgurnus anguillicaudatus</i>	泥鯮	NP	C	+	+	+	+	+		+	+	+		+	+	+		+	+	+		+	+	+		+	+	+		+	+	+		+	+	+													
<i>Oreochromis niloticus</i>	巨羅口非鯽	NP	C	+	++	++	+	+	++	++	++	+	+	++	++	++	+	+	++	++	+	+	++	++	+	+	++	++	+	+	++	++	+	+	++	++	+												
<i>Parazacco spilatus</i>	異鱔	NP, V	C	+	+	+	+	+		+	+	+		+	+	+		+	+	+		+	+	+		+	+	+		+	+	+		+	+	+													
<i>Poecilia reticulata</i>	孔雀花魚膽	NP	VC		+		+		+		+		+		+		+		+		+		+		+		+		+		+		+		+		+												
<i>Pterocryptis cochinchinensis</i>	綠背隆鱔	NP	C																																														
<i>Puntius semifasciolatus</i>	七星魚	NP	C	+	+	+	+	+		+	+	+		+	+	+		+	+	+		+	+	+		+	+	+		+	+	+		+	+	+													
<i>Rhinogobius spp.</i>	鰓虎魚	NP	C	+	+	+	+	+		+	+	+		+	+	+		+	+	+		+	+	+		+	+	+		+	+	+		+	+	+													
<i>Xiphophorus hellerii</i>	劍尾魚	NP	C	+	+	+	+	+		+	+	+		+	+	+		+	+	+		+	+	+		+	+	+		+	+	+		+	+	+													
<i>Xiphophorus variatus</i>	雜色劍尾魚	NP	C		+	+	+	+		+	+	+		+	+	+		+	+	+		+	+	+		+	+	+		+	+	+		+	+	+													
<i>Zacco platypus</i>	寬胸鱔	NP	C	+	++	++	+	+	++	++	++	+	+	++	++	++	+	+	++	++	+	+	++	++	+	+	++	++	+	+	++	++	+	+	++	++	+												
		2x2m fish number			40	40	30	20	30	20	20	10	30	20	25	8	20	15	20	3	20	10	15	5	20	12	15	8	25	20	10	35	35	30	20	45	40	40	20	45	45	45	20						
		No of Species			8	8	12	7	8	8	12	7	8	8	12	7	8	8	12	8	8	12	5	8	8	12	5	8	8	12	5	8	8	12	5	8	8	12	5	8	8	12	5						
Amphibian																																																	
<i>Paramesotriton hongkongensis</i>	香港瘰螈	R, Cap 170, NT, V	R			+																																											

Note: NP – Not protected in Hong Kong
“VC” – Very Common; “UC” – Uncommon; “C” - Common
“-” – Species exists in the study area
“+” – Species common in the study area
“++” – Species abundance in the study area
- Reference point was the sampling location outside the works area used to compare the with the data within works area.
“Cap 170” - List in Wild Animals Protection Ordinance (Cap.170)
“NT” - Near Treated in IUCN Red List Status
“PGC”-Potential Global Concern by Fellowes *et al* (2002)
“V” - Vulnerable - in Red China Data Book

Table 4.6 Fish species and Hong Kong Newt recorded at She Shan River (T1- Upper stream section, T2 - middle stream section and T3 - Lower stream section)

Species		Status	Commonness	Post construction monitoring				Post construction monitoring				Post construction monitoring				Post construction monitoring			
				Feb-17				Mar-17				Apr-17				May-17			
				Reference	T1	T2	T3	Reference	T1	T2	T3	Reference	T1	T2	T3	Reference	T1	T2	T3
<i>Channa maculata</i>	斑鱧	NP	C			+				+							+		
<i>Clarias gariepinus</i>	革胡子鯪	NP	VC			+				+							+		
<i>Gambusia affinis</i>	食蚊魚	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
<i>Misgurnus anguillicaudatus</i>	泥鰍	NP	C	+	+	+		+	+	+		+	+	+		+	+	+	
<i>Oreochromis niloticus</i>	巨羅口非鯽	NP	C	+	++	++	+	+	++	++	+	+	++	++	+	+	++	++	
<i>Parazacco spilurus</i>	黑鰱	NP, V	C	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
<i>Poecilia reticulata</i>	孔雀花魚膽	NP	VC			+				+							+		
<i>Pterocryptis cochinchinensis</i>	越南陸鰱	NP	C																
<i>Puntius semifasciolatus</i>	七星魚	NP	C	+	+	+		+	+	+		+	+	+		+	+	+	
<i>Rhinogobius spp.</i>	鰓片魚	NP	C	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
<i>Xiphophorus hellerii</i>	劍尾魚	NP	C	+	+	+		+	+	+		+	+	+		+	+	+	
<i>Xiphophorus variatus</i>	雜色劍尾魚	NP	C			+				+			+			+		+	
<i>Zacco platypus</i>	寬胸鰱	NP	C	+	++	++	+	+	++	++	+	+	++	++	+	+	++	++	
		2x2m fish number		50	50	50	30	55	55	50	20	35	30	40	15	20	20	15	10
		No of Species		8	8	12	5	8	8	12	5	8	8	12	5	8	8	12	5
Amphibian																			
<i>Paramesotriton hongkongensis</i>	香港瘰螈	R, Cap 170, NT, PGC, V	R							+				+				+	

Note: NP - Not protected in Hong Kong
 "VC" - Very Common; "UC" - Uncommon; "C" - Common
 "+" - Species exists in the study area
 "++" - Species common in the study area
 "+++" - Species abundance in the study area
 - Reference point was the sampling location outside the works area used to compare the with the data within works area.
 "Cap 170" - List in Wild Animals Protection Ordinance (Cap.170)
 "NT" - Near Threatened in IUCN Red List Status
 "PGC"-Potential Global Concern by Fellowes *et al* (2002)
 "V" - Vulnerable - in Red China Data Book

Table 4.7 Aboitic data for the Upper She Shan River

(T1- Upper stream section, T2 - middle stream section and T3 - Lower stream section)

Parameter / date	Baseline monitoring	Impact monitoring			Impact monitoring			Impact monitoring			Impact monitoring			Impact monitoring			Impact monitoring			Impact monitoring			Impact monitoring			Impact monitoring			Post construction monitoring			Post construction monitoring			Post construction monitoring			Post cons			
	Aug-08	Jan-09			Jul-09			Jan-10			Jul-10			Jan-11			Jul-11			Jan-12			Jul-12			Jul-13			Dec-13			Jan-14			Feb-14			Mar-14			
Replicate		T1	T2	T3	T1	T2	T3	T1	T2	T3	T1	T2	T3	T1	T2	T3	T1	T2	T3	T1	T2	T3	T1	T2	T3	T1	T2	T3	T1	T2	T3	T1	T2	T3	T1	T2	T3	T1			
DO (mg/L)	8.9	--	9.1	8.3	6	5.8	6.5	--	8.9	--	8.2	8.3	8.3	8	8.5	8.8	8	8.5	9	8.6	8.2	8.8	7.7	7.7	6.3	7.8	7.8	7.7	8.7	8.6	9.2	8.3	8.2	8.6	7.2	7.6	7.8	7.1	7.2	7.2	7.3
pH	7.29	--	7.51	7.42	7.22	7.16	7.35	--	7.5	--	7.5	7.42	7.5	6.9	7	7.2	7	7.2	7.5	6.9	6.6	7.1	6.7	6.6	6.6	6.8	7.2	7.6	6.6	6.9	7.1	6.8	7.3	7.4	7.8	6.7	7.6	7.2	6.8	7.5	6.6
Nitrate (mg N/L)	0.5	--	1.6	1.5	0.22	0.3	0.4	--	0.75	--	0.1	0.14	0.2	0.1	0.2	0.7	0.1	0.3	0.4	0.2	0.2	0.4	0.84	0.86	1.14	0.6	0.61	0.7	0.78	0.63	0.53	1.2	1.12	1.02	1.5	1.2	1.6	1.2	1.1	0.77	0.6
Ammonia (mg N/L)	0.1	--	PO4-P (µg P/L) :<100	PO4-P (µg P/L) :110	0.83	0.97	0.99	--	0.03	--	0.25	0.2	0.12	0.1	0.1	0.12	0.1	0.1	0.15	0.2	0.2	0.3	0.05	0.02	1.08	0.14	0.06	0.05	0.08	<0.01	0.42	1.9	1.8	1.73	0.8	1.2	1.4	0.4	0.6	0.01	0.6
Salinity (ppt)	<0.1	--	0.1	0.1	0	0	0	--	0	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0	0	0	0.03	0.04	0.07	0.03	0.03	0.04	0	0	0	0	0	0	0	0	0	0	0	0	0
Conductivity (µS/cm)	90	--	140	170	116	114	116	--	105	--	410	410	390	110	111	115	120	115	130	122	118	126	121	120	160	94	97	97	116	116	134	124	118	132	128	113	132	123	136	140	112
BOD (mg/L)	<2	--	<2	4	<2	<2	<2	--	2	--	<2	3.2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Water flow at pool (m/s)	0.1-0.3	--	<0.01-0.1		<0.01	N.A	<0.01-0.1	--	<0.01-0.1	--	0.1	0	0	0.1	0	0	0.2	0.05	0.1	0.2	0.05	0.1	0.2	0.05	0.1	0.2	0.05	0.1	0.1	0.05	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Water flow at riffle (m/s)	0.4-0.5	--	0.2-0.3		<0.01	N.A	0.2-0.3	--	0.01	--	0.1	0	0	0.1	0	0	0.2	0.1	0.1	0.2	0.1	0.1	0.2	0.1	0.1	0.2	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2-0.4
Sand (%)	55	65	23	65	23	23	65	5	23	--	5	30	5	5	30	2	5	30	2	10	25	5	10	25	5	15	25	5	15	10	5	15	10	5	15	10	5	15	10	5	10
Stone (%)	25	30	75	30	75	75	30	40	75	--	40	65	80	40	65	2	40	65	2	45	65	5	45	65	5	65	65	15	65	80	20	65	80	20	65	80	20	65	80	20	70
Mud (%)	30	5	2	5	2	2	5	5	2	--	5	5	5	5	5	1	5	5	1	5	10	10	5	10	10	10	10	10	10	10	10	10	5	10	10	5	10	10	5	10	
Concrete (%)	0	0	0	0	0	0	0	50	0	100	50	0	10	50	0	95	50	0	95	40	0	80	40	0	80	10	0	70	10	0	70	10	0	70	10	0	70	10	0	70	

Table 4.7 Abiotic data for the Upper She Shan River

(T1- Upper stream section, T2 - middle stream section and T3 - Lower stream section)

Parameter / date	Post construction monitoring			Post construction monitoring			Post construction monitoring			Post construction monitoring			Post construction monitoring		
	Jan-17			Feb-17			Mar-17			Apr-17			May-17		
Replicate	T1	T2	T3	T1	T2	T3	T1	T2	T3	T1	T2	T3	T1	T2	T3
DO (mg/L)	8.0	8.0	7.9	8.1	7.9	7.9	8.0	7.9	8.0	8.0	8.0	8.0	7.8	7.8	7.8
pH	7.6	7.6	7.6	7.7	7.6	7.6	7.7	7.6	7.7	7.6	7.7	7.6	7.6	7.6	7.6
Nitrate (mg N/L)	0.4	0.5	0.5	0.4	0.5	0.5	0.4	0.5	0.5	0.4	0.5	0.5	0.4	0.5	0.5
Ammonia (mg N/L)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Salinity (ppt)	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.01	0.01	0.01	0.01
Conductivity (µS/cm)	29	29	32	33	29	33	36	37	52	32	35	33	22	23	27
BOD (mg/L)	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Water flow at pool (m/s)	0.1-0.2	0.1-0.2	0.1-0.2	0.1-0.2	0.1-0.2	0.1-0.2	0.1-0.2	0.1-0.2	0.1-0.2	0.1-0.2	0.1-0.2	0.1-0.2	0.1-0.2	0.1-0.2	0.1-0.2
Water flow at riffle (m/s)	0.2-0.5	0.2-0.5	0.2-0.5	0.2-0.5	0.2-0.5	0.2-0.5	0.2-0.5	0.2-0.5	0.2-0.5	0.2-0.5	0.2-0.5	0.2-0.5	0.2-0.5	0.2-0.5	0.2-0.5
Sand (%)	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Stone (%)	80	80	30	80	80	30	80	80	30	80	80	30	80	80	30
Mud (%)	5	5	2	5	5	2	5	5	2	5	5	2	5	5	2
Concrete (%)	10	10	63	10	10	63	10	10	63	10	10	63	10	10	63

**Agreement No. CE65/2013(EP) Post-Construction
Ecological Monitoring of River Improvement Work in
Upper Lam Tsuen River, She Shan River and Upper Tai Po
River – Investigation
Post-Construction Ecological Monitoring Report (No. 41)
Upper Tai Po River**

May 2017



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June 22, 2017

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June 22, 2017

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**Post-Construction Ecological Monitoring of River
Improvement Work in Upper Lam Tsuen River, She Shan
River and Upper Tai Po River – Investigation
Agreement No. CE65/2013(EP)**

**Post-Construction Ecological Monitoring Report (No.41)
Upper Tai Po River**

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1 Introduction

- 1.1 The current post-construction ecological monitoring programme is under Agreement No. CE65/2013(EP) Post-Construction Ecological Monitoring of River Improvement Work in Upper Lam Tsuen River, She Shan River and Upper Tai Po River. The collected data are mainly used to assess ecological recovery process and effectiveness of ecological migration proposed and enforced during the construction period.
- 1.2 The scope of the ecological monitoring was detailed in EM & A Manual of the project. In brief, the survey aimed to collect data on abiotic factors such as water quality, substratum characteristics, water flow as well as flora and fauna.
- 1.3 China Hong Kong Ecology Consultants Ltd. was committed by Allied Environmental Consultants Ltd (AEC) to undertake the ecological monitoring tasks for the project from December 2014.
- 1.4 This is the number 41 post-construction ecological monitoring report for the project conducted **on 18th May 2017**. It contains the following subsections:
 - Summary of major points
 - Monitoring Methods and Results
 - Summary and Comments

2 Summary of Major Points

- Fauna and flora along the drainage project sections are in a process of re-establishing or restoration;
- Bird abundance was similar to those recorded during baseline survey;
- The abundance of target river fauna, i.e., fish *Parazacco spilurus* recorded was lower than those recorded during baseline monitoring (before fish capture/relocation took place). The reason for low fish population of *Parazacco spilurus* was due to river bed modification. The rare fish *Pseudobagrus trilineatus* was consistently recorded in the river during recent monitoring. The other target species, Hong Kong Newt *Paramesotriton hongkongensis*, was not found within works area during baseline, impact monitoring and it was recorded in the river during post construction monitoring. Apart from fauna species, 55 flora species was recorded within the survey transects along the river course. Some common herbs were observed generating on the embankment, which indicating that vegetation was recovering. Flora species of *Tibouchina semidecandra* and *Ipomoea pes-caprae* were planted on the gabion along the river for landscape purpose;
- The abundance of fish was similar to last month with slight decrease;
- Higher abundance of odonata was recorded in this month; and
- Hong Kong Newt was not recorded during the survey.

3 Monitoring Methodology

3.1 Riparian Vegetation

Riparian vegetation including aquatic and emergent was sampled by line transects along the affected river channel and riparian habitat. Species, relative abundance and average heights were recorded. Vegetation surveys were conducted at three selected belt transects with one located at the upper portion of the river channel (T1) and another one at the middle section of the river (T2), as well as reference site (**Figure 1**). The belt transects was run across the river channel in order to collect quantitative data of the vegetation, e.g., species inventory, height, percentage cover. Qualitative data of plants was collected by recording plant species along line transect, e.g., species inventory, relative abundance. Nomenclature and protection status of the species has followed those documented in Lai *et al.* (2004) and Hong Kong Herbarium (2015).

3.2 Avifauna

Avifauna survey was conducted during post construction monitoring period. Special attention was given to the river channel and corridor area which birds used as feeding and foraging habitat. Avifauna survey was undertaken in the early morning plus species recorded in the rest of the day when conducting other taxonomic groups (benthic, fish, insect) monitoring. Numerical abundance was recorded at fixed count points within a radius of 30 to 50m according to landscape feature and visual penetration extent. The duration of the point count of birds was standardized for 10 minutes at each location in order to collect comparable data. Transect count along accessible sections of river channel were used in order to collect qualitative data. Binoculars and digital camera were the main items of equipment used. Nomenclature and protection status of the species has followed in the AFCDD website (www.hkbiodiversity.net) and Carey *et al.* (2001).

The point count was conducted at two locations with one located at the lower portion of the river channel (T2) and the other located at the upper section of the river (T1). The point count locations, survey transect for bird survey and sampling sites for surveys of other faunal groups and flora was given in **Figure 1**.

3.3 Adult Odonata Survey

Adult Odonata surveys were conducted along transects (**Figure 1**). Binoculars, digital camera and hand net were utilized to aid identification. Numerical abundance, species identity and other notable behavior were recorded. Nomenclature and protection status of the species has followed those documented in the AFCDD website (www.hkbiodiversity.net), Wilson *et al.* (2004) and Tam *et al.* (2011). Adult Odonata survey was conducted along line transects in parallel with river channel within the works area where access was permitted.

3.4 Aquatic Macro-invertebrates

Macro-invertebrates in the river channel were surveyed in three sampling sites with two located at upper (T1) and middle (T2) proportion of the river respectively and one reference site. It aims to collect necessary macro-invertebrate fauna for ecological monitoring programme (**Figure 1**). Five replicates were taken at each sampling point and pool together for further sample sorting and identification. Kick sampling and hand netting were the survey methodologies for river organisms. Dissection microscope and digital camera were used to aid identification and enumeration. Numerical abundance and species identity were recorded. Nomenclature and protection status of the species has followed those documented in the AFCD website (www.hkbiodiversity.net) and other literatures such as Dudgeon (1994).

3.5 Fish and Newt

Fish community including target species *Parazacco spilurus* and *Paramesotriton hongkongensis* at the specified river channel was monitored by live trapping, hand netting and direct observation methods.

Sampling was conducted at three sampling locations with one located at upper section (T1) and one located at middle section (T2), as well as reference site. The selected sampling site covered major type of river habitats, e.g. river pool and riffle (**Figure 1**). The number of the observed fish and newt was estimated and recorded. Nomenclature and protection status of the species has followed those documented in the AFCD website (www.hkbiodiversity.net) and Lee *et al.* (2004).

3.6 Abiotic Data Collection

3.6.1 Water Quality Monitoring

Dissolved oxygen level, pH value, conductivity, salinity, BOD and nutrient level (nitrate and ammonium) were measured and analyzed by conventional methods in situ or in laboratory. The instruments for measuring dissolved oxygen level, pH value, conductivity, salinity were model: DO-5510, AZ8685, AZ8361 and AZ8374 respectively. All the instruments were calculated every monitoring month according to the operation manuals in order to obtain the precise result. BOD test took 5 days to complete within darkness incubator with stable temperature at 20°C and was performed using model: DO-5510 for measuring dissolved oxygen. Nutrient levels including nitrate and ammonia were performed in laboratory by applying the In-house method SOP056 (FIA) and SOP057 (FIA) respectively.

3.6.2 Sediment Characteristics

Sediment/substrate characteristics were recorded of sediment cover in percentage e.g. mud, sand, rock, boulder and cemented bottom in the river bed at sampling sites.

3.6.3 Water Flow

Water flow rates in river channel were measured by recording the time taken for a floating object (e.g. floating ball) in a measured distance. The sampling sites for surveys were given in **Figure 1**.

4 Monitoring Results

4.1 Vegetation

Major proportion of river bed and bank was concrete and without plant colonizing (Photos 1-4). Vegetation has sparsely covered the gabion wall along the upper Tai Po River and the river bed with some common plants (Photo 4) including invasive species *Mikania micrantha*, and native species *Commelina diffusa*. Most of the plants on the river bed along the river have been removed from the clearance work. In total, 55 flora species were recorded within the survey transects along the river course. Abundant native species *Commelina diffusa* was the dominant species established in the river bed. Vegetation coverage in upper section was still low. The flora were generally in good health, and the height of the dominated riparian grass and herb species were in a range from 0.3m to 1.7m as observed along survey transect. Dominant flora species were shown in the **Table 4.1** marked with relative abundance sign “+++”. Results of vegetation survey and belt transect survey were presented in **Table 4.1** and **Table 4.2**. **Figure 1** shows the transect line for the flora surveys.

4.2 Fauna

4.2.1 Avifauna

An avifauna survey was undertaken along survey transects and at two defined point count locations. In total, 17 species of birds were recorded during bird survey. Among them, 4 species were wetland dependant birds observed feeding and roosting in the river channel including *Ardeola bacchus* (Photo 5), *Motacilla cinerea*, *Motacilla alba* and *Egretta garzetta*. A common species *Pycnonotus jocosus* was the dominant species of most of the proportion of the river. All the birds in Hong Kong are under protection of Wild Animals Protection Ordinance (Cap. 170). Some of the wetland dependent species recorded are classified as Regional Concern by Fellowes *et al.* (2002) including *Egretta garzetta* and *Ardeola bacchus*, which were usually observed feeding in the river. *Centropus sinensis* was found in the river, which is considered as Vulnerable in China Red Data Book. Only foraging and roosting behaviour of some wetland dependent birds were noticed. Transect and Point Count locations were shown on **Figure 1**. Result of bird survey was presented in the **Table 4.3**.

4.2.2 Adult Odonata Survey

Odonata surveys were performed and a list of recorded odonata species at Upper Tai Po River is shown in **Table 4.4**. Number of odonata species recorded was similar to the previous surveys conducted in approximate period of last year. In total, 9 species odonata was found, the recorded odonata species was common species in Hong Kong (Photo 6). Comparing with the result of last month, more odonata were found in this month due to seasonality. Most of the odonata species in Hong Kong has the peak emergence from spring to late summer. It is expected that number of odonata will increase in the following months during wet season (Wilson *et al.*, 2004 & Tam *et al.*, 2011). Sampling location was shown in **Figure 1**.

4.2.3 Aquatic Macro-invertebrates

Aquatic-net and kick sampling were performed at the river. The river benthic fauna collected was mainly comprised of insects, molluscs and crustaceans (Photos 7-8). Details of recorded of river benthic fauna refers to **Table 4.5**. Sampling location was shown on **Figure 1**.

4.2.4 Hong Kong Newt

Survey of Hong Kong Newt was conducted at Upper Tai Po River. Adult Hong Kong Newt was not captured in this month at reference site. Hong Kong Newt is listed in Wild Animals Protection Ordinance (Cap. 170) and classified as “Near Threatened” under IUCN Red List Status and as “Potential Global Concern” by Fellowes *et al.* (2002). Record of Hong Kong Newts can be referred to **Table 4.6**.

4.2.5 River Fish Fauna

Fish surveys were performed at Upper Tai Po River during surveys. In total, 12 species freshwater fish were recorded within project area. Fish abundance was low along the modified river channel. The *Parazacco spilurus*, *Glyptothorax pallozonum* and *Pseudobagrus trilineatus*, which have conservation interest, were restricted in the upper section of the surveyed river outside the works boundary where the habitat was not affected by construction works, while *Parazacco spilurus* is listed in China Red Data Book Status as Vulnerable and *Pseudobagrus trilineatus* is classified as Global Concern by Fellowes *et al.* (2002). The data showed that fish abundance was similar to the record of last month with slight decrease in reference site. Details of records of fish fauna refers to **Table 4.6**. Sampling location was shown on **Figure 1**.

4.3 **Abiotic Data**

Data on water quality and major river hydrological feature (water flow and substratum) of the river were collected and are presented in the **Table 4.7**.

Generally, the water was not polluted and nutrient levels were generally low. Results of water test were presented in the **Table 4.7**.

The river substratums of upper and lower sections were comprised of 40% stone and 60% concrete, 20% stone and 80% concrete respectively. Moderate water flow up to 0.3m/second at pool and 0.6m/second at riffle was measured.

5 **Summary and Commentary**

Post construction ecological monitoring was carried out in current month and relevant biotic and abiotic data were collected according to project specification and EM & A Manual. Adult Newt was not recorded during the survey. Fish's abundance appears to be similar to last month. Bird abundance was similar to those recorded during baseline survey. Species richness of odonata was similar to last month's result.

Aquatic and riparian vegetation along river channel was re-established compared to those recorded during baseline surveys. Vegetation has sparsely covered gabion wall and river bed along to the Upper Tai Po River.

The water quality of the surveyed river was not polluted as indicated by low nutrient concentration level of ammonium and nitrate although the river channel may receive discharge and runoff from the village areas.

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FIGURE

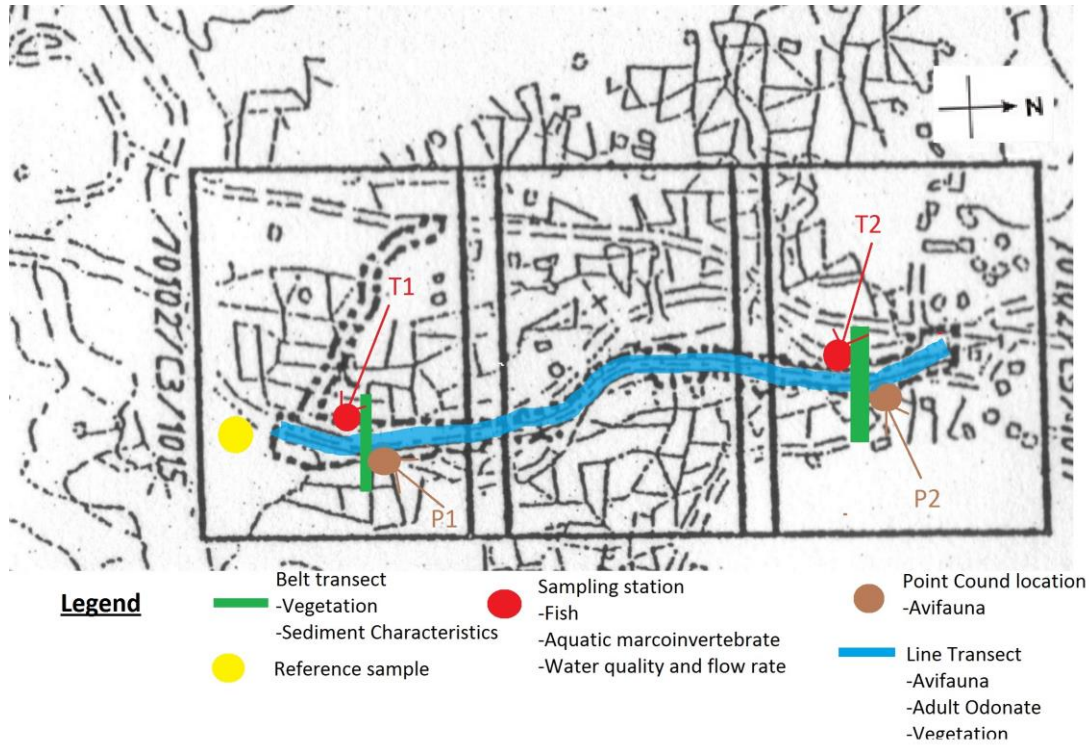


Figure 1. Sampling Location of Ecological Survey and Monitoring at Upper Tai Po River, Tai Po.

PHOTOS



Photo 1: General view of the river channel
(Reference site)



Photo 2: General view of the river channel
(Upper section)



Photo 3: General view of the river channel
(Middle section)



Photo 4: Vegetation sparsely growing on
gabion (Middle section)



Photo 5: Avifauna – *Ardeola bacchus*



Photo 6: Odonata – *Trithemis Aurora*



Photo 7: Aquatic sample



Photo 8: Aquatic sample

TABLE

Table 4.2. Flora species recorded from belt transect survey at the Upper Tai Po stream (T1- Upper stream sampling site and T2 - Lower stream sampling site)

Family	Species	Transsect	Chinese name	Baseline survey				Impact monitoring				Impact monitoring				Impact monitoring				Impact monitoring				Impact monitoring				Impact monitoring				Impact monitoring															
				Oct-07				Jan-09				Jul-09				Jan-10				Jul-10				Jan-11				Jul-11				Jan-12															
				P1		P2		Reference		T1		T2		Reference		T1		T2		Reference		T1		T2		Reference		T1		T2		Reference		T1		T2		Reference		T1		T2					
Asteraceae	<i>Mikania micrantha</i>		蕨甘菊	0.4	15	1	40	0.5	5	0.5	5	0.5	5	0.5	3	0.2	5	0.2	2	0.5	20	0.5	60	0.5	10	0.5	10	0.5	10	0.5	10	0.4	20														
Moraceae	<i>Ficus hispida</i>		對葉榕	1	2			5	5			2	10	5	5			2	10	5	5																										
Ulmaceae	<i>Celtis sinensis</i>		朴樹	5	2					6	15			6	15							4m	5																								
Poaceae	<i>Microstegium ciliatum</i>		剛秀竹	1.2	45	1.2	30			0.8	10	0.5	12					0.7	30			1	35	1	5	0.5	10	1	15	1	5	0.5	2	1	2												
Euphorbiaceae	<i>Macaranga tanarius</i>		血桐	2	2			5	5	3	5	1.5	4	5	5	3	5	1.5	5	5	5			4m	5																						
Araceae	<i>Alocasia odora</i>		海芋	1.5	23							1.5	25			2	30							2	10					0.4	3																
Araceae	<i>Colocasia esculenta</i>		芋	0.3	<1	0.4	<1	0.3	2					0.3	2	0.8	5			0.3	1																										
Myrtaceae	<i>Cleistocalyx operculatus</i>		水翁					0.4	10	7	5			0.4	10	7	5			0.4	10			0.4	5	5m	5																				
Athyriaceae	<i>Callipteris esculenta</i>		菜蕨			0.6	1	0.8	10			0.4	10			0.4	2	0.8	6			0.8	6																								
Poaceae	<i>Phragmites karka</i>		卡開蘆					1.5	51					1.5	53					1.5	10					1.5	2					1.5	2														
Thelypteridaceae	<i>Cyclosorus parasiticus</i>		華南毛蕨	0.4	10					0.4	10			0.4	2																																
Equisetaceae	<i>Equisetum debile</i>		筆管草			0.6	<1	0.3	2			0.3	2			0.3	2																														
Asteraceae	<i>Ageratum conyzoides</i>		勝紅薊					0.4	2					0.4	2															0.3	2	1.2	10			0.4	20										
Commelinaceae	<i>Commelina diffusa</i>		錦雞草													0.2	5	0.2	5	0.2	5			0.5	20					0.2	4				0.4	10											
Solanaceae	<i>Solanum nigrum</i>		龍葵															0.4	5															0.5	4												
Euphorbiaceae	<i>Mallotus paniculatus</i>		白楸													0.3	5			0.3	5																										
Poaceae	<i>Eleusine indica</i>		牛筋草											0.5	5																				0.3	5											
Poaceae	<i>Pennisetum purpureum</i>		象草									3	4																																		
Asteraceae	<i>Wedelia chinensis</i>		蟛蜞菊																																												
Asteraceae	<i>Bidens alba</i>		白花鬼針草																								0.5	5			3			0.2	2												
Poaceae	<i>Panicum repens</i>		結骨草																												1.5	5			1.5	5											
Poaceae	<i>Coix lacryma-jobi</i>		蒺藜																																	1.5	5										
Convolvulaceae	<i>Ipomoea cairica</i>		五爪金龍																																	0.2	5										
Cucurbitaceae	<i>Benincasa hispida</i>		冬瓜																																												
Fabaceae	<i>Pueraria lobata</i>		野葛																																												
Convolvulaceae	<i>Merremia hederacea</i>		魚黃草																																												
Poaceae	<i>Pennisetum alopecuroides</i>		鵝尾草																																												
Poaceae	<i>Brachiaria mutica</i>		巴拉草																																												
Onagraceae	<i>Ludwigia erecta</i>		美洲水丁香																																												
Malvaceae	<i>Hibiscus rosa-sinensis</i>		大紅花																																												
Cyperaceae	<i>Cyperus sp.</i>		莎草																																												
Balsaminaceae	<i>Impatiens walleriana</i>		非洲鳳仙																																												
Amaranthaceae	<i>Celosia argentea</i>		青葙																																												
Bare Gound								10		73		10		10		78		6		10		73		88		9		15		65		68		80		89		71		100		89		35		100	

- Reference point was the sampling location outside the works area used to compare with the data within works area.

P1 - Point count location 1; P2 - Point count location 2

Table 4.2. Flora species recorded from belt transect survey at the Upper Tai Po stream (T1- Upper stream sampling site and T2 - Lower stream sampling site)

Family	Species	Chinese name	Impact monitoring		Impact monitoring				Impact monitoring				Post construction monitoring				Post construction monitoring				Post construction monitoring				Post construction monitoring				Post construction monitoring					
			Stream		Jul-12		Mar-13				Jul-13				Jan-14				Feb-14				Mar-14				Apr-14				May-14			
			Transect	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	
Asteraceae	<i>Mikania micrantha</i>	蕨甘菊	0.4	10																														
Moraceae	<i>Ficus hispida</i>	對葉榕																																
Ulmaceae	<i>Celtis sinensis</i>	朴樹																																
Poaceae	<i>Microstegium ciliatum</i>	剛秀竹	1	55																														
Euphorbiaceae	<i>Macaranga tanarius</i>	血桐																																
Araceae	<i>Alocasia odora</i>	海芋																																
Araceae	<i>Colocasia esculenta</i>	芋																																
Myrtaceae	<i>Cleistocalyx operculatus</i>	水翁																																
Athyriaceae	<i>Callipteris esculenta</i>	蕨																																
Poaceae	<i>Phragmites karka</i>	卡開蘆																																
Thelypteridaceae	<i>Cyclosorus parasiticus</i>	華南毛蕨																																
Equisetaceae	<i>Equisetum debile</i>	筆管草																																
Asteraceae	<i>Ageratum conyzoides</i>	勝紅蕒																																
Commelinaceae	<i>Commelina diffusa</i>	節節草	0.4	5																														
Solanaceae	<i>Solanum nigrum</i>	龍葵																																
Euphorbiaceae	<i>Mallotus paniculatus</i>	白楸																																
Poaceae	<i>Eleusine indica</i>	牛筋草																																
Poaceae	<i>Pennisetum purpureum</i>	象草																																
Asteraceae	<i>Wedelia chinensis</i>	地黃菊																																
Asteraceae	<i>Bidens alba</i>	白花鬼針草																																
Poaceae	<i>Panicum repens</i>	荳蔻草																																
Poaceae	<i>Coix lacryma-jobi</i>	薏苡	1.5	5																														
Convolvulaceae	<i>Ipomoea cairica</i>	五爪金龍	0.2	5																														
Cucurbitaceae	<i>Benincasa hispida</i>	冬瓜																																
Fabaceae	<i>Pueraria lobata</i>	野葛																																
Convolvulaceae	<i>Merremia hederacea</i>	魚黃草																																
Poaceae	<i>Pennisetum alopecuroides</i>	鵝尾草																																
Poaceae	<i>Brachiaria mutica</i>	巴拉草																																
Onagraceae	<i>Ludwigia erecta</i>	美洲水丁香																																
Malvaceae	<i>Hibiscus rosa-sinensis</i>	大紅花																																
Cyperaceae	<i>Cyperus sp.</i>	莎草																																
Balsaminaceae	<i>Impatiens walleriana</i>	非洲鳳仙																																
Amaranthaceae	<i>Celosia argentea</i>	青葙																																
Bare Ground				20		100		100					20	76					19	74					19	69					19	67		

- Reference point was the sampling location outside the works area used to compare with the data within works area.

P1 - Point count location 1; P2 - Point count location 2

Table 4.2. Flora species recorded from belt transect survey at the Upper Tai Po stream (T1- Upper stream sampling site and T2 - Lower stream sampling site)

Family	Species	Stream Transect	Post construction monitoring						Post construction monitoring					
			Reference		T1		T2		Reference		T1		T2	
			Height (m)	%	Height (m)	%	Height (m)	%	Height (m)	%	Height (m)	%	Height (m)	%
Asteraceae	<i>Mikania micrantha</i>	蕨甘菊	0.6	5					0.6	5				
Moraceae	<i>Ficus hispida</i>	對葉榕												
Ulmaceae	<i>Celtis sinensis</i>	朴樹												
Poaceae	<i>Microstegium ciliatum</i>	剛秀竹	1.2	5				1.2	5					
Euphorbiaceae	<i>Macaranga tanarius</i>	血桐					1.5	5					1.5	10
Araceae	<i>Alocasia odora</i>	海芋												
Araceae	<i>Colocasia esculenta</i>	芋	0.5	5				0.5	5					
Myrtaceae	<i>Cleistocalyx operculatus</i>	水翁												
Athyriaceae	<i>Callipteris esculenta</i>	菜蕨												
Poaceae	<i>Phragmites karka</i>	卡開蘆	1.5	5				1.5	5					
Thelypteridaceae	<i>Cyclosorus parasiticus</i>	華南毛蕨												
Equisetaceae	<i>Equisetum debile</i>	筆管草	0.3	5				0.3	5					
Asteraceae	<i>Ageratum conyzoides</i>	勝紅薊												
Commelinaceae	<i>Commelina diffusa</i>	節節草	0.4	5	0.3	5	0.4	2	0.4	5	0.3	5	0.4	5
Solanaceae	<i>Solanum nigrum</i>	龍葵												
Euphorbiaceae	<i>Mallotus paniculatus</i>	白楸												
Poaceae	<i>Eleusine indica</i>	牛筋草												
Poaceae	<i>Pennisetum purpureum</i>	象草												
Asteraceae	<i>Wedelia chinensis</i>	蟛蜞菊												
Asteraceae	<i>Bidens alba</i>	白花鬼針草	0.7	5			0.5	5	0.7	5			0.5	8
Poaceae	<i>Panicum repens</i>	結骨草	0.4	5				0.4	5					
Poaceae	<i>Coix lacryma-jobi</i>	薏苡												
Convolvulaceae	<i>Ipomoea cairica</i>	五爪金龍												
Cucurbitaceae	<i>Benincasa hispida</i>	冬瓜												
Fabaceae	<i>Pueraria lobata</i>	野葛												
Convolvulaceae	<i>Merremia hederacea</i>	魚黃草												
Poaceae	<i>Pennisetum alopecuroides</i>	鵝尾草					2	3					2	5
Poaceae	<i>Brachiaria mutica</i>	巴拉草			1.2	2					1.2	2		
Onagraceae	<i>Ludwigia erecta</i>	美洲水丁香												
Malvaceae	<i>Hibiscus rosa-sinensis</i>	大紅花												
Cyperaceae	<i>Cyperus sp.</i>	莎草												
Balsaminaceae	<i>Impatiens walleriana</i>	非洲鳳仙												
Amaranthaceae	<i>Celosia argentea</i>	青葙	1.7	5				1.7	5					
Bare Gound				55		93		85		55		93		72

- Reference point was the sampling location outside the works area used to compare with the data within works area.

P1 – Point count location 1; P2 – Point count location 2

Table 4.2. Flora species recorded from belt transect survey at the Upper Tai Po stream (T1- Upper stream sampling site and T2 - Lower stream sampling site)

Family	Species	Chinese name	Post construction monitoring						Post construction monitoring						Post construction monitoring						Post construction monitoring					
			Reference		T1		T2		Reference		T1		T2		Reference		T1		T2		Reference		T1		T2	
			Height (m)	%	Height (m)	%	Height (m)	%	Height (m)	%	Height (m)	%	Height (m)	%	Height (m)	%	Height (m)	%	Height (m)	%	Height (m)	%	Height (m)	%	Height (m)	%
Asteraceae	<i>Mikania micrantha</i>	蕨甘菊	0.5	10					0.5	10					0.5	10					0.5	10				
Moraceae	<i>Ficus hispida</i>	對葉榕																								
Ulmaceae	<i>Celtis sinensis</i>	朴樹																								
Poaceae	<i>Microstegium ciliatum</i>	剛秀竹	1.5	10					1.6	10					1.6	10					1.7	10				
Euphorbiaceae	<i>Macaranga tanarius</i>	血桐				0.3	10						0.3	10					0.3	10				0.3	10	
Araceae	<i>Alocasia odora</i>	海芋	0.4	5					0.5	5					0.5	5					0.6	5				
Araceae	<i>Colocasia esculenta</i>	芋	0.5	5					0.5	5					0.5	5					0.6	5				
Myrtaceae	<i>Cleistocalyx operculatus</i>	水翁																								
Athyriaceae	<i>Callipteris esculenta</i>	菜蕨																								
Poaceae	<i>Phragmites karka</i>	卡開蘆	1.6	5					1.6	5					1.6	5					1.7	5				
Thelypteridaceae	<i>Cyclosorus parasiticus</i>	華南毛蕨																								
Equisetaceae	<i>Equisetum debile</i>	筆管草	0.5	5					0.5	5					0.5	5					0.5	5				
Asteraceae	<i>Ageratum conyzoides</i>	勝紅蕖																								
Commelinaceae	<i>Commelina diffusa</i>	節節草	0.6	10	0.4	10	0.3	10	0.6	10	0.5	10	0.3	10	0.6	10	0.5	10	0.3	10	0.6	10	0.5	10	0.3	10
Solanaceae	<i>Solanum nigrum</i>	龍葵																								
Euphorbiaceae	<i>Mallotus paniculatus</i>	白楸																								
Poaceae	<i>Eleusine indica</i>	牛筋草																								
Poaceae	<i>Pennisetum purpureum</i>	象草																								
Asteraceae	<i>Wedelia chinensis</i>	蜘蛛菊																								
Asteraceae	<i>Bidens alba</i>	白花鬼針草	0.8	5		0.4	8	0.8	5			0.4	8	0.8	5			0.4	8	0.8	5			0.4	8	
Poaceae	<i>Panicum repens</i>	結骨草	0.4	5					0.5	5					0.5	5					0.5	5				
Poaceae	<i>Coix lacryma-jobi</i>	薏苡																								
Convolvulaceae	<i>Ipomoea cairica</i>	五爪金龍																								
Cucurbitaceae	<i>Benincasa hispida</i>	冬瓜																								
Fabaceae	<i>Pueraria lobata</i>	野葛																								
Convolvulaceae	<i>Merremia hederacea</i>	魚黃草																								
Poaceae	<i>Pennisetum alopecuroides</i>	狼尾草				0.3	5					0.3	10					0.3	10					0.3	10	
Poaceae	<i>Brachiaria mutica</i>	巴拉草			0.3	5					0.5	10	0.3	5			0.5	10	0.3	5			0.5	10	0.3	5
Onagraceae	<i>Ludwigia erecta</i>	美洲水丁香																								
Malvaceae	<i>Hibiscus rosa-sinensis</i>	大紅花																								
Cyperaceae	<i>Cyperus sp.</i>	莎草																								
Balsaminaceae	<i>Impatiens walleriana</i>	非洲鳳仙																								
Amaranthaceae	<i>Celosia argentea</i>	青葙	1.5	5					1.5	5					1.5	5					1.5	5				
Bare Gound				35		85		62		35		80		57		35		80		57		35		80		57

- Reference point was the sampling location outside the works area used to compare with the data within works area.

P1 – Point count location 1; P2 – Point count location 2

Table 4.4. Odonate species recorded at the UpperTai Po River

Species	Common name	Chinese name	Status	Commonness	Post construction monitoring																															
					Jun-15	Jul-15	Aug-15	Sep-15	Oct-15	Nov-15	Dec-15	Jan-16	Feb-16	Mar-16	Apr-16	May-16	Jun-16	Jul-16	Aug-16	Sep-16	Oct-16	Nov-16	Dec-16	Jan-17	Feb-17	Mar-17	Apr-17	May-17								
<i>Aethriamanta brevipennis brevipennis</i>	Elusive Adjutant	短腹異蜻	NP	U													+	+	+																	
<i>Macrodiplex cora</i>	Coastal Glider	高翔濛蜻	NP	C	+	+																														
<i>Ceritagrion auranticum ryukyuenum</i>	Orange-tailed Sprite	琉球橘黃蝶	NP	VC	+	+	+	+									+	+	+	+																
<i>Copera marginipes</i>	Yellow Featherlegs	黃脊扇蝶	NP	VC	+	+	+	+																								+	+			
<i>Crocothemis servilia servilia</i>	Crimson Darter	紅蜻	NP	VC		+	+	+	+	+									+	+	+	+	+													
<i>Euphaea decorata</i>	Black-banded Gossamerwing	方帶幽蝶	NP	VC																																
<i>Neurobasis chinensis</i>	Chinese Greenwing	華麗色蝶	NP	C			+	+	+								+	+	+	+	+	+										+	+			
<i>Neurothemis fulvia</i>	Russet Percher	網脈蜻	NP	VC		+	+	+																												
<i>Orthetrum chrysis</i>	Red-faced Skimmer	華麗灰蜻	NP	VC			+	+	+	+					+	+	+	+	+	+	+	+											+	+		
<i>Orthetrum glaucum</i>	Common blue skimmer	黑尾灰蜻	NP	VC						+	+																									
<i>Orthetrum luzonicum</i>	Marsh Skimmer	呂宋灰蜻	NP	VC	+	+	+										+	+	+	+	+	+	+									+	+	+	+	
<i>Orthetrum prunosum neglectum</i>	Common Red Skimmer	赤褐灰蜻	NP	VC	+	+											+	+	+	+	+	+	+													
<i>Palpopleura sexmaculata sexmaculata</i>	Asian Widow	六斑曲緣蜻	NP	C	+	+																														
<i>Pantala flavescens</i>	Wandering Glider	黃蜻	NP	VC						+	+						+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Paracercion calamarum dyeri</i>	Dusky Lilysquatter	藍尾蝶	P, LC	C																																
<i>Prodasineura autumnalis</i>	Black Threadtail	烏齒原蝶	NP	VC			+																													+
<i>Pseudagrion rubriceps rubriceps</i>	Orange-faced Sprite	丹頂斑蝶	NP	C	+	+																														
<i>Rhinocypha perforata</i>	Common Blue Jewel	三斑鼻蝶	NP	VC	+	+	+	+	+											+	+	+	+	+											+	
<i>Trithemis Aurora</i>	Crimson dropwing	曉靨蜻	NP	VC					+	+							+	+	+	+	+	+	+													+
<i>Trithemis festiva</i>	Indigo Dropwing	靨靨蜻	NP	VC	+	+	+	+	+								+	+	+	+	+	+	+										+	+	+	+
<i>Urothemis signata signata</i>	Scarlet Basket	赤斑曲鈎脈蜻	NP	C																																
<i>Zygonyx iris insignis</i>	Emerald Cascader	彩須蜻	P	P,PGC																																
No of Species					9	11	10	8	8	5	1	2	1	2	7	10	11	11	10	8	7	5	1	1	2	3	6	9								

Note: NP – Not protected in Hong Kong P- Protected in Hong Kong
 "VC" – Very Common; "UC" – Uncommon; "C" – Common
 "+" – Species exists in the study area
 "++" – Species common in the study area
 "+++ – Species abundance in the study area
 Commonness and status were decided according to AFCD biodiversity website (www.hkbiodiversity.net)
 LC- Local Concern - Fellowes *et al* (2002)
 PGC - Potential Global Concern - Fellowes *et al* (2002)

Table 4.5 Aquatic Macro invertebrates recorded at Upper Tai Po River (T1- Upper stream sampling site and T2- Lower stream sampling site)

Species	Chinese name	Sampling point	Baseline survey		Impact monitoring		Impact monitoring		Impact monitoring		Impact monitoring		Impact monitoring		Impact monitoring		Impact monitoring		Impact monitoring		Impact monitoring		Impact monitoring		Impact monitoring		Post construction monitoring						Post construction monitoring																
			Oct-07	Jan-09	Jul-09	Jan-10	Jul-10	Jan-11	Jul-11	Jan-12	Jul-12	Mar-13	Jul-13	Jan-14	Feb-14	Mar-14	Apr-14	May-14	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2													
Mollusca			T1	T2	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2												
<i>Biomphalaria sp.</i>	--	NP VC	+					+	+				+			+			+			+			+			+			+			+			+												
<i>Brotia hainanensis</i>	--	NP VC	++	+	++						++	+													+			+			+			+			+												
<i>Melanoides tuberculata</i>	福寿螺	NP VC						+	+		+					++	+			+			+			+			+			+			+			+											
<i>Physella acuta</i>	小pond螺	NP VC											+	+	++				+			+			+			+			+			+			+												
<i>Pomacea canaliculata</i>	福寿螺	NP VC				+			++		+					+			+			+			+			+			+			+			+												
<i>Radix plicatulus</i>	田螺	NP VC		++		+		+	+	+	+		+	+	+	+		+		+		+		+		+		+		+		+		+		+		+											
<i>Sinotia quadrata</i>	田螺	NP VC			++			+	++							++			+			+			+			+			+			+			+												
Insects																																																	
<i>Anisocentropus sp.</i>	--	NP VC																																															
<i>Arctopora sp.</i>	--	NP VC																																															
<i>Aulocodes sp.</i>	--	NP VC																																															
<i>Baetis sp.</i>	--	NP VC	+																																														
<i>Chironomus sp.</i>	蚊幼虫	NP VC	+	+																																													
<i>Ephemera sp.</i>	蜉蝣	NP VC																																															
<i>Endobaetis sp.</i>	--	NP VC	+																																														
<i>Mnais sp.</i>	--	NP VC		+																																													
Odonate Larvae	--	NP VC																																															
<i>Orthetrum sp.</i>	--	NP VC	+	+																																													
<i>Perla sp.</i>	--	NP VC																																															
<i>Rhaphium sp.</i>	--	NP VC																																															
<i>Tipulidae spp.</i>	--	NP VC																																															
Crustacea																																																	
<i>Caridina cantonensis</i>	廣東米蝦	NP VC				+					+	++		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	++	++	+	+												
<i>Cryptopotamon anacoluthon</i>	棘刺溞	NP C																																															
<i>Eriocheir japonica</i>	日本絨螯蟹	NP C																																															
<i>Macrobrachium hainanense</i>	海南沼蝦	NP VC				+																																											
No of Species			5	6	9	0	5	11	2	5	11	12	6	11	16	8	10	6	5	12	4	4	10	6	4	14	7	1	14	2	0	13	4	1	13	7	4	14	10	8	17	11	9	18	13	9	15	9	7

Note:
 "NP" – Not protected in Hong Kong
 "+" - Listed in Wild Animals Protection Ordinance (Cap. 170) and listed as "Near Threatened" in IUCN Red List Status
 "VC" – Very Common; "UC" – Uncommon; "C" - Common
 "+" – Species exists in the study area
 "++" – Species common in the study area
 "+++" – Species abundance in the study area
 - Reference point was the sampling location outside the works area used to compare the with the data within works area.

Table 4.5 Aquatic Macro invertebrates recorded at Upper Tai Po River (T1- Upper stream sampling site and T2- Lower stream sampling site)

Species	Chinese name	Sampling point	Pre construction monitoring			Post construction monitoring																																						
			Jun-14			Jul-14			Aug-14			Sep-14			Oct-14			Nov-14			Dec-14			Jan-15			Feb-15			Mar-15			Apr-15			May-15			Jun-15			Jul-15		
			Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2						
Mollusca																																												
<i>Biomphalaria sp.</i>	--	NP	VC	+	+	+																																						
<i>Brotia hainanensis</i>	--	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+					
<i>Melanoides tuberculata</i>	福寿螺	NP	VC	+																																								
<i>Physella acuta</i>	小湖肺螺	NP	VC	+																																								
<i>Pomacea canaliculata</i>	福寿螺	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+						
<i>Radix plicatulus</i>	鐘白螺	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+						
<i>Sinotia quadrata</i>	田螺	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+						
Insects																																												
<i>Anisocentropus sp.</i>	--	NP	VC	+			+																																					
<i>Arctopora sp.</i>	--	NP	VC																																									
<i>Aulocodes sp.</i>	--	NP	VC																																									
<i>Baetis sp.</i>	--	NP	VC	+			+																																					
<i>Chironomus sp.</i>	蠓幼虫	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+						
<i>Ephemera sp.</i>		NP	VC	+			+																																					
<i>Indobaetis sp.</i>		NP	VC	+			+																																					
<i>Mnais sp.</i>		NP	VC	+	+		+																																					
Odonate Larvae		NP	VC																																									
<i>Orithetrum sp.</i>		NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+						
<i>Perla sp.</i>		NP	VC				+																																					
<i>Rhaphium sp.</i>		NP	VC				+																																					
<i>Tipulidae spp.</i>		NP	VC																																									
Crustacea																																												
<i>Caridina cantonensis</i>	廣東米蝦	NP	VC	+	+	+	+	+	+	+	+	+	+	++	+	+	++	+	+	++	+	+	++	+	+	++	++	++	++	++	++	++	++	++	++	++	++	++	++					
<i>Cryptopotamon anacoluthon</i>	鱗刺溞	NP	C	+			+																																					
<i>Eriochelone japonica</i>	日本絨螯蟹	NP	C																																									
<i>Macrobrachium hainanense</i>	海南沼蝦	NP	VC	+			+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+						
No of Species				15	9	5	18	10	6	18	9	8	19	12	8	19	13	7	19	11	6	16	10	5	19	10	5	18	7	4	19	7	5	20	7	4	15	7	4	15	7	4		

Note:
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 "VC" – Very Common; "UC" – Uncommon; "C" – Common
 "+" – Species exists in the study area
 "++" – Species common in the study area
 "+++ " – Species abundance in the study area
 - Reference point was the sampling location outside the works area used to compare the with the data within works area.

Table 4.5 Aquatic Macro invertebrates recorded at Upper Tai Po River (T1- Upper stream sampling site and T2- Lower stream sampling site)

Species	Chinese name	Sampling point	Post construction monitoring																																																
			Aug-15			Sep-15			Oct-15			Nov-15			Dec-15			Jan-16			Feb-16			Mar-16			Apr-16			May-16			Jun-16			Jul-16			Aug-16												
			Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2													
Mollusca																																																			
<i>Biomphalaria sp.</i>	環形扁螺	NP	VC	+			+					+							+					+																											
<i>Brotia hainanensis</i>	海南扁螺	NP	VC	+	+		+	+				+	+					+	+				+	+																											
<i>Melanoides tuberculata</i>	網環扁螺	NP	VC	+			+					+							+					+																											
<i>Physella acuta</i>	小溝扁螺	NP	VC																																																
<i>Pomacea canaliculata</i>	福壽螺	NP	VC	++	+	+	++	+	+	+	++	+	+	+	++	+	+	++	+	+	++	+	+	++	+	+	++	+	+	++	+	+	++	+	+	++	+	+	++	+	+	++	+	+							
<i>Radix plicatulus</i>	鐘白螺	NP	VC	+			+					+							+					+																											
<i>Sinoitaia quadrata</i>	田螺	NP	VC	+	+		+	+				+	+						+	+				+	+																										
Insects																																																			
<i>Anisocentropus sp.</i>		NP	VC	+			+					+							+					+																											
<i>Arctopora sp.</i>		NP	VC	+			+					+							+					+																											
<i>Autocodes sp.</i>		NP	VC																																																
<i>Baetis sp.</i>		NP	VC																																																
<i>Chironomus sp.</i>	蠅幼虫	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+				
<i>Ephemerella sp.</i>		NP	VC																																																
<i>Endobaetis sp.</i>		NP	VC	+								+											+																												
<i>Mnais sp.</i>		NP	VC	+								+											+																												
Odonate Larvae		NP	VC	+								+											+																												
<i>Orthetrum sp.</i>		NP	VC	+	+			+			+	+			+	+			+	+		+	+			+	+			+	+			+	+			+	+			+	+								
<i>Perla sp.</i>		NP	VC	+			+				+				+				+				+			+				+				+				+													
<i>Rhaphium sp.</i>		NP	VC																																																
<i>Tipulidae spp.</i>		NP	VC																																																
Crustacea																																																			
<i>Caridina cantonensis</i>	廣東米蝦	NP	VC	++	+	+	++	+		++	+		++	+		++	+		++	+		++	+		++	+		++	+		++	+		++	+		++	+		++	+		++	+		++	+		++	+	
<i>Cryptopotamon anacoluthon</i>	鱗刺溞	NP	C																																																
<i>Eriocheir japonica</i>	日本絨螯蟹	NP	C																																																
<i>Macrobrachium hainanense</i>	海南沼蝦	NP	VC	+			+				+				+				+			+			+				+				+				+				+				+						
No of Species				16	6	4	16	6	3	16	6	3	16	6	3	16	6	3	16	6	3	16	6	3	16	6	3	15	6	3	15	6	3	15	6	3	15	6	3	15	6	3	15	6	3	15	6	3			

Note:
 "NP" - Not protected in Hong Kong
 "r" - Listed in Wild Animals Protection Ordinance (Cap. 170) and
 listed as "Near Threatened" in IUCN Red List Status
 "VC" - Very Common; "UC" - Uncommon; "C" - Common
 "+" - Species exists in the study area
 "++" - Species common in the study area
 "+++ " - Species abundance in the study area
 - Reference point was the sampling location outside the works
 area used to compare the with the data within works area.

Table 4.5 Aquatic Macro invertebrates recorded at Upper Tai Po River (T1- Upper stream sampling site and T2- Lower stream sampling site)

Post construction monitoring																													
Species	Chinese name	Sampling point	Sep-16			Oct-16			Nov-16			Dec-16			Jan-17			Feb-17			Mar-17			Apr-17			May-17		
			Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2
Mollusca																													
<i>Biomphalaria sp.</i>		NP VC	+			+			+			+			+			+			+			+			+		
<i>Brotia hainanensis</i>		NP VC	+	+		+	+		+	+		+	+		+	+		+	+		+	+		+	+		+	+	
<i>Melanoides tuberculata</i>	福寿螺	NP VC	+		+	+		+		+		+		+		+		+		+		+		+		+		+	
<i>Physella acuta</i>	小膀胱螺	NP VC	+			+			+			+			+			+			+			+			+		
<i>Pomacea canaliculata</i>	福寿螺	NP VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
<i>Radix plicatulus</i>	田螺	NP VC	+			+			+			+			+			+			+			+			+		
<i>Sinotia quadrata</i>	田螺	NP VC	+	+		+	+		+	+		+	+		+	+		+	+		+	+		+	+		+	+	
Insects																													
<i>Anisocentropus sp.</i>		NP VC	+			+			+			+			+			+			+			+			+		
<i>Arctopora sp.</i>		NP VC	+			+			+			+			+			+			+			+			+		
<i>Aulocodes sp.</i>		NP VC																											
<i>Baetis sp.</i>		NP VC																											
<i>Chironomus sp.</i>	孑孓	NP VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
<i>Ephemera sp.</i>		NP VC																											
<i>Indobaetis sp.</i>		NP VC	+			+			+			+			+			+			+			+			+		
<i>Mnais sp.</i>		NP VC	+			+			+			+			+			+			+			+			+		
Odonate Larvae		NP VC	+			+			+			+			+			+			+			+			+		
<i>Orthetrum sp.</i>		NP VC	+	+		+	+		+	+		+	+		+	+		+	+		+	+		+	+		+	+	
<i>Perla sp.</i>		NP VC	+			+			+			+			+			+			+			+			+		
<i>Rhaphium sp.</i>		NP VC																											
<i>Tipulidae spp.</i>		NP VC																											
Crustacea																													
<i>Caridina cantonensis</i>	廣東米蝦	NP VC	+	+		+	+		+	+		+	+		+	+		+	+		+	+		+	+		+	+	
<i>Cryptopotamon anacoluthon</i>	刺藻蟹	NP C	+			+			+			+			+			+			+			+			+		
<i>Eriocheir japonica</i>	日本絨螯蟹	NP C																											
<i>Macrobrachium hainanense</i>	海南沼蝦	NP VC	+			+			+			+			+			+			+			+			+		
No of Species			17	6	3	17	6	3	17	6	3	17	6	3	18	6	3	18	6	3	18	6	3	18	6	3	18	6	3

Note:
 "NP" – Not protected in Hong Kong
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 "VC" – Very Common; "UC" – Uncommon; "C" - Common
 "+" – Species exists in the study area
 "++" – Species common in the study area
 "+++" – Species abundance in the study area
 - Reference point was the sampling location outside the works area used to compare the with the data within works area.

Table 4.6 Fish species and Hong Kong Newt recorded at Upper Tai Po River (T1- Upper stream sampling site and T2 - Lower stream sampling

Species	Status	Commonness	Post construction monitoring										Post construction monitoring										Post construction monitoring						Reference					
			Dec-15			Jan-16			Feb-16			Mar-16			Apr-16			May-16			Jun-16			Jul-16			Aug-16			Sep-16				
			Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	Reference	
<i>Cyprinus carpio</i> var. <i>viridiviolaceus</i>	錦鯉	NP	C																															
<i>Gambusia affinis</i>	食蚊魚	NP	VC	+	+		+	+		+	+		+	+		+	+		+	+		+	+		+	+		+	+		+	+		
<i>Glyptothorax pallozomum</i>	白線紋胸鮒	NP	R																															
<i>Liniparhomaloptera disparis</i>	擬平鰈	NP	C	+			+			+			+			+			+			+			+			+			+			
<i>Misgurnus anguillicaudatus</i>	泥鰌	NP	C																															
<i>Oreochromis niloticus</i>	尼羅口孵非鯽	NP	C	+			+			+			+			+			+			+			+			+			+			
<i>Parazacco spilurus</i>	異鱸	V and	C	+	+		+	+		+	+		+	+		+	+		+	+		+	+		+	+		+	+		+	+		
<i>Poecilia reticulata</i>	孔雀花魚將	NP	C																															
<i>Pseudobagrus trilineatus</i>	三線變鱧	NP,GC	R	+																														
<i>Pseudogastromyzon myersi</i>	麥氏擬腹吸鰍	NP	C	+			+			+			+			+			+			+			+			+			+			
<i>Pterocryptis cochinchinensis</i>	越南隱鰐鯪	NP	C	+			+			+			+			+			+			+			+			+			+			
<i>Puntius semifasciolatus</i>	七星魚	NP	C	+	+		+	+		+	+		+	+		+	+		+	+		+	+		+	+		+	+		+	+		
<i>Rhinogobius</i> spp.	鰓虎魚	NP	C	+	+	+	+	+		+	+	+	+	+		+	+	+	+	+		+	+	+	+	+	+	+	+	+	+	+	+	
<i>Schistura fasciolata</i>	橫紋南鰍	NP	C	+			+			+			+			+			+			+			+			+			+			
<i>Xiphophorus hellerii</i>	劍尾魚	NP	C	+			+			+			+			+			+			+			+			+			+			
<i>Xiphophorus variatus</i>	雜色劍尾魚	NP	C																															
			2x2m fish	45	20	5	50	15	5	45	20	5	45	20	5	40	15	5	25	10	5	25	10	5	20	7	2	22	5	2	22	2	2	25
			No of Speices	12	4	1	11	4	1	11	4	1	11	4	1	11	4	1	12	2	1	11	2	1	12	2	1	12	2	1	12	1	1	12
Amphibian																																		
<i>Paramesotriton hongkongensis</i>	香港摩螈	P	UC	+			+			+			+			+			+			+			+			+			+			

Note: NP – Not protected in Hong Kong; P - Protected in Hong Kong
 "VC" – Very Common; "UC" – Uncommon; "C" - Common
 "+" – Species exists in the study area
 "++" – Species common in the study area
 "+++" – Species abundance in the study area
 V – Listed as vulnerable in China Fish Red Data Book
 GC- Global Concern - Fellowes *et al* (2002)
 - Reference point was the sampling location outside the works area used to compare with the data within works area.

Table 4.6 Fish species and Hong Kong Newt recorded at Upper Tai Po River (T1- Upper stream sampling site and T2 - Lower stream sampling

Species	Status	Commonness	Construction monitoring		Post construction monitoring			Post construction monitoring			Post construction monitoring			Post construction monitoring			Post construction monitoring			Post construction monitoring						
			Oct-16		Nov-16		Dec-16		Jan-17		Feb-17		Mar-17		Apr-17		May-17									
			T1	T2	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	
<i>Cyprinus carpio var. viridiviolaceus</i>	錦鯉	NP	C																							
<i>Gambusia affinis</i>	食蚊魚	NP	VC			+																				
<i>Glyptothorax pallozomum</i>	白線紋胸鮡	NP	R			+																				
<i>Liniparhomaloptera disparis</i>	擬平鰈	NP	C			+																				
<i>Misgurnus anguillicaudatus</i>	泥鰍	NP	C																							
<i>Oreochromis niloticus</i>	尼羅口孵非鯽	NP	C			+																				
<i>Parazacco spilurus</i>	異鱸	V and	C			+																				
<i>Poecilia reticulata</i>	孔雀花魚將	NP	C																							
<i>Pseudobagrus trilineatus</i>	三線鰻鮠	NP,GC	R			+																				
<i>Pseudogastromyzon myersi</i>	麥氏擬腹吸鰈	NP	C			+																				
<i>Pterocryptis cochinchinensis</i>	越南隱鰈鮠	NP	C			+																				
<i>Puntius semifasciolatus</i>	七星魚	NP	C			+																				
<i>Rhinogobius spp.</i>	鰻虎魚	NP	C	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+		
<i>Schistura fasciolata</i>	橫紋南鰈	NP	C			+																				
<i>Xiphophorus hellerii</i>	劍尾魚	NP	C			+																				
<i>Xiphophorus variatus</i>	雜色劍尾魚	NP	C																							
		2x2m fish		2	2	30	2	2	35	2	2	40	2	2	45	2	2	45	2	2	40	2	2	30	2	2
		No of Speices		1	1	12	1	1	12	1	1	12	1	1	12	1	1	12	1	1	12	1	1	12	1	1
Amphibian																										
<i>Paramesotriton hongkongensis</i>	香港摩螈	P	UC																							

Note: NP – Not protected in Hong Kong; P - Protected in Hong Kong
“VC” – Very Common; “UC” – Uncommon; “C” - Common
“+” – Species exists in the study area
“++” – Species common in the study area
“+++” – Species abundance in the study areae
V – Listed as vulnerable in China Fish Red Data Book
GC- Global Concern - Fellowes *et al* (2002)
- Reference point was the sampling location outside the works area used to compare with the data within works area.

Table 4.7 Abiotic data for Upper Tai Po River (T1- Upper stream sampling site and T2- Lower stream sampling site)

Parameters/ Date	Jan-17		Feb-17		Mar-17		Apr-17		May-17	
	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2
Replicate										
DO (mg/L)	7.9	8.0	8	8.0	7.9	8.0	8.0	8.0	7.9	8.0
pH	7.6	7.6	7.6	7.7	7.6	7.7	7.7	7.7	7.7	7.8
Nitrate (mg N/L)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Ammonia (mg/L)	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Salinity (ppt)	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Conductivity (mS/cm)	33	35	29	32	27	29	30	31	29	27
BOD (mg/L)	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2
Water flow at pool (m/s)	0.01-0.3		0.01-0.3		0.01-0.3		0.01-0.3		0.01-0.3	
Water flow at riffle (m/s)	0.3-0.6		0.3-0.6		0.3-0.6		0.3-0.6		0.3-0.6	
Sand (%)	0	0	0	0	0	0	0	0	0	0
Stone (%)	40	20	40	20	40	20	40	20	40	20
Mud (%)	0	0	0	0	0	0	0	0	0	0
Concrete(%)	60	80	60	80	60	80	60	80	60	80